ROYAL CANADIAN SEA CADETS

PHASE FIVE

INSTRUCTIONAL GUIDE

SECTION 2

EO C523.02A – PLOT A FIX

Total Time: 90 min

PREPARATION

PRE-LESSON INSTRUCTIONS

Resources needed for the completion of this self study package are listed in the lesson specification located in A-CR-CCP-605/PG-001, *Phase Five Qualification Standard and Plan*, Chapter 4. Specific uses for said resources are identified throughout the self study package within the section for which they are required.

Self study packages are intended to be completed by the cadet independently. More information about self study packages can be found in the foreword and preface.

Review the lesson content and become familiar with the material prior to facilitating this lesson.

Photocopy the self study package located at Attachment A for each cadet.

Photocopy the answer key located at Attachment B but **do not** provide it to the cadet.

PRE-LESSON ASSIGNMENT

Nil.

APPROACH

A self study was chosen for this lesson as it allows the cadet to examine in greater detail potting a fix at their own learning pace. This encourages the cadet to become more self-reliant and independent by focusing on their own learning instead of learning directed by the instructor.

INTRODUCTION

REVIEW

Nil.

OBJECTIVES

By the end of this lesson the cadet shall have plotted a fix.

IMPORTANCE

It is important for cadets to plot a three-bearing fix and a horizontal angle fix as it is an accurate way of fixing a position by a visual means. Plotting a fix ensures the vessel's safety during navigation.

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SELF STUDY PACKAGE INSTRUCTIONS

OBJECTIVE

The objective of this self study package is to have the cadet plot a fix.

RESOURCES

Self study package,

Chart 3441 Haro Strait, Boundary Pass and / et Satellite Channel,

Navigation instruments, and

Pen / pencil.

ACTIVITY LAYOUT

Provide the cadet with a classroom or training area suitable to complete the self study package.

ACTIVITY INSTRUCTIONS

1. Provide the cadet with a copy of the self study package located at Attachment A, *Chart 3441 Haro Strait, Boundary Pass and / et Satellite Channel*, navigation instruments and a pen / pencil.

2. Allow the cadet 90 minutes to complete the self study package.

3. Provide assistance as required to the cadet.

4. Collect the self study package once the cadet has finished.

5. Correct the self study package with the self study package answer key located at Attachment B.

6. Provide feedback to the cadet and indicate whether or not they have completed the Enabling Objective (EO).

7. Return the completed self study package to the cadet for their future reference.

8. Record the result in the cadet's logbook and Cadet Training Record.

SAFETY

Nil.

END OF LESSON CONFIRMATION

The cadet's completion of the self study package will serve as the confirmation of this lesson.

CONCLUSION

HOMEWORK / READING / PRACTICE

Nil.

METHOD OF EVALUATION

Nil.

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CLOSING STATEMENT

Locating a position on a chart is an important skill which cadets can use whenever they navigate small craft. Accurate navigation will allow the cadets to safely navigate and complete their objectives.

INSTRUCTOR NOTES / REMARKS

EO C523.02A (Plot a Fix) may be completed by cadets who have not completed complementary navigation EOs during Phase Four training.

This lesson requires the use of a station pointer, which is a navigation instrument that the cadets have not been introduced to previously.

REFERENCES

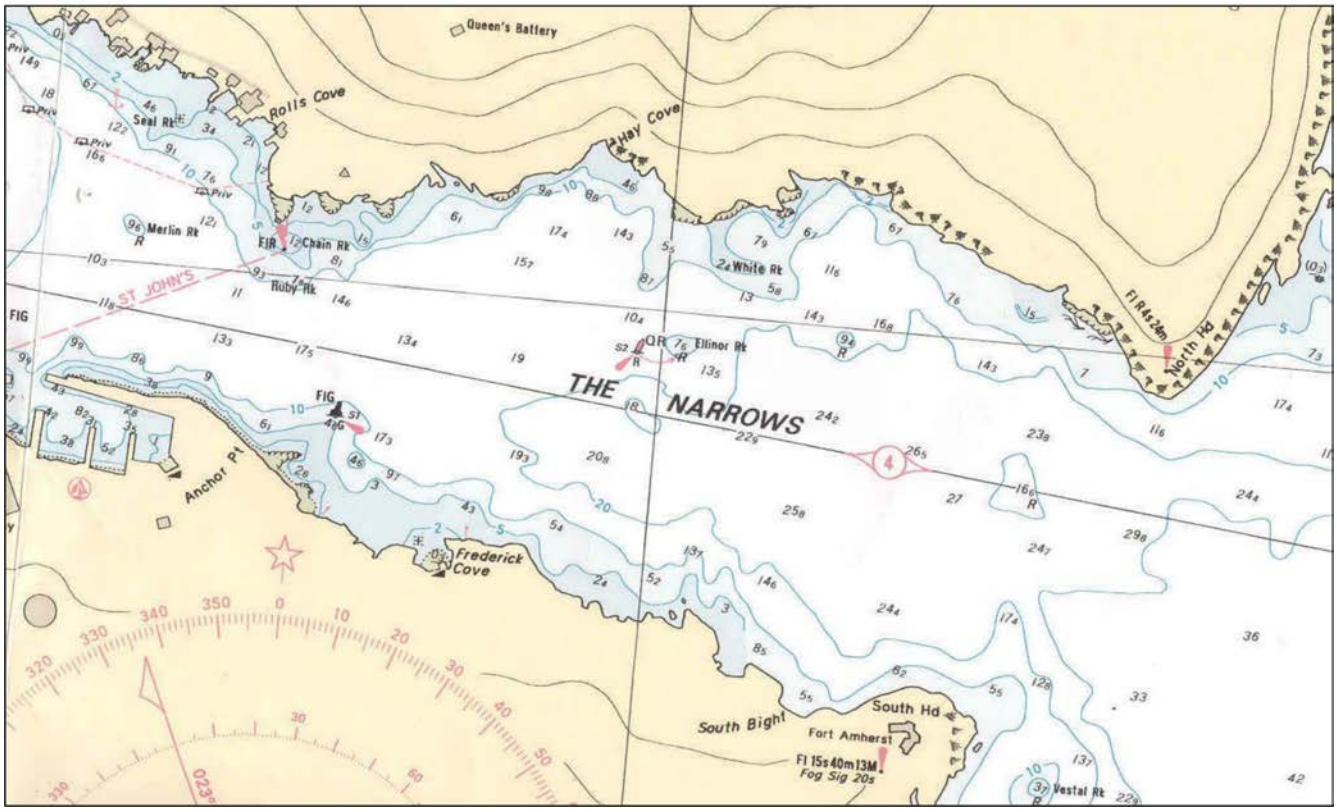
C1-164 C-57-007-002/AF-001 Royal Navy. (1987). *Admiralty manual of navigation* (Vol. 1). (Rev. 1987). London, England: Her Majesty's Stationery Office.

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PLOT A FIX



Self Study Package

Section 1: PLOT A POSITION USING A THREE-BEARING FIX

Section 2: PLOT A POSITION USING A HORIZONTAL ANGLE FIX

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SECTION 1
PLOT A POSITION USING A THREE-BEARING FIX

FIXING TERMINOLOGY

To better understand the principles outlined, it is important to know the following terms:

Heading. The direction in which the bow of the small craft is pointing. Headings are expressed in

degrees (°)—000 through 360.

Bearing. A line of position sighted from a small craft to another object. Only true bearings can be plotted on charts.

Lines of Position (LOPs). Lines that are plotted on a chart for the bearings taken of objects.

A fix. The intersection of two or more LOPs. While a fix can be made with two LOPs, it is considered more accurate to use three LOPs in every fix. An ideal three-bearing fix should have 60-degree angles between the LOPs.



Did you know?

True bearings are obtained from a gyrocompass. Small craft are not normally fitted with a gyrocompass due to their weight and size. If taking bearings from a small craft, a handheld magnetic compass may be used to obtain the bearings. However, these bearings should be converted to true bearings before plotting them on a chart.



Throughout this self study package, all bearings given in examples and exercises are to be considered true bearings.

THREE-BEARING FIX

In order to plot a three-bearing fix, three LOPs must cross at a specific point.

Example: Plot the following fix on *Chart 3441 Haro Strait, Boundary Pass and / et Satellite Channel*:

	East Pt. light	010°
0800	Skipjack I. light	085°
	Monarch Hd.	326°

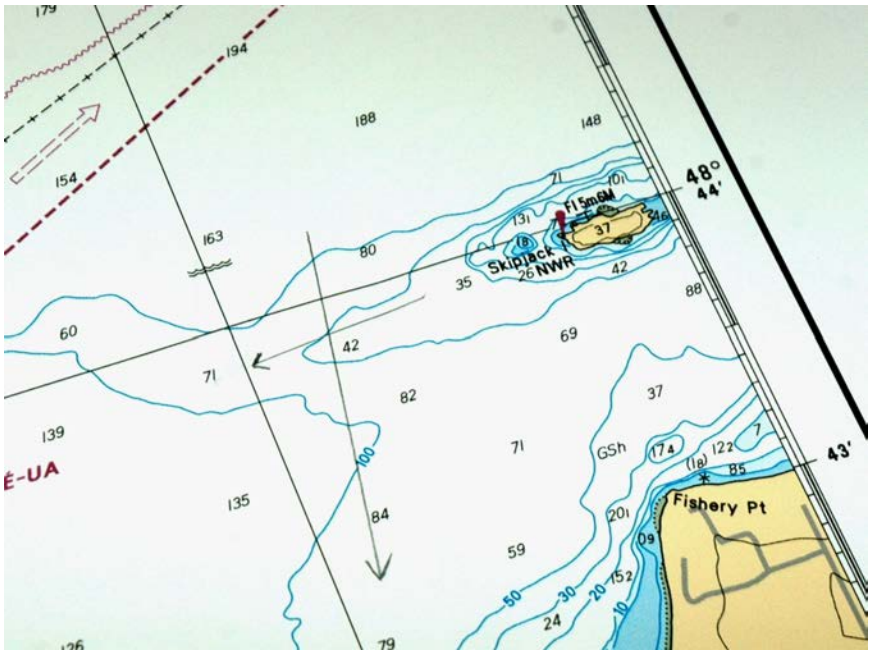
1. Align the parallel ruler with the centre of the compass rose and 010° on the outer ring of the compass rose.

2. Roll the ruler along the chart until the edge aligns with East Pt. light.

3. Draw a line from the light along the ruler.

4. Repeat Steps 1–3 for the other two bearings. After the first LOP is plotted, the remaining LOPs are only drawn across the first LOP plotted.

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Figure AA-1 Three-Bearing Fix Step 4

5. Once an LOP is drawn it can be shortened to the same size as the diameter of a quarter.



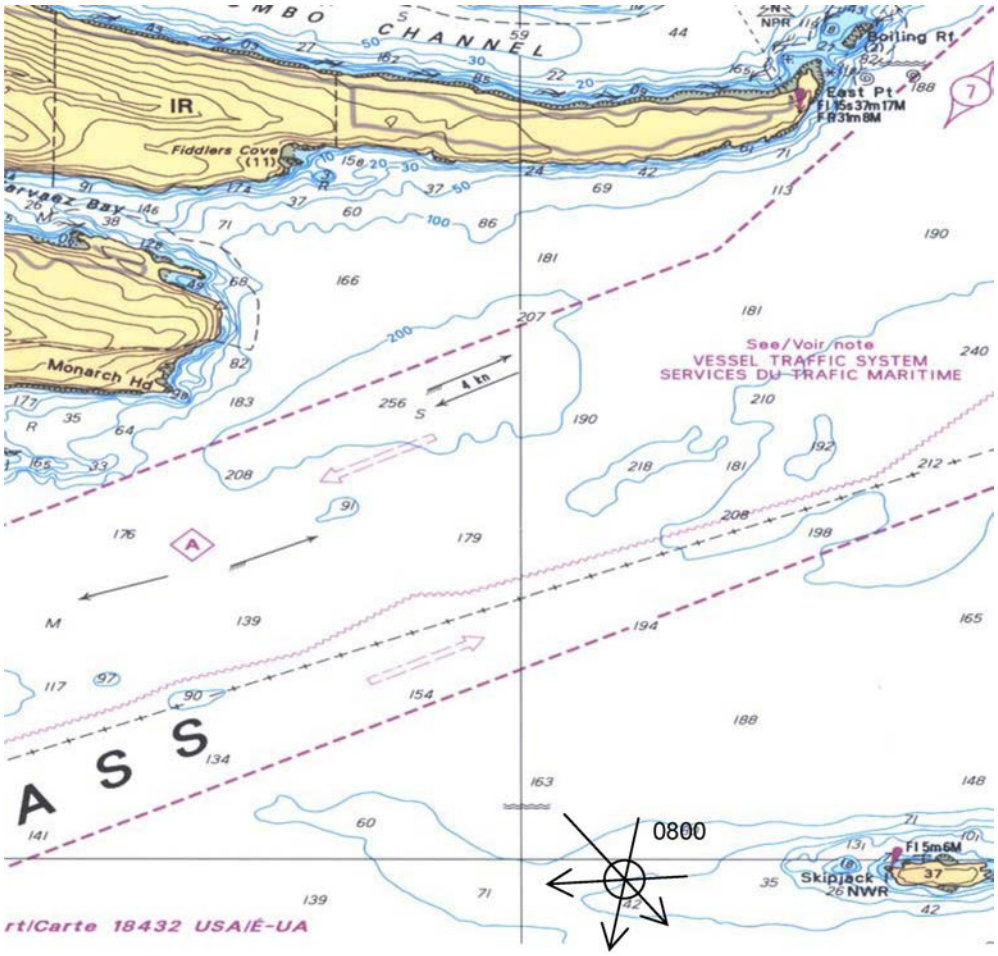
Note. Created by Director Cadets 3, 2008, Ottawa, ON: Department of National Defence.

Figure AA-2 Three-Bearing Fix Step 5

6. Draw arrows at the outer ends of the LOPs pointing away from the object. These arrows indicate the direction in which the observer must lie from the observed object.

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7. Circle the intersection of the three LOPs and label with the four digit time the bearings were taken next to the fix.



Note. Created by Director Cadets 3, 2008, Ottawa, ON: Department of National Defence.

Figure AA-3 Three-Bearing Fix Step 7

When plotting LOPs, plot from the black dot at the bottom of the symbol or from the edge of the points of land.

When referring to edges of land, it is common to use RHE for right-hand edge and LHE for left-hand edge.

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SECTION 2
PLOT A POSITION USING A HORIZONTAL ANGLE FIX

THE STATION POINTER

The station pointer was invented in 1801 by Joseph Huddart of the United States Navy (USN). It is a simple tool used to fix, or locate a position on a chart when the relative bearings are known between three visible, fixed objects.

Parts of a Station Pointer

The following parts are found on a station pointer (as illustrated in Figure A-4):

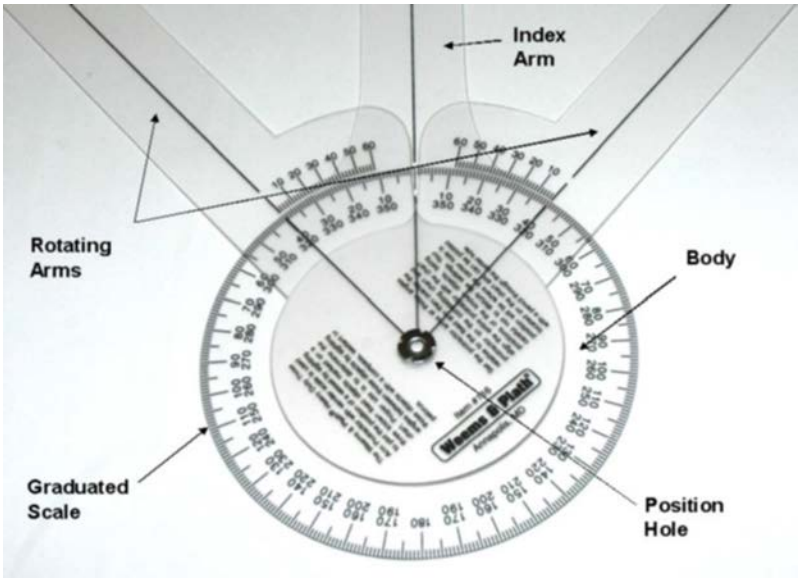
1. **Body.** A graduated circle.

2. **Position hole.** A hole in the centre of the body used to mark a position with the point of a pencil.

3. **Index arm.** Centre arm that is fixed to the body with its measurement line oriented to zero degrees on the circle. This arm is also referred to as the zero arm.

4. **Rotating arms.** Two arms, attached at the position hole that rotate freely around the body. The measurement lines on the arms overlay the graduated circle on the body.

5. **Graduated scale.** Marked in degrees around the circumference of the body.



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Figure AA-4 Parts of a Station Pointer

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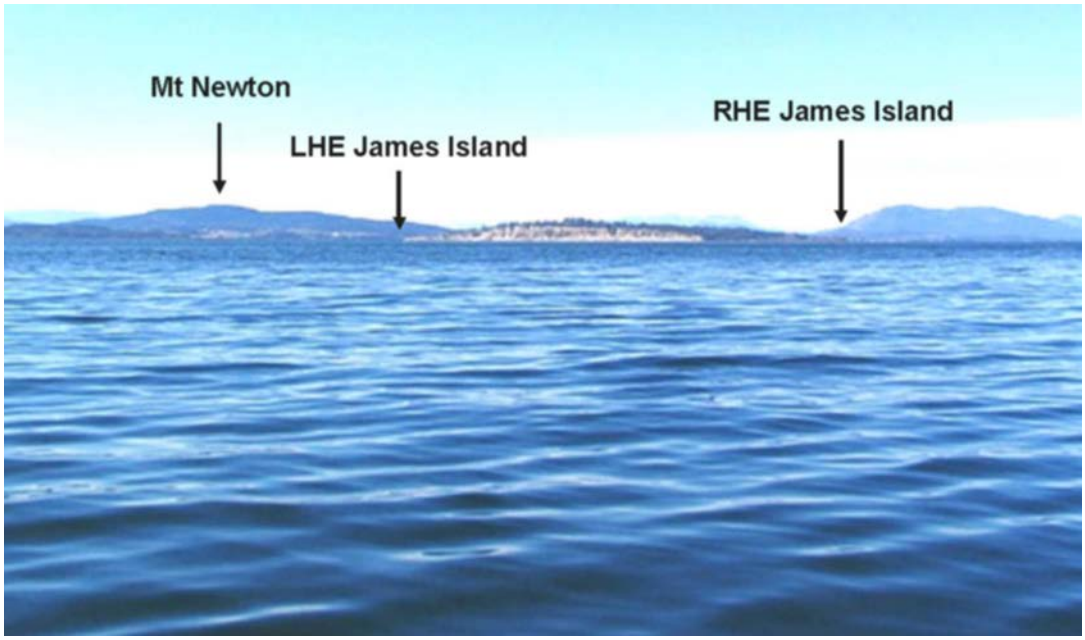
HORIZONTAL ANGLE FIX

A horizontal angle fix uses the difference in the angles between three points to locate position. Although it is not frequently used today, it can give a navigator an accurate fix when electronic position equipment or a gyrocompass is not available.

For the steps listed below, a magnetic compass is used. However, any navigational instrument that measures a bearing of an object can be used.

Use the following directions to plot a position on a chart using a station pointer:

1. Identify three visible, fixed objects that can be found on the chart.

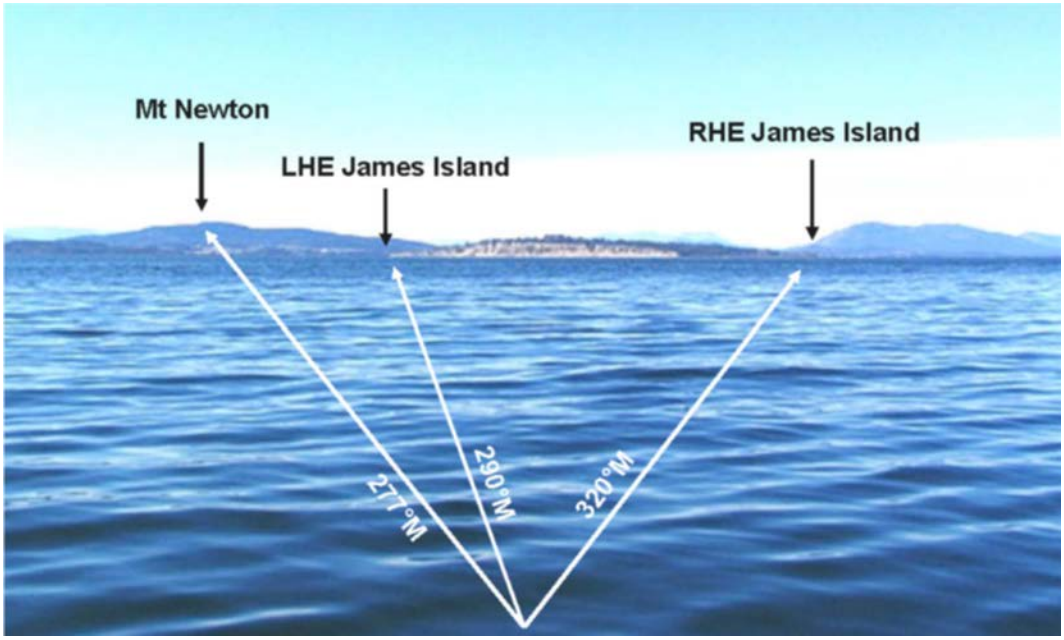


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Figure AA-5 Horizontal Angle Fix Step 1

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2. Using a hand-held compass, measure the bearings to the objects.



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Figure AA-6 Horizontal Angle Fix Step 2

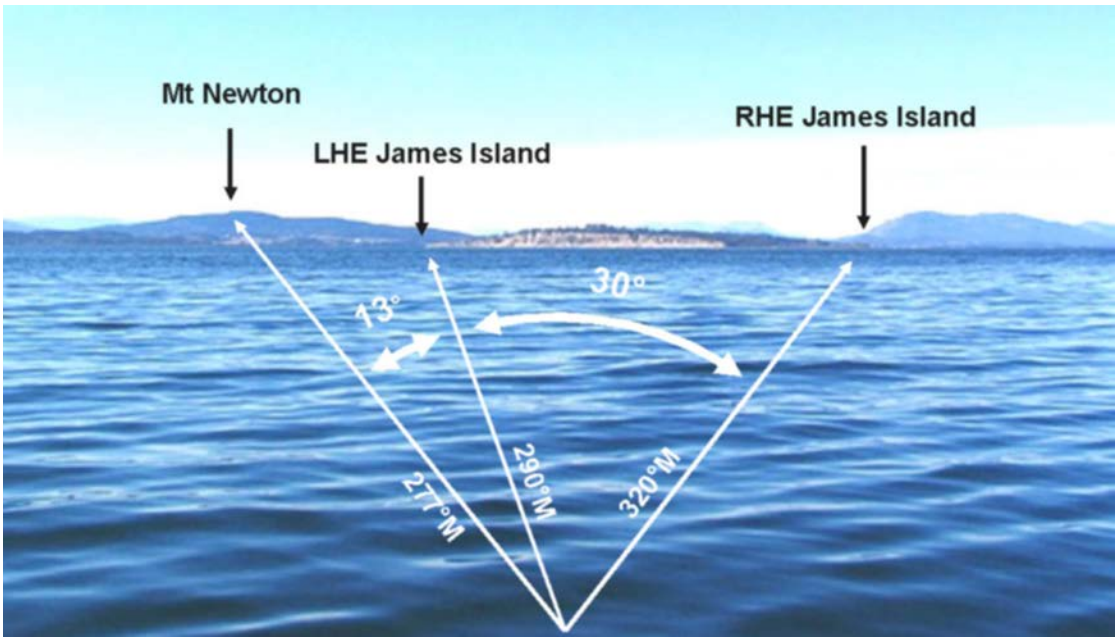
3. The angles for the fix will be written as:

Mt. Newton	277°M
LHE James Island	290°M
RHE James Island	320°M

For the purposes of this example, the middle bearing will be the index arm of the station pointer.

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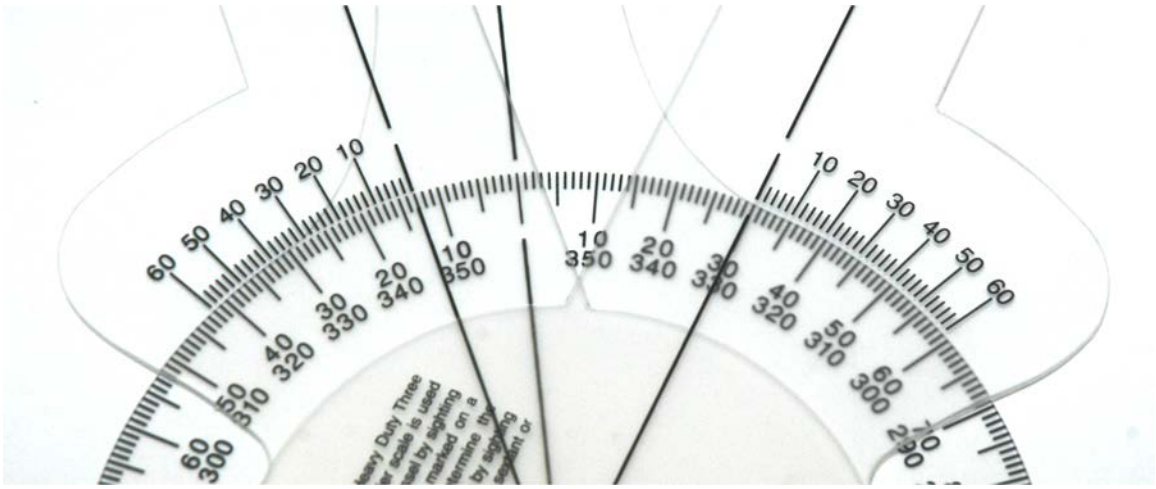
4. Calculate the two relative bearings between the left and centre and the right and centre objects. These are known as the horizontal angles.



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Figure AA-7 Horizontal Angle Fix Step 4

5. Set the rotating arms of the station pointer to the relative bearings, calculated in Step 4, using the graduated scale.

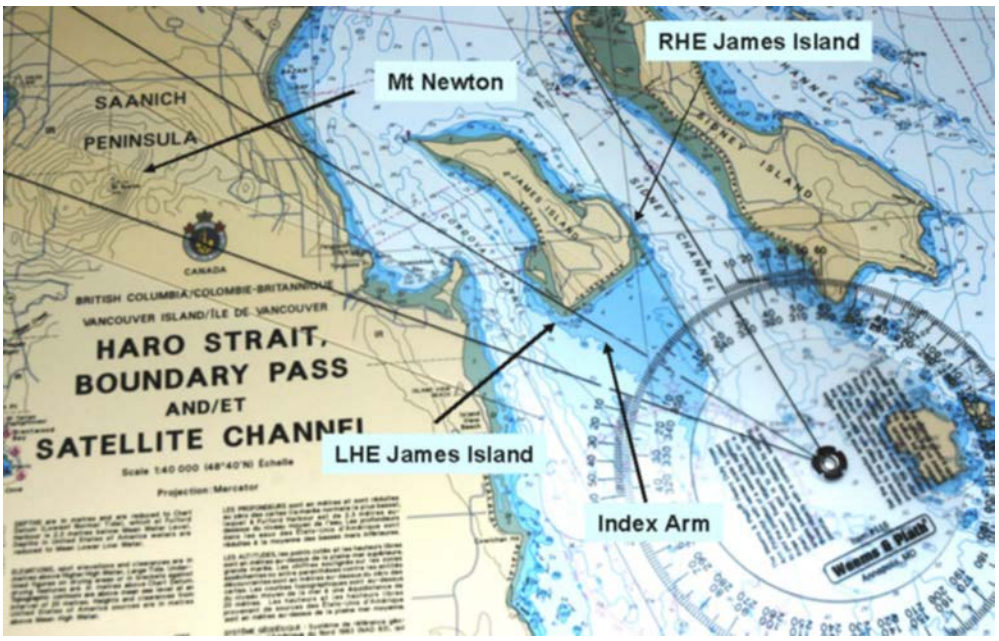


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Figure AA-8 Horizontal Angle Fix Step 5

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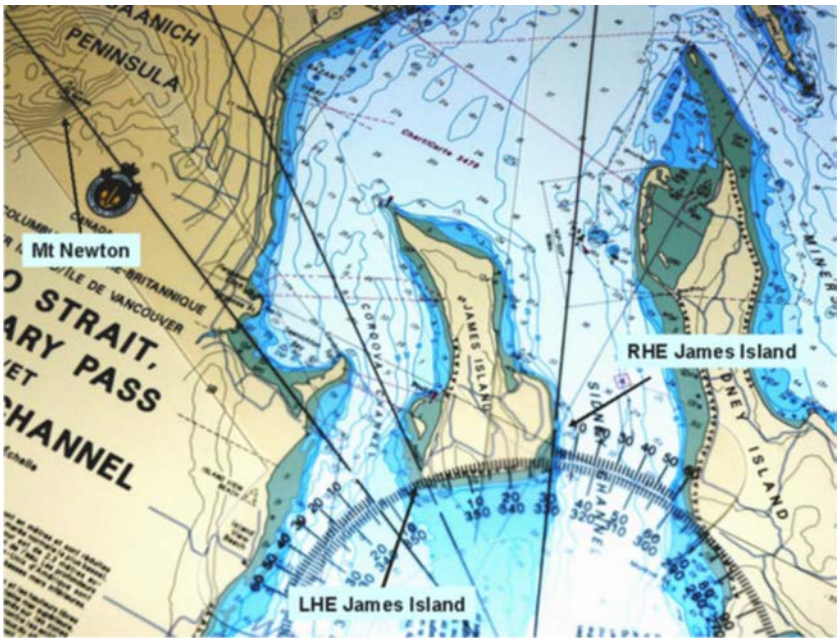
6. Place the station pointer on the chart with the index arm passing through the centre object.



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Figure AA-9 Horizontal Angle Fix Step 6

7. Slowly move the station pointer until all three arms are aligned with the three objects.



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Figure AA-10 Horizontal Angle Fix Step 7

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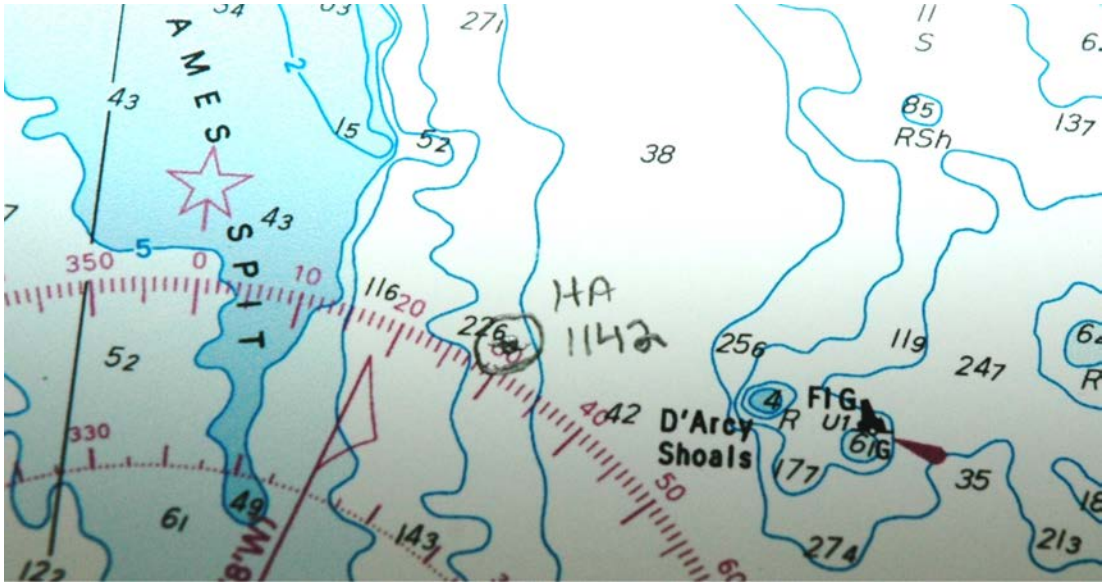
8. Using the point of a pencil, mark the position on the chart through the position hole.



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Figure AA-11 Horizontal Angle Fix Step 8

9. Draw a small circle around the pencil mark and label the fix with 'HA' and the time.



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Figure AA-12 Horizontal Angle Fix Step 9

The fix is labelled with 'HA' to describe that the fix was obtained using horizontal angles.

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CONCLUSION

Plotting a fix using a three-bearing fix and horizontal angle fix are an important aspect of navigation. Knowing where you are and where you will be at any given time leads to safe navigation.



Congratulations, you have completed your self study package on EO C523.02 (Plot a Fix). Complete the following exercise and hand your completed package to the Training Officer / Course Officer who will record your completion in your Phase Five logbook.

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FINAL EXERCISE

Instructions:

Complete the following work on your chart. When you have finished, inform your training / level officer who will correct your work.

1. On *Chart 3441 Haro Strait, Boundary Pass and / et Satellite Channel*, plot the following fixes.

		Gowlland Pt.	025°			Thieves Bay light	050°
a.	0900	Turn Pt.	225°	b.	0930	Canoe Rk. light	181°
		Wallace Pt.	319°			Beaver Pt. light	310°
		RHE Russell I.	000°			Pt. Fairfax light	090°
c.	1000	Isabella I. light	294°	d.	1030	Greig I. day mark	160°
		Kanaka Bluff light	060°			Dock I. light	190°

2. On *Chart 3441 Haro Strait, Boundary Pass and / et Satellite Channel*, calculate the relative bearings and plot the following horizontal angle fixes (the middle bearing will be the index arm).

		Hay Pt.	300°			Arachne Rf Light	230°
a.	1100	Turn Pt. light	340°	b.	1130	Pt. Fairfax Light	250°
		Wallace Pt.	358°			Turn Pt. Light	280°
		Turn Pt. light	137°				
c.	1200	Tom Pt. light	197°				
		Arachne Rf. light	247°				

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FINAL EXERCISE ANSWER KEY

1. If the fixes are plotted correctly, the following symbols should be identified:

    1. Border between Canada and USA,
    2. 64 m depth,
    3. Contour line around 34 m hole, and
    4. 44 m depth

Check to ensure the cadets are using the correct symbol for a fix:

- Arrows away from the object,
- Circle around the intersection of the LOPs,
- Four digit time next to the fix, and
- Each fix no larger than the diameter of a quarter.

2. If the fixes are plotted correctly, the following symbols should be identified:

    1. Next to 243 degree mark on the compass rose,
    2. In south-bound traffic lane southwest of Gowlland Pt, and
    3. Just north of 300 m contour in Swanson Channel.

Check to ensure the cadets are using the correct symbol for a fix:

- Circle around the fix,
- Four digit time next to the fix, and
- Fix labelled HA to describe that the fix was obtained using horizontal angles.

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