

Nov 2025 PM,
May 2018

Q1. While on a course of 122 deg (T) at 15 kts in restricted visibility following observations were made

Buoy X			Target Y			Target Z		
Time	Bearing	Range	Time	Bearing	Range	Time	Bearing	Range
1300	113 (T)	8.2 M	1300	162 (T)	10.2 M	1300	201 (T)	10.3 M
1318	102 (T)	3.8 M	1318	156 (T)	06.0 M	1318	201 (T)	07.0 M

Using a radar plot, find

- a) CPA range and time of all three targets b) Course and speed of targets Y and Z
c) When buoy X is abeam own vessel and it is decided to have a CPA of 2.0M from targets Y and Z what alteration of course is to be made under applicable COLREGS? All actions are assumed to be instantly effective and sufficient depth of water is available all around.

Soln :-

Step 1: Plot Buoy 'X' brg x rng
and join both i.e. OA & extend it
1300: 113°(T) X 8.2 M (i.e. O)
1318: 102°(T) X 3.8 M (i.e. A)

Note: DA: apparent motion of the target
WO: own vessel co & speed
WA: target vessel co & speed

Step 2: Plot Target Y brg x rng

Step 3: Plot target Z brg x rng

Step 4: Plot own vessel co & speed (on all three)

↓ i.e. 122° X 4.5 M →
WO
60 MIN = 15 M
1 MIN = 15/60
18 MIN = 15/60 × 18 = 4.5 M

Step 5: Join W & A i.e. target vessel co & speed

a) CPA range and time of all three targets

* CPA range & time for Buoy X

→ CPA: i.e. CD = 1.3 M

→ TCPA: DA ⇒ 8.2 - 3.8 = 4.4 NM in 18 min
1 NM in 18/4.4

AD = 3.6 NM in 18/4.4 × 3.6 = 14.73 min
+ 1318 HRS
1333 HRS

* CPA range & time for Target Y

→ CPA: i.e. CE = 1.5 NM

→ TCPA: DA = 10.2 - 6.0 = 4.2 NM in 18 min

AE = 5.9 NM in 18/4.2 × 5.9 = 25.29 min
+ 1318 hrs
1343 HRS

* CPA range & time for Target Z

→ CPA: 0 NM i.e. on collision course

→ TCPA: DA = $10.3 - 7.0 = 3.3$ NM in 18 min

AC = 7.1 NM in $\frac{18}{3.3} \times 7.1 = 38.73$ min

+ 1318 hrs

1357 hrs

b) Course and speed of targets Y and Z

* Course and speed of target Y

Target Y: WA = 060° (T)

18 min = 3.6 NM

1 min = $3.6/18$

60 min = $3.6/18 \times 60 = 12.0$ Kts

* Course and speed of target Z

Target Z: WA = 082° (T)

18 min = 5.1 NM

1 min = $5.1/18$

60 min = $5.1/18 \times 60 = 17.0$ Kts

c) When buoy X is abeam own vessel and it is decided to have a CPA of 2.0 M from targets Y and Z, what alteration of course is to be made under applicable COLREGS? All actions are assumed to be instantly and sufficient depth of water is available all around.

→ When buoy X is abeam own vessel
Bearing of buoy = Hdg of VL + 90° (abeam)
= $122 + 90$
= 212°

At Target Y

Make DA i.e. 212° (C₁) & 4.5 NM arc (C₂)

WA remain same

Make WO' i.e. 18 min triangle (C₃)



i.e. own vessel new course i.e. 186° (T)

CPA = 4.8 NM (C₄)

At Target Z

Transfer C_3 at target Z & make W_0'
Join $O'A$

Answer:

To pass target Y & Z at 2 NM CPA and as per COLREGS Rule 19.d(i),
we need to alter course by 64° to stbd

$$\begin{aligned} W_0' (186^\circ) - \text{vessel course} \\ &= 186 - 122 \\ &= 64^\circ \end{aligned}$$

New course = $186(T)$, with this we get CPA of

$$Y = 4.8 \text{ NM}$$

$$Z = 2 \text{ NM}$$

At target Y

Transfer W_0' at make W_0''

Measure W_0'' i.e. 3.0 NM

Ship's reduced speed = 10 kts

$$\left. \begin{aligned} 18 \text{ min} &= 3.0 \text{ NM} \\ 1 \text{ min} &= \frac{3}{18} \\ 60 \text{ min} &= \frac{3}{18} \times 60 = 10 \text{ kts} \end{aligned} \right\}$$

Hence,

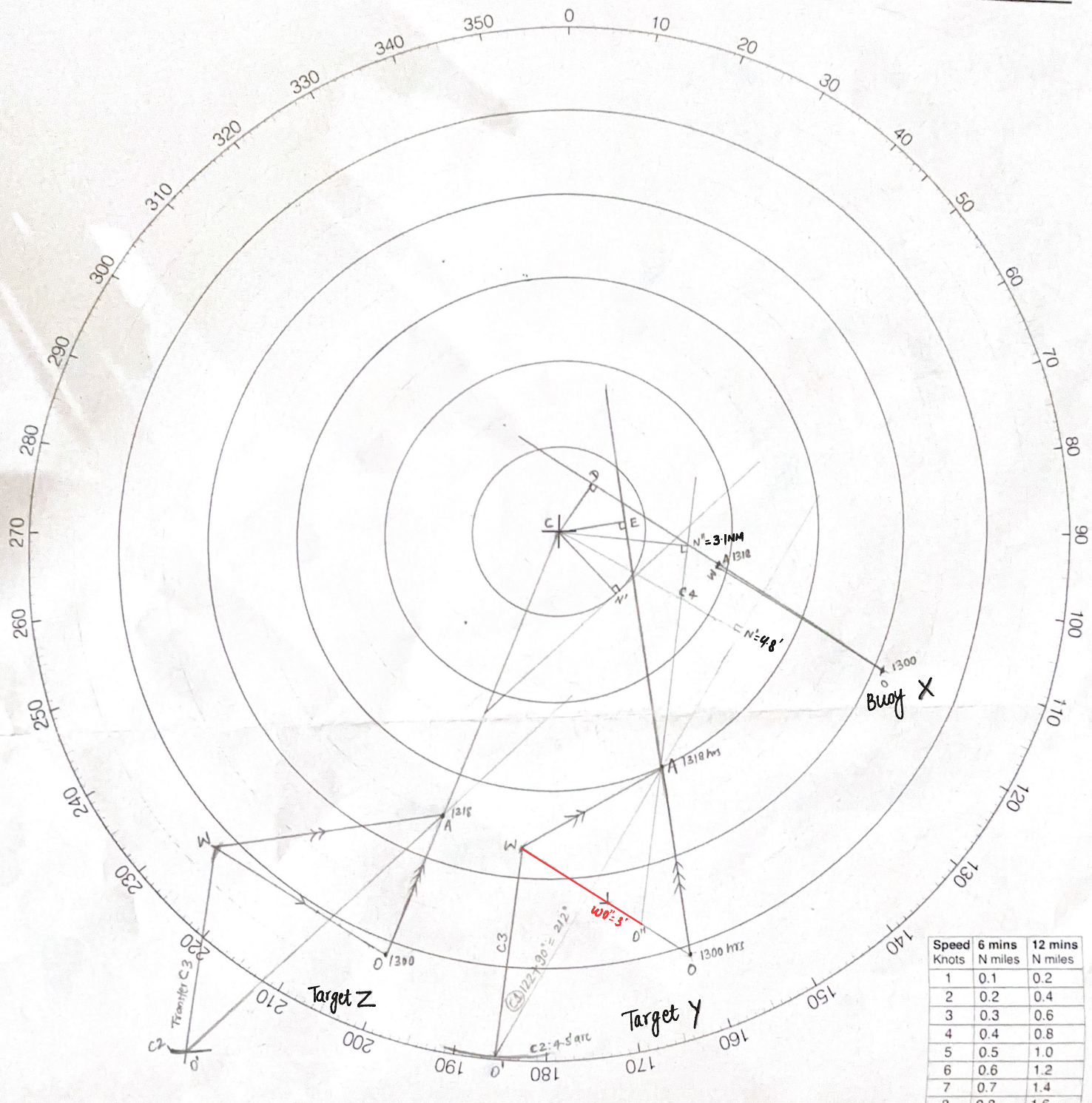
If reduce speed to 10 kts, we get CPA

$$Y = 3.1 \text{ NM}$$

$$Z = 2 \text{ NM}$$

Conclusion:

Since any action is assumed to be instantly effective, it is better
to reduce speed to 10 kts rather than making a broad alteration
of 64° to stbd in RV.

$$1 \text{ CM} = 1 \text{ NM}$$


Speed Knots	6 mins N miles	12 mins N miles
1	0.1	0.2
2	0.2	0.4
3	0.3	0.6
4	0.4	0.8
5	0.5	1.0
6	0.6	1.2
7	0.7	1.4
8	0.8	1.6

AUG 25 AM,
JAN 2022,
AUG 2019

Q.1 In restricted visibility, own vessel on a course of 000°(T) at 10 kts observes the following targets on her radar screen:

Sr No	Time	Bearing & Range (Target 1)	Bearing & Range (Target 2)
1	1000	315° × 8'	000° × 11'
2	1006	315° × 7'	000° × 9.5'
3	1012	315° × 6'	000° × 8'

a) Report the targets at 1012 hrs.

b) Analyze the above plot and basis that identify, in order to maintain a minimum CPA of 2 miles, which vessel is required to take action and what is that action. Any action taken will be effective from 1016.

Soln:-
 Target 1 $\Rightarrow$ 1000 : 315° × 8' (0)
 1006 : 315° × 7'
 1012 : 315° × 6' (A)
 Target 2 $\Rightarrow$ 1000 : 000° × 11' (0)
 1006 : 000° × 9.5'
 1012 : 000° × 8' (A)

WO: own vessel co & speed

$$60 \text{ min} = 10 \text{ m}$$

$$12 \text{ min} = \frac{10}{60} \times 12$$

$$= 2$$

Plot WO = 000° × 2'

Join WA i.e. Target vessel co & speed

a) Report the targets at 1012 hrs.

Target 1 : At port bow,
 bearing 315°(T), bearing not changing
 Range 6 NM, range decreasing
 CPA : 0 NM i.e. on collision course
 TCPA : 1048 hrs
 Target vessel co & speed : 067°(T) × 8 Kts
 Aspect : 065°(G)
 Visibility low

Target 2 : At right ahead,
 bearing 000°(T), bearing not changing
 Range 8 NM, range decreasing.
 CPA : 0 NM, i.e. on collision course
 TCPA : 1044 Hrs
 Target vessel co & speed : 180°(T) × 5 Kts
 Aspect : 000°
 Visibility low

ROUGH

2 miles in 12 min

$$6 \quad \frac{12}{2} \times 6 = 36 \text{ min}$$

$$+ 1012$$

$$1048 \text{ min}$$

12 min = 1.6 m

$$60 \text{ min} = \frac{1.6}{12} \times 60 = 8 \text{ (K)}$$

3 miles in 12

$$8 \quad \frac{12}{3} \times 8 = 32 \text{ min}$$

12 min = 1 m

$$60 \quad \frac{1}{12} \times 60 = 5 \text{ Kts}$$

12 min = 2 m

$$2 \text{ min} = \frac{2}{12} \times 2 = 0.33$$

b) Analyze the above plot and basis that identify in order to maintain a minimum CPA of 2 miles which vessel is required to take action and what is that action. Any action taken will be effective from 1016.

As per Rule 19.d, In restricted visibility, own vessel should take action.

As per Rule 19.d.i, Action: Alter course to starboard.

As per 19.d.i, an alteration of course to port for a vessel forward of the beam should be avoided, other than for a vessel being overtaken.

From 1012 to 1016, both target will move on same line of approach

Target 1: 0.70 NM

Target 2: 1.00 NM

mark it as P on line of approach

From P_1 , make a tangent on 2 NM radius from C

Transfer that on A

From W cut a 2' arc on the line made from A, that gives WO'

own vessel cover in
12 min

i.e. new course after alteration

027°(T) X 10 Kts

Target 2

WO' is transferred to W₂ & cut 2' arc & make WO' at target 2

Join O' & A

Transfer O'A at P

i.e. new line of approach for Target 2

Calⁿ CPA

Target 1

CPA: 2 NM

TCPA: 1102 hrs

Target 2

CPA: 2.3 NM

TCPA: 1044 hrs

Answer:

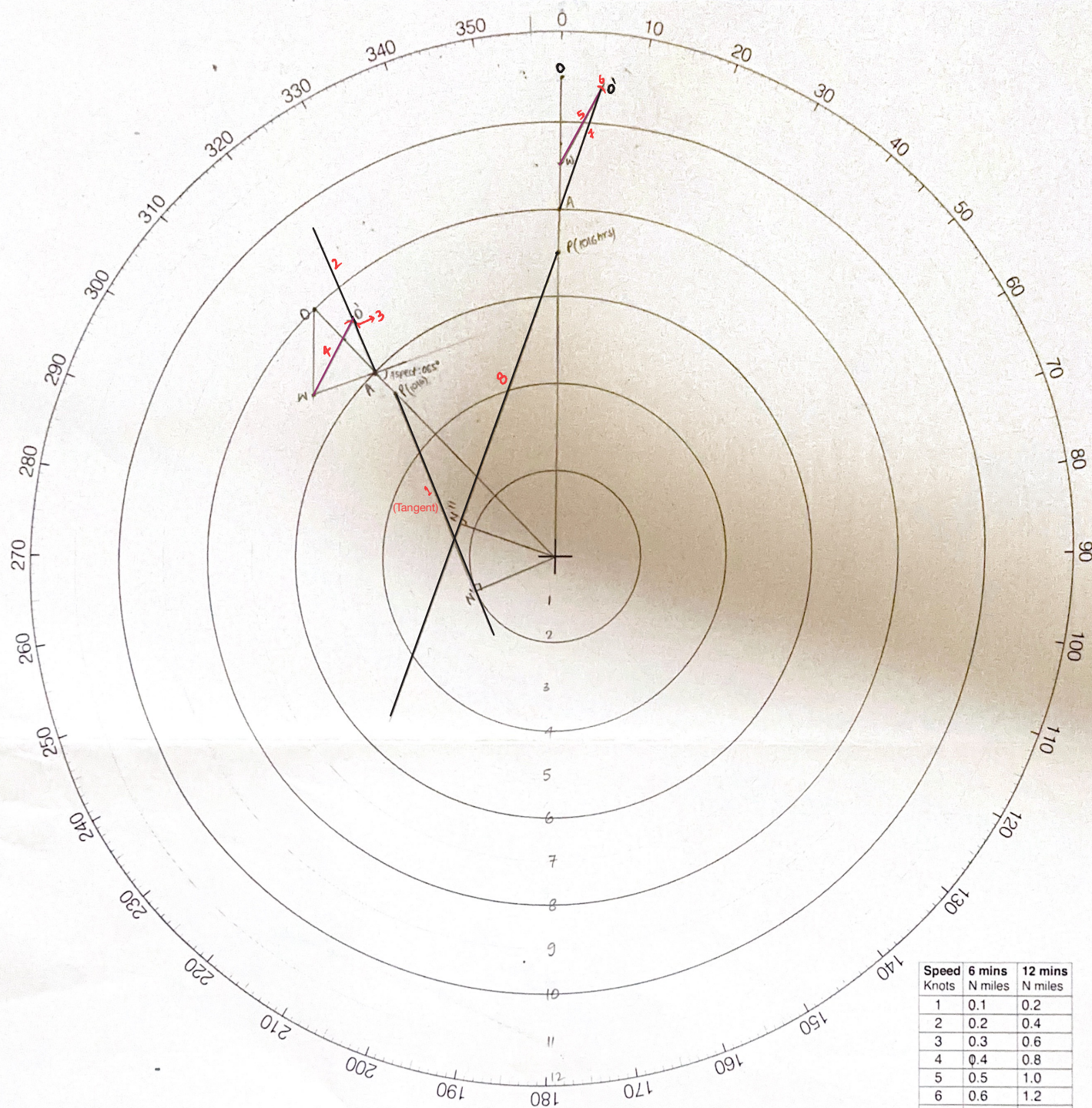
Own vessel is required to take action

Action is alter course to stbd by 027°

New course of own vessel = 027°(T)

Speed remains same

Radar plotting sheet



Scale in nautical miles



Speed Knots	6 mins N miles	12 mins N miles
1	0.1	0.2
2	0.2	0.4
3	0.3	0.6
4	0.4	0.8
5	0.5	1.0
6	0.6	1.2
7	0.7	1.4
8	0.8	1.6
9	0.9	1.8
10	1.0	2.0
11	1.1	2.2
12	1.2	2.4
13	1.3	2.6
14	1.4	2.8
15	1.5	3.0
16	1.6	3.2
17	1.7	3.4