A Mariner's Guide to

PREVENTING COLLISIONS

Convention on the International Regulations for Preventing Collisions at Sea, 1972; including all amendments.

Interpreted & fully explained for practical application



Includes

- IALA Maritime Buoyage System
- Basic Ship Handling
- Trend Analysis of Maritime Collisions
- Leadership and Management
- STCW Code Section A-VIII/2 as revised in June 2010 on Bridge Watchkeeping
- Self Assessment Tests

APPROVED
By Indian Maritime University
For Deck Cadets DNS Course

RECOMMENDED
By D G. Shipping (Govt. of India)
For Chief Mate (FG) Phase I & II

Revised
...t 2014

Capt. Yashwant Chhabra

MAREX

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...a remarkable piece of work that should find a place of pride on the desk of every officer whose job requires them to peer through the wheelhouse windows.

Capt. Kamal Chadha
Editor and Managing Director, Marex Media Pvt Ltd

The best book available today on the subject. A must for every navigator.

Capt. Sunder Singh Chowdhry
Recently promoted Master (Anglo-Eastern Ship Management Ltd.)

Capt. Yashwant Chhabra has a deep understanding of the importance of ensuring that attitudes are in line with desired behaviour. ...he also makes us understand that the COLREGs are indeed there for good reason.

Martin Hernqvist
Managing Director, The Swedish Club Academy AB

The work is a bright ray of knowledge shining through the prism of professionalism.

Tony Fernandez
Risk Management Consultant. Former Visiting Professor of Maritime Law and Insurance Law, Mumbai University.



...the 'maritime trainer' shows his hand in the way that case studies have been included... the lucid explanations will make understanding of the subject fairly simple to even the new entrants to shipping.

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M.Sc (MET), World Maritime University Sweden

For over 2 decades I have seen Capt. Chhabra's expertise in navigational training to be amongst the best. The book is even more exhaustive, surely recommended from fresh cadets to the well experienced to achieve mastery of the subject.

Capt. K S D Mistree
Former Principal, Anglo-Eastern Maritime Academy

The case studies will be of immense help to the students as well as their teachers and examiners; I am sure that the book will be of great value and immense help to all in the Nautical profession.

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Former Managing Director Indian Operations, Wallem Shipmangement Limited, Hong Kong & past Master of The Company of Master Mariners of India

Interpretation of the Rules to the minutest details are explained for practical application. Diagrams, case studies, ship handling, leadership & management and watchkeeping requirements with self examination tests invoke thinking.

Captain Sunil Srivastava
Officer-in-Charge Navigation Direction School, Naval Base, kochi

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Interpreted & fully explained for practical application

Capt. Yashwant Chhabra

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Inside front cover picture & sailing vessel after Rule 25:
Mrs. Seema Chhabra when on a ship transiting across Copenhagen, June 2009.

Inside back cover picture:
Mr. Naveen Singh Pundir, on a vessel anchored off Hammerfest, March 2009.

Chartlets of Lights and Shapes:
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CONTENTS

i	**Contents**		i
ii	**Foreword**		iii
iii	**Acknowledgements**		v
iv	**Waiver note**		vi
v	**Study notes**		vi
1	Introduction to 'The Convention on International Regulations for Preventing Collisions at Sea', 1972, as amended		1
2	Rule 1	Application (of the Rules)	7
3	Rule 2	Responsibility	10
4	Rule 3	General definitions	14
5		Introduction - Part B Steering and Sailing Rules	21
6	Rule 4	Application - section I of Part B: Conduct of vessels in any condition of visibility	21
7	Rule 5	Look-out	22
8	Rule 6	Safe speed	31
9	Rule 7	Risk of collision	48
10	Rule 8	Action to avoid collision	61
11	Rule 9	Narrow channels	74
12	Rule 10	Traffic separation schemes	80
13		History of Ships' routeing and Traffic Separation Schemes	96
14		Introduction - Part B Section II	99
15	Rule 11	Application - section II of Part B: Conduct of vessels in sight of one another	102
16	Rule 12	Sailing vessels	104
17	Rule 13	Overtaking	107
18	Rule 14	Head-on situation	112
19	Rule 15	Crossing situation	116
20	Rule 16	Action by give-way vessel	121
21	Rule 17	Action by stand-on vessel	123
22	Rule 18	Responsibilities between vessels	130
23		Conclusions Comments to Section II of Part B	135
24		Introduction to Section III of Part B Conduct of vessels in restricted visibility	139
25	Rule 19	Conduct of vessels in restricted visibility	140
26		Introduction - Part C Lights and Shapes	153
27	Rule 20	Application (of Part C)	155

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28	Rule 21	Definitions (Lights and Shapes)	157
29	Rule 22	Visibility of lights	160
30	Rule 23	Power-driven vessels underway	161
31	Rule 24	Towing and pushing	165
32	Rule 25	Sailing vessels underway and vessels under oars	174
33	Rule 26	Fishing vessels	178
34	Rule 27	Vessels not under command or restricted in their ability to manoeuvre	183
35	Rule 28	Vessels constrained by their draught	192
36	Rule 29	Pilot vessels	193
37	Rule 30	Anchored vessels and vessels aground	194
38	Rule 31	Seaplanes	197
39		introduction - Part D Sound and Light signals	199
40	Rule 32	Definitions	200
41	Rule 33	Equipment for sound signals	201
42	Rule 34	Manoeuvring and warning signals	202
43	Rule 35	Sound signals in restricted visibility	208
44	Rule 36	Signals to attract attention	213
45	Rule 37	Distress signals	214
46	Rule 38	Exemptions (Part E)	215
47	Annex I	Positioning and technical details of lights and shapes	217
48	Annex II	Additional signals for fishing vessels fishing in close proximity	222
49	Annex III	Technical details of sound signal appliances	223
50	Annex IV	Distress signals	225
51	IALA Buoyage System		227
52	Basic ship handling for preventing risk of collision		237
53	Trend analysis of maritime collisions		261
54	Leadership and Management in preventing collisions		267
		Risk of collision - Management	270
		Human element and human factors	276
		Practical Management aspects	280
		Training / Mentoring	293
		Leadership challenge	294
55	STCW Requirements on watchkeeping (navigational) as revised in June 2010		296
56	Self assessment test		305
57	Answers to the self assessment test		344
58	Circulars issued by the flag states of Bahamas, Marshall Islands and Singapore		349

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सत्यमेव जयते

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Date: 27th April 2011

FOREWORD

I have known Capt. Yashwant Chhabra since 1994. His intimate association with maritime training & education, safety and quality management systems, and the HR management aspects of the shipping industry is indeed noteworthy.

In this book, Capt. Chhabra has explained not only the interpretation of the collision prevention rules, but also their best practical application. The script is well linked to the STCW watchkeeping requirements, case studies, basic ship handling and the human element. The self examination test is well crafted to invoke the thinking process of the readers. This work is a substantial improvement on his previous book on the same subject and reflects on collision prevention in a fresh light.

I have often observed that in the certificate of competency examinations there is a lack of appreciation and proper application of the collision prevention rules. This conviction is further vindicated by the disturbing increase in collision incidents at sea. Clearly, there is an urgent need to address this concern, and I am pleased to note that this book is a sincere effort in that direction.

I am sure this work will impart an impetus to those concerned with the fields of maritime education, examination and management on board and ashore, to continuously improve the comprehension and application of the collision prevention regulations, which in turn will lead to enhanced safety at sea.

Besides Collision Prevention the Traffic Separation Schemes and Buoyage systems are lucidly explained in the book. In line with the latest requirements in shipping he has also included the relevance of management in prevention of collisions at sea.

I wish success to the author, publishers, and all users of this book.

(Capt. M.M. Saggi)

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Dedicated to my late Parents
Lt. Col. Harbans Lal Chhabra (MBBS) and Mrs. Nirmala Chhabra

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It is with immense gratitude that I acknowledge the support and help of:

My many teachers, colleagues and students, who have in many ways, obvious and at times unseen, moulded my thoughts and continue to fuel my quest for deeper knowledge. And the multitude of course participants whose curious minds have had me researching, often past civilized hours.

Late Dr. Narendra Singh (B.Sc, MBBS, MD), my lifelong guide and mentor, who mentored and influenced my life since early childhood.

Capt. P.S. Barve, former Nautical Advisor to the Government of India, under whose guidance I participated in the Distance Learning Diploma programme of BITS Pilani from 1997 till 2004. He has also been my guide for this book on the interpretation and application of the Rules; the book also reflects many distance learning concepts of self studies. I remain grateful for his time, support and sound advice.

Capt. R.M.A. Mody, my Guru at sea and whom I fondly call Godfather, for his innumerable practical suggestions.

Mr. Tony Fernandez, my Guru ashore; the chapter on 'Leadership and Management' was written with his active involvement through several sessions.

Mr. S.K. Batra, topper and gold medallist from IIT Kharagpur, 1968. He taught me sciences way back in 1971 and has guided me ever since then; a special mention here not just for being the first person to encourage me to write but also for having reviewed most of this work from a non mariner's perspective and having made many significant suggestions.

Capt. Pradeep K. Chawla, Managing Director, QHSE and Training at Anglo-Eastern Ship Management for encouraging and supporting this work.

Capt. Kiriti Guha, who passed on to me the best practical HR and management practices during the decade of working under his stewardship.

Mr. B.S. Teeka, who had appreciated the effectiveness of my navigational training in Executive Ship Management and who, despite being an engineer, had also asked me to write on navigation.

My close friends and former colleagues Capt. S.S. Manjeshwar and Capt. N.K. Sah with whom I have had the most intense debates on these Rules when we started delving deeper into these subjects from 1995 onwards when working at Wallem Maritime Training Centre. My colleagues in Anglo-Eastern for their active involvement in the many debates and related research, Capt. Karamjit Singh Sodhi, Capt. Ravi Kulkarni, Capt. Tescelin Almeida, Capt. Sureen Narang, Capt. Prashant Gour, Capt. Anil Bhatia, Capt. Sriram Rajagopal, Capt. Gulraj Chhugani, Capt. Sanjay Mohan, Capt. Suneel Sule, Capt. Varun Rawat, Capt. Sanjiv Sehgal, Capt. M.R. Sriram, Capt. Deepankar Das and Ms. Pinky B. Roy.

Capt. Kamal Chadha, the Managing Director of Marex Media Pvt. Ltd., and a friend of many summers, who has cast a careful eye on the final manuscripts and made several useful suggestions to help the work to final fruition. I remain obliged and thankful to him and his cooperative team, especially Shirish, Manish and Santosh for toiling with me on many a holiday and Seema Singh for proof reading the Rules.

I appreciate my wonderful wife Seema, not just for encouraging me to work on this book but also for her patience and support every time I have remained removed from the family working awkward hours, for helping me with net-based research, HR elements, proof reading and editing.

Our children, Anukriti, Ansh and Aakriti for assisting with the work from a young learners perspective.

The Almighty for keeping me in sound mind and health throughout.

Yashwant Chhabra
08 August 2014

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STUDY NOTES

1: The book is primarily designed as a self study guide to help educate fresh cadets and officers for certificates of competency examinations, to learn best practical application at sea, to serve as a reference book for all ranks, as well as for teachers and examiners. A lot of mature level study work within the book has been placed inside boxes. **The contents in these boxes, the chapters on basic ship handling, leadership and management and self assessment test questions with a star, may be skipped by the beginners till after they have gained adequate sea experience.**

2: It is suggested that beginners highlight in their copies the words 'shall' and 'should' in red or orange, and the word 'may' in green; this will help analyse the meaning of the Rules to construe their aspects better, and help in their practical application at sea.

3: Updated Errata and Corrections are available on www.marexbulletin.com

REFERENCES

The following books and publications have been referred to in the research associated with developing the explanations given in this book:

- Various information published and/or released by IMO, Flag States, Maritime bodies, Associations, Shipping Companies, P & I Clubs and court rulings including information available on the internet. The majority has been acknowledged in the text wherever quoted.
- Marine Guidance and Information notes of The Maritime and Coastguard Agency of UK.
- U.S. Department of Homeland Security, United States Coast Guard, Navigation Rules.
- Collision Avoidance Principles and Practice, Capt. Y. Chhabra, published by Bhandarkar Publications in October 2008.
- The Nautical Institute, various surveys and articles on 'International Regulations for Preventing Collisions at Sea', especially those of Capt. Roger Syms.
- Marine Resource Management concepts, The Swedish Club.
- A Guide to the Collision Avoidance Rules, A.N. Cockcroft and J.N.F. Lameijer.
- A Guide to Preventing Marine Casualties, especially the Collision. Mitsui Sumitomo Insurance Co. Ltd.
- Collisions and their causes, Capt. R.A. Cahill, published by The Nautical Institute.
- Handbook of the Nautical Rules of the Road by Llana and Wisneskey.
- Managing Collision Avoidance at Sea, Capt. Gilbert W.U. Lee and Mr. Julian Parker, published by The Nautical Institute.

WAIVER NOTE

The Rules, Regulations and Legislative requirements have been quoted in this book in good faith as per the latest information available only for the purpose of explaining the same.

The interpretation of the International Regulations for Preventing Collisions at Sea, 1972, as amended, and other legislation referred to combined with the advice on the best practical application is based on the authors understanding and perception based on his experience.

Neither the author, Capt. Yashwant Chhabra, nor the publishers of his work. Marex Media Pvt. Ltd., claim that the legislation quoted or the advice given in this book is perfect or free of any errors, though all efforts have been made to eliminate the same. And as such both cannot be held liable for any claims of any kind whatsoever for any failure whatsoever attributed to this work.

All readers and users of this book are advised to refer to IMO and/or Flag State publications for exact wordings of the law and their advice on any interpretations and/or expected best practice.

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Introduction to the "Convention on the International Regulations for Preventing Collisions at Sea", 1972; as amended

The presently applicable Rules explained in this book were adopted by the International Maritime Organization (IMO) in the ***'Convention on the International Regulations for Preventing Collisions at Sea'*** on 20th October 1972 which entered into force on 15th July 1977. They have been amended several times since then - in 1981, 1987, 1989, 1993, 2001 and the last effective from 1st December 2009. MSC.1/Circ. 1427 of 28 May 2012 is the last known circular by IMO clarifying the interpretations of these Rules. There were earlier versions of these Rules too; the historical details about their evolution is a separate matter.

IMO and many bodies usually refer to the Rules of this convention as ***'COLREGS'***; this short form has been used in this book, of late ***'IRPCS'*** is being used as a more appropriate short form and has also been used in this book at places. These Rules have traditionally been, and continue to be referred to as 'ROR' (Rules of the Road), though there are no roads at sea, and are sometimes simply called 'Collision Regulations', though they are and remain ***'the International Regulations for Preventing Collisions at Sea'***, meant for ***'Preventing Collisions'***. The objective of this book is to educate the readers in understanding these Rules by way of interpretations, case studies and court rulings. Advice on best practices ***'for Preventing Collisions'*** by proper application of these Rules while navigating at sea remains the prime element of these explanations.

These Rules are an international convention by themselves and applicable to all vessels irrespective of their type or flag. Their applicability is stated and required by the STCW convention quoted below, ***'STCW', 'SOLAS'*** and other regulatory requirements have been referred to and/or quoted with the explanations as and where relevant. The ***'COLREGS'*** or ***'IRPCS'*** have to be applied in conjunction with the ***'watchkeeping arrangements and principles'*** from the ***'STCW Code'*** and other Regulatory requirements for safe navigation, not alone or in isolation.

STCW Code A-VIII/2, paragraph 10 states:
The master of every ship is bound to ensure that watchkeeping arrangements are adequate for maintaining a safe navigational watch. Under the master's general direction, the officers of the navigational watch are responsible for navigating the ship safely during their periods of duty, when they will be particularly concerned with avoiding collision and stranding.

And

STCW Code A-VIII/2, paragraph 13 states:
The officer in charge of the navigational watch is the master's representative and is primarily responsible at all times for the safe navigation of the ship and for complying with the International Regulations for Preventing Collisions at Sea, 1972, as amended.

Note: underlined text, here or later, is not part of the original legislation but meant to highlight the importance of the requirement underlined.

GENERAL ARRANGEMENT OF THE RULES

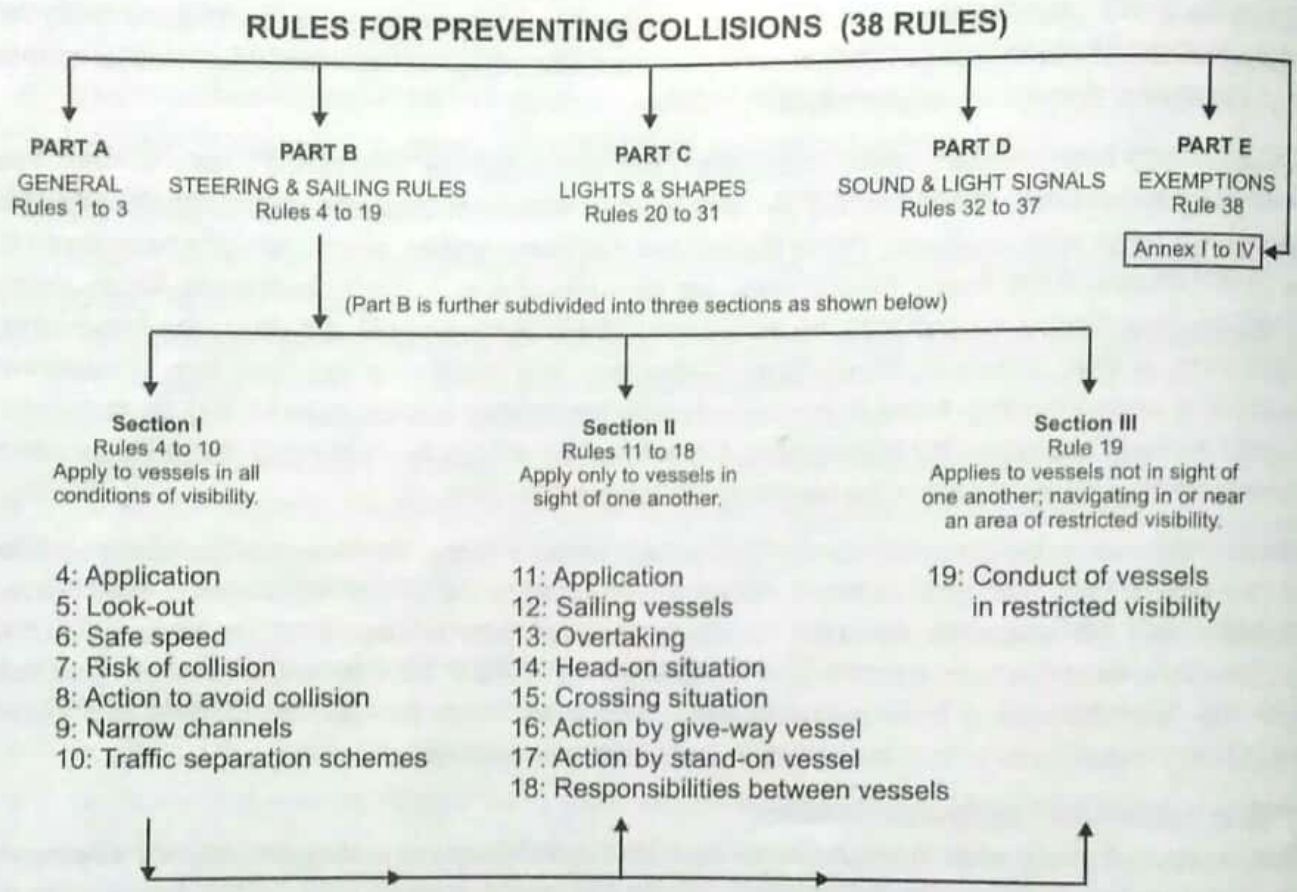
Since the layout, location and language of the Rules have an impact on their interpretation and practical application, it is important to understand these aspects. The Rules are divided into 5 Parts, namely A, B, C, D and E followed by Annexes I to IV. Part B is further subdivided into 3 sections I, II & III; other Parts have no such subdivisions.

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Annexes give detailed information on the technical requirements, standards and specifications of fittings and equipment. They also influence the way some of these Rules are interpreted and applied in practice.

The layout of the Rules is shown below:

The Rules are followed by Annexes I to IV, the details of which are given further below.



(For titles of other Rules, please refer to the content page.)

Part ***A,*** termed ***'General',*** consists of Rules 1 to 3 on ***'application'***, ***'responsibility'*** and ***'general definitions'***.

Part ***B,*** termed ***'Steering & Sailing Rules',*** contains Rules 4 to 19 which pertain to all activities for ***'preventing collisions'***. Part B is further subdivided into three sections as shown above. This Part is considered the most important of the five Parts because almost all actions required for detecting, assessing and determining any ***'risk of collision'*** as well as ***'any action to avoid collision'*** should be executed in compliance with the Rules of this Part.

Part B section **I** contains Rules 4 to 10, applicable to vessels ***'in any condition of visibility'***. This means **at all times** at sea without exception. It is important to note that Rules 4 to 10 continue to apply fully with the Rules of Section II (Rules 11 to 18) and Section III (Rule 19). However, the requirements of Rule 13 on ***'overtaking'*** over ride all other Rules from 4 to 18.

Part B section **II** contains Rules 11 to 18 that only ***'apply to vessels in sight of one another'***. In sight

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is defined in Rule 3(k) as ***'vessels shall be deemed to be in sight of one another only when one can be observed visually from the other'.***

Part B section **III** on ***'conduct of vessels in restricted visibility'*** contains only Rule 19 applicable ***'to vessels not in sight of one another when navigating in or near an area of restricted visibility'***. When Rule 19 gets invoked as per these conditions, Rules of Part B section I continue to apply as explained, but Rules of section II are not applicable as vessels are ***'not in sight of one another'***. This is one of the two requirements stated for the activation of Rule 19.

Part ***C,*** termed ***'Lights & Shapes',*** consists of Rules 20 to 31 and specifies the lights and shapes required to be exhibited by various types of vessels depending on their condition and/or activity.

Part ***D,*** termed ***'Sound and Light Signals',*** consists of Rules 32 to 37 and specifies the sound and light signals that have to be complied with by different types of vessels in various circumstances and conditions.

Part ***E,*** termed ***'Exemptions',*** consists only of Rule 38, which defines the various exemptions granted to older vessels with respect to complying with the requirements of the present set of Rules.

These 5 Parts are followed by 4 Annexes as follows:

ANNEX I: **Positioning and technical details of lights and shapes**.

ANNEX II: **Additional signals for fishing vessels fishing in close proximity**.

ANNEX III: **Technical details of sound signal appliances**.

ANNEX IV: **Distress signals**.

Although the English language has become the lingua franca of the world, the interpretation and the meanings of several words may sometimes get confusing and lead to misunderstandings. Though these Rules have officially been published in several languages by IMO, the final interpretations are usually based on the English text in case of any dispute with respect to their meaning; it is also because the vast majority of court judgements on collisions are done as per English law.

To achieve correct interpretation and understanding of these Rules and to enable their correct application at sea, it is important that the meanings of some of the important words are clear. The meanings and/or explanations of some of the commonly used words and abbreviations follow, some from the text of the Rules, others may feature as part of the explanations.

APPRAISAL: Evaluation, assessment, review, consideration and judgment.

ASPECT: The way in which something may be viewed or regarded, side, position or viewpoint.

AUTHORISED: Formally sanction, permit, give permission, allow or consent.

CONSTRUING: The way something is interpreted and understood or taken to mean.

COMPLYING: Act in accordance with the Rules, commands, or wishes. Obey, or conform to, meet the terms.

DEEMED: Consider to be, to judge or consider something in a particular light.

EXCEPTIONAL: Unusual, extraordinary. Not something usual.

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EXONERATE: Relieve from the wrongful act, pronounce not guilty of criminal charges. Absolve, forgive or pardon.

IMPEDE: Be a hindrance or obstacle to. Block, get in the way of, or hamper.

IMPEDIMENT: Something that interferes with or delays action or progress. Barrier, obstruction.

LOOK-OUT: Watch out, pay attention, be alert, be watchful, keep your eyes open, beware, take care.

MAY: Might, could. Gives an option to do or not to do. While ***may*** gives latitude or freedom to act within the meaning of these Rules, the responsibility of decision-making is not removed. This means that even in a 'May' situation there is a choice, 'to take action or not to take action', but it has to be with due thought and intention. 'May' does not give exemption from any Rule, requirement or an act. 'May' also is used to describe a choice, or is an expression allowing an act or activity.

MUST: Something which has to be done or complied with without exception. Should, be obliged to, have got to, ought to, be required to.

NAVIGATING: Travel through, pass through or traverse, find the way, follow a route.

NOTWITHSTANDING: Despite, in spite of, regardless of.

OBLIGE: Required by law, command, conscience, or force of necessity, to bind morally or legally. Require or compel.

PROPER: Good, correct, appropriate, suitable, apt, fitting etc, and may also mean both efficient and effective.

PRUDENT or **PRUDENCE**: Careful and sensible. Act marked by sound judgment. Being careful, cautious, using good sense, applying farsighted forethought. Discretion applied in practical affairs.

REQUIRED: An order to do something, to impose, necessary, obligatory, compulsory or mandatory.

SHALL: Expressing a strong statement, intention or order. Must be done or followed with no option to deviate.

Note: 'Shall' has been used 272 times in these Rules and 92 times in STCW Code A-VIII/2 paragraph, 1 to 51.

SHOULD: Something right, ought to be done or probable. 'Should' is used as a recommendation only in law but normally is expected to have the same force as 'shall'.

Note: These Rules do use this word 'should', but just thrice, in Rule 8(b), Annex I (8-b) and Annex III(e), while the STCW Code A-VIII/2 till paragraph 51 uses this word just once in paragraph 30.

WILL: Expressing a strong intention or claim about the future or inevitable events. Shall happen. The faculty by which a person decides on and takes action.

In addition, the full forms of some common marine abbreviations are given below; some may feature in this book too.

AIS: Automatic Identification System.

ARPA: Automatic Radar Plotting Aid.

BCR: Bow crossing Range (The closest range at which a target will cross the bows, or the heading marker, not the same as CPA).

BCT: Bow crossing Time.

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COG: Course over Ground.

CBD: Frequently used as a short form for a ***'vessel constrained by her draught'***.

CPA: Closest Point of Approach.

ECDIS: Electronic Chart Display and Information System.

ENC: Electronic Navigational Chart, (Usually Official Vector charts).

HDG: Heading.

INS: Integrated Navigation system.

ISM: International Safety Management (Code).

KTS: Knots (Speed in Nautical miles per hour).

MT: Metric Tonnes.

NM: Nautical miles.

NAVTEX: A device used for sending navigational warning in text by radio telex.

NUC: Frequently used as a short form for a ***'vessel not under command'***.

OOW: 'Officer in charge of the navigational watch' or 'Officer on Watch'.

PPI: Plan Position Indicator, or simply the radar display screen.

PSC: Port State Control.

RADAR:

X-BAND: The smaller 3 cm band width used in Radars, preferred for detecting small targets and short ranges.

S-BAND: The bigger 10 cm band width used in Radars, preferred for long range scanning. Usually gives a better picture in bad weather and rain.

RAM: Frequently used as a short form for a ***'vessel restricted in her ability to manoeuvre'***.

SMS: Safety Management System, required by the ISM Code.

STCW: International convention on Standards of Training, Certification and Watchkeeping for Seafarers 1978, as amended in 2010 and thereafter. Includes the Seafarers' Training, Certification and Watchkeeping Code (STCW Code).

TCPA: Time to the Closest Point of Approach.

TSS: Traffic Separation Scheme (s).

UTC: Universal Time Coordinated.

VDR: Voyage Data Recorder.

VHF: Very High Frequency radiotelephony system used for short range audible communication.

VRM: Variable Range Marker.

VTIS: Vessel Traffic Information System.

VTMS: Vessel Traffic Management System.

VTS: Vessel Traffic Services.

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Rule 1

Application

(a) **These Rules shall apply to all vessels upon the high seas and in all waters connected therewith navigable by seagoing vessels.**

(b) **Nothing in these Rules shall interfere with the operation of special rules made by an appropriate authority for roadsteads, harbours, rivers, lakes or inland waterways connected with the high seas and navigable by seagoing vessels. Such special rules shall conform as closely as possible to these Rules.**

(c) **Nothing in these Rules shall interfere with the operation of any special rules made by the Government of any State with respect to additional station or signal lights, shapes or whistle signals for ships of war and vessels proceeding under convoy, or with respect to additional station or signal lights or shapes for fishing vessels engaged in fishing as a fleet. These additional station or signal lights, shapes or whistle signals shall, so far as possible, be such that they cannot be mistaken for any light, shape or signal authorized elsewhere under these Rules.**

(d) **Traffic separation schemes may be adopted by the Organization for the purpose of these Rules.**

(e) **Whenever the Government concerned shall have determined that a vessel of special construction or purpose cannot comply fully with the provisions of any of these Rules with respect to the number, position, range or arc of visibility of lights or shapes, as well as to the disposition and characteristics of sound-signalling appliances, such vessel shall comply with such other provisions in regard to the number, position, range or arc of visibility of lights or shapes, as well as to the disposition and characteristics of sound-signalling appliances, as her Government shall have determined to be the closest possible compliance with these Rules in respect of that vessel.**

This Rule describes the application of these Rules. ***'The International Maritime Organization'*** (IMO) is a body of the United Nations referred to in paragraph 'd' of this Rule where all international maritime legislation is developed.

[QUIZ: WHEN WAS IMO ESTABLISHED? WHAT WAS THE ORIGINAL NAME OF THIS BODY? WHERE IS IT LOCATED?]

a: Defines the applicability that ***'these Rules shall apply to all vessels'***. ***'Vessel'*** has a rather broad-spectrum definition stated in Rule 3(a) and covers all types of crafts from the largest ships to the tiniest rowing boat, be they civil or naval. ***'High seas'*** means open seas, coastal waters or waters far away from land; 'coastal waters' has no linkage with the territorial waters of any country. These Rules continue to apply to all vessels navigating in all waters connected with the ***'high seas'*** and ***'navigable by sea going vessels'***. However, certain exemptions are given to this latter aspect by paragraph 'b' of this Rule.

b: Allows ***'special rules'*** to be ***'made by an appropriate authority'*** for specific areas and such Rules, if made, shall remain restricted only to the defined areas stated in this paragraph, ***'roadsteads, harbours, rivers, lakes or inland waterways'***. These areas are only ***'connected with the high seas and navigable by sea going vessels'***. The authority to make and implement

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any such special rules is vested with the appropriate body in control of the area concerned.

The requirement that ***'such special rules shall conform as closely as possible to these Rules'*** is to eliminate major differences between any ***'special rules'*** and ***'these Rules'*** to bring about greater consistency between them which should help minimise confusion and related errors and thus reduce the potential for any accidents; mainly collisions. The US inland rules, for example, are generally similar to these International Rules but still do differ substantially in places. The US Rules have not been described or explained in this book but are required to be referred to and observed in US Waters.

Only one set of Rules shall apply in any area. Demarcation boundaries are clearly defined to avoid any confusion. There is no option available to navigators to choose which Rules to follow; neither can the Rules be mixed to suit any individual preferences.

> It is important that sailing directions, navigational charts and other relevant publications are consulted during the passage planning stage of an intended voyage to be aware of such special rules as well as any reporting requirements so that the same are complied with. For example, such special rules exist and are applicable in the inland waters of Japan and in inland waters within the US. The inland rules of the US begin to apply to all traffic when within 3 miles from the US Coast.

c & e: Contain details of special requirements that may be applied as per the defined criteria. However, there is a distinct difference in the requirements stated in paragraphs 'c' & 'e' which sometimes gets confusing, these are explained first and paragraph 'd' is explained later.

c: Covers two aspects, (i) ***'additional station or signal lights, shapes or whistle signals'*** but restricted to ***'ships of war or vessels proceeding under convoy'***.

And (ii) for ***'fishing vessels engaged in fishing as a fleet'***, the points are similar but with a slightly lowered extent of application; the ***'whistle signals'*** clause is absent. The additional provisions cannot be applied to a single fishing vessel operating alone or independently and not forming part of ***'a fleet'***. The provisions stated and required by all other Rules or requirements stated in these Rules shall not interfere with the operation of these ***'special rules'*** . The authority of making any such ***'special rules'*** vests with ***'the Government of any State'***.

This paragraph 'c' further states that the characteristics of these ***'additional station or signal lights, shapes or whistle signals'***, ***'shall, so far as possible, be such that they cannot be mistaken for any light, shape or signal authorised elsewhere under these Rules'***. In other words, the characteristics of these additional systems should be so designed that they are distinctly different from whatever is prescribed and required by these Rules; this is to ensure that there is no confusion in identification and that the additional requirements are not mixed up with the normal requirements of these Rules.

Governments usually prescribe special additional signals for their naval vessels; usually these requirements are universal and some are given below as stated in the US Code of Federal Regulations.

- *Man overboard lights (two pulsating all-round red lights in a vertical line).*
- *Aircraft warning lights (one all-round red light).*

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- *Minesweeping station-keeping lights (two white limited-sector lights).*
- *Submarine identification light (intermittent flashing amber beacon - three flashes, one per second, followed by three-second off period).*
- *Convoy operations stern light (blue light in lieu of regular stern light).*

e: Applies to ***'a vessel of special construction or purpose'*** which is unable to comply with the provisions of these Rules for any reason, as may be determined by the Government of the flag state concerned ***'with respect to the number, position, range or arc of visibility of lights or shapes, as well as to the disposition and characteristics of sound-signalling appliances'***. The Government concerned can then approve alternate provisions in all these aspects, but here the Rule states, ***'as her Government shall have determined to be the closest possible compliance with these Rules in respect of that vessel'***.

This is the main difference between these two paragraphs 'c' and 'e' of this Rule. Requirements developed under paragraph 'c' should have features which ***'cannot be mistaken for any light, shape or signal authorised elsewhere under these Rules'*** and these are ***'additional'*** to the requirements stated in these Rules, whereas the requirements developed to meet paragraph 'e' are in lieu of the requirements of these Rules or are alternate substitutes because the vessel concerned cannot comply with the prescribed standards.

Examples of ***'a vessel of special construction or purpose'*** include aircraft carriers: because of their unique construction, their side lights may be on the sides of the small superstructure which itself is situated on one side to allow for the large flight deck, the mast head lights would also be way off the vessels centre line and with substantially reduced horizontal separation. Some warships of over 50 metres in length may not carry the second masthead light, or the two may be placed much closer to each other both vertically and horizontally than as prescribed by these Rules. Similarly, some research ships and supply vessels may be granted similar exemptions and submarines may have their masthead lights lower than the sidelights, especially the forward one. A submarine may, in addition, display an amber flashing light described above which is usually placed 2 metres above the aft masthead light to indicate its presence.

Hovercrafts are also usually covered under this category: these and other vessels operating on an air cushion are required to be fitted with an additional ***'all-round flashing yellow light'*** as per Rule 23(b), not because of their special construction alone but also due to the high speeds at which they operate.

Annex II contains details of ***'additional signals for fishing vessels fishing in close proximity'*** referred to in Rule 26(d), an activity which could be considered same as ***'fishing vessels engaged in fishing as a fleet'***.

d: Clarifies that IMO only has the authority to adopt ***'traffic separation schemes'***. The conduct of vessels in such officially declared or promulgated schemes is as per Rule 10 of these Rules explained later. All such schemes are usually marked on navigational charts but these may not contain all details, especially on the applicability of the schemes to different types of vessels. Full details should be studied from 'Ships Routeing', an IMO publication.

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Rule 2

Responsibility

(a) Nothing in these Rules shall exonerate any vessel, or the owner, master or crew thereof, from the consequences of any neglect to comply with these Rules or of the neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case.

(b) In construing and complying with these Rules due regard shall be had to all dangers of navigation and collision and to any special circumstances, including the limitations of the vessels involved, which may make a departure from these Rules necessary to avoid immediate danger.

Though these Rules are the law, this Rule emphasises that they are not statements of customary practice or recommended guidance but have to be complied with at all times. This Rule is considered one of the most important amongst all the Rules; not only does it define the authority and responsibility on the application of these Rules but also allows navigators the freedom to deviate from them if the circumstances so warrant by stating, ***'which may make a departure from these Rules necessary to avoid immediate danger'***. This implies that be it strict compliance with the Rules or otherwise, if the situation is turning dangerous, the danger of collision is to be mitigated by all means, including deviating from the routine application of these Rules.

No one connected with the operation of any vessel can be exonerated for not complying with these Rules. In addition, the precautions, which may be required by way of the two factors given below, have to be applied in the day-to-day practice of these Rules, namely:

i: ***'Ordinary practice of seamen'***: this small phrase has a very wide-ranging application and many a times may not be taken into account in the routine day-to-day working. Though it follows the word **may** in ***'may be required'***, it is of paramount importance in these Rules. This phrase has been interpreted to mean all practices, procedures, processes, systems and actions handed down through generations of seafaring and which have proved themselves successful for safe navigation. Such practices and procedures can also be described by the word **'tradition'**, handed down by word of mouth or practices followed on board and need not always be part of the present day documented management systems. In other words practices which have proved to be right in the past or will be expected to be correct by the logical application of **'common sense'** to seafaring. And:

ii: ***'Special circumstances of the case'***: the judgement and discretion of the navigator is allowed for in deciding these. Though these Rules cover all likely situations of vessel types, traffic and encounters, they cannot practically cover all possible situations. Whatever has not been explicitly covered by these Rules may be covered under this category and it is impossible to provide a definitive and complete list of all ***'special circumstances'***. The importance of keeping ***'look-out'*** to determine ***'special circumstances'*** coupled with determining ***'risk of collision'*** are paramount for ***'any action to avoid collision'*** which may be contemplated or executed. The below stated examples should help understanding these two clauses and are only indicative of the situations where these clauses may be applied, this is not an exhaustive list.

- Taking into account the navigational hazards of shallow water and narrow channel effects that reduce the manoeuvrability of a vessel leading to a collision or even stranding

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(grounding). This may include but not be limited to squat (reduction of under keel clearance), interaction between vessels and banking effects.

- Rules in Part B covering collision avoidance actions have no requirement stating that vessels should keep clear of a vessel ***'at anchor'***, but this is always done as a matter of good seamanship and all vessels ***'underway'*** are expected to keep clear of vessels ***'at anchor'***.

'At anchor', all vessels are required to exhibit lights and/or shapes as prescribed by Rule 30. However, there are some exemptions, ***'a vessel engaged in fishing'*** continues to exhibit lights and shapes as prescribed in Rule 26 even ***'at anchor'*** and not as prescribed by Rule 30. ***'A vessel engaged in dredging or underwater operations,*** **when restricted in her ability to manoeuvre' - 'when an obstruction exists'** even when ***'at anchor'*** is required to exhibit only the lights and shapes prescribed by Rule 27(d) and not as prescribed by Rule 30.

Note: on seamanship practice: Passing close ahead of a vessel at anchor should always be avoided, as the tidal current will normally be flowing towards the stern of the anchored vessel. There have been many accidents where vessels or their tows when attempting to pass ahead of a vessel at anchor have misjudged the flow rate of the current and have drifted on to the anchored vessel and collided. It is a matter of common sense that a vessel at anchor cannot do much immediately to avoid a collision of this kind even if her watchkeepers have observed the developing situation. Passing too close from the sides may also induce interaction affects, so a safe distance should always be allowed for.

Consideration also has to be given to the fact that a vessel at anchor may not have her engines ready to instantly manoeuvre for avoiding collision, paying out of anchor cable to move out may take time and has limitations linked with the length of anchor cable available. Picking up anchor to move out is a rather lengthy and time consuming process, too slow to be of immediate help.

In 1989, I was on board a loaded oil tanker anchored in the Singapore waiting area, when the vessel suffered a collision with a buoy being towed across the harbour. The tug towing the buoy passed ahead of and across our anchored vessel. The tug passed clear but the towed buoy made contact with the forward end of the vessel as it drifted downstream due to the current, creating a hole into the fore peak ballast tank just above the bulbous bow.

- A vessel proceeding to anchor should avoid anchoring in the way of normal traffic and keep well clear of other vessels at anchor. This is also reflected in Rules 9(g) and 10(g)
- Multiple vessel situations may make it impossible to fully comply with all the provisions of these Rules for ***'preventing collisions'***; action required with respect to one vessel may conflict with the action required with respect to one or more of the other vessels.
- In restricted visibility, a vessel navigating without operational radars should stop instead of relying on sound signals alone, she should be considered **'NUC'**. A better option is that such a vessel should anchor, if possible, until the visibility improves. Both acts being ***'ordinary practice of seamen'*** or of common sense and ***'observance of good seamanship'***.
- Vessels entering or leaving a slip may not be able to follow a steady course, similarly vessels proceeding stern-first for any reason would also fall under this category.
- Courts have held that when two vessels are approaching each other in a tidal river or channel

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around a difficult bend, it should be the duty of the one having the tide or current against her to wait until the other has passed. Since these Rules do not explicitly mention this aspect, this can be considered as derived from ***'ordinary practice of seamen'***. The reasoning for this is that it is relatively difficult for a vessel moving with the tide or current to be able to stop, as the flow of the current will cause her to keep moving, but the one going against the tide can practically stop in position and still be able to manoeuvre.

- Vessels ***'underway'*** but stopped and making no way through the water. Though a vessel should avoid stopping, especially in a high-traffic area, it has to be done sometimes. When drifting, her course/heading and speed may not be readily obvious to other vessels and she may not be able to move out of the way of a fast oncoming vessel in good time.

Encountering a vessel ***'underway'*** but stopped can be tricky because the vessel stopped is ***'underway'*** and as such obliged to comply with these Rules for **'preventing collisions'**. The vessels course is usually taken as or understood to be the course being steered or the vessels heading and the application of COLREGS (or IRPCS) is based on the relative aspect between the vessels concerned. However, the course of a vessel stopped may not be obvious as her drift vector (speed and direction) may be quite different from her heading. Further, if she is a large vessel, she may not be able to move out of the way of a fast oncoming vessel in good time. As such, any encounter with a vessel ***'underway'*** but stopped requires caution, even if she is the one who should keep clear.

'In construing and complying with these Rules', in context to these Rules, it is the way the navigators concerned perceive the meaning of these Rules or the way the design and operating features incorporated into any collision avoidance systems are understood for its operation, be it manual, semi or fully automatic. All these will influence the way the requirements are applied in practice. The apparent vagueness in the language of these Rules itself does lead to slightly differing interpretations and thus different methodologies in the levels of compliance or practical application. However, the Rule emphasises that ***'due regard shall be had all dangers of navigation'***. This phrase has far reaching implications and the responsibility of taking ***'all dangers'*** into account rests with all concerned in the chain of management of the vessel's navigation, most important of them being the navigators on board vessels who are applying the Rules in practice, and who are sometimes called the last line of defence.

'All dangers' could include dangers of stranding (grounding) presence of shallow water in the vicinity, the type and density of traffic in the vicinity which may impose some restrictions on the actions of other vessels in the near vicinity, and most importantly the weather conditions, which are very much a part of ***'all dangers'*** but are sometimes ignored when considering the application of these Rules. This term also includes all perils of the sea; a maritime voyage is still referred to as an **adventure** in some sections of law because of the uncertainties of the natural elements involved.

We all have heard the famous saying, *'to err is human, and to forgive divine'*. Unfortunately, these Rules do not allow any mercy as far as forgiveness goes, as emphasised: ***'nothing in these Rules shall exonerate'***. After any accident or incident, the investigators find out faults, the prosecution recommends the severest punishment for those blamed for the accident and courts generally award strict sentences. All this can be avoided by knowing and practicing the requirements of these Rules correctly and thereby **'preventing collisions'** from taking place.

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'Limitations of the vessels involved' is again a broad-spectrum phrase and has to be decided by the navigators on a case-to-case basis. Any and all factors can be considered here, for example the manoeuvring characteristics of a vessel with respect to her size, draught (draft), the under keel clearance, the available sea room, the prevailing weather, the vessels stability, the type and amount of traffic etc. Any of these may lead to the application of ***'ordinary practice of seamen'*** and/or ***'by the special circumstances of the case'***.

This Rule concludes with a very important statement, ***'which may make a departure from these Rules necessary to avoid immediate danger'***, the word ***'may'*** is of extreme importance. These Rules do not imply that as a routine anyone should depart from them just because it feels advantageous, ***'a departure'*** allowed by this Rule should really and necessarily be required. To invoke ***'a departure'***, there has to be ***'danger'***, it should be ***'immediate'*** and the ***'departure'*** or deviation from the Rules must be justifiable in the circumstances concerned. In fact, these Rules clearly imply that this is an expected duty of a vessel if she is in such a situation.

There are many court judgements implicating non-departure from the Rules a failure even though the vessel was a ***'stand-on vessel'*** and continued to ***'keep her course and speed'*** till it was too late, even though it was very clear that the ***'give-way vessel'*** was not showing any indications of taking action to avoid an imminent collision. The ***'stand-on vessel'*** therefore should have acted in the most appropriate manner in compliance with Rule 17 to ***'avoid collision'***. Prudent navigational practices should ideally prevent navigators from finding themselves in such situations, but accident statistics prove otherwise. However, it is possible to prevent such situations from occurring with the correct and proper application of these Rules.

For example, assume a stiff bulk carrier heading into heavy seas and swell, when she meets a vessel crossing from her starboard side involving ***'risk of collision'***, and when she is contemplating taking action as a ***'give-way vessel'*** in compliance with Rule 15, (stiff refers to stability, a vessel with a vary large GM and a large righting lever). The action being contemplated is to alter course substantially to starboard, but this action will bring the swell abeam; there is danger of heavy and/or synchronous rolling setting in and thus extreme stresses on the hull. The navigators on this vessel may invoke Rule 2(b) and take such other action as may be considered best in the circumstances but not make a substantially large alteration of course to avoid the swell from getting on to their vessel's beam. However, any action taken should be in ***'good time'*** or well in advance so as not to cause any confusion as required by Rule 8. This is a hypothetical situation intended to invoke thinking on ***'special circumstances'*** which have not been defined in these Rules and thus this term can be applied in countless similar situations.

To conclude, this Rule requires compliance with all these Rules, but mere compliance is not enough. If too strict a compliance is leading to a ***'risk of collision'*** or to an ***'immediate danger'***, then actions must be taken to the extent necessary to avoid such situations - even ***'a departure from these Rules'***. In fact, it is a duty of the navigators to do so, the end objective being that all efforts should be made for ***'preventing collisions'*** by all possible means.

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Rule 3

General definitions

For the purpose of these Rules, except where the context otherwise requires:

(a) The word *vessel* includes every description of water craft, including non-displacement craft, WIG craft and seaplanes, used or capable of being used as a means of transportation on water.

(b) The term *power-driven vessel* means any vessel propelled by machinery.

(c) The term *sailing vessel* means any vessel under sail provided that propelling machinery, if fitted, is not being used.

(d) The term *vessel engaged in fishing* means any vessel fishing with nets, lines, trawls or other fishing apparatus which restrict manoeuvrability, but does not include a vessel fishing with trolling lines or other fishing apparatus which do not restrict manoeuvrability.

(e) The word *seaplane* includes any aircraft designed to manoeuvre on the water.

(f) The term *vessel not under command* means a vessel which through some exceptional circumstance is unable to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel.

(g) The term *vessel restricted in her ability to manoeuvre* means a vessel which from the nature of her work is restricted in her ability to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel.

The term *vessels restricted in their ability to manoeuvre* shall include but not be limited to:

(i) a vessel engaged in laying, servicing or picking up a navigation mark, submarine cable or pipeline;

(ii) a vessel engaged in dredging, surveying or underwater operations;

(iii) a vessel engaged in replenishment or transferring persons, provisions or cargo while underway;

(iv) a vessel engaged in the launching or recovery of aircraft;

(v) a vessel engaged in mine clearance operations;

(vi) a vessel engaged in a towing operation such as severely restricts the towing vessel and her tow in their ability to deviate from their course.

(h) The term *vessel constrained by her draught* means a power-driven vessel which, because of her draught in relation to the available depth and width of navigable water, is severely restricted in her ability to deviate from the course she is following.

(i) The word *underway* means that a vessel is not at anchor, or made fast to the shore, or aground.

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(j) **The words *length* and *breadth* of a vessel mean her length overall and greatest breadth.**

(k) **Vessels shall be deemed to be in sight of one another only when one can be observed visually from the other.**

(l) **The term *restricted visibility* means any condition in which visibility is restricted by fog, mist, falling snow, heavy rainstorms, sandstorms or any other similar causes.**

(m) **The term *Wing-In-Ground (WIG) craft* means a multimodal craft which, in its main operational mode, flies in close proximity to the surface by utilizing surface-effect action.**

These definitions have evolved in a long time and are important. The following explanations cover most of them; others are self-explanatory, keep in mind ***'where the context otherwise requires'***.

a: ***'Vessel'*** covers everything used or capable of being used as a means of transportation on water, ships, non displacement craft, seaplanes and WIG craft etc. In effect, this means all kinds of crafts, powered or not, manned or unmanned, on their own or being towed. The type of vessel or the circumstances in which she is operating does not make any difference to this basic definition; all are vessels.

b: The term ***'power-driven'*** is straightforward, means ***'propelled by machinery'***, but a ***'power-driven vessel'*** may also be ***'fishing'*** or ***'not under command'*** or ***'restricted in her ability to manoeuvre'***. All are covered by different definitions stated separately, but none alters their condition of being ***'power-driven'*** under this definition. As will be seen later in these Rules, the latter types of vessels are sometimes dealt with differently and not as simply as ***'power-driven vessels'.***

A vessel propelled by oars, paddles, or other human or animal-powered means is not considered ***'power-driven'*** or covered by this definition.

c: ***'sailing vessel'*** very clearly means she is <u>only</u> using sails for navigational activities and ***'propelling machinery, if fitted, is not being used'***.

d: Emphasises that the term ***'vessel engaged in fishing'*** is to be used only for vessels using fishing equipment ***'which restrict manoeuvrability'***, not otherwise. The navigators on board a ***'fishing vessel'*** have to judge this aspect and accordingly display the applicable signals prescribed in Rule 26 and Annex II. These vessels are given certain special rights and privileges by these Rules. The use of ***'nets, lines, trawls'*** is presumed to ***'restrict manoeuvrability'*** while the use of ***'trolling lines'*** not; lines may even extend a few nautical miles from these vessels at times.

If ***'fishing vessels'*** are not ***'engaged in fishing'*** or are ***'engaged in fishing'*** in a manner which does not ***'restrict manoeuvrability'***, then they are not covered by this definition but by paragraphs 'b' or 'c' of this Rule depending if she is ***'power-driven'*** or ***'sailing'***.

Such vessels are anyway restricted in their manoeuvrability by this definition, have separate lights and shapes assigned exclusively for them and are thus not included in paragraph 'g' of this Rule on ***'vessels restricted in their ability to manoeuvre'***.

By Rule 26(a), ***'a vessel engaged in fishing, whether underway or at anchor, shall exhibit <u>only</u> the lights and shapes prescribed in this Rule'***.

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f: ***'Vessel not under command'*** often simply referred to as ***'NUC'*** defines that for any vessel to be covered under this definition, she should fulfil two basic criteria:

(i) Is ***unable to manoeuvre*** *as required by these Rules to keep out of the way of another vessel and,*

(ii) The reasons for this are exceptional.

'Exceptional' means something unusual, extraordinary and perhaps beyond the reasonable control of the operators. In other words, a vessel which is suffering from some disability that was neither predictable nor preventable. Though not stated, it is clearly implied that a vessel claiming ***'NUC'*** status should be underway, that is ***'not at anchor, or made fast to the shore, or aground'***.

Some accepted examples of unusual and extraordinary situations are: a vessel which has a breakdown of her engines, steering systems, has lost her rudder and/or one of her propeller blades or the same are damaged to such an extent that have become ineffective, or it could be the loss of the propeller itself. Other examples are a vessel at anchor with her anchor not holding or a sailing vessel becalmed, which is in a situation when there is no wind. In addition, exceptionally bad weather may also be a reason to render a vessel ***'NUC'*** explained further below.

A vessel, which has her propulsion and steering systems in working condition, should not declare herself ***'Not Under Command'*** or display the prescribed signals for the same. If simply stopped, for example awaiting commercial voyage orders, she remains ***'underway'*** by definition and remains obliged to comply with the applicable Rules for a vessel ***'underway'***.

Adverse/heavy weather conditions are normally not accepted as ***'exceptional'*** to justify that a vessel declares herself as ***'NUC'***. However, this situation cannot totally be ruled out; refer the hypothetical example of a bulk carrier in the second last paragraph of the explanations on Rule 2. Adverse weather may not affect all the vessels in the vicinity in the same manner, a vessel may be in danger of synchronous and/or parametric rolling if she were to alter her course. Such situations are also linked with ***'ordinary practice of seamen'*** or ***'by the special circumstances of the case'*** as explained with Rule 2.

> A vessel navigating in restricted visibility whose radars fail, when in deep waters and unable to anchor, may be justified to declare herself as ***'NUC'***.

g: ***'Vessel restricted in her ability to manoeuvre'*** is different from a ***'vessel not under command'*** though the Rules provide very similar rights and privileges to both of them. Though the two are required to show different lights and/or shapes, Rule 35(c) prescribes a common sound signal for them in restricted visibility. It is important that the differences between these two types are clear and that they are not confused with one another, this vessel is ***'restricted in her ability to manoeuvre'***.

'The term "vessels restricted in their ability to manoeuvre" shall include but not be limited to': The list stated in the Rule is not exhaustive and any vessel ***'which from the nature of her work is restricted in her ability to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel'*** can be included under this clause.

Some of the vessels covered by this Rule may be proceeding at high speeds, for example an aircraft carrier ***'engaged in the launching or recovery of aircraft'*** or naval vessels ***'engaged in replenishment'*** at sea.

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Manoeuvrability is referred to as the capability of a vessel to change her course and/or the quantum and direction of speed. Restrictions in manoeuvring should be imposed ***'from the nature of her work'***, the activity being done or the conditions created by such work, which are known and predictable, and not from the type of vessel involved. For example, a cable-laying vessel is not always entitled to this status because of her design: the status can be activated only when she is actually ***'engaged'*** in cable laying activity and ***'restricted in her ability to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel'***. Similarly a towing situation will not normally fall under this definition; this clause will apply only when the activity ***'severely restricts the towing vessel and her tow in their ability to deviate from their course'*** or actually ***'restricted in her*** (their) ***ability to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel'*** for the purpose of ***'preventing collisions'***. When this is the case, the towing vessel and the tow should not only show the lights and shapes prescribed by Rule 24 for ***'towing and pushing'*** but also for ***'restricted in their ability to manoeuvre'*** as per Rule 27.

Any vessel that has any kind of restrictions imposed on her to manoeuvre for reasons explained above is traditionally referred to as **'hampered'** - and they get certain privileges by these Rules. Vessels ***'Not Under Command'*** or ***'Constrained by her draught'*** are also usually referred to as **'hampered'**, a term not stated in these Rules but frequently used in practice.

A vessel engaged in an immediate rescue operation, for example in a manoeuvre to pick up a man overboard is not explicitly covered by paragraphs 'f' or 'g' of this Rule, There are also no past rulings on this aspect. However, by application of Rule 2, she should consider it prudent to claim privilege as a vessel ***'restricted in her ability to manoeuvre'***. This would be well covered as a ***'precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case'***.

When executing such an operation a vessels manoeuvring ability is reduced to a certain extent when taking a turn and even further when in the vicinity of the person being rescued. In fact not announcing the circumstances and/or exhibiting the appropriate signals including flag 'D' may be construed as a ***'neglect'***.

h: ***'Constrained by her draught'*** the Rules appear to leave it to the professional judgement and discretion of the navigator when a vessel should be declared ***'constrained by her draught'***. Not just the under keel clearance, (the total depth of water less the maximum draught), but also the clearance from the sides of the channel, (the total width of the channel less the maximum breadth or width of the vessel), in which a vessel can navigate, have to be considered. The depth and width of available water, or rather lack of it, close to all side of a vessel determines the level of constraint. This is irrespective of the size of the ship. ***'Available depth and width of navigable water'*** are both applicable as a combined function.

If the under keel clearance is low but there is more than ample width of sea room available, then this alone will not justify a vessel to be considered ***'constrained by her draught'***. Both the conditions must exist in conjunction and impose manoeuvring restrictions on the vessel concerned. In other words, if there is a reasonable width of deep enough water around to enable

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a vessel to alter her course and manoeuvre for ***'preventing collisions'***, she will not be justified in declaring herself as ***'constrained by her draught'***.

These Rules do provide right of way to such vessels. Rule 18(d)(i) clearly requires most vessels to ***'avoid impeding the safe passage'*** of such a vessel and Rule 18(d)(ii) requires them to ***'navigate with particular caution'***. Rules 28 and 35(c) respectively prescribe special lights, shapes and sound signals for them to enable them to warn others of their difficult situation. The requirements of Rules 9 on ***'narrow channels'*** allows certain privileges to these vessels by implication without directly naming them.

In certain areas special rules may apply, for example in Malacca Straits both the deadweight and draught of the vessel have been considered for declaring a vessel under this clause, but this may not be the case everywhere. Please also refer to the explanations given for Rule 1(b).

i: ***'Underway'*** is self explanatory and applicable if any one of the three clauses stated in the Rule is fulfilled by a vessel, that is not ***'at anchor'*** or ***'made fast to the shore'*** or ***'aground'***. This is irrespective of whether the vessel concerned is making way (moving) through the water or not.

For example, it is common for vessels in some rivers to hold their position by putting their bows against the riverbank and applying nominal forward thrust to prevent movement over the ground with the flow of water. In this situation, the vessel is free to manoeuvre and thus still considered ***'underway'*** and not ***'aground'***.

The term ***'making way'*** used in some of the Rules starting from Rule 26(b) is not specifically defined in these Rules and remains open to slightly differing interpretations. Rule 35 (b) appears to give the closest explanation in its phrase, ***'a power-driven vessel underway but stopped and making no way through the water'***. To be ***'making way'*** a vessel has to be ***'underway'*** but not the other way around.

With the above, it seems the authors of these Rules meant that vessels ***'stopped and making no way through the water'*** are practically stopped in water relative to the surrounding water. They would still very much be ***'underway'***, drifting and with no relative movement through the water. The best interpretation of this term ***'making way'*** would mean a physical movement of the vessel through water, or the vessel must have some relative speed through the water because of the use of her own propulsion, or having stopped the propulsion, then because of her own momentum, but not any movement through the water caused due to wind or movement over ground due to wind and/or current.

For example, a vessel making a speed of 3 knots through the water and heading directly against a water current also having a speed of 3 knots will be considered ***'making way'*** through the water even though she has '0' speed over the ground, assuming no wind. In comparison, another vessel stopped in water and drifting down with the current will be considered ***'stopped and making no way through the water'***, even though she has considerable speed over ground, 3 knots in this example.

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The sound signals required to be given by a ***'power-driven vessel'*** in or near an area of restricted visibility, are different when she is just ***'underway'*** by Rule 35(a) versus when ***'underway but stopped and making no way through the water'*** by Rule 35(b) though both situations are covered by ***'underway'***.

k: Clarifies that vessels shall be considered ***'to be in sight of one another only when one can be observed visually from the other'***. This is important in the understanding and practical application of the requirements of Part B of these Rules pertaining to actions ***'for preventing Collisions'***; Rules of section II of Part B only ***'apply to vessels in sight of one another'*** as stated in Rule 11.

Visual sighting can take place only if the visibility is good enough for navigators to be able to see other vessels visually, by their eyes alone or with the help of binoculars. Detection by radar is excluded and the Rules do not refer to the prevailing visibility in numerical terms. Range of visibility to the visible horizon is restricted by the height of eye due to the curvature of the earths surface.

l: ***'Restricted visibility'*** is fairly well defined, except for any numerical range. However, the list has been left open for inclusion of any other similar causes. At the first glance it appears that since the quoted list only covers various meteorological conditions the additional ones should also be similar by the statement ***'any other similar causes'***. ***'Similar'*** implies conditions which restrict visibility and which could be from any source, not necessarily only meteorological; for example, smoke from any source which restricts visibility. Rule 19, the only Rule in Section III of Part B is only applicable to ***'vessels not in sight of one another when navigating in or near an area of restricted visibility'***.

Do note that good or fair visibility is not defined but in section 8(a) of Annex II it is implied as the ***'meteorological visibility of approximately 13 nautical miles'***.

Thick smoke had rolled into the Malacca Straits due to forest fires in Indonesia. Two tankers navigating through the smoke covered waters collided on 15th October 1977 just 2 miles south of Singapore resulting in the largest accidental oil spill in the area, estimated at about 28,000 metric tonnes of fuel oil. The investigation was done by the authorities in Singapore who concluded that ***'restricted visibility'*** *prevailed in the area at the time of the collision, caused by the smoke. The Masters and OOWs of both the vessels were jailed and fined for not complying with the requirements of Rule 19 of these Rules. In addition, the vessels operators, (that means the owners), were also fined. (Evoikos and Orapin Global collision).*

m: WIG craft look like aircrafts but are not aircraft as they can only fly close to the surface of land or sea, the definition of a seaplane is not applicable to them, they also do not fit in to the definition of non-displacement crafts. A WIG craft has wings and cruises close above the land or water surface; it floats on a cushion of relatively high-pressure air between its wing and the earth's surface. WIG is an abbreviation of 'Wing In Ground' effect vehicle.

You may visit the IMO website http://www.imo.org/Newsroom/mainframe.asp?topic_id=757 or http://www.se-technology.com/wig/ to learn more about WIG craft.

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PART B
STEERING & SAILING RULES

INTRODUCTION

Part B of these Rules, named the ***'Steering and Sailing Rules'*** cover actions required to be carried out by vessels in all respects ***'for preventing collisions at sea';*** that is from determining ***'risk of collision'*** to ***'action to avoid collision'***. The full spectrum of management is generally well covered within the Rule themselves along with STCW Code A-VIII/2 and SOLAS Chapter V.

This Part B is further subdivided into three separate sections I, II and III covering Rules 4 to 10, 11 to 18 and Rule 19 respectively, as explained in the introduction to these Rules.

Rules 1 to 3 of Part A, especially the statements of Rule 2 ***'construing and complying'*** and ***'ordinary practice of seamen',*** are important and continue to apply throughout these Rules with respect to their interpretation, understanding and most importantly, their best practical application.

Each of the descriptive clauses in this Rule, or for that matter anywhere else in these Rules, do not state any numerical or mathematical values. Interpretations on the application of the requirements where the descriptive adjectives have to be transformed into numerical values do vary considerably and are usually based on any one or a combination of ***'ordinary practice of seamen'***, past court rulings, simulator based studies and most importantly, the practical experience of the navigators.

Many Rules have escape clauses in them, which at times make it difficult to understand their clear meaning. If you disregard the escape clauses, the Rules are easy to construe. The escape clause can be linked with 'a departure from these Rules' clause of Rule 2(b).

Rule 4

Application

Rules in this section apply in any condition of visibility.

'This section' means section I of Part B of these Rules comprising Rules 4 to 10. These Rules apply at all times ***'in any condition of visibility'***, whether vessels are ***'in sight of one another'*** or not, in good or ***'restricted visibility'***, by day or at night, in all weather conditions, round the clock, and round the year to all vessels when they are navigating. Some of the aspects remain applicable even to vessels at anchor; refer STCW Code A-VIII/2, paragraph 51.

Rules in this section I are of a general nature on watchkeeping procedures and conduct of vessels with respect to ***'preventing collisions'***.

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Rule 5

Look-out

Every vessel shall at all times maintain a proper look-out by sight and hearing as well as by all available means appropriate in the prevailing circumstances and conditions so as to make a full appraisal of the situation and of the risk of collision.

This short and apparently simple Rule on ***'look-out'*** has many implications. The efficient functioning of ***'look-out'*** is required in the application of almost all these Rules from determining ***'risk of collision'***, the applicable situations and executing ***'any action to avoid collision'***. Almost all other navigational activities also depend on ***'look-out'***, which forms the backbone of bridge watchkeeping.

The term ***'look-out'*** features abundantly in the mandatory navigational watchkeeping requirements stated in the ***'STCW Code A, section VIII/2'***, quoted in full in this book, and in most professional publications pertaining to marine navigation and ***'preventing collisions'***.

This Rule applies to all vessels whether underway or anchored. ***'Shall at all times'*** highlights the need of continuous and uninterrupted ***'look-out'*** while ***'sight and hearing'*** is self explanatory. The words ***'proper'***, ***'all available means'*** and ***'appropriate'*** as used in this Rule neither define nor prescribe any required or acceptable standards for ***'look-out'*** activities. Common sense and good seamanship, as explained earlier with Rule 2 and the standards prescribed in the ***STCW Code*** have to be applied in the practical application of this Rule.

'Proper' has been explained in the introduction and for this Rule may also mean efficient, effective and reasonably continuous. ***'Look-out'*** means watch out, pay attention, be alert, be watchful, keep your eyes open, use all your senses, beware and take care.

'All available means' is about all processes and equipment, internal or external, which can be used for the purpose of maintaining ***'look-out'***, and is additional to the minimum ***'sight and hearing' - 'at all times'***. This may include but may not be limited to binoculars and telescopes, own radar, shore radar, ARPA, VHF, AIS, ECDIS, NAVTEX, VTIS or VTMS systems and navigational information or warnings from any of the presently existing or any future systems which can be considered capable of assisting in this function. Finally it is the analysis, interpretation and use of the information from all sources by the navigators ***'to make a full appraisal of the situation and of the risk of collision'*** that will help them act to avoid any ***'risk of collision'***. Disregarding the use of any available equipment which can be used to maintain ***'look-out'*** would mean non compliance of this Rule and of the requirement that ***'the officer in charge of the navigational watch shall have full knowledge of the location and operation of all safety and navigational equipment on board the ship and shall be aware and take account of the operating limitations of such equipment'.*** *(STCW Code A-VIII/2, paragraph 26)*

'Prevailing circumstances' may vary, such as ***'state of visibility'***, ***'traffic density'***, ***'state of wind, sea and current'*** and ***'the presence of background lights'***. In the open sea with negligible traffic, it has been often assumed that the intensity or continuity of ***'look-out'*** may be reduced. Unfortunately, such assumptions have led to dangerous situations; even head-on collisions have taken place in open sea in good visibility during daytime as the sole navigators of both vessels involved got busy with other work and inadvertently interrupted the continuity of ***'look-out'***.

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Investigations into the causes of navigational accidents continue to show that the vast majority are due to the failure of keeping ***'proper look-out'***, which is and remains the first essential element of good navigational watchkeeping practice for efficient, effective and accident free operations.

The end objective of this Rule is simply stated within the Rule, ***'so as to make a full appraisal of the situation and of the risk of collision'***. Unless the navigators maintain ***'proper look-out'***, they will be unable to determine ***'risk of collision'*** or apply the provisions of these Rules.

'Full appraisal of the situation and of the risk of collision' is the correct understanding of information from all available means seen, sensed or received by the navigator in control, be it data processed and displayed by the various instrumentation or inputs from other bridge team members. Only when situations are assessed and analysed correctly to achieve ***'full appraisal'*** and if this shows that a ***'close quarter situation is developing and/or risk of collision exists'***, can ***'any action to avoid collision'*** be carried out in compliance with these Rules.

All information from different sources, which contributes to the ***'look-out'*** function, needs to be analysed and applied in practice. ***'Look-out'*** does not mean information inputs by ***'sight and hearing'*** alone, which constitutes the minimum for ***'proper'*** and has been the traditional method with its own limitations, but from ***'all available means'***. Navigators should use their knowledge and experience to judge and filter the information flow from all sources to consciously seek out important inputs, prioritise the analysis and corresponding actions depending on the circumstances. It is important that conflicting evidence is never suppressed or overlooked but verified, preferably from more than one source, whenever possible, and if not, acted on with relevant cautions.

'Look-out' should primarily watch out for and report whatever appears to be of reasonable concern- not just what appears to present a ***'risk of collision'***, but whatever may also affect safe navigation like risks of grounding (stranding) or even change of weather etc. ***'Look-out'*** should further watch out for people or craft in distress as well as activities taking place on board. For example, the course being steered, ECDIS, radar display, proper working of the various navigational equipments, monitoring the emergency alarms, keeping a watch on deck, the engine room exhausts, and even the correct usage of communication and radio equipment like correct selection of coast stations on the NAVTEX or setting of the correct area in the GMDSS system. The OOW must follow this requirement when alone and explicitly clarify these requirements, as relevant, to the person(s) on ***'look-out'*** duty.

A vessel was reported to have transited the full Malacca Straits in 2005 and did not receive any weather or navigational warnings for the area. It was noticed much later that her NAVTEX receiver was set to manual selection of stations and the required stations had not been activated to receive transmissions. No one had changed the station selection.

Keeping a watch or ***'look-out'*** on the performance of the automatic systems is also very important. A judge has rightly stated in a court verdict that automatic systems are very valuable inventions if properly used, but they may lead to disasters if left alone, or vigilance relaxed in monitoring their effectiveness and actions. **'It is the people operating the vessels on whom safety at sea depends, and they cannot make a greater mistake than to suppose that machines can do all their work for them'**.

The duty to maintain a ***'look-out'*** in all respects continues to apply to a vessel at anchor. In fact, there is nothing in these Rules or in the watchkeeping requirements in the ***STCW Code A-VIII/2*** that relax the application of ***'look-out'*** at any time.

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*A case I witnessed in 1978 as a cadet: On a voyage from Australia to India, in very good visibility and calm open seas, the 2nd & 3rd officers became busy with the noon sight and noon calculations. There was no traffic in sight and none on the radar screen either, which had been put 'on' specifically for this duration; vessels traffic had been sighted for days. The ship's rudder came stuck to one side, and by the time this was noticed, the vessel had already swung by a large amount. Subsequently, the engineers rectified the problem, and though no navigational mishap took place, this turned out to be a good lesson on the importance of continuous **'look-out'**. The vessel was not fitted with an off course alarm and, being daytime, no extra person was present on the bridge for **'look-out'** duty. In different circumstances, this may have resulted even in an accident.*

The importance of a continuous ***'look-out'*** can be gauged from the following quoted from the STCW Code; the requirement goes to the extent to state that the OOW shall not even visit a separate chartroom unless the continuity of ***'look-out'*** can be maintained. Though applicable to vessels with a separate chartroom, the implication of this Rule points to the need of a **continuous** and **uninterrupted** ***'look-out'*** function, which is considered critical for all aspects of safe navigation, and which automatically includes all activities related to ***'preventing collisions'***.

It is of special importance that at all times the officer in charge of the navigational watch ensures that a proper lookout is maintained. In a ship with a separate chartroom, the officer in charge of the navigational watch may visit the chartroom, when essential, for a short period for the necessary performance of navigational duties, but shall first ensure that it is safe to do so and that proper lookout is maintained. *(STCW Code A-VIII/2, paragraph 32)*

*Not too long ago a vessel navigating on the western end of the English Channel failed to answer VHF calls from the shore based traffic regulatory control system who were calling the vessel to inform her that she appeared to be deviating out of the traffic lane she was required to be in. When no reply was received from the vessel for a reasonable time, a coast guard helicopter was sent across to check. It reported that they could not see anyone on the bridge and were unable get any response to VHF or visual signalling calls. As the helicopter circled the vessel a few times, its sound alerted some of the people on board the vessel who went up on the bridge; It turned out that the 2nd Officer was busy on the communication console fitted in a separate Radio Room with various noon messages to several parties in their own different formats, having left the guard zone activated on the ARPA to give an alarm for any traffic (a dangerous practice). However, little did he realise that sound reception from any of the bridge equipment inside the Radio Room was poor and he had lost track of time while working on the messages, and also with what was happening outside or that the vessel was moving out of its **'traffic lane'**. There was no one carrying out the **'look-out'** function while the 2nd Officer was working in the Radio Room. Apart from the unwanted embarrassment the incident caused to all concerned, the vessel was later fined for this violation.*

Court verdicts on the interpretation and application of this Rule have not given a firm answer about the best location of the person on ***'look-out'*** duty. Right forward has been the preferred location by tradition, the old crows nest, so that not only can the person hear sound signals from other vessels without any disturbance of the internal sounds generated by machinery or normal bridge operations, but can perhaps see ahead better; next has been on the bridge wings. Factors against the ***'crows nest'*** position are that the person is not available immediately to assist the bridge team, the risk of communication failure between the person and the bridge and the fact that modern vessels are rarely equipped with a 'crows nest'. Deciding the sufficiency of ***'look-out'***, the number of people deployed

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and/or their positioning is a practical matter not really defined or prescribed in any Rule. The number of people available on board for the task, the sea area a vessel is in, the traffic density, the type of vessel and the overall noise levels at various locations etc. are all factors that need to be considered when deciding the application of ***'look-out'*** in practice. The ***'look-out'*** activity should be reasonable and adequate to fulfil the minimum requirements of ***'sight and hearing'*** and in line with the ***'ordinary practice of seamanship'***. Variance of the circumstances between day and night also requires consideration. During day and in good visibility, a vessel can be seen visually at a much greater distance than at night when the sighting distance is linked with the range of visibility of the lights exhibited. Masthead lights of a vessel 50 metres or more in length are required to have a minimum visible range of only 6 nautical miles and for those less than 12 metres just 2 miles as per Rule 22.

The ***STCW Code A-VIII/2*** paragraphs 14 to 16, (quoted in full further below), prescribe more detailed requirements on ***'look-out'*** for navigational watchkeeping. One of the most important aspects is that the person performing ***'look-out'*** functions should not be given any other task that may interfere with this activity, and that the helmsperson shall not be considered a ***'look-out'*** when steering except on some very small vessels. And ***'the officer in charge of the navigational watch may be the sole look-out in daylight provided.....'*** means that the discretion to have the OOW alone on watch and also acting as the sole ***'look-out'*** is available only during ***'daylight'*** after taking into account the listed circumstances and conditions. By reverse interpretation, it clearly implies that an OOW shall not be the ***'sole look-out'*** outside the ***'daylight'*** hours or at **night**, defined as the duration between sunset and the next morning sunrise. At night, there has to be an additional appropriately qualified person in addition to the OOW for ***'look-out'*** functions, should be physically present on duty and should not leave the position for any reasons like going for fire rounds, coffee/smoke breaks or to wake up relief staff, etc. ***'Appropriately qualified ratings'*** is a requirement stated in STCW Code A-VIII/2 *paragraph 18* for persons performing the ***'look-out'*** function and their qualification is governed by ***section II/4 of the STCW convention***, the latter is not quoted in this book.

Below is an abridged abstract of the grounding (stranding) accident of the 'Svendborg Guardian'. This is to highlight the ***'look-out'*** aspect along with dangers of fatigue and ineffective communications, though this is not a collision accident. The full report, which is very interesting, can be seen on the following website:

http://www.atsb.gov.au/publications/investigation_reports/1995/MAIR/pdf/mair82_001.pdf

*Note: Regulation II/1.9 on **'look-out'** referred to in this report is from the International Convention on Standards of Training, Certification and Watchkeeping for seafarers, 1978. This legislation was the one in force at the time of the accident.*

The Australian Transport Safety Bureau, from where this report has been taken contains many others and there are several other similar sites available on the internet, for example the U.S., UK, European and the French. http://www.atsb.gov.au, www.ntsb.gov, www.maib.gov.uk, www.emsa.europa.eu, and www.beamer-france.org.

The Danish vessel Svendborg Guardian sailed from Townsville at about 2000 on 23rd June 1995 on a voyage to Kiunga, on the Fly River, Papua New Guinea. The ship had been on this service since 1988. At about 0400 on 24th June, the ship failed to make a course alteration off Brook Islands and maintained a straight course to run aground south off Murdering Point, Queensland,

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at about 0600 hrs. The ship was towed off the ground on 24th June evening.

Conclusions

These identify the different factors contributing to the accident and should not be read as apportioning liability or blame to any particular organisation or individual. The vessel grounded as a result of a number of factors that combined to contribute to the grounding:

1. *There was nobody on the bridge for a period of almost five hours with the ship effectively out of control.*
2. *The bridge was unmanned because the Second Mate left the bridge shortly after 0105 and failed to return because he fell asleep.*
3. *The Second Mate was suffering from extreme fatigue as a result of poor quality sleep from 18th to 23rd June and decided not to sleep after the ship left Townsville. This decision, prompted by his desire to watch a rugby league match on TV rather than ensure he was as fit as possible to keep his watch, displayed inexperience and irresponsibility.*
4. *There was no look-out stationed on the bridge, and the ship was not equipped with any other system to alert the Master or the crew in the event of the OOW being incapacitated or otherwise not able to perform his/her duties.*
5. *The absence of a look-out made the accident inevitable once the Second Mate had fallen and remained asleep, because there was nobody to rouse the Second Mate, call the Mate or summon the Master.*
6. *The Master, Mate and Second Mate were all fatigued to a significant degree.*
7. *The new Master in command from 24th June had ordered that a seaman should act as look-out during the hours of darkness. This instruction was not complied with possibly due to a misunderstanding and a lack of effective communications in the form of written notification, and because of the entrenched practice of the officers to keep the watch alone during the night.*
8. *The Owner's standard instructions did not give clear direction to the ship's masters to comply with the STCW Convention requirements.*
9. *The habitual practice of not posting a look-out should have been detected by the ship operators and rectified.*

To highlight the vital importance of ***'look-out'*** in navigational watchkeeping, some of the requirements of the STCW Code as applicable to ***'look-out'*** are quoted below.

STCW Code A-VIII/2, Part 4-1, paragraphs 14, 15 & 16:

Lookout:

14. A proper lookout shall be maintained at all times in compliance with Rule 5 of the International Regulations for Preventing Collisions at Sea, 1972, as amended and shall serve the purpose of:

.1 maintaining a continuous state of vigil by sight and hearing, as well as by all

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other available means, with regards to any significant change in the operating environment;

.2 ***fully appraising the situation and the risk of collision, stranding and other dangers to navigation; and***

.3 ***detecting ships or aircraft in distress, shipwrecked persons, wrecks, debris and other hazards to safe navigation.***

15. ***The lookout must be able to give full attention to the keeping of a proper lookout and no other duties shall be undertaken or assigned which could interfere with that task.***

16. ***The duties of the lookout and helmsperson are separate and the helmsperson shall not be considered to be the lookout while steering, except in small ships where an unobstructed all-round view is provided at the steering position and there is no impairment of night vision or other impediment to the keeping of a proper lookout. The officer in charge of the watch 'MAY' be the sole lookout in daylight provided that, on each such occasion:***

.1 ***the situation has been carefully assessed and it has been established without doubt that it is safe to do so;***

.2 ***full account has been taken of all relevant factors, including, but not limited to:***

- ***state of weather,***
- ***visibility,***
- ***traffic density,***
- ***proximity of dangers to navigation, and***
- ***the attention necessary when navigating in or near traffic separation schemes; and***

.3 ***assistance is immediately available to be summoned to the bridge when any change in the situation so requires.***

The statement ***'the officer in charge of the watch may be the sole lookout 'in daylight'*** in paragraph 15 quoted above clearly states that this is allowed ***'in daylight'*** only provided the conditions described so allow.

Without doubt, the inputs from the radar have increasingly become a major contributor as well, and it is an important element amongst ***'all available means'*** for the ***'look-out'*** function. The ***STCW Code A-VIII/2*** defines the minimum usage of radar; paragraph 28 establishes the all-important link between the use of radar and compliance with these Rules. Though these requirements define the minimum compulsory requirements on the use of radar and the need to ***'carry out radar practice'***, they place no restriction that the radar should not be used at other times. It is important that the navigators use their discretion judiciously to use radar as a navigational aid and as one of the ***'all available means'*** for ***'lookout'***. The ***STCW Code*** also requires fair weather practice to be carried out to make the navigators familiar with and master the use of radar equipment.

Some P & I clubs, as part of their risk management and risk reduction techniques, and some Companies as part of their SMS procedures, recommend or require that one, two or all Radars should continuously be used at all times when the vessel is at sea, underway or at anchor.

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Apart from that described before, Rules 6, 7, 8 and 19 of these Rules imply on the use of radar. Of these Rules 6, 7 and 8 in this Section I of Part B apply at all times, and Rule 19, the only Rule in Section III of Part B, ***'applies to vessels not in sight of one another when navigating in or near an area of restricted visibility'***.

The tools available to assist navigators in maintaining ***'look-out'*** will continue to develop. The continued exploitation of microprocessor technology may make available new means for maintaining ***'look-out'***. Whatever changes the future may bring, Rule 5 will continue to require that the person(s) controlling the vessel know the benefits and limitations of ***'all available means'*** and to be able to use them to exploit all their capabilities for maximum benefit.

"In determining that the composition of the navigational watch is adequate to ensure that a proper lookout can continuously be maintained, the master shall take into account all relevant factors, ..." *(Extract from STCW Code A-VIII/2, paragraph 17)*

> ***.2 traffic density, and other activities occurring in the area in which the vessel is navigating.*** *(STCW Code A-VIII/2, paragraph 17.2)*

[SELF STUDY EXERCISE: READ THROUGH AND UNDERSTAND PARAGRAPH 16 FROM THE STCW CODE A-VIII/2. HOW MANY FACTORS ARE LISTED UNDER THIS PARAGRAPH? MAKE A NOTE AND COMPARE WITH THE OTHER REQUIREMENTS STATED IN THESE EXPLANATIONS OF RULE 5.]

Prior to taking over the watch, relieving officers shall satisfy themselves as to the ship's estimated or true position and confirm its intended track, course and speed, and UMS controls as appropriate and shall note any dangers to navigation expected to be encountered during their watch. *(STCW Code A-VIII/2, paragraph 21)*

> ***5.3*** the presence and movement of ships in sight or known to be in the vicinity. *(STCW Code A-VIII/2, subparagraph 22.5.3)*

[TASK: READ PARAGRAPHS 32, 35, 42, 45, 46 AND 51 FROM THE STCW CODE A-VIII/2 AND SEE THE USAGE OF THE TERM 'LOOKOUT' AND IT'S IMPORTANCE.

HOW MANY TIMES HAS THIS TERM BEEN USED IN THE STCW CODE A-VIII/2?

TASK: READ PARAGRAPHS 18, 28, 37, 38, 39, 44 AND 45 FROM THE STCW CODE A-VIII/2 TO LEARN THE REQUIREMENTS ABOUT THE PROPER USE OF RADAR IN PRACTICE.

SOLAS Chapter V, Regulation 22 defines the requirements for visibility from a navigating bridge. This was amended by IMO Resolution MSC.201 (81) which became effective from 1st July 2010.

The amendment addresses any increased blind sectors or reduced horizontal fields of vision resulting from ballast water exchange operations which have to be taken into account by the Master before determining that it is safe to proceed with the exchange. Extracts from this Regulation on Navigation bridge visibility are given below:

1 Ships of not less than 55 m in length, as defined in regulation 2.4, constructed on or after 1 July 1998, shall meet the following requirements:

> ***.1 The view of the sea surface from the conning position shall not be obscured by***

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more than two ship lengths, or 500 m, whichever is the less, forward of the bow to 10° on either side under all conditions of draught, trim and deck cargo;

.2 *No blind sector caused by cargo, cargo gear or other obstructions outside of the wheelhouse forward of the beam which obstructs the view of the sea surface as seen from the conning position, shall exceed 10 degrees. The total arc of blind sectors shall not exceed 20 degrees. The clear sectors between blind sectors shall be at least 5 degrees. However, in the view described in .1, each individual blind sector shall not exceed 5 degrees;*

.3 *The horizontal field of vision from the conning position shall extend over an arc of not less than 225 degrees that is from right ahead to not less than 22.5 degrees abaft the beam on either side of the ship;*

.4 *From each bridge wing the horizontal field of vision shall extend over an arc at least 225 degrees that is from at least 45 degrees on the opposite bow through right ahead and then from right ahead to right astern through 180 degrees on the same side of the ship;*

.5 *From the main steering position the horizontal field of vision shall extend over an arc from right ahead to at least 60 degrees on each side of the ship;*

.6 *The ship's side shall be visible from the bridge wing.* (continues further till 9.4, the rest is not quoted here).

2 *Ships constructed before 1 July 1998 shall, where practicable, meet the requirements of paragraphs 1.1 and 1.2. However, structural alterations or additional equipment need not be required.*

3 *On ships of unconventional design which, in the opinion of the Administration, cannot comply with this regulation, arrangements shall be provided to achieve a level of visibility that is as near as practical to that prescribed in this regulation.*

4 *Notwithstanding the requirements of paragraphs 1.1, 1.3, 1.4 and 1.5, ballast water exchange may be undertaken provided that:*

.1 *the master has determined that it is safe to do so and takes into consideration any increased blind sectors or reduced horizontal fields of vision resulting from the operation to ensure that a proper lookout is maintained at all times;*

.2 *the operation is conducted in accordance with the ship's ballast water management plan, taking into account the recommendations on ballast water exchange adopted by the Organization; and*

.3 *the commencement and termination of the operation are recorded in the ship's record of navigational activities pursuant to regulation 28.*

Guidelines for ballast water exchange are stated in IMO Resolution MEPC.124(53) adopted on 22 July 2005. The following extracts from this resolution which address navigational safety and lookout aspects are quoted below, underlined text is only to further highlight a requirement:

5.4 *The procedures, advice, and information in the Ballast Water Management Plan, may include but is not limited to the following:*

.6 *forward and aft draughts and trim, with particular reference to bridge visibility, slamming, propeller immersion and minimum forward draft;*

.11 *admissible weather conditions;*

.12 *weather routeing in areas seasonably affected by cyclones, typhoons, hurricanes, or heavy icing conditions;*

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5.5 During ballast water exchange sequences there may be times when, for a transitory period, one or more of the following criteria cannot be fully met or are found to be difficult to maintain:

- ***.1 bridge visibility standards (SOLAS V/22);***
- ***.2 propeller immersion; and***
- ***.3 minimum draft forward.***

5.7 In planning a ballast water exchange operation that includes sequences which involve periods when the criteria for propeller immersion, minimum draft and / or trim and bridge visibility cannot be met, the Master should assess:

- ***.1 the duration(s) and time(s) during the operation that any of the criteria will not be met;***
- ***.2 the effect(s) on the navigational and manoeuvring capabilities of the ship; and***
- ***.3 the time to complete the operation.***

5.8. A decision to proceed with the operation should only be taken when it is anticipated that:

- ***.1 the ship will be in open water;***
- ***.2 the traffic density will be low;***
- ***.3 an enhanced navigational watch will be maintained including if necessary an additional look out forward with adequate communications with the navigation bridge;***
- ***.4 the manoeuvrability of the vessel will not be unduly impaired by the draft and trim and or propeller immersion during the transitory period; and***
- ***.5 the general weather and sea state conditions will be suitable and unlikely to deteriorate.***

BRIDGE NAVIGATIONAL WATCH ALARM SYSTEM (BNWAS)

SOLAS Chapter V Regulation 19 was amended by Resolution MSC 282(86) at IMO on 5th June 2009. This requires that BNWAS is to be installed on all ships of over 150 GT and all passenger ships irrespective of size constructed after 1st July 2011. For all other vessels the system will become mandatory between this date and 1st July 2014. ***'Automatic operational mode, if it is available, should not be used'.*** *(MSC.1/Circ. 1474 of 23 May 2014 issued by IMO)*

The purpose of BNWAS is to monitor bridge activity and detect operator disability, which could lead to marine accidents. The system monitors the awareness of the OOW and automatically alters the Master or other qualified OOW if for any reason an OOW becomes incapable of performing watch duties. In effect the device would be a deterrent against breaks in look-out functions which are critical for safety of navigation.

[QUIZ: DOES THE NAVTEX SYSTEM WORK IN AUSTRALIA OR BRAZIL? IF NOT, WHAT ARE THE ALTERNATE SYSTEMS AVAILABLE?]

[TASK: REFER TO LOOK-OUT ASPECTS GIVEN IN THE CHAPTER ON LEADERSHIP AND MANGEMENT]

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Rule 6

Safe speed

Every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions.

In determining a safe speed the following factors shall be among those taken into account:

(a) By all vessels:

(i) the state of visibility;

(ii) the traffic density including concentrations of fishing vessels or any other vessels;

(iii) the manoeuvrability of the vessel with special reference to stopping distance and turning ability in the prevailing conditions;

(iv) at night the presence of background light such as from shore lights or from backscatter of her own lights;

(v) the state of wind, sea and current, and the proximity of navigational hazards;

(vi) the draught in relation to the available depth of water.

(b) Additionally, by vessels with operational radar:

(I) the characteristics, efficiency and limitations of the radar equipment;

(ii) any constraints imposed by the radar range scale in use;

(iii) the effect on radar detection of the sea state, weather and other sources of interference;

(iv) the possibility that small vessels, ice and other floating objects may not be detected by radar at an adequate range;

(v) the number, location and movement of vessels detected by radar;

(vi) the more exact assessment of the visibility that may be possible when radar is used to determine the range of vessels or other objects in the vicinity.

This Rule is divided into two parts; the first applicable to all vessels at all times, the latter to vessels with an operational radar. Placed in section I of Part B, this Rule applies in ***'any condition of visibility'*** or at all times. ***'All vessels'*** means any vessel irrespective of her type or activity, ***'power-driven'***, ***'sailing'***, ***'fishing'***, ***'restricted in their ability to manoeuvre'*** or ***'constrained by her draught'*** etc. The Rule applies to any vessel the moment she falls under the category ***'proceed';*** a vessel ***'underway',*** if she is stopped and not proceeding or is at zero speed through the water, would naturally not fall under the category ***'proceed'*** or be subject to comply with the requirements of this Rule.

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It may appear that even a ***'vessel not under command'*** would also stand covered by this Rule if she were proceeding. While these Rules do grant such a vessel many direct and implied privileges, none directly allows her or any other vessel any exemption from the requirements of ***'safe speed'***.

On the other hand, since a ***'vessel not under command'*** by definition ***'is unable to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel'***, it is clearly implied that she would also be unable to comply with any of the requirements of ***'these Rules'*** which would automatically include ***'safe speed'***.

'Shall at all times' stated at the very beginning means that this Rule has to be complied with at all times without any exception and implies that all ***'prevailing circumstances and conditions'*** should be monitored regularly in relation to the listed as well as any unlisted factors as may be relevant. As best judged, a vessel's speed should be changed immediately as necessary to always maintain her at ***'safe speed'***. The prime objective of the Rule is ***'that she can take proper and effective action to avoid collision'***. The two terms ***'proper and effective action'*** are closely interlinked in this Rule, the former being the conditions required to enable affective performance of the latter ***'action(s)'***.

In case of need, the officer in charge of the navigational watch shall not hesitate to use the helm, engines and sound signalling apparatus. However, timely notice of intended variations of engine speed shall be given where possible or effective use made of UMS engine controls provided on the bridge in accordance with the applicable procedures. *(STCW CODE A-VIII/2, paragraph 29)*

All bridge orders shall be promptly executed. Changes in direction or speed of the main propulsion units shall be recorded, except where an Administration has determined that the size or characteristics of a particular ship make such recording impracticable. The officer in charge of the engineering watch shall ensure that the main propulsion unit controls, when in the manual mode of operation, are continuously attended under stand-by or manoeuvring conditions. *(STCW CODE A-VIII/2, paragraph 65, performing the engineering watch)*

Further to paragraphs 29 and 65 of the ***STCW Code A-VIII/2*** quoted above, it must be borne in mind by all navigators that these Rules (IRPCS) do not always give any firm advice on the preferred ***'action to avoid collision'*** in the varying situations described under separate Rules. However, full freedom for taking any action as may be considered necessary in the circumstances is allowed as stated later in Rule 8 on ***'action to avoid collision'***. Such action may at times be to change a vessel's speed; therefore a vessel should always proceed at ***'safe speed'*** to enable rapid changes of speed.

Though not written or required by any Rule, it has been traditionally practiced that any change made to a vessels speed is done in consultation and with due approval of the Master. This may sometimes cause undue delay in taking action and could be interpreted as a breach of the requirements of these Rules. The freedom of deciding and executing any changes to the vessels speed so as to always maintain it ***'safe'*** should ideally rest with the OOW with no restrictions of any kind whatsoever.

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Navigators are known to be reluctant to reduce speed of their vessel's, as they give more attention to factors that support a higher cruising speed to maintain a vessels ETA, (estimated time of arrival), usually for commercial purposes than to factors that point to the need to slow down for safety and ***'to avoid collision'***. It is very important that due consideration is given to all factors suggesting a change in speed, since ***'a close-quarters situation'*** may develop rapidly. Navigators should be free to make speed changes, if required, without having first to notify another person or seek permissions (for example, the master or any engineer).

'Proper and effective action to avoid collision', the word ***'proper'*** has been discussed with Rule 5 on ***'look-out'***. However, in this Rule, ***'proper'*** also describes the ***'speed'*** that a vessel is proceeding at in conjunction with ***'safe',*** though in the Rule the word ***'safe'*** alone has been used to define speed. ***'Effective action'*** means effectiveness of actions taken to achieve the desired result, which is to ***'avoid collision'***. A vessel must be moving slow enough to be able to control its forward motion but in other circumstances fast enough for the rudder to remain effective, especially in channels where use of the rudder should be able to counteract any banking or interaction affects, at slow speed or with propulsion stopped the rudder becomes ineffective.

All vessels including a ***'stand-on vessel'*** should be at ***'safe speed'*** to be ready to act even for the most unexpected situation. Compliance with Rule 2 requirements make it mandatory to ***'make a departure from these Rules necessary to avoid immediate danger'***. Rule 17(b) requires a ***'stand-on vessel'*** to act if ***'risk of collision'*** becomes extreme, and this should still be ***'proper and effective'***. Though Rule 17 initially requires a ***'stand-on vessel'*** to ***'keep her course and speed'*** even after ***'risk of collision'*** has been established, too high a speed may place a ***'stand-on vessel'*** in a dangerously awkward position. Compliance with Rule 17 should not be considered ***'a departure from these Rules'***.

'Action to avoid collision' in differing situations is prescribed later in sections II & III of Part B of these Rules. However, ways of determining ***'risk of collision'*** and implementing any ***'action to avoid collision'*** are prescribed in this section I of Part B itself. This Rule 6 is about ***'safe speed'***, which means a speed that would enable a vessel to take the required ***'action to avoid collision'*** expected of her efficiently with emphasis on ***'be stopped within a distance appropriate to the prevailing circumstances and conditions'***.

The six factors listed in paragraph 'a' of this Rule ***'shall be among those taken into account: By all vessels'-'in determining'-'safe speed'***. These are the minimum that have to be considered but there could also be other factors that may influence this decision, even though not listed in this Rule. No mathematical formulae are prescribed wherein numbers pertaining to the various factors can be punched in and ***'safe speed'*** obtained. All aspects have to be accounted for in judging and deciding ***'safe speed',*** which is at best a subjective or a qualitative assessment and not a quantitative one. The result arrived may vary depending on the individual views of the navigators, their perception of the existing circumstances, their respective judgements and all this in turn would also depend on their experience. However, analysis of the results arrived at by different people show that the vast majority are within a rather narrow spectrum, even though the analysis remains subjective as explained.

The six factors applicable to all vessels at all times are essentially self-explanatory but each has several implications, explained below, each one is important.

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'Safe' is a difficult word to explain in simple terms it essentially means freedom from any harm or damage through accidents. ***'Safe'*** is also used as a relative term when describing or comparing different activities or similar activities carried out in varying manners or conditions: safer or less safe or not so safe, etc. Its use with the word ***'speed'*** implies that whatever ***'speed'*** is decided, after having taken into account all the factors, listed or not, is reasonably ***'safe'*** in the circumstances. ***'Safe speed'*** also implies a speed sufficiently slow to comply with Rule 8(e), ***'if necessary to avoid collision or allow more time to assess the situation, a vessel shall slacken her speed or take all way off by stopping or reversing her means of propulsion'***.

Though the explanations that follow primarily refer to power-driven vessels, they are applicable to all vessels. When applied to sailing vessels, the direction and strength of prevailing winds automatically become a point to be considered.

(a) By all vessels:

i: 'Visibility' means the visual range at which objects are visible, in practice means objects on or close to the sea surface. ***'The state'*** means the range and clarity of ***'visibility'*** and could further be extended to define the state of metrological and other factors affecting ***'visibility'***. The latter could include the direction of sunlight and its blinding effects, such that objects lying in the direction from where the sunlight is being received may not be sighted. Also, smoke from any source, the type of ship the navigators are on, their height above sea level, the layout of the navigating bridge and the positioning of the funnel and any deck gear like cranes and/or deck cargo. The latter may create blind sectors for both visual and radar scanning and interfere with the keeping of ***'proper look-out'***.

The better the visibility the earlier the possibility of visual detection of any object, and so more the time available to analyse the situation, as also more time available to plan and execute any ***'action to avoid collision'***, if required, and ***'in ample time'***, (from Rule 8 a).

Early detection by Radar also allows more time and is not affected by the state of visibility.

The range of visibility is of prime consideration in collision avoidance - for detection, analysis and action, and several court rulings have also referred to this aspect. A judge in a 1933 ruling had observed that a vessel *'should be able to stop within its limits of visibility'*. Stop is to bring the vessels movement through water to nil as an ***'action to avoid collision'***, this being an available option and an important one too. Such rulings have transformed into an unwritten *'half-distance Rule'* which has evolved in court rulings discussed at the end along with the case study of the collision between 'Tricolor' and 'Kariba', but this is not binding as explained later.

However, Rule 8(c) states ***'alteration of course alone may be the most effective action to avoid a close-quarters situation'***. As such this is the first choice for any ***'action to avoid collision'*** as discussed later with Rule 8 and linked to a vessels manoeuvring characteristics, especially turning capabilities as explained in the chapter on basic ship handling.

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ii: ***'Traffic density'*** is simple, if there is no other traffic the possibility of ***'risk of collision'*** with another vessel is also non-existent and obviously no need of any ***'action to avoid collision'***. On the other hand, if ***'traffic density'*** or concentration of vessels is high, then vessels should navigate with extra caution, as the frequency of meeting other traffic is higher including those with whom ***'risk of collision'*** may develop.

Monitoring of other vessels in high traffic density will also require a more alert ***'look-out'***.

When ***'in sight of one another'***, almost all vessels are required to keep clear of ***'a vessel engaged in fishing'*** as per Rule 18.

An almost regular assessment and analysis of the positions and movement of all vessels in the vicinity needs to be done to determine ***'risk of collision'***, and where required, prompt and swift actions executed ***'to avoid collision'***. The speed a vessel is proceeding at will have a direct impact on these aspects. The emphasis on ***'fishing vessels'*** is due to their nature of work and their unpredictable behaviour: a ***'vessel engaged in fishing'*** may work in groups and may make sudden and abrupt changes in her course and/or speed.

iii: ***'Manoeuvrability of the vessel'*** is about the way a vessel behaves with respect to the efficiency and effectiveness in turning, stopping, reducing speed or even increasing speed or any combination thereof linked to the time and distance parameters for any of these actions.

The manoeuvring characteristics depend on many factors; the type of vessel and its size, design, loaded or in ballast, momentum, the power and type of the main propulsion systems, propulsion power : displacement ratio, further linked to the type and efficiency of the steering systems. The parameters are further subject to the ***'prevailing conditions'*** of weather and sea. In addition, any time delay factors of the propulsion systems to respond to any change of propulsion power ordered, like reducing, stopping increasing or reversal of direction also affect the manoeuvrability of the vessel. The depth and width of water further have a large effect on the manoeuvrability of any vessel and very much a part of the ***'prevailing conditions'***. Though all these are subjects of separate detailed studies on ship handling, they all have a direct impact in the practical implementation of these Rules.

'Stopping distance' and time for a vessel to stop vary considerably when propulsion is stopped versus when it is reversed and vary in loaded, ballast or intervening conditions. Use of rudder cycling, zigzag turns or just turning the vessel full turn around can be used for a faster reduction of speed if required, depending on the available sea room and the proximity of other traffic or navigational hazards-these actions are normally more efficient and effective in initially reducing a vessels speed as compared to a crash reversal of propulsion. The chapter on basic ship handling refers to some of these in more detail and explains why turning a vessel, normally remains the most effective and efficient action.

Turning is not just about the time required for the action to be activated, carried out and concluded but importantly the advance, transfer and tactical diameter distances. These vary from vessel to vessel, differ in loaded/light conditions and on conventional vessels depend on

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the amount of rudder used, not on the engine speed. The advance and tactical diameter distances of most vessels remain almost the same at different speeds in deep waters and calm seas, provided the propulsion speed remains unchanged during the turn and it is executed at a constant rudder angle.

Navigators should be fully aware of the manoeuvring characteristics of their vessels.

The experience of each officer of the navigational watch, and the familiarity of that officer with the ship's equipment, procedures, and manoeuvring capability. *(STCW CODE A-VIII/2, paragraph 17.7)*

Officers of the navigational watch shall know the handling characteristics of their ship, including its stopping distances, and should appreciate that other ships may have different handling characteristics. *(STCW CODE A-VIII/2, paragraph 30, also see paragraphs 17.7, 17.10. 17.11, 22.4, 22.5.5.5, 30, 40.6 and 49)*

iv: 'At night the presence of background light' is not exactly but something similar to the blinding affects of sunlight. At night, background lights from any source would interfere with the vision of the navigators, the degree of interference depending on their intensity. This in turn will have a detrimental effect on visual ***'look-out'*** and may not allow lights of other vessels or navigational aids to be sighted. The Rule only states ***'such as from shore lights'*** but similar background lights may also originate from other external sources like accommodation lights of other ships if not properly shut off, large concentration of vessels engaged in fishing which at times use search lights or ships lying at anchor with their deck lights working or pleasure craft and passenger ships where open decks usually are and at times even the exterior hull may be illuminated.

'Backscatter of her own lights' means the glare caused by the various lights of a vessel itself, for example the accommodation lights and in some metrological conditions even the ships own navigational lights.

Background or backscattered lights can have a direct and severe detrimental effect on the efficiency and effectiveness of visual ***'look-out',*** reducing both range and clarity of sighting lights of other vessels and/or navigational aids. The reduced sighting range is dependent on the degree of interference this in turn will reduce the time available to analyse the situation and act if required. A proportional decrease in speed may thus be required to maintain a vessel at ***'safe speed'*** in such conditions. The STCW Watchkeeping Code also refers to these aspects as quoted below.

When deciding the composition of the watch on the bridge, which may include appropriately qualified ratings, the following factors, inter alia, shall be taken into account:

.2 Weather conditions, visibility and whether there is daylight or darkness. *(STCW CODE A-VIII/2, paragraph 18.2)*

The relieving officer shall ensure that the members of the relieving watch are fully capable of performing their duties, particularly as regards their adjustment to night vision. Relieving officers shall not take over the watch until their vision is fully adjusted to the light conditions. *(STCW CODE A-VIII/2, paragraph 20)*

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Note: This will also apply when any one walks out from a lighted chart room into a dark bridge at night and it is for this reason chart room or other lights in the wheelhouse, but even those outside the navigating bridge are always kept at low illumination intensity during hours of darkness. It takes 10 to 15 minutes for the eyes to adjust in darkness.

v: ***'The state of wind, sea and current'*** refers to the effects of prevailing weather on the manoeuvring of a vessel.

> Sea state is due to the prevailing wind, and swell is from weather disturbances elsewher; both are technically separate terms. They can exist in isolation or together; their individual characteristics direction and effects also vary. There may be swell and no sea (as there is no wind), and vice versa.

The wind effect on a car carrier with a shallow draught and a very large freeboard area would be different from a loaded tanker with deep draught and low freeboard. The relative direction between the vessel and the wind and/or the swell do matter. Sea and swell could invoke rolling and/or pitching, a certain amount of drift, restrict manoeuvrability and impose restrictions on the propulsion machinery operating parameters. If dangerous rolling and/or pitching is experienced then vessels should change their propulsion power and/or their course to cope with or get out of such situations. Synchronous rolling and parametric rolling are terms used for such conditions and are a combined function of various components, the length, breadth and stability of a vessel and the relative direction, length and height of the waves being encountered.

'Proximity of navigational hazards' means any and all factors that can be hazardous to safe navigation: other traffic, shallow waters, shoals, wrecks, land or anything else that can be, or contribute to, hazards of navigation.

All the above can impose restrictions on the vessel's ability to manoeuvre, usually restricting her from turning due to limited sea room but sometimes also from changing her speed. Weather aspects have been discussed earlier in the explanations following Rules 2 and 3.

vi: 'Draught in relation to the available depth of water' is about **'under keel clearance'** (UKC). If the UKC is large, a vessel will manoeuvre as normally expected of her. However, when the UKC is low, the water displaced by the vessel's movement through the water is not filled in immediately, creating a vacuum effect. The hydrodynamic forces created in such situations induce a suction effect on the vessel that not only pulls her bodily down to compensate for the vacuum or the low pressure created by the displaced water, but also has an extremely detrimental effect on the vessels normal manoeuvring behaviour. A vessel becomes rather sluggish to manoeuvre when experiencing squat and all the various effects are referred to simply as squat effects.

Normally when the UKC reduces from large values and drops to an amount equal to the vessels draught, squat effects start showing and increase gradually in a parabolic pattern as the UKC drops to half the draught, increasing rapidly thereafter as the UKC further reduces. Squat effects have been explained in more detail in the chapter on basic ship handling; their study will help in better understanding the implications of this subparagraph of this Rule.

'Available depth of water' also applies to the depth of water in the vicinity. If the depth of the surrounding waters is low, a vessel cannot go towards such areas without the risk of stranding

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(agrounding). Depths restrict sea room as explained with ***'proximity of navigational hazards'***.

(b) Additionally, by vessels with operational radar:

Paragraph b of this Rule is about additional factors to be considered in determining ***'safe speed'*** by vessels with an operational radar(s).

Neither this Rule, nor any other Rule in IRPCS clearly states when radar should be used. Its use is implied in Rule 5 on ***'look-out'***; it is referred to here in this Rule 6 and in Rule 7 on ***'risk of collision'*** and finally in Rule 19 (d) on ***'conduct of vessels in restricted visibility'***. All these references point to the fact that use of radar is actually desired and accepted by these Rules as an important tool for ***'preventing collisions'***.

STCW CODE A-VIII/2 clearly specifies the minimum use of radar. This has already been referred to in the explanations of Rule 5. While this minimum defined usage must be complied with, nothing restricts the usage of radar at other times and it is recommended that radar(s) should be used whenever deemed necessary. The fitment of radar and ARPA systems is governed by the SOLAS convention; which automatically implies that the same should also be used.

'Operational radar' means the radar is actually in use for any of its intended functions. If radar is in use, then the factors listed in paragraph 'b' of this Rule have to be considered and taken into account in determining ***'safe speed'***.

It must be borne in mind by navigators that use of radar or any other electronic devices is considered an aid to navigation and that a wide variety of equipments exist with varying levels of capabilities. Wherever required by law, all radars should comply with the minimum technical specifications and performance standards set by IMO. However, some vessels not requiring radar by law may have radar sets fitted on board with very basic features and not necessarily complying with IMO criteria. Radar is an aid, and an aid is not a substitute for the human sensory systems or the analytical ability of the human mind. (*Even NASA's Challenger has always been manually guided, controlled and landed in its last long leg of its re entry return flight, not by computer controlled automation, the sensors and computers only providing all the required inputs. Studies by NASA have shown that modern computer controlled automation is still not a good enough substitute for the human brain).*

Radar systems may fail to detect small targets, especially small wooden or fiber glass vessels. Bearing and range data obtained from radar may have some errors. Change of course and/or speed by targets and even change of radar bearings may not reflect immediately on the radar and this may lead to a higher rate of error in determining ***'risk of collision'*** as compared to visual bearings. ARPA systems also take time to analyse the changes in the course and/or speed of the targets and the predictions are reasonably accurate only if the bodies are on a steady course and speed, IMO performance criteria allow for up to 3 minutes for analysis and calculating predictions. Notwithstanding any technical and performance related limitations, radar over the years has proved

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to be of immense help in navigation and in the application of these Rules for ***'preventing collisions'***. However, the competence and experience of the navigators using radar(s) cannot be undervalued since the assimilation of data provided by the radar, its interpretation and subsequent application to ***'any action to avoid collision'***, all depend on a navigators' skills. The radar controls should be properly set and the efficiency of the radar sets for optimum performance should be checked and maintained by all means such as the use of performance monitors or by manual tuning devices.

It should be borne in mind that watching the radar screen continuously causes screen fatigue, or stresses similar to when watching a TV or a computer screen for too long.

At times, especially in congested traffic and/or restricted visibility when radar is used as the primary or main collision avoidance tool, its use is emphasised in a 1962 Ruling by Mr. Justice Hewson. *"When reliance is placed on the radar, it cannot be too strongly emphasised that a continuous radar watch should be kept by one person experienced in its use."*

"High speeds at collision cause much greater damage than low speeds. High speeds before collision give less time to appreciate properly the development of the situation. Therefore, if radar is relied upon it must be properly used. If you rely upon the extended and accurate look-out that is provided by radar to justify immoderate speed, you must be careful to see that you use your radar properly and with seamanlike prudence upon the indications and inferences that are given by it, or may be drawn from data supplied by it. (Mr. Justice Hewson, 1963)"

Note: The older version of these Rules used the term 'moderate speed' which is now replaced by ***'safe speed'****, and is also better defined in the present Rules, as such the reference to immoderate speed in the above quoted court verdict was based on the older edition of the Rules.*

There are two basic types of marine radar systems, the 'X' and 'S' band systems.

The X-band, also called the 3 cm radars, send out short high-frequency pulses, yielding a very sharp and detailed image of the surrounding area. However, these have a limited range and are affected substantially by rain and sea clutter.

The S-Band, also called the 10 cm radar, packs a lot of power into their low frequency but long wavelength signals and is able to look into and beyond the weather. They can detect objects at further ranges, are less affected by rain or sea clutter, but may not provide a display picture as sharp as the X-band radars.

In short, the larger the wavelength the lesser the effect of sea clutter, better the detection of targets but less sharp the radar picture.

i: 'The characteristics, efficiency and limitations of the radar equipment'. Characteristics of radar systems include many differences especially between the 'X' and 'S' band radars explained above. Efficiency would be the sensitivity of detecting targets and the range at which they are picked up coupled with the various display and analysing features.

Limitations of the equipment can be many: starting up time, interference due to weather or other radars, shadow and blind sectors, the possibility that smaller targets, especially those made of poor radar reflecting materials like wood or synthetic materials like fibre glass and ice, may not be

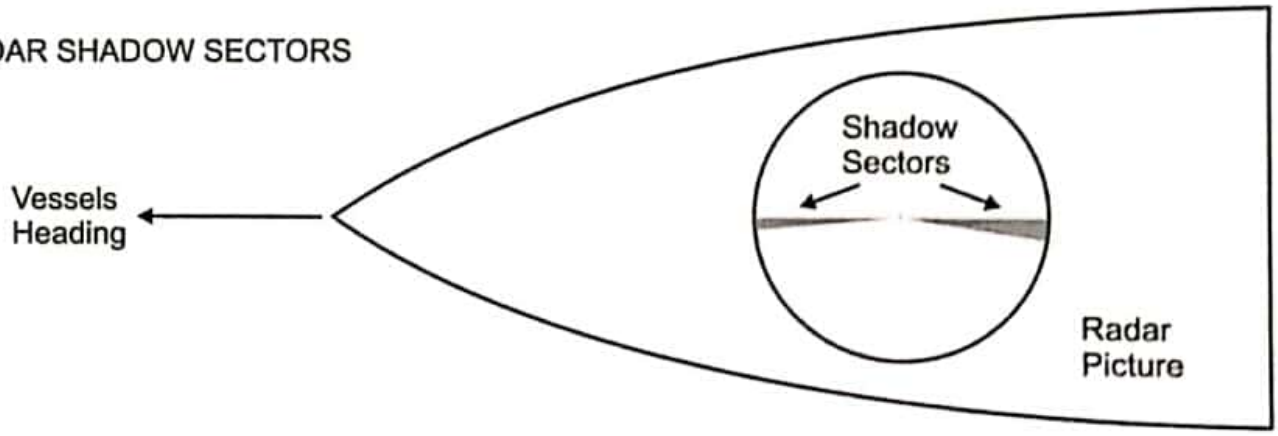
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picked up or displayed at long ranges or get obscured due to sea or rain clutter. Further the probability of false echoes, the range scale in use, the range and/or bearing accuracy, target discrimination aspects and the effects of manual sea and/or rain clutter or automatic clutter controls on the sensitivity of the radar systems all add up for the limitation aspects. The use of clutter controls unwanted echoes, but they also tend to fade echoes of real targets and in general must be used with caution with reference to the performance capabilities of the radar in use. The interfering effects of other equipment feeding in or taking information from the radar also has to be accounted for.

Most radar systems usually incorporate built in ARPA systems and these have a time lag in determining the way a target is moving based on the input data. If the target(s) or own vessel change their course and/or speed, the predictions will not be accurate till both are steady on their new course and speed for some time, this may take up to 3 minutes.

To ensure that known radar shadow or blind sectors are scanned, changing the vessel's course by amounts equal to or slightly more than the shadow sectors for short durations at regular intervals, is considered prudent practice in the proper usage of radar. Should something go wrong, the failure of not doing so might be held against the navigators on the grounds that best navigational practices were not being followed.

RADAR SHADOW SECTORS



[TASK: READ AND UNDERSTAND THE DIFFERENCE BETWEEN SEA, RAIN AND AUTO CLUTTER, HOW THEY WORK AND IN WHICH WAY EACH OF THEM MAY BE USED?]

ii: 'Any constraints imposed by the radar range scale in use' means that the range scale in use has a direct effect on the overall efficiency and effectiveness of the radar systems. At a small range it is a large scale picture but even in the off centred mode the range of radar ***'look-out'*** is still reduced. If long range is selected it is like using a small scale chart: everything appears small. Long range allows early detection of targets and a better overall assessment of the situation, but small targets and/or those with weak radar wave reflection characteristics may not be detected due to weak returning echoes and as such may not show on the radar display screen or the PPI at all. Short range scales usually provide good resolution and enable detection of small targets; long range scales sacrifice detail to display a larger range and allow early detection. There are both positive and negative aspects for both the extremes and navigators should decide the optimum range scale to be used,

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keeping in mind that changing the range scale is considered a necessary act for proper radar operations.

[TASK: READ PARAGRAPH 38 OF STCW CODE SECTION A-VIII/2 ON RANGE SCALES.]

In a radar picture, the range and bearing accuracy of targets may also be affected by the range scale in use. However, the ARPA or electronic readouts should not be affected by the range in use. Navigators must exercise caution when seeing and analysing data of targets acquired on ARPA. If the targets pass very close to each other, target swap may take place: that means the number or alphabet assigned to identify the targets swap over and the observer looking at the data window will see a totally different data/prediction than what was there before the swap. It is a prudent practice to confirm that the data being seen is of the intended target on the display. This may or may not affect targets showing or take place on ECDIS systems, depending on whether the ECDIS totally takes all inputs from the radar or assigns its own reference tags.

Having an approved ECDIS on board vessels is not yet a mandatory requirement though their use is allowed if fitted. ECDIS systems become mandatory in a phased manner from 1st July 2012 for new ships till 1st July 2018 for existing ships. Most ECDIS systems have an option of being interfaced with the radars, exchange information and display the same in different display layers, also referred to as radar overlay. The operator can thus use the ECDIS system to see the radar picture on the same screen, but, as a matter of caution, this may interfere with the viewing clarity of the navigational data being shown on the ECDIS system and vice versa. The navigational data may automatically take priority of display over radar information at times. Navigators should exercise caution when using an ECDIS system to replicate the radar picture on it.

Whenever necessary, two or more radar sets should be put in operation on different range scales to avoid changing scales frequently. In such cases, it should also be considered to use one exclusively for ***'preventing collisions'*** and the other for position fixing and monitoring to reduce any chance of confusion between the bridge team members. If there are more than two sets in use, the bridge team members should decide on their optimum usage to gain maximum benefit.

Speed through water must be used as the input for the ARPA system used for ***'preventing collisions'***. This is a requirement for vessels over 10'000 gross tonnage and upwards stated in Regulation 19, paragraph 2.8.1 of SOLAS Chapter V, ***'an automatic radar plotting aid .... connected to a device to indicate speed and distance through water'***.

[TASK: AS PER THE ABOVE PARAGRAPH OF SOLAS, WHAT IS THE MINIMUM NUMBER OF TARGETS AN ARPA SYSTEM MUST BE ABLE TO PLOT AUTOMATICALLY?]

iii) 'The effect on radar detection of the sea state, weather and other sources of interference' is essentially about echoes returned by the sea itself, called sea clutter which can hide the echoes of real targets. Weather conditions also affect radar performance like low heavy rain bearing clouds and/or rain itself that will reflect the radar waves and show as patches on the radar PPI, obscuring real targets. Other sources of interference can be many, like other radars in the vicinity or false or multiple echoes etc. The navigators have to account for all these in assessing the dependability they can

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place on the radar and decide, on this basis, the required ***'safe speed'*** at which their vessel should proceed when using radar for ***'preventing collisions'***.

The reasons for the radar not being able to detect targets have been discussed earlier and sometimes it may be because the radar itself is weak, that means that its transmission is so weak that reflected echoes fade off before being received back, or the internal amplification systems are not working well, as such the importance to carry out performance checks as stated earlier. If targets are not detected at an adequate range, their assessment cannot be done in good time to ***'determine if a close-quarters situation is developing and/or risk of collision exists'*** and if any ***'action to avoid collision'*** is required.

iv) 'The possibility that small vessels, ice and other floating objects may not be detected by radar at an adequate range' have been explained with Rule 5, in the beginning of this explanation on paragraph 'b' and also after subparagraph 'b-i', thus not repeated here.

v) 'The number, location and movement of vessels detected by radar' is also to do with the workload of the navigators, the task of detecting, observing, analysing and keeping a track of the targets till they have passed clear, especially those which have or may have had a ***'risk of collision'*** or those likely to pass too close for comfort. Judgement and decision making depends on the workload which in turn depends on the ***'number, location and movement of vessels'*** in the vicinity.

Though the radar and ARPA may give all the information, the human mind has limitations and can get saturated or overloaded when there is too much information to analyse; a navigator's concentration can be locked on some of the information while missing other data. These factors depend on the time available: the faster the speed the less the time available, hence consideration should be given to these aspects when determining ***'safe speed'***. If the number of vessels in the vicinity is fewer and they are spaced farther away, or they are moving in directions well away and will pose no ***'risk of collision'***, the situation may not impose any restrictions on the speed. However, if the number of vessels in the vicinity is large and at closer range, the vessel should be at a speed which gives the navigators on board sufficient time to assess the situation and any dynamic changes to it. The implication of these Rules clearly is on slower speeds to allow for time, not just for making assessments but for executing ***'any action to avoid collision'*** too.

vi) 'The more exact assessment of the visibility that may be possible when radar is used to determine the range of vessels or other objects in the vicinity' is implying that assessment of visibility by visual determination is fraught with errors. If there are any vessels or objects visible in the vicinity, their range can be accurately determined by radar to allow a ***'more exact assessment of the visibility'***. Compliance with requirement of subparagraph 'a-i' of this Rule on ***'state of visibility'*** can be better done if the visibility is known correctly, which can be easily determined by radar.

In concluding the explanations of this Rule, the reluctance of Masters and navigating officers to reduce the speed to ***'SAFE'*** has been held not only against them as a wilfully committed wrong act, but also against the shore based management of companies in case of a collision at sea. In many cases, various logs and reports made to the shore based management have been checked as part of the investigations. In some, it was found that the shore-based management had not reviewed the information and detected the errors, or having done so, had not taken any, or had taken ineffective corrective or preventive actions, leading to legal action even against the shore staff. In one such case the navigation log abstract sent from the vessel to the

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shore based management office showed visibility as poor but the corresponding speed entries as well as the engine room log entries indicated that the vessel did proceed at full speed and the engines not placed in a state of readiness. Non-compliance by the vessel with these Rules and the watchkeeping requirements of the STCW Code was confirmed and legal action initiated against all concerned because it was established that the shore management had not taken cognisance of these reports or reacted to correct the same.

In a judgement about a collision in restricted visibility conditions when a vessel collided with another lying at anchor, the court of appeal judge upheld the lower court judgement holding the ship owner guilty and had stated, *"A primary concern of a ship owner must be safety of life at sea. That involves a seaworthy ship, properly manned, but it also requires safe navigation. Excessive speed in fog is a grave breach of duty, and ship owners should use all their influence to prevent it. In so far as high speed is encouraged by radar, the installation of radar requires particular vigilance of owners"*. It is also worth mentioning that the certificates of competency of the master and the navigating officer on watch of the vessel underway were also suspended for some time as punishment towards not correctly complying with the requirements.

The implication of this Rule is that the higher the speed, the lesser the time available to detect traffic, analyse the same and react to it, and vice versa. The larger the vessel, the greater the momentum and that much longer the distance she will carry on travelling even after her propulsion is stopped or even reversed. Reversal of propulsion is normally not immediately possible on conventional vessels and remains debatable as far as day to day practical operations are concerned; the technical and operational limitations of the machinery involved makes it difficult to reverse propulsion immediately. These aspects vary from the type of machinery system and its working parameters, and these details must be known to the navigators of the vessel they are serving on. Reversal of engines is discussed in more detail in the chapter on basic ship handling.

Navigators must always be able to justify that the speed at which they are navigating their vessel is reasonably ***'safe'*** as per the provisions of this Rule applied in the existing circumstances, be it full sea speed or down to near stopped. Steerage can be maintained at very low speeds even if the propulsion power is cut to zero by using short propulsion kicks to maintain a vessel on her course, or to change her heading as may be necessary.

Many years ago, two very large laden tankers had a minor collision off Tobago near the edge of a tropical rain squall. One of them had just passed through the heavy rain. Both vessels had been proceeding at full sea speed and detected each other when just less than 2 miles away. At the subsequent enquiry it was held that both the vessel's had not made proper and effective use of their radar's and both were proceeding at excessive speed which was not considered safe in the prevailing conditions of visibility.

There are many other similar cases on record of collisions caused due to improper use of the radar or failure to detect smaller targets, especially in rough sea conditions or rain/snow squalls when they were hidden in clutter and were not sighted visually. In all such cases, repeatedly, it was concluded that the vessels concerned were at too high a speed vis-à-vis the prevailing visibility, weather and sea conditions. This will also apply to detection of ice: it is common knowledge that ice is a poor radar reflector and may not be detected until too close,

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sometimes as close as 3 to 4 nautical miles. As such, too much or over reliance should not be placed on the radar and the same used with caution as an aid to navigation only.

The following details of the collision *between 'Tricolor' and 'Kariba' are very interesting not just about this Rule but on the overall application of these Rules for collision prevention. These two vessels that collided had no risk of collision between them initially; the risk existed between Kariba and another vessel 'Clary'; Clearly the visibility was not good, therefore the lessons learnt from this case study can be used in practice for preventing collisions at sea.*

*Just after 0200 hrs on 14th December 2002, three vessels were navigating off the coast of Dunkerque, France and were approaching an intersection in a Traffic Separation Scheme (**TSS**). The Kariba and the Tricolor were proceeding Westward on the East-West branch of the TSS, with the Kariba ahead and the Tricolor some distance behind and about one-half mile to the North of the Kariba. Because the Kariba was sailing at about 16 knots and the Tricolor at 17.9 knots, the Tricolor was gradually overtaking the Kariba and, had the ships maintained their courses, the Tricolor would have passed the Kariba on its starboard side with about one-half mile between them. The Clary, meanwhile, was moving Northward on the North-South branch of the TSS at 13 knots, on a collision course with the Kariba. The collision occurred when both vessels were about to enter into the North-South shipping route through the English Channel. Clary did not take **'any action to avoid collision'**; Kariba altered towards Tricolor and struck her on the port side. Tricolor, a car carrier, quickly took on water, then capsized and sank within 30 minutes: all the people on board managed to abandon the vessel safely and were rescued. The third vessel, the Clary, was said to have embarrassed the navigation of Kariba causing Kariba to turn into Tricolor, ram her, and sink her. The Tricolor was travelling from Zeebrugge to Southampton, the Kariba was on a voyage from Antwerp en route to Le Havre.*

*The wreck of Tricolor was immediately marked by buoys but within two days, on 16th December, a German cargo vessel Nicola, proceeding in ballast, struck her wreck. Tugs pulled the cargo ship from the wreck on the same day. However, on Wednesday, 1st January 2003, the wreck of the Tricolor was struck again. This time, the Turkish tanker Vicky, which was carrying 77,000 tons of gas oil, hit the wreck. This highlights not just the importance of maintaining **'look-out'** but also to be aware of navigational warnings issued regularly: the details of the wreck and the buoy marking the same had been announced repeatedly through various navigational warnings.*

Following extracts from the judgement delivered on 21st May 2008 should help you analyse the situation and learn for it to prevent similar problems in future:

The Kariba, the Tricolor and the Clary - committed navigational errors that caused the Kariba and the Tricolor to collide and the Tricolor to capsize and sink. On January 4, 2006, after a bench trial, this Court found the Kariba 100% liable for the collision. The Kariba's owner and various owners of lost cargo appealed, and on July 6, 2007, the Second Circuit held that all three vessels were liable for the collision and remanded the matter to this Court to allocate percentages of liability among them. For the reasons set forth below, and with guidance from the Court of Appeals, this Court now finds that the Kariba was 63% liable for the collision, the Clary 20% liable and the Tricolor 17% liable.

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Other issues on remand are whether the Tricolor's speed was a proximate cause of the Collision. For the reasons set forth below, this Court holds that the Tricolor's speed was a proximate cause of the collision.

In sum, the Tricolor is culpable for two unsafe acts, unsafe overtaking and excessive speed, which together violated four COLREGS. The Tricolor's overtaking violated COLREGS 13 and 16, the Tricolor's speed violated COLREGS 6 and 19(b). Moreover, each of the Tricolor's unsafe acts was a cause of the collision and will be counted in the allocation of liability below.

On safe speed, COLREG 6 requires that "every vessel shall at all times proceed at a safe speed so that she can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions," and COLREG 19(b) provides that "every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility." The Circuit held that, as a matter of law, the Tricolor's speed of 17.9 knots was not a safe speed "under conditions of heavy fog, in a TSS known for its traffic congestion, and with the knowledge the Kariba was on a collision course with the Clary."

This question of whether the Tricolor's unsafe speed was a proximate cause of the collision hinges entirely on whether the Tricolor, had it not been proceeding at an unsafe speed, would have been able to stop soon enough to avert or mitigate the harm of the collision. In other words, the question hinges not on the factor of the Tricolor's speed in isolation, but whether that speed reflected an inability to stop, or slow, in time to avoid the Kariba's abrupt abaft-the-beam turn.

The Circuit left unanswered the question of what would have constituted a safe speed, but suggested that "a court might usefully consult the half-distance Rule for frame of reference." Under the half-distance Rule, a safe speed is "a speed permitting [the vessel] to stop within half the distance the lookout could see ahead." [citing Union Oil Co. v. The San Jacinto, 409 U.S. 140 (1972)]. In other words, "the vessel's speed should be sufficiently slow to enable her to stop within half the limit of visibility." Here, Captain Knutsen stated in his trial declaration that visibility was less than a mile on the night of the collision. Accordingly, under the half-distance Rule, a safe speed would have allowed the Tricolor to stop within a half-mile's distance. The Tricolor's maneuvering characteristics show that at Full Sea Speed, or 17.5 knots, the Tricolor would need about 1.02 miles to stop. The Tricolor was proceeding at a slightly faster speed, at 17.9 knots. Had it been proceeding at Full Ahead, or 11.2 knots, however, the Tricolor could have stopped within half a mile. Therefore, a safe speed under the half-distance Rule would have been 11.2 knots. The Tricolor argues extensively that its speed was not a proximate cause under the logic of Berry v. Sugar Notch Borough, 191 Pa. 345 (1899). Specifically, the Tricolor reasons that its speed could not have been a proximate cause because it did not increase the risk that the Kariba would make an abrupt turn to starboard. While the district court found this line of cases to have some merit, the Second Circuit explicitly charged me with determining whether the Tricolor's speed was a proximate cause, "notwithstanding" Berry and its progeny. The Circuit clearly set

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forth the standard for determining whether the Tricolor's speed was a proximate cause, separate and apart from whether the speed increased the likelihood that the Kariba would make its fateful turn.

The Circuit, however, observed that while stopping distance is a "major factor for considering whether a speed was safe," a court also must consider additional factors such as visibility, sea conditions, traffic and the vessels' capabilities. Nevertheless, given the restricted visibility and heavy traffic that night, this Court will suppose for the moment that a safe speed would not have exceeded 11.2 knots.

Next, it must be determined whether a safe speed of 11.2 knots would have permitted the Tricolor to slow or stop in time to avoid the collision. The CD simulation prepared by Captain Boyce demonstrates that, if Captain Knutsen had decreased the Tricolor's speed to 11.2 knots once he realized that the Kariba and the Clary were on a collision course, the Kariba and the Tricolor would not have collided. Captain Knutsen testified that he became aware of the other two ships' collision course by 2:04:38 a.m. If at 2:05 a.m., he had started to decrease the Tricolor's speed from 17.9 knots to 11.2 knots, which conservatively would have required about 638.1 seconds, the simulation shows that the Kariba, after making its starboard turns, would have passed in front of the Tricolor, with no collision. Therefore, had the Tricolor reduced her speed to 11.2 knots, the collision would not have occurred.

While the Tricolor does not identify a safe speed, it argues that the half-distance Rule is inapplicable here because this Rule is customarily used when vessels are approaching one another head-to-head, and not moving parallel to one another, as here. The Tricolor also argues that the Rule is less relevant where vessels operate advanced radar equipment, as here. These arguments are moot, however. Even disregarding the half-distance Rule, had the Tricolor reduced its speed to only 16 knots, the speed of the Kariba, the Boyce simulation demonstrates that the collision would not have occurred, assuming that the Kariba steadied on its course after making its abrupt turn to starboard instead of stopping. (The Kariba put on the brakes only because Captain Kamola realized it was going to ram into the Tricolor; if the Tricolor had reduced its speed to 16 knots, beginning at 2:05 a.m., there would have been no need for the Kariba to stop.) Therefore, even if the Tricolor had reduced its speed to 16 knots to match the Kariba's speed, so that she was no longer overtaking the Kariba, she could have avoided the accident.

The full text of the judgement may be seen on the internet and is available on the link. http://www.hklaw.com/File.aspx?id=2677&inline=1

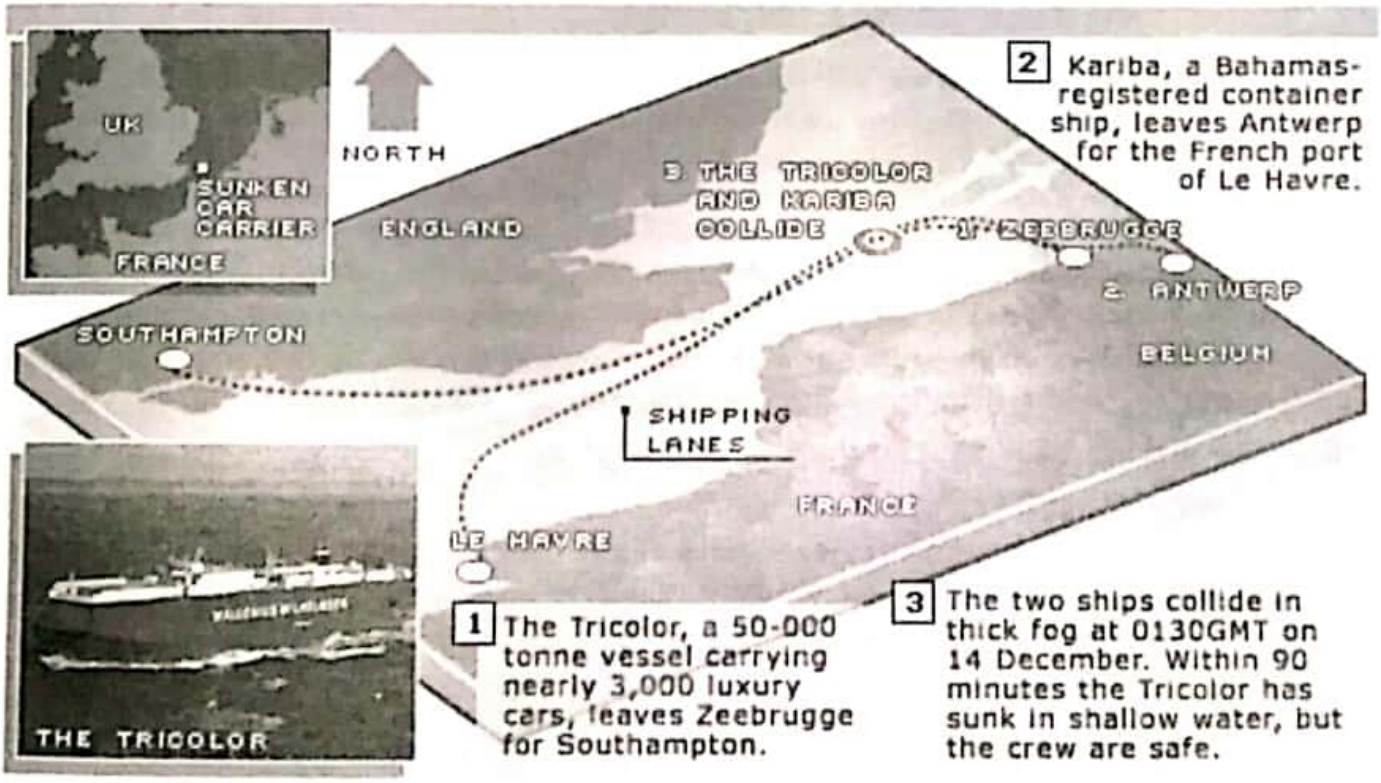
The above court ruling may appear scary but legal cases can become a major headache for the vessels owners, managers and most of all for the navigators in control of navigational activities. In this case, the visibility was restricted or very poor and the application of Rule 19, discussed in depth later, may have prevented the collision. The so called **'half-distance Rule'** referred to in the judgment is not an existing Rule anywhere in the present legislation but has been used in court cases as a base or an argument to determine ***'safe-speed'***. Once such an example or argument used in a court sustains through a judgement, it usually becomes a sort

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of a standard which can be referred to in future court cases by any other court even if in another country, since these Rules apply universally across the world. Notwithstanding the use of Radar, as late as in 2008, the courts have felt that the range of visual visibility remains one of the most important criteria in determining ***'safe-speed'***. However, the court has used the comment, ***"a court might usefully consult the half-distance Rule for frame of reference"***. This implies that this is something not necessarily binding in all situations. Another court ruling of 1933 stated earlier with the explanation of Rule 6(a)(i) is repeated to highlight this aspect again, a vessel ***'should be able to stop within its limits of visibility'***.

[TASK: SEARCH THE INTERNET TO RESEARCH AND STUDY MORE ON THIS UNFORTUNATE ACCIDENT AS WELL AS THE REMOVAL OF THE WRECK OF THE ILL FATED 'TRICOLOR'. DO YOU FIND ANY SIMILARITIES WITH THE JANUARY/FEBRUARY 1971 ACCIDENTS WHICH TOOK PLACE OFF U.K. AND STATED AT THE END OF RULE 10.

ONE OF THE WEBSITE IS http://www.tricolorsalvage.com]







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Rule 7

Risk of collision

(a) **Every vessel shall use all available means appropriate to the prevailing circumstances and conditions to determine if risk of collision exists. If there is any doubt such risk shall be deemed to exist.**

(b) **Proper use shall be made of radar equipment if fitted and operational, including long-range scanning to obtain early warning of risk of collision and radar plotting or equivalent systematic observation of detected objects.**

(c) **Assumptions shall not be made on the basis of scanty information, especially scanty radar information.**

(d) **In determining if risk of collision exists the following considerations shall be among those taken into account:**

- **(i)** **such risk shall be deemed to exist if the compass bearing of an approaching vessel does not appreciably change;**
- **(ii)** **such risk may sometimes exist even when an appreciable bearing change is evident, particularly when approaching a very large vessel or a tow or when approaching a vessel at close range.**

To recompile, Rule 2 ends with the remark ***'to avoid immediate danger'***- danger includes ***'risk of collision'***. Rule 5 requires the navigator ***'make a full appraisal of the situation and of the risk of collision';*** Rule 6 states that they take ***'proper and effective action to avoid collision'*** and the next Rule 8 is on ***'action to avoid collision'***. These Rules repeatedly refer to the dangers or ***'risk of collision'*** and the prime need for ***'preventing collisions'***.

Rule 7 describes the practices to be followed by the navigators of all vessels to determine ***'risk of collision'***. Naturally and logically, any action to ***'avoid collision'*** should be after having determined that ***'a close-quarters situation is developing and/or risk of collision exists'***. Once this is confirmed, timely or otherwise, it triggers the application of many other Rules that may need to be applied by the navigators depending on ***'the prevailing circumstances and conditions'***.

Rules in Part B Sections II (11-18) and III (19) describe the various types of situations which may be encountered and the expected ***'action to avoid collision'*** from vessels ***'in sight of one another'*** or ***'to vessels not in sight of one another when navigating in or near an area of restricted visibility'*** respectively.

In a simple sequence, the steps for ***'preventing collisions'*** are as follows.

1) ***'Look-out'***; *(full appraisal)*
2) Determination of ***'risk of collision'***, and if it exists, then;
3) ***'Action to avoid collision'*** as per the relevant Rules of Part B.

This Rule 7 is about a detailed analysis of all relevant information from any source to determine ***'risk of collision'***. Rule 5 on ***'look-out'***, in comparison, is more to do with the collection of data. Do note that both these Rules start with ***'every vessel shall'*** and contain the phrase ***'all available means***

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appropriate to the prevailing circumstances and conditions'. Rule 5 ends with the requirement ***'to make a full appraisal of the situation and of the risk of collision'***. This Rule 7 is about doing this ***'full appraisal of the situation'*** - ***'to determine if risk of collision exists'***.

This Rule applies at all times as per Rule 4. However, there have been some court rulings in the past saying that this Rule on ***'risk of collision'*** should not apply at very long ranges especially when the speed of approach between vessels is low. Arguments in court cases regarding the range at which these Rules apply have not ended in any firm judgement. The Rules in this section -or anywhere else for that matter- have neither defined nor given even the slightest hint or indication of any numerical or mathematical limits about their application except Rule 25(f). Rule 1(a) states ***'these Rules shall apply to all vessels upon the high seas and in all waters connected therewith navigable by seagoing vessels'***. By this clause alone, all the Rules apply to all vessels at all times irrespective of range. However, going by Rule 2 (a), and the latter part of the phrase ***'precaution which may be required by the ordinary practice of seamen'***, it is a matter of common sense and logic that this or any other Rule should apply to vessels in the vicinity of each other and not on opposite sides of the globe.

'Risk of collision' is a combination of the relative speed of approach and the time it will take for the vessels or bodies to make contact. Determining ***'risk of collision'*** is an analysis of the vectors of the bodies concerned. If the vectors meet at the same point at the same time when projected forward in time it signifies that they will collide. This also applies to vessels that are moving on a particular course at a certain speed or having a vector. If they continue on their paths, and would make contact with each other, as explained, it means they have ***'risk of collision'***. At sea the implied bodies are vessels by this Rule, but there could also be ***'risk of collision'*** with other fixed or floating objects, those not moving have a zero vector and lie in the projected path of the other. Do note that contact with fixed objects like bridges is sometimes called an 'allision'; this is vessel contact with a fixed object, but that does not make any difference to the determination of the ***'risk of collision'***. One school of thought is that a vessel at anchor is also considered a fixed object and any contact with her is sometimes termed as an allision, usually in USA. However, this is not universally accepted and the traditional view remains that a vessel at anchor is not a fixed object since she is afloat, similar to buoys which are also not considered fixed objects.

The closest range of approach is perhaps the most important element in deciding ***'risk of collision'***. A collision occurs when the range decreases to zero, but ***'risk of collision'*** may exist even when the projected range of closest approach is somewhat greater than zero. A very close passing, say within one vessel length, could certainly be considered as a condition involving ***'risk of collision'***; more on this is explained later, with the term ***'close-quarters situation'***.

'Risk of collision' does not usually arise suddenly like the light from an on-off switch, but rather increases or decreases gradually, like the light from a dimmer switch, and save for some vessels making a sudden and abrupt change of movement like in the Tricolor and Kariba collision explained with Rule 6, there should usually be reasonable time to determine the same if ***'proper look-out'*** is being maintained.

There will be a difference in deciding the ***'risk of collision'*** when in open sea situations where

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vessels are likely to continue on the same course and speed for considerably long durations versus harbour channels or rivers with bends where course changes may be frequent and the situations between vessels changing rather rapidly. In such channels, the conduct of vessels is governed by Rule 9 so that frequently changing tracks do not lead to confusion in determining the rather rapidly changing situations and application of the concerned Rules.

a: Describes that determination of ***'risk of collision'*** has to be carried out by every vessel. Though not stated, it is implied and is a matter of ***'ordinary practice of seamen'*** or basic common sense that this requirement applies at sea or in other navigable waters when the vessels are underway and may also apply to vessels at anchor too, ***'if the master considers it necessary, a continuous navigational watch shall be maintained at anchor'***. *(Extract from STCW Code A-VIII/2, paragraph 51)*

'All available means' is a repetition of the words used in Rule 5, so are the words ***'appropriate'*** and ***'prevailing circumstances and conditions'*** and mean the same as explained earlier. ***'All available means'*** would include any and all systems, humans or machines and any combination thereof, whether internal on board a vessel or external, listed in these Rules or not and information or signals from other vessels or shore based systems. All human sensory and mental systems can also be very much included as part of this clause, while the list of machinery can be endless- existing or future equipment. Most have been listed in the explanation of Rule 5 on ***'look-out'***. Any such lists are only indicative at best and not exhaustive.

In paragraph 'a', the most important statement with extremely far reaching consequences is ***'if there is any doubt such risk shall be deemed to exist'***. ***'Any doubt'*** about the existence of a ***'risk of collision'*** should be ***'deemed'*** to mean that ***'risk of collision'-'exist(s)'***. A ***'doubt'*** about the possibility of ***'risk of collision'*** may arise from any source and for numerous reasons, including the location and apparent movement of a vessel or any object sighted visually or detected on radar or AIS or seen on an ECDIS system. If the apparent situation invokes a feeling of suspicion that it may entail ***'risk of collision'*** even before being analysed, then ***'such risk shall be deemed to exist'*** and should automatically activate further actions for a more thorough analysis of the situation and taking action as per the applicable Rules to ***'avoid'*** the ***'risk'***.

At this point, it will be worth mentioning about Automatic Identification Systems (AIS) now fitted on board most vessels. These can display numerous data about other vessels in the vicinity, the data being picked up directly by the transmissions made by AIS systems fitted on the vessels concerned. AIS uses radio transponders in much the same way as the mandatory aircraft T-CAS (collision avoidance system) uses Mode-S radar transponders to transmit information from each aircraft to other aircrafts and air traffic controllers. In the case of the shipboard AIS systems, the information transmitted could include the vessel's identity, type, dimensions, draughts, navigation status, GPS/DGPS position, course, speed, rate of turn, voyage destination and even details of the cargo on board. AIS thus presents a lot of navigational and vessel traffic information about other vessels in the vicinity to the bridge team. AIS systems on board, using the transmitted information from other vessels and own ships inputs, can analyse the data of the other vessels to give similar information like predictions from ARPA systems from range and bearing to the time and range of passing (CPA and TCPA) etc. AIS systems are still undergoing a standardisation transition and many commercial models are in use with substantial differences between them.

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The idea of using AIS to improve situational awareness towards, ***'preventing collisions'*** was originally initiated by SAAB of Sweden.

Though IMO resolution of 1998 on performance standards for an AIS states amongst its usage ***'in ship-to-ship mode for collision avoidance'***. Navigators need to exercise great caution here: although the AIS may be helpful in providing a lot of information, its predictions are as good as the data received from the vessels detected, which in turn depends not only on the accuracy of the inputs made by those vessels into their AIS systems but of the own vessel too. The use of AIS as an effective device to determine ***'risk of collision'*** or to act as an aid to ***'avoid collision'*** is yet to be proved **'fail safe'**. Information received from AIS should be used with extreme caution and not relied upon in totality. Extracts from IMO resolution A.917(22) adopted in 2001 on the use of AIS are quoted below. Even the IMO has stated in paragraph 39 of this resolution that use of AIS for anti-collision may be recommended in future.

USE OF AIS IN COLLISION AVOIDANCE SITUATIONS:

39. The potential of AIS as an anti-collision device is recognized and AIS may be recommended as such a device in due time.

40. Nevertheless, AIS information may be used to assist in collision avoidance decision making. When using the AIS in the ship-to-ship mode for anti-collision purposes, the following cautionary points should be borne in mind:

.1 AIS is an additional source of navigational information. It does not replace, but supports, navigational systems such as radar target-tracking and VTS; and

.2 the use of AIS does not negate the responsibility of the OOW to comply at all times with the Collision *(prevention)* ***Regulations.***

41. The user should not rely on AIS as the sole information system, but should make use of all safety-relevant information available.

42. The use of AIS on board ship is not intended to have any special impact on the composition of the navigational watch, which should continue to be determined in accordance with the STCW Convention.

43. Once a ship has been detected, AIS can assist in tracking it as a target. By monitoring the information broadcast by that target, its actions can also be monitored. Changes in heading and course are, for example, immediately apparent, and many of the problems common to tracking targets by radar, namely clutter, target swap as ships pass close by and target loss following a fast manoeuvre, do not affect AIS. AIS can also assist in the identification of targets, by name or call sign and by ship type and navigational status.

Though AIS is helpful in identifying and tracking vessels in the vicinity, providing instant information about them and unlike the ARPA, it does not suffer any time delays. However, the information depends on the accuracy of the data transmitted by the AIS fitted on the vessels concerned, which in turn is dependent on various inputs into the system fitted on board. AIS systems also do not suffer the common problems radar systems are associated with, like shadow sectors, clutter, radar interference, false targets and target swap, the latter may occur on ARPA systems when targets pass close to each other.

The AIS as such remains another aid to navigation; it may not be fitted on all ships and is not expected to have any significant impact on navigational watchkeeping which still continues to be governed by the provisions in the ***'STCW'***, ***'IRPCS'*** (these Rules) and the ***'SOLAS'*** conventions.

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Navigators should keep in mind the clause ***'all available means'*** that has been discussed earlier. If an AIS system is fitted but is not used at all, then, should something go wrong, lawyers would argue that its use may have prevented the accident. In fact, such questions are already beginning to surface in some recent court cases.

[TASK: To study errors of AIS and ECDIS systems please research www.panbo.com and http://www.nautinst.org/ais/reportedProbs.htm]

b: The SOLAS convention governs the fitment of radar equipment, the performance standards of which are as per the norms published separately by IMO and the minimum use governed by STCW Code A-VIII/2 as explained earlier with Rule 5. However, nothing restricts the use of radar at other times.

'Proper' has been discussed with Rule 5, except that now the term is used about the use of radar equipment. ***'If fitted and operational'*** has been explained earlier, including the minimum usage criteria, with Rule 5. Traditionally, navigators have been able to determine ***'risk of collision'*** and take ***'action to avoid collision'*** long before radar was invented and these Rules still reflect this traditional practice, although the speed, number and size of vessels has increased over the years. No doubt, the availability and use of radar makes watchkeeping much easier, but radar legally still remains an aid to navigation. Notwithstanding this, navigators remain free to use the radar and any other equipment as may be needed at anytime. However, it is recommended that they remain familiar with the basic principles of determining ***'risk of collision'***, both in theory and in practice.

If the radar is in use, its use should be ***'proper'***, keeping in mind its capabilities and limitations, both technical and operational as explained earlier, especially with Rule 6(b). ***'Long-range scanning'*** assists in detecting targets well in advance so that proper assessments can be made. Changing the radar scale usually also changes the pulse repetition frequency on most radar sets and thus enhances the probability of target detection by radar. Radar coverage usually extends well beyond the visible range even in good visibility, though both may have restrictions depending on the height of the eye or the height of the radar antenna above the water surface. Any target detected on the radar screen by an OOW, or by the radar itself (automatic acquiring), should be analysed to check if it poses any ***'risk of collision'***. This determination should be done by ***'radar plotting or equivalent systematic observation'***. Radar plotting can also be done manually on the radar screen itself using the old reflection plotter with soft glass marking pencils or on radar plotting sheets; the latter is still a requirement in some companies and considered a good practice. The ***'equivalent systematic'*** systems can be the various types of ARPA systems usually inbuilt in radar systems, although there may still be some external stand-alone ARPA units interconnected with the radar. ARPA systems can track several targets simultaneously and provide their data and predictions. The ARPA, ECDIS and AIS systems can all usually be interlinked with each other. In such interlinked systems, the radar screen can display ECDIS and/or AIS information or the ECDIS can display the radar picture, targets and AIS data all superimposed on its basic display. However, it must be kept in mind that the basic intent of this Rule is that detected targets must be analysed to verify if they pose any ***'risk of collision'***. The longer the range at which this task is accomplished, the better it will be to enable an overview of the situation, obtain ***'early warning of risk of collision'***, allow more time and sea room to decide and execute the applicable ***'action to avoid collision'***.

Radar has developed into one of the most important navigational equipment for many navigational tasks including ***'preventing collisions'*** and may form part of new integrated bridge systems.

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However, even the most sophisticated and efficient radar system, as of now, should not be expected to be regarded as a substitute for the human eye (in good visibility) and other sensory systems; this fact should always be kept in mind during navigational watchkeeping. Although the benefits of radar are many and outside the scope of this book, it remains a valuable and reliable aid to navigation and should be exploited to its full potential, keeping in mind its various limitations.

'Detected objects' means any and all objects fixed or floating which may pose a ***'risk of collision'***, not just vessels alone, and any object detected on the radar must be analysed for ***'risk of collision'***. If it is a fixed object or a buoy and there is ***'risk of collision'*** with it, then the vessel detecting the object would be required to keep clear as only she can take ***'action to avoid collision'***. There is no specific Rule for such situations except to apply the guiding principles of Rule 2.

'Radar plotting' implies that the activity is done by a person competent in the task and that bearings and distances of the targets are being plotted manually or by other equivalent methods and that the plot is carefully evaluated to ***'obtain early warning of risk of collision'*** on a continuous basis.

It is for the navigators to choose the type of Radar display and the type of vectors, but with COLREGS/IRPCS essentially being based on the relative aspect(*), own ships speed through water should be used for manual or automatic plotting, the latter usually using ARPA. Ground stabilised displays are likely to give an incorrect picture of the scenario, wrong aspects and sometimes even wrong future predictions that may lead to incorrect analysis of the situation and ***'action to avoid collision'***. Relative vectors instantly indicate ***'risk of collision'*** and this should be kept in mind when looking at and analysing vectors. Please refer the two circulars issued by Bahamas and Marshal Island flag administrations on the proper use of ARPA quoted at the end of this book.

(*): *Relative aspect means the relative bearing of a target from own vessel, using the right ahead direction of own vessels fore-and-aft line as the zero reference point. As you will learn in these Rules later, not only do you need to be aware of the aspect of another vessel from your vessel but a target vessel would also need to determine its aspect or relative direction from your vessel to judge the situation and, based on that, the application of the relevant Rules for* ***'preventing collisions'*** *and associated actions. The application of many Rules are based on the relative positions or aspect between the vessels concerned; this will get clear later as you study the Rules applicable to the various situations.*

'Equivalent systematic observation' is not clearly defined. Apart from the explanation given above, even a proper record of the bearings and distances taken and recorded regularly at frequent intervals by an observer who may analyse the situation just by this data alone without resorting to any plot, may at times, still be acceptable as fulfilling this requirement provided that the observer had no means to plot the data or the ***'prevailing circumstances'*** did not allow the same, for example in an area of high traffic density or in heavy weather. If the information on the radar/ARPA is monitored carefully and regularly, then it can be detected with reasonable accuracy which targets will pass clear and those likely leading to ***'close-quarters'*** or ***'risk of collision'*** situations. Navigators should focus their attention on these latter targets not passing well clear while still keeping track of the others till they are ***'finally past and clear'***.

c: ***'Scanty'*** means very little, less, scarce, insufficient or inadequate. If the input data is not correct or complete, then logically the result based on such data will also not be correct and this may well be the starting of an error chain leading to wrong judgements, wrong decisions and may even lead to an

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accident (collision). Cross checking of information from more than one source whenever possible plus observation of several readings with repeated analysis to check the consistency of results are the basics of practical management, so that error chains can be detected and corrected in time. This applies as much to ***'preventing collisions'*** as to other navigational watchkeeping activities or anything else in life.

'Scanty information' may lead to wrong inferences and ***'assumptions'*** based on ***'scanty information'*** can be rather dangerous. A special caution has been stated in these Rules for ***'scanty radar information'***. The limitations of the radar equipment and the errors they are prone to have been explained earlier. In addition, any input errors like a wrong compass heading or the speed input to the radar/ARPA may lead to wrong analysis and predictions. Ultimately, it is left to the navigators to analyse the quality of the information, use their knowledge and experience to analyse and judge its reliability to arrive at sound and effective conclusions and related actions. Please note the emphasis on the word ***'shall'*** in this paragraph of the Rule: ***'Assumptions SHALL not be made.'***

Although this Rule requires the full and proper use of radar, it also warns against over relying on the same. Distances magnify small errors, and errors may also be induced because the target vessels may not always maintain a steady ***'course and speed'***. Many collisions and allisions have occurred because ***'action to avoid collision'*** was based on such faulty assumptions.

d: While paragraph 'a' of this Rule makes an overriding statement ***'if there is any doubt such risk shall be deemed to exist'***, this paragraph goes further to describe the way ***'risk of collision'*** should be determined. By using the phrase ***'among those taken into account,'*** the Rule implies that other means may also be employed for the task, but as a minimum the ***'following considerations shall be among those taken into account'***. Although this paragraph is further divided into two subparagraphs 'i' and 'ii', essentially there is only one important factor given in subparagraph 'i', the latter subparagraph 'ii' only contains the precaution to be exercised when practically implementing this important factor.

d (i): 'Such risk shall be deemed to exist if the compass bearing of an approaching vessel does not appreciably change'. Earlier, ***'risk of collision'*** has been explained in terms of vectors. The procedure to determine ***'risk of collision'*** as stated in this subparagraph is another approach to analyse the vectors that can be easily practiced on board. If the ***'compass bearing'*** between any two objects is constant and the range is decreasing, it is indicative of the vectors of the two bodies moving in such a manner that they will meet in future at the same time and at the same position. The ***'compass bearing'*** denotes this line of approach between the two vessels (or bodies) concerned, the decreasing range confirming that the two are ***'approaching'*** each other and will make contact, the time depending on their relative speed of approach.

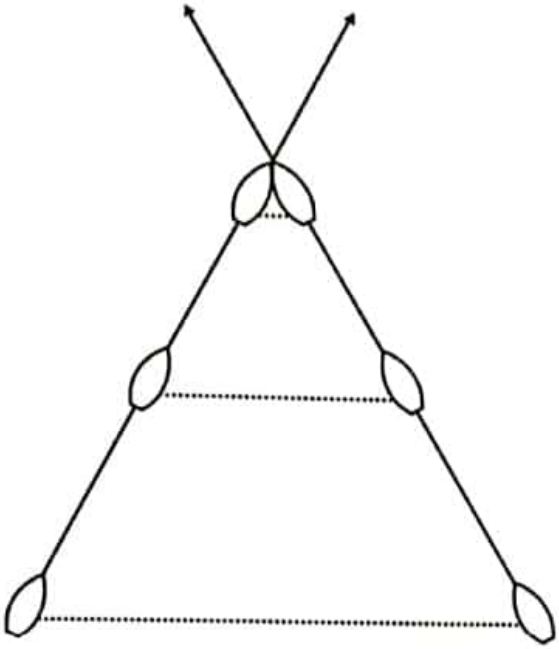
Unlike relative bearings explained earlier, compass bearings are measured from the North direction of the compass, which is referred to as 000°, and counted clockwise until 359°, 360° being the same as 000°.

The word ***'approaching'*** in this subparagraph means getting closer; this would obviously apply to an object or a vessel in the vicinity. Even if on a steady ***'compass bearing'*** but not ***'approaching'***, a vessel/object may not pose any ***'risk of collision'***, she/it may be at a steady range or even moving

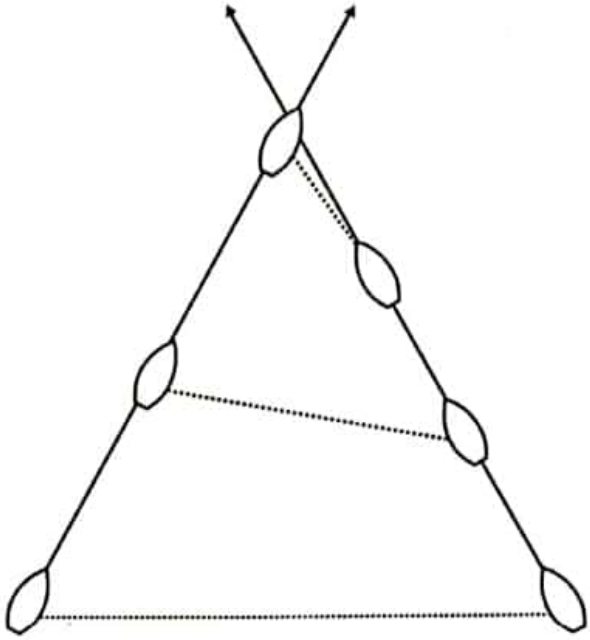
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RULE 7 – RISK OF COLLISION (PART B, SECTION I)

Dotted line indicates compass bearing between the two vessels



Risk of collision exists when the compass bearing does not change



Risk of collision does not exist when compass bearings change appreciably

away. The line of approach determined by the ***'compass bearing'*** gives the first warning signal of an impending ***'risk of collision'*** if it remains steady or almost steady. ***'Approaching'*** has to be interpreted in a relative sense as the other vessel may be ***'approaching'*** your own vessel or vice-versa with the range between the vessels decreasing along a steady line of approach. Under such conditions, the two will ultimately make contact or collide if they ***'keep'*** their ***'course and speed'***. If it is a fixed object or even a buoy or a vessel stopped or at anchor, then it would be your own vessel ***'approaching'*** the vessel or body concerned.

The Rules do not specify the various methods that may be employed to determine the range of the objects, leaving it to the navigators to choose the best systems available. Radar is the most convenient and frequently used equipment for an accurate analysis as of date but AIS systems may provide the required information with ease, if there is one fitted on the other vessel/object. Change of range easily be determined by the naked eye also. Visual ***'look-out'*** including determination of ***'risk of collision'*** by visual analysis has been the basic tradition of navigation since ancient times and is still considered part of good watchkeeping practices, inputs from various electronic equipment still considered only as aids to navigation, though this may change with time, this fact remains valid and true as of now. However, radar is valuable in clear weather also whether a target has been sighted visually or not being better able to analyse the data and predict the future projections than the human eye and compass bearings alone.

By virtue of its placement in Part B section I, the requirements of Rule 7 apply at all times. But for vessels ***'not in sight of one another when navigating in or near an area of restricted visibility'***, by Rule 19, they shall ***'determine if a close-quarters situation is developing and/or risk of collision exists'-'by radar alone'***. However, other instruments that source primary information from the radar may be used, for example ECDIS systems. AIS does provide fairly reliable information, provided AIS is fitted and operating on all vessels in the vicinity with correct inputs. If the radar is not

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functional then reliance on sound signals alone will not be the best (sound or good) practice because of the inherent errors in determining the direction of the source of sound as well as the fact that sound signals have a rather low audible range. This has been further explained with Rule 19 later; good seamanship has been explained earlier in Rule 2, that a vessel without operational radar(s) should rather not navigate at all in ***'restricted visibility'*** than risk doing so relying on sound signals alone.

'Compass bearing' observations can be taken by various means, primarily by visual observation, by radar, by an ECDIS system etc. AIS bearings are determined independently and are true bearings calculated basis the GPS positions, of the vessels, they are not compass bearings and as such would not qualify as complying with the requirements of this Rule. It is a proven fact that visual bearings are the best between ***'vessels in sight of one another'***. Radar bearings may not be as accurate for various reasons even if the radar heading is properly aligned to the compass. Compass would include any type of compass, gyro or magnetic as may be fitted on the vessel concerned. All vessels are not required to be fitted with a gyro compass and many still navigate using only a magnetic compass. Errors of AIS have been discussed earlier and it is recommended that the use of AIS should be the last choice for this purpose, and if used, extreme caution should be exercised until these systems grow and prove their perfection in times ahead. *In my recent experience while sailing as Master between February 2009 and February 2010, I have observed some of the information being transmitted by other vessels from their AIS systems to be in error on several occasions. In one case, the gyro heading was wrong by almost 100°; probably because the initial input may have been fed in wrong and thereafter no one verified or corrected it. As such, relying blindly on AIS is and can be very dangerous.*

In practice, be careful not to use and/or rely on relative bearings to determine ***'risk of collision'***. Relative bearings are relative with respect to the point of reference as explained earlier; for the purpose of this subject, they are with respect to the fore-and-aft direction of the vessel the navigator is on. However, as explained, the relative bearing or relative position between vessels is the methodology used in these Rules for the determination of various types of situations and any associated ***'action to avoid collision'*** whenever there is any ***'risk of collision'*** involved.

Different terminologies and systems may be used to define relative bearings, as the height of a person may be measured in metres, centimetres, or feet and inches. The traditional way of measuring and describing relative bearings has been using points; the horizon around the vessel is divided into 32 points each of 11.25° and the presence of any object is measured by 'the number of points', on the 'port' or 'starboard' bow, 'abeam' or 'abaft the beam'.

Some navigators prefer to simply use degrees to indicate the relative direction of any object. Two versions are normally used, one measuring from right ahead as 0° to right aft as 180° going down port or starboard from right ahead; some navigators tend to prefix 'red' and 'green' in place of 'port' and 'starboard' respectively. The other version is to use the same concept of counting, right ahead being 0° measuring clockwise in degrees until 360° degrees which is same as 0°. In this 0° is 'right ahead', 90° 'starboard beam', 180° 'right astern' and 270° the 'port beam'.

Another concept is to view the area around the vessel as a clock, right ahead being the 12 'O' clock position, right aft being '6', starboard and port beams being '3' and '9' respectively.

Before communicating, bridge team members should first clarify and agree to the concept they are all going to use to avoid any misunderstandings during navigation.

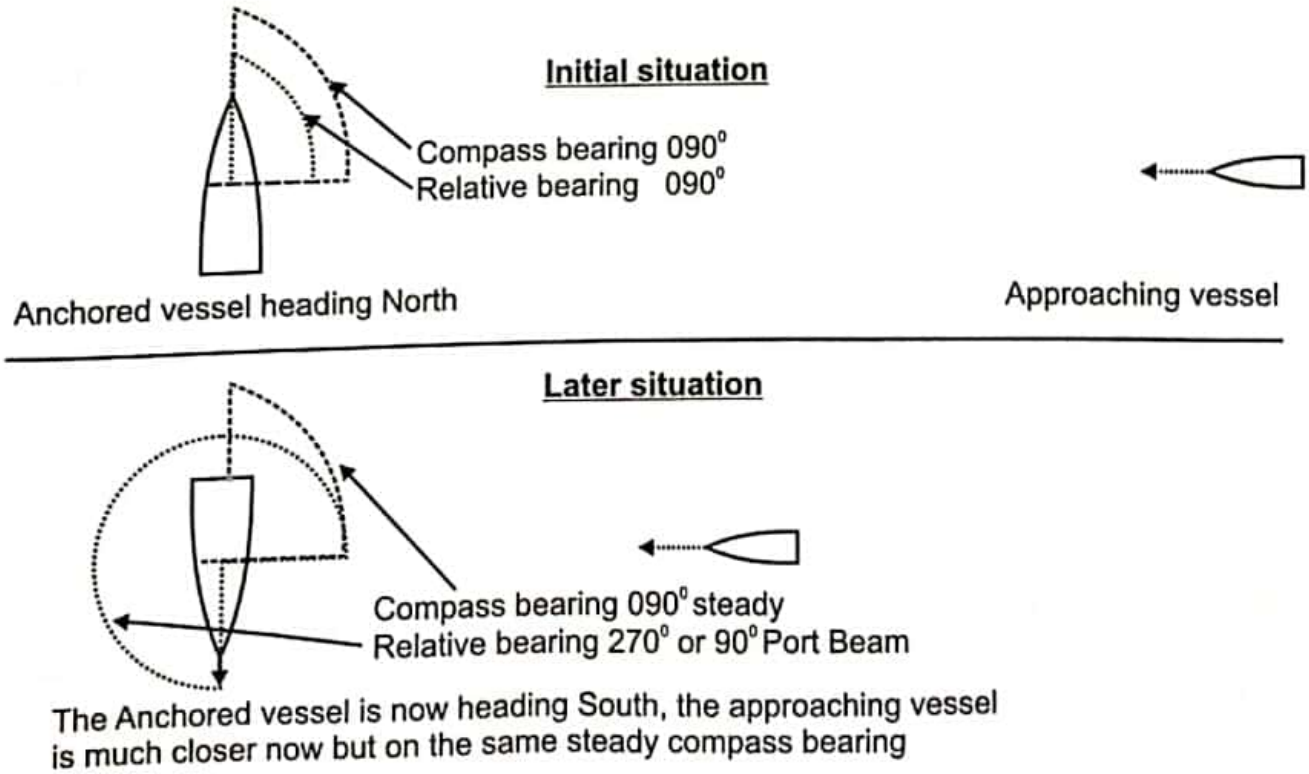
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[TASK: MAKE A SKETCH OF A VESSEL AS IF SEEN FROM TOP AND MARK THE RIGHT AHEAD, BEAM AND RIGHT ASTERN DIRECTIONS. THEN MARK THE VARIOUS PATTERNS OF MEASURING THE RELATIVE DIRECTIONS OF THE VESSEL AS EXPLAINED. THIS WILL HELP YOU GET A CLEAR PICTURE OF THE ABOVE.]

NOTE: 1) The above is to explain the various systems in practice as known. 2) The best practices of communication has been published by IMO as "Standard Marine Communication Phrases" (SMCP). It is strongly recommended that SMCP terminology be adopted in day to day working to reduce any misunderstandings due to communication failures linked with differences in concepts and perceptions. On the other hand, these phrases published by IMO are intended neither to supplant nor contradict these Rules nor supersede the International Code of Signals or the ITU Radio regulations. The IMO SMCP is not included in this book.

If relative bearings are used to determine horizontal movement of other vessels or objects by observing changes in their relative bearings, this can be fraught with dangers and may give extremely misleading indications. Any change in the own vessels heading (or direction) will automatically bring the same amount of change in the relative bearing of the object concerned, though the true or compass bearing may not have changed at all. A changing relative bearing of an object does not necessarily mean that its actual line of approach established by the compass (or true) bearing is changing. A change in the relative bearing of an object can create a false impression that there is no ***'risk of collision'***. This is described below with some simple examples.

Assume you are on a vessel at anchor, heading North and from a long distance (say 8-10 miles) a service boat is approaching slowly, a speed of 8 to 10 knots; the tidal stream direction has just commenced changing. Initially the approaching vessel is on a compass bearing of 090° and on your vessels starboard beam. After half an hour or so your vessel has swung around with the tide by 180° and is now heading South, the relative bearing of the approaching boat has also changed by the same amount and she is now on your vessel's port beam, but her compass bearing is still the same, 090°. See the diagrams on the following page showing this.



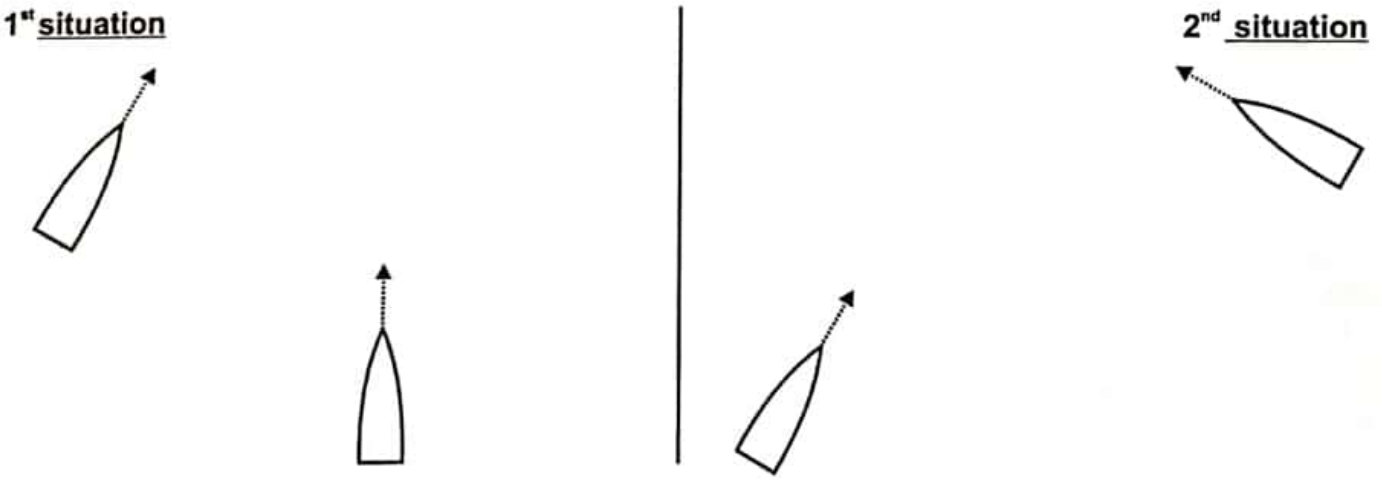
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In both the cases, the compass bearing of the approaching boat remains 090° but her relative bearing from the vessel at anchor has changed by 180°, from being 090° or on the starboard beam to 270° or port beam, but the ***'risk of collision'*** has remained unchanged as depicted by the line of approach which is the steady compass bearing.

The Rule states ***'does not appreciably change'***. ***'Appreciable'*** means large or noticeable enough. It therefore follows that if the change in bearing is not large or noticeable enough, it is was not appreciable / changed and is thus a matter of concern because this means that it is a steady or almost steady compass bearing indicative of ***'risk of collision'***. However, as explained, this has to be linked with ***'approaching'***.

In maintaining their consistency of using descriptive adjectives open to differing interpretations depending on the situations, the Rules have not given any numerical limits but have used ***'appreciably'*** to explain the change of compass bearings in determining ***'risk of collision'***. A steady ***'compass bearing'*** of an ***'approaching'*** object is a firm confirmation of ***'risk of collision'***. However, how much and how fast the bearing should change to confirm that there is no ***'risk of collision'*** is for the navigators to judge. The ***'appreciably'*** aspect thus depends not on the circumstances and conditions alone but on the way the navigators judge the situation, which in turn depends on their understanding of the concepts coupled with their actual practical experience. The range between the vessels, their speed, their direction of movement and their relative aspect from each other would be some of the important factors in considering the situation. The longer the range and closer the direction of movement or heading, the slower the rate and quantum of change of bearings would be between vessels to indicate the fact that the other vessel is indeed passing clear.

In the 1st steadysituation shown below, assuming the vessel ahead has a slightly faster speed, the range would be increasing slowly and though there is no ***'risk of collision'*** because the range is increasing, change in bearing would be very slow. In the 2nd situation shown below, assuming the vessels are moving at similar speeds, the change in bearing would be rather rapid in the position shown, indicating no ***'risk of collision'***.

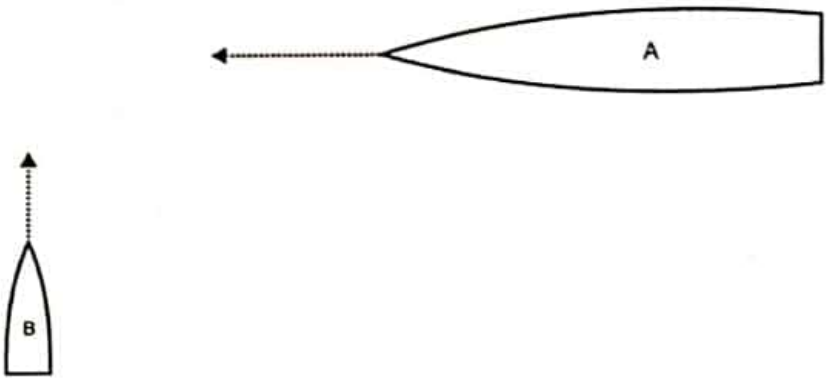


[TASK: YOU SHOULD ATTEMPT AN EXERCISE USING GRAPH PAPER AND DRAW TRUE VECTORS OF VESSELS MOVING IN VARIOUS DIRECTIONS AND WORK OUT THE CHANGE IN THE BEARING BETWEEN THEM TO UNDERSTAND THE ABOVE BETTER.]

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d (ii): This subparagraph cautions that ***'even when an appreciable bearing change is evident'***, it alone may not be a firm indication that there is no ***'risk of collision'***, ***'particularly when approaching a very large vessel or a tow or when approaching a vessel at close range'***.

If an object, even a vessel, is at long range, it is still like taking a bearing of a point object. Even if the vessel is presenting her beam profile, there will be negligible difference in the bearing of her bow and/or stern. However, if the same vessel is at close range, there will be substantial difference in the visual bearings of her bow/stern. It may happen that the bearings of the point of reference are changing appreciably but that ***'risk of collision'*** remains intact because of the very close range. It must be understood that this will invariably happen at very close ranges and it could be any object or a vessel, and when the length of the object being analysed is large - ***'very large vessel or a tow'***, it may happen that one end of the long object is being observed and appears to be passing clear and will actually pass clear with associated appreciable change of ***'compass bearing'***, but the other end may not be passing clear even though its bearing will also be changing rapidly. For example, the compass bearings of the bows of an approaching vessel taken from the bridge wing located towards the aft end of a vessel indicates that the compass bearings are changing rapidly, then it can be concluded that a collision is probably not set up between the bridge wing and the other vessels bow. However, this may not apply to the bows of the observing vessel and the stern of the passing vessel, as shown below.



In the above figure, assume both vessels are moving, if any one reference point is taken on 'A' by 'B' then that point on 'A' would be showing a rapid change of bearing, but since the range is very low, this alone will not be indicative that ***'risk of collision'*** does not exist with all points of 'A'. As may be clearly evident in the above figure, the forward end of 'A' may pass clear but the aft end is not likely to.

Two vessels proceeding on parallel courses at an acceptable and safe range, even with a steady ***'compass bearing'*** between them, have no ***'risk of collision'*** as they are not ***'approaching'*** each other. This explains the practical application of the Rules by common sense. All the factors explained are interdependent and must be considered as a whole and in the context of the circumstances. There can be innumerable situations encountered and all can be analysed by applying the requirements of these Rules.

This and other Rules discussed earlier clearly imply that actions required to determine ***'risk of collision'*** should be made as early in time as possible to assess the situation, plan ***'action to avoid collision'*** if required, execute the same and keep monitoring the results till the ***'risk'*** is mitigated successfully. All elements pertaining to ***'any action to avoid collision'*** are covered in the following Rule 8.

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In determining ***'risk of collision'*** by compass bearings alone, several observations should be made at short and regular intervals to reduce the chance of any error. A small error in taking a bearing at long range may lead to incorrect conclusions, especially when relying on radar bearings. When vessels are ***'in sight of one another'***, visual compass bearings are considered the best method and their accuracy superior to radar bearings, the latter being prone to many types of errors. Caution should be exercised when making visual observations if the vessel is rolling and/or pitching, especially if using the magnetic compass, as it may not be steady in such circumstances.

The following from the *STCW Code* further clarifies the above.

The officer in charge of the navigational watch shall take frequent and accurate compass bearings of approaching ships as a means of early detection of risk of collision and shall bear in mind that such risk may sometimes exist even when an appreciable bearing change is evident, particularly when approaching a very large ship or a tow or when approaching a ship at close range. The officer in charge of the navigational watch shall also take early and positive action in compliance with the applicable International Regulations for Preventing Collisions at Sea, 1972, as amended and subsequently check that such action is having the desired effect. *(STCW CODE A-VIII/2, paragraph 43)*

[QUIZ:

1: SHOULD COMPASS BEARINGS BE CORRECTED TO TRUE BEARINGS FOR THE PURPOSE OF COMPLYING WITH THIS RULE?

2: WHAT IS THE EFFECT OF CHANGE OF A VESSELS COURSE (HEADING) AND/OR SPEED ON THE ERRORS OF A GYRO OR A MAGNETIC COMPASS?

3: WHAT IS THE DIFFERENCE BETWEEN BEARING, COURSE, HEADING AND AZIMUTH?]

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Rule 8

Action to avoid collision

(a) **Any action to avoid collision shall be taken in accordance with the Rules of this part and shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship.**

(b) **Any alteration of course and/or speed to avoid collision shall, if the circumstances of the case admit, be large enough to be readily apparent to another vessel observing visually or by radar; a succession of small alterations of course and/or speed should be avoided.**

(c) **If there is sufficient sea-room, alteration of course alone may be the most effective action to avoid a close-quarters situation provided that it is made in good time, is substantial and does not result in another close-quarters situation.**

(d) **Action taken to avoid collision with another vessel shall be such as to result in passing at a safe distance. The effectiveness of the action shall be carefully checked until the other vessel is finally past and clear.**

(e) **If necessary to avoid collision or allow more time to assess the situation, a vessel shall slacken her speed or take all way off by stopping or reversing her means of propulsion.**

Give way vessel

(f) **(i)** **A vessel which, by any of these Rules, is required not to impede the passage or safe passage of another vessel shall, when required by the circumstances of the case, take early action to allow sufficient sea-room for the safe passage of the other vessel.**

Give way vessel

(ii) **A vessel required not to impede the passage or safe passage of another vessel is not relieved of this obligation if approaching the other vessel so as to involve risk of collision and shall, when taking action, have full regard to the action which may be required by the Rules of this part.**

(iii) **A vessel the passage of which is not to be impeded remains fully obliged to comply with the Rules of this part when the two vessels are approaching one another so as to involve risk of collision.**

This Rule describes neither the type of vessels involved nor the required ***'action to avoid collision'*** in any particular situation; that is all covered in subsequent Rules. When initiating or executing ***'any action to avoid collision'***, the fundamentals of this Rule become applicable immediately. It is important to understand the essential guidelines of this Rule because these directly influence the practical efficacy of ***'any action to avoid collision'*** irrespective of the situation, the type of action executed or other applicable Rules.

Before studying this Rule it may be good to reconcile some important requirements stated so far in these Rules: Rule 2 states ***'comply with these Rules'***, uses the terms ***'any precaution which may be required by the ordinary practice of seamen'*** and ***'all dangers of navigation and collision'***. Rule 5 states ***'so as to make a full appraisal of the situation and of the risk of collision'***, Rule 6

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states ***'proper and effective action to avoid collision'***, Rule 7 adds that vessels shall ***'determine if risk of collision exists'*** and use radar ***'to obtain early warning of risk of collision'***.

a: This Rule states ***'any action to avoid collision shall be taken in accordance with the Rules of this Part'***. ***'This part'*** means Part B of these Rules comprising Rules 4 to 19.

'Shall, if the circumstances of the case admit' echoes the basic principle on the application of these Rules. It is for navigators to decide the best action(s) possible in compliance with these Rules, their timing, quantum and implement them in practice depending on the ***'prevailing circumstances'***. Obviously, the actions decided and executed may differ on a case-to-case basis, even Rule 2 on ***'responsibility'*** highlights ***'neglect of any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case'***. The ***'prevailing circumstances'*** may sometimes have a detrimental effect on the proper and/or full implementation of the requirements of these Rules in letter and spirit. This escape clause allows leeway for any such restrictions, for example presence of other traffic or lack of safe navigable waters which may not allow a ***'give-way vessel'*** to act in ***'ample time'***, also refer Rule 4 explanation.

'Any action to avoid collision' should be ***'positive'***, that is constructive, helpful, affirmative, optimistic and encouraging towards ***'prevention collisions'***. Not negative or such that the action may not be successful or that no action is taken at all.

'Made in ample time' means earlier rather than later, so that actions contemplated and executed are efficient, effective and successful in ***'preventing collisions'***, the desired end result. ***'Due regard to the observance of good seamanship'*** is similar to ***'ordinary practice of seamen'*** used in Rule 2, and means actions based on common sense and sound logic. This also means actions that have stood the test of time, having been practically successful and handed down as the cumulative experience of best practices accumulated through time. The final realisation of the practical aspects stated in this book, or in any other publication, can only be developed through live experience and hands on exposure in real life, like cycling, driving or swimming. This is also linked to the manoeuvring characteristics of a vessel, the time factors to execute any manoeuvre, the time required to cover the distance parameters of advance, tactical diameter and reducing ***'her speed or take all way off by stopping or reversing her means of propulsion'***.

This paragraph tells navigators to act early and do more than the absolute minimum necessary to ***'avoid collision'***, while always allowing a generous margin of safety both in time and distance.

b: ***'Any action to avoid collision'*** stated in paragraph 'a' can either be an ***'alteration of course'*** or a change of ***'speed'*** or any combination thereof. ***'Any action'*** in compliance with these Rules ***'shall, if the circumstances of the case admit, be large enough to be readily apparent to another vessel observing visually or by radar'***. ***'Circumstances'***, in the real sense, can vary as explained earlier; ***'readily'*** is not defined in numerical limits and may be subject to varying interpretations but implies that all other vessels in the vicinity are able to sense and detect the action taken, judge the intentions of a vessel taking action and reasonably predict the expected outcome. The onus of deciding the timing and/or quantum of action is on the vessel executing ***'any action to avoid collision'*** so that it is ***'readily apparent'*** to ***'another vessel'***; the latter means not only the vessel concerned for which ***'action to avoid collision'*** is being executed but all vessels in the vicinity. ***'Readily apparent'*** automatically includes the rate of action. If a large action is intended but is implemented very slowly, it is unlikely to be ***'readily apparent to another vessel'***, which is very important and quite logically required by this Rule.

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It is of vital importance for any ***'stand-on vessel'*** involved in a developing ***'close quarters'*** and/or ***'risk of collision'*** situation that it should be able to determine rather quickly if ***'any action to avoid collision'*** is being initiated and executed by a ***'give-way vessel'***. If the ***'give-way vessel'*** appears to be ***'not taking appropriate action in compliance with these Rules'*** then the ***'stand-on vessel'*** is required to ***'take action to avoid collision by her manoeuvre alone'*** in compliance with Rule 17(a)(ii). ***'Readily apparent'*** applies to any action(s) ***'to avoid collision'***. This should include, by ***'observance of good seamanship'***, even those actions taken in compliance with Rule 2 clause, ***'departure from these Rules necessary to avoid immediate danger'***, or even actions taken to avoid other ***'dangers of navigation'***.

Combining ***'ample time'*** from paragraph 'a' and ***'readily apparent'*** from this paragraph 'b', ***'any action to avoid collision'*** should be taken as early as possible, be of a large quantum and executed as rapidly as circumstances best allow. It should ensure that there is no doubt left in the minds of the navigators of the other vessel(s) in the vicinity about the intent and intended outcome of the actions.

Rule 5 on ***'look-out'*** states, ***'by sight and hearing as well as by all available means'*** and requires every vessel to ***'make a full appraisal of the situation'*** and Rule 6 on ***'safe speed'*** requires an assessment of ***'traffic density'***. Rule 19 'd' applicable only ***'to vessels not in sight of one another when navigating in or near an area of restricted visibility'*** requires that ***'a vessel which detects by radar alone the presence of another vessel shall determine if a close-quarters situation is developing and/or risk of collision exists'***. In addition, Rule 17 ***'action by stand-on vessel'***, though applicable only ***'to vessels in sight of one another'***, requires a ***'stand-on vessel'*** to take ***'action to avoid collision - as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in compliance with these Rules'***. To fulfil all these requirements including those of ***'ordinary practice of seamen'*** and any other similar requirements stated or implied by the Rules, any ***'action to avoid collision'*** should always be ***'readily apparent'*** to other vessels in the vicinity.

'Visually or by radar' covers the two most important elements by which ***'look-out'*** functions are usually performed and which would be the first to detect changes in course and/or speed of other vessels in the vicinity. ***'Large enough to be readily apparent'*** may be summed up in that ***'any action to avoid collision'*** is substantially ***'large'*** to let other vessels in the vicinity know instantly by being obvious to their ***'look-out'***.

Although AIS devices may be of assistance in this task, they do not feature in these Rules by name yet as have still been left out in the very recent revisions, perhaps for the reasons explained earlier with Rule 7. Their use, as of any other aid to navigation, can only be considered as implied since the Rules do not impose any restrictions on equipment which may be used to advantage for ***'preventing collisions'***.

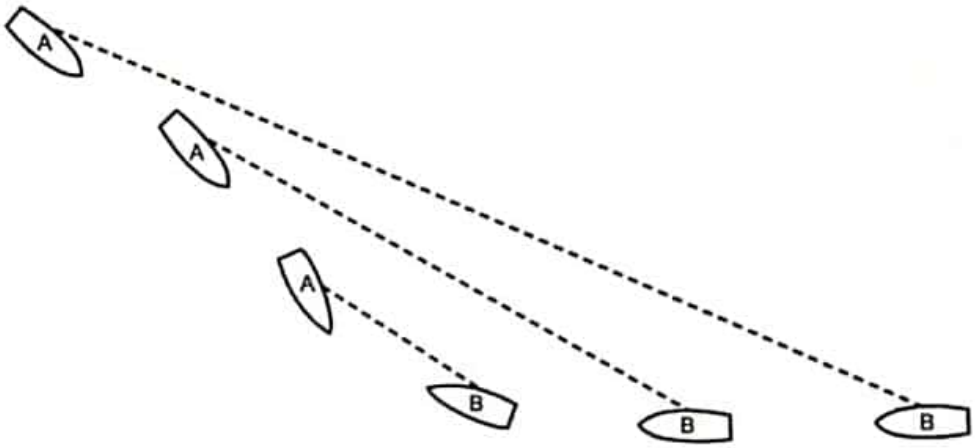
'A succession of small alterations of course and or speed should be avoided'. This is straightforward: if a series of small alterations are done, or are carried out very slowly, they may not ***'be readily apparent to another vessel'*** at all or she may remain confused about the actions being

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executed. This would be more so in ***'restricted visibility'*** or in case of a series of small speed changes, since changing speed usually takes longer to implement than altering course and also requires larger sea-room, especially on bigger/heavier vessels. ***'Small alterations'*** directly go against the requirements of ***'readily apparent'***. A series of ***'small alterations'*** may not be apparent even by ***'radar plotting or equivalent systematic observation'***. Between the two, ***'alteration of course alone'*** is perhaps a better choice and is recommended in paragraph 'c' of this Rule itself. It is also considered a superior action from ship handling principles as it is fast, requires less sea room, is usually expected to be ***'readily apparent'*** if ***'substantial'*** and carried out rapidly. (Please refer to the explanations on turning circles and stopping distances of vessels in the chapter on basic ship handling).

'An appreciable bearing change' of another vessel at a large range does not necessarily mean, by itself, that there is ***'no risk of collision'*** or that it has been eliminated. It is prudent practice to observe the present and expected passing range also and not just monitor compass bearing alone, as shown in the example below based on an actual collision in restricted visibility conditions.

Two vessels 'A' and 'B' shown below were navigating in restricted visibility, not in sight of one another and both acted to ***'take avoiding action in ample time'*** as required. However, they both made a series of small course alterations and, even though the compass bearings between them apparently changed though not appreciable, ***'risk of collision'*** was not averted and the two collided as shown, ***'a succession of small alterations'*** created misunderstanding and confusion.



The quantum of ***'any action to avoid collision'*** which may be considered ***'large enough'*** or ***'substantial'*** so that it is ***'readily apparent'*** to another vessel is not mathematically defined in the Rules. However, analysis of research data done by way of experiments and tests on simulators and practical experience shows the following:

In good visibility ***'in sight of one another'***, even a small course alteration, say 10°, is likely to be ***'readily apparent to another vessel observing visually'***, but this may not be the case if monitoring is being done by ***'radar alone'***, using and relying only on radar in practice is not recommended unless a vessel is in ***'restricted visibility'***. This does not mean that such a small course change is recommended for ***'preventing collisions'***; this small amount may be just

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sufficient to ***'avoid collision'*** with a vessel in a ***'head-on situation'*** if carried out at sufficiently long range, but not at medium or lower ranges or when altering course to ***'avoid collision'*** with another vessel on the ***'starboard side'*** especially one abaft the starboard beam in a ***'crossing situation'***. In a ***'crossing situation'***, the initial alteration of course to starboard should be as to change the heading to aim for passing clear of the stern of the other vessel and may be as large as 120° at times, this will get clear after studying Rule 15.

In ***'restricted visibility'*** and dependent on ***'radar alone'***, course alterations should be large, preferably 60° or more so that they are ***'readily apparent'*** to ***'another vessel observing by radar alone'***. Some experts, while confirming these figures for ***'restricted visibility'***, further recommend that at any time ***'an alteration of course'*** should never be less than 30° to be ***'readily apparent'***, ***'if the circumstances of the case admit'***. Having quoted these figures based on various data and experiences, the Rules themselves remain silent on numerical values except stating ***'alteration of course alone'*** as the preferred action in Rule 8(c).

Comparatively, alterations of speed, if undertaken, will be slow to implement and may not be ***'readily apparent'*** to other vessels as explained. For example, a vessel that decides to change her speed from full to half ahead will not have her speed fall down to half ahead immediately. As speed drops, the rate of change will be even slower, for example going from half to slow ahead.

To ensure that speed changes are ***'readily apparent to another vessel observing visually or by radar'***, if restrictive circumstances like lack of safe navigable sea room or other traffic in the vicinity do not allow an ***'alteration of course alone'***, then the speed changes should be made as rapid as possible. It would be prudent to bring the vessels propulsion power down to zero or near zero immediately to allow for a rapid decrease in speed, even applying astern propulsion if necessary. Once the speed has reduced substantially, ahead propulsion may be resumed at low power. This fast rate of decrease of speed action should normally ***'be readily apparent to another vessel'***. However, keep in mind that this may still be a rather slow act on a large and heavy vessel, for example, a loaded VLCC or a large loaded bulk carrier. Astern propulsion effectiveness is weak in comparison to the ahead propulsion and is generally 50% to 80% of the latter. Also see paragraph 'e' of this Rule.

Only a reduction of speed has been referred to above as all Rules either require or generally point to a reduction of speed, be it Rule 6 on ***'safe speed'*** or paragraph 'e' of this Rule itself or Rule 19(e) on ***'conduct of vessels in restricted visibility'***. An increase of speed by a vessel already proceeding at ***'safe speed'*** may go against basic ***'safe speed'*** principles. In addition, an increase in speed on merchant vessels would normally be slow to implement and not be ***'readily apparent'*** to another vessel. However, if circumstances so require and the navigators feel that increasing speed is the best ***'action to avoid collision'***, the Rules do not directly state anything against the same. It should be borne in mind that this is neither the preferred nor the recommended ***'action to avoid collision'*** and should be considered only if no other options are found feasible, and should be executed as rapidly as possible.

c: ***'Alteration of course alone may be the most effective action to avoid a close-quarters situation'***. This important requirement can be closely linked with the manoeuvring characteristics of vessels, (refer to the explanations on turning circles in the chapter on basic ship handling), though a

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rider has been placed ***'if there is sufficient sea room'***. Sufficient is not described and would mean the area of navigationally safe waters coupled with any restrictions imposed by traffic in the immediate vicinity.

For the purpose of understanding and practically applying this Rule, it may be assumed that the term ***'close-quarters'*** has the same implication as ***'risk of collision'*** and both terms mean the same. Discussions on this term have been placed inside the box for higher studies but make no difference in the way this Rule is interpreted, understood and complied with.

[TASK: BEFORE READING FURTHER, STUDY TURNING CIRCLES, ESPECIALLY THE REQUIREMENTS OF ADVANCE, TRANSFER AND TACTICAL DIAMETER IN THE CHAPTER ON BASIC SHIP HANDLING.]

The efficacy of course alterations (turning) versus speed changes have been explained in the basic ship handling chapter and it should be quite clear that ***'an alteration of course alone'*** is easier to achieve, is effective, needs little sea room and fulfils all requirements of this paragraph of this Rule. Further and most importantly, an ***'alteration of course alone'*** also fulfils the requirement of paragraph 'b' of this Rule by being ***'readily apparent'*** if it is ***'large enough'*** or ***'substantial'*** and ***'made in ample time'***. The availability of safe navigable sea room must be verified each and every time before ***'an alteration of course alone'*** is undertaken, keeping in mind the turning circle parameters of your vessel.

'Good time' is synonymous with the clause ***'ample time'*** explained earlier and implies an action taken early in time. ***'Substantial'*** is not numerically defined but means large, extensive, sizeable, considerable, significant, ample and generous. In other words, it is the opposite of small and opposite of the clause ***'a succession of small alterations of course and or speed should be avoided'***. Only substantial actions would be effective and ***'readily apparent'*** to other vessels in the vicinity.

The action taken should be such that it ***'does not result in another close-quarters situation'***. This is quite logical, as an action to avoid any developing ***'close-quarters'*** or ***'risk of collision'*** situation with one vessel should not result in a similar condition developing with any other vessel in the vicinity.

Any ***'Close-quarters situation'*** should always be avoided where possible, except perhaps in rivers, harbours, and other waterways where these appear unavoidable, but in reality the navigational activities in such ***'narrow channels'*** are governed by Rule 9.

This paragraph of this Rule uses the clause ***'close-quarters'*** and not ***'collision'*** which is to be avoided, or to be guarded against. It may be argued that this Rule recommending ***'alteration of course'*** is only applicable to avoid a ***'close-quarters'*** situation but not ***'collision'***. Actually both the terms ***'close-quarters'*** and ***'collision'*** are close to each other, though only this paragraph of Rule 8 and thereafter Rule 19(d and e) use the former. At all other places in these Rules, only the word ***'collision'*** has been used to prescribe actions both for its determination and avoidance. It is accepted by tradition and otherwise that before actual ***'collision'*** takes place a ***'close-quarters'*** situation will develop: that vessels will get dangerously close. If navigators can avoid a developing ***'close-quarters situation'***, it automatically means that ***'risk of collision'*** has also been avoided. In other words, the Rules are pointing to a proactive approach of taking avoiding action similar to **prevention is better than cure.**

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For all practical purposes both the phrases ***'close-quarters'*** and ***'risk of collision'*** are synonymous and tantamount to mean the same.

'Close-quarters' is different from the projected point of contact of the extended vectors of vessels or ***'risk of collision'*** as explained with Rule 7. ***'Close-quarters'*** can be used to cover the range between zero or ***'collision'*** and the minimum desired limit of ***'close-quarters'***. A projected CPA closer than say 2 times the maximum outer limit of a vessel's turning circle or less then the desired closest safe passing range may all be considered as the minimum cut off limits of ***'close-quarters'***. Lord Justice Willmer in 1961 had remarked on the term ***'close-quarters situation'*** by saying, it leaves open to argument what is meant by the phrase.

'Safe distance' used later in paragraph 'd' of this Rule or the term ***'well clear'*** used in Rule16 both imply the same meaning but are still clearly different from the term ***'close-quarters'***.

The Rules, having recommended ***'alteration of course alone'***, do allow the navigators to choose the best action between ***'alteration of course and/or speed to avoid collision'*** as per paragraph 'b' of this Rule. However, from a ship handling viewpoint, when altering course on a conventional vessel, if it's speed is reduced during turning it results in an increased turning circle taking her closer to danger. The reverse will happen if the speed is increased, this is explained in the chapter on basic ship handling. When altering course for ***'preventing collisions'***, it is strongly recommended that a vessel's propulsion power should never be reduced during a turn; if possible, an increase in propulsion power will help in achieving a faster and shorter turn.

Limits of area around a vessel where a vessels bow wave and/or stern wake may endanger another vessel, especially small vessels may also be considered as the limit of ***'close-quarters'*** range. Master's and OOW's have been held guilty in law for damages caused by these factors.

Capt. Glen Aroza, Indian national and master of the Panama flag vessel 'TOSA', had been detained in Taiwan since 17th April 2009 along with the 2/O from Bangladesh who was the OOW and a Filipino seaman, who was on 'look-out' duty at the time.

It was first alleged that the 'TOSA' had collided with a Taiwanese fishing trawler in international waters killing two fishermen. When inspections of the hulls of the trawler and 'TOSA' revealed no physical contact between them, it was then alleged that the 21.6 meters long and 100 ton trawler capsized due to the wake of 'TOSA'. The case is still going on at the time of publication of this book, Capt Aroza was released after sustained legal and political efforts of many especially The Company of Master Mariners of India and arrived back in India on 1st October 2010.

Rules in US Title 33 CFR 164.11 contain clear guidelines about a vessels wake. Vessels over 1600 Gross Tons are specifically required to set their speed with consideration for damage that might be caused by their wake. Though vessels under 1600 GT are not specifically addressed, they are required to operate in a prudent matter in compliance with these or the equivalent inland Navigation Rules of US, so as not to endanger life, limb, or property (46 USC 2302).

Marine Guidance Note, MGN 369 (M+F) on 'Navigation In Restricted Visibility' published by the Maritime and Coastguard Agency of U.K. in July 2008 has the following interpretation about this term:

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"Similar to 'safe speed', a 'close-quarters situation' depends on the particular circumstances and closing speeds of the vessels involved. Manoeuvring characteristics, visibility, weather, traffic density and restricted or open waters will all have an influence on determining at what distance a 'close-quarters situation' begins to exist. A close-quarters situation is not to be confused with a risk of collision which begins at an earlier point in time".

This interpretation sums up the above explanations and that ***'a close-quarters situation'*** will always first take place followed by ***'collision'***, though its limits remain variable. If any organisation recommends a minimum safe passing range with other traffic then this range should be used as the minimum cut off range to define ***'close-quarters'***, provided it is more than the maximum outer limit of a vessels turning circle.

d: ***'Any action to avoid collision'*** should be such that it leads to ***'passing'*** the other vessel(s) at ***'a safe distance'***, and this range is to be decided by the navigators on board depending on the circumstances. In open waters, the expected ***'safe distance'*** would naturally be large but in ***'narrow channels'*** or congested waters with heavy traffic a lower ***'safe distance'*** margin is usually accepted. In the latter situations, the number of people forming the bridge team is usually higher than in open sea; this may be coupled with greater alertness levels and perhaps slower ship speeds. However, when accepting lower margins, precautions should be exercised so as not to allow the passing range to drop so low that interaction between vessels creates a dangerous situation. If this cannot be avoided, as in ***'narrow channels'***, then bold use of propulsion and rudder should normally be able to counteract any adverse interaction affects. In addition, allowance should be made for dangers associated with shallow water effects due to low clearances from the bottom or sides of any channel, all combined and referred to as squat refer definition 3(h).

Compliance with Rule 6 on ***'safe speed'*** helps with the above. Some companies and/or operators are known to recommend minimum safe passing ranges expected during navigation though this is not stated in these Rules.

'Any action to avoid collision' 'shall be carefully checked' by the navigators for its ***'effectiveness' 'until the other vessels is finally past and clear'***. The last clause means that the ***'close-quarters situation'*** or ***'risk of collision'*** has been averted, actions were effective and the vessel can return back to her ***'original course and speed'*** safely with no further ***'risk of collision'***.

e: This paragraph has an absolute requirement emphasised by ***'shall'*** - that propulsion systems being used by a vessel are readily available for use ***'if necessary'*** to reduce, slacken, or relax the vessel's speed or to bring her to dead stop in water by ***'stopping or reversing her means of propulsion'***. The Rule allows freedom of these actions in two distinct and clearly defined circumstances:

1: ***'if necessary to avoid collision'*** and 2: ***'allow more time to assess the situation'***.

As explained earlier with Rule 6 on ***'safe speed'***, and in the explanation box of paragraph 'b' of this Rule, lower speeds are required and/or implied by these Rules. This Rule also replicates the same spirit: ***'a vessel shall slacken her speed or take all way off'***. The Rules have thus clearly stated their preference for speed to be lowered or brought down as ***'action to avoid collision'***. In

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circumstances when the preferred ***'action to avoid collision'***, that is ***'an alteration of course alone'***, is not possible, vessels are required to reduce speed as per this Rule. This is also required by Rule 19(e), ***'shall reduce her speed to the minimum at which she can be kept on her course'***, though this is applicable in different circumstances.

Reduction of speed ***'by stopping or reversing her means of propulsion'*** may be readily possible on a small vessel with small engines, but is a cumbersome process on big vessels because of their sheer momentum and/or technical limitations of large propulsion systems. Though propulsion can usually be stopped instantly, there are limitations in reversing them instantly. In any case, the larger a vessel's displacement and the lower her propulsion power, the longer she will carry herself in water by momentum. (These aspects are explained in detail in the chapter on basic ship handling). As explained, do remember that speed changes are not likely to be ***'readily apparent'*** to other vessels as compared to large course changes, especially on their radars, a requirement stated in paragraph 'b' of this Rule.

The objective of taking ***'action to avoid collision'*** is to enable passing at a ***'safe distance'***. Checking the ***'effectiveness of the action'*** is the basic concept of any management activity. To quote the famous PDCA cycle of Dr. Deming, the guru of modern quality management concepts, the four stages of management are PLAN–DO–CHECK–ACT. Check is to verify the effectiveness and act is to correct the actions so that the same is as per and within the limits of the intended plan. The actions taken should be monitored for their effectiveness ***'until the other vessel is finally past and clear'.***

The onus to decide the safe passing distance is primarily on the ***'give-way vessel'***, which is required to ***'take early and substantial action to keep well clear'*** as per Rule 16, since a ***'stand-on vessel'***, ***'shall keep her course and speed'***. However, as per Rule 17 (a)(ii), a ***'stand-on vessel'*** may act ***'as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in compliance with these Rules'***. However, she shall or must act if she is too close as per Rule 17(b). In such cases a ***'stand-on'*** vessel acting to prevent a collision may not be in a condition to decide and/or implement much on safe passing distances since she would be trying to avert an impending accident ***'by her manoeuvre alone'***. It is for these reasons that a ***'stand-on vessel'*** must not wait too long to act, and when executing ***'any action to avoid collision'*** should continue to comply with all the requirements of this Rule 8.

In case of a ***'head-on situation'*** described in Rule 14, each of the two vessels becomes a ***'give-way vessel'***. Further, when Rule 19 in section III of part B of these Rules gets activated for ***'vessels not in sight of one another when navigating in or near and area of restricted visibility'***, the ***'give-way'*** or ***'stand-on'*** rules do not apply as they are applicable only ***'to vessels in sight of one another'*** and both vessels are obliged to take ***'action to avoid collision'***, as explained with Rule 19.

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f: NOTE: Beginners should skip paragraph 'f' of this Rule till they have studied all Rules till Rule 19 so that the cross references are clearer.

'Not impede' and similar terms using ***'impede'*** are included in Rules 9 (b), (c), (d), 10 (i), (j), 18 (d-i), (e) and (f-i) of this Part B. These state when 'not to impede' applies. The application of any of these Rules is in conjunction with and by complying with the requirements of Rule 8(f).

This Rule shall ***'apply in any condition of visibility'***, which also applies to Rules 9 and 10. However, when applied with Rule 18, this Rule will only ***'apply to vessels in sight of one another'***, as Rule 18 is in section 'II' of Part 'B'. '

Not to impede' takes precedence over ***'give-way'*** as will be the first obligation whenever required. ***'keep her course and speed'*** will not apply with this Rule as explained later.

The gist of the requirements of this Rule may be summarized as shown in the chart below.

Rule 8(f)	A Vessel required not to impede the passage or safe passage of another vessel.	A vessel the passage of which is not to be impeded'.
i	i) Shall ***'take early action'*** so as ***'not to impede'*** or keep clear and ***'allow sufficient sea-room'***, or maintain sufficient ***'safe distance'*** from the path ***'of the other vessel'***. ii) Should not allow ***'risk of collision'*** to develop. iii) Action shall be initiated whenever required by Rules 9, 10 and 18, irrespective whether ***'risk of collision'*** exists or not. iv) Vessel has full freedom of action.	Keep watch and keep observing, no action required at this stage.
ii	i) If the situation develops ***'to involve risk of collision'*** with the other vessel, obligation to keep clear as per subparagraph 'i' remains fully applicable and she shall ***'take action to avoid collision'*** in accordance with the Rules of Part 'B'. ii) ***'Keep her course and speed'*** status cannot be applied, even if these vessels are ***'in sight of one another'***.	
iii		i) If the situation develops ***'to involve risk of collision'*** with ***'a vessel required not to impede the passage or safe passage'***, ***'take action to avoid collision'***. ii) Actions shall ***'comply with the Rules of this part'*** or Part 'B', this may be considered similar to ***'action by stand-on vessel'*** as per Rule 17.

Note: subparagraphs "ii' and 'iii" get activated simultaneously when the situation develops ***'to involve risk of collision'***.

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(i)'A vessel which, by any of these Rules, is required not to impede the passage or safe passage of another vessel shall, when required by the circumstances of the case, take early action to allow sufficient sea room for the safe passage of the other vessel'.

This subparagraph very clearly places the obligation to keep clear on a vessel which is required by any of these Rules, underlined above ***'not to impede the passage or safe passage of another vessel'***. She ***'shall'*** take ***'early action to allow sufficient sea-room for the safe passage of the other vessel'***. The Rules, as usual, do not numerically define ***'sufficient'*** and the same should be judged basis ordinary ***'practice of seamen'***

A vessel required ***'not to impede'*** is obliged to ***'take early action'*** even before ***'determining if risk of collision exists'*** or not allow any ***'risk of collision'*** or ***'a close-quarters situation'*** from developing. this may be done even before ***'determining if risk of collision exists'***. This subparagraph does not prescribe any action so a vessel has full freedom of choice in deciding ***'any alteration of course and/or speed'***. Not allow any ***'risk of collision'*** is derived from subparagraphs 'ii' and 'iii' which get activated only when the situation is leading ***'to involve risk of collision'***.

'When required by the circumstances of the case' clause could mean situations not only where such action is required but provides an escape clause, like many other similar escape clauses in these Rules, when circumstances may not allow ***'early action'*** and/or the desired quantum of action. For example, a small vessel is not able to observe from a reasonable distance away the day signals of a ***'vessel constrained by her draught'*** in a ***'narrow channel'*** and because of this does not take action in ***'ample'*** or ***'good time'***. This clause may also be applied when ***'restricted visibility'*** conditions impose any restrictions.

(ii) 'A vessel required not to impede the passage or safe passage of another vessel is not relieved of this obligation if approaching the other vessel so as to involve risk of collision and shall, when taking action, have full regard to the action which may be required by the Rules of this part'.

This subparagraph clearly states that a vessel required ***'not to impede'*** continues to retain her obligation to ***'allow sufficient sea room'*** in case an encounter with ***'another vessel'*** is leading ***'to involve risk of collision'***.

'Have full regard to the action which may be required by the Rules of this part' means normal ***'action to avoid collision'*** required by any of the Rules of this Part B, that is Rules 4 to19. If ***'risk of collision'*** develops ***'a vessel'- 'required not to impede'*** should take into account the expected normal ***'action to avoid collision'*** by both the vessels involved in the situation as per the Rules of Part 'B' and should act in conformity with the same. Or, if she is a ***'stand-on vessel'*** in the situation, then irrespective of what any other Rules may otherwise prescribe, this vessel cannot ***'keep her course and speed'***. When she is ***'required not to impede'***. She should take such action as will not hinder or embarrass the action expected of the other vessel which is also now obliged to act as per subparagraph 'iii' of this Rule.

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(iii) 'A vessel the passage of which is not to be impeded remains fully obliged to comply with the Rules of this part when the two vessels are approaching one another so as to involve risk of collision'.

Initially ***'a vessel the passage of which is not to be impeded'***, as implied by subparagraph 'i', ***'shall keep her course and speed'*** to stay on her ***'passage'*** or ***'safe passage'***. She should keep a good watch on the vessel which is ***'required not to impede'***, to monitor her actions.

This subparagraph, like subparagraph 'ii', applies as soon as it appears that ***'a vessel required not to impede'*** is not taking any action, or substantial action or not in good time, to keep clear and that a ***'close-quarters'*** and/or ***'risk of collision'*** situation begins to develop. Now a vessel 'not to be impeded' should also take ***'action to avoid collision'*** and ***'remains fully obliged to comply with the Rules of this part'***. ***'This part'*** means Rules of Part 'B'.

When read in conjunction with the previous subparagraph 8(f)(ii), both, a vessel ***'required not to impede'*** as well as the vessel ***'not to be impeded'***, are obliged to and expected to execute ***'action to avoid collision'*** if they reach a situation which may ***'involve risk of collision'***. Their actions should be in compliance with the Rules of Part 'B', but both shall ***'take action'*** even if ***'in sight of one another'***, when if ***'not in sight of one another when navigating in or near an area of restricted visibility'***, both must act in compliance with Rule 19.

The application of subparagraphs 'ii' and 'iii' is to avoid any conflicting actions which may further jeopardize the situation or can be considered taking actions ***'with due regard to the observance of good seamanship'***.

Two different situations are given below to clarify the application of this Rule 8(f), the 1st on the application of subparagraph 'i' and the 2nd on subparagraphs 'ii' and 'iii'.

1: A small ***'vessel of less than 20 m in length or a sailing vessel'*** is inside or approaching a **'narrow channel'**. She detects or gets to know of a large ***'power-driven vessel'*** - ***'navigating within'*** this ***'narrow channel'*** and feels that the large vessel ***'can safely navigate only within'*** this ***'narrow channel'***.

The small vessel, obliged to ***'not impede the passage of any other vessel navigating within a narrow channel or fairway'***, ***'shall'*** - ***'take early action to allow sufficient sea-room for the passage of'*** the large ***'power-driven vessel'***, allow her to pass at a ***'safe distance'*** and do this immediately to not even allow ***'risk of collision'*** to develop. This is required by Rules 9(b) and 8(f)(i) and will ***'apply in any condition of visibility'***. She has full freedom of action.

The ***'not to impede'*** will not apply if the situation is ***'overtaking'*** but only if these vessels are ***'in sight of one another'***. Rule 13(a) on ***'overtaking'*** states ***'notwithstanding anything contained in the Rules of part B, sections I and II'*** and hence over-rides any other requirements stated in Rules 4 to 18.

2. In this example, consider ***'two power-driven vessels are crossing so as to involve risk of collision'*** in good visibility and ***'in sight of one another'*** as shown in the adjoining diagram. 'A' is ***'proceeding along the course of a narrow channel'***. This encounter looks like a typical

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'crossing situation'.



(A heading 090°, can safely navigate only within the narrow channel shown.)

It is clear that 'B' has not acted as per subparagraph 'i' of this rule in ***'not to impede the passage'*** of 'A' since ***'risk of collision'*** has developed.



(B heading 000°)

Vessel 'B' ***'is not relieved of this obligation'*** and should do whatever she can to keep clear as per subparagraph 'ii' of this Rule. She should also ***'have full regard to the action which may be'*** expected of ***'power-driven vessel'*** 'A' ***'for preventing collision'*** as ***'may be required by the Rules of this part'*** and should thus take appropriate actions in compliance with ***'the Rules of this part'*** or Part 'B'. This is required by Rule 9(d) in conjunction with Rule 8(f)(ii).

Freedom of action available to 'B' available under subparagraph 'i' is curtailed by subparagraph 'ii' and she should now act as per the Rules of Part B.

Though this appears as a like a typical ***'crossing situation'*** vessel 'B' cannot claim to be a ***'stand-on vessel'*** as the obligation to keep clear under subparagraph 'ii' of this Rule continues, so she may alter her course to starboard or reduced speed. An alteration to port is prohibited by Rule 17(c), the restriction now applicable by the application of the Rules of Part 'B'.

As per Rule 15 on ***'crossing situation'***, 'A' should normally have been a ***'give-way vessel'*** in open waters. However, by subparagraph 'i' of this Rule, she should have ***'kept her course and speed'*** as can now ***'safely navigate only within such channel or fairway'***. But as per subparagraph 'iii' of this Rule, she now ***'remains fully obliged to comply with the Rules of this part'*** as the situation now involves ***'risk of collision'***.

In the circumstances shown, the best action by 'A' may appear to be to reduce speed substantially, as she cannot alter course towards either side without the risk of stranding or running aground.

History

This paragraph 'f' was added to Rule '8' in 1989 primarily to clarify the application of ***'shall not impede'*** and thus making MSC/Circ.320 of 05.04.82, *'Guidance for the Uniform Application of Certain Rules of the International Regulations for Preventing Collisions at Sea, 1972'* redundant as far as it explained the requirements on ***'not to impede'***.

Till then ***'shall not impede'*** as explained in the above IMO circular stated, ***'such vessel shall so far as practicable navigate in such a way as to avoid the development of risk of collision. If, however, a situation has developed so as to involve risk of collision, the relevant Steering and Sailing Rules shall be complied with'***. This meant that ***'shall not impede'***, wherever stated would no longer be valid if ***'risk of collision'*** did actually develop. This gave rise to conflicting actions and vessels directed ***'not to impede'*** many a times would simply disregard this requirement and take no action to ***'keep well clear'*** if they were ***'stand-on'*** in a particular situation. The other vessel would anyway have to keep clear by virtue of becoming a ***'give-way vessel'*** when 'risk of collision' developed. As such, vessels required ***'not to impede'*** were not even breaching the requirements of these Rules from a legal viewpoint.

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Rule 9

Narrow channels

(a) **A vessel proceeding along the course of a narrow channel or fairway shall keep as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable.**

(b) **A vessel of less than 20 m in length or a sailing vessel shall not impede the passage of a vessel which can safely navigate only within a narrow channel or fairway.**

(c) **A vessel engaged in fishing shall not impede the passage of any other vessel navigating within a narrow channel or fairway.**

(d) **A vessel shall not cross a narrow channel or fairway if such crossing impedes the passage of a vessel which can safely navigate only within such channel or fairway. The latter vessel may use the sound signal prescribed in Rule 34(d) if in doubt as to the intention of the crossing vessel.**

(e) (i) **In a narrow channel or fairway when overtaking can take place only if the vessel to be overtaken has to take action to permit safe passing, the vessel intending to overtake shall indicate her intention by sounding the appropriate signal prescribed in Rule 34(c)(i). The vessel to be overtaken shall, if in agreement, sound the appropriate signal prescribed in Rule 34(c)(ii) and take steps to permit safe passing. If in doubt she may sound the signals prescribed in Rule 34(d).**

(ii) **This Rule does not relieve the overtaking vessel of her obligation under Rule 13.**

(f) **A vessel nearing a bend or an area of a narrow channel or fairway where other vessels may be obscured by an intervening obstruction shall navigate with particular alertness and caution and shall sound the appropriate signal prescribed in Rule 34(e).**

(g) **Any vessel shall, if the circumstances of the case admit, avoid anchoring in a narrow channel.**

The terms ***'narrow channel'*** and ***'fairway'*** are not defined clearly, neither in these Rules nor anywhere else. However, being so frequently used, it may have been felt that these terms did not need to be defined. ***'Narrow'*** can be relative to the type of vessel, and keeping safe margins from the sides and/or bottom of the channel. Usually, ***'a narrow channel'*** or ***'fairway'*** marked in or near ports depends on local customs and conditions of available sea-room. Alternatively, because of restricted depths, port infrastructure or reserved anchorage spaces etc., a clear corridor is kept marked for vessels to navigate in, whether or not marked by buoys, beacons, other navigational marks or leading lights.

'Narrow channels' or ***'fairways'*** may also exist in open seas due to depth restrictions or due to offshore structures and activities, like oil rigs and platforms, where safety corridors have been marked for vessels to navigate in. Normally ***'narrow channel'*** is used to describe a channel where the surrounding depths or proximity of land naturally impose navigable restrictions, even if it is a dredged channel, whereas ***'fairway'*** is used for restricted routes in more open waters, including

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dredged channels, which are used to route vessels away from navigational hazards like oil platforms, mines or even smaller vessels even to act as a safe channel for port approaches/departure. The terms may sometimes be interchanged; as such, do not let them be of any major concern but be guided by the information provided on charts and/or associated supporting publications.

Courts have not been consistent in deciding on the application of the term ***'a narrow channel'***. Sometimes a 1.2 mile wide channel has not been accepted to be ***'a narrow channel'*** but a 2 mile wide channel accepted as one. An Australian court has ruled that the provisions of this Rule should only apply to channels less than 3 nautical miles in width. However, these Rules are silent on the numerical aspects. Normally, any ***'channel'*** or marked ***'fairway'*** which restricts the navigable sea room would fall under the term ***'narrow channels'***. The guidelines issued by US authorities state, ***'a waterway is deemed a narrow channel by the practical and traditional uses of that waterway (usually a court determination) or it can be specified by the Secretary in Title 33 CFR part 89.25'***.

As per Rule 1(a), this Rule 9 shall apply to any ***'narrow channel or fairway'*** connected with ***'the high seas and in all waters connected therewith navigable by seagoing vessels'***, except if there are any local rules contrary to this authorised by Rule 1(b). However this Rule 9 will not apply to ***'traffic separation schemes'*** where the requirements of Rule 10 become applicable, even though the ***'traffic lanes'*** may at times be ***'narrow'*** or appear as a ***'fairway'***.

For example, the application of this Rule differs in the inland waters of the United States which state, ***'a power-driven vessel travelling down-bound with a following current shall have the right-of-way over an up-bound vessel in the Great Lakes, Western Rivers, and those waters specified by the Secretary'***.

The terms ***'shall not impede'*** and ***'impedes'*** have been used in this Rule; these have been explained earlier with Rule 8(f).

a: This paragraph is simple and applies to all vessels when ***'proceeding along the course of a narrow channel or fairway'***. The vessel concerned ***'shall keep as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable'***.

This requirement is applicable whether there is traffic approaching from the other direction or not. If the depth of the channel decreases from the middle towards the sides, a vessel with a deeper draught would naturally remain a little closer to the centre than one with a shallow draught. Vessels also need not frequently change course every few metres just to maintain themselves to the extreme starboard side since they are required to remain ***'as near to the outer limit'***, ***'as is safe and practicable'***. Navigators should use all navigational equipment and techniques (*see page 79*) to help them navigate their vessels in compliance with this Rule through ***'a narrow channel or fairway'***, especially if restricted visibility is being encountered.

The Rule does not restrict vessels using a ***'narrow channel'*** from leaving the same, for example cross it to go to a berth. If obliged to cross a ***'narrow channel or fairway'***, a vessel must comply with the requirements of Rule 9(d).

Sailing vessels may, because of the wind direction, find it not ***'practicable'*** to keep to the outer limit; however, they should then ensure compliance with Rule 9(b) explained later.

Vessels proceeding in opposite directions in narrow channels with bends enroute will be constantly changing their headings and their relative or true directions from each other leading to confusion and

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the normal application of these Rules would be impossible. These vessels may appear to be ***'head-on'*** at one time or ***'crossing'*** a bit later or even appear as if they are moving away etc. However, since each is required to comply with this Rule 9(a), they cannot be considered to be covered by any other Rule with respect to ***'preventing collision'*** due to the constantly changing scenario and the rather limited sea room. In a 1948 judgement on a collision which took place in ***'a narrow channel'***, Mr. Justice Willmer had ruled, *"I have no hesitation in saying that as between a vessel coming up and a vessel going down, approaching each other in that way in a narrow channel, the narrow channel Rule, and the narrow channel Rule only, is the Rule which has to be applied."*

b: Requires any ***'vessel of less than 20 m in length or a sailing vessel'*** not to ***'impede the passage of a vessel which can safely navigate only within a narrow channel or fairway'***.

Hence any vessel less than 20 m in length and all sailing vessels, when getting to know of ***'a vessel which can safely navigate only within a narrow channel or fairway'***, must ***'not impede'*** her passage. That is, take early and substantial action to allow sufficient and safe sea-room for her passage. The Rules are silent on the means and parameters to be adopted to identify vessels which can ***'safely navigate only within a narrow channel or fairway'***. This is left to a large extent on the judgement of the navigators of these small and sailing vessels. They would need to take into account both the depth and the width of the channel and watch out for and keep clear of such vessels especially those indicating any restrictions; for example, ***'a vessel constrained by her draught'*** indicating her condition by lights, shapes or sound signals.

In other words, this Rule gives sort of a first right of passage to non-sailing vessels that are over 20 m in length and ***'which can safely navigate only within a narrow channel or fairway'*** by directing vessels less than 20 m in length and sailing vessels to keep clear. Vessels required ***'not to impede'*** should take early action, keep well clear and not allow any ***'risk of collision'*** to develop as required by Rule 8(f) explained earlier.

c: Requires any ***'vessel engaged in fishing'***, defined in Rule 3(d), to stay out of the way of ***'any other vessel navigating within a narrow channel or fairway'***, not just those ***'which can safely navigate only within a narrow channel or fairway'*** as required by paragraph 9(b). A ***'vessel engaged in fishing'*** thus must also keep clear of any ***'vessel'*** when they are ***'navigating within a narrow channel or fairway'***.

> Requirements of Rule 18 (a) and (b) will not apply here. Rule 18 will apply only if these vessels meet outside a ***'narrow channel or fairway'***.

'Navigating' is a fairly general term and would apply irrespective of the direction of movement of ***'any other vessel'***.

By implication, ***'fishing vessels'*** are therefore permitted to fish in a ***'narrow channel or fairway'*** since this Rule 9 says nothing on prohibiting fishing within the same. However, fishing may be carried out if a ***'narrow channel or fairway'*** is not being used by any other vessel, or if ***'fishing vessels'*** are well clear of the vessels concerned, or can promptly vacate the ***'narrow channel or fairway'*** immediately to allow any other vessel to pass with a safe margin.

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As explained earlier with Rule 8(f), in case a ***'vessel engaged in fishing'*** fails to keep clear for any reason and ***'a close-quarters situation is developing and/or risk of collision exists'***, the other vessel will also be obliged to take ***'action to avoid collision'*** as per the Rules of Part B of these Rules, the ***'vessel engaged in fishing'*** continues to retain her obligation to keep clear.

d: Prohibits all vessels from crossing ***'a narrow channel or fairway'***, ***'if such crossing impedes the passage of a vessel which can safely navigate only within such channel or fairway'***. All the requirements of Rule 8(f) continue to apply in such cases as explained earlier.

A vessel restricted to the ***'narrow channel or fairway'*** - ***'may use the sound signal prescribed in Rule 34(d) if in doubt as to the intention of the crossing vessel'***, that is sound ***'at least five short and rapid blasts on the whistle'***.

The Rule here says that this sound signal ***'may'*** be used. However, Rule 34(d) referred to requires its use in case of doubt and states ***'shall immediately'*** for the use of this signal. The ***'may use'*** advice may thus be considered a reminder only and not necessarily contradicting the requirement of Rule 34(d).

It is clear that this Rule does not prohibit vessels from crossing a ***'narrow channel or fairway'***. The essence of the requirement is that they should not impede the ***'passage of a vessel which can safely navigate only within such channel or fairway'***. The onus of deciding which vessel can or cannot ***'safely navigate only within such channel or fairway'*** appears to be left to the judgement of the navigators on board a vessel intending to cross ***'a narrow channel or fairway'***; not always an easy task.

It appears that the main purpose of this Rule is to reduce the number and frequency of vessels crossing ***'a narrow channel or fairway'***, some of them having led to collisions in the past. This also encourages smaller vessels to stay clear of ***'a narrow channel or fairway'*** if they can navigate outside the same, or requires them to wait to cross until the route is clear of other vessels.

e: Defines the procedures for overtaking ***'in a narrow channel or fairway when overtaking can take place only if the vessel to be overtaken has to take action to permit safe passing'***. This Rule gets linked with the requirements of Rule 13 on ***'overtaking'*** and Rule 34(c) on ***'manoeuvring and warning signals'*** as stated in this Rule itself. The procedure prescribed in subparagraph (i) of this Rule is self explanatory.

Do note that since this Rule does not use the word ***'impede'***, the requirements of Rule 8(f) do not apply to overtaking situations described in this paragraph.

Subparagraph (ii) of this Rule states ***'does not relieve the overtaking vessel of her obligation under Rule 13'***. Only If vessels are ***'in sight of one another'*** does Rule 13 apply and it states ***'notwithstanding anything contained in the Rules of part B, sections I and II, any vessel overtaking any other vessel shall keep out of the way of the vessel being overtaken'***.

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If ***'any vessel overtaking'*** can pass safely and overtake within ***'a narrow channel or fairway'*** without requiring the vessel to be overtaken to take any action ***'to permit safe passing'***, then obviously the requirements of this paragraph will not apply though Rule 13 will still remain applicable.

The method of communication described is by way of sound signals; ***'the vessel intending to overtake shall indicate her intention'*** of overtaking and the side she intends to overtake from. The vessel to be overtaken, ***'if in agreement'*** with the proposal, shall ***'sound the appropriate signal'*** - ***'and take steps to permit safe passing'***.

Rule 9(e)(i) further states that if the vessel to be overtaken ***'is in doubt'***, which may include that the navigators on board feel it is not safe to do so or for any other factors which create a doubt, then ***'she may sound the signals prescribed in Rule 34(d)'***.

Similar to subparagraph (d) of this Rule, ***'may'*** has been used here too. However, Rule 34(d) referred to, requires its use in case of doubt and states ***'shall immediately indicate such doubt by giving at least five short and rapid blasts on her whistle'***. The explanation for ***'may sound'*** remains the same as given earlier for subparagraph (d) of this Rule.

Both the above subparagraphs (d) and (e) of this Rule 9 apply in ***'any condition of visibility'*** by virtue of this Rule being placed in section I of Part B. Whereas the sound signals required by Rule 34(c) are applicable to vessels only ***'when in sight of one another'***. Since Rules 9(d) and 9(e) refer to Rule 34(d) and 34(c) respectively and do not state anything to the contrary, the application of sound signals would naturally be as prescribed in the latter Rules, that is to vessels ***'in sight of one another'***.

Similarly the requirements of subparagraph (ii) of this Rule, ***'does not relieve the overtaking vessel of her obligation under Rule 13'*** shall apply only if vessels are ***'in sight of one another'***.

The above requirements will reduce risks of collisions, especially due to interaction between vessels when large vessels proceeding along ***'a narrow channel or fairway'*** may overtake other vessels. A ***'vessel to be overtaken'***, should by ***'good seamanship'***, move as far ***'as is safe and practicable'*** away from the side of the ***'narrow channel or fairway'*** from which the ***'vessel intending to overtake'*** intends to pass and may also reduce speed. This would be to allow as great a passing distance as possible to ensure safe passage with minimum interaction effects and time duration between the vessels.

f: This Rule applies to all vessels ***'nearing a bend or an area of a narrow channel or fairway where other vessels may be obscured by an intervening obstruction'***, and directs them to ***'navigate with particular alertness and caution'***. This may even be considered a reminder towards ***'look-out'*** by all means and ***'proceed at a safe speed'***.

This Rule remains silent on which vessel is required to take ***'action to avoid collision'***, if so required. If the vessels are keeping to their starboard side as per Rule 9(a), they should anyway pass clear of each other. Any bend must be rounded ***'with particular alertness and caution'*** regardless of whether an approaching vessel is present or her sound signal has been heard or not.

'A vessel nearing a bend or an area of a channel or fairway where other vessels may be obscured', ***'shall sound the appropriate signal prescribed in Rule 34(e)'***. That is ***'shall sound***

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one prolonged blast. Such signal shall be answered with a prolonged blast by any approaching vessel that may be within hearing *(range)* ***around the bend or behind the intervening obstruction'***.

Having said ***'navigate with particular alertness and caution'*** this Rule does not prescribe ***'any action to avoid collision'***. For ***'any action to avoid collision'***, navigators should decide on a case to case basis applying ***'ordinary practice of seamen'*** and ***'observance of good seamanship'*** for such situations as given in Rules 2(a) and 8(a) respectively, or ***'special circumstances of the case'***, again from Rule 2(a).

However, when transiting a bend, local Rules may clearly require, but more usually it is considered a precaution required by ***'good seamanship'***, this has been stated in the inland Rules of the US stated earlier and in some court rulings also, that a vessel stemming the tide should wait until the other has passed clear.

g: ***'Avoid anchoring in a narrow channel'*** applies to all vessels at all times. ***'Anchoring in a narrow channel'*** is obviously not a good practice and may obstruct or impede the safe passage of other vessels, though the Rule refrains from using these or any other explanatory words.

Though the Rule does not totally prohibit a vessel from ***'anchoring in a narrow channel'***, it strongly requires that this not be done, ***'shall, if the circumstances of the case admit, avoid'***. In other words, a vessel **shall** ***'avoid anchoring in a narrow channel'*** except when compelled by pressing circumstances, which she can justify.

If a vessel does find it necessary for any reason to anchor in a ***'narrow channel'***, she should try to do so in a position where she will not be an obstruction to other vessels navigating through the narrow channel and remain anchored for the shortest time possible.

This Paragraph is silent on ***'fairways'***. However, for practical purposes, it is recommended that the spirit of this Rule also be applied to ***'fairways'*** if it is ever required to anchor in one. Do refer to the warning cautions and instructions given on the charts and related publications.

Rule 9 does not have anything on a vessel entering ***'a narrow channel or fairway'*** with the intention of proceeding in the same. Rule 2(a) may apply in such circumstances as per the following extract from a court verdict.

The Rule of good seamanship for a vessel entering a main channel is that she should do so with caution and not hamper traffic already navigating in it. Vessels already in it, as well as those about to enter it, should behave reasonably. It does not appear to me that the vessel in the channel has a complete right of way, and she must not hog the river regardless of the reasonable aspirations of other vessels. (Mr Justice Hewson, 1962)

(*) All has a broad band application. As use of ECDIS increases and E. Navigation sets in, relying on automation would keep increasing in future. However, visual navigation, manual position fixing by visual / radar, use of parallel indexing and echo sounder are time tested best practices which should be continued to ensure safe navigation. Always ensuring that requirements from STCW VIII/2 are fully complied or followed in letter and spirit.

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Rule 10

Traffic separation schemes

(a) This Rule applies to traffic separation schemes adopted by the Organization and does not relieve any vessel of her obligation under any other rule.

(b) A vessel using a traffic separation scheme shall:

(i) proceed in the appropriate traffic lane in the general direction of traffic flow for that lane;

(ii) so far as practicable keep clear of a traffic separation line or separation zone;

(iii) normally join or leave a traffic lane at the termination of the lane, but when joining or leaving from either side shall do so at as small an angle to the general direction of traffic flow as practicable.

(c) A vessel shall, so far as practicable, avoid crossing traffic lanes but if obliged to do so shall cross on a heading as nearly as practicable at right angles to the general direction of traffic flow.

(d) (i) A vessel shall not use an inshore traffic zone when she can safely use the appropriate traffic lane within the adjacent traffic separation scheme. However, vessels of less than 20 m in length, sailing vessels and vessels engaged in fishing may use the inshore traffic zone.

(ii) Notwithstanding subparagraph (d)(i), a vessel may use an inshore traffic zone when *en route* to or from a port, offshore installation or structure, pilot station or any other place situated within the inshore traffic zone, or to avoid immediate danger.

(e) A vessel other than a crossing vessel or a vessel joining or leaving a lane shall not normally enter a separation zone or cross a separation line except:

(i) in cases of emergency to avoid immediate danger;

(ii) to engage in fishing within a separation zone.

(f) A vessel navigating in areas near the terminations of traffic separation schemes shall do so with particular caution.

(g) A vessel shall so far as practicable avoid anchoring in a traffic separation scheme or in areas near its terminations.

(h) A vessel not using a traffic separation scheme shall avoid it by as wide a margin as is practicable.

(i) A vessel engaged in fishing shall not impede the passage of any vessel following a traffic lane.

(j) A vessel of less than 20 m in length or a sailing vessel shall not impede the safe passage of a power-driven vessel following a traffic lane.

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(k) **A vessel restricted in her ability to manoeuvre when engaged in an operation for the maintenance of safety of navigation in a traffic separation scheme is exempted from complying with this Rule to the extent necessary to carry out the operation.**

(l) **A vessel restricted in her ability to manoeuvre when engaged in an operation for the laying, servicing or picking up of a submarine cable, within a traffic separation scheme, is exempted from complying with this Rule to the extent necessary to carry out the operation.**

International Maritime Organisation (IMO), is the organization referred to in paragraph 'a'.

'Traffic separation schemes', called ***TSS*** henceforth both for singular or plural use, are amongst the most important of the many routeing measures adopted by IMO to separate opposing streams of traffic. Their purpose is to improve safety of navigation in areas of high traffic density like crowded sea lanes, approaches to busy ports, in convergent areas, areas where freedom of movement is curtailed due to restricted sea-room and areas where obstructions to navigation exist. Analysis of the collision statistics in relation to application of conventional Rules showed that the Rules alone were not being effective in preventing collisions in such areas; this led to the development and imposition of ***TSS*** by IMO. IMO defines ***TSS*** as ***'a routeing measure aimed at the separation of opposing streams of traffic by appropriate means and by the establishment of traffic lanes'***. A ***TSS*** is distinct and separate from a ***'narrow channel or fairway'*** and so are the Rules applicable to a ***TSS***; they may or may not include ***'a narrow channel'*** within them.

A ***TSS*** is adopted by the IMO after a country (or countries) submits a proposal to IMO and is a long process. Navigational charts are obliged to show the schemes adopted by IMO, and they may also show other locally adopted schemes; the latter, if shown, will normally be remarked accordingly. The IMO publishes ***'Ships' Routeing'*** which contains details of applicable ***TSS*** as well as lists with diagrams and coordinates of all adopted ***TSS***. New editions are published from time to time and it is important that the latest edition is used along with updated charts and sailing directions to ensure that the latest information is used. The latter will usually be updated for any new schemes being introduced. The IMO publication does not contain details of any experimental ***TSS*** undergoing trials, though the same will be made known to vessels through T & P notices and other means like local broadcasts, navigational warnings or flag state circulars.

Some governments are known to have adopted, within their territorial waters, similar ***TSS*** which may not have been adopted by IMO or even differ from the IMO adopted standards; navigators should consult all publications to ensure that they are familiar with these, especially with regard to any differences. For example, off the coast of Japan several such ***TSS*** exist, most recommended by the Japanese Captains Association but not adopted by IMO. The requirements of this Rule do not legally apply to such schemes. However, in line with ***'the ordinary practice of seamen'***, it will be prudent to comply with them.

Navigators must keep in mind that use of a particular ***TSS*** in full or in part may be declared mandatory for use by all traffic or by certain type of vessels by size or those carrying dangerous, oil or chemical cargoes as specified and must be complied with. On the other hand, requirements may be imposed requiring some specified type of vessels to keep away from the coast by a specified minimum distance in some places, in which case if a ***TSS*** is inshore of the minimum specified range, vessels should not use the same, keeping well clear of it.

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The IMO publication **'Ships' Routeing'** (2012 edition) is divided into Parts 'A' to 'H'. Part 'B' contains details of all applicable ***'TSS'*** but details of mandatory requirements are contained in Part 'G' which should be studied in detail and independently since there is little cross referencing between the various Parts of this publication. Other Parts of the publication and passage planning charts, especially those published by the counties in the vicinity of a ***TSS*** may contain more detailed advice on the requirements, these should be consulted for voyage planning and its execution.

[TASK:

1. **STUDY REGULATION 10, 11 & 12 IN CHAPTER V OF SOLAS.**
2. **STUDY THE LATEST EDITION OF SHIPS' ROUTEING INTRODUCTION TO GET FAMILIAR WITH THE SAME. ALSO LIST THE DETAILS OF THE CONTENTS OF ALL THE PARTS.]**

a: Clarifies that the requirements of this Rule only apply ***'to traffic separation schemes adopted by the Organisation'.***

'Does not relieve any vessel of her obligation under any other Rule' clarifies that requirements of all Rules continue to apply within a ***TSS*** in all respects - be it the determination of ***'risk of collision'*** or execution of any ***'action to avoid collision'*** or the display of ***'lights and shapes'*** and the use of ***'sound and light signals'***.

> For example, a ***'power-driven vessel'*** within a ***TSS*** following a ***'traffic lane'*** is not relieved of her obligation to keep out of the way of another ***'power-driven vessel'*** crossing the ***TSS*** and approaching from her starboard side (crossing as per Rule 15), involving ***'risk of collision'*** if they are ***'in sight of one another'***. ***'In or near an area of restricted visibility'***, in a similar situation, for ***'vessels not in sight of one another'***, then both would need to act preferably as per Rule 19(d). In other words a vessel following a ***TSS*** gets no preference.

b: A vessel is said to be ***'using a traffic separation scheme'*** when she is within the outer limits of the scheme and is not ***'crossing'*** the scheme. This requirement applies to all vessels; the only exemption granted is to a ***'vessel restricted in her ability to manoeuvre'*** defined in Rule 3(g), but only in certain conditions as stated in paragraphs 'k' and 'l' of this Rule.

These Rules do not seem to restrict fishing within a ***TSS*** and this is an important aspect to keep in mind, though paragraph 'i' of this Rule requires that ***'a vessel engaged in fishing shall not impede the passage of any vessel following a traffic lane'***. The requirement for a vessel not using a ***TSS*** is as per paragraph 'h' of this Rule.

The requirements for vessels using a ***TSS*** are simply stated in this paragraph 'b' of this Rule subdivided into three subparagraphs as follows.

b-i: Is obviously stating ***'proceed'*** or move with the flow within the ***'appropriate traffic lane in the general direction of traffic flow for that lane'***. A vessel proceeding in the wrong or opposite direction in a ***'traffic lane'*** will be in violation of this Rule, will mess up the movement of all other vessels following the recommended direction of movement and also increase probability of ***'risk of collision'***.

There have been a few cases where vessels have actually proceeded in wrong directions and have been heavily fined, including personal fines on the navigators. The reasons have been many, from simple human error to having missed the ***TSS*** during voyage planning or in its execution to not being

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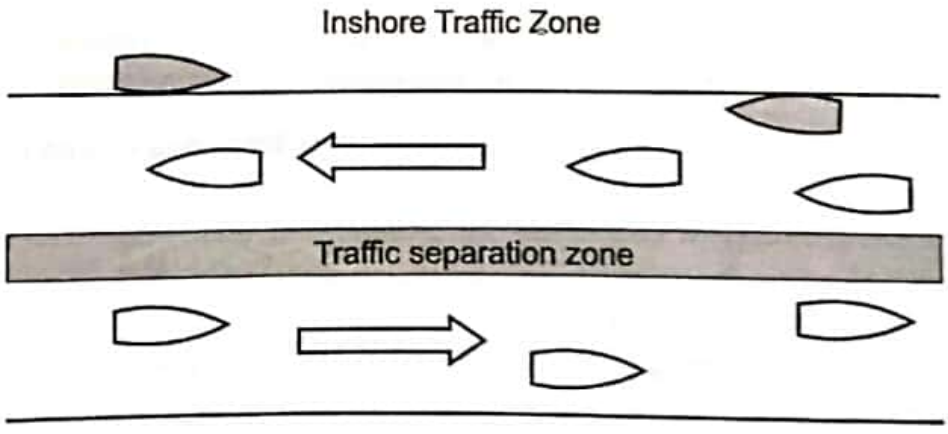
aware of a newly commissioned ***TSS*** as the charts and/or publications were obsolete and/or not updated, or not having consulted all relevant information updates.

b-ii: 'Keep clear of a traffic separation line or separation zone' is intended to give greater effect to the separation of opposing streams of traffic but does not define or recommend any minimum margin. The Rule uses the phrase ***'so far as practicable'*** placing the discretion of minimum clearance margins on the navigators, who when deciding should keep in mind the requirements stated in Rule 2, ***'precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case'***.

Boundaries of a ***TSS*** are usually not marked by buoys, or, unlike roads and highways on land they also cannot have white or yellow lines marking them. This requirement to keep safe clearance margins is to do with an old principle of safe navigation, *'to err towards the safer side'*.

If a vessel proceeds on a course near the edge of a ***'traffic lane'***, she risks drifting accidentally into the opposite lane of oncoming traffic if she suffers from any inaccuracy, however small, for example in position fixing and any sudden propulsion or steering failure. She may even create a doubt for other vessels in the vicinity whether she is actually using the ***TSS*** or not.

It is important that vessels proceeding along ***'traffic lanes'*** keep clear of the outer limit which lies on their starboard side, particularly if this line separates the lane from an inshore zone which is likely to contain traffic moving in the opposite direction. On the edge of the lane ***'two power-driven vessels'*** when ***'meeting on reciprocal or nearly reciprocal courses'*** would each be required to ***'alter her courses to starboard'*** in compliance with Rule 14. This would take them into the opposite zone/lane and perhaps directly against other incoming traffic, not just making it difficult for them to return to their correct path but increasing the probability of ***'risk of collision'***. The following diagram depicts this danger for the two shaded vessels, one inside a ***TSS*** and the other inside the inshore traffic zone.

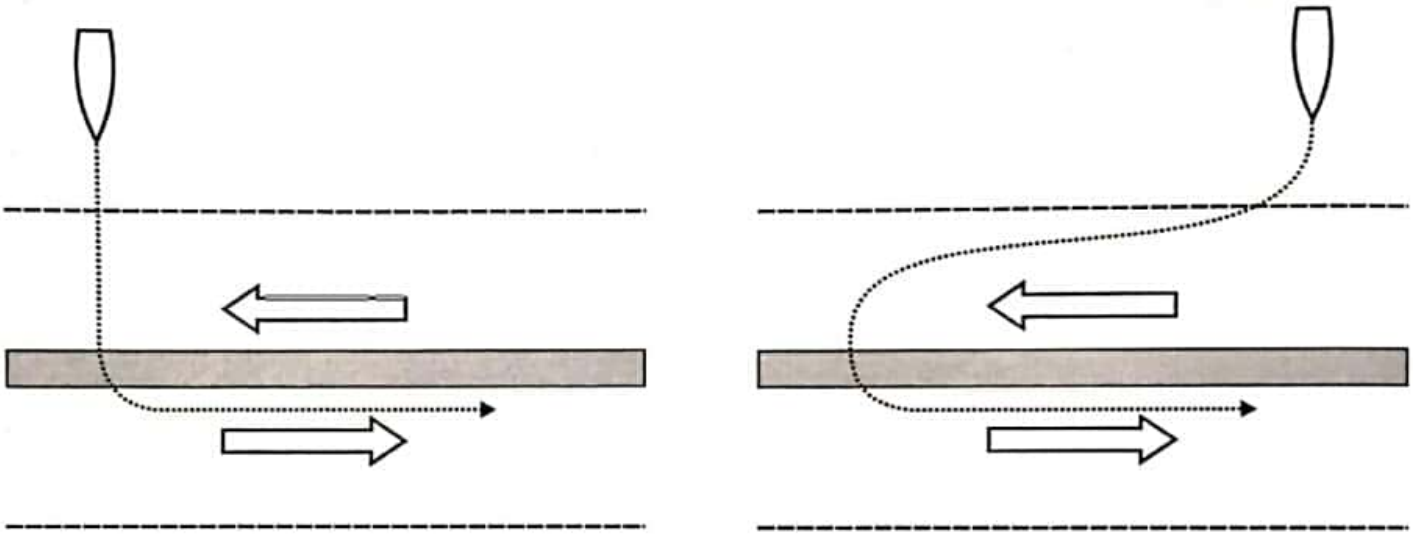


b-iii: Requires vessels to ***'normally join or leave a traffic lane at the termination of the lane'***. However, should they need to join or leave in between at any other point within the extreme boundaries of a ***TSS,*** this is not prohibited, but in this case vessels should do so ***'at as small an angle to the general direction of traffic flow as practicable'***. This is to align such a vessel as close as possible with the ***'general direction of traffic flow'*** so that she can easily join in the same, that her

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intentions are clear to other vessels following the ***TSS*** and to differentiate her from one which may be crossing the ***'traffic lane'***. The requirements for a vessel intending to cross or ***'crossing'*** a ***TSS*** follow in paragraph 'c' of this Rule.

Sometimes a vessel may require **'crossing'** one ***'traffic lane'*** to join an opposite one, she must cross the first lane at a heading of right angles, allowed by the next paragraph 'c' and then join the next at as small an angle as possible. At times it may become necessary to join the first lane itself if heavy traffic does not allow a safe crossing and thereafter take a 'U' turn, as shown below.



c: The initial requirement stated is ***'a vessel shall, so far as practicable, avoid crossing traffic lanes'***. To comply a vessel may go around ***'traffic lanes'*** but not through them. This is not always practical especially if a vessel has to go around a very long ***TSS***. To allow for such situations, the Rule contains a waiver to this recommendation, ***'but if obliged to do so'***. This means that when a vessel cannot comply with the initial recommendation, she may go ahead and cross a ***'traffic lane'***, but when doing so ***'shall cross on a heading as nearly as practicable at right angles to the general direction of traffic flow'***. ***'Heading'*** means true heading, or true course steered.

It is important to note and understand that the Rule states ***'heading as nearly as practicable at right angles'*** and not course made good, this requirement remains applicable irrespective if there are other vessels transiting through a ***TSS*** or not. ***'As practicable'*** allows for minor deviations from an absolute right angle heading, for example a sailing vessel may not be able to achieve this due to the prevailing wind direction or a vessel may make minor adjustments of the course steered to avoid any dangers on the way when ***'crossing'***. However, if a vessel ***'crossing'*** a ***TSS*** has to take ***'any action to avoid collision'***, or having nearly completed her act of ***'crossing'*** a ***'traffic lane'*** is turning to join the opposite ***'traffic lane'***, then obviously this recommendation will not apply.

Sailing vessels if fitted with ***'propelling machinery'*** or engines as usually referred to, if ***'crossing'*** a ***TSS*** should preferably use the same to enable them cross faster and maintain their heading at right angles especially if the wind direction is not favourable. Sailing vessels not using their ***'propelling machinery'***, where fitted, and crossing a ***TSS*** at awkward angles have had their navigators prosecuted for breach of these Rules where court judgements have stated that the navigators have not followed **'ordinary practice of (prudent) seamanship'**, the courts having added 'prudent'.

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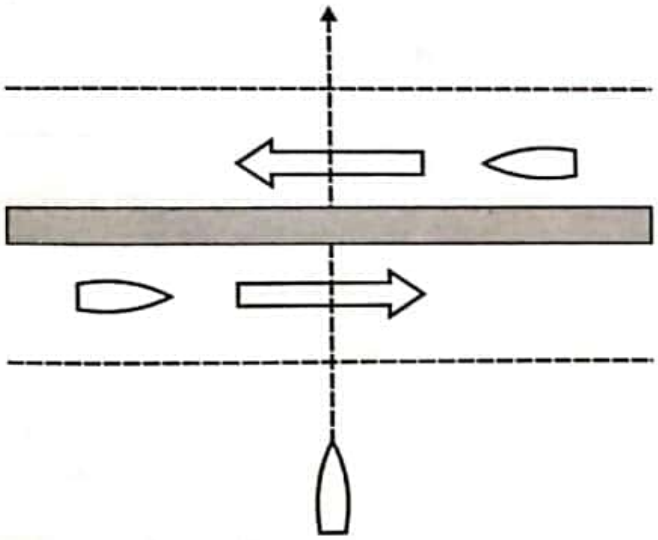
A vessel crossed one lane of a ***TSS*** steering an oblique course far away from the required ***'heading as nearly as practicable at right angles to the general direction of traffic flow'*** as she was intending to join the next traffic lane which she had to do so at ***'as small an angle'*** as possible. During her initial transit she was involved in a collision. The judgment blamed her for breach of the Rules, *'the obligation in Rule 10(c) applies to vessels crossing any traffic lane whether the purpose of crossing it is to cross the next lane or to join it. Of course the obligation to cross at a right angle is qualified by the expression* ***'as nearly as practicable'****. Moreover, no attempt should be made to cross either lane in a traffic separation scheme unless it is safe to do so. (Mr. Justice Clarke, 1994).*

Though it would be a good and prudent practice for vessels intending to cross a ***TSS*** to wait for a suitable opportunity to cross the ***TSS*** till it appears free of other vessel movements, this may not always be feasible in practice.

[TASK: COMBINE THE ABOVE WITH CHART WORK AND ASSUME A VESSEL IS DOING A SPEED OF 10 KNOTS THROUGH WATER AND IS CROSSING A TSS WHICH IS ALSO 10 MILES WIDE, A CURRENT OF 5 KNOTS IS FLOWING ALONG THE DIRECTION OF THE TSS.

WORK OUT WHERE THE VESSEL WILL REACH AND IN HOW MUCH TIME IF SHE STEERS A COURSE AT THE REQUIRED RIGHT ANGLES REQUIRED BY THIS RULE? ALSO, IS SHE WISHES TO MAKE GOOD A COURSE AT RIGHT ANGLES, THEN WHAT COURSE SHOULD SHE STEER AND HOW LONG WILL SHE TAKE TO CROSS THE TSS NOW?

YOU MAY CONSIDER REVISING VECTORS OR THE CHAPTER ON COUNTERACTING CURRENTS FROM CHART WORK BEFORE ATTEMPTING THE ABOVE.]



This diagram indicates the way a ***TSS*** or ***'traffic lane'*** should be crossed only if it is essential to do so and on a course steered or ***'heading as nearly as practicable at right angles to the general direction of traffic flow'***. Not only this clearly indicates a crossing vessels intention to other vessels in the vicinity, when the course steered or ***'heading'*** is ***'at right angles'*** or perpendicular to the ***'general direction of traffic flow'***, it also takes the least time to cross the ***'lane'***.

A vessel crossing a ***TSS*** is likely to disturb normal traffic flow within the lanes and increase the probability of ***'risk of collision'*** with other vessels. If ***'risk of collision'*** develops between vessels within a ***TSS***, the Rules ***'for Prevention Collision'*** from this Part B of these Rules shall apply to ***'any action to avoid collision'*** as they normally would have, had the vessels not been in a ***TSS*** - this requirement is clearly stated in paragraph 'a' of this Rule.

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Sailing vessels and small vessels less than 20 m in length ***'shall not impede the safe passage of a power-driven vessel following a traffic lane'***, is stated in paragraph 'j' of this Rule. ***'A vessel engaged in fishing'***, '***shall not impede the passage of any vessel following a traffic lane'*** as per paragraph 'i' of this Rule. These requirements would not apply to other vessels crossing a ***TSS.***

Two different terms ***'safe passage'*** and ***'passage'*** have been used at different places within this Rule. To my mind any ***'passage'*** has to be safe as such both may mean the same from ***'ordinary practice of seamen'*** approach. Courts may interpret these terms differently though, have been unable find any clear ruling on these two terms so leave their interpretation open to debate. While ***'passage'*** simply indicates ***'passage'***, the prefix ***'safe'*** may indicate some sort of navigational restrictions on availability of sufficient sea room.

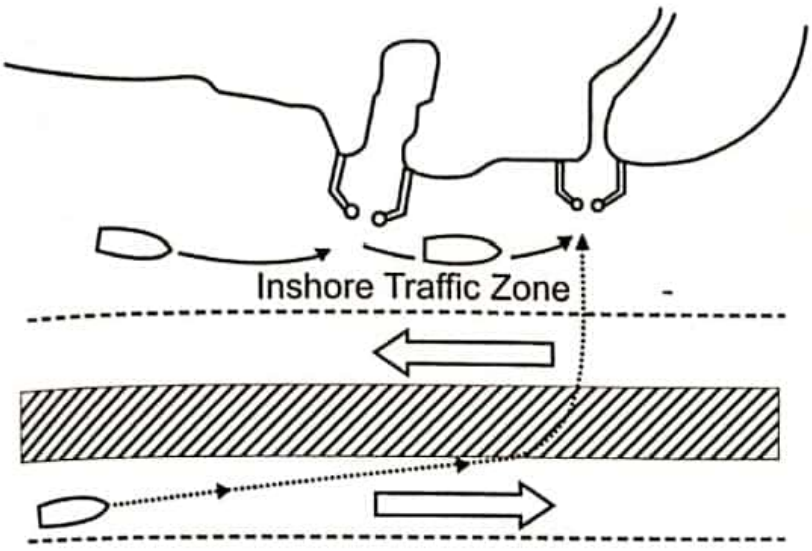
Traffic in a ***TSS*** may sometimes be under surveillance and/or control of a shore based authority, for example a VTIS or a VTMS station using shore radar, directional VHF and other equipment like AIS etc. The shore operators should ideally allow for the wind and current effects in determining if a vessel is following or crossing a ***TSS***. Depending on the way they have set their system, they may see only the true vectors of the vessels movement and not necessarily her heading or course steered. It is important navigators should keep this in mind if questioned or charged about their intentions when navigating through a ***TSS***.

d: 'Inshore traffic zone' is the designated sea area between the landward boundary of a ***TSS*** and the adjacent coast intended for coastal traffic. Such zones may be relatively narrow and would become dangerous if traffic density gets high within them, which would happen if through traffic were allowed to navigate through them. Their prime purpose is to keep coastal shipping traffic away from the through traffic which should pass via the main traffic lanes of a ***TSS***. The segregation between ***'inshore traffic zone'*** and adjacent ***'traffic lanes'*** of a ***TSS*** reduces traffic density within an ***'inshore traffic zone'***, ***'risk of collision'*** and also the anxieties often felt in areas of heavy traffic density.

It is not mandatory for vessels to use a ***TSS***, if they choose not to, then they ***'shall avoid it by as wide a margin as is practicable'***, in accordance with paragraph 'h' of this Rule, and pass well outside the scheme. However, when an ***'inshore traffic zone'*** has been adopted as part of any ***TSS***, through traffic vessels are required to either use the designated ***'traffic lane'*** or stay well away even from the ***'inshore traffic zone'***. If an ***'inshore traffic zone'*** exists on both sides of a ***TSS***, then obviously through traffic has to use the ***'traffic lanes'*** within the ***TSS*** as required by subparagraph 'd-i' - ***'a vessel shall not use an inshore traffic zone when she can safely use the appropriate traffic lane within the adjacent traffic separation scheme'***.

'However, vessels of less than 20 m in length, sailing vessels and vessels engaged in fishing may use the inshore traffic zone'. This waiver is perhaps to do with the size and type of vessels which are often required to be near the coast.

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In addition to the above vessels, subparagraph 'd-ii' further adds that ***'a vessel may use an inshore traffic zone when en route to or from a port, offshore installation or structure, pilot station or any other place situated within the inshore traffic zone'***.This is to allow ease of passage to vessels on coastal trade as well as to those providing services within the ***'inshore traffic zone'***. This clearly implies that through traffic is still prohibited from using an ***'inshore traffic zone'***.

This paragraph 'd' also allows any vessel to enter an ***'inshore traffic zone'-'to avoid immediate danger'***. Danger is not defined but could be any emergency on the ship or to the people on board, the cargo or any danger to the vessel or to the navigation in general for which a vessel may need to go into or pass through an ***'inshore traffic zone'***. This implies that a vessel may enter an ***'inshore traffic zone'*** for the purpose of ***'preventing collisions'*** too, since ***'risk of collision'*** is clearly a danger for any vessel, or to proceed to a port of refuge because of an emergency on board.

e: Traffic lanes within a ***TSS*** or any adjacent ***'inshore traffic zone'*** are usually separated by a ***'separation zone'*** to allow safe sea margins between vessels, which within a ***TSS*** are for traffic proceeding in opposite directions. Where the available sea-room is less, a ***'separation line'*** may instead be used.

This Rule requires that any vessel ***'shall not normally enter a separation zone or cross a separation line'*** but allows vessels carrying out the following two activities an exception from this ***'normally'*** applicable requirement, that is to:

(1) ***'A crossing vessel'***, means a vessel crossing a ***TSS*** as authorised by paragraph 'c' of this Rule, explained earlier. And,

(2) ***'A vessel joining or leaving a lane'***. This means the traffic lane of a ***TSS*** and the act is authorised by subparagraph 'b-iii' of this Rule, as explained earlier.

In addition to the above two conditions, vessels are further exempted from the restrictions imposed by this Rule in the following two situations stated as:

(i) ***'in cases of emergency to avoid immediate danger';*** And,
(ii) ***'to engage in fishing within a separation zone'.***

The right to deviate in an emergency is similar to subparagraph 'd-ii' of this Rule, ***'to avoid immediate danger'***.

A ***'vessel engaged in fishing'***, allowed to use an ***'inshore traffic zone'*** by subparagraph 'd-i' of this Rule, is granted further freedom to enter ***'separation zones'*** to engage in fishing by this Rule. Like any other vessel, a ***'vessel engaged in fishing'*** should also follow all the requirements of ***'crossing'***,

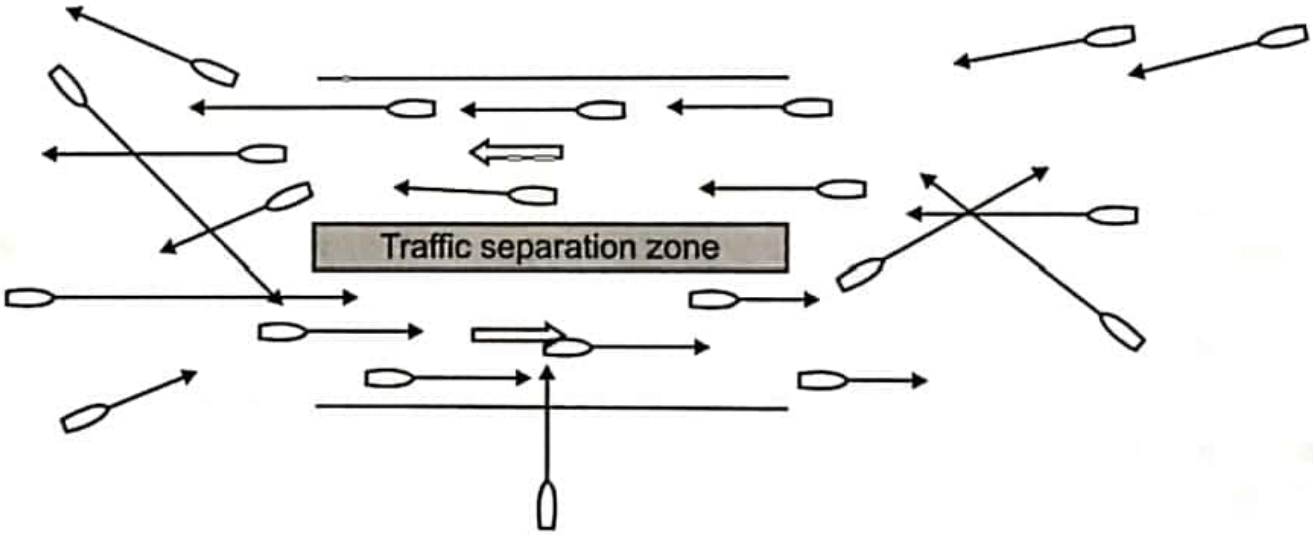
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'joining or leaving' or ***'proceed'*** in a ***'traffic lane'*** as described earlier. However, within a ***'separation zone'*** they are free to move in any direction, but ***'ordinary practice of seamen'*** would dictate that they should not proceed against the ***'general direction of traffic flow'*** when at the boundary of any ***'separation zone'***; this will also ensure that their nets remain clear of the adjacent traffic lanes. The latter requirement is stated later in paragraph 'i' of this Rule.

f: '*A vessel navigating in areas near the terminations of traffic separation schemes shall do so with particular caution*'.

The reasons for the establishment of ***TSS*** have been described in the beginning. As all vessels are proceeding ***'in the general direction of traffic flow for that lane'***, the relative rate of approach between them is slow allowing more time for the navigators to assess the situations and take ***'action to avoid collision'***, if so required. It is an accepted fact that ***TSS*** have been proved very successful in achieving their objectives, and this is reflected in their growing numbers. Though they have reduced the probability of ***'risk of collision'*** within them, rather unfortunately, the probability of collisions outside their immediate end limits continues to remain relatively high.

The diagram below is to depict typical flow of traffic inside and outside a ***TSS***; it is quite clear that complex situations may exist outside their extreme end limits.



Large numbers of vessels with multi directional movements, converging and diverging traffic all originating from or heading for their desired ***'traffic lane'*** leads to complex movement patterns, both in direction and in speed. Navigators should exercise extreme caution when navigating their vessels near the outer extremities of any ***TSS***. Statistics continue to show that vessels are more vulnerable to collisions in these areas than within a ***TSS***. Even though normal Rules ***'for preventing collisions'*** apply both outside and inside a ***TSS***, in approaches to and near the outer ends of a ***TSS*** complex movement patterns and rapidly changing situations can make things difficult.

Locations where several ***TSS*** meet and complex traffic patterns are expected are usually designated as ***'precautionary areas'***, especially near some port approaches and busy intersections. ***'Precautionary area'*** is defined as ***'a routeing measure comprising an area within defined limits where ships must navigate with particular caution and within which the direction of traffic flow may be recommended'***.

This Rule simply makes it clear that navigators should navigate their vessels with utmost caution near

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the ends of any ***TSS***, even where a ***'precautionary area'*** may have been established. The emphasis on ***'shall'*** in this Rule is important.

The following recent collisions highlight the risks associated in areas outside the ends of any ***TSS*** and even in a controlled ***'precautionary area'***.

1: On 8th December 2007, the VLCC 'Samco Europe' and the container vessel 'MSC Prestige' collided at 0247 hours local time in light traffic conditions and ample sea room. The VLCC was heading for the inbound traffic lane, while the container vessel had passed well clear of the outer limit of the 'Bab El Mandeb' ***TSS*** on the South Eastern end of the Red Sea. The detailed report may be viewed at ***http://www.emsa.europa.eu/end185d007d003d002d004d002.html.*** However; the gist from this report is given below.

*The French flag VLCC 'SAMCO EUROPE' fully loaded with crude oil and Panama flag container ship 'MSC PRESTIGE' collided 16 NM East South East of the 'Bab el Mandeb' **TSS** in good visibility and calm weather conditions.*

SAMCO EUROPE was steering a course of 300° towards Ain Sukhna (Red sea) at 16.3 knots and MSC PRESTIGE was steering 101° bound for Port-Louis (Mauritius) at a speed of 24 kts. SAMCO EUROPE had MSC PRESTIGE on her port bow, they were 7 miles apart when MSC PRESTIGE started to alter her course slowly to her starboard. SAMCO EUROPE then started to alter her course slowly to her port. Despite VHF contacts, the two OOW's failed to coordinate their actions. A few seconds before the collision, the Captain of SAMCO EUROPE, alerted too late by the OOW, tried a "hard to port manoeuvre". The starboard bow of SAMCO EUROPE collided with the stem of MSC PRESTIGE; thereafter the vessels swung and their stern area also made contact, a 2nd collision.

No one was injured and no pollution took place. Though both vessels sustained severe damages they remained afloat and later proceeded under their own power, the forward bulbous bow area of MSC Prestige later broke away from the hull and sank.

Some of the main recommendations made by EMSA in their report are:

- *OOWs should have a good knowledge of the COLREG rules and their appropriate application.*
- *OOWs are sufficiently qualified for the use of electronic aids (ARPA and AIS) through regular sessions on bridge simulators.*
- *The promotion by IMO of development of sophisticated "e-Navigation" equipment must be accompanied by appropriate and frequently updated training.*
- *Masters to ensure that in case of difficulty, officers on watch, particularly the less experienced, will not hesitate to call them on time, thus enforcing their standing orders unwaveringly.*
- *EMSA has reservations about the systematic use of VHF. That is in some particular situation VHF may be of no effective assistance, especially when an officer of the watch tends to exert influence on the officer of the watch of the other vessel. COLREG rules are sufficient to be enforced **"in silence"**.*

***NOTE:** Other reports about this accident reveal that the OOW of MSC Prestige had probably not noticed the other vessel till just before action to avoid collision was initiated by him when the vessels were about 7 miles*

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away. Verbal communication by VHF of discussing and related arguments on action to avoid collision is believed to have caused severe misunderstandings between the OOW's. The OOW on MSC PRESTIGE never called the Master, while the OOW of SAMCO EUROPE called him just moments before the collision.

The case of the collision between 'Samco Europe' and 'MSC Prestige' referred to earlier was decided on 23rd June 2011 at the Royal Courts of Justice, London. Mr. Justice Teare in his judgment has ruled stating: ***'I have therefore concluded that MSC PRESTIGE should bear 60% responsibility for the collision and that SAMCO EUROPE should bear 40% responsibility for the collision'.***

[TASK: YOU ARE REQUESTED TO READ THE FULL JUDGMENT ON THE WEBLINKS AND LEARN FROM THE MANY FAILURES ATTRIBUTED TO THE COLLISION.

http://www.bailii.org/ew/cases/EWHC/Admlty/2011/1580.html
and
http://www.bailii.org/ew/cases/EWHC/Admlty/2011/1656.html]

[TASK: BASIS THE ABOVE INFORMATION ANALYSE THE ABOVE ACCIDENT WITH RESPECT TO THE REQUIREMENTS OF AND LEVEL OF COMPLIANCE WITH RULE 8.]

2: On 29th August 2009, the Panama flag container vessel 'MSC NIKITA' and the Isle of Man flag general cargo vessel 'NIRINT PRIDE' collided at the intersection point of the outward shipping lane and the shipping lane for the Southbound traffic outside Rotterdam, also called the 'roundabout', in good weather conditions.

The 32629 GT 'MSC NIKITA' was on a voyage Skaw to Antwerp and the 8861 GT 'NIRINT PRIDE' had sailed out of Rotterdam bound for Bilbao (Spain), just before collision she had cleared the Hook of Holland.

As a result of the collision 'MSC NIKITA' suffered a large hole to her starboard side in way of the engine room which got flooded along with holds 5, 6 and 7. Her crew abandoned ship fearing she would sink but fortunately she did not. She was later towed into Europoort, her cargo of containers unloaded and thereafter declared a constructive total loss. The bow of 'Nirint Pride' was totally damaged, where a fire also broke out. After her crew extinguished the fire, she returned to Rotterdam on her own power.

Investigation reports about the above accident are still not available but the pictures given later are self explanatory. It is a matter of dramatic irony that in both the cases quoted, one of the vessels has the prefix MSC to her name; it is sheer coincidence since both vessels belong to different owners.

g: This Rule uses language very similar to Rule 9(d) and advises ***'avoid anchoring in traffic separation scheme or in areas near its terminations'.*** Avoid is not a very strong word, but ***'shall'*** has been used to emphasise the requirement. However, immediately thereafter, an escape clause has also been added - ***'so far as practicable'***, allowing a vessel to anchor in these areas, perhaps in compelling and pressing circumstances which can justify the act.

However, there have been cases where vessels, because of machinery problems or otherwise, have anchored in a ***TSS***, but coastal authorities have ordered them to or had them towed away to safer locations to ensure safety of navigation of other traffic; as such, the escape clause does not necessarily allow an absolute right to deviate from the basic directive of this Rule.

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If a vessel anchors in a ***'traffic lane'***, she will not only cause confusion for other vessels but she may also obstruct their path leading to chaos and increased ***'risk of collision'***, not just with her but amongst other vessels too. An anchored vessel will swing depending on the combined effect of wind and current and her heading directions will only add to the confusion.

A vessel anchored within a ***TSS***, or even a vessel stopped but underway in a ***TSS***, is hazardous and a source of potential danger to other traffic with added risks at night and in ***'restricted visibility'***.

h: As explained above, vessels are not necessarily obliged to use a ***TSS***, as clearly stated in this Rule ***'a vessel not using a traffic separation scheme shall avoid it by as wide a margin as is practicable'***.

The safe and smooth movement of vessels within a ***TSS*** is dependent on minimum external disturbance. A vessel not using a ***TSS*** should stay as far away from it as is reasonably practicable so as not to cause any disturbance to the vessels using the ***TSS***. This will especially apply ***'in areas near the termination of traffic separation schemes'*** as explained with paragraph 'f' of this Rule. The intent of this Rule is that vessels not using a ***TSS*** stay as far away as possible to enhance the safety of all vessels, whether or not using the ***TSS***.

i: Applies to any ***'vessel engaged in fishing'*** and obviously implies that she is within or so near a ***TSS*** that her movement may ***'impede the passage of any vessel following a traffic lane'***. The Rule also implies that a vessel may engage in fishing within a ***TSS***, be it a ***'traffic lane'*** or a ***'separation zone'***, for the latter subparagraph 'e-ii' of this Rule clarifies that fishing is allowed in ***'a separation zone'***.

A ***'vessel engaged in fishing'*** will be considered to be using a ***TSS*** and as such must comply with all the requirements of this Rule, especially of subparagraphs 'i' and 'ii' of paragraph 'b' because no Rule grants them any exemptions from compliance with the requirements of this Rule 10.

As per this paragraph, ***'a vessel engaged in fishing shall not impede the passage of any vessel following a traffic lane'***. In other words, all vessels following a ***'traffic lane'*** should expect ***'a vessel engaged in fishing'*** to keep clear and the requirements of Rule 8(f), explained earlier, shall apply.

However, ***'a vessel engaged in fishing'*** outside the outer limits of a ***TSS*** should also take precautions to ensure that their nets or other fishing gear being towed astern of them ***'shall not impede the passage of any vessel following a traffic lane'*** in keeping with the directive of this Rule, because nets and lines are considered a part of the vessel.

The requirements of this Rule are similar to Rule 9(c) on ***'Narrow Channels'***, this Rule uses the term ***'following a traffic lane'*** whereas Rule 9(c) states ***'navigating within a narrow channel or fairway'***. Though both terms appear to mean the same for practical purposes, they can be interpreted differently. A vessel ***'navigating'*** could be heading or moving in any direction whereas ***'any vessel following a traffic lane'*** would mean one actually using the same and subject to the requirements stated in paragraph 'b' of this Rule, especially subparagraph 'b-i'.

'A vessel engaged in fishing' thus would not be obliged to keep clear of vessels not ***'following a traffic lane'*** for example vessels ***'crossing traffic lanes'***. In such cases if ***'risk of collision'*** does develop, the Rules ***'for preventing collisions'*** shall apply as they normally would. For example, if vessels are ***'in sight of one another'***, ***'a power-driven vessel underway shall keep out of the way of a vessel engaged in fishing'*** as required by Rule 18 (a-iii).

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j: States that ***'a vessel of less than 20 m in length or a sailing vessel shall not impede the safe passage of a power-driven vessel following a traffic lane'***. The former could be any vessel less than 20 m in length, including a ***'power-driven vessel'***. The latter covers all sailing vessels irrespective of size. The requirements of Rule 8(f) remain applicable due to the use of the term ***'shall not impede'***.

Do note the contrast of this Rule with respect to Rule 9(b) applicable in ***'Narrow Channels'*** where such vessels are required not to impede the passage of any vessel but by this Rule ***'shall not impede the safe passage of a power-driven vessel'*** only.

Since this Rule requires ***'vessel of less than 20 m in length or a sailing vessel'*** to ***'not impede the safe passage of a power-driven vessel following a traffic lane'***, it implies that this requirement is not applicable to any other type of vessels even if they are ***'following a traffic lane'*** or a ***'power-driven vessel'*** which may not be ***'following a traffic lane'***, for example if she is ***'crossing'*** - ***'a traffic lane'***. ***'Crossing'*** is authorised by paragraph 'c' of this Rule. Should ***'risk of collision'*** develop in such cases, then the Rules ***'for preventing collisions'*** shall be applied as they normally would if there was no ***TSS***.

It may be worth noting that these Rules very often distinguish between the size and types of vessels, not just here but at many other places also. The above paragraph 'j' of this Rule and also Rule 9(b) separate ***'vessel of less than 20 metres in length or a sailing vessel'*** from larger vessels and requires them to keep clear. But Rule 10(d), on the contrary, allows use of any ***'inshore traffic zone'*** to similar small vessels and any ***'vessel engaged in fishing'***.

'k' and 'l': All vessels in a ***TSS*** are expected to comply with all the requirements of this Rule 10, that includes either ***'proceed in the appropriate traffic lane in the general direction of traffic flow for that lane'*** or ***'cross'*** at right angles as explained earlier. These two paragraphs grant exception from strictly complying with the requirements of this Rule ***'to the extent necessary to carry out the operation'*** to ***'a vessel restricted in her ability to manoeuvre'***, when carrying out the activities defined. The deviation allowed is for circumstances when strictly complying with the requirements of this Rule 10 would either not allow the vessel to carry out the designated tasks at all or without experiencing great difficulty. As per Rule 3(g), such a vessel will continue to be ***'restricted in her ability to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel'*** even in a ***TSS***.

The exemptions granted are for two activities ***'when engaged in an operation for the maintenance of safety of navigation'*** as per paragraph 'k' and may include vessels servicing buoys or other navigational marks or engaged in hydrographical surveying etc. Additionally, as per paragraph 'l', ***'when engaged in an operation for the laying, servicing or picking up of a submarine cable'***.

Any such vessel should indicate her special status by displaying the ***'lights and shapes'*** prescribed in Rule 27(b). Such operations would normally be announced through notices to mariners or navigational warnings. ***'Ships' Routeing'*** published by IMO requires that such operations shall, as far as possible, be avoided in conditions of restricted visibility.

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FOLLOWING FROM THE BACK COVER OF 'SHIPS' ROUTEING' 2010 EDITION

Both the safety of shipping and the cleanliness of oceans are promoted in many ways, one of which is the continuing development of routeing measures to control the navigation of vessels and to monitor their progress. The measures that are described or defined in parts A and H of this publication are individually described in parts B (traffic separation schemes), C (deep-water routes), D (areas to be avoided), E (other routeing measures, such as recommended tracks, two-way routes and recommended directions of traffic flow), F (the rules and recommendations on navigation that are associated with particular traffic areas and straits), G (mandatory Ship reporting systems, mandatory routeing systems and mandatory areas) and H (archipelagic sea lanes).

This edition incorporates routeing measures that have been adopted through May 2010.

RESTRICTION ON USE OF AUTO PILOT BY OIL TANKERS WHEN TRANSITING THROUGH TSS OR SAFETY FAIR WAYS IN US WATERS.

Title 33: Navigation and Navigable Waters CHAPTER I: COAST GUARD, DEPARTMENT OF HOMELAND SECURITY SUBCHAPTER P: PORTS AND WATERWAYS SAFETY PART 164: NAVIGATION SAFETY REGULATIONS 164.13 - **NAVIGATION UNDERWAY: TANKERS.**

(a) As used in this section, 'tanker' means a self-propelled tank vessel, including integrated tug barge combinations, constructed or adapted primarily to carry oil or hazardous material in bulk in the cargo spaces and inspected and certificated as a tanker.

(d) Except as specified in paragraph (e) of this section, a tanker may operate with an auto pilot engaged only if all of the following conditions exist:

(1) The operation and performance of the automatic pilot conforms with the standards recommended by the International Maritime Organization in IMO Resolution A.342(IX).

(2) A qualified helmsman is present at the helm and prepared at all times to assume manual control.

(3) The tanker is not operating in any of the following areas:

(i) The areas of the traffic separation schemes specified in subchapter P of this chapter.

(ii) The portions of a shipping safety fairway specified in part 166 of this chapter.

(iii) An anchorage ground specified in part 110 of this chapter.

(iv) An area within one-half nautical mile of any U.S. shore.

(e) A tanker equipped with an integrated navigation system, and complying with paragraph

(d) (2) of this section, may use the system with the auto pilot engaged while in the areas described in paragraphs

(d) (3) (i) and (ii) of this section. The master shall provide, upon request, documentation showing that the integrated navigation system?

(1) Can maintain a predetermined trackline with a cross track error of less than 10 meters 95 percent of the time;

(2) Provides continuous position data accurate to within 20 meters 95 percent of the time; and

(3) Has an immediate override control.

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'Ships' Routeing' also contains details of deep water routes established in certain places. The same may or may not form part of a ***'traffic lane'***, and sometimes their mandatory use may apply to vessels which need not have a deep draught; please see the incident stated below. The requirements of this Rule 10 would apply to a deep water route only if it is within or part of a ***TSS***.

Deep water routes which do not form part of a ***TSS*** may be for use by one-way or two-way traffic, as indicated by arrows. It would be prudent for a vessel using a deep water route for two-way traffic to keep to the starboard side of the recommended route.

I was master on a 31'500 GT loaded oil tanker on a voyage from Finland to Rotterdam in June 2009 which was to anchor outside Europort before berthing. The Voyage plan for the approaches was to pass the 'Friesland Junction precautionary area', then through the TSS "West Friesland", then through the TSS "Off Brown Ridge" and thereafter cross over to the East somewhere near position (6) shown in the following diagram and head for the outer anchorage outside Europoort.

The navigational chart showed the TSS with 'DW' marked. The B.A. navigational charts had no reference to any mandatory compliance requirements. Similarly 'Ships' Routeing' Part 'B' had the TSS details but the cross reference to Part G or any other Part was not clear. Reference to the mandatory nature of the DW route was found later in Part 'G' of 'Ships' Routeing', quoted below.

Application and use of the route

The route is mandatory for use by the following classes of ships:

(a) tankers of 10,000 tons gross tonnage and upwards, carrying oil as defined under Annex I to the International Convention for the Prevention of Pollution from Ships, 1973.

(b) chemical tankers of 5000 tons gross tonnage and upwards, carrying noxious liquid substances in bulk.

(c) chemical tankers and NLS tankers of 10,000 tons gross tonnage and upwards, carrying noxious liquid substances in bulk; and

(d) ships of 10,000 tons gross tonnage and upwards, carrying liquefied gases in bulk.

These ships shall avoid the sea area between the mandatory route and the adjacent Frisian Islands' coast, except when joining or leaving the route at the nearest point of the route to the port of departure or destination which permits a safe passage to or from that port.

The classes of ships referred to above shall use the mandatory route or part of it:

The British Admiralty sailing directions for the area, NP 55, on page 68 clearly states the mandatory use of the DW route by the above class of vessels but implies that it is only till the Southern end of the 'Brown Ridge TSS' or where the 'Frisian Islands' limits end on the Southern side.

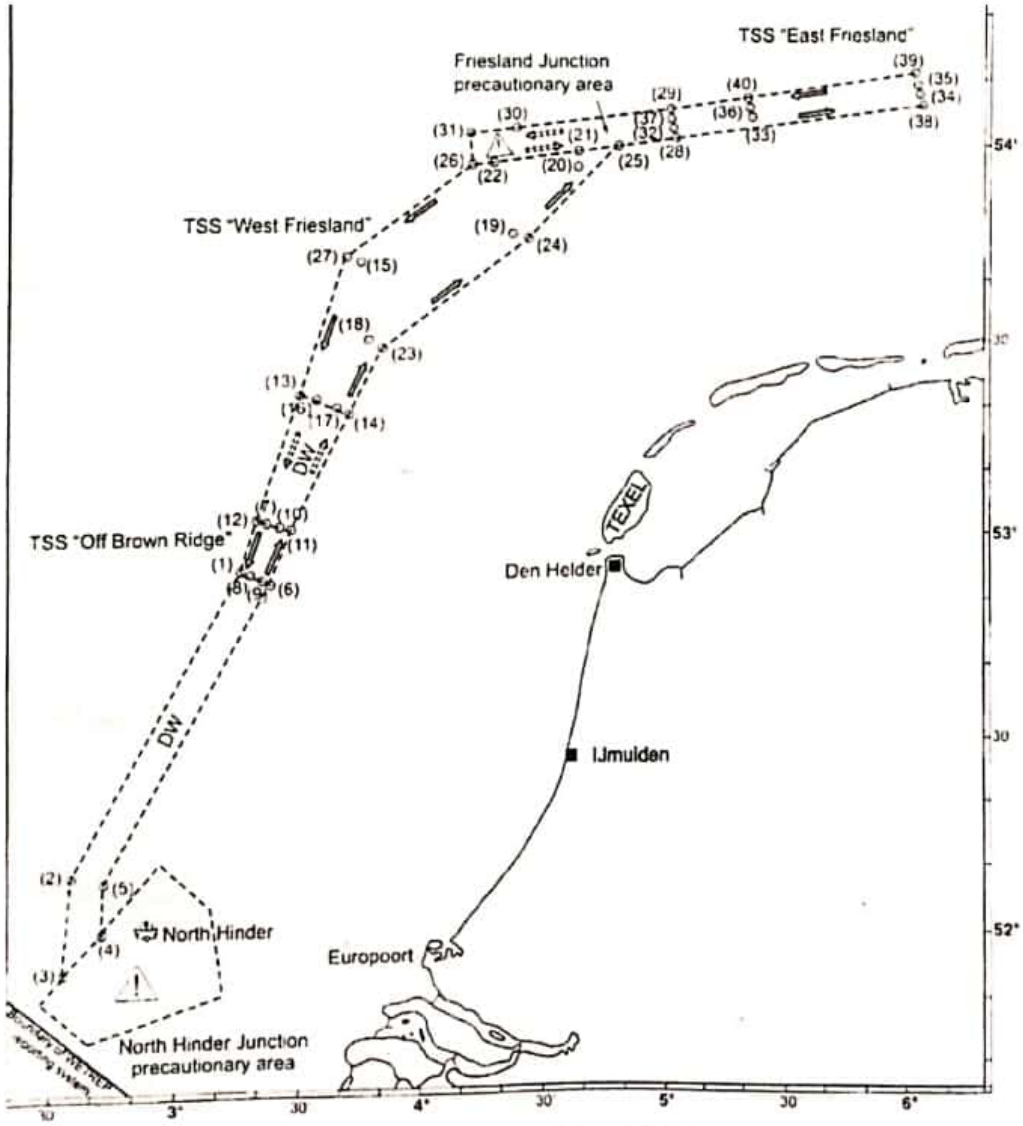
During the voyage about half an hour after clearing the TSS "Off Brown Ridge" and having passed the position shown as (6) in the following diagram, the vessel was called by the Netherlands Coast Guard on VHF to verify the voyage. They expressed concern on the draught since the vessel was not following the DW route. It was explained that the maximum draught was 11.6 metres and there was more than 22 metres water enroute. The Coast Guard official was queried if the vessel should follow the DW route to which he replied in the negative saying that it was the discretion of the master. The vessel was anyway turned back and followed the DW route, altering towards the anchorage when

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closest from it and anchored outside Europoort 2 hours behind her original schedule.

Much to everyone's surprise, the Dutch Water police boarded the vessel after berthing and served a notice from the Netherlands Coast Guard stating that the vessel had contravened the 'Routeing measures for tankers from North Hinder to the German Bight and vice versa' and that the Public Prosecutor in Amsterdam had proposed an out of court settlement for an amount (fine) of € 5'500; further prosecution would be stopped on payment. The notice referred to the British Admiralty sailing directions, the Dutch Pilot and Netherlands chart 1970, the chart being a guide for passage planning for the North Sea. The vessel did not have the Dutch publications on board.

In view of the comments made by the Coast Guard official saying 'discretion' on VHF and the way the information had been interpreted on board, mainly that the 'DW' route was mandatory only till the Southern end of the 'Frisian Islands' which coincides with the Southern end of 'Brown Ridge TSS', the fine was not immediately paid, the notice was disputed and put up for a review by the competent court. On 1st October 2012, the maritime police of The Netherlands informed that the judge had rejected the review petition and order the fine be paid or I go to prison for 62 days, the fine was paid.



Mandatory route for tankers from North Hinder to the German bight as shown in Part G of Ships Routeing (2008 edition)

The above clearly shows that information may not always necessarily be readily available, may not be indicated on the navigational charts and that its wordings could easily be subject to differing interpretations.

Apart from the above, of late, there have been collisions reported between vessels within a ***TSS*** since they were maintaining their position on the charted course and the one overtaking did not deviate away from it, most vessels are likely to have the same plotted course.

[TASK: Read paragraph 16.2 and 17.3 from STCW Code Section A-VIII/2]

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HISTORY OF SHIPS' ROUTEING AND TRAFFIC SEPARATION SCHEMES:

Sometime in 1898 passenger vessels operating in the North Atlantic started using predetermined routes to prevent groundings and collisions. The 1960 SOLAS Convention referred to these voluntary ships' routeing measures in busy areas of the North Atlantic and member states assumed the responsibility to encourage ships flying their flags to follow these recommended routes, as far as circumstances permitted. During this time, statistics of maritime collisions showed an increasing trend especially in congested waterways, a matter of grave concern to all connected with maritime transportation.

In 1963, the Liverpool Underwriters Association reported 21 collisions with total losses of ships in congested traffic areas in 1 year as compared with the previous 5 year average of 13.8. A report on tanker hazards presented to the United States Treasury in late 1963 stated that most accidents were due to human error, with high speed in congested waters a principal cause. The report further concluded that too many diverse rules being observed by vessels of different flags, restricted width of navigable channels, increased size and number of ships coupled with poor use of modern communications were the other main contributory factors for these increasing numbers of collisions. (Underlined points remain true even now.)

In 1966 the institutes of Navigation of the Federal Republic of Germany, France and the United Kingdom released a report of a study on improving navigational safety in congested areas, such as the English Channel. The report proposed that ships should follow a system of one-way lanes like on the roads on land which had also been adopted for use by marine traffic in the Great Lakes of North America. The report recommended traffic separation schemes in a number of areas. As recommended by this report, the world's first traffic separation scheme was established in the Dover Straits in June 1967 on an experimental basis and a significant fall was seen in the number of collisions between ships on opposing courses. However, compliance with this scheme, at this time, was voluntary.

While experiments and deliberations continued with this one voluntary scheme in operation, like all other safety related developments usually always an aftermath of accidents, the development of ships' routeing measures as a mandatory requirement has been no different. The authorities reacted only after a series of serious accidents during 1971 in the English Channel which led to calls for immediate and drastic actions to make such schemes compulsory.

On 11th January 1971, a severe collision took place in thick fog off the Varne Shoals between the Peruvian cargo vessel 'Paracas' and the Panamanian tanker 'Texaco Caribbean' in ballast. The former ignored the voluntary TSS of Dover Straits and took a shorter route close to the English coast. The 'Texaco Caribbean' exploded and split in two. The aft section kept floating for some time before sinking while the forward remained submerged just below the sea surface. ***8 lives were lost*** *in the accident, though 22 crew were rescued, 600 mt of bunker oil and dirty ballast was also spilled in the sea. 'Paracas' survived the collision but was seriously damaged; she was towed to Hamburg by the salvage tug 'Heros'. The explosion was so strong that it shattered several windows in Folkestone and it was also heard by many ashore.*

3 vertical green lights were quickly placed around the wreck of 'Texaco Caribbean' by UK authorities to warn other vessels. However, on 12th January 1971 the West German freighter 'Brandenburg' hit the wreck of 'Texaco Caribbean' and sank shortly 2 miles away. Only 11 out of 32 crew members could be rescued by local fishing boats, ***21 lives were lost****, of these only 7 bodies were recovered.*

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*A light ship and 5 light buoys were further added to the 3 vertical green lights to warn other vessels. However, on 27th February 1971 the Greek vessel 'Nikki' having missed the warnings collided with the submerged wrecks. The Norwegian tanker 'Hebris' responded to the distress calls of 'Nikki' but arrived only to see her sink with her entire crew of **22 people** who **perished** with their ill fated vessel.*

The 3 wrecks close to each other were a serious hazard for passing ships. A second lightship and about 10 more buoys were added to the existing set to warn passing traffic of the hazards. In the next 2 months 16 vessels were observed to have just missed the wrecks having ignored the lightships and buoys placed for warning, fortunately none struck them. A Southampton based company took 18 months to remove the three wrecks.

To see a picture of 'Texaco Caribbean' after the collision please see:

http://www.kenthistoryforum.co.uk/index.php?PHPSESSID=728a21035dc77fe31431dc686f0a19f9&topic=4867.msg54531#msg54531

[TASK: IS THERE ANY SIMILARITY IN THE ABOVE CASE AND THAT OF THE WRECK OF TRICOLOR, THE LATTER HAS BEEN EXPLAINED WITH RULE 6.]

In this multiple collision **51 people died**, three vessels were totally lost and one badly damaged. This and other maritime disasters around the UK coast further triggered action on safe management of maritime traffic. The UK Department of Trade, which was responsible, at that time, for maritime affairs, then said that a voluntary TSS without radar surveillance was inadequate for the dense and complex traffic situations in the Dover Strait and worked on getting the scheme adopted as a compulsory measure.

As a result of the above efforts, IMO's (then called IMCO) Maritime Safety Committee meeting in March 1971 recommended that observance of all traffic separation schemes be made mandatory and this was adopted by the IMO Assembly later the same year. The Dover Straits scheme therefore became the first mandatory traffic scheme, from 1971, and the first with shore based radar coverage too.

The Conference which adopted the International Regulations for preventing Collisions at Sea in 1972 also made observance of traffic separation schemes mandatory, Rule 10 was a new addition to the Regulations on the conduct of vessels following a TSS, its application has already been explained.

IMO's work is governed by the United Nations Convention on Law of The Sea (UNCLOS), which designates IMO as "the competent international organization" in matters of navigational safety, safety of shipping traffic and marine environmental protection. Chapter V of the present SOLAS states that IMO is the only international body responsible for establishing ships' routeing's. Initiating proposals for establishing a ships' routeing system in an area is the responsibility of the Government or Governments concerned for the area in question, but they have to refer all proposals to IMO for further processing and final adoption.

Traffic separation schemes and other ship routeing systems have now been established in most of the major congested; shipping areas of the world, and the number of collisions and groundings has often been dramatically reduced. For example, statistics from Malacca Straits show that prior to December 1998, before full TSS was established, there were 8 collisions in a short duration of 2 months, as shown on the following page. After the scheme had been in operation for a while, only 6 collisions were recorded in the next 3 years.

You may visit http://www.imo.org/safety/mainframe.asp?topic_id=770 to further see what IMO says about TSS.

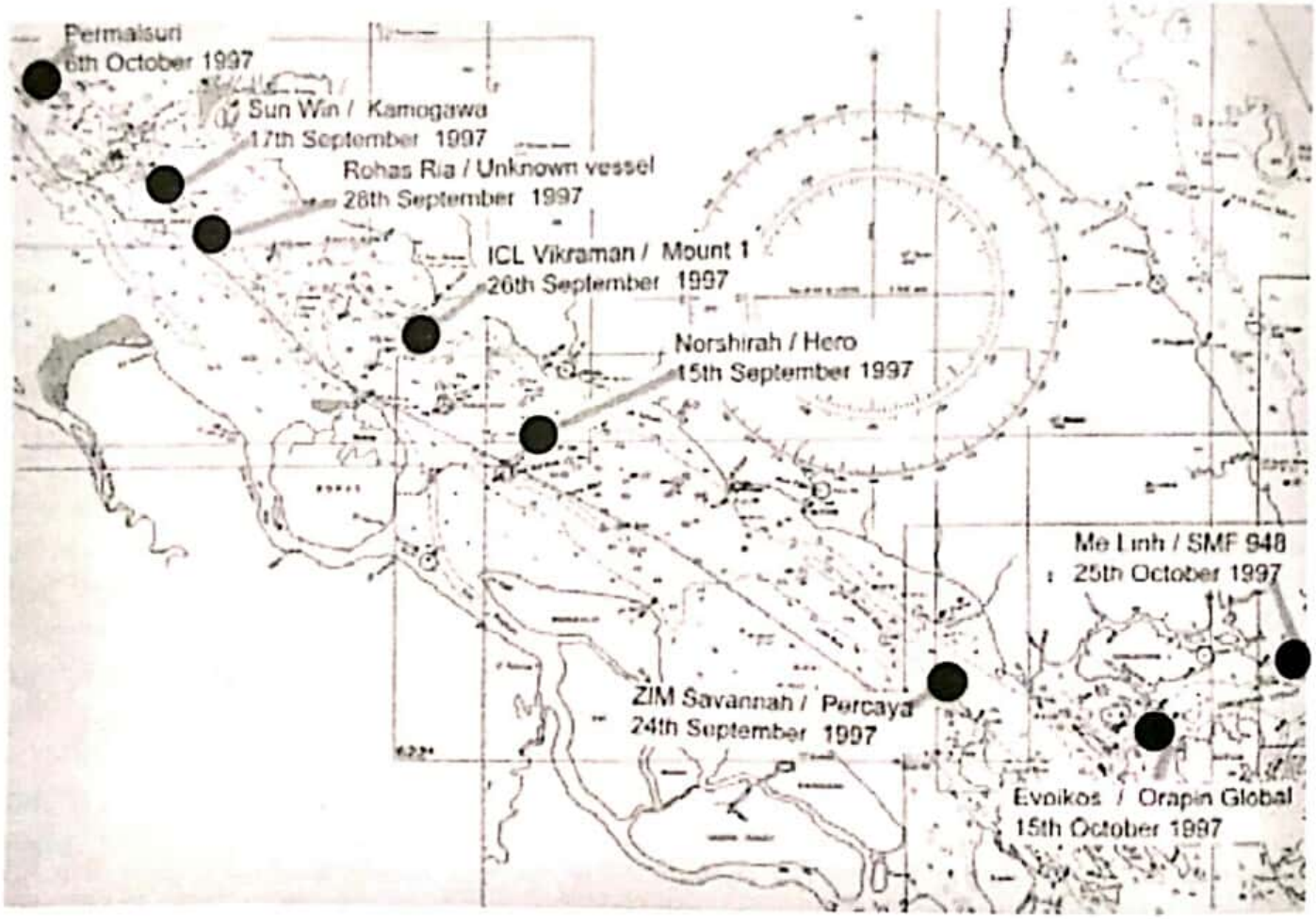
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Further reading is recommended too:

i. *General Provisions on Ships' Routeing adopted by the Organization by resolution A.572(14)), as amended.*

ii. MSC/Circ.1060 Guidance Note on the Preparation of Proposals on Ships' Routeing Systems and Ship Reporting Systems.

The 1971 accidents also prompted a review and revision of the buoyage systems since many vessels failed to recognise the wreck marking buoys placed for warning.



Collisions within 2 months in the Malacca Straits prior to December 1998

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INTRODUCTION: Part B Section II - Conduct of vessels in sight of one another

NOTE : Read this introduction before studying the Rules in this section, repeating studying this introduction after studying the Rules in this section, that is Rules 11 to 18.

The Rules in this section II of part B define various situations and/or conditions when ***'risk of collision'*** may exist between two vessels ***'in sight of one another'***, and ***'action to avoid collision'*** required to be executed by one or both the vessels involved. These are Rules 12, 13, 14, 15 and 18; except for Rules 13 and 18, the other Rules include the term ***'involve risk of collision'***. At other times, it is implied. The phrase ***'risk of collision'*** always and automatically includes any developing ***'close-quarters'*** situation, both these terms are synonymous, as explained with Rule 8(c), and mean the same for practical application.

The Rules in this section are applicable only when the vessels involved are ***'in sight of one another'***. This depends on the range of visibility, which in turn depends on the prevailing weather conditions. Visibility may vary from excellent to rather low levels, but if two vessels having ***'risk of collision'*** or a developing ***'close-quarters situation'*** are ***'in sight of one another'***, they must take ***'action to avoid collision'*** as per the provisions of these Rules, in this section II of Part B, i.e. Rules 11 to 18.

Apart from the duties, responsibilities and expected actions of ***'give-way'*** and ***'stand-on'*** vessels explained later, the Rules in this section also state the ***'responsibilities between vessels'***. At times there is a difference in action required by different vessels in varying situations, for example a ***'power-driven vessel'*** is obliged to keep out of the way of a ***'sailing vessel'*** at all times except when being overtaken by a ***'sailing vessel'***; all these aspects have been explained with the Rules.

Another important element is that the Rules do not venture into dealing with multi vessel situations and quite rightly so, as there can be an infinite number of situations, making it an impossible task to cover them all. In such situations, vessels concerned may need to take ***'action to avoid collision'*** in order of priority and the navigators may need to apply the following clauses from Rule 2 as may be relevant, ***'ordinary practice of seamen'***, ***'special circumstances'*** and/or ***'which may make a departure from these Rules necessary to avoid immediate danger'***.

In the Rules of this section, other than Rule 14 governing a ***'head-on situation'*** where both ***'power-driven vessels'*** are required to take ***'action to avoid collision'*** and each becomes a ***'give-way vessel'***, all other Rules require only ***'one of the two vessels to'*** take ***'action to avoid collision'*** and ***'keep out of the way'***. An exception is when a ***'stand-on vessel'*** is required to act ***'to avoid collision'***, but that is only when it appears that the ***'give-way'*** vessel is not acting as per the requirements of these Rules, and this is not the normal intent of these Rules.

Rules of part B section I (4-10) continue to apply at all times as stated earlier and have to be complied with when following the Rules of this section II (11-18), or for that matter even with Rule 19 in section III.

Rule 13 requirements in overtaking situations over-ride all other Rules of both sections I and II of this Part B. Similarly, Rule 18 on ***'responsibilities between vessels'*** over-rides all Rules of this section (II of part B) except the requirements of Rules 9, 10 and 13.

Nowhere do these Rules mathematically define or give any numerical values to the ranges and/or time frames when a vessel should start to act, or the quantum of action required, though all the describing adjectives used in these Rules have a clear and implied meaning open to reasonable interpretations. The determination of the quantum and type of action required in each case and when

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it should be initiated, whether by a ***'give-way vessel'*** or a ***'stand-on vessel'***, may vary and depend on various factors which may include but not be limited to:

- range,
- speed of the vessels,
- rate and angle of approach,
- size and manoeuvring characteristics of the vessels,
- available sea room - depth and width,
- presence and proximity of other traffic or navigational hazards, and also,
- the prevailing weather conditions.

Elementary ship handling principles need to followed in practice when executing ***'any action to avoid collision'***; some important ones are included in this book in the chapter on basic ship handling. Their application, coupled with common sense and the requirements of these Rules, will have a definite impact on the desired outcome of the actions taken. Numerical limits are neither defined in these Rules nor expected to be, not in the near future.

As explained earlier, ***'risk of collision'*** has a clear meaning - firm prediction of contact confirmed by a steady compass bearing and reducing range between vessels. However, the term ***'close-quarters situation'*** does not have such a clear definition. To repeat, as explained with Rule 8, Lord Justice Willmer in 1961 had remarked on the term ***'close-quarters situation'*** by saying, '*it leaves open to argument what is meant by the phrase*'. The interpretation of this term can vary on a case by case basis, for example the size and manoeuvrability of the vessels concerned and if they are likely to pass too close to each other. Vessels passing each other at very close range may result in sudden dangerous situations developing due to interaction between them, in addition other sudden operational factors like steering or engine failure may also lead to dangerous situations even culminating in a collision. Good navigational practices require that a certain minimum safe passing margin be set by the navigators; this may vary on different types of vessels and, furthermore, in different conditions. While Rule 2 states ***'due regard shall be had to all dangers of navigation and collision'***, Rule 8 only emphasises ***'passing at a safe distance'*** and Rule 16 requires ***'keep well clear'*** - none state any numerical limits. If the passing distance is predicted to be or appears to be anything less than the desired minimum safe range distance, action must be taken and should be in compliance with the general requirements of these Rules. The extreme limits of advance and tactical diameter figures of a vessel's turning circle may be considered as the absolute minimum range limits of a ***'close-quarters situation'***. In practice at sea double these figures to allow for interaction or for even higher margins of safe passing ranges especially if so required by the SMS.

There can be cases where an apparent ***'stand-on vessel'*** cannot or does not hold a steady course, for example in congested areas or where vessels may be rounding buoys, shallow water patches or a corrugated coast etc., and thus constantly changing their courses and at times even their speeds. In such cases, a clear application of some of the Rules from this section II or even section III may be difficult. In a collision that took place in such circumstances when the ***'power-driven vessels'*** concerned were ***'in sight of one another'***, the court observed that in a constantly changing situation determination of the situation itself was difficult and therefore establishing a ***'give-way vessel'*** or a ***'stand-on vessel'*** an impossible task. Just before collision, it appeared to be a ***'crossing situation'*** between the two vessels but as the ***'stand-on vessel'*** had been changing her course constantly, the ***'give-way vessel'*** got confused. The court finally ruled that in these circumstances the application of

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any particular Rule could not be established. Though this ruling is of 1949, its implications will remain valid for all time. In such confusing situations, there seems to be no other recourse than to be guided by the various requirements of the all-empowering Rule 2. Do note that this ruling is not connected with a similar ruling mentioned with Rule 9 (a) regarding a ***'narrow channel'*** in which only the requirements of Rule 9 should apply.

A vessel simply stopped and drifting is considered ***'underway'*** and obliged to comply with these Rules, including keeping clear of other vessels as required by the various Rules except when she is ***'not under command'***, ***'restricted in her ability to manoeuvre'***, ***'engaged in fishing'*** or due to any ***'special circumstances of the case'***. Special circumstances may be many, as explained with Rule 2; for example, a large loaded tanker that is stopped and is physically unable to manoeuvre out of the way of a fast approaching ***'stand-on vessel'***. However, even then she must make all efforts to keep clear as even vessels at anchor, when finding that an approaching vessel is not keeping clear, have been criticised in courts if they made no efforts to attract the attention of the other vessel and took no ***'action to avoid collision'***.

Of all the Rules, the application of the requirements stated in Rule 8 gets activated the moment any ***'action to avoid collision'*** is activated by any vessel in compliance with these Rules ***'in any condition of visibility'***, even if it is a ***'stand-on vessel'*** compelled to ***'take action by her manoeuvre alone'***.

[TASK: REVISE RULE 8 BEFORE PROCEEDING FURTHER.]

'Hebei Spirit', a Hong Kong flagged fully loaded single hull VLCC at anchor off South Korea awaiting berthing, was hit by a Samsung Heavy Industries crane barge 'Samsung No 1' on 7th December 2007 leading to an approximate spill of 10'500 mt crude oil. The crane barge broke off from the tugs towing her in heavy weather, drifted on to the VLCC and collided with her. The Master and the Chief Officer were detained and even jailed in South Korea on charges of negligence in preventing the oil pollution from their vessel. Amongst many charges, it was alleged that they did not take sufficient action to move their vessel away from anchorage to prevent collision and the resulting oil pollution. These Indian officers holding UK certificates of competency were eventually allowed to return to India in June 2009 after protracted legal efforts, even as the legal battle continues in the Korean courts.

A video clip of the accident can be viewed at http://www.youtube.com/watch?v=66J_MazbAfE.

As master on a loaded product/chemical tanker anchored outside Brownsville in December 2009 in passing fog patches, at around 0430 hrs., a small fishing vessel passing close by made contact with my vessel at the forward end, the damage was almost nil. Though she was initially noticed at 0330 and all efforts made by the OOW's to attract her attention; I was not called till she disappeared from the radar screen at 0425 and then it was too late to do anything. One of the actions possible was to let go the full length of the anchor chain and use engines to manoeuvre the vessel away from the approaching fishing boat, but even this required time. Subsequent enquiry by USCG revealed that all the crew members on watch on the fishing boat were fast asleep.

Note: A vessel at anchor can do little to immediately move out of the way of another approaching vessel and in any case is explicitly not required to by these Rules.

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Rule 11

Application

Rules in this section apply to vessels in sight of one another.

Rule 3(k) definition states ***'vessels shall be deemed to be in sight of one another only when one can be observed visually from the other'***. The application of the Rules in this section II of Part B is governed by this definition. It is important to note that by this it is implied that the Rules in this section are not applicable to vessels not in visual ***'sight of one another'***, even in good visibility.

Thus, if two vessels not ***'in sight of one another'*** are navigating in an area of reasonably good visibility and having determined that ***'a close-quarters situation is developing and/or risk of collision exists'*** between them by means of radar, AIS or any other means, they are not necessarily obliged to comply with the Rules of this section till such time that they are actually ***'in sight of one another'*** - this range depends on the prevailing visibility. On the other hand, since the Rules of section I of Part B (Rules 4 to 10) continue to apply at all times, determination of ***'risk of collision'*** as required by Rule 7 using all available means including but not limited to radar, AIS or even VHF continue to apply. It would certainly appear absurd to have determined that a ***'risk of collision'*** exists but not to act just because ***'in sight of"*** is not yet or cannot be established as will go against the ***'made in ample time'*** clause in Rule 8 (a). By applying ***'ordinary practice of seamen'***, it will be natural to conclude that ***'any action to avoid collision'***, if being contemplated in such situations, should be in line with the basic guiding spirit, principles and requirements of these Rules so as not to cause any conflict or embarrassment.

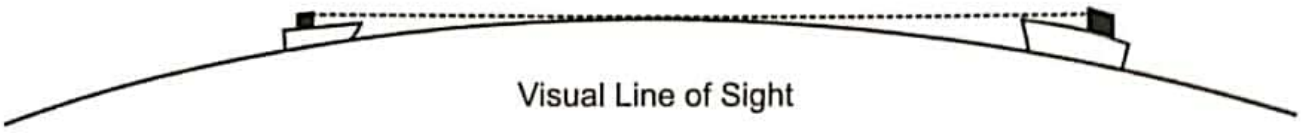
When ***'risk of collision'*** is established by the use of ***'radar alone'*** for ***'vessels not in sight of one another when navigating in or near an area of restricted visibility'***, only the requirements of Rule 19 alone are applicable for ***'any action to avoid collision'***. When Rule 19, (the only Rule in section III of this Part B of the Rules), becomes applicable, then Rules 11 to 18 of this section II are not applicable any more as they apply only to vessels ***'in sight of one another'***. However, Rules 4 to 10 of section I of Part B remain applicable as they ***'apply in any condition of visibility'***.

Even in ***'restricted visibility'*** conditions when Rule 19 alone is applicable, if the vessels concerned reach close enough that they get ***'in sight of one another'***, then Rules of section II, (11 to 18), automatically get activated. The cut off point between the Rules of sections II and III of this Part B is whether the vessels concerned are ***'in sight of one another'*** or not. However, when analysing the above by invoking the meaning of ***'ordinary practice of seamen'*** given in Rule 2 and the requirements of ***'ample time'*** stated in Rules 8 and 19, if reasonably applied in practice, then ***'any action to avoid collision'*** taken in accordance with Rule 19 alone should suffice to ensure that the vessels involved pass at a safe distance and there should normally be no need to take ***'action to avoid collision'*** using Rules of section II, Rules 11 to 18.

Maintaining ***'proper look-out'*** required by Rule 5 coupled with ***'watchkeeping arrangements and principles to be observed'*** from STCW Code A-VIII/2, as explained, are important elements of navigation practices. Not observing these requirements can never be accepted as an excuse for

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failure to sight or detect another vessel. It must be kept in mind that the range of visual sightings may vary for different vessels in the vicinity due to various factors: for example, the intensity and height of their navigational lights, the height of eye of the observers, the range of the visible horizon, the prevailing visibility, presence of fog, mist, smoke or haze patches, the height and colour of the vessels, presence of any background lights and in daylight the position of the sun at that time, etc. Two vessels in the same area may therefore visually sight each other with substantial time lag at times. It is for the navigators to determine and judge the prevailing visibility conditions and accordingly apply the relevant Rules pertaining to the situations encountered.



Visual Line of Sight

Failure to change over to hand steering in good time has frequently been found to be a contributory factor leading to navigational accidents including collisions. The requirements to change over to hand steering are given in chapter V of the SOLAS convention in Regulation 24 quoted below and in the STCW Code A-VIII/2, paragraph 35. The latter has been referred to earlier as a task in the explanations of Rule 5 on ***'look-out'***:

Regulation 24: Use of heading and/or track control systems (SOLAS Chapter V)

1 In areas of high traffic density, in conditions of restricted visibility and in all other hazardous navigational situations where heading and/or track control systems are in use, it shall be possible to establish manual control of the ship's steering immediately.

2 In circumstances as above, the officer in charge of the navigational watch shall have available without delay the services of a qualified helmsperson who shall be ready at all times to take over steering control.

3 The change-over from automatic to manual steering and vice versa shall be made by, or under the supervision of, a responsible officer.

4 The manual steering shall be tested after prolonged use of heading and/or track control systems and before entering areas where navigation demands special caution.

[TASK: COMPARE THE ABOVE WITH THE REQUIREMENTS STATED IN PARAGRAPH 35 OF STCW CODE A-VIII/2 AND ALSO THOSE IN PARAGRAPH 16 OF THE CODE.

QUIZ ? DO THESE REQUIREMENTS APPLY AT ALL TIMES AT SEA OR NOT?]

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Rule 12

Sailing vessels

(a) When two sailing vessels are approaching one another, so as to involve risk of collision, one of them shall keep out of the way of the other as follows:

(i) when each has the wind on a different side, the vessel which has the wind on the port side shall keep out of the way of the other;

(ii) when both have the wind on the same side, the vessel which is to windward shall keep out of the way of the vessel which is to leeward;

(iii) if a vessel with the wind on the port side sees a vessel to windward and cannot determine with certainty whether the other vessel has the wind on the port or on the starboard side, she shall keep out of the way of the other.

(b) For the purpose of this Rule the windward side shall be deemed to be the side opposite to that on which the mainsail is carried or, in the case of a square-rigged vessel, the side opposite to that on which the largest fore-and-aft sail is carried.

This Rule applies to ***'sailing vessels'*** as defined in Rule 3(c) - ***'any vessel under sail provided that propelling machinery, if fitted, is not being used'***. Propelling machinery, if fitted and being used, in conjunction with sails or not, changes the vessel's status to a ***'power-driven vessel'*** as defined in Rule 3(b). Sailing vessels have to keep clear of each other if there is any ***'risk of collision'*** between them as per the various situations listed in this Rule.

The self explanatory diagrams on the following pages show the application of this Rule. ***'Windward side'*** is shown in the last diagram.

However, in case any one of them is ***'overtaking'*** another, or any other vessel, then the requirement ***'any vessel overtaking any other shall keep out of the way of the vessel being overtaken'*** stated in Rule 13 over-rides this Rule 12, explained later with Rule 13. Apart from this, Rule 18 defines the basic ***'responsibilities between vessels'***; Rule 18 (b) states that ***'a sailing vessel underway shall keep out of the way of:***

(i) a vessel not under command;

(ii) a vessel restricted in her ability to manoeuvre;

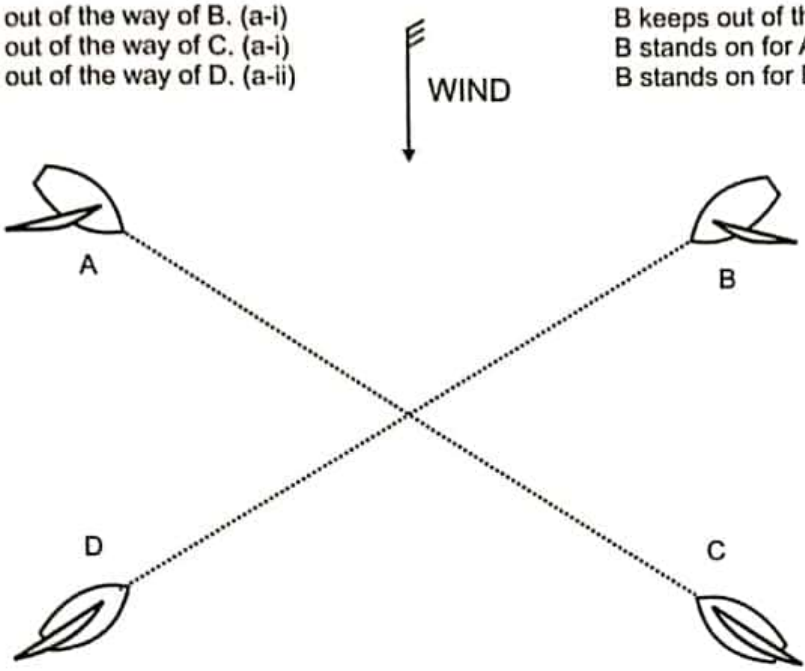
(iii) a vessel engaged in fishing.

The vessels under the categories described above may be of any type, ***'power-driven'*** or ***'sailing'***, but they all have the right of way when encountering a ***'sailing vessel'***.

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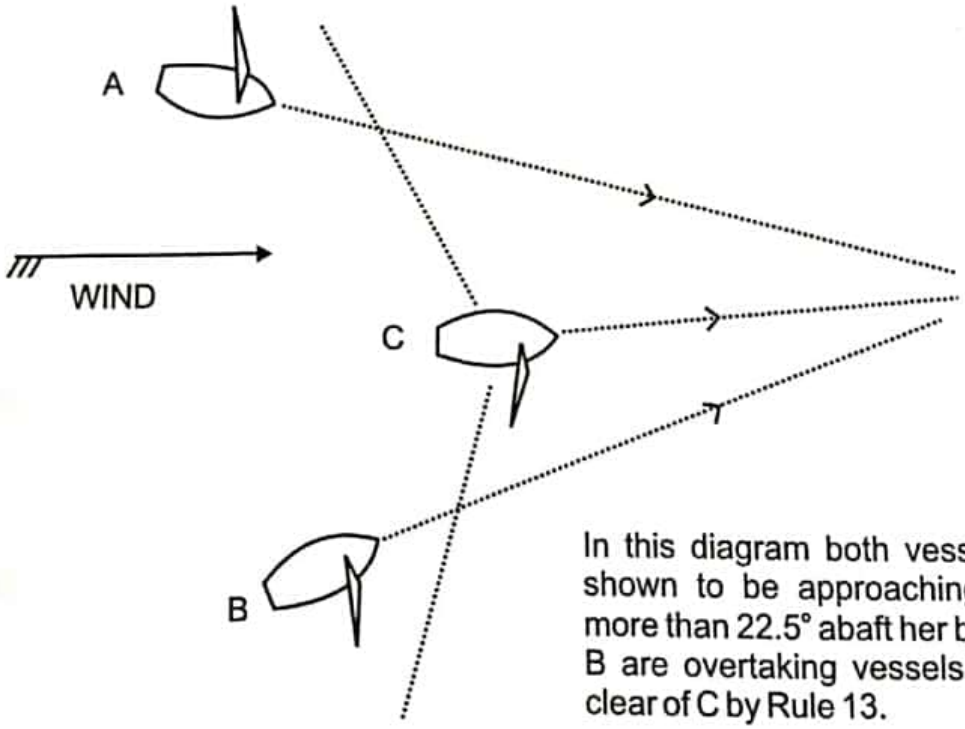
A keeps out of the way of B. (a-i)
A keeps out of the way of C. (a-i)
A keeps out of the way of D. (a-ii)

B keeps out of the way of C. (a-ii)
B stands on for A. (a-i)
B stands on for D. (a-i)



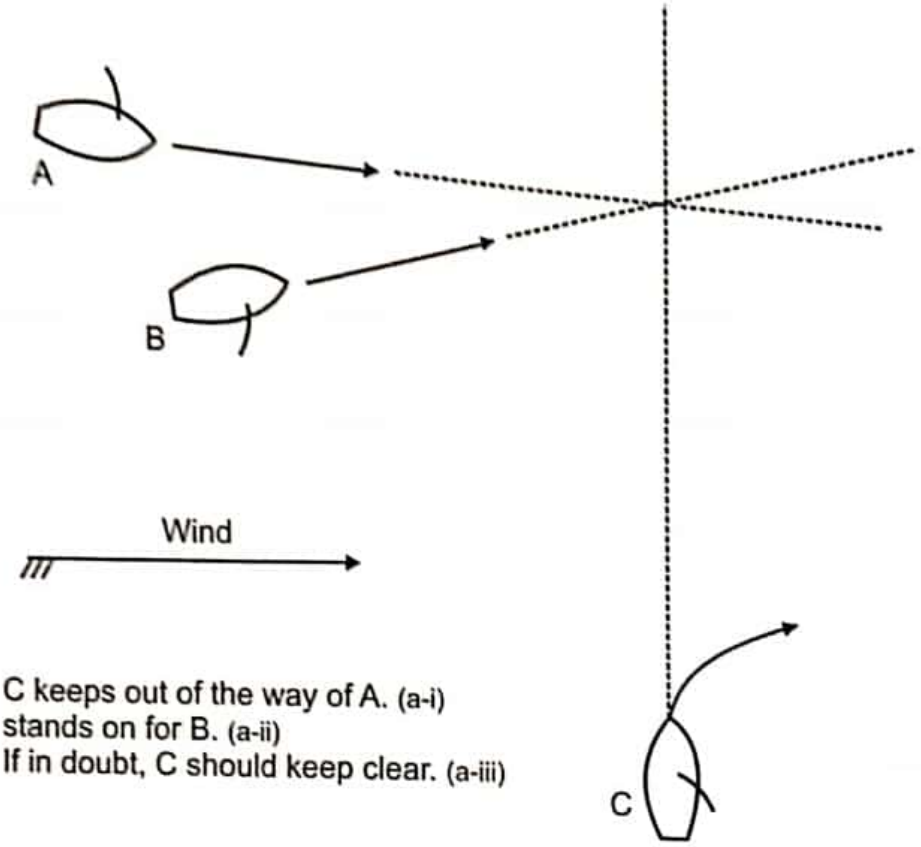
D keeps out of the way of B. (a-i)
D keeps out of the way of C. (a-i)
D stands on for A. (a-ii)

C stands on for A. (a-i)
C stands on for B. (a-ii)
C stands on for D. (a-i)

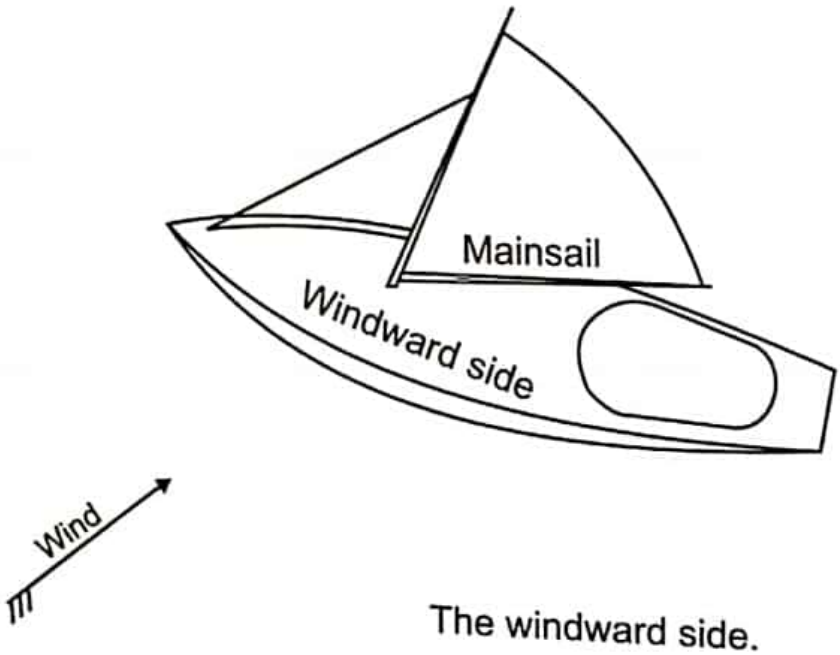


In this diagram both vessels A and B are shown to be approaching vessel C from more than 22.5° abaft her beam. Since A and B are overtaking vessels, they must keep clear of C by Rule 13.

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C keeps out of the way of A. (a-i)
stands on for B. (a-ii)
If in doubt, C should keep clear. (a-iii)



The windward side.

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Rule 13

Overtaking

(a) Notwithstanding anything contained in the Rules of part B, sections I and II, any vessel overtaking any other shall keep out of the way of the vessel being overtaken.

(b) A vessel shall be deemed to be overtaking when coming up with another vessel from a direction more than 22.5° abaft her beam, that is, in such a position with reference to the vessel she is overtaking, that at night she would be able to see only the sternlight of that vessel but neither of her sidelights.

(c) When a vessel is in any doubt as to whether she is overtaking another, she shall assume that this is the case and act accordingly.

(d) Any subsequent alteration of the bearing between the two vessels shall not make the overtaking vessel a crossing vessel within the meaning of these Rules or relieve her of the duty of keeping clear of the overtaken vessel until she is finally past and clear.

a: ***'Notwithstanding anything contained in the Rules of part B, sections I and II'***, means that when vessels are ***'in sight of one another'***, this Rule over-rides all other Rules from 4 to 18. Whether it is open waters, ***'a narrow channel'***, ***'traffic separation scheme'*** or anywhere else, ***'any vessel overtaking any other shall keep out of the way of the vessel being overtaken'***. Rule 9(e)(ii) regarding overtaking in ***'a narrow channel'*** states ***'this Rule does not relieve the overtaking vessel of her obligation under Rule 13'***. Similarly, Rule 10(a) clarifies that in a ***TSS*** all other Rules apply as it states, ***'does not relieve any vessel of her obligation under any other rule'***. The size, type of the vessels involved or the distance between them are of no consequence. This Rule equally applies to sailing vessels also when they are ***'overtaking'*** because of the ***'notwithstanding'*** clause explained above. This Rules applies irrespective if there is any ***'risk of collision'*** between the vessels or not.

The ***'shall not impede'*** aspects, wherever stated in any other Rule and explained with Rule 8(f), are not applicable during ***'overtaking'***.

This Rule does not recommend any specific action to be taken by a ***'vessel overtaking'***. The Rule simply states that she ***'shall keep out of the way'***. It is left for the navigators on board a ***'vessel overtaking'*** to choose and decide the best action keeping in mind ***'ordinary practice of seamanship'***, the various other requirements and recommendations of these Rules, especially of Rule 8 on ***'action to avoid collision'*** and Rule 16 on ***'action by give-way vessel'***.

Like overtaking on a road, the driver of a faster vehicle looking forward has a better view and is in a better position to plan and execute an overtaking manoeuvre. Similarly, from the bridge of most vessels, the front view is usually superior as compared to the other sides. It is also relatively easy for a vessel intending to ***'overtake'*** to ***'keep out of the way'*** by her actions alone since she has a wide variety of actions available to her; ***'alteration of course and/or speed'*** or any combination thereof.

'Alteration of course alone may be the most effective action' is recommended by Rule 8(c) as the first choice for any ***'action to avoid collision'*** provided ***'there is sufficient sea-room'*** and it ***'does***

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not result in another close-quarters situation'. 'Any vessel overtaking' is free to choose the side to overtake from, the best action by the navigators on board should be to choose a side that is clear and where the ***'vessel overtaking'*** moves away from or stays parallel to the ***'vessel being overtaken'*** for the shortest possible time duration. If this is not possible, prudent action would be to reduce speed to wait until it is safe to overtake as recommended by Rule 8(e).

[TASK: REVISE RULE 8(E) REQUIREMENTS WITH RESPECT TO THE ABOVE PARAGRAPH.]

Caution also needs to be exercised for the potentially strong hydrodynamic interactive forces and their dangerous effects when vessels pass at very close range, causing one or both vessels to suddenly swing from their course and at times even collide. Keeping a large passing margin is the best solution; if not possible, for example in a ***'narrow channel'*** or otherwise, bold use of helm and propulsion power can assist counteract interaction effects.

It is obvious that a vessel ***'overtaking'*** will be moving at a relatively faster speed; else there would not be any ***'risk of collision'*** or the need for her to ***'keep out of the way of the vessel being overtaken'***. The relative speed of approach between two vessels in an ***'overtaking'*** situation would usually be substantially less as compared to say a ***'head-on situation'*** and a lot more time available to analyse the situation and to take ***'action to avoid collision'***. On the other hand, the vessels will be together for a longer duration too; hence, a careful watch is required to verify compliance with Rule 8(d), ***'the effectiveness of the action shall be carefully checked until the other vessel is finally past and clear'***.

> Increase of speed is theoretically correct, is amongst the available choices for ***'any action to avoid collision'*** and may be resorted to ***'provided it does not result in another close-quarters situation'***. However, the concepts of ***'safe speed'*** from Rule 6 prescribe or imply a slower speed or a reduction of speed, never an increase. Rule 8(e) states ***'a vessel shall slacken her speed or take all way off'***, Rule 19(e), though not applicable when vessels are ***'in sight of one another'***, states, ***'shall reduce her speed to the minimum at which she can be kept on her course'***. Any action should also be ***'readily apparent to another vessel'***, an increase in speed would not only be contrary to the general principles of these Rules for ***'safe speed'*** but will usually be too slow to implement and not likely to be ***'readily apparent to another vessel'*** as required by Rule 8(b).

b & c: ***'A vessel shall be deemed to be overtaking when coming up with another vessel from a direction more than 22.5° abaft her beam'***. The statement ***'that at night she would be able to see only the sternlight of that vessel but neither of her sidelights'*** is a reference to ***'sternlight'*** both to explain the relative position of a ***'vessel overtaking'*** with respect to ***'the vessel being overtaken'*** and to highlight the navigational lights a ***'vessel overtaking'*** would normally see during darkness on a ***'vessel being overtaken'***. The sternlight sector extends ***'67.5° from right aft on each side of the vessel'*** as stated in Rule 21(c) and this horizontal sector coincides exactly with the clause in this Rule, ***'from a direction more than 22.5° abaft her beam'***.

In several situations, different types of vessels may show just one single white light, which may not be the stern light. If there is a doubt paragraph 'c' of this Rule clarifies; ***'when a vessel is in any doubt as to whether she is overtaking another, she shall assume that this is the case and act***

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accordingly'. If ***'in any doubt'***, this Rule requires navigators to be prudent, assume the situation to be ***'overtaking'*** and keep their vessel ***'out of the way'***. Later, if and when the situation gets clear and doubts are removed, comply with the appropriate Rules as applicable. However, by then, having taken ***'action to avoid collision'*** the ***'risk of collision'*** should normally have disappeared.

'Sternlight means a white light placed as nearly as practicable at the stern'. However, sighting a single white light does not necessarily mean that it is the ***'sternlight'*** of a ***'vessel being overtaken'***; it may be the single ***'masthead light'*** of a ***'power-driven vessel'*** of less than 50 m in length, (but over 20 m), and the ***'sidelights'*** are still not visible because of their lower visibility range. As per Rule 22(b) the minimum visible range of ***'a masthead light'*** varies from 2 to 6 miles, but of ***'sidelights'*** and ***'sternlight'*** is only 1 to 3 miles.

There can be situations when a vessel approaching another ***'from a direction more than 22.5° abaft her beam'*** and can also see any one of her ***'sidelights'*** in addition to her ***'sternlight'***. This is because ***'sidelights'*** do not cut off at exactly 22.5° abaft the beam but may extend up to 5° outside the prescribed sector and as such be visible up to 27.5° abaft the beam, though overlapping with the sternlight and with their intensity diminishing steadily. If this creates ***'any doubt'*** to the vessel approaching ***'whether she is overtaking'*** or not, ***'she shall assume that this is the case and act accordingly'***, in other words take action ***'to keep out of the way of the vessel being overtaken'***.

If a vessel is approaching another from an angle slightly less than 22.5° abaft the beam of the latter, it technically is not a situation covered by this Rule. However, for the vessel approaching there may be a doubt whether she is more than or less than the cut off angle of 22.5° abaft the beam of the other. In all such cases also ***'when a vessel is in any doubt as to whether she is overtaking another, she shall assume that this is the case and act accordingly'***.

The Rules basically require a proactive approach ***'for preventing collisions at sea'*** as can be seen in the above.

[TASK: STUDY ANNEX I PARAGRAPH 9 PRESCRIBING THE REQUIREMENTS OF HORIZONTAL SECTORS OF NAVIGATIONAL LIGHTS.]

d: ***'Any vessel overtaking any other'*** retains the status of a ***'overtaking vessel'*** and is obliged to comply with this Rule ***'of keeping clear of the overtaken vessel until she is finally past and clear'***, the latter is a repeat of the requirement from Rule 8(d).

During the overtaking process, as the ***'overtaking vessel'*** moves relatively forward of the ***'22.5° abaft her beam'*** with respect to the ***'overtaken vessel'***, for example ***'abeam'*** or ***'forward of the beam'***, she shall continue to be an ***'overtaking vessel'*** and not ***'a crossing vessel'*** or be covered by any other situation or condition mentioned in these Rules, because ***'any subsequent alteration of the bearing between the two vessels'*** does not change the original status or the situation.

This is an important element of the Rule to prevent confusion. Unfortunately, there have been some cases where this has not been correctly implemented by an ***'overtaking vessel'***, leading to collision.

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As mentioned, this Rule does not state anything on its applicability, it just states ***'any vessel overtaking any other shall keep out of the way of the vessel being overtaken'***. The Rules by their very title are meant ***'for preventing collisions'***. It has been held in courts that there has to be a '***developing'*** - ***'close-quarters situation'*** or ***'risk of collision'*** before any of these ***'International Regulations for Preventing Collisions at Sea'*** are applicable. This also applies to any ***'overtaking'*** situation when a ***'vessel overtaking'*** - ***'shall keep out of the way of the vessel being overtaken'*** - ***'until she is finally past and clear'***. If these conditions are not applicable, for example, two vessels are on parallel or diverging courses, with one of them being more than 22.5° abaft the beam of the other; then obviously, this Rule would not apply. However, if there is a development of ***'risk of collision'*** and/or ***'close-quarters situation'***, the requirements of this Rule become applicable immediately.

Some court rulings on collisions involving ***'overtaking'*** situations have commented otherwise; that even if the vessels are far apart, the basic principles of this Rule continue to apply since this Rule by itself does not state ***'risk of collision'*** and requires ***'any vessel overtaking any other shall keep out of the way of the vessel being overtaken'***. ***'Overtaking'*** continues even when the ***'vessel overtaking'*** moves out of the sternlight sector and pulls abeam of or even ahead of the ***'vessel being overtaken'***, as explained and is so stated in paragraph d of this Rule.

The requirements in paragraph 'd' are to cover situations like, if a ***'vessel overtaking'*** another from the starboard side of a ***'vessel being overtaken'*** subsequently alters her course to port across the bows of the ***'vessel being overtaken'***. This situation would now appear as ***'crossing situation'***; the vessel which has ***'overtaken'*** and then altered her course while presently on the starboard side (bow) of the ***'overtaken vessel'***, would appear to have gained the first right-of-way as per Rule 15, ***'crossing situation'***. The ***'overtaken vessel'*** which was so far a ***'stand-on vessel'*** would suddenly become a ***'give-way vessel'***. This would quite absurdly change the situation very rapidly and suddenly make the ***'stand-on vessel'*** a ***'give-way vessel'***. This sudden change of roles and the transfer of onus to ***'keep out of the way'*** to a vessel which only moment ago was a ***'stand-on vessel'*** may leave her neither the time nor perhaps enough manoeuvring sea room to ***'keep out of the way'***, leading to utter chaos. As such, the requirements of this paragraph 'd' are for a fair and reasonable approach to ***'avoid collision'***.

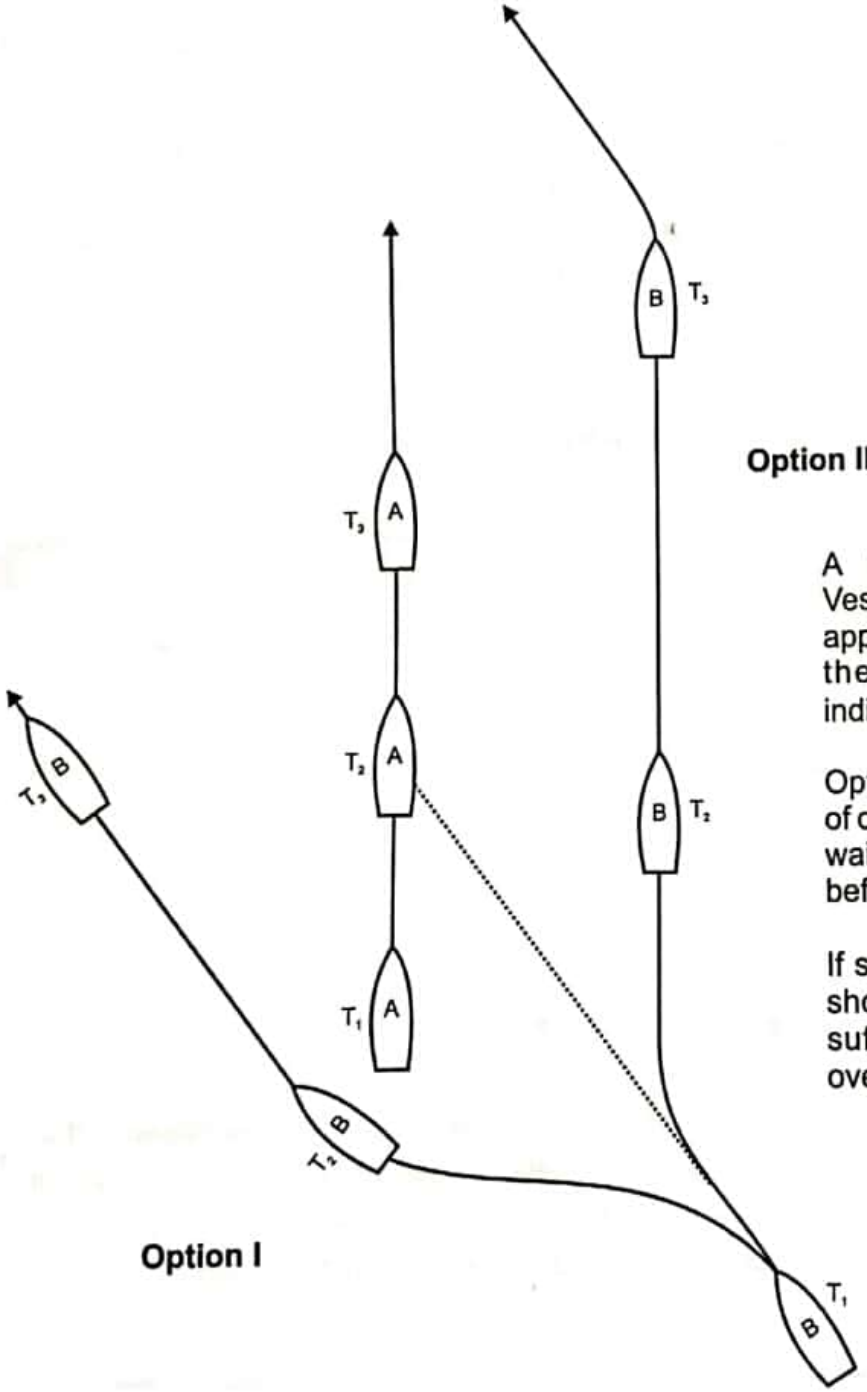
[TASK: DRAW A SKETCH WHERE A 'VESSEL OVERTAKING' AFTER PASSING FORWARD OF THE BEAM OF THE 'VESSEL BEING OVERTAKEN' ALTERS COURSE AND SEE HOW THE SITUATION WOULD SUDDENLY CHANGE HAD PARAGRAPH 'D' OF THIS RULE NOT PROHIBITED THE SAME.]

Further to the extract of the judgment given at the end of Rule 6 about the collision between Tricolor and Kariba, the same judgement also has comments regarding the application of this Rule regarding overtaking: ***"The Circuit (court) held that under COLREGS 13 and 16, the overtaking vessel also has a duty to keep far enough away to allow the overtaken vessel to conduct "reasonably predictable adjustments," and that the overtaking vessel must select a safe place to overtake in the first instance, with regard to factors such as visibility, sea conditions, the space confining the vessels, the vessels' speed and their capabilities. On the Tricolor's causative impact, the Circuit held that its violations of the***

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COLREGS on overtaking were a but-for cause of the collision, finding that "if the Tricolor had not chosen to overtake in an unsafe place and in an unsafe manner, the collision would not have occurred; the Kariba would have passed across the Tricolor's bow." The Circuit found too that the Tricolor's overtaking was a proximate cause of the collision because the "choice to overtake created a risk that other vessels, particularly the Kariba, would have less space, and less time, to avoid navigational exigency leading to a collision—the very same risk as makes inopportune overtaking a violation of the COLREGS." Therefore, the Circuit held that the Tricolor's overtaking violations were a cause of the collision".

Note: The word 'Circuit' in the above quoted judgement means the Circuit court.



Option II

Option I

A typical overtaking situation Vessel 'B' is overtaking Vessel 'A', approaching from more than 22.5° abaft the beam of 'A'. T_1 ,T_2 & T_3 indicate the time progression.

Options I and II are the typical methods of overtaking. In option II vessel 'B' must wait till she ***'is finally past and clear'*** before returning to her original course.

If sea room does not permit, vessel 'B' should reduce speed till there is sufficient and safe sea room to overtake.

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Rule 14

Head-on situation

(a) **When two power-driven vessels are meeting on reciprocal or nearly reciprocal courses so as to involve risk of collision each shall alter her course to starboard so that each shall pass on the port side of the other.**

(b) **Such a situation shall be deemed to exist when a vessel sees the other ahead or nearly ahead and by night she could see the masthead lights of the other in a line or nearly in a line and/or both sidelights and by day she observes the corresponding aspect of the other vessel.**

(c) **When a vessel is in any doubt as to whether such a situation exists she shall assume that it does exist and act accordingly.**

a and b: If ***'two power-driven vessels are meeting'***, ***'meeting'*** is the same as ***'approaching'*** used in Rule 7(d) or getting closer. In this case the ***'two power-driven vessels'*** concerned are closing in from right ahead or nearly right ahead direction, that is ***'reciprocal or nearly reciprocal courses'***. The moment it is determined that this approach is leading to ***'risk of collision'*** between them, then ***'action to avoid collision'*** required is that ***'each shall alter her course to starboard so that each shall pass on the port side of the other'***. The requirement of this Rule is to ensure quick and predictable action without any delays and to eliminate chances of uncertainties because in a ***'head-on situation'***, the relative speed of approach will be much faster as compared to other situations and thus less time is available.

This Rule applies explicitly to ***'power-driven vessels'*** and with reference to other Rules it is clearly implied that they are ***'underway'***. In a ***'head-on situation'*** and ***'in sight of one another'***, if one of the two vessels is a ***'sailing vessel'***, ***'not under command'***, ***'restricted in her ability to manoeuvre'*** or ***'engaged in fishing'***, then this Rule will not apply but the requirements stated in Rule 18 shall prevail. If both are ***'sailing vessels'***, their actions will be governed by Rule 12. However, if the two are ***'engaged in fishing'*** and both are ***'power-driven'***, they shall still be governed by this Rule 14. A ***'vessel engaged in fishing'*** may thus be covered by any of these categories.

In the Rules of this section II of Part B, this is the only Rule that places the responsibility of ***'preventing collisions'*** on both the ***'power-driven vessels'*** and clearly specifies the action to be taken. In all other situations, only one of the two vessels is required to take ***'action to avoid collision'***, the required action is not clearly specified, most Rules just state ***'shall keep out of the way'***, while the other ***'shall keep her course and speed'*** - though this latter statement is subject to the provisions of all other applicable Rules, especially Rule 2 (***responsibility***), 5 (***look-out***), 6 (***safe speed***), 7 (***risk of collision***), 8 (***action to avoid collision***), and 17 (***action by stand-on vessel***).

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'Reciprocal' means exactly the opposite, but the Rule goes further on to say ***'or nearly reciprocal'*** and does not directly specify the limit for this ***'nearly'*** aspect.The Rule states that ***'such a situation shall be deemed to exist'*** if ***'by night she could see the masthead lights of the other in a line or nearly in a line and/or both sidelights'***. As can be seen, the ***'nearly reciprocal'*** depends on ***'and/or both sidelights'*** as explained in depth in the box below.

You have been assigned a task to study Annex I paragraph 9 on the horizontal sectors of navigational lights with Rule 13. Analysis of the ***'cut-off limits'*** of ***'sidelights'*** - ***'in the forward direction'*** clarifies the ***'nearly reciprocal'*** aspect. ***'In the forward direction'***, ***'the full intensity of the side lights to be maintained in the forward direction of 1° outside the prescribed sector with the practical cut-off between 1° and 3°. This is needed to enable other vessels to determine a "head-on-situation" as per COLREG rule 14'***(*), the latter as stated in Rule 21(b). It is apparent that sidelights show from 1° up to 3° outside their prescribed sector on either side and could be visible up to a maximum total arc of 6° in the right ahead direction, 3° on either side.

If a ***'power-driven vessel'*** is carrying 2 or more ***'masthead lights'*** which are horizontally separated and they are ***'nearly in a line'***, then the continuing clause should be read as ***'and both sidelights'***. If only a single ***'masthead light'*** is carried, or more than one is at the same location, then the continuing clause should be read as ***'or both sidelights'***, because ***'nearly in a line'*** will not apply in this case.

A small ***'power-driven vessel'*** of less than 50 m in length may display just one masthead light there is no ***'second masthead light'***, refer Rule 23(a)(ii), even if she is towing, the 2nd and 3rd masthead lights would be in the same location as the 1st one.

The provisions of this Rule are thus applicable when ***'both sidelights'*** of each ***'power-driven vessel'*** are visible to the other. Hence if only one ***'sidelight'*** is visible even if the ***'masthead lights'*** are ***'nearly in a line'***, then the requirements of this Rule are no more applicable as the situation is clearly outside the ***'nearly reciprocal'*** limit. Though ***'nearly in a line'*** is not defined in the Rule, the 3° maximum on either side limit when both sidelights may be visible is practically considered the cut off limit. When only one ***'sidelight'*** is visible, the situation will be well covered by Rule 15 on ***'crossing situation'***, but keep in mind the caution and requirements stated in paragraph 'c' of this Rule.

However, there is an inbuilt ambiguity regarding daytime application, the ***'corresponding aspect'*** clause. This ***'corresponding aspect'*** can usually, easily be determined visually by practical experience; however, the clarity that will be there at night by virtue of the cut off limits of the navigational lights will be missing in daylight. In addition, the sidelights may not have the same intensities, and the sensitivity of the human eye is not the same for red and green lights. Fair probability exists that one sidelight may be sighted well before the other even when watching another vessel from right ahead.

** MSC.1/Circ. 1427 of 28 May 2012 is the last known circular by IMO clarifying the interpretations of these Rules. Please see Annex I, Sections 9 and 10.*

c: If there is ***'any doubt as to whether such a situation exists'***. In such situations, it has to be assumed that it is a ***'head-on situation'*** and action taken ***'accordingly'*** by both the vessels involved, that is ***'each shall alter her course to starboard so that each shall pass on the port side of the other'***.

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There may be many doubts like the type of an approaching vessel, her range, whether she is a ***'power-driven'*** vessel or not, is she on a course ***'reciprocal or nearly reciprocal'*** or slightly out of this range. The requirement for vessels to act in line with the requirements of this Rule is to avoid the development of any ***'close-quarters'*** and/or ***'risk of collision'*** situations. The requirement for an alteration to starboard is not just by this Rule but is the most predominant action implied by many other Rules too. This clarification of action to be taken in case of ***'any doubt'*** is similar to Rule 13(c) applicable in overtaking situations.



A typical head-on situation, two power-driven vessels on reciprocal courses. Both alter their course to starboard



Nearly Reciprocal Courses. Both power-driven vessels alter their course to starboard



Nearly Reciprocal Courses. Both power-driven vessels alter their course to starboard

There have been cases involving collisions between ***'power-driven vessels'*** that were meeting at nearly reciprocal courses or crossing at a very fine angle, when it appeared that they would likely pass clear starboard to starboard. One of the vessels altered to port to increase the passing distance while the other altered to starboard in compliance with the ***'nearly reciprocal'*** aspect of this Rule resulting in a collision. Courts have held that in such situations, if the passing distance appeared less than comfortable, it clearly implies a ***'close-quarters situation'*** is developing, in which case this Rule applies and the alteration of course to port by any vessel is in violation of the Rule. Both vessels in such situations should comply and act as per this Rule 14, ***'each shall alter her course to starboard so that each shall pass on the port side of the other'***. Please refer to the collision accident of VLCC 'Samco Europe' and the container vessel 'MSC Prestige', details given with Rule 10(f) earlier, which took place in December 2007 in similar circumstances.

The dividing line between a ***'head-on situation'*** and a ***'crossing situation'*** can sometimes be rather fine. If ***'two power-driven vessels'*** are approaching on ***'nearly reciprocal courses'*** or crossing at a fine angle, there may be some misunderstanding. Rule 15 on ***'crossing situation'***, explained later, has no restrictions on an alteration of course to port as ***'action to avoid***

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collision' by the ***'give-way vessel'***. Prudent action in such cases would be to consider such situations also as ***'head-on'*** by the clause ***'nearly reciprocal'***. The following diagram is self-explanatory and is meant to highlight the danger of an alteration of course to port by either of the **'two power-driven vessels'** involved which may lead to a collision.



[TASK: THE CUT OFF LIMIT OF NEARLY HEAD ON IS 3° OUTSIDE THE RIGHT AHEAD RELATIVE DIRECTION OF A VESSEL CONCERNED. WORK OUT BY HOW MANY DEGREES THE OTHER VESSEL'S COURSE MAY BE OFFSET FROM THE RIGHT AHEAD HEADING OF THE FIRST VESSEL FOR THE SITUATION TO BE COVERED BY THIS RULE.]

Regarding course(s), it must be understood that as per the basic principles on which these Rules are framed, this means the course steered and not the course made good. Normally the effect of current is the same on all vessels in the near vicinity of each other in open waters but drift due to wind may vary depending on the draught and the freeboard profile or windage area of the vessels. These factors neither influence the application of these Rules nor the expected actions of vessels in compliance with these Rules ***'for preventing collisions'***.

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Rule 15

Crossing situation

When two power-driven vessels are crossing so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way and shall, if the circumstances of the case admit, avoid crossing ahead of the other vessel.

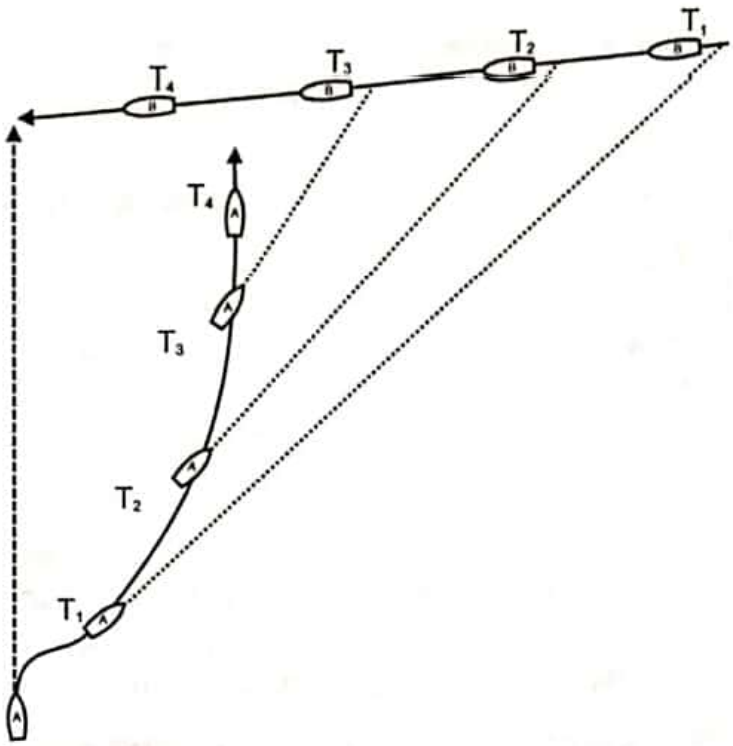
The majority of ***'risk of collision'*** situations between ***'power driven vessels'*** when ***'in sight of one another'*** and the corresponding ***'action to avoid collision'*** are generally covered under any one of the three situations, ***'overtaking'***, ***'head-on'*** or ***'crossing'***. The remainder are by Rule 12 when ***'sailing vessels'*** encounter each other and Rule 18 on ***'responsibilities between vessels'***. Even in this generality, Rule 13 over-rides Rule 12 and 18 if one of the vessels is ***'overtaking'***, be it of any type.

This Rule applies ***'when two power-driven vessels are crossing so as to involve risk of collision'***, the requirements being similar to Rule 14. A ***'crossing situation'*** may simply be defined as one that is not covered by Rules 13 on ***'overtaking'*** and 14 on ***'head-on'*** situations that have already been explained. By this reasoning, the relative direction of approach of a vessel would be between the right or almost right ahead, ***'reciprocal or nearly reciprocal courses'***, direction and up to 22.5° degrees abaft the beam of the vessel being approached. In a ***'crossing situation'*** and ***'in sight of one another'***, if one of the vessels is not a ***'power-driven vessel'***, then this Rule does not apply as explained earlier with Rule 14. ***'Vessels are crossing'*** may be interpreted to mean that both are moving, because if one of them is stopped then ***'risk of collision'*** may not develop at all.

The responsibility of keeping clear has been very simply stated in this Rule: ***'the vessel which has the other on her own starboard side shall keep out of the way'***. However, ***'action to avoid collision'*** is not specified. Applying the common sense of ship handling principles and vectors, it will be quite clear that normally the best ***'action to avoid collision'*** in a ***'crossing situation'*** would appear to be that a vessel required to ***'keep out of the way'*** or ***'give-way vessel'*** should alter her course to starboard and pass astern of the other, the stand-on vessel, as shown next.

Notwithstanding the above, it must be clarified and emphasised that this Rule does not prevent or prohibit a vessel required to ***'keep out of the way'***, or the ***'give-way vessel'***, from altering her course to port, ***'slacken her speed or take all way off'*** or even go astern; any of these actions may be executed singly or coupled with the others except that she ***'shall, if the circumstances of the case admit, avoid crossing ahead of the other vessel'***. The final ***'action to avoid collision'*** executed is up to the prudent judgement and discretion of the OOW of a ***'give-way vessel'***, keeping in mind all the requirements of Rule 8 that remain applicable, especially Rule 8(c) that recommends ***'alteration of course alone'***. An increase in speed alone by a ***'give-way vessel'*** in a ***'crossing situation'*** may be an act contrary to this Rule as is likely to take the ***'give-way vessel'*** ahead of the ***'stand-on vessel'***, which is not allowed by the Rule - ***'avoid crossing ahead of the other vessel'***.

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The adjoining diagram shows a typical crossing situation between two ***'power-driven vessels'*** underway. Assume they are a reasonable distance away, ***'in sight of one another'*** with ***'risk of collision'*** confirmed, that is constant compass bearing and reducing range. There is ample safe navigable sea room, no navigational dangers, no other traffic in the vicinity and the weather is fair. As per this Rule, vessel 'A' should keep clear of vessel 'B' which is on her starboard side. The best recommended action would be for 'A' to initially make a wide alteration of her course to starboard such that 'B' is on her port bow or can only see her red sidelight , i.e. 'A' is heading clear of the stern of 'B'. As 'B' moves on her course, 'A' should slowly return to her original heading, but always keeping 'B' on her port bow and ensuring that a safe passing range is maintained, until 'A' is back on her original course. When initially taking the above action, in compliance with Rule 34(a), 'A' is required to give a sound signal of one short blast which may be supplemented by a light signal, this is irrespective of the range between the vessels. Traditionally the initial alteration should be minimum to a course which is the bearing of 'B' from 'A' plus 3° more to ensure that it is clear to 'B' that 'A' has taken sufficient action and 'B' can now only see the red sidelight of 'A'. Sidelights may show up to 3° outside the right ahead direction as such the reference to this numbers.

[TASK: IN THE ABOVE CASE DETERMINE HOW MUCH CROSS TRACK ERROR 'A' WILL GENERATE FROM HER ORIGINAL PATH UNTIL SHE IS BACK ON HER ORIGINAL HEADING ON COMPLETION OF THE ACTION. ASSUME 'A' TOOK ACTION WHEN 'B' WAS 8 MILES AWAY AND BOTH VESSELS DOING ABOUT 12 KNOTS]

The above best action of a ***'give-way vessel'*** altering her course to starboard to keep clear is also implied and can be derived from the requirement of Rule 17(c) stated below.

In the above scenario, assume that 'A', the ***'give-way vessel'***, does not take any action, and 'B', the ***'stand-on vessel'***, has to take action as per Rule 17. If 'B' alters her course to port, it will take her closer to 'A', and if 'A' at the same time, or a little later and perhaps correctly, starts altering her course to starboard, you can well imagine the disastrous situation developing with a high probability of collision between the two vessels.

These Rules have been designed to prevent such dangerous and conflicting actions from taking place. Rule 17(c) states, ***'a power-driven vessel which takes action in a crossing situation in accordance with subparagraph (a)(ii) of this Rule to avoid collision with another power-driven vessel shall, if the circumstances of the case admit, not alter course to port for a vessel on her own port side'***. This restriction imposed by Rule 17(c) applies only to a

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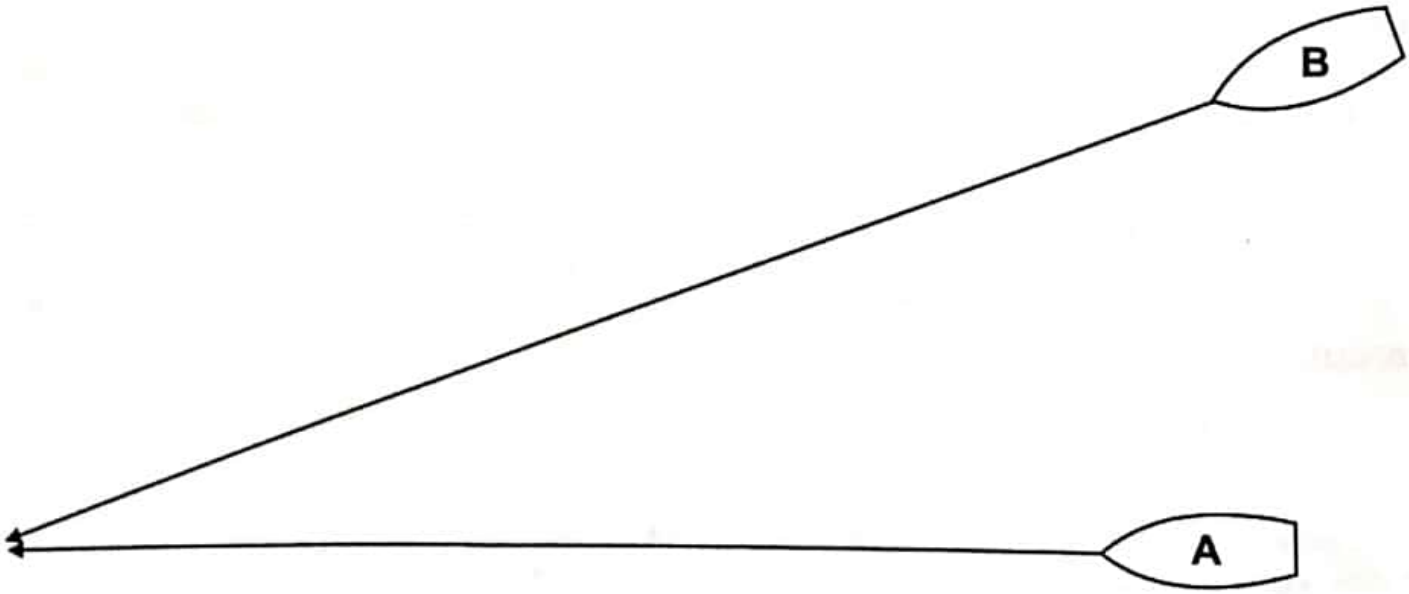
'stand-on vessel' acting under Rule 17(a)(ii) not 17(b) and implies that 'A', the ***'give-way vessel'***, is expected to alter to starboard to keep clear and hence 'B' should not alter her course to port.

[TASK: READ RULE 17(a)(ii) FOR WHICH THIS RESTRICTION OF RULE 17(c) APPLIES)

A ***'give-way vessel'*** may cross ahead of any other type of a ***'stand-on vessel'*** in a ***'crossing situation'***, for example a ***'sailing vessel'***, as this Rule 15 requirements apply only to ***'two power-driven vessels'***. However, principles of ***'ordinary practice of seamen'*** from Rule 2, Rule 8(d) requirement to pass at a ***'safe distance'*** and ***'keep well clear'*** from Rule 16 should always be kept in mind and complied with.

[TASK: IN THE SITUATION SHOWN, ASSUME THE TWO APPROACHING POWER-DRIVEN VESSELS 'A' & 'B' ARE IN SIGHT OF ONE ANOTHER, THE CONSTANT COMPASS BEARING BETWEEN THEM IS 017° – 197°, RANGE OVER 8 NAUTICAL MILES AND RISK OF COLLISION IS CONFIRMED. ASSUME VESSEL 'A' IS HEADING 270° AND 'B' IS HEADING 250°.

DETERMINE THIS SITUATION AND THE APPLICATION OF THE RELEVANT RULES. WHAT APPEARS TO BE THE BEST ACTIONS BY THE TWO VESSELS TO PREVENT COLLISION IN FULL COMPLIANCE WITH IRPCS (COLREGS).]



(Answer given at the end of this chapter)

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[TASK: HERE IS A COMPARISON CHART FOR RULES 13, 14 AND 15. PLEASE FILL UP THE EMPTY BOXES TO COMPLETE THE EXERCISE, 3 BOXES HAVE BEEN FILLED IN ITALICS TO START THE EXERCISE.]

RULE NO	THIS RULE APPLIES TO VESSELS AND HOW MANY?	DOES THIS RULE USE THE TERM *'INVOLVE RISK OF COLLISION'?*	DOES THIS RULE USE THE TERM *'DOUBT'?*	THE RELATIVE APPROACH SECTOR IS DIRECTLY DEFINED, DEFINED BY IMPLICATION OR MAY BE DETERMINED BY ELIMINATION	IS THERE A CORRESPONDING LIGHT SECTOR ASSOCIATED WITH THE HORIZONTAL LIMITS OF THE SECTOR APPLICABLE TO THE RULE / SITUATION?
13 OVERTAKING	*All vessels, implies 2 Vessels*	*No*			
14 HEAD ON SITUATION	*Only to 2 power-driven vessels*				*Both side lights of each vessel to be visible to the other.*
15 CROSSING SITUATION			*No*		

[COMPARE YOUR RESULTS WITH THE DIAGRAM GIVEN AT THE END OF RULE 21 OF PART C COMPARING THE LIGHT SECTORS AND THESE THREE MAIN SITUATIONS APPLICABLE WHEN VESSELS ARE IN SIGHT OF ONE ANOTHER.]

'Power-driven vessels' meeting in a ***'crossing situation' 'so as to involve risk of collision'*** are required to comply with the requirements of this Rule if ***'in sight of one another'***. However, there are a few exceptions stated in Rules 9 and 10, explained below with reference to those Rules.

'Power-driven vessels' proceeding in opposite directions in ***'narrow channels'*** with bends may appear to be ***'crossing'***. However, since each is required to comply with Rule 9(a), ***'a vessel proceeding along the course of a narrow channel or fairway shall keep as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable'***. They should not be considered covered by this Rule on ***'crossing situation'*** when in ***'narrow channels'***. A 1948 judgement on this aspect has been quoted with the explanation of Rule 9(a) and is repeated here for ready reference: On a collision which took place in a ***'narrow channel'***, Mr. Justice Willmer had Ruled, *"I have no hesitation in saying that as between a vessel coming up and a vessel going down, approaching each other in that way in a narrow channel, the narrow channel Rule, and the narrow channel Rule only, is the Rule that has to be applied."*

Rule 9(d) states that ***'a vessel shall not cross a narrow channel or fairway if such crossing impedes the passage of a vessel which can safely navigate only within such channel or***

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fairway'. The term ***'a vessel'*** in Rule 9(d) quoted above includes all types of vessels and hence the conduct of any ***'power-driven vessel'*** also. This requirement of Rule 9(d) shall remain applicable in ***'a narrow channel or fairway'***, even though there is no cross reference to it in this Rule 15. However, should there be a developing ***'close-quarters'*** and/or a ***'risk of collision'*** situation in areas governed by Rule 9(d), then the requirements of Rule 8(f) would apply for any ***'action to avoid collision'*** as the word ***'impedes'*** has been used in Rule 9(d).

Rule 10 governs the conduct of vessels in ***'traffic separation schemes'*** but also states that it ***'does not relieve any vessel of her obligation under any other Rule'***. So within a ***TSS*** should there be a developing ***'close-quarters'*** and/or a ***'risk of collision'*** situation between any two vessels, normal Rules ***'for Preventing Collisions'*** shall apply. If it is a ***'crossing situation'*** involving ***'two power-driven vessels',*** then the requirements of Rule 15 would prevail when they are in ***'sight of one another'***.

Rule 10(c) does allow vessels to cross ***'traffic lanes'***; however, Rule 10(j) only prohibits vessels of less than 20 m in length and sailing vessels from impeding ***'the safe passage of a power-driven vessel following a traffic lane'***. Interpreted inversely, the Rules do not prohibit vessels over 20 m in length to impede ***'the safe passage of a power-driven vessel following a traffic lane'*** and in all such cases the requirements of the relevant Rules shall apply for ***'any action to avoid collision'***. This aspect has deliberately been stated here because by now all the three conditions of ***'overtaking'***, ***'head-on'*** and ***'crossing'*** have been explained.

[TASK: REFER TO THE COLLISION BETWEEN 'MSC PRESTIGE' AND 'SAMCO EUROPE', DETAILS GIVEN WITH RULE 10(F). ANALYSE THE SAME WITH RESPECT TO RULES 14 AND 15. WERE THESE RULES APPLIED CORRECTLY? HAD ANY OF THESE TWO RULES BEEN APPLIED CORRECTLY IN CONJUNCTION WITH THE REQUIRMENTS OF RULE 8, WOULD THEY HAVE PREVENTED THE COLLISION FROM TAKING PLACE?]

Solution to the situation shown on page 118 where 'A' is heading 270° and 'B' is heading 250°. Work out the relative position of the vessels from each other to first determine the situation. Since 'B' is only 17° abaft the beam of 'A' this is not an overtaking but a crossing situation between the vessels. 'A' is the give-way vessel by this Rule 15. 'A' should alter her course initially to starboard at least to a heading 020° or even higher so that 'B' is clearly on her port bow.

Rules 5, 6, 7, 8, 11, 15, 16, 17 and 34 may all be considered applicable in the situation.

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Rule 16

Action by give-way vessel

Every vessel which is directed to keep out of the way of another vessel shall, so far as possible, take early and substantial action to keep well clear.

This Rule is self-explanatory. Any ***'give-way vessel'*** - ***'shall, so far as possible'*** keep clear by taking ***'early and substantial action'***. The different situations involving vessels having ***'risk of collision'***, except the requirements of Rule 18, and the best expected actions ***'to avoid collision'*** have already been explained. A vessel required to keep clear, termed ***'give-way vessel'***, is required to act as per the Rule applicable in the relevant situation, she shall ***'take early and substantial action to keep well clear'*** and also pass at a ***'safe distance'***. The application of these '***International Regulations for Preventing Collisions at Sea***' is stated in Rule 1(a), but the requirement to take ***'action to avoid collision'*** is further stated in Rule 8(a); ***'any action to avoid collision shall be taken in accordance with the Rules of this part'***. ***'This part'*** means Part B of these Rules as explained earlier. A ***'give-way vessel'*** has the prime duty and responsibility to ***'keep well clear'***.

Any ***'action to avoid collision'*** has to be coupled with and executed in conjunction and compliance with all the requirements of Rule 8. A quick reminder of the main elements stated in Rule 8: ***'Any action to avoid collision shall be positive, made in ample time, with due regard to the observance of good seamanship, substantial, be large enough to be readily apparent to another vessel, if there is sufficient sea room - alteration of course alone may be the most effective action, result in passing at a safe distance, not result in another close-quarters situation and the effectiveness of the action shall be carefully checked until the other vessel is finally past and clear'***.

Both Rules 8 and 16 contain similar requirements. Rule 16 states ***'take early and substantial action'***; Rule 8 states take action that is ***'positive, made in ample time';*** Rule 16 states take action ***'to keep well clear'***; Rule 8 states take action that will ***'result in passing at a safe distance';*** Rule 16 implies take the prescribed action ***'so far as possible'***; Rule 8 states take action ***'if circumstances of the case admit'***. Though the language varies, the requirements are essentially the same.

The ***'so far as possible'*** clause in this Rule does give a ***'give-way vessel'*** some discretion, that is in circumstances where she may be unable take ***'action to avoid collision'*** as required by these Rules. For example, due to the presence of navigational dangers like other traffic and/or no-go areas etc. If a ***'give-way vessel'*** finds herself in such a situation, she continues to remain a ***'give-way vessel'*** and should take such other action to keep clear as best possible in the circumstances. In these conditions, if a ***'give-way vessel'*** is not able to act in compliance with the requirements of the relevant Rule(s) applicable for the situation, she is allowed ***'any alteration of course and/or speed'*** by Rule 8(b), and can further invoke Rule 2 in deciding the best ***'action to avoid collision'***. The important elements from Rule 2 are quoted here as a quick reminder: ***'any precaution which may be required by the ordinary practice of seamen'***, ***'special circumstances of the case'***, ***'due regard shall be had to all dangers of navigation and collision'*** and ***'which may make a departure from these Rules necessary to avoid immediate danger'***.

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Rule 34(a), applicable to a ***'power-driven vessel'***, states ***'when manoeuvring as authorised or required by these Rules, shall indicate that manoeuvre by the following signals on her whistle'***. This requirement has to be complied with by any ***'power-driven vessel'*** whenever she takes ***'any action to avoid collison'*** as a ***'give-way vessel'***, irrespective of the range between the vessels. This Rule applies only ***'when vessels are in sight of one another'***.

It must be emphasised in no uncertain terms that although a ***'stand-on vessel'***, by virtue of the next Rule 17, is also required to ***'take action to avoid collision by her manoeuvre alone'***, this is to be executed only and only when a ***'give-way vessel'*** does not act to avoid collision. By no stretch of the imagination does Rule 17 imply that a ***'give-way vessel'*** is relieved of her primary duty and obligation ***'to keep well clear'***.



Collision in September 2011: An Indonesian-registered ship sank after it collided with another ship about eight nautical miles off Pulau Tioman in the South China Sea. 19 crew on board were rescued by a passing ship, Lady Anyvisia, some had suffered serious injuries but none lost their life.

The rescued crew said they saw the oncoming vessel swerving to the left to avoid their ship. However, she swerved the wrong way, causing the vessels to collide. The one which sank was hit in the mid-section of its engine, causing her to rapidly sink

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Rule 17

Action by stand-on vessel

(a) (i) Where one of two vessels is to keep out of the way the other shall keep her course and speed.

(ii) The latter vessel may, however, take action to avoid collision by her manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in compliance with these Rules.

(b) When, from any cause, the vessel required to keep her course and speed finds herself so close that collision cannot be avoided by the action of the give-way vessel alone, she shall take such action as will best aid to avoid collision.

(c) A power-driven vessel which takes action in a crossing situation in accordance with subparagraph (a)(ii) of this Rule to avoid collision with another power-driven vessel shall, if the circumstances of the case admit, not alter course to port for a vessel on her own port side.

(d) This Rule does not relieve the give-way vessel of her obligation to keep out of the way.

When apportioning the percentage of blame to vessels involved in collisions, very rarely have the courts concluded that it was 100 % the fault of just one of them. Such rulings are based on the requirements stated in this rather important Rule designed for ***'preventing collisions'*** at any cost. If a ***'give-way vessel'*** is closing in to cause discomfort to the navigators of a ***'stand-on vessel',*** then the latter are required to act to ***'avoid collision'***. One rare ruling blaming one vessel alone is given at the end of these explanations about this Rule.

'Give-way' or ***'stand-on'*** terms of Rules 16 and 17 respectively become applicable when an encounter between any two vessels ***'in sight of one another'*** develops into a ***'close-quarters and/or risk of collision'***. This is so, since these Rules are placed in Section II of this Part B of these Rules. As explained earlier, if ***'risk of collision'*** is not established at long range or otherwise then the application of some of these Rules requiring ***'action to avoid collision'*** are also not applicable.

'If a close-quarters situation is developing and/or risk of collision exists' between any two vessels and one of the two is ***'directed to keep out of the way of another vessel'*** by any of the Rules in this section II of Part B, applicable ***'to vessels in sight of one another'***, she is classified a ***'give-way vessel'***. She has a simple obligation to ***'keep well clear'*** of a ***'stand-on vessel'*** as required by Rule 16 and take ***'action to avoid collision'*** in accordance with the Rule(s) applicable to the prevailing situation.

This Rule is about a ***'stand-on vessel',*** but this term has only been used in the title and not even once in the contents. The text uses the terms ***'other'*** in paragraph 'a-i' and ***'the vessel required to keep her course and speed'*** in paragraph 'b'. Both imply that the vessel referred to is the ***'stand-on vessel'***. A ***'stand-on vessel'*** is placed in a more complex situation with complicated responsibilities because her initial obligation is ***'shall keep her course and speed'*** or to ***'stand-on'*** as per

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subparagraph 'a-i' of this Rule. The purpose is to allow time to a ***'give-way vessel'*** to plan and execute ***'action to avoid collision'*** - ***'to keep out of the way'*** of the ***'stand-on vessel'***.

> This Rule also states ***'one of two vessels'***; for reasons explained earlier, these Rules restrain themselves to various situations involving two vessels only. For example, assume a vessel is in a situation where there are two other vessels in her vicinity and both of them have ***'risk of collision'*** with this vessel. If this vessel is ***'give-way vessel'*** for one and ***'stand-on vessel'*** for the other, obviously she cannot do both the acts of a ***'stand-on vessel'*** and of a ***'give-way vessel'*** at the same time. In such situations the requirements of Rule 2, as explained earlier, should be considered if necessary.

The provisions of this Rule 17 get invoked ***'if a close-quarters situation is developing and/or risk of collision exists'*** where it appears that a ***'give-way vessel'*** is not taking the required actions to ***'keep out of the way'*** of a ***'stand-on vessel'***. This Rule requires a ***'stand-on vessel'*** ***'to take action to avoid collision'*** in these situations; it is expected that collisions can still be prevented. This Rule places a duty on a ***'stand-on vessel'*** to compulsorily act in such circumstances ***'for Preventing Collisions'***. The two important elements to activate action by a ***'stand-on vessel'*** as prescribed by this Rule are:

1: The ***'give-way vessel'*** must appear to be ***'not taking appropriate action in compliance with these Rules'***. That means taking nil or insufficient ***'appropriate action'*** to eliminate the developing ***'close-quarters'*** and/or ***'risk of collision'*** situation as perceived by the ***'stand-on vessel'***, as per subparagraph 'a-ii' of this Rule. And

2: A ***'give-way vessel'*** should have reached ***'so close'*** to the ***'stand-on vessel'*** that it appears to the latter that actions of the ***'give-way vessel'*** alone will not eliminate the imminent ***'risk of collision'***, as per paragraph 'b' of this Rule.

To enable the above-mentioned determinations, these Rules require a proactive approach by all vessels to remain alert and vigilant in monitoring the behaviour and actions of all other vessels in the vicinity. All vessels should always continue to comply with all the requirements of these Rules, especially Rule 5 on ***'look-out'***, Rule 7 ***'to determine if risk of collision exists'*** and Rule 8 on ***'action to avoid collision'***.

Subparagraph 'a-ii' of this Rule requires that ***'as soon'*** any ***'stand-on vessel'*** feels that a ***'give-way vessel'*** - ***'is not taking appropriate action in compliance with these Rules'***, she ***'may'*** take action to eliminate any developing ***'close-quarters'*** and/or ***'risk of collision'*** situation. ***'Appropriate action'*** expected from a ***'give-way vessel'*** has been explained with each Rule earlier. Activating evasive action required by this Rule depends on the perception of a ***'stand-on vessel'*** about the ***'appropriate action'*** of a ***'give-way vessel'***. ***'As soon'*** limits are open to debate, but appear to emphasise that action is taken earlier rather than later. Similarly, but to a lesser extent, ***'appropriate'*** may also be debated. It is all finally dependent on the sound and prudent judgement of the navigators on board a ***'stand-on vessel'*** to decide on the time, range and quantum of ***'action to avoid collision'*** taken by a ***'give-way vessel'***. Do note the discretion of action allowed to a ***'stand-on vessel'*** by the use of ***'may'*** in this subparagraph can be both for time & range.

Many factors can be considered in determining ***'not taking appropriate action'*** by a ***'give-way vessel':*** no action at all, late action, not sufficient action or action contrary to the Rules, etc. In all

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cases, it depends on the perception of a ***'stand-on vessel'*** that must also gauge if the situation is likely to turn dangerous.

Paragraph 'b' of this Rule gives an indication of the range, if vessels are ***'so close that collision cannot be avoided by the action of the give-way vessel alone'***, then a ***'stand-on vessel' 'shall take such action as will best aid to avoid collision'***. Note the emphasis on ***'shall';*** there is no discretion granted to a ***'stand-on vessel',*** she **must** now act if she finds herself in such a situation. Both the factors ***'so close'*** and ***'collision cannot be avoided by the action of the give-way vessel alone'*** are to be judged by a ***'stand on vessel'***. The limits remain debatable and depend on the prevailing circumstances, including the type of vessels involved. Passing range of even a few miles may be ***'so close'*** in open sea but a few cables not considered ***'so close'*** in congested waterways like the Singapore or Dover Straits. ***'So close'*** may also be considered to imply too close a range where ***'collision cannot be avoided by the action of the give-way vessel alone'***, which implies that the projected CPA is close to the outer limits of the turning circle parameters of a ***'stand on vessel'***. TCPA also is an important factor to consider since a ***'stand on vessel'*** would also take time to act.

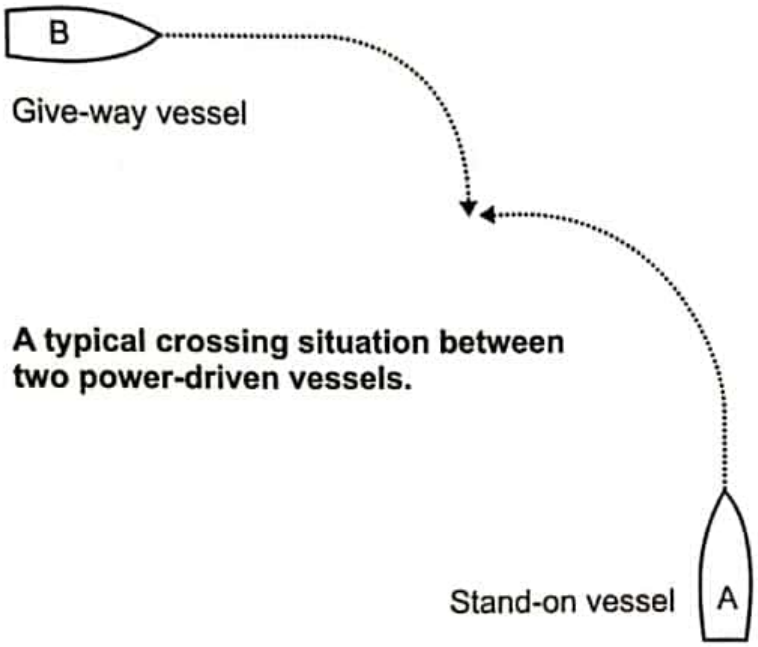
Actions that may be taken in both the above-described circumstances are not defined and it is for the navigators to decide the best ***'action to avoid collision'***. To ***'determine if risk of collision exists'*** in such circumstances and to execute ***'any action to avoid collision'***, the requirements of the various applicable Rules remain valid, especially Rules 2, 5, 7 and 8. Normally, the expected action of a ***'stand-on vessel'*** in such situations should be to take her away from the direction of a ***'give-way vessel';*** this may well be considered the safest manoeuvre and in line with the recommendations of Rule 8(c), ***'if there is sufficient sea room, alteration of course alone may be the most effective action to avoid a close-quarters situation provided that it is made in good time, is substantial and does not result in another close-quarters situation'***. Alteration of speed remains a valid option. However, as referred to with Rule 8 and explained later in the chapter on basic ship handling, this takes longer to put into effect and may not always be ***'readily apparent to another vessel observing visually or by radar'***, required by Rule 8(b). In any case, whatever best can be done must be done in such circumstances; a ***'stand-on vessel'*** should not wait for too long but act at a large enough range in ***'ample time'*** as per subparagraph 'a-ii' of this Rule.

Other than the restriction to ***'not alter course to port for a vessel on her own port side'*** in a ***'crossing situation'*** by a ***'stand-on vessel'*** as per paragraph 'c', this Rule does not provide any advice on what ***'action to avoid collision'*** should be taken by a ***'stand-on vessel'***, as explained above. However, this restriction is only when a ***'stand-on vessel'*** acts in compliance with subparagraph a(ii) of this Rule. This restriction does not apply when paragraph 'b' of this Rule becomes applicable. In the latter case the ***'stand-on vessel', 'shall taken such action as will best aid to avoid collision'***.

By not providing any advice, the Rule implies that conflicting actions by vessels should be avoided. A ***'stand-on vessel'*** having the freedom to decide her action, except as required by paragraph 'c' of this Rule, should always consider the most likely action expected to be taken by a ***'give-way vessel'*** in compliance with these Rules. Hence, any action initiated by a ***'stand-on vessel'*** should not embarrass the expected action of a ***'give-way vessel'*** or lead to a more dangerous situation or an imminent collision. Navigators of a ***'stand-on vessel'*** must remember that they also enjoy the freedom of choosing actions by Rule 2 keeping ***'ordinary practice of seamen'*** and ***'special***

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circumstances' in mind and that the requirements of Rule 8 continue to apply when executing ***'any action to avoid collision'***.



A typical crossing situation between two power-driven vessels.

The requirements of paragraph 'c' of this Rule are self-explanatory. The best ***'action to avoid collision'*** in a ***'crossing situation'*** has been explained with Rule 15; a similar situation is shown here involving ***'two power-driven vessels'***. It will be quite clear that 'A', the ***'stand-on vessel'***, should not alter her course to port because 'B', the ***'give-way vessel'*** on her port side, 'B' in all likelihood should be expected to alter her course to starboard to pass astern of 'A'. If 'A', the ***'stand-on vessel'***, alters course to port and then finds 'B', the ***'give-way vessel'***, starting to alter her course to her starboard, the conflicting actions could lead to a very dangerous situation which may even culminate in a collision - a situation that has to be avoided. Such cases have occurred in the past and thus the inclusion of this restriction in the Rule itself.

If ***'risk of collision'*** is developing and a ***'give-way vessel'*** does not appear to be taking appropriate action, a ***'stand-on vessel'*** needs to attract her attention ***'by giving at least five short and rapid blasts on the whistle'*** as prescribed in Rule 34(d) which ***'may be supplemented by a light signal of at least five short and rapid flashes'***. These are customarily called **'wake up'** signals. The optional supplementary light signal is to enable this caution or wake-up signal to be transmitted visually to ranges beyond that of sound signals.

However, should the 'wake-up' signals fail to make a ***'give-way vessel'*** take ***'any action to avoid collision'*** and a ***'stand-on vessel'*** has to take such action as per this Rule, then the requirements of Rule 34(a) shall still apply if this ***'stand-on vessel'*** is a ***'power-driven vessel'***. The requirement of giving the '**wake up**' sound signals given in Rule 34(d), however, remains applicable to all vessels.

The last paragraph 'd' of this Rule highlights that a ***'give-way vessel'*** remains obliged to keep clear of a ***'stand-on vessel'*** and the requirements of this Rule (17) by which a ***'stand-on vessel'*** may act to ***'avoid collision'*** do not in any way imply or suggest that a ***'give-way vessel'*** should not act correctly, or is absolved of her prime responsibilities and obligations ***'to keep well clear'***.

As mentioned earlier, the restriction by paragraph 'c' of this Rule is only applicable when a ***'stand-on vessel'*** acts in compliance with subparagraph 'a-ii' of this Rule and not when she acts as per paragraph 'b', in the latter scenario she has full freedom to take ***'any action to avoid collision'*** and this also reflects the requirements stated in Rule 2.

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There have been some interesting court rulings on these aspects; two different rulings are explained below.

Two vessels proceeding on the same parallel course and speed in open waters, good visibility, vessels ***'in sight of one another'*** *no change in the compass bearing or range between them,* ***'no risk of collision'****, and the range between them about 5 miles. The vessel ahead started doing compass adjustment and altered her course to starboard by almost 90° resulting in a collision. In this case, the court ruled that since there was no* ***'risk of collision'*** *initially, these Rules did not apply until such time that the one ahead had altered and* ***'risk of collision'*** *actually developed. The argument by the one ahead, that she assumed this to be an* ***'overtaking'*** *situation and expected the one behind to keep clear, did not hold good as the Rules do not apply till* ***'risk of collision'*** *is established. The court observed that when the vessel forward altered to starboard bringing the other vessel on her starboard side (bow), the application of these Rules became applicable because* ***'risk of collision'*** *had developed, and since this was a* ***'crossing situation'****, the relevant Rule applied. Though this is a ruling of 1938, the implications of the interpretations of the Rules by the courts remain valid even today. The application of any of these Rules* **'for preventing collisions'** *are activated as soon as there is development of any* ***'close quarters'*** *and/or* ***'risk of collision'****.*

The act of altering course to adjust compasses was not an ordinary navigational act or a required nautical manoeuvre in the area, which the other vessel ought to have foreseen or envisaged and thus taken precautions to keep clear by ***'ordinary practice of seamen'****. This aspect is highlighted in the other case stated below.*

In a second case, two vessels were approaching a pilot station on crossing courses ***'in sight of one another'****; the two collided during the approach. Sometime before collision, the* ***'stand-on vessel'*** *reduced speed by stopping her engines to embark the pilot. In the court ruling, she was not found at fault on account of* ***'shall keep her course and speed'****. Being in the act of embarking a pilot, she was unable to take any* ***'action to avoid collision'*** *as required by these Rules. On the contrary, her actions were totally justified in the circumstances, and to quote a few of the remarks made in the judgement:* ***'course and speed'****, mean the course and speed in following the nautical manoeuvre in which, to the knowledge of the other vessel, the vessel is at the time engaged. Is the manoeuvre in which the vessel is engaged an ordinary and proper manoeuvre in the course of navigation that will require an alteration of course and speed?; ought the other vessel to be aware of the manoeuvre which is being attempted to be carried out?*

On 27th July 1993 at about 00.05 hrs, the Hamburg registered container vessel 'Contship Success' of 16'250 gross steering about 065° true at 17 knots collided with the UAE flag anchor handling tug 'Selat Arjuna' of 499 gross steering about 245° true at 9 knots in the Arabian Sea off Yemen, the latter subsequently sank, though all on board survived.

In a judgment handed down on 22nd July 1998, Mr Geoffrey Brice QC, sitting as a Deputy High Court judge in the Admiralty Court, held that the 'Contship Success', which had claimed, perhaps incorrectly, to be the ***'stand-on vessel'****, was alone to blame for the collision. On 11th April 2000, a* bench of three: Lord Justice Roch, Lord Justice Clarke and Sir Christopher Slade, in the Supreme Court of Judicature, Court of Appeal upheld the previous ruling and passed the order

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'Appeal dismissed with costs'.

This is a very rare ruling where the container vessel was found to be totally at fault and blamed 100% for the collision by the Courts twice. Although the owners of the container vessel had tried to claim that she was a ***'stand-on vessel'*** *in a* ***'crossing situation'****, this did not sustain because of the manner in which she claimed to have became a* ***'stand-on vessel'****.*

The vessels, initially passing clear and safe of each other on near opposite courses, should have passed on the starboard side of each other at an estimated range of just less than one nautical mile. The container ship suddenly altered her course to starboard and collided with the starboard side of the tug. The owners of the container vessel claimed that she was crossing the path of the tug and was on the starboard side of the tug; as such she was the ***'stand-on vessel'*** *and the tug should have kept* ***'out of the way'*** *being the* ***'give-way vessel'****. During the trial, the court established that the two vessels would have passed each other safely starboard to starboard had they maintained their* ***'course and speed'****. 'Contship Success', the container vessel, made several 10° alterations of course to starboard placing 'Selat Arjuna' right ahead of her and then made another sudden course alteration to starboard leading to the collision.*

The owner's of 'Contship Success', while arguing that their vessel was crossing, further claimed that 'Selat Arjuna' failed to ***'give-way'*** *and their vessel was thus forced to make a last-minute alteration of course to starboard, but that was insufficient to prevent the collision.*

The Admiralty Court concluded that 'Contship Success' had to take all the blame. In reaching this decision, the court commented that a remarkable feature of the case was that 'Contship Success' altered course to starboard and collided with 'Selat Arjuna' although 'Selat Arjuna' was at all material times on the starboard bow of 'Contship Success'. According to the judgement, 'Selat Arjuna' could not have been readily aware of a slow alteration to starboard by 'Contship Success', and having confirmed a safe starboard to starboard passing 'Selat Arjuna' was caught by surprise, had few options when it became apparent to her that 'Contship Success' was taking improper action and did not have any opportunity to react in time. Although 'Selat Arjuna' held her course and speed over roughly 8 minutes, from the time 'Contship Success' started altering her course to starboard in the 10° incremental steps using her auto pilot (note: to avoid the off course alarm), having confirmed the earlier safe passing, it missed noticing the slow and incremental course changes made by 'Contship Success' till it was too late. (A succession of small alterations of course and/or speed should be avoided, Rule 8(b)

The main arguments were whether actions of 'Contship Success' created a legitimate ***'crossing situation'*** *by which 'Selat Arjuna' became a* ***'give-way vessel'*** *as was being claimed by the owners of the former. Various previous judgements were referred to, including the fact that the crossing rule applied regardless of the fault of any vessel.*

The court finally held that the crossing rule may apply in principle to make 'Selat Arjuna' a ***'give-way vessel'****, subject to the Lord Wright test in the 'Alcoa Rambler' (a case of 1949) that a ship was on a course only if its actions were open and notorious to a seaman on the other ship in the ordinary course of navigation. According to Lord Wright, the ordinary idea of a course is sufficiently constant direction of a ship on the same line of heading.*

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Using this definition, the Admiralty court concluded that the 'Contship Success' was never on a course for its actions to be open and notorious to the watchkeeper on 'Selat Arjuna'. As such, the crossing rule would not apply and 'Contship Success' was solely to blame for the collision.

The following are quoted from the Court of Appeal ruling dated 11th April 2000, which upheld the above ruling:

A) The sidelights of the CONTSHIP SUCCESS did not comply with the Regulations, which provide that sidelights should be visible between 1° and 3° outside the prescribed sector.

B) In summary, I find Contship Success was at fault for:

1) ***Failing to keep a good radar and visual lookout;***
2) ***Wrongly interpreting the information from (or which ought by proper operation of the ARPA to be available) on radar;***
3) ***Wrongly altering course to starboard to a ship on her starboard bow;***
4) ***If an alteration to starboard was to be made, failing to make a bold alteration in due time or at all and which could be observed from on board Selat Arjuna;***
5) ***Failing to put her engines on standby and reduce to manoeuvring full ahead in due time or at all;***
6) ***Operating the engines so as to cause a temporary blackout;***
7) ***Failing to sound a whistle signal of one short blast in due time or at all;***
8) ***Failing to reduce speed in due time to avoid a collision;***
9) ***Failing to comply with rules 2, 5, 6, 7, 8, 20b, 23(a)(iii) and 34(a) of the International Regulations for Preventing Collisions at Sea 1972 (as amended).***

There was no causative fault as regards rules 34(d) or 36 because the ships were never in a situation where those rules were relevant.

The text of the full ruling may be seen on the website
http://www.bailii.org/ew/cases/EWCA/Civ/2000/121.html

[TASK: ANALYSE THIS COLLISION ACCIDENT AND COMPARE WITH THE COLLISION BETWEEN 'SAMCO EUROPE' AND 'MSC PRESTIGE' GIVEN AFTER RULE 10(F) AND LINK IT WITH THE REQUIREMENTS OF RULES 16 & 17.]

The above collision also exhibits that situational ambiguity of the watch keepers had certainly contributed to the accident. This collision took place soon after change of watch. Statistical research on navigational accidents indicates that the duration from 15 minutes before the end of a watch until 15 minutes after change over is vulnerable for accidents. The outgoing OOW may get busy completing various ongoing activities and miss out on navigation; the incoming OOW would take some time to gain full situational awareness. In the above case the small incremental alterations prohibited by Rule 8(b) contributed to the accident but advice from the watchkeeping guidelines, see the task below, also do not appear to have been complied with.

[TASK: REFER TO PARAGRAPHS 23 & 35 IN STCW CODE SECTION A-VIII/2 TO COMPLETE THIS ANALYSIS]

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Rule 18

Responsibilities between vessels

Except where Rules 9, 10 and 13 otherwise require:

(a) A power-driven vessel underway shall keep out of the way of:

- **(i) a vessel not under command;**
- **(ii) a vessel restricted in her ability to manoeuvre;**
- **(iii) a vessel engaged in fishing;**
- **(iv) a sailing vessel.**

(b) A sailing vessel underway shall keep out of the way of:

- **(i) a vessel not under command;**
- **(ii) a vessel restricted in her ability to manoeuvre;**
- **(iii) a vessel engaged in fishing.**

(c) A vessel engaged in fishing when underway shall, so far as possible, keep out of the way of:

- **(i) a vessel not under command;**
- **(ii) a vessel restricted in her ability to manoeuvre.**

(d) (i) Any vessel other than a vessel not under command or a vessel restricted in her ability to manoeuvre shall, if the circumstances of the case admit, avoid impeding the safe passage of a vessel constrained by her draught, exhibiting the signals in Rule 28.

(ii) A vessel constrained by her draught shall navigate with particular caution having full regard to her special condition.

(e) A seaplane on the water shall, in general, keep well clear of all vessels and avoid impeding their navigation. In circumstances, however, where risk of collision exists, she shall comply with the Rules of this part.

(f) (i) A WIG craft, when taking off, landing and in flight near the surface, shall keep well clear of all other vessels and avoid impeding their navigation;

(ii) A WIG craft operating on the water surface shall comply with the Rules of this Part as a power-driven vessel.

This Rule states that the requirements of ***'Rules 9, 10 and 13'***, explained earlier, always prevail and have precedence over or automatically override the requirements stated in this Rule18.

Simply worded and self-explanatory, this Rule creates a clear division between different types of vessels and defines the ***'responsibilities between vessels'*** for areas not covered by earlier Rules.

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In apparent order of priority, the more manoeuvrable vessels are required to ***'give-way'*** to those less manoeuvrable or restricted in their movements. Of the situations covered earlier, Rule 12 was only about ***'two sailing vessels'*** when they have a ***'risk of collision'*** between them. When ***'overtaking'***, Rule 13 alone is applicable since it overrides all other Rules from 04 to 18. Rules 14 & 15 on ***'head-on'*** and ***'crossing'*** situations govern actions only between ***'two power-driven vessels'*** when they ***'involve risk of collision'***.

The requirements of these Rules apply when there is a developing ***'close-quarters'*** and/or ***'a risk of collision'*** between vessels and has been so held by courts in several cases; this principle should naturally apply to the application of this Rule 18 too. Further, any ***'action to avoid collision'*** should be appropriate to the ***'circumstances and conditions'*** of each situation and the application of the general principles of these Rules, especially Rules 2 and 8. Rule 16, ***'action by give-way vessel'*** and Rule 17, ***'action by stand-on vessel'***, continue to apply along with the application of this Rule.

Only when a vessel is actually meeting Rule 3 definitions and the criteria defined can she justify claiming the privileges granted by this Rule. Such vessels should also display ***'lights and shapes'*** indicating their special condition as prescribed in Part C of these Rules.

This Rule neither states ***'risk of collision'*** nor defines or implies any expected actions; the Rule uses the terms ***'keep out of the way of'***, ***'avoid impeding the safe passage'***, or ***'keep well clear of'***. Interestingly, different paragraphs of this Rule have used these different phrases and, though all may have the same intent, each can be interpreted differently. While paragraphs 'a', 'b' and 'f' of this Rule only use ***'shall'***, paragraphs 'c' and 'd-i' respectively use the phrases ***'so far as possible'*** and ***'if the circumstances of the case admit'*** after ***'shall'***, which does dilute the strictness imposed by the word, ***'shall'***. These aspects should be kept in mind in the interpretation of the different requirements, their understanding and practical application, for example application of ***'avoid impeding'*** is as explained in depth with Rule 8(f).

The practical application of this Rule, like most others, depends on ***'look-out'***, which does depend on prevailing visibility. At times, the special category of a particular vessel may not be recognized at a reasonable range to allow timely ***'action to avoid collision'***. During day, especially if a special category vessel is towards the direction of the sun, the shapes may not be seen/recognised by other vessels till they are too close to take effective ***'action to avoid collision'***. If, such a situation is likely to or does develop, a ***'stand-on'*** vessel should take action ***'in good time'*** as per Rule 17. Use of AIS, listening watch on VHF along with full and proper use of radar should always be practiced.

[TASK: PLEASE REVISE RULES '9', '10' AND '13' AND THEIR EXPLANATIONS.]

a: Requires that a ***'power-driven vessel underway shall keep out of the way of'*** all kinds of vessels that have some sort of restriction in manoeuvring and are usually called **'hampered'**. These have been listed as those ***'not under command'***, (NUC), ***'restricted in her ability to manoeuvre'***, (RAM), ***'engaged in fishing'*** and ***'sailing'***. Keeping clear of a ***'vessel engaged in fishing'*** implies keeping clear of her fishing gear also which may extend a considerable distance from the vessel. The exceptions to this Rule would be the requirements stated in Rules 9, 10 and 13 that always override this full Rule as explained earlier.

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The word ***'underway'*** has a wide spectrum application and applies even if a ***'power-driven vessel'*** is stopped and drifting, when she is still very much required to comply with this and other Rules. In addition, paragraph 'd' of this Rule also requires ***'any vessel'*** to ***'avoid impeding the safe passage of a vessel constrained by her draught'***, the later would always be a ***'power-driven vessel'*** as per the definition in Rule 3(h).

By reverse implication of these Rules, a ***'power-driven vessel'*** that is not ***'underway'***, for example if she is ***'at anchor, or made fast to the shore, or aground'***, is not required by any of these Rules to keep out of the way of another vessel as this requirement is not stated in any of these Rules.

[TASK: PLEASE REFER TO THE EXPLANATIONS GIVEN AFTER RULE 2 REGARDING KEEPING CLEAR OF VESSELS AT ANCHOR.]

By ***'ordinary practice of seamen'***, an expected exception to this paragraph 'a' of this Rule may be small sailing yachts or similar craft, on pleasure trips, making frequent changes in their ***'course and speed';*** such craft should normally and reasonably be expected to keep clear of ***'power-driven vessels'***. Frequent changes in their ***'course and speed'*** will make it extremely difficult for other vessels to even ascertain ***'risk of collision'*** with them, leave alone plan and execute ***'any action to avoid collision'***.

b: Requires ***'sailing vessels'*** ***'underway'*** to keep out of the way of vessels ***'not under command'***, (NUC), ***'restricted in her ability to manoeuvre'***, (RAM) and those ***'engaged in fishing'***. The explanation on the application of the requirement is same as for paragraph 'a'.

c: States that ***'a vessel engaged in fishing when underway shall'***, ***'keep out of the way of'*** vessels ***'not under command'***, (NUC) and ***'restricted in her ability to manoeuvre'***, (RAM) but ***'so far as possible'***. This latter clause marginally reduces the strictness imposed by the word ***'shall'*** but does not eliminate it. The various possibilities when this exception under ***'so far as possible'*** may be applied are not defined and would have to be decided by the navigators of a ***'vessel engaged in fishing'***. Requirements of Rules 2, 5 and 7 always apply, in addition application of Rules 17 and 8 shall also apply if a ***'vessel engaged in fishing'*** decides not to appear to take ***'appropriate action'***.

For ***'a vessel engaged in fishing'***, the very nature of her work and the outlying gear may impose severe restrictions on her manoeuvrability such that it may be physically impossible for her to ***'keep out of the way'*** at times. A trawler's speed is often limited to a few knots and a purse seiner may not be able to move at all while drawing in its nets. This Rule surely would not require a ***'vessel engaged in fishing'*** to cut loose its fishing gear just to keep out of the way of these 'hampered' vessels.

Rule 26(a) states, ***'a vessel engaged in fishing, whether underway or at anchor, shall exhibit only the lights and shapes prescribed in this Rule'***. This requirement places her in a peculiar situation where she displays the same signals at anchor or underway. If she is ***'at anchor'***, she would be not be able to take any action; but to others it would not be clear whether she is ***'underway'*** or ***'at anchor'***.

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Vessels ***'not under command'*** or ***'restricted in her ability to manoeuvre'*** are restricted in their manoeuvring capabilities, though the intensity varies as explained with Rule 3 definitions. On a comparative basis, ***'a vessel engaged in fishing'*** will be far more manoeuvrable and this explains/justifies the requirements of this Rule.

d-i: Requires all vessels other than a vessel ***'not under command'*** or ***'restricted in her ability to manoeuvre'*** to ***'avoid impeding the safe passage of a vessel constrained by her draught'***. The severity of the requirement imposed by ***'shall'*** is reduced by ***'if the circumstances of the case admit'***. As explained earlier for ***'so far as possible'*** with the previous paragraph 'c', the same parameters can be used to define this clause too. ***'Avoid impeding'*** has been explained in detail earlier with Rule 8(f).

By the definition given in Rule 3(h) a ***'vessel constrained by her draught means a power-driven vessel which, because of her draught in relation to the available depth and width of navigable water, is severely restricted in her ability to deviate from the course she is following'***. By definition, such a vessel can only be a ***'power-driven vessel';*** it is both ***'the available depth and width of navigable water'*** that matter and ***'severely restricted'*** does not mean incapable. However, it must be borne in mind that a vessel ***'constrained by her draught'***, because of the low under keel and/or side clearance of the channel, will be slow and lethargic in executing any manoeuvres she undertakes, be it a change of course and/or speed. Negative effects of low clearances referred to above are generally termed 'squat' and have been explained later with basic ship handling.

This subparagraph refers to Rule 28 which states, ***'a vessel constrained by her draught may'*** exhibit the following signals ***'three all-round red lights in a vertical line, or a cylinder'***. ***'This'*** implies that a vessel has to decide when she is actually ***'constrained by her draught'*** when she ***'may'*** display these additional signals if she wishes to use the privileges granted by this Rule.

d-ii: ***'A vessel constrained by her draught shall navigate with particular caution having full regard to her special condition'***. The Rule does not specify the special conditions but these would primarily be the reduced manoeuvring capabilities of such a vessel as explained above. Such a vessel must consider this aspect in determining ***'safe speed'***, especially Rule 6(a)(ii) clause, ***'the manoeuvrability of the vessel with special reference to stopping distance and turning ability in the prevailing conditions'***. The implication here is that the onus of exercising caution when navigating in such circumstances is primarily on ***'a vessel constrained by her draught'***. In practice, such a vessel should navigate at reasonably slow speed; the quantum to be decided by the navigators on board based on the ***'prevailing circumstances and conditions'***, always keeping the propulsion systems ready for immediate use.

Rule 1(b) empowers local authorities to make special Rules. If in any particular area such Rules prescribe requirements different than as prescribed by these Rules for ***'a vessel constrained by her draught'***, such local Rules would prevail and override the requirements of these Rules to the extent declared by the local authorities. Appropriate sources like publications and/or web-based sites should be consulted to check for any such local Rules.

e: Requires seaplanes when on water to ***'keep well clear of all vessels'***. The strictness of ***'shall'*** is slightly diluted by the remark ***'in general'***, but the emphasis is quite clear.

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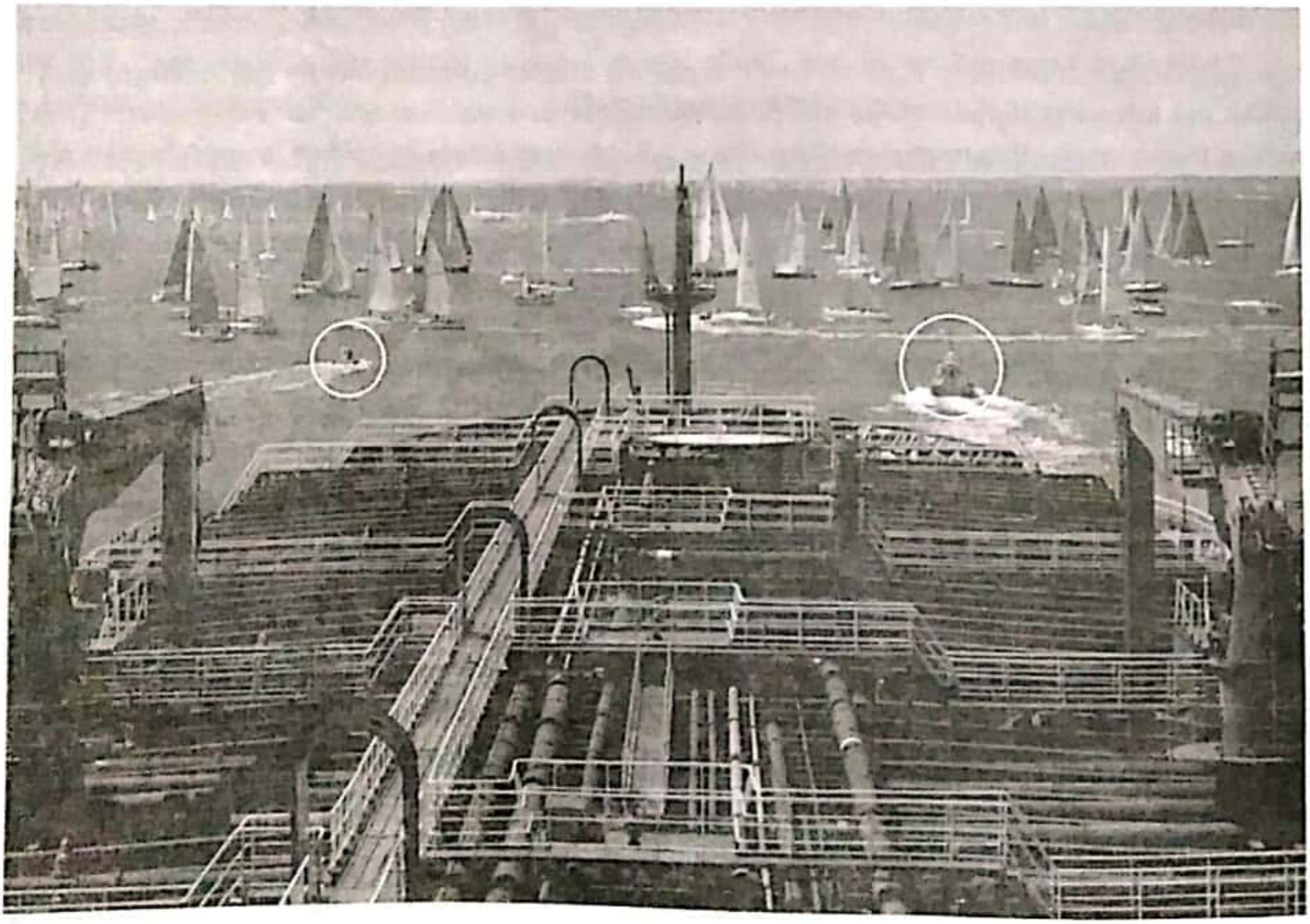
By definition, ***'seaplane includes any aircraft designed to manoeuvre on water'*** stated in Rule 3(e). This automatically excludes hovercrafts and similar craft like hydrofoils, which operate on the water in the non-displacement mode. Requirements of Rule 8(f) also apply with this Rule because of the ***'avoid impeding'*** clause.

f-i: Requires ***'A WIG craft'*** to ***'keep well clear of all other vessels and avoid impeding their navigation'***. ***'A WIG craft'-'shall'*** do this ***'when taking off, landing and in flight near the surface'***; do note these three specific conditions. Requirements of Rule 8(f), as explained earlier, apply with this Rule because of the ***'avoid impeding'*** clause.

f-ii: States that except for the conditions stated in subparagraph 'i' explained above, ***'A WIG craft'***, at other times when operating on the water surface, ***'shall'*** comply with the Rules of this Part B like any other ***'power-driven vessel'***.

This Rule has not referred to other high-speed craft like hovercrafts and hydrofoils that would continue to be covered by the definition of a ***'vessel'***. However, when applying the provisions of ***'special circumstances'*** from Rule 2, such high-speed craft may be reasonably expected to keep clear of other traffic.

[QUIZ: A VESSEL CONSTRAINED BY HER DRAUGHT IS NAVIGATING THROUGH A NARROW CHANNEL. OTHER VESSELS SHOULD KEEP CLEAR OF HER BY WHICH RULE; 9(b), 9(d) OR 18(d-i) ?]



A Power-driven vessel sailing out of an European port being assisted by the pilot boats to pass clear of the sailing yauchts

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CONCLUSION COMMENTS TO SECTION II OF PART B

All normally expected ***'in sight of one another'*** situations and expected **best actions** ***'to avoid collision'*** covered by these Rules have been explained. Beyond these, if some situations may appear at times as not having been specifically addressed in these Rules. Answers and solutions for them problems can be found within the Rules themselves - either by direct, reverse or implied interpretations. Some such situations have been explained below; a study of actual cases and court rulings given in this book will further help in the interpretation, understanding and application of these Rules, other legislative requirements and expected best practices.

Generally, ***'if a close-quarters situation is developing and/or risk of collision exists'*** and the responsibility of action is neither specifically defined, prescribed nor implied by these Rules for the situation or the type of vessels involved, it should be tackled as per the provisions of Rule 2 explained earlier. All requirements of Rule 8 continue to apply including ***'if there is sufficient sea-room alteration of course alone may be the most effective action'***. This action, more often than not, is an alteration of course to starboard that is specified in Rules 14 and is the implied best action in a ***'crossing situation'*** as explained with Rule 15 and 17(c).

1: Two vessels both ***'engaged in fishing'*** meeting each other in a ***'head-on situation'*** with ***'risk of collision'***. The Rules need to be interpreted for the said situation: if both are ***'power-driven'***, Rule 14 will apply, if both are ***'sailing***, Rule 12. If one is ***'power-driven'*** and the other ***'sailing'*** then the provisions of Rule 18 should be applied.

2: Two hampered ***'power-driven vessels'*** in a ***'head-on'*** or a ***'crossing situation'***, ***'so as to involve risk of collision'***. The vessels may be showing the 'RAM' or 'NUC' signals depending on their individual circumstances. The degree of responsibility cannot be clearly established in such cases. A vessel 'NUC' is defined as one which ***'through some exceptional circumstance is unable to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel'***. A vessel 'RAM' ***'from the nature of her work is restricted in her ability to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel'***.

Vessels indicate their status by displaying ***'lights and shapes'*** as applicable and may supplement the same by navigational safety warnings. As per the general trend of the Rules, a vessel less ***'restricted in her ability to manoeuvre'*** should take the best possible ***'action to avoid collision'***. If one of them is 'RAM' then she should act as a ***'give-way vessel'***, but if both are 'NUC', they may need to resort to some extraordinary means. Though the probability of such situations is extremely rare in reality, it cannot be ruled out in theory and helps in analysing these Rules better.

As per these Rules, a ***'vessel restricted her ability to manoeuvre'*** and a ***'vessel not under command'*** have similar status. Any ***'vessel underway'*** under normal circumstances is required to ***'keep out of the way'*** of these vessels.

3: Another hypothetical situation that usually leads to heated debates is a ***'vessel not under command'*** overtaking a ***'power-driven vessel'***. Assume this is in good visibility, vessels are ***'in sight of one another'***, ample sea room exists and there is no other traffic.

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Rule 13 states ***'notwithstanding anything contained in the Rules of Part B, Sections I and II, any vessel overtaking any other shall keep out of the way of the way of the vessel being overtaken'***. By this, a ***'vessel overtaking'*** is clearly required to keep clear and no other Rule of Sections I & II of Part B is applicable. As such, a vessel ***'not under command'*** should keep clear. She should be considered the ***'give-way vessel'*** and the ***'power-driven vessel'*** the ***'stand on vessel'*** by Rules 16 and 17 respectively. All situations and the related ***'action to avoid collision'*** are anyway prescribed in Part B and hence this argument seems reasonably satisfactory and acceptable.

However, the definition of a ***'vessel not under command'*** stated in Rule 3(f) is, ***'the term "vessel not under command" means a vessel which through some exceptional circumstance is unable to manoeuvre as required by these rules and is therefore unable to keep out of the way of another vessel'.***

Rule 13 on ***'overtaking'***, while over-riding all other Rules of Part B sections I & II, (Rules 4 to 18) does not change the definition which is contained in Rule 3 and is in Part A. Thus obviously a vessel 'NUC' cannot be expected to take any actions prescribed in the Rules of Part B to keep clear.

When ***'ordinary practice of seamen'*** and ***'special circumstances'*** are considered for this situation in conjunction with the definition; it gets apparent that a ***'power-driven vessel'*** should ideally keep clear.

4: Vessels ***'underway'*** but stopped are frequently known to display ***'not under command'*** signals. Unless a vessel is ***'not under command'*** or ***'restricted in her ability to manoeuvre'*** she is not granted any special privileges by these Rules. Determination of ***'risk of collision'*** or the requirement to take ***'action to avoid collision'*** apply to any vessel ***'underway'*** even if she is stopped, when she should continue to display lights, shapes or signals as normally applicable to her.

There have been clarifications issued by IMO that normal Rules ***'for Preventing Collisions'*** apply to any vessel ***'underway'*** even if stopped and she must comply with the rules of part B. The following extracts from SN/Circ. 177 of 02 November 1995 issued by IMO are quoted below to highlight this aspect.

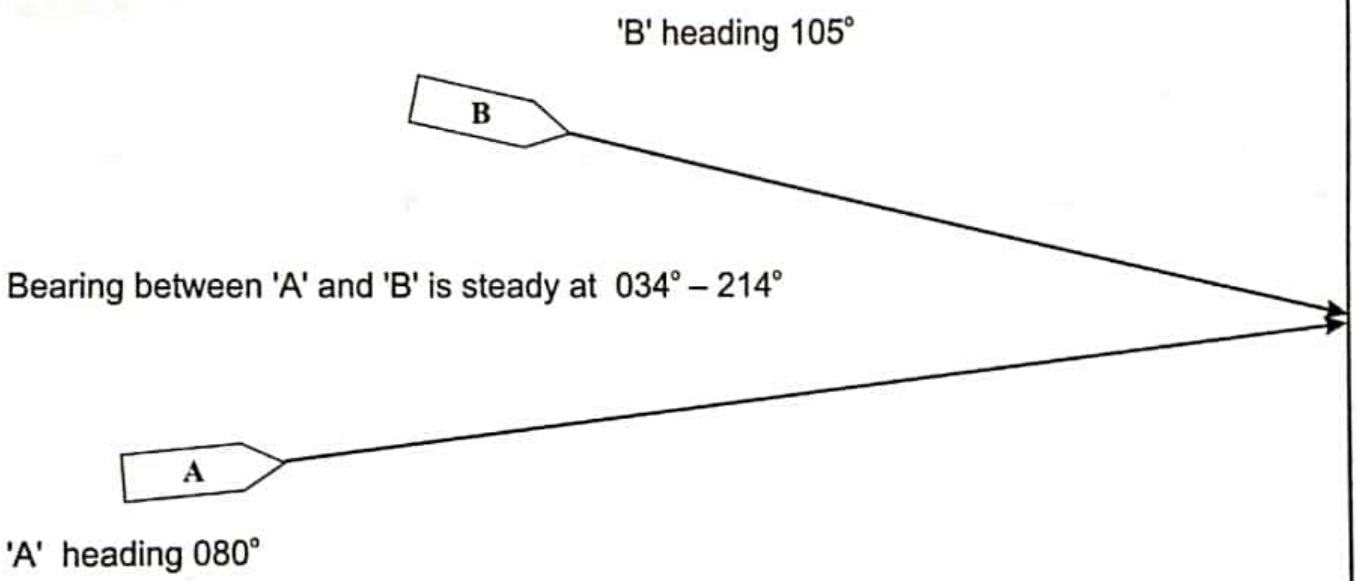
2 In many cases, vessels have deliberately shut down their main propulsion machinery for no justifiable reason, and have considered themselves to be "vessels not under command" and therefore relieved from their responsibilities as power-driven vessels underway, as set out in rule 18.

3 A vessel which is underway and stopped, unless actually a "vessel not under command" as defined in the rules, must not use the NUC signal. Such a vessel must continue to exhibit the lights as prescribed in rule 23 for a power-driven vessel underway. This is particularly important when vessels engaged in fishing or restricted in their ability to manoeuvre, are forced to take action to avoid collision with a vessel which is the give-way vessel in accordance with rule 16.

4 Member Governments are urged to remind seafarers that NUC lights and signals should only be exhibited in circumstances as defined in rule 3(f). Such contraventions should be reported to the flag state for appropriate action.

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5: While the Rules do place clear requirements ***'when a vessel is in any doubt'***, there still have been cases of confusion in determining the applicable situation with the navigators on board assuming different situations and waiting for the other to act; this had led to collisions. In the following diagram, ***'power-driven'*** vessels 'A' and 'B' have risk of collision. Vessel 'B' may analyse this as a ***'crossing situation'***, whereas 'A' may analyse that she is ***'overtaking'*** and both assume they are ***'give-way'*** and take ***'action to avoid collision'***. If done at good range it is unlikely their actions will lead to continuing ***'risk of collision'*** even if both act simultaneously, the probability of this being low but not nil. 'A' should follow the general advice of Rules '2', '8' and '16' executing a large alteration away from 'B' in good time or even reduce speed substantially.



However, if their analysis of the situation is reversed, then each would assume she is a ***'stand-on vessel'*** and wait for the other to act and may cause a collision unless they both act as per Rule 17, preferably '17(a)(ii)' The below gist of the investigation report from the website of MAIB, UK, about a collision in good visibility highlights this aspect.

Hyundai Dominion and Sky Hope, these large container vessels collided at 07.38 local time on 21st June 2004 in the East China Sea in good visibility conditions, fortunately with very minor damage. The investigations were jointly undertaken by the UK & Hong Kong authorities where the vessels were respectively registered.

As the vessels approached, the OOW on Sky Hope apparently incorrectly assessed the situation that Hyundai Dominion was overtaking; the latter assessed the situation as crossing. No action was taken by any of them till too late. The initial delay was due to VHF discussions, then again when the OOW on Hyundai Dominion requested the other vessel to keep clear using the free text facility on the AIS. None took early or effective action and they collided.

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The contributory factors leading to the accident are stated in the report as:

- *Though not fatigued, however, both watchkeepers had worked in excess of the hours permitted by the STCW convention over the previous two days.*
- *Both vessels had been observing each other approaching. However, other than VHF communication there was no avoidance action taken until they were within a range of 0.2 nautical miles.*
- *Sky Hope incorrectly judged Hyundai Dominion to be an overtaking vessel, which, in accordance with the COLREGS, required Sky Hope not to take any immediate collision avoiding action.*
- *Hyundai Dominion correctly considered Sky Hope to be a crossing vessel requiring Hyundai Dominion to 'stand-on'.*
- *In VHF communications between the vessels leading up to the collision, it is likely that a disagreement took place due to the difference in opinion over the 'crossing' or 'overtaking' situation. (With apparent disregard for the need of both Ships to take collision avoiding action).*
- *The OOW of Hyundai Dominion stated that he sent a text message over AIS asking Sky Hope to keep clear. The OOW of Sky Hope stated that he did not receive this message.*
- *Hyundai Dominion gave a sound signal before the collision, using the forward whistle. There was no sound signal from Sky Hope before the collision.*
- *Neither OOW informed their respective masters nor sought their advice prior to the collision.*
- *Correct emergency procedures were not followed by Hyundai Dominion after the collision.*
- *Sky Hope resumed passage some 22 minutes after the collision. It is unlikely that a proper assessment of the vessel's condition could have been completed within this time.*
- *The bridge watchkeepers of Hyundai Dominion lacked a clear understanding of the operation of the engine controls.*

The above report also highlights the fact that sound signals for manoeuvring and warning required by Rule 34 are seldom practiced at sea and also the misuse of VHF/AIS communication systems. There are many recommendations from IMO and flag states that these Rules can be applied in silence to prevent collision without resorting to any kind of communication.

Since both vessels assumed they were ***'stand-on'***, it is clear both of them failed to act as per Rule 17 when minimum CPA/TCPA limits were being breached. This case proves the importance of Rule 17, especially '17(a)(ii), since there have been many similar cases.

6: Multiple vessel situations are not covered by these Rules which restrict themselves to various situations involving two vessels only. In such situations the requirements of Rule 2, as explained earlier, would normally need to be applied in conjunction with Rule 8. As far as possible the closest encounter should be dealt with first but in any such cases early and substantial action would be the key to avoid any confusion, and actions executed should avoid embarrassing other vessels.

If this vessel is ***'give-way vessel'*** for one and ***'stand-on vessel'*** for the other, obviously she cannot do both the acts of a ***'stand-on vessel'*** and of a ***'give-way vessel'*** at the same time.

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INTRODUCTION TO SECTION III OF PART B

CONDUCT OF VESSELS IN RESTRICTED VISIBILITY

Part B Section III consists only of Rule 19.

[TASK: HAVE A QUICK REFRESHER LOOK AT THE BREAK-UP AND APPLICATION OF THESE RULES, ESPECIALLY SECTIONS I, II & III OF PART B, IN THE INTRODUCTION

YOU MAY ALSO MAKE A LIST OF THE RULES AND ANNEXES APPLICABLE IN AND THOSE HAVING A SPECIAL IMPORTANCE IN 'RESTRICTED VISIBILITY' CONDITIONS].

As explained earlier Rules of Part B which prescribe activities for ***'preventing collisons'*** are divided into three distinct sets. Section I: Rules 4 to 10 apply to all vessels at all times ***'in any condition of visibility'***; Section II: Rules 11 to 18 apply to all vessels in visual ***'sight of one another'*** and Section III: Rule 19 ***'applies to vessels not in sight of one another when navigating in or near an area of restricted visibility'***.

The requirements of Rule 19 apply independently but in conjunction with the Rules of Section I of this Part B, that is Rules 4 to 10. Rules 11 to 18 are not applicable when requirements of Rule 19 are activated and applied. The only exception, perhaps, is the definition of ***'overtaking'*** that is not defined in Rule 19 but is indirectly linked to that given in Rule 13 of Section II; this has been considered one of ***'ordinary practice of seamen'*** and upheld by courts.

A large number of navigators tend to analyse ***'risk of collision'*** situations and decide ***'action to avoid collision'*** in ***'restricted visibility'*** conditions using Rules 11 to 18 though these are not applicable to ***'vessels not in sight of one another when navigating in or near an area of restricted visibility'***; they apply only to ***'vessels in sight of one another***. Surveys by several nautical bodies and my own experience through the years support this statement. This is because Rules 11 to 18, applicable ***'in sight of one another'***, are so frequently used by navigators that they become part of their primary thinking and are unknowingly used even in ***'restricted visibility'*** conditions, which is not correct.

The requirements of Rule 19 differ substantially from the Rules 11 to 18. The differences will get clear as you study Rule 19, some of them are:

i. In ***'restricted visibility'*** conditions the responsibility of taking ***'action to avoid collision'*** rests on both or all the vessels involved; there is nothing like ***'give-way'*** or ***'stand-on'***; Rules 16 and 17 prescribing these requirements apply only to vessels ***'in sight of one another'***.

ii. There is no differentiation in the type of vessels involved; Rule 19 applies equally to all types of vessels.

iii. The cut off sectors of the relative position, or aspect or relative directions of vessels from each other for the application of the Rule 19 'd' & 'e' are different from those used for the various situations in ***'sight of one another'***. Other than for a vessel overtaking, the beam direction is predominantly used.

iv. Instant readiness of engines or propulsion systems is required.

v. The use of sound signals varies in ***'restricted visibility'*** conditions, ***'manoevouring and warning signals'*** from Rule 34 do not apply, only those in Rule 35 are applicable.

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Rule 19

Conduct of vessels in restricted visibility

(a) **This Rule applies to vessels not in sight of one another when navigating in or near an area of restricted visibility.**

(b) **Every vessel shall proceed at a safe speed adapted to the prevailing circumstances and conditions of restricted visibility. A power-driven vessel shall have her engines ready for immediate manoeuvre.**

(c) **Every vessel shall have due regard to the prevailing circumstances and conditions of restricted visibility when complying with the Rules of section I of this part.**

(d) **A vessel which detects by radar alone the presence of another vessel shall determine if a close-quarters situation is developing and/or risk of collision exists. If so, she shall take avoiding action in ample time, provided that when such action consists of an alteration of course, so far as possible the following shall be avoided:**

(i) **an alteration of course to port for a vessel forward of the beam, other than for a vessel being overtaken;**

(ii) **an alteration of course towards a vessel abeam or abaft the beam.**

(e) **Except where it has been determined that a risk of collision does not exist, every vessel which hears apparently forward of her beam the fog signal of another vessel, or which cannot avoid a close-quarters situation with another vessel forward of her beam, shall reduce her speed to the minimum at which she can be kept on her course. She shall if necessary take all her way off and in any event navigate with extreme caution until danger of collision is over.**

Watchkeeping practices change the moment a vessel is ***'navigating in or near an area of restricted visibility'***. *STCW Code A-VIII/2, paragraph 45* on watchkeeping requires:

When restricted visibility is encountered or expected, the first responsibility of the officer in charge of the navigational watch is to comply with the relevant rules of the International Regulations for Preventing Collisions at Sea, 1972, as amended with particular regard to the sounding of fog signals, proceeding at a safe speed and having the engines ready for immediate manoeuvre. In addition, the officer in charge of the navigational watch shall:

.1 inform the master;
.2 post a proper lookout;
.3 exhibit navigation lights; and
.4 operate and use the radar.

A very important and interesting aspect is that this Rule refers to ***'vessels'*** or to a ***'vessel'***. It applies equally to all types of vessels and does not grant any special privileges or status to any particular type of a vessel or the activity she is engaged in.

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Paragraph 'e' of this Rule and the STCW Code quoted above use the terms ***'fog signal'*** and ***'fog signals'*** respectively. These terms actually refer to Rule 35 that prescribes ***'sound signals in restricted visibility'***, not ***'fog signals'***, which shall be used by vessels ***'in or near an area of restricted visibility'***. This is to do with traditional terminology overflowing into the Rules, the term ***'fog signals'*** has been used so widely in practice that it has been used in these Rules and legislative requirements too.

Rule 35(c) does prescribe different sound signals for all vessels that have any kind of restriction imposed on them by virtue of their activity or condition. These sound signals give a general indication, are not vessel specific and may be heard at too close a range for comfort. If properly used, AIS systems can be of assistance, if fitted, in determining the status of other vessels in the vicinity for application of ***'ordinary practice of seamen'***, to keep clear of it needed, but the application of this Rule is common to vessels.

[TASK: READ RULE 35 ON 'SOUND SIGNALS IN RESTRICTED VISIBILITY'.]

The definition in Rule 3(k) neither states nor implies any range when ***'restricted visibility'*** is invoked in practice; on the other hand, visibility is the first point of consideration in deciding ***'safe speed'***. The cut off range of visibility to apply provisions of ***'restricted visibility'*** depend on ***'prevailing circumstances and conditions'*** and application of ***'ordinary practice of seamen'***. Some organisations either define the cut off visibility range as part of their SMS or documented quality management systems or require Masters to state this in their standing/bridge orders. ***'Restricted visibility'*** does not mean zero visibility and can be caused due to many reasons, not fog alone.

Sound signals have a low audible range only between 0.5 to 2.0 miles depending on the length of a vessel as prescribed in Annex III of these Rules that too ***'with 90% probability in condition of still air' - 'on its forward axis'. 'In practice the range - is extremely variable and depends critically on weather conditions'***. The actual ***'range'*** is further subject to ***'noise level'*** and can be extremely variable, discussed further with paragraph 'e' of this Rule.

a: Explains the applicability of this Rule, vessels shall:

1: ***'Not be in sight of one another',***
and
2: ***'Navigating in or near an area of restricted visibility'.***

If vessels reach close enough to be ***'in sight of one another'***, then as per Rule 11 they are required to follow Rules 11 to 18. ***'In or near'*** means that vessels, not just within, but also those ***'near an area of restricted visibility'*** need to comply with this Rule. ***'Near'*** is not defined numerically, and, as explained for other Rules, has to be decided by the navigators on board. Rule 6(b)(vi), ***'the more exact assessment of the visibility that may be possible when radar is used to determine the range of vessels or other objects in the vicinity',*** should be used if possible. Firm determination of visibility by sight alone is a difficult task; the analysis can be fairly misleading. Heavy rain and squalls, even if only in the vicinity usually cause a severe reduction in visibility which invokes application of this Rule. These weather aspects can usually be detected well in advance by proper use of radar, in addition monitoring weather forecasts also helps.

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It has always been held that, just because vessels are ***'not in sight of one another'***, it does not invoke application of this Rule if ***'risk of collision'*** is established by the use of radar alone; ***'restricted visibility'*** conditions must also exist and the vessels concerned should be ***'in or near'*** the same, these two requirements invoke the application of this Rule as per paragraph 'a'.

However, Marine Guidance Note, MGN 369 (M+F) on ***'Navigation in Restricted Visibility'*** published by the MCA of UK in July 2008 states the following interpretation about the application of this Rule, quoted below. This interpretation creates a totally new dimension on the interpretation and application of this Rule. Though Rule 19(a) states, ***'this Rule applies to vessels not in sight of one another when navigating in or near an area of restricted visibility'***, the above quoted MGN 369 explains the application as:

'If you cannot see the other vessel visually, then Rule 19 shall apply, regardless of whether your vessel is in or near an area of restricted visibility.'

The MGN itself carries a waiver saying ***'where this document provides guidance on the law it should not be regarded as definitive'***. Having taken this up with MCA received the following from Forkanul Quader, Nautical Policy Lead, MCA on 18th May 2010: ***'We do take note of your comments and will take that forward during our review of Guidance Notes. We have a review cycle and among others MGN 369 will also be reviewed/revised. We have also reassured GlobalMet in response to a similar query.***

Readers and practitioners may be guided by this viewpoint to ensure that they continue to do their best ***'to avoid collision'***. My view is that this MGN 369 in its present form does not appear to give the correct interpretation or advice on the application of Rule 19.

The word ***'navigating'*** is open to several interpretations, but is generally linked with movement. If a vessel is not moving and is stopped in water; though she is ***'underway'*** she may not be considered to be ***'navigating'*** and thus not required to comply with this Rule. This aspect is not specifically defined anywhere, neither within these Rules nor in any court ruling. However, it has been held that as per ***'ordinary practice of seamen'***, a vessel without an operational radar should stop and not navigate in ***'restricted visibility'*** as explained with Rule 2. She may even declare herself 'NUC' This is also evident in Rule 35 on ***'sound signals in restricted visibility'***, which differentiates between a ***'power-driven vessel'*** when ***'making way'*** versus, when ***'underway but stopped'***. ***'Making way'*** is like ***'navigating'*** and the latter, ***'underway but stopped'***, as not ***'navigating'***.

This aspect on the application of Rule 19 differs from the application of the Rules in Section II which do not use the term ***'navigating'***, but it is implied by the terms ***'approaching'***, ***'overtaking'***, ***'meeting'***, ***'crossing'*** and ***'keep her course and speed'*** as used in Rules 12, 13, 14, 15 and 17 respectively, which all mean moving. However, all these Rules are applicable to vessels ***'in sight of one another'*** and ***'underway'***; though the term ***'underway'*** is used only in Rule 18. Rules 6, 9 and 10 - applicable at all times - use the terms ***'proceed'***, ***'proceeding'***, ***'navigate'*** and ***'navigating'***. A ***'vessel at anchor'*** is clearly neither ***'navigating'*** nor ***'underway'*** and the requirements of sound signals for a vessel at anchor differ from others as stated in Rule 35(g), with some exemptions given in Rule 35(d).

b: Is a reflection of Rule 6 on ***'safe speed '***, which remains applicable at all times even if it had not been stated in this paragraph. ***'Adapted to the prevailing circumstances and conditions of restricted visibility'*** is to emphasise the prevailing conditions which may warrant a slower speed as

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an additional precaution. ***'Safe speed'*** is determined by subjective analysis as explained with Rule 6 and applies to all vessels.

In addition, ***'a power-driven vessel shall have her engines ready for immediate manoeuvre'***. In practice, this means placing the propulsion systems/engines on **stand-by**, this (refer MGA 315 of 2006 paragraph 10.2) applies in all waters. This will also ensure compliance with paragraph 'e' of this Rule that a vessel ***'shall reduce her speed to the minimum at which she can be kept on her course. She shall if necessary take all her way off'***. Readiness of engines is also required by Rule 8(e), ***'if necessary to avoid collision or allow more time to assess the situation, a vessel shall slacken her speed or take all way off by stopping or reversing her means of propulsion'***.

Diesel engines require their RPM reduced by a certain amount from full speed before they can be manoeuvred. Vessels fitted with variable pitch propellers may also require some reduction in the propeller pitch and/or the engine speed before manoeuvring. Normally it takes some time to bring down the engine speed (RPM) to manoeuvring; as such, engineers should be given maximum possible notice as soon as it is felt that visibility is likely to deteriorate. Navigators on watch should know the ***'procedures for the use of main engines to manoeuvre when the main engines are on bridge control'***. *(STCW Code A-VIII/2, paragraph 22.4)*

In cases of need, the officer in charge of the navigational watch shall not hesitate to use the helm, engines and sound signalling apparatus. However, timely notice of intended variations of engine speed shall be given where possible or effective use made of UMS engine controls provided on the bridge in accordance with the applicable procedures. *(STCW Code A-VIII/2, paragraph 29)*

When the machinery spaces are in the manned condition, the officer in charge of the engineering watch shall at all times be readily capable of operating the propulsion equipment in response to needs for changes in direction or speed. *(STCW Code A-VIII/2, paragraph 63)*

When the machinery spaces are in the periodic unmanned condition, the designated duty officer in charge of the engineering watch shall be immediately available and on call to attend the machinery spaces. *(STCW Code A-VIII/2, paragraph 64)*

All bridge orders shall be promptly executed. Changes in direction or speed of the main propulsion units shall be recorded, except where an Administration has determined that the size or characteristics of a particular ship make such recording impracticable. The officer in charge of the engineering watch shall ensure that the main propulsion unit controls, when in the manual mode of operation, are continuously attended under stand-by or manoeuvring conditions. *(STCW Code A-VIII/2, paragraph 65)*

Do note that Rule 3 definitions use the term ***'machinery'*** used for ***'propelling'*** or ***'propelled'*** and Rule 34 uses the term ***'propulsion'***. However, this paragraph 'b' of this Rule uses the term ***'engines'***. For all practical purposes, these terms mean the same and refer to the power plants providing the propulsion power to vessels.

c: Simply reminds about the requirements of Rule 4 that Rules 4 to10 contained in section I of this Part 'B' continue to apply with this Rule 19. These Rules are applicable at all times, as explained earlier, even if this paragraph did not state so. ***'Shall have due regard to the prevailing circumstances and conditions of restricted visibility when complying with the Rules of***

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Section I of this part' is pointing towards additional cautions and precautions may be required in ***'restricted visibility'*** conditions though nothing is defined or prescribed directly in these Rules.

Some basic extra precautions, which are accepted to reasonably fulfil this requirement are:

- Improved ***'look-out'*** activity; additional people round the clock, not just in hours of darkness. Their location, not inside the bridge or wheelhouse with doors closed, but outside on the wings or even better in a forward location with means of communication with the bridge.
- Any work, which creates noise, should be stopped so that it does not interfere with audible ***'look-out'*** functions, a ***'vessel shall at all times maintain a proper look-out by sight and hearing'***.
- ***Safe speed'*** is determined in compliance with Rule 6 adopted for ***'restricted visibility'***.
- Apart from paragraph 'd' of this Rule, Rules on ***'look-out'***, ***'safe speed'***, and ***'risk of collision'*** imply or require radar/s to be used. In ***'restricted visibility'***, this means use of all radars, change of range scale done frequently and maintaining an alert and continuous observation of the display by competent persons. Paragraph 45.4 quoted from the STCW Code A-VIII/2 at the beginning clearly states ***'operate and use the radar'***. Use of radar has been explained earlier.
- Determination of ***'risk of collision'*** by all ***'available means'*** in ***'restricted visibility'*** will depend more on radar than visual or audible ***'look-out'***. Interpretation and analysis of all information including from VHF, AIS and other navigational warning systems should also be intelligently used to determine any ***'risk of collision'***. The hazard of using VHF for deciding and agreeing to any ***'action to avoid collision'*** is extremely dangerous; this is also addressed separately in this book. AIS is also not to be considered as fully reliable or used as the only means for ***'preventing collisions'*** as explained earlier with Rule 7.
- ***'Any action to avoid collision'***, continues to be governed by all the requirements of Rule 8. In ***'restricted visibility'***, ***'to be readily apparent to another vessel'***, ***'any alteration of course and/or speed to avoid collision shall'*** have to be ***'large enough'***, much larger as compared to the quantum of actions in good visibility conditions because vessels would be observing each other by radar alone. ARPA predictions are accurate only when own vessel and the targets are on a steady course and speed for at least 2 to 3 minutes. ***'The effectiveness of the action shall be carefully checked until the other vessel is finally past and clear'*** required by Rule 8(d) would need careful monitoring by radar alone.

[QUIZ: BY THESE RULES WHAT IS THE RECOMMENDED BEST *'ACTION TO AVOID COLLISION'*, AN ALTERATION OF COURSE OR AN ALTERATION OF SPEED? WHICH RULE STATES THIS?]

Rules 9 and 10 on ***'narrow channels'*** and ***'traffic separation schemes'*** respectively remain applicable in ***'restricted visibility'***. Sound signals for overtaking required by Rule 9(e) and prescribed in Rule 34(c and d) are applicable only to ***'vessels in sight of one another'***, not in ***'restricted visibility'*** conditions when vessels are ***'not in sight of one another'***. This reasoning can also be applied for sound signals by vessels when ***'nearing a bend...'*** stated in Rule 34(e) where visibility aspects on its application are not specifically stated.

d: Is about the use of ***'radar alone'*** for detection, analysis and avoidance of any ***'risk of collision'***. ***'A vessel which detects by radar alone the presence of another vessel shall determine if a close-quarters situation is developing and/or risk of collision exists'***, is a repeat of Rule 7.

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This paragraph applies to ***'preventing collisions'*** when this Rule is activated as per the conditions stated in paragraph 'a'. In addition, if another vessel is detected by her sound signals alone, then the requirements of paragraph 'e' of this Rule apply; the latter also implies that the range between the vessels is too close for comfort. However, if vessels get into visual ***'sight of one another'***, then Rules 11 to 18 of section II automatically become applicable.

The use of radar has been explained with Rules 5 and 6. Not using or not properly using the radar, especially in ***'restricted visibility'***, goes against all norms. Any vessel irrespective of her type, if fitted with radars as required by SOLAS, should use them as stated in the watchkeeping requirements of STCW Code A-VIII/2 and these Rules. The former have been quoted as necessary, especially Paragraph 45.4 at the beginning of the explanations of this Rule.

'A vessel which detects by radar alone the presence of another vessel' in the prevailing conditions of restricted visibility should immediately act to ***'determine if a close-quarters situation is developing and/or risk of collision exists'*** with this detected vessel. This is also a requirement by Rule 5 on ***'look-out'*** but elaborated in Rule 7 on ***'risk of collision'***. Paragraph 'b' of the latter Rule explicitly states ***'proper use shall be made of radar equipment if fitted and operational, including long-range scanning to obtain early warning of risk of collision and radar plotting or equivalent systematic observation of detected objects'***.

The next two words of this Rule ***'if so'*** are extremely important in the understanding and practical application of this paragraph. ***'If so'*** is to do with the conclusion of the analysis for determining whether ***'a close-quarters situation is developing and/or risk of collision exists'*** with ***'another vessel'***. ***'If so'*** means that the answer to the analysis is **'YES'**, then the Rule requires ***'she shall take avoiding action in ample time'***. It is implied that if the answer of this determination is 'NO', or in other words there is no developing ***'close-quarters and/or risk of collision'*** with ***'another vessel'*** then there is also no need to take ***'any action to avoid collision'***, assuming that the vessels will pass at a comfortable ***'safe distance'***, this being the normal application of these Rules.

'A vessel' means any vessel in the area and ***'another vessel'*** is one whose presence has been detected by the former. ***'By ordinary practice of seamen'***, it can be reasonably expected that both vessels should be able to detect each other by radar as are in vicinity of each other, and determine if a ***'close-quarters situation is developing and/or risk of collision exists'*** between them. ***'She'*** in ***'she shall take avoiding action in ample time'*** means both the vessels concerned, ***'a vessel'*** and ***'another vessel'***. This clearly means that both vessels ***'shall take avoiding action in ample time'***.

'Ample time' is a repetition from Rule 8(a), which is applicable ***'in any condition of visibility'***. It has been used to highlight its importance and of taking ***'early and substantial action'*** in ***'restricted visibility'***.

With Rule 19 in force, Rules 16 & 17 on ***'stand-on vessel'*** and ***'give-way vessel'*** are not applicable. The two latter Rules only ***'apply to vessels in sight of one another'***.

This Rule does not directly state any preferred ***'action to avoid collision'***, leaving it for navigators to decide the same, be it an ***'alteration of course and/or speed'*** or any combination thereof. The benefits of changing course have been explained with Rule 8(c). An increase of speed may go against ***'safe speed'*** concepts and also may not be ***'readily apparent to another vessel'***.

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All requirements of Rule 8 apply in the application of this Rule 19. Rule 8(b) requirement, ***'any alteration of course and/or speed to avoid collision shall, if the circumstances of the case admit, be large enough to be readily apparent to another vessel observing visually or by radar'***, has a very large influence on the way ***'any action to avoid collision'*** is practically implemented, even in ***'restricted visibility'***. This recommendation of Rule 8(b) coupled with Rule 8(c), ***'if there is sufficient sea room, alteration of course alone may be the most effective action to avoid a close-quarters situation provided that it is made in good time, is substantial, and does not result in another close-quarters situation'***, suggests that ***'alteration of course'*** should be the first choice provided ***'there is sufficient sea room'***. Changing course is also considered a superior action from ship handling principles as is fast, requires little sea room, usually is ***'readily apparent'*** if ***'substantial'*** and can be executed rapidly, as explained earlier and in basic ship handling chapter.

It is important that if an ***'alteration of course'*** has been initiated, a vessels speed should not be reduced simultaneously. On the contrary, increasing propulsion power during the duration of the turn will be helpful to achieve a faster and a shorter turn to move away from harm's way. (Refer explanations with Rule 8(c) and the chapter on basic ship handling.)

[TASK: REFER TO THE EXPLANATIONS GIVEN WITH RULE 8(B) ON *'READILY APPARENT TO THE OTHER VESSEL']*.

It should be verified that Rule 8(d) requirement that ***'action taken to avoid collision with another vessel shall be such as to result in passing at a safe distance. The effectiveness of the action shall be carefully checked until the other vessel is finally past and clear'***, is being complied with.

Rule 7(b) requirements remain applicable ***'in or near an area of restricted visibility'*** to vessels ***'not in sight of one another'***. If development of ***'a close-quarters situation' - 'and/ or risk of collision'*** had been confirmed by radar alone, it should normally be at sufficiently long-range and applicable ***'action to avoid collision'*** initiated in ***'good time'***. Rule 8(a) on ***'ample time'*** and ***'observance of good seamanship'***, coupled with the repetition of ***'ample time'*** in this paragraph 'd' of Rule 19, all point towards taking early action. Vessels should thus take ***'avoiding action in ample time'***. This means early and effective action much before they reach within the audible range of each other's sound signals, which is dangerous considering the rather low range of sound signals.

Having left the choice of action to the navigators by the clause ***'she shall take avoiding action in ample time'*** as explained above, this paragraph further states, ***'provided that when such action consists of an alteration of course'***. If navigators opt for ***'an alteration of course'***, which anyway should be the first preferred action for reasons explained earlier, this Rule restricts certain actions. The Rule does not say what should be done, but just states, ***'so far as possible the following shall be avoided:***

(i) ***an alteration of course to port for a vessel forward of the beam, other than for a vessel being overtaken;***

(ii) ***an alteration of course towards a vessel abeam or abaft the beam.***

The ***'beam'*** or ***'abeam'*** direction is the 90° relative direction to the port and starboard of right ahead or the fore-and-aft centreline of a vessel as explained with Rule 7.

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[TASK: REFER TO THE DESCRIPTION ON VARIOUS WAYS TO MEASURE RELATIVE BEARINGS EXPLAINED WITH RULE 7(D).]

While advising the navigators ***'so far as possible the following shall be avoided'*** the Rule remains silent in directly giving any advice on the preferred ***'action to avoid collision'***. Maybe it is to do with the legality affecting the use of the language in the Rules, but the acceptable interpretation of these clauses is; action shall be taken, should take into account the existing circumstances, conditions, and not be contrary to the advice given in this Rule.

> ***'So far as possible'*** is typical of the many escape clauses used in these Rules and is to take care of situations where the preferred action may not be possible. For example, in the event of other traffic, shallow water or shoals, the latter collectively referred to as **'no go areas'**. However, unless the circumstances and conditions do not permit, navigators should take ***'action to avoid collision'*** keeping in mind actions to ***'be avoided'*** as well as the requirements stated or implied in Rules 8 and 2.

d-i: If a vessel analyses, by the use of radar alone, that a ***'close-quarters situation is developing and/or risk of collision exists'*** with another vessel forward of her beam ***'she shall take avoiding action in ample time'***. If the navigators exercise the option ***'provided that when such action consists of an alteration of course'*** - ***'so far as possible the following shall be avoided'***. That is ***'an alteration of course to port for a vessel forward of the beam, other than for a vessel being overtaken'.***

The best action then is that this vessel should alter her course to starboard, ***'to avoid collision'*** complying with the requirements of Rule 8.

However, ***'other than for a vessel being overtaken'*** gives an exception to the above. If the vessel forward of the beam is ***'being overtaken'***, then the restriction of avoiding ***'an alteration of course to port for a vessel forward of the beam'*** does not apply. This is provided a vessel ***'overtaking'*** is approaching from a relative direction more than 22.5° abaft the beam of the vessel forward; she may then either alter her course to port or to starboard. Do note that there is a fair amount of similarity here with Rule 13; the ***'vessel overtaking'*** has freedom to decide her action. The responsibility of determining the relative direction of approach or aspect would be on the vessel that has the other forward of her beam.

Courts have held that since this Rule does not define overtaking, the definition given in Rule 13 shall prevail, even though Rule 13 is not directly applicable in ***'restricted visibility'*** conditions when Rule 19 from section III alone applies. If a vessel is approaching another from a relative direction more than 22.5° abaft the beam of the one ahead, she is deemed to be ***'overtaking'***. This is explained with diagrams later.

d-ii: Avoid ***'an alteration of course towards a vessel abeam or abaft the beam'*** is simple and straightforward. The explanation of ***'shall be avoided'*** is the same as mentioned above for Rule 19(d)(i) and implies that the vessel taking ***'action to avoid collision'*** should alter away from the other vessel. The best ***'action to avoid collision'*** would be as follows: if the other vessel is on the port beam or abaft the port beam, alter course to starboard and if the other is on the starboard beam or abaft the starboard beam, alter course to port.

Both vessels are required to take ***'action to avoid collision'***. If an ***'alteration of course'*** is the action

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chosen, it depends on where the vessels are relatively located with respect to each other.

1: Forward of the beam;
or
2: Abeam or abaft the beam.

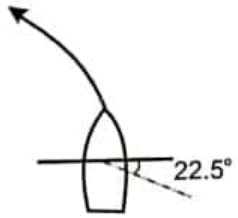
If risk of collision is with a vessel forward of the beam, then the one approaching should determine her relative position - less than or more than 22.5° abaft the beam of the one forward - to determine if she is overtaking or not.

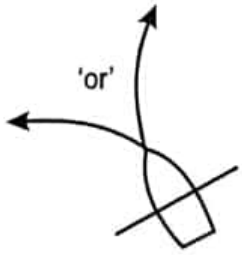
A



Both vessels have each other forward of their beam; each alters her course to starboard, Rule 19(d)(i)

B





The one overtaking has a choice of altering her course to port or starboard by Rule 19(d)(I). The one forward can only alters to port by Rule 19(d)(ii)

In the above diagram 'A' the situation looks like ***'crossing'***, this analysis would be correct if both the vessels are ***'power-driven'*** and ***'in sight of one another'*** considering their relative positions shown, but not in ***'restricted visibility'***. The type of vessels has not been stated to highlight the fact that Rule 19 applies to all vessels irrespective of their type.

Use of manoeuvring sound signals stated in Rule 34(a) are not applicable ***'in or near an area of restricted visibility'***.

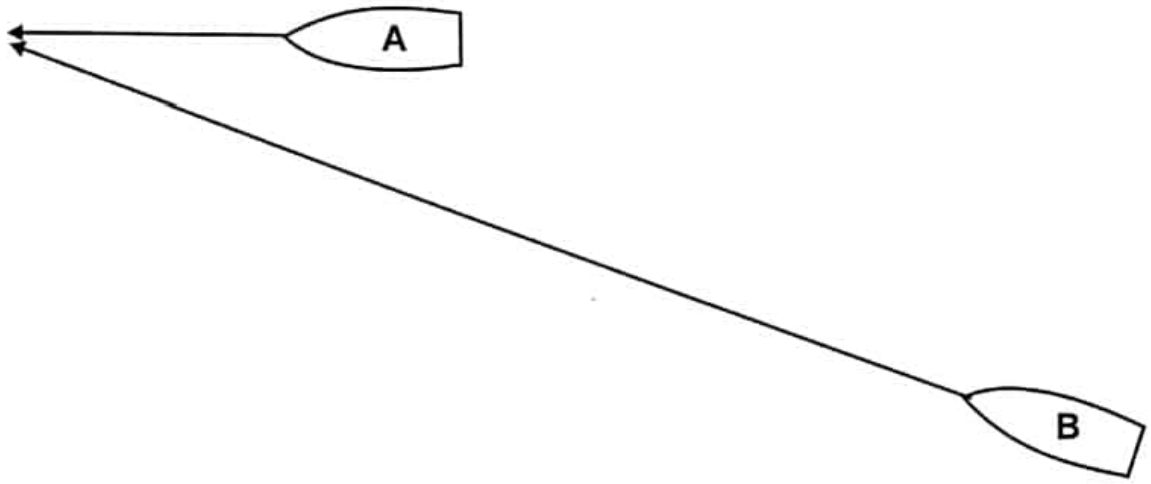
Rule 8(c) states, ***'if there is sufficient sea room, alteration of course alone may be the most effective action to avoid a close-quarters situation';*** this requirement continues to apply in ***'restricted visibility'*** and remains the preferred action if circumstances so allow. However, ***'alteration of speed'*** as an ***'action to avoid collision'*** is very much a valid and legally correct option at all times including in ***'restricted visibility'***. If opted for, changes in speed should be ***'large enough to be readily apparent to another vessel observing visually or by radar; a succession of small alterations of course and or speed should be avoided'*** as explained. A drastic reduction in speed may be better as will also not go against any ***'safe speed'*** principles.

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SELF TEST QUIZ IN RESTRICTED VISIBILITY:

Shown below are two vessels navigating in restricted visibility, not in sight of one another, proceeding at safe speed, engines (or propulsion machinery) ready for immediate manoeuvre, range around 8 miles or more and sound signals required in restricted visibility (Rule 35) in operation. There is ample navigable sea room, no navigational dangers and no other traffic in the vicinity. ***'Risk of collision'*** has been established by the use of radar alone. At this range, the vessels cannot hear each other's sound signals.

What do you think should be the very best ***'action to avoid collision'*** by these vessels in full compliance with these Rules? Mark the best choice's in the box given below. Subsequently compare with the explanation given later. You may mark more than one option but do clarify the same with remarks. 'A' is heading 270° and 'B' is heading 295°, compass bearing between 'A' and 'B' steady at 120° – 300° as observed on the radar(s).



QUIZ ANSWER BOX

BY 'A'	*BEST ACTION TO TAKE*	*BY 'B'*
	1: Maintain or keep her course and speed.	
	2: Make a large course alteration to port.	
	3: Make a large course alteration to starboard.	
	4: Reduce speed slowly by reducing the propulsion power.	
	5: Reduce speed rapidly by going to minimum propulsion speed or stopping propulsion.	
	6: Reduce speed by reversing the propulsion to maximum power.	
	7: Increase speed by increasing the propulsion power to maximum.	
	8: Sound one short blast on her whistle signal to indicate a course alteration to starboard.	
	9: Sound two short blasts on her whistle signal to indicate a course alteration to port.	
	10: Sound three short blasts on her whistle signal to indicate astern propulsion.	

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EXPLANATION OF THE SELF TEST QUIZ:

Please read these explanations only after marking your answers in the quiz answer box.

In this case both subparagraphs 'i' and 'ii' of Rule 19(d) apply. The ***'as far as possible'*** escape clause will not be applicable as no restrictions of any kind exist in the situation shown.

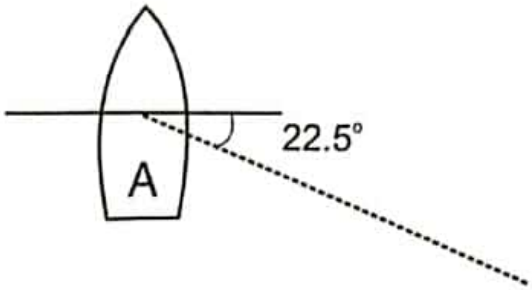
'B' is abaft the port beam of 'A', and 'A' shall not alter towards a vessel abeam or abaft the beam; 'A' should thus alter her course to starboard. 'A' is forward of the beam of 'B', 'B' shall not alter course to port for a vessel forward of her beam, however, since 'A' is being overtaken by 'B' which is approaching from more than 22.5° abaft the beam of 'A', 'B' has the freedom to alter her course to port or starboard. Since 'A' will alter her course to starboard, 'B' should logically opt to alter her course to port, both altering over 40 ***'to be readily apparent'***.

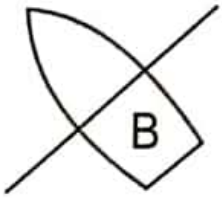
In the circumstances of this case, a reduction or an increase of speed is not required. A large alteration of course alone will fulfil all requirements and comply with the requirements of Rule 8.

However, if at all one of the vessels decides to reduce speed it should be 'B', as she is overtaking and abaft of 'A'. 'B' may reduce speed, allow 'A' to pass clear, and once 'A' is clear 'B' may increase her speed. On the other hand, if 'A' reduces speed, this will increase the rate of decrease of range between the vessels and a faster development of ***'a close-quarters/risk of collision'*** situation. This obviously would be an absurd choice as is likely to aggravate the situation. Action by 'B' does not absolve 'A' from taking action.

Basis above, best action by vessel 'A' would be action no. '3'. And, the choice of actions available to 'B' will be action no. '2' or '3' or '5'. Since 'A' should alter her course to starboard, prudent actions by 'B' should be '2' or '5'.

[SELF TEST QUIZ: VESSELS 'A' AND 'B' HAVE RISK OF COLLISION IN RESTRICTED VISIBILITY AS SHOWN BELOW. ASSUMING THEY ARE AT MEDIUM TO LARGE RANGE, NOT INSIGHT OF ONE ANOTHER AND ARE ACTING BY RADAR ALONE. WHAT IS THE BEST ACTION EACH OF THEM SHOULD TAKE TO AVOID COLLISION?]





Please see the answer at the end of the explanation of this Rule.

e: Starts with ***'except where it has been determined that a risk of collision does not exist'***. Determining ***'that a risk of collision does not exist'*** is the first step and should start when vessels are at sufficiently long range as required by both Rules 5 and 7 on ***'look-out'*** and ***'risk of collision'*** respectively. In ***'restricted visibility'***, since visual determination is not possible and the audible range of sound signals has a very limited range apart from the various inaccuracies associated with them, the best way to ***'determine if a close-quarters situation is developing and/or risk of collision exists'*** would be by the use of radar as implied by Rules 5 and 6 and clearly required by Rules 7, 19(d) and the watchkeeping requirements stated in STCW Code A-VIII/2.

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Radar remains the primary and perhaps the only reliable means for detecting and assessing the movements of other vessels in the vicinity. However, use of AIS, VHF and ECDIS systems can all be considered under ***'all available means'*** and used to determine ***'risk of collision'***. If the assessment by any of these creates ***'any doubt'***, then ***'such risk shall be deemed to exist'*** as per Rule 7(a). However, caution must be exercised, as explained earlier, that information from such equipment may not be fully reliable and may lead to misleading or wrong conclusions. Be reminded of Rule 7(c), ***'assumptions shall not be made on the basis of scanty information, especially scanty radar information'***. Determination of ***'risk of collision'*** by sound signals alone is a near impossible task, this is explained next. At times, shore based VTS/VTIS systems may also be available, but any advice given by them can at best be regarded as recommendatory and does not absolve the navigators on board vessels of their responsibilities towards safe navigation and ***'preventing collisions'***

[TASK: PLEASE READ ANNEX III, ESPECIALLY PARAGRAPH 1-C REGARDING THE AUDIBILITY RANGE AND THE EXPLANATORY COMMENTS.]

If a vessel has reached a situation that she ***'hears apparently forward of her beam the fog signal of another vessel'*** it clearly indicates that the distance separating them is low and a high probability that ***'a close-quarters situation is developing and/or risk of collision exists'***. Audible range of the sound signals being low justifies this approach of this Rule. Reaching such a situation also clearly implies that determination of ***'risk of collision'***, as well as early and effective ***'action to avoid collision'***, has perhaps not been done in compliance with the various Rules that have been explained before. Requirements of this Rule serve as a last line of defence to ***'avoid collision'***.

This paragraph states two conditions:

1: ***'Every vessel which hears apparently forward of her beam the fog signal of another vessel'***
and
2: ***'Or which cannot avoid a close-quarters situation with another vessel forward of her beam'***.

If either of these situations develop, they both indicate that ***'a close-quarters situation is developing'***, though it is clearly stated in the Rule only for the latter situation implied for the former. In both cases, the vessel concerned must take ***'action to avoid collision'*** - ***'except where it has been determined that a risk of collision does not exist'***. The first condition is self-explanatory, too close for comfort and the latter means a confirmed ***'close-quarters situation with another vessel forward of her beam'***, determined by any means.

The means to ***'determine that a risk of collision does not exist'*** are not addressed in this Rule and need not be, as they are covered in Rules 5 and 7, which continue to apply in all conditions of visibility. Paragraph 'd' of this Rule also requires this determination, ***'a vessel which detects by radar alone the presence of another vessel shall determine if a close-quarters situation is developing and/or risk of collision exists'***.

In both the conditions, which may occur independently or in conjunction with each other, the vessel concerned ***'shall reduce her speed to the minimum at which she can be kept on her course. She shall if necessary take all her way off and in any event navigate with extreme caution until danger of collision is over'***. The first action required is for a vessel to reduce her speed to bare minimum to maintain steering on her course. The minimum speed at which a vessel can be steered to maintain her course may vary from vessel to vessel, this could be as near as zero, dead stop in water,

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or very close to zero. Even if a vessel is stopped or drifting with her propulsion power at nil, she can still be maintained on her course or heading using rudder and slight propulsion (engine) movements. If a vessel is fitted with one, use of her bow and/or stern thrusters can also be used to keep her on her course. A vessel should carry out the reduction of speed by reducing, stopping or even reversing her propulsion power, this should be achieved as quickly as possible in compliance with the general principles of Rule 8.

After reducing speed to ***'the minimum'***, the next clause, ***'if necessary take all her way off'***, gives a bit of operating freedom to the navigators on board as far as this action to bring the vessel to dead stop is concerned.

This Rule gives no further guidance on ***'any action to avoid'*** the situations. All that the Rule states is, ***'in any event navigate with extreme caution until danger of collision is over'***. Since the expected action is neither prescribed nor implied, it makes the job of the navigators difficult after the initial action to reduce speed to ***'the minimum'*** has been implemented. If further action is required, it should then be as per the guidelines of Rule 2.

Other than sound signals prescribed by Rule 35, no other sound signals should be sounded ***'in or near an area of restricted visibility'***. ***'Manoeuvring and warning signals'*** stated in Rule 34 are required only when ***'vessels are in sight of one another'***. These, if sounded along with those stated in Rule 35, would only lead to confusion and absolute chaos.

Fog, mist, haze, rain and smoke patches or other factors that restrict visibility may not have a uniform linear density. Sound waves behave similar to light waves and are subject to both refraction and reflection when passing through these non-uniform mediums and may change direction in the process. To add to this, physical limitations of the human body also affect the analysis made from sound signals. By design, human ear and connected sensory systems have limitations in being able to accurately determine the exact direction sound signals are being received from, leave alone the range. These factors influence the way this paragraph of this Rule is to be interpreted and practically implemented, especially the clause ***'every vessel which hears apparently forward of her beam the fog signal of another vessel'***. ***'Apparently'*** implies reduced accuracy in determining the direction of the sound signals. ***'Apparently forward of her beam'*** may not be actually forward of the beam; in reality the sound signal may be originating from any direction, even abaft the beam for reasons explained above. Refer to the audible range of sound signals explained with paragraph 'a' of this Rule.

[TASK: READ INTRODUCTION TO PART- D 'SOUND AND LIGHT SIGNALS'.]

Answer to the second self test quiz

Vessel A alters course to port, Rule 19- d-ii. Vessel B alters course to starboard, Rule 19-d-i, she is not overtaking.

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PART C - LIGHTS AND SHAPES

INTRODUCTION:

Earlier vessels did not exhibit any lights, leading to many collisions at nights. Using lights to show a vessel's presence ***'for preventing collisions'*** started by using oil lanterns showing an all round light. Use of lights and shapes has evolved slowly like these Rules; shapes were added much later. Lights are a critical component during darkness when a vessel's hull form cannot be seen.

These ***'International Regulations for Preventing Collisions at Sea'*** are so framed that navigators should be able to judge and determine by sight alone, if not in restricted visibility, be it day or night, the type of vessel sighted, its aspect and/or likely direction of movement to ***'determine if risk of collision exists'*** and take ***'action to avoid collision'***, if so required. Exhibition of lights by vessels greatly assists in determining the type of vessel and the arc of the direction of her heading (or movement) during darkness.

Lights have visible sectors, both vertical and horizontal. The horizontal sectors are of prime importance and are referred to in directions relative to the vessel they are fitted on, measuring from right ahead, abeam or right astern of the vessel. The various methods to measure and/or report the relative directions have been explained earlier with Rule 7(d)(i).

Numerous permutations and combinations of lights can be formed from the requirements stated in these Rules and sometimes one particular light or a combination of lights may even depict more than one situation. It is not intended to give an exhaustive explanation of all the many possibilities that may be formed by use of the lights prescribed in these Rules. The requirements have been explained so that with the knowledge and understanding gained, lights and/or shapes displayed by vessels can be analysed and interpreted correctly. The shapes used as day signals are relatively fewer and easier to understand, but usually more difficult to sight visually.

Lights and shapes form an important part of these Rules and do take some time to understand and learn. However, with some practice and exercises the requirements can be well mastered, which is essential and important for the ultimate goal of ***'preventing collisions'***.

Several internet sites have self-learning videos and animations to learn the various possibilities of lights; one of them is http://www.deck-officer.info/rorsimulator.htm. You may try these sites after learning the requirements about lights to test your knowledge.

Lights required to be exhibited by these Rules are commonly referred to as ***'navigational lights'*** and sometimes also as 'steaming lights'; the former term has been officially used in IMO publications like the STCW Convention.

Visibility aspects and cut off sectors of the various navigational nights should meet the requirements stated in Rules 21, 22 and 23 of this Part C, but also Rule 34(b), all coupled with annex I and II of these Rules, though annex II only applies to fishing vessels fishing in close proximity. Annex to IMO resolution MSC.253(83), adopted on 8th October 2007 on performance standards for navigation lights, navigation light controllers and associated equipment provides further guidance, clarifications and recommends that all such equipment installed on or after 1st January 2009 is not to be inferior than these new standards. A few of the requirements from this annex are quoted further. MSC.1/Circ. 1427 of 28 May 2012 further clarifies the intensity of side lights in the forward direction and vertical sectors of electric lights

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This annex states that the purpose of ***'Navigation Lights'*** is to identify ships and for them to notify their intentions at sea while the purpose of Navigation Light Controllers is to provide means of control and monitoring of the status of navigation lights onboard the vessel to the Officer of the Watch (OOW). These lights are defined in this resolution as:

3.5 Navigation Light (NL) means the following lights:

.1 masthead light, sidelights, sternlight, towing light, all-round light, flashing light as defined in Rule 21 of COLREGs;

.2 all-round flashing yellow light required for air-cushion vessels by Rule 23 of COLREGs; and

.3 manoeuvring light required by Rule 34(b) of COLREGs.

Further under paragraph 4.1 it is stated that:

4.1.1 NLs should appear steady and non-flashing.

4.1.3 A masthead light, sidelights and a sternlight installed on board a ship not less than 50 m in length should be duplicated or be fitted with duplicate lamps.

The luminous intensity requirements are clarified in paragraph 4.2 as follows:

4.2.1 In the horizontal directions where decrease of luminous intensity to "practical cut-off" is required by section 9 of Annex I to COLREGs, the luminous intensity should be no more than 10% of the average luminous intensity within the prescribed sector for vessels not less than 12 m in length.

4.2.2 Within the prescribed sector in which the minimum luminous intensity is required by section 9 of Annex I to COLREGs, the horizontal intensity distribution of the light should be uniform in such a way that the measured minimum and maximum luminous intensity values (in candelas) do not differ by more than a factor of 1.5, to avoid luminous intensity changes which may result in the appearance of a flashing light for vessels not less than 12 m in length.

4.2.3 Within the prescribed sector in which the minimum luminous intensity is required by section 10 of Annex I to COLREGs, the vertical intensity distribution of the light should be uniform in such a way that the measured minimum and maximum luminous intensity values (in candelas) do not differ by more than a factor of 1.5, to avoid luminous intensity changes which may result in the appearance of a flashing light for vessels not less than 12 m in length.

[TASK: READ THE FULL ANNEX 31 OF IMO RESOLUTION MSC.253(83).

QUIZ: WHAT DOES THIS ANNEX SAY ON 'SPECIAL REQUIREMENTS FOR LIGHTS USING LEDs'?]

Normally all vessels are fitted with two sets of lights, and sometimes even additional portable lights or lanterns are provided, powered by batteries or electric mains including emergency power, for some of the lights. Oil lanterns for emergency use may still be found on some vessels. However, any failure of a navigational light should be rectified as soon as possible and may even warrant transmitting a navigational warning to other vessels in the vicinity.

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Rule 20

Application

(a) **Rules in this part shall be complied with in all weathers.**

(b) **The Rules concerning lights shall be complied with from sunset to sunrise, and during such times no other lights shall be exhibited, except such lights as cannot be mistaken for the lights specified in these Rules or do not impair their visibility or distinctive character, or interfere with the keeping of a proper look-out.**

(c) **The lights prescribed by these Rules shall, if carried, also be exhibited from sunrise to sunset in restricted visibility and may be exhibited in all other circumstances when it is deemed necessary.**

(d) **The Rules concerning shapes shall be complied with by day.**

(e) **The lights and shapes specified in these Rules shall comply with the provisions of annex I to these Regulations.**

a: This paragraph is self explanatory: requirements in the Rules of this part C, ***'lights and shapes'***, shall be complied in all kinds of weathers, calm seas or storms, skies open or overcast. Visibility, a component of weather, has been addressed later in paragraph 'c' of this Rule.

All vessels are required to exhibit the ***'lights'*** and/or ***'shapes'*** prescribed for their size and type; a vessel without lights cannot be seen visually or identified during darkness. The display of lights is very important, because some vessels may not show on the radar as explained earlier, and not all are required to carry an AIS device.

b: Requires that Rules ***'concerning lights shall be complied with from sunset to sunrise'***; this also includes twilight, i.e. the gradual transition from light to dark and back again.

Important requirements stated here are:

1: When lights required by these Rules are displayed, ***'during such times no other lights shall be exhibited'***. However, if any others are exhibited, they shall be such that ***'cannot be mistaken for the lights specified in these Rules'***. In other words, their characteristics should not be similar or close to any of the lights required by these Rules.

And,

2: If any other lights are exhibited, they shall neither ***'interfere'*** with the lights required by these Rules nor ***'impair their visibility or distinctive character'***. In addition, they shall not ***'interfere with the keeping of a proper look-out'***. Visual ***'look-out'*** is vital and the most important element in navigational watchkeeping, as has been explained and emphasised earlier.

[QUIZ: WHICH RULE IS ON 'LOOK-OUT'? DO YOU REMEMBER THE SALIENT POINTS OF MAINTAINING A GOOD 'LOOK-OUT' BY THIS RULE AND ALL THE REQUIREMENTS STATED IN THE STCW CONVENTION CODE A-VIII/2 ON LOOKOUT?]

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A good practice on board a vessel is to ensure that all accommodation windows and any which may be visible from outside are blocked so that only the lights required to be exhibited by these Rules can be seen from outside.

c: Requires that apart from the minimum display required ***'from sunset to sunrise'***, ***'the lights prescribed by these rules shall' - 'also be exhibited from sunrise and sunset'*** when ***'in restricted visibility'*** and also ***'may be exhibited in all other circumstances when it is deemed necessary'***. If the navigators feel that, it will be prudent to display ***'the lights prescribed by these rules'*** at times other than the prescribed minimum, they may do so. This option is nothing but ***'ordinary practice of seamanship'***. For example, the visibility is not good but is not low enough to be described as restricted.

Requirements of Rule 19 apply even ***'near an area of restricted visibility'*** and paragraph 45 of STCW Code A-VIII/2 states ***'exhibit navigational lights' - 'when restricted visibility is encountered or expected'***: these requirements must be complied with.

> Though not required by the Rules, many vessels keep the navigation lights on during the day; nothing in these Rules prohibits a vessel from doing so. However, remember to switch them off when ***'made fast to the shore'*** or alongside. There have been cases of vessels being fined when alongside a berth if navigational lights are left on and/or the vessel status not changed in the AIS.

'If carried' is an escape clause for vessels which may not be equipped to display the lights required by these Rules. For example, a vessel designed for daylight operations only. Alternatively, it could be that a vessel carrying out an activity in an emergency is not equipped or capable to display the lights required for the said activity.

d: Requires that shapes, as prescribed by these Rules, shall be ***'complied with by day'*** or during daylight, which includes twilight time also. It would be prudent and following ***'ordinary practice of seamen'*** to display both ***'lights and shapes'*** during twilight.

e: Requires ***'lights and shapes specified in these Rules shall comply with the provisions of annex I to these Regulations'***. Annex I is about ***'positioning and technical details of lights and shapes'*** and is generally self explanatory. All navigators should read and understand this annex, not just to know the requirements from the design or placement point of view, but also to be able to better judge the ***'lights'*** seen on other vessels.

The minimum intensity of ***'Navigation lights'*** is calculated using the formula stated in Annex I, section 8, which also contains a caution note that ***'the maximum luminous intensity of navigation lights should be limited to avoid undue glare. This shall not be achieved by a variable control of the luminous intensity'***. Compliance with Annex I is required by this paragraph of this Rule.

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Rule 21

Definitions

(a) ***Masthead light*** **means a white light placed over the fore-and-aft centreline of the vessel showing an unbroken light over an arc of the horizon of 225° and so fixed as to show the light from right ahead to 22.5° abaft the beam on either side of the vessel.**

(b) ***Sidelights*** **means a green light on the starboard side and a red light on the port side each showing an unbroken light over an arc of the horizon of 112.5° and so fixed as to show the light from right ahead to 22.5° abaft the beam on its respective side. In a vessel of less than 20 m in length the sidelights may be combined in one lantern carried on the fore-and-aft centreline of the vessel.**

(c) ***Sternlight*** **means a white light placed as nearly as practicable at the stern showing an unbroken light over an arc of the horizon of 135° and so fixed as to show the light 67.5° from right aft on each side of the vessel.**

(d) ***Towing light*** **means a yellow light having the same characteristics as the *sternlight* defined in paragraph (c) of this Rule.**

(e) ***All-round light*** **means a light showing an unbroken light over an arc of the horizon of 360°.**

(f) ***Flashing light*** **means a light flashing at regular intervals at a frequency of 120 flashes or more per minute.**

This Rule lists the lights required to be exhibited by these Rules, their placement and their horizontal sectors. The Rules have not used any general terms for the display of lights: ***'navigation lights'*** is the modern term used by IMO.

The requirements of paragraphs 'a' to 'f' of this Rule are simple and straightforward. However, a few salient aspects are explained below.

It is said that the horizontal sectors for the masthead and sidelights more or less match the field of vision of the human eye. Though the eyes normally focus in a narrow horizontal band of about 15°, they do receive data from up to 200°, which is close to the cut off sectors of these lights.

Paragraph 'b' requires sidelights to be placed on the side of a vessel but also grants a waiver, ***'in a vessel of less than 20 m in length the sidelights may be combined in one lantern carried on the fore-and-aft centreline of the vessel'***. ***'May be'*** allows such small vessels an option to opt for a combined lantern if they so wish; it is not a compulsion.

Lights assist in the practical implementation of these Rules. The determination of situations and the type of vessel during darkness is by analysing the lights exhibited by the vessel concerned. Lights also assist in determining, with a fair degree of accuracy, the limits of the direction of movement of vessels and their relative aspect (bearing) from each other, which is necessary for the correct application of these Rules. Before the advent of radar and other modern aids like AIS, this was the only way to determine these parameters during darkness.

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Some exceptions are allowed in the placement of lights by these Rules. Rule 1(e) allows deviations, but the characteristics of any such deviations should still be ***'as her Government shall have determined to be the closest possible compliance with these Rules'***. Paragraph 'c' of this Rule 21 states that the sternlight should be placed ***'as nearly as practicable at the stern'***, not necessarily exactly on the ***'stern'***. It is usual for the ***'sternlight'*** to be quite some distance from the ***'stern'*** on supply vessels where the aft deck is very low, serving as working area and exposed to the elements. Similarly, the sternlight need not be placed on the fore-and-aft centreline of a vessel. Rule 23(d)(iii) allows masthead lights to be displaced from the ***'fore-and-aft centre line'***, but only ***'on a power-driven vessel of less than 12 m in length'***. A masthead light need not always be placed on a mast, and some vessels may even be exempted from displaying the same in certain conditions, for example, a vessel ***'not under command'*** is not required to exhibit masthead light/s.

White lights appear slightly yellow in reality; as such, use of a single steady yellow lights is absent in these Rules except for the towing light. In this case, the yellow towing light is placed next to a white sternlight: as such, the variance in colour will be distinct and clear. In Annex I paragraph 7, the lights are not specified by colour but by their technical specifications. The visibility range of different colours of lights, even of the same intensity does vary.

An ***'all-round light'*** stated in paragraph 'e' may have broken sectors of up to 6°, except for anchor lights, as allowed by Annex I paragraph 9(b)(i). This is to take care of the practical limitations of placing a single light with 360° horizontal visibility on board a vessel. If one all-round light fails to fulfil the requirements, two all-round lights may be placed close by such that they practically appear as one all-round light from a distance, refer Annex I paragraph 9(b)(ii).

The flashing light requirement of 120 or more flashes per minute would clearly indicate that it is originating from a vessel and not a light from any navigational aid, for example a buoy or a beacon, where the frequency never exceeds 60 flashes per minute.

The requirements of lights should be studied in conjunction with Annex I, where all specifications are given in detail including requirements about the placement of lights, their intensity and vertical and horizontal cut off sectors. It is important to note that lights do not cut off exactly at the end of their prescribed horizontal sectors as stated in this Rule, but continue to show a little beyond, at end close to the cut off limits, both lights are visible over a small horizontal sector. For example, the side lights in the forward direction are required to show from a minimum of 1° to a maximum of 3° outside the prescribed right ahead direction and in the aft ***'22.5° abaft the beam'***, up to a maximum of ***'5° outside the prescribed sectors'***, with diminishing intensity in the latter. Also refer IMO resolution MSC.253(83) mentioned in the introduction to Part C.

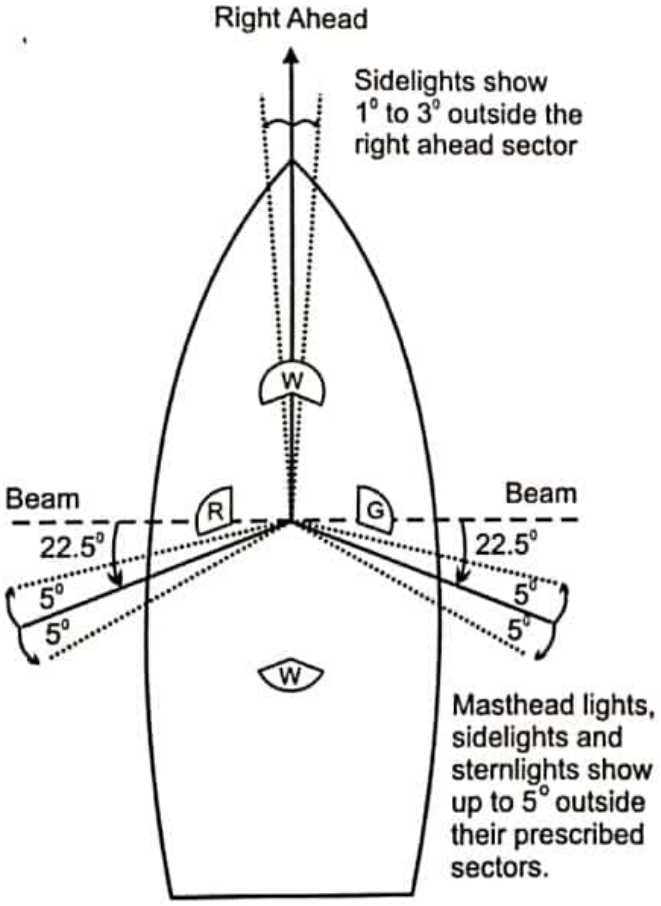
The schematic diagrams which follow show the defined horizontal sectors and the cut off limits of the lights. These match closely with the three main ***'risk of collision'*** situations when vessels are in sight of one another, namely ***'overtaking'***, ***'head-on'*** and ***'crossing'*** defined in Rules 13, 14 and 15 respectively, these apply only ***'to vessels in sight of one another'*** but the latter two only to ***'power-driven vessels'***.

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It will be clear that ***'head-on situation'*** exists only when both vessels can either see both sidelights of each other or are equivalent aspects with the masthead lights ***'in a line or nearly in a line'***, ***'overtaking'*** when only the sternlight is seen and a ***'crossing situation'*** is one which is not covered by the former two. However, since sidelights, masthead lights and the sternlight can show for a maximum of up to 5° outside their defined limits, though at decreasing intensities, the border between crossing and overtaking can sometimes be confusing when judged by lights alone. Rule 13 states ***'when a vessel is in any doubt'***, then the vessel approaching from near about 22.5° abaft the beam of the other ***'shall assume that'*** she is ***'overtaking'*** and keep clear; a similar statement on ***'doubt'*** is there in Rule 14 also, but not in Rule 15.

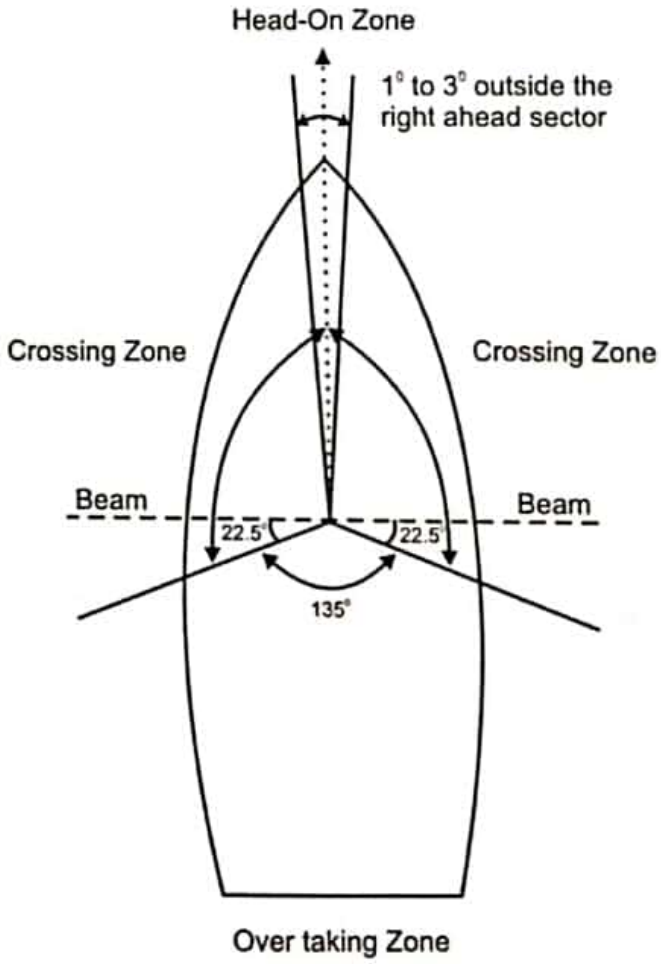
COMPARISON DIAGRAMS

Light Sectors



[TASK: PLEASE COLOUR THE RED AND GREEN SIDELIGHTS IN THE ABOVE DIAGRAMS.]

Usual situation when in sight of one another



NOTE: Head-on situation exists when both power-driven vessels can see both sidelights of each other or are in a corresponding aspect, refer Rule 14(b) ***'and/or both sidelights'***

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Rule 22

Visibility of lights

The lights prescribed in these Rules shall have an intensity as specified in section 8 of annex I to these Regulations so as to be visible at the following minimum ranges:

(a) In vessels of 50 m or more in length:

- **a masthead light, 6 miles;**
- **a sidelight, 3 miles;**
- **a sternlight, 3 miles;**
- **a towing light, 3 miles;**
- **a white, red, green or yellow all-round light, 3 miles.**

(b) In vessels of 12 m or more in length but less than 50 m in length:

- **a masthead light, 5 miles; except that where the length of the vessel is less than 20 m, 3 miles;**
- **a sidelight, 2 miles;**
- **a sternlight, 2 miles;**
- **a towing light, 2 miles;**
- **a white, red, green or yellow all-round light, 2 miles.**

(c) In vessels of less than 12 m in length:

- **a masthead light, 2 miles;**
- **a sidelight, 1 mile;**
- **a sternlight, 2 miles;**
- **a towing light, 2 miles;**
- **a white, red, green or yellow all-round light, 2 miles.**

(d) In inconspicuous, partly submerged vessels or objects being towed:

- **a white all-round light, 3 miles.**

This rule is self-explanatory and requires that ***'the lights prescribed in these Rules shall have an intensity as specified in section 8 of annex I'***. Annex I contains guidelines on calculating the luminous intensity of lights, which incorporates the range of visibility required by this Rule and the atmospheric transmissivity or meteorological visibility of 13 nautical miles, which has apparently been considered as reasonably good visibility.

The requirements of this Rule apply to all vessels.

The actual range at which a light is sighted may be higher or lower than prescribed in this Rule depending on the prevailing visibility. Lights would have a better range say in a clear dark night in the middle of an ocean than in a smoggy environment near a big city at night.

The lights should not have their intensity higher than prescribed to avoid unwanted glare; this has been explained with Rule 20.

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Rule 23

Power-driven vessels underway

(a) A power-driven vessel underway shall exhibit:

(i) a masthead light forward;

(ii) a second masthead light abaft of and higher than the forward one; except that a vessel of less than 50 m in length shall not be obliged to exhibit such light but may do so;

(iii) sidelights;

(iv) a sternlight.

(b) An air-cushion vessel when operating in the non-displacement mode shall, in addition to the lights prescribed in paragraph (a) of this Rule, exhibit an all-round flashing yellow light.

(c) A WIG craft only when taking off, landing and in flight near the surface shall, in addition to the lights prescribed in paragraph (a) of this Rule, exhibit a high-intensity all-round flashing red light.

(d) (i) A power-driven vessel of less than 12 m in length may in lieu of the lights prescribed in paragraph (a) of this Rule exhibit an all-round white light and sidelights;

(ii) a power-driven vessel of less than 7 m in length whose maximum speed does not exceed 7 knots may in lieu of the lights prescribed in paragraph (a) of this Rule exhibit an all-round white light and shall, if practicable, also exhibit sidelights;

(iii) the masthead light or all-round white light on a power-driven vessel of less than 12 m in length may be displaced from the fore-and-aft centreline of the vessel if centreline fitting is not practicable, provided that the sidelights are combined in one lantern which shall be carried on the fore-and-aft centreline of the vessel or located as nearly as practicable in the same fore-and-aft line as the masthead light or the all-round white light.

The requirement that vessels shall exhibit lights, usually referred to as ***'navigation lights'***, starts with this Rule which prescribes the lights applicable to ***'a power-driven vessel underway'***. Power-driven fishing vessels, when not ***'engaged in fishing'*** or tugs when assisting a vessel but not actually towing also need to comply with the requirements of this Rule, as in these situations they would be ***'a power-driven vessel underway'***. ***'A power-driven vessel'*** stopped and drifting is also ***'underway'*** and is required to comply with this Rule unless it is ***'through some exceptional circumstance'***. Details on positioning and other technical aspects of lights are prescribed in Annex I; It is important to study and understand these details.

The requirements of this Rule are generally very straight forward; however, some salient features are explained.

a: ***'A power-driven vessel'*** of less than 50 m in length is not required to exhibit ***'a second masthead light'***, ***'but may do so'***. Hence, ***'a power-driven vessel'*** exhibiting one masthead light is surely less than 50 m in length, but one exhibiting two masthead lights may also be less than 50 m in length.

'A power-driven vessel' of less than 50 m in length which opts not to exhibit ***'a second masthead light'***, should place the single masthead light in the forward position as required by subparagraph 'i' of

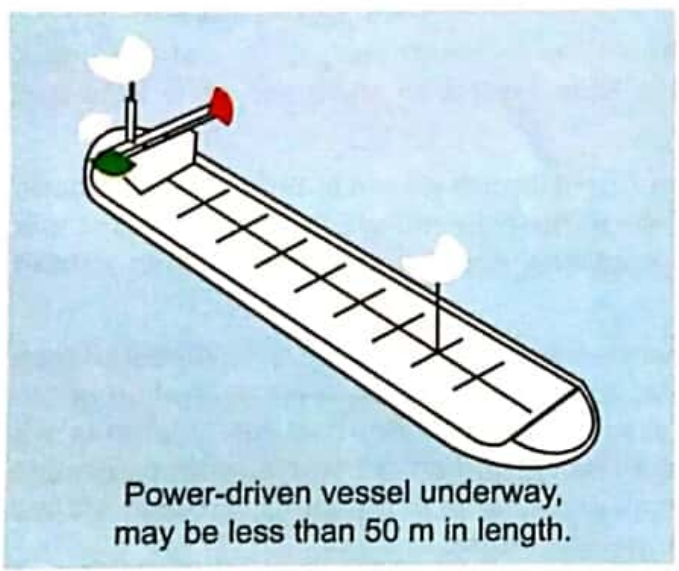
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this Rule. However, this single light need not comply with the horizontal placing prescribed in Annex I (3)(a) ***'when two masthead lights are prescribed'***, but should be in compliance with Annex I (3)(d) requirements on ***'only one masthead light'***.

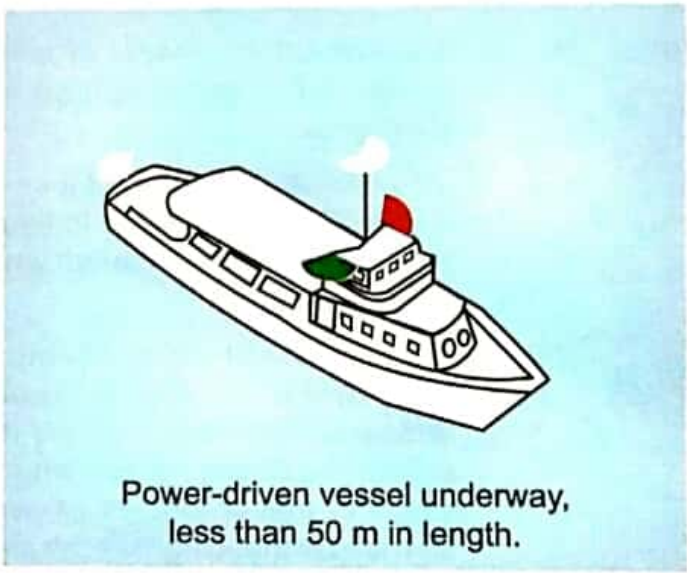
[TASK: READ THE REQUIREMENTS IN SECTIONS 2 AND 3 OF ANNEX I ON VERTICAL AND HORIZONTAL POSITIONING AND SPACING OF LIGHTS.]

The next Rule 24 prescribes ***'two masthead lights'*** in a vertical line for ***'a power-driven vessel when towing'*** or ***'pushing ahead or towing alongside'***, but these have to be placed in a vertical line. Sighting two masthead lights from right ahead may thus indicate more than one type of a vessel. Confusion can arise when the two masthead lights are seen from a right ahead direction of a vessel they are displayed on. When seen from any other angle, the second masthead light will appear horizontally displaced on ***'a power-driven vessel'*** but both would continue to remain together vertically if the vessel is ***'towing'***, explained later.

The following diagrams show the lights as prescribed by the Rules applicable for the vessel depicted and indicates their visible sectors in the horizontal field.



Power-driven vessel underway, may be less than 50 m in length.

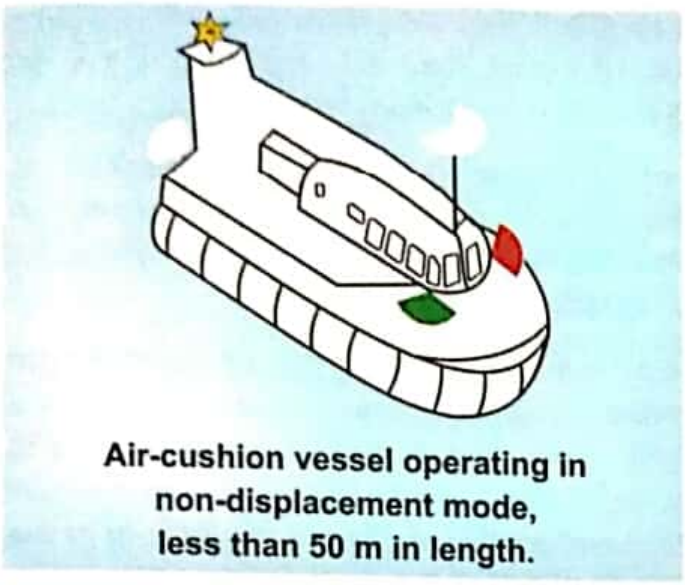


Power-driven vessel underway, less than 50 m in length.

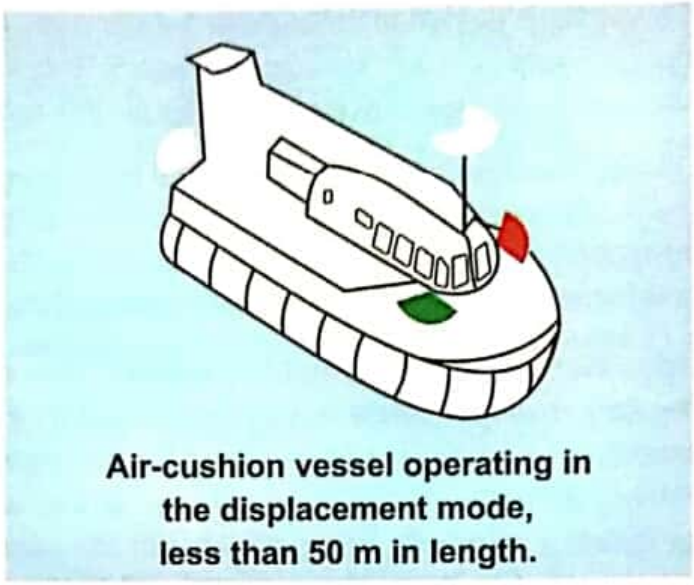
b: ***'An all-round flashing yellow light'*** is to be exhibited only by ***'an air-cushion vessel when operating in the non-displacement mode'***, not otherwise. Such vessels usually move at very high speeds, and because of negligible draught, may have a large drift due to prevailing winds, if any. Hence, their course made good may be quite different than that being steered by them or depicted by their lights; in addition, they also may not be able to turn quickly because of their speed. The flashing yellow light is intended to warn other vessels of these special conditions.

Submarines, when underway on the surface, may display in addition to the normal lights of ***'a power-driven vessel'*** a flashing yellow or amber light for identification purposes but the characteristics of such a light would be different from the one required on ***'an air-cushion vessel'***. Submarines would be least effected by wind as they have very low freeboards and sometimes may suddenly disappear if they dive under the surface. (For special lights recommended for naval vessels, refer Mariners Hand Book, Annual Notices to Mariners and other official publications, like the US Code of Federal Regulations, these requirements are generally common to all naval vessels.)

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Air-cushion vessel operating in non-displacement mode, less than 50 m in length.



Air-cushion vessel operating in the displacement mode, less than 50 m in length.

c: A WIG craft, when operating on the water surface, should follow the Rules applicable to any ***'power-driven vessel'*** as stated in Rule 18(f)(ii) and exhibit lights as prescribed in paragraph 'a' of this Rule.

Rule 18(f)(i) requires WIG craft to ***'keep well clear of all other vessels and avoid impeding their navigation'*** but only ***'when taking off, landing and in flight near the surface'***. At such times this Rule 23(c) requires a WIG craft to ***'exhibit a high-intensity all-round flashing red light'*** in addition to the lights of a ***'power-driven vessel'***.

d: In general allows certain exemptions from the provisions of paragraph 'a' for a small ***'power-driven vessel'*** as specified.

Subparagraph 'i' allows ***'a power-driven vessel of less than 12 m in length'*** the discretion to exhibit a single ***'all-round white light'*** if she is unable to exhibit ***'a masthead light'*** and ***'a sternlight'*** required by paragraph 'a' of this Rule.

Do note that by Rule 21(b) ***'in a vessel of less than 20 m in length the sidelights may be combined in one lantern carried on the fore-and-aft centreline of the vessel'***. This clause applicable to any ***'vessel'*** can be applied with subparagraph 'i', it is optional though provided by the use of ***'may'***.

Subparagraph 'ii' allows ***'a power-driven vessel of less than 7 m in length whose maximum speed does not exceed 7 knots'*** further relaxations. The discretion to exhibit a single ***'all-round white light'*** in lieu of ***'a masthead light'*** and ***'a sternlight'*** required by paragraph 'a' of this Rule is similar to subparagraph 'i'. Here the requirement of exhibiting ***'sidelights'*** has also been given a discretion, ***'shall, if practicable, also exhibit sidelights'***. It is not that she shall not, but if not ***'practicable'***, she may not show sidelights

There have been two differing interpretations of 'maximum' as used in the clause ***'maximum speed does not exceed 7 knots'***.

1: The capability of the vessel, the maximum speed she can achieve by her design is 7 knots; and;
2: The speed of a vessel, when it does not exceed 7 knots, may comply with this Rule, even though she is capable of faster speeds.

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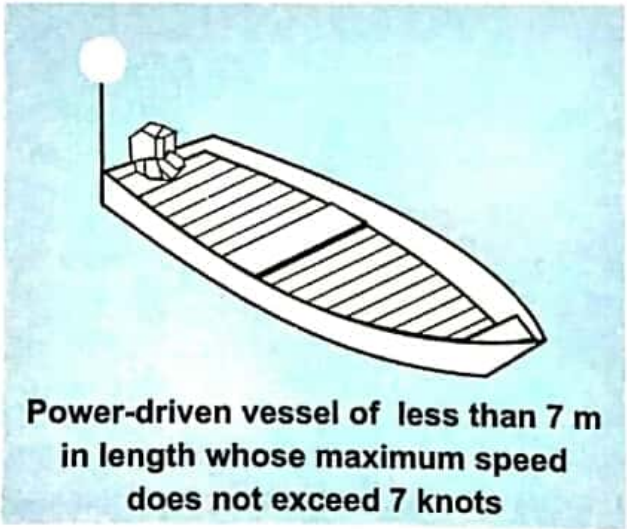
If a vessel is designed for speeds greater than 7 knots she should naturally comply with the more stringent requirements of subparagraph 'i'. This exemption clause should thus apply only to a vessel not capable of speeds higher than 7 knots; this seems to be the correct interpretation.

On the other hand, the language of the Rule ***'does not'*** - in the present tense - may be interpreted to mean the speed being done and not the capability. Since this Rule applies only to ***'a power-driven vessel of less than 7 m in length'***, it is not applicable to the vast majority of vessels. I have also not been able to find any past court ruling on the correct interpretation of this clause.

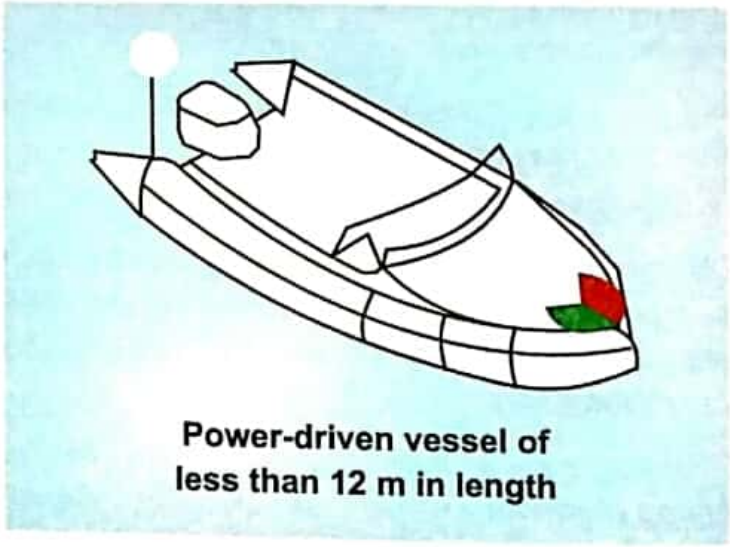
Subparagraph 'iii' allows that a masthead light or the all-round white light ***'may be displaced from the fore-and-aft centre line of the vessel if centreline fitting is not practicable'***, but only ***'on a power-driven vessel of less than 12 m in length'***. This may be done ***'provided that the sidelights are combined in one lantern which shall be carried on the fore-and-aft centreline of the vessel or located as nearly as practicable in the same fore-and-aft line as the masthead light or the all-round white light'***. The requirement is self-explanatory.

Smaller vessels may find difficulties in complying with paragraph 'a' of this Rule. They may not have sufficient electrical power capacity and may also be unable comply with placement requirements stated in Annex I and thus seem to have been granted these exceptions. However, do note that the alternatives given suggest closest possible compliance with the basic requirements.

The diagrams show how the lights on some of the vessels would appear when complying with this Rule.



Power-driven vessel of less than 7 m in length whose maximum speed does not exceed 7 knots



Power-driven vessel of less than 12 m in length

Rule & Vessel	Shape	When viewed from			Sound signals in restricted visibility, at intervals of not more than 2 minutes.
		Port	Ahead	Starboard	
Rule 23 Power-Driven Vessels underway	None	Vessel underway Plus yellow flashing light Hovercraft less than 50m Vessel less than 7m & less than 7kts underway Vessel less than 50m underway	Under 50m	Plus yellow flashing light Hovercraft less than 50m Vessel underway Vessel less than 50m underway Vessel less than 7m & less than 7kts underway	Making way through the water Underway but stopped

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Rule 24

Towing and pushing

(a) A power-driven vessel when towing shall exhibit:

(i) instead of the light prescribed in Rule 23(a)(i) or (a)(ii), two masthead lights in a vertical line. When the length of the tow, measuring from the stern of the towing vessel to the after end of the tow, exceeds 200 m, three such lights in a vertical line;

(ii) sidelights;

(iii) a sternlight;

(iv) a towing light in a vertical line above the sternlight;

(v) when the length of the tow exceeds 200 m, a diamond shape where it can best be seen.

(b) When a pushing vessel and a vessel being pushed ahead are rigidly connected in a composite unit they shall be regarded as a power-driven vessel and exhibit the lights prescribed in Rule 23.

(c) A power-driven vessel when pushing ahead or towing alongside, except in the case of a composite unit, shall exhibit:

(i) instead of the light prescribed in Rule 23(a)(i) or (a)(ii), two masthead lights in a vertical line;

(ii) sidelights;

(iii) a sternlight.

(d) A power-driven vessel to which paragraph (a) or (c) of this Rule applies shall also comply with Rule 23(a)(ii).

(e) A vessel or object being towed, other than those mentioned in paragraph (g) of this Rule, shall exhibit:

(i) sidelights;

(ii) a sternlight;

(iii) when the length of the tow exceeds 200 m, a diamond shape where it can best be seen.

(f) Provided that any number of vessels being towed alongside or pushed in a group shall be lighted as one vessel,

(i) a vessel being pushed ahead, not being part of a composite unit, shall exhibit at the forward end, sidelights;

(ii) a vessel being towed alongside shall exhibit a sternlight and at the forward end, sidelights.

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(g) An inconspicuous, partly submerged vessel or object, or combination of such vessels or objects being towed, shall exhibit:

(i) if it is less than 25 m in breadth, one all-round white light at or near the forward end and one at or near the after end except that dracones need not exhibit a light at or near the forward end;

(ii) if it is 25 m or more in breadth, two additional all-round white lights at or near the extremities of its breadth;

(iii) if it exceeds 100 m in length, additional all-round white lights between the lights prescribed in subparagraphs (i) and (ii) so that the distance between the lights shall not exceed 100 m;

(iv) a diamond shape at or near the aftermost extremity of the last vessel or object being towed and if the length of the tow exceeds 200 m an additional diamond shape where it can best be seen and located as far forward as is practicable.

(h) Where from any sufficient cause it is impracticable for a vessel or object being towed to exhibit the lights or shapes prescribed in paragraph (e) or (g) of this Rule, all possible measures shall be taken to light the vessel or object towed or at least to indicate the presence of such vessel or object.

(l) Where from any sufficient cause it is impracticable for a vessel not normally engaged in towing operations to display the lights prescribed in paragraph (a) or (c) of this Rule, such vessel shall not be required to exhibit those lights when engaged in towing another vessel in distress or otherwise in need of assistance. All possible measures shall be taken to indicate the nature of the relationship between the towing vessel and the vessel being towed as authorized by Rule 36, in particular by illuminating the towline.

Requirements for a ***'power-driven vessel when towing'*** or ***'pushing'*** are covered by paragraphs 'a' to 'e' of this Rule and for ***'a vessel or object being towed'*** by paragraphs 'e' to 'h'. ***'Towing'*** is not defined but traditionally means when one vessel is pulling another vessel or an object astern of her, usually connected by a line. The Rules differentiate between ***'towing'***, ***'a vessel being pushed ahead'*** or ***'being towed alongside'*** by prescribing different lights and shapes for the latter situations. The requirements of this rule are generally self-explanatory. They would be better understood by sketching the requirements after studying the explanations given below.

'A vessel engaged in a towing operation' is not granted any special privileges. The exhibition of lights and shapes specified in this Rule is just to indicate her special condition. However, if ***'restricted in her ability to manoeuvre'*** applicable only and only when the activity ***'severely restricts the towing vessel and her tow in their ability to deviate from their course'***, then she must, in addition to the requirements of this Rule, also exhibit the lights or shapes prescribed by Rule 27(b). The intensity of the lights and their minimum range of visibility should be as prescribed in Rule 22.

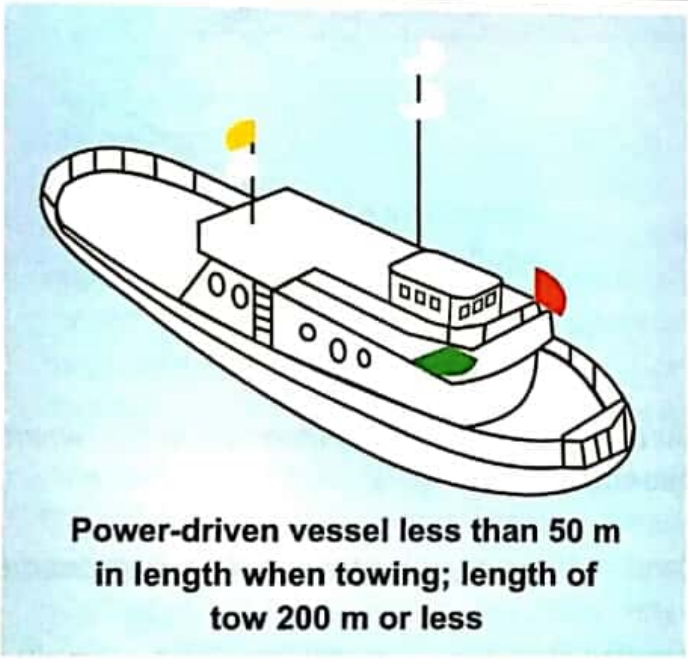
a: Subparagraph 'i' of this Rule states, ***'instead of the light prescribed in Rule 23(a)(i), or (a)(ii), two masthead lights in a vertical line. When the length of the tow, measuring from the stern of the towing vessel to the after end of the tow exceeds 200 m, three such lights in a vertical line'***.

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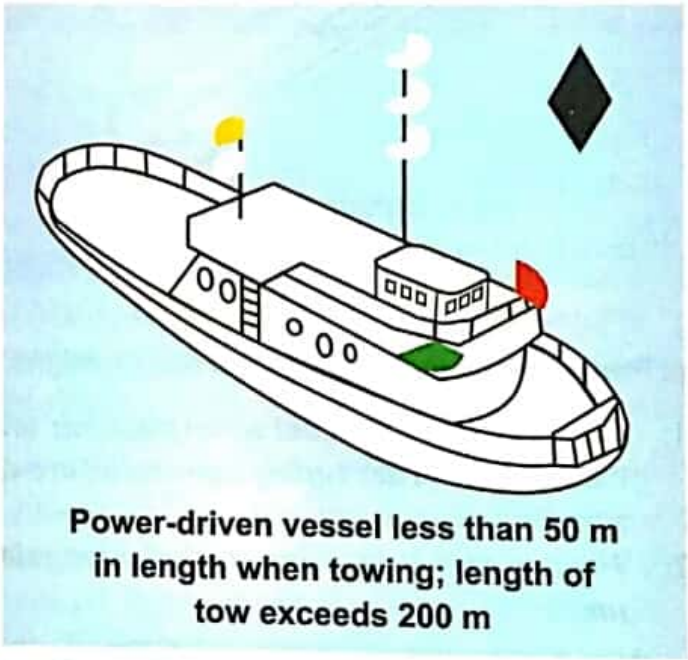
It is the length until the extreme end of the tow measured from the stern of the vessel towing that determines the number of masthead lights to be exhibited. The reason is obvious; this is to indicate the overall length of the tow to other vessels in the vicinity.

'A power-driven vessel when towing' shall continue to show ***'sidelights'***, ***'a sternlight'*** and, in addition, exhibit ***'a towing light vertically above the sternlight'*** as required by subparagraphs 'ii', 'iii' and 'iv' of this Rule 24(a). Further, ***'when the length of the tow - - - exceeds 200 m, a diamond shape where it can best be seen'***, This to be complied with during the day only as per Rule 20(d).

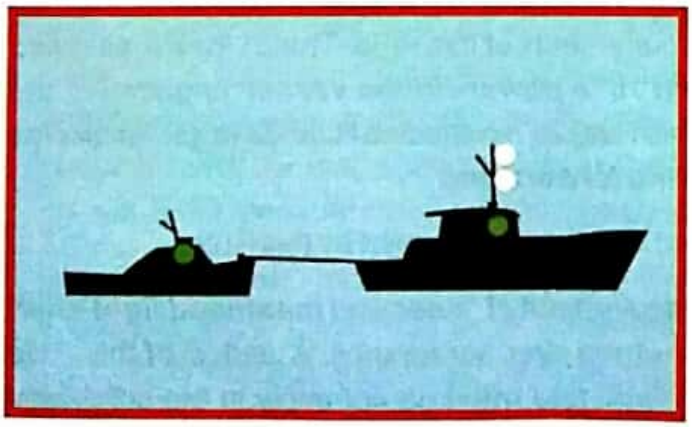
Paragraphs 'a' and 'c' of this Rule deactivate the application of both subparagraphs 'i' and 'ii' of Rule 23(a) on masthead lights. However, paragraph 'd' of this Rule 24 again reactivates Rule 23(a)(ii) ***'a second masthead light abaft of and higher than the forward one'*** to apply with paragraphs 'a' and 'c' of this Rule. As such in effect there is no change regarding Rule 23(a)(ii) which apply equally to a ***'power-driven vessel when towing';*** a must for a vessel more than 50 m in length and optional for a vessel less than this length.



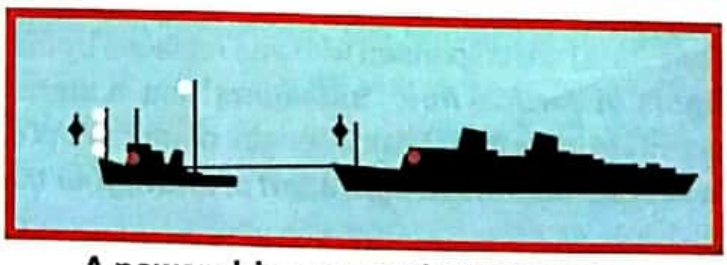
Power-driven vessel less than 50 m in length when towing; length of tow 200 m or less



Power-driven vessel less than 50 m in length when towing; length of tow exceeds 200 m



A power-driven vessel when towing, less than 50 m and a tow less than 200 m in length seen from their starboard side.



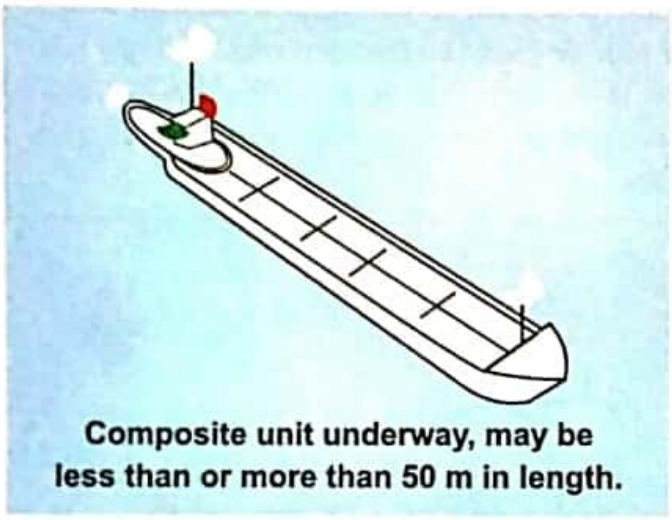
A power-driven vessel when towing (may be over 50 m), and a tow over 200 m in length seen from their port side.

Note: Towing vessel may be less or more than 50 m in length because a 2nd masthead light is optional for a vessel less than 50 m, mandatory for those over 50 m in length. Sternlights will not be visible from the beam hence not shown.

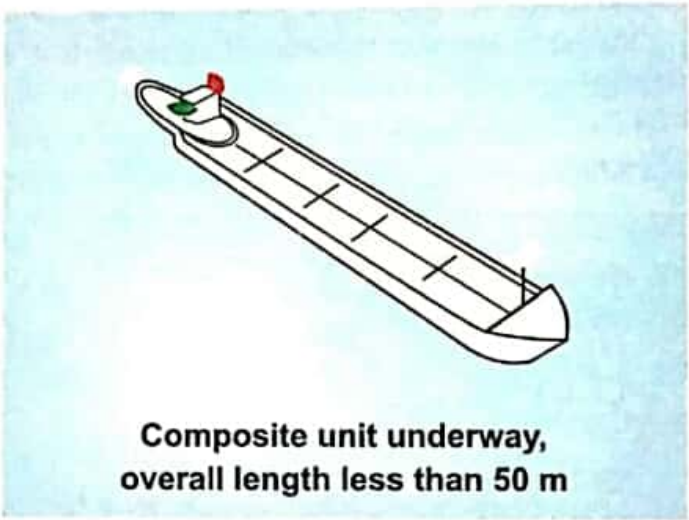
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b: The Rule clarifies that ***'when a pushing vessel and a vessel being pushed ahead are rigidly connected in a composite unit they shall be regarded as a power-driven vessel and exhibit the lights prescribed in Rule 23'.*** When ***'rigidly connected in a composite unit'*** they comply with the requirements like any normal ***'power-driven vessel'*** and not the requirements of Rule 24.

'Rigidly connected in a composite unit' are constructions so designed that the pushing vessel's bow fits into a matching slot on the stern of the other being pushed. Normally these are tug and barge combinations designed to fit together mutually as one vessel and can be interlocked together so rigidly that they lose their independence of individual motion. They appear and behave like a single vessel.



Composite unit underway, may be less than or more than 50 m in length.



Composite unit underway, overall length less than 50 m

c: Prescribes the requirements for two situations.

1: ***'A power-driven vessel when pushing'*** another ahead of it, similar to paragraph 'b' but when the vessels are not ***'rigidly connected in a composite unit'***
and;

2: When a vessel is being ***'towed alongside'*** and not ***'rigidly connected in a composite unit'.***

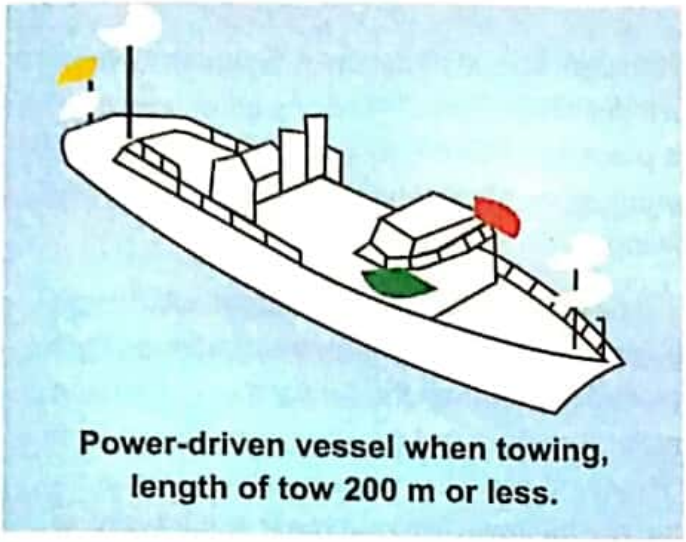
In both situations, the requirements of masthead lights prescribed for a ***'power-driven vessel'*** by Rule 23(a) are dispensed with and replaced by the requirements of this Rule. That is ***'two masthead lights in vertical line'***, ***'sidelights'*** and ***'a sternlight'***. If ***'a power-driven vessel'*** engaged in the activity is more than 50 m in length, paragraph 'd' of this Rule 24 reactivates Rule 23 (a)(ii) to display ***'a second masthead light abaft of and higher than the forward one'.***

There is no requirement of a towing light to be exhibited in situations covered by this Rule.

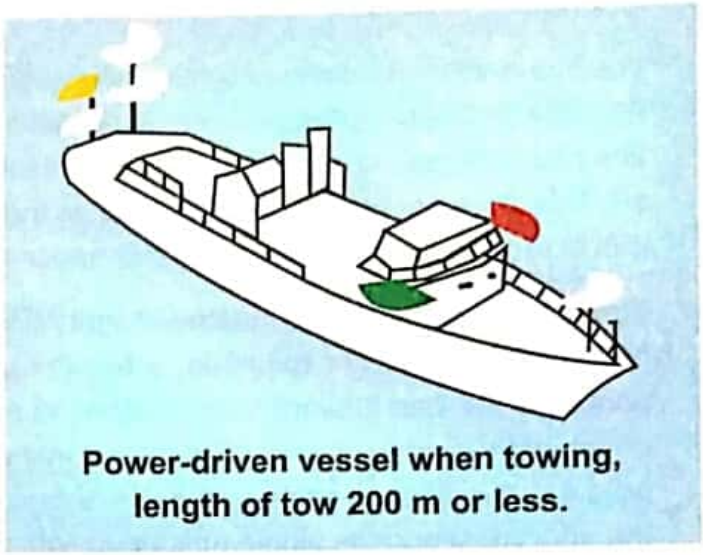
d: Reactivates the application of Rule 23 (a)(ii), the requirement of ***'a second masthead light abaft of and higher than the forward one'*** if applicable, where ever paragraphs 'a' and 'c' of this Rule apply. Both paragraphs 'a' and 'c' state that Rule 23 (a)(i) and (a)(ii) do not apply in the conditions covered by them. The reactivation of Rule 23 (a)(ii) has been explained earlier.

The aft masthead light is optional for vessels less than 50 m in length. However, if just a single masthead light is opted for by a smaller vessel, ***'this light shall be exhibited forward of amidships'*** as per Annex I (3)(d).

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Power-driven vessel when towing, length of tow 200 m or less.



Power-driven vessel when towing, length of tow 200 m or less.

Note : In the above two diagrams, notice the difference in the placement of the two masthead lights, both options are correct.

Only the requirements of masthead lights prescribed for a ***'power-driven vessel'*** by Rule 23(a) are dispensed with or made redundant by subparagraph 24(a)(i). But paragraph 'd' reinstates the requirement of Rule 23(a)(ii) with paragraphs 'a' and 'c' of this Rule, that is, ***'a second masthead light'***, if required. This implies that the 2 or 3 ***'masthead lights in a vertical line'*** prescribed in subparagraph 'a-i' should be placed forward because ***'a second masthead light'*** means a single light which has to be ***'abaft of and higher than the forward one'***. On the other hand, this Rule does not specify if the 2 or 3 masthead lights in a vertical line have to be displayed at the forward or the aft masthead light locations.

However, Annex I, paragraph 2(e) on the vertical positioning and spacing of lights states ***'one of the two or three masthead lights'***, - ***'shall be placed in the same position as either the forward masthead light or the after masthead light'***. This clearly means that the 2 or 3 masthead lights required by this Rule may be placed together either in the forward or aft masthead light positions. This Annex further states ***'if carried on the after mast, the lowest after masthead light shall be at least 4.5 m vertically higher than the forward masthead light'***. This requirement on vertical separation is exactly the same as required for masthead lights on any power-driven vessel prescribed in Annex I(2)(a)(ii). Analysing all these requirements, the gist is that, provided where the towing lights are carried on the after mast, the lowest of the two or three lights shall comply with this requirement.

'A power-driven vessel when towing' if over 50 m in length, with a tow which is less than 200 meters in length could thus show 2 masthead lights in a vertical line forward and 1 masthead light aft, or one masthead light forward and 2 masthead lights in a vertical line aft, as Annex I allows both options. If the length of the tow exceeds 200 m, the 2 masthead lights in a vertical line shall be replaced by 3 masthead lights. However, a vessel of less than 50 m length when towing may or may not follow the norms of a vessel more than 50 m in length regarding the second masthead light since Rule 23(a)(ii) allows this option.

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The above configurations of lights when viewed from right ahead direction of ***'a power-driven vessel when towing'*** would appear the same, but differ when viewed from any other direction. The two or three masthead lights in a vertical line placed together may be forward or may be aft. This does not really matter as long as the navigators on other vessels can clearly identify that this is ***'a power-driven vessel'*** engaged in towing.

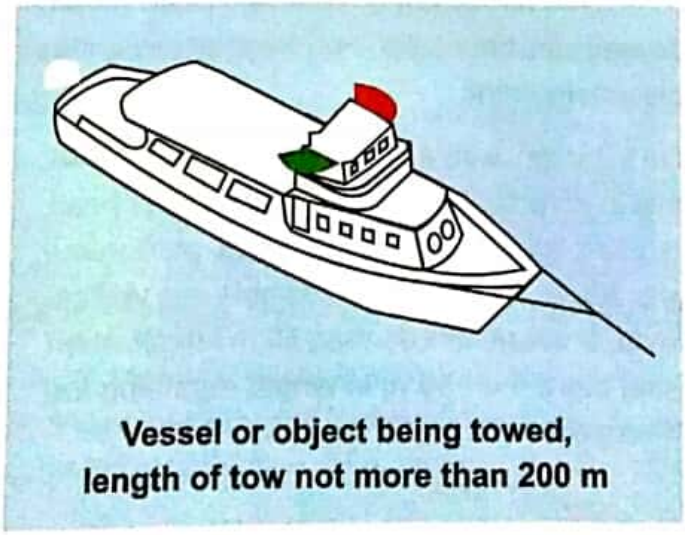
The options of placing the masthead lights is to allow flexibility in meeting structural and design needs of vessels. For example, a tug designed for towing would have two masts or light posts/stands: one forward and the other aft and placed higher than the forward one, perhaps on top of the bridge. Such tugs usually have a smaller fore deck but a large open afterdeck. It will be convenient on such a vessel to design the fitment to carry the three masthead lights on the after mast and the single masthead light placed on the lower forward mast or light post. If she is less than 50 m in length, then the forward fitment may be dispensed with as long as the placement is ***'forward of amidships'*** required by Annex I (3)(d).

[TASK: DRAW DIAGRAMS SHOWING PLACEMENT OPTIONS OF LIGHTS ON A POWER-DRIVEN VESSEL OVER 50 M TOWING, LENGTH OF TOW EXCEEDING 200 METRES BEHIND HER STERN.

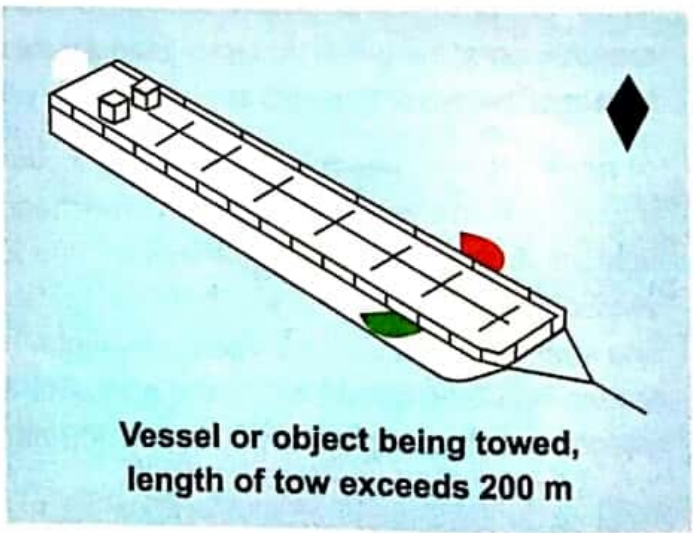
ALSO DRAW DIAGRAMS TO SHOW THE LIGHTS AS THEY MAY BE VISBLE ON THIS VESSEL WHEN SEEN FROM RIGHT AHEAD, SEEN FROM ABOUT 60° OF HER PORT SIDE AND SEEN FROM ABOUT 60° OF HER STARBOARD SIDE. YOU MAY ALSO MAKE DIAGRAMS FOR OTHER VIEWING DIRECTIONS]

e and f: Are similar to each other, though they cover different types of tows other than an ***'inconspicuous, partly submerged vessel or object'*** - which get covered in paragraph 'g'. In general, anything being towed ***'shall exhibit'*** some lights to indicate its presence. Each is explained below.

e: Any ***'vessel or object being towed'***, other than those ***'being towed alongside or pushed'*** covered by paragraph 'f', must display ***'sidelights'*** and a ***'sternlight'***. If ***'the length of the tow exceeds 200 m'***; the tow shall also display the day signal of a diamond. The day signal is



Vessel or object being towed, length of tow not more than 200 m



Vessel or object being towed, length of tow exceeds 200 m

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independent of the one required by subparagraph (a)(v) of this Rule. In effect, if the length of the tow exceeds 200 m, then ***'a power driven vessel when towing'*** as well as the ***'vessel or object being towed'*** shall both display this day signal.

f: Applies in two conditions: 1: to vessels ***'being towed alongside'***;
Or
2: being ***'pushed in a group'.***

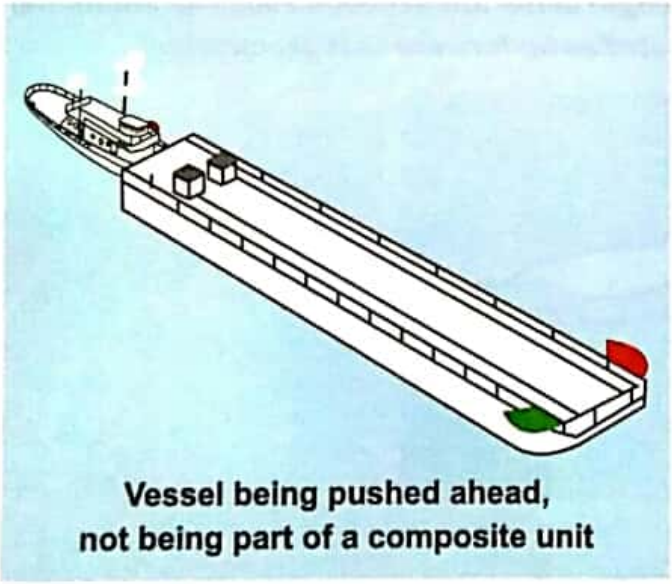
Even if there is more than one vessel, in both cases, the full group shall be considered and ***'lighted as one vessel'***.

A ***'vessel being pushed ahead'*** is quite logically exempted from showing a sternlight; it will not be visible to anyone, as such she is only required to exhibit ***'at the forward end, sidelights'***. This applies only if the vessels are not joined as ***'a composite unit'***. If they ***'are rigidly connected in a composite unit'***, the two combined are considered a single ***'power-driven vessel'*** and shall comply with paragraph 'b' of this Rule.

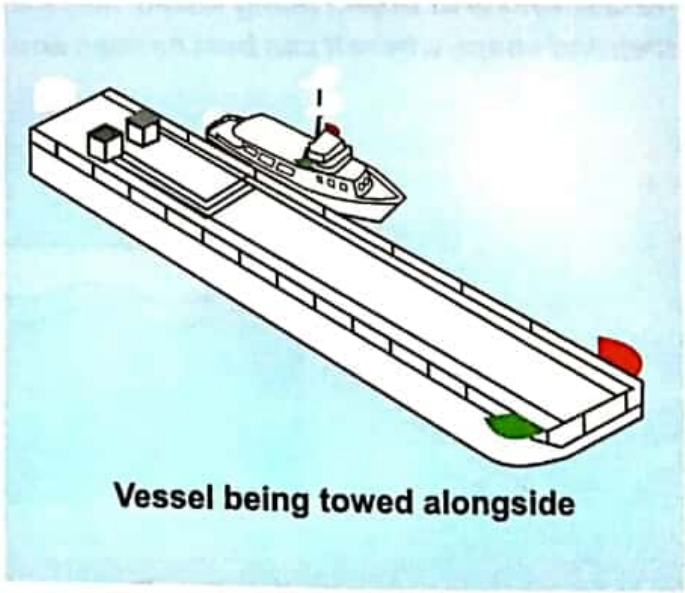
If it is ***'a vessel being towed alongside'***, she shall in addition to the above, ***'exhibit a sternlight'***.

Do note that, in both cases covered by this paragraph, sidelights have to be placed ***'at the forward end'***, a requirement not stated in any of the other paragraphs.

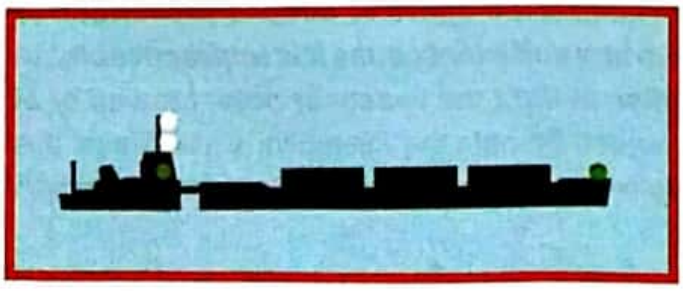
In conditions prescribed by this Rule, the extreme total length of the vessels involved should be taken into account when determining the required intensity of lights as per Rule 22.



Vessel being pushed ahead, not being part of a composite unit



Vessel being towed alongside



A power-driven vessel less than 50 m pushing ahead, other than a composite unit, as seen from the starboard side. Refer Rules 24(c) and (f).

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g: Is about lighting any ***'inconspicuous, partly submerged vessel or object, or combination of such vessels'*** when under tow. These vessels or objects, for the nature of their work are of a design that it may be difficult to properly equip them with conventional sidelights and sternlight prescribed in paragraphs 'e' or 'f' of this Rule.

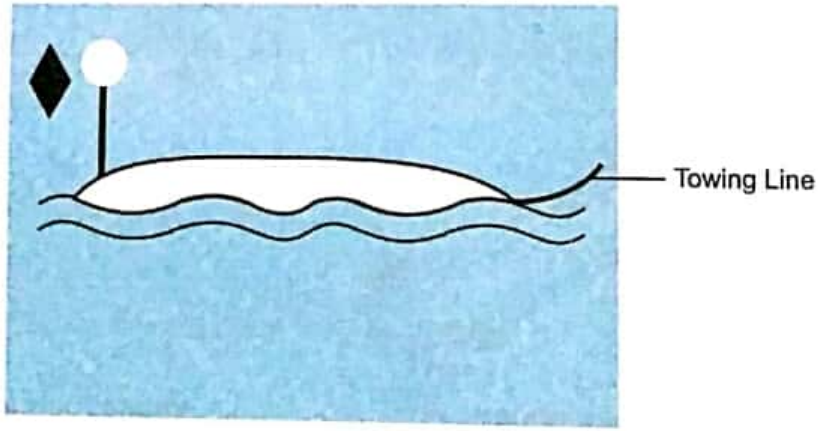
'Dracones' are large flexible bags or barges used for transporting liquids. When filled, these usually would be very close to being or may actually be fully submerged in water. Though not stated in the Rule, by the same principle and implication, this term could also include timber floats or other vessels or objects being towed which consist of inconspicuous or partly submerged objects, and the requirements of this Rule applied to them too.

Subparagraph 'i' of this Rule requires ***'one all-round white light at or'*** as close as possible on the forward and aft ends of such a ***'partly submerged vessel or object' - 'being towed'***. However, ***'dracones'*** are partially exempted, they ***'need not exhibit a light at or near the forward end'***.

By subparagraph 'ii' those exceeding a breadth of 2.5 m are in addition required to display ***'two additional all-round white lights'*** to mark the extremity of the breadth.

Subparagraph 'iii' requires such vessels exceeding a length of 100 m to exhibit ***'additional all-round white lights between the lights prescribed in subparagraphs (i) and (ii) so that the distance between the lights shall not exceed 100 m'***. In other words, there should not be an unlit span of more than 100 meters, and in addition, compliance with subparagraphs 'i' and 'ii' of this Rule explained above should also be ensured.

Subparagraph 'iv' requires a diamond shape to be displayed ***'at or near the aftermost extremity of the last vessel or object being towed'*** and ***'if the length of the tow exceeds 200 m an additional diamond shape where it can best be seen and located as far forward as is practicable'***.



Dracone being towed

h: In effect allows a waiver from the requirement ***'to exhibit the lights or shapes prescribed in paragraph (e) or (g) of this Rule'*** but only ***'where from any sufficient cause it is impracticable'***. In such a situation, ***'all possible measures shall be taken to light the vessel or object towed or at least to indicate the presence of such vessel or object.*** Do note the exemptions granted by this Rule do not apply to ***'vessels being towed alongside or pushed in a group'*** covered by paragraph 'f'.

The term ***'sufficient cause',*** that makes it ***'impracticable for a vessel or object being towed to exhibit the lights or shapes',*** is not clearly defined. This waiver or exemption has to be applied using

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the principles of ***'ordinary practice of seamen'*** or ***'special circumstances'*** from Rule 2. For example, a disabled vessel with her lights broken because of an accident, or if she is suffering a total loss of power or any other similar circumstances.

In all such cases ***'all possible measures shall be taken to light the vessel or object towed or at least to indicate the presence of such vessel or object'***. No guidelines are given; this may be done by using searchlights from a ***'towing vessel'*** focused on ***'a vessel or object being towed'*** or her lights and use of radar transponders ***'to indicate the presence'***. In doing so, the guidelines prescribed in Rule 36 should also be complied with.

[TASK: PLEASE READ RULE 36, 'SIGNALS TO ATTRACT ATTENTION' TO UNDERSTAND THE REQUIREMENTS STATED THERE.]

i: Paragraphs 'a' and 'c' of this Rule prescribe the lighting requirements for a ***'power-driven vessel when towing'***, ***'pushing ahead or towing alongside'***. This Rule allows waivers from these requirements but only ***'for a vessel not normally engaged in towing operations'.***

Such ***'operations'*** may sometimes be referred to as **'Good Samaritan'** acts undertaken by a vessel not designed to be ***'normally engaged in towing'*** but is assisting another vessel having found her ***'in distress or otherwise in need of assistance'***. Such ***'a vessel not normally engaged in towing operations' - 'shall not be required to exhibit those lights'*** as ***'prescribed in paragraph (a) or © of this Rule'***. However, ***'all possible measures shall be taken to indicate the nature of the relationship between the towing vessel and the vessel being towed as authorized by Rule 36, in particular by illuminating the towline'***.

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Rule 25

Sailing vessels underway and vessels under oars

(a) **A sailing vessel underway shall exhibit:**

(i) sidelights;
(ii) a sternlight.

(b) **In a sailing vessel of less than 20 m in length the lights prescribed in paragraph (a) of this Rule may be combined in one lantern carried at or near the top of the mast where it can best be seen.**

(c) **A sailing vessel underway may, in addition to the lights prescribed in paragraph (a) of this Rule, exhibit at or near the top of the mast, where they can best be seen, two all-round lights in a vertical line, the upper being red and the lower green, but these lights shall not be exhibited in conjunction with the combined lantern permitted by paragraph (b) of this Rule.**

(d) **(i) A sailing vessel of less than 7 m in length shall, if practicable, exhibit the lights prescribed in paragraph (a) or (b) of this Rule, but if she does not, she shall have ready at hand an electric torch or lighted lantern showing a white light which shall be exhibited in sufficient time to prevent collision.**

(ii) A vessel under oars may exhibit the lights prescribed in this Rule for sailing vessels, but if she does not, she shall have ready at hand an electric torch or lighted lantern showing a white light which shall be exhibited in sufficient time to prevent collision.

(e) **A vessel proceeding under sail when also being propelled by machinery shall exhibit forward where it can best be seen a conical shape, apex downwards.**

Note: All diagrams pertaining to this Rule are shown at the end of the explanations.

a: Only ***'sidelights'*** and ***'a sternlight'*** are required to be exhibited by ***'a sailing vessel underway'***. This is perhaps to do with the design of a sailing vessel: the sails are hoisted right up close to the top end of the masts and are likely to obscure and render the ***'masthead lights'*** useless, even if these were to be exhibited. However, and very importantly, this requirement also helps differentiate ***'sailing vessels'*** from other vessels when seen at night, when sails would not be visible. The lights exhibited give no indication about the length of ***'a sailing vessel'***.

b: This Rule allows ***'in a sailing vessel of less than 20 m in length the lights prescribed in paragraph (a) of this Rule may be combined in one lantern carried at or near the top of the mast where it can best be seen'***. Being right on top, this combined lantern, sometimes referred to as 'tricolour', is least likely to be obscured by sails and may also require lesser power with perhaps just one bulb in use. This is similar to Rule 21(b) which states ***'in a vessel of less than 20 m in length the sidelights may be combined in one lantern carried on the fore-and-aft centreline of the vessel'***.

c: ***'A sailing vessel underway may, in addition'*** exhibit ***'at or near the top of the mast, where they can best be seen, two all-round lights in a vertical line, the upper being red and the lower***

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green'. These lights are optional, may or may not be exhibited, and are additional to the requirement of exhibiting ***'sidelights'*** and ***'a sternlight'*** prescribed by paragraph 'a' of this Rule. ***'But these lights shall not be exhibited in conjunction with the combined lantern permitted by paragraph (b) of this Rule'***.

Paragraph 'b' prescribes that the combined lantern is to be ***'carried at or near the top of the mast where it can best be seen'***. This paragraph 'c' also has a similar requirement ***'exhibit at or near the top of the mast, where they can best be seen'***. It obviously would be difficult to practically comply with both these requirements at the same time, and if done would surely create confusion to those seeing such a combination of lights. Therefore, if the ***'two all-round lights'*** prescribed by this Rule are carried on a sailing vessel less than 20 m in length, then the ***'sailing vessel'*** shall not use the ***'combined lantern'*** or vice versa.

d(i): A small ***'sailing vessels of less than 7 m in length shall, if practicable, exhibit the lights prescribed in paragraph (a) or (b) of this Rule'***. However, if this requirement is not practicable, for any reason, ***'she shall have ready at hand an electric torch or lighted lantern showing a white light which shall be exhibited in sufficient time to prevent collision'***. The onus is on the sailing vessel to display her presence ***'in sufficient time to prevent collision'***. Navigator should keep in mind that such a small ***'sailing vessel'*** may also be a weak radar target.

This option is certainly a poor substitute for the ***'sidelights'*** and ***'sternlight'*** that are exhibited continuously, which would help other vessels to identify such small ***'sailing vessels'*** in ***'good time'*** - ***'to obtain early warning of risk of collision'*** and ***'keep out of the way'*** if so required, but is allowed by these Rules only if the continuous display of the lights is not ***'practicable'***.

d(ii): Applies to ***'a vessel under oars'***. The requirements are similar to those of a small ***'sailing vessel'*** described above. However, unlike those, there is no stipulation on the length for ***'a vessel under oars'***.

Mariners should remain cautious when navigating; they may suddenly encounter such a small ***'sailing vessel'*** or ***'a vessels under oars'***, which may not even be lighted at night and indicates her presence only ***'in sufficient time to prevent collision'***. ***'Action to avoid collision'*** in such cases would need to be very prompt and large.

'A personal experience I had as a third officer in 1980: a small vessel suddenly flashed her lights close right ahead. She had not been sighted earlier neither visually nor on the radar and appeared rather close. A hard over alteration was immediately executed, and as the vessels swinging bows cleared this small vessel, the wheel was turned hard over to the opposite side to move the vessels stern away from her, which otherwise may have hit her. It was a scary near miss.'

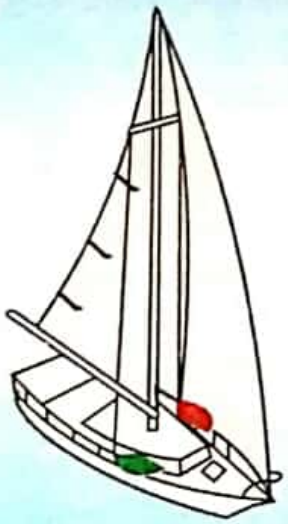
The importance of **visual look-out** has been repeatedly emphasised in the explanations as the first and foremost duty of an OOW and other bridge team members. ***'It is of special importance that at all times the officer in charge of the navigational watch ensures that a proper lookout is maintained. In a ship with a separate chartroom, the officer in charge of the navigational watch may visit the chartroom, when essential, for a short period for the necessary performance of navigational duties, but shall first ensure that it is safe to do so and that proper lookout is maintained'***. *(STCW Code A-VIII/2, paragraph 32)*

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e: Requires that during day ***'a vessel proceeding under sail when also being propelled by machinery shall exhibit forward where it can best be seen a conical shape, apex downwards'***.

By reverse implication of Rule 3(c) definition, ***'a sailing vessel'*** if using her propelling machinery, would no more be a sailing vessel but a ***'power-driven vessel'***. This is the accepted norm and thus she would be required to display the lights as defined in Rule 23, appearing at night clearly as a ***'power-driven vessel'***. However, during the day it would be the reverse, as only the sails would be visible. To ensure that other vessels can correctly judge a sailing vessel ***'also being propelled by machinery'*** as a ***'power-driven vessel'***, the day signal serves to identify her correct status for ***'preventing collisions'***.

Rule 25(a)



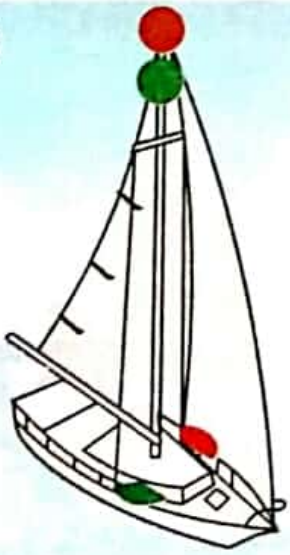
A sailing vessel underway

Rule 25(b)



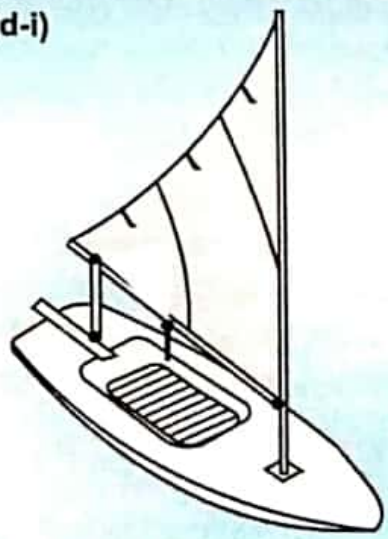
A sailing vessel underway - less than 20 m in length using the combined lantern

Rule 25(c)



A sailing vessel underway exhibiting the optional all round lights

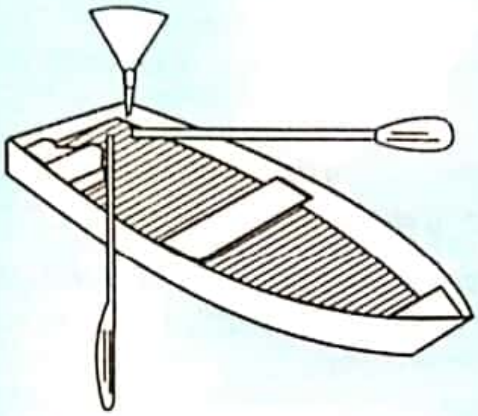
Rule 25(d-i)



A sailing vessel underway, less than 7 m in length

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Rule 25(d-ii)



A vessel under oars

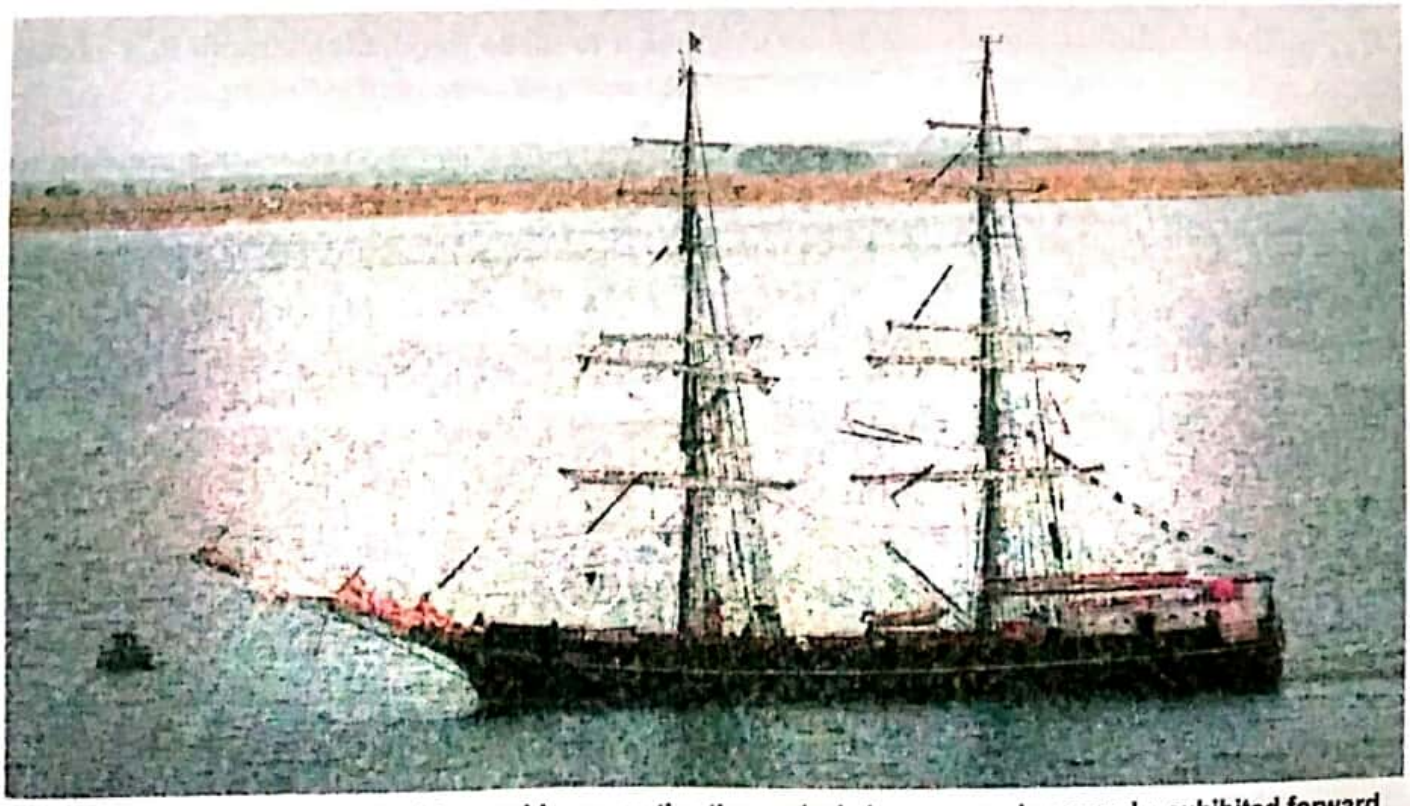
Rule 25(e)



A vessel proceeding under sail when also being propelled by machinery

To sum up, the following diagram should be of help in understanding the requirements of this Rule as applicable to ***'a sailing vessel'***.

Rule & Vessel	Shape	When viewed from			Sound signals in restricted visibility, at intervals of not more than 2 minutes.
		· Port	Ahead	Starboard	
Rule 25 Sailing Vessels underway	Under both sail & power	Less than 7m — If not showing navigation lights, hand held torch shown in time to prevent collision		Less than 7m — If not showing navigation lights, hand held torch shown in time to prevent collision	— • •



A sailing vessel being propelled by machinery - notice the conical shape, apex downwards, exhibited forward

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Rule 26

Fishing vessels

(a) A vessel engaged in fishing, whether underway or at anchor, shall exhibit only the lights and shapes prescribed in this Rule.

(b) A vessel when engaged in trawling, by which is meant the dragging through the water of a dredge net or other apparatus used as a fishing appliance, shall exhibit:

(i) two all-round lights in a vertical line, the upper being green and the lower white, or a shape consisting of two cones with their apexes together in a vertical line one above the other;

(ii) a masthead light abaft of and higher than the all-round green light; a vessel of less than 50 m in length shall not be obliged to exhibit such a light but may do so;

(iii) when making way through the water, in addition to the lights prescribed in this paragraph, sidelights and a sternlight.

(c) A vessel engaged in fishing, other than trawling shall exhibit:

(i) two all-round lights in a vertical line, the upper being red and the lower white, or a shape consisting of two cones with apexes together in a vertical line one above the other;

(ii) when there is outlying gear extending more than 150 m horizontally from the vessel, an all-round white light or a cone apex upwards in the direction of the gear;

(iii) when making way through the water, in addition to the lights prescribed in this paragraph, sidelights and a sternlight.

(d) The additional signals described in annex II to these Regulations apply to a vessel engaged in fishing in close proximity to other vessels engaged in fishing.

(e) A vessel when not engaged in fishing shall not exhibit the lights or shapes prescribed in this Rule, but only those prescribed for a vessel of her length.

'A vessel engaged in fishing' means ***'fishing vessels'*** fishing in a manner ***'which restrict manoeuvrability'*** as defined in Rule 3(d): only then the requirements of this Rule shall apply. When ***'in sight'*** and ***'if risk of collision exists'*** then all vessels have to ***'keep out of the way of'*** - ***'a vessel engaged in fishing'*** except by Rule 18(c) ***'a vessel engaged in fishing when underway shall, so far as possible, keep out of the way of'*** **'NUC'** and **'RAM'** vessels. ***'Fishing vessels'*** have been given a high degree of privilege by these Rules. However, in restricted visibility, the requirements of Rule 19 ***'for preventing collisions'*** apply equally to all vessels with no exceptions whatsoever.

At other times when not ***'engaged in fishing'***, ***'fishing vessels'*** must conduct themselves like any other vessel as per the requirements of these Rules and also exhibit the lights and/or shapes relevant and applicable to the size and type of vessel, not the lights and shapes stated in this Rule 26.

a: As per this Rule, ***'whether underway or at anchor'***, ***'a vessel engaged in fishing'*** - ***'shall only exhibit the lights and shapes prescribed in this Rule'*** and none other. The use of the word ***'only'*** and its placement in the latter half of the Rule leads to this interpretation. ***'A vessel engaged in***

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fishing' is not allowed to exhibit any other lights or shapes except as stated in this Rule whether she is ***'underway or at anchor'***. The requirements of Rule 30 on ***'anchored vessels'*** shall thus not apply to her provided she remains ***'a vessel engaged in fishing'*** even when at anchor.

The above scenario creates a peculiar situation applicable only to ***'a vessel engaged in fishing'*** and this should be clearly understood.

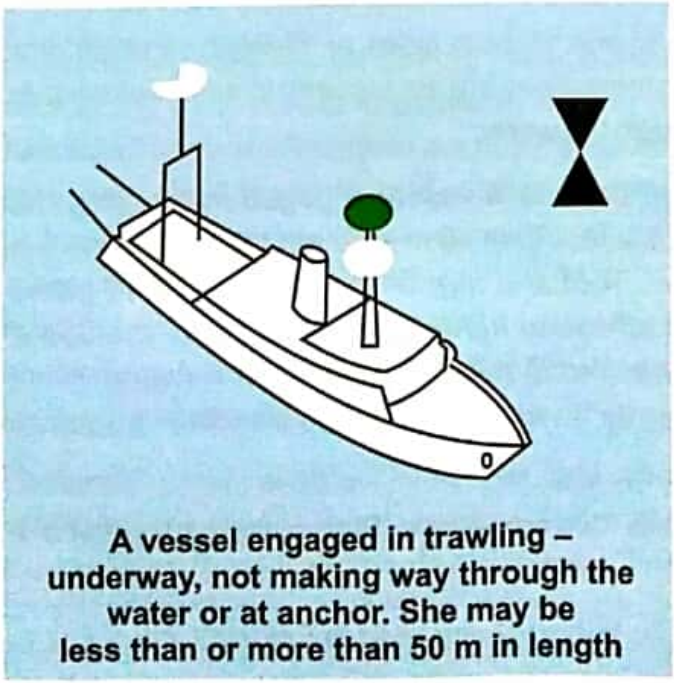
Rule 3(g) states, ***'the term vessel restricted in her ability to manoeuvre means a vessel which from the nature of her work is restricted in her ability to manoeuvre as required by these Rules and is therefore unable to keep out of the way of another vessel'.*** And a ***'vessel engaged in fishing'*** is applicable to ***'fishing vessels'*** fishing in a manner ***'which restrict manoeuvrability'*** as defined in Rule 3(d). Both terms are similar except that the former further states ***'therefore unable to keep out of the way of another vessel'.***

However, as per the requirements of Rule 18(c) explained earlier, ***'a vessel engaged in fishing'*** is anyway restricted in her manoeuvres and thus except **'NUC'** and **'RAM'**, all other vessels have to keep clear of her when in sight. Considering these aspects that ***'a vessel engaged in fishing'*** is anyway restricted in ***'manoeuvrability'*** and is most unlikely to ever fit the 6 conditions stated in Rule 3(g), she may never be required to exhibit **'RAM'** lights or signals. In fact, some experts on this subject suggest she never should, though the Rules do not explicitly state anything to support this expert viewpoint.

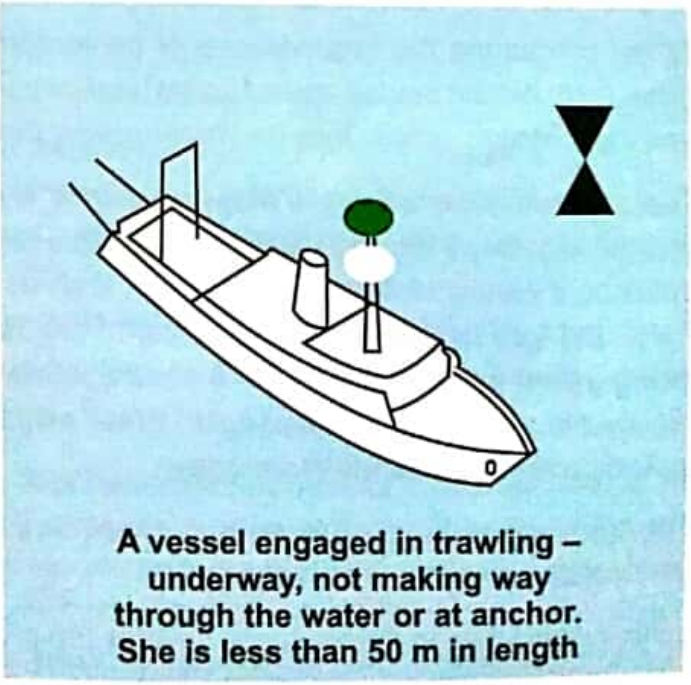
This Rule further separates these vessels into two classes: ***'engaged in trawling'*** and ***'engaged in fishing, other than trawling'***. The requirements for both types further differentiate these vessels ***'when making way through the water'*** or not. The term ***'making way'*** has been explained in the text box with Rule 3 (i) defining ***'underway'***.

[TASK: REVISE THE EXPLANATIONS GIVEN FOR RULE 3(l)].

b: Applicable to ***'a vessel when engaged in trawling'***. ***'Trawling'*** is explained in this paragraph and the requirements are self-explanatory; the requirements of lights are shown in the sketches below.

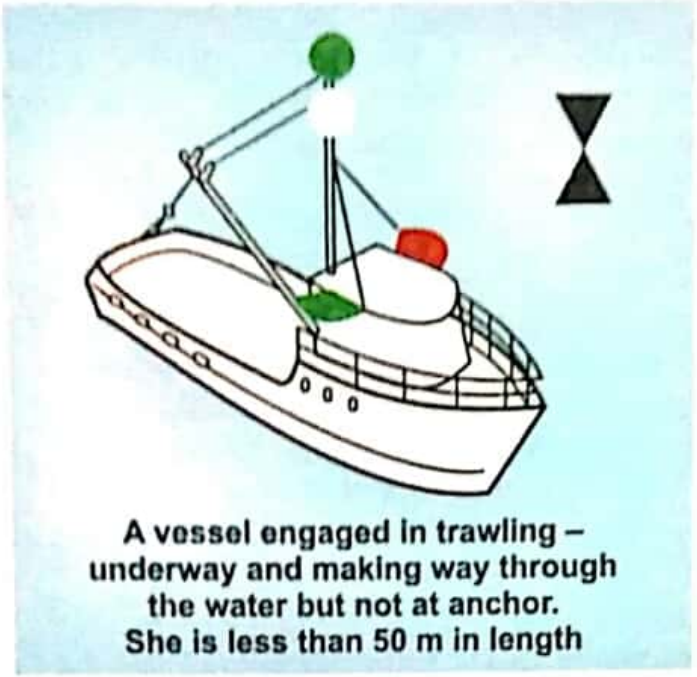


A vessel engaged in trawling – underway, not making way through the water or at anchor. She may be less than or more than 50 m in length

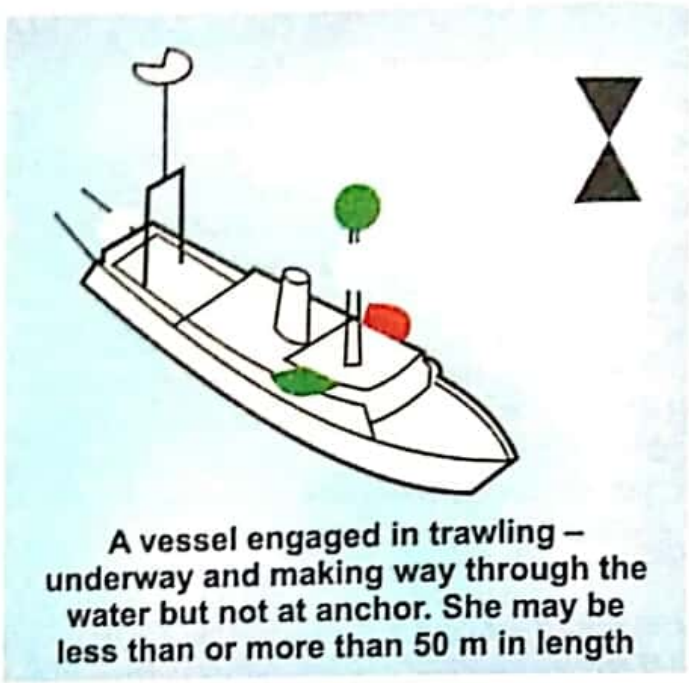


A vessel engaged in trawling – underway, not making way through the water or at anchor. She is less than 50 m in length

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A vessel engaged in trawling – underway and making way through the water but not at anchor. She is less than 50 m in length



A vessel engaged in trawling – underway and making way through the water but not at anchor. She may be less than or more than 50 m in length

The requirements for ***'a vessel when engaged in trawling'*** may be summed up as shown below.

Rule & Vessel	Shape	When viewed from: Port	When viewed from: Ahead	When viewed from: Starboard	Sound signals in restricted visibility, at intervals of not more than 2 minutes.
Rule 26 Trawling vessels underway or at anchor					— • •
Rule 26 Fishing Vessels Trawling See also Annex II					— • •

c: The requirements are applicable to ***'a vessel when engaged in fishing, other than trawling'***; the requirements are self-explanatory and are shown in the sketches further below.

When comparing the requirements of paragraphs 'b' and 'c', both types of ***'fishing vessels'*** are required to exhibit the ***'all-round lights'*** applicable to them. They are not required to exhibit sidelights and the sternlight unless they are ***'making way through the water'***.

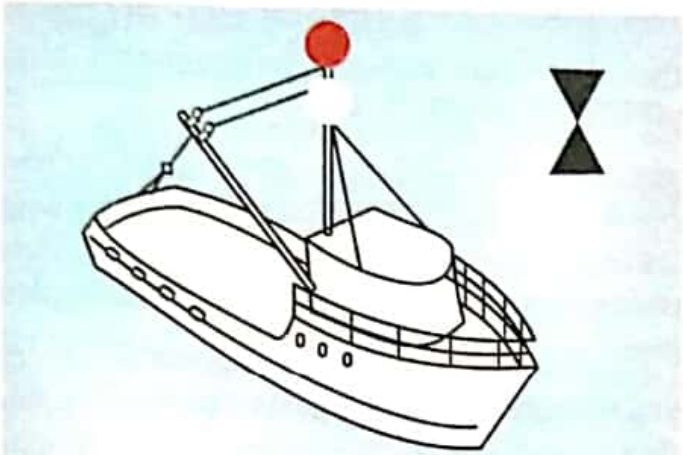
The requirement to exhibit ***'a masthead light'*** is applicable to ***'a vessel engaged in trawling'*** but compulsory only if she is over 50 m in length. For those less than 50 m in length this requirement is optional. If exhibited, the masthead light shall be ***'abaft of and higher than the all-round green light'***, the ***'green light'*** being the upper of the ***'two all-round lights in a vertical line, the upper being green and lower white'***. ***'A vessel when engaged in fishing, other than trawling'*** is not required to exhibit ***'a masthead light'***. When exhibited by ***'a vessel engaged in trawling'***, it gives no indication about the length of the vessel.

The day signal is the same for both the types of vessels, ***'two cones with their apexes together in a vertical line one above the other'***.

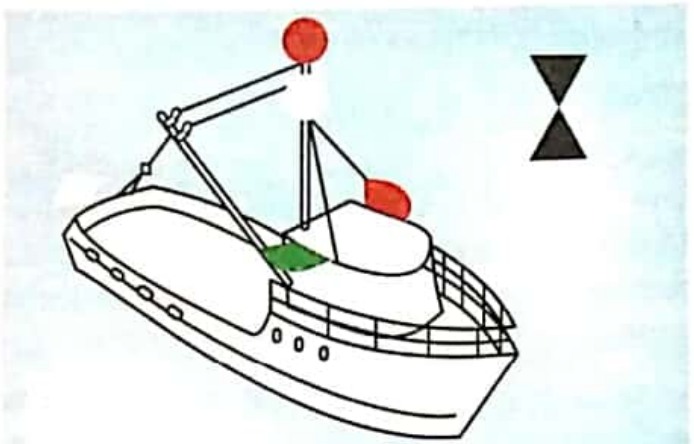
If the outlying fishing gear extends beyond 150 m from ***'a vessel engaged in fishing'***, she needs to

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indicate this by an additional ***'all-round white light or a cone apex upwards in the direction of the gear'***. ▲



A vessel engaged in fishing other than trawling, underway or at anchor but not making way through the water



A vessel engaged in fishing other than trawling, making way through the water

The requirements for ***'a vessel when engaged in fishing, other than trawling'*** may be summed up as shown below.

Rule & Vessel	Shape	When viewed from			Sound signals in restricted visibility, at intervals of not more than 2 minutes.
		Port	Ahead	Starboard	
Rule 26 Fishing Vessels Other than Trowling See also Annex II		 Fishing Vessels with outlying gear extended more than 150m (on port side), underway or at anchor. Fishing Vessels with outlying gear extended more than 150m (on port side), making way	making way + outlying gear (on port side)	 Fishing Vessels underway or at anchor. Fishing Vessels making way	

d: ***'Additional signals for fishing vessels fishing in close proximity'*** are prescribed ***'in annex II'*** and ***'apply to a vessel engaged in fishing in close proximity to other vessels engaged in fishing'***. These requirements are applicable only if there is more than one such vessel engaged in the activity in close proximity of another; the range of ***'close proximity'*** is not defined. Paragraph '1' of annex II defines the placement and range requirements for these additional lights. The additional ***'signals for trawlers'***, prescribed in paragraph '2' of annex II, shall apply to vessels more than 20 m in length - but are optional for those below this length. However, compliance with paragraph '3' of annex II is optional and applicable to ***'vessels engaged in fishing with purse seine gear'*** irrespective of length.

Paragraph 2(a)(ii) of annex II requires ***'one white light over one red light in a vertical line'*** to be exhibited by a trawler ***'when hauling their nets';*** this requirement is similar to Rule 29 for the all-round lights to be exhibited by ***'a pilot vessel'*** when ***'on pilotage duty'***. However, the two should not create any confusion, as the former lights are required to be displayed in addition to and at a lower level than the green over white all-round light required to be exhibited by subparagraph 'b-i' of this

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Rule for ***'a vessel when engaged in trawling'***. (Further, they shall also not be as bright since they are required to have a lower range of visibility.)

These Rules have earlier stated that the ***'Government of any State'*** is authorised to make ***'special rules'***, ***'with respect to additional station or signal lights or shapes for fishing vessels engaged in fishing as a fleet'***.

[TASK – LOCATE: IN WHICH RULE IS THIS REQUIREMENT GIVEN?]

If any such ***'special rules'*** are made for additional requirements, the same should be different from the requirements stated in this Rule. The Governments concerned will promulgate these through their publications, marine notices or broadcasts, and mariners are required to study any such local regulations for the areas they are navigating in. For example, Japan has made such special rules defining additional requirements for their fishing vessels.

e: Is straightforward and clear: a vessel not ***'engaged in fishing'*** shall exhibit lights or shapes applicable to any ordinary ***'power-driven'*** or a ***'sailing vessel'***, as may be applicable for her length, and not the lights or shapes required by this Rule 26. The requirements of this Rule apply only if the vessel is actually ***'engaged in fishing'***.

(QUIZ: WHICH VESSELS ARE REQUIRED TO EXHIBIT A MASTHEAD LIGHT BUT NO SIDE LIGHT OR A STERNLIGHT WHEN UNDERWAY BUT NOT MAKING WAY THROUGH THE WATER?

QUIZ: FOR THE ABOVE VESSELS HOW WOULD THE REQUIREMENTS CHANGE IF SHE WERE TO ANCHOR WITHOUT CHANGING HER STATUS?)

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Rule 27

Vessels not under command or restricted in their ability to manoeuvre

(a) A vessel not under command shall exhibit:

(i) two all-round red lights in a vertical line where they can best be seen;

(ii) two balls or similar shapes in a vertical line where they can best be seen;

(iii) when making way through the water, in addition to the lights prescribed in this paragraph, sidelights and a sternlight.

(b) A vessel restricted in her ability to manoeuvre, except a vessel engaged in mine clearance operations, shall exhibit:

(i) three all-round lights in a vertical line where they can best be seen. The highest and lowest of these lights shall be red and the middle light shall be white;

(ii) three shapes in a vertical line where they can best be seen. The highest and lowest of these shapes shall be balls and the middle one a diamond;

(iii) when making way through the water, a masthead light or lights, sidelights and a sternlight, in addition to the lights prescribed in subparagraph (i);

(iv) when at anchor, in addition to the lights or shapes prescribed in subparagraphs (i) and (ii), the light, lights or shape prescribed in Rule 30.

(c) A power-driven vessel engaged in a towing operation such as severely restricts the towing vessel and her tow in their ability to deviate from their course shall, in addition to the lights or shapes prescribed in Rule 24(a), exhibit the lights or shapes prescribed in subparagraphs (b)(i) and (ii) of this Rule.

(d) A vessel engaged in dredging or underwater operations, when restricted in her ability to manoeuvre, shall exhibit the lights and shapes prescribed in subparagraphs (b)(i), (ii) and (iii) of this Rule and shall in addition, when an obstruction exists, exhibit:

(i) two all-round red lights or two balls in a vertical line to indicate the side on which the obstruction exists;

(ii) two all-round green lights or two diamonds in a vertical line to indicate the side on which another vessel may pass;

(iii) when at anchor, the lights or shapes prescribed in this paragraph instead of the lights or shape prescribed in Rule 30.

(e) Whenever the size of a vessel engaged in diving operations makes it impracticable to exhibit all lights and shapes prescribed in paragraph (d) of this Rule, the following shall be exhibited:

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(i) three all-round lights in a vertical line where they can best be seen. The highest and lowest of these lights shall be red and the middle light shall be white;

(ii) a rigid replica of the International Code flag "A" not less than 1 m in height. Measures shall be taken to ensure its all-round visibility.

(f) A vessel engaged in mine clearance operations shall in addition to the lights prescribed for a power-driven vessel in Rule 23 or to the lights or shape prescribed for a vessel at anchor in Rule 30 as appropriate, exhibit three all-round green lights or three balls. One of these lights or shapes shall be exhibited near the foremast head and one at each end of the fore yard. These lights or shapes indicate that it is dangerous for another vessel to approach within 1000 m of the mine clearance vessel.

(g) Vessels of less than 12 m in length, except those engaged in diving operations, shall not be required to exhibit the lights and shapes prescribed in this Rule.

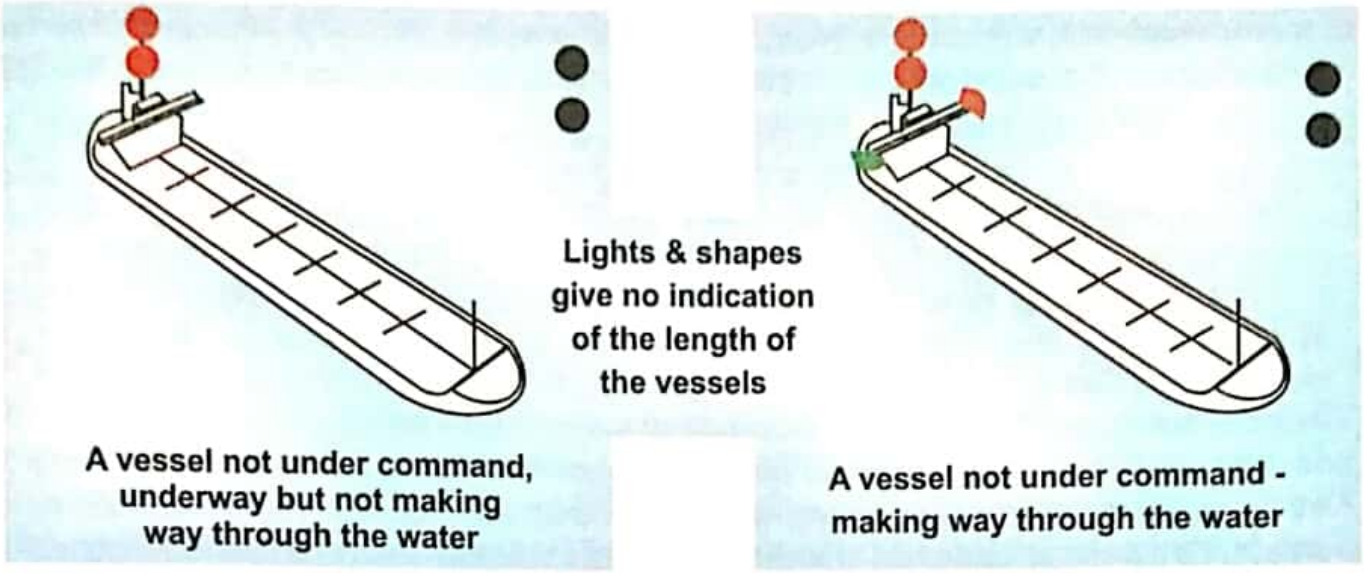
(h) The signals prescribed in this Rule are not signals of vessels in distress and requiring assistance. Such signals are contained in annex IV to these Regulations.

Two similar types of vessels - ***'a vessel not under command'***, defined in Rule 3(f) as ***'which through some exceptional circumstance is unable to manoeuvre as required by these Rules'***, and ***'a vessel restricted in their ability to manoeuvre'***, defined in Rule 3(g) as ***'which from the nature of her work is restricted in her ability to manoeuvre as required by these Rules'*** are covered by this Rule. The concluding remark in both definitions is the same, ***'therefore unable to keep out of the way of another vessel'***, though the reasons for not being able to do so are slightly different. Being ***'unable to'*** and ***'restricted in her ability to manoeuvre'*** respectively, these vessels cannot physically comply with the usual requirements of these Rules to take ***'any action to avoid collision'*** and as such have been granted special privileges. When ***'in sight of one another'***, Rule 18 requires all other vessels to keep out of the way of these two types of vessels, traditionally called **'hampered vessels'**.

This Rule applies only to vessels more than 12 m in length ***'except those engaged in diving operations'*** as stated in paragraph 'g' of this Rule. The term ***'making way'*** used in this rule has been explained earlier; a vessel not ***'making way'*** if ***'not at anchor, or made fast to the shore, or aground'*** is still very much ***'underway'***.

a: Applies to any vessel which declares herself ***'not under command'***, **(NUC)** due to ***'some exceptional circumstance'*** explained with Rule 3(f). When ***'not under command'***, the requirement of lights to be exhibited vary between a vessel ***'underway'*** but stopped and drifting versus ***'when making way through the water'***. In the latter case, such a vessel is also required to exhibit ***'sidelights and a sternlight'***. The day signal described in this Rule is common in both situations. Since masthead lights are not required to be exhibited, the other lights give no indication about the probable length of ***'a vessel not under command'***.

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Rule & Vessel	Shape	When viewed from			Sound signals in restricted visibility, at intervals of not more than 2 minutes.
		Port	Ahead	Starboard	
Rule 27 Vessels not under command		Under way but not making way through the water		Under way but not making way through the water	
Rule 27 Vessels not under comm'd making way through water		Under way and making way through the water		Under way and making way through the water	

b: This covers any vessel ***'restricted in her ability to manoeuvre except a vessel engaged in mine clearance operations'***, usually referred to as **'RAM'** vessels. Paragraphs 'c' and 'd' of this Rule contain additional requirements for some specific types of vessels also covered under ***'restricted in her ability to manoeuvre'***. These requirements apply to all such vessels.

For ***'a vessel restricted in her ability to manoeuvre',*** the requirements of lights and shapes change when she is ***'underway'***, ***'making way'*** or ***'at anchor'***. Only when ***'making way'*** are such vessels required to exhibit ***'a masthead light or lights, sidelights and a sternlight'***.

[TASK: STUDY ANNEX I PARAGRAPHS 2(f)(ii) AND 3(c) REGARDING PLACEMENT OF RAM LIGHTS.

REVISE RULE 3(G): THE CONDITIONS WHEN A VESSEL SHALL BE CONSIDERED TO BE *'RESTRICTED IN HER ABILITY TO MANOEUVRE']*

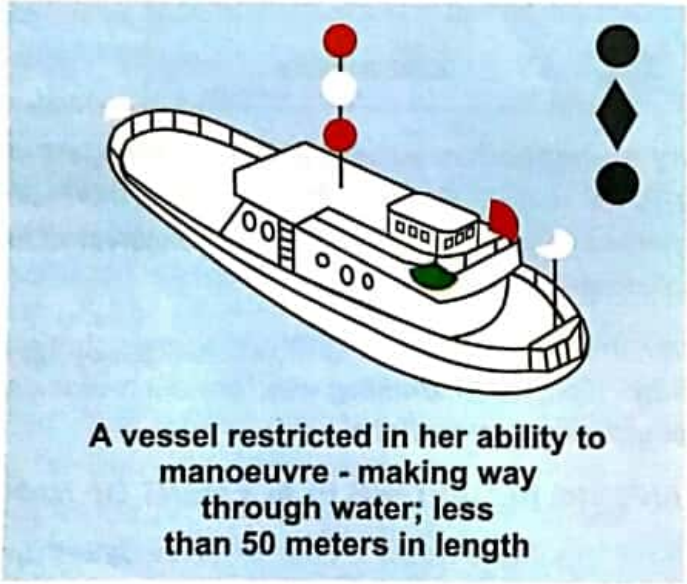
Though not stated in this Rule, ***'a masthead light or lights'*** depend on the length of a vessel in compliance with Rule 23(a). While Rule 23(a) applies to ***'power-driven vessels underway',*** the requirements of this Rule 27(b)(iii) apply to any ***'vessel restricted in her ability to manoeuvre'*** but only when she is ***'making way through the water'***. The requirements are otherwise self-explanatory. Basis this Rule it appears that ***'a sailing vessel',*** when carrying out any task defined in Rule 3(g) and declaring herself as ***'a vessel restricted in her ability to manoeuvre',*** should display ***'a masthead light or lights'*** when ***'making way through the water',*** a rather unlikely scenario.

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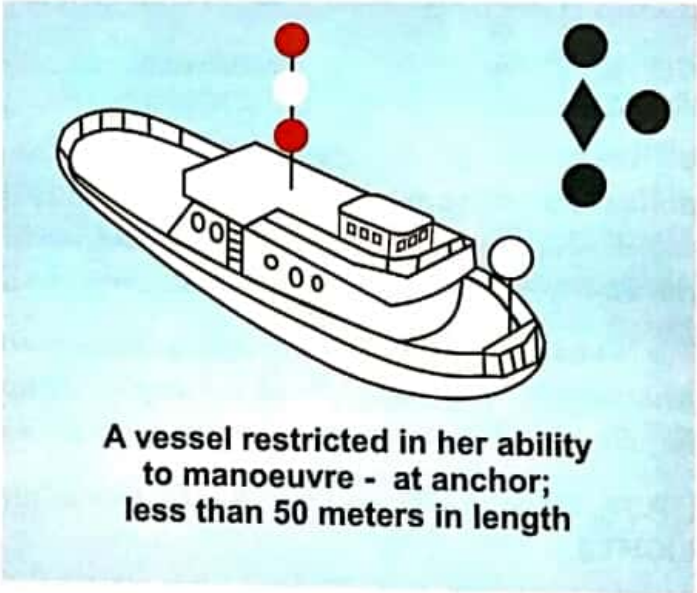
At anchor is referred to in paragraphs 'b', 'd' and 'f' of this Rule with contrasting requirements. Subparagraph 'd-iii' does not require compliance with anchor lights or shapes prescribed in Rule 30 but paragraphs 'b' and 'f' require compliance.

A vessel ***'at anchor'*** is not capable of manoeuvring as per the requirements of these Rules or expected to act to keep clear of any other vessel. As such, the requirement to continue displaying the lights and shapes of ***'restricted in her ability to manoeuvre'*** do initially appear absurd since all vessels should keep clear of a vessel at anchor as per ***'ordinary practice of seamen'*** explained with Rule 2. A vessel at anchor may get engaged in only some of the activities listed in subparagraphs 'i to vi' of Rule 3(g), which defines the conditions allowing a vessel to declare herself as ***'a vessel restricted in her ability to manoeuvre'***. Of these conditions, Rule 3(g) subparagraph 'iii' on replenishment applies only to a vessel underway. Launching and recovery of aircraft is usually not carried out at anchor and a vessel at anchor cannot normally be engaged in towing as per Rule 3(g) subparagraphs 'iv' and 'vi' respectively.

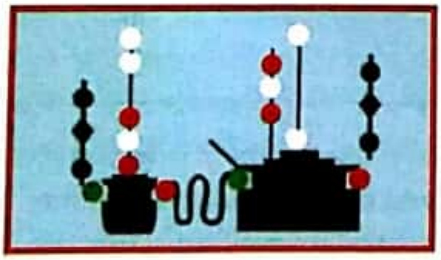
The requirement for such vessels to exhibit ***'restricted in her ability to manoeuvre'*** status even at anchor in certain conditions appears to be to caution other vessels of their special status even while at anchor so that they pass well clear of them.



A vessel restricted in her ability to manoeuvre - making way through water; less than 50 meters in length



A vessel restricted in her ability to manoeuvre - at anchor; less than 50 meters in length



Two vessels engaged in replenishment, restricted in their ability to manoeuvre, making way through the water, both may be less than or more than 50 m in length as seen from right ahead. Both masthead and all round lights options shown are correct.

Rule & Vessel	Shape	When viewed from			Sound signals in restricted visibility, at intervals of not more than 2 minutes.
		Port	Ahead	Starboard	
Rule 27 Vessels restricted in her ability to manoeuvre		 Not Making way / Making way 50m or more	 Making way	 Making way 50m or more / Not Making way	— • •

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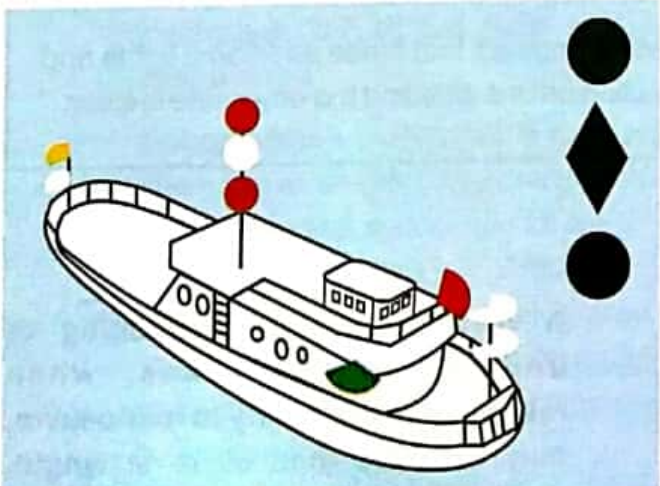
Annex I, paragraphs 2(f)(ii) and 3(c) prescribe the positioning details of the lights required by this Rule.

c: ***'A vessel engaged in a towing operation'*** is not considered ***'restricted in her ability to manoeuvre'***. If she is ***'power-driven'***, she is required to indicate that she is towing as per Rule 24 should comply with these Rules like any other vessel as is not granted any special privileges by these Rules. The towing lights and shapes are an indication is to let others know of her special condition that wires or ropes connecting the two vessels exist and are usually not visible since they usually pass under the sea surface. Passing between a tug and tow could thus be extremely dangerous.

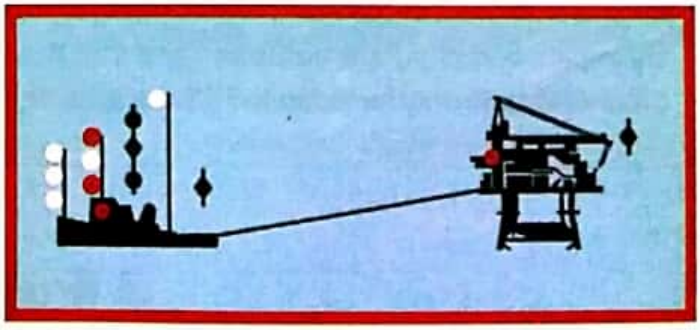
This Rule is about ***'a power driven vessel engaged in a towing operation such as severely restricts the towing vessel and her tow in their ability to deviate from their course'***. The underlined part of this clause is a word-to-word repetition of Rule 3(g) (vi) describing ***'vessels restricted in their ability to manoeuvre'***. The difference being that this Rule 27(c) applies only to ***'a power-driven vessel engaged in a towing operation'***, when she shall ***'in addition to the lights or shapes prescribed in Rule 24(a) exhibit the lights or shapes prescribed in subparagraphs (b)(i) and (ii) of this Rule'***. The same are self-explanatory.

It must be noted that subparagraphs 'iii' and 'iv' of Rule 27(b) have quite logically not been referred to in this Rule 27(c). Rule 27(b)(iii) is on exhibiting ***'when making way through the water a masthead light or lights, sidelights and a sternlight'***. A vessel engaged in towing shall anyway be exhibiting these lights in compliance with Rule 24(a) and (d). And, Rule 27(b)(iv) is about lights to be displayed by a ***'vessel restricted in their ability to manoeuvre'***, ***'when at anchor'***. At anchor, she should not be considered ***'engaged in towing'***, and as such it would be absurd to seek compliance with this subparagraph. Though a vessel at anchor may have a tow attached to it.

In effect, lights required by both these Rules 24(a) and 27(b) are required to be exhibited, but only when the ***'severely restricts'*** clause is applicable and not otherwise. The requirements of this Rule apply only to ***'a power-driven vessel engaged in a towing operation'***, and not to the vessel or vessels being towed.



A power-driven vessel engaged in a towing operation such as severely restricts her and her tow in their ability to deviate from their course; length of tow does not exceed 200 meters; towing vessel less than 50 meters in length.



A vessel engaged in towing, maybe over 50 m in length, length of tow exceeds 200m, restricted in their ability to deviate from their course, seen from their port side.

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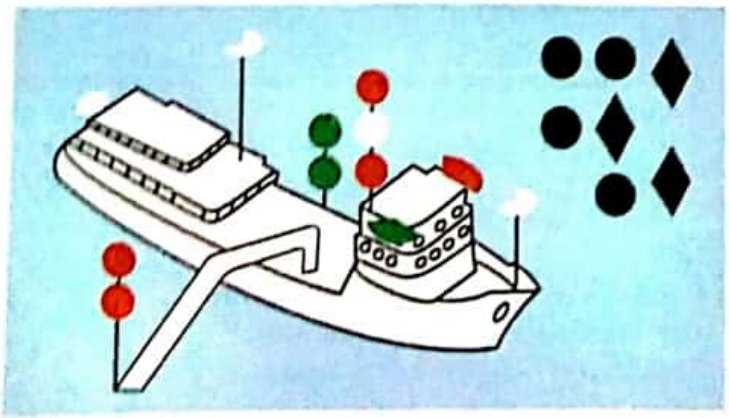
d: The first part of this Rule is quite straightforward: ***'a vessel engaged in dredging or underwater operations, when restricted in her ability to manoeuvre, shall exhibit the lights and shapes prescribed in subparagraph (b)(i), (ii) and (iii) of this Rule'***.

'When an obstruction exists', such vessels should further comply with subparagraphs 'i to iii' of this Rule which states ***'and shall in addition, when an obstruction exists, exhibit...'***. That is ***'to indicate the side on which the obstruction exists'***, and ***'to indicate the side on which another vessel may pass'***. The obstruction could be a dredging arm or a float or other equipment used to support underwater operations. The requirements on the positioning of the lights for the above are stated in Annex I paragraph 4(b).

This Rule 27(d) requires compliance with Rule 27(b) subparagraphs 'i to iii' but not with subparagraph 'iv'. As such, there is no clarity on the requirement with respect to exhibition of lights and shapes if such a vessel were to anchor when no ***'obstruction exists'***. Since subparagraph 'b-iv' is not referred to, it can be inferred that such a vessel need not exhibit anchor lights or shapes when at anchor. On the other hand, it can also be argued that nothing is mentioned prohibiting her from complying with the requirements of Rule 30 applicable to a vessel at anchor. It may thus be concluded that ***'a vessel engaged in dredging or underwater operations, when restricted in her ability to manoeuvre'*** (from Rule 27d) when no ***'obstruction exists'***, if at anchor, should as a matter of good seamanship comply with the requirements of Rule 30. Though subparagraph 'iii' of this Rule 27(d) clearly states that anchor lights and shapes are not to be displayed, but this requirement is applicable only ***'when an obstruction exists'***.

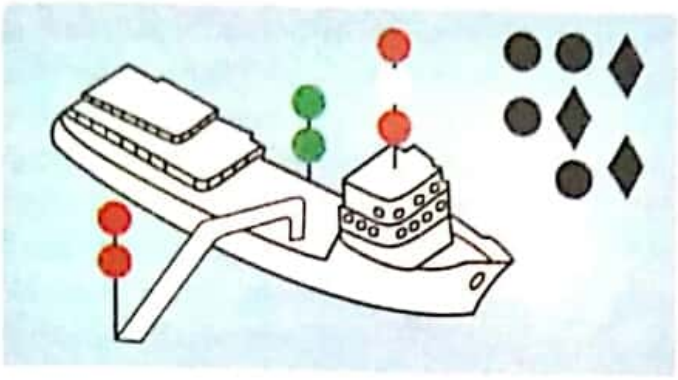
This Rule does not provide any guidance if there is an obstruction on both the sides, having just stated ***'when an obstruction exists'***. If it were so, should this vessel then display ***'two all-round red lights or two balls in a vertical line'*** on each side and not ***'two all-round green lights or two diamonds'***? Even if she were not to show the obstruction signals on both sides, her status is clear and other vessels would anyway pass clear of her. It appears thus, that there is no need to show such signals if obstructions exist on both sides. Similar reasoning can be applied that if both the sides are clear, the vessel need not show the ***'two all-round green lights or two diamonds'***.

By implication of subparagraphs 'i and ii' of this Rule, it appears that these additional lights and shapes should only be exhibited if there is an obstruction on one side and the other side is clear.

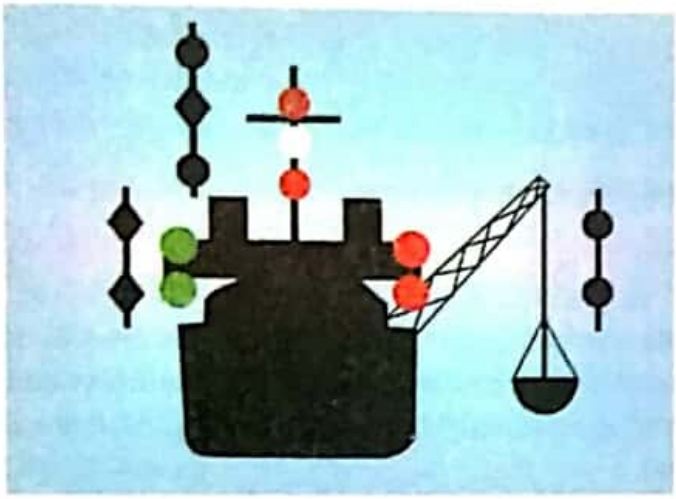


A vessel engaged in dredging or underwater operations, when restricted in her ability to manoeuvre, may be more than 50 m in length, making way through the water with an obstruction on her starboard side.

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A vessel engaged in dredging or underwater operations, when restricted in her ability to manoeuvre; underway but not making way through the water with an obstruction on her starboard side.



Vessel engaged in dredging or underwater operations when restricted in her ability to manoeuvre; underway but not making way through the water with an obstruction on her starboard side, as seen from right astern.

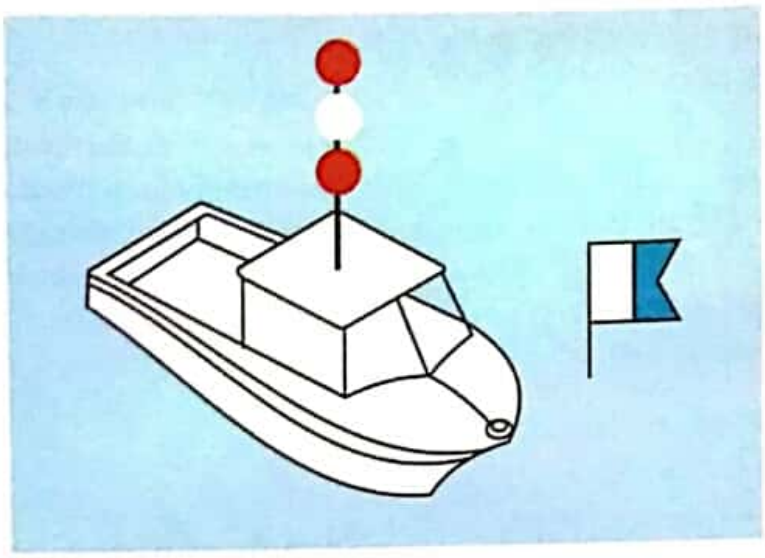
e: ***'The size of vessel engaged in diving operations'***: the size is not stated in this Rule. However, paragraph 'g' of this Rule 27, while exempting vessels of less than 12 m from the requirements of this Rule, does not exempt ***'those engaged in diving operations'***. As such, it implies that these alternate arrangements are for rather small vessels that find ***'it impracticable to exhibit all lights and shapes prescribed in paragraph (d) of this Rule'***.

Such a vessel may in lieu of the requirements stated in paragraph 'd' exhibit the requirements stated in this paragraph 'e' of this Rule as follows:

- Subparagraph 'i' states that the requirement for the all-round lights are the same as in paragraph 'b-i' of this Rule applicable to any vessel ***'restricted in her ability to manoeuvre'***.
- Subparagraph 'ii' requires ***'a rigid replica of the International Code flag "A" not less than 1 m in height'***. All possible measures are to be taken that this flag is visible from all sides. This flag substitutes for the standard day signal of a ball-diamond-ball prescribed under subparagraph 'b-ii' of this Rule. Though Annex I paragraph 6(c) allows a reduced size for the day signal shapes for vessels less than 20 m in length, by this Rule the rigid flag smaller than ***'1 m in height'*** is not permitted even for a small vessel. This size may appear huge for a small vessel; but from a distance, this may still go unnoticed when seen from the bridge of a large vessel.

The stricter requirements, for a ***'vessel engaged in diving operations'***, do not allow a complete waiver from compliance with these Rules and appear to give due priority to the safety of life of the divers.

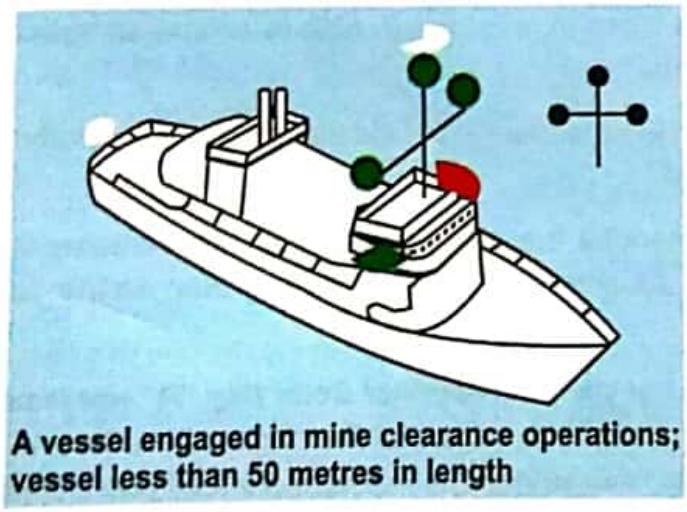
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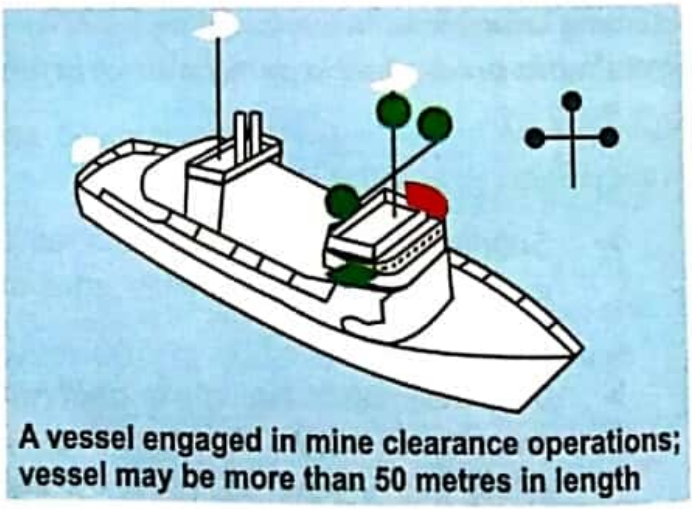
A small vessel engaged in diving operations

f: ***'A vessel engaged in mine clearance operations'*** is a vessel ***'restricted in her ability to manoeuvre'*** defined by Rule 3(g). However, she is required to exhibit a unique pattern of lights and shapes to exhibit when engaged in this activity. While continuing to comply with the requirements of Rules 23 and 30 as ***'a power-driven vessel underway'*** and ***'at anchor'*** respectively, she is required to ***'exhibit three all-round green lights or three balls'***, placed near her foremast head and fore yard as described, and not the usual 'RAM' lights or shapes.

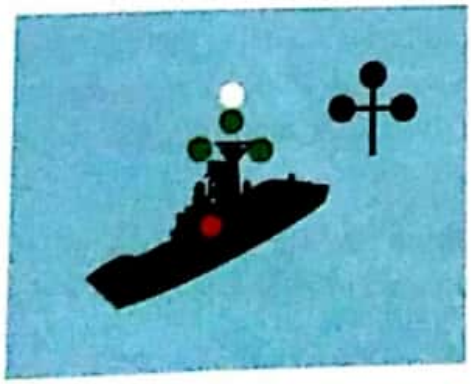
An interesting aspect of this Rule is that it specifies the minimum safe passing distance from such a vessel. ***'These lights or shapes indicate that it is dangerous for another vessel to approach within 1000 m of the mine clearance vessel'***. This is unique, as these Rules otherwise do not state any numerical values for the purpose of ***'preventing collisions'***.



A vessel engaged in mine clearance operations; vessel less than 50 metres in length



A vessel engaged in mine clearance operations; vessel may be more than 50 metres in length



A Vessel engaged in mine clearance operations; vessel less than 50 metres in length seen from her port side

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g: ***'Vessels of less than 12 m in length shall not be required to exhibit the lights & shapes prescribed in this Rule'***. Vessels less than 12 metres in length are exempt from displaying the lights or day signals required to be shown by ***'a vessel not under command'*** or ***'a vessel restricted in her ability to manoeuvre'***. However, the Rule does not restrict such smaller vessels from displaying these lights or shapes if they so desire, though this is not mentioned in these Rules in so many words. If vessels decide not to display these signals, then they also cannot claim the applicable privileges. They may communicate the status of their predicament to other vessels by other means too but these Rules do not refer to any such alternate arrangements.

Using the guidance given in Rule 2, it is thus recommended that the bigger vessels should try, if possible and practicable, to keep clear of small vessels as the latter may be **'NUC'** or **'RAM'** but not exhibiting those signals. This recommendation may be considered as a best practice advice and has no clear-cut legal sanctity as per these Rules or otherwise.

A very important element of this Rule is that these exemptions are not available to ***'a vessel engaged in diving operations'***. They must continue to comply with the requirements of this Rule 27, but may opt for the alternate requirements stated in paragraph 'e' as explained above.

h: This final paragraph makes it clear that even though ***'a vessel not under command'*** or ***'a vessel restricted in her their ability to manoeuvre'*** may actually be in ***'distress'***, the lights and shapes prescribed by this Rule are not meant to and do not indicate ***'distress'*** or imply that the vessels need any assistance.

If vessels are in distress, they should use one or more of the signals stated in Annex IV to communicate their need for assistance. These issues are generally outside the purview of these Rules meant for ***'preventing collisions'***, except that the ***'distress signals'*** are listed in Annex IV of these Regulations.

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Rule 28

Vessels constrained by their draught

A vessel constrained by her draught may, in addition to the lights prescribed for power-driven vessels in Rule 23, exhibit where they can best be seen three all-round red lights in a vertical line, or a cylinder.

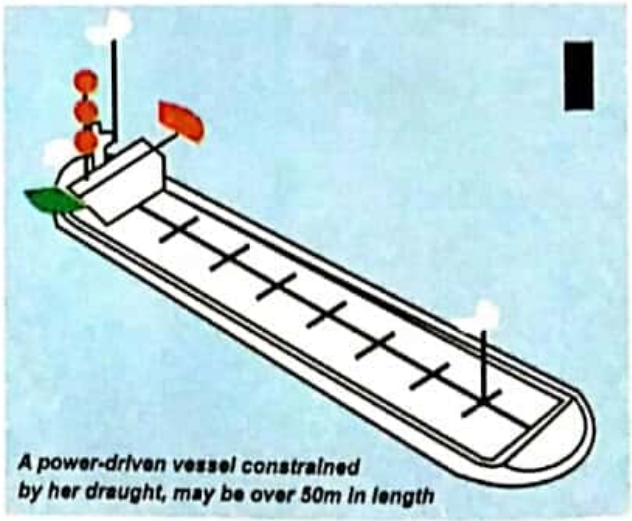
Rule 3(h) states: ***'The term "vessel constrained by her draught" means a power-driven vessel which, because of her draught in relation to the available depth and width of navigable water, is severely restricted in her ability to deviate from the course she is following'***. Such a vessel may usually be referred to as a vessel **'CBD'** and will always be ***'a power-driven vessel'***.

'A power-driven vessel' has to take into account both the depth and the width of available sea room in deciding if she can invoke **'CBD'** status. Rule 9(c and d), without using this term, do imply certain privileges to such **'CBD'** vessels. Rule 18(d) requires all vessels other than hampered vessels to **'avoid impeding the safe passage of a vessel constrained by her draught, exhibiting the signals in Rule 28' - *'except where Rules 9, 10 and 13 otherwise require'*.**

[TASK: REVISE RULE 9, ESPECIALLY PARAGRAPHS 'C' AND 'D'.]

This Rule states the additional lights and day signals that ***'a vessel constrained by her draught may, in addition to the lights prescribed for power-driven vessels in Rule 23, exhibit where they can best be seen'***. Please note the optional nature of this Rule by the use of the word ***'may'***. If these lights and shapes are not exhibited, obviously the vessel concerned cannot expect the privileges granted by these Rules. ***'A power-driven vessel'*** exhibiting lights and/or shapes by this Rule must continue to exhibit the normal ***'navigation lights'*** required to be displayed by a ***'power-driven vessel'*** as per Rule 23.

NOTE :
The placement of the CBD lights is governed by Annex I, paragraphs 2(f) (ii) and 3(c).



A power-driven vessel constrained by her draught, may be over 50m in length

A vessel constrained by her draft

Rule & Vessel	Shape	When viewed from			Sound signals in restricted visibility, at intervals of not more than 2 minutes.
		Port	Ahead	Starboard	
Rule 28 Vessels constrained by her draft					— • •

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Rule 29

Pilot vessels

(a) A vessel engaged on pilotage duty shall exhibit:

(i) at or near the masthead, two all-round lights in a vertical line, the upper being white and the lower red;

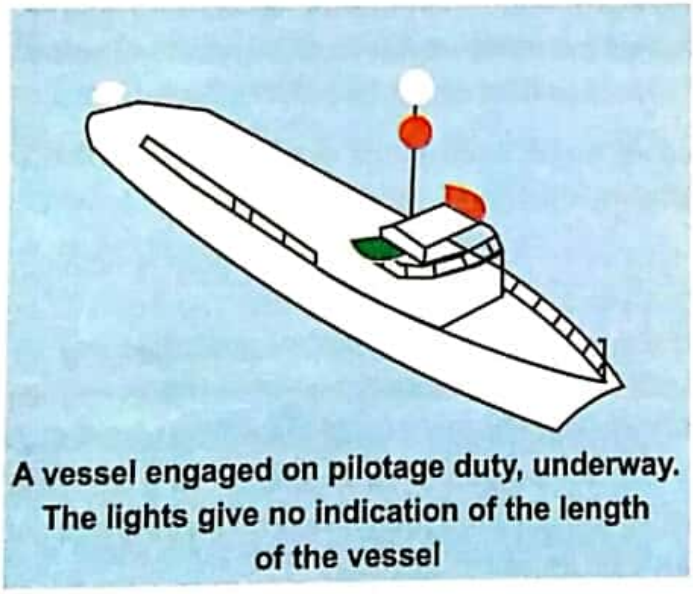
(ii) when underway, in addition, sidelights and a sternlight;

(iii) when at anchor, in addition to the lights prescribed in subparagraph (i), the light, lights or shape prescribed in Rule 30 for vessels at anchor.

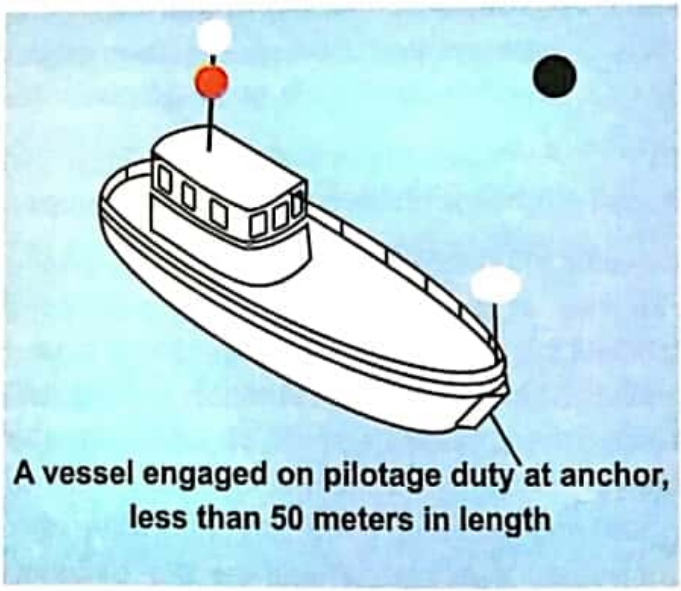
(b) A pilot vessel when not engaged on pilotage duty shall exhibit the lights or shapes prescribed for a similar vessel of her length.

'A vessel engaged on pilotage duty shall exhibit' only the lights prescribed by this Rule, none others. They are not required to exhibit any masthead lights. The requirements of this Rule are simple and straightforward. When ***'not engaged on pilotage duty'***, a ***'pilot vessel'*** is not entitled to exhibit the lights and shapes prescribed in this Rule, then she must comply with the other Rules applicable to her depending on her size and type.

There are no day signals or shapes specified in the Rules for such a vessel, though in practice they normally fly flag 'H' and have the term 'PILOTS', or similar marked on their sides or even on top.



A vessel engaged on pilotage duty, underway. The lights give no indication of the length of the vessel



A vessel engaged on pilotage duty at anchor, less than 50 meters in length

Rule & Vessel	Shape	When viewed from				
		Port		Ahead	Starboard	
Rule 29 Pilot Vessels on Pilotage duty	At anchor	PILOT At anchor	PILOT Under way	Underway	PILOT Under way	PILOT At anchor

*Note: Sound signals for a **'vessel engaged on pilotage duty'**, **'in or near an area of restricted visibility'** vary depending on her condition. Please refer to Rule 35(k), which further refers to the application of paragraphs 'a', 'b' or 'g' of the same Rule 35.*

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Rule 30

Anchored vessels and vessels aground

(a) **A vessel at anchor shall exhibit where it can best be seen:**

(i) **in the fore part, an all-round white light or one ball;**

(ii) **at or near the stern and at a lower level than the light prescribed in subparagraph (i), an all-round white light.**

(b) **A vessel of less than 50 m in length may exhibit an all-round white light where it can best be seen instead of the lights prescribed in paragraph (a) of this Rule.**

(c) **A vessel at anchor may, and a vessel of 100 m and more in length shall, also use the available working or equivalent lights to illuminate her decks.**

(d) **A vessel aground shall exhibit the lights prescribed in paragraph (a) or (b) of this Rule and in addition, where they can best be seen:**

(i) **two all-round red lights in a vertical line;**

(ii) **three balls in a vertical line.**

(e) **A vessel of less than 7 m in length, when at anchor, not in or near a narrow channel, fairway or anchorage, or where other vessels normally navigate, shall not be required to exhibit the lights or shape prescribed in paragraphs (a) and (b) of this Rule.**

(f) **A vessel of less than 12 m in length, when aground, shall not be required to exhibit the lights or shapes prescribed in subparagraphs (d)(i) and (ii) of this Rule.**

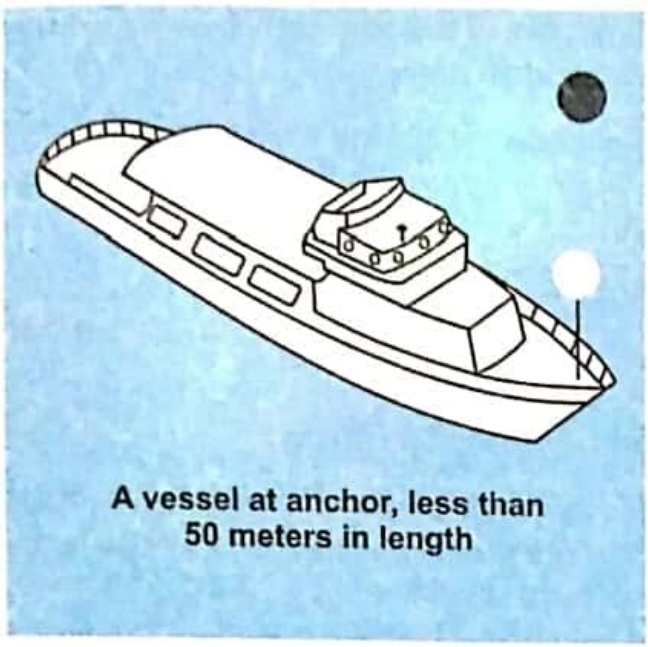
A vessel should be considered to be ***'at anchor'*** only when her anchor is down and it is holding. However, in practice a vessel is generally considered to be ***'at anchor'*** from the time her anchor touches the seabed till it is off the seabed, otherwise she is simply ***'underway'***. A vessel dredging her anchor is also considered ***'underway'***. A vessel whose anchor is dragging along the seabed and not holding may declare herself ***'Not Under Command'*** as explained with Rule 3(f). A vessel fastened to mooring buoys which themselves are anchored is also considered to be at anchor, so is a vessel whose anchor is fouled with any underwater obstruction. But a vessel ***'made fast to the shore'*** is not considered ***'at anchor'*** even if she has her anchor(s) down as part of the mooring.

'a to c': These paragraphs state the requirements of lights and shapes to be exhibited by ***'a vessel at anchor'***. Illuminating decks is a must for vessels 100 m or more in length, though smaller vessels may exercise this option if they wish to; it is recommended that they should do so.

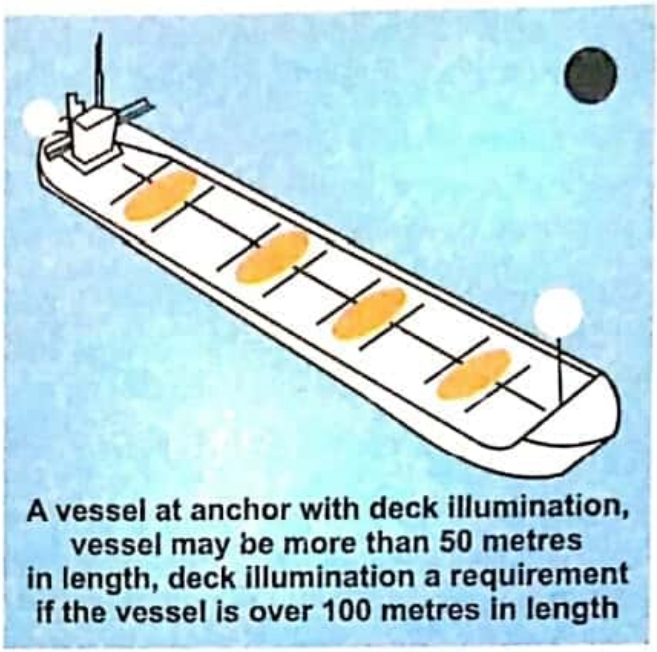
Certain vessels are exempted from exhibiting ***'lights and shapes'*** prescribed for vessels at anchor, for example by Rule 26, ***'a vessel engaged in fishing'*** when ***'at anchor'***, if still ***'engaged in fishing'***, ***'shall exhibit only the lights and shapes prescribed'*** by Rule 26 and not by this Rule 30.

[TASK: WHICH OTHER RULES STATE THAT VESSELS COVERED BY THEM ARE NOT REQUIRED TO DISPLAY LIGHTS AND/OR SHAPES PRESCRIBED BY THIS RULE WHEN AT ANCHOR?]

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A vessel at anchor, less than 50 meters in length



A vessel at anchor with deck illumination, vessel may be more than 50 metres in length, deck illumination a requirement if the vessel is over 100 metres in length

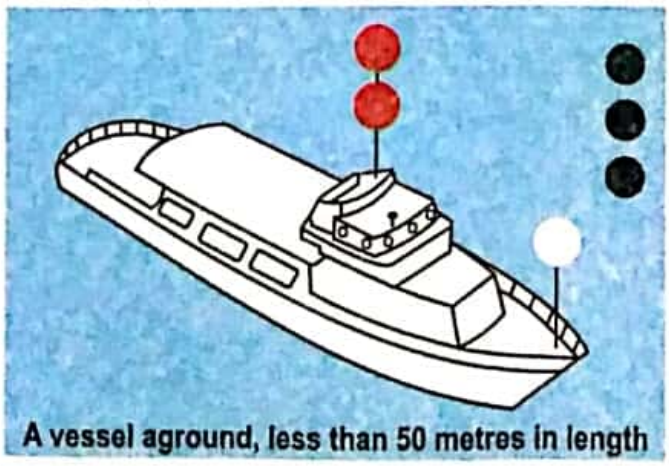
'd': States the requirements of ***'lights and shapes'*** to be exhibited by ***'a vessel aground'***. A vessel is not considered ***'aground'*** if she is intentionally made to push against the bottom or side of a river to hold her position. Such a vessel using her propulsion and steering to maintain her position is otherwise free to move from this holding position so is not ***'aground'*** but very much ***'underway'***.

The lights and shapes to be exhibited by ***'a vessel aground'*** are additional to those required of ***'a vessel at anchor'***. The ***'two all-round red lights'*** are also required to be exhibited by a vessel **'NUC'**; but she is further required to exhibit ***'sidelights and a sternlight'***, though only ***'when making way through the water'***, ***'a vessel aground'*** is linked with anchor lights.

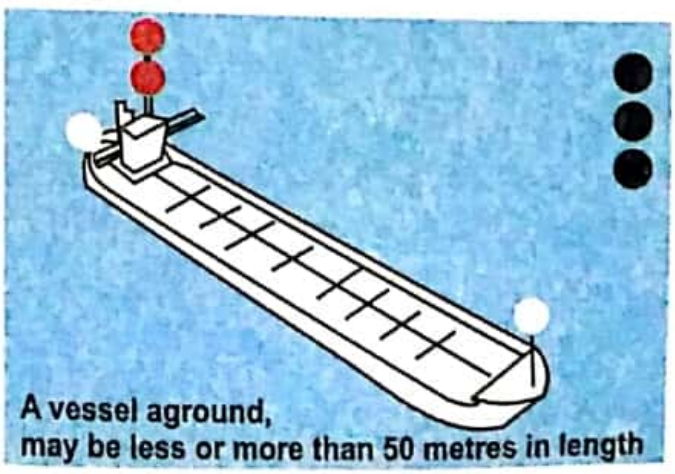
When comparing the above, the lights may appear the same if you were to sight either ***'a vessel aground'*** less than 50 m in length at night showing just one ***'all-round white light'***, or a vessel **'NUC'** making way through the water when viewed from astern.

[TASK: COMPARE THE LIGHTS OF A VESSEL AGROUND, LESS THAN 50 M IN LENGTH, WHICH OPTS TO EXHIBIT A SINGLE WHITE LIGHT IN COMPLIANCE WITH RULE 30(B) AND A VESSEL NUC VIEWED FROM ASTERN EXHIBITING THE LIGHTS PRESCRIBED BY RULE 27(A).]

On sighting a vessel aground the best actions is to turn your vessel back to the reciprocal course



A vessel aground, less than 50 metres in length



A vessel aground, may be less or more than 50 metres in length

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immediately. This is an action based on good seamanship point of view, though not stated in these Rules. However, it is for the navigators to judge the situation and act accordingly.

'e': Exempts vessels smaller than 7 m in length from exhibiting lights and shapes required of ***'a vessel at anchor'***, but only if she is ***'not'*** anchored ***'in or near a narrow channel, fairway or anchorage, or where other vessels normally navigate'***.

[TASK: REVISE RULES 9(G) AND 10(G) WITH RESPECT TO THE RESTRICTIONS PLACED ON ANCHORING INSIDE A 'NARROW CHANNEL' OR 'IN A TRAFFIC SEPARATION SCHEME OR IN AREAS NEAR ITS TERMINATIONS'.

QUIZ ?: WHAT ARE THE DANGERS IF SUCH ANCHORING IS RESORTED TO?]

'f': Vessels smaller than 12 m in length ***'when aground'*** are exempted from exhibiting the additional lights and shapes required of ***'a vessel aground'*** which are prescribed in subparagraphs 'd-i' and 'd-ii' of this Rule.

On comparing the requirements of paragraphs 'e' and 'f' of this Rule, a vessel between 7 and 12 m in length, if at anchor, ***'shall exhibit'*** the lights and shapes required by this Rule but is exempted from displaying the signals of ***'a vessel aground'***, even if she is ***'aground'***.

Paragraphs 'e' and 'f' do not necessarily prohibit a vessel from following the requirements of the Rules if she so desires, all that is stated is, ***'shall not be required'***.

[TASK: COMPARE THE REQUIREMENTS OF THIS RULE WITH THOSE OF RULE 27(g).]

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Rule 31

Seaplanes

Where it is impracticable for a seaplane or a WIG craft to exhibit lights and shapes of the characteristics or in the positions described in the Rules of this part she shall exhibit lights and shapes as closely similar in characteristics and position as is possible.

This Rule provides some exemptions - ***'where it is impracticable for a seaplane or a WIG craft to exhibit lights and shapes of the characteristics or in the positions described in the Rules of this Part'*** - that is in Part C of these Rules. This is perhaps to do with the special construction of ***'a seaplane or a WIG craft'*** and Rule 1(e) allows for this. However, any alternate arrangements are required to be ***'as closely similar in characteristics and position as is possible'***; this refers to the requirements stated in this Part C of these Rules, which automatically refer further to Annex I of these Regulations.

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PART D - INTRODUCTION TO SOUND AND LIGHT SIGNALS

The requirements of these Rules appear to carry over from the ancient systems of communication at sea that were dependent on sound and light signals alone, radiotelephony or other electronic systems of communication were nonexistent. These traditional methods of communication are the only ones prescribed within these Rules even now, though modern systems feature in the revised Annex IV applicable from December 2009, but nowhere else in these Rules.

Annex III contains the technical details about sound signals and should be read in conjunction with these Rules, especially the requirements on their audible range. The audible range is within a bandwidth of 0.5 to 2.0 nautical miles only depending on the length of a vessel. Annex III, Section 1(c) states, ***'the range of audibility in the table above is for information and is approximately the range at which a whistle may be heard on its forward axis with 90% probability in conditions of still air on board a vessel having average background noise level at the listening posts (taken to be 68 dB in the octave band centred on 250 Hz and 63 dB in the octave band centred on 500 Hz).***

In practice the range at which a whistle may be heard is extremely variable and depends critically on weather conditions; the values given can be regarded as typical but under conditions of strong wind or high ambient noise level at the listening post the range may be much reduced'.

Though Annex III prescribes the approximate range of sound signals explained above, it does not state any range requirements for sound signals from a bell or gong equipment. Only the construction details and intensity parameters are prescribed in Section 2 of Annex III. The intensity requirement is, ***'a bell or gong or other device having similar sound characteristics shall produce a sound pressure level of not less than 110 dB at a distance of 1 meter from it'***.

Noise levels inside and outside the navigating bridge of a ***'power-driven vessel'*** can be substantial because of machinery and external blowers and can thus interfere with the ability to detect external sounds, sometimes even rendering them inaudible. Navigators should be cautious of these facts and not depend upon sound signals alone in totality. They should also take these factors into account when deciding ***'safe speed'***, especially ***'in or near an area of restricted visibility'***. It must also be ensured that seafarers on ***'look-out'*** duties are located in positions where disturbance caused by sounds of their own vessels is minimal, so that they can detect the ***'sound signals'*** from other vessels or even buoys or other objects in the vicinity.

Apart from the above, it is important to understand the fact that the human ear cannot determine the direction of sound accurately. Further, sound signals during their transit, travelling through varying densities of medium like uneven fog patches, may be affected by refraction, reflection or even total internal reflection. The apparent direction the sound signals are being received from may give a false indication of the direction of the source which may be quite different from its actual true direction. As such, relying on ***'sound signals'*** alone is rather risky and dangerous.

[TASK: 1: DO YOU RECOLLECT THE REQUIREMENTS OF RULE 6 ON 'SAFE SPEED' AND THE SIX FACTORS APPLICABLE TO ALL VESSELS? IF NOT PLEASE REVISE THEM.

2: WHICH RULE STUDIED EARLIER USES THE TERM 'APPARENTLY' WHEN REFERRING TO SOUND SIGNALS?]

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Rule 32

Definitions

(a) **The word *whistle* means any sound signalling appliance capable of producing the prescribed blasts and which complies with the specifications in annex III to these Regulations.**

(b) **The term *short blast* means a blast of about one second's duration.**

(c) **The term *prolonged blast* means a blast of from four to six seconds' duration.**

The term ***'whistle'*** is used for devices that produce sounds, like whistles or horns. The limits of the frequencies at which a vessel's equipment generates sound is dependent on the length of the vessel and is stated in Annex III(b). The signals prescribed in the Rules are specified in terms of short blasts and prolonged blasts as defined in this Rule.

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Rule 33

Equipment for sound signals

(a) **A vessel of 12 m or more in length shall be provided with a whistle, a vessel of 20 m or more in length shall be provided with a bell in addition to a whistle, and a vessel of 100 m or more in length shall, in addition, be provided with a gong, the tone and sound of which cannot be confused with that of the bell. The whistle, bell and gong shall comply with the specifications in annex III to these Regulations. The bell or gong or both may be replaced by other equipment having the same respective sound characteristics, provided that manual sounding of the required signals shall always be possible.**

(b) **A vessel of less than 12 m in length shall not be obliged to carry the sound signalling appliances prescribed in paragraph (a) of this Rule but if she does not, she shall be provided with some other means of making an efficient sound signal.**

In the introduction to this Part D, the cautions required to be exercised by navigators on board a vessel regarding the direction of propagation and audible range of sound signals have been explained.

Fitment of ***'equipment for sound signals'*** is a must for vessels 12 metres or more in length by this Rule with the requirements changing at 20 and 100 metres, and all equipment ***'shall comply with the specifications in Annex III to these Regulations'***. For vessels less than 12 metres in length, the requirement is optional with the proviso that ***'she shall be provided with some other means of making an efficient sound signal'***. The frequency and audible range of a whistle is related to the length of a vessel; this allows a wide variety of characteristics; the sound generated also indicates the size of a vessel. Vessels over 200 m in length have a frequency range that provides a relatively deep tone of sound, those below 75 m in length a relatively shrill tone and the others in between these lengths a mid range sound.

'A whistle' cannot be replaced by alternate equipment. Only ***'the bell or gong or both may be replaced by other equipment having the same respective sound characteristics'***. Alternate equipment is not defined or listed, but could be electronic equipment that can normally produce sound of any frequency and amplify it to the required levels; such equipment may be used in lieu of the ***'bell or gong'***. These systems producing synthesised sounds may be more convenient to use and perhaps cheaper too. However, this Rule, while permitting alternate systems, also imposes that ***'manual sounding of the required signals shall always be possible'***. This is to provide a backup against any failures of pure electronic alternates, if opted for. Though the use of powered means is acceptable, real bells and gongs may have to be installed in any case. Annex III requirements on ***'bell or gong'*** in paragraph 2(b) also states ***'but manual operation shall be possible'***.

b: ***'Other means of making an efficient sound signal'*** prescribed for ***'a vessel of less than 12 m in length'*** could be some form of ***'sound signals'*** generated by using simple equipment that can be heard and understood by other vessels in ample time to fulfil the requirements of these Rules. Equipment fitted on a medium size boat operating in a harbour would not be needed on a 3 metre dinghy operated in a yacht club's moorings. Depending on the circumstances, the requirement could be even met by a lung-powered horn, portable compressed-gas or aerosol air horn, a simple whistle or even a small electric horn.

[TASK: 1. COMPARE RULES 27, 30 AND 33 ON WHAT IS COMMON FOR VESSELS BELOW 12M.

2. WHICH ALL RULES DIFFERENTIATE BETWEEN 7, 12, 20, 50, 100 AND 200 M LENGTHS]

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Rule 34

Manoeuvring and warning signals

(a) When vessels are in sight of one another, a power-driven vessel underway, when manoeuvring as authorized or required by these Rules, shall indicate that manoeuvre by the following signals on her whistle:

- one short blast to mean "I am altering my course to starboard";

- two short blasts to mean "I am altering my course to port";

- three short blasts to mean "I am operating astern propulsion".

(b) Any vessel may supplement the whistle signals prescribed in paragraph (a) of this Rule by light signals, repeated as appropriate, whilst the manoeuvre is being carried out:

(i) these light signals shall have the following significance:

- one flash to mean "I am altering my course to starboard";

- two flashes to mean "I am altering my course to port";

- three flashes to mean "I am operating astern propulsion";

(ii) the duration of each flash shall be about one second, the interval between flashes shall be about one second, and the interval between successive signals shall be not less than ten seconds;

(iii) the light used for this signal shall, if fitted, be an all-round white light, visible at a minimum range of 5 miles, and shall comply with the provisions of annex I to these Regulations.

(c) When in sight of one another in a narrow channel or fairway:

(i) a vessel intending to overtake another shall in compliance with Rule 9(e)(i) indicate her intention by the following signals on her whistle:

- two prolonged blasts followed by one short blast to mean "I intend to overtake you on your starboard side";

- two prolonged blasts followed by two short blasts to mean "I intend to overtake you on your port side".

(ii) the vessel about to be overtaken when acting in accordance with Rule 9(e)(i) shall indicate her agreement by the following signal on her whistle:

- one prolonged, one short, one prolonged and one short blast, in that order.

(d) When vessels in sight of one another are approaching each other and from any cause either vessel fails to understand the intentions or actions of the other, or is in doubt whether sufficient action is being taken by the other to avoid collision, the vessel in doubt shall immediately indicate such doubt by giving at least five short and rapid blasts on the whistle. Such signal may be supplemented by a light signal of at least five short and rapid flashes.

(e) A vessel nearing a bend or an area of a channel or fairway where other vessels may be obscured by an intervening obstruction shall sound one prolonged blast. Such signal

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shall be answered with a prolonged blast by any approaching vessel that may be within hearing around the bend or behind the intervening obstruction.

(f) If whistles are fitted on a vessel at a distance apart of more than 100 m, one whistle only shall be used for giving manoeuvring and warning signals.

This Rule prescribes routine and warning communication between vessels; paragraphs 'a, 'c' and 'd' apply only when ***'vessels are in sight of one another'***, as clearly stated, as such, these are dependent on the quality of ***'look-out'***. Paragraphs 'a' and 'b' apply only to power-driven vessels; other paragraphs to all vessels.

[QUIZ: DO YOU REMEMBER RULE 5 ON 'LOOK-OUT' AND THE EXPLANATIONS ABOUT LOOK-OUT?

QUIZ: WHAT REQUIREMENTS ARE STATED REGARDING 'LOOKOUT' IN THE STCW CODE A-VIII/2 AND HOW MANY TIMES?]

a: The requirements to indicate a ***'manoeuvre by'*** use of sound ***'signals on her whistle'*** apply ***'when vessels are in sight of one another'***, but only to ***'a power-driven vessel underway'*** - ***'when manoeuvring as authorised or required by these Rules'***. This requirement has nothing to do with the range of sound signals; their low range has been discussed in the introduction to this Part 'D'. These sound signals are meant to indicate ***'that manoeuvre'*** to all vessels in the vicinity, so that they can watch out for the manoeuvre and exercise caution if necessary. *'If the vessels are in sight, the signals must be given. The obligation is not conditional upon the signal being audible to the other vessel. It is easy to understand why the rule was drawn in these peremptory terms. It would be very dangerous if the officer in charge were encouraged to speculate as to whether the signal, if given, would be heard; he must give it if in sight. (Ruling in House of Lords, 1921)*

Requirements of this Rule need not apply to ***'any action to avoid collision'*** executed based on radar alone before vessels are ***'in sight of one another'***. However, if vessels are within range so as to be ***'in sight of one another'*** and ***'a power-driven vessel underway'*** relies only on her radar but fails to visually sight the other vessel, ***'nothing in these Rules shall exonerate'*** her if she does ***'not comply with these Rules'***. She and the navigators are more likely to be held at fault for lack of ***'proper look-out'***. ***'In sight'***, *in my view, means something which is visible if you take the trouble to keep a look-out, which of course is the position here. In short, the obligation to make sound signals is not excused by the fact that nobody looks to see what there is about. (Mr. Justice Karminski, 1966)*

Excuses for not using the sound signals because the other vessel is too far away to be within audible range or that the use of sound signals could disturb those on board are not reasonable or sufficient reasons for non-compliance with this Rule, the latter would in fact be termed absurd. The Rule uses the word ***'shall'*** and this means the requirements stated have to be followed.

The prescribed sound signals have to be sounded only by ***'a power-driven vessel underway'***, ***'when manoeuvring as authorised or required by these Rules'***. ***'Manoeuvring'*** is the act of taking action. If two ***'power-driven'*** vessels ***'in sight of one another'*** are passing clear and either of them makes a course alteration which is not an ***'action to avoid collision'***, then such action does not fall under the clause ***'required by these Rules'***; for example a routine navigational course alteration. These vessels are not obliged to comply with this Rule in such a situation. Similarly, if a vessel acts at long range before ***'risk of collision'*** is clearly established or begins to exist, then she need not follow this Rule. However, in all such situations also, the vessels concerned should still comply with the requirements of this Rule as explained further in the box.

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'Required' is when ***'action to avoid collision'*** is as per the requirements stated in these Rules. A ***'power-driven vessel'***, if she is ***'in sight of'*** any other vessel, must comply with this Rule if she takes ***'any action to avoid collision'***, irrespective if done as a ***'give-way vessel'*** or as a ***'stand-on vessel'***. However, ***'authorised'*** appears to have a larger meaning and encompasses manoeuvres done not necessarily for ***'preventing collisions'*** alone but for other reasons which can be linked with ***'authorised'*** or which are not necessarily prohibited by these Rules. For example, Rule 2 clauses ***'ordinary practice of seamen, or by the special circumstances of the case'*** and ***'which may make a departure from these Rules necessary to avoid immediate danger'***. If a navigator executes manoeuvres basis these considerations which are not necessarily ***'required by these Rules'***, such acts may fall under ***'authorised'*** and would still necessitate compliance with this Rule, provided the ***'power-driven vessel'*** has any another vessel ***'in sight'***.

As such the requirements of this Rule should be followed even during routine navigational course alterations, for example: when approaching to anchor in an area where other vessel(s) are present at anchor or otherwise. Even if the approach to the anchoring position is clear and the ***'power-driven vessel'*** is passing at a safe range from all other vessels, then if ***'astern propulsion'*** is operated to reduce speed, she should sound ***'three short blasts'***, though this is not a ***'manoeuvre'*** to ***'avoid collision'*** but gives a clear indication to other vessels in the vicinity about the act. Similarly, when a ***'shall not impede'*** situation is likely to develop, the sound signals should be given as early as possible.

[QUIZ: WHICH ALL RULES HAVE THE CLAUSES 'SHALL NOT IMPEDE' AND 'AVOID IMPEDING' IN THEM AND WHAT IS THE DIFFERENCE BETWEEN THESE TWO TERMS?]

The requirements of all the whistle signals stated in this Rule are simple and clear. However, ***'I am operating astern propulsion'***, is many a times not understood clearly. This means a ***'power-driven vessel'*** has reversed her propulsion; it does not mean she is actually moving astern through the water. She may still have a headway, be stopped or may even have developed sternway. As long as her propulsion is working to make her go astern and is ***'authorised or required by these Rules'***, she is required to indicate this by her whistle signals. It is the astern direction movement of any vessel's propulsion machinery, not motion through the water, which is the criterion this Rule is about.

This paragraph is silent about repeating sound signals. However, the next paragraph 'b' on the optional but additional light signals to supplement this Rule states ***'repeated as appropriate'*** and ***'the interval between successive signals shall be not less than ten seconds'.*** Thus the light signals may be repeated but the sound signals need not be, though nothing in the Rule restricts the sound signals from being repeated if it is felt necessary.

[QUIZ:

1: WHICH RULE RECOMMENDS ALTERATION OF COURSE ALONE TO BE THE MOST EFFECTIVE ACTION TO AVOID A CLOSE-QUARTERS SITUATION?

2: WHY IS THIS ACTION REQUIRED TO BE LARGE ENOUGH?]

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b: The light signal requirements are optional; ***'any vessel may supplement the whistle signals prescribed in paragraph (a)'***. '***Any***' implies ***'a power-driven vessel'***. Since the Rule says ***'may supplement'***, this can only be by a ***'power-driven vessel'***, as only she is required to comply with paragraph 'a' of this Rule. The characteristics of the light signals are the same as the sound signals prescribed in paragraph 'a'. Requirements stated in this paragraph 'b' are optional, supplement paragraph 'a' and cannot be implemented in isolation, but always in addition to and in conjunction with the sound signals prescribed in paragraph 'a'.

The sound signals shall be given at least once per manoeuvre, the Rules being silent on their repetition. The light signals may be ***'repeated as appropriate'*** at intervals exceeding 10 seconds as per subparagraph 'b-ii' of this Rule. There is no requirement that the light and whistle signals have to be synchronized, but on most vessels, where such a signalling light is provided, it usually is synchronised with the sound signals. Usually the light signal is exhibited automatically with the sound signals but can also be operated independently; the latter so that it may be repeated alone if required.

'The light used for this signal shall, if fitted, be an all-round white light, visible at a minimum range of 5 miles'. This optional light should be placed as described in paragraph 12 of annex I. It is required to have a higher visible range than the audible range of the sound signals, it also stands a better chance of being detected as compared to the sound signals; repetition of light signals also increases the probability of them being sighted.

> Navigators should keep in mind that the use of the light signal may be avoided where it is felt that their use may confuse other vessels in the vicinity; since their use is optional, there would be no breach of compliance with this Rule. Since it is optional, many power-driven vessels are not even fitted with this signalling light.
>
> Similar requirements of optional light signals exist in paragraph 'd' of this Rule - the ***'doubt'*** signal - but paragraph 'c' on overtaking signals does not refer to any light signals. Paragraph 'e' also does not refer to any light signals since this applies around bends where the other vessels may be obscured, they will anyway not be able to see the light signals originating from another vessel; light does not travel around bends. Paragraph 'd' does not refer to the same light as referred to by this paragraph 'b', nor does it refer to any provisions contained in annex I.

c: These sound signals apply to vessels ***'when in sight of one another'*** when acting in compliance with Rule 9(e) quoted for ready reference.

Rule 9 (e) (i): 'In a narrow channel or fairway when overtaking can take place only if the vessel to be overtaken has to take action to permit safe passing, the vessel intending to overtake shall indicate her intention by sounding the appropriate signal prescribed in Rule 34(c)(i). The vessel to be overtaken shall, if in agreement, sound the appropriate signal prescribed in Rule 34(c)(ii) and take steps to permit safe passing. If in doubt she may sound the signals prescribed in Rule 34(d).'

Rule 9(e) (ii): 'This Rule does not relieve the overtaking vessel of her obligation under Rule 13.'

As described with Rule 9(e), no sound signal is prescribed when ***'the vessel to be overtaken'*** is not in agreement with the proposal of the one intending to overtake. However, Rule 9(e-i) states ***'if in doubt she may sound the signals prescribed in Rule 34(d)'***, that is ***'at least five short and rapid***

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blasts on the whistle'. While Rule 9(e-i) uses ***'may'***, for the same signal and for the same reasons, Rule 34(d) uses ***'shall'***. Since there is no prescribed signal for a vessel ***'to be overtaken'*** to indicate her disagreement with the proposal made by ***'a vessel intending to overtake'*** this doubt signal may be used by the former to indicate her disagreement with or rejecting the proposal. The overtaking vessel may keep repeating her intentions until she receives a signal of agreement before attempting to overtake. This Rule applies to all vessels.

> Although not stated in these Rules, and even contrary to the advice usually given against inter-vessel communication by the use of radiotelephony like VHF in reaching agreements on ***'any action to avoid collision'***, direct communication between the vessels may prove to be useful as a supplement to these sound signals in situations covered by this particular Rule.

d: Prescribes the ***'doubt'*** signal also frequently referred to as the **'wake-up signal'** of ***'giving at least five short and rapid blasts on the whistle. Such signal may be supplemented by a light signal of at least five short and rapid flashes'***. This Rule applies to all ***'vessels in sight of one another'*** when they ***'are approaching each other and from any cause either vessel fails to understand the intentions or actions of the other, or is in doubt whether sufficient action is being taken by the other to avoid collision'***. This signal should be given as soon as a vessel ***'is in doubt'*** about the action of an approaching vessel, or cannot determine the action or intention of the other vessel, or feels that the other vessel is doing something wrong, or not taking any action, or not taking sufficient ***'action to avoid collision'***.

If a ***'give-way vessel'*** does not appear to be taking ***'positive'*** and ***'substantial action to avoid collision in ample time'***, this signal should be immediately sounded. Unlike in sub-paragraph 'b-ii', this Rule does not state anything about repeating the signal, but if there is no immediate response by the other vessel then this ***'doubt'*** signal should be repeated as necessary to attract the other vessel's attention.

'Such signal may be supplemented by a light signal of at least five short and rapid flashes'. This Rule does not specify which light may be used for this optional ***'light signal'*** to supplement this sound signal and the statement ***'at least five'*** implies that more flashes of the light may be given. This signal may be made by any light, preferably a searchlight or a daylight-signalling lamp, and is likely to be more effective than a whistle, especially at night.

[QUIZ: SHOULD A 'STAND-ON VESSEL' USE THESE SIGNALS BEFORE OR WHEN ACTING IN COMPLIANCE WITH RULE 17?]

e: Prescribes the sound signal of ***'one prolonged blast'*** for use by any vessel when ***'nearing a bend or an area of a channel or fairway where other vessels may be obscured by an intervening obstruction'***. It is meant to alert other vessels to watch out for the one approaching; the vessel must then listen for a reply from the other vessel that may be approaching from the other side provided she has heard the signal, which depends on whether she is within the audible range. If the other vessel hears the signal, then ***'such signal shall be answered with a prolonged blast'***. This Rule and other Rules remain silent on the actions required in such circumstances, these seem to have been left for the navigators to decide in the circumstances using ***'ordinary practice of seamen'***.

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This paragraph 'e' implies that another vessel, if one is there, is in close proximity but ***'obscured by an intervening obstruction'***. Though not stated, this requirement would apply in visibility conditions that are good enough in which navigators can be expected to visually see other vessels in the vicinity if they were not ***'obscured'***. ***'In sight of one another'*** is clearly stated as the basic criteria in the application of paragraphs 'a', 'c' and 'd' and is implied in paragraphs 'b' and 'e' of this Rule. A vessel ***'obscured'*** cannot be seen, as such mentioning this would be absurd and the Rules have strictly avoided giving any mathematical figures for visibility or other aspects ***'for Preventing Collisions'***.

f: Sound travels relatively slowly, and sound signals given together or simultaneously by two widely separated whistles from a vessel may be received as two separate signals on another vessel. The strength of the signals as well as the direction of the source will be confusing, which can be misleading even with one whistle, leave alone from multiple whistles.

In line with this requirement paragraph 1(f) of annex III on ***'fitting of more than one whistle'*** also states ***'if whistles are fitted at a distance apart of more than 100 m, it shall be so arranged that they are not sounded simultaneously'***.

The judgment on the collision between 'Samco Europe' and 'MSC Prestige' referred to in Rule 10 has the following comments:

'Neither sound nor light signals were sounded by MSC PRESTIGE when her course was altered to starboard. The liberty to supplement sound signals by light signals ought to have been exercised. She failed to announce that she was altering the starboard by appropriate sound and light signals.

The Second Officer failed to indicate that SAMCO EUROPE was turning to port by either sound or light signals. She failed to announce her alteration to port by appropriate sound and light signals'.

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Rule 35

Sound signals in restricted visibility

In or near an area of restricted visibility, whether by day or night, the signals prescribed in this Rule shall be used as follows:

(a) A power-driven vessel making way through the water shall sound at intervals of not more than 2 minutes one prolonged blast. 1 Prolonged blast

(b) A power-driven vessel underway but stopped and making no way through the water shall sound at intervals of not more than 2 minutes two prolonged blasts in succession with an interval of about 2 seconds between them. 2 Prolonged blast

(c) A vessel not under command, a vessel restricted in her ability to manoeuvre, a vessel constrained by her draught, a sailing vessel, a vessel engaged in fishing and a vessel engaged in towing or pushing another vessel shall, instead of the signals prescribed in paragraphs (a) or (b) of this Rule, sound at intervals of not more than 2 minutes three blasts in succession, namely one prolonged followed by two short blasts.

(d) A vessel engaged in fishing, when at anchor, and a vessel restricted in her ability to manoeuvre when carrying out her work at anchor, shall instead of the signals prescribed in paragraph (g) of this Rule sound the signal prescribed in paragraph (c) of this Rule.

(e) A vessel towed or if more than one vessel is towed the last vessel of the tow, if manned, shall at intervals of not more than 2 minutes sound four blasts in succession, namely one prolonged followed by three short blasts. When practicable, this signal shall be made immediately after the signal made by the towing vessel.

(f) When a pushing vessel and a vessel being pushed ahead are rigidly connected in a composite unit they shall be regarded as a power-driven vessel and shall give the signals prescribed in paragraphs (a) or (b) of this Rule.

(g) A vessel at anchor shall at intervals of not more than one minute ring the bell rapidly for about 5 seconds. In a vessel of 100 m or more in length the bell shall be sounded in the forepart of the vessel and immediately after the ringing of the bell the gong shall be sounded rapidly for about 5 seconds in the after part of the vessel. A vessel at anchor may in addition sound three blasts in succession, namely one short, one prolonged and one short blast, to give warning of her position and of the possibility of collision to an approaching vessel.

(h) A vessel aground shall give the bell signal and if required the gong signal prescribed in paragraph (g) of this Rule and shall, in addition, give three separate and distinct strokes on the bell immediately before and after the rapid ringing of the bell. A vessel aground may in addition sound an appropriate whistle signal.

(i) A vessel of 12 m or more but less than 20 m in length shall not be obliged to give the bell signals prescribed in paragraphs (g) and (h) of this Rule. However, if she does not, she shall make some other efficient sound signal at intervals of not more than 2 minutes.

(j) A vessel of less than 12 m in length shall not be obliged to give the above-mentioned signals but, if she does not, shall make some other efficient sound signal at intervals of not more than 2 minutes.

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(k) A pilot vessel when engaged on pilotage duty may in addition to the signals prescribed in paragraphs (a), (b) or (g) of this Rule sound an identity signal consisting of four short blasts.

This Rule 35 prescribes ***'sound signals in restricted visibility'*** which have to be complied with by vessels ***'in or near an area of restricted visibility, whether by day or night'***. This is exactly the same as the second criteria of the application of Rule 19, ***'when navigating in or near an area of restricted visibility'***. These Rules apply even when a vessel is close to ***'an area of restricted visibility'***. These signals are also referred to as ***'fog signals'***; Rule 19(e) uses this term, though by Rule 3(l) ***'restricted visibility'*** can be by conditions other than ***'fog'*** stated as, ***'mist, falling snow, heavy rainstorms, sandstorms or any other similar causes'***. For the purpose of these Rules the term ***'fog signal'*** means the same as the title of this Rule, ***'sound signals in restricted visibility'***. ***'Fog signal'*** in reality is used far more often than the title of this Rule including in the STCW Code.

These Rules do not quantify visibility or the limits when its deterioration makes it ***'restricted'*** enough to activate the sound signals prescribed by this Rule. The approximate audible range of sound signals for the longest vessels is 2 miles reducing to 0.5 miles for the smallest.

The officer in charge of the navigational watch shall notify the master immediately if restricted visibility is encountered or expected. *(STCW Code A-VIII/2, paragraph 40.1)*. The watchkeeping guidelines are also silent and do not provide any guidance on numerical limits when good visibility changes over to ***'restricted'***. Some organisations define minimum visibility limits in their SMS or documented management systems; in other cases, masters tend to define this as part of their bridge instructions. This limit should certainly be more than the approximate audible ranges stated in annex III, which anyway can be quite variable. If not defined then the navigators should use their own judgement in deciding on a minimum visibility range at which to activate the sound signals when ***'in or near an area of restricted visibility'***. This will also keep the navigator on the correct side of the Rules in letter and spirit and in compliance with ***'the ordinary practice of seamen'***. As explained before, determination of visibility always is a difficult task.

[QUIZ: WHICH RULE STATES THAT RADAR MAY BE USED FOR THE ASSESSMENT OF VISIBILITY? HOW SHOULD THIS BE DONE?]

Rule 32 defines a ***'prolonged blast'*** as one lasting from ***'four to six seconds'***. In this Rule 35, the clause ***'shall sound at intervals of not more than 2 minutes'*** is the stated maximum interval between successive ***'sound signals'*** in most of the paragraphs except 'g' and 'h', where the stated interval is ***'not more than one minute'***. The ***'may in addition'*** requirements of sound signals in paragraphs 'g', 'h' and 'k' are optional and do not define time intervals. Linking them with the primary sound signals prescribed for the respective vessels in this Rule, the ***'may in addition'*** signals should logically follow the same time intervals as prescribed for the primary signals.

'At intervals of not more than--', imposes a maximum time limit interval between successive sound signals, and it is left to the judgement and discretion of the navigators to decide if these have to be repeated at lesser time intervals. For example, when other vessels are nearby or if it is suspected that any of them may not have an operational radar on board, thus giving them a better chance of hearing the sound signal and determining the apparent bearing of the vessel sounding the signals. However, too high a frequency of repeating the signals will dilute their clarity and may even cause confusion in identifying the type of signal being sounded.

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The various sound signals prescribed for different types of vessels in varying conditions are generally self-explanatory.

a and **b:** describe the two most common ***'sound signals'*** for ***'a power-driven vessel'*** underway. The difference is when ***'making way through the water'*** or ***'underway but stopped and making no way through the water'***. The sound signals are ***'one prolonged blast'*** or ***'two prolonged blasts in succession with an interval of about 2 seconds between them'*** respectively. The two-blast signal should not be given unless it is certain and confirmed that ***'a power-driven vessel'*** has totally stopped and is not ***'making way through the water'***. For both, the time interval requirement is ***'at intervals of not more than 2 minutes'***.

c: Encompasses various vessels that have some impediment which impairs their manoeuvrability or are likely to be less manoeuvrable than ordinary ***'power-driven vessels'***. Though this signal lets the other vessels know about their less manoeuvrable condition, it should be noted that, as per Rule 19, they have no special privileges and all vessels, irrespective of their type, are required to take ***'action to avoid collision'***.

The list of vessels in this paragraph combines various types of vessel that have been covered by separate Rules earlier and includes almost all vessel types which have been given some priority over another in Rule 18. All these have been assigned a common sound signal to ***'sound at intervals of not more than 2 minutes three blasts in succession, namely one prolonged followed by two short blasts'***. This Rule is applicable when the vessels are ***'underway'***, irrespective of whether they are ***'making way through the water'*** or not. Even if their status changes, for example a ***'sailing vessel'*** underway finds her condition changed to a ***'vessel not under command'*** because there is no wind, or she is becalmed, there will be no change in her sound signals.

'A vessel engaged in towing or pushing another vessel' is included in the list of vessels covered by this paragraph. ***'A vessel engaged in a towing operation'*** is not considered a ***'vessel restricted in her ability to manoeuvre'*** unless as per the definition of Rule 3(g)(vi), and repeated again in Rule 27(c) on lights and shapes required on a ***'towing vessel'***, the activity ***'severely restricts the towing vessel and her tow in their ability to deviate from their course'***. A vessel ***'pushing'*** gets no privilege elsewhere in these Rules. Both these types of vessels are required to comply with the sound signals of this Rule as they are not likely to be as free to manoeuvre as a normal ***'power-driven vessel'***. Do note that, for ***'a vessel engaged in towing or pushing another vessel'***, it's activity is the sole criteria stated in this Rule; it makes no difference if she ***'is restricted in her ability to manoeuvre'*** or not.

However, as per paragraph 'f' of this Rule, ***'when a pushing vessel and a vessel being pushed ahead are rigidly connected in a composite unit they shall be regarded as a power-driven vessel and shall give the signals prescribed in paragraphs (a) or (b) of this Rule'***.

If any of these vessels were to anchor, they would need to change their sound signals to those prescribed in paragraph 'g' for ***'a vessel at anchor'***. However, ***'a vessel engaged in fishing, when at anchor, and a vessel restricted in her ability to manoeuvre when carrying out her work at anchor'***, will continue to comply with the requirements of paragraph 'c' of this Rule as stated in the next paragraph 'd'.

d: The requirements have been explained in the previous paragraph. The list of vessels and the explanatory remarks when they are to be considered ***'vessels restricted in their ability to manoeuvre'*** as per Rule 3(g) have to be applied in the activation of the requirements of this Rule too. ***'A vessel engaged in replenishment or transferring persons, provisions or cargo'*** is included under this category only when she is ***'underway'*** as per Rule 3(g)(iii); if at anchor, then she should automatically comply with the requirements stated in paragraph 'g' of this Rule.

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There are some similarities in these requirements and those of Rule 26(a) on lights and shapes required to be exhibited by ***'a vessel engaged in fishing'***; such vessels, even if anchored, are not required to display the anchor lights or shapes. However, by Rule 27, ***'a vessel engaged in dredging or underwater operations, when restricted in her ability to manoeuvre'*** only ***'when an obstruction exists'***, is not required to display anchor lights or shapes.

e: Prescribes the sound signals for ***'a vessel towed or if more than one vessel is towed the last vessel of the tow, if manned...'***, this requirement is obligatory only if the tow is ***'manned'***. If not ***'manned'***, then the towed vessels are not required to sound these signals. A prudent mariner should normally arrange, if possible, for automatic signals to be given from a towed vessel or the last vessel of any long tow. This may even be considered as a precautionary act required by Rule 2(a), ***'any precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case'***. However, by the Rule, ***'if manned'*** applies.

Though this signal is independent of the sound signal required to be sounded by a vessel engaged in towing as prescribed in paragraph 'c', ***'when practicable, this signal shall be made immediately after the signal made by the towing vessel'***. The sound signal prescribed is ***'at intervals of not more than 2 minutes sound four blasts in succession, namely one prolonged followed by three short blasts'***.

f: This has been explained with paragraph 'c'. It may be noted that this requirement is the sound signal counterpart of the lights required by Rule 24(b) ***'when a pushing vessel and a vessel being pushed ahead are rigidly connected in a composite unit they shall be regarded as a power-driven vessel'***. This Rule treats these composite units as any other normal ***'power-driven vessel'***. If the two are not ***'rigidly connected in a composite unit'***, the one pushing will sound the sound signals prescribed in paragraph 'c'. ***'A vessel being pushed ahead'*** is not required to sound any signals in either of these two situations.

g: The requirements of the sound signals for vessels at anchor are simple and straightforward. ***'A vessel at anchor <u>shall</u> at intervals of not more than one minute ring the bell rapidly for about 5 seconds. In a vessel of 100 m or more in length the bell shall be sounded in the forepart of the vessel and immediately after the ringing of the bell the gong shall be sounded rapidly for about 5 seconds in the after part of the vessel. A vessel at anchor <u>may</u> in addition sound three blasts in succession, namely one short, one prolonged and one short blast, to give warning of her position and of the possibility of collision to an approaching vessel'***. The optional whistle signal should normally be heard much further away than the bell and gong combination, it may also give a better indication of the vessels position and should be used when necessary, for example when anchored in congested waters or if another vessel appears to be approaching too close or too fast.

This Rule does not prescribe the time duration for the optional whistle signal; it is only stated for the bell and the gong, which have to be sounded ***'at intervals of not more than one minute'*** and are not optional. The introduction to this Rule contains explanatory remarks to assist in deciding the time interval between these optional whistle signals.

Surprisingly, Annex III does not state any minimum audible range requirements for the ***'bell or gong'***, it just states the minimum sound pressure level. Basis the equipment normally seen on board, the audible range of sound signals made by the use of ***'bell or gong'*** are likely to be much lower than the range of the whistle signals.

[TASK: STUDY THE EXEMPTIONS FROM THIS PARAGRAPHS AS STATED IN PARAGRAPHS 'D', 'I' AND 'J' OF THIS RULE]

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h: The sound signals for a vessel aground are the same as for a vessel at anchor as ***'prescribed in paragraph (g) of this Rule'*** with an additional requirement of ***'three separate and distinct strokes on the bell immediately before and after the rapid ringing of the bell'***.

Appropriate' is also not defined; it is believed the authors of these Rules were unable to agree to a common signal suitable at all times. In the ***'International Code of Signals'*** the Morse code signal ***'U'*** (two short blasts followed by one prolonged blast) means ***'you are running into danger'***. This signal is used for the purpose of warning other vessels to keep well clear and is also distinctly different than all the other sound signals prescribed in this Rule, as such it is usually recommended as ***'an appropriate whistle signal'*** for ***'a vessel aground'***.

Similar to as explained with paragraph 'g' for ***'a vessel at anchor'***, this is an optional signal and the Rule also does not define any time intervals for it.

i and j: Provide exemptions to small vessels from the sound signalling requirements prescribed in this Rule. These exemptions are based on the requirements given in Rule 33 on the carriage of sound signalling equipment on vessels below 12 m, 12 to 20 m and over 20 m.

However, both these Rules require ***'some other efficient sound signal at intervals of not more than 2 minutes'***. This alternate sound signal is not defined in the Rules but should be such that it can be heard by other vessels early enough ***'for preventing collisions'***, and preferably have characteristics to indicate that the sound signal has originated from a small vessel. As with most mandatory sound signals, this one also has an upper time limit of 2 minutes between successive signals.

k: ***'When engaged on pilotage duty'***, ***'a pilot vessel'*** is required to comply with ***'signals prescribed in paragraphs (a), (b) or (g) of this Rule'***. That is, ***'a power-driven vessel making way'***, ***'underway but stopped and making no way through the water'*** or ***'a vessel at anchor'*** respectively.

'A pilot vessel may in addition sound an identity signal consisting of four short blasts'. This optional signal would apply to any vessel on pilotage duty in any of the conditions explained. No time durations have been prescribed for this optional signal in the Rule. The sound signal of four short blasts is akin to the ***'International Code of Signals'*** Morse code signal ***'H'*** - ***'I have a pilot on board'***.

This signal of 4 short blasts is close to the doubt signal of 5 or more short blasts prescribed by Rule 34(d), but that is only for use between ***'vessels in sight of one another'***. It is possible in rare circumstances for both these signals to be heard in the same area. The requirements of this Rule 35 apply only ***'in or near an area of restricted visibility'***, and unless the visibility is zero, vessels may get close enough to be able to see the other visually, and, if in doubt about the other, they would need to comply with Rule 34(d) and sound five or more short blasts. If ever in such a rare situation, count the blasts carefully to differentiate between the signals, and remember that four shorts blasts indicates the presence of ***'a pilot vessel'*** in the vicinity ***'in or near an area of restricted visibility'***.

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Rule 36

Signals to attract attention

If necessary to attract the attention of another vessel any vessel may make light or sound signals that cannot be mistaken for any signal authorized elsewhere in these Rules, or may direct the beam of her searchlight in the direction of the danger, in such a way as not to embarrass any vessel. Any light to attract the attention of another vessel shall be such that it cannot be mistaken for any aid to navigation. For the purpose of this Rule the use of high-intensity intermittent or revolving lights, such as strobe lights, shall be avoided.

When reading this Rule it is important to refer to Rule 20(b), this Rule also states a similar principle ***'may make light or sound signals that cannot be mistaken for any signal authorized elsewhere in these Rules'***.

This Rule should normally apply to ***'vessels in sight of one another'***; the lights would not be visible otherwise. However, this Rule is silent on this aspect and does not recommend any sound signals. As explained with Rule 35(h), the sound signal 'U', two short blasts followed by one prolonged blast, meaning ***'you are running into danger'*** may be an appropriate signal for the purposes of this Rule too.

The ***'doubt'*** signal to attract attention prescribed in Rule 34(d) is, ***'at least five short and rapid blasts on the whistle. Such signal may be supplemented by a light signal of at least five short and rapid flashes'***. However, the requirement of this Rule is to show to her ***'the direction of the danger'*** or to warn another vessel of some danger in her way or path. When this is required, then obviously it would be ***'necessary to attract the attention of another vessel'***.

The former aspect of this Rule -***'if necessary to attract the attention of another vessel'*** - may be invoked for other purposes too; for example, a sailing vessel may wish to illuminate her sails at night to attract the attention of other vessels to show them that she is under sail.

[QUIZ: WHEN SHOULD THE DOUBT SIGNAL STATED IN RULE 34(D) BE ACTIVATED?]

If the beam of a searchlight is directed towards a dangerous area, it should not be directed towards the vessel whose attention is being sought. The navigators on board the vessel will be blinded and unable to see anything.

'Any light to attract the attention of another vessel shall be such that it cannot be mistaken for any aid to navigation' is self-explanatory.

'For the purpose of this Rule the use of high intensity intermittent or revolving lights, such as strobe lights, shall be avoided'. This prohibition aims to stop the use of flash tubes or ***'strobe lights'*** to attract attention. These lights have often been used by commercial fishing vessels and some recreational vessels to warn other vessels to keep away from them. Though such use is not legal it may sometimes be resorted to and justified under Rule 2(b) clauses of ***'special circumstances'*** and ***'may make a departure from these Rules necessary to avoid immediate danger'***.

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Rule 37

Distress signals

When a vessel is in distress and requires assistance she shall use or exhibit the signals described in annex IV to these Regulations.

Distress signals have nothing to do with ***'preventing collisions at sea',*** but are included in these Rules and listed in annex IV.

Distress signals have been a part of the earlier editions of these Rules; during the last revision, the majority of the participating States felt that retaining distress signals within the framework of the Rules would give the distress signals the widest possible circulation. Navigators should study the same in annex IV; these signals are specifically required to be used by a vessel in distress and requiring assistance. Annex IV has been revised effective December 2009, the last known revision to these Rules at the time of publication of this book.

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PART E – EXEMPTIONS

Rule 38

Exemptions

Any vessel (or class of vessels) provided that she complies with the requirements of the International Regulations for Preventing Collisions at Sea, 1960, the keel of which is laid or which is at a corresponding stage of construction before the entry into force of these Regulations may be exempted from compliance therewith as follows:

(a) The installation of lights with ranges prescribed in Rule 22, until four years after the date of entry into force of these Regulations.

(b) The installation of lights with colour specifications as prescribed in section 7 of annex I to these Regulations, until four years after the date of entry into force of these Regulations.

(c) The repositioning of lights as a result of conversion from Imperial to metric units and rounding off measurement figures, permanent exemption.

(d) (i) The repositioning of masthead lights on vessels of less than 150 m in length, resulting from the prescriptions of section 3(a) of annex I to these Regulations, permanent exemption.

(ii) The repositioning of masthead lights on vessels of 150 m or more in length, resulting from the prescriptions of section 3(a) of annex I to these Regulations, until nine years after the date of entry into force of these Regulations.

(e) The repositioning of masthead lights resulting from the prescriptions of section 2(b) of annex I to these Regulations, until nine years after the date of entry into force of these Regulations.

(f) The repositioning of sidelights resulting from the prescriptions of section 2(g) and 3(b) of annex I to these Regulations, until nine years after the date of entry into force of these Regulations.

(g) The requirements for sound signal appliances prescribed in annex III to these Regulations, until nine years after the date of entry into force of these Regulations.

(h) The repositioning of all-round lights resulting from the prescription of section 9(b) of annex I to these Regulations, permanent exemption.

These ***'International Regulations for Preventing Collisions at Sea'*** were adopted by the IMO in October 1972 and became effective from 15th July 1977. The older set of Rules of 1960, effective since 1965, became redundant from this date.

This Rule set time limits for the changeover to the new requirements; paragraphs 'a', 'b', 'd-ii', 'e', 'f' and 'g', describe areas where existing ships had time limits of 4 or 9 years as stated in the relevant

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paragraphs to comply with these new Rules, ***'after the date of entry into force of these Regulations'***. From 1977 to now the time elapsed is well over these limits.

Paragraphs 'c', 'd-i', and 'h' provide for ***'permanent exemption'***. It may be interesting to note that paragraph 'h' was added to this Rule when the Rules were amended in 1981.

The ***'permanent exemption'*** for conversion to metric units refers to old requirements that have been retained in these new Rules but were converted to the metric system of measurement. For example, an old requirement might have called for six feet spacing between lights. The new requirement rounds off the measurement to two meters, a little more than six feet. If the lights are separated by six feet, there is no need to adjust them to meet the new exact metric requirements.

This Rule now mainly serves as a warning to navigators that on any old vessel being served on or encountered at sea, everything may not conform exactly to the present set of requirements, but are close enough to not allow any distortions or cause any confusion in practice.

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ANNEX- I

Positioning and technical details of lights and shapes

1 Definition

The term *height* above the *hull* means height above the uppermost continuous deck. This height shall be measured from the position vertically beneath the location of the light.

2 Vertical positioning and spacing of lights

(a) On a power-driven vessel of 20 m or more in length the masthead lights shall be placed as follows:

(i) the forward masthead light, or if only one masthead light is carried, then that light, at a height above the hull of not less than 6 m, and, if the breadth of the vessel exceeds 6m, then at a height above the hull not less than such breadth, so however that the light need not be placed at a greater height above the hull than 12 m;

(ii) When two masthead lights are carried the after one shall be at least 4.5 m vertically higher than the forward one.

(b) The vertical separation of masthead lights of power-driven vessels shall be such that in all normal conditions of trim the after light will be seen over and separate from the forward light at a distance of 1000 m from the stem when viewed from sea-level.

(c) The masthead light of a power-driven vessel of 12 m but less than 20 m in length shall be placed at a height above the gunwale of not less 2.5 m.

(d) A power-driven vessel of less than 12 m in length may carry the uppermost light at a height of less than 2.5 m above the gunwale. When, however, a masthead light is carried in addition to sidelights and a sternlight or the all-round light prescribed in Rule 23(d)(i) is carried in addition to sidelights, then such masthead light or all-round light shall be carried at least 1 m higher than the sidelights.

(e) One of the two or three masthead lights prescribed for a power-driven vessel when engaged in towing or pushing another vessel shall be placed in the same position as either the forward masthead light or the after masthead light; provided that, if carried on the aftermast, the lowest after masthead light shall be at least 4.5 m vertically higher than the forward masthead light.

(f) (i) The masthead light or lights prescribed in Rule 23(a) shall be so placed as to be above and clear of all other lights and obstructions except as described in subparagraph (ii).

(ii) When it is impracticable to carry the all-round lights prescribed by Rule 27(b) (i) or Rule 28 below the masthead lights, they may be carried above the after masthead light(s) or vertically in between the forward masthead light(s) and after masthead light(s), provided that in the latter case the requirement of section 3(c) of this annex shall be complied with.

(g) The sidelights of a power-driven vessel shall be placed at a height above the hull not greater than three quarters of that of the forward masthead light. They shall not be so low as to be interfered with by deck lights.

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(h) The sidelights, if in a combined lantern and carried on a power-driven vessel of less than 20 m in length, shall be placed not less than 1 m below the masthead light.

(i) When the Rules prescribe two or three lights to be carried in a vertical line, they shall be spaced as follows:

(i) on a vessel of 20 m in length or more such lights shall be spaced not less than 2 m apart, and the lowest of these lights shall, except where a towing light is required, be placed at a height of not less than 4 m above the hull;

(ii) on a vessel of less than 20 m in length such lights shall be spaced not less than 1 m apart and the lowest of these lights shall, except where a towing light is required, be placed at a height of not less than 2 m above the gunwale;

(iii) When three lights are carried they shall be equally spaced.

(j) The lower of the two all-round lights prescribed for a vessel when engaged in fishing shall be at a height above the sidelights not less than twice the distance between the two vertical lights.

(k) The forward anchor light prescribed in Rule 30(a)(i), when two are carried, shall not be less than 4.5 m above the after one. On a vessel of 50 m or more in length this forward anchor light shall be placed at a height of not less than 6 m above the hull.

3 **Horizontal positioning and spacing of lights**

(a) When two masthead lights are prescribed for a power-driven vessel, the horizontal distance between them shall not be less than one half of the length of the vessel but need not be more than 100 m. The forward light shall be placed not more than one quarter of the length of the vessel from the stem.

(b) On a power-driven vessel of 20 m or more in length the sidelights shall not be placed in front of the forward masthead lights. They shall be placed at or near the side of the vessel.

(c) When the lights prescribed in Rule 27(b)(i) or Rule 28 are placed vertically between the forward masthead light(s) and the after masthead light(s) these all-round lights shall be placed at a horizontal distance of not less than 2 m from the fore-and-aft centreline of the vessel in the athwartship direction.

(d) When only one masthead light is prescribed for a power-driven vessel, this light shall be exhibited forward of amidships; except that a vessel of less than 20m in length need not exhibit this light forward of amidships but shall exhibit it as far forward as is practicable.

4. **Details of location of direction-indicating lights for fishing vessels, dredgers and vessels engaged in underwater operations**

(a) The light indicating the direction of the outlying gear from a vessel engaged in fishing as prescribed in Rule 26 (c) (ii) shall be placed at a horizontal distance of not less than 2 m and not more than 6 m away from the two all-round red and white lights. This light shall be placed not higher than the all-round white light prescribed in Rule 26 (c) (i) and not lower than the sidelights.

(b) The lights and shapes on a vessel engaged in dredging or underwater operations to

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indicate the obstructed side and/or the side on which it is safe to pass, as prescribed in Rule 27(d) (i) and (ii), shall be placed at the maximum practical horizontal distance, but in no case less than 2 m, from the lights or shapes prescribed in Rule 27(b) (i) and (ii). In no case shall the upper of these lights or shapes be at a greater height than the lower of the three lights or shapes prescribed in Rule 27(b) (i) and (ii).

5. **Screens for sidelights**

The sidelights of vessels of 20 m or more in length shall be fitted with inboard screens painted matt black, and meeting the requirements of section 9 of this annex. On vessels of less than 20 m in length the sidelights, if necessary to meet the requirement of section 9 of this annex, shall be fitted with inboard matt black screens. With a combined lantern, using a single vertical filament and a very narrow division between the green and red sections, external screens need not be fitted.

6. **Shapes**

(a) Shapes shall be black and of the following sizes:

(i) a ball shall have a diameter of not less than 0.6 m;

(ii) a cone shall have a base diameter of not less than 0.6 m and a height equal to its diameter;

(iii) a cylinder shall have a diameter of at least 0.6 m and a height of twice its diameter;

(iv) a diamond shape shall consist of two cones as defined in (ii) above having a common base.

(b) The vertical distance between shapes shall be at least 1.5 m.

(c) In a vessel of less than 20 m in length shapes of lesser dimensions but commensurate with the size of the vessel may be used and the distance apart may be correspondingly reduced.

7. **Color specification of lights**

The chromaticity of all navigation light, shall conform to the following standards, which lie within the boundaries of the area of the diagram specified for each colour by the International Commission on Illumination (CIE).

The boundaries of the area for each colour are given by indicating the corner co-ordinates, which are as follow:

(i) White

x	0.525	0.525	0.452	0.310	0.310	0.443
y	0.382	0.440	0.440	0.348	0.283	0.382

(ii) Green

x	0.028	0.009	0.300	0.203
y	0.385	0.723	0.511	0.356

(iii) Red

x	0.680	0.660	0.735	0.721
y	0.320	0.320	0.265	0.259

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(iv) Yellow

x	0.612	0.618	0.575	0.575
y	0.382	0.382	0.425	0.406

8 **Intensity of lights**

(a) The minimum luminous intensity of lights shall be calculated by using the formula:

$I = 3.43 \times 10^{6} \times T \times D^{2} \times K^{-D}$

Where I is luminous intensity in candelas under service conditions,

T is threshold factor 2×10^{-7} lux,

D is range of visibility (luminous range) of the light in nautical miles,

K is atmospheric transmissivity.

For prescribed lights the values of K shall be 0.8, corresponding to a meteorological visibility of approximately 13 nautical miles.

(b) A selection of figures derived from the formula is given in the following table:

Range of visibility (luminous range) of light in nautical miles D	Luminous intensity of light in candelas for K=0.8 I
1	0.9
2	4.3
3	12
4	27
5	52
6	94

NOTE: The maximum luminous intensity of navigation lights should be limited to avoid undue glare. This shall not be achieved by variable control of the luminous intensity.

9. **Horizontal sectors**

(a) (i) In the forward direction, sidelights as fitted on the vessel shall show the minimum required intensities. The intensities shall decrease to reach practical cut-off between 1° and 3° outside the prescribed sectors.
'Annex I, section 9(a)(i) would require the full intensity of the side lights to be maintained in the forward direction of 1° outside the prescribed sector with the practical cut-off between 1° and 3°. This is needed to enable other vessels to determine a "head-on-situation" as per COLREG rule 14'. (MSC.1/Circ. 1427 of 28 May 2012)

(ii) For sternlights and masthead lights and at 22.5° abaft the beam for sidelights, the minimum required intensities shall be maintained over the arc of the horizon up to 5° within the limits of the sectors prescribed in Rule 21. From 5° within the prescribed sectors the intensity may decrease by 50% up to the prescribed limits; it shall decrease steadily to reach practical cut-off at not more than 5° outside the prescribed sectors.

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(b) (i) All-round lights shall be so located as not to be obscured by masts, topmasts or structures within angular sectors of more than 6°, except anchor lights prescribed in Rule 30, which need not be placed at an impracticable height above the hull.

(ii) If it is impracticable to comply with paragraph (b) (i) of this section by exhibiting only one all-round light, two all-round lights shall be used suitably positioned or screened so that they appear, as far as practicable, as one light at a distance of one mile.

10 **Vertical sectors**

(a) The vertical sectors of electric lights as fitted, with the exception of lights on sailing vessels underway, shall ensure that:

(i) at least the required minimum intensity is maintained at all angles from 5° above to 5° below the horizontal;

'The vertical sectors of electric lights, as fitted, with the exception of lights on sailing vessels, should ensure that at least the required intensity is maintained at all angles from 5° above to 5° below the horizontal when measured at even keel'. (MSC.1/Circ. 1427 of 28 May 2012)

(ii) at least 60% of the required minimum intensity is maintained from 7.5° above to 7.5° below the horizontal.

(b) In the case of sailing vessels underway the vertical sectors of electric lights as fitted shall ensure that:

(i) at least the required minimum intensity is maintained at all angles from 5° above to 5° below the horizontal;

(ii) at least 50% of the required minimum intensity is maintained from 25° above to 25° below the horizontal.

(c) In the case of lights other than electric these specifications shall be met as closely as possible.

11 **Intensity of non-electric lights**

Non-electric lights shall so far as practicable comply with the minimum intensities, as specified in the table given in section 8 of this annex.

12 **Manoeuvring light**

Notwithstanding the provisions of paragraph 2(f) of this annex, the maneuvering light described in Rule 34(b) shall be placed in the same fore-and-aft vertical plane as the masthead light or lights and, where practicable, at a minimum height of 2 m vertically above the forward masthead light, provided that it shall be carried not less than 2 m vertically above or below the after masthead light. On a vessel where only one masthead light is carried, the manoeuvreing light, if fitted, shall be carried where it can best be seen, not less than 2 m vertically apart from the masthead light.

13 **High-speed craft***

(a) The masthead light of high-speed craft may be placed at a height related to the breadth of

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the craft lower than that prescribed in paragraph 2 (a)(i) of this annex, provided that the base angle of the isosceles triangles formed by the sidelights and masthead light, when seen in end elevation, is not less than 27°.

(b) On high-speed craft of 50 m or more in length, the vertical separation between foremast and mainmast light of 4.5 m required by paragraph 2 (a) (ii) of this annex may be modified provided that such distance shall not be less than the value determined by the following formula:

$$Y = \frac{(a + 17\Psi)\, C}{1000} + 2$$

Where: y is the height of the mainmast light above the foremast light in metres;

a is the height of the foremast light above the water surface in service condition in metres;

Ψ is the trim in service condition in degrees;

C is the horizontal separation of masthead lights in metres.

* Refer to the International Code of Safety for High-Speed Craft, 1994 and the International Code of Safety for High-Speed Craft, 2000.

14 Approval

The construction of lights and shapes and the installation of lights on board the vessel shall be to the satisfaction of the appropriate authority of the State whose flag the vessel is entitled to fly.

ANNEX II

Additional signals for fishing vessels fishing in close proximity

1 General

The lights mentioned herein shall, if exhibited in pursuance of Rule 26(d), be placed where they can best be seen. They shall be at least 0.9 m apart but at a lower level than lights prescribed in Rule 26(b) (i) and (c) (i). The lights shall be visible all round the horizon at a distance of at least 1 mile but at a lesser distance than the lights prescribed by these Rules for fishing vessels.

2 Signals for trawlers

(a) Vessels of 20 m or more in length when engaged in trawling, whether using demersal or pelagic gear, shall exhibit:

(I) when shooting their nets: two white lights in a vertical line;

(II) when hauling their nets: one white light over one red light in a vertical line;

(III) when the net has come fast upon an obstruction: two red lights in a vertical line.

(b) Each vessel of 20 m or more in length engaged in pair trawling shall exhibit:

(I) by night, a searchlight directed forward and in the direction of the other vessel of the pair;

(II) when shooting or hauling their nets or when their nets have come fast upon an obstruction, the lights prescribed in 2(a) above.

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(c) A vessel of less than 20m in length engaged in trawling, whether using demersal or pelagic gear or engaged in pair trawling, may exhibit the lights prescribed in paragraphs (a) or (b) of this section, as appropriate.

3 **Signals for purse seiners**

Vessels engaged in fishing with purse seine gear may exhibit two yellow lights in a vertical line. These lights shall flash alternately every second and with equal light and occultation duration. These lights may be exhibited only when the vessel is hampered by its fishing gear.

ANNEX- III

Technical details of sound signal appliances

1 **Whistles**

(a) *Frequencies and range of audibility*

The fundamental frequency of the signal shall lie within the range 70-700 Hz. The range of audibility of the signal from a whistle shall be determined by those frequencies, which may include the fundamental and/or one or more higher frequencies, which lie within the range 180-700 Hz ($\pm$ 1%) for a vessel of 20 m or more in length, or 180-2100 Hz ($\pm$ 1%) for a vessel of less than 20 m in length and which provide the sound pressure levels specified in paragraph 1(c) below.

(b) *Limits of fundamental frequencies*

To ensure a wide variety of whistle characteristics, the fundamental frequency of a whistle shall be between the following limits:

(i) 70-200 Hz, for a vessel 200 m or more in length;
(ii) 130-350 Hz, for a vessel 75 m but less than 200 m in length;
(iii) 250-700 Hz, for vessel less than 75 m in length.

(c) *Sound signal intensity and range of audibility*

A whistle fitted in a vessel shall provide, in the direction of maximum intensity of the whistle and at a distance of 1 m from it, a sound pressure level in at least one 1/3 - octave band within the range of frequencies 180-700 Hz ($\pm$ 1%) for a vessel of 20 m or more in length, or 180-2100 Hz ($\pm$ 1%) for a vessel of less than 20 m in length, of not less than the appropriate figure given in the table below.

Length of vessel in metres	1/3 -octave band level at 1 m in dB referred to 2×10^{-5} N /m^2	Audibility range in nautical miles
200 or more	143	2
75 but less than 200	138	1.5
20 but less than 75	130	1
Less than 20	120*	0.5
	-	
	111‡	

* When the measured frequencies lie within the range 180-450 Hz
† When the measured frequencies lie within the range 450-800 Hz
‡ When the measured frequencies lie within the range 800-2100 Hz

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The range of audibility in the table above is for information and is approximately the range at which a whistle may be heard on its forward axis with 90 % probability in conditions of still air on board a vessel having average background noise level at the listening posts (taken to be 68 dB in the octave band centred on 250 Hz and 63 dB in the octave band centred on 500 Hz).

In practice the range at which a whistle may be heard is extremely variable and depends critically on weather conditions; the values given can be regarded as typical but under conditions of strong wind or high ambient noise level at the listening post the range may be much reduced.

(d) *Directional properties*

The sound pressure level of a directional whistle shall be not more than 4 dB below the prescribed sound pressure level on the axis at any direction in the horizontal plane within ±45° of the axis. The sound pressure level at any other direction in the horizontal plane shall be not more than 10 dB below the prescribed sound pressure level on the axis, so that the range in any direction will be at least half the range on the forward axis. The sound pressure level shall be measured in that 1/3rd-octave band which determines the audibility range.

(e) *Positioning of whistles*

When a directional whistle is to be used as the only whistle on a vessel, it shall be installed with its maximum intensity directed straight ahead.

A whistle shall be placed as high as practicable on a vessel, in order to reduce interception of the emitted sound by obstructions and also to minimize hearing damage risk to personnel. The sound pressure level of the vessel's own signal at listening posts shall not exceed 110 dB (A) and so far as practicable should not exceed 100 dB (A).

(f) *Fitting of more than one whistle*

If whistles are fitted at a distance apart of more than 100 m, it shall be so arranged that they are not sounded simultaneously.

(g) *Combined whistle systems*

If due to the presence of obstructions the sound field of a single whistle or one of the whistles referred to in paragraph 1 (f) above is likely to have a zone of greatly reduced signal level, it is recommended that a combined whistle system be fitted so as to overcome this reduction. For the purposes of the Rules a combined whistle system is to be regarded as a single whistle. The whistles of a combined system shall be located at a distance apart of not more than 100 m and arranged to be sounded simultaneously. The frequency of any one whistle shall differ from those of the others by at least 10 Hz.

2 Bell or gong

(a) *Intensity of signal*

A bell or gong, or other device having similar sound characteristics shall produce a sound pressure level of not less than 110 dB at a distance of 1 m from it.

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(b) *Construction*

Bells and gongs shall be made of corrosion-resistant material and designed to give a clear tone. The diameter of the mouth of the bell shall be not less than 300 mm for vessels of 20 m or more in length. Where practicable, a power-driven bell striker is recommended to ensure constant force but manual operation shall be possible. The mass of the striker shall be not less than 3% of the mass of the bell.

3 Approval

The construction of sound signal appliances, their performance and their installation on board the vessel shall be to the satisfaction of the appropriate authority of the State whose flag the vessel is entitled to fly.

ANNEX- IV

Distress signals (as amended effective 1st December 2009)

1. The following signals, used or exhibited either together or separately, indicate distress and need of assistance:
   (a) a gun or other explosive signals fired at intervals of about a minute;
   (b) a continuous sounding with any fog-signalling apparatus;
   (c) rockets or shells, throwing red stars fired one at a time at short intervals;
   (d) a signal made by any signalling method consisting of the group ... --- ... (SOS) in the Morse Code;
   (e) a signal sent by radiotelephony consisting of the spoken word .MAYDAY.;
   (f) the International Code Signal of distress indicated by N.C;
   (g) a signal consisting of a square flag having above or below it a ball or anything resembling a ball;
   (h) flames on the vessel (as from a burning tar barrel, oil barrel, etc);
   (i) a rocket parachute flare or a hand-flare showing a red light;
   (j) a smoke signal giving off orange-colored smoke;
   (k) slowly and repeatedly raising and lowering arms outstretched to each side;
   (l) a distress alert by means of digital selective calling (DSC) transmitted on:
      (i) VHF channel 70, or
      (ii) MF/HF on the frequencies 2187.5 kHz, 8414.5 kHz, 4207.5 kHz, 6312 kHz, 12577 kHz or 16804.5 kHz;
   (m) a ship-to-shore distress alert transmitted by the ship's Inmarsat or other mobile satellite service provider ship earth station;
   (n) signals transmitted by emergency position- indicating radio beacons;
   (o) approved signals transmitted by radiocommunications systems, including survival craft radar transponders.
2. The use or exhibition of any of the foregoing signals, except for the purpose of indicating distress and need of assistance and the use of other signals which may be confused with any of the above signals, is prohibited.
3. Attention is drawn to the relevant sections of the International Code of Signals, the International Aeronautical and Maritime Search and Rescue Manual, Volume III and the following signals:
   (a) a piece of orange-coloured canvas with either a black square and circle or other appropriate symbol (for identification from the air);
   (b) a dye marker.

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IALA - MARITIME BUOYAGE SYSTEM (MBS)

PURPOSE: Buoys are floating aids to navigation. They may be seen in several types of shapes with or without topmarks, having varying colour patterns and some even fitted with white or coloured lights for use at night. Their shape, colour and light patterns all indicate a message towards safe navigation. Buoys are used to mark the approach points of ports, the sides or navigable limits of approach channels, act as dividers in between channels to separate opposite flow of traffic, to mark natural dangers and underwater obstructions like wrecks. Buoys are also used to mark important features of importance in navigation, safe waters, any new dangers and wrecks.

In this chapter a very brief introduction is being provided to the buoyage system, it is recommended that IALA publications, Mariners Handbook and Sailing Directions for the area concerned are studied to obtain in depth knowledge about the MBS and their proper use.

THE HISTORY: A long evolution has led to the present day systems. In 1889 a few countries placed black can buoys on the port side and red conical buoys on the starboard side of their port approach channels to mark the safe navigable limits, the approach direction being considered for the marking. Later red lights and green lights were placed on them respectively. However, in North America the lights were placed in the opposite manner. In the Geneva Convention of 1936 a common system was agreed to but varying interpretations led to the setting up of 9 different systems even in the North European waters.

IALA, International Association of Marine Aids and Lighthouse Authorities, was established in 1957. IALA provides nautical expertise and advice to harmonise aids to navigation worldwide and to ensure that movements of vessels are safe, expeditious and cost effective whilst simultaneously protecting the environment. In 1965 a committee was formed by IALA to study the many existing buoyage systems and provide cost effective solutions to standardise the same.

The IALA process was accelerated by the 11th January 1972 collision and sinking of 'Texaco Caribbean' in the Dover straits followed soon by two other vessels which hit her wreck and sank in the vicinity, details given at the end of Rule 10 on TSS. Though the wreck was marked by buoys, they were not recognized by the other ill fated vessels following the then voluntary TSS off Dover, they struck the submerged wreck apart from many which had near misses with the same.

Over 30 systems were in use as late as 1976 and some in total conflict with each other. It was an impossible task for navigators to be fully familiar with all these systems and this did lead to many accidents too especially when unable to make out that a new uncharted buoy had been placed to mark a recent underwater wreck.

This committee proposed two systems, using red colour to mark the port and starboard sides of the approach channels in different parts of the world naming them as System A and B respectively, green being the colour used for the other side. System A was adopted by Inter-Governmental Maritime Consultative Organization (IMCO) in 1976, now known as IMO. System B Rules were developed only in early 1980. However, even now, if an authority considers that the green colour is not satisfactory due to any exceptional reasons; black colour may be used instead.

The two systems have been combined by IALA into a common set of Rules which were adopted in November 1980 in a conference convened by IALA with the support of IMCO and IHO (International Hydrographic Organization).

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Adoption of the IALA systems across the world is now almost over. Geographical limits of the areas following A or B systems is well demarcated and readily available in sailing directions, is usually marked on the relevant navigational charts and also on maps published by IALA showing the demarcation of areas.

As per the available information the general demarcation is as follows:

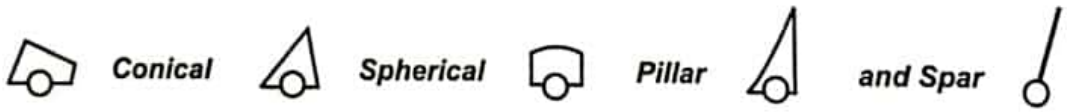
Region A: Europe, Australia, New Zealand, Africa, the Gulf and most of the Asian countries except as listed under Region B.

Region B: North, Central & South America, Japan, North & South Korea and the Philippines.

The knowledge of navigators to recognise and act on sighting buoys still remains weak. The submerged wreck of the 'Tricolor', due to her unfortunate collision and sinking on 14th December 2002, was hit by two other vessels on 16th December 2002 and 1st January 2003, even though wreck marking buoys had been immediately placed near the same. Several other vessels had near misses with this wreck too; the case is described with Rule 6 and has similarities with the 11th January 1972 collision and sinking of 'Texaco Caribbean' referred to above.

THE SYSTEM:

Six different types of marks are used, namely: Lateral, Cardinal, Isolated Danger, Safe Water, Special and Emergency Wreck Marking Buoys, the last was introduced only in 2006 by IMO on the recommendation of IALA. The marks may be used alone or in any combination. The buoys may be shaped in the form of Can / cylindrical, Conical, Spherical, Pillar or Spar. The first three usually indicate the correct side to pass from except in US waters where similar shaped buoys are frequently used on both sides of a channel, though painted differently in compliance with the Rules applicable to Region B. In addition buoys may be fitted with topmarks and the vast majority now feature radar reflectors incorporated into their design. The usual shapes of buoys are as shown below.



The approach direction to a port, harbour or estuary from seaward is normally taken as the **'local direction of buoyage'**. However, **'general direction of buoyage'** may be adopted by local authorities and may be different than the former. The directions are usually clearly marked on the navigational charts if they have been so declared by the local authorities.



Symbol showing direction of buoyage where not obvious.



Symbol showing direction of buoyage where not obvious, on multicoloured charts (red and green circles coloured as appropriate).

LATERAL MARKS: These are used in conjunction with the conventional direction of buoyage, usually to mark the edges of well defined navigable channels. Modified marks are used to indicate areas where the channels divide and/or indicate the preferred routes to follow.

Lateral Marks are the only marks that differ by region; the other four marks are common to both Region A and Region B.

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CARDINAL MARKS: Are used to indicate the position of a hazard and the direction of safe navigable waters around it linked to the true directions of the compass.

ISOLATED DANGER MARKS: Are used to indicate isolated dangers of limited size with safe navigable waters around them, for example a submerged rock or even a small wreck. They are placed over or as close to the danger.

SAFE WATER MARKS: usually indicate the end of a channel and that deep, safe navigable water lies ahead. They also are used as a mid-channel marker buoy and indicate that there is safe navigable deep water around them in all directions.

SPECIAL MARKS: Are not necessarily intended for providing directional guidance to assist navigation but to highlight areas or features referred to in charts and nautical publications. Areas having speed restrictions or mooring locations are marked by such buoys. The best point of passage in a channel may also be marked by such buoys, for example when passing under bridges.

EMERGENCY WRECK MARKS: Is placed as soon as possible close near to a new wreck or newly discovered obstruction considered hazardous to shipping or surface navigation. This was adopted by IMO on 11th December 2006 at the request of IALA and with a view to improve safety of navigation.

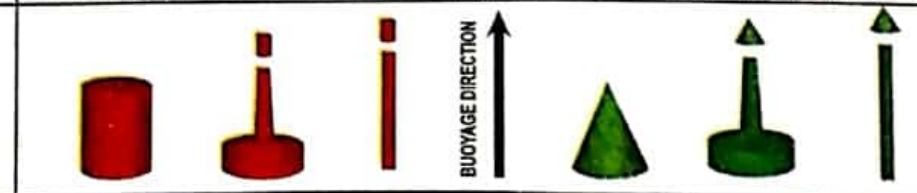
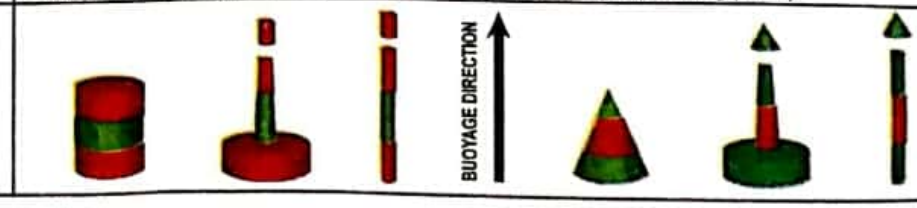
The emergency wreck-marking buoy is designed to provide high visual and radio aid to navigation recognition. It should be placed as close to the wreck as possible, or in a pattern around the wreck, and within any other marks that may be subsequently deployed. The emergency wreck marking buoy should be maintained in position until:

- the wreck is well known and has been promulgated in nautical publications;
- the wreck has been fully surveyed and exact details such as position and least depth above the wreck are known; and
- a permanent form of marking of the wreck has been carried out.

Principal features of each system and type of the above is shown in the below diagrams and charts.

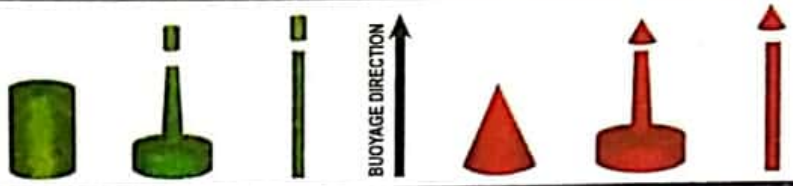
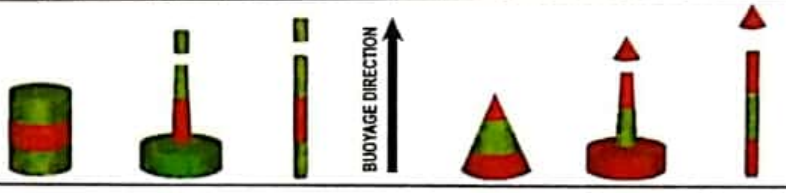
LATERAL MARKS: REGION A

NP735

	Port Hand Marks	Starboard Hand Marks
Colour	Red	Green
Buoy Shape	Cylindrical (can), pillar or spar	Conical, pillar or spar
Topmark (if any)	Single red cylinder (can)	Single green cone, point upwards
Light Colour (when fitted)	Red	Green
Light Rhythm (when fitted)	Any apart from composite group flashing (2 + 1)	Any apart from composite group flashing (2 + 1)
		
	Preferred Channel to Starboard	**Preferred Channel to Port**
Colour	Red with one broad green horizontal band	Green with one broad red horizontal band
Buoy Shape	Cylindrical (can), pillar or spar	Conical, pillar or spar
Topmark (if any)	Single red cylinder (can)	Single green cone, point upward
Light Colour (when fitted)	Red	Green
Light Rhythm (when fitted)	Composite group flashing (2 + 1)	Composite group flashing (2 + 1)
		

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LATERAL MARKS: REGION B

	Port Hand Marks	Starboard Hand Marks
Colour	Green	Red
Buoy Shape	Cylindrical (can), pillar or spar	Conical, pillar or spar
Topmark (if any)	Single green cylinder (can)	Single red cone, point upwards
Light Colour (when fitted)	Green	Red
Light Rhythm (when fitted)	Any apart from composite group flashing (2 + 1)	Any apart from composite group flashing (2 + 1)
		
	Preferred Channel to Starboard	**Preferred Channel to Port**
Colour	Green with one broad green horizontal band	Red with one broad green horizontal band
Buoy Shape	Cylindrical (can), pillar or spar	Conical, pillar or spar
Topmark (if any)	Single green cylinder (can)	Single red cone, point upward
Light Colour (when fitted)	Green	Red
Light Rhythm (when fitted)	Composite group flashing (2 + 1)	Composite group flashing (2 + 1)
		

CARDINAL MARKS: REGION A & REGION B

Are used to signify a danger and show the direction of safety as a compass direction relative to the mark. They are after the quadrant in which they are placed. This system makes them free from direction of approach of a vessel. These are usually used to show:

- The deepest water on an area on the named side of the mark;
- The safe side on which to pass a danger; and
- Draw attention to a feature in a channel such as a bend, junction, bifurcation or end of a shoal.

They do not have a distinctive shape prescribed for them, but buoys used as Cardinal marks are usually either pillar or spar shaped.

Only quick or very quick flashing white lights are used on the lighted cardinal marks. The light characteristics prescribed are:

N Uninterrupted,

E 3 flashes in a group at 5 second intervals if very quick flashing or 10 second intervals if quick flashing,

S 6 flashes in a group followed by a long flash, the latter not less than 2 seconds duration. At 10 second intervals if very quick flashing or 15 second intervals if quick flashing,

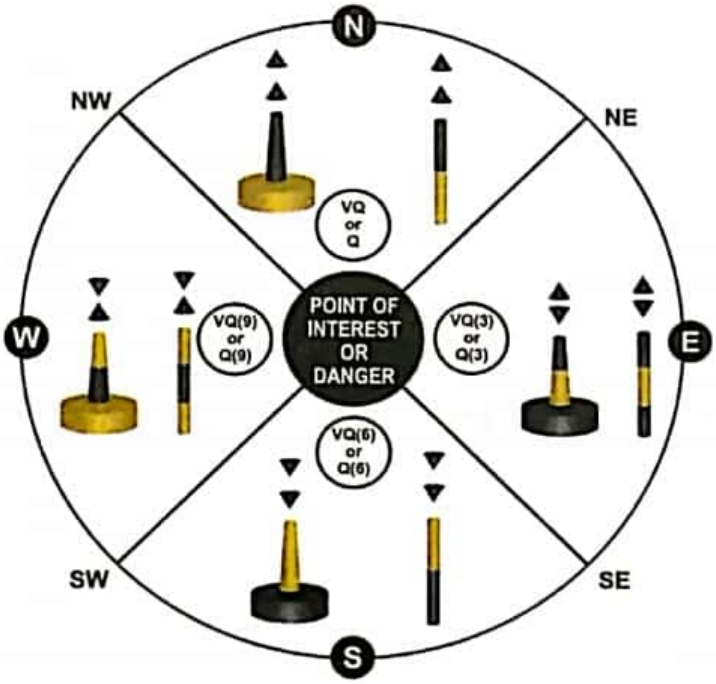
W 9 flashes in a group, at 10 second intervals if very quick flashing or 15 second intervals if quick flashing.

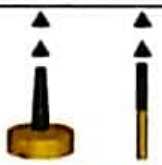
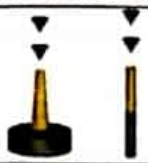
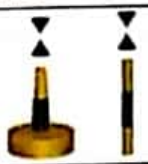
The number of flashes used for East, South and West match the time values used in a clock, 3, 6 and 9 o'clock positions.

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Quick flashing means a rate between 50 and 79 flashes/minute, usually 50 or 60. Very quick flashing means a rate between 80 and 159 flashes/minute, usually 100 or 120.

A vessel is safe if the navigators take her N off a North mark, E of an East mark, S of a South mark and W of a West mark.



	North Cardinal mark	East Cardinal Mark
Colour	Black above yellow	Black with a single broad horizontal yellow band
Buoy Shape	Pillar or spar	Pillar or spar
Topmark	2 black cones, one above the other, pointing upward	2 black cones, one above the other, base to base
Light Colour (when fitted)	White	White
Light Rhythm (when fitted)	VQ or Q	VQ(3) every 5 seconds or Q(3) every 10 seconds
		
	South Cardinal Mark	**West Cardinal Mark**
Colour	Yellow above black	Yellow with a single broad horizontal black band
Buoy Shape	Pillar or spar	Pillar or spar
Topmark	2 black cones, one above the other, points downward	2 black cones, one above the other, point to point
Light Colour (when fitted)	White	White
Light Rhythm (when fitted)	VQ(6) + Long flash every 10 seconds or Q(6) + Long flash every 15 seconds	VQ(9) every 10 seconds or Q(9) every 15 seconds
		

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ISOLATED DANGER MARKS: REGION A & REGION B

The double sphere topmark is an important feature and needs to be visible by day. The topmarks should be as large as possible with the spheres clearly separated.

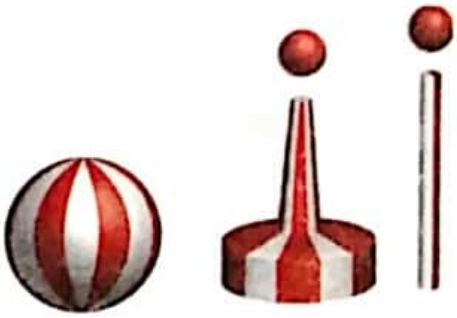
ISOLATED DANGER MARKS: REGION A & REGION B

	Isolated Danger Mark
Colour	Black with one or more broad horizontal red bands
Buoy Shape	Optional, but not conflicting with lateral marks; pillar or spar preferred
Topmark	2 black spheres, one above the other
Light Colour (when fitted)	White
Light Rhythm (when fitted)	Group flashing (2)



SAFE WATER MARKS: REGION A & REGION B

	Safe Water Mark
Colour	Red and white vertical stripes
Buoy Shape	Spherical; pillar or spar with spherical topmark
Topmark (if any)	Single red sphere
Light Colour (when fitted)	White
Light Rhythm (when fitted)	Isophase, occulting, one long flash every 10 seconds or Morse "A"



SPECIAL MARKS: REGION A & REGION B

	Special Mark
Colour	Yellow
Buoy Shape	Optional but not conflicting with navigational marks
Topmark (if any)	Single yellow "X" shape (St Andrew's Cross)
Light Colour (when fitted)	Yellow
Light Rhythm (when fitted)	Any other than those described in cardinal, isolated danger and safe water marks

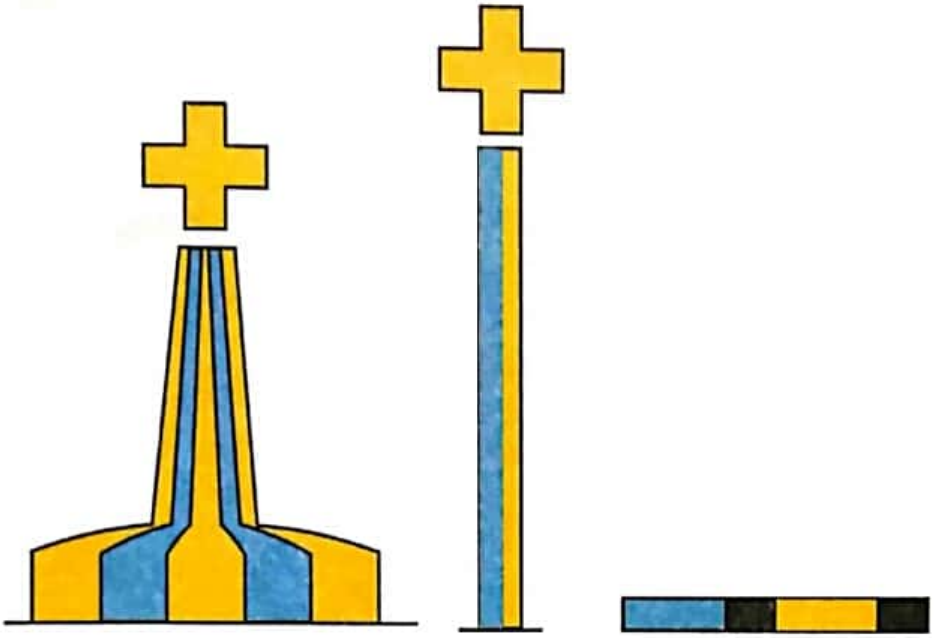


EMERGENCY WRECK MARKING BUOY

- A buoy used for this purpose is required to have the following characteristics as per the IMO SN.1/Circ.259 of 11 December 2006:
- A pillar or spar buoy, with size dependant on location.
- Coloured in equal number and dimensions of blue and yellow vertical stripes (minimum of 4 stripes and maximum of 8 stripes).
- Fitted with an alternating blue* and yellow flashing light with a nominal range of 4 nautical miles (authorities may wish to alter the range depending on local conditions) where the blue and yellow 1 second flashes are alternated with an interval of 0.5 seconds.
  * B1.0s + 0.5s + Y1.0s + 0.5s = 3.0s

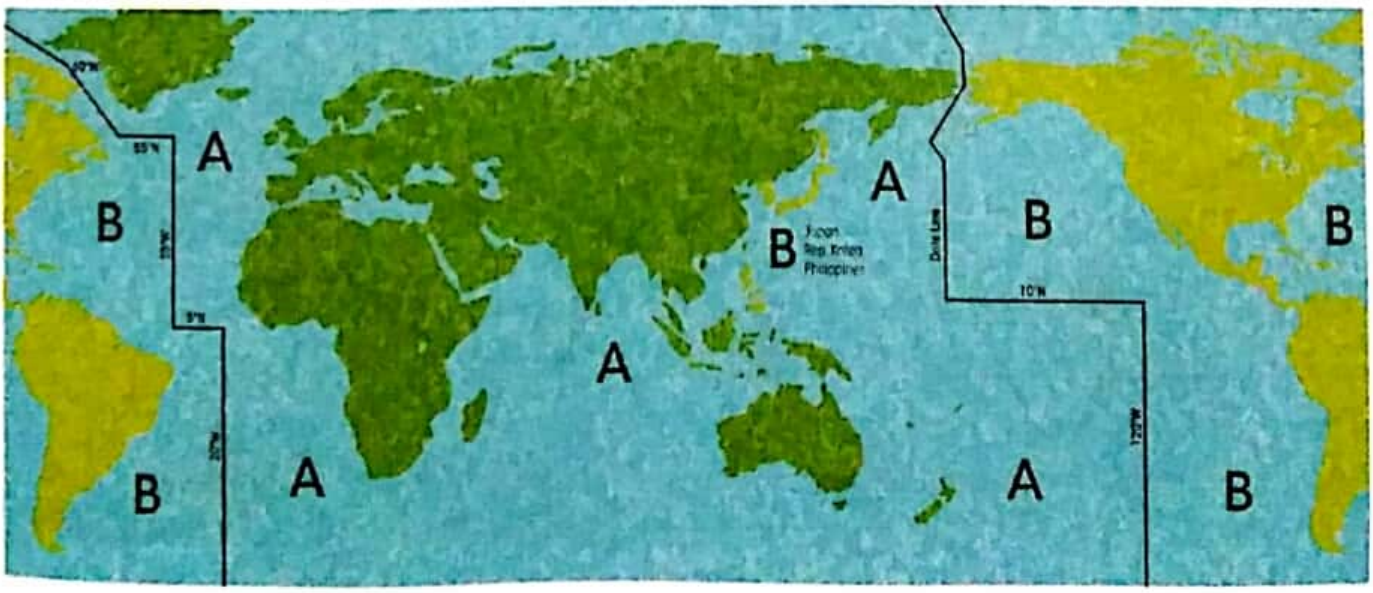
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- If multiple buoys are deployed then the lights should be synchronized.
- Consideration should be given to the use of a racon Morse Code "D" and/or AIS transponder.
- The top mark, if fitted, is to be a standing/upright yellow cross.



The world is divided into buoyage regions A and B as shown in the map below. The buoyage direction in the two regions is as shown in the examples further below.

IALA buoyage region A & B:



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IALA Buoyage System: REGION A:



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IALA Buoyage System: REGION B:



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BASIC SHIP HANDLING - FOR PREVENTING RISK OF COLLISION

Only the very basics from the vast subject of ship handling are explained in this chapter which should be helpful in navigational activities but more so when executing ***'any action to prevent collision'***. Familiarity with the manoeuvring capabilities of a vessel, basic ship handling principles coupled with the skills and ability to use them in real life situations will help achieve the desired objectives of ***'preventing collisions'***. Ship handling studies have usually focused on port, docking and undocking manoeuvres, little thought given to them for application during sea voyages.

There are many forces acting on a vessel at any given moment, some cannot even be quantified properly and some are perhaps still unknown. The resultant of the various forces or their combined effects on a vessel cannot always be predicted with accuracy. Ship handling is a combination of science and skills or an art developed in time with experience, scientific research on this subject is yet imperfect and may not always be confirmed by solid proof. However, an understanding of these basics will be of help to understand, predict and control your vessel. These comments may sound absurd since theory and practice should go hand in hand, but ship handling is still being studied, the theory and practice are not yet fully integrated, a fact even acknowledged by IMO.

Ship behaviour as seen or learnt on simulators should be with caution. Simulators operate on mathematical models based on real ships but if the collection and/or analysis of data or their input on the simulator software have any errors, these will reflect in the simulation too. Academic theory of this subject is usually based assuming various forces act on a vessel's centre of gravity, the calculated positions of the centre of the buoyancy and floatation. All stability calculations also are generally assuming a vessel is in static conditions. These parameters are dependent on the underwater shape and cross sectional area of a vessel; which are subject to dynamic changes when a vessel is at sea. The real behaviour of a vessel may be substantially different at sea than predicted by static calculations especially in heavy sea and/or swell conditions. Practical experience is the best way to master this subject than pure academic studies; this has been my experience too. However, the information and advice provided is largely correct but the best predictions on ship behaviour may sometimes fail without any reasonable explanations.

Navigators should know the manoeuvring capabilities and characteristics of their vessels, also stated in the STCW Code Section A-VIII/2, quoted below. The parameters vary on different vessels, sometimes even on sister vessels.

Paragraph 17:

.7: the experience of each officer of the navigational watch, and the familiarity of that officer with the ship's equipment, procedures, and manoeuvring capability.

.10: Rudder and propeller control and ship manoeuvring characteristics.

.11: The size of the ship and the field of vision available from the conning position.

.12: The configuration of the bridge, to the extent such configuration might inhibit a member of the watch from detecting by sight or hearing any external development.

Paragraph 22.4: ***Procedures for the use of main engines to manoeuvre when the main engines are on bridge control.***

Paragraph 22.5.5.5: ***The possible effects of heel, trim, water density and squat on under-keel clearance.***

Paragraph 30: ***Officers of the navigational watch shall know the handling characteristics of***

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their ship, including its stopping distances, and should appreciate that other ships may have different handling characteristics.

Paragraph 49: ***The master and the pilot shall exchange information regarding navigation procedures, local conditions and the ship's characteristics.***

A vessel or a ship floats in water because its underwater volume displaces water equivalent to its weight or mass, and the equivalent upward force of buoyancy keeps the vessel afloat.

[TASK: REVISE ARCHIMEDES PRINCIPLE.

QUIZ: IS ARCHIMEDES PRINCIPLE APPLICABLE WHEN A BALOON FLOATS AND GOES UP IN AIR?]

The hull of a vessel is designed to ease her movement ahead through the water and the flow of the water astern. The designs vary from warships, passenger and container vessels with fine contours and pointed bow profiles designed for faster speed, to the large bulk carriers and tankers with a rather blunt face. A vessel's block coefficient, or Cb, should give a fair idea of the type of her underwater construction.

[QUIZ: FIND OUT WHAT EXACTLY IS BLOCK COEFFICIENT?

TASK: REVISE NEWTON'S THREE LAWS OF MOTION AND MOMENTUM.

QUIZ: CALCULATE AND COMPARE THE MOMENTUM GENERATED BY A CONTAINER VESSEL OF 12'000 MT DISPLACEMENT MOVING AT 24 KNOTS AND A LARGE BULK CARRIER 3'35'000 MT DISPLACEMENT MOVING AT 12 KNOTS?]

The momentum of a vessel is not just in the fore-and-aft direction but also the angular momentums when turning, rolling, pitching or swinging, as such the combined effects would be of 'Longitudinal', 'Lateral', 'Rotational or 'Angular' momentum, individually or in any combination.

Other than momentum, is the inertia a vessel has when stopped. To make a vessel move the force exerted should be large enough to overcome inertia and result in the vessel achieving movement through the water.

MOVEMENT THROUGH WATER: Unlike a vehicle on the road there is no road for a vessel. A vessel not only floats in water but also uses the same medium to propel her through it. A vessel has no brakes; she can only change the force or direction of her propulsion system. A vessel does not turn as easily as vehicles on land, the time and distance taken for any movement or stopping takes much longer and these aspects make ship handling very different from handling various modes of transport on land. Though Newton's laws of motion apply to all movements, they do so in conjunction with the laws of floatation and fluid hydrodynamics. The following explanations cover motorised vessels only.

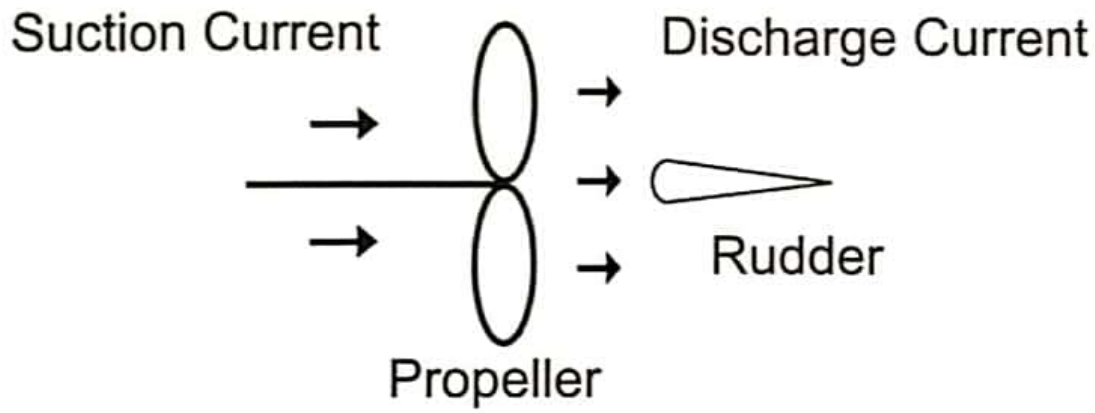
PROPULSION AND PROPELLORS: The development of engines also led to their being fitted on board to provide propulsion power. Starting with steam engines, modern vessels now come fitted with various types of engines or power plants, the diesel engine being the most common but steam turbine engines are still used on LNG vessels. Some of the latter have diesel/LNG powered generators and electric propulsion systems; nuclear power is usually restricted to Naval vessels.

Propulsion systems started with paddle wheels fitted on the side, but some time since the 1860's the screw type fixed pitch propeller was developed and remains most popular even now with many

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models. The number of blades in a propeller, their size, pitch and diameter are all based on expected usage. If a vessel is fitted with two propellers, one on each side, she is highly manoeuvrable and the two usually rotate in opposite directions cancelling each others transverse thrust effects, explained later. A single screw propeller is fairly efficient and is mostly right handed, this means it turns clockwise when viewed from right astern of a vessel looking forward, this nomenclature is used to describe a propeller whether it is right or left handed.

Propulsion is provided by the combined total of suction of water from one side and the thrust of the water to the other side created by the rotation of the propeller. Some experts claim that up to two thirds of the propulsion force generated is by the suction effect of a propeller. However, the steering provided by the rudder is dependent only on the discharged thrust of water thrown by the propeller.



Note: A propeller is designed to suck water from ahead and thrust it astern. When reversed, by design itself it loses its efficiency. Further the vessel's hull resists the water flow and also deflects it side ways.

However, other types of propulsion systems do exist like the variable or controllable pitch propellers where the pitch angle of the blades can be controlled, but the engine keeps running in one direction only at a constant RPM. With the reversible pitch propellers use of non reversible machinery like gas turbine engines is possible. Some of the new craft of smaller size are being fitted with water jet propulsion systems, there is no propeller, and water is sucked from the bottom of the hull from the forward side and thrown back astern across a rudder. Some of these vessels have twin outlets and thus dispense with a rudder too. Even single propellers have many designs but that is outside the scope of the basic level of explanations in this chapter.

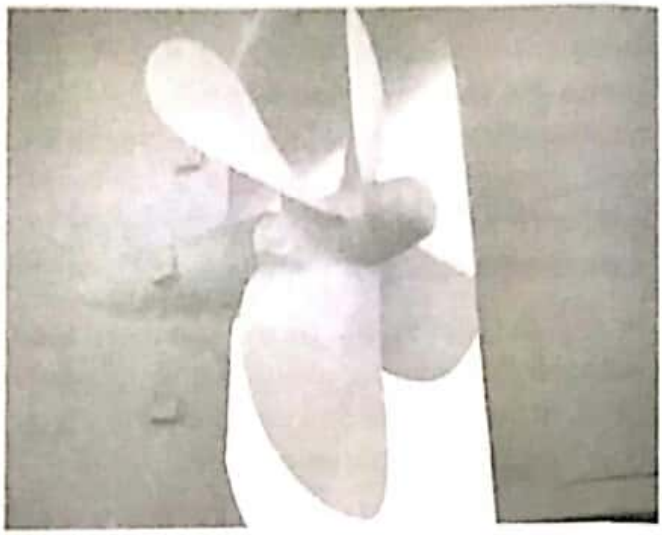
Some tugs and ferries also use Voith Schneider propulsion systems (VSP), also known as a cycloidal drive. In this specialised system, changing the power and direction of thrust through 360° is very fast and as such a rudder is also not required. Another type of propulsion where the rudder and traditional propeller shaft are dispensed with is known as the azimuth or azipod thruster, swivelling pods contain a powerful electric or hydraulic motor and propeller combination; these can rotate a full 360° without any limitations. These systems are now common but there may be even other systems in existence now or may develop in future, you need to be fully familiar with the system on your own vessel.

Engine power is now expressed in Kilowatts, earlier it was BHP (Brake horse Power). Actual power delivered at the propeller shaft is termed SHP (Shaft Horse Power).

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A 4 blade, fixed pitch left handed propeller of a ferry fitted on her starboard side having twin engines. Propeller and part of tail shaft are visible.

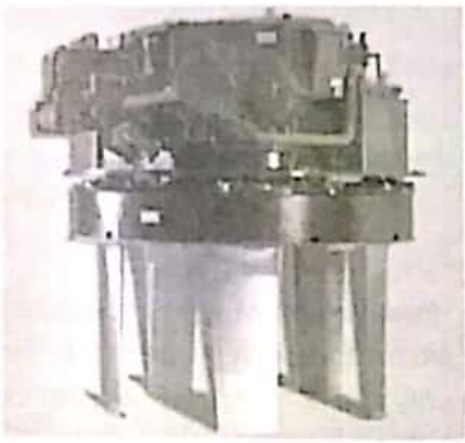


A 4 blade, fixed pitch right handed propeller of a single engine tanker fitted in the centre line with the tail shaft and part of the rudder visible.

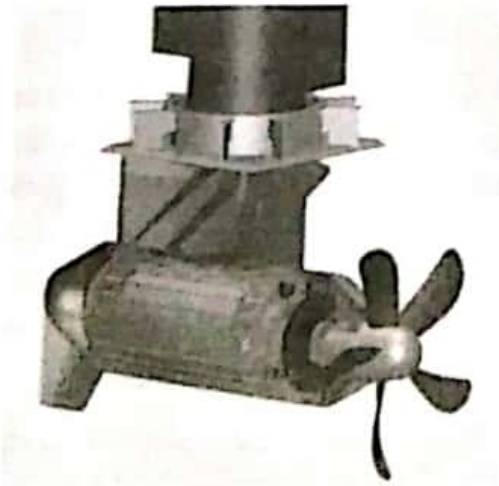
Note: Where twin propellers are fitted on a vessel, they usually work in opposite directions to eliminate transverse thrust.



A fast marine propeller in action.



A typical Voith Schneider propeller, usually on tugs and smaller vessels



azimuth or azipod thrusters, the one on the right is being fitted on a new building passenger ferry.



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[QUIZ Q: WHAT IS THE CONVERSION FACTOR FROM KILOWATTS TO BHP AND VICE-VERSA?]

PROPULSION SYSTEMS: Each type of power plant / propeller combination has its advantages and disadvantages as shown in the chart below, data is indicative only.

ENGINETYPE / RESPONSE	STEAM TURBINE VARIABLE RPM	DIESEL (MOTOR) VARIABLE RPM	ELECTRIC VARIABLE RPM	DIESEL OR ELECTRIC ALMOST FIXED RPM (VERY LITTLE VARIATION)
PROPELLER TYPE	Fixed pitch	Fixed pitch	Fixed pitch	Variable or controllable pitch
START	Slow	Good	Good	Good
STOP	Slow	Good	Good	Good, some residual speed may remain
ACCELERATE	Slow	Good	Good	Good
SLOWING	Slow	Good	Good	Good
FULL POWER AHEAD	Slow to develop but reliable	Good	Good	Good
GRADUAL CHANGES IN SPEED (INTERMEDIATE)	Not normally unless specially arranged	Possible	Possible	Possible
STERN POWER EFFICIENCY (APPROXIMATE % OF AHEAD POWER)	Separate turbine for astern since turbines are not reversible. Poor – around 40 %	Fair – 50 TO 75 %	Good - Up to 85 %	Good - Up to 80 %
STEERING	Good	Good	Good	Poor when pitch set to zero as cuts off all water flow across the rudder.
PRECAUTIONS	Necessary and anticipation is necessary	For crash stops, number of stops and starts	Nil	For stopping and crash stops

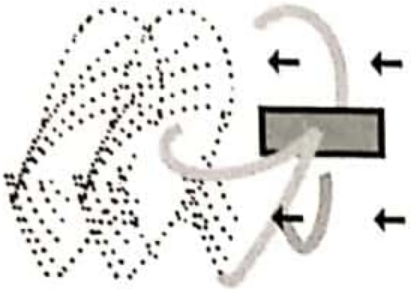
TRANSVERSE THRUST BY PROPELLERS: The water discharge from the propeller is helical in pattern as shown in the following diagram and not uniform resulting in uneven distribution of the thrust force. In a conventional right handed propeller, the thrust delivered from the starboard side is stronger resulting in an uneven couple, and when going ahead the stern is pushed sideways to the starboard side, or the bow cants (turns) to port. The reverse happens when the propeller direction is reversed.

Another reason for this is that the sideway force created by a propeller blade, should ideally cancel the sideway force created by the one opposite, but since water pressure is lower on top, the sideways force created by the lower blades is higher being in higher pressure of water, adding to the couple.

For the purpose of understanding this phenomenon, assume a propeller blade is walking along the bottom of the sea, but with very low efficiency like a person trying to walk in a swimming pool standing in neck deep water, this is to emphasise that the side force due to transverse thrust is rather weak. If the direction of rotation of a propeller is reversed, the direction of the residual force also reverses. The following diagrams describe the transverse thrust effect using this example. The efficacy of any force

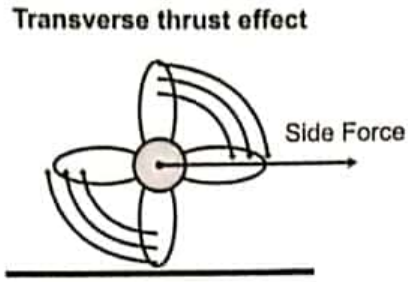
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turning the vessel depends on the point of application of the force and the position of the pivot point at that time. Pivot point is described later.



Helical discharge from a Propeller

PROPELLER FORCES



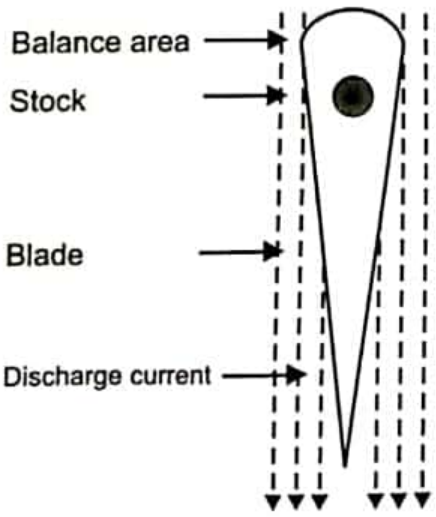
Visualize the lower blades walking along the bottom. The stern moves in the same direction as the rotation of the propeller.



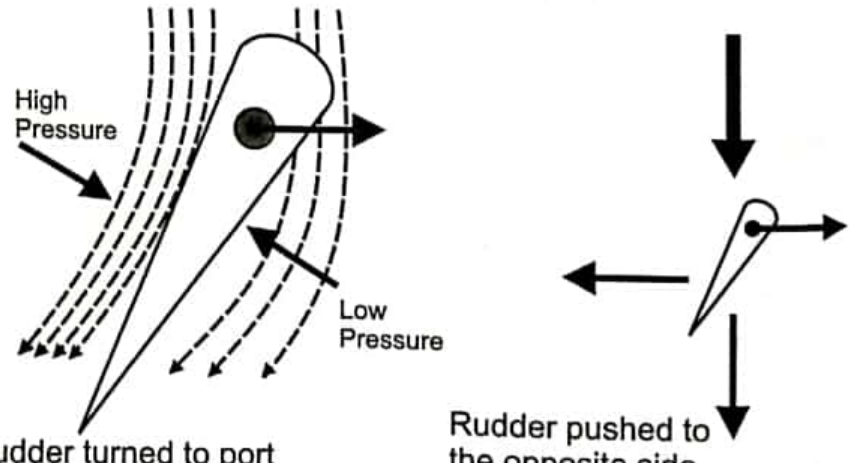
Longitudinal and transverse thrust

RUDDERS: Amongst the various methods have been used through time to turn a vessel sideways, the most common now is the rudder. Other than in Voith Schneider propulsion systems, most others have a rudder placed aft of the propulsion system to enable turn the vessel and is effective when there is a flow of water across it. There are many kinds of rudders in use, the modern ones have an aerodynamic shape, and these may be balanced, semi-balanced or at times even un-balanced. When turned they deflect the flow of water in a direction away from the right astern direction to enable the ships stern to turn.

The flow of water from the propeller on hitting a rudder, which is turned, gets deflected and can be considered divided into two components, a fore-and-aft one and one perpendicular to the vessels fore-and-aft line, this latter provided the turning force at the rudder stock. If a rudder is turned more than about 45° the smooth water flow will start to eddy and the rudder will stall, loosing its effectiveness. In practice, 35° rudder angle has been found to give the maximum turning effect on conventional vessels. Rudder efficacy is directly proportional to the discharge current, with propulsion stopped, even with a headway due to existing momentum, a rudder loses its turning efficacy substantially, down close to nil.



Rudder amidships



Rudder turned to port deflects the water current. The deflected water stream may be considered divided into two components. The fore and aft one makes the vessel to move ahead, the side component causes the rudder stalk to move to the opposite side.

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[QUIZ? WHICH NEWTON'S LAW IS APPLICABLE WHEN A RUDDER TURNS A VESSEL?]

There is another force created by the rudder when turned, a drag force which causes a reduction in speed of the vessel. This can be large and dangerous if the rudder was to be made too long because it is higher at large rudder angles when the drag force could be larger than the sideways force. In order to keep the drag force under control the size of rudder is limited to be within 1.2 to 2.0 % of the length of a vessel.

RUDDER PROPERTIES.

- Takes time to turn.
- Effective as long as there is a thrust of water across it. If the propeller stops the flow of water reduces and rudders become ineffective even if the vessel has headway.
- In case of a variable or controllable pitch propeller, reducing the pitch to zero cuts off the flow of water across the rudder even if a vessel has headway. The rudder becomes totally ineffective.
- Rudder effect is close to nil when propulsion is reversed, the reverse flow does not impact the rudder surface.

A turned rudder causes the stern of the vessel to physically move along the rudder stalk axis. A vessel would turn around its pivot point; this is explained a little later.

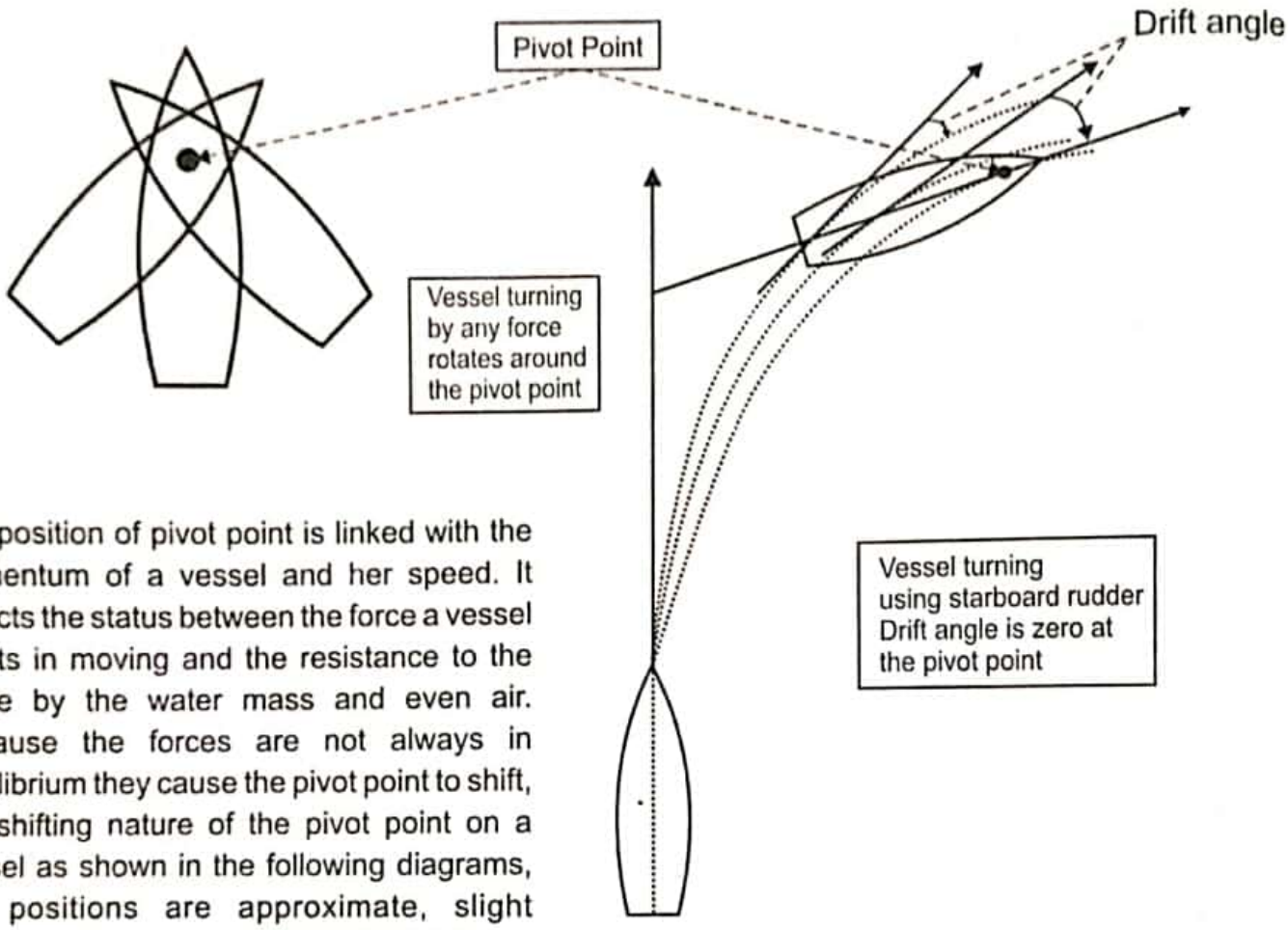
When a vessel has considerable sternway with the propeller running in the astern direction, a turned rudder restricts suction of water into the propeller causing a couple, this appears as if the rudder has a slight steering effect. However, this varies from vessel to vessel, the effect is very weak and usually felt at high astern speeds, as such should not be relied upon.

[TASK: MAKE A DIAGRAM OF FORCES WITH THE PROPELLER GOING ASTERN, THE SUCTION OF THE WATER RESTRICTED ON ONE SIDE – WHAT DO YOU THINK WILL BE THE TURNING COUPLE EXERTED ON THE HULL OF A VESSEL IN THIS CONDITION?]

THRUSTERS: On some ships, bow, and sometimes even stern thrusters are fitted, more than one at times depending on the need. These are underwater tunnels perpendicular to the vessels fore-and-aft line and can be used to move the bow / stern of a vessel sideways. These are designed for mooring / harbour operations and loose their efficacy if a vessel is moving, usually at speeds over 5 knots. Thrusters are not designed to turn a vessel proceeding at high speeds.

PIVOT POINT: Vessels do not turn around their longitudinal centre of gravity or centre of floatation but on the Pivot Point. Pivot point can be described as the point around which something turns or rotates. It may be compared to the pointed fulcrum on which a bar lying horizontally would oscillate. On a vessel this lies on the fore-and-aft centre line of a vessel and is the point around which the vessel appears to turn whenever any turning force is acting on a vessel. Pivot point is also described as the point on the fore-and-aft centre line of a vessel where the drift angle between the fore-and-aft line and the tangent to the circular movement is zero. Drift angle is the angle the tangent of the circular path of any point makes with the vessels fore-and-aft line when in a circular turning motion. The following diagrams show this, as a vessel turns every point has a drift angle with the fore-and-aft line except at the pivot point.

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The position of pivot point is linked with the momentum of a vessel and her speed. It reflects the status between the force a vessel exerts in moving and the resistance to the same by the water mass and even air. Because the forces are not always in equilibrium they cause the pivot point to shift, the shifting nature of the pivot point on a vessel as shown in the following diagrams, the positions are approximate, slight variations will be there on vessels of different designs.



DEAD STOP

Pivot Point is approximately at the centre of the vessel.



ACCELERATING AHEAD

Pivot Point moves ahead, the higher the rate of acceleration the further it goes, even outside the vessel.



HEADWAY - STEADY SPEED AND COURSE

At steady speed the Pivot Point is approximately 1/3rd to 1/4th of the vessels length from forward, at constant/steady speed, the quantum of speed does not matter.

Note : When moving astern the positions of the Pivot Point are a reverse mirror image of the forward movements shown above.

[TASK: BASIS THE ABOVE DRAW A DIAGRAM SHOWING THE PIVOT POINT POSITIONS WITH A VESSEL MOVING ASTERN IN DIFFERENT CONDITIONS].

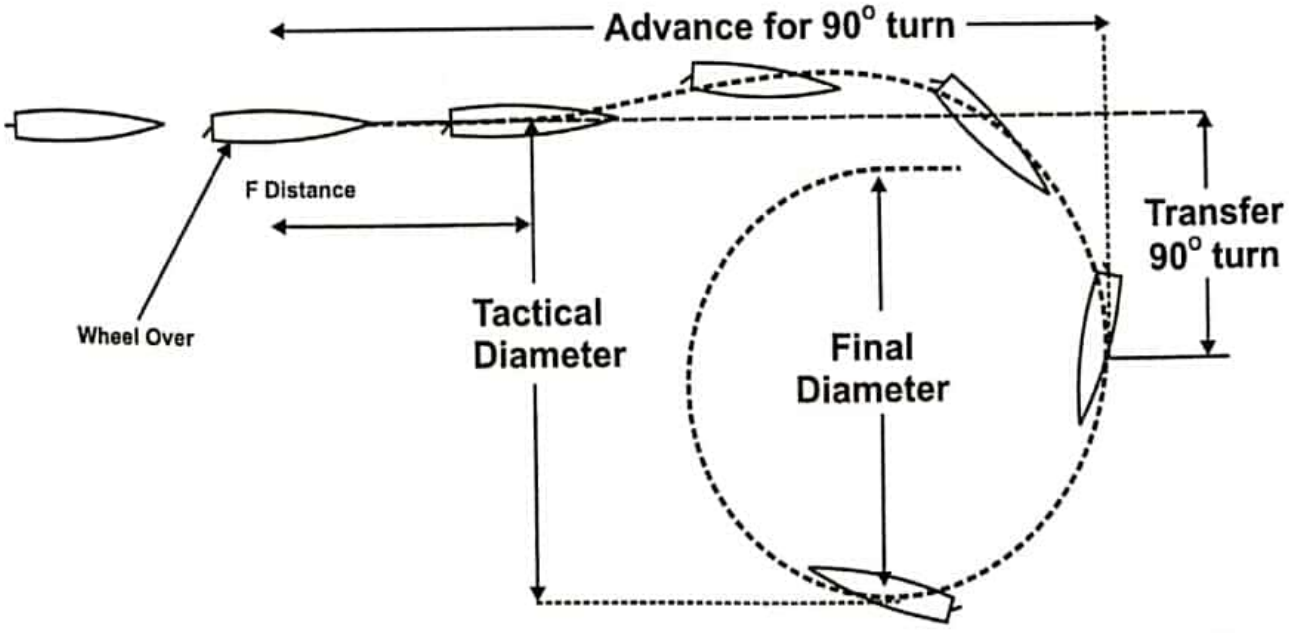
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The actual position of the Pivot Point may vary depending on a vessel's hull form, block coefficient, trim, depth of water etc. The approximate positions shown are sufficient to understand its shifting nature. The change in the length of the lever from the point of application of any turning force to the pivot point changes the moment of a turning force at the pivot affects and has a direct impact on the efficacy of turning. The larger the length of the lever; the more effective will be the force turning a vessel. For example in the middle picture, accelerating ahead, the rudder fitted astern will be most effective and the bow thruster the least.

This simple method can be used to determine the efficiency of any turning force and determine how this may change if the vessel's direction or rate of movement of direction changes, which will cause the Pivot Point to shift in the fore and aft direction and thus change the length of the turning lever.

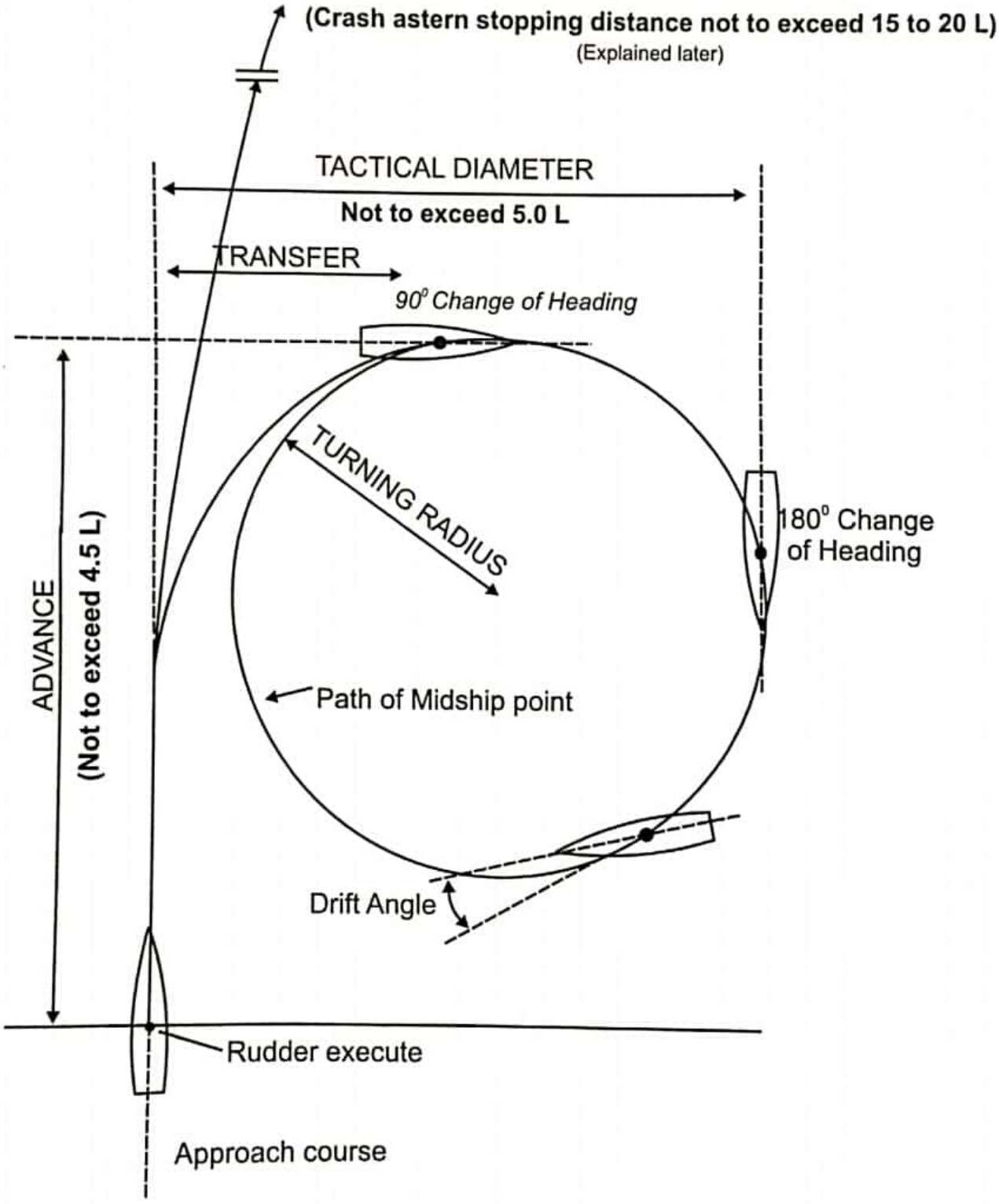
TURNING & TURNING CIRCLES: Similar to driving a vehicle on the road, to plan and execute any turn a navigator must have the full knowledge of the turning capabilities of a vessel, that is the turning circle parameters of the vessel being conned. It should be keep in mind that a vessels behaviour when turning may not always match the turning circles posted on the bridge but is also effected by the weather conditions and depends on the position of the pivot point explained above. Knowledge of turning characteristics of a vessel is extremely vital and essential for safe and efficient shiphandling, especially when operating in restricted sea room.

When the rudder is put over to one side, it forces the stern to the opposite side. When watching forward from the navigating bridge the vessel's bows will be seen swinging towards the same side the rudder is applied; in restricted sea room, watch out for the stern moving towards the other side, ensuring it is also passing clear of any dangers. Also a vessel drifts slightly opposite to the side the rudder is applied before entering the circular path. Further note that though a vessel would develop a rate of turn almost immediately after the rudder is applied, she will not enter the circular path immediately but move in her original direction for a while. This is because of her initial inertia. This reaction distance is frequently referred to as the 'F' distance and varies on different vessels. This inertial 'F' distance is usually between one to four ship lengths from smaller large powered to larger weak powered vessels and also depends on other factors like the hull shape, trim, displacement and under keel clearance etc. These basic parameters are shown in the below diagram.



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The below turning circle diagram is based on the MSC/Circular 1053 of 16th December 2002, which is linked with the earlier IMO resolution MSC.137(76) of 4th December 2002 on ***'standards for ship manoeuvrability'***. As can be seen, after 'Rudder Execute' the vessel has been shown to continue on an almost straight path for considerable distance, this is the 'F' distance explained above, the rudder applied in the below diagram is to starboard.



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The above explained turns may also be referred to as 'CONSTANT RUDDER TURNS' since the rudder angle remains constant throughout the turn, whatever be the rudder angle used. At hard over wheel the figures of advance and transfer, etc. would be the least and will increase in quantum proportional to the decrease in the rudder angle applied.

The turning circle parameters in deep water vary with rudder angle used and a vessel's displacement. However, and this may appear strange, **but is very important**: in deep waters and calm seas, for the same rudder angle used, the parameters of advance, transfer and tactical diameter remain almost the same at different engine speeds. In other words, if a vessel is at a steady propulsion power / speed, whatever be the quantum, for any given rudder angle, her turning circle parameters would be about the same if the propulsion power remains steady during the turn. Only the time factor will vary, the lower the speed, the longer the time to complete a similar turn.

The slight difference I observed in the manoeuvring characteristics of a VLCC I served on in 2001 as master was just 4m in the advance figures of 964 and 960 m at full and half ahead respectively, and 7m in the transfer (90° turn) figures of 497 and 490 m respectively, negligible in practice.

[TASK: STUDY THE MANOEUVRING CHARACTERISTICS OF THE VESSELS YOU SAIL ON AND KEEP A RECORD, COMPARE THE FIGURES OF VARIOUS VESSELS.]

During a turning manoeuvre with the rudder angle steady, if the propulsion power is reduced, say from full to slow, the negative acceleration will cause the pivot point to move aft reducing the lever between the same and the rudder, and the thrust of water on the rudder would also decrease. These combined reduce the rate of turn leading to a larger turning circle. Reducing speed during a turn is thus extremely dangerous as the increased turning circle will take a vessel closer to a vessel or object being avoided. When turning a vessel for ***'any action to avoid collision'***, the propulsion speed should never be reduced, stopped or reversed, on the contrary, if circumstances permit, an increase in propulsion power will lead to a shorter and faster turn, a technique usually employed by Pilots. The forward acceleration moves the pivot point forward increasing the turning lever.

Had the navigators on board the ill fated Titanic not reversed the engines when turning the vessel away from the iceberg they may have succeeded in avoiding the same. Immediately after the iceberg was sighted, hard over wheel was applied but the engines were simultaneously ordered to emergency full astern. The reversal of the engines rendered the rudder ineffective creating an increased turning circle which perhaps contributed to the accident. The facts stated are not meant to be critical of or to express any disrespect to the navigators on board the ill fated vessel. Similar actions have led to many other collisions and grounding, most notably the 'Norwegian Dream' and 'Ever Decent' collision of 24th August 1999 in the approaches to the Dover Strait.

[QUIZ: WHICH RULE STATES THAT AN ALTERATION OF COURSE MAY BE THE MOST EFFECTIVE ACTION TO AVOID A CLOSE-QUARTERS SITUATION? WHAT ARE THE OTHER REQUIREMENTS STATED IN THIS RULE TO BE CONSIDERED?]

LEGISLATIVE REQUIREMENTS ON MANOEUVRING PARAMETERS: Vessels should have good manoeuvring capability has been known but formal work to standardise it started only after the 1978 grounding accident of the loaded oil tanker AMOCO CADIZ off France resulting in a large oil pollution. This is typical of most legislation; they are always developed as corrective actions after major accidents. Large modern vessels are designed to carry maximum cargo at lower speeds for economy of transport. They have low powered engines and not much thought was given to their manoeuvring

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capabilities. Research in the 1980's analysed that unsatisfactory manoeuvring characteristics were the cause of over 70% collisions, shore contact and grounding accidents involving merchant vessels. Classification societies and ship building yards used their own standards for these aspects since no formal standards or requirements existed. IMO is known to have discussed this issue for the first time in 1968. MSC/Circ.389 titled ***'Interim Guidelines for Estimating Manoeuvring Performance in Ship Design'*** was issued only on 10th January 1985. In November 1993 IMO adopted resolution A.751(18) on ***'Interim Standards for Ship Manoeuvrability'***.

The last resolution on this subject is **MSC.137(76)** ***'standards for ship manoeuvrability'*** adopted by IMO on 4th December 2002 states: ***'The standards should be applied to ships of all rudder and propulsion types, of 100m in length and over, and chemical tankers and gas carriers, regardless of the length, which are constructed on or after 1 July 1994'***. This was followed by MSC/Circular 1053 of 16th December 2002 containing ***'appropriate explanatory notes for the uniform interpretation, application and consistent evaluation of the manoeuvring performance of ships'***, this superseded the earlier MSC/Circ.644 of 6th June 1994.

The two most important manoeuvring requirements stated in section 5.3 of the above referred IMO resolution **MSC.137(76)** are:

The manoeuvrability of the ship is considered satisfactory if the following criteria are complied with:

5.3.1 Turning ability: The advance should not exceed 4.5 ship lengths (L) and the tactical diameter should not exceed 5 ship lengths in the turning circle manoeuvre.

5.3.4 Stopping ability: The track reach in the full astern stopping test should not exceed 15 ship lengths. However, this value may be modified by the Administration where ships of large displacement make this criterion impracticable, but should in no case exceed 20 ship lengths. This means that the vessel stops ***'to dead in water'.*** This aspect is explained further below where emergency reversal of propulsion / engines is explained.

When conducting tests to verify compliance with the above the approach speed specified is to be at least 90 % of the ships speed corresponding to 85 per cent of the maximum engine output and using ***'35° rudder angle or the maximum rudder angle permissible at the test speed, following a steady approach with zero yaw rate'***.

[TASK: COMPARE THE MAXIMUM ALLOWED TURNING ABILITY AT MAXIMUM ALLOWED RUDDER AND FULL ASTERN STOPPING DATA FOR VESSELS HAVING A LENGTH OF 100, 200, 300 AND 400 METRES, CONVERT THE FIGURES INTO NAUTICAL MILES WHEN COMPARING.]

It is important to link these requirements with those of Rule 8(c), ***'if there is sufficient sea room, alteration of course alone may be the most effective action to avoid a close-quarters situation provided that it is made in good time, is substantial and does not result in another close quarters situation'.*** The reasonable logic of this Rule recommending ***'alteration of course alone'*** is quite clear. A vessel needs a rather small area to turn than to be stopped even with emergency astern propulsion when at full speed. As has been emphasized earlier, turning a vessel for ***'any action to avoid collision'***, if sea room permits, is the most effective action.

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In an emergency hard over wheel should always be used, this neither has any detrimental effects on the propulsion or steering systems nor on a vessels stability, such assumptions are dangerous myths. However, if the requirements of Rule-8(a) ***'any action to avoid collision shall be taken in accordance with the Rules of this Part and shall, if the circumstances of the case admit, be positive, made in ample time and with due regard to the observance of good seamanship'***, are practiced, there may never be a need for such a drastic action. There are many reported incidents when the navigator in charge hesitated in using maximum rudder to turn the vessel away resulting in a large turning circle and a collision, please see the details of the collision between the VLCC 'Samco Europe' and the container vessel 'MSC Prestige' given with Rule 10, hard over wheel was applied far too late. The vessels were new, built in 2007 and 2006 and measured 333 and 293 metres in length respectively. Their advance for a 90 degree turn using hard over wheel as per their manoeuvring characteristics is stated as 844.5 and 895 m respectively. The total is 1739.5 m or 0.94 nautical miles. Allowing a safe margin for interaction, even if hard over wheel had been applied when they were just over one mile away, the severe collision and direct loss of about US$ 51 million may have been avoided.

Usually there are no technical limitations if hard over wheel is applied. However, in case there are any, for example a shaft generator coupled to the propeller shaft and / or a problem with an increase of load on engines as there is no governor fitted, such factors will vary on different vessels. Systems fitted on board should be studied, understood and any limitations known to the navigators in order to enable plan and execute their actions correctly. It is good to remember that turning a vessel is reasonably fast and does not need a large sea room. It is also important to study and be aware of the manoeuvring characteristics of the vessel under your control, the requirements given in the STCW Code on this aspect have been stated in the beginning of this chapter.

REVERSING PROPULSION OR ENGINES FOR AN EMERGENCY CRASH STOP: Some of the important requirements from the STCW Code Section A-VIII/2 regarding propulsion machinery have been quoted with the explanations of Rule 19(b).

[TASK: PLEASE REVISE AND REFRESH THE SAME BEFORE READING THIS SECTION FURTHER.]

These Rules ***'for preventing collisions'*** and the ***'watchkeeping arrangements'*** from the STCW Convention clearly state that the propulsion machinery shall be available for use when required, in reality reluctance to use propulsion systems or engines even when this is perhaps the only choice left has led to many accidents, both collisions and standings (groundings).

If propulsion is stopped, a vessel will continue to travel a considerable distance before stopping, the distance depends on her speed, momentum, displacement, hull form, weather and UKC etc. Heavier vessels tend to go longer before stopping. In order to reduce speed rapidly and/or stop a vessel, astern propulsion is required. Activating astern propulsion may even take a few minutes on some vessels.

Before resorting to a crash stop manoeuvre, navigators should consider the merits of Rule 8, relevant paragraphs quoted below for ready reference, which remain applicable at all times whenever ***'any action to avoid collision'*** is executed, irrespective of the Rule applicable to the situation.

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8(b) ***Any alteration of course and/or speed to avoid collision shall, if the circumstances of the case admit, be large enough to be readily apparent to another vessel observing visually or by radar; a succession of small alterations of course and or speed should be avoided.***

8(c) ***If there is sufficient sea-room, alteration of course alone may be the most effective action to avoid a close-quarters situation provided that it is made in good time, is substantial and does not result in another close-quarters situation.***

A large course alteration can usually be executed rapidly and would be ***'readily apparent to another vessel observing visually or by radar'***. When turning, a vessel has a natural loss of speed when its larger hull profile is retarded by the water resistance. Though turning is the most preferred and the ***'most effective action to avoid a close-quarters situation'***, as explained with Rule's 8 and 19 if and when circumstances do not allow this, ***'a vessel shall slacken her speed or take all way off by stopping or reversing her means of propulsion'.*** There should be no hesitation to use engines in such cases bringing them to stop or astern as appropriate. A vessels speed will initially decrease rapidly on stopping propulsion but the rate of drop of speed will decrease as the water resistance decreases. The hull resistance being directly proportional to the square of the speed.

The following extract from the IMO circular 'MSC/Circ.1053' of 16th December 2002 explains a crash stop manoeuvre: ***'The behaviour of a ship during a stopping manoeuvre is extremely complicated. For any ship the longest stopping distance can be assumed to result when the ship travels in a straight line along the original course, after the astern order is given. In reality the ship will either veer off to port or starboard and travel along a curved track, resulting in a shorter track reach, due to increased hull drag'.***

The IMO requirements on this test are based on the following:

i. ***The resistance of the hull is proportional to the square of the ship speed.***
ii. ***The astern thrust is constant throughout the stopping manoeuvre and equal to the astern thrust generated by the propeller when the ship eventually stops dead in the water; and***
iii. ***The propeller is reversed as rapidly as possible after the astern order is given.***

IMO has used an assumed figure of one minute delay for the propeller to reverse, none of the regulations state any maximum time requirement, in reality it may take longer than 1 minute.

Astern propulsion on a vessel fitted with a steam turbine engines is slow and weak. A steam turbine by design can move in only one direction and to provide astern propulsion a separate smaller lower powered turbine unit is installed. Astern power on vessels fitted with such systems is rather weak and may take long to activate since a steam turbine cannot even be started instantly if has not been kept heated and in readiness.

Diesel engines are reversible and are most common on merchant vessels. However, they have their own technical limitations for instant reversal when operating in one direction. Every new vessel may not go through crash stop trials, in a series of sister vessels only the first one is usually subjected to the crash stop test when at full sea speed the engines are reversed from full speed ahead to maximum speed astern. The stopping distance depends on the astern power developed and various other factors.

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If engines have to be reversed on a vessel proceeding at sea operating her engines at full sea speed, the following sequence would normally take place. A common technical restriction in most reversible diesel engines is that the engines must be at dead stop before being reversed; this is similar to engaging the reverse gear on a car. In effect the propeller shaft must stop before the engine can be operated in the reverse direction, the propeller shaft is usually directly connected to the engine.

Even after the air and fuel to an engine is cut off, a propeller keeps rotating for considerable time due to the flow of water across it with the vessels movement through water due to her momentum, the rotating propeller keeps the engine moving too. To stop the engine faster, compressed air is released into the cylinders when the piston is down (bottom dead centre) of the engine cylinder to act as a brake. However, this can only be done after the engine speed (RPM) has dropped by a certain amount, varying from model to model. Only after the engine actually moves in the reverse direction by an air kick can it be fired on air & fuel to develop full astern power.

Compressed air available for braking is limited. The release of braking air into a hot engine causes severe thermal shocks and the sudden reversal of the engines causes stress on all components and may even inflict permanent damage to some of them. Since it is meant only for use in a severe emergency, this manoeuvre is not tested on board as a routine. The risk of a last minute machinery component failure due to the stresses and shocks should always be kept in mind by the navigators when considering this option.

Modern automated controls of the main engine have automatic pre programmed load up/down parameters for normal increase and decrease of RPM from harbour manoeuvring to sea speed and vice versa. These have to be bypassed in carrying out the crash stop/astern manoeuvre, achieved manually or automatically as per the design installed. In most modern systems, bringing the telegraph to a position half ahead or lower bypasses the automatic load up/down programmes, ie if the telegraph is put to stop the air and fuel supply to the engines is immediately cut off. It is important that both the navigators and engineers on board a vessel are well familiar with the design and operating of the systems installed should it ever be required to carry out this manoeuvre.

The vessels hull profile is designed for forward movement; at the aft end the design is to allow free flow of water into the propeller which is thrust astern by it, the propeller blades are designed for this. The resistance to the water thrust by the propeller is the water astern of a vessel and her rudder, the latter is anyway designed to offer least resistance when in the neutral or amidships position. When the propeller is rotating in the reverse direction or providing astern propulsion, the efficiency of its blades is lower. Further, a vessels hull offers resistance to and deflects the water thrust towards the hull by the propeller. These factors cause the efficiency and effectiveness of the propeller to drop when moving astern in comparison to when moving ahead at the same RPM.

In case of controllable/variable pitch propellers, it is the pitch of the propeller which is reversed, to avoid severe stresses and permanent damage there are some restrictions on such systems too and a sudden reversal may not be possible when moving at full speed, which is at maximum pitch for the forward propulsion. The propeller pitch may have to be reduced slowly to allow a certain drop in speed before the pitch angle can be reversed. At zero pitch the flow of water through the propeller will be almost nil even when the vessel is moving ahead due to its momentum and in this condition the rudder is likely to be totally ineffective.

Reversing propulsion takes time and is less efficient too. The standards set by IMO allow a vessel 15

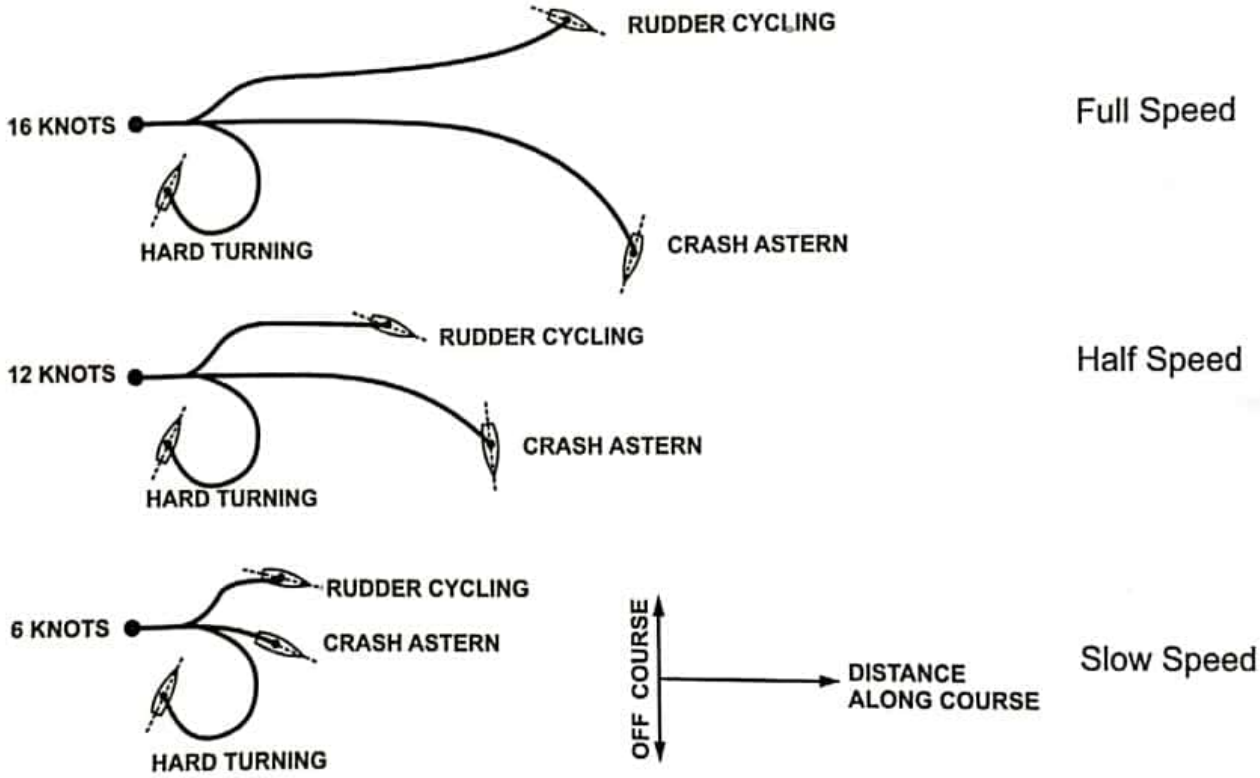
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ship lengths to stop dead in the water which may be extended up to 20 ship lengths for larger ships. In comparison the maximum advance for a 90° turn should not exceed 4.5 ship lengths.

In addition, when astern propulsion is in operation the flow of water across the rudder to allow steering is not there. A vessel will follow a path dictated by her characteristics and the prevailing conditions, navigators having no control on it.

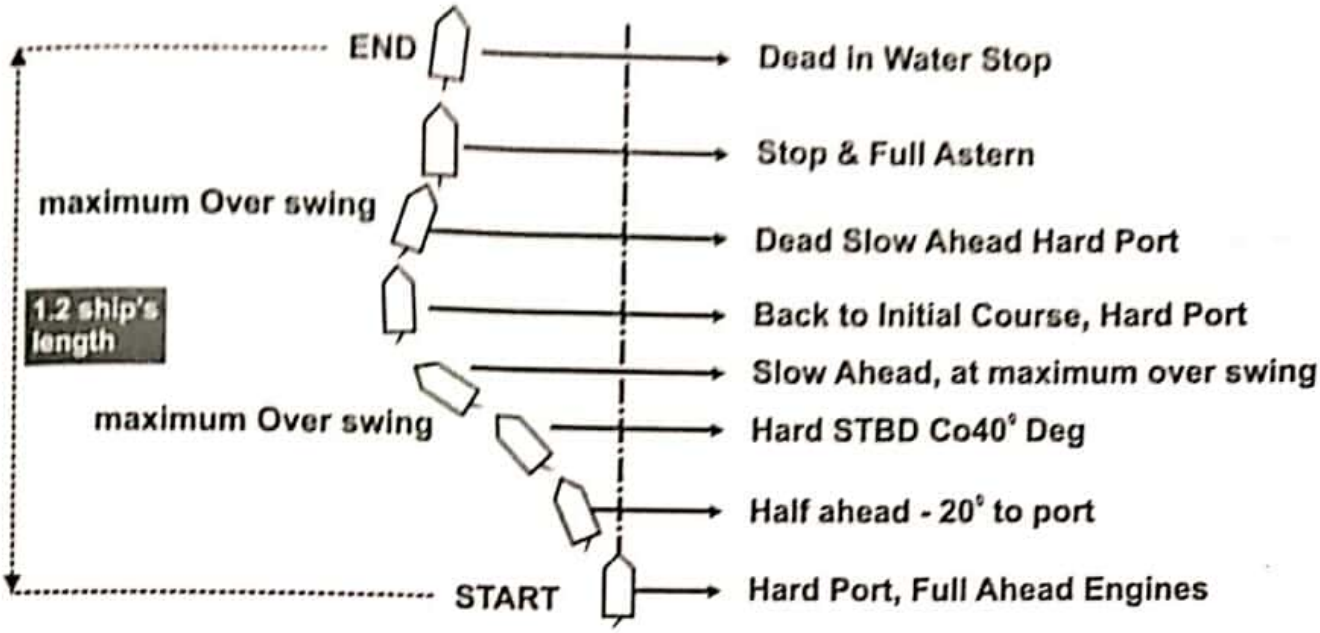
[QUIZ: ON A RIGHT HANDED SINGLE PROPELLER VESSEL, HOW WILL THE TRANSVERSE THRUST TURN A VESSEL WHEN THE PROPELLER IS OPERATED TO GIVE ASTERN PROPULSION?]

The following diagram shows a comparison between hard over turning 35° rudder, crash stop and zig-zag turns to stop a vessel. As can be seen, turning is far more efficient and effective; it is fast, takes less space or sea room and does not strain the propulsion or steering machinery as compared to a sudden emergency reversal of propulsion. One version of a zig-zag turn is shown further, there are several versions and this manoeuvre may be considered in lieu of a crash stop manoeuvre. The comparison diagram shown below is of a 300 m long oil tanker having a DWT of 1'93'000 MT.



ZIG-ZAG OR LOW FREQUENCY RUDDER CYCLING FOR EMERGENCY STOPPING: One of the versions of this manoeuvre is shown below and is basically self explanatory. The vessels fore and aft hull profile is pushed against the water mass by swinging the vessel, this retards the speed. Propulsion power is reduced in stages and then maximum astern power applied. There are several versions of this manoeuvre and may be a better choice when compared to an emergency crash stop manoeuvre explained above. Since propulsion is reduced in stages and then reversed, it has lesser strain on the propulsion machinery. However, as can be seen, turning is still a better choice as requires least sea room.

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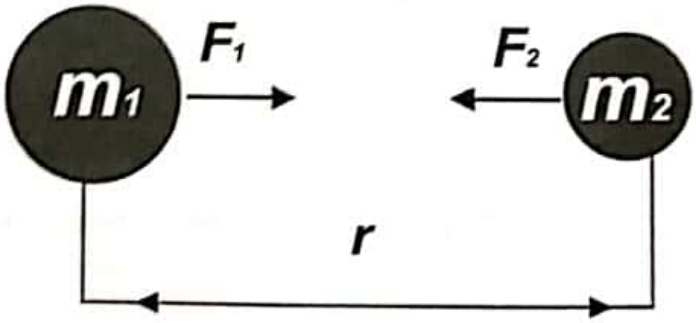


INTERACTION FORCES: Any vessels manoeuvring behaviour is subject to the universal law of gravitation and the hydrodynamic forces. The many interactive forces affecting vessels behaviour are due to a combination of these two main components, the former being very weak and not considered in practice.

The former is Newton's law of universal gravitation, first published on 5th July1687, the physical law is about the gravitational attraction between bodies having a mass. In modern language the law states: ***Every point mass attracts every other point mass by a force pointing along the line intersecting both points. The force is proportional to the product of the two masses and inversely proportional to the square of the distance between the point masses.***

where:

- F is the magnitude of the gravitational force between the two point masses,
- G is the gravitational constant,
- m_1 is the mass of the first point mass,
- m_2 is the mass of the second point mass, and
- r is the distance between the two point masses.



$$F_1 = F_2 = G\frac{m_1 x\ m_2}{r^2}$$

Assuming SI units, F is measured in newtons (N), m_1 and m_2 in kilograms (kg), r in metres (m), and the constant G is approximately equal to $6.67 \times 10^{-11}\ \mathrm{N\,m^2\,kg^{-2}}$.

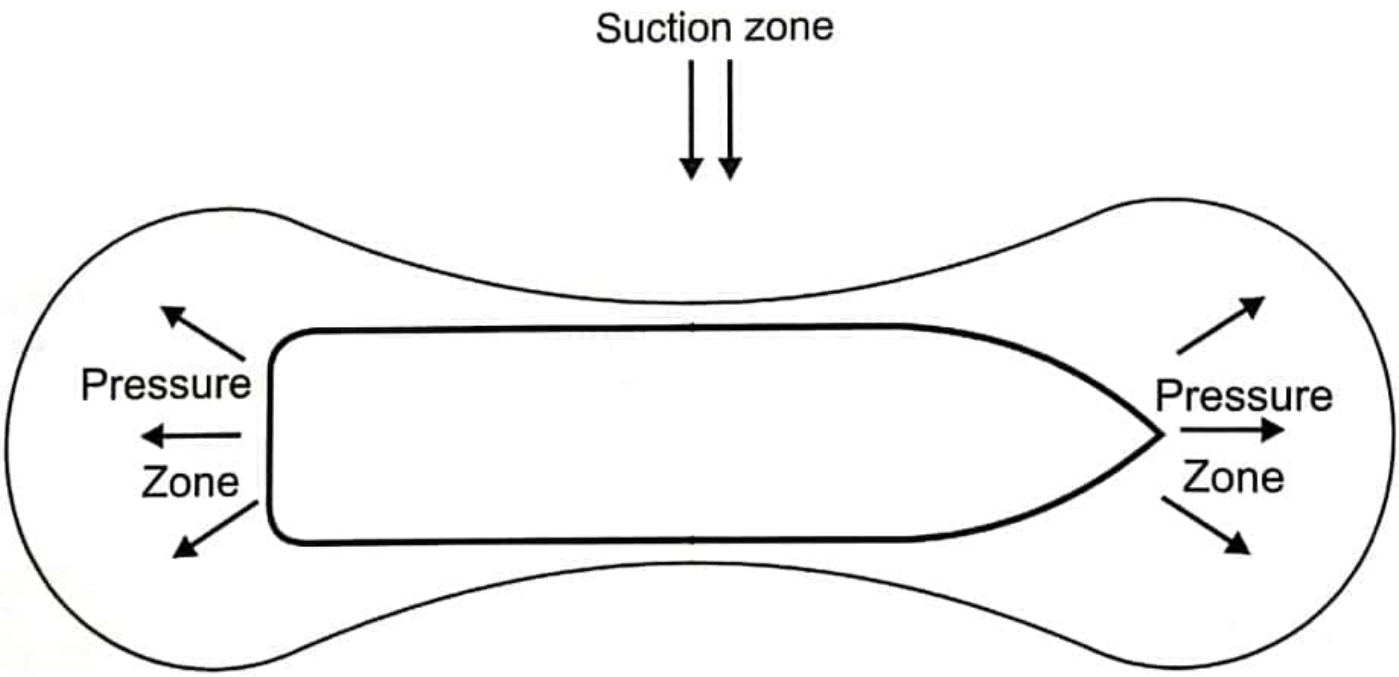
[QUIZ: ASSUME TWO LARGE VESSELS LYING 25 METRES AWAY WHEN DOUBLE BANKING, ONE OF DISPLACEMENT 3'35'000 METRIC TONNES AND THE OTHER OF 1'00'000 METRIC TONNES, WHAT IS THE FORCE OF ATTRACTION BETWEEN THEM?]

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The hydrodynamic forces exist even when vessels are stationary and get pronounced as soon a vessel has a movement through water or its pressure fields interact with other pressure fields in the vicinity. A vessels movement has to overcome the resistance of the surrounding water mass which is pushed away creating a positive pressure field in the direction of movement, this pressure field is forward of the pivot point when a vessel is moving ahead at a steady speed.

The vessels movement, normally ahead, displaces water and water from below, the sides or even from astern will rush in to fill in the void created by the moving hull. In addition the suction by the propulsion system adds to the negative forces forward of the propeller, a negative pressure field is created around the hull generally aft of the mid length position. The water thrown or pushed astern by the propulsion system creates a positive pressure field astern of the vessel.

Interaction forces and their affect depends on many factors but mainly on a vessels speed, the distance between the vessels or the coast, the slope of the coast, if a narrow channel, its depth and width and any breaks in the channel, UKC, vessels design, her block coefficient and trim etc.

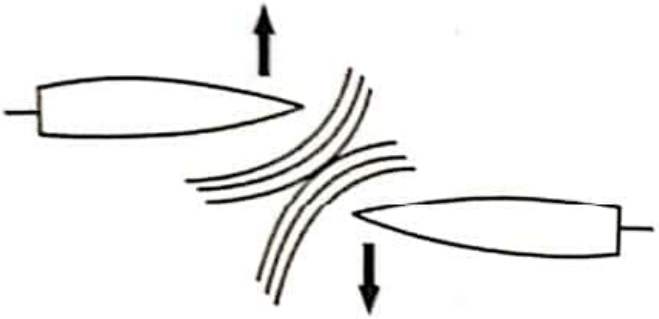


The pressure fields created when a conventional vessel is moving through the water.

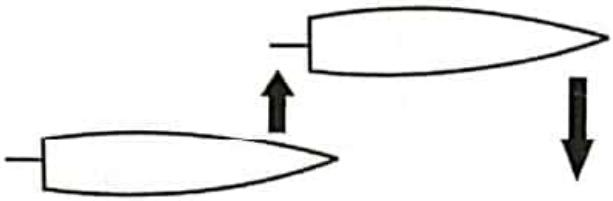
As vessels pass each other at close ranges, the interaction and hydrodynamic forces of attraction and repulsion get activated between them. These are more pronounced when the vessels are on parallel courses at high speeds and are higher in shallow waters because there is less space. With vessels moving in opposite directions the time duration for the forces to effect a vessel is less than when vessels are moving in the same direction. Interaction forces are higher in restricted waters but even in open waters too they have been seen to act at ranges of over 300 metres.

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The following diagrams show the interaction effects when two vessels pass too close to each other.



When two vessels meet as shown, the pressure fields forward of the vessel make the bows swing out and away from each other.



When two vessels are passing as shown the pressure fields make the bows of the one overtaking swing towards the stern of the other, the vessel being overtaken will develop an opposite sheer.

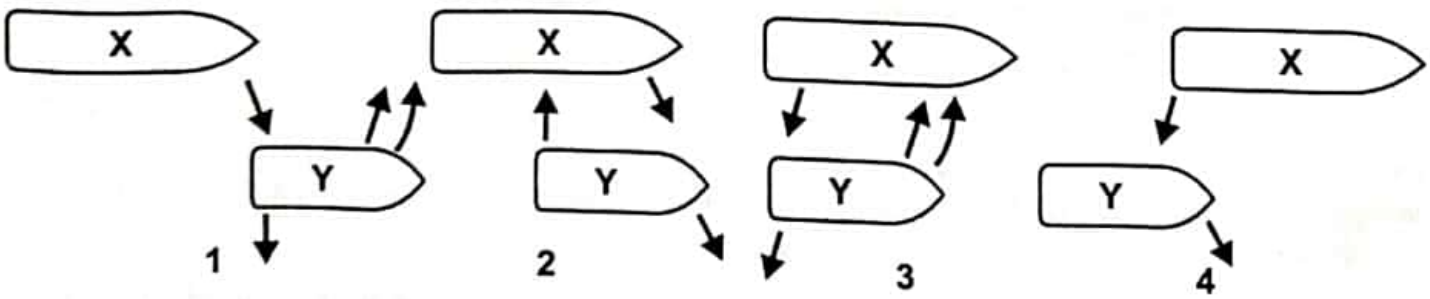
[TASK: IN THE ABOVE DIAGRAM SHOWING ONE VESSEL OVERTAKING ANOTHER DRAW THE PRESSURE FIELDS BASIS THE ABOVE EXPLANATIONS TO EXPLAIN THE INTERACTION EFFECT.

WHAT WILL BE THE PRESSURE FIELDS AND THEIR EFFECT ON THESE VESSELS WHEN THE TWO ARE CLOSE TO AND PARALLEL TO EACH OTHER?]

Similar to interaction between vessels, even when vessels pass close to a shore bank, or too near the side of a narrow channel, the pressure fields do not have sea room to travel and dissipate but rebound from the sides of the bank or narrow channel. The rebound pressure waves can cause vessels to suddenly turn (sheer) and that too very rapidly that they may not remain controllable even with full use of engines and rudder. These are generally referred to as banking effects with many subdivisions and form part of higher studies on ship handling.

Vessels should pass each other at maximum possible range when at sea to avoid the interaction dangers. When navigating in restricted areas close to the shore banks or in narrow channels where other vessels have to be passed at close range, keeping the speed low at interaction points with timely and bold use of engines and rudder assist in keeping vessels under control and to counteract interaction effects.

In the below figure, the larger vessel 'X' is overtaking the smaller vessel 'Y'. The 4 diagrams with explanations as seen from left to right numbered 1 to 4 show the pressure fields/interaction effects.



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The pressure wave from a large overtaking vessel can easily cause a smaller one to swing uncontrollably. As the large vessel approaches, its pressure wave pushes the stern of the other vessel further away, causing the bow to swing in and bring the smaller vessel directly to collision, or close enough so that she can be sucked in to collide with the side as the big vessel passes.

As the bows of vessel X overtakes the stern of vessel Y there will be a repulsive force between them so the stern of vessel Y is thrown out and there will be a tendency for vessel Y to swing her bows across the path of vessel X as shown in fig. 1.

Later the turning moment is reversed, and as the bows of the two ships are closer, vessel Y will tend to swing outward as shown in fig. 2.

When the sterns of the two vessels come together there will be a repulsive force between them so that once again there will be a tendency for the bows of vessel Y to swing inwards as shown in fig. 3.

Finally as the stern of vessel A passes the stern of vessel Y the turning moment on vessel Y will again be reversed as shown in fig. 4.

Interaction between vessels is said to have led to the unfortunate collision between the passenger vessel Queen Mary, engaged in carrying troops, and the light naval cruiser HMS Curacao having a displacement of about 4'200 mt which was escorting her off the coast of Ireland in 1942 even though the water depths in the area were over 100 metres.

The Queen Mary was zig-zagging to deter German U-Boats and aircraft with the HMS Curacoa sweeping the waters ahead. Queen Mary caught up with her escort which slowed suddenly when one of the persons on look-out duty reported a probable sighting of a periscope, raising the threat about the presence of a German U Boat. Queen Mary found herself swinging fast and towards the cruiser on a collision course. Queen Mary, some twenty times the size of Curacoa and steaming at 28.5 knots sliced the Cruiser neatly in two. She could not even stop to assist as her orders were to keep proceeding at full speed till her safe arrival at the destination port no matter what. HMS Curacao sank with severe loss of life.

A first hand report from men on board a naval destroyer which rescued some of the seafarers from the ill fated HMS Curacao states, ***'the sea was soon covered in oil and hundreds of heads with oily faces and panicky white eyes in the water, many just choking with fuel oil in their lungs and others dying from drowning'****. Only 97 people out of 650 on board were rescued, of these another 5 died later because of fuel which had gone in and damaged their lungs.*

In another case, on 8th January 2007 the U.S. nuclear-powered fast-attack submarine USS 'Newport News' having a displacement of about 6'900 mt was manoeuvring under water near the Straits of Hormuz. A Japanese owned but Panama flag fully loaded oil tanker 'Mogamigawa', 317 m long, having a displacement of around 3'00'000 mt, with a draught of about 20 m passed over the submarine. The bows of the submarine collided with the stern of the oil tanker around 2215 hrs. Fortunately no one was injured and the two vessels sustained only minor damages.

According to a US navy spokesman the preliminary findings about this accident, (available on the internet), as the mammoth oil tanker passed overhead the submerged submarine at high speed and low passing range it created a suction or venturi effect that suddenly forced the submarine to rise upward and hit the oil tanker, a case of interaction between vessels.

The navigators of the oil tanker could not have known about the presence of a submerged submarine

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and the submarine staff probably underestimated the draught of the loaded oil tanker. Submerged submarines stay out of other vessels, an ***'ordinary practice of seamen'****. On 2nd October 2007 the US Navy agreed to pay the Japanese Company Kawasaki Kisen Kaisha Ltd, (K Line) which owns 'Mogamigawa' an undisclosed amount in compensation for the collision.*

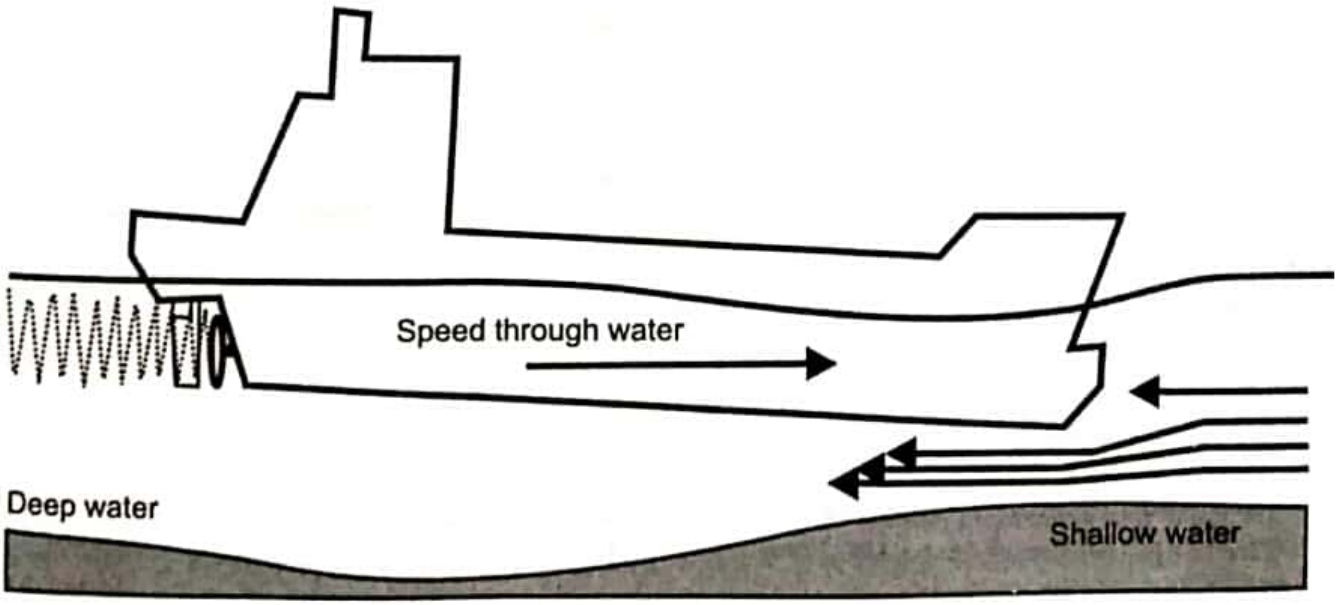
[TASK: SEARCH THE INTERNET ABOUT THIS ACCIDENT TO LEARN MORE DETAILS ABOUT THE ABOVE AND OTHER SIMILAR ACCIDENTS.]

The effects of interaction, bow cushion and bank suction must be taken into account when overtaking in a narrow channel. Overtaking vessels should not attempt to pass too close from an overtaken vessel in open waters to when there is plenty of sea room to manoeuvre. In narrow channels it would be dangerous to overtake another vessel which itself may be moving at high speed.

SQUAT: A vessel moving through the water displaces the water, a vacuum is created in the space from where the hull moves away, the vacuum created in the water is immediately filled in by water from all sides, especially from below; in deep waters the pressure fields created are as described earlier.

However, when the under keel (UKC) or side clearances are low, the water displaced by a moving vessel is not immediately filled in and creates a negative pressure field below the vessel. To compensate for this imbalance of pressures, the surrounding water mass with the vessel afloat in it move down towards the sea bottom leading to a further reduction in the under keel clearance. This phenomenon is called squat or more technically vertical squat.

It is the UKC which decreases, there is no change in a vessels draught since the displacement remains the same. Squat would take place in all waters but its effects are negligible in deep waters, they increase in a parabolic fashion as the under keel clearance (UKC) decreases. The squat effects increase substantially as UKC reduces lower than half a vessels draught.



[TASK: REVISE BERNOUILLI'S LAW AND ITS APPLICATIONS. DOES IT APPLY IN THIS CASE?]

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Squat is:

1. Inversely proportional to the UKC, and
2. Directly proportional to the square of the speed.

The adjoining graph gives an indication of expected squat for a small vessel being propelled at constant propulsion power.

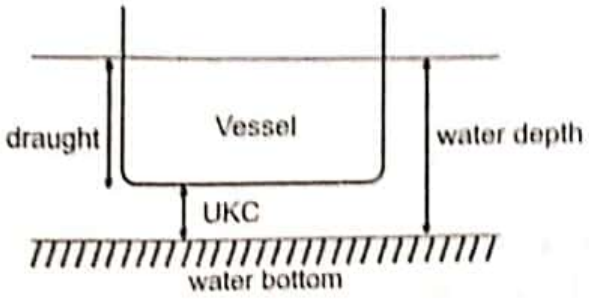
Squat has severe detrimental effects on a vessel's manoeuvring characteristics and on ship handling. When affected by squat a vessel will not behave like she does in deep water or as explained so far. If inside a narrow channel with restricted width then squat effects increase even more.

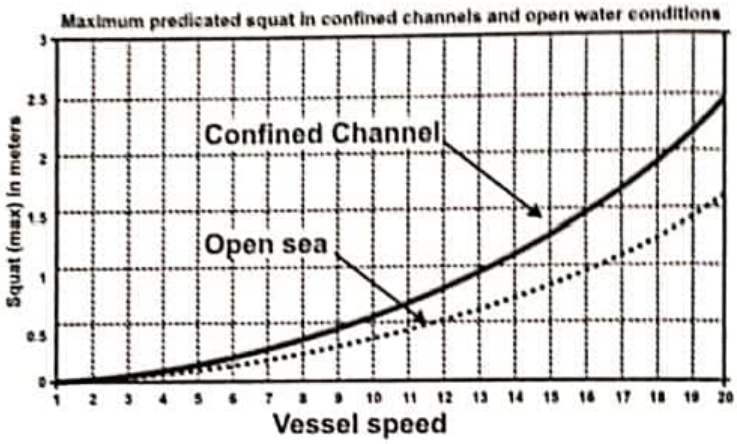
The change in longitudinal resistance affects the position of longitudinal equilibrium which in turn pushes the Pivot Point aft. This reduces the length of the lever between the Pivot Point and the Rudder and thus the rudder effectiveness and in general all other manoeuvring parameters or characteristics.

A dredger moving through a shallow channel is shown on the right. The UKC is about two metres and the speed 10 knots. The extreme bow wave is noticeable and so is the mud being thrown aft.

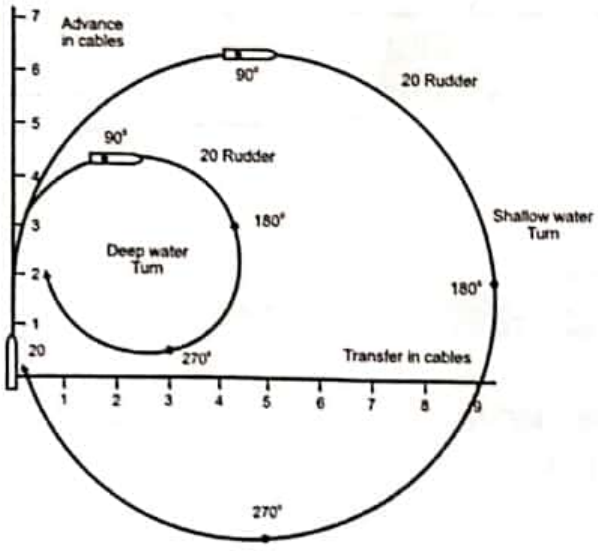
The Turning Circle parameters change substantially when in shallow waters. With the same helm, the parameters increases substantially and could be more than double than in deep waters as shown below.

It is the relative speed of a vessel through water which matters; as such a vessel at anchor too will be affected by squat with the flow of tidal stream. The lower the UKC and the higher the speed of relative flow of water, the more the drag on the vessels hull, this should be kept in mind at anchorage as a vessel may drag anchor









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due to these squat affects even in otherwise fair weather, especially on a falling tide as the UKC drops.

One or more of the following symptoms indicate a vessel is in shallow water conditions and experiencing squat.

1. Wave making resistance increases at the forward end of the ship.
2. Ship becomes more sluggish to manoeuvre.
3. Draught indicators on the bridge or echo sounder traces will indicate changes in end draughts or indicate lower UKC respectively.
4. RPM indicator of main engine will show a decrease. If the ship is in "open water" conditions, i.e. without breadth restrictions, this decrease in RPM can still be about 20% of the service RPM.
5. There will be a drop in speed of the ship. If the ship is in open water conditions, it may amount to about 30%. If the ship is in a confined channel, it may be a drop of up to 60% of the corresponding speed in deep waters. (Points 4 and 5 are on same engine power)
6. The ship may start to vibrate suddenly because of entrained water effect causing the natural hull frequency to become resonant with another frequency.
7. Pitching and rolling motions decrease.
8. Turning diameter becomes larger, twice or even higher than the deep water turning diameter.
9. Takes a longer time to stop naturally or in a crash stop manoeuvre.

[QUIZ: DO YOU REMEMBER WHICH RULE IS ON *'SAFE SPEED'*? DOES IT INDIRECTLY REFER TO THIS PHENOMENON OF SQUAT?]

'Safe speed' requirements apply to all vessels when navigating and at all times. This has to be kept in mind by navigators especially on large, heavily loaded vessels operating in shallow waters with low UKC. Due to their momentum such vessels carry themselves for considerable distances after being stopped in deep waters, and when affected by squat will have a longer carry over distance. They would need to maintain a lower speed in shallow waters to be kept in control and in compliance with the Rule on ***'safe speed'***. Since squat and other interactive forces are directly proportional to the square of a vessels speed, they can be reduced substantially by reduction of speed.

INCREASE IN DRAUGHT WHEN TURNING: As a vessel turns, it tends to heel outwards especially at high speeds and with the rudder on hard over. This effect is larger on vessels with lower transverse stability. The effective draught also increases on the side a vessel heels to with reduced UKC. This should be kept in mind especially when turning in shallow waters.

WIND AND CURRENT: Current is the full flow of the water in a particular direction, the water carries everything floating in the water with it at the same speed and in the same direction as the current. If a vessel is underway but dead stopped and drifting, she will have a course and speed of movement equal to that of the current, her heading may be very different though.

A vessel moving at sea has a final direction of movement which usually is the resultant of two vectors, the vessels course steered and her speed through water being one vector and the other the vector of the direction and strength of current. This will normally be covered in chart work.

Wind generally has a lesser effect on a vessel as compared to current as it exerts a push only on the exposed surface of a vessel above the water line. However, vessels with a large freeboard like car carriers, passenger vessels, gas ships, and oil tankers or bulk carriers in ballast all have relatively

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smaller draught but a larger above water profile or windage area which can be severely affected by the wind. Wind effect is called leeway.

Air-cushion vessels when operating in non-displacement mode have almost nil draught and are prone to large wind effects. They could have a leeway or a drift angle of as much as 45° and their heading as seen or indicated by their navigation lights, giving a false indication of their direction of travel which can be very different than as indicated by their heading. Apart from their high speeds it is also for this reason that they are required by Rule 23(b) to exhibit an all-round flashing yellow light which is in addition to the lights prescribed for power-driven vessels underway.

To conclude, there are three basic categories of forces acting on any vessel, the controllable, the semi-controllable and the uncontrollable. All these should be taken in to account in not only planning and deciding actions but in deciding the safe passing distance.

[TASK: HAVING READ THE ABOVE, DIVIDE ALL THE FORCES INTO THE THREE CATEGORIES.]

Captain Jayant K. Sahu, who has earned the respect of the industry having regularly served as Master on the worlds largest tanker the 'Jahre Viking' from 1991 till 2007, the last 2 when she had been converted to a FSO. In 1998 he was specially invited to review a BTM course being conducted by me since he had attended several such courses around the world.

His simple comment on ship handling was, 'make full and bold use of engines, rudder and all machinery, without any reluctance or hesitation, do not worry, they are designed to take the load and the related stress'.

[TASK: FURTHER STUDY RECOMMENDED ON THE SUBJECTS OF BOW CUSHION, BANK SUCTION EFFECTS AND INCREASE IN DRAFT WHEN TURNING]

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TREND ANALYSIS OF MARITIME COLLISIONS

The trend of navigational accidents, including collisions, had shown a steady decrease since 1978 reaching the minimum levels around 2003. Thereafter collisions have gone up and have continued to show an increasing trend. The statistics shown further are self explanatory. This and the following chapter contain a gist of several recommendations to prevent accidents made by several organisations which investigate maritime accidents. This book is also an attempt to enhance maritime safety by explaining the interpretation of the International Regulations for Preventing Collisions at Sea to achieve a better understanding of their best practical application linked to other navigational watchkeeping activities, basic ship handling and risk management concepts.

A tanker industry report released in the last week of December 2010 states that collisions have increased to 31% of the total incidents reported in 2010 as compared to 26% in 2009.

The following extracts are from a recent study conducted by ***'The Swedish Club'*** titled ***'Loss prevention project – Collisions and contact study'***. It is self explanatory and the information is provided with the kind courtesy of **'The Swedish Club'.**

'Nine claims selected from 2005 and 2006 having a claim value of over or equal to US$ 5'000/- have been considered excluding deductibles. The investigation is limited towards bridge, navigation, and manoeuvring activities, port approaches and berthing to quay / lock.

Approximately 50% of all accidents at sea can be related to navigation bridge system failures causing collision, grounding or contact damages.

It has been an increase in the frequency of serious maritime accidents since the start of the new century, coinciding with a stronger emphasis on safety is a result of a positive trend with few accidents from the late 1980's is beginning to change.

This unwelcome reversal of the trend could most plausibly be attributed to a 'loss of competence' among crews, linked with stress, fatigue and inexperience, but not necessarily attributable to fewer crew members per ship.

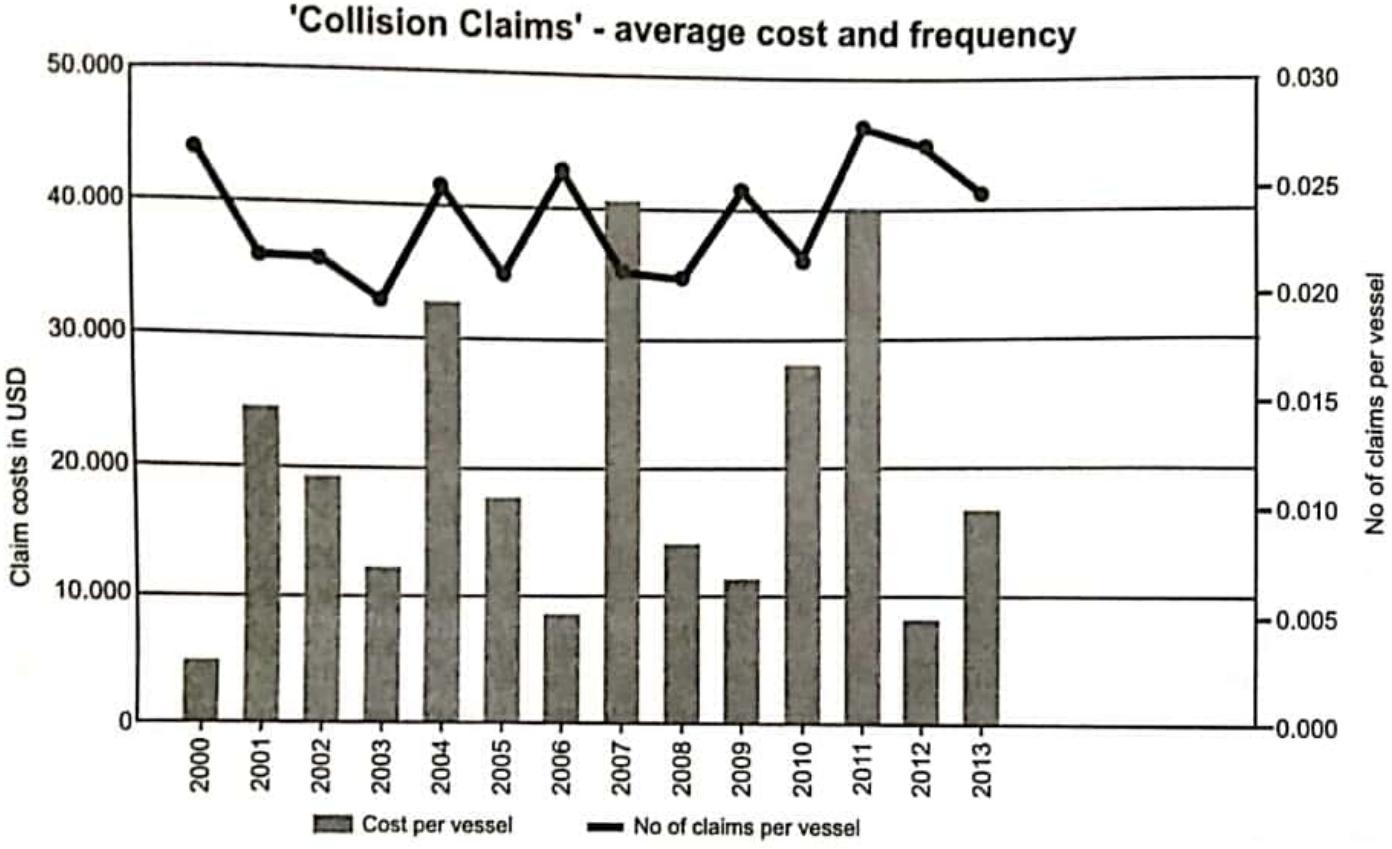
There are more new recruits, less retention and faster promotion. In addition, on board workloads with respect to paperwork and inspections have increased while crew size is stable. The loss of experience is a stress factor for those on board, who have to continuously train newer crew members. (Based on the data released by DNV).

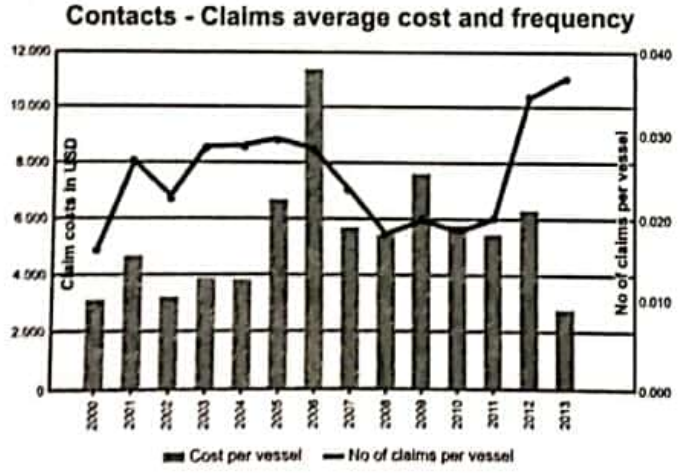
With the above factors given, correct procedures must be imperative to maintain an improved level of nautical safety and put stress off the crew involved. This procedure should not be limited only to pure operation of the vessel, it should also include proper training on board as well as ashore eg., simulators, leadership and other training facilities'.

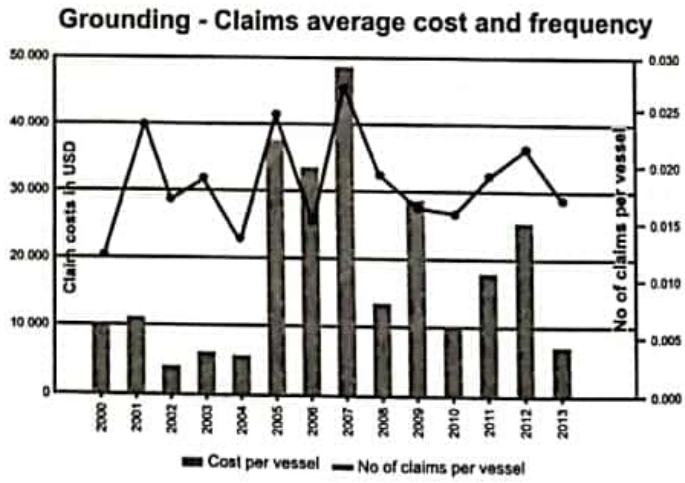
This report concludes that ***'standard operating procedures for daily bridge work means that the vessel should maintain good routines in order to keep a high level of seamanship, eg., adherence of collision (prevention) regulations, route planning, internal/external communication and weather routing. Breach of the international collision (prevention) regulations acts as a main contribution to collision in the cases studied.***

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The following data and statistics are courtesy **'The Swedish Club'** to show the trend of accidents.







A previous study by **'The Swedish Club'** on collisions had the following statistics:

- 2 of 24 collisions occurred in daylight and in good visibility.
- 8 of 24 collisions occurred in poor or very poor visibility.
- 11 of 24 collisions occurred during the dark hours but in good visibility.
- 20 of 24 collisions occurred in light or moderate winds (Beaufort Force 4 or less).
- 19 of 24 collisions occurred in congested areas such as straits, harbours, channels or rivers
- 9 of 24 collisions occurred with Pilot on board.

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This reasons for collisions were attributed to the following factors in the same study:

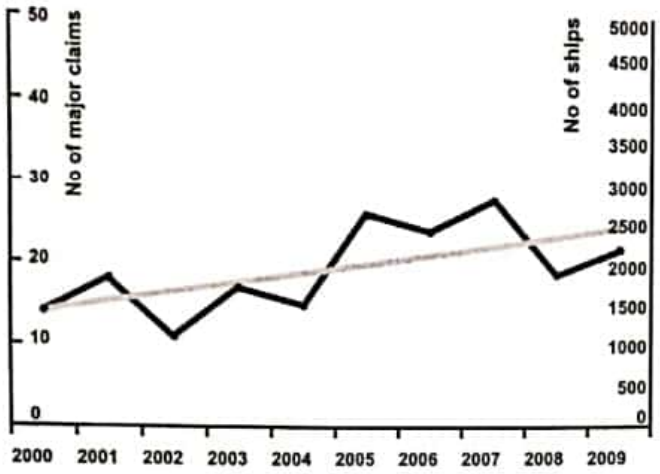
- Darkness and/or poor visibility left the crew to rely on information from navigational instruments alone.
- In many cases, this information was misinterpreted or not fully understood.
- During darkness and/or poor visibility the crew misjudged many situations. They were often caught by surprise by a sudden dangerous situation arising.
- Bad weather is not a common cause of these collisions.
- Speed was not reduced and adapted to the heavy traffic situations – perhaps due to commercial pressure.
- Reduced speed would have given the extra time needed to avoid collisions in a number of these cases.
- Heavy traffic requires additional attention towards proper communication between bridge team members, pilots as well as surrounding vessels.
- In several cases, the collision might have been avoided if the master had communicated better, or at all, with other parties
- In at least three cases there were language issues complicating master/pilot communication.
- In other cases the collision might have been avoided if there had been more prudent planning of the passage.
- Sometimes when the pilot is onboard; the bridge team tends to relax – a well functioning co-pilot system might prevent this from happening.

The major areas of failures were determined to be as follows.

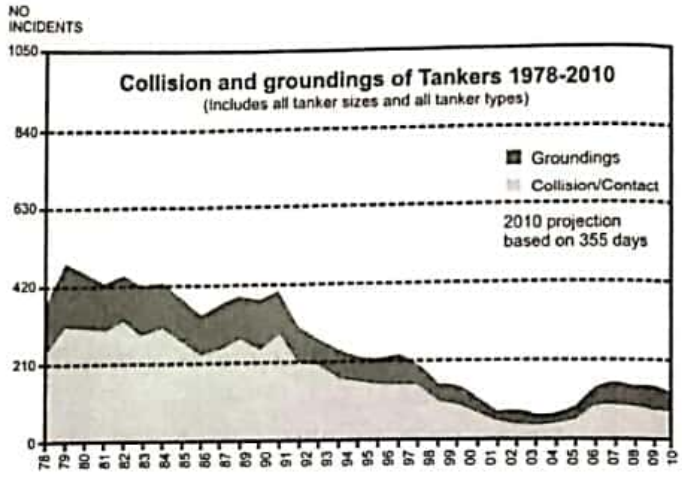
- Misjudgement and lack of situational awareness.
- False sense of security, reduced vigilance and narrowing margins.
- Failure to use and interpret available resources such as radar, AIS, GPS and ARPA etc.
- Lack of briefings, planning and communication.
- Non-adherence to Standard Operating Procedures (SOP's).
- Lack of adherence to the Collision Prevention Rules.
- Insufficient preparation.
- Failure to properly follow BRM/MRM principles of good planning combined with adequate safety margins. That is:
  - Take into account unforeseen events which may develop into a serious and difficult situations.
  - Effective communication between all bridge team members, timely and accurate communication is a key element.
  - Navigation during pilotage is a shared task.
- Routine is dangerous, that is:
  - Procedures are necessary and must always be followed to the fullest extent possible, no matter how familiar the operation.

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In addition to the previous information, similar statistics have been provided by a leading P & I Club based in UK and also released by the tanker industry recently show a rising trend of Maritime Collisions as shown below:

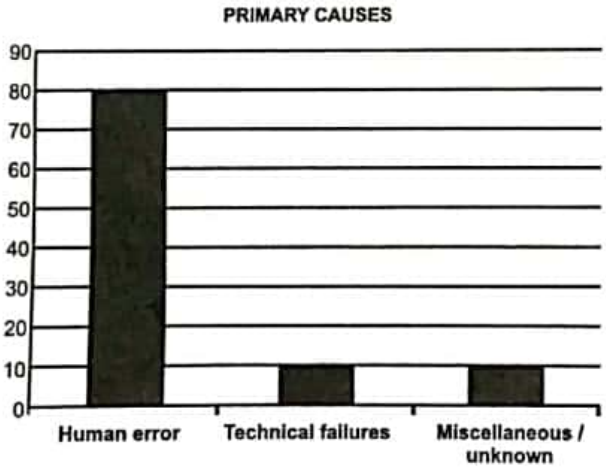


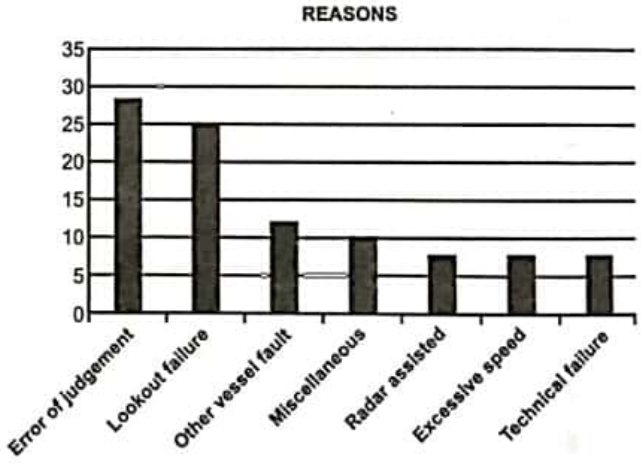
UK based P & I Club Statistics

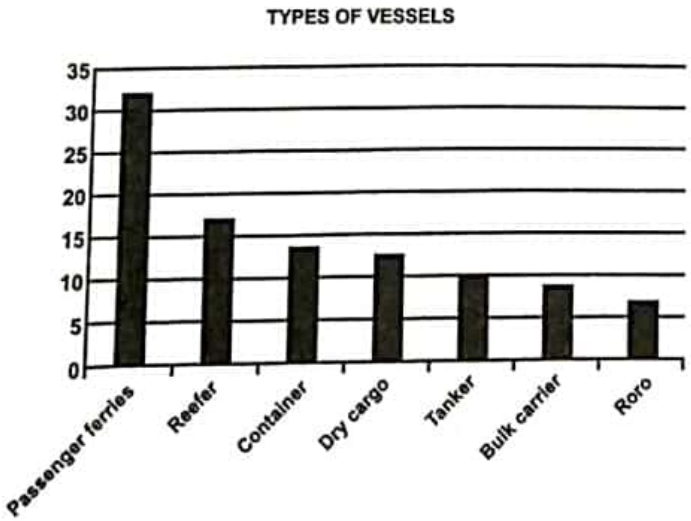


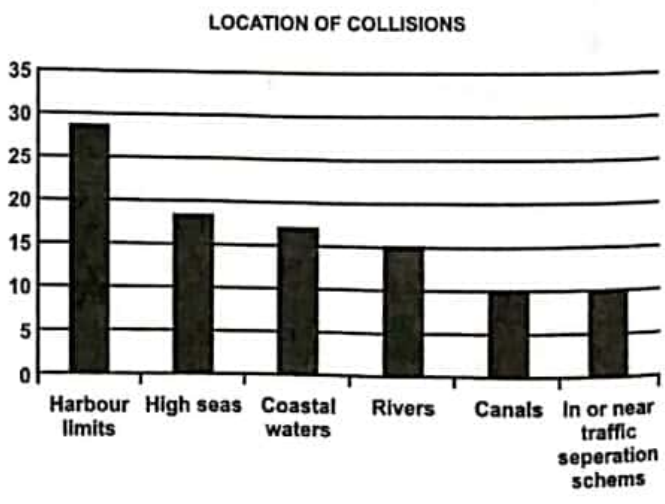
Tanker Statistics

The analysis by the above UK based P & I Club showed the reasons of Maritime Collisions as follows (all figures in percentage)

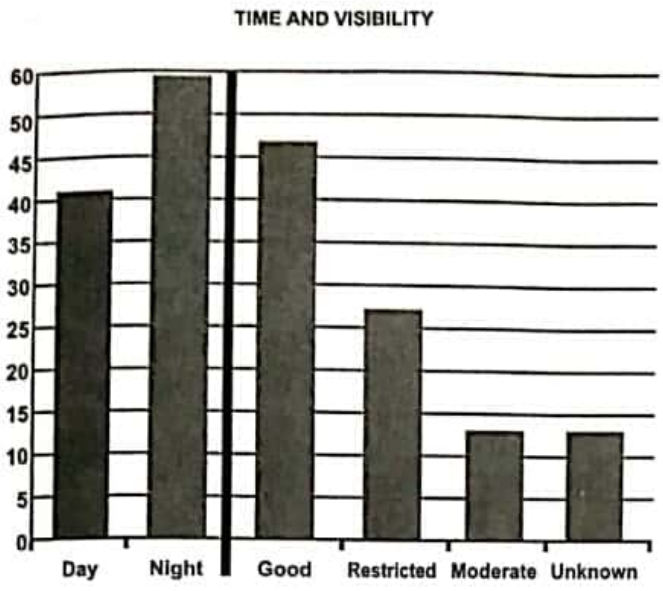


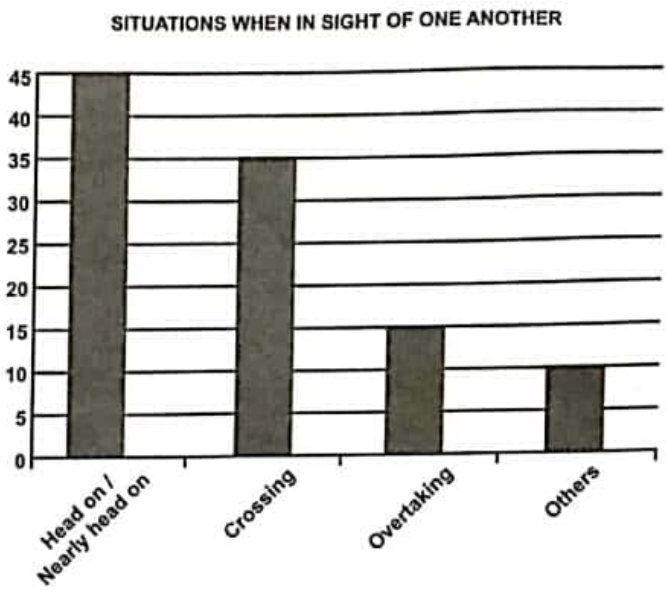






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The following are the reports of a few other organisations providing reasons of failures leading to navigational (Collision) accidents.

Nautical institute survey results released in July 2003 state the reasons of failures as:

- Ignorance or disregard of the rules,
- Reluctance to slow down or deviate from track,
- Poor lookout,
- Poor traffic awareness,
- Lack of experience, and
- Wrong action taken by other vessel

The most objective evidence is from The Nautical Institute's confidential Marine Accident Reporting Scheme (MARS). This scheme, which has been running for years, demonstrates that seventy four percent of all incidents or near incidents reported relate to uncertainty, violations and total disregard of the ***'International Regulations for Preventing Collisions at Sea'***.

GARD P & I Club had published the following in October 2004 as reasons for navigational accidents and it appears valid even now:

- *Insufficient watch-keeping.*
- *Lack of situational awareness.*
- *Failure to set priorities – lack of positive action.*
- *Preoccupation with administrative tasks.*
- *Failure to communicate intentions (officer/master/pilot).*
- *Lack of assertiveness – failure to challenge incorrect decisions (officer/master/pilot).*
- *Failure to comply with standard procedures and international regulations.*
- *Failure to utilise available data and resources.*
- *Lack of training – "human-technology" interface.*

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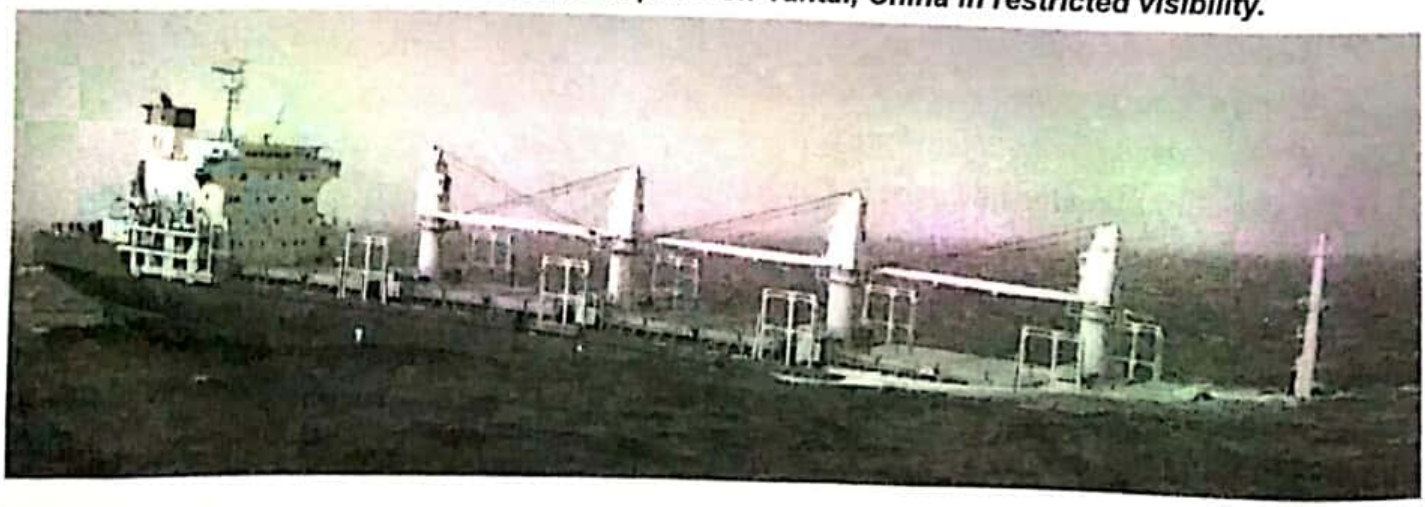
The UK P&I Club, in their Analysis of Major Claims ten year trends, confirm that deck officer and pilot error account for 83% of major collisions. The average claim is US$ 500,000 but, as every master knows, the effect of pollution can increase the consequential costs considerably.

It is not only collisions but in all other areas of maritime operations also that safety standards need further improvement, statistics show that on average 5 ships and 20 seafarers were lost each week during the ten-year period preceding 1994. On World Maritime Day that year, IMO Secretary General William O'Neil had said, ***'we have become so used to the risks involved in seafaring that we have come to see them as a cost that has to be paid, a price which is exacted for challenging the wrath of the oceans'***. But accidents are not inevitable; they can and should be prevented. Between 1996 and 2005 the accident statistics done in UK and published by MCA in November 2007 state, ***'fatal accident rate in UK merchant shipping was 12 times higher than in the general workforce, it was also 2½ times higher than the construction industry and 8½ times higher than in manufacturing'***. Another international analysis published in 2008 states that mercantile marine is the only industry internationally where accident rates have stopped going down but have started showing a reverse increasing trend, rather unfortunate since all efforts are to reduce this.

19th August 2009, a loaded oil tanker on fire after collision with a bulk carrier in Malacca Straits in good visibility / weather. Nine crew members died in the blaze.



02nd May 2010, a 27,000 dwt bulk carrier afloat after collision with a 178,739 dwt bulk carrier, the latter sank. The collision took place off Yantai, China in restricted visibility.



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LEADERSHIP AND MANAGEMENT IN PREVENTING COLLISIONS

INTRODUCTION

'Leadership' and **'Management'** principles are enshrined within various legislations governing maritime activities and both are required for ***'proper and effective action to avoid collision'***. These concepts have always been followed in the day to day working for years, even when they were not listed formally. ***'Risk of collision'*** is a pure risk - not speculative like financial risks of a business. However, collisions can be extremely detrimental to people, ships, the environment and the very survival of an enterprise. ***'Preventing collisions'*** is achieved not by clash of egos or a battle of wits but correct, systematic, sensible and logical application of the ***'International Regulations for Preventing Collisions at Sea'***. Vessel-encounters generally differ; ***'risk of collision'*** has to be determined for each and every one of them, followed by correct analysis of the situation and proper application of these Rules to mitigate the ***'risk'***. Navigators should aim to ***'prevent'*** even the development of a ***'close-quarters situation'*** and in the process should also be aware of their responsibilities, both to the law as well as to the community.

'Management' is a part and parcel of everyday life, be it a single person working or a group. Management is a systematic way for optimum utilization of all available resources and execution of the activities to achieve the desired objectives efficiently. It is dependent on the many interconnected processes, procedures, interactions and the people involved. Lack of or failure of good management causes disorder, confusion, wastage, delay, destruction and even depression. Good management is essential to achieve success, which means zero collisions for the purpose of this book.

'Leadership' is the ability of empowering people to do their best to achieve individual and organisational goals or objectives. Admiral Grace Hopper, US Navy (Retired) had said, ***"You cannot manage men into battle. You manage things; you lead people".*** **'Leadership'** or **'Effectiveness'** is **'Doing the Right Thing'** and **'Management'** or **'Efficiency'** is **'Doing the Thing Right',** if done right the first time and every time any activity should achieve 100% effectiveness and efficiency, though not always experienced in real life.

Adoption of ***'resource management principles'*** for all watchkeeping activities, navigational, engine or cargo is now required by the revised STCW Convention.

[TASK: PLEASE READ PARAGRAPH 8 IN PART 3 – 'WATCHKEEPING PRINCIPLES IN GENERAL' OF THE STCW CODE SECTION A-VIII/2]

HISTORY OF SHIPPING LEGISLATION: Venturing into the sea has always meant taking extreme risks. Past accident statistics show that working at sea was as risky as mining. Development of safety legislation, especially for maritime activities has been rather slow and almost always after repeated accidents and/or serious disasters.

However, in the last few decades', regulations governing maritime activities have been changing so rapidly that sometimes it gets difficult to even keep a track. Modern machinery systems are reasonably efficient, effective and reliable in most respects due to these efforts. Though there has been an overall reduction, accident and/or casualty rates have not gone down in the maritime industry in the same proportion as other shore based industries, unfortunately there has been a slight reversal as explained with trend analysis. It is now felt that the focus of development was on technology and the human factor has not been addressed sufficiently. The ISM Code did address this

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since inception and the amendments effective from July 2010 now focus on the effectiveness of management systems. The revised STCW Convention also addresses this issue further. Attention to the human factor in maritime industry has been given importance only after realising that ultimately it is the performance of people in the chain of management that determines the end result.

LEGISLATION GOVERNING SAFE NAVIGATION: This is a combination of the many requirements given in ***'SOLAS'***, ***'STCW'*** and the ***'International Regulations for Preventing Collisions at Sea'***. The requirements of the ***'ISM Code'***, a part of **SOLAS**, also have an impact on all activities, explained further.

'Safety of Navigation' as prescribed in Chapter 'V' of **SOLAS** prescribes many technical and other requirements. Apart from paragraph 10 of the STCW Code A-VIII/2 explained earlier, SOLAS places **'management'** of ***'safe navigation and avoidance of dangerous situations'*** directly under the control of the master in Regulation 34 of Chapter V, which allows absolute ***'Master's discretion'***:

Regulation 34-1, Master's discretion:

'The owner, the charterer, the company operating the ship as defined in regulation IX/1, or any other person shall not prevent or restrict the master of the ship from taking or executing any decision which, in the master's professional judgement, is necessary for safety of life at sea and protection of the marine environment'.

'International Regulations for Preventing Collisions at Sea' provide the inputs for managing ***'any action to avoid collision'***. Mr. Justice Sheen, in a Judgement delivered in 1993, stated: *"The structure of the Collision avoidance rules is designed to ensure that, whenever possible, ships will not reach a close quarters-situation in which there is risk of collision and in which decisions have to be taken without time for proper thought. Manoeuvres taken to avoid a close-quarters situation should be taken at a time when the responsible officer does not have to make a quick decision or a decision based on inadequate information. Those manoeuvres should be such as to be readily apparent to the other ship. The errors of navigation which I regard as the most serious are those errors which are made by an officer who has time to think. At such time there is no excuse for failure to comply with the Regulations."*

The mandatory objectives of the ISM Code, (last revisions effective from 1st January 2015), require that a Company should ***'assess all identified risks to its ships, personnel and the environment and establish appropriate safeguards'*** (1.2.2.2). The ISM Code (1.2.3) requires that ***'the safety management system should ensure'***:

.1 compliance with mandatory rules and regulations; and

.2 that applicable codes, guidelines and standards recommended by the Organization, Administrations, classification societies and maritime industry organizations are taken into account.

The ***'functional requirements for a safety management system'*** (1.4) should include ***'instructions and procedures to ensure safe operation of ships and protection of the environment in compliance with relevant international and flag State legislation'***, (1.4.2). This is elaborated as: ***'the Company should establish procedures, plans and instructions, including checklists as appropriate, for key shipboard operations concerning the safety of the personnel, ship and protection of the environment. The various tasks should be defined and assigned to qualified personnel'***, (7). While ensuring compliance with applicable legislation a

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Company may prescribe additional requirements in their SMS which automatically become binding by virtue of the mandatory ISM Code.

Qualification of personnel is a critical element in any management standard, though similarly qualified people may actually perform differently, a matter of intense continuing debates.

The master, finally responsible for safe navigation by SOLAS is also required by the ISM Code to be ***'verifying that specified requirements are observed'***, (5.1.4).

The ISM Code requires that ***'the Company should periodically evaluate the effectiveness of the safety management system in accordance with procedures established by the Company'*** (12.2). If accidents (collisions) take place it indicates that the ***'established' - 'safety management system'*** is not ***'effective'***. Non-conformities can also be found during the conduct of ***'internal safety audits on board and ashore at intervals not exceeding twelve months to verify whether safety and pollution-prevention activities comply with the safety management system'***, (12.1).

The Preamble of the ISM Code in paragraph 6 contains extremely important statements: ***'The cornerstone of good safety management is commitment from the top. In matters of safety and pollution prevention it is the commitment, competence, attitudes and motivation of individuals at all levels that determines the end result'***. Each of the underlined words say a lot, both directly and in their implied meaning for the design and practical application of any ***'safety management system'***. On board ***'the top'*** role is assumed by the master who has to **'lead'** the team and **'manage'** the many activities taking place, empowered by ***"the top"*** of the Company and must demonstrate these qualities.

VOYAGE PLANNING & PREVENTING COLLISIONS: SOLAS Chapter V, regulation 34 states:

1. ***Prior to proceeding to sea, the master shall ensure that the intended voyage has been planned using the appropriate nautical charts and nautical publications for the area concerned, taking into account the guidelines and recommendations developed by the Organization.***

2. ***The voyage plan shall identify a route which:***
   - ***.1 takes into account any relevant ships' routeing systems;***
   - ***.2 ensures sufficient sea room for the safe passage of the ship throughout the voyage;***
   - ***.3 anticipates all known navigational hazards and adverse weather conditions; and***
   - ***.4 takes into account the marine environmental protection measures that apply, and avoids, as far as possible, actions and activities which could cause damage to the environment.***

Link the above ***'sufficient sea room for the safe passage'*** with Rule 8(c) requirement, ***'if there is sufficient sea-room, alteration of course alone may be the most effective action to avoid a close-quarters situation'***, then it is very clear that voyage plans should allow for sufficient and safe sea room in all legs to allow execution of this recommended ***'action to avoid collision'***. This is also linked to a vessel's manoeuvring characteristics; the maximum allowed 4.5 and 5.0 ships length of advance and tactical diameter for a 90° and 180° turn respectively as explained in the basic ship handling chapter. In reality most vessels are able to turn in much shorter distances than the maximum allowed and thus the importance for an OOW to know the ***'handling characteristics of their ship'***. Voyage planning should be with the concept of safe margins on either side of the plotted track.

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It has been frequently observed that with accurate position fixing there is a very strong tendency for navigators to rigidly follow the plotted course lines and allow just marginal cross track variations or sometimes not at all, not even to execute ***'action to avoid collision'*** in compliance with Rule 8(c) that, ***'alteration of course alone may be the most effective action to avoid a close-quarters situation'***. At times charted tracks are too close to dangers allowing little sea room for comfort, usually done as short cuts for commercial considerations to achieve minimum distance with the confidence that position fixing will always be accurate and nothing would fail or go wrong.

There have been numerous cases of grouping of vessels at certain key turning points and within TSS leading to dangerous situations. Vessels are known to have gone too close to each other in traffic lanes and some overtaking vessels have collided with the ones being overtaken simply because there was a tendency to maintain positions on the planned track and reduction of speed was not resorted to by the vessels overtaking, apart from a hesitation to leave a traffic lane and go out.

On 28th May 2001 an oil tanker in ballast named 'Rowan', collided with a smaller vessel 'Singapura Timur' while overtaking her within a traffic lane in the Malacca straits around 0240 in the morning. The 'Singapura Timur' sank soon thereafter, though all its crew were rescued by 'Rowan' the vessel was arrested. When the vessel was released after the usual legal process and financial guarantees, the OOW and the rating on look-out duty were detained for investigations along with the master, who was not even physically present on the bridge. When released on bail, their professional documents were seized by the court while the case went on, effectively prohibiting them from gainful employment for almost 2 years.

The OOW on the Rowan was reluctant to allow his vessel steer away from the charted course; he also was under the impression that he had to maintain his vessel inside the traffic lane though there was ample deep and safe water outside. The Rules actually do allow this ***'to avoid immediate danger'****. It is also believed, that passing the smaller vessel at too close a range and at full speed may have induced interactive forces leading to the collision. Some of the websites containing information about this collision are:*

http://www.ipsofactoj.com/highcourt/2003/Part4/hct2003(4)-004.htm

http://www.ibiblio.org/maritime/Scheepvaartnieuws/Pdf/scheepvaartnieuws/2001/29-5-2001B.PDF

http://www.imo.org/includes/blastDataOnly.asp/data_id%3D8934/4.pdf

'RISK OF COLLISION' - MANAGEMENT

APPLICATION OF THE RULES: The interpretations of the Rules and their best practical application have been explained in the preceding chapters. If the process of ***'preventing collisions'*** was to be shown as a flow chart, it should follow the following sequence.

Part I:

1. Watchkeeping being performed by competent navigators in compliance with the STCW and any additional requirements stated in the SMS.
2. Sufficient number of navigators and support staff on duty appropriate to the prevailing circumstances and conditions,.
3. Proper look-out being maintained.
4. Vessel proceeding at safe speed.
5. Risk of collision being determined on a continuous basis.

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Part II:

1. If a developing close quarters situation and/or risk of collision is determined with another vessel, then
2. Determination if vessels are in sight of one another, or vessels are not in sight of one another when navigating in or near an area of restricted visibility.
3. Correct determination and assessment of the developing situation.
4. Clearly identifying the Rules which apply to the developing situation to decide action to avoid collision.
5. Action to avoid collision to be executed in full compliance with these Rules and all requirements of Rule 8 applied.

[TASK: MAKE A FLOW CHART OF THE ABOVE AND ADD MORE DETAILS INTO THE SAME, FOR EXAMPLE THE RELEVANT ELEMENTS OF RULE 8 AND THE DIFFERENT ACTIONS REQUIRED DEPENDING ON THE APPLICATION OF THE MANY RULES.]

It is also recommended to study the local regulations, normally given in the sailing directions or local publications about local practices within the internal waters of some counties. For example the following local law exists in the USA as stated in 33 CFR 82.

82.5 Lights for moored vessels: For the purposes of Rule 30 of the 72 COLREGS, a vessel at anchor includes a barge made fast to one or more mooring buoys or other similar device attached to the sea or river floor. Such a barge may be lighted as a vessel at anchor in accordance with Rule 30, or may be lighted on the corners in accordance with 33 CFR 88.13

A voyage, still a ***'maritime adventure'*** in some sections of law, especially in maritime insurance, is considered safe if collisions and strandings (or groundings) can be prevented as clearly stated in paragraph 10 of the STCW Code section A-VIII/2.

'Risk' is the lack of precise prediction about the intended outcome of an event, planned or not. Risk is usually taken as the product of the probability or expected frequency (F) of a negative occurrence and the magnitude of its consequences or severity (S), **R = F x S**. The probability of a collision is, for example, related to traffic density and pattern of vessel movements coupled with the way the navigator's function, while the magnitude of consequences depends on the type of vessels, the angle and speeds at ***'collision'*** as well as the cargo being carried.

Risks depend on the hazards present in an activity. Managing Risk is to identify or determine the appropriate hazards which have a potential to activate risks and then to remove, nullify or lower them to acceptable levels through introduction of various safeguards. Traffic separation schemes, for example, are a safeguard ***'for preventing collisions'*** in areas of high traffic density and have proved their effectiveness as explained at the end of Rule 10. Use of seatbelts and airbags in a car or helmets at a place of work reduce severity in the event of an accident.

Statistics show that human error is the biggest single cause in activating ***'risk of collision'*** which continue in large numbers at sea; the groundings having reduced substantially. Though modern radars are fairly accurate and AIS can be of some assistance, management of ***'any action to prevent collision'*** still rests with the navigators; that is the practical application of these ***'Regulations'***. ***'Collisions'***, sometimes even assisted by Radar, ARPA, VHF or AIS, are regularly in the news.

Most investigation reports on maritime accidents show that the root causes for ***'collisions'*** are

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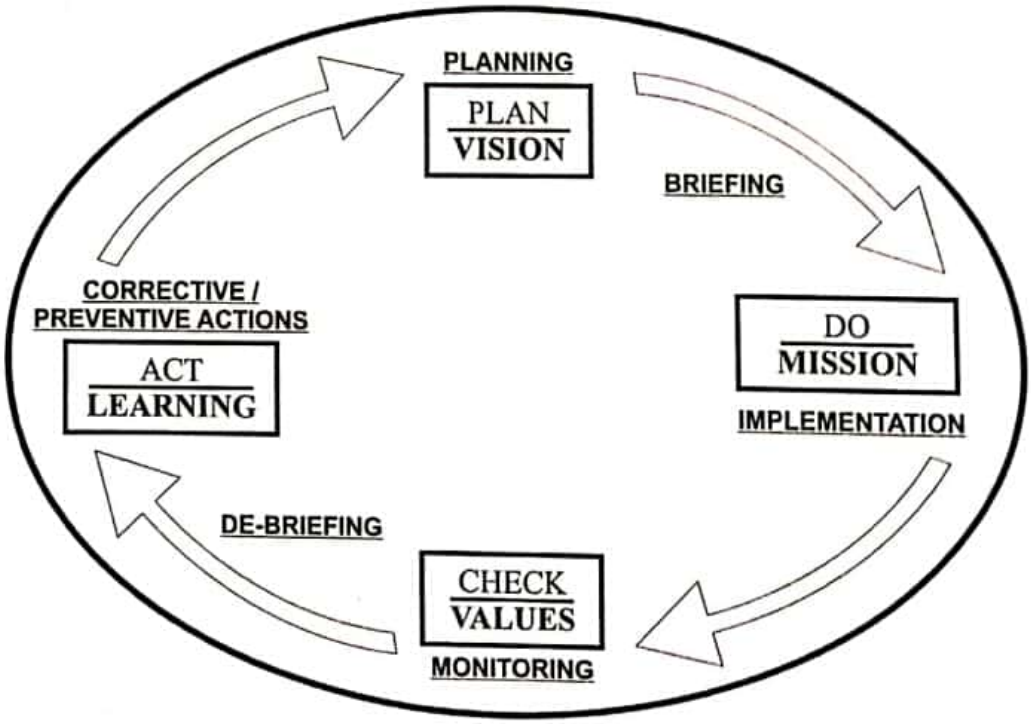
similar and there appears little difference between recent reports versus those made years ago. One such report of 1963 by the Liverpool Underwriters Association is quoted at the end of Rule 10, recent findings have been quoted in the previous chapter on **'trend analysis'**.

Amongst the root cause of failures of management systems is frequently the lack of importance given to **'leadership'**. Every seafarer has to play the role of a leader to his teammates and be a teammate to the leader. It sounds strange, but good management practices actually require that people are able to shift through these two roles as situations demand, unless a person is a good team-mate, s/he cannot aspire to be a good leader. An OOW has to assume both the roles when alone on watch during routine navigation.

The famous PDCA Cycle of Dr. Deming, one of the famous Guru of modern quality management concepts describes the four stages of management as: Plan – Do – Check – Act, referred earlier with Rule 8(d). It addresses both leadership and management, applies almost to all activities including preventing collisions and may be elaborated as follows:

- **Planning** is always the first step for any activity, since, as it is said that ***'Failing to Plan means Planning to Fail'***;
- **Do** is to carry out the activity as per the plan;
- **Check** is to verify the efficiency and effectiveness; and,
- **Act** is to correct the actions so that the same is within the framework of the plan.

The PDCA cycle can be adapted for leadership in the form:



In the now famous Maritime/Bridge Resource Management (MRM/BRM) Programmes, (adopted from the aviation industry), and of which the author is a qualified workshop leader since 1995, practical management is described as a cycle of **Planning** – **Briefing** – **Monitoring** – **Debriefing**, very similar to the PDCA cycle described. **Briefing** is an important activity so that all concerned are clear on the way the plans made have to be executed, **Monitoring** is verifying the execution of the plans but also correcting the activities so that they proceed as planned, sometimes dynamic changes

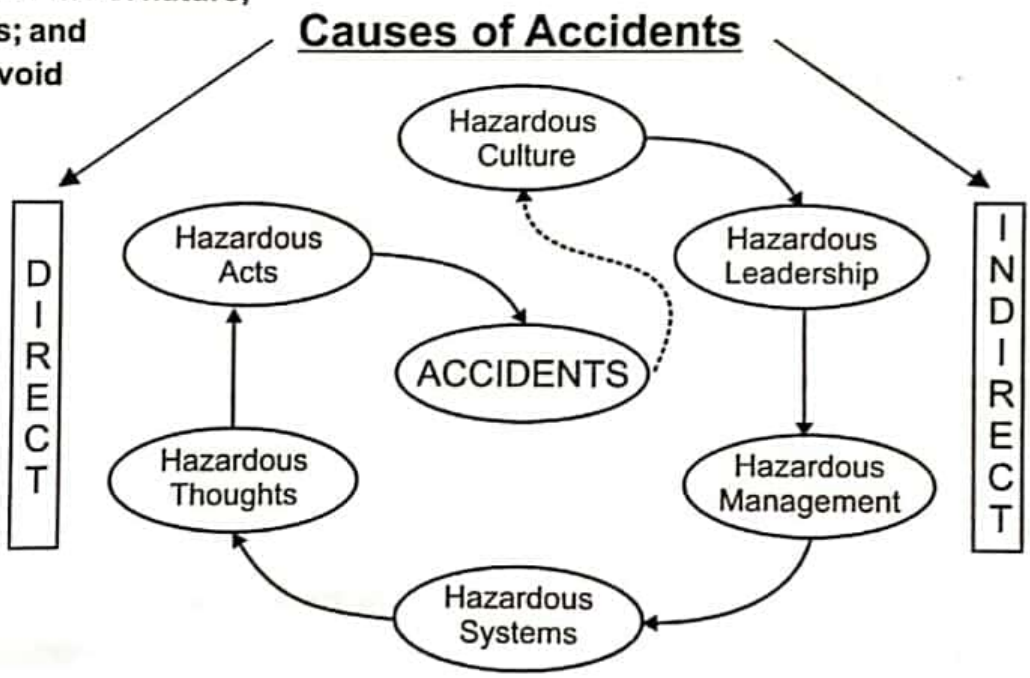
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may be made to the Plan itself during execution, in which case a short **Briefing** to update the plans is again required. ***Debriefing*** is to review the efficiency and effectiveness after completion of the activity and acts as a continual learning and improvement tool. These concepts remain applicable even for the **'management'** of ***'any action to avid collision'***.

'Preventing collisions' cannot be planned in advance; it is an extremely dynamic activity. When ***'a close quarters and/or risk of collision'*** develops, all vessels involved are expected to take correct ***'action to avoid collision'*** in compliance with the ***'International Regulations for Preventing Collisions at Sea'***. Commercial aspects including any minimum performance criteria of speed or any other deadlines, like trying to maintain ETA, are secondary to the safety of a voyage and should not be considered when planning and executing ***'any action to avoid collision'***.

'Accidents do not happen, they are caused' is the guiding theme of ***'MRM',*** and are preventable by proper management. Every navigator must remember that:

1. **The sea is dangerous;**
2. **We cannot change the laws of nature;**
3. **We all make mistakes; and**
4. **We cannot fully avoid risks of collisions.**



Accidents are rarely because of one single failure; usually many direct or indirect failures take place in an error chain culminating into an accident or ***'collision'***, the adjoining flowchart shows the same. Analysis of failures helps develop short term corrective and long term preventive actions to manage the risks, this is linked to Formal Safety Assessment explained further.

Management systems based on the ISM Code, which in turn echoes the ISO-9000 quality management concepts, aims to improve efficiency and effectiveness of processes such that they are ***'done right the first time and every time'***. When applied ***'for preventing collisions'*** the objective simply is zero collisions. Unfortunately the accident trends do not reflect this, a sure indication that improvements are required.

[TASK: PLEASE RESEARCH AND FIND THE BEST DEFINITIONS OF THE WORDS 'SAFETY' AND 'ACCIDENT'].

FORMAL SAFETY ASSESSMENT (FSA): A part of IMO processes since 2002 is ***'a rational and systematic process for assessing the risks associated with shipping activity and for evaluating the costs and benefits of IMO's options for reducing these risks'***, it is another way of

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'risk management'. FSA development was in response to the **Piper Alpha** disaster of 1988, this offshore platform suffered an explosion and fire in the North Sea killing 167 people.

There are many ways of doing risk assessment, qualitative based on pure experience alone or quantitative using past statistical data, the former depends on perceptions developed through individual or collective experiences. ***'Fault Tree Analysis'***, ***'Event Tree Analysis'***, ***'Failure Mode and Effect Analysis'***, ***'Hazard and Operability Studies'***, ***'What if Analysis Technique'*** and ***'Risk Contribution Tree'*** are amongst those listed in FSA guidelines. Perceptions of ***'risk'*** in real time operations may change abruptly, for example failure to maintain a proper ***'look-out'*** may lead to missing a target and create a false impression that it is all clear or of low risk. If a vessel is suddenly sighted and the relative approach indicates low CPA, the perception would immediately change to one of high risk.

As per FSA guidelines: ***'The current best practice is to recognise that there are three levels of risk:*** (IMO combined circular MSC/Circ.1023, MEPC/Circ.392 of 5 April 2002, Appendux 5)

1) ***Intolerable: the risk cannot be justified except in extraordinary circumstances,***
2) ***Negligible: the risk has been made so small that no further precaution is necessary. And***
3) ***As Low As Reasonably Practicable (ALARP): the risk falls between these two states.***

The risk when travelling on a ferry should therefore be made "ALARP". There are no exceptional benefits to a passenger to allow an "intolerable" risk and sea travel can clearly never be made so safe that the risk is "negligible" and no precautions need to be made.

IMO work culminates into various legislations to minimise or prevent accidents or to enhance and ensure high standards of safety and pollution prevention. These are equivalent to introduction of safeguards in Risk Management. FSA is a pro-active and structured approach for assessing and reducing risks by helping develop better appropriate safeguards.

FSA comprises of five steps:

1. ***Identification of hazards.***
2. ***Assessment of risks associated with those hazards.***
3. ***Consideration of alternative ways of managing the identified risks.***
4. ***Cost benefit assessment of alternative risk management options.***
5. ***Decisions on which option to select.***

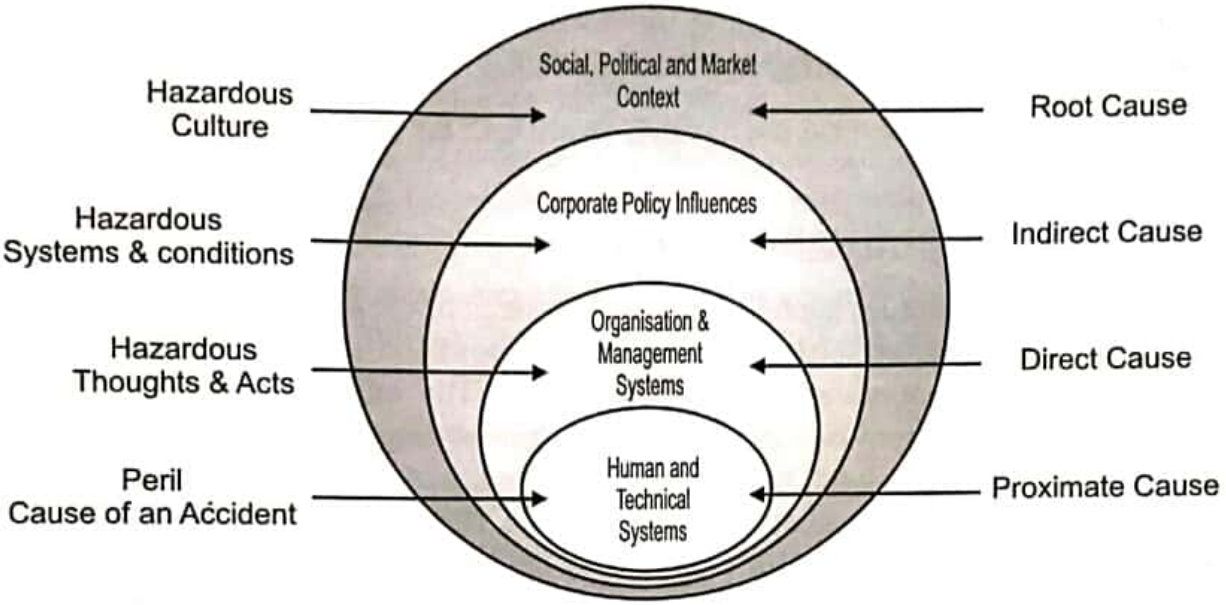
This determination leads to identifying and applying risk control measures (RCMs), which is nothing else but safeguards from the ISM Code. The applications of RCMs should in general be aimed at one or more of the following in order of priority:

1. ***Reducing the frequency of failures through better design, procedures, organisational policies, training etc.***
2. ***Mitigating the effect of failures, in order to prevent accidents.***
3. ***Alleviating the circumstances in which failures may occur. And***
4. ***Mitigating the consequences of accidents.***

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The following diagram on ***'Nested System of Influences'*** is based on the Regulatory Influence Diagrams which are part of FSA.

Accident Causation Model based on IMO - RID



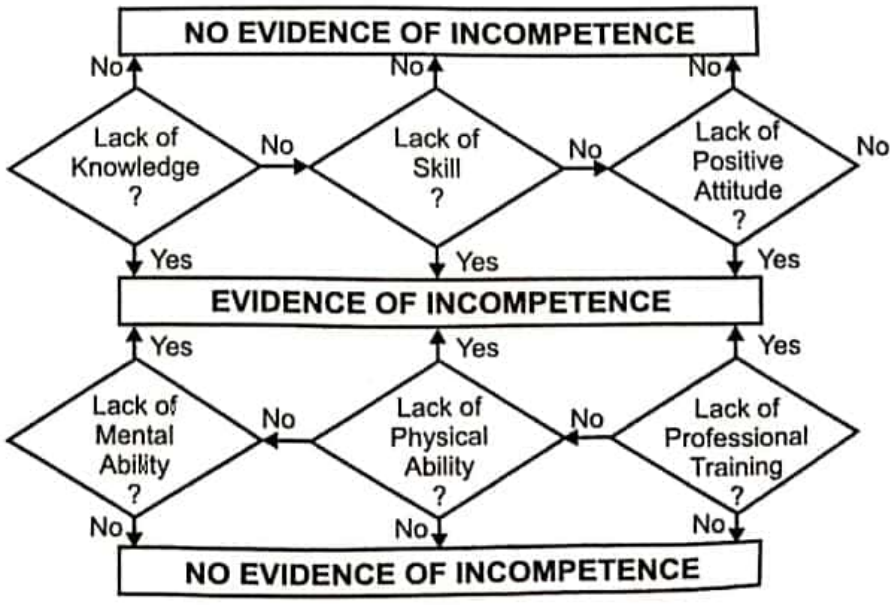
Note: The captions placed outside with arrows are not part of the original diagram published by IMO; they are based on error chain development and the direct/indirect causes of accidents.

[TASK: FSA MAY BE STUDIED FURTHER IN THE COMBINED IMO CIRCULAR MENTIONED ABOVE]

COMPETENCY AND SEAWORTHINESS: Are both part of legislation, ***'every officer in charge of a navigational watch - shall hold a certificate of competency'***, *(paragraph 1 of STCW Regulation II/1)* and ***'shall be duly qualified'*** *(STCW Code A-VIII/2 extract from paragraph 1)*. These requirements are a must for a vessel to be considered seaworthy, competency is linked to the human factor.

On competency, in a judgement delivered by the Honourable Mr. Justice Cresswell in the High Court of Justice at London on 7th February 2002 for a case regarding fire on board a car carrier. The ruling implied that the characteristics of incompetence can be over and above than stated in the STCW Code as shown in the flow chart, and if any of these elements can be proved to exist, then the person concerned should be considered incompetent. This is perhaps the

Flow Chart For Evidence of Incompetence



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first time that competency aspects have been addressed in a court ruling, future judgements on competency, citing this case, may bring up more points too.

***Standard of competence** means the level of proficiency to be achieved for the proper performance of functions on board ship in accordance with the internationally agreed criteria as set forth herein and incorporating prescribed standards or levels of **knowledge, understanding** and demonstrated **skill**, (STCW Code A-I/1).*

[TASK: STUDY SEAWORTHINESS AND WHAT IS MEANT BY 'DUE DILIGENCE TO PROVIDE A SEAWORTHY SHIP'?]

HUMAN ELEMENT AND HUMAN FACTORS

This is a vast topic, addressed in short in this book, research by the Nautical Institute on this may be viewed at www.he-alert.org. It is the human beings in charge of and in control of vessels; the success or failure of any voyage generally rests on their actions. The way human beings think, interact, behave and work has a direct bearing on the way ***'preventing collisions'*** is practiced. These elements apply from the way fresh trainees are educated, examined and the way they apply the subject in practice. For further studies the book: **"The Human Element - a guide to human behaviour in the shipping industry"** should be studied, a read only PDF version may be downloaded from http://www.mcga.gov.uk/c4mca/mcga-ds-ssh-human-element.htm.

In the 88th session of the IMO's Maritime Safety Committee held towards end 2010 a proposal was put forward to incorporate human element principles in the working of IMO. Once approved it would mean that any future proposals of IMO must demonstrate that the human element has been sufficiently addressed before the same can be accepted.

HUMAN PHYSIOLOGY / LIMITATIONS: The origin of human beings has evolved over a long time. A person can work but always within the limits of the human body allowing for some individual variations. The human body has its own limitations, sight, hearing, working thinking or anything else, some examples on sight and hearing follow. The body timings and functions are said to be linked to the natural biological clock and perhaps genetically embedded. Human beings walk on solid and stable surfaces, have got up and slept with sunrise and sunset respectively; these natural systems set in through multiple generations are under severe pressure of the present modern industrial world. To change and adapt to new requirements is not an easy task.

Human beings are known to have ventured out to sea from 6000 BC; as such the sea is not as alien as it appears to some, though it remains extremely dangerous, needs to be respected, and can never be taken for granted. However, the human organs, the sensory systems, the social connectivity, all get disturbed from their natural habitat when working at sea. Isolation, awkward work timings in shifts force the body away from its natural biological clock. These elements also lead to fatigue and stress, it is well established that maximum navigational accidents take place in the morning 0500-0700 time range when the senior most watchkeeping officer, the chief officer, is usually on duty. Research has shown that this phenomenon is primarily a combination of sleep patterns linked to fatigue but sometimes also due to complacency and an attitude of **'I know it all'**.

The eye receives data from a horizontal field of about 200°, but sharp high resolution images are only within an angle of about 15° from the line of sight. Hearing may get impaired at sea by the noise of wind, waves and ship's machinery. Ship's whistle may block out other sounds and temporarily reduce

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hearing ability of person(s) on ***'look-out'***. The human ear is also not designed to accurately determine the direction of the sound it receives.

HUMAN ELEMENT: This subject has bewildered many experts and invoked a lot of discussions since early 1990's. As technological advances have resulted in more reliable machinery and other associated equipment their failure rate has declined sharply, but analysis of accidents again and again shows human error as the single largest cause of failures leading to accidents.

Human error is difficult to explain, it is defined as a mistake made by a person rather than being caused by a poorly designed process or the malfunctioning of a machine. IMO defines ***'human error'*** as ***'a departure from acceptable or desirable practice on the part of an individual or a group of individuals that can result in unacceptable or undesirable results'***. Or it may be explained as **'an inappropriate or undesirable human decision or behaviour that reduces, or has the potential for reducing, effectiveness, safety, or system performance'.**

Human errors are usually:

1. **An act, assertion, or belief that unintentionally deviates from what is correct, right, or true.**
2. **The condition of having incorrect or false knowledge.**
3. **The act or an instance of deviating from an accepted code of behaviour.**
4. **A mistake.**

And are closely linked to the **behaviour of a** person which could be **'Skill-based'**, **'Rule-based'** or **'Knowledge-based'.**

Human error can be reduced or controlled by cross checking and verification. A very senior master, Capt. S.S. Sekhon I had sailed with as Chief Officer in 1989, had got the following notice posted at several places ***'CHECK – RECHECK – CHECK AGAIN'***. It was his philosophy that one must think through the tasks before starting to execute the same, modern systems on loss prevention echo this philosophy in different versions, one of them being ***'engage the brain before the hands'***. These concepts are helpful when planning and executing ***'any action to avoid collision'***.

FSA Guidelines state: ***'The human element is one of the most important contributory aspects to the causation and avoidance of accidents. Human element issues throughout the integrated system should be systematically treated within the FSA framework, associating them directly with the occurrence of accidents, underlying causes or influences. Appropriate techniques for incorporating human factors should be used'***.

The following chart from the IMO guidelines well explains the human errors.

TYPICAL HUMAN ERRORS	
Physical Errors	***Mental Errors***
Action omitted	Lack of knowledge of system/situation
Action too much/little	Lack of attention
Action in wrong direction	Failure to remember procedures
Action mistimed	Communication breakdowns
Action on wrong object	Miscalculation

With respect to human error the FSA requirements contain guidelines on ***HUMAN RELIABILITY ANALYSIS (HRA)*** which uses terms like ***Human error analysis, Error producing condition, Human error recovery, Human error consequence, Human error probability, Human reliability, Performance shaping factors, Human error quantification, Technique for Human Error Rate Prediction (THERP)*** and ***Human Error Assessment and Reduction Technique (HEART)***.

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The IMO's FSA guidelines further explain that ***'human error occurs onboard ships when a crew member's ability falls below what is needed to successfully complete a task. Whilst this may be due to a lack of ability, more commonly it is because the existing ability is hampered by adverse conditions.***

The principal causes listed are:

1) ***Personal factors, e.g. stress, fatigue;***
2) ***Organizational and leadership factors, e.g. manning level;***
3) ***Task features, e.g. task complexity; and***
4) ***Onboard working conditions, e.g. human-machine interface.***

COMPLACENCY: Is a critical human factor function which largely contributes to human errors and may be described as:

- A false sense of well being and security.
- Satisfaction or self-satisfaction accompanied by unawareness of actual dangers or deficiencies.
- An unrealistic concept of the situation.
- A negligent or an over-confident attitude that nothing serious (or negative) will happen or all will turn out well.
- A passive, uncritical acceptance of other people's actions.

Complacency may set in for many reasons, but usually is due to lack of experience and/or knowledge about the risks associated with the tasks; At times the routine of the activity and sheer boredom of watchkeeping may invoke complacency. It may also be because of "ignorance" or "arrogance" or their combination.

It is surprising, but over-experience may lead to an over-confident attitude and that in turn leads to complacency. Well experienced people with all the knowledge are more prone to fall prey to this dangerous phenomenon. Good management techniques mean that people should guard against this, always questioning their own and their team members actions and monitoring the expected results.

It is said that the following questioning approach helps in all operational and risk management activities, not just for carrying out accident investigations or development of management systems.

What / Why / When / Where / Who / Which / How? This is the **'what if analysis technique'** mentioned in the IMO circular. DNV calls this **'SWIFT'** or **'Structured what if technique'**.

MOTIVATION, HUMAN RELATIONSHIPS AND TEAMWORK: Human nature and behaviour is complex, human relationships are built up through interactions in families, social circles and organizations. People like to be treated with respect and dignity, in a just manner, irrespective of the position held or the type of job performed. People need a feeling of belonging and of importance for the activities they do apart from a social status. These aspects can help understand motivation. However, a rather critical aspect but often neglected is the emotional or religious beliefs (*) of a person; these influence both the behaviour and individual motivation. The era of motivation by fear has faded as civilisations have progressed and though there are a lot of factors which may motivate a person, usually survival is said to be the biggest factor. People are not motivated by the directives they receive on what to do, but by the goals they are asked to achieve. Further, people are motivated by what they themselves desire to achieve, motivation propels individuals to advance and excel in whatever they wish to do.

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Good teamwork is important, though when a vessel is in open seas with a sole OOW on watch in daytime, or even when supported by a lookout person at night, will usually take all decisions alone. However, as a vessel moves into congested waters or into restricted visibility the number of people on watch may be proportionately increased with pilots joining in for manoeuvring the vessel into and out of ports or assisting in navigating transits through some congested waters. Most passenger vessels have 2 OOW's and 2 ratings on watch as a minimum, a luxury not on the vast fleet of cargo vessels.

Research done on teamwork shows that most often it is management failures in various areas resulting in incidents and accidents and not lack of professional competency. The below is based on the research findings of N.T.S.B. and N.A.S.A., (National Transportation Safety Board & National Aeronautics and Space Administration, both in USA).

Most common management errors during team work:

- Preoccupation with minor technical problems (paralysis of analysis).
- Failure to delegate tasks and assign responsibilities.
- Failure to set priorities.
- Inadequate monitoring / feedback.
- Failure to utilise available data.
- Failure to communicate intent and plans.
- Failure to detect or challenge deviations from SOP's (Standard Operating Procedures).
- Failure to handle minor deficiencies in skills.

The same research had concluded that teams which performed well and best handled the situations had the following qualities.

- They had good situational awareness, they anticipated the next condition.
- They made cognitive resources free.
- They obtained relevant information early.
- They built a shared mental model.
- They applied conservative strategies, kept options open.
- Their decisions were sensitive to constraints.
- They applied explicit task allocation.
- They monitored progress.
- They had good interactive closed loop communication.

The aviation industry, using the above research elements has developed several versions of management and team building courses; the one most widely known is CRM, or Cockpit/Crew Resource Management, which aims on developing teamwork and operational managerial skills. These concepts have filtered into the merchant marine too, SAS Flight Academy, a pioneer in conducting CRM Courses, had transformed the aviation CRM into a marine BRM (Bridge Resource Management) course, which is also run under the name MRM (Maritime Resource Management) by

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The Swedish Club Academy. These and similar courses help develop good practical managerial skills and are strongly recommended. ***'Bridge resource management'*** *and* ***'Engine-room resource management'*** *now feature in the* ***'standards of competence'*** *in the STCW Convention revised in 2010.*

(*) The Maritime Labour Convention adopted at the ILO in February 2006 states: ***'In the case of ships where there is need to take account, without discrimination, of the interests of seafarers having differing and distinctive religious and social practices, the competent authority may, after consultation with the shipowners' and seafarers' organizations concerned, permit fairly applied variations in respect of this Standard on condition that such variations do not result in overall facilities less favourable than those which would result from the application of this Standard'***.

[TASK: WHAT ARE THE QUALITIES YOU WOULD EXPECT IN A GOOD TEAM MEMBER?]

PRACTICAL MANAGEMENT ASPECTS

The various elements addressed and explained under this heading are inter related. for example A person suffering from fatigue will not be able to perform any of the activities to the expected standard. Lookout functions may not be done correctly or targets seen may not be reported which initially may be seen as failure of communication but further analysis may show up the fatigue aspect.

GUIDELINES ON FATIGUE: Fatigue, is no more an activity left to the Companies and/or maritime organisations to manage but features as part of law.

Fatigue may be defined in many ways. However, it is generally described as a state of feeling tired, weary, or sleepy due to prolonged mental or physical work, extended durations of anxiety, exposure to harsh environments, or loss of sleep. The result of fatigue is impaired performance and diminished alertness. Fatigue can also affect vision. The effects of fatigue can be dangerous, the specialized nature of maritime industry requires constant alertness and intense concentration from its work force. Fatigue is dangerous because it affects everyone regardless of skill, knowledge or training; and is linked to human body capabilities and frailties.

In a few very rare cases navigators have even been found sleeping due to sheer fatigue and exhaustion or sometimes due to total boredom. Regulation VIII/1 on ***'Fitness for duty'*** in the STCW Convention requires ***'that watch systems are so arranged that the efficiency of all watchkeeping personnel is not impaired by fatigue and that duties are so organized that the first watch at the commencement of a voyage and subsequent relieving watches are sufficiently rested and otherwise fit for duty'***. Sections VIII/1 of Codes A and B further amplify the requirements which should be observed to protect everyone from potential dangers associated with fatigue and related accidents.

The Maritime Labour Convention of 2006 also addresses this issue and covers all seafarers as follows:

'Regulation 2.3 - Hours of work and hours of rest.

Purpose: To ensure that seafarers have regulated hours of work or hours of rest.

1. ***Each Member shall ensure that the hours of work or hours of rest for seafarers are regulated.***

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2. ***Each Member shall establish maximum hours of work or minimum hours of rest over given periods that are consistent with the provisions in the Code'.***

Effectively dealing with fatigue in the maritime environment requires a holistic approach. There is no one-system approach to addressing fatigue, but there are certain principles (like lifestyle habits, rest, medication and workload, etc.) that must be addressed in order to gain knowledge and understanding of this phenomenon to enable manage this human element issue.

[TASK: STUDY FULLY ALL SECTIONS NUMBERED VIII/1 IN THE STCW CONVENTION; THAT IS IN THE REGULATIONS, CODE 'A' AND CODE 'B'.

QUIZ: WHAT DOES SECTION B-VIII/1 RECOMMEND REGARDING REST HOURS AND THE WAY THE MANDATORY REQUIREMENTS OF SECTION A-VIII/1 HAVE TO BE ENFORCED?

WHEN THE MLC 2006 IS AVAILABLE, READ SECTION 2.3 OF THE SAME IN FULL AND COMPARE WITH THE STCW REQUIREMENTS AND ANY REQUIREMENTS STATED IN FLAG STATE LEGISLATION.

QUIZ: AS PER THESE REQUIREMENTS, DO THE AUTHORITIES HAVE A RIGHT TO VERIFY WORK / REST RECORDS MAINTAINED ON BOARD?]

The human element, in particular fatigue, is widely perceived as a contributing factor in many accidents. The Exxon Valdez stranding and oil pollution in 1989, one of the worst maritime environmental disasters in this century, is one where fatigue was identified as a major contributing factor. The Air India Express aircraft crash in May 2010 at Mangalore is also said to have been caused due to the commanding Pilot's fatigue, he was sleeping in the major part of the flight from Dubai and when he did get up, he was unable gain situational awareness (discussed later) and/or take correct actions, he also did not heed to the co-pilot's warnings to abort landing, turn around and make a fresh approach. Rest hour requirements in commercial aviation are far more stringent than required by maritime laws.

[TASK: RESEARCH AND STUDY THE GROUNDING ACCIDENT OF EXXON VALDEZ OFF ALASKA.

QUIZ: WHICH LAW WAS ENACTED AND MADE MANDATORY FOR VESSELS CALLING AT USA PORTS AFTER THIS ACCIDENT?]

LOOK-OUT: Further to explanations with Rule 5, research into reasons for collisions has revealed that in a very large proportion of these accidents the watchkeeping officers were either completely unaware about the presence of the other vessel or saw it too late, some having dispensed with visual ***'look-out'*** and relying only on Radar. A study by MAIB states:

- ***65% of vessels involved in collisions were not keeping a proper lookout;***
- ***33% of all accidents that occurred at night involved a sole watchkeeper on the bridge; and***
- ***19% of the vessels involved in collisions, the bridge watchkeeping officers were completely unaware of the other vessel until or, in some cases, after the collision.***

Vision does get affected adversely when a person moves rapidly between extremes of light, and takes time to adjust to changing conditions. Watchkeeping requirements address this as ***'no***

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impairment of night vision or other impediment to the keeping of a proper lookout', *(STCW Code A-VIII/2, extract from paragraph 16)* and ***'particularly as regards their adjustment to night vision. Relieving officers shall not take over the watch until their vision is fully adjusted to the light conditions'***, *(STCW Code A-VIII/2, extract from paragraph 20)*.

MGN 357 issued by the MCA of UK in December 2007 states: ***'No suitable period for dark adaptation is stated, but MAIB's report says that research indicates that this period is typically 10 to 15 minutes. This needs to be taken into account in determining the watchkeeping regime for the vessel'***. This MGN also states, ***'photochromic lenses, even after being in the dark for an extended period and in their most translucent state, can reduce night vision significantly. They should not be worn for lookout duties at night'***.

Capt. Beer of U.K Marine Accident Investigation Branch (MAIB) had stated, ***'earlier detection, appraisal, prediction and situational awareness are the principal duties of any watchkeeper. Without these functions the ship can be put at risk. Clearly, some watchkeepers have come to the conclusion that maintaining a proper look-out is somehow unimportant. This must be corrected***.

Rule 5 is indisputably the most important: complying with it is a fundamental prerequisite for the other rules to be of any use. If you do not see or detect another vessel, how can you know what action is necessary, let alone what action is appropriate.'

Usually all court verdicts on collisions link their judgements to the Rules from the ***'International Regulations for Preventing Collisions at Sea'*** and few also refer to the watchkeeping requirements from the STCW Code. It may be worth looking at the way paragraph 32 of the STCW Code Section A-VIII/2 can be interpreted purely from a legal **"rule construction"** point of view, the paragraph is quoted with the key words highlighted.

'It is of special importance that at ***all times*** *the officer in charge of the navigational watch* ***ensures that a proper lookout is maintained***. *In a ship with a* ***separate chartroom***, *the officer in charge of the navigational watch* ***may visit the chartroom, when essential, for a short period for the necessary performance of navigational duties, but shall first ensure that it is safe to do so and that proper lookout is maintained'***.

This paragraph has two limbs, the first relates to the Duty of an OOW regarding ***'lookout'***. The second limb describes situations where deviation from the first limb is permissible and can be broken down into as follows:

01. The OOW may visit a SEPARATE CHARTROOM - ONLY when;
02. It is ***ESSENTIAL***, **and**
03. It is ONLY ***for a SHORT PERIOD*** **and**
04. It is ***for the NECESSARY PERFORMANCE OF NAVIGATIONAL DUTIES***;
05. Provided that, the ***OOW SHALL FIRST ENSURE that***;
06. ***It is SAFE to do so***, **and**;
07. ***That PROPER LOOKOUT IS MAINTAINED***.

If an OOW does not ensure ***'that proper look out is maintained'*** the OOW should be considered negligent for having committed a **breach of duty**. Interpreting the Rules by breaking them into

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segments brings home the manner in which Rules should ideally be interpreted for better understanding.

As stated in Rule 5 on ***'look-out'***: ***'every vessel shall at all times maintain a proper look-out by sight and hearing'*** and if an OOW blinks the eyes even for an instant, by virtue of hair splitting analysis, an OOW would not have kept ***'a proper look-out'- 'at all times'***.

A ship not using radar collided with a large, newly constructed oil platform in the Gulf of Mexico. The platform was not properly lit, but so are many other vessels and objects. Just because a person fails to sight something at night in good visibility, does not mean it is not there.

Apart from Rule 5 other Rules also refer to and depend on this critical function. Use of radar is also accepted for 'lookout', ***'a vessel which detects by radar alone the presence of another vessel shall determine if a close-quarters situation is developing and/or risk of collision exists'***, (extract from Rule 19-d) and ***'or interfere with the keeping of a proper look-out'***, (extract from Rule 20-b). The STCW Code amplifies a lot more on lookout as explained, especially with Rule 5.

COMMUNICATION – INTER PERSONAL: Analysis of accidents in highly operational environments show that failure of communication frequently leads to dangerous situations and/or accidents. Interaction between professionals is a key element towards safe and sound navigation including efficient and effective ***'action to avoid collision'***.

From a vessels operational point of view, communication broadly covers two areas, on board and external. The former is one of the most important activities in the dynamic management of operations on board. However, there is a difference between the two, especially if the latter is undertaken for communicating with other vessels in the vicinity for ***'preventing collisions'***.

Essentially the concepts of '***closed loop communication***' (a term adopted from the aviation CRM courses) should be followed in all communications to prevent failures. The following steps are considered the best for good '***closed loop communication***' which is an interactive communication pattern between all players involved to minimise failures. This pattern of communication is recommended for all communications irrespective if it is internal or external. This system is almost always used on the bridge for wheel or engine orders, where any order is repeated by the receiver and then reconfirmed after execution.

All orders, instructions and messages, referred to as message below should be brief, to the point and follow the following steps before being implemented.

1: SENDER: Sends a verbal message or instruction.

2: RECEIVER: Repeats the same or the important elements of the same.

3: SENDER: Confirms to the receiver that the understanding is correct.

4: RECEIVER: Confirms to the Sender that the action has been initiated / completed.

In case the receiver gives a wrong feedback in step-2, the communication is aborted and the sequence started again from step-1. This does not fully eliminate misunderstanding due to language and pronunciation issues.

[TASK: MAKE A SCHEMATIC BLOCK DIAGRAM SHOWING CLOSED LOOP COMMUNICATION]

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From the human element aspect, ship board personnel do not spend much time with each other and people do take time to learn about each other and get along. There is a classic statement on this made by the late Mr. Martin Luther King often called ***'fear of the unknown'***, quoted below. This can be used for understanding interrelationships, human factors, and to develop good communication.

- **People do not get along:** ***Because they fear each other.***
- **They fear each other:** ***Because they do not know each other.***
- **They do not know each other:** ***Because they have not properly communicated with each other.***

This barrier also extends to the sometimes unsatisfactory senior – junior communication in some bridge teams, the reluctance of juniors to speak up, sometimes assuming that the senior 'knows all'. The passenger liner 'Queen Elizabeth 2' suffered a major grounding on 7th August 1992 South of Cuttyhunk Island, Massachusetts, USA. Amongst the major causes stated in the NTSB investigation report were ineffective or rather negligible communication between the vessels bridge team and the Pilot, which resulted in no briefing between them for the intended passage, both had separate intended routes to follow and the OOW who did notice the error did not speak up. This was coupled with hidden pressure (explained later) to go fast for maintaining ETA at the next port and make up for the time lost for some delays in the previous port.

VHF RADIO COMMUNICATION: The Rules contained in the ***'International Regulations for Preventing Collisions at Sea'*** have no clearly stated requirements on this aspect. Like anywhere else, for example vehicles on the road, vessels at sea are expected to take ***'action to avoid collision'*** without resorting to any communication between them. The Rules only provide for communication by sound signalling, supplemented by light signals as prescribed in Rules 34 and 36 or the sound signals in restricted visibility given in Rule 35.

'All available means' referred to in Rules '5' and '7' could well include communication between all concerned within or outside a vessel, (navigators, pilots, other bridge team members, various shore based stations including VTIS / VTMS etc.), which can give warning of any developing and/or existing ***'risk of collision'*** situations. However, Rule '8' and all following Rules do not use ***'all available means'*** and as such there is no direct or implied reference that vessels should communicate with each other for the purpose of deciding and/or executing ***'any action to avoid collision'***. There are inherent dangers of miscommunication or misunderstandings in this activity apart from wrong identification of the stations and/or their positions, though the latter has reduced substantially with the advent of AIS.

However, it has been argued that the Rules also do not explicitly state anything against use of communication and with the development of modern communication systems; it may be considered illogical to say none should ever be used. However, extreme caution is required to ensure that any communication remains effective if at all resorted to, and must never be counter-productive. This means, never ever should an agreement of ***'any action to avoid collision'*** be arrived at which is either contrary to the Rules or results in passing at too close a range.

Considering the investigation reports of various accidents and the recommendations made with a view of learning lessons, the general advice given in various publications including IMO and various flag state notices is that there is no need of any verbal or other communication between vessels for the purpose of ***'preventing collisions'*** and that miscommunication may cause more harm than

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good. Many collisions have taken place due to miscommunication between vessels, or when navigators have agreed to actions contrary to the Rules or due to sheer misunderstandings and this has led to the coining of the phrase 'VHF assisted collisions'.

Analysis of accidents on the IMO website contain a lot of details including comments against the use of VHF for collision avoidance, one such report is quoted below which was obtained from the IMO website: ***analysis based on report from Panama (FSI 11):***

- ***The collision was mainly caused by the failure of the passenger cruise ship, which was the give way vessel in a crossing situation, to make sufficient alteration of course or speed to avert collision.***
- ***The VHF conversation between the two vessels might have delayed a sense of urgency from building up in the minds of the bridge officers on the two vessels.***
- ***The use of VHF as a collision avoidance tool can be counter-productive. If the COLREGS are being followed correctly it would not be necessary to use VHF for collision avoidance and thus be distracted from the attentiveness in watchkeeping.***
- ***When overtaking another vessel, careful consideration should be given to the side on which to overtake. Factors to be taken into account should include available sea room and possible need to take avoiding action in respect of other vessels in the vicinity.***

This is further highlighted in MGN 324 (M + F) of July 2006 issued by MCA of the UK. Similar guidelines are given in a circular issued by Maritime and Port Authority of Singapore on 16-06-2005; the latter is stated in the Annex section of this book.

[TASK: STUDY *'PROPER USE OF VHF CHANNELS AT SEA'* IN IMO RESOLUTION A.954(23) DATED 5TH DECEMBER 2003 AND PUBLISHED ON 26TH FEBRUARY 2004; AND,

STUDY MGN 324 TO ACHIEVE A FULLER UNDERSTANDING OF THE DANGERS ASSOCIATED WITH USING VHF AND AIS AT SEA FOR PREVENTING COLLISIONS.]

Note: MGN 324 can be found on the website www.mcga.gov.uk where a lot of other useful information is also available, or can be seen at: http://www.mcga.gov.uk/c4mca/mcga-mnotice.htm?textobjid=908E08C2F38A0072]

However, local requirements may vary; for example, it is a requirement under the USA laws for bridge to bridge communication between vessels when navigating in US territorial waters. Some US inland Rules refer to the use of communication for deciding ***'action to prevent collision'***, quite a variance from the international Rules where there is no such discretion. The US inland Rules do not extend beyond 3 miles from the US coast as stated in the **'Vessel bridge-to-bridge radiotelephone regulations given in US** 33 CFR 26'.

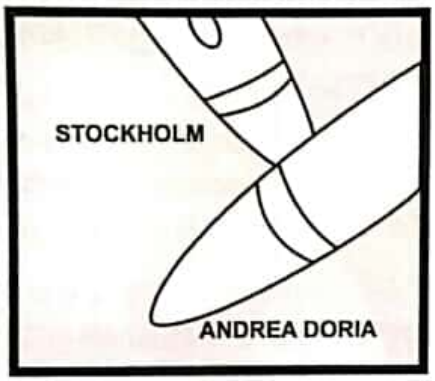
Many collisions have been caused due to improper VHF communication; a few have even been described in this book. The French report of safety investigation into the collision between 'Samco Europe' and 'MSC Prestige' states: ***'BEAmer has reservations about the systematic use of VHF. That could be, in some particular situation, of no effective assistance, especially when an officer of the watch tends to exert influence on the officer of the watch of the other vessel. COLREG rules are sufficient to be enforced "in silence".***

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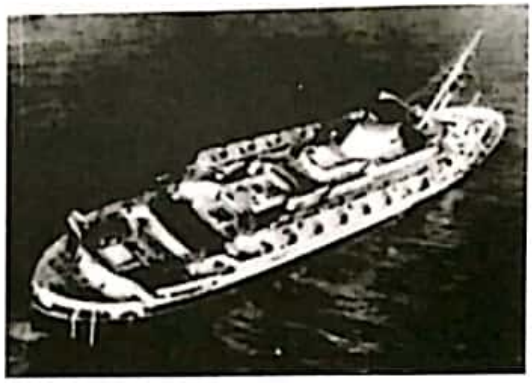
That these Rules can be applied in silence is the principle on which they have been written and this guiding spirit should be put into their practice also. (Please refer to this case given with Rule 10)

RADAR: Radar / ARPA or equivalent systems, explained earlier, can monitor and track targets and have facilities to set alarms for various parameters like CPA and TCPA etc. These systems should be set and used properly so that they can be of assistance in the navigational activities.

Relative vectors give a near immediate indication of any developing risk of collision, but are not suitable to determine the relative aspects (relative angle) between the vessels or the correct application of these Rules ***'for preventing collisions'***. It should be noted that a vessel's speed through water and the true course steered should be the correct input into the ARPA systems to get proper future predictions of the targets concerned and their aspects.



A graphic of the Stockholm and the Andrea Doria collision



Andrea Doria sinks into the Atlantic

The severe collision between passenger liners 'Andrea Doria' and 'Stockholm' off New York a little after 2300 hrs., on 25th July 1956 is attributed to wrong assessment of the data from Radar and known as the first ***'radar assisted collision'****. Andrea Doria was inbound and Stockholm was sailing out, the latter only had the 3rd Officer on the bridge. Restricted visibility due to fog patches is believed to have contributed to the collision as have been the high speeds of both the vessels, said to be around 22 and 18 knots respectively.*

The OOW on the Stockholm thought he was looking at radar data based on a 15 mile range scale, but the radar was mistakenly set at 5 miles. When he determined Andrea Doria being at 12 miles range, she was actually only 4 miles away, there was no indication of the same on the screen nor any range rings to check the exact distance, these features did not exist then.

The 'Stockholm' collided with the 'Andrea Doria' delivering a fatal gaping hole on her side and soon she was leaning dangerously to her starboard side. Watertight compartments helped keep her afloat while preparations were made to evacuate the people, many ships responded to the SOS calls. The next day Andrea Doria slowly started sinking at 0945 hrs disappearing at 1009, long after all survivors had been safely evacuated. It is said 46 people died on the 'Andrea Doria' and 5 on the 'Stockholm' due to the collision, 14 more have perished since then till mid 2006 while diving to see the wreck of 'Andrea Doria' resting on its side about 200 feet down in frigid waters North of Nantucket.

The collision took place about 40 miles southwest of Nantucket. Traffic lanes existed in the area even then but the Stockholm was heading North of its prescribed lane in order to save time. Neither vessels

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knew exactly where the other was and at the last minute the OOW on 'Stockholm' ordered starboard helm while the 'Andrea Doria' went to the port, both thinking that they were increasing the range but in reality these actions accelerated the collision.

The collision between the Bahama registered passenger cruise liner 'Norwegian Dream' bound for Dover and the Panama registered container vessel 'Ever Decent' on 24th August 1999 around 0100 hrs. is attributed to misinformation on the radar of 'Norwegian Dream', which was the give-way vessel and had confirmed on VHF that she would keep clear. Her Radar/ARPA units were all set to show true vectors, the speed input was manual instead of being through water. Apart from this excessive speed, failure to reduce speed, failure of visual look-out, failure to take visual compass bearings and failure to take ***'action to avoid collision'****, at a suitable range in ample time are the main reasons amongst others leading to the accident. The use of VHF between the two vessels confused the 'Ever Decent' that 'Norwegian Dream' would take* ***'action to avoid collision'*** *because she had verbally confirmed the same on VHF. Both vessels were close to 52'000 GT each.*

'Norwegian Dream' reversed her propulsion just before collision, which surely increased her turning circle and may also have contributed to the collision.

The Bahama Flag State Authority issued a circular about the correct use of ARPA/Radar after investigations in the above accident were completed. This and another one issued by the Marshall Islands Maritime Administrator are included in the Annex section of this book.

AUTOMATION: Automation has been a great boon in all spheres of life. However keeping a watch on the performance of the automatic systems is important. Since system failures are rare, it also becomes boring to keep watching something not prone to failure. Another aspect is controlling the settings of the automatic systems, the outputs generated will be as good or as bad as the inputs, the GIGO syndrome, ***'garbage in = garbage out'***.

Relying on guard rings of a radar is also dangerous. If a target crosses the guard ring it activates an alarm, the system on the earlier versions. However, if a target is detected inside the guard zone there may be no alarm, a usual phenomenon for weak targets. An OOW being confident that an alarm would get activated may get busy with other jobs and not maintain ***'a proper look-out'*** or radar watch leading even to collisions. Many a times, what all can go wrong in the operations of any equipment cannot always be accurately determined or forecast and can be realised only after an accident, that too after a detailed investigation or root cause analysis.

Design and ergonomics also have an impact on the way people see and react to the information.

A modern vessel was nicely fitted with computer control systems including the Auto Pilot. She suffered a few near misses as changing over to manual steering required a few keyboard/mouse controlled commands, a similar procedure applied to even change the auto pilot course settings. This led to severe disruptions in operations and the systems had to be changed back to the good old manually controlled switches.

Modern aircraft cockpit controls have evolved and have slowly changed to digital read outs, but most still carry the clock with its traditional dials since most pilots still prefer to see the time in the traditional fashion. Many digital displays have now been reversed back to dial type with needles as the readings are easier to sight and compare at a glance, for example the operating parameters of several engines.

A judge has rightly stated in a verdict that automatic systems are very valuable inventions if properly used, but they may lead to disasters if left alone, or vigilance relaxed in monitoring their effectiveness

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and actions. *'It is the people operating the vessels on whom safety at sea depends, and they cannot make a greater mistake than to suppose that machines can do all their work for them'.*

Automation and over reliance on electronic navigational aids has contributed to many accidents and an erosion of many traditional good seamanship practices. IMO and flag states have many recommendations on the cautions to be exercised when dealing with automation.

MGN 379 on correct use of navigational equipment by watch-keepers starts with, ***'accidents have occurred where the primary cause has been over-reliance on a single electronic navigational aid. Watch-keepers must always ensure that positional information is regularly cross-checked using other equipment, as well as visual aids to navigation. In other cases accidents have occurred where the watch-keeper was not fully conversant with the operation of equipment or its limitations'***. This MGN addresses the following key points:

- ***Be aware that each item of equipment is an aid to navigation.***
- ***Be aware of the factors which affect the accuracy of position fixing systems.***
- ***Appreciate the need to cross check position fixing information using other methods.***
- ***Recognise the importance of the correct use of navigational aids and knowledge of their limitations.***
- ***Be aware of the dangers of over-reliance on the output from, and accuracy of, a single navigational aid.***

[TASK: READ AND STUDY MGN 379 ON THE FOLLOWING LINK: http://www.mcga.gov.uk/c4mca/mcga-mnotice.htm?textobjid=B94E7C9E5EB6C418]

VTIS / VTMS: At times all vessels, especially small coasters, pleasure and fishing craft may not report to the controlling authorities and navigators should be careful of such traffic. Unless clearly stated VTIS/VTMS services may act in an advisory role only with the final responsibility of safe navigation, which includes ***'preventing collisions'***, resting on the navigators on board a vessel.

BRIDGE DESIGN: Though some standards have been developed, bridge designs primarily depend on the style of individual ship yards, specific requirements by the owners and the type and/or models of equipment installed. Minimum visibility criteria and fields of vision only are mandatory and have been referred to at the end of the explanations of Rule 5. Bridge designs and the array of equipment varies so much that it takes considerable time for a new seafarer on board to get used to the systems, sister ships also may have major differences between them. However, from the day a person joins a vessel, the performance levels expected are of absolute perfection.

HIDDEN PRESSURE: Human beings are well known to take undue risks; sometimes these risks are associated with complacency and at times are self-imposed or due to external pressures. People tend to cut corners or attempt an activity knowing well that the way it is being performed is not as per the normal standard operating procedures. This is a phenomenon of the human mind and thinking. Sometimes it is an individual trying to preserve their name or reputation to show that they can always outperform others and at times it may be because of commercial considerations.

These acts are unknowingly done due to subtle thoughts of an individual concerned and not because of any one directly ordering or pressurising the person on the scene to deviate from the correct norms. This pressure affects individuals to cloud their judgement or decision making so silently that the person affected may not even notice it at all and even the other team members may miss noticing the same. When team members are working together, or for example, an OOW is alone, speaking out

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the thought process of reasoning and the intended actions acts as a good safeguard to help detect any hidden pressures. Verbalising the thoughts or thinking aloud allows the brain to analyse the planned action many times over and helps an individual detect any hidden pressures, once detected a person will normally correct the wrong decisions planned, it automatically also involves other team members who may be present and they are likely to detect any errors in the planned processes. The questioning approach to management explained earlier also helps detect and correct hidden pressure.

NORMALISATION OF DEVIANCE: People are prone to deviate a little from the stated and/or normally accepted norms, without a sense of guilt or remorse, because they rationalise that the minor deviation is insignificant. When the end result is not adversely affected despite this, it creates a sense of complacency and develops into a habit to bend the rules a bit, giving rise to an attitude and behaviour of accepting the risk involved as routine, even though this may be termed as an irresponsible act. For example, breaching the speed limits on the road.

The phrase ***'normalisation of deviance'*** is used to describe this very gradual erosion of safety and quality standards caused by a taking-for-granted attitude that such small deviations are acceptable. This attitude of tolerance for gradual minute diminishing of safety and quality standards tends to gradually lower the accepted standard. Over time the deviance gets accepted as routine. If the lower accepted standard ultimately results in an accident, it takes everyone by surprise. The progressive acceptances of the lowered standards as a norm, that were perhaps initially considered high-risk, reduce the risk perception of the associated hazards.

With specific reference to ***'preventing collisions'***, rationalising the absence of a ***'look-out'*** on some occasions may slowly make it an accepted norm. Other examples are sub standard performance levels of Radar, or any other navigational equipment, which gradually get accepted as the norm or an acceptable condition of the equipment. From the point of view of navigational skills, not many new generation officers know the correct use of a sextant because position fixing has become very easy with the GPS systems, but if the GPS fails, position fixing becomes a problem in mid ocean. Similarly, over dependence on ARPA or automatic target tracking systems has led to erosion of manual radar plotting skills. The ease of Radar/AIS data has led to lower levels of taking visual compass bearings.

Normalisation of deviance develops as a hazardous culture usually born out of hazardous leadership and hazardous management practices and is a major but hidden contributor to the human errors.

JUDGEMENT & DECISION MAKING: Watchkeeping at sea is normally a combination of activities of one qualified watchkeeping officer assisted by a rating as and when necessary. Doubling up of watches or the availability of master is not a routine activity, it is only in certain critical areas of a voyage like passing areas of restricted sea room, high traffic density, when experiencing heavy weather or sometimes in restricted visibility or any combination of any of these or other factors affecting safe navigation.

The way an OOW interprets, analyses, judges and acts in any situation will determine the outcome and therefore a lot of responsibility rests on them. Using all available information, cross checking the same from all sources coupled with their full and proper interpretation, to decide the best action and execute it in a sensible and logical manner are keys to good judgement, decision making and successful, efficient and effective operations.

Causes of accidents are frequently stated as human error, lack of teamwork, not having situational

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awareness, failure to apply the Rules and so on. But effective team work or work by a sole watchkeeper can be practiced successfully only and only when the professional competence of all the team members is of the highest order and they all think and work on similar professional wavelengths.

The following best advice from a long time practicing mariner Capt. Rastom M.A. Mody, ex Dufferin 1958-1960 batch, an active seafarer from 1960 to 1997 of which in command from 1971 and one whose vessels never did suffer any collisions or any other navigational accidents, may be found useful.

"Prevention has always been better than cure. While it is prudent to go by the collision prevention Rules, it is also important never to get trapped in a dangerous situation caused by the failure of someone else whose duty it was to give-way. Always take preventive action long before a situation develops into one of close-quarters or with a possibility of collision.

To assume that the navigators on the other vessel may not follow the rules due to ignorance, sheer laziness or even plain stupidity helps create a pro active environment. That is always practice prudent navigation to ensure early action by your vessel and never allow a situation to even migrate close to grief.

Knowledge of the Rules is a must, but their application must be backed up by first hand knowledge and practical ability of ship handling. Simply said, better to be always safe than ever sorry".

Like **'defensive driving'**, **'defensive navigation'** is one of the many methods of managing ***'risk of collision'*** and is effective as the above comments prove.

SITUATIONAL AWARENESS: A full analysis of the existing scenario, as the name suggests is awareness of the situation as to what all is happening, what is anticipated and any actions required to maintain safe navigation which can be contemplated in advance and planed. Knowledge and experience play an important part in maintaining situational awareness as do alertness, attention and presence of mind of the individuals involved at any given time. Situational awareness plays an important role in effectively managing and mitigating ***'risk of collision'***.

Having complete, accurate and up-to-the-minute **'situational awareness'** is essential for successful decision-making in the management of dynamically operational activities where technological and situational complexities influence a person in control. Situational awareness is the perception of the various operational elements within a volume of time and space, the comprehension of their meaning, and the projection of their status in the near future. It is important and linked to the perception of the activities by the people in control in any complex and dynamic activity like marine navigation, aviation and power plant operations but also in very routine but complex tasks such as driving a vehicle on the road or cooking in the kitchen.

Situational awareness involves being aware of what is happening around to understand how information, events, and actions will impact the expected goals and objectives, both at present and in the near future. Lack of or inadequate situational awareness has been identified as one of the primary factors in accidents attributed to human error. It is especially important where the information flow is relatively high and poor decisions may lead to serious consequences.

This term has evolved in the aviation industry where one study found that 26.6% of the accidents took place due to unsatisfactory decision making even though sufficient information was available for

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failure of situational awareness. In the maritime sector also there is a fair amount of similarity and it is usual to see reports which state that the master, the OOW and/or the pilot failed to assimilate all available information leading to a collision, contact or stranding.

Situational Awareness is also described as a function of perception versus reality and requires that all information is received and analysed factually to arrive at decisions which are executed, a factual approach to judgement and decision making is important, not ones based on wishful thinking. However, while training helps in this aspect, there is nothing which can be done to ensure that a team will pick up on all the available information available from many available sources leading to even an overdose and the danger of over reliance on automation being always omnipresent.

All requirements on watchkeeping directly or indirectly address situational awareness without naming it. Paragraph 21 of STCW Code section A-VIII/2 for example requires that:

Relieving officers shall personally satisfy themselves regarding the:

.1 standing orders and other special instructions of the master relating to navigation of the ship;

.2 position, course, speed and draught of the ship;

.3 prevailing and predicted tides, currents, weather, visibility and the effect of these factors upon course and speed;

.4 procedures for the use of main engines to manoeuvre when the main engines are on bridge control; and

.5 navigational situation, including, but not limited to:

- ***.5.1 the operational condition of all navigational and safety equipment being used or likely to be used during the watch;***
- ***.5.2 the errors of gyro- and magnetic compasses;***
- ***.5.3 the presence and movement of ships in sight or known to be in the vicinity;***
- ***.5.4 the conditions and hazards likely to be encountered during the watch; and***
- ***.5.5 the possible effects of heel, trim, water density and squat on under-keel clearance.***

Rule 5 on look-out explains situation awareness by its clause ***'so as to make a full appraisal of the situation'***.

Each and every point, if adhered to, will help achieve situational awareness. Analysis and interpretation of the existing situation and then projecting it into future to visualise what is the expected outcome is the key. That is ***'any action to avoid collision' – 'does not result in another close-quarters situation'*** as stated in Rule 8(c) and Rule 8(d) again addresses this element by stating, ***'action taken to avoid collision with another vessel shall be such as to result in passing at a safe distance. The effectiveness of the action shall be carefully checked until the other vessel is finally past and clear'***.

Nothing to do with preventing collisions, but contrary to the advise in most text books on chart work or voyage planning in several publications, on board most vessels a line with an arrow is marked parallel to the charted course line to indicate the direction to follow. The author is aware of one near miss where an OOW got confused and was steering the vessel on this line, not on the charted course. In another case a fresh 3rd officer told a vetting inspector that this line marks the boundary of the 'no go

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area', but got confused when the inspector asked, what about the other side? He explained, the 2nd Officer must have forgotten to mark the other side.

RECORD KEEPING: No matter how inconvenient it appears, there is a legal obligation to maintain records of all activities on board. ***'A proper record shall be kept during the watch of the movements and activities relating to the navigation of the ship'.*** *(STCW Code A-VIII/2, paragraph 26).* ***'Operational tests of shipboard navigational equipment shall be carried out at sea as frequently as practicable and as circumstances permit, in particular before hazardous conditions affecting navigation are expected. Whenever appropriate, these tests shall be recorded. Such tests shall also be carried out prior to port arrival and departure'.*** *(STCW Code A-VIII/2, paragraph 33)*

'All ships engaged on international voyages shall keep on board a record of navigational activities and incidents which are of importance to safety of navigation and which must contain sufficient detail to restore a complete record of the voyage'. *(SOLAS Chapter V Regulation 28 extract)*

Companies usually prescribe suitable guidelines on record keeping as part of their SMS, sometimes directly in the various log books. All records should ideally be filled in one's own hand writing and soonest after the events in a factual manner. Errors, if any, should be neatly cut and the correct entry made with a signature, though electronic systems are slowly gaining acceptance.

Records are checked as a matter of routine in any audit or inspection but assume a very important role should something go wrong and can be of great help to prove that activities being followed were legally correct and as per established best practices.

PENALTY PROVISIONS: Shipping is an international industry, vessels are subject to the laws of the country they are registered in and also of the countries they visit. Failure to comply with the laws may lead to legal action against the staff. Some extracts from the STCW Code Regulation I/5 governing this aspect are quoted below.

1 Each Party shall establish processes and procedures for the impartial investigation of any reported incompetency, act, omission or compromise to security that may pose a direct threat to safety of life or property at sea or to the marine environment by the holders of certificates or endorsements issued by that Party in connection with their performance of duties related to their certificates and for the withdrawal, suspension and cancellation of such certificates for such cause and for the prevention of fraud.

3 Each Party shall prescribe penalties or disciplinary measures for cases in which the provisions of its national legislation giving effect to the Convention are not complied with in respect of ships entitled to fly its flag or of seafarers duly certificated by that Party.

However, all acts of punishment are invoked only if something goes wrong, that is why 'prevention is better than cure'. Quoted below is an extract from the US law.

Violations of International Navigation Rules and Regulations (33 U.S.C. 1608)

(a) Whoever operates a vessel, subject to the provisions of this Chapter, in violation of this Chapter or of any regulation promulgated pursuant to section 1607 of this title, shall be liable to a civil penalty of not more than $5,000 for each such violation.

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ACCIDENT PREVENTION: This book is all about preventing collisions. However, no matter the efforts made, in some rare cases, navigators may find that an accident is inevitable. It is not a matter of concern, whose fault. At such times it would be the duty of all to keep safety of life as their first priority, followed by environmental pollution prevention and them the preservation of property. As far as possible the impact should be taken forward of the collision bulkhead of a vessel.

In accident prevention to **'err on the safer side'** while navigating should be the first priority and **'utmost despatch'** of a voyage secondary. Remember ***'all dangers of navigation and collision'*** from Rule 2(b).

TRAINING / MENTORING

A fresh cadet going out to sea from a shore based environment with the sudden change of life style and working will take time to adjust and get used to and adjust to the same.

The human element has been discussed earlier and has a major impact on the working of the systems anywhere. Proper education and training of the human beings concerned is a very important and critical activity, it is often said that it is the human being alone who need to be educated. Training may be considered more towards acquisition of skills but education is more to do with acquisition of knowledge and the attitude to be continuous learner and share such skills and knowledge with others, especially team-mates. Not just learn the rules and procedures but to understand them well, interpret them correctly and apply them in the real working environment, in order to obtain effective results.

It is important that the seniors on board take the trouble to train their juniors in actual independent and efficient ship handling, whether in open waters or in congested waters or in narrow canals without a pilot where vessels pass within kissing distance. One does not learn cycling, horse riding or swimming by sitting on a fence and watching others perform. The STCW revisions of 2010 in resolution 7.3 states, ***'encourage all officers serving on their ships to participate actively in the training of junior personnel'***.

During team work on the bridge, whenever the master or another senior officer is present on the bridge to assist, the OOW should normally continue to have the operational control of the vessel with the master or the senior officer remaining in an advisory role, this helps the OOW in gaining confidence and experience in the navigational activities. It is easier for the more senior of the two to correct the junior by giving timely advice and suggestions than the other way round and enhances team work. The subtle difference between motivation and empowerment is best brought out on the Bridge when the Master makes a visit and observes the officer of the watch demonstrate his navigational skills. Leadership is about mentoring not merely 'on board training'.

To quote an age old saying about practice as used in training of the defence forces, **'the more you sweat in peace the less you bleed in war'**. This saying stands good for anything from games to studies to use of any equipment etc. This message is to guide you to repeat and revise the subjects you study till you achieve perfection in the same, it is important towards the practical implementation of the knowledge gained such that you **get the job done right the first time and every time**. That will be efficiency and effectiveness combined as absolute efficacy, which will achieve operational excellence free from any near misses, incidents or accidents.

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A very interesting episode to share. We received a report from a vessel that a fresh 3rd Officer posted on board was unable perform well and should be replaced. We delved into the various records and found that this 3rd Officer was a senior cadet sailing on a vessel where this master was earlier the Chief Officer. As Chief Officer he had given the cadet a very good appraisal. We quoted the reports back to the master and asked him to now complete the tasks he purportedly had done earlier.

I also remember fondly the time I was sailing as a second officer after obtaining my Master's certificate of competency with Capt. Rastom M.A. Mody in command in 1987. Whenever he came on the bridge, there was empowerment and a feeling of comfort. He rarely took the con even when approaching ports and pilot stations, but allowed us to control, observing us with a keen eye, supporting by giving professional advice with a gentle smile, intervening to the minimum but quickly answering queries or supporting the activities. That to my mind was not only the personification of leadership on the bridge but a laudable *belief in training and mentoring. I can quote several other similar examples from the time I was a cadet till I reached the level of a Master, but few dared to* take up the challenge to *reach anywhere close to these heights.*

CASE STUDIES: Several case studies have been included in this book to invoke thinking, discussion of the circumstances which led to the unfortunate accidents and to learn from the misfortune and bad experience of others. No one wishes to be involved in an accident; as such the effort is to look at the facts and the circumstances leading to the accidents and not to do any criticism of the navigators in control at the time. There are books purely on accidents and their causes and much data is abundantly available on the internet.

[TASK: YOU MAY RESEARCH THE INTERNET FOR MORE CASES, THERE ARE PLENTY TO STUDY AND LEARN FROM. REFERENCE TO SOME WEBSITES IS GIVEN WITH THE GROUNDING ACCIDENT OF THE 'SVENDBORG GUARDIAN' IN RULE 5]

The following are the weblinks to some good cases to study at convenience.

http://www.ntsb.gov/publictn/1997/MAR9701.pdf

Royal Majesty Grounding – Automation and Situational awareness related – 10/06/1995

http://www.ntsb.gov/publictn/1997/MAR9701S.pdf

Weather related near grounding of Liberian flagged tanker 'Patriot Bay' near Mexico on 15/10/1995

http://www.ntsb.gov/publictn/2005/MAB0501.pdf

fast attack US Submarine collision with Japanese Fishing training vessel, 09/02/2001

http://www.ntsb.gov/publictn/2005/MAB0503.pdf

Bahamas-flag passenger vessel Norwegian Dawn Heavy weather damage 16-04-2005.]

LEADERSHIP CHALLENGE (*)

Major factors leading to human error accidents are those that cannot readily be identified. Leadership, or rather a lack of leadership, is to blame for many accidents amongst the many causes leading to them, typically more than 20 per accidents, and human error is always there. A 'fix-it' approach like placing better radars or an ECDIS and carry out more rigorous audits/inspections is not necessarily the right approach. Companies should look at how their bridge teams operate. This may

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mean less paperwork, fewer inspections and simpler equipment, so more time could be used on operational leadership on board.

A three-factor formula to ensure safer voyages should be:

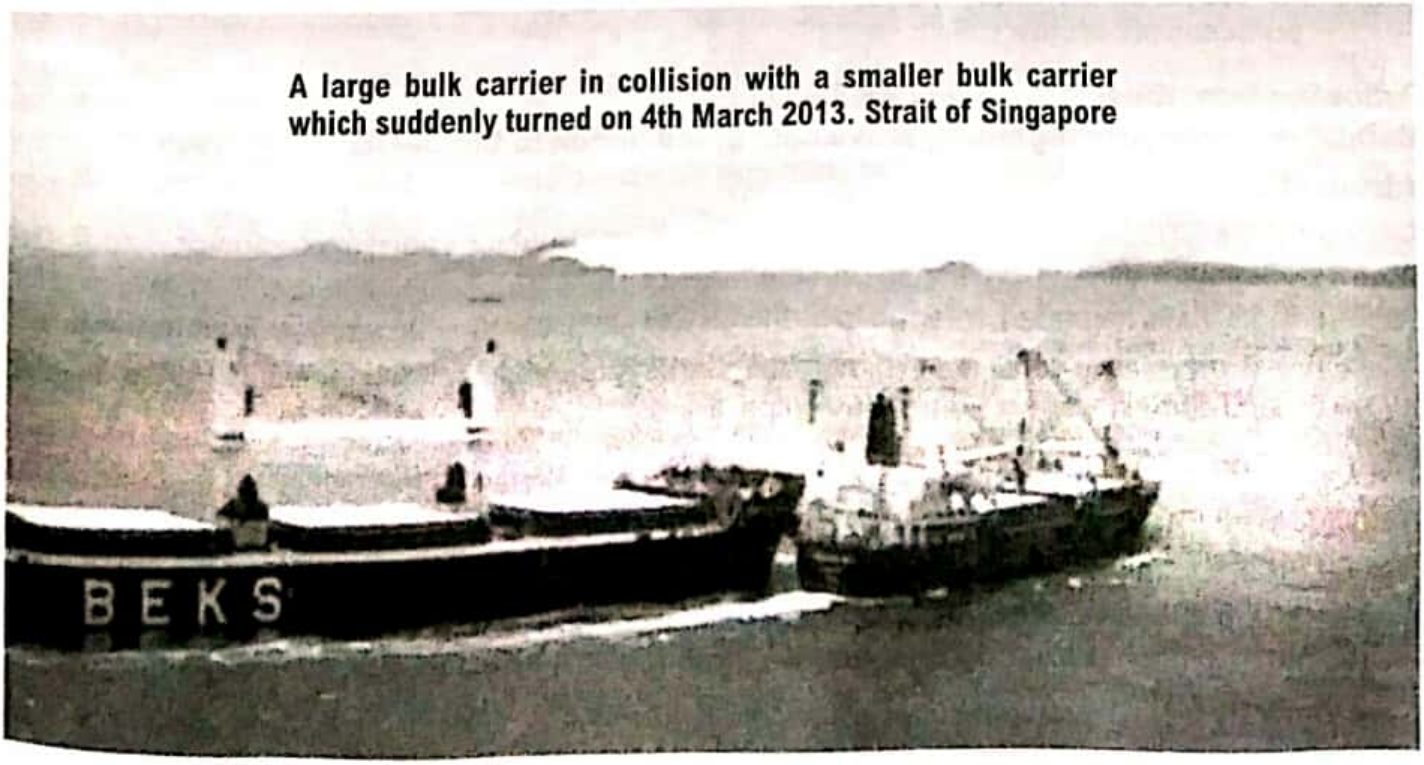
1. Planning. Effective preparation by officers and crews before voyages begin.
2. Decision-making. Officers should be able to take responsibility and be decisive without getting involved in unnecessary discussion.
3. Emergency co-operation. Everyone, regardless of rank, should be trained to co-operate during emergencies.

Some accidents are inevitable, no matter how hard an organization works to prevent them. The key is error reduction for damage limitation. With better leadership, bridge teams would be more confident and better motivated. The key to safety is a happy ship with good social environment or atmosphere among officers and crew, so that everyone is not afraid to speak up and take up individual concerns as is now being done in the aviation industry.

*(*) This is based on a **UK Maritime Pilots' Association report quoting** Torkel Soma, DNV Maritime Solutions, principal consultant. He focused on maritime accidents for his PhD from Norway's University of Technology and Science.*

[TASK: VISIT http://www.mcga.gov.uk/c4mca/mcga-research_report_521.pdf AND STUDY THE PUBLICATION TITLED, "IDENTIFICATION OF LEADERSHIP QUALITIES FOR EFFECTIVE SAFETY MANAGEMENT" REFERRED TO IN MGN 351 WHICH CAN BE SEEN ON THE MCGA WEBSITE.]

[TASK: STUDY PARAGRAPHS 17 AND 18 OF THE STCW CODE SECTION A-VIII/2. WHAT DO THESE REQUIREMENTS STATE ABOUT COMPETENCY AND/OR QUALIFICATION OF THE WATCHKEEPING STAFF?]



A large bulk carrier in collision with a smaller bulk carrier which suddenly turned on 4th March 2013. Strait of Singapore

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STCW REQUIREMENTS ON WATCHKEEPING:

Below sections governing watchkeeping include amendments done at the STCW conference in Manila during June 2010.

CHAPTER VIII

Guidance regarding watchkeeping

Regulation VIII/2

Watchkeeping arrangements and principles to be observed

1 Administrations shall direct the attention of companies, masters, chief engineer officers and all watchkeeping personnel to the requirements, principles and guidance set out in the STCW Code which shall be observed to ensure that a safe continuous watch or watches appropriate to the prevailing circumstances and conditions are maintained in all seagoing ships at all times.

2 Administrations shall require the master of every ship to ensure that watchkeeping arrangements are adequate for maintaining a safe watch or watches, taking into account the prevailing circumstances and conditions and that, under the master's general direction:

.1 officers in charge of the navigational watch are responsible for navigating the ship safely during their periods of duty, when they shall be physically present on the navigating bridge or in a directly associated location such as the chartroom or bridge control room at all times;

.2 radio operators are responsible for maintaining a continuous radio watch on appropriate frequencies during their periods of duty;

.3 officers in charge of an engineering watch, as defined in the STCW Code, under the direction of the chief engineer officer, shall be immediately available and on call to attend the machinery spaces and, when required, shall be physically present in the machinery space during their periods of responsibility;

.4 an appropriate and effective watch or watches are maintained for the purpose of safety at all times while the ship is at anchor or moored and, if the ship is carrying hazardous cargo, the organization of such watch or watches takes full account of the nature, quantity, packing and stowage of the hazardous cargo and of any special conditions prevailing on board, afloat or ashore; and

.5 as applicable, an appropriate and effective watch or watches are maintained for the purposes of security.

Following from the STCW Code PART A

Mandatory standards regarding provisions of the annex to the STCW Convention

Introduction

This part of the STCW Code contains mandatory provisions to which specific reference is made in the annex to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, as amended, referred to as the STCW Convention.

These provisions give in detail the minimum standards required to be maintained by Parties in order to give full and complete effect to the Convention.

Section A-VIII/2

Watchkeeping arrangements and principles to be observed

PART 1 – CERTIFICATION

1 The officer in charge of the navigational or deck watch shall be duly qualified in accordance with the provisions of chapter II or chapter VII appropriate to the duties related to navigational or deck watchkeeping.

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2 The officer in charge of the engineering watch shall be duly qualified in accordance with the provisions of chapter III or chapter VII appropriate to the duties related to engineering watchkeeping.

PART 2 – VOYAGE PLANNING

General requirements

3 The intended voyage shall be planned in advance, taking into consideration all pertinent information, and any course laid down shall be checked before the voyage commences.

4 The chief engineer officer shall, in consultation with the master, determine in advance the needs of the intended voyage, taking into consideration the requirements for fuel, water, lubricants, chemicals, expendable and other spare parts, tools, supplies and any other requirements.

Planning prior to each voyage

5 Prior to each voyage, the master of every ship shall ensure that the intended route from the port of departure to the first port of call is planned using adequate and appropriate charts and other nautical publications necessary for the intended voyage, containing accurate, complete and up-to-date information regarding those navigational limitations and hazards which are of a permanent or predictable nature and which are relevant to the safe navigation of the ship.

Verification and display of planned route

6 When the route planning is verified, taking into consideration all pertinent information, the planned route shall be clearly displayed on appropriate charts and shall be continuously available to the officer in charge of the watch, who shall verify each course to be followed prior to using it during the voyage.

Deviation from planned route

7 If a decision is made, during a voyage, to change the next port of call of the planned route, or if it is necessary for the ship to deviate substantially from the planned route for other reasons, then an amended route shall be planned prior to deviating substantially from the route originally planned.

PART 3 – WATCHKEEPING PRINCIPLES IN GENERAL

8 Watches shall be carried out based on the following bridge and engine-room resource management principles:

.1 proper arrangements for watchkeeping personnel shall be ensured in accordance with the situations;

.2 any limitation in qualifications or fitness of individuals shall be taken into account when deploying watchkeeping personnel;

.3 understanding of watchkeeping personnel regarding their individual roles, responsibility and team roles shall be established;

.4 the master, chief engineer officer and officer in charge of watch duties shall maintain a proper watch, making the most effective use of the resources available, such as information, installations/equipment and other personnel;

.5 watchkeeping personnel shall understand functions and operation of installations/equipment, and be familiar with handling them;

.6 watchkeeping personnel shall understand information and how to respond to information from each station/installation/equipment;

.7 information from the stations/installations/equipment shall be appropriately shared by all the watchkeeping personnel;

.8 watchkeeping personnel shall maintain an exchange of appropriate communication in any situation; and

.9 watchkeeping personnel shall notify the master/chief engineer officer/officer in charge of watch duties without any hesitation when in any doubt as to what action to take in the interest of safety.

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PART 4 – WATCHKEEPING AT SEA

Principles applying to watchkeeping generally

9 Parties shall direct the attention of companies, masters, chief engineer officers and watchkeeping personnel to the following principles, which shall be observed to ensure that safe watches are maintained at all times.

10 The master of every ship is bound to ensure that watchkeeping arrangements are adequate for maintaining a safe navigational or cargo watch. Under the master's general direction, the officers of the navigational watch are responsible for navigating the ship safely during their periods of duty, when they will be particularly concerned with avoiding collision and stranding.

11 The chief engineer officer of every ship is bound, in consultation with the master, to ensure that watchkeeping arrangements are adequate to maintain a safe engineering watch.

Protection of marine environment

12 The master, officers and ratings shall be aware of the serious effects of operational or accidental pollution of the marine environment and shall take all possible precautions to prevent such pollution, particularly within the framework of relevant international and port regulations.

Part 4-1 – Principles to be observed in keeping a navigational watch

13 The officer in charge of the navigational watch is the master's representative and is primarily responsible at all times for the safe navigation of the ship and for complying with the International Regulations for Preventing Collisions at Sea, 1972, as amended.

Lookout

14 A proper lookout shall be maintained at all times in compliance with rule 5 of the International Regulations for Preventing Collisions at Sea, 1972, as amended and shall serve the purpose of:

.1 maintaining a continuous state of vigilance by sight and hearing, as well as by all other available means, with regard to any significant change in the operating environment;

.2 fully appraising the situation and the risk of collision, stranding and other dangers to navigation; and

.3 detecting ships or aircraft in distress, shipwrecked persons, wrecks, debris and other hazards to safe navigation.

15 The lookout must be able to give full attention to the keeping of a proper lookout and no other duties shall be undertaken or assigned which could interfere with that task.

16 The duties of the lookout and helmsperson are separate and the helmsperson shall not be considered to be the lookout while steering, except in small ships where an unobstructed all-round view is provided at the steering position and there is no impairment of night vision or other impediment to the keeping of a proper lookout. The officer in charge of the navigational watch may be the sole lookout in daylight provided that, on each such occasion:

.1 the situation has been carefully assessed and it has been established without doubt that it is safe to do so;

.2 full account has been taken of all relevant factors, including, but not limited to:

– state of weather,

– visibility,

– traffic density,

– proximity of dangers to navigation, and

– the attention necessary when navigating in or near traffic separation schemes;

and

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.3 assistance is immediately available to be summoned to the bridge when any change in the situation so requires.

17 In determining that the composition of the navigational watch is adequate to ensure that a proper lookout can continuously be maintained, the master shall take into account all relevant factors, including those described in this section of the Code, as well as the following factors:

.1 visibility, state of weather and sea;

.2 traffic density, and other activities occurring in the area in which the vessel is navigating;

.3 the attention necessary when navigating in or near traffic separation schemes or other routeing measures;

.4 the additional workload caused by the nature of the ship's functions, immediate operating requirements and anticipated manoeuvres;

.5 the fitness for duty of any crew members on call who are assigned as members of the watch;

.6 knowledge of, and confidence in, the professional competence of the ship's officers and crew;

.7 the experience of each officer of the navigational watch, and the familiarity of that officer with the ship's equipment, procedures, and manoeuvring capability;

.8 activities taking place on board the ship at any particular time, including radiocommunication activities, and the availability of assistance to be summoned immediately to the bridge when necessary;

.9 the operational status of bridge instrumentation and controls, including alarm systems;

.10 rudder and propeller control and ship manoeuvring characteristics;

.11 the size of the ship and the field of vision available from the conning position;

.12 the configuration of the bridge, to the extent such configuration might inhibit a member of the watch from detecting by sight or hearing any external development; and

.13 any other relevant standard, procedure or guidance relating to watchkeeping arrangements and fitness for duty which has been adopted by the Organization.

Watch arrangements

18 When deciding the composition of the watch on the bridge, which may include appropriately qualified ratings, the following factors, *inter alia*, shall be taken into account:

.1 at no time shall the bridge be left unattended;

.2 weather conditions, visibility and whether there is daylight or darkness;

.3 proximity of navigational hazards which may make it necessary for the officer in charge of the watch to carry out additional navigational duties;

.4 use and operational condition of navigational aids such as ECDIS, radar or electronic position-indicating devices and any other equipment affecting the safe navigation of the ship;

.5 whether the ship is fitted with automatic steering;

.6 whether there are radio duties to be performed;

.7 unmanned machinery space (UMS) controls, alarms and indicators provided on the bridge, procedures for their use and their limitations; and

.8 any unusual demands on the navigational watch that may arise as a result of special operational circumstances.

Taking over the watch

19 The officer in charge of the navigational watch shall not hand over the watch to the relieving

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officer if there is reason to believe that the latter is not capable of carrying out the watchkeeping duties effectively, in which case the master shall be notified.

20 The relieving officer shall ensure that the members of the relieving watch are fully capable of performing their duties, particularly as regards their adjustment to night vision. Relieving officers shall not take over the watch until their vision is fully adjusted to the light conditions.

21 Prior to taking over the watch, relieving officers shall satisfy themselves as to the ship's estimated or true position and confirm its intended track, course and speed, and UMS controls as appropriate and shall note any dangers to navigation expected to be encountered during their watch.

22 Relieving officers shall personally satisfy themselves regarding the:

.1 standing orders and other special instructions of the master relating to navigation of the ship;

.2 position, course, speed and draught of the ship;

.3 prevailing and predicted tides, currents, weather, visibility and the effect of these factors upon course and speed;

.4 procedures for the use of main engines to manoeuvre when the main engines are on bridge control; and

.5 navigational situation, including, but not limited to:

.5.1 the operational condition of all navigational and safety equipment being used or likely to be used during the watch;

.5.2 the errors of gyro- and magnetic compasses;

.5.3 the presence and movement of ships in sight or known to be in the vicinity;

.5.4 the conditions and hazards likely to be encountered during the watch; and

.5.5 the possible effects of heel, trim, water density and squat on under-keel clearance.

23 If, at any time, the officer in charge of the navigational watch is to be relieved when a manoeuvre or other action to avoid any hazard is taking place, the relief of that officer shall be deferred until such action has been completed.

Performing the navigational watch

24 The officer in charge of the navigational watch shall:

.1 keep the watch on the bridge;

.2 in no circumstances leave the bridge until properly relieved; and

.3 continue to be responsible for the safe navigation of the ship, despite the presence of the master on the bridge, until informed specifically that the master has assumed that responsibility and this is mutually understood.

25 During the watch, the course steered, position and speed shall be checked at sufficiently frequent intervals, using any available navigational aids necessary, to ensure that the ship follows the planned course.

26 The officer in charge of the navigational watch shall have full knowledge of the location and operation of all safety and navigational equipment on board the ship and shall be aware and take account of the operating limitations of such equipment.

27 The officer in charge of the navigational watch shall not be assigned or undertake any duties which would interfere with the safe navigation of the ship.

28 When using radar, the officer in charge of the navigational watch shall bear in mind the necessity to comply at all times with the provisions on the use of radar contained in the International Regulations for Preventing Collisions at Sea, 1972, as amended in force.

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29 In cases of need, the officer in charge of the navigational watch shall not hesitate to use the helm, engines and sound signalling apparatus. However, timely notice of intended variations of engine speed shall be given where possible or effective use shall be made of UMS engine controls provided on the bridge in accordance with the applicable procedures.

30 Officers of the navigational watch shall know the handling characteristics of their ship, including its stopping distances, and should appreciate that other ships may have different handling characteristics.

31 A proper record shall be kept during the watch of the movements and activities relating to the navigation of the ship.

32 It is of special importance that at all times the officer in charge of the navigational watch ensures that a proper lookout is maintained. In a ship with a separate chartroom, the officer in charge of the navigational watch may visit the chartroom, when essential, for a short period for the necessary performance of navigational duties, but shall first ensure that it is safe to do so and that proper lookout is maintained.

33 Operational tests of shipboard navigational equipment shall be carried out at sea as frequently as practicable and as circumstances permit, in particular before hazardous conditions affecting navigation are expected. Whenever appropriate, these tests shall be recorded. Such tests shall also be carried out prior to port arrival and departure.

34 The officer in charge of the navigational watch shall make regular checks to ensure that:

.1 the person steering the ship or the automatic pilot is steering the correct course;

.2 the standard compass error is determined at least once a watch and, when possible, after any major alteration of course; the standard and gyro-compasses are frequently compared and repeaters are synchronized with their master compass;

.3 the automatic pilot is tested manually at least once a watch;

.4 the navigation and signal lights and other navigational equipment are functioning properly;

.5 the radio equipment is functioning properly in accordance with paragraph 86 of this section; and

.6 the UMS controls, alarms and indicators are functioning properly.

35 The officer in charge of the navigational watch shall bear in mind the necessity to comply at all times with the requirements in force of the International Convention for the Safety of Life at Sea (SOLAS), 1974(*). The officer of the navigational watch shall take into account:

.1 the need to station a person to steer the ship and to put the steering into manual control in good time to allow any potentially hazardous situation to be dealt with in a safe manner; and

.2 that, with a ship under automatic steering, it is highly dangerous to allow a situation to develop to the point where the officer in charge of the navigational watch is without assistance and has to break the continuity of the lookout in order to take emergency action.

(*) See SOLAS regulations V/24, V/25 and V/26.

36 Officers of the navigational watch shall be thoroughly familiar with the use of all electronic navigational aids carried, including their capabilities and limitations, and shall use each of these aids when appropriate and shall bear in mind that the echo-sounder is a valuable navigational aid.

37 The officer in charge of the navigational watch shall use the radar whenever restricted visibility is encountered or expected, and at all times in congested waters, having due regard to its limitations.

38 The officer in charge of the navigational watch shall ensure that the range scales employed are

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changed at sufficiently frequent intervals so that echoes are detected as early as possible. It shall be borne in mind that small or poor echoes may escape detection.

39 Whenever radar is in use, the officer in charge of the navigational watch shall select an appropriate range scale and observe the display carefully, and shall ensure that plotting or systematic analysis is commenced in ample time.

40 The officer in charge of the navigational watch shall notify the master immediately:

.1 if restricted visibility is encountered or expected;

.2 if the traffic conditions or the movements of other ships are causing concern;

.3 if difficulty is experienced in maintaining course;

.4 on failure to sight land, or a navigation mark or to obtain soundings by the expected time;

.5 if, unexpectedly, land or a navigation mark is sighted or a change in soundings occurs;

.6 on breakdown of the engines, propulsion machinery remote control, steering gear or any essential navigational equipment, alarm or indicator;

.7 if the radio equipment malfunctions;

.8 in heavy weather, if in any doubt about the possibility of weather damage;

.9 if the ship meets any hazard to navigation, such as ice or a derelict; and

.10 in any other emergency or if in any doubt.

41 Despite the requirement to notify the master immediately in the foregoing circumstances, the officer in charge of the navigational watch shall, in addition, not hesitate to take immediate action for the safety of the ship, where circumstances so require.

42 The officer in charge of the navigational watch shall give watchkeeping personnel all appropriate instructions and information which will ensure the keeping of a safe watch, including a proper lookout.

Watchkeeping under different conditions and in different areas

Clear weather

43 The officer in charge of the navigational watch shall take frequent and accurate compass bearings of approaching ships as a means of early detection of risk of collision and shall bear in mind that such risk may sometimes exist even when an appreciable bearing change is evident, particularly when approaching a very large ship or a tow or when approaching a ship at close range. The officer in charge of the navigational watch shall also take early and positive action in compliance with the applicable International Regulations for Preventing Collisions at Sea, 1972, as amended and subsequently check that such action is having the desired effect.

44 In clear weather, whenever possible, the officer in charge of the navigational watch shall carry out radar practice.

Restricted visibility

45 When restricted visibility is encountered or expected, the first responsibility of the officer in charge of the navigational watch is to comply with the relevant rules of the International Regulations for Preventing Collisions at Sea, 1972, as amended with particular regard to the sounding of fog signals, proceeding at a safe speed and having the engines ready for immediate manoeuvre. In addition, the officer in charge of the navigational watch shall:

.1 inform the master;

.2 post a proper lookout;

.3 exhibit navigation lights; and

.4 operate and use the radar.

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In hours of darkness

46 The master and the officer in charge of the navigational watch, when arranging lookout duty, shall have due regard to the bridge equipment and navigational aids available for use, their limitations, procedures and safeguards implemented.

Coastal and congested waters

47 The largest scale chart on board, suitable for the area and corrected with the latest available information, shall be used. Fixes shall be taken at frequent intervals, and shall be carried out by more than one method whenever circumstances allow. When using ECDIS, appropriate usage code (scale) electronic navigational charts shall be used and the ship's position shall be checked by an independent means of position fixing at appropriate intervals.

48 The officer in charge of the navigational watch shall positively identify all relevant navigation marks.

Navigation with pilot on board

49 Despite the duties and obligations of pilots, their presence on board does not relieve the master or the officer in charge of the navigational watch from their duties and obligations for the safety of the ship. The master and the pilot shall exchange information regarding navigation procedures, local conditions and the ship's characteristics. The master and/or the officer in charge of the navigational watch shall co-operate closely with the pilot and maintain an accurate check on the ship's position and movement.

50 If in any doubt as to the pilot's actions or intentions, the officer in charge of the navigational watch shall seek clarification from the pilot and, if doubt still exists, shall notify the master immediately and take whatever action is necessary before the master arrives.

Ship at anchor

51 If the master considers it necessary, a continuous navigational watch shall be maintained at anchor. While at anchor, the officer in charge of the navigational watch shall:

.1 determine and plot the ship's position on the appropriate chart as soon as practicable;

.2 when circumstances permit, check at sufficiently frequent intervals whether the ship is remaining securely at anchor by taking bearings of fixed navigation marks or readily identifiable shore objects;

.3 ensure that proper lookout is maintained;

.4 ensure that inspection rounds of the ship are made periodically;

.5 observe meteorological and tidal conditions and the state of the sea;

.6 notify the master and undertake all necessary measures if the ship drags anchor;

.7 ensure that the state of readiness of the main engines and other machinery is in accordance with the master's instructions;

.8 if visibility deteriorates, notify the master;

.9 ensure that the ship exhibits the appropriate lights and shapes and that appropriate sound signals are made in accordance with all applicable regulations; and

.10 take measures to protect the environment from pollution by the ship and comply with applicable pollution regulations.

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Following from the STCW Code Part B: *This Part of the STCW Code contains recommended guidance intended to assist those involved in implementing, applying or enforcing its measures to give the Convention full and complete effect in a uniform manner. The measures suggested are not mandatory, however, the recommendations in general represent an approach to the matters concerned which has been harmonized through discussion within IMO involving, where appropriate, consultation with the International Labour Organization, the International Telecommunication Union and the World Health Organization.*

Observance of the recommendations contained in this part will assist the IMO in achieving its goal of maintaining the highest practicable standards of competence in respect of crews of all nationalities and ships of all flags.

STCW Code : Section B-VIII/2 ***(Non Mandatory Guidelines)***

Guidance regarding watchkeeping arrangements and principles to be observed

1 The following operational guidance should be taken into account by companies, masters and watchkeeping officers.

PART 1, 2 and 3: No provisions.

PART 4 – GUIDANCE ON WATCHKEEPING AT SEA

Part 4-1 – Guidance on keeping a navigational watch

Introduction

2 Particular guidance may be necessary for special types of ships as well as for ships carrying hazardous, dangerous, toxic or highly flammable cargoes. The master should provide this operational guidance as appropriate.

3 It is essential that officers in charge of the navigational watch appreciate that the efficient performance of their duties is necessary in the interests of the safety of life and property at sea and of preventing pollution of the marine environment.

Anchor watch

4 The master of every ship at an unsheltered anchorage, at an open roadstead or any other virtually "at sea" conditions in accordance with chapter VIII, section A-VIII/2, part 4-1, paragraph 51 of the STCW Code, should ensure that watchkeeping arrangements are adequate for maintaining a safe watch at all times. A deck officer should at all times maintain responsibility for a safe anchor watch.

5 In determining the watchkeeping arrangements, and commensurate with maintaining the ship's safety and security and the protection of the marine environment, the master should take into account all pertinent circumstances and conditions such as:

.1 maintaining a continuous state of vigilance by sight and hearing as well as by all other available means;

.2 ship-to-ship and ship-to-shore communication requirements;

.3 the prevailing weather, sea, ice and current conditions;

.4 the need to continuously monitor the ship's position;

.5 the nature, size and characteristics of anchorage;

.6 traffic conditions;

.7 situations which might affect the security of the ship;

.8 loading and discharging operations;

.9 the designation of stand-by crew members; and

.10 the procedure to alert the master and maintain engine readiness.

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SELF ASSESSMENT TEST : MULTIPLE CHOICE QUESTIONS

Based on IRPCS or COLREGS, STCW and SOLAS Conventions, connected legislation and ship handling principles. The best choice given separately for reference are based on the author's perception on the interpretation and application of the applicable legislation and/or best practices; at times more than one choice may be correct. (* indicates higher level questions)

1: With respect to navigational or bridge watchkeeping of sea going vessels, which of the following is correct?

A. Navigational watchkeeping is governed only by the requirements stated in the Bridge Procedures Guide, and supporting flag state circulars, if any;
B. Navigational watchkeeping is governed only by the requirements of the International Regulations for Preventing Collisions at Sea, 1972, as amended;
C. Navigational watchkeeping is governed only by the legislation of the flag state a vessel is registered in which in turn is based solely on chapter V of the SOLAS convention;
D. Navigational watchkeeping is governed by the requirements, principles and guidance set out in the STCW Convention Regulations and Codes numbered VIII/2 which cross refer to other applicable conventions and/or regulations which need to be complied with.

2: ★ Which of the below is in **error** with respect to the watchkeeping principles stated in the STCW Code A-VIII/2?

A. The master, chief engineer officer and officer in charge of watch duties shall maintain a proper watch, making the most effective use of the resources available, such as information, installations/equipment and other personnel;
B. Watchkeeping personnel shall understand functions and operation of installations/equipment, and be familiar with handling them;
C. Watchkeeping personnel shall maintain absolute fitness to enable keep their assigned watches which shall not be changed without the express permission of the DPA;
D. Watchkeeping personnel shall notify the master, chief engineer officer or the officer in charge of watch duties without any hesitation when in any doubt as to what action to take in the interest of safety.

3: The International Regulations for Preventing Collisions at Sea, 1972, as amended are:

A. A recommendation only by IMO divided into 4 parts and 3 Annexes, last revised in 2001;
B. Divided into 5 sections, 5 parts and 5 annexes, and are a mandatory code;
C. Variable and depend on the way a particular flag state administration finally approves and adopts the same in their legislation;
D. Divided into 5 parts named 'A' to 'E' and Annex I to IV, Part B is subdivided into 3 sections, they are a convention by themselves.

4: An appropriate authority for roadsteads, harbours, rivers, lakes or inland waterways connected with the high seas and navigable by seagoing vessels, in making special Rules for such areas shall ensure that the same?

A. Conform as closely as possible to the International Regulations for Preventing Collisions at Sea, 1972, as amended;
B. Have been approved by a classification society on behalf of IMO;
C. Have their coordinates clearly shown on the appropriate nautical charts;
D. Conform with all of the above.

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5: Special Rules may be made by the Government of any State with respect to the use of additional whistle signals between?

A. Tugs engaged in coastal towing operations;
B. Ships of war and vessels proceeding under convoy;
C. Pilot vessels and vessels requiring pilots;
D. None of the above.

6: ★ Under the International Regulations for Preventing Collisions at Sea there is a requirement to practice 'good seamanship'. Which of the following should be considered 'good seamanship'?

A. Proceeding at full speed in near zero visibility as no targets are detected on any radar or on the AIS;
B. Using deck and accommodation lights at Sea which may obscure the proper running lights;
C. Proceeding on the port side of a narrow channel to take advantage of a favourable current;
D. A vessel underway should keep clear of a vessel at anchor.

7: ★ Which of the following statements 'X' & 'Y' would you consider as actions which have been carried out in compliance with the requirements of Rule 2 of the International Regulations for Preventing Collisions at Sea, 1972, as amended?

X. A power-driven vessel meeting another power-driven vessel in a head on situation, both in sight of each other, reasonable distance away and being unable to alter course to starboard owing to a large number of fishing vessels on the starboard side, she makes a rapid 90° alteration of course to port at a large range of over 7 miles.
Y. Action by a power driven vessel to avoid a formation of warships, or merchant vessels proceeding in a convoy detected on the port bow at long range, carried out assuming that the situation may likely develop into a close-quarters/risk of collision.

A. 'X' only;
B. Y' only;
C. Neither 'X' nor 'Y';
D. Both 'X' and 'Y'.

8: Which of the following is/are a vessel 'not under command', (NUC)?

A. A vessel engaged in minesweeping operations;
B. A sailing vessel becalmed (there is no wind blowing);
C. An offshore supply vessel engaged in towing another offshore supply vessel;
D. All of the above.

9: Which of the following is **not** a vessel 'restricted in her ability to manoeuvre'?

A. A vessel engaged in servicing a navigation buoy;
B. A minesweeper engaged in minesweeping operations;
C. A tanker refuelling a warship at sea, both making way through the water;
D. A loaded VLCC navigating in a narrow channel surrounded by shallow water.

10: Your power-driven vessel receives instructions in mid Atlantic in calm weather conditions of good visibility to stop and await further voyage orders. You shall arrange exhibit the following and update the status on the AIS as may be necessary:

A. Lights as per rule 23(a) at night {mast head light(s), sidelights and sternlight}, no day signals by these Rules but should hoist flag 'M' during daylight.
B. Three all-round red lights in a vertical line at night or a black cylinder during day time;

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C. Lights and shapes as per rule 27(a), i.e. Not Under Command, since the vessel now cannot manoeuvre as required by these Rules;
D. No flag or shapes during the day, put on all deck lights at night.

11: Complete the following: 'The term ***'power-driven vessel_____'***?
A. Is any vessel other than a vessel powered by sails;
B. Includes any vessel which is self-propelled;
C. Means any vessel propelled by machinery;
D. Means any vessel propelled by an internal combustion engine.

12: The statement, ***'vessels shall be deemed to be in sight of one another'*** means:
A. When one can be observed visually from the radar of the other;
B. Only when one can be observed visually from the other;
C. When one can be observed on the AIS of the other;
D. None of the above.

13: The definition of ***'restricted visibility'*** in Rule 3(l) ends with the statement ***'or any other similar causes'***. In your view which of the following fit this statement?
A. The bridge view glasses are covered with ice spray;
B. The OOW has pulled down anti glare screens in blinding sunlight;
C. Thick smoke from a forest fire ashore which has rolled over the sea;
D. None of the above.

14: According to these Rules?
A. A vessel is 'underway' **only** if she is not at anchor or made fast to a shore jetty;
B. A vessel is 'underway' **only** if she is has a speed vector over the ground;
C. A vessel is 'underway' **only** if she is not made fast to the shore;
D. None of the above is completely correct.

15: ★ A proper look-out by sight and hearing as well as all available means appropriate in the prevailing circumstances is required at all times by Rule 5 of IRPCS. Where else are lookout aspects prescribed and elaborated on?
A. Only in the Bridge Procedures Guide;
B. Only in SOLAS Chapter V which states that the master has the right to set the standards;
C. In Rule 20(b) of IRPCS (or COLREGS) and in Section A-VIII/2 of the STCW Code, the latter elaborates look-out principles and procedures in depth and uses the term about 16 times;
D. In flag state legislation and associated circulars, for example MGN 315 on **'keeping a safe navigational watch on merchant vessels'** published by MCA of the UK.

16: When making a full appraisal of the situation, can risk of collision be confirmed only as per the provisions of Rule 5 of the International Regulations for Preventing Collisions at Sea, 1972, as amended?
A. Yes;
B. No;
C. Yes and no;
D. No, look-out procedures are to make a full appraisal of the situation and of the risk of collision but any likely risk of collision should be confirmed as per the provisions of Rule 7 of IRPCS.

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17: On a vessel underway when it is dark outside, that means there is no daylight, the requirement to have an additional qualified person on look-out duty other than the OOW is a:

A. Requirement by Rule 5 of IRPCS on look-out;
B. Discretion of the OOW in consultation with or as may be instructed by the master;
C. Requirement stated in paragraph 16 of the STCW Code Section A-VIII/2;
D. Discretion of the shore based management of the organisation as may be elaborated in their Safety Management System.

18: Rule 5 of the International Regulations for Preventing Collisions at Sea, 1972, as amended, requires that a proper look-out shall be maintained at all times. Which of the following further describes look-out functions, be it an OOW who may be the sole look-out during daylight and any additional persons placed on look-out duty at any time?

A. As stated in several paragraphs of STCW Code Section A-VIII/2 but primarily in Paragraphs 14 to 17;
B. No other duties shall be undertaken by or assigned to persons on look-out duties which could interfere with that task;
C. The duties of the lookout and helmsperson are separate and the helmsperson shall not be considered to be the lookout while steering, except in small ships where an unobstructed all-round view is provided at the steering position and there is no impairment of night vision or other impediment to the keeping of a proper lookout;
D. All of the above.

19: ★ Where would you find this statement? *'In determining that the composition of the navigational watch is adequate to ensure that a proper lookout can continuously be maintained, the master shall take into account all relevant factors'.*

A. In Rule 5 of the International Regulations for Preventing Collisions at Sea, 1972, as amended;
B. In the book 'Bridge Watchkeeping';
C. In STCW Code Section A-VIII/2;
D. Usually stated in an organisations bridge procedures guidelines, does not exist in any of the above.

20: ★ Requirements of Rule 5 referred to in the previous question no. 18, read in conjunction with the mandatory requirements of the STCW Code-A Section VIII/2, an OOW when alone on watch during daylight and acting as the sole lookout:

A. May keep the bridge wing doors closed as long as the radars have the guard zone rings activated, even on totally enclosed bridges not fitted with a sound reception system;
B. May visit a separate chart room to carry out essential navigational duties for short periods if it is safe to do so without maintaining the continuity of proper lookout;
C. May make noon messages and/or complete other paper work or correct charts / publications if there is no traffic in the vicinity as determined by all sources provided radars (or ECDIS linked to working radars) have auto acquire / alarm system or the guard zone rings activated, bridge wing doors open and the VHF volume is high;
D. None of the above, proper lookout is continuous by sight and hearing and maintaining a continuous state of vigilance by sight and hearing, as well as by all other available means, with regard to any significant change in the operating environment.

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21: In considering 'safe speed' as defined in Rule 6 of IRPCS, is it true to say that:

I. At safe speed a vessel can take proper and effective action to avoid collision and be stopped within a distance appropriate to the prevailing circumstances and conditions.

II. This clearly implies that in low sea/swell conditions a vessel may proceed at full sea speed if there are no other vessels in the vicinity.

A. Both 'I' and 'II';'
B. 'I' only;'
C. 'II' only;
D. Neither 'I' nor 'II'.

22: As an OOW of a vessel you sight another vessel visually or on the radar PPI or detect her on AIS and have a doubt that there is a likelihood of risk of collision with her. As per the Rules of IRPCS (or COLREGS) this means:

A. Such risk shall be deemed to exist;
B. A doubt would fall under Rule 7(c), 'assumptions shall not be made on the basis of scanty information', so should not be taken into consideration and further checks done especially as per Rule 7(d);
C. Notify the master because of the doubt, this is required by paragraphs 8.9 and 40.10 of the STCW Code A-VIII/2, the master shall assess the situation and decide;
D. All the above are correct.

23: Two vessels are approaching each other at considerably large range but also in sight of one another. In compliance with Rule 7 of the International Regulations for Preventing Collisions at Sea, 1972, as amended (IRPCS), and paragraph 43 of the STCW Code Section A-VIII/2, they shall determine if risk of collision exists between them?

A. By monitoring each other's ranges and bearings obtained by AIS;
B. By monitoring the compass bearing of each other to check appreciable bearing change;
C. Assume it exists if either of the two vessels is heading towards the other;
D. At night, assume it exists if either of them sight both the sidelights of the other vessel on any bearing.

24: 'Proper use shall be made of radar equipment', which of the below best describes proper use of the radar.

A. It may be as defined by the Company in their documented Safety Management system;
B. By using the radar properly as per the directives given in its own operating manual;
C. As required by Rules 6, 7, 8 and 19 of IRPCS in conjunction with the various requirements contained in STCW Code Section A-VIII/2 and in other industrial codes and guides;
D. All of the above.

25: Which of the following should be accepted as proper use of radar equipment to determine if risk of collision exists?

I. Observations of other targets on the radar by a competent person, means a person trained and formally qualified to operate a radar set.

II. Compass bearing and range of other vessels obtained from the radar at regular intervals and carefully evaluated, manually or by automatic means.

A. 'I' only;
B. 'II' only;
C. Both 'I' and 'II';

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D. Neither 'I' nor 'II'.

26: With respect to the radar is this statement 'the officer in charge of the navigational watch shall ensure that range scales employed are changed at sufficiently frequent intervals so that echoes are detected as early as possible. It shall be borne in mind that small or poor echoes may escape detection.'

A. Is a part of ordinary practice of seamanship;
B. Depends on the Company SMS;
C. Is stated in legislation governing bridge watchkeeping;
D. Do not know for sure.

27: The statement, 'the officer in charge of the navigational watch shall take frequent and accurate compass bearings of approaching ships as a means of early detection of risk of collision and bear in mind that such risk may sometimes exist even when an appreciable bearing change is evident, particularly when approaching a very large ship or a tow or when approaching a ship at close range.'

A. Is based on Rule 7, compass bearing could be radar bearings and compass error must be applied to convert all compass bearings to true bearings first;
B. Is a requirement stated in STCW Code A-VIII/2 paragraph 43 and supplements IRPCS (or COLREGS) requirements as prescribed in Rule 7, the latter applies at all times and in any condition of visibility ;
C. Is a practice handed down in time and is simply an ordinary practice of seamen;
D. Is a requirement stated in the new SOLAS Chapter V and explained in the new edition of the Mariners Handbook.

28 When is Rule 8 on 'action to avoid collision' applicable?

A. In all conditions of visibility, whenever any action to avoid collision is planned and executed;
B. For any action to avoid collision but only when vessels are in sight of one another;
C. For any action to avoid collision but only between vessels not in sight of one another when navigating in or near an area of restricted visibility;
D. None of the above.

29: Rule 8(b) states, *'any alteration of course and/or speed to avoid collision shall, if the circumstances of the case admit, be large enough to be readily apparent to another vessel observing visually or by radar'.*

In case of a head-on situation involving two power-driven vessels, confirmed risk of collision in open sea, good visibility, vessels in sight of one another, at moderate to long range and moving at full sea speed, considered to be 'safe speed' in the circumstances.

What should be the amount of initial course alteration in your opinion to comply with the above quoted requirement of Rule 8 to be readily apparent to the other vessel on her radar only?

A. 5° to 10°;
B. 10° to 15°;
C. 15° to 20°;
D. 20° to 30° or even larger.

30: In a situation similar to the above but in restricted visibility, vessels not in sight of one another, still at moderate to long range and at safe speed. What will be amount of initial course alteration

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in your opinion to comply with the requirement of Rule 8(b) quoted in the above question?

A. 10° to 15°;
B. 15° to 20°;
C. 20° to 25°;
D. Minimum 30° but preferably in the range of 60° to 90°, or even higher.

31: ★ In restricted visibility a power-driven vessel is proceeding at safe speed, propulsion at manoeuvring full ahead and the engines (propulsion machinery) in a state of readiness (stand by). To avoid risk of collision with a vessel forward of her beam confirmed by radar alone, the other vessel at moderate to long range, this power-driven vessel decides to change speed only and not alter course. In your opinion, which of the below actions may be considered best to comply with Rule 8(b)?

A. Reduce speed slowly to half ahead;
B. Reduce speed slowly to slow ahead;
C. Stop engines, allow a rapid reduction in speed, using astern propulsion if necessary, and then resume forward movement at minimum propulsion power, increasing speed only after the other vessel is finally past and clear;
D. Increase to full sea speed so as to quickly pass clear of the other vessel.

32: ★ The term 'a close-quarters situation' as used in Rule 8(c), 19(d) and 19(e) means?

A. The vessels involved have a projected Closest Point of Approach (CPA) so close that collision cannot be avoided by the actions of any one vessel alone once they reach this CPA;
B. The vessels involved have a CPA bordering close to or within each vessels outer turning circle limits, where the advance should not exceed 4.5 ship lengths and the tactical diameter 5 ship lengths as per IMO criteria on ship manoeuvrability;
C. This is a term with no clear definition and is open to a continuing debate on its exact meaning;
D. All of the above statements can be used to describe 'a close-quarters situation'.

33: In any condition of visibility, with respect to Rule 8 of IRPCS, in order to avoid collision, which of the following statement is **in error or wrong**?

A. If there is sufficient sea room, alteration of course alone may be the most effective action to avoid a close-quarters situation;
B. Any alteration of course and/or speed to avoid collision shall, if the circumstances of the case admit, be large enough to be readily apparent to another vessel observing visually or by radar;
C. A large course alteration to port should always be the preferred best action;
D. A succession of small alterations of course and/or speed should be avoided.

34: Rule 8(b) states that ***'a succession of small alterations of course and/or speed should be avoided'***. In your opinion which of the below statement best describes why this requirement has been put in the Rule?

A. Small alterations of course and/or speed cause fluctuations to the engine load and propeller RPM;
B. A succession of small course or speed alterations, especially small speed alterations, will not be readily apparent to other vessels in the vicinity observing visually or by radar;
C. Executing small course and/or speed alterations is a nuisance for the watchkeepers;

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D. Small course alterations take an extremely long time to implement because a very small rudder angle is used.

35: ★ IMO **resolution MSC137(76) standards for ship manoeuvrability on** turning ability states that, the advance should not exceed 4.5 ship lengths and the tactical diameter should not exceed 5 ship lengths in the turning circle manoeuvre. This is based on using 35° rudder angle or the maximum rudder angle permissible at the test speed (85% MCR), following a steady approach with zero yaw rate. Crash astern stop distance should not exceed 15 ship lengths which a flag state may allow up to 20 lengths for large displacement vessels. In practice this means:

A. The turning circle diameter at half speed will be much larger with both advance and tactical diameter increasing substantially, the time taken to execute the turn will be longer;
B. The turning circle diameter at half speed will be more or less the same, no substantial change for practical purposes, the time taken to execute the turn will be longer;
C. The turning circle diameter at half speed will be smaller with both advance and tactical diameter reducing substantially, the time taken to execute the turn will be longer;
D. None of the above, the manoeuvring characteristics vary from vessel to vessel and depend on the classification society rules for ship construction.

36: The statement: "Whenever radar is in use, the officer in charge of the navigational watch shall select an appropriate range scale and observe the display carefully, and shall ensure that plotting or systematic analysis is commenced in ample time".

A. Is from Bridge Procedures Guide;
B. Is contained in MGN 315 published by MCA of UK pertaining to best navigational practices;
C. Is a legislative requirement in an IMO convention;
D. Is usually stated in the guidelines on navigational procedures of any organisation.

37: Immediately after commencing a large altering of course using a large rudder angle (say hard over 35°) as an action to avoid collision, a vessels propulsion speed is substantially reduced, what may happen? (Assume vessel has a single propeller).

A. The pivot point will fall aft and coupled with reduced thrust will result in a larger turning circle and reduced passing range with the other vessel;
B. Nothing will happen, speed changes have not effect on turning;
C. The action will allow more time and increase the passing range from the other vessel;
D. Will reduce the stress on the hull and machinery.

38: Navigation through a narrow channel or fairway is governed by Rule 9, basis this Rule which of the below statements is correct?

A. Vessels over 20 m in length other than sailing vessels 'which can safely navigate only within a narrow channel or fairway' have absolute privilege;
B. A vessel engaged in fishing as defined in Rule 3(d) need not stay out of the way of 'any other vessel navigating within a narrow channel or fairway';
C. Vessels must continue to keep clear of each other only as prescribed in Rule 18;
D. A vessel shall not cross a narrow channel or fairway if such crossing impedes the passage of a vessel which can safely navigate only within a narrow channel or fairway and this is to be complied with and executed as prescribed in Rule 8(f).

39: Power-driven vessel 'A' constrained by her draught is proceeding along a narrow channel displaying the optional 'CBD' signals prescribed in Rule 28. A small power-driven vessel 'B' less

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than 20 m in length commences to cross this narrow channel from the starboard side to the port side of 'A'. It appears that she will impede the safe passage of 'A', though 'B' is obliged not to. What signal should 'A' give under these circumstances?

A. One short blast;
B. At least five short and rapid blasts, which may be supplemented by a light signal of at least five short and rapid flashes;
C. Three short blasts;
D. One prolonged, one short, one prolonged and one short blast in that order.

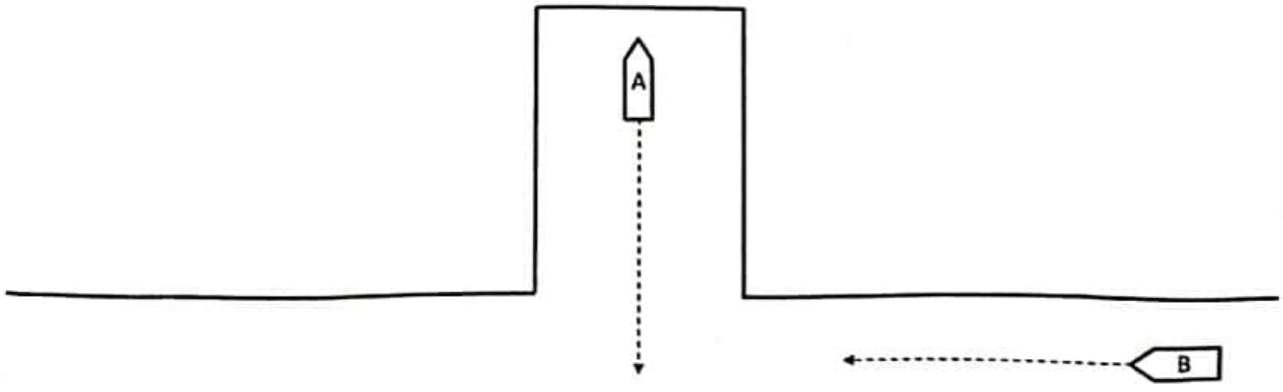
40: In the above scenario if these two vessels find that the situation is developing into a close-quarters and/or a risk of collision between them, assuming the visibility is good, the range between the vessels moderate and the time to collision still around 12 to 15 minutes provided they both keep their course and speed. What will be the best actions expected in compliance with the Rules?

A. Vessel 'A' should keep her course and speed and wait for 'B' to take action to avoid impeding her safe passage;
B. Vessel 'B' should keep her course and speed and wait for 'A' to take action as this is a simple crossing situation;
C. Vessel 'A' should take action to avoid collision as per the Rules in Part 'B' of these Rules, while vessel 'B' continues to retain her obligation to not impede the safe passage of 'A' and keep clear but should act in line with the Rules of part B so as not to embarrass or frustrate any actions which may be taken by 'A' to avoid the imminent developing close-quarters and/or a risk of collision situation;
D. The two vessels should communicate with each other by VHF or any other means to decide what actions they should take to avoid collision.

41 A power-driven vessel is proceeding up a narrow channel against the current, she should?

A. Navigate in the channel on the side opposite of the one maintained by the down bound vessels;
B. Proceed and keep as near to the outer limit of the channel or fairway which lies on her starboard side as is safe and practicable;
C. Proceed and keep as near to the outer limit of the channel or fairway which lies on her port side as is safe and practicable;
D. Always keep as close to the centre of the channel as possible.

42: Vessel 'A' is exiting stern first from a dock and is sounding one prolonged blast on her whistle as per Rule 34(e). Power-driven vessel 'B' is passing by as illustrated, hears the whistle signal but cannot see vessel 'A'. Vessel 'B' shall?



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A. Reduce speed or turn around to wait until vessel 'A' clears the slip;
B. Sound one prolonged blast using her whistle and navigate with particular alertness and caution;
C. Sound at least five short and rapid blasts on her whistle to wake up 'A';
D. Take such action as may be felt necessary and required by the ordinary practice of seamen, or by the special circumstances of the case.

43: Requirements of Rule 10 of the International Regulations for Preventing Collisions at Sea, 1972, as amended, applies to traffic separation schemes:
A. Adopted by the International Maritime Organisation;
B. Adopted by local authorities;
C. Adopted by the association of the navies of the world;
D. All of the above.

44: As per Rule 10, referred to in the previous question, 'a vessel shall, so far as practicable, avoid crossing traffic lanes but if obliged to do so shall cross .....':
A. At a course and speed which will lead to the least number of encounters with other vessels in the traffic lane;
B. On a heading, (heading means true course steered), that will cause her to spend the least time in the traffic lane;
C. On a heading, (heading means true course steered), as nearly as practicable at right angles to the general direction of traffic flow of the traffic lane;
D. On a heading so that her track or course made good will be as nearly as practical at right angles to the general direction of the concerned traffic lane.

45 Which of the following vessels may use inshore traffic zones at any time?
A. Any vessel constrained by her draught (CBD) or restricted in her ability to manoeuvre (RAM);
B. Vessels of less than 20m in length, sailing vessels and vessels engaged in fishing;
C. Any vessels engaged in a towing operation;
D. All the above vessels.

46: Which of the following statement(s) best describes a situation or situations when a vessel shall avoid anchoring:
I: In a narrow channel, if the circumstances of the case admit.
II: In a traffic separation scheme or in areas near its terminations, so far as practicable.
A. Only statement 'I' is correct;
B. Both statements 'I' and 'II' are correct;
C. Both statements 'I' and 'II' are not correct, it is a matter of master's discretion; all traffic is obliged to keep clear of any vessel at anchor;
D. Only statement 'II' is correct.

47: ★ Do the rules of IRPCS or mandatory watchkeeping provisions of STCW provide any clear or specific advice to use VHF, AIS or any other means of communication to decide and/or confirm action to avoid collision during navigational watchkeeping at sea?
A. Yes;
B. No, but this may be considered as part of, 'precaution which may be required by the ordinary practice of seamen, or by the special circumstances of the case', under Rule 2;

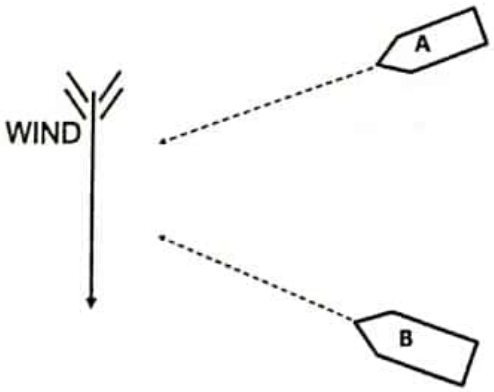
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C. No, but this may be considered as use of 'all available means' under Rule 5 and/or Rule 7;
D. No, there is no clear or specific advice. Compliance with the rules of IRPCS in silence alone is more effective in avoiding collisions.

48: Rule 7 of the IRPCS and paragraph 43 of STCW Code Section A-VIII/2 mention compass bearing. Compass bearings should be?
A. Visual bearings taken using the standard magnetic compass and any connected repeaters;
B. Visual bearings taken using the gyro compass and any connected repeaters;
C. Radar bearings taken from gyro stabilised radar if the above two options are not available, keeping in mind the inherent errors and/or reduced accuracy of radar bearings;
D. All of the above.

49: Which of the following statement are correct in describing the way any action to avoid collision should be executed in compliance with the IRPCS?
I. In sight of one another, one or sometimes both vessels are obliged to take action;
II. All situations are usually governed by the relative aspect between vessels. Exceptions being, situations involving sailing vessels as per Rule 12; and responsibilities between vessels as per Rule 18 where no specific directional aspects or actions are prescribed;
III. In or near an area of restricted visibility when not in sight of one another, both vessels are always required to take action irrespective of the type of vessel;
IV. The use of manoeuvring signals is applicable only to power-driven vessels provided they are within the approximate audible range of their sound signals;
A. 'I' and 'II' are correct;
B. 'I', 'II' and 'III' are correct;
C. 'I', 'II' and 'IV' are correct;
D. All 4 options 'I', 'II', 'III' and 'IV' are correct.

50: In the illustrated encounter between two sailing vessels at medium range, in sight of one another and involving risk of collision; which of the below is correct as per IRPCS?'

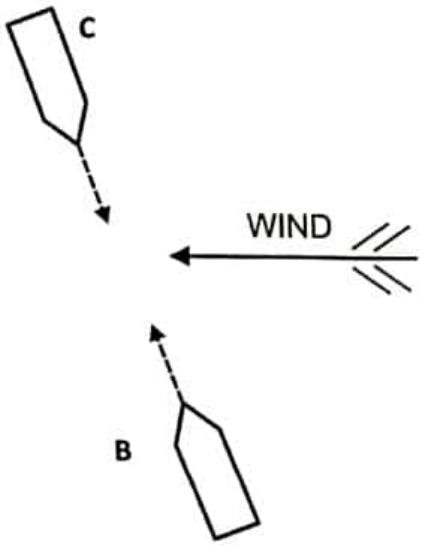


A. 'A' keeps out of the way of 'B';'
B. 'B' keeps out of the way of 'A';
C. Both 'A' and 'B' have equal responsibilities to keep clear;
D. No Rules apply.

51: You should assume that your vessel is overtaking another vessel if:
★ A. By night, you are unable to see the other vessel's sidelights and/or her masthead light(s);
B. By day, you are in doubt whether your vessel is approaching from more than 22.5° abaft the beam of the other vessel or not, your vessel is somewhere near this direction;
C. You can only see the sternlight of the other vessel;
D. If any of the above conditions exist.

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52: Two sailing vessels 'B' and 'C' are approaching each other as illustrated below and are in sight of one another. To avoid collision their action to avoid collision shall be?



A. Vessel 'C' shall keep clear of vessel 'B';

B. Vessel 'B' should keep clear of vessel 'C';

C. Both vessels 'B' and 'C' are equally responsible to keep clear as per Rule 14 and each shall alter her course to starboard;

D. This is a case of special circumstances and ordinary practice of seamen to be applied, there are no specific Rules which prescribe responsibilities and/or actions for this type of a situation.

53: When a sailing vessel is overtaking a power-driven vessel and both are in sight of one another, assuming there is a developing risk of collision between them:

A. The power-driven vessel shall keep out of the way of the sailing vessel;
B. The sailing vessel shall keep out of the way of the power-driven vessel being overtaken;
C. Both vessels shall take action to stay away from each other;
D. There is no need for anyone to take action as the sailing vessel will stop as she approaches close to the power-driven vessel, no wind will be left on her sails.

54: ★ A vessel Not Under Command (NUC) is overtaking a normal power-driven vessel in conditions similar to the above, sufficient sea room and no other vessels in the vicinity, if there is a developing close-quarters and/or risk of collision how should it be prevented?

A. The vessel 'NUC' should keep out of the way of the power-driven vessel as required by Rule 13;
B. Both vessels should make all efforts to keep clear of each other because no Rules clearly apply in this situation and it is a case of ***'precaution which may be required by the ordinary practice of seamen' and 'due regard shall be had to all dangers of navigation and collision and to any special circumstances including the limitations of the vessels involved'***;
C. The power-driven vessel should keep clear in these circumstances by application of 'precaution which may be required by the ordinary practice of seamen' and 'due regard shall be had to all dangers of navigation and collision and to any special circumstances including the limitations of the vessels involved';
D. This 'NUC' vessel is in distress and the power-driven vessel must render all possible assistance simultaneously informing the rescue coordination centres and all other vessels in the vicinity and assume the role of an on scene commander.

55: Power-driven vessel 'A' first visually sights power-driven vessel 'B' approaching from a relative bearing of about 29° abaft her starboard beam. After some time 'B' is on a relative bearing 05° forward of her starboard beam as illustrated and there is a developing close-quarters and/or risk of collision, the range is still medium to large. The situation shall now be governed by:

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A. Rule 15, two power-driven vessels crossing;
B. Rule 13, a vessel overtaking another;
C. Rule 14, two power-driven vessels meeting in a head-on situation;
D. Rule 2, 'all dangers of navigation and collision and to any special circumstances'.

56: In the forward direction the sidelights?
A. Do not overlap;
B. Practically cut off at 1° to 3° outside the prescribed sector while maintaining the minimum required intensity up to 1° outside the prescribed sector;
C. Some overlap is allowed and depends on the classification society's rules;
D. There is no Rule regarding this.

57: In the aft direction, that is 22.5° abaft the beam, the masthead, stern and sidelights shall:
I: Maintain their minimum required intensity up to 5° of the prescribed sector.
II: The intensity may decrease by 50 % from within 5° of the prescribed sector till the limit of the sector and thereafter decrease steadily to reach practical cut off at not more than 5° outside their prescribed sectors.
Which of the above statement/s is/are correct?
A. Both the above statements are wrong as are not defined in Rule 21;
B. Both the above statements are correct and are as given in SOLAS Chapter V;
C. There is no regulation in the SOLAS, STCW or the Loadline conventions about the cut off limits, lights must cut off exactly at the limits as prescribed in Rule 21 of the Convention on the International Regulations for Preventing Collisions at Sea, 1972, as amended;
D. Both the above statements 'I' and 'II' are correct as are stated in Annex I of the Convention on the International Regulations for Preventing Collisions at Sea, 1972, as amended.

58: At night, power-driven vessel 'A' is approaching a power-driven vessel 'B' as illustrated, 'B' is more than 50 m in length and there is developing risk of collision. In excellent visibility conditions vessel 'A' occasionally sees both white masthead lights and the green sidelight of vessel 'B', the range is over 5 miles. As per the International Regulations for Preventing Collisions at Sea, 1972, as amended, the action to avoid collision should be?



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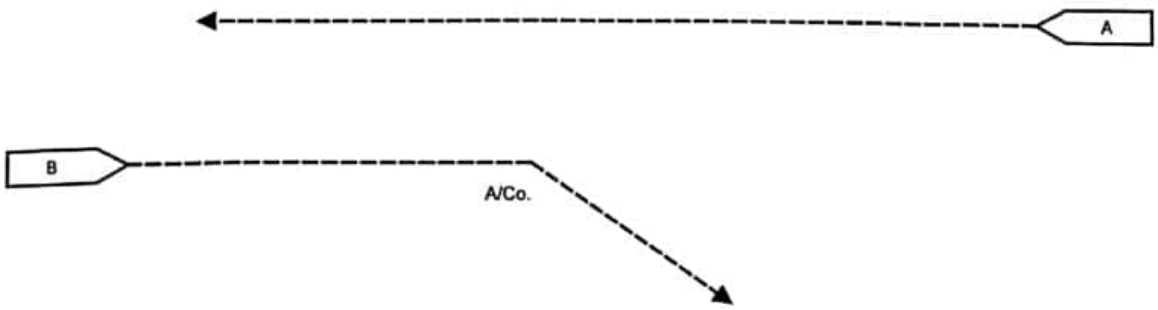
A. Vessel 'B' must keep clear of vessel 'A' as this is a crossing situation;
B. Vessel 'A' must keep clear of vessel 'B' as she is clearly overtaking;
C. Both vessels are equally responsible for keeping clear, these are special circumstances;
D. This is a confusing situation and the OOW must notify the master immediately as required by paragraphs 8.9 and 40.2 of the STCW Code Section A-VIII/2 and not hesitate to take immediate action for the safety of the ship as per paragraph 41of this section A-VIII/2.

59: If two power-driven vessels 'A' and 'B' are proceeding towards each other in sight of one another as shown at a reasonably large enough range of around 10 miles, which of the following statements is correct about their expected best action in full compliance with IRPCS as amended, if carried out when they are still over 6 to 8 miles range?



A. Both 'A' and 'B' shall alter their course to starboard so that each shall pass on the port side of the other to avoid collision, each shall indicate the manoeuvre by one short blast on her whistle;
B. Both 'A' and 'B' shall alter their course to starboard so that each shall pass on the port side of the other to avoid collision, no whistle signals are required to be sounded since they are very far and out of the range of sound signals;
C. 'A' or 'B' should each blow 5 blasts on their whistles and wait for a response from the other, if not call the other vessel by VHF after confirming her data using the AIS, then inform each other of their intended actions either by an AIS text message or by VHF radiotelephony using Standard Marine Communication Phrases published by IMO;
D. Either 'A' or 'B' should make a large course alteration to starboard, and sound one prolonged blast on her whistle supplemented by an all-round light signal. With the risk of collision mitigated, the other vessel should keep her course and speed.

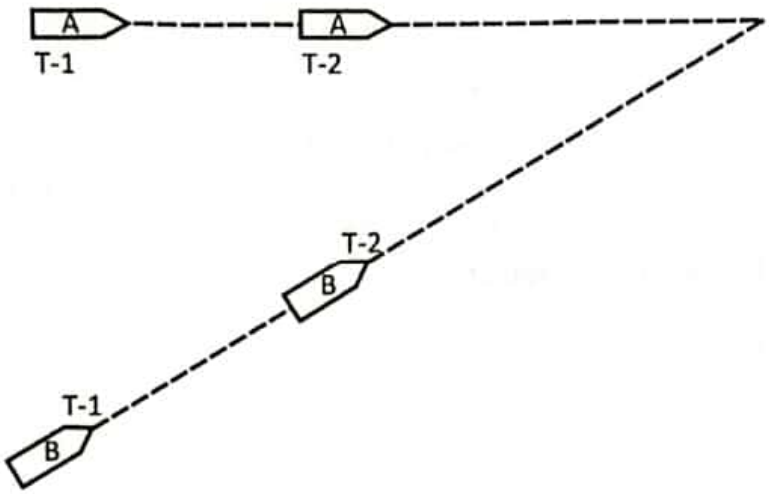
60: ★ Two power driven vessels 'A' & 'B' in sight of one another are passing clear of each other with CPA over 2.0 miles as shown; there is no risk of collision. Vessel 'B' is about to make a normal navigational course alteration to starboard. Is vessel 'B' authorized or required by the International Regulations for Preventing Collisions at Sea, 1972, as amended, to sound one short blast to indicate her alteration of course to starboard?



A. Yes and is a requirement of the Rules for preventing collisions;
B. It is left to the discretion of the OOW or as may be stated in masters standing orders;
C. Not specifically required by the collision prevention Rules but may be done as an ordinary practice of seamanship and by the 'authorized' clause of Rule 34(a);
D. None of the above.

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61: Two power-driven vessels 'A' & 'B' are approaching each other in good visibility as shown involving risk of collision. 'A' is steering East (090°). T-1 indicates the time and position when they first sight each other at long range. At T-2 the range is about 8 miles, the compass bearing between them has remained steady as 194° - 014°. Both vessels are moving at full sea speed considered safe in the prevailing circumstances. Assuming ample sea room and no other vessels in the vicinity, which of the following best describes the situation and the expected best action to avoid collision to be executed as the range reduces?



A. 'B' is overtaking and thus 'B' is obliged to keep clear, 'A' to keep her course and speed;
B. This is a crossing situation, 'B' to keep her course and speed as a stand-on vessel, 'A', the 'give-way vessel' should preferably make a large alteration to starboard, initially to about 197° and keep slowly returning to port but always aiming to finally pass well clear astern of 'B' such that 'B' can see only her red sidelight sector or her port side. Instead 'A' may even alter by a large amount to port or may even reduce speed by stopping or reversing her means of propulsion, always complying with the applicable manoeuvring sound signals stated in Rule 34(a);
C. Use Rule 2, 'special circumstances' and/or 'ordinary practice of seamen', both 'A' & 'B' to take action to keep clear of each other;
D. Both vessel's to identify each other by AIS, communicate by VHF and then decide/execute the best actions between them.

62: In open waters, you are the OOW on a power-driven vessel and visually sight the lights illustrated right ahead, at medium range and confirm that risk of collision exists. The best action to avoid risk of collision shall be?

○ white
○ white
○ white
○ green ○ red

A. You take action to keep your vessel out of the way, the other vessel shall keep her course and speed;
B. Reduce speed and wait for the other vessel to indicate the passing side, by VHF or flashing of lights;
C. Both vessels shall alter their courses to starboard, sounding one short blast each;
D. Your vessel should turn around and run away at maximum speed as this is a pirate vessel.

63: ★ Do the International Regulations for Preventing Collisions at Sea, 1972, as amended, provide any clear or specific advice on actions to be taken in case of multi vessel situations where each

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vessel in the vicinity may have or may develop a risk of collision or a close-quarters situation with more than one vessel in the vicinity?

A. No;
B. Yes;
C. There is no clear advice; the Rules should be applied as best applicable in compliance with the spirit of the best expected actions in the situations and the requirements contained in Rules 2 and 8;
D. There is no clear advice for such situations; there are no Rules to apply and the navigating staff may take any action they deem fit as long as they manage to avoid collision, best is to discuss on VHF and/or teletext on AIS to decide the best actions.

64: In the situation shown below in an area of ample sea room power-driven vessels shown are underway, at medium range, navigating (making way) through the water, in sight of each other and approaching closer. The OOW on vessel 'A' determines that risk of collision exists with both 'B' and 'C', the OOW on 'A' should?



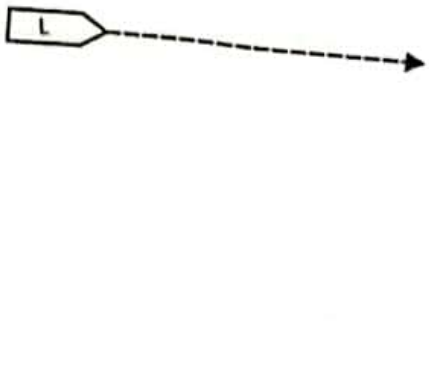
A. Comply with the International Regulations for Preventing Collisions at Sea, 1972, as amended, as a give-way vessel, by making a large alteration of course to starboard to avoid 'B' and sound one short blast. 'C' is the give-way vessel for 'A', 'B' for both 'A' and 'C' and they are expected to act accordingly;
B. Keep course and speed as a stand-on vessel with regard to 'C';
C. Stop own vessels propulsion as being the best single action to avoid both 'B' and 'C' and notify the master immediately;
D. Execute a bold alteration of course to port of about 90° to pass around the stern of 'C'.

65: You are an OOW on a power-driven vessel proceeding in a traffic lane of a TSS and another large power-driven vessel, visible by sight, medium to large range, is crossing your vessel from the starboard side. There is developing risk of collision, deep water extends even outside the TSS but as part of the adjoining inshore traffic zone. Your vessel should?

A. Keep her course and speed as a stand-on vessel. Following a traffic lane makes your vessel a privileged vessel;
B. Act as a 'give-way vessel' as per Rule 15 and keep clear even if it means crossing or going into an inshore traffic zone;
C. Act as a 'give-way vessel' as per Rule 15 and try to keep clear but only if it can be done without crossing a separation line, a separation zone or entering an inshore traffic zone;
D. Leave the traffic lane so that your vessel will have full freedom to manoeuvre as per your choice to enable avoid collision as per Rules 2 and 17.

66: Power-driven vessel 'K' sights a fast power-driven vessel 'L' as illustrated at a range of just over 10 miles, 'K' should initially?

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A. Keep her course and speed as a 'stand-on vessel', carefully observe the compass bearing of the approaching vessel 'L' and comply with all other requirements of Rule 7 to determine if a close-quarters situation and/or risk of collision is developing while maintaining proper look-out to see if 'L' is taking any action to avoid collision, if so required;
B. Sound one short blast and alter to starboard;
C. If necessary, reduce speed or stop;
D. Slacken her speed or take all way off to allow more time to assess the situation while monitoring the compass bearings of vessel 'L'.

67: Which of the following describes the correct application of the Rules contained in IRPCS?
A. Any action to avoid collision in normal circumstances is governed by the Rules contained in Part 'B' of the Regulations;
B. Rules in section I of part B apply in any condition of visibility or at all times;
C. In case vessels are not in sight of one another when navigating in or near an area of restricted visibility, Rules 4 to 10 of sections I and Rule 19 of section III apply but Rules 11 to 18 of section II do not, except the definition of overtaking from Rule 13. Rules 11 to 18 are applicable only when the vessels concerned can sight each other visually;
D. All the above statements are correct.

68: As per Rule 8(f), which applies in all conditions of visibility, which of the following statement is **wrong**?
★ A. A vessel required not to impede shall take early action to allow sufficient sea-room for the other vessel and shall avoid impeding her passage or safe passage;
B. A vessel whose passage is not to be impeded remains fully obliged to comply with the Rules of Part B of these Rules to take action to avoid collision, should risk of collision develop with the vessel which is required not to impede her passage or safe passage;
C. In case Risk of collision develops between these two vessels concerned, only the relevant steering and sailing Rules shall be complied with in case the vessels are in sight of one another, the 'give-way vessel' shall still be the one to take action as per Rules 8 and 16 and a 'stand-on vessel' should continue to keep her course and speed as long as possible;
D. In case Risk of collision develops between the vessels concerned covered by this Rule, the vessel required not to impede the passage or safe passage of the other, continues to retain her obligation to not impede her passage or safe passage. And shall, when taking action, have full regard to the action which may be required by the Rules in Part B.

69: When a power-driven vessel and a sailing vessel are approaching so as to involve risk of collision and are in sight of one another, a power-driven vessel shall keep out of the way of a sailing vessel:
A. In all circumstances;
B. Except when the sailing vessel is overtaking;

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C. Except when the sailing vessel is overtaking or the power-driven vessel is fishing;

D. Except when the sailing vessel is overtaking the power-driven vessel or the power-driven vessel is a fishing vessel actually engaged in fishing, or the power-driven vessel is either not under command or restricted in her ability to manoeuvre.

70: Rule 17(c) on a 'stand-on vessel' states, 'a power-driven vessel which takes action in a crossing situation in accordance with sub-paragraph (a) (ii) of this Rule to avoid collision with another power-driven vessel shall, if the circumstances of the case admit, not alter course to port for a vessel on her own port side'. Assuming two power-driven vessels are involved in such a scenario, in application these requirements mean that:

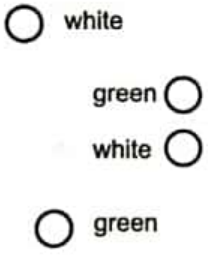
A. A give-way vessel is not relieved of her obligation in such circumstances to keep out of the way and she alone must act properly to avoid collision, the stand-on vessel should continue to keep her course and speed;

B. A stand-on vessel is restricted from altering her course to port when she takes action to avoid collision by her manoeuvre alone, as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in compliance with these Rules, in the situation quoted in the question;

C. A stand-on vessel is restricted from altering her course to port when she finds herself so close that collision cannot be avoided by the action of the give-way vessel alone;

D. A give-way vessel is not authorised to invoke Rule 2 requirements which may make a departure from these Rules necessary to avoid immediate danger.

71: In open waters, a power-driven vessel observing the lights illustrated on a steady compass bearing and slowly decreasing range on the port side shall:



A. Keep her course and speed; keep a careful watch on the compass bearing of this other vessel and the OOW should notify the master;

B. Keep out of the way of the other vessel, she is free to take any action as best suited in the situation;

C. Execute a large course alteration to port and sound two short blasts in ample time;

D. Make a substantial alteration of course to starboard in good time and sound one short blast.

72: ★ A power-driven vessel with operational radars is navigating inside an area of restricted visibility varying from 0.5 to 1.0 Nautical Miles, she should proceed at?

A. Any speed if there are no targets showing on her radars or on the AIS and she also cannot hear any sound signals other than her own;

B. Full speed if there are no targets showing on her radars or on the AIS and she also cannot hear any sound signals other than her own but only in deep open waters;

C. A safe speed always, further adapted to the prevailing circumstances and conditions of restricted visibility and her engines ready for immediate manoeuvre, that is on 'stand-by';

D. Full sea speed with the engines ready for immediate emergency manoeuvring since a proper look-out watch is being maintained by all available means including hearing, visual, radar, VHF and AIS.

73: "The officer in charge of the navigational watch shall use the radar whenever restricted visibility is encountered or expected, and at all times in congested waters, having due regard to its limitations." And, 'in clear weather, whenever possible, the officer in charge of the navigational

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watch shall carry out radar practice'. These requirements are?

A. Part of ordinary practice of seamanship;
B. Depends on the procedures stated in the SMS;
C. Do not know for sure but are usually always practiced on board vessels;
D. Are stated in legislation governing bridge watchkeeping.

74: Rule 15 of IRPCS states, 'when two power-driven vessels are crossing so as to involve risk of collision, the vessel which has the other on her own starboard side shall keep out of the way'. 'Her own starboard side' in this Rule means?

A. The other power-driven vessel is located anywhere from right ahead or 000° relative bearing till the starboard beam or 090° relative bearing;
B. The other power-driven vessel is located anywhere from close to right ahead relative bearing on the starboard side till right astern or 180° relative bearing;
C. The other power-driven vessel is located anywhere from right ahead or very close to right ahead on the starboard side till 22.5° abaft the starboard beam, only her read sidelight being visible at night or corresponding equivalent aspect during day;
D. The other power-driven vessel is located anywhere from either absolute right ahead or anywhere very close to right ahead relative bearing on either side till 22.5° abaft the starboard beam.

75: You are OOW on a power-driven vessel crossing a traffic lane of a TSS steering a course as nearly as practicable at right angles to the general direction of traffic flow of that lane. You sight another power-driven vessel proceeding in the general direction of the traffic flow lane for that lane; she is on your port bow and reasonable distance away. She is crossing your path from your vessels port to starboard, you are on her starboard side and risk of collision is determined to exist. You shall:

A. Act as a give-way vessel and not impede her passage as per Rules 9(d) and 8(f);
B. Act initially as a stand-on vessel in compliance with Rule 17, maintain course and speed;
C. Comply with IRPCS or COLREGS correctly, that is not cross a TSS but go around it;
D. Leave the traffic lane, turn back immediately and await a clear passage free of any traffic before attempting to cross the TSS again.

76: You are OOW on a vessel navigating in an area of restricted visibility, which of the following statement(s) is/are correct?

I. If close-quaters situation and/or risk of collision is developing with another vessel detected by radar alone at moderate to long range, take early action in ample time to avoid the developing situation between your vessel and the other vessel which you cannot visually see or hear the sound signals of.
II. In certain circumstances, an alteration of course to port may be required to avoid a developing close-quarters and/or risk of collision situation with another vessel forward of the beam detected by radar alone.

A. 'I' only;
B. 'II' only;
C. Both 'I' and 'II';
D. Neither 'I' nor 'II'.

77: A power-driven vessel is approaching an area of restricted visibility. She hears apparently from a direction 30° on her starboard bow a sound signal of one prolonged blast but no targets are

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visible or showing on her radar screen and/or AIS, she:

A. Should sound one prolonged blast on her whistle repeatedly to acknowledge the signal and also put her engines on standby;
B. She shall reduce her speed to the minimum at which she can be kept on her course. She shall if necessary take all her way off and in any event navigate with extreme caution until danger of collision is over. She shall continue to comply with the sound signals prescribed in Rule 35 for use in or near an area of restricted visibility;
C. May contact the VTIS/VTMS services monitoring traffic in the approaches to Mumbai and seek their guidance or instructions for actions to take if in VHF range;
D. Should sound two short blasts on her whistle and give hard to port rudder.

78: When should a prudent OOW ensure that the Rules from IRPCS concerning lights are complied with?

A. From sunrise to sunset in restricted visibility;
B. From sunset to sunrise, during darkness when there is no daylight;
C. In all other circumstances when it is deemed necessary irrespective of weather and/or visibility conditions;
D. All of the above, always ensuring that no other lights shall be exhibited which could interfere with the keeping of a proper look-out.

79 On a power-driven vessel of more than 12 m in length a masthead light should be placed over the fore-and-aft centerline of the vessel showing an unbroken light over an arc of the horizon of?

A. 22.5° (2 points) forward of the beam from the port through the right ahead direction to 22.5° (2 points) forward of the beam on the starboard side of a vessel or a total of 135°;
B. 135° (12 points) on both port and starboard sides of the right ahead direction or a total of 270°;
C. 112.5° (10 points) on both port and starboard sides of the right ahead direction or a total of 225°;
D. 360° (32 points) or all around the horizon.

80: Atmospheric transmissivity or meteorological visibility used for calculating the minimum luminous intensity of navigational lights to ensure they can be sighted at the prescribed ranges by these Rules:

A. Is always taken as 10 miles;
B. Is as per the formula given in SOLAS Chapter V;
C. Is considered equivalent to 13 nautical miles as implied in the International Regulations for Preventing Collisions at Sea, 1972, as amended;
D. Is to be decided by the class or the flag state administration of the vessel.

81: On a vessel of 50 m or more in length engaged in towing, the yellow towing light should be visible for at least?

A. 2 miles and visible over an arc of the horizon of 135°;
B. 3 miles and visible all round the horizon, the full 360°;
C. 3 miles and visible over an arc of the horizon of 135°;
D. 3 miles and visible over an arc of the horizon of 235°.

82: Can the intensity of navigational lights be kept higher than as stated in Annex I; for example by using a dimmer device whose minimum setting is equivalent to the required intensity.

A. Yes, the intensity may be increased at the discretion of the master/OOW when situations so require, for example in restricted visibility or high traffic;

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B. It depends on the flag state legislation which is supposed to only consider the guidelines stipulated by IMO in these Rules (COLREGS / IRPCS);
C. No, the maximum luminous intensity of navigation lights should be limited to avoid undue glare. This shall not be achieved by variable control of the luminous intensity;
D. It varies from vessel to vessel and as approved by class.

83: On a vessel of 50 m or more in length, the all-round lights used to display the Not Under Command (NUC) or Restricted in her Ability to Manoeuvre (RAM) signals shall be visible for a distance of at least?
A. 5 miles for the white lights and 3 miles for the red lights;
B. 3 miles for the white lights and 3 miles for the red lights;
C. 3 miles for the white lights and 2 miles for the red lights;
D. 2 miles for the white lights and 3 miles for the red lights.

84: On a power-driven vessel of 50 m or more in length, at night the masthead light/s must be visible for a distance of at least?
A. 3 miles, when the atmospheric transmissivity factor is 0.75;
B. 5 miles, when the atmospheric transmissivity factor is 0.8;
C. 6 miles, when the atmospheric transmissivity corresponds to a meteorological visibility of approximately 13 nautical miles;
D. 10 miles, when the atmospheric transmissivity is so good that all the stars are visible in the sky.

85: Which of the following statement(s) best describe the requirements of day signals or shapes prescribed by these Rules:
'I': All shapes should be black in colour, a ball and a cone shall have a diameter of not less than 0.6 metres, the cone having a height equal to its diameter. A diamond shall consist of two cones having a common base. A cylinder shall have a diameter of at least 0.6 meters and a height of twice its diameter.
'II': If more than one shape is exhibited, they shall be placed with at least 1.5 metre vertical separation between them. On a vessel less than 20 m in length shapes of lesser dimensions but commensurate with the size of the vessel may be used and the distance apart may correspondingly reduced.
A. None of the above statements are correct; all these criteria depend on IMO resolution linked to the length of a vessel;
B. Statement 'II' is correct;
C. Statement 'I' is correct;
D. Both Statements 'I' and 'II' are correct.

86: On small power-driven vessels which of the following statement/s is/are correct?
A. A power-driven vessel of less than 12 meters in length may in lieu of the lights prescribed in Rule 23(a) exhibit only sidelights and a sternlight combined in one lantern exhibited at or near the top of the mast where they can best be seen;
B. A power-driven vessel of less than 7 meters in length whose maximum speed does not exceed 7 knots may in lieu of the lights prescribed in Rule 23(a) exhibit only sidelights and a sternlight combined in one lantern exhibited at or near the top of the mast where they can best be seen;
C. A power-driven vessel of less than 12 meters in length may exhibit the masthead light

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displaced from the fore and aft centerline of the vessel, provided the sidelights are not combined in one lantern and are placed to be exhibited at or near the sides;

D. None of the above are correct as per Rule 23(d).

87: The intensity of electric lights fitted on all vessels other than sailing vessels, in the vertical sectors shall be as follows:

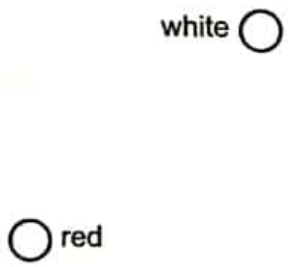
A. 100% of the minimum required intensity is maintained from 5° above to 5° below horizontal and 60% beyond 5° to 7.5°;

B. 100% of the minimum required intensity is maintained from 5° above to 5° below horizontal and 75% beyond 5o to 6.5°;

C. 100% of the minimum required intensity is maintained from 5° above to 5° below horizontal and thereafter reduce steadily to reach 50% intensity on reaching the 7.5° vertical sector limit;

D. There is no Rule prescribing electric light intensities in the vertical sector.

88: The lights illustrated below indicate?



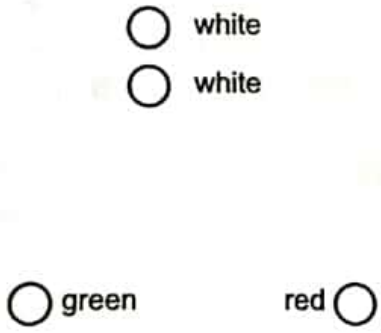
A. A vessel towing a barge;

B. A power-driven vessel underway, less than 20 m in length;

C. A power-driven vessel underway, less than 50 m in length;

D. A dredger indicating the safe side to pass from.

89: The lights below indicate?



A. A power-driven vessel more than 50 m in length when underway;

B. A power-driven vessel less than 50 m in length when underway, engaged in towing and the length of the tow does not exceed 200 m;

C. A pushing vessel which is power-driven and a vessel being pushed ahead rigidly connected as a composite unit, the total length is more than 50 m;

D. Any of the above vessels.

90: A power-driven vessel more than 50 m in length when engaged in towing and the length of the tow exceeds 200 m as measured from the stern of this power-driven vessel or the towing vessel to the after end of the tow, this power-driven vessel shall exhibit the following signals?

A. Three masthead lights forward, one masthead light aft, sidelights, sternlight and a towing light, as a minimum from sunset to sunrise;

B. One mast head light forward, three masthead lights aft, sidelights, sternlight and a towing light, as a minimum from sunset to sunrise;

C. A diamond shape where it can best be seen during the day;

D. Option A, B or C as and when required by Rule 20, always ensuring that no other lights are exhibited which may interfere with the keeping of a proper look-out.

91: When two vessels are in sight of one another, the main type of situations are as follows other than those covered by Rules 8(f), 9, 12 and 18:

A. Overtaking by Rule 13, any vessel overtaking is to keep clear, the limits are clearly defined.

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An overtaking vessel is the one approaching from more than 22.5° abaft the beam of the one being overtaken or from the latter's sternlight sector; if in doubt a vessel shall assume she is overtaking and in any case retain her duty of keeping clear of the overtaken vessel until she is finally past and clear, this Rule over rides all other Rules from 4 to 18;

B. Head-on by Rule 14, only applicable to power-driven vessels. The cut off limits of nearly right ahead are clearly stated, that is a sector from where both vessels should be able to see both the sidelights of each other, this could be a maximum of 3° on either side of the right ahead direction of each vessel. The nearly reciprocal courses thus may differ by up to 6°; if in doubt a vessel shall assume that a head-on situation exists and act accordingly;

C. Crossing by Rule 15, applicable to power-driven vessels only. The limits are not stated but implied. Whatever does not get covered by Overtaking and Head-on sectors is to be considered crossing, so crossing sector range extends from the right ahead direction till 22.5° abaft the starboard beam of the power-driven vessel concerned. Unless in the overlapping sector of lights, only one sidelight of the other vessel should be visible at night in such a situation;

D. All the above 3 statements are correct.

92: When navigating in or near an area of restricted visibility and not in sight of one another, except where Rules 9 or 10 require otherwise, only Rule 19 applies to all vessels irrespective of their type for the purpose of taking action to avoid collision, which should be executed in compliance with the requirements of Rule 8. Of the below statement(s) which of them describe the best expected actions to avoid collision if another vessel is detected by radar alone and a close-quarters situation is developing and/or risk of collision exists with this vessel still at medium to large range:

i. A vessel being overtaken shall keep her course and speed and act only if the overtaking vessel is getting so close that collision cannot be avoided by the action of the overtaking vessel alone;

ii. A vessel shall avoid altering her course to port for a vessel forward of the beam; this means she should ideally alter to starboard, except if approaching from the overtaking sector when this restriction of avoiding an alteration to port does not apply. Limits of overtaking are as stated in Rule 13;

iii. A vessel shall avoid an alteration of course towards a vessel abeam or abaft the beam; this means alter away from the vessel concerned;

iv. Requirements of Rule 34 on sound signals for manoeuvring and warning continue to remain applicable in restricted visibility.

A. All four statements 'i', 'ii', 'iii' and 'iv' are correct;

B. Only statements 'ii' and 'iii' are correct;

C. Only statements 'i', 'ii', and 'iii' are correct;

D. None of the above, a vessel navigating in or near an area of restricted visibility is required to act to avoid collision only when she hears apparently forward of her beam the fog signal of another vessel.

93: 'A vessel restricted in her ability to manoeuvre' other than one 'engaged in mine clearance operations' shall exhibit:

X: Three all-round lights in a vertical line namely red-white-red when underway or at anchor.

Y: In addition to the above statement 'X', when making way through the water, a masthead light or lights, sidelights and a sternlight and when at anchor the usual lights prescribed by

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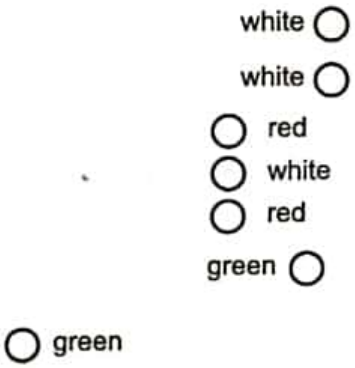
Rule 30 for vessels at anchor.

A. Only statement 'X' is correct;
B. Both statements 'X' and 'Y' are not correct;
C. Only statement 'Y' is correct;
D. Both statements 'X' and 'Y' are correct.

94: A group of vessels being pushed ahead, not being part of a composite unit, shall exhibit?

A. Red and green sidelights on each vessel;
B. Red and green sidelights at the forward end of the leading vessel;
C. Red and green sidelights at the forward end of the leading vessel and a white all-round light on each vessel;
D. A white all-round light at the forward end of each vessel.

95: The lights illustrated indicate that the power-driven vessel showing them is?



A. A vessel towing a vessel astern, the length of the tow exceeds 200m, seen from their starboard side;
B. A vessel towing a vessel made fast alongside;
C. A vessel towing more than one vessel astern;
D. A power-driven vessel less than 50 m in length engaged in towing a vessel or object not inconspicuous or partly submerged. The length of the tow is less than 200 m and they are severely restricted in their ability to deviate from their course, seen from their starboard side.

96: A power-driven vessel is towing a single vessel alongside on her port side. As prescribed by Rule 20, this towed alongside vessel shall exhibit:

A. Sidelights only;
B. A sternlight and at the forward end, sidelights;
C. Port sidelight and a sternlight;
D. Starboard sidelight only.

97: A sailing vessel over 25 m in length shall as a minimum exhibit?

A. Sidelights and a stern light;
B. Sidelights and a stern light and a white light towards any approaching vessel;
C. An all round flashing yellow light;
D. Sidelights and a stern light and at or near the top of the mast, where they can best be seen red over green all-round lights in a vertical line.

98: A vessel under oars at night:

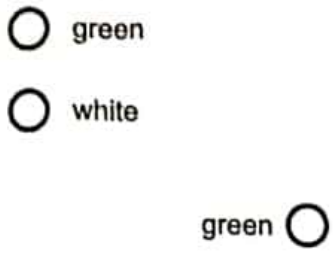
A. Shall carry one light at each end of the vessel;
B. Should carry a white light forward at least 2 m above the surface of the water;
C. May exhibit the lights prescribed for a sailing vessel or show a white light in sufficient time to prevent collision;
D. Shall exhibit the lights prescribed for a sailing vessel.

99: A sailing vessel underway when also using propelling machinery shall exhibit forward where it can best be seen, the following shape:

A 
B 
C 
D 

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100: The lights below indicate?

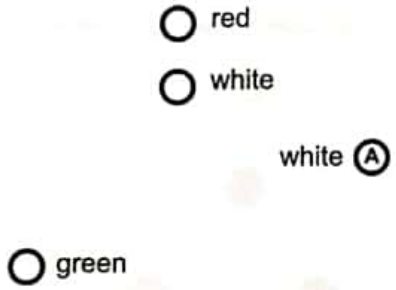


A. A vessel less than 50 m in length engaged in trawling, making way through the water;
B. A vessel engaged in trawling at anchor;
C. A vessel over 50 metres in length engaged in trawling;
D. A vessel engaged in trawling with her outlying gear extending more than 150 metres.

101: At night how can you differentiate a vessel engaged in fishing in the following 2 conditions, (I) underway but not making way through the water and (ii) at anchor?

A. If the vessel engaged in fishing is at anchor, she will also exhibit the normal anchor lights prescribed in Rule 30;
B. It is not possible to differentiate since in both the situations the lights and shapes exhibited are the same;
C. By prudent navigation, proper look-out and radar plotting or equivalent systematic observations. If her speed is '0' she should be at anchor;
D. By judging her heading in comparison with other vessels at anchor, if it is matching, she should be at anchor, application of ordinary practice of seamen.

102: The white light marked 'A' means?



A. That this vessel is at anchor;
B. This is her forward masthead light;
C. It is the sternlight of a power-driven vessel as seen from her starboard side from the overlap sector of her green sidelight;
D. Is indicating the direction of outlying gear of a vessel engaged in fishing other than trawling extending more than 150 m horizontally.

103: During the day a vessel displaying two black cones with their apexes together in a vertical line indicates that this vessel is:

A. Hard aground;
B. Engaged in underwater diving operations;
C. Engaged in laying, servicing or picking up a navigation mark, submarine cable or pipeline;
D. Engaged in trawling or engaged in fishing.

104: A vessel exhibiting two all-round red lights in a vertical line is Not Under Command (NUC). When also exhibiting sidelights and a sternlight it means she is?

A. Underway;
B. Underway and also making way through the water;
C. Now able to keep clear of vessels being overtaken;
D. Is testing her propulsion machinery.

105: For 'fishing vessels' which of the following statement(s) is/are correct?

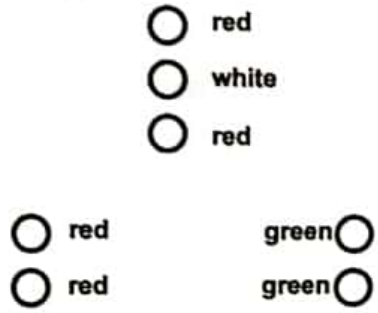
A. A vessel engaged in trawling shall always exhibit 2 masthead lights in addition to the green over white all-round lights when underway, making way through water or at anchor. Such a vessel less than 50 m in length shall exhibit only 1 single masthead light;
B. A vessel engaged in fishing is not required to exhibit a masthead light/s whether underway, making way through the water or at anchor;

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C. Both 'a vessel engaged in trawling' and 'a vessel engaged in fishing' shall exhibit sidelights and a sternlight only when underway but not making way through the water;
D. A 'fishing vessel' when not 'engaged in fishing' shall comply only with the requirements of Annex II of these regulations.

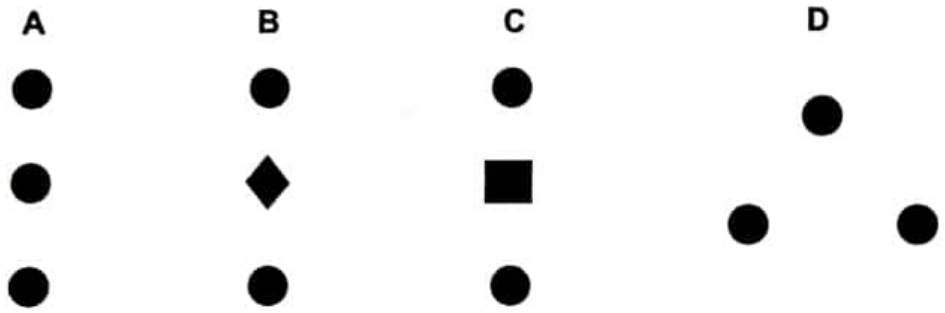
106: Sighting a rigid replica of the International Code Flag 'A' on a vessel at sea means keep clear of this vessel which is:
A. Engaged in diving operations;
B. Engaged in mine laying operations;
C. Engaged in fishing with purse seine gear;
D. Engaged in guiding a submarine which is navigating below the water surface.

107: The following lights if seen at night indicate:



A. A vessel engaged in trawling using pelagic gear;
B. Two sailing vessels engaged in towing a vessel restricted in her ability to manoeuvre;
C. A vessel engaged in underwater operations not making way through the water or at anchor indicating the side on which an obstruction exists and the side from which another vessel may pass;
D. A vessel engaged on pilotage duties.

108: A vessel engaged in hydrographic surveying shall exhibit the following during the day?



109: The International Regulations for Preventing Collisions at Sea, 1972, as amended, state the following about safe passing distances:
A. From a vessel engaged in trawling, the distance specified is 1000 yards;
B. From a vessel engaged in minesweeping operations, the distance specified is 1000 metres;
C. From a dredger engaged in underwater demolition work, the distance specified is 2.3 nautical miles;
D. From a loaded oil, chemical or gas tanker and passenger vessels the distance specified is 2'50'00'00'000.00 centimetres.

110: Vessels not required to exhibit masthead light/s are:
A. A vessel engaged in fishing other than trawling. For a vessel engaged in trawling this exemption is optional only if she is less than 50 m in length;
B. A vessel Not Under Command if not making way through the water;
C. Pilot Vessels when engaged on pilotage duty;
D. All the above options are correct as per the International Regulations for Preventing Collisions at Sea, 1972, as amended.

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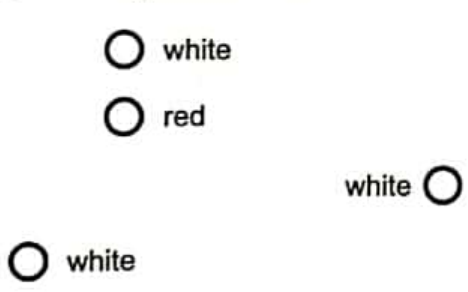
111: A power-driven vessel underway is sighted exhibiting a black cylinder during day, at night the equivalent lights this vessel should display, in addition to the lights prescribed by Rule 23, shall be:

A. Three all-round lights in a vertical line, the upper and the lower green, the middle one white as she is restricted in her ability to manoeuvre;
B. Three all-round red lights in a vertical line as she is constrained by her draught;
C. Two all-round lights in a vertical line, the upper one red and the lower one white as she is engaged in fishing;
D. Two all-round red lights in a vertical line as she is a vessel constrained by her draught now not under command.

112: The optional signals prescribed in Rule 28 for a vessel constrained by her draught (CBD) mean:

A. They are only meant to warn other vessels that these are special circumstances with the vessel exhibiting the signals indicating that she has some manoeuvring limitations;
B. The vessel CBD has no specific privilege and she should comply with the Rules of Part B for any actions to avoid collisions with particular caution having full regard to her special condition;
C. All other vessels shall not impede her safe passage, if circumstances so allow, except 'a vessel not under command' or 'a vessel restricted in her ability to manoeuvre';
D. Such vessels should not transit areas with traffic and wait till all traffic clears as part of ordinary practice of seamen and prudent safe navigation.

113: The lights below indicate?



A. A group of trawlers using demersal or pelagic gear hauling their nets;
B. A pilot vessel engaged in fishing indicating the direction of the nets;
C. A pilot vessel at anchor, may be more or less than 50 m in length;
D. A vessel engaged in fishing underway or at anchor.

114: A sailing vessel, more than 20 m in length, if restricted in her ability to manoeuvre when making ★ way through the water, shall exhibit:

A. Only the sidelights, sternlight and the optional red over green all-round lights as prescribed in Rule 25;
B. The lights and shapes prescribed in Rule 27. That is the all-round lights red-white-red at night and in addition masthead light or lights, sidelights and a sternlight or three shapes ball-diamond-ball during day;
C. The lights and shapes prescribed in Rule 25 and in addition exhibit in a vertical line all-round lights in the order red-white-red at night or three shapes in the order ball-diamond-ball during daylight hours;
D. Only the lights and shapes prescribed in Rule 25 but in addition and also transmit a caution message to warn other vessels by VHF / RT of her special condition asking them to keep clear of her.

115: Which of the following requirement/s is/are correct for a vessel 150 m in length at anchor at night:

I: Exhibit one all-round white light forward and one all-round white light aft.

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II: Use the available working or equivalent lights to illuminate her decks.

A. Both 'I' and 'II';
B. 'I' only;
C. 'II' only;
D. Neither 'I' nor 'II'.

116: A vessel sighted exhibiting the following signal is?



A. Any vessel aground;
B. A vessel in distress and requiring immediate assistance;
C. A sailing vessel aground;
D. A vessel engaged in underwater demolition work.

117: The equivalent night signal for the vessel shown in the previous question should be?

A. 2 all-round red lights in a vertical line and anchor lights;
B. 3 all-round red lights in a vertical line and anchor lights;
C. 2 all-round red lights in a horizontal line, anchor lights and lights to illuminate her decks;
D. 3 all-round green lights, one near the foremast head and one at each end of the fore yard.

118: When navigating on water and if there is any risk of collision with another vessel, a seaplane:

A. Is granted full right of way, all other vessels must keep clear of her;
B. Shall be considered a stand-on vessel;
C. Should be considered under 'all dangers of navigation' or 'special circumstance' under Rule 2 and all vessels should keep clear of such dangerous seaplanes which can be a menace to safe navigation;
D. Shall comply with the Rules of part 'B' like any other vessel to prevent collision.

119: As an OOW on a power-driven vessel you visually sight a vessel aground right ahead, what is the best set of actions to execute?

A. Order engines full astern, give three short blasts on the whistle and inform the Master;
B. Place the steering hard over to port or starboard and give 2 or 1 short blasts on the whistle as applicable, turn your vessel to the reciprocal course, use echo sounder to check depths, verify your vessels position and simultaneously notify/inform the master;
C. Reduce speed, identify the other vessel using AIS, immediately establish contact with her by VHF and simultaneously notify/inform the master;
D. This is a case of special circumstances to be considered under Rule 2 which may make a departure from these Rules necessary to avoid immediate danger.

120: A power-driven vessel when towing and only exhibiting the towing lights and/or shapes as per Rule 24 (towing and pushing) means she:

A. Is restricted in her ability to manoeuvre and has right of way over any other vessel except a vessel not under command;
B. Does not have an absolute right of way but all other vessels other than a vessel not under command should try and avoid impeding her passage;
C. Is required to behave like any other normal power-driven vessel and take action to avoid collision, if required, as per these Rules (IRPCS / COLREGS);
D. Stands covered by Rule 2 clauses of 'special circumstances' and 'ordinary practice of seamen' which should be considered by all other vessels in the vicinity who should, as far as possible, keep clear of her.

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121: Which of the following correctly describes the requirements for masthead lights?

★ A. Any vessel engaged in fishing other than trawling shall never and a vessel engaged in trawling if less than 50 m in length may not display masthead light/s;

B. A power-driven vessel when Not Under Command should exhibit masthead light(s) when making way through the water;

C. A pilot vessels is exempted from exhibiting masthead lights in all circumstances, even when not on pilotage duty;

D. A sailing vessel when restricted in her ability to manoeuvre in a condition covered by Rule 3(g) and exhibiting the signals prescribed in Rule 27(b) when making way through water is exempted from exhibiting masthead lights.

122: The term 'short blast' means a sound signal any sound signalling appliance complying with the specifications in Annex III to these Regulations and having a duration of about?

A. One second;

B. Two seconds;

C. Three seconds;

D. Four seconds.

123: The bell or gong or both may be replaced by other equipment having the same respective sound characteristics. However it shall always be possible to sound the prescribed signals by?

A. Manual means;

B. Automatic mechanical means;

C. Both manual and automatic means;

D. Either manual or automatic means.

124: A power-driven vessel underway, when manoeuvring as authorized or required by these Rules shall indicate her manoeuvre. A sound signal of three short blasts by such a vessel means:

A. She is making way through the water in the astern direction;

B. She is operating astern propulsion;

C. She only has her main engine operating in the astern direction;

D. All the above three options are correct.

125: The doubt or 'wake-up' signal prescribed by Rule 34(d) is?

A. Five short blasts only using the ships whistle which may be supplemented by similar flashes using a light and applicable to all vessels;

B. Five or more short rapid blasts using the ships whistle which may be supplemented by similar flashes using a light and applicable to all vessels;

C. Five or more short rapid blasts using the ships whistle which may be supplemented by similar flashes using a light and applicable only to power-driven vessels;

D. Five or more short rapid blasts using the ships whistle which must always be supplemented by similar flashes using a search light and applicable to all vessels.

126: When vessels are in visual sight of one another, by Rule 34, which statement(s) is/are correct?

'I' Only power-driven vessels are required to give the manoeuvring signals when taking action as authorised or required by these rules and sailing vessels are exempted from the same.

'II' All vessels including sailing vessels are required to immediately sound signal of at least five short and rapid blasts when in doubt about the intentions of any other approaching vessel. This signal may be supplemented by a light signal of at least five short and rapid flashes.

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(For example, when in sight of one another, a stand-on vessel should execute this action as soon as it becomes apparent to her that the vessel required to keep out of the way is not taking appropriate action in compliance with these Rules).

A. 'I' only;
B. 'II' only;
C. Neither 'I' nor 'II';
D. Both 'I' and 'II'.

127: In a narrow channel or fairway:

A. If a vessel, which can safely navigate only within such channel or fairway, is in doubt as to the intention of any crossing vessel she may use the sound signal prescribed in Rule 34(d);
B. In a narrow channel or fairway a vessel to be overtaken if in doubt about the intentions or expected actions of a vessel intending to overtake may sound the signals prescribed in Rule 34(d);
C. By Rule 34(d) if any vessel is in doubt, she shall immediately indicate such doubt by giving at least five short and rapid blasts on the whistle;
D. All the above statements are correct.

128: Which of the following vessels, when at anchor, are clearly exempted by these Rules from exhibiting anchor lights and/or shapes prescribed in Rule 30?

I: A vessel engaged in dredging or underwater operations, when restricted in her ability to manoeuvre, when an obstruction exits.
II: A vessel engaged in fishing.

A. Both 'I' and 'II';
B. 'I' only;
C. 'II' only;
D. Neither 'I' nor 'II', any vessel at anchor is obliged to only comply with the requirements of Rule 30 without any exemptions.

129: When proceeding along the course of a narrow channel or fairway, there is a vessel following your vessel and can be seen visually. You hear this vessel sound two prolonged blasts followed by two short blasts using her whistle, this sound signal indicates?

A. The other vessel intends to overtake your vessel from your starboard side;
B. The other vessel intends to follow your vessel;
C. The other vessel intends to overtake your vessel from your port side;
D. The other vessel wishes to attract your attention so that you may establish VHF communication with her.

130: As per Rule 33 and Annex III:

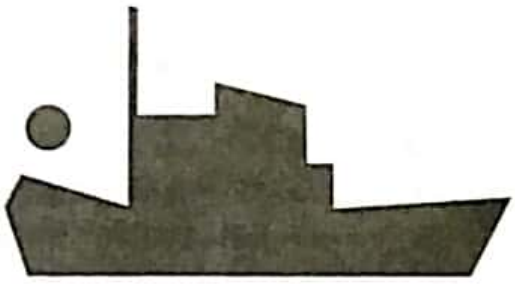
A. A whistle may be replaced with other alternate equipment which shall produce sounds of the same intensity and frequency as prescribed for a whistle;
B. The bell or gong cannot be replaced by any alternate equipment because they have to be sounded manually;
C. A whistle cannot be replaced by alternate equipment. Only the bell or gong or both may be replaced by other equipment having the same respective sound characteristics, provided that manual sounding of the required signals is always possible;
D. There is no restriction on the alternate types of equipments used as long as the sounds produced are exactly as prescribed by IRPCS / COLREGS.

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131: A sound signal at intervals of not more than 2 minutes consisting of two prolonged blasts in succession with an interval of about 2 seconds between them indicates?
- A. A power-driven vessel underway but stopped and making no way through the water;
- B. A sailing vessel underway but stopped and making no way through the water;
- C. Any vessel of any category underway but stopped and making no way through the water;
- D. None of the above.

132: In restricted visibility a vessel towed or the last vessel of the tow if it's a group of vessels being towed, if manned, when practicable shall, immediately after the sound signal made by the towing vessel, at intervals of not more than 2 minutes, sound a signal of:
- A. Four blasts in succession, namely one short followed by three prolonged blasts;
- B. Four blasts in succession, namely two prolonged followed by two short blasts;
- C. Four blasts in succession, namely one prolonged followed by three short blasts;
- D. Four blasts in succession, namely two short followed by two prolonged blasts.

133: A small vessel of 32 m in length as illustrated, when in restricted visibility is required to sound:
- A. One prolonged followed by two short blasts using her whistle at intervals of one minute;
- B. Four strokes on the bell at intervals not exceeding one minute;
- C. At intervals of not more than one minute ring the bell rapidly for about 5 seconds and in addition three separate and distinct strokes on the bell immediately before and after the rapid ringing of the bell;



- D. At intervals of not more than one minute ring the bell rapidly for about 5 seconds and she may in addition sound three blasts in succession, namely one short, one prolonged and one short blast.

134: A vessel of length 95 m when aground in a narrow channel or fairway in restricted visibility is required to sound:
- A. Three short blasts using her whistle followed by rapid ringing of the bell for about 5 seconds at intervals of not more than one minute;
- B. A prolonged blast by her whistle at intervals of not more than one minute and in addition three separate and distinct strokes on the bell immediately before and after the prolonged blast from her whistle;
- C. Four strokes on the bell at intervals of one second with the cycle repeated at intervals not exceeding 1 minute;
- D. At intervals of not more than one minute rapid ringing of the bell for about 5 seconds and three separate and distinct strokes on the bell immediately before and after the rapid ringing of the bell, in addition she may sound an appropriate whistle signal; generally accepted as 'U'.

135: In restricted visibility, in addition to the signals prescribed by paragraphs (a), (b) or (g) of Rule 35, a sound signal of four short blasts may be sounded by:
- A. A vessel engaged in towing;
- B. A pilot vessel when engaged on pilotage duty;
- C. A vessel constrained by her draught;

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D. Any of the above.

136: For a vessel 198 m in length the approximate range at which the sound signal made by her whistle may be heard in conditions of still air on board is:
A. 1.5 miles with 90 % probability in the forward axis;
B. 2.0 miles with 95 % probability in the forward axis;
C. 3.0 miles; actual range subject to prevailing weather conditions;
D. 2.0 miles if only one whistle is used and 3.0 miles if both whistles are used, the latter ensures almost 100% efficiency.

137: A power-driven vessel when engaged in towing or pushing another vessel, not restricted in her ability to manoeuvre, when underway in or near an area of restricted visibility shall:
A. Sound at intervals of not more than 2 minutes three blasts in succession, namely one prolonged followed by two short blasts;
B. Sound at intervals of not more than 2 minutes one prolonged blast;
C. Sound at intervals of not more than 2 minutes two prolonged blasts in succession with an interval of about 2 seconds between them;
D. Any of the above as per the master's standing orders.

138: Which of the following signal may be used by a vessel, if necessary, to attract the attention of another vessel:
A. Exhibit a square flag having above or below it a ball or anything resembling a ball;
B. Direct the beam of her searchlight in the direction of the danger;
C. Fire a rocket parachute flare or a hand-flare showing a red light;
D. Give at least five short and rapid blasts using her whistle.

139: Which of the following is **NOT** a signal used by a vessel in distress?
A. Flames on the vessel (as from a burning tar barrel, oil barrel, etc);
B. A rocket parachute flare or a hand flare showing a red light;
C. Two all-round red lights one over the other flashing alternately;
D. A distress alert by means of digital selective calling (DSC) transmitted on VHF channel 70.

140: As per the requirements prescribed by Rule 34, which of the following statement is **wrong**:
A. The Rule clearly prohibits repetition of the sound signals prescribed in paragraphs 'a' and 'd';
B. Any vessel may supplement the whistle signals prescribed in paragraph (a) of this Rule by light signals, repeated as appropriate such that the interval between successive signals is not less than ten seconds;
C. The signal of five short and rapid blasts on the whistle prescribed in paragraph 'd' may be supplemented by a light signal of at least five short and rapid flashes;
D. The light used to supplement the whistle signals prescribed in paragraph 'a', if fitted, shall be an all-round white light, visible at a minimum range of 5 miles. However, any light may be used to supplement the whistle signals prescribed in paragraph 'd', for example, a search light or daylight signalling lamp may be used for the latter.

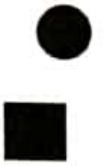
141: A continuous sounding with any fog-signalling apparatus by a vessel indicates that she is?
A. Aground, in or near a narrow channel or fairway;
B. Trying to attract the attention of another vessel;
C. In distress and in need of assistance;
D. Not under command.

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142: A vessel requesting assistance to search for and pick up a man overboard should indicate this by using the following prefix in her initial radiotelephony message.

A. May-day; May-day; May-day;
B. Pan-Pan; Pan-Pan; Pan-Pan;
C. Securite; Securite; Securite;
D. May-day relay; May-day relay; May-day relay.

143: At sea you sight the following signal being exhibited by a vessel during the day in good visibility, your vessel should?



A. Keep well clear as this vessel is restricted in her ability to manoeuvre;
B. Keep well clear as this vessel is accompanying a dracone;
C. Keep well clear as this vessel is escorting a submarine;
D. Render assistance as soon as possible as this vessel is in distress.

144: On a vessel 125 m long and of breadth 25 m, the forward masthead light shall be at a height above the hull not less than:

A. 05 metres;
B. 10 metres;
C. 12 metres;
D. 25 metres.

145: The vertical separation of masthead lights of power-driven vessels shall be such that in all normal conditions of trim the after light will be seen over and separate from the forward light at a distance of 1000 m from the stem when viewed from sea-level. However, the aft masthead shall be placed vertically higher than the forward one by at least:

A. 5.5 m;
B. 3.0 fathoms;
C. 450 cm;
D. There is no requirement for this, as long as the one aft light can be seen over and separate from the forward light.

146: The horizontal distance between the two white masthead lights carried by a power-driven vessel is required to be?

A. Not less than half the length of the vessel but need not be more than 100 m apart;
B. Not less than 33% of the length of the vessel but need not be more than 75 m;
C. Not less than 15 fathoms;
D. Minimum 27.5 m plus 20% of the overall length of the vessel.

147: With regard to shapes, for vessels 20 m or over in length, which of the following statement is **wrong**?

A. A ball shall be black and not less than 0.6 metres in diameter;
B. A cone shall be black with a base diameter of not less than 0.6 metres;
C. A cylinder shall be black, have a diameter of at least 0.6 metres and a height of twice its diameter;
D. A diamond shall consist of two cones pointing at each other painted red in colour.

148: On vessels over 20 m in length the internal screens of the sidelights shall be painted as follows:

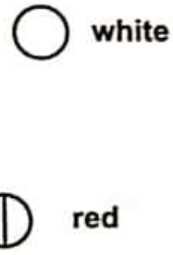
A. Use matt finish paint which is not glossy;
B. Both screens matt black;

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C. Port screen red, starboard screen green using non glossy finish;
D. There is no regulation regarding this.

149: With respect to bells and gongs the correct requirement from Annex III, Section II is:
A. The range of their sound signals varies from 0.5 to 2.0 miles depending on the length of the vessel they are fitted on;
B. They shall be made of corrosion-resistant material and on a vessel over 20 m in length the minimum diameter of the mouth of the bell shall be 0.3 metres. They shall produce a sound pressure level of not less than 110 dB at a distance of 1 meter from it;
C. A bell or gong or other device having similar sound characteristics shall be capable to be sounded by a power-driven bell striker using electrical input of 110 volts from a supply source located at a distance of not more than 1 meter from it;
D. When a power-driven bell striker is fitted instead of manual sounding, to ensure constant force the mass of the striker shall be not less than 300 grams.

150: If the lights illustrated below are sighted at night, they indicate that the vessel exhibiting them is:



A. A power-driven vessel engaged in trawling as seen from her ahead direction;
B. A power-driven pilot vessel on pilotage duty, underway and as seen from her ahead direction;
C. A power-driven vessel of less than 50 m in length underway;
D. A power-driven vessel of less than 12 metres in length underway as seen from her right ahead direction.

151: A vessel engaged in trawling is exhibiting one white light over one red light in a vertical line at a level lower and of lower intensity (weaker) than her other navigational lights when in close proximity of other fishing vessels, these lights indicate:
A. She is shooting nets;
B. She is picking up fishes;
C. She is over 20 m in length, is using demersal or pelagic gear and is hauling her nets;
D. Her nets have become fast upon an obstruction.

152: At night you sight, in addition to any other navigation lights, two yellow lights in a vertical line which are flashing alternately every second with equal light and occultation duration, these flashing lights indicate?
A. A vessel engaged in towing seen from more than 22.5° abaft her beam;
B. An air cushion vehicle operating in the displacement mode;
C. A vessel engaged in fishing hampered by her purse seine gear;
D. A dredger indicating her side from where other vessels may pass safely.

153: A long vessel is fitted with two whistles placed more than 100 m apart along her length in the fore and aft direction. The regulations require that:
A. The forward whistle shall sound before the after whistle;
B. The two shall not be sounded simultaneously;
C. The after whistle shall sound before the forward whistle;
D. The two should, as far as possible, be sounded simultaneously to ensure a good signal.

154: As per the requirements stated in Rule 35 which statement is correct?
A. A vessel engaged in towing shall comply with paragraph 'c' of the Rule only if she is restricted in her ability to manoeuvre; otherwise she shall comply with paragraph 'a';

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B. A vessel of less than 12 m in length shall still remain obliged to give the signals prescribed in this Rule. However, if she does not, she shall blow a manual whistle at intervals of not more than 1 minute;

C. A power-driven vessel underway with her propulsion stopped but still making way through the water shall sound at intervals of not more than 2 minutes two prolonged blasts in succession with an interval of about 2 seconds between them;

D. When a pushing vessel and a vessel being pushed ahead are rigidly connected in a composite unit they shall be regarded as a power-driven vessel and shall give the signals prescribed in paragraphs (a) or (b) of this Rule.

155: A vessel engaged in fishing, 75 m in length, when at anchor in restricted visibility should sound the following signals?

A. At intervals of not more than one minute ring the bell rapidly for about 5 seconds Sound signal of a normal power driven vessel at anchor in restricted visibility;

B. Two prolonged blasts in succession at intervals of not more than 2 minutes;

C. At intervals of not more than 2 minutes three blasts in succession, namely one prolonged followed by two short blasts

D. None of the above, she may give any sound signal to warn other vessels to keep clear, preferably the danger signal 'U'.

156: ★ Why is it necessary to navigate with caution inside or near the terminations of traffic separation schemes?

A. Since there may be a large concentration of vessels which may be moving in complex directions approaching or departing from the end termination points of the schemes;

B. Because of multiple and variable vessel encounters due to statement 'A' there is likelihood of increased risk of collision encounters with vessels crossing, joining or leaving traffic lanes or even turning around to join the opposite traffic lane;

C. It is so stated in IRPCS Rule 10(f); In STCW Code Section A-VIII/2 paragraph 16.2, ***'the attention necessary when navigating in or near traffic separation schemes'*** and also in paragraph 17.3, ***'the attention necessary when navigating in or near traffic separation schemes or other routeing measures'***;

D. All of the above statements 'A', 'B' and 'C' are correct.

157: Your power-driven vessel is approaching an East-West TSS from the South, you need to cross the East traffic lane and then turn West to join the West bound traffic lane but there is very heavy traffic going in the Easterly direction, assuming all traffic consists of normal power-driven vessels. You should con your vessel such as to:

A. Continue crossing the East lane, your vessel would be on the starboard side of and crossing the East bound vessels, as such they are required to give-way and your vessel is a stand-on vessel;

B. Turn to starboard and join the East lane as prudent navigation best practice demands (ordinary practice of seamen) so as not to embarrass other vessels, slowly creep in closer to the separation zone or line dividing the two lanes and when there is a clear window in the traffic proceeding in the West bound lane take a U turn and join the West lane, all along keeping your propulsion systems on standby and enhanced bridge watch levels;

C. Stop and wait endlessly close to the East lane till your vessel gets a clear window to cross the same;

D. Turn back, stop and look for alternate routes.

158: A vessel restricted in her ability to manoeuvre when carrying out her work at anchor in restricted visibility shall sound the following signals:

A. Sound at intervals of not more than 2 minutes two prolonged blasts in succession with an interval of about 2 seconds between them;

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B. Sound at intervals of not more than 2 minutes three blasts in succession, namely one prolonged followed by two short blasts;

C. Shall at intervals of not more than one minute ring the bell rapidly for about 5 seconds. In a vessel of 100 m or more in length the bell shall be sounded in the forepart of the vessel and immediately after the ringing of the bell the gong shall be sounded rapidly for about 5 seconds in the after part of the vessel;

D. Shall at intervals of not more than one minute ring the bell rapidly for about 5 seconds. In a vessel of 100 m or more in length the bell shall be sounded in the forepart of the vessel and immediately after the ringing of the bell the gong shall be sounded rapidly for about 5 seconds in the after part of the vessel. In addition she shall give three separate and distinct strokes on the bell immediately before and after the rapid ringing of the bell.

159: ★ When navigating in restricted visibility close to zero, if you hear a continuous sounding of the whistle (a fog-signalling apparatus) of another vessel, from somewhere forward of the bridge of your vessel, the action should be:

A. Reduce speed of your vessel to the minimum at which your vessel can be kept on her course. If necessary take all her way off and in any event navigate with extreme caution until danger of collision is over;

B. This signal indicate distress and the other vessel needs immediate assistance. You should consider reduce speed further, proceed towards the signal with caution to render assistance if possible, immediately acknowledge the signal, inform the closest shore based MRCC and also other vessels in the vicinity to be ready to assist if needed and even transmit a mayday relay;

C. Execute a large alteration of course to starboard since the following shall be avoided by Rule 19-d, that is, 'an alteration of course to port for a vessel forward of the beam';

D. Contact the superintendent, marine operations manager or the DPA of the management office and act as per their advise, till then stop your vessel and maintain strict radio silence.

160: ★ The clause 'so as to involve risk of collision':

A. Has been used in each and every Rule which describe the various situations and assign the responsibility of keeping clear to one or both the vessels so as to prevent collision;

B. The application of all these Rules is independent of this clause;

C. Has been used only in Rules 8, 12, 14 and 15. However, Rule 18(e) uses the term 'where risk of collision exists'. Except the 'not to impede' requirements in Rules 8, 9, 10 and 18, the application of these Rules are linked to the development of a firm 'close quarters and/or risk of collision' situation, including the application of Rules 13, 18 and 19, whether stated or not;

D. None of the above. All Rules from 1 to 38 contained in the 5 parts of which part B is subdivided into 3 sections and Annexes I to IV apply at all times whether there is any 'risk of collision' or not.

161: ★ By Rules 17 and 34, a 'stand-on vessel' may do the following in case she has concerns about any 'give-way vessel' not taking action to avoid collision:

A. Shall also give at least five short and rapid blasts on the whistle which may be supplemented by a light signal of at least five short and rapid flashes to wake up the 'give-way vessel', this action prescribed by Rule 34(d) applies even to a sailing vessel;

B. May take action to avoid collision by her manoeuvre alone, as soon as it becomes apparent to her that a 'give-way vessel' is not taking appropriate action;

C. Shall taken such action as will best aid to avoid collision when she finds herself so close that collision cannot be avoided by the action of the give-way vessel alone, in this case a power-driven vessel may even alter her course to port for another power-driven vessel on her port side;

D. All the above actions are correct.

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162: With respect to Rule No.19, Conduct of vessel's in restricted visibility, which of the following statements is/are true?

I: When Rule No.19 applies, vessels are obliged to comply with Rules 4 to 10 contained in section I of Part B, the Steering and Sailing Rules.

II: Rules 16 and 17 on 'give-way' or 'stand-on vessel' respectively or similar terms are not applicable when the application of section III of Part B of IRPCS or Rule 19 gets activated.

A. 'I' only;
B. 'II' only;
C. Both 'I' and 'II' are true;
D. None of the two are correct.

163: You are OOW on a vessel and detect another vessel exactly one point on the port bow of your vessel by radar in restricted visibility and determine that risk of collision exists. The course of your vessel is 284° and the other vessels course as per ARPA is determined as 306.5°, as per Rule 19, in order to avoid collision your vessel:

A. Shall alter course only to port;
B. Shall make a large course alteration to port or to starboard or reduce speed substantially;
C. Shall alter course only to starboard;
D. Shall reduce speed only.

164: A vessel engaged in a rescue operation should ideally exhibit lights and shapes to indicate that she is:

A. Not under command;
B. Restricted in her ability to manoeuvre;
C. Need not exhibit any special lights or shapes, just her routine navigational lights;
D. These are special circumstances, put on all navigational lights, all-round lights and deck lights; also put up two large balls in a vertical line coloured bright red.

165: A power driven vessel would normally become sluggish and/or lose control during manoeuvring if:

A. The propeller RPM is suddenly reduced to below dead slow ahead or set to very low pitch, the rudder efficiency would drop to near zero;
B. The propeller is stopped, or the propeller pitch is reduced to zero to stop the thrust of water across the rudder even though the vessel has headway;
C. Only bow/stern thrusters are used to control the vessel at high speeds of over 5 knots;
D. All the above statements are correct.

166: Rule 38 allows permanent exemptions for the following:

A. The repositioning of all-round lights resulting from the prescription of section 9(b) of Annex-I to these Regulations;
B. The repositioning of lights as a result of conversion from imperial to metric units and rounding off measurement figures;
C. The repositioning of masthead lights on vessels of less than 150 m in length, resulting from the prescriptions of section 3(a) of Annex-I to these Regulations;
D. All of the above.

167: The STCW Code Section A-VIII/2 requires that an OOW shall notify or inform the Master for various reasons, where in the STCW Code are these requirements stated?

A. In paragraphs 8.9, 19, 40, 41, 45.1, 50, 51.6 and 51.8;
B. In paragraphs 9, 12, 16, 17, 26 and 37;
C. In paragraphs 41 and 50;
D. The STCW Convention has no relevance to bridge watchkeeping.

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168: You are the OOW on a shallow draught power-driven vessel navigating through Malacca Straits at night. You determine that your vessel may develop, after some time, a close-quarters situation with another power-driven vessel displaying three all-round red lights in a vertical line. Good visibility prevails; you can see the other vessel by sight and can clearly see all her navigational lights through the binoculars. The situation and action shall be as follows:

A. Action to avoid collision shall be as per one of the Rules 13, 14 or 15 applicable to vessels in sight of one another;

B. This is a case of special circumstances, place engines on stand-by, place the vessel on hand steering as per paragraph 35 of the STCW Code A-VIII/2, post additional look-out and notify the master;

C. Take action so as to avoid impeding the safe passage of this other vessel;

D. Contact the other vessel by VHF after checking and verifying her identity using AIS or other means and work out a reasonable and practical solution to prevent collision.

169: A VLCC on even keel with a mean draught of 20.8 metres is navigating through an area near one fathom bank (Malacca Straits entrance from East) at safe speed. The charted depth is 15.5 fathoms. Assuming no hog, sag, squat and/or tide, what should be the expected UKC when transiting this area?

A. 5.3 metres;

B. 24.76 feet;

C. 5.3 fathoms;

D. 279.21 feet.

170: In the above scenario if there is need to take action to avoid collision by making a 45° alteration of course to starboard, the minimum charted depth on this proposed amended track is 14.5 fathoms. Assuming a 6.0% reduction in UKC due to squat, can this VLCC take this proposed action? If yes, what will be the expected UKC when passing the 14.5 fathoms patch?

A. No she cannot do this as she may run aground;

B. Yes she can and the expected UKC will be 24.67 feet;

C. Yes she can and the expected UKC will be 4.24 fathoms;

D. Yes she can and the expected UKC will be 4.47 metres.

171: Vessel 'X' is approaching vessel 'Y', both vessels are inside restricted visibility and not in sight of one another, the range between them is 8.3 miles, risk of collision is confirmed. The compass bearing between them, obtained by radar, is constant as 100 – 280°, range is reducing slowly. Vessel 'Y' is heading 000° and vessel 'X' heading 335°. The best action to avoid collision in compliance with these Rules should ideally be as follows:

A. 'X' is overtaking and shall be obliged to keep clear, 'Y' to keep her course and speed;

B. 'Y' to alter her course substantially to port as 'X' is abaft her starboard beam. 'X' as the overtaking vessel may alter her course substantially to port or starboard, ie 'Y' is being overtaken by 'X';

'C. 'Y' to alter her course substantially to port as 'X' is abaft her starboard beam. 'X' has 'Y' forward of her beam but is not approaching 'Y' from more than 22.5° abaft the beam of 'Y' so is not in the overtaking zone, as such shall alter her course substantially to starboard. However, 'X' may even consider a substantial reduction in speed in the shortest time to ensure it is readily apparent to 'Y';

D. 'Y' to alter her course substantially to port, 'X' as the overtaking vessel has full right of way and shall keep her course and speed.

172: ★ Watchkeeping legislation states, 'when the route planning is verified taking into consideration all pertinent information, the planned route shall be clearly displayed on appropriate charts and shall be continuously available to the officer in charge of the watch, who shall verify each course to be followed prior to using it during the voyage. In practice this means:

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A. The plan is such that it ensures sufficient sea room for the safe passage of the ship throughout the voyage as required by SOLAS Chapter V, Regulation 34.2.2;

B. A vessel need not always be maintained on or very close to the charted course/track but is free to stay within 'margins of safety' or not go into any 'no go areas', especially for preventing collisions;

C. Navigational guidelines especially Master's standing orders or bridge/night orders should not state 'maintain vessel on-track' or similar terms as it may confuse an OOW, if an alteration of course is executed, especially a large alteration, as an action to avoid collision, it is likely to take the vessel slightly away from the charted course/track;

D. All the above statements are correct.

173: When restricted visibility is encountered or expected, the first responsibility of the officer in charge of the navigational watch is to:

A. Inform the master and post a proper lookout;

B. Operate and use the radar(s);

C. Exhibit navigation lights;

D. Comply with the relevant rules of the International Regulations for Preventing Collisions at Sea, 1972, as amended, with particular regard to the sounding of fog signals, proceeding at a safe speed and having the engines ready for immediate manoeuvre.

174: ★ A vessel is underway and navigating well away from land. She is encountering near zero visibility, is fully complying with the safe speed and all other requirements to be followed in restricted visibility, if all her radars fail.

A. She should navigate with extreme caution at 'safe-speed' with additional 'look-out' and sound signals as per Rule 35(a) using AIS supplemented by VHF for preventing collisions;

B. She should stop and consider announce she is NUC. Or anchor if depths allow, maintain additional 'look-out', sound signals as per Rule 35(b)/(g), repeatedly broadcast a warning for vessels in the vicinity till the visibility improves or at least one of her radar becomes operational when she can resume her passage;

C. It all depends on the master's discretion subject to any past or likely expected traffic in the vicinity or not;

D. Contact the vessel's superintendent / shore based manager / DPA to seek their guidance and act accordingly.

175: 'The owner, the charterer, the company, ... or any other person shall not prevent or restrict the master of the ship from taking or executing any decision which, in the master's professional judgement, is necessary for safety of life at sea and protection of the marine environment'. A master gets this authority from:

A. The Company SMS based on the ISM Code – the overriding authority clause;

B. The STCW Convention, incorporated in the certificate of competency and is the obligation of every master of any vessel;

C. Is stated in SOLAS (5th edition of 2009) Chapter V, Regulation 34-1;

D. Is part of the merchant shipping act of IMO which is automatically incorporated in the flag state legislation as soon as they sign up as members of IMO.

176: Refer to MCQ 61 diagram and explanation, assume the vessels are not in sight, in restricted visibility but with operational radars.

A. 'B' is overtaking 'A' and should keep clear; 'A' to keep her course and speed;

B. Same as per MCQ 61 except that sound signals prescribed in rule 34 are not applicable;

C. 'A' should alter her course to port and 'B' should alter her course to starboard;

D. 'B' would eventually hear the fog signal of 'A' from forward of her beam. She shall reduce her speed to the minimum and navigate with extreme caution until danger of collision is over.

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Q.NO	BEST ANSWER	RULE REFERENCES WITH REMARKS / COMMENTS
1	D	STCW Code Regulation VIII/2 paragraph 1.
2	C	STCW Code Section A-VIII/2 paragraph 8.
3	D	See introduction chapter explaining the layout / break up.
4	A	Rule 1(b).
5	B	Rule 1(c).
6	D	See Rule 2 explanations.
7	D	Rules 2, 7(a) and guidance given in UKHO – NP 100 (Mariners handbook), section 12.33.
8	B	Rule 3(f).
9	D	Rule 3(g).
10	A	Rule 3(i), flag 'M' is required as per the international code of signals.
11	C	Rule 3(b).
12	B	Rule 3(k).
13	C	Rule 3(l) – any other similar causes.
14	D	Rule 3(i).
15	C	Self explanatory.
16	D	Rules 5 and 7.
17	C	An OOW may be the sole lookout in daylight as per paragraph 16 of the STCW Code Section A-VIII/2.
18	D	STCW Code Section A-VIII/2.
19	C	Paragraph 17 of the STCW Code Section A-VIII/2.
20	D	Rule 5 and the various requirements in STCW Code A-VIII/2, paragraph 14.1 is quoted in the choice.
21	B	Rule 6, 1st paragraph.
22	A	Rule 7(a).
23	B	Rule 7(d-i) and paragraph 43 of the STCW Code Section A-VIII/2.
24	D	Self explanatory.
25	C	Statement 'II' is clear, but observations have to be taken by a competent person, competent means duly qualified as required by the STCW Convention, that justifies statement 'I'.
26	C	STCW Code Section A-VIII/2 paragraph 38.
27	B	Rule 7(d-i) / STCW Code A-VIII/2.
28	A	Rule 4, application of the Rules of Part B Section I.
29	D	Questions 29, 30 and 31 do not have a clear answer in IRPCS, at lesser range a larger course or speed alteration is needed. However, the best answers given are based on the authors experience and practical research. Actual actions may vary in the prevailing circumstances, the best answers stated are not a verdict on right or wrong.
30	D	
31	C	

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Q.NO	BEST ANSWER	RULE REFERENCES WITH REMARKS / COMMENTS
32	D	Self explanatory.
33	C	Rule 8 does not recommend any action, all others are correct as per Rule 8 itself.
34	B	Self explanatory.
35	B	Ship Handling.
36	C	STCW Code Section A-VIII/2 paragraph 39.
37	A	Ship handling.
38	D	Rule 9(d) and 8(f).
39	B	Rule 34(d).
40	C	Rules 8(f-ii and iii) & 9(b).
41	B	Rule 9(a).
42	B	Rules 9(f) & 34(e).
43	A	Rule 10(a).
44	C	Rule 10(c).
45	B	Rule 10(d-i).
46	B	Rules 9(g) and 10(g).
47	D	Self explanatory, based on many investigations and recommendations by Governemnts after finding that many collisions were caused due to communication misunderstandings. MGN 325
48	D	Self explanatory.
49	B	Application of the Rules of Part B. 'D' is not correct, the requirements of Rule 34(a) grant no exemptions for the range between vessels.
50	A	Rule 12(a-ii).
51	D	Rule 13.
52	A	Rule 12(a-i).
53	B	Rule 13(a).
54	C	The vessel 'NUC' cannot manoeuvre as required by these Rules by definition and hence cannot act as required by Rule 13. The definitions in Rule 3 of Part A are independent of the 'notwithstanding' or overriding clause of Rule 13.
55	B	Rule 13(d).
56	B	Annex I, paragraph 9(a-i), IMO - MSC.1/Circ. 1427 of 28 May 2012.
57	D	Self explanatory, as per the quiz choice, paragraph 9-a of Annex I.
58	B	By Rule 13 (a). Note: In case of doubt 'A' should keep clear as per Rule 13(c). However, as per the screening, side lights can show up to 5° outside the prescribed sectors. By seeing them occasionally 'A' is surely more than 22.5° abaft the beam of 'B' and hence overtaking therefore there should be no doubt on this aspect. 'B' can easily determine if 'A' is approaching from more than 22.5° abaft her beam or not.
59	A	Rules 14 & 34(a).
60	C	A course alteration is not a manoeuvre required by these Rules.
61	B	Rule 15, crossing limit stays till 22.5° abaft the beam of 'A', & Rule 34(a)

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Q.NO	BEST ANSWER	RULE REFERENCES WITH REMARKS / COMMENTS
62	C	Rules 14(a) and 34(a). It is a towing vessel not showing RAM lights as such not entitled to any special right of way.
63	C	Only two vessels are referred to or implied at a time in any situation described.
64	A	Ordinary practice of seamen, comply with Rule 14 with respect to vessel 'B'.
65	B	Rules 10(a), 10(d-ii) - (to avoid immediate danger) & Rule 15.
66	A	Rules 7, 15, 16 and 17 (a-i).
67	D	Self explanatory; as per the quiz choice, application of the IRPCS explained in the introduction.
68	C	Rule 8(f).
69	D	Rules 13(a) & 18(b).
70	B	Self explanatory as per Rule 17.
71	B	Rule 18(a-iii).
72	C	Rule 6, 19(b) and 19(c), the last refers back to section I of part B which contains Rule 6.
73	D	STCW Code Section A-VIII/2 paragraphs 37 and 44.
74	C	Rule 15, crossing sector by eliminating 'head-on' and 'overtaking' sectors.
75	B	Rules 10(a), 15 and 17.
76	C	Rules 19(d) and 19(d-i) coupled with Rule 8 in general and 8-c in particular.
77	B	Rules 19(e) & 35(a).
78	D	Rule 20(b & c).
79	C	Rule 21(a) and also see Rule 23(d-i).
80	C	Annex I section 8-a.
81	C	Rule 21(d) & 22(a).
82	C	Annex I section 8-b, note.
83	B	Rule 22(a).
84	C	Rule 22(a) & Annex I paragraph 8(a).
85	D	Annex I, section 6.
86	D	Rule 23(d).
87	A	Annex I, 10(a).
88	B	Rule 23(a), Annex I, paragraphs 3(b & d). Side light appears placed forward of the masthead light.
89	D	Rules 23(a) and 24(a and b).
90	D	Rule 24(a) seems to over ride 23(a), but 24(d) requires a second mast head light. See Annex I, paragraph 2(e) regarding placement of masthead lights.
91	D	Rules 13, 14, 15, 21 and Annex I - 9(b).
92	B	Rule 19(d).
93	D	Rule 27(b).
94	B	Rule 24(f-i).
95	D	Rules 24(a and e) & 27(b).
96	B	Rule 24(f-ii).
97	A	Rule 25(a). All round lights are optional as per Rule 25(c).

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Q.NO	BEST ANSWER	RULE REFERENCES WITH REMARKS / COMMENTS
98	C	Rule 25(d-ii).
99	A	Rule 25(e).
100	A	Rule 26(b).
101	B	Rule 26(a).
102	D	Rule 26(c-ii & iii).
103	D	Rule 26(b-i) & (c-i).
104	B	Rule 27(a-iii).
105	B	Rule 26(b).
106	A	Rule 27(e-ii).
107	C	Rule 27(d).
108	B	Rules 3(g-ii) & 27(b).
109	B	Rule 27(f).
110	D	Rules 26, 27(a) and 29(a).
111	B	Rule 28.
112	C	Rule 18(d-i).
113	C	Rule 29(a-iii).
114	B	Rule 27(b-iii), applies to all vessels
115	A	Rule 30(a & c).
116	A	Rule 30(d-ii).
117	A	Rule 30(d).
118	D	Rule 18(e).
119	B	Since vessels size and draughts are not mentioned, the action may also be considered a case of avoiding collision with the vessel aground along with the normal seamanship action of immediately turning to a reciprocal course.
120	C	She is not showing lights and/or shapes to indicate she is restricted in her ability to manoeuvre.
121	A	Rule 26 (b and c).
122	A	Rule 32.
123	A	Rule 33(a) and Annex III, Section 2-b.
124	B	Rule 34(a).
125	B	Self explanatory from Rule 34(d).
126	D	Rule 34(a & d).
127	D	Self explanatory.
128	A	Rule 27(d-iii) and Rule 26(a).
129	C	Rule 34(c) linked with Rule 9(e).
130	C	Rule 33(a) and Annex III, section 2-b.
131	A	Rule 35(b).
132	C	Rule 35(e).
133	D	Rule 35(g).
134	D	Rule 35(h).
135	B	Rule 35(k).

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Q.NO	BEST ANSWER	RULE REFERENCES WITH REMARKS / COMMENTS
136	A	Annex III, paragraph 1(c).
137	A	Rule 35(c).
138	B	Rule 36.
139	C	See Annex IV.
140	A	Self explanatory.
141	C	Annex IV, paragraph 1(b).
142	A	Annex IV, paragraph 1(e), SOLAS and IAMSAR
143	D	Annex IV, paragraph 1(g).
144	C	Annex I, paragraph 2(a-i).
145	C	Annex I, paragraph 2(a-ii) & 2(b).
146	A	Annex I, paragraph 3(a).
147	D	Annex I, paragraph 6.
148	B	Annex I, paragraph 5.
149	B	Self explanatory.
150	D	Rule 23(d-i and iii), (The white light should be an all-round light).
151	C	Annex II, paragraph 2(a-ii).
152	C	Annex II, paragraph 3.
153	B	Rule 34(f) & Annex III paragraph f.
154	D	Rule 35(f).
155	C	Rule 35(d) clearly requires compliance with Rule 35(c). This is similar to the requirements of lights prescribed in Rule 26.
156	D	Rule 10(f), choice 'C' of the question itself & requirements of Rule 2.
157	B	Prudent safe navigation to avoid embarrassing other vessels.
158	B	Rule 35(d/c).
159	B	This is a distress signal as per Annex IV.
160	C	Self explanatory.
161	D	Self explanatory.
162	C	Self explanatory.
163	B	Rule 19(d) and 19(d-i), overtaking in restricted visibility.
164	B	Rule 3(g) and Rule 2.
165	D	Self explanatory, (Ship Handling)
166	D	Rule 38.
167	A	Self explanatory.
168	C	Rule 18(d) and 8(f).
169	B	Self explanatory.
170	D	Self explanatory.
171	C	Rules 19(d), 8(b and c).
172	D	Self explanatory, Paragraph 6 of STCW A-VIII/2.
173	D	STCW Code A-VIII/2, paragraph 45.
174	B	Rule 2.
175	C	Self explanatory
176	C	Rule 19(d)

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BAHAMAS MARITIME AUTHORITY

BMA INFORMATION BULLETIN No. 14 BMA.B14 - 12/00

USE OF ARPA RADAR FOR COLLISION AVOIDANCE

1. It was noted during the investigation of a recent collision that the ARPA radars were not used to best advantage for the avoidance of collision. The failure to use the ARPA radar correctly is considered to have been a contributory cause of the collision.

2. Two ARPA radars were in use at the time of the incident, one 10 cm and one 3 cm. The shipping traffic was very heavy, requiring the close concentration of the officer of the watch. Both radars were in true north-up relative motion mode and both ARPA displays were being used to determine if a close quarters situation was developing with any of the vessels in the area as they approached. The use of more than one ARPA display for anti collision purposes by one officer is likely to lead to increased scope for error. It is accordingly recommended that only one display should be used for collision avoidance at any one time.

3. Where the automatic plotting function is being used for anti-collision purposes the risk of error will be reduced if Relative vectors are used to determine the risk of a close quarters situation developing. True vectors should be used mainly to determine the aspect of other ships, particularly in a multi-ship situation. The use of True vectors to determine risk of collision is likely to lead to error, especially when traffic is heavy. Using one display for True vectors and another for Relative vectors is also likely to lead to errors being made when traffic is heavy.

4. It was noted in the investigation that speed over the ground was used for the anti collision plot. It is important that the speed input for all anti-collision plots on radar or ARPA should be speed through the water and not speed over the ground. The use of speed over the ground can lead to errors especially when predicting the effect of intended manoeuvres.

5. It is strongly recommended that:

   (a) only one radar should be used at any one time for anti-collision plotting; and

   (b) Relative vectors should be used to determine the risk of collision and True vectors to determine aspect.

6. Owners and managers of Bahamian vessels are requested to bring this bulletin and the above recommendations to the attention of masters and navigating officers on their vessels, and to remind them that course and speed through the water and not over the ground should be used for all anti-collision plotting.

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MARINE SAFETY ADVISORY NO. 23-04

To : Regional Marine Safety Offices, Nautical Inspectors, Masters, Owners/Agents

Subject : RADAR FOR COLLISION AVOIDANCE

Date : 22 March 2004

Accuracy of inputs:

In radar plotting, the measurement of the course, speed and aspect of the target is used to determine the time and closest approach of the target and whether or not there is risk of collision.

The accuracy of the radar plot will depend upon the accuracy of the input information to the radar itself. Such information includes ship's course and speed. Any errors of this input information during the plotting period will lead to inaccuracies of calculated target vectors. When the speed log is not operational, the speed may be input manually using the engine rpm and applying a suitable calculated allowance for slip.

The plotting inaccuracies will have the most effect when the target is in a head-on situation. This may make a target appear to be passing clear, when in fact it is crossing ahead or nearly ahead.

Electronic Plotting Devices:

On larger ships at least one of the radars provided will have ARPA. Smaller vessels may be provided with Automatic tracking aids. Watchkeepers must be aware of the limitations of both these devices and avoid being over-reliant on them. They must:

- Understand the types of errors that are possible and recognize the operational warnings that appear on the display.
- Understand the limitations of the device.
- Regularly test the devices using the built - in test functions.
- If targets are to be processed correctly, it is essential that accurate speed and heading information are fed into the ARPA.
- Speed and heading inputs must be sea stabilized (water tracked) to provide the ARPA or ATA with speed and course through the water. To use ground stabilized display (bottom track) could be dangerous when assessing the risk of collision especially in sea areas that experience significant tidal streams and currents. When the speed log is not operational through any reason, the speed should be input manually.

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SC No. 23 of 2005

16-06-2005

CAUTION ON THE USE OF VHF RADIO IN COLLISION AVOIDANCE

Applicable to: This circular is for the attention of shipowners, shipmanagers , masters and crews of Singapore registered ships.

Many investigations worldwide have revealed that VHF communication is one of the contributing factors in collisions at sea. In many of the so called "VHF assisted" collisions, the "VHF communication" between the bridges had created misunderstanding among the officers, which led to close quarter situations and collisions. We are of the view that compliance with the International Regulations for Preventing Collisions at Sea will be more effective to avert a collision rather than the use of VHF communications, based on scanty and unclear information, to avoid a close quarter situation. A recently concluded investigation showed that both the vessels were using VHF communication to agree on a collision avoidance action, which led to the collision later.

2 "VHF assisted" collisions, contacts or near misses are not uncommon occurrences at sea. IMO has taken a serious view of this trend and has issued Resolution A. 954(23) on "Proper Use of VHF channels at Sea".

3 Based on our findings and experience in similar occurrences, we believe that such incidents are avoidable. We wish to reinforce this learning among all the masters and navigators serving on Singapore ships through this circular. We take this opportunity to reiterate the following possible dangers involved in the use of VHF communication as a means to avoid collision. The factors to be considered are as follows:

(a) Uncertainty over the identity of vessels[1], especially during periods of darkness, poor visibility, and in situations when there is more than one vessel;

(b) Uncertainty over the interpretation of messages received due to language difficulties and an imprecise or ambiguously expressed message;

(d) The danger of agreeing to a course of action that does not comply with the Collision Regulations resulting in a situation that the action was intended to avoid.

4 Shipowners, managers and agents are advised to bring the contents of this circular to the attention of their shipmasters and all navigating officers.

5 For any query regarding this circular, please contact Capt Sunil Thapliyal at Tel: 63756209 or Shipping@MPA.gov.sg.

LEE SENG KONG
DIRECTOR OF MARINE
MARITIME AND PORT AUTHORITY OF SINGAPORE

[1]Not applicable where vessels are fitted with AIS

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2007 built VLCC after collision with 2006 built container ship in December 2007, see Rule 10



Container vessels after collision of 29th August 2009, see Rule 10

One vessel on her way back to port, the damage from the collision is clearly visible



Second vessel still afloat with her aft deck and containers submerged under water



Chemical tanker after collision of 29th December 2013, tugs assisting in fire fighting

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MAREX
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Capt. Yashwant Chhabra has done an admirable job of putting across the practice and essence of the Regulations for Preventing Collisions at Sea.

These have been analysed, detailed, explained, and prioritized for pragmatic application. Even the most minor points have been brought out, reflected upon, referenced to complementing regulations, supported by case studies and linked to legal precedents.

Capt. P S Barve, Extra Master, FNI
Nautical Advisor to Govt. of India (Retd), Dean, Tolani Maritime Institute

Capt. Chhabra is doing exemplary work on collision prevention and navigational training in Anglo-Eastern.

He has explained the practicality of implementing the Rules in a simple and exhaustive manner. His dedication and devotion to the subjects has well transformed into print.

Capt. Pradeep Chawla, FNI
Managing Director, QHSE and Training, Anglo-Eastern Ship Management Ltd., Hong Kong

Writing a book of this calibre needs domain knowledge, practical experience and courage to withstand criticism from peers. Capt. Chhabra has all these. This book is worth reading by all navigators.

Capt. H Subramaniam Extra Master (UK), FNI
Principal Emeritus, LBS College of Advanced Learning & Research, Mumbai

Capt. Yashwant Chhabra has produced an invaluable and unique master piece. Detailed references to various case studies, dove-tailed in relevant parts of the book, highlight the consequences of any negligence in the application of COLREGS. The book, in particular the assessments, will help a navigator, a teacher or even an examiner.

Capt. Milind J Karkhanis
Vice President, Videotel Training Services, London

The book certainly appears to be a comprehensive and well written piece of work and a valuable reference for masters and deck officers alike.

Capt. Mark Williams
Director Loss Prevention, West Of England P & I Club

It is a very good book for trainees up to Masters with clear explanation and links to STCW watchkeeping requirements, ship handling, management aspects and case studies. A comprehensive guide for practical application, a very good source of reference for educators and examiners.

Capt. Andrew Winbow
Assistant Secretary-General, Director, Maritime Safety Division
International Maritime Organization (IMO)

A Mariner's Guide to PREVENTING COLLISIONS



Capt. Yashwant Chhabra

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