Aboriginal Fisheries

Training Program

SERIES 10 - Small Boat Safety

MODULE 10-5

Plotting a Course and Finding the Boat's Position

Reference Manual

PART TWO

Contents

Introduction

The Aim of this Module

This module is designed to help you plot a course and find your position.

This module is optional, depending on your work location.

You should learn from the training activities, not from the manual. As the name implies, the Reference Manual is for reference purposes only: use it only when you need to refresh your memory.

Learning objectives

The course is divided into sections with different **learning objectives.**

A **learning objective** is a task you should be able to perform at the end of each section. The learning objective is contained in a grey box at the start of each section.

Evaluation

Testing conditions and **passing criteria** follow the learning objective. They tell you how you will be evaluated. There will be no surprises or trick questions during the evaluation.

How to Use this Manual

To get around in the manual, consult the table of contents.

To know where you are in the manual, check the top and bottom of each page. Start from the upper left corner of the page and move in a clockwise direction. This will tell you:

- what module this is
- what section you're in
- what page you're on.

1. Chart Abbreviations & Symbols

Learning Objective

After this section, you should be able to identify and interpret common chart abbreviations and symbols.

Testing Conditions

Given several charts, and at least 25 oral or written short-answer questions.

Passing Criteria

Correctly answer all the questions.

Key points

Before using a chart.
Listing of symbols and abbreviations.

Training aids

Several charts.
25 oral or written short-answer questions on the abbreviations and symbols on the charts.

Charts

This section presents the symbols and abbreviations you'll find on charts.

Before using a chart

Before using a navigation chart, check the following:

The chart is a navigation chart. Navigation charts clearly show depths and the location of navigation aids such as lightstations, daybeacons and buoys. Charts without these details cannot be used for navigational purposes.

The chart is recent. Look for the date of issue in the lower-right-hand corner. Over time, rocks are discovered, navigation buoys are moved, and magnetic headings drift.

You have the right chart. Some coastline charts look alike, and open-sea charts *all* look alike. Check the title of the chart to make sure you have the right one.

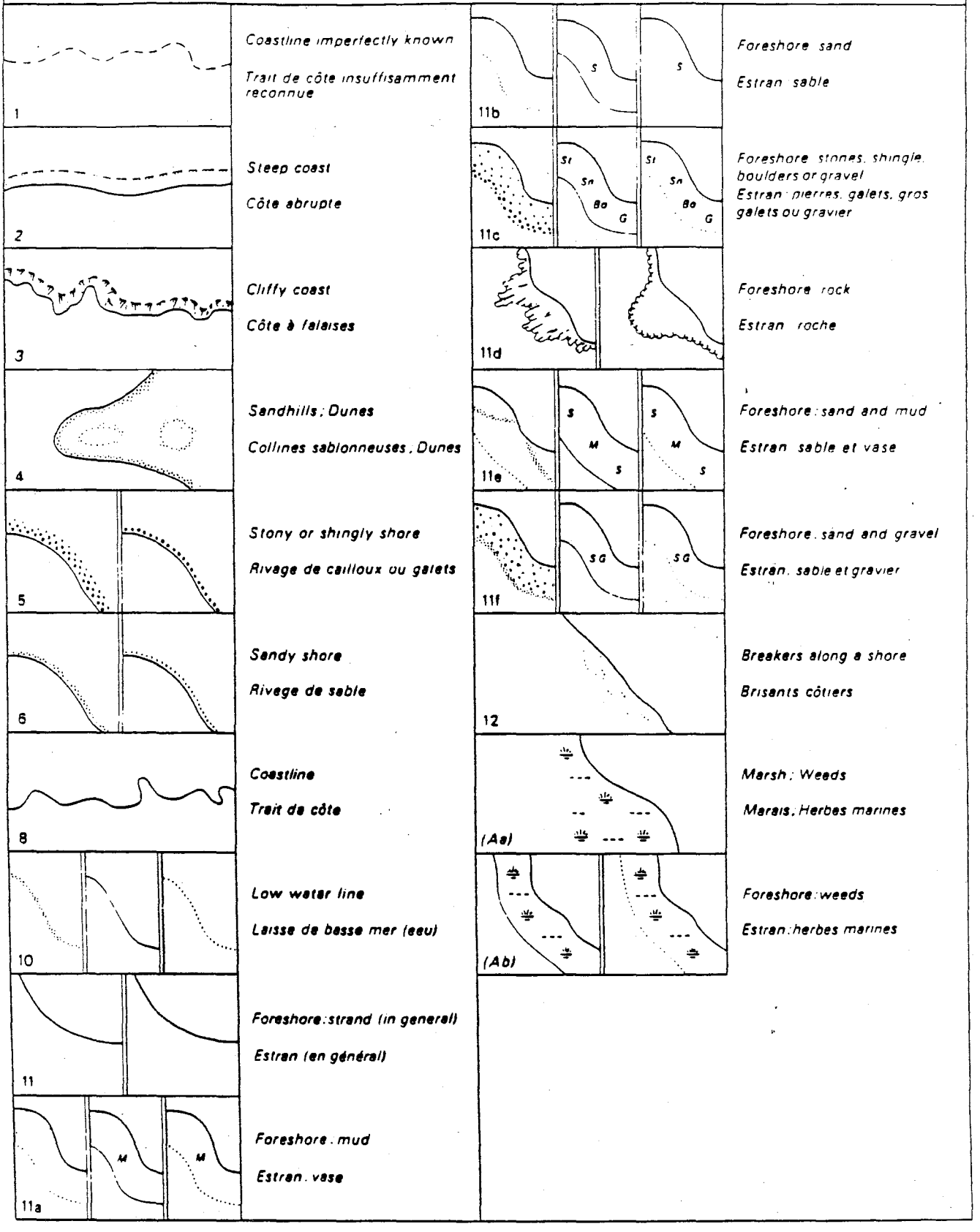
You have the largest scale chart available. The larger the scale, the better the detail.

You know the unit of measure used for water depths -- fathoms, metres or feet. A **fathom** equals 6 feet or 1.83 meters. Mistake feet for fathoms and you could soon run aground.

Symbols & Abbreviations

Here is a listing of symbols and abbreviations found on Canadian charts:

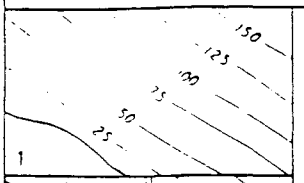
The Coastline (Nature of the coast) / Contour de la côte (Nature de la côte)



Coast Features (Explanation of Abbreviations)
Physionomie de la côte (Explication des abréviations)

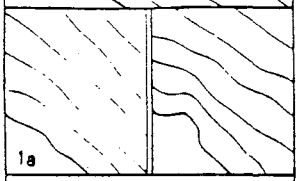
1	G	*Gulf* *Golfe*
2	B	*Bay* *Baie*
3	Fd	*Fjord; Fiord* *Fjord, Fiord*
4	L	*Loch; Lough; Lake* *Loch; Bras de mer; Lac*
5	Cr	*Creek* *Crique*
5a	C	*Cove* *Anse*
6	Int	*Inlet* *Entrée; Goulet; Anse*
7	Str	*Strait* *Détroit*
8	Sd	*Sound* *Pertuis; Goulet; Bras de mer*
9	Pass	*Passage; Pass; Thoroughfare; Thorofare* *Passage; Passe*
10	Chan Ch	*Channel* *Chenal; Canal*
10a	Nrs	*Narrows* *Pertuis*
11	Ent	*Entrance* *Entrée*
12	Est	*Estuary* *Estuaire*
14	Rd	*Road; Roadsteed* *Rade*
15	Anch Mouil	*Anchorage* *Mouillage*
16	Hr	*Harbour* *Port (en général)*
16a	Hn	*Haven* *Havre, Port (naturel)*
18	I Is	*Island, Islands* *Île; Îles*
19	It Its	*Islet; Islets* *Îlot; Îlots; Îlet, Îlets*
20	Arch	*Archipelago* *Archipel*
21	Pen	*Peninsula* *Presqu'île; Péninsule*
22	C	*Cape* *Cap*
23	Prom	*Promontory* *Promontoire*
24	Hd	*Head; Headland* *Nez*
25	Pt Pte	*Point* *Pointe*
26	Mtn Mts Mt	*Mountain; Mount* *Montagne; Mont*
27	Rge	*Range of mountains* *Chaine de montagnes*
29	Pk	*Peak* *Pic*
32	Bo	*Boulder* *Grosse pierre*
33	Lndg Ldg	*Landing* *Point de débarquement*
35	Rk Rks	*Rock; Rocks* *Rocher; Rochers*
(Ba)	App	*Approach; Approaches* *Approche; Approches*
(Bb)	R	*River* *Rivière*
(Bc)	Dist	*District* *District*
(Bd)	Jct	*Junction* *Jonction*
(Be)	Gp	*Group* *Groupe*
(Bf)	Lag	*Lagoon* *Lagune*
(Bg)	Br Bk Ruis	*Brook* *Ruisseau*
(Bh)	Bk Bks	*Bank; Banks* *Banc, Bancs*
(Bi)	Sh Shl	*Shoal* *Haut-fond*
(Bj)	Rf Rfs	*Reef; Reefs* *Récif; Récifs*
(Bk)	Le Les	*Ledge; Ledges* *Bordure de récifs*
(Bl)	Grd Gd	*Ground* *Fond*
(Bm)	Gl	*Glacier* *Glacier*

The Land (Natural features) / Terrain (Caractéristiques naturelles)



Contour lines (with elevations)

Lignes de niveau, Isohypses (avec altitudes)



Contour lines (approximate)

Lignes de niveau, Isohypses (approchées)

Depression contour

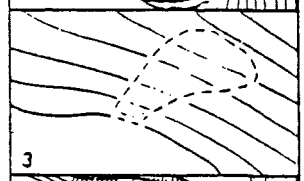
Lignes de niveau de dépression

Relief: shown by hachures

Figuration du relief par hachures

Relief: shown by form-lines

Figuration du relief par courbes

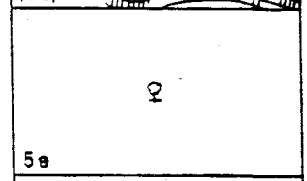


Glaciers

Glaciers

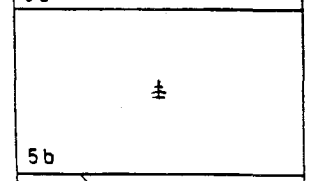
Slide

Éboulement



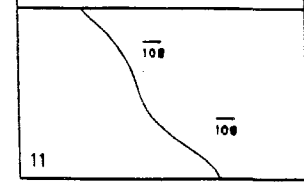
Prominent tree - deciduous

Arbre remarquable - caduc



Prominent tree - coniferous

Arbre remarquable - conifère

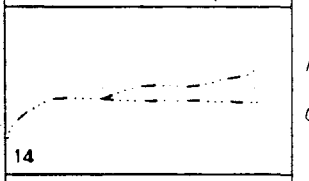


Elevation of top of trees

Altitude du sommet des arbres

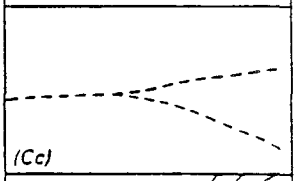
River, Stream, Creek

Fleuve, Rivière, Ruisseau, Crique



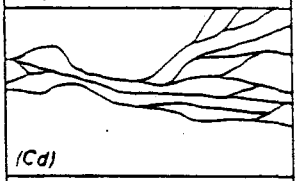
Intermittent stream

Cours d'eau intermittent



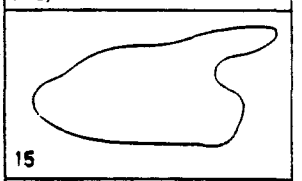
Indefinite stream

Cours d'eau indéfini



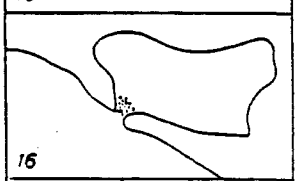
Braided stream

Cours d'eau anastomosé



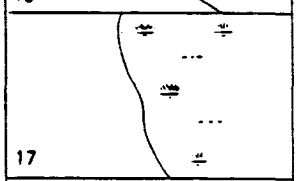
Lake, Pond

Lac, Étang



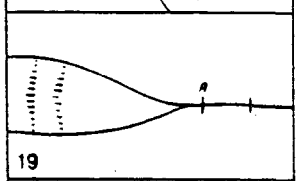
Lagoon

Lagune



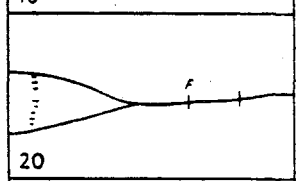
Marsh, Swamp

Marais, Marécage



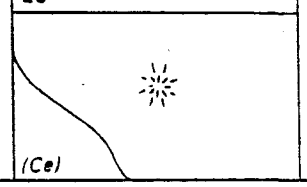
Rapids

Rapides



Waterfall

Cascade, Chute



Pingo (peak)

Pingo (sommet)

Control Points / Points de repère

1	△	*Triangulation point* *Point de triangulation*	4	⊕	*Observation spot or pillar* *Point ou pilier d'observation*
1a	+ + ASTRO	*Astronomic station* *Station astronomique*	5	• • BM	*Bench mark* *Repère de nivellement*
2	○ • ⊙	*Fixed point* *Point de position déterminée*	*14*	◇ (66)	*International boundary monument with number* *Borne frontière internationale avec numéro*
3	·245	*Summit (spot elevation)* *Sommet (point coté)*			

Units, etc. / Unités, etc.

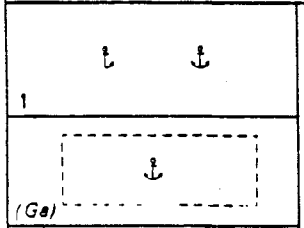
1	h	*Hour* *Heure*	7	ft	*Foot* *Pied*	20	°	*Degree* *Degré*
2	min	*Minute (of time)* *Minute (de temps)*	8	yd	*Yard* *Yard; Verge*	21	′	*Minute (of arc)* *Minute (d'arc)*
3	s sec	*Second (of time)* *Seconde (de temps)*	9	fm	*Fathom* *Brasse*	22	″	*Second (of arc)* *Seconde (d'arc)*
4	m	*Metre* *Mètre*	11	M	*Nautical mile* *Mille marin*	23	No	*Number* *Numéro*
4a	dm	*Decimetre* *Décimètre*	*(Ea)*	Sm	*Statute mile* *Mille terrestre*	*(Ed)*	kc	*Kilocycle* *Kilocycle*
4b	cm	*Centimetre* *Centimètre*	12	kn	*Knot* *Noeud*	*(Ee)*	kHz	*Kilohertz* *Kilohertz*
4c	mm	*Millimetre* *Millimètre*	*13*	Lat	*Latitude* *Latitude*	*(Ef)*	MHz	*Megahertz* *Mégahertz*
4d	m^2	*Square metre* *Mètre carré*	*14*	Long	*Longitude* *Longitude*	*(Eg)*	μs μsec	*Microseconds* *Microsecondes*
4e	m^3	*Cubic metre* *Mètre cube*	*(Eb)*	Edn	*Edition* *Édition*	*(Eh)*	±	*Approximate; About* *Approché; Approximatif; Environ*
5	km	*Kilometre* *Kilomètre*	*(Ec)*	Corr	*Correction* *Correction*			
6	in	*Inch* *Pouce*	*18*	Alt	*Altitude* *Altitude*			

Adjectives, adverbs, etc. / Adjectifs, adverbes, etc.

1	Gt	*Great* *Grand*	*17*	Abt	*About* *Environ*	*34*	Approx	*Approximate* *Approché; Approximatif*
2	Lit	*Little* *Petit*	*22*	Aero	*Aeronautical* *Aéronautique*	*37*	Aband	*Abandoned* *Abandonné*
7	Mid	*Middle* *Du milieu, Moyen*	*26*	Prohib Inter	*Prohibited* *Interdit*	*39*	Occasl	*Occasional* *Occasionnel*
11	St Ste	*Saint* *Saint; Sainte*	*30*	Priv	*Private, Privately* *Privé; Particulier*	*42*	NM	*Notices to Mariners* *Avis aux navigateurs*
12	Conspic	*Conspicuous* *Visible; Remarquable*	*33*	Subm	*Submerged* *Immergé; Submergé*			

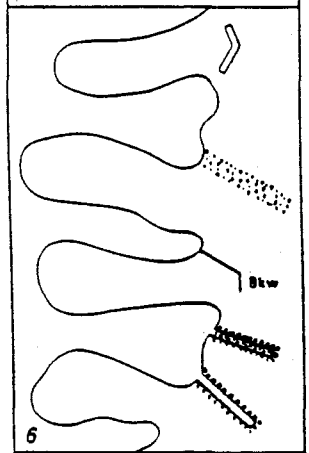
For complete list of abbreviations shown on Canadian charts, see Pages 24 - 28
Pour une liste complète des abréviations indiquées sur les cartes canadiennes, consulter les pages 24 - 28.

Ports and Harbours / Ports

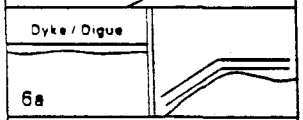


Anchorage for vessels
Mouillage pour navires

Anchorage with defined limits
Mouillage avec limites précisées

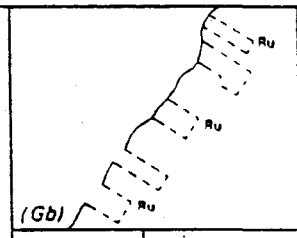


Breakwater
Brise-lames

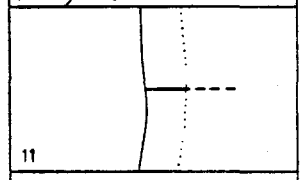


Dyke
Digue

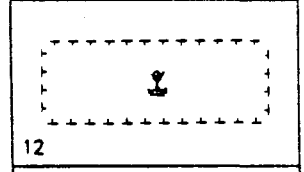
Jetty; Pier
Jetée, Môle



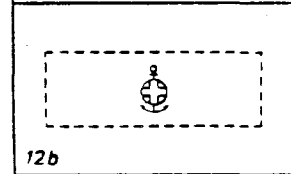
Ruins
Ruines



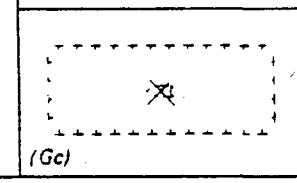
Groyne
Épi



Anchorage prohibited
Mouillage interdit

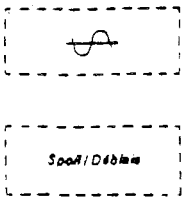
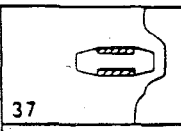
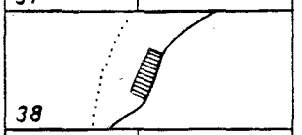
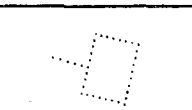
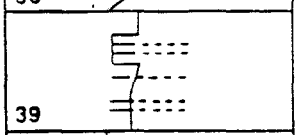
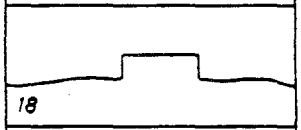
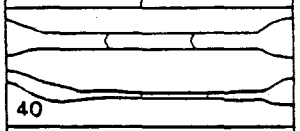
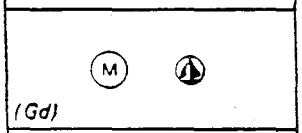
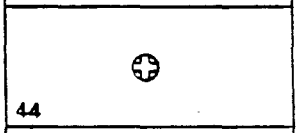
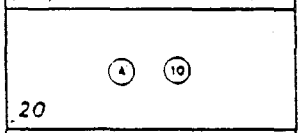
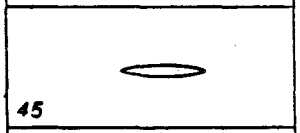
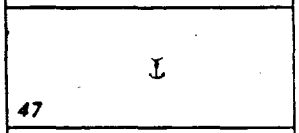
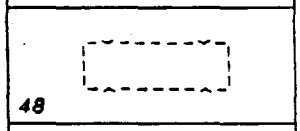
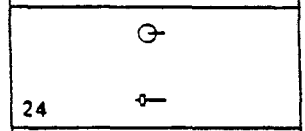
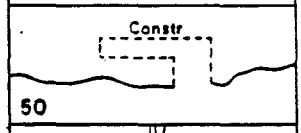
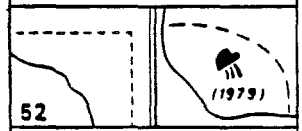
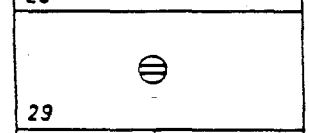
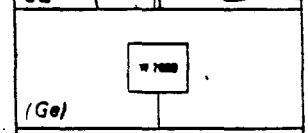
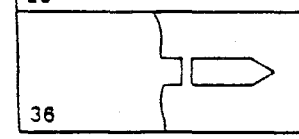
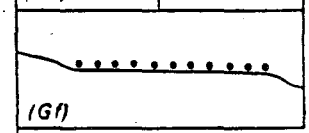


Quarantine anchorage
Mouillage de quarantaine

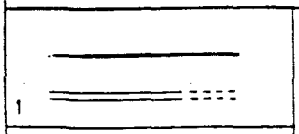
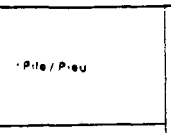
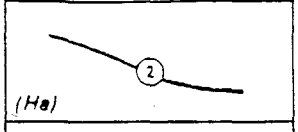
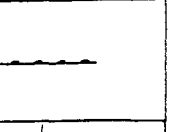
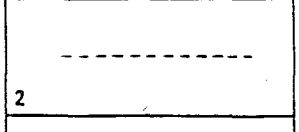
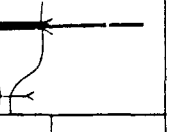
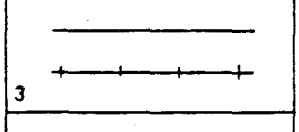
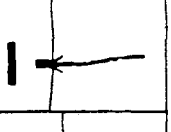
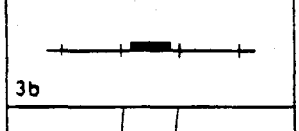
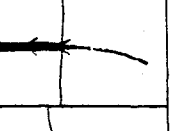
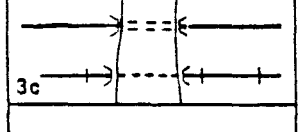
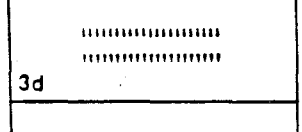
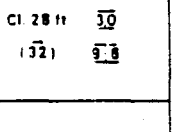
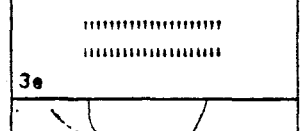
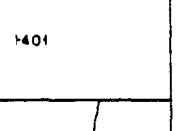
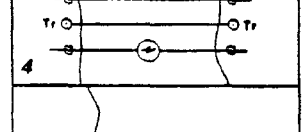
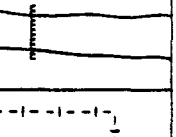
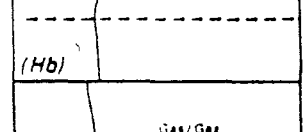
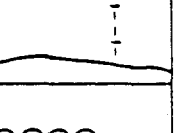
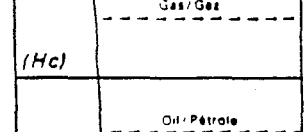
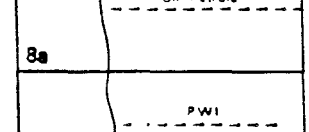


Fishing prohibited
Pêche interdite

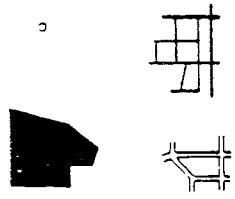
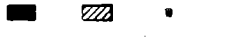
Ports and Harbours (continued) / Ports (suite)

 13	*Spoil ground* *Dépôt de déblais*	 37	*Floating dry-dock* *Cale sèche flottante*
14	*Fisheries; Fishing stakes* *Pêcheries*	 38	*Gridiron; Careening grid* *Gril de carénage*
 14a	*Fish-trap; Fish-weir* *Madrague; Nasse*	 39	*Patent slip; Slipway; Ways; Haul out; Marine railway* *Cale de halage*
 15a	*Marine farm* *Ferme marine*	 39a	*Ramp* *Cale de quai*
 18	*Wharf; Quay* *Appontement; Quai*	 40	*Lock* *Sas; Écluse*
 (Gd)	*Marine* *Port de plaisance*	 44	*Port medical office* *Bureau de santé du port*
 20	*Berth (with letter or number)* *Poste d'amarrage (avec lettre ou numéro)*	 45	*Hulk* *Ponton*
 20a	*Designated anchoring berth (with letter or number)* *Poste de mouillage désigné (avec lettre ou numéro)*	 47	*Anchorage for sea-planes* *Mouillage d'hydravions*
 21	*Dolphin* *Dauphin*	 48	*Sea-plane landing area* *Amerrissage d'hydravions*
 24	*Crane in general* *Grue en général* *Container crane* *Grue pour conteneurs*	 50	*Under construction* *En construction*
 28	*Harbour-master's office* *Bureau du Capitaine du port*	 52	*Area under reclamation; Being filled* *Terre-plein en cours de construction; En remplissage*
 29	*Custom-house* *Bureau de douane*	 (Ge)	*Whistle station (with distance)* *Poteau de signalisation (avec distance)*
 36	*Dry-dock* *Bassin de radoub; Cale sèche*	 (Gf)	*Tie-up wall* *Mur d'amarrage*

Topography (Artificial features) / Topographie (Constructions artificielles)

 1	*Highway; Road; Street* *Route; Rue*	 9	*Pile; Piling; Post* *Pieu; Pylône; Pilier; Poteau*
 (Ha)	*Highway marker* *Route avec numéro*	 13	*Canal* *Canal*
 2	*Track; Footpath; Trail* *Chemin; Sentier; Piste*	 14	*Bridge (in general)* *Pont (en général)*
 3	*Railway; Railroad* *Chemin de fer*	 16	*Swing-bridge* *Pont tournant*
 3b	*Railway station* *Station de chemin de fer; Gare*	 16a	*Lift-bridge* *Pont à soulèvement*
 3c	*Tunnel* *Tunnel*	 (He)	*Bascule; Draw-bridge* *Pont basculant; Pont roulant*
 3d	*Embankment; Levee* *Remblai; Levée; Digue*	 18a	*Clearance, vertical* *Hauteur libre; Tirant d'air*
 3e	*Cutting* *Tranchée*	 18b	*Clearance, horizontal* *Largeur horizontale*
 3f	*Causeway* *Chaussée surélevée*	 19	*Ferry* *Bac; Traversier*
 4	*Overhead transporter; Overhead cable; Power transmission line* *Téléphérique; Câble aérien, Ligne de haute tension*	 21	*Dam* *Barrage*
 (Hb)	*Pipeline* *Pipeline*	 24	*Log boom; booming ground; boomsticks* *Barrière flottante en bois, panne; panne de barrage*
 (Hc)	*Gas pipeline* *Gazoduc*	 (Hf)	*Ice boom* *Panne à glace*
 8a	*Oil pipeline* *Oléoduc*		
 (Hd)	*Potable water intake* *Prise d'eau potable*		

Buildings / Édifices

 1	*City; Town* *Cité, Ville*	37	*Elevator; Lift* *Élévateur; Ascenseur*
		 40	*Ruins* *Ruines*
 3a	*Buildings (in general)* *Constructions (en général)*	 41	*Tower in general* *Tour en général*
8	*Church, Spire; Steeple* *Église; Flèche; Clocher*	 42	*Windmill* *Moulin à vent*
 17	*Calvary; Cross* *Calvaire; Croix*	 44	*Chimney; Stack* *Cheminée* *Flame tower* *Torchère*
 23	*Airfield; Airport* *Champ d'atterrissage;* *Aéroport; Aérodrome*	 45	*Water tower; Stand-pipe* *Château d'eau*
 35	*Monument* *Monument*	 53	*Tank* *Réservoir*
 36	*Cupola* *Coupole*		
(1a)	*Dome* *Dôme*		

Miscellaneous Stations / Stations diverses

 6	*Lifesaving station* *Station de sauvetage*	 19	*Flagstaff; Flagpole* *Mât de pavillon*
 8	*Pilot boarding station* *Station d'embarquement* *de pilotes*		

Lights / Feux

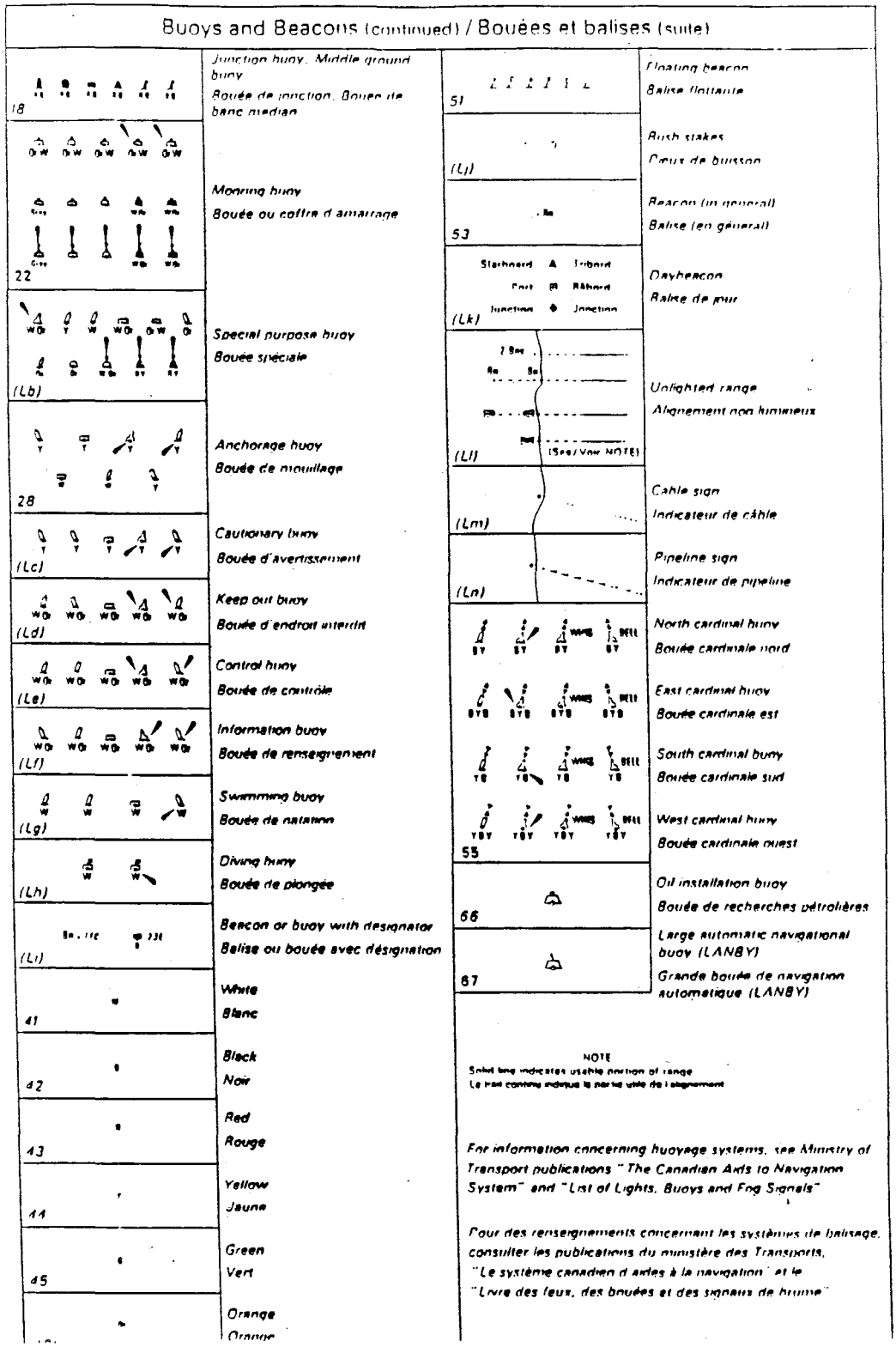
1	*Position of light* *Emplacement d'un feu*	24 Qk Fl Q	*Quick flashing light* *Feu scintillant*
2	*Light flash* *Enluminure*	(Kc) VQ	*Very quick flashing light* *Feu scintillant rapide*
4 AERO	*Air light; Aeronautical light* *Feu aéronautique*	25 Int Qk Fl IQ	*Interrupted quick flashing light* *Feu scintillant discontinu*
(Ka) R Lte	*Air obstruction light* *Feu d'obstacle aérien*	(Kd) L Fl	*Long flashing light* *Feu à éclats longs*
(Kb) Aero Fl R Tr	*Air obstruction light (Arctic charts)* *Feu d'obstacle aérien (Cartes de l'arctique)*	26 Alt Al	*Alternating light* *Feu à changements de colorations*
6	*Light vessel; Lightship* *Bateau-feu*	27 Gp Occ(2) Oc(2)	*Group occulting light* *Feu à occultations groupées*
11 2 Lts Ldg (See/Voir NOTE) 2 Lts	*Leading lights* *Feux d'alignement*	28 Gp Fl(3) Fl(3)	*Group flashing light* *Feu à éclats groupés*
12	*Sector light* *Feu à secteur*	(Ke) Q(3)10s Q(9)15s	*Group quick flashing light* *Feu à scintillements groupés*
13 (See/Voir NOTE) Dir 270°	*Direction light* *Feu à direction*	(Kf) Q(6) + LFl15s	*Group quick flashing plus long flashing light* *Feu à scintillements groupés et un éclat long*
21 F	*Fixed light* *Feu fixe*	(Kg) VQ(3)5s VQ(9)10s	*Group very quick flashing light* *Feu à scintillements rapides groupés*
22 Occ Oc	*Occulting light* *Feu à occultations*	(Kh) VQ(6) + LFl10s	*Group very quick flashing plus long flashing light* *Feu à scintillements rapides groupés et un éclat long*
23 Fl	*Flashing light* *Feu à éclats*	(Ki) Fl(2 + 1)8s Fl(2 + 1)10s	*Composite group flashing light* *Feu à éclats diversement groupés*
23a Ec Int Iso	*Isophase light; Equal interval light* *Feu isophase*	29 F Fl	*Fixed and flashing light* *Feu fixe varié par un éclat*
		30 F Gp Fl(3) F Fl(3)	*Fixed and group flashing light* *Feu fixe varié par des éclats groupés*

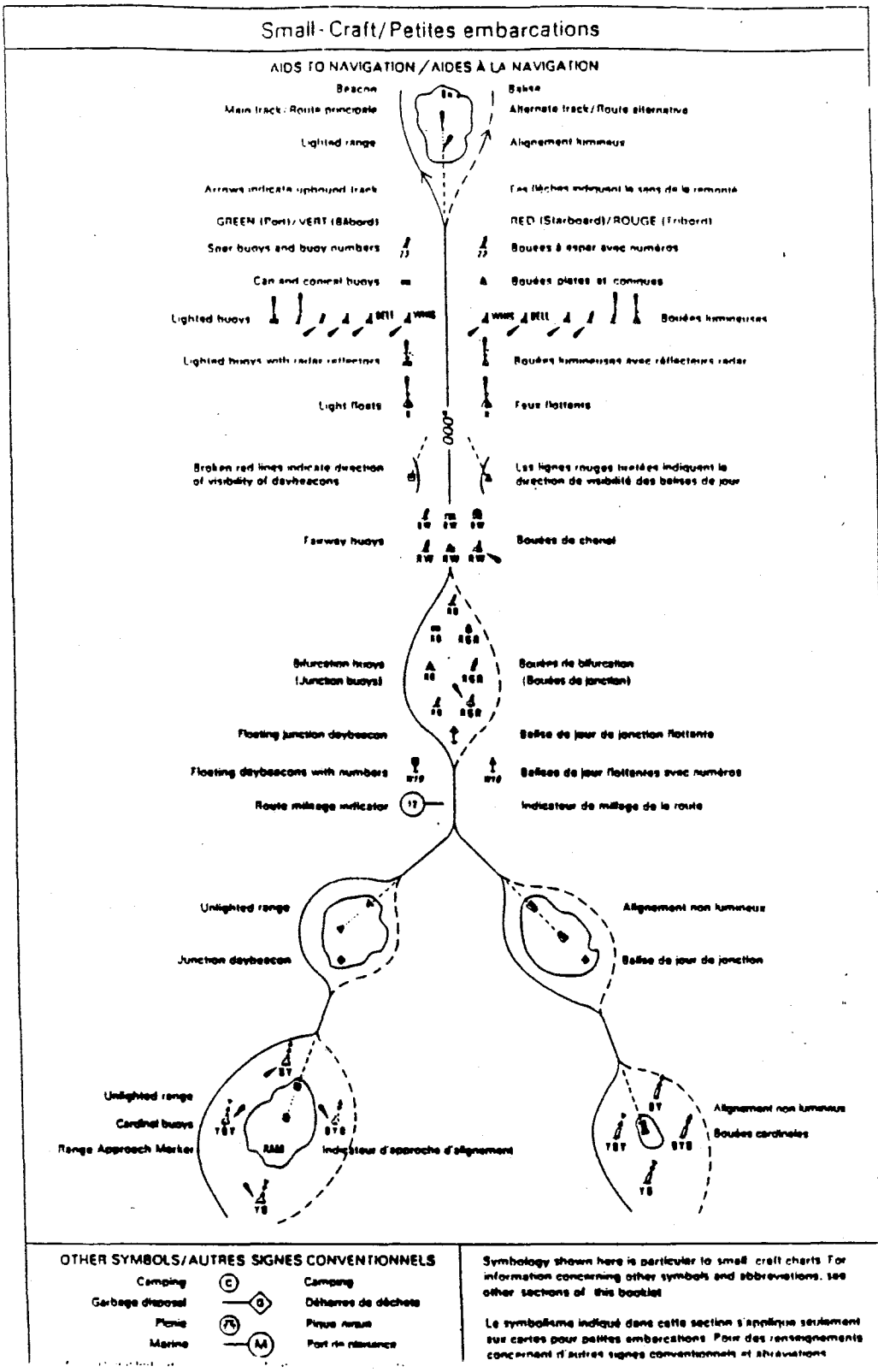
Lights (continued) / Feux (suite)

Mo (A) 30a	*Morse code light (With flashes grouped as in letter "A")* *Feu à signes Morse (Avec enluminures groupées comme dans la lettre "A")*	Y (Kj)	*Yellow, Amber, Orange* *Jaune, Ambre, Orange*
ev 42	*Every* *Chaque*	Obscd Obsc 68	*Obscured light* *Feu masqué*
Vis 44	*Visible (range)* *Visibilité (portée)*	(U) (Kk)	*Unwatched light* *Feu non gardé*
Bl Bu 63	*Blue* *Bleu*	Occasl Occas 70	*Occasional light* *Feu occasionnel*
G 64	*Green* *Vert*	Vert 80	*Vertical lights* *Feux verticaux*
R 66	*Red* *Rouge*	*All lights are white unless otherwise stated* *Tous les feux sont blancs sauf indication contraire*	
W 67	*White* *Blanc*	*For information concerning lights, see Ministry of Transport publication "List of Lights, Buoys and Fog Signals".* *Pour des renseignements concernant les feux, consulter la publication du ministère des Transports, "Livre des feux, des bouées et des signeux de brume".*	

Buoys and Beacons / Bouées et balises

1	*Position of buoy or beacon (floating)* *Emplacement d'une bouée ou balise (flottante)*	7	*Spherical buoy* *Bouée sphérique*
(La)	*Buoy symbol out of position* *Symbole pour une bouée hors de position*	8	*Spar buoy* *Bouée à espar*
2	*Light buoy* *Bouée lumineuse*	10	*Barrel buoy; Ton buoy* *Bouée-tonne; Tonne*
3 Bell BELL	*Bell buoy* *Bouée à cloche*	12	*Light-float* *Feu flottant*
3a Gong GONG	*Gong buoy* *Bouée à gong*	14 RW BELL WHIS	*Fairway buoy; Mid-channel buoy; Safe-water buoy* *Bouée de chenal; Bouée de mi-chenal; Bouée d'eaux sauves*
4 Whistle WHIS	*Whistle buoy* *Bouée à sifflet*	15 BELL WHIS	*Starboard hand buoy* *Bouée de tribord*
5	*Can buoy, Cylindrical buoy* *Bouée plate; Bouée cylindrique*	16 WHIS BELL	*Port hand buoy* *Bouée de bâbord*
	Conical buoy Nun buoy	RGR WHIS BELL	*Starboard bifurcation buoy* *Bouée de bifurcation de tribord*
		GRG WHIS BELL	*Port bifurcation buoy*


Buoys and Beacons (continued) / Bouées et balises (suite)
18
Junction buoy. Middle ground buoy
Bouée de jonction. Bouée de banc médian
22
Mooring buoy
Bouée ou coffre d'amarrage
(Lb)
Special purpose buoy
Bouée spéciale
28
Anchorage buoy
Bouée de mouillage
(Lc)
Cautionary buoy
Bouée d'avertissement
(Ld)
Keep out buoy
Bouée d'endroit interdit
(Le)
Control buoy
Bouée de contrôle
(Lf)
Information buoy
Bouée de renseignement
(Lg)
Swimming buoy
Bouée de natation
(Lh)
Diving buoy
Bouée de plongée
(Li)
Beacon or buoy with designator
Balise ou bouée avec désignation
41
White
Blanc
42
Black
Noir
43
Red
Rouge
44
Yellow
Jaune
45
Green
Vert
Orange
51
Floating beacon
Balise flottante
(Lj)
Bush stakes
Perches de buisson
53
Beacon (in general)
Balise (en général)
Starboard A Tribord
Port B Bâbord
Junction Jonction
(Lk)
Daybeacon
Balise de jour
(See/Voir NOTE)
(Ll)
Unlighted range
Alignement non lumineux
(Lm)
Cable sign
Indicateur de câble
(Ln)
Pipeline sign
Indicateur de pipeline
55
North cardinal buoy
Bouée cardinale nord
East cardinal buoy
Bouée cardinale est
South cardinal buoy
Bouée cardinale sud
West cardinal buoy
Bouée cardinale ouest
66
Oil installation buoy
Bouée de recherches pétrolières
67
Large automatic navigational buoy (LANBY)
Grande bouée de navigation automatique (LANBY)
NOTE
Solid line indicates usable portion of range
Le trait continu indique la partie utile de l'alignement
For information concerning buoyage systems, see Ministry of Transport publications "The Canadian Aids to Navigation System" and "List of Lights, Buoys and Fog Signals"
Pour des renseignements concernant les systèmes de balisage, consulter les publications du ministère des Transports, "Le système canadien d'aides à la navigation" et le "Livre des feux, des bouées et des signaux de brume"


Small - Craft/Petites embarcations
AIDS TO NAVIGATION / AIDES À LA NAVIGATION
Beacon
Balise
Main track / Route principale
Alternate track / Route alternative
Lighted range
Alignement lumineux
Arrows indicate upbound track
GREEN (Port) / VERT (BAboard)
RED (Starboard) / ROUGE (Tribord)
Spar buoys and buoy numbers
Bouées à espar avec numéros
Can and conical buoys
Bouées plates et coniques
Lighted buoys
Bouées lumineuses
Lighted buoys with radar reflectors
Bouées lumineuses avec réflecteurs radar
Light floats
Feux flottants
Broken red lines indicate direction of visibility of daybeacons
Les lignes rouges tirétées indiquent la direction de visibilité des balises de jour
Fairway buoys
Bouées de chenal
Bifurcation buoys (Junction buoys)
Bouées de bifurcation (Bouées de jonction)
Floating junction daybeacon
Balise de jour de jonction flottante
Floating daybeacons with numbers
Balises de jour flottantes avec numéros
Route mileage indicator
Indicateur de millage de la route
Unlighted range
Junction daybeacon
Alignement non lumineux
Balise de jour de jonction
Unlighted range
Cardinal buoys
Range Approach Marker
Indicateur d'approche d'alignement
Alignement non lumineux
Bouées cardinales
OTHER SYMBOLS/AUTRES SIGNES CONVENTIONNELS
Camping
Campsite
Garbage disposal
Déharres de déchets
Picnic
Pique nique
Marina
Port de plaisance
Symbology shown here is particular to small craft charts. For information concerning other symbols and abbreviations, see other sections of this booklet
Le symbolisme indiqué dans cette section s'applique seulement aux cartes pour petites embarcations. Pour des renseignements concernant d'autres signes conventionnels et abréviations

Radio and Radar Stations / Stations de radio et de radar

2 Ro Tel RT	*Radio telephone station* *Station radiotéléphonique*	11 Ra	*Radar station* *Station de radar*
3 Ro Bn RC	*Radiobeacon* *Radiophare*	12 Racon	*Radar responder beacon* *Balise radar répondeuse*
4 Ro Bn RC	*Circular radiobeacon* *Radiophare circulaire*	13	*Radar reflector* *Réflecteur radar*
9 Ro Tr	*Radio tower ; Radio mast* *Pylône de T.S.F. ; Mât de T.S.F.*	16 Aero Ro Bn Aero RC	*Aeronautical radiobeacon* *Radiophare aéronautique*
9a TV Tr	*Television tower ; Television mast* *Pylône de télévision*	(Mc)	*Radio calling - in point* *Point d'appel par radio*
(Ma) Micro Tr	*Microwave tower* *Tour de micro - ondes*	(Md)	*Aerial dish* *Antenne parabolique*
(Mb) Ra Tr	*Radar tower* *Tour de radar*		
10 Ro Sta	*Radio broadcasting station* *Station de radiodiffusion*		
10a R	*Coast radio station (Q.T.G.)* *Station radio côtière (Q.T.G.)*		

For information concerning radio aids, see Ministry of Transport publication "Radio Aids to Marine Navigation"

Pour des renseignements concernant les aides radio, consulter la publication du ministère des Transports, "Aides radio à la navigation maritime".

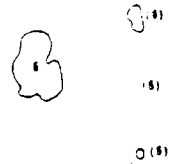
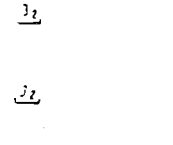
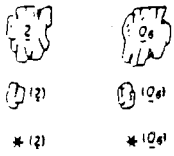
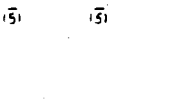
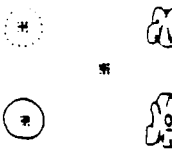
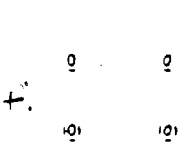
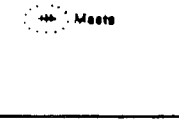
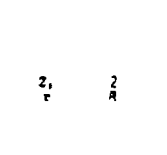
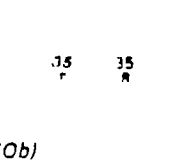
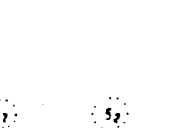
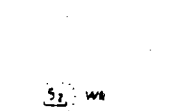
Fog Signals / Signaux de brume

1 Fog Sig	*Fog signal (all types)* *Signaux de brume (toutes sortes)*	15 Whis	*Fog whistle* *Sifflet de brume*
13 Horn	*Fog horn* *Cornet de brume*		
14 Bell	*Fog bell* *Cloche de brume*		

For information concerning fog signals, see Ministry of Transport publication "List of Lights, Buoys and Fog Signals".

Pour des renseignements concernant les signaux de brume, consulter la publication du ministère des Transports, "Livre des feux, des bouées et des signaux de brume"

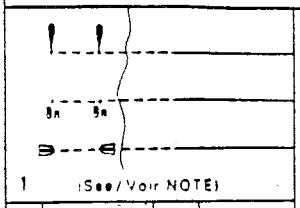
Dangers/Dangers

 1	*Rock which does not cover with height (see general remarks)* *Roche ne couvrant jamais avec hauteur (voir remarques générales)*	 6a	*Underwater danger with depth cleared by wire drag* *Danger submergé avec profondeur vérifiée à la drague hydrographique*
 2	*Rock which covers and uncovers (dries) with height (see general remarks)* *Roche couvrant et découvrant (assèche) avec hauteur (voir remarques générales)*	 (Oc)	*Known depth over an artificial feature* *Profondeur connue couvrant une construction artificielle*
 3	*Rock awash at the level of chart datum* *Roche à fleur d'eau au niveau de réduction des sondes*	11	*Stranded wreck showing any portion of hull or superstructure* *Épave échouée montrant une portion de la coque ou de la superstructure*
 (Oa)	*Awash* *À fleur d'eau*	 12	*Wreck of which the masts only are visible* *Épave dont les mâts seuls sont visibles*
 4	*Underwater rock 6 ft (2m) or less or dangerous to surface navigation* *Roche submergée 6 pi (2m) ou moins ou dangereuse pour la navigation de surface*	 13	*Old symbols for wrecks* *Anciens signes conventionnels pour les épaves*
 5	*Shoal sounding on isolated rock* *Brassiage d'une roche isolée*	 14	*Sunken wreck, dangerous to surface navigation* *Épave submergée dangereuse pour la navigation de surface*
 (Ob)	*Underwater rock with depth* *Roche submergée avec profondeur*	 15	*Wreck over which depth is known* *Épave de profondeur connue*
		 15a	*Wreck with depth cleared by wire drag* *Épave avec profondeur vérifiée à la drague hydrographique*

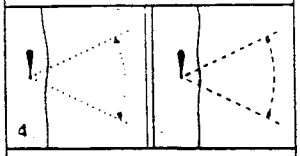
Dangers (continued) / Dangers (suite)

16	*Sunken wreck, not dangerous to surface navigation* *Épave submergée non dangereuse pour la navigation de surface*	38	*Limiting danger line* *Limite de dangers*
17	*Foul ground (Foul area)* *Fond dangereux ; Mauvais fond (Zone dangereuse)*	41	*Position approximate* *Position approchée*
17a	*Sandwaves* *Dunes de sable sous-marines*	42	*Position doubtful* *Position douteuse*
18	*Overfalls ; Tide-rips* *Remous ; Clapotis*	43	*Existence doubtful* *Existence douteuse*
19	*Eddies (whirlpool)* *Tourbillons*	(Of)	*Crib* *Caisson*
20	*Kelp ; Seaweed* *Algues ; Herbes marines*	(Og)	*Crib with height* *Caisson avec hauteur*
25	*Breakers* *Brisants*	(Oh)	*Submerged crib* *Caisson submergé*
27	*Obstruction* *Obstruction*	(Oi)	*Submerged crib with depth* *Caisson submergé avec profondeur*
27a	*Offshore oil exploitation platform* *Plate-forme d'exploitation pétrolière au large*	(Oj)	*Crib awash* *Caisson à fleur d'eau*
(Od)	*Artificial island* *Île artificielle*	(Ok)	*Crib with drying height* *Caisson avec sonde découvrante*
30	*Snags ; Stumps ; Submerged piles* *Troncs d'arbres ; Pieux submergés*	(Ol)	*Submerged well-head* *Tête de puits sous-marins*
(Oe)	*Snags ; Stumps ; Submerged piles (position known)* *Troncs d'arbres ; Pieux submergés (position connue)*		

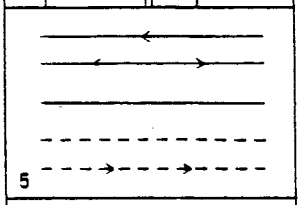
Various Limits, etc. / Limites diverses, etc.



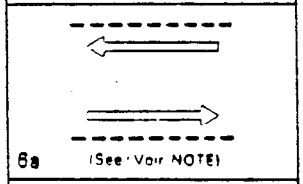
Leading line. Range line
Alignement



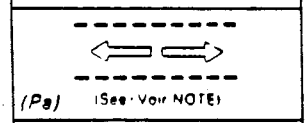
Limit of sector
Limite de secteur



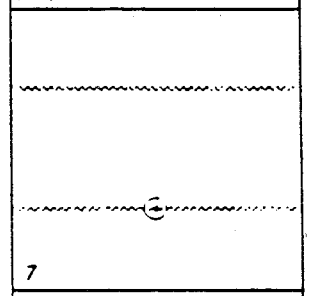
Channel, Course; Track (may not be marked by buoys or beacons)
Chenal; Route (peut être non précisé par le balisage)



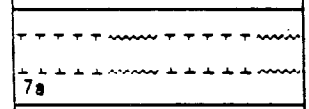
Traffic separation scheme
Dispositif de séparation du trafic



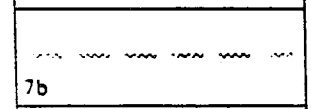
Two-way routing system
Système d'organisation du trafic à deux sens



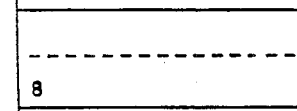
Submarine cable (telegraph, telephone, power, etc)
Câble sous-marin (télégraphique, téléphonique, haute tension, etc)
Submarine cable (power)
Câble sous-marin (haute tension)



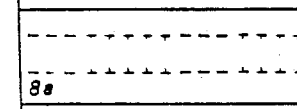
Submarine cable area
Zone de câbles sous-marins



Abandoned submarine cable
Câble sous-marin abandonné

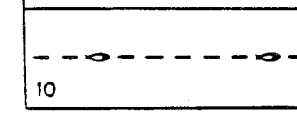


Submarine pipeline
Canalisation sous-marine



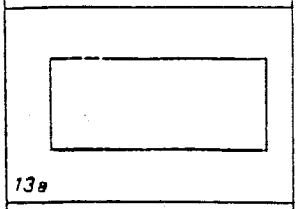
Submarine pipeline area
Zone de canalisations sous-marines

Limits in general
Limites en général



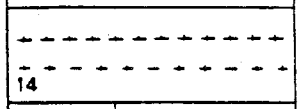
Limit of fishing zone
Limite de zone de pêche

Anchorage limit
Limite de mouillage

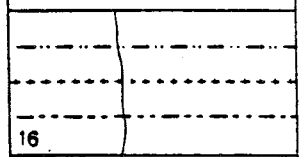


Limit of military practice areas
Limite de zones d'exercices militaires

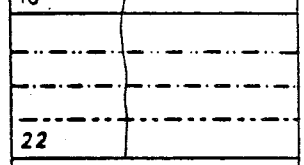
Harbour limit
Limite de port



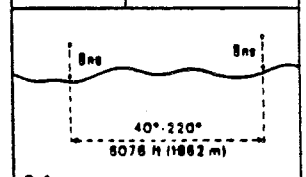
Limit of sovereignty (Territorial waters)
Limite de souveraineté (Eaux territoriales)



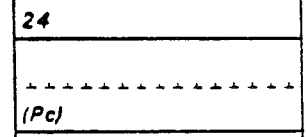
International boundary
Limite internationale



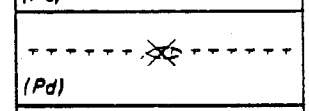
District or provincial boundary
Limite provinciale ou de district



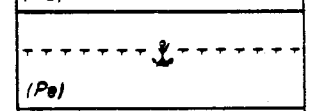
Measured distance
Base de vitesse



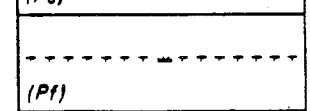
Limit of restricted area
Limite d'une zone où il existe des restrictions



Prohibited fishing area limit
Limite d'une zone de pêche interdite



Prohibited anchorage area limit
Limite d'une zone de mouillage interdit



Vessel dumping ground limit
Limite d'un cimetière de navires

NOTE

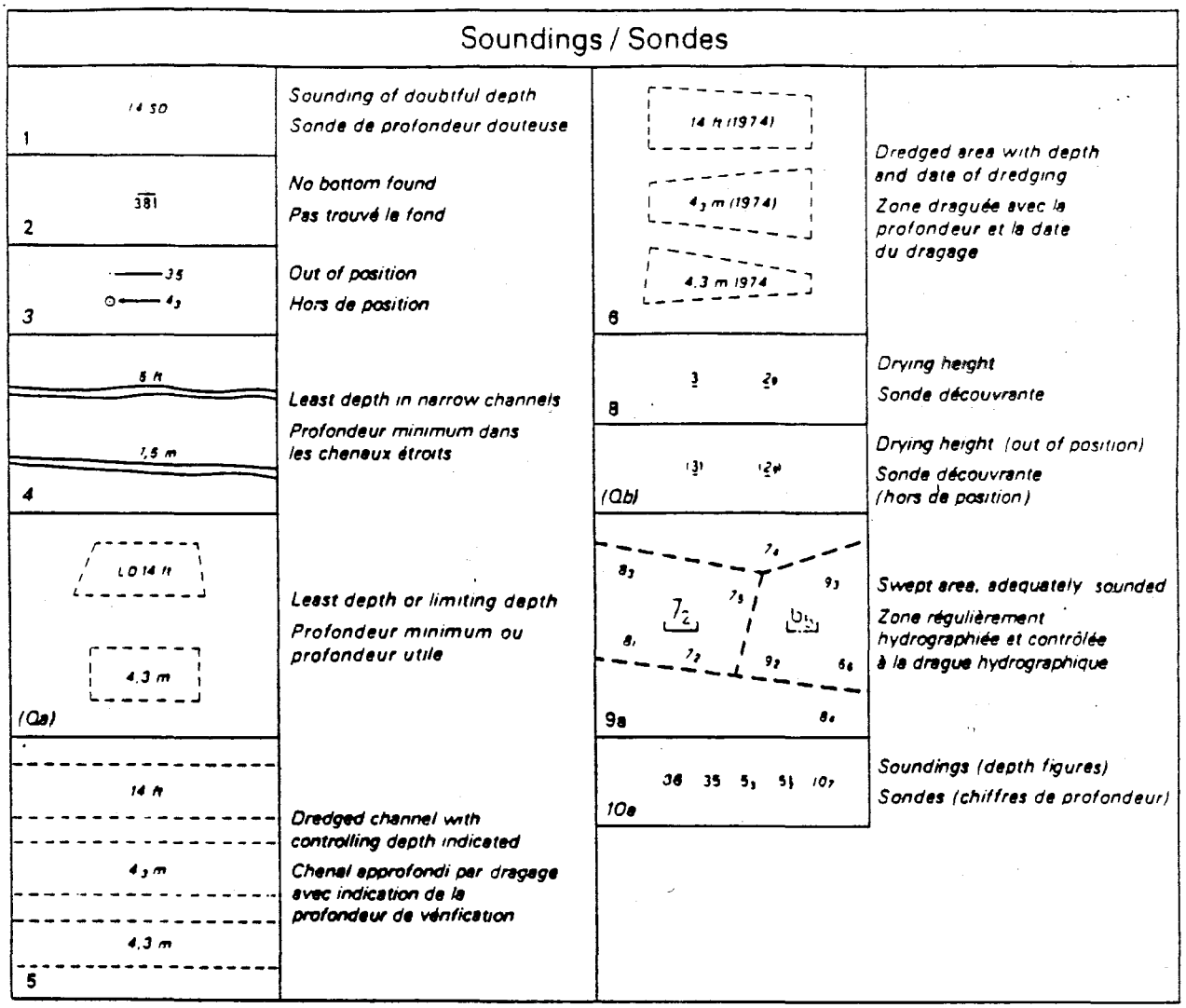
Solid line indicates usable portion of range.

Le trait continu indique la partie utile de l'alignement

NOTE

For information on the use of Traffic Separation Schemes, see Notice to Mariners No. 22 of each year

Pour les renseignements sur l'utilisation des Dispositifs de séparation du trafic, consulter l'Avis aux navigateurs No 22 de chaque année.

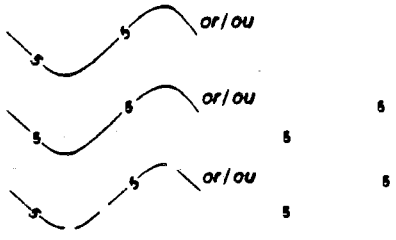

Soundings / Sondes
14 50
1
Sounding of doubtful depth
Sonde de profondeur douteuse
381
2
No bottom found
Pas trouvé le fond
35
4 3
3
Out of position
Hors de position
14 ft (1974)
4 3 m (1974)
4.3 m 1974
6
Dredged area with depth and date of dredging
Zone draguée avec la profondeur et la date du dragage
8 ft
7.5 m
4
Least depth in narrow channels
Profondeur minimum dans les cheneux étroits
3
2 9
8
Drying height
Sonde découvrante
(3)
(2 9
(Qb)
Drying height (out of position)
Sonde découvrante (hors de position)
LO 14 ft
4.3 m
(Qa)
Least depth or limiting depth
Profondeur minimum ou profondeur utile
9a
Swept area, adequately sounded
Zone régulièrement hydrographiée et contrôlée à la drague hydrographique
14 ft
4 3 m
4.3 m
5
Dredged channel with controlling depth indicated
Chenal approfondi par dragage avec indication de la profondeur de vérification
36 35 5 3 5 1 10 7
10a
Soundings (depth figures)
Sondes (chiffres de profondeur)

Depth Contours and Tints / Lignes de niveau et teintes

Metres / Mètres	*Fathoms / Brasses*	*Feet / Pieds*
0	0	0
2	1	6
5	2	12
10	3	18
15	5	30
20	6	36
30	10	60
40	20	120
50	50	
100	100	
	500	
	1000	

Continuous line depth contour with depth value expressed in same unit as the soundings

Approximate depth contour



Isobathe continue avec la cote de cette courbe exprimée dans la même unité que les sondes

Isobathe approximative

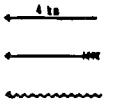
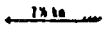
A blue tint is shown on most charts to emphasize the shallow water areas. Normally a full blue tint is shown between the Low Water line and the 3 fathom line, and a half blue tint from the 3 fathom line to the 6 fathom line. On metric charts the full blue tint is normally shown to the 5 metre line and the half blue tint to the 10 metre line. Blue tints may be shown to other depths and in some cases a narrow blue band is used to emphasize a particular contour depending on the scale and purpose of the chart.

Une teinte bleue apparaît sur la plupart des cartes pour accentuer les zones d'eau peu profonde. Habituellement on colore de plein bleu l'espace compris entre la laisse de basse eau et la courbe de trois brasses et de demi-bleu entre la courbe de trois brasses et celle de six brasses. Sur les cartes métriques, le plein bleu désigne habituellement une profondeur de cinq mètres et le demi-bleu s'étend jusqu'à la courbe de 10 mètres. Les teintes bleues peuvent désigner d'autres profondeurs et dans certains cas un ruban bleu étroit est cartographié afin d'accentuer une courbe particulière selon l'échelle et l'objet de la carte.

Quality of the Bottom / Nature du fond

1	Gd Grd grd	*Ground* *Fond*
2	S s	*Sand* *Sable*
3	M m	*Mud, Muddy* *Vase ; Vaseux*
4	Oz oz	*Ooze* *Boue ; Fange*
5	Ml ml	*Marl* *Marne*
6	Cy Cl cl	*Clay* *Argile*
7	G g	*Gravel* *Gravier*
8	Sn shin	*Shingle* *Galets*
9	P peb	*Pebbles* *Cailloux*
10	St st	*Stones* *Pierres*
11	R r Rk rky	*Rock ; Rocky* *Roche ; Rocheux*
11a	B b Bo Blds	*Boulders* *Gros galets*
12	Ck chk	*Chalk* *Craie*
12a	Ca ca cal	*Calcareous* *Calcaire*
13	Qz qrtz	*Quartz* *Quartz*
13a	Sch	*Schist* *Schiste*
14	Co crl	*Coral* *Corail*
23	Sh sh	*Shells* *Coquilles*
24	Oy Oys oys	*Oysters* *Huitres*
25	Ms mus	*Mussels* *Moules*
28	Wd wd	*Weeds* *Herbes marines*
39	f fne	*Fine* *Fin*
40	c crs	*Coarse* *Gros ; Grossier*
41	so sft	*Soft* *Mou*
42	h hrd	*Hard* *Dur*
43	sf stf	*Stiff* *Rigide ; Ferme*
44	sm sml	*Small* *Petit*
45	l lrg	*Large* *Gros ; Grand*
46	sy stk	*Sticky* *Gluant*
47	bk brk	*Broken* *Brisé*
56	w wh	*White* *Blanc*
57	bl blk bk	*Black* *Noir*
59	b bu	*Blue* *Bleu*
60	gn	*Green* *Vert*
61	y yl	*Yellow* *Jaune*
63	r rd	*Red* *Rouge*
64	br	*Brown* *Brun*
66	gy	*Grey* *Gris*
68	d dk	*Dark* *Foncé*

Tides and Currents / Marées et courants

1	H.W.	High Water Pleine mer (Haute eau)
1a	H.H.W.	Higher High Water Pleine mer supérieure
2	L.W.	Low Water Basse mer (Basse eau)
2a	L.L.W.	Lower Low Water Basse mer inférieure
4	M.S.L.	Mean Sea Level Niveau moyen de la mer
(Ta)	M.W.L.	Mean Water Level Niveau moyen de l'eau
6	Sp Spr	Spring Tide Marée de vive-eau
7	Np	Neap Tide Marée de morte-eau
7a	M.H.W.	Mean High Water Pleine mer moyenne (Haute eau moyenne)
8c	M.L.W.	Mean Low Water Basse mer moyenne (Basse eau moyenne)
11	H.W.F.&C.	High Water Full and Change (Vulgar establishment of the port) Moyenne des intervalles de pleine mer les jours de pleine et nouvelle lune (Établissement vulgaire du port)
18		Current, with rate (in knots) Courant, avec vitesse (en nœuds)
19		Flood stream (current), with rate Courant de flot, avec vitesse
20		Ebb stream (current), with rate Courant de jusant, avec vitesse
21		Tide gauge; Tide pole; Automatic tide gauge; Water level gauge (Limnograph) Échelle de marée; Marégraphe, Limnigraphe
24	kn	Knots Nœuds
34		Place for which tabulated tidal stream data are given Emplacement pour lequel sont donnés sous forme de tableaux les renseignements concernant les courants de marée

Abbreviations of Foreign Terms (used on Canadian charts)
Abréviations des termes étrangers (utilisées sur les cartes canadiennes)

1	Banke	*Bank* *Banc*
2	Bugt;B	*Bay* *Baie*
3	Forbjerg	*Bluff* *Promontoire*
4	Kap	*Cape* *Cap*
5	Kanal;Kan	*Channel* *Chenal*
6	Øst;E	*East* *Est*
7	Østlig;E-lig	*Eastern* *Oriental*
8	Fjord;Fj	*Fiord* *Fjord*
9	Havbugt	*Gulf* *Golfe*
10	Havr	*Harbour* *Port*
11	Nais	*Head* *Nez*
12	Ø	*Island* *Ile*
13	Øer	*Islands* *Iles*
14	Holm;Lille ø	*Islet* *Ilot*
15	Sø	*Lake* *Lac*
16	Bjerg;Bj	*Mount* *Mont*
17	Gennemsejling	*Narrows* *Goulet; Passe*
18	Nord;N	*North* *Nord*
19	Nordlig;N-lig	*Northern* *Septentrional*
20	Pynt;Pt	*Point* *Pointe*
21	Havn	*Port* *Port*
22	Flood;Elv	*River* *Rivière; Fleuve*
23	Klippe;Skaer	*Rock* *Roche*
24	Grund;GR	*Shoal* *Haut-fond*
25	Sund	*Sound* *Pertuis; Goulet. Bras de mer*
26	Syd;S	*South* *Sud*
27	Sydlig;S-lig	*Southern* *Méridional*
28	Straede;Str	*Strait* *Détroit*
29	Vest;W	*West* *Ouest*
30	Vestlig;W-lig	*Western* *Occidental*
31	Ejland	*Isthmus* *Isthme*
32	Isblink	*Glacier* *Glacier*
33	Sondre	*Southern* *Méridional*
34	Dyb	*Deep* *Abysses*
35	Gletscher	*Glacier* *Glacier*
36	Brae	*Sloping bank; Hillside* *Berge; Flanc de coteau*
37	Punkt	*Point* *Pointe*
38	Klint	*Cliff* *Falaise*
39	Gap	*Narrow passage* *Passage étroit*

FEET TO METRES
FATHOMS AND FEET TO METRES
PIEDS EN MÈTRES
BRASSES ET PIEDS EN MÈTRES

fm & ft	ft	m
0	0	0
1	0.3	0.3
2	0.6	0.6
3	0.9	0.9
4	1.2	1.2
5	1.5	1.5
6	1	1.8
7	1.3	2.1
8	1.6	2.4
9	1.9	2.7
10	1.8	3
11	1.5	3.4
12	2	3.7
13	2.3	4
14	2.6	4.3
15	2.9	4.6
16	2.4	4.9
17	2.5	5.2
18	3	5.5
19	3.3	5.8
20	3.6	6.1
21	3.9	6.4
22	3.4	6.7
23	3.5	7
24	4	7.3
25	4.3	7.6
26	4.6	7.9
27	4.9	8.2
28	4.4	8.5
29	4.5	8.8
30	5	9.1
31	5.3	9.4
32	5.6	9.8
33	5.9	10.1
34	5.4	10.4
35	5.5	10.7

fm & ft	ft	m
36	6	11
37	6.3	11.3
38	6.6	11.6
39	6.9	11.9
40	6.4	12.2
41	6.5	12.6
42	7	12.9
43	7.3	13.3
44	7.6	13.4
45	7.9	13.7
46	7.4	14
47	7.5	14.3
48	8	14.6
49	8.3	14.9
50	8.6	15.2
51	8.9	15.5
52	8.4	15.9
53	8.5	16.2
54	9	16.5
55	9.3	16.8
56	9.6	17.1
57	9.9	17.4
58	9.4	17.7
59	9.5	18
60	10	18.3
61	10.3	18.6
62	10.6	18.9
63	10.9	19.2
64	10.4	19.5
65	10.5	19.8
66	11	20.1
67	11.3	20.4
68	11.6	20.7
69	11.9	21
70	11.4	21.3
71	11.5	21.6

fm & ft	ft	m
72	12	21.9
73	12.3	22.3
74	12.6	22.6
75	12.9	22.9
76	12.4	23.2
77	12.5	23.5
78	13	23.9
79	13.3	24.1
80	13.6	24.4
81	13.9	24.7
82	13.4	25
83	13.5	25.3
84	14	25.6
85	14.3	25.9
86	14.6	26.2
87	14.9	26.5
88	14.4	26.8
89	14.5	27.1
90	15	27.4
91	15.3	27.7
92	15.6	28
93	15.9	28.3
94	15.4	28.7
95	15.5	29
96	16	29.3
97	16.3	29.6
98	16.6	29.9
99	16.9	30.2
100	16.4	30.5

FATHOMS AND FRACTIONS
TO METRES
BRASSES ET FRACTIONS
EN MÈTRES

fm	m
1/4	0.3
1/2	0.5
3/4	0.9
1	1.8
1 1/4	2.3
1 1/2	2.7
1 3/4	3.2
2	3.7
2 1/4	4.1
2 1/2	4.6
2 3/4	5
3	5.5
3 1/4	5.9
3 1/2	6.4
3 3/4	6.9
4	7.3
4 1/4	7.8
4 1/2	8.2
4 3/4	8.7
5	9.1
5 1/4	9.6
5 1/2	10.1
5 3/4	10.6
6	11
6 1/4	11.4
6 1/2	11.9
6 3/4	12.3
7	12.8
7 1/4	13.3
7 1/2	13.7
7 3/4	14.2
8	14.6
8 1/4	15.1

fm	m
8 1/2	15.5
8 3/4	16
9	16.5
9 1/4	16.9
9 1/2	17.4
9 3/4	17.8
10	18.3
10 1/4	18.7
10 1/2	19.2
10 3/4	19.7
11	20.1
11 1/4	20.6
11 1/2	21
11 3/4	21.5
12	21.9
12 1/4	22.4
12 1/2	22.8
12 3/4	23.3
13	23.8
13 1/4	24.2
13 1/2	24.7
13 3/4	25.1
14	25.6
14 1/4	26.1
14 1/2	26.6
14 3/4	27
15	27.4
15 1/4	27.9
15 1/2	28.3
15 3/4	28.8
16	29.3
16 1/4	29.7
16 1/2	30.2

Explanation of Abbreviations/Explication des abréviations

Periods are not shown after abbreviations in the following list, however on older editions of Canadian charts, they are included.

Lettering styles and the use of capitalization varies considerably on charts published by the Canadian Hydrographic Service and may not be exactly as shown in this publication; however no change in meaning is implied by these differences.

La liste suivante n'indique pas de points après les abréviations, mais ils sont compris sur les anciennes cartes canadiennes.

Les styles de lettrage et l'emploie de majuscules varient considérablement sur les cartes publiées par le Service hydrographique du Canada et quoique la présentation peut différer dans cette publication, ces différences ne suggèrent aucun changement dans le sens projeté

Abbreviations Abréviations	English Anglais	French Français
Abend	Abandoned	Abandonné
Abt	About	Environ
AERO	Aeronautical light	Feu aéronautique
Aero	Aeronautical	Aéronautique
Aero	Air obstruction light	Feu d'obstacle aérien
Aero RC	Aeronautical radiobeacon	Radiophare aéronautique
Al	Alternating light	Feu à changements de colorations
Alt	Alternating light	Feu à changements de colorations
Alt	Altitude	Altitude
Alta	Alberta	Alberta
Anch, anche	Anchorage	Mouillage
Ang, Angn	Anglican	Anglican
App	Approach, Approaches	Approche, Approches
Approx	Approximate	Approché, Approximatif
Arch	Archipelago	Archipel
Astro	Astronomical	Astronomique
Ave	Avenue	Avenue
B	Bay	Baie
B	Black	Noir
b	Blue	Bleu
B, b	Boulders	Gros galets
Bapt	Baptist	Baptiste
B C	British Columbia	Colombie-Britannique
B F C	Canadian Forces Base	Base des forces canadiennes
B H I	International Hydrographic Bureau	Bureau Hydrographique International
bk	Broken	Brisé
Bk	Brook	Ruisseau
bk	Black	Noir
Bk, Bks	Bank, Banks	Banc, Bancs
Bkw, Bkws	Breakwater	Brise-lames
Bl	Blue	Bleu
bl	Black	Noir
blk	Black	Noir
Bldg	Building	Édifice
Blds	Boulders	Gros galets
Blvd	Boulevard	Boulevard
BM	Bench Mark	Repère de nivellement
Bm	Boom, Booming	Panne
Bm Grd	Booming ground	Panne de barrage
Bn, Bns	Beacon, Beacons	Balise, Balises
Bo, bo	Boulder	Grosses pierres
BP	Post Office	Bureau de poste
Br	Brook	Ruisseau
br	Brown	Brun
brk	Broken	Brisé
bu	Blue	Bleu
C	Cape	Cap
c	Coarse	Gros, Grossier
C	Cove	Anse
Ca, ca, cal	Calcareous	Calcaire
CAN NAT RYS	Canadian National Railways	Chemin de fer Canadien National
CAN PAC RYS	Canadian Pacific Railways	Chemin de fer Canadien Pacifique
C B	British Columbia	Colombie-Britannique
C F B	Canadian Forces Base	Base des forces canadiennes
CG	Coast Guard Station	Poste de garde-côte
Ch	Church	Église, Temple
Ch, Chan	Channel	Chenal, Canal
Chk	Chalk	Craie
C H S	Canadian Hydrographic Service	Service hydrographique du Canada
Chy, Chys	Chimney, Chimneys	Cheminée, Cheminées
Ck	Chalk	Craie
Cl, cl	Clay	Argile
cl	Clearance	Hauteur libre, Tirant d'air
Clear	Clearance	Hauteur libre, Tirant d'air
cm	Centimetre	Centimètre
C N R	Canadian National Railways	Chemin de fer Canadien National

Co	Company	Compagnie
Consn, Conspic	Conspicuous	Remarquable
Constr	Construction	Construction
Corp	Corporation	Corporation
Corr	Correction, Corrected	Correction, Corrigé
CP, C P R	Canadian Pacific Railways	Chemin de fer Canadien Pacifique
C P N	National Harbours Board	Conseil des Ports Nationaux
Cr	Creek	Crique
crl	Coral	Corail
crs	Coarse	Gros, Grossier
Cup	Cupola	Coupole
Cy	Clay	Argile
d, dk	Dark	Foncé
Dia	Diaphone	Diaphone
Dir	Direction	Direction
Dist	District	District
Dist Find Sta	Distance Finding Station	Station télémétrique
Dm	Dome	Dôme
Dn	Dolphin	Dauphin
dm	Decimetre	Décimètre
DND	Department of National Defence	Ministère de la Défense nationale
DOE	Department of the Environment	Ministère de l'Environnement
Dol, Dols	Dolphin, Dolphins	Dauphin, Dauphins
DOT	Department of Transport	Ministère des Transports
DPW	Department of Public Works	Ministère des Travaux publics
Dr, dr	Dries	Asséche
E	East	Est
ED	Existence doubtful	Existence douteuse
Edn	Edition	Édition
E Int	Equal interval light, Isophase light	Feu isophase
Elev	Elevation	Élévation
Elev	Elevator, Lift	Élévateur, Ascenseur
Ent	Entrance	Entrée
Episc	Episcopalian	Épiscopalien
Est	Estuary	Estuaire
ev	Every	Chaque
F	Waterfall	Chute, Cascade
F	Fixed light	Feu fixe
f	Fine	Fin
Fd	Fjord, Fiord	Fjord, Fiord
F Fl	Fixed and flashing light	Feu fixe varié par un éclat
F Gp Fl	Fixed and group flashing light	Feu fixe varié par des éclats groupés
Fishg	Fishing	Pêche
Fl	Flashing light	Feu à éclats
Fls Tr	Flame tower	Torchère
fm	Fathom	Brasse
fne	Fine	Fin
Fog Sig	Fog Signal	Signaux de brume
FS	Flagstaff, Flagpole	Mât de pavillon
ft	Foot, Feet	Pied, Pieds
G, g	Gravel	Gravier
G	Green	Vert
G	Gulf	Golfe
Gd	Ground	Fond
GD	Geodetic Datum	Niveau de référence géodésique
Geod	Geodetic	Géodésique
Gl	Glacier	Glacier
gn	Green	Vert
Govt	Government	Gouvernement
Gp	Group	Groupe
Gp Fl	Group flashing light	Feu à éclats groupés
Gp Occ	Group occulting light	Feu à occultations groupées
gr	Ground	Fond
GRC	Royal Canadian Mounted Police	Gendarmerie royale du Canada
Grd, grd	Ground	Fond
GRI	Group Repetition Interval	Intervalle de répétition des impulsions
GSC	Geodetic Survey of Canada	Levés géodésiques du Canada
Gt	Great	Grand
Gy, gy	Grey	Gris
h	Hard	Dur
h	Hour	Heure
Harb	Harbour	Port
H B C, H B Co	Hudson's Bay Company	Compagnie de la Baie d'Hudson
Hbr	Harbour	Port
Hd	Head, Headland	Nez
H H W	Higher High Water	Pleine mer supérieure
Hn	Haven	Havre, Port
Ho	House	Maison
Hort	Horizontal	Horizontal
Hosp	Hospital	Hôpital
Hr	Harbour	Port
hrd	Hard	Dur
Hrs	Hours	Heures
HS	Horizontal Stripes	Bandes horizontales
HS	Canadian Hydrographic Service	Service hydrographique du Canada
Ht	Height	Hauteur

Hwy	Highway	Route
I	Island	Île
IGLD	International Great Lakes Datum	Plan de référence international des Grands Lacs
IHB	International Hydrographic Bureau	Bureau Hydrographique International
IHO	International Hydrographic Organization	Organisation Hydrographique Internationale
Illum	Illuminated	Illuminé
in	Inch	Pouce
Ind Vil	Indian Village	Village indien
INT	International Chart Series	Série de cartes internationale
Int	Inlet	Entrée, Goulet, Anse
Inter	Prohibited	Interdit
Int Qk Fl	Interrupted quick flashing light	Feu scintillant discontinu (interrompu)
I. P. É	Prince Edward Island	Île du Prince-Édouard
IQ	Interrupted quick flashing light	Feu scintillant discontinu (interrompu)
IR	Indian Reserve	Réserve indienne
Is	Islands	Îles
Iso	Isophase light, Equal interval light	Feu isophase
Islt, Islts	Islet, Islets, Islet, Islets	Îlot, Îlots
Jct	Junction	Jonction
kc	Kilocyle	Kilocycle
kHz	Kilohertz	Kilohertz
km	Kilometre	Kilomètre
kn	Knot	Noeud
L	Loch, Lough, Lake	Lac, Loch
L	Large	Gros, Grand
Lag	Lagoon	Lagune
Lat	Latitude	Latitude
LD	Limiting Depth, Least Depth	Profondeur utile, Profondeur minimale
Ldg	Landing	Débarcadère
Ldg	Leading light	Feu d'alignement
Le	Ledge	Bordure rocheuse
Leg	Ledges	Bordures rocheuses
LFl	Long flashing light	Feu à éclats longs
LH	Lighthouse	Phare
Lit	Little	Petit
LLW	Lower Low Water	Basse mer inférieure
Lndg	Landing	Débarcadère
Long	Longitude	Longitude
lrg	Large	Gros, Grand
Lt	Little	Petit
Lt	Light	Feu
Lt Ho	Lighthouse	Phare
Lts	Lights	Feux
Luth	Lutheran	Luthérien
LW	Low Water	Basse mer, Basses eaux
M	Nautical mile	Mille marin
M, m	Mud, Muddy	Vase, Vaseux
m	Metre	Mètre
m²	Square metre	Mètre carré
m³	Cubic metre	Mètre cube
Magn	Magnetic	Magnétique
Man	Manitoba	Manitoba
Mast	Mast	Mât
Max	Maximum	Maximum
MDN	Department of National Defence	Ministère de la Défense nationale
MOT	Ministry of Transport	Ministère des Transports
Met Sta	Meteorological Station	Station météorologique
MHW	Mean High Water	Pleine mer moyenne, Hautes eaux moyennes
MHz	Megahertz	Mégahertz
Micro Tr	Microwave Tower	Tour de micro-ondes
Mid	Middle	Milieu
min	Minute (of time)	Minute (de temps)
Min	Minimum	Minimum
Ml, ml	Marl	Marne
MLW	Mean Low Water	Basse mer moyenne, Basses eaux moyennes
mm	Millimetre	Millimètre
Mo	Morse code light	Feu à signes Morse
Mon	Monument	Monument
Mont	Monument	Monument
MOT	Ministry of Transport	Ministère des Transports
Mouil	Anchorage	Mouillage
MSL	Mean Sea Level	Niveau moyen de la mer
Mo	Mussels	Moules
Mt	Mount	Mont
Mtn, Mtns	Mountain, Mountains	Montagne, Montagnes,
MTP	Department of Public Works	Ministère des Travaux publics
mus	Mussels	Moules
MWL	Mean Water Level	Niveau moyen de l'eau
N	North	Nord
Nars	Narrows	Pertuis
Nat	National	National
Nat His Park	National Historical Park	Parc historique national
NB	New Brunswick	Nouveau Brunswick
N B	New Brunswick	Nouveau-Brunswick
NE	Northeast	Nord est
N S	Nova Scotia	[illegible] Écosse

N H B	National Harbours Board	Conseil des Ports Nationaux
NM, N/M	Notices to Mariners	Avis aux navigateurs
No	Number	Numéro
Np	Neap Tide	Marée de morte-eau
Nps	Neap Tides	Marées de morte-eau
Nrs	Narrows	Passe, Goulet
NS	Net Stakes	Pêcheries
N S	Nova Scotia	Nouvelle-Écosse
NW	Northwest	Nord-ouest
N W T	Northwest Territories	Territoires du Nord-Ouest
Obs	Observation	Observation
Obsc, Obscd	Obscured light	Feu masqué
Obsn	Observation	Observation
Obstn	Obstruction	Obstruction
Obstr	Obstruction	Obstruction
Oc, Occ	Occulting light	Feu à occultations
Occas, Occasl	Occasional	Occasionnel
Off	Office	Office, Bureau
O H I	International Hydrographic Organization	Organisation Hydrographique Internationale
Ont	Ontario	Ontario
Or	Orange	Orange
Oy, Oys, oys	Oysters	Huîtres
Oz, oz	Ooze	Boue, Fange
P	Pebbles	Cailloux
P	Pond	Étang
PA	Position approximate	Position approchée
Pass	Passage	Passage
PCSP	Polar Continental Shelf Project	Étude du plateau continental polaire
PD	Position doubtful	Position douteuse
peb	Pebbles	Cailloux
P E I	Prince Edward Island	Île-du-Prince-Édouard
Pen	Peninsula	Péninsule, Presqu'île
Pk	Peak	Pic
PO	Post Office	Bureau de poste
Posn	Position	Position
PQ	Province of Québec	Province de Québec
Pres	Presbyterian	Presbytérien
Presb	Presbyterian	Presbytérien
Presbn	Presbyterian	Presbytérien
Priv	Private	Privé
Prohib	Prohibited	Interdit
Prom	Promontory	Promontoire
Prov	Province, Provincial	Province, Provincial
Pt	Point	Pointe
Pte	Point	Pointe
Pub	Public Landing	Débarcadère public
Public	Public or Government Wharf	Quai public ou du gouvernement
PWI	Potable Water Intake	Prise d'eau potable
Q	Quick flashing light	Feu scintillant
Qk Fl	Quick flashing light	Feu scintillant
qrtz	Quartz	Quartz
Quar	Quarantine	Quarantaine
Qué	Québec	Québec
Qz	Quartz	Quartz
R	Rapids	Rapides
R	Coast radio station (OTG)	Station radio côtière (OTG)
R, r	Red	Rouge
R	River	Rivière
R, r	Rock, Rocky	Roche, Rocheux, Rocher
Ra	Radar station	Station de radar
Racon	Radar responder beacon	Balise radar répondeuse
Ra (conspic)	Radar conspicuous object	Objet remarquable au radar
R A M	Range Approach Marker	Indicateur d'approche d'alignement
Ra Tr	Radar Tower	Tour de radar
RC	Circular radiobeacon	Radiophare circulaire
RC	Roman Catholic	Catholique
RCMP	Royal Canadian Mounted Police	Gendarmerie royale du Canada
Rd	Road, Roadstead	Rade
rd	Red	Rouge
Red Lts	Air obstruction lights	Feux d'obstacle aérien
Reed	Reported	Signalé
Rf, Rfs	Reef, Reefs	Récif, Récifs
Rge	Range of mountains	Chaînes de montagnes
Rk, rk	Rock, Rocky	Roche, Rocheux, Rocher
Rks	Rocks	Roches, Rochers
rky	Rocky	Rocheux
R Lts,	Air obstruction lights	Feux d'obstacle aérien
Ro	Radio	Radio
Ro Bn	Radiobeacon	Radiophare
Ro Df	Radio direction finding station	Station radiogoniométrique
Ro Sta	Radio broadcasting station	Station de radiodiffusion
Ro Tel	Radio telephone station	Station radiotéléphonique
Ro Tr	Radio mast, Radio tower	Mât de TSF, Pylône de TSF
RT	Radio telephone station	Station radiotéléphonique
Ru	Ruins	Ruines
Rus	Brook	Ruisseau

Ry	Railway	Chemin de fer, Voie ferrée
S, s	Sand	Sable
S	second	seconde
S	South	Sud
Sask	Saskatchewan	Saskatchewan
Sch	School	École
Sch	Schist	Schiste
SD	Doubtful sounding	Sonde douteuse
Sd	Sound	Passage, Goulet, Bras de mer
SE	Southeast	Sud-est
sec	Second (of time)	Seconde (de temps)
Sec	Section	Section
Sem	Semaphore	Sémaphore
sf	Stiff	Rigide, Ferme
Sft	Soft	Mou
Sh	Shoal	Haut-fond
Sh, sh	Shells	Coquilles
S H C	Canadian Hydrographic Service	Service hydrographique du Canada
shin	Shingle	Galets
Shl	Shoal	Haut fond
Sig	Signal	Signal
Sig Sta	Signal station	Station de signaux
Sm	Statute mile	Mille terrestre
sm, sml	Small	Petit
SMT, SMt	Seamount	Mont sous-marin
Sn	Shingle	Galets
so	Soft	Mou
Southd	Southward	Vers le sud
Sp	Spire, Steeple	Flèche, Clocher
Sp	Spring tide	Marée de vive-eau
Sp, sp	Sponge	Éponge
Sogs	Spring tides	Marées de vive-eau
Spr	Spring tide	Marée de vive-eau
St, st	Stones	Pierres
St	Street	Rue, Chemin
St	Saint	Saint
Sta	Station	Station
Ste	Saint	Sainte
stf	Stiff	Rigide, Ferme
stk	Sticky	Gluant
Stn	Station	Station
Str	Stream	Ruisseau
Str	Steamer	Steamer, Paquebot
Str	Strait	Détroit
Sub, Subm	Submerged	Immergé, Submergé
SW	Southwest	Sud-ouest
Sy	Sticky	Gluant
Tel	Telephone	Téléphone
Telh	Telegraph	Télégraphe
Telp	Telephone	Téléphone
Term	Terminal	Terminus
T-N	Newfoundland	Terre-Neuve
T N-O	Northwest Territories	Territoires du Nord-Ouest
Tr	Tower, Mast	Tour, Mât
Tr Post	Trading Post	Comptoir de commerce
Trs	Towers	Tours
TS	Topographical Survey	Levé topographique
T S F	Wireless telegraph	Télégraphie sans fil
TV Tr	Television mast or tower	Pylône de télévision
T Y	Yukon Territory	Territoire du Yukon
U	Unwatched light	Feu non gardé
Un	United	United
Uncov	Uncovers	Asséche
US, USA	United States, United States of America	États-Unis, États-Unis d'Amérique
us, usec	Microseconds	Microsecondes
Vare	Variation	Déclinaison
Vert	Vertical	Vertical
Vil	Village	Village
Vis	Visible	Visibilité
VQ	Very Quick Light	Feu scintillant rapide
VS	Vertical stripes	Bandes verticales
W	West	Ouest
W, w	White	Blanc
Wd, wd, Wds	Sea-weed, Grass, Weeds	Algues, Herbes marines
wh	White	Blanc
Whf	Wharf	Appontement, Quai
Whis	Whistle	Sifflet de brume
Wk, Wks	Wreck, Wrecks	Épave, Épaves
WT	Water Tower, Stand-pipe	Château d'eau
W/T	Wireless telegraph	Télégraphie sans fil
Y, y	Yellow, Amber, Orange	Jaune, Ambre, Orange
yl	Yellow	Jaune
yd	Yard	Verge, Yard
Y T	Yukon Territory	Territoire du Yukon

2. Working with Latitudes and Longitudes

Learning Objective

After this section, you should be able to give the latitude and longitude of a position on a chart.

Testing Conditions

Given charts and a list of at least 5 locations.

Passing Criteria

Give the correct latitude and longitude for each location.

Key points

What is the equator?
What are parallels of latitude?
What are meridians of longitude?
Minutes.
Finding a position on a chart.

Training aids

Transparency 1, *Latitudes and Longitudes.*
Charts.
A list of 5 locations on the charts.

What is the equator?

The **equator** is the imaginary line around the earth halfway between the north and the south poles.

What are parallels of latitude?

Parallels of latitude are the imaginary horizontal lines running parallel to the equator.

Starting with 0 at the equator, parallels of latitudes are numbered from 0 to 90 degrees north and 0 to 90 degrees south. These are known as **degrees of latitude.**

What are meridians of longitude?

Meridians of longitude are the imaginary vertical lines that run from the north pole to the south pole.

The zero meridian -- the vertical equator, if you wish -- passes through Greenwich, England. Starting with 0 at Greenwich, meridians of longitude are numbered from 0 to 180 degrees east and 0 to 180 degrees west, encircling the globe. These degrees are known as **degrees of longitude.**

Minutes

Each degree of latitude and longitude is divided into 60 smaller units called **minutes**. Even if the lines aren't drawn, minutes represent genuine parallels of latitude and meridians of longitude. They allow you to pinpoint a spot on a chart with more precision.

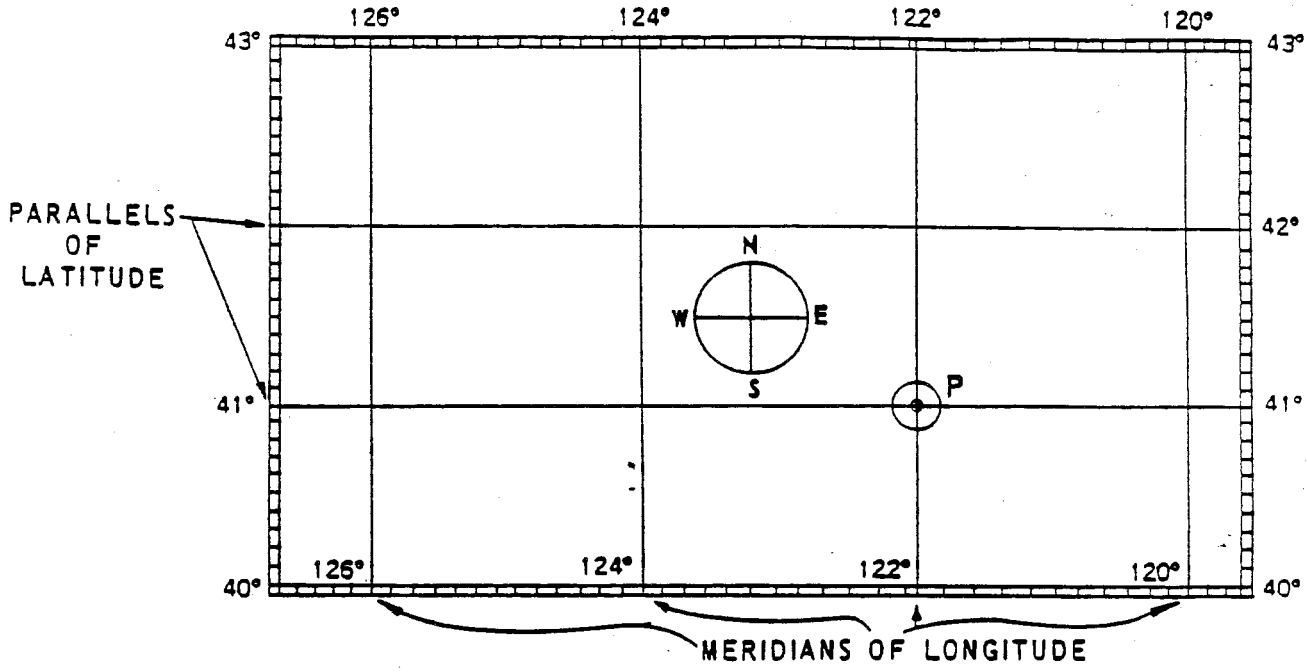
Degrees and minutes are expressed like this:

latitude 41° 51' NORTH.

The little zero beside the 41 means degrees. The ' mark beside the 51 means minutes.

Example: Finding a position

You can use degrees of latitude and longitude to pinpoint a spot anywhere in the world. Here is an example:



The parallels of latitude 40°, 41°, 42° and 43° run horizontally across the chart. The meridians of longitude 120°, 122°, 124° and 126° run vertically up and down the chart.

What is the position of point P?

On the chart, the latitude of P is 41° and the longitude of P is 122°.

Problem: 2 latitudes of 41° exist -- one is north of the equator and the other is south. Is the 41° on our chart north or south of the equator?

The same problem applies with longitudes: one 122° longitude runs east of Greenwich and another runs west of Greenwich. Is the 122° on our chart east or west of Greenwich?

Solution: In B.C., all the latitudes are **north** of the equator and all the longitudes are **west** of Greenwich.

Conclusion: We conclude that the position of P is:

latitude 41° NORTH and
longitude 122° WEST.

This position is also called the **coordinates** of P.

3. Magnetic, True & Compass Bearings

Learning Objective

After this section, you should be able to convert magnetic, true and compass bearings.

Testing Conditions

Given charts and 1 magnetic course, 1 true course and 1 compass course.

Passing Criteria

Convert all 3 courses without error.

Key points

What is a true bearing?
What is a magnetic bearing? The variation?
What is a compass bearing? The deviation?
What is a deviation card?
Converting compass bearings to chart bearings.
Converting chart bearings to compass bearings.

Training aids

Transparency 2, *The Magnetic North Pole.*
Transparency 3, *The Magnetic Compass Rose.*
Transparency 4, *Compass Deviation.*
Exercise.
Charts.
A magnetic, a true and a compass course.

There are 3 kinds of bearings: true, magnetic and compass. This section:

- explains the different characteristics of each kind of bearing
- tells you how to convert one bearing into another.

True Bearing

True bearings are lines you draw on a chart from one point to another.

The north and south poles on charts are called **true poles**.

Magnetic Bearing

Contrary to popular belief, the compass needle does not point to the north pole shown on charts.

Think of the earth as a giant magnet with two magnetic poles. Your compass needle is attracted to the *magnetic* north pole, not the true north pole. Unfortunately for navigators around the world, *the magnetic north pole is not located at the true north pole.*

Here is an illustration:

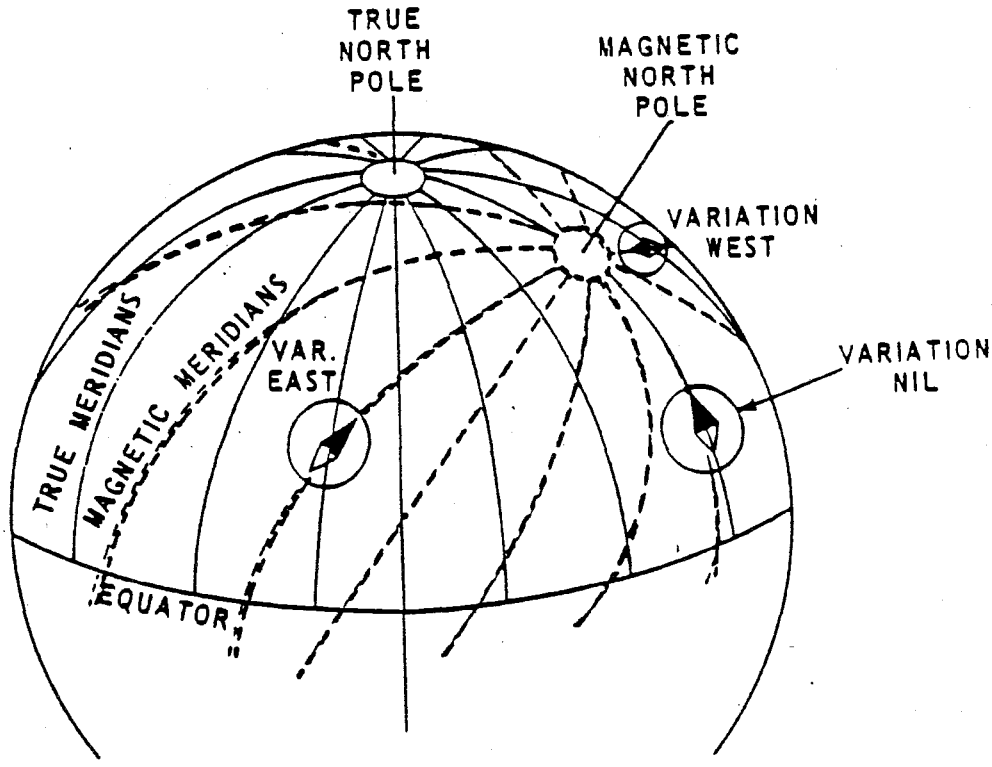


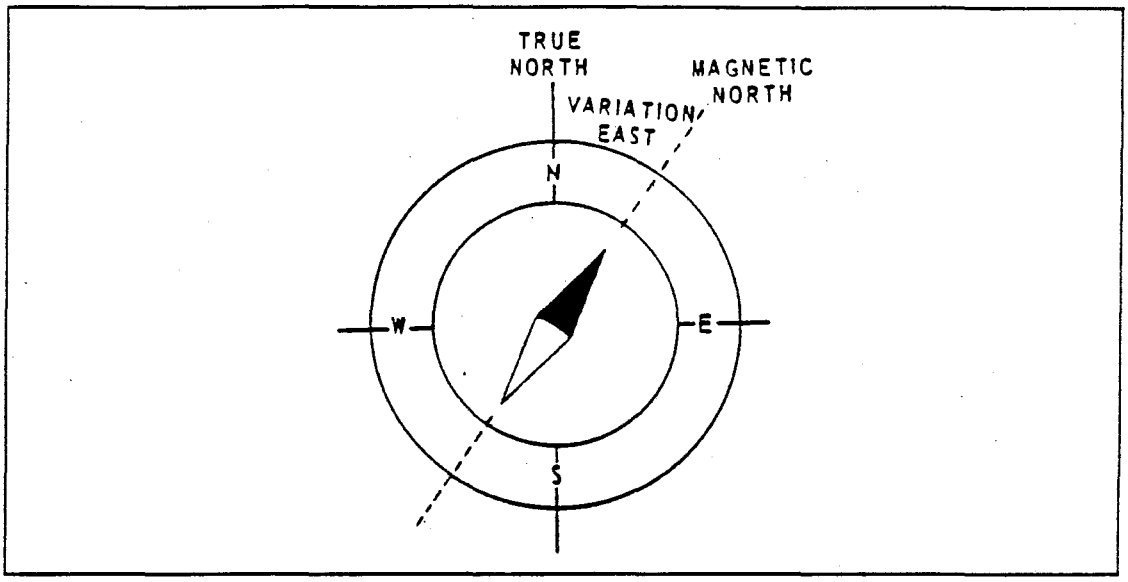
DIAGRAM 62

Notice that the compass needle does not point at the true north pole. It points at the magnetic north pole, located south-east of the true north pole.

The variation

The angle formed between a meridian of longitude and a line drawn to the magnetic north pole is called the **variation.**

Here is what a variation looks like:



The Magnetic Compass

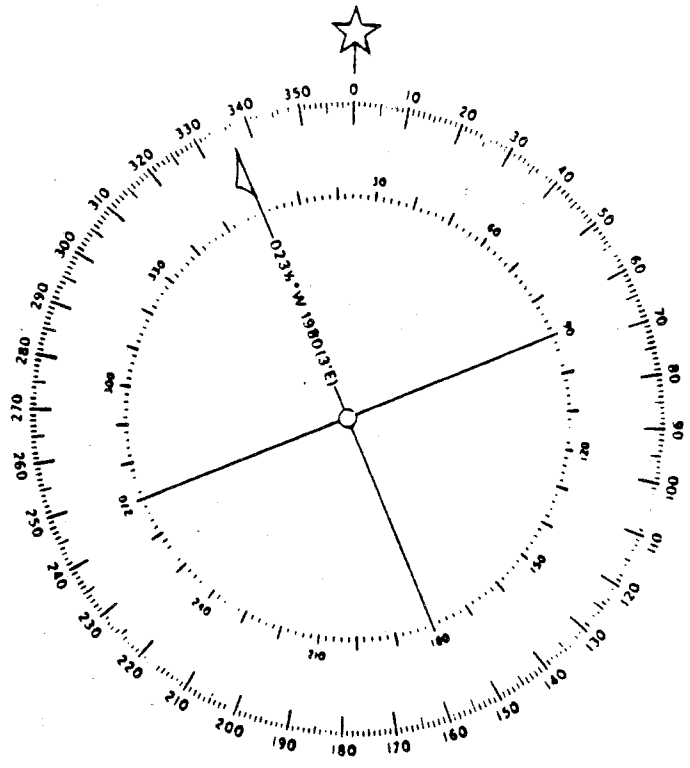
In British Columbia, the variation is easterly at about 23 degrees.

Changes in the variation

The magnetic north pole is not stationary: it tends to drift slightly every year. Therefore, the variation drifts slightly every year too.

Reading a magnetic bearing

Each chart shows the variation for the area. The information is contained in the **compass rose.** The compass rose is a circular design printed on the chart that helps you calculate your position. Here is an example of a compass rose:



1	N	*North* *Nord*
2	E	*East* *Est*
3	S	*South* *Sud*
4	W	*West* *Ouest*
5	NE	*Northeast* *Nord-Est*
6	SE	*Southeast* *Sud-Est*
7	SW	*Southwest* *Sud-Ouest*
8	NW	*Northwest* *Nord-Ouest*

24	023½°W 1980	*Variation (with date)* *Déclinaison (avec date)*
25	(3'E)	*Annual change* *Variation annuelle*
25a	(0')	*Annual change nil* *Variation annuelle nulle*
26	+15	*Abnormal variation; Magnetic attraction* *Déclinaison anormale; Anomalie magnétique*
(Usl)	025°W	*Magnetic variation curves* *Courbes isogones*

The outer ring shows the true compass. The inner ring shows the magnetic compass. Notice how the magnetic compass is pulled to the west. This tells you the compass rose might be from a chart of Atlantic Canada, which has a westerly variation.

The line through the magnetic compass reads:

23½°W 1980 (3'E).

The variation in the area was 23½° west in 1980. As well, the magnetic compass was drifting east, or clockwise, by 3 minutes annually because of the drift of the magnetic pole.

Because these annual changes in variation can add up, always use the most recent charts.

Compass Bearing

That takes care of the true and magnetic bearings. What about the compass bearing? This part looks at this third kind of bearing.

Another complication

We noted above that the magnetic north pole -- not the true north pole -- attracts the compass needle, and that unfortunately for navigators, the magnetic north pole is not located at the true north pole.

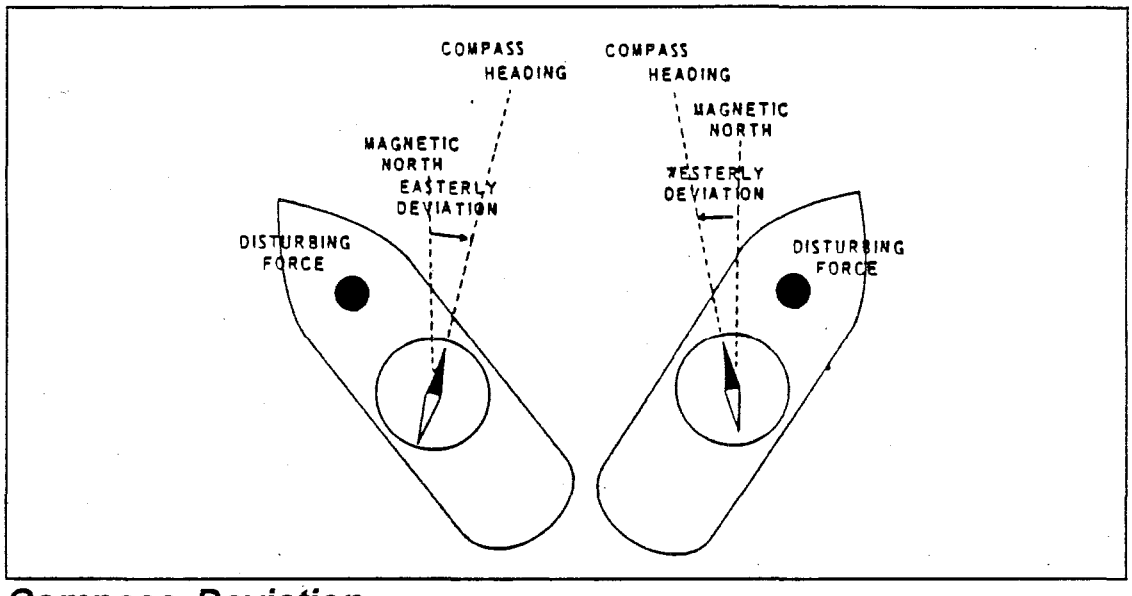
To make matters worse for the navigator, *the compass needle may not even do a good job of pointing to the magnetic north pole*. That's because the needle can be affected by nearby interference.

The compass needle is a magnet. It is attracted to other magnets and to metal. When you read a compass in the middle of a wheat field, you get a pretty accurate reading of magnetic north because nothing around you interferes with the needle.

However, when you read a compass aboard a boat, you may get an inaccurate reading because the needle is affected by the metal in the engine, in the anchor, in the equipment, and probably in the hull too.

This kind of compass error is called the **deviation**.

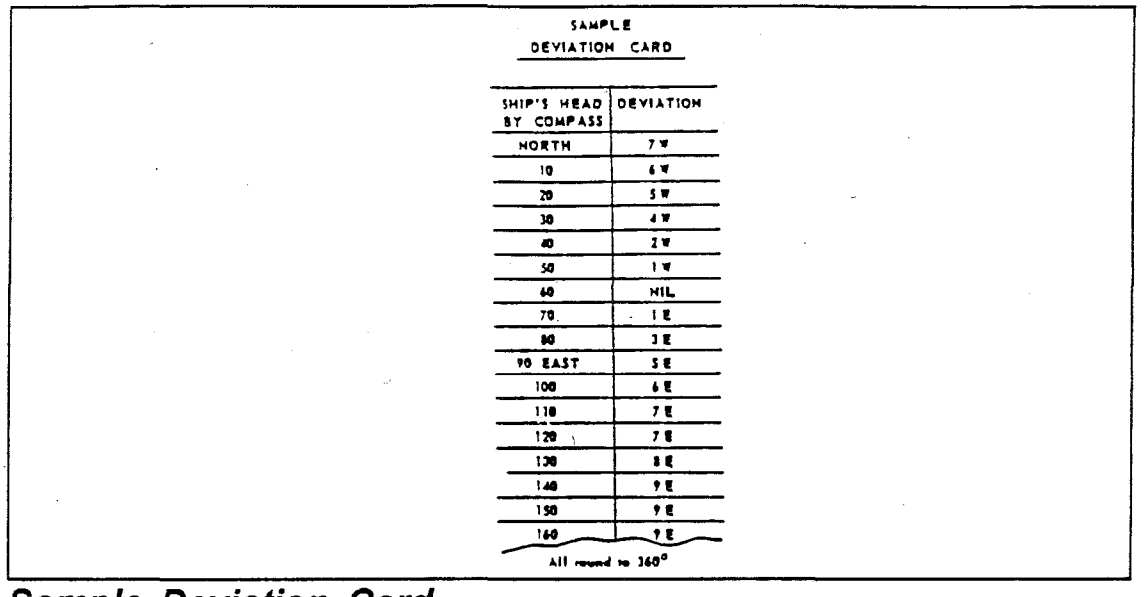
The deviation changes as the direction of the ship's bow changes. Here is an example of a force aboard ship that repels the compass needle:



Compass Deviation

What to do Take out a **deviation card** and make the heading corrections. A **deviation card** is a list of how much each actual compass heading deviates--or differs--from the accurate magnetic heading. The deviation card lets you calculate the compass bearing for your boat. Because each ship is different, each ship has a different deviation card.

Here is a sample deviation card:



SAMPLE
DEVIATION CARD

SHIP'S HEAD BY COMPASS	DEVIATION
NORTH	7 W
10	6 W
20	5 W
30	4 W
40	2 W
50	1 W
60	NIL
70	1 E
80	3 E
90 EAST	5 E
100	6 E
110	7 E
120	7 E
130	8 E
140	9 E
150	9 E
160	9 E

All round to 360°

Sample Deviation Card

Converting Bearings

A compass bearing is inappropriate for chart work, and a true bearing is inappropriate for steering a boat. Here is how to convert:

- a compass bearing to a chart bearing
- a chart bearing to compass bearing.

Compass to chart

You are out on patrol. You want to find out which way you're heading on your chart. You take your bearing. The compass reads 30°. This is your *compass bearing.*

However, the compass bearing doesn't necessarily translate to a 30° bearing on the chart. You must take into account the variation and deviation.

What is your *true bearing* on the chart?

Rule *If the variation and deviation are both easterly*:

1. **Take the compass bearing.**
2. **Add** the deviation, which gives you the magnetic bearing.
3. **Add** the variation, which gives you the true bearing.

Example

1. You take a compass bearing of 30°.

2. Your deviation card indicates that, at a 30° compass heading, your ship suffers from a 20° easterly deviation. Since the deviation is easterly, you add the deviation:

   30° + 20° = 50°

   Your magnetic bearing is 50°.

3. Next, the compass rose on the chart tells you there is a 20° easterly variation. Therefore:

   50° + 20° = 70°

   Your true bearing is 70°.

Conclusion: Your 30° compass bearing translates to a 70° true bearing on your chart.

Rule *If the variation is easterly and the deviation is westerly*:

1. **Take the compass bearing.**
2. **Subtract** the deviation, which gives you the magnetic bearing.
3. **Add** the variation, which gives you the true bearing.

Example

1. You take a compass bearing of 260°.

2. Your deviation card indicates that, at a 260° compass heading, your ship suffers from a 15° westerly deviation. Since the deviation is westerly, you deduct the deviation:

   260° - 15° = 245°

   Your magnetic bearing is 245°.

3. Next, the compass rose on the chart tells you there is a 25° easterly variation. Therefore:

   245° + 25° = 270°

   Your true bearing is 270°.

Conclusion: Your 260° compass bearing translates to a 270° true bearing on your chart.

Chart to compass

You are out on patrol and decide you want to change heading and follow a true heading of 150°. That doesn't mean you should steer a 150° compass bearing. You must take into account the variation and deviation.

What is the appropriate compass bearing?

Rule

If the variation and deviation are both easterly:

1. **Write down the true bearing.**
2. **Subtract** the variation, which gives you the magnetic bearing.
3. **Subtract** the deviation, which gives you the compass bearing.

Example

1. You plot a true bearing of 60° on the chart.

2. The compass rose on the chart tells you there is a 20° easterly variation. Therefore:

   60° - 20° = 40°

   Your magnetic bearing is 40°.

3. Your deviation card indicates that, at a 40° magnetic heading, your ship suffers from a 10° easterly deviation. Since the deviation is easterly, you deduct the deviation:

   40° - 10° = 30°

   Your compass bearing is 30°.

Conclusion: A 60° true bearing translates to a 30° compass bearing. You should steer a 30° course by compass to travel a true 60° course.

Rule

If the variation is easterly and the deviation is westerly:

1. **Write down the true bearing.**
2. **Subtract** the variation, which gives you the magnetic bearing.
3. **Add** the deviation, which gives you the compass bearing.

Example

1. You plot a true bearing of 300° on the chart.

2. The compass rose on the chart tells you there is a 25° easterly variation. Therefore:

   300° - 25° = 275°

   Your magnetic bearing is 275°.

3. Your deviation card indicates that, at a 275° magnetic heading, your ship suffers from a 10° westerly deviation. Since the deviation is westerly, you add the deviation:

   275° + 10° = 285°

   Your compass bearing is 285°.

Conclusion: A 300° true bearing translates to a 285° compass bearing. You should steer a 285° course by compass to travel a true 300° course.

Rules Summary

From compass to chart
If the variation and deviation are both easterly: 1. **Take the compass bearing.** 2. **Add** the deviation, which gives you the magnetic bearing. 3. **Add** the variation, which gives you the true bearing.
If the variation is easterly and the deviation is westerly: 1. **Take the compass bearing.** 2. **Subtract** the deviation, which gives you the magnetic bearing. 3. **Add** the variation, which gives you the true bearing.

From chart to compass
If the variation and deviation are both easterly: **1. Write down the true bearing.** **2. Subtract** the variation, which gives you the magnetic bearing. **3. Subtract** the deviation, which gives you the compass bearing.
If the variation is easterly and the deviation is westerly: **1. Write down the true bearing.** **2. Subtract** the variation, which gives you the magnetic bearing. **3. Add** the deviation, which gives you the compass bearing.

4. Distances in Nautical Measurements

Learning Objective

After this section, you should be able to calculate distances in nautical measurements.

Testing Conditions

Given charts, a ruler, and at least 5 short-answer distance questions.

Passing Criteria

Make all the distance calculations without error.

Key points

What is a nautical mile?
Calculating distances on a chart.
Nautical mile equals minute of latitude.
What is the datum?
Tides: why you need to know about them.
Canadian Tide and Current Tables.
Finding the tide at: a reference port, a secondary port.
Estimating the tide height between high and low tide.
Finding the actual depth.

Training aids

Transparency 5, *Tide Table for Fulford Harbour.*
Transparency 6, *Table 3 from the Tide and Current Tables - Swartz Bay.*
Transparency 7, *Table 2 from the Tide and Current Tables - Fulford Harbour.*
5 short-answer questions on distances.

Nautical Miles

The **nautical mile** is a measure of distance equal to 6076 feet, or 1852 metres.

Do not confuse the nautical mile with the **statute mile** used on land. The statute mile, at 5128 feet, is 800 feet shorter than the nautical mile.

A **cable** is one tenth of a nautical mile, or 608 feet.

Calculating distances on a chart

Earlier, we noted that each degree of latitude and longitude is divided into 60 smaller units called **minutes**.

A special feature of the nautical mile is that it represents exactly one minute of a degree of latitude on a chart:

1 minute of latitude = 1 nautical mile.

Example

You want to know the distance between latitude 41° NORTH and latitude 43° 20' NORTH.

This distance covers 2 degrees and 20 minutes (2° 20') of latitude on the chart. Since each degree is divided into 60 minutes, 2 degrees equal 120 minutes. Adding the remaining 20 minutes gives you a total of 140 minutes.

Since each minute is equal to one nautical mile, the distance between the two latitudes is 140 nautical miles:

2° 20' = 140'

= 140 nautical miles.

Conclusion: The distance between latitude 41° NORTH and latitude 43° 20' NORTH is 140 nautical miles.

Depth

The depths on your navigational charts do not tell you how the deep the water actually is. The depth on the chart is the **datum**. The datum is the height below which the water seldom falls. The datum is also called the **chart datum**.

How deep the water really is at any given time depends on the tides. Because of the tides, the depth of the water is constantly changing.

Why you need to know about tides

You need to know about the tides because they affect the depth readings on your chart. Tides affect:

- where you can take your boat and when. Places you can take your boat at high tide may be too shallow at low tide.
- how deep the water is over obstructions such as reefs, shoals and bars. If the water is too low, you may not be able to pass over.
- how much space there is between your boat and things overhead, like bridges and powerlines. If the water is too high, you may not be able to pass under.
- when you can use dredged passages. If the water is too low, your boat may not be able to pass through.
- where you should anchor or dock. If the tide goes out, you must be in a place where your boat won't get stranded.
- how much line you should use when you dock or anchor your boat. You need to have enough line to allow your boat to move up and down with the tides, without pulling loose.

The rest of this section:

- describes why you need to know about tides to figure out the water's actual depth at a specific time on a specific day

- describes the following procedures:
  - finding the tide at a reference port
  - finding the tide at a secondary port
  - estimating the tide height between high and low tide
  - finding the actual depth.

Tide and Current Tables

The Canadian Tide and Current Tables tell you the time and heights of high and low tide in selected coastal ports on each day of the year. These ports are called **reference ports.**

The other ports listed are called **secondary ports.** The tables don't give daily predictions for these ports. To get a prediction for a secondary port, you have to add specific numbers, called **differences,** to the predictions of the nearest reference port.

Reference ports are listed in Tables 1 and 2 of the Tide and Current Tables. Secondary ports are listed in Table 3.

The **tide height** is the height of the water, measured from the datum. It is measured in both feet and meters.

Time

The Tide and Current Tables use the 24-hour clock. For example, 0000 is midnight, 0734 is 7:34 am, 1200 is noon, 1300 is 1:00 pm and 1400 is 2:00 pm.

The times are **not daylight savings times.** From the first Sunday in August to the last Sunday in October, add one hour to the standard times in the tables to get the local daylight savings time.

Finding the tide at a reference port

To find tide information at a reference port:

1. Look up the port in the index. Reference ports appear in bold, capital letters.

2. Go to the listed page to find the tide table for that port.

3. Locate the date you want in the table. The table lists the times and heights of each high and low tide on that date.

Here is a sample tide table for Fulford Harbour.

TABLE DES MARÉES **FULFORD HARBOUR** HNP Z+8

1993

OCTOBER–OCTOBRE

Day	Time	Ht./ft.	Ht./m	Jour	Heure	H./pi	H./m
1	0540	9.4	2.9	16	0555	10.5	3.2
	1100	6.4	2.0		1050	7.4	2.3
FR	1650	9.7	3.0	SA	1615	10.7	3.3
VE	2320	3.7	1.1	SA	2315	1.2	.4
2	0625	9.6	2.9	17	0655	10.7	3.3
	1140	7.0	2.1		1145	8.0	2.4
SA	1710	9.6	2.9	SU	1650	10.7	3.3
SA	2350	3.3	1.0	DI			
3	0710	9.7	3.0	18	0000	1.0	.3
	1220	7.5	2.3		0755	10.9	3.3
SU	1730	9.5	2.9	MO	1245	8.5	2.6
DI				LU	1725	10.5	3.2
4	0020	3.0	.9	19	0050	1.2	.4
	0800	9.8	3.0		0855	10.9	3.3
MO	1305	7.9	2.4	TU	1350	8.7	2.7
LU	1750	9.4	2.9	MA	1805	10.1	3.1
5	0100	2.9	.9	20	0140	1.8	.5
	0850	9.8	3.0		0955	10.9	3.3
TU	1400	8.3	2.5	WE	1510	8.7	2.7
MA	1810	9.3	2.8	ME	1850	9.5	2.9
6	0140	2.8	.9	21	0235	2.5	.8
	0950	9.9	3.0		1055	10.9	3.3
WE	1455	8.5	2.6	TH	1635	8.4	2.6
ME	1835	9.1	2.8	JE	1945	8.9	2.7
7	0225	2.8	.9	22	0330	3.3	1.0
	1050	10.0	3.0		1150	10.9	3.3
TH	1610	8.7	2.7	FR	1810	7.9	2.4
JE	1905	8.9	2.7	VE	2105	8.2	2.5

NOVEMBER–NOVEMBRE

Day	Time	Ht./ft.	Ht./m	Jour	Heure	H./pi	H./m
1	0720	10.5	3.2	16	0750	11.5	3.5
	1225	8.6	2.6		1250	9.1	2.8
MO	1625	9.5	2.9	TU	1645	10.3	3.1
LU	2345	2.0	.6	MA			
2	0800	10.6	3.2	17	0020	1.1	.3
	1320	8.7	2.7		0840	11.5	3.5
TU	1650	9.4	2.9	WE	1355	8.9	2.7
MA				ME	1730	9.8	3.0
3	0025	2.0	.6	18	0110	1.8	.5
	0840	10.7	3.3		0925	11.5	3.5
WE	1415	8.7	2.7	TH	1510	8.5	2.6
ME	1720	9.2	2.8	JE	1825	9.1	2.8
4	0105	2.1	.6	19	0155	2.8	.9
	0925	10.8	3.3		1010	11.4	3.5
TH	1515	8.7	2.7	FR	1625	8.0	2.4
JE	1755	8.9	2.7	VE	1930	8.4	2.6
5	0150	2.4	.7	20	0245	3.8	1.2
	1010	10.9	3.3		1050	11.3	3.4
FR	1620	8.4	2.6	SA	1740	7.3	2.2
VE	1840	8.6	2.6	SA	2110	7.7	2.3
6	0235	2.8	.9	21	0335	4.9	1.5
	1050	11.0	3.4		1130	11.1	3.4
SA	1725	7.9	2.4	SU	1840	6.5	2.0
SA	1955	8.1	2.5	DI	2320	7.5	2.3
7	0330	3.5	1.1	22	0430	6.0	1.8
	1130	11.0	3.4		1205	10.9	3.3
SU	1815	7.1	2.2	MO	1920	5.7	1.7
DI	2200	7.7	2.3	LU			

DECEMBER–DECEMBRE

Day	Time	Ht./ft.	Ht./m	Jour	Heure	H./pi	H./m
1	0745	11.1	3.4	16	0000	1.5	.5
	1310	9.1	2.8		0810	11.6	3.5
WE	1615	9.6	2.9	TH	1340	8.7	2.7
ME				JE	1715	9.6	2.9
2	0000	1.5	.5	17	0045	2.3	.7
	0820	11.2	3.4		0845	11.6	3.5
TH	1400	8.8	2.7	FR	1440	8.2	2.5
JE	1700	9.3	2.8	VE	1820	8.9	2.7
3	0040	1.8	.5	18	0125	3.3	1.0
	0855	11.4	3.5		0920	11.5	3.5
FR	1450	8.5	2.6	SA	1540	7.5	2.3
VE	1750	8.9	2.7	SA	1935	8.3	2.5
4	0125	2.4	.7	19	0205	4.4	1.3
	0930	11.5	3.5		0955	11.4	3.5
SA	1545	7.9	2.4	SU	1645	6.8	2.1
SA	1855	8.4	2.6	DI	2105	7.8	2.4
5	0205	3.2	1.0	20	0245	5.6	1.7
	1000	11.5	3.5		1020	11.2	3.4
SU	1640	7.1	2.2	MO	1740	6.1	1.9
DI	2035	7.9	2.4	LU	2300	7.7	2.3
6	0255	4.3	1.3	21	0330	6.8	2.1
	1035	11.5	3.5		1050	11.0	3.4
MO	1735	6.1	1.9	TU	1825	5.3	1.6
LU	2235	7.6	2.3	MA			
7	0345	5.5	1.7	22	0125	8.1	2.5
	1105	11.5	3.5		0415	7.8	2.4
TU	1825	4.9	1.5	WE	1115	10.8	3.3
MA				ME	1905	4.5	1.4

Finding the tide at a secondary port

To find tide information at a secondary port:

1. Look up the port in the index. The index number appears next to it.

   Example: Look up Swartz Bay in the index. It is not in bold, capital letters, so it is a secondary port. The index number is 7270.

2. To find the port, turn to Table 3 and find the index number in the Index No. column.

   Example: Look up 7270 in Table 3 (below).

SECONDARY PORTS **PORTS SECONDAIRES**

TABLE 3
INFORMATION AND TIDAL DIFFERENCES
RENSEIGNEMENTS ET DIFFÉRENCES DES MARÉES

INDEX NO. / NO D'INDEX	SECONDARY PORT / PORT SECONDAIRE	TIME ZONE / FUSEAU HORAIRE	POSITION / POSITION LAT. N.	POSITION LONG. W. / LONG. O.	DIFFERENCES HIGHER HIGH WATER / PLEINE MER SUPÉRIEURE TIME / HEURE	MEAN TIDE / MARÉE MOYENNE	LARGE TIDE / GRANDE MARÉE	DIFFÉRENCES LOWER LOW WATER / BASSE MER INFÉRIEURE TIME / HEURE	MEAN TIDE / MARÉE MOYENNE	LARGE TIDE / GRANDE MARÉE	RANGE / MARNAGE MEAN TIDE / MARÉE MOYENNE	RANGE / MARNAGE LARGE TIDE / GRANDE MARÉE	MEAN WATER LEVEL / NIVEAU MOYEN DE L'EAU
			° ′	° ′	h. m.	ft./pi.	ft./pi.	h. m.	ft./pi.	ft./pi.	ft./pi.	ft./pi.	ft./pi.
	AREA 3 / RÉGION 3 **S.E. VANCOUVER ISLAND AND GULF ISLANDS**												
						on/sur FULFORD HARBOUR, pages 42–45							
	HARO STRAIT												
7255	SAANICHTON BAY	+ 8	48 36	123 23	-0 12	-0.4	-0.3	-0 18	0.0	+0.1	7.5	12.1	7.2
7260	SIDNEY	+ 8	48 39	123 24	-0 07	-0.8	-0.6	-0 17	-0.7	-0.6	7.8	12.5	6.7
7270	SWARTZ BAY	+ 8	48 41	123 24	-0 05	-0.1	+0.1	-0 04	0.0	+0.1	7.8	12.5	7.4
	SAANICH INLET												
7277	PATRICIA BAY	+ 8	48 39	123 27	+0 01	-0.1	+0.2	+0 05	0.0	0.0	7.8	12.7	7.4
7280	BRENTWOOD BAY	+ 8	48 35	123 28	+0 07	+0.1	+0.1	+0 02	-0.3	-0.3	8.0	12.5	7.4
7284	FINLAYSON ARM	+ 8	48 30	123 33	+0 02	-0.1	+0.1	+0 04	0.0	+0.1	7.8	12.5	7.4
	SATELLITE CHANNEL												
7310	COWICHAN BAY	+ 8	48 44	123 37	-0 04	+0.3	+0.6	+0 06	+0.3	+0.4	7.9	12.7	7.8
7315	MAPLE BAY	+ 8	48 49	123 37	0 00	+1.5	+1.6	+0 11	+0.6	+0.4	8.8	13.7	8.5
	BOUNDARY PASS												
7345	NARVAEZ BAY	+ 8	48 46	123 06	+0 07	+0.6	+0.6	+0 20	0.0	-0.2	8.5	13.3	7.7
7350	BEDWELL HARBOUR	+ 8	48 44	123 14	-0 08	-0.1	-0.1	+0 05	-0.1	-0.1	7.9	12.5	7.3

3. Jot down the time and height differences for the low or the high tide. In the table, the Lower Low Water column lists the differences for low tide. The Higher High Water column lists the differences for high tide.

   Example: You want to find low tide, so jot down the time and height differences for lower low water. They are:

   time = -0 04
   mean tide = 0.0
   large tide = +0.1

4. Jot down the name of the reference port listed above the secondary port.

   Example: The reference port for Swartz Bay is Fulford Harbour.

5. Look up the reference port in Table 2 and jot down the mean and large tides for the low or high tide. As in Table 3, the Lower Low Water column lists tides for low tide. The Higher High Water columns lists tides for high tide.

   Example: Look up Fulford Harbour in Table 2 (below) and jot down the mean and large tides for the lower low water. They are:

   mean tide = 2.5 ft
   large tide = -0.2 ft

TABLE 2
TIDAL HEIGHTS, EXTREMES, AND MEAN WATER LEVEL
HAUTEURS DES MARÉES, EXTRÊMES ET NIVEAU MOYEN DE L'EAU

REFERENCE PORT / PORT DE RÉFÉRENCE	HEIGHTS HAUTEURS				RECORDED EXTREMES EXTRÊMES ENREGISTRÉS		MEAN WATER LEVEL NIVEAU MOYEN DE L'EAU	
	HIGHER HIGH WATER PLEINE MER SUPÉRIEURE		LOWER LOW WATER BASSE MER INFÉRIEURE					
	MEAN TIDE MARÉE MOYENNE	LARGE TIDE GRANDE MARÉE	MEAN TIDE MARÉE MOYENNE	LARGE TIDE GRANDE MARÉE	HIGHEST H.W. EXTRÊME DE PLEINE MER	LOWEST L.W. EXTRÊME DE BASSE MER		
	ft./pi. m.	ft./pi. m.	ft./pi. m.	ft./pi. m.	ft./pi. m.	ft./pi. m.	ft./pi. m.	
SOOKE	9.1 2.8	11.7 3.6	2.5 0.8	1.1 0.3	12.9 3.9	-0.6 -0.2	6.4 1.9	
VICTORIA	8.2 2.5	10.8 3.3	2.2 0.7	0.5 0.2	12.2 3.7	-1.5 -0.5	6.2 1.9	
PORT TOWNSEND	8.2 2.5	9.9 3.0	0.1 0.0	-2.3 -0.7	— —	— —	5.1 1.6	
SEATTLE	11.1 3.4	13.7 4.2	-0.3 -0.1	-4.2 -1.3	— —	— —	6.7 2.0	
FULFORD HARBOUR	10.4 3.2	12.3 3.7	2.5 0.8	-0.2 -0.1	14.4 4.4	-1.5 -0.5	7.4 2.3	
VANCOUVER	14.3 4.4	16.3 5.0	3.6 1.1	0.1 0.0	18.5 5.6	-1.0 -0.3	10.0 3.1	

6. Look up the daily predictions for the low or high tide at the reference port and jot them down.

   Example: For the first low tide on November 19:

   time = 1 55 am
   tide height = 2.8 ft

7. Look at the time and height differences you jotted down from Table 3.

   - If the predicted time of the tide at the reference port is closer to the large tide height from Table 2, use the large tide difference.

   - If the predicted time of the tide at the reference port is closer to the mean tide height from Table 2, use the mean tide difference.

   Example: 2.8 ft is closer to the mean tide for Fulford Harbour. Use the mean tide difference from Swartz Bay (0.0) in step 8.

8. To calculate the tide time and height at the secondary port, add the time and height differences to the predicted time and height for the reference port. If the differences have a minus sign (-) in front of them, subtract them.

   Example: The time and height of low tide in Swartz Bay on November 19 are:

   time = 1 55 - 0 40 = 1 15 am
   tide height = 2.8 - 0.0 = 2.8 ft

Estimating the tide height between high and low tide

Sometimes you may want to know the tide height of a specific time between high and low tide. Here is how:

1. From the tide tables, get the heights and times of the high and low tides, as explained in the previous pages.

   Example: The last high tide was 12 feet at 5 o'clock and the coming low tide will be 3 feet at 11 o'clock.

2. Subtract the high-tide height from the low-tide height. This gives you the **range**.

   Example: 12' - 3' = 9'. The range is 9 feet.

3. Subtract the low-tide time from the high-tide time. This gives you the **duration**.

   Example: 11 - 5 = 6 hrs. The duration is 6 hours.

With this information, you can make a *rough* estimate of the tide height at a specific time during the tide's duration.

Example 1: If the specific time you have in mind is halfway through the tide's duration, then the tide is roughly halfway through its range. If the range is 9 feet, then half the range equals 4 1/2 feet.

To estimate the tide height halfway through the tide's duration:

- **subtract** 4 1/2 feet from the last high-tide height if the tide is **going out**
- **add** 4 1/2 feet to the last low-tide height if the tide is **coming in**.

Example 2: If the time you have in mind is a third of the way through the duration, then the tide is roughly a third of the way through its range. In our example, a third of the range equals 3 feet.

Depending on which way the tide is moving, add or subtract 3 and the last tide height to estimate the tide height a third of the way through the tide's duration.

Note: Please keep in mind that this method gives you only a very rough estimate of the tide height.

Finding the Actual Depth

Now you can use your chart to find out the actual depth of the water at a specific time on a specific day. Here is how:

1. From the tide tables, find or estimate the tide height in a specific area at a specific time.

2. Add the tide height to the chart datum for a specific spot. This gives you the actual depth of the water at that spot at the specific time.

5. Working With a Parallel Ruler and Dividers

Learning Objective

After this section, you should be able to locate positions on a chart using a parallel ruler and dividers.

Testing Conditions

Given charts and the required instruments, and at least 5 short-answer questions testing your proficiency with the instruments.

Passing Criteria

Correctly locate all the positions using the instruments.

Key points

What are parallel rulers and dividers?
Using parallel rulers and dividers to find a position on a chart.

Training aids

Transparency 8, *Parallel Ruler and Divider.*
Charts.
Parallel rulers and dividers.
5 short-answer questions testing the trainee's proficiency with the instruments.

What are parallel rulers and dividers?

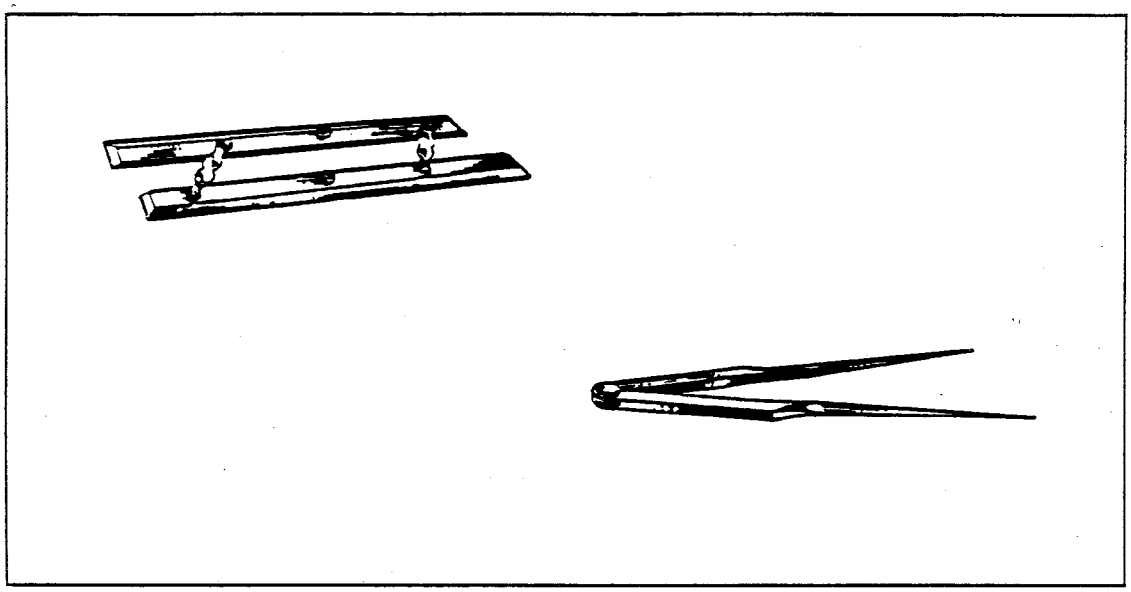
Parallel rulers and dividers are essential for chart work.

A **parallel ruler** consists of two rulers connected by moving straps. Use a parallel ruler:

- to carry lines from the compass rose to other parts of the chart
- to determine your latitude and longitude.

Dividers are usually made of metal and have sharp points. Use dividers:

- to measure off distances
- to determine your latitude and longitude.



Parallel Ruler and Divider

Note: Use an HB pencil for all chart work. Don't press too hard and use a soft eraser to erase your work.

Finding your position on a chart

You are out on patrol and spot a lighthouse 4 miles away. You want to find out where you are on the chart.

Use a parallel ruler and dividers to find out. Here are the steps to follow:

1. **Take the compass bearing to the lighthouse.**

2. **Convert the compass bearing to the true bearing** so you can use it on your chart.

   Let's say you get a true bearing of 50°.

3. **Place the parallel ruler on the compass rose on your chart.** Make sure one edge touches:

   - the center point of the compass
   - the 50° mark on the *true* compass -- that is, the one on the outer ring.

4. **Slide the parallel ruler towards the lighthouse symbol on the chart.** Make sure you don't let it slip or change directions. Stop when the edge of the ruler touches the lighthouse symbol.

5. **Draw a line along the ruler.** This line is called the **position line.** Your position is somewhere on the line.

   You know you are at a point 4 miles along the position line, but what does 4 miles represent on your chart?

6. **Place the dividers along the scale of minutes at the side of the chart and measure off the distance in minutes of latitude.**

   Since 4 miles equal 4 minutes of latitude, measure 4 minutes of latitude with the dividers.

Plotting a course between 2 points

Here is how to plot a course between 2 points:

1. **Find your position on the chart.** Let's call it point A.

2. **Determine where you want to go.** Let's call it point B.

3. **Align a parallel ruler between A and B and draw a line.**

4. **Slide the ruler towards the compass rose from the line formed by A and B.** Make sure you don't let it slip or change directions. Stop when the edge of the ruler touches the center point of the compass rose.

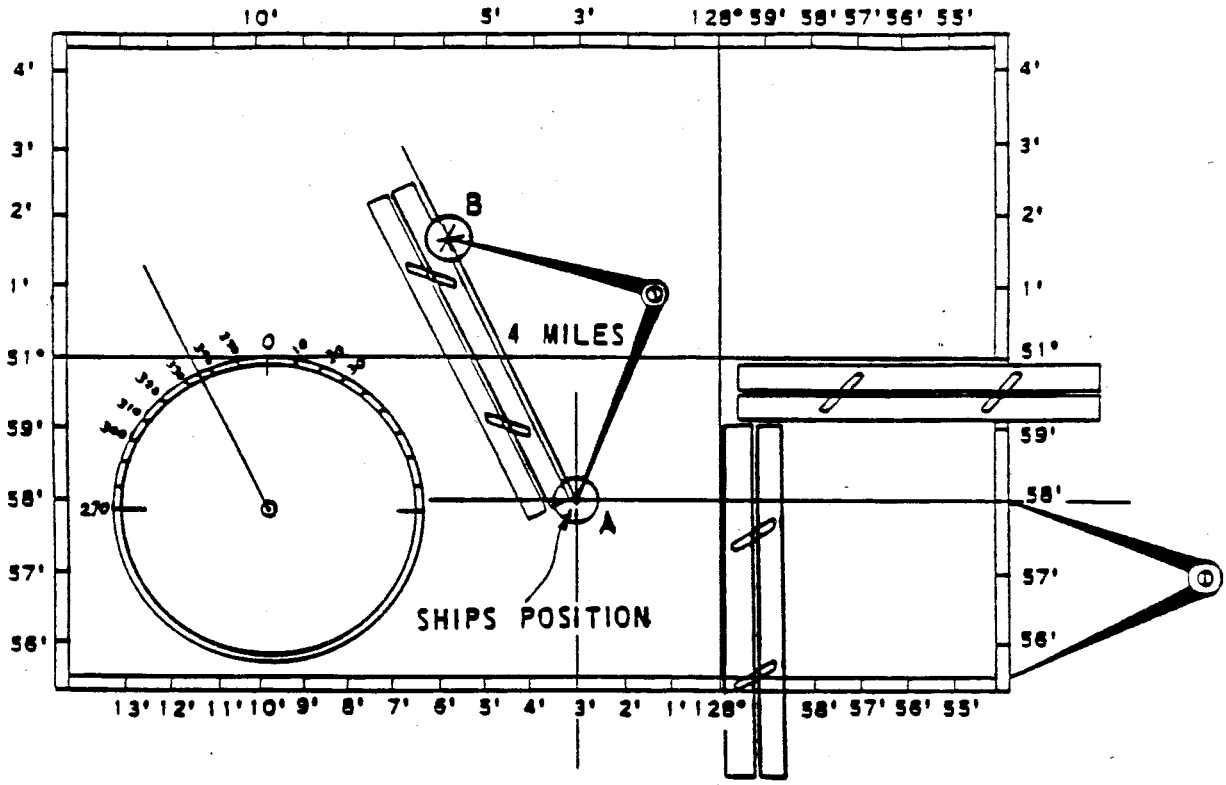
5. **Read off the true bearing on the outer ring of the rose.** Let's say it's 335°.

6. **Convert the true bearing to a compass bearing** you can use to steer the boat.

7. **Measure the distance between A and B on the chart using dividers.**

8. **Place the dividers along the scale of minutes at the side of the chart; convert the minutes spanned by the dividers into nautical miles.** This gives you the distance in nautical miles between A and B. Let's say 4 minutes for 4 nautical miles.

The illustration below shows what your chart might look like after you're done. Point A indicates your present position and point B where you want to go:



7. Estimating Travel Time

Learning Objective

After this section, you should be able to use speed and distance calculations to estimate the travel time between 2 points.

Testing Conditions

Given charts and at least 5 questions requiring you to estimate travel times.

Passing Criteria

Correctly estimate travel times.

Key points Estimating travel time.
How to deal with fractions of an hour.

Training aids Charts.
5 questions requiring trainees to estimate travel times.

You can easily estimate the travel time between 2 points if you know:

- the speed of the boat
- the distance you want to cover.

Estimating travel time

To estimate travel time, simply divide the distance by the speed:

Distance ÷ Speed = Travel Time (in hours).

Example

You plan a 20-nautical-mile trip at an average speed of 10 knots:

20 ÷ 10 = 2 hours.

Conclusion: Your estimated travel time will be 2 hours.

Fractions of an hour

To figure out what a fraction of an hour is worth in minutes, simply multiply the fraction by 60.

Example

You plan a 40-nautical-mile trip at an average speed of 15 knots. Your estimated travel time is:

40 ÷ 15 = 2 2/3 hours.

But what is 2/3 hour in minutes?

2/3 x 60 = (2 x 60)/3
= 120/3
= 40.

Your estimated travel time will be 2 hours and 40 minutes.

8. Lights, Lighthouses & Navigation Aids

Learning Objective

After this section, you should be able to identify and respond appropriately to lights, lighthouses and other navigation aids.

Testing Conditions

Given a boat and at least 2 courses that have navigation aids.

Passing Criteria

Pilot the boat over each course and respond correctly to all navigation aids.

Key points

Role of navigation aids.
Facing upstream to read navigation aids.
Lightstations and their navigation markings.
Daybeacons and their navigation markings.
The 6 lateral buoys.
The 4 cardinal buoys.
The 10 special buoys.

Training aids

A boat.
2 courses that have navigation aids.
Chart of navigation aids.

Navigation Aids

Navigation aids are devices that help you:

- determine your position and course
- warn you of dangers or obstructions
- advise you which course is best.

This section looks at the 3 major kinds of navigation aids: **lightstations, daybeacons** and **buoys.**

How to read navigation markings

To correctly interpret navigation markings on lightstations, daybeacons and buoys, read them as if you were proceeding **upstream**, which includes proceeding:

- towards the headwaters of a river
- into a harbour
- with the flood tide.

In areas along the Pacific Coast where the upstream direction is unclear, assume the direction is northward.

For a more detailed presentation on navigation aids, consult the reprinted pages at the end of this section.

Lightstations

Lightstations are fixed structures equipped with a light and located on prominent sites.

Markings

Look for the following navigation markings on lightstations:

Solid red triangle, or single red stripe around the top of the tower: Marks the starboard (right) side of the channel. Keep the tower on the starboard side of the boat when proceeding upstream.

Solid black or green square, or single black or green stripe around the top of the tower: Marks the port (left) side of the channel. Keep the tower on the port side of the boat when proceeding upstream.

Red, white-faced diamond: Marks a division in the channel. Passage is safe on either side of the tower.

Solid red triangle inside a red diamond: The best route upstream is to the left of the lightstation.

Solid black or green square inside a red diamond: The best route upstream is to the right of the lightstation.

Daybeacons

Daybeacons are fixed, lightless structures located on prominent sites. Here are the 3 kinds of daybeacons:

Starboard daybeacon

Marks the starboard (right) side of a channel. Keep the daybeacon on the starboard side of the boat when proceeding upstream.

Marking: **A solid red triangle framed by another red triangle.**

Port daybeacon

Marks the port (left) side of a channel. Keep the daybeacon on the port side of the boat when proceeding upstream.

Marking: **A solid black or green square framed by a green square.**

Junction daybeacon

Marks a division in the channel.

The best route upstream is to the *left* of the junction if the daybeacon displays: **a solid red triangle framed by a red diamond.**

The best route upstream is to the *right* of the junction if the daybeacon displays: **a solid green square framed by a red diamond.**

Buoys

Buoys are floating devices that tell you where hazards lie as well as where the safest or deepest water is located.

There are three families of buoys: **lateral** buoys, **cardinal** buoys and **special** buoys.

The rest of this section outlines the 3 families of buoys.

Lateral Buoys

Lateral buoys indicate the side where passage is safest. Like lightstations, they must be read as if proceeding upstream.

Here are the 6 lateral buoys:

Port hand buoy

Marks the port side of a channel. Indicates the location of a danger you must keep on the vessel's left side when proceeding upstream.

Color: **Green.**

Starboard hand buoy

Marks the starboard side of a channel. Indicates the location of a danger you must keep on the vessel's right side when proceeding upstream.

Color: **Red.**

Port bifurcation buoy

Marks the point where a channel divides in two. Indicates the best route upstream is on the starboard side of the buoy. In other words, pass with the buoy on your port side.

Color: **Green with a horizontal red stripe.**

Starboard bifurcation buoy

Marks the point where a channel divides in two. Indicates the best route upstream is on the port side of the buoy. In other words, pass with the buoy on your starboard side.

Color: **Red with a horizontal green stripe.**

Fairway buoy

Marks:

- a landfall
- the entrance to a channel
- the center of a channel.

Color: **Vertical red and white stripes.**

Isolated danger buoy

Marks isolated dangers surrounded by safe water. Indicates the best route to take is on either side of the buoy, giving due regard to the size and nature of the danger.

Color: **Black with a horizontal red stripe.**

Cardinal Buoys

Cardinal buoys point to the safest or deepest water with one of the 4 cardinal points of the compass: North, South, East or West.

Here are the 4 cardinal buoys:

North cardinal buoy

Indicates safe water to the north of the buoy.

Color: **Black top half; yellow bottom half.**

East cardinal buoy

Indicates safe water to the east of the buoy.

Color: **Black with horizontal yellow stripe.**

South cardinal buoy

Indicates safe water to the south of the buoy.

Color: **Yellow top half; black bottom half.**

West cardinal buoy

Indicates safe water to the west of the buoy.

Color: **Yellow with horizontal black stripe.**

Special Buoys

Special buoys give information. They are not intended for navigation purposes.

Here are the 10 special buoys:

Anchorage buoy

Marks the boundary of a designated anchorage area.

Color: **Yellow with a black anchor symbol.**

Cautionary buoy

Marks:

- various dangers such as firing ranges, boat racing courses, seaplane bases, underwater structures
- areas where no safe through-channel exists
- traffic separations.

Consult your chart to determine the precise nature of the danger.

Color: **Yellow.**

Ocean Data Acquisition System (ODAS) buoy

Marks a scientific, meteorological or oceanographic station.

Color: **Yellow.**

Mooring buoy

Used to moor or secure a vessel.

Color: **Orange top third; white bottom two-thirds.**

Diving buoy

Marks an area where scuba or other diving activity is in progress.

Color: **White buoy; red flag with white diagonal stripe.**

Keepout buoy

Marks an area where boats are prohibited.

Color: **White with orange, white-faced diamond containing an orange cross; orange horizontal stripes above and below the diamond.**

Control buoy

Marks an area where boating is restricted.

Color: **White with orange, white-faced circle; orange horizontal stripes above and below the circle; information in black within the circle.**

Hazard buoy

Marks random hazards like rocks and shoals.

Color: **White with solid orange diamond; orange horizontal stripes above and below the diamond; information about the hazard within the diamond or between the stripes.**

Information buoy Displays information of interest to the mariner using words or symbols.

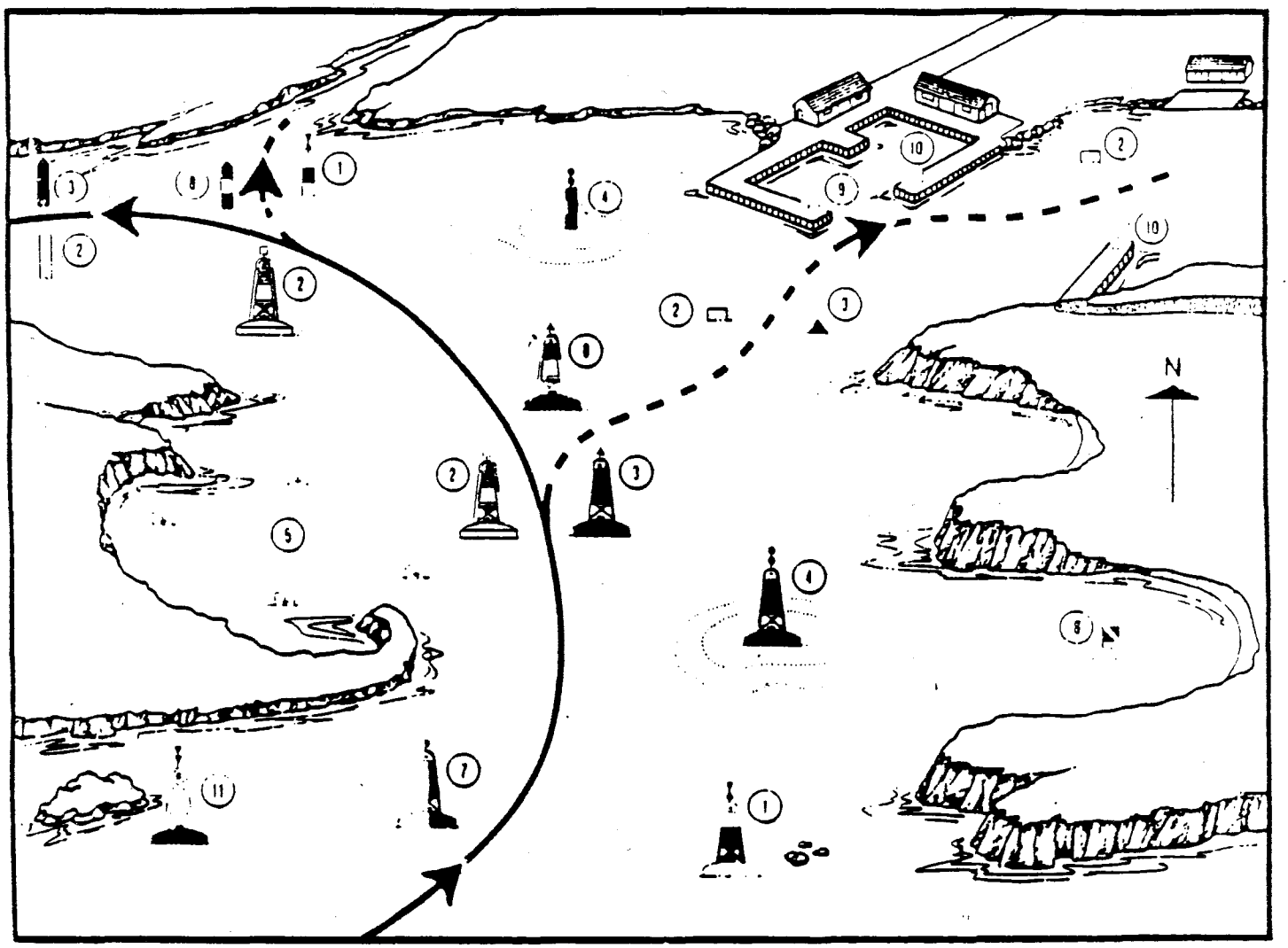
Color: **White with orange, white-faced square; orange horizontal stripes above and below the square; information in black within the square.**

Swimming buoy Marks the boundary of a swimming area.

Color: **White.**

[illustr - Brian to insert color laminated chart of navigation aids (p. 8-91), as discussed w/ me on Feb 10]

Example Here is an example of how different kinds of buoys work:



1. West Cardinal Buoy
2. Port Hand Buoy
3. Starboard Hand Buoy
4. ISOLATED DANGER BUOY
5. Anchorage Buoy
6. Diving Buoy
7. Fairway Buoy
8. Starboard Bifurcation Buoy
9. Port Hand Day Beacon
10. Starboard Hand Day Beacon
11. South Cardinal Buoy

NOTE
The introduction of the Isolated Danger Buoy does not imply any change in the Coast Guard's policy with respect to the marking of channels. Rather, it increases the ability of both the Coast Guard and private buoy owners to provide an effective aids to navigation service

1. Bouee cardinale ouest
2. Bouee de bâbord
3. Bouée de tribord
4. BOUÉE DE DANGER ISOLÉ
5. Bouée de mouillage
6. Bouee de plongee
7. Bouée de mi-chenal
8. Bouée de bifurcation de tribord
9. Balise de jour de bâbord
10. Balise de jour de tribord
11. Bouee cardinale sud

NOTA
La mise en service de la bouee de danger isole ne comporte aucun changement dans la politique de la Garde côtière en ce qui concerne le balisage des voies navigables. Elle augmente plutôt la capacite de la Garde côtiere et des proprietaires de bouees privees à fournir un service efficace d'aides à la navigation

Detailed Information

Consult the following pages for more detailed information on the navigation aids discussed in this section.

GENERAL

Definition

Aids to Navigation are devices or systems, external to a vessel, which are provided to help a mariner determine his position and course, to warn him of dangers or obstructions or to advise him of the location of the best or preferred route.

Responsibility

The Canadian Coast Guard, which is part of the Department of Transport, is responsible for the provision of aids to navigation in Canadian waters with the exception of the Trent-Severn and Rideau waterways, which are served by Parks Canada, Department of the Environment.

Other Publications

Aids to Navigation are to be used in conjunction with available marine publications including nautical charts, Lists of Lights, Buoys and Fog Signals, Radio Aids to Marine Navigation and Sailing Directions, for proper understanding and interpretation of their function. Information concerning nautical charts and Sailing Directions may be obtained from the Canadian Hydrographic Service, Department of Fisheries and Oceans, Ottawa.

The Canadian Aids to Navigation System

The Canadian Aids to Navigation system is a combined Lateral-Cardinal system. A knowledge of the characteristics of each of these basic types of aids is a prerequisite to the safe use of the system.

Lateral Aids to Navigation

Lateral aids may be in the form of either buoys or fixed aids. These aids indicate the location of hazards and of the safest or deepest water by indicating the side on which they are to be passed. The correct interpretation of lateral aids requires a knowledge of the direction of buoyage known as the "upstream direction". The upstream direction is the direction taken by a vessel when proceeding from seaward, toward the headwaters of a river, into a harbour or with the flood tide. In general, the upstream direction is in a southerly direction along the Atlantic Coast, in a northerly direction along the Pacific Coast and in an easterly direction along the Arctic Coast. In some waters the upstream direction is indicated on the charts by the use of lines and arrows.

When a vessel is proceeding in the upstream direction, starboard hand aids must be kept to starboard (right) and port hand aids must be kept to port (left).

Cardinal Aids to Navigation

Cardinal aids may be in the form of either buoys or fixed aids; however, at present, their use is confined to buoys in the Canadian system.

Cardinal aids indicate the location of hazards and of the safest or deepest water by reference to the cardinal points of the compass. There are four cardinal marks, North, East, South and West, which are positioned so that the safest or deepest water is to be found to the named side of the mark (e.g. to the north of a north cardinal mark).

Winter Navigation

In many parts of Canada ice conditions in winter necessitate the removal of navigation buoys and the closing of navigation. The operation of navigation lights and fog signals on shore may also be discontinued during such times. In areas of less severe ice conditions the buoys used in summer are replaced by more rugged, but unlighted, winter buoys and navigation continues. Mariners are advised of the closing of navigation, of the removal or substitution of buoys and of the temporary discontinuance of other aids to navigation by local marine radio broadcasts, Notices to Shipping and Notices to Mariners.

CAUTIONS IN THE USE OF AIDS TO NAVIGATION

1. Most aids to navigation are not under continuous observation and mariners should be aware that, with the many thousands of aids in Canada, failures and displacements do occur. The Coast Guard does not guarantee that all aids to navigation will operate as advertised and in the positions advertised at all times. Mariners observing lights out of operation or buoys, markers, etc., off charted position, damaged or missing are responsible for reporting such to the nearest Coast Guard Radio Station, Vessel Traffic Centre, Coast Guard office, or to the Chief, Marine Aids, Canadian Coast Guard, Ottawa.

2. Aids to navigation are subject to damage, failure or dislocation by ice or storms, to being struck by vessels or tows and to power failures. Ice and storm damage may be widespread and require considerable time to repair. Isolated damage may exist for a long time without being discovered and reported. Floating aids and pier lights in or near the water are exposed to particularly rigorous strain during ice movement.

3. Mariners are cautioned that buoys may fail to exhibit their advertised characteristics. Lights may be extinguished or sound signals may not function due to ice, collisions, mechanical failure and, in the case of bell and whistle buoys, calm water. The shape of a buoy may be altered by ice formation or damage. The colour of a buoy may be altered by freezing spray, marine growth or fouling by birds.

4. Mariners are cautioned not to rely solely on buoys for navigation purposes. Navigation should be by bearings or angles from fixed shore aids or other charted landmarks and by soundings whenever possible. Buoys should be considered only as warning markers.

5. The buoy positions shown on government charts should be considered only approximate positions. There are a number of limiting factors in accurately positioning buoys and their anchors, such as prevailing atmospheric and sea conditions, tidal and current conditions, seabed conditions and the fact that buoys are moored to anchors by varying lengths of chain and may drift about their charted positions within the scope of their moorings.

6 Since moving ice is liable to move buoys from their advertised positions, mariners should proceed with extreme caution under these circumstances.

7 Mariners are reminded that grids of charts of an area may vary from one chart to another. When plotting the positions of aids by the latitude and longitude method, the results should be checked against other available information.

8. In some instances where it is necessary to establish a buoy in close proximity to or on a navigational hazard, i.e., shoal, reef or ledge, etc., the buoy symbol may be off-set slightly on the chart in the direction of the preferred navigable water so that the existing hazard depicted on the chart will not be overprinted by the buoy symbol.

9. Mariners are cautioned not to navigate too closely to a buoy and risk collision with it, its mooring or with the underwater obstruction which it marks.

10. Many lights are equipped with sun switches that turn the lights off in daylight. These lights, both ashore and on most buoys, are unlit between sunrise and sunset. Mariners unable to see these lights during the daylight hours should not assume that the equipment is not functioning normally.

11. At some lightstations, winter lights equipped with sun switches are operated when the main lights are decommissioned for the winter months. A winter light does not necessarily exhibit the same characteristics as the main light and has reduced intensity. The characteristics of a particular winter light and its season of operation are noted in the 'Remarks' column of the List of Lights, Buoys and Fog Signals.

12. Major lightstations which exhibit the main light 24 hours per day are equipped with an emergency light which is brought into service automatically throughout the hours of darkness in the event of failure of the main light. These emergency lights are white and have a standard characteristic of group flashing (6) 15 sec., that is six flashes, each of $^1/_3$ second duration, followed by a period of darkness (eclipse) of 7 seconds. Emergency lights are normally (on a dark night with a clear atmosphere) visible at 5 nautical miles. The List of Lights, Buoys and Fog Signals publications identify which lightstations are equipped with emergency lights.

13. Atmospheric conditions can have a considerable effect on light transmission and the visibility of lights. For example:

(a) The distance of an observer from a light cannot be reliably estimated from its apparent brightness.

(b) At night it is difficult to distinguish between a white light and a yellow or blue light seen alone, except at a short distance.

(c) Under some atmospheric conditions white lights may take on a reddish hue.

(d) Alternating lights with phases of different luminous intensity may change their apparent characteristics at different distances because some phases may not be visible.

(e) Weak lights are more easily obscured by conditions of low visibility than more powerful lights. Coloured lights are also inferior in intensity to white lights and are more quickly lost under unfavourable circumstances.

(f) During cold weather, and more particularly with rapid changes of weather, ice, frost or moisture may form on the windows of lantern houses, thereby greatly reducing their visibility and possibly causing coloured lights to appear white.

(g) A light exhibiting a very short flash may not be visible at as great a range as a light exhibiting a longer flash.

14. The mariner should not rely solely on colour when using a sector light, but should verify his line of position by taking a bearing on the light. On either side of the line of demarcation, between white and red, and also between white and green, there is always a small arc of uncertain colour.

15. When the arc of visibility of a light is cut off by sloping land, the bearing at which it disappears or appears will vary with the observer's distance and height of eye.

16. The sighting of a light may be adversely affected by a strongly illuminated background.

17. In view of the varying distances at which a fog signal can be heard at sea, and the frequent occurrence of fog near, but not observable from, a fog signal station, Mariners are cautioned that:

(a) While every endeavour will be made to start fog signals as soon as possible after signs of fog have been detected, they should not, when approaching the land in a fog, rely implicitly upon these fog signals, but should always take soundings, which, in nearly all cases, will give sufficient warning of danger.

(b) They should not judge their distance from a fog signal by the power of the sound. Under certain atmospheric conditions the sound may be lost at a very short distance from the station, and these conditions may vary within very short intervals of time. Mariners should not assume that a fog signal is not in operation because they do not hear it, even when in close proximity to it.

18. The visual aids to navigation (e.g. lights) provided by the Coast Guard are for the purpose of assisting marine navigation. Hunters, snowmobilers and ice fishermen are cautioned that aids to navigation installed for marine navigation purposes cannot be relied upon after the close of the marine navigation system. Such aids may stop operating without warning and will not be recommissioned by the Coast Guard until the next opening of marine navigation.

AIDS TO NAVIGATION PROTECTION REGULATIONS

Regulations have been enacted, under the Canada Shipping Act, to protect Canadian aids to navigation from wilful or neglectful damage and thus to ensure the availability of the important service which they provide. These Regulations, which are called the Aids to Navigation Protection Regulations, are as follows:

1. These Regulations may be cited as the Aids to Navigation Protection Regulations.
2. In these Regulations "aid to navigation" means a buoy, beacon, lighthouse, lightship or any other structure or device installed, built or maintained for the purpose of assisting the navigation of vessels.
3. (1) The person in charge of any vessel or tow that, through accident or unavoidable circumstances, runs down, moves, injures or destroys an aid to navigation shall report the fact to the nearest District Manager (or any other office), Canadian Coast Guard, by wireless telegraphy or radio telephone via the nearest coast radio station, commercial telegram or telephone or in person as soon as practicable.

   (2) Every person who is required by subsection (1) to report to a District Manager, Canadian Coast Guard, and who fails to report as soon as practicable by the means prescribed in subsection (1) is guilty of an offence and is liable on summary conviction to a fine not exceeding fifty dollars.
4. Every person who wilfully or negligently injures, conceals, removes, alters or destroys an aid to navigation or permits any vessel or tow under his control to run foul of or to be made fast to any aid to navigation is guilty of an offence and is liable on summary conviction to a fine not exceeding two hundred dollars.

PRIVATE AIDS TO NAVIGATION

In Canada it is permissable for private individuals, clubs, corporations or other groups to provide aids to navigation for their own use. Such aids to navigation are known as "private" aids and those that are advertised in the Lists of Lights and on the Charts are so identified. While private fixed aids may take a variety of forms, all private buoys must conform to the Private Buoy Regulations. These Regulations describe the colour, shape, size and markings required for each buoy as well as the responsibilities of the person(s) placing them. The requirements for the colour and shape of private buoys as well as their placement and use are the same as those for buoys provided by the Canadian Coast Guard.

FIXED AIDS TO NAVIGATION

LIGHTSTATIONS.

General

Lightstations are fixed structures equipped with a light and located at prominent sites to assist the mariner to fix his position. They may be at or near shorelines or on built-up man-made piers in or near waterways.

Types

The types and shapes of lightstation structures used in Canada are varied. They may have vertical or tapering sides, may be circular, square, polygonal or octagonal in section, and may be constructed of wood, masonry, concrete, metal or libreglass. They may be slender cylindrical structures such as pipes or poles or open skeleton towers.

Characteristics

The characteristics of fixed aids are for identification purposes. They consist of the light colour and flash characteristics by night and the colour and shape of the structure by day (daymark), as advertised in the appropriate List of Lights, Buoys and Fog Signals publication.

Lateral Significance

When proceeding upstream, lightstations displaying a red triangular symbol in the centre of the daymark or a single red band at the top of the tower must be kept on the vessel's starboard (right) hand. Lightstations displaying a black or green square symbol in the centre of the daymark or a single black or green band at the top of the tower must be kept on the vessel's port (left) hand.

Lightstations displaying an open-faced red diamond symbol in the centre of the daymark indicate a division in the channel and may be passed on either side. However, when proceeding upstream, a red triangle in the centre of the red diamond indicates that the preferred route is to the left of the lightstation (i.e. the lightstation should be kept on the vessel's starboard (right) side). Similarly, a black or green square in the centre of the red diamond indicates that the preferred route is to the right of the lightstation (i.e. the lightstation should be kept on the vessel's port (left) side).

DAYBEACONS

General

Although the majority of fixed structures support and display a light for night navigation, a limited number do not. These unlit aids are known as Daybeacons and are used primarily to assist the mariner during daylight hours where night navigation is negligible or where it is not practicable to operate a light.

Colour, shape and possibly a number are the characteristics which identify the significance of a daybeacon to the mariner. Reflective material is applied to the daybeacons to improve their identification at night with the aid of a searchlight.

Starboard Daybeacon

A starboard hand daybeacon is triangular in shape, with a red triangular centre on a white background and with a red reflecting border. It may display an even number made of white reflecting material. When proceeding upstream, a starboard hand daybeacon must be kept on the vessel's starboard (right) side.

Port Daybeacon

A port hand daybeacon is square in shape with a black or green square centre on a white background and with a green reflecting border. It may display an odd number made of white reflecting material. When proceeding upstream, a port hand daybeacon must be kept on the vessel's port (left) side.

Junction Daybeacon

A junction daybeacon marks a point where the channel divides and may be passed on either side. When proceeding in the upstream direction, a junction daybeacon displaying a red reflecting triangle on a white diamond with a red border indicates that the preferred route is to the left. Similarly a green reflecting square on a white diamond with a red border indicates that the preferred route is to the right.

FOG SIGNALS

General

Fog Signals are sound-producing aids that warn of dangers when visual aids are obscured by weather conditions.

Operation

Fog signals are normally operated when weather conditions are such as to reduce the visibility to less than two nautical miles. However, other values may be assigned because of local noise abatement laws or local operational requirements.

While most fog signals are operated manually or automatically by fog detection equipment in response to a low visibility condition, some fog signals may be operated continuously.

Characteristics

The Mariner can identify fog signals by their distinctive sound and signal characteristics as advertised in the appropriate List of Lights, Buoys and Fog Signals publication.

SECTOR LIGHTS

General

A sector light consists of a single light whose total luminous beam is divided into sectors of different colours to provide a warning or a leading line to mariners. The boundaries of these sectors are indicated in the appropriate List of Lights, Buoys and Fog Signals publication and on marine charts.

Characteristics

When only a red sector is used within a white luminous beam, the red sector marks obstructions such as shoals.

A combination of red, white and green sectors in a luminous beam is used to provide a leading line to navigators.

When proceeding upstream, the red sector indicates the starboard hand limit, the white sector indicates the recommended course, and the green sector indicates the port hand limit.

RANGES

A range consists of two or more fixed navigation marks situated some distance apart and at different elevations to provide a leading line for navigators. Ranges may or may not be lighted. The shape and colour of the range daymark as well as the colours and characteristics of the lights are advertised in the appropriate List of Lights, Buoys and Fog Signals publication.

South Cardinal Buoy

(a) A south cardinal buoy is located so that safe water exists to the south of it.
(b) A south cardinal buoy is coloured black and yellow in approximately equal areas above the waterline, the top half of the buoy being yellow and the lower half being black, and
  (i) if it carries a light, the light is white and is a group quick flashing six plus long flash (Q(6) + LFl) light or group very quick flashing six plus long flash (VQ(6) + LFl) light,
  (ii) if it carries reflecting material, the reflecting material is white,
  (iii) if it does not carry a light, it is normally spar shaped although other shapes may be used, and
  (iv) if it carries a topmark, the topmark is two black cones, one above the other, points downward.

West Cardinal Buoy

(a) A west cardinal buoy is located so that safe water exists to the west of it.
(b) A west cardinal buoy is coloured yellow with one broad black horizontal band, and
  (i) if it carries a light, the light is white and is a group quick flashing nine (Q(9)) light or a group very quick flashing nine (VQ(9)) light,
  (ii) if it carries reflecting material, the reflecting material is white,
  (iii) if it does not carry a light, it is normally spar shaped although other shapes may be used, and
  (iv) if it carries a topmark, the topmark is two black cones, one above the other, point to point.

SPECIAL BUOYS

Special buoys are used to convey, to the mariner, a variety of information which, while important to him, is not primarily intended to assist in the navigation of his vessel. The shapes of special buoys have no significance and a variety of shapes may be used in practice.

Anchorage Buoy

(a) An anchorage buoy marks the perimeter of a designated anchorage area.
(b) An anchorage buoy is coloured yellow, and
  (i) displays a black anchor symbol on at least two opposite sides,
  (ii) if it carries a light, the light is yellow and is a flashing (Fl) light,
  (iii) if it carries reflecting material, the reflecting material is yellow, and
  (iv) if it carries a topmark, the topmark is a single yellow "X" shape.

Cautionary Buoy

(a) A cautionary buoy marks an area where mariners are to be warned of dangers such as firing ranges, racing courses, seaplane bases, underwater structures; of areas where no safe through channel exists and of traffic separations. The mariner must consult his chart to determine the precise nature of the danger being marked.
(b) A cautionary buoy is coloured yellow, and
  (i) if it carries a light, the light is yellow and is a flashing (Fl) light,
  (ii) if it carries reflecting material, the reflecting material is yellow, and
  (iii) if it carries a topmark, the topmark is a single yellow "X" shape.

Ocean Data Acquisition System (ODAS) Buoy

(a) An ODAS buoy marks a scientific, meteorological or oceanographic station.
(b) An ODAS buoy is coloured yellow, and
  (i) if it carries a light, the light is yellow and is a group flashing light of 5 flashes every 20 seconds, (Fl(5) 20S) and
  (ii) if it carries reflecting material, the reflecting material is yellow, and
  (iii) if it carries a topmark, the topmark is a single yellow "X" shape.

NOTE: ODAS buoys are described in Rule 44 of the Collision Regulations, Canada Shipping Act.

Mooring Buoy

(a) A mooring buoy is used for mooring or securing a vessel, seaplane, etc.
(b) A mooring buoy is coloured white and orange, the orange colour covering the top one-third of the buoy above the waterline, and
  (i) if it carries a light, the light is yellow and is a flashing (Fl) light, and
  (ii) if it carries reflecting material, the reflecting material is yellow.

Diving Buoy

(a) A diving buoy marks an area where scuba or other such diving activity is in progress.
(b) A diving buoy is coloured white and carries a red flag not less than 50 centimetres square with a white diagonal stripe extending from the tip of the hoist to the bottom of the fly, and
  (i) if it carries a light, the light is yellow and is a flashing (Fl) light, and
  (ii) if it carries reflecting material, the reflecting material is yellow.

Keepout Buoy

(a) A keepout buoy marks an area where boats are prohibited.
(b) A keepout buoy is coloured white and has an orange diamond containing an orange cross, on two opposite sides and two orange horizontal bands, one above and one below the diamond symbols, and
  (i) if it carries a light, the light is yellow and is a flashing (Fl) light, and
  (ii) if it carries reflecting material, the reflecting material is yellow.

NOTE: Keepout buoys are described in the Boating Restriction Regulations, Canada Shipping Act.

Control Buoy

(a) A control buoy marks an area where boating is restricted.
(b) A control buoy is coloured white and has an orange, open-faced circle on two opposite sides and two orange horizontal bands, one above and one below the circles. A black figure or symbol inside the orange circles indicates the nature of the restriction in effect, and
  (i) if it carries a light, the light is yellow and is a flashing (Fl) light, and
  (ii) if it carries reflecting material, the reflecting material is yellow.

NOTE: Control buoys are described in the Boating Restriction Regulations, Canada Shipping Act.

Information Buoy

(a) An information buoy displays, by means of words or symbols, information of interest to the mariner.

(b) An information buoy is coloured white and has an orange, open-faced square symbol on two opposite sides and two orange horizontal bands, one above and one below the square symbols. The information words or symbols are black and are placed within the white face of the square symbol, and
  (i) if it carries a light, the light is yellow and is a flashing (Fl) light, and
  (ii) if it carries reflecting material, the reflecting material is yellow.

Swimming Buoy

(a) A swimming buoy marks the perimeter of a swimming area.
(b) A swimming buoy is coloured white, and
  (i) if it carries a light, the light is yellow and is a flashing (Fl) light, and
  (ii) if it carries reflecting material, the reflecting material is yellow.

DAYTIME IDENTIFICATION

During daytime, the colour and shape of a buoy indicate the buoy type and hence its function and interpretation by the mariner.

1. Buoy Colour

The following are the buoy colours used in the Canadian Buoyage System:

Buoy Type	Colour
Port	green
Starboard	red
Fairway	red and white vertical stripes
Port bifurcation	green with one broad horizontal red band
Starboard bifurcation	red with one broad horizontal green band
North Cardinal	black above yellow
East Cardinal	black with one broad horizontal yellow band
South Cardinal	yellow above black
West Cardinal	yellow with one broad horizontal black band
Anchorage Cautionary ODAS	yellow
Mooring Keepout Control Information	white and orange
Swimming	white
Diving	white with red and white flag

2. Buoy Shape

The shape of an unlighted buoy indicates the position of the buoy with respect to the channel and thus the side on which the buoy should be passed.

(a) A pointed (conical) shape indicates that the buoy is marking the starboard (right) side of the channel or the location of a danger which must be kept on the vessel's starboard (right) side when proceeding upstream.

(b) A flat top or cylindrical (can) shape indicates that the buoy is marking the port (left) side of the channel or the location of a danger which must be kept on the vessel's port (left) side when proceeding upstream.

(c) A spherical shape indicates that the buoy is marking the centre of the channel or safe water and that it may be safely passed on either side although generally it should be kept on the vessel's port (left) side when proceeding in either direction.

3. Topmarks

The use of topmarks as an additional means of daytime buoy identification is new in Canada and, at present, is restricted to cardinal buoys. It is unlikely that topmarks will ever be used in Canada to the extent that they are used in other parts of the world because of the environmental conditions with which Canadian aids to navigation must cope. However, the Canadian buoyage system includes topmarks for each buoy as follows:

Buoy Type	Topmark Description
Port and Port Bifurcation	single green cylinder
Starboard and Starboard Bifurcation	single red cone, point upward
Fairway	single red sphere
North Cardinal	2 black cones, points upward
East Cardinal	2 black cones, base to base
South Cardinal	2 black cones, pointed downward
West Cardinal	2 black cones, point to point

NOTE: A way of remembering the arrangement of the conical topmarks on Cardinal Buoys is to relate the direction of the points of the cones to the location of the black portion(s) of the buoy (e.g. on an East Cardinal, the upper cone pointing up and the lower cone pointing down relate to the black colour of the upper and lower portions of the buoy).

NIGHTTIME IDENTIFICATION

At night, the colour and flash characteristic of a buoy light indicate the buoy type and hence its function and interpretation by the mariner.

1. **Buoy Light Flash Characteristics**

The following are the names, abbreviations and descriptions of the flash characteristics of the lights used in the Canadian buoyage system.

Name	Abbreviation	Description	Buoy
Flashing	Fl	A light in which a flash is regularly repeated at a rate of 15 flashes per minute (a flash every 4 seconds)	Port Starboard Anchorage Cautionary Mooring Keepout Control Information Swimming Diving
Quick Flashing	Q	A light in which a flash is regularly repeated at a rate of 60 flashes per minute (a flash every second)	Port Starboard North Cardinal
Very Quick Flashing	VQ	A light in which a flash is regularly repeated at a rate of 120 flashes per minute (a flash every ½ second)	North Cardinal
Morse "A"	Mo(A)	A light in which a short flash is followed by a long flash to form the letter "A" in the Morse Code 10 times per minute (every 6 seconds)	Fairway
Long Flash	LFl	A light in which a flash of 2 seconds duration is repeated at a rate of 6 flashes per minute (a flash every 10 seconds)	Fairway

Name	Abbreviation	Description	Buoy
Composite Group Flashing	Fl(2 + 1)6S	A light in which a group of 2 flashes is followed by a single flash, the whole sequence being regularly repeated 10 times per minute (every 6 seconds)	Port Bifurcation Starboard Bifurcation
	or Fl(2 + 1)10S	A light in which a group of 2 flashes is followed by a single flash; the whole sequence being regularly repeated 6 times per minute (every 10 seconds)	
Group Quick Flashing(3)	Q(3)10S	A quick flashing light in which a group of 3 flashes is regularly repeated 6 times per minute (every 10 seconds)	East Cardinal
Group Very Quick Flashing (3)	VQ(3)5S	A very quick flashing light in which a group of 3 flashes is regularly repeated 12 times per minute (every 5 seconds)	East Cardinal
Group Quick Flashing (6) plus Long Flash	(Q(6) + LFl)15S	A light in which a group of 6 quick flashes is followed by a single long flash; the whole sequence being regularly repeated 4 times per minute (every 15 seconds)	South Cardinal
Group Very Quick Flashing (6) plus Long Flash	(VQ(6) + LFl)10S	A light in which a group of 6 very quick flashes is followed by a single long flash; the whole sequence being regularly repeated 6 times per minute (every 10 seconds)	South Cardinal
Group Quick Flashing (9)	Q(9)15S	A quick flashing light in which a group of 9 flashes is regularly repeated 4 times per minute (every 15 seconds)	West Cardinal
Group Very Quick Flashing(9)	VQ(9)10S	A very quick flashing light in which a group of 9 flashes is regularly repeated 6 times per minute (every 10 seconds)	West Cardinal
Group Flashing (5)	Fl(5)20S	A light in which a group of 5 flashes is regularly repeated 3 times per minute (every 20 seconds), the flash rate being 30 per minute.	ODAS

NOTE: As a way of remembering the light flash characteristics of the East, South and West Cardinal buoys, the number of flashes in each group for these lights is the same as the figure on a clock face in the corresponding compass direction (e.g. the 3 flashes in each group for the East Cardinal correspond to 3 o'clock). The long flash in the South Cardinal characteristic ensures that there is no confusion between the 6 flashes per group for this buoy and the 9 flashes per group of the West Cardinal.

2. Buoy Light Colour

The following are the colours of the buoy lights used in the Canadian buoyage system:

Buoy Type	Light Colour
Port and port bifurcation	green
Starboard and starboard bifurcation	red
Fairway and all cardinals	white
All special buoys	yellow

3. Reflective Material

In certain waterways, reflective material is applied to unlighted buoys to aid in their identification at night with a flashlight or other light source. In general, the colour of the reflective material is the same as that of the light which would be appropriate for that buoy. Reflective white material may also be used for buoy numbers on both lighted and unlighted buoys.

OTHER CHARACTERISTICS

Buoy Numbering

Only starboard and port hand buoys are numbered; starboard hand buoys with even numbers and port hand buoys with odd numbers. Buoy numbers increase in the upstream direction and are kept in approximate sequence on both sides of the channel by omitting numbers where required. Buoy numbers are usually preceded by one or two letters to facilitate channel identification. All other types of buoys may be identified by letters only. All types of buoys may be identified by a name in addition to a number or letter identification. All buoy numbers and letters are white or reflective silver.

Sound

Any of the buoy types in the Canadian buoyage system may be fitted with a bell or a whistle that is activated by the motion of the buoy in the water. The use of such buoys is generally restricted to coastal waters where there is sufficient buoy motion to activate the sound device and where there is a requirement for an audio signal to enable location of the buoy under low visibility conditions.

Radar Reflectors

Many buoys are fitted with radar reflectors to improve their visibility on the radar screen.

Radar Beacons (RACONs)

When precise identification of a buoy is considered essential, the buoy may be fitted with a radar beacon (RACON).

Marking of New Dangers

New dangers such as a shipwreck or the discovery of an uncharted shoal or rock can occur suddenly and unexpectedly in waters which mariners have come to regard as safe. Because of the surprise aspect of new dangers, the IALA buoyage system and thus the Canadian buoyage system make special provisions for the marking of them. These provisions, which are for use in especially grave situations, are:

(a) One or more of the buoys marking the new danger may be duplicated, the duplicate being identical to its partner in all respects.

(b) Any lighted buoy used to mark a new danger shall have an appropriate cardinal or lateral Q or VQ light flash characteristic.

(c) A new danger may be marked by a RACON coded Morse "D".

(d) Special measures taken to mark a new danger may be discontinued when information concerning the new danger has been sufficiently promulgated.

9. Position by Dead Reckoning

Learning Objective

After this section, you should be able to find your current position by dead reckoning.

Testing Conditions

Given a boat in typical marine conditions on at least 3 occasions. Given all the necessary charts and instruments.

Passing Criteria

Find the boat's position on each occasion using dead reckoning.

Key points

Finding a position using dead reckoning.
Accuracy.

Training aids

Transparency 10, *Dead Reckoning.*
A boat.
All necessary charts and instruments.

Dead Reckoning

To determine your position by dead reckoning, you need the following information:

- your last known **position**
- the **time** the position was taken
- your **speed** since the position was taken
- the **compass bearing** of your course since the position was taken.

The dead reckoning method is not as accurate as other methods because it doesn't take into account how winds, tides or currents can affect the boat's position.

However, the method is useful when navigation aids can't be seen or identified, such as in fog, heavy rain, or at night.

Here are the steps to follow to determine your position by dead reckoning:

1. **Mark your last known position on the chart.**

2. **Next to your last known position, write down the time the position was taken.**

3. **Determine your compass bearing since the position was taken and convert it to a true bearing.**

4. **With a parallel ruler, establish the true bearing line on the compass rose on your chart. Carry the line over to your last known position.**

5. **Draw a line along the ruler to lay off your position line.**

6. **Determine your speed in knots since the position was taken.**

7. **Multiply the speed by the time elapsed since the position was taken to get the distance travelled.** Remember: one knot is one nautical mile per hour. Example:

   6 knots x 2 hours = 12 nautical miles.

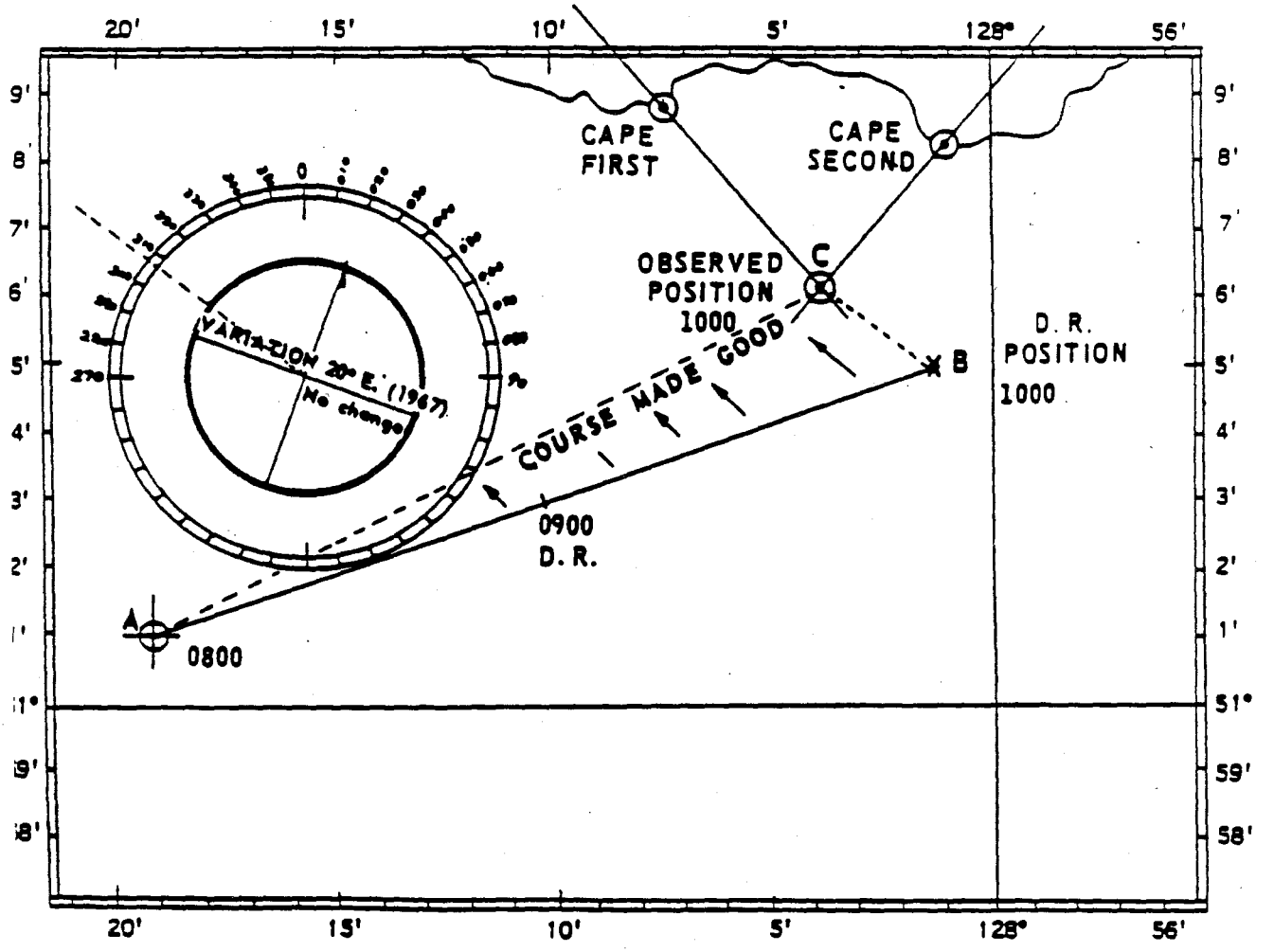
8. **Mark off the distance in minutes with the dividers.**

9. **Place one point of the dividers on the previously known position and the other point on the position line you drew.**

   The divider point on the position line represents your current position on the chart.

Example From position A at 8 a.m. on a foggy morning, a boat travels on a true course of 70° at 6 knots. By 10 a.m., the pilot is lost. He decides to find his position by dead reckoning (D.R. in the illustration below).

Using the dead reckoning method, the pilot calculates he's at point B.



Suddenly the fog clears. The pilot takes advantage of this break to quickly double-check his position using cross bearings. Cross bearings are covered in Learning Objective 11.

Using the new method, the pilot calculates he's at point C. Now he has two positions to choose from: B and C.

The more accurate position is C. Position B is less accurate because it didn't take into account the wind, tide or current that pushed the boat landward to point C.

10. Position by Doubling Angle on the Bow

Learning Objective

After this section, you should be able to find your current position by doubling the angle on the bow.

Testing Conditions

Given a boat in typical marine conditions on at least 3 occasions. Given all the necessary charts and instruments.

Passing Criteria

Find the boat's position on each occasion by doubling the angle on the bow.

Key points Find a position by doubling the angle on the bow.

Training aids Transparency 11, *Doubling the Angle On the Bow.*
A boat.
All necessary charts and instruments.

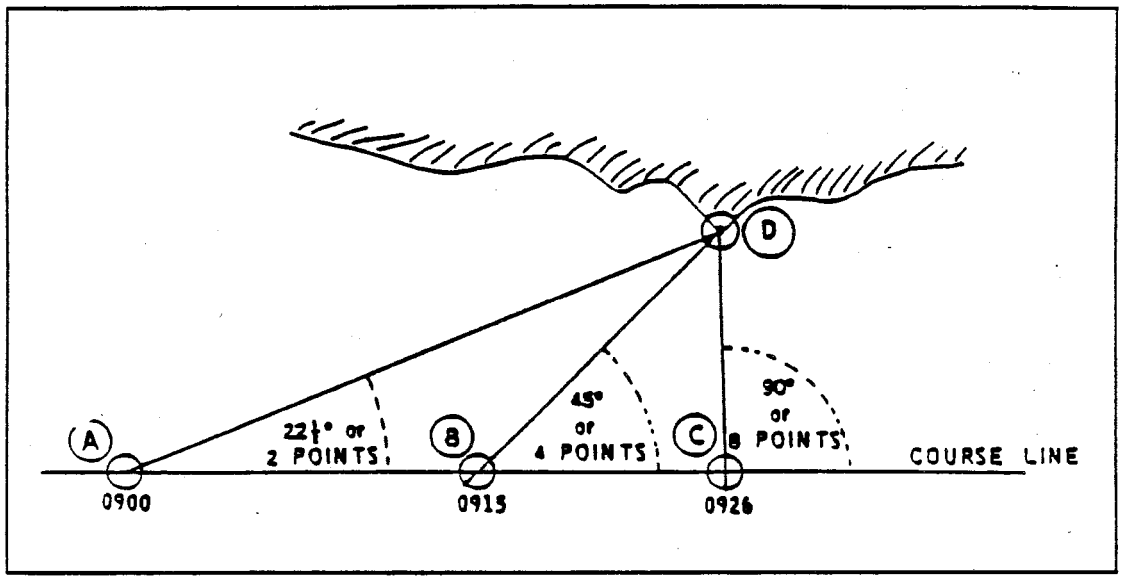
Doubling the Angle On the Bow

Use this method when you're running parallel to the coast. The method works only if you maintain a steady course and speed.

Like the dead reckoning method, this method does not take into account the effects of winds, tides or currents on the boat's position. Other methods may be more accurate.

Example

At 9 a.m., you're at position A and travelling east along the course line drawn on the chart below:



Doubling the Angle on the Bow

You spot the prominent point D on the coast. You decide to find your position by doubling the angle on the bow.

Here are the steps to follow:

1. **Take the angle of point D relative to the bow and note the time.** Example: At 9:00 a.m., you determine that point D is 22½° on the port bow.

2. **When the angle of D on the bow doubles, note the time in hours.** Example: The angle on the bow reached 45° at 9:15. It took ¼ hour to double the angle.

3. **Use the angle in Step 2 to draw a position line from point D.**

4. **Multiply your speed with the time it took to double the angle.** Example: 10 knots x ¼ hour = 2½ nautical miles.

   The rules of geometry say that, when the angle is doubled along a straight line, the distance to your former position A equals the distance to D.

   So you conclude you are 2½ miles from D.

5. **Mark off 2½ minutes with the dividers, a distance representing 2½ nautical miles.**

6. **Place one point of the dividers on D and the other point on the position line.**

   The divider point rests on position B. This represents your current position on the chart.

In the illustration above, the angle on the bow doubles again 11 minutes later. Hence, the distance between B and C at that time equals the distance between C and D.

11. Position Using Cross Bearings

Learning Objective

After this section, you should be able to find your current position using cross bearings.

Testing Conditions

Given a boat in typical marine conditions on at least 3 occasions. Given all the necessary charts and instruments.

Passing Criteria

Find the boat's position on each occasion using cross bearings.

Key points Finding a position using cross bearings.

Training aids Transparency 12, *Cross Bearings*.
A boat.
All necessary charts and instruments.

Cross Bearings

You can plot your position on a chart by taking two bearings and drawing intersecting position lines on a chart.

Here are the steps to follow:

1. **Take a compass bearing to a landmark or navigation aid and convert the compass bearing to a true bearing.**

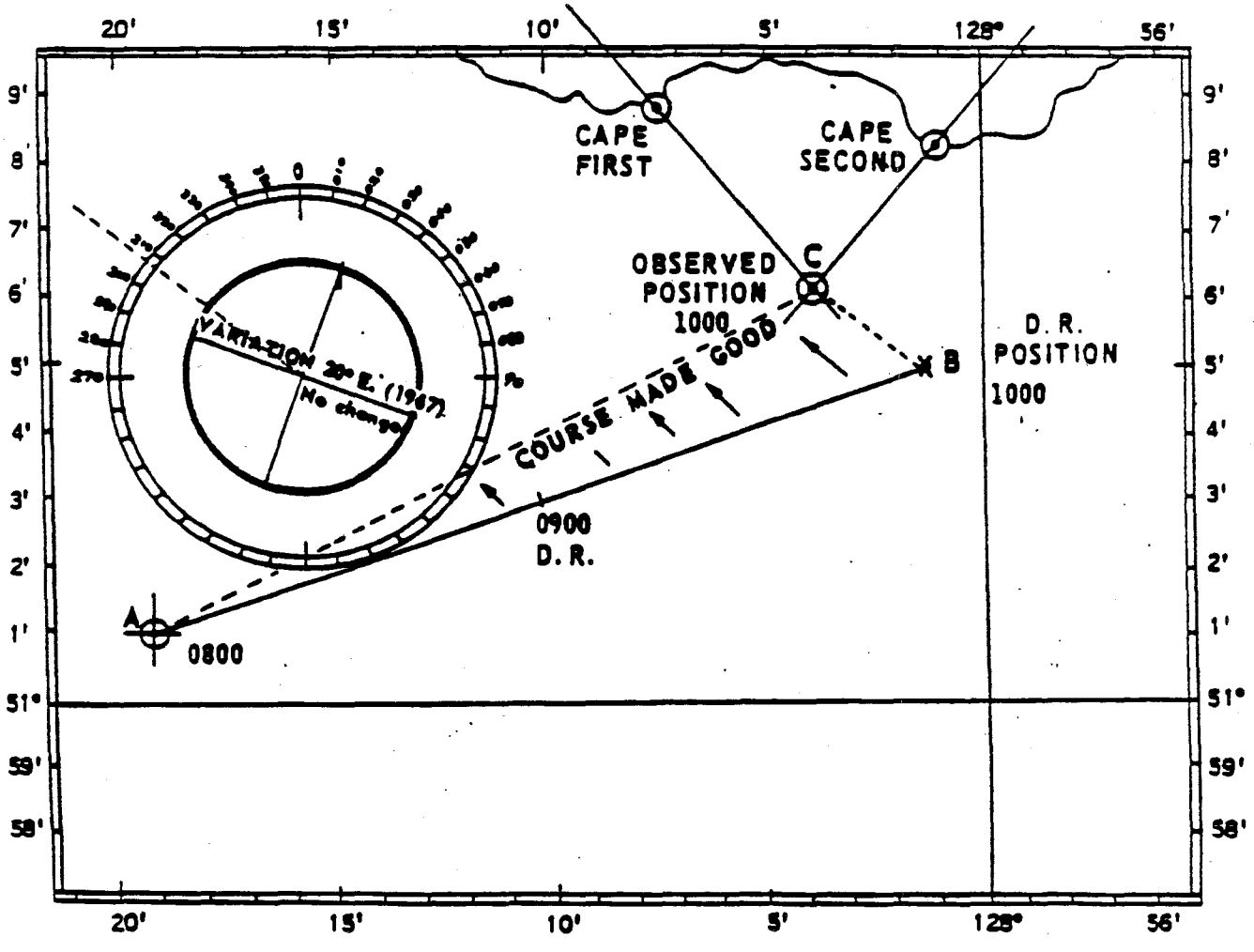
2. **With a parallel ruler, establish the bearing line on the compass rose on your chart. Carry the bearing line over to the landmark or navigation aid symbol on your chart.**

3. **Draw a line along the ruler to lay off your position line.**

4. **Repeat Steps 1 to 3 with a different landmark or navigation aid.** Make sure the new landmark or navigation aid is not too close to the first one. For best results, the position lines on the chart should intersect at a 90° angle.

5. Mark your position at the point where the two position lines intersect.

In the illustration below, the pilot took cross bearings of Cape First and Cape Second to get position C. This example is discussed in more detail in Learning Objective 9.



12. Position Using a Bearing & Sounding

Learning Objective

After this section, you should be able to find your current position with a bearing and a sounding.

Testing Conditions

Given a boat in typical marine conditions on at least 3 occasions. Given all the necessary charts and instruments.

Passing Criteria

Find the boat's position on each occasion using a bearing and a sounding.

Key points Finding a position by taking a bearing and a sounding.

Training aids Transparency 13, *A Bearing & Sounding.*
A boat.
All necessary charts and instruments.

One Bearing & Sounding

You can plot your position on a chart by taking a single bearing and a sounding.

Here are the steps to follow:

1. **Take a compass bearing to a landmark or navigation aid and convert the compass bearing to a true bearing.**

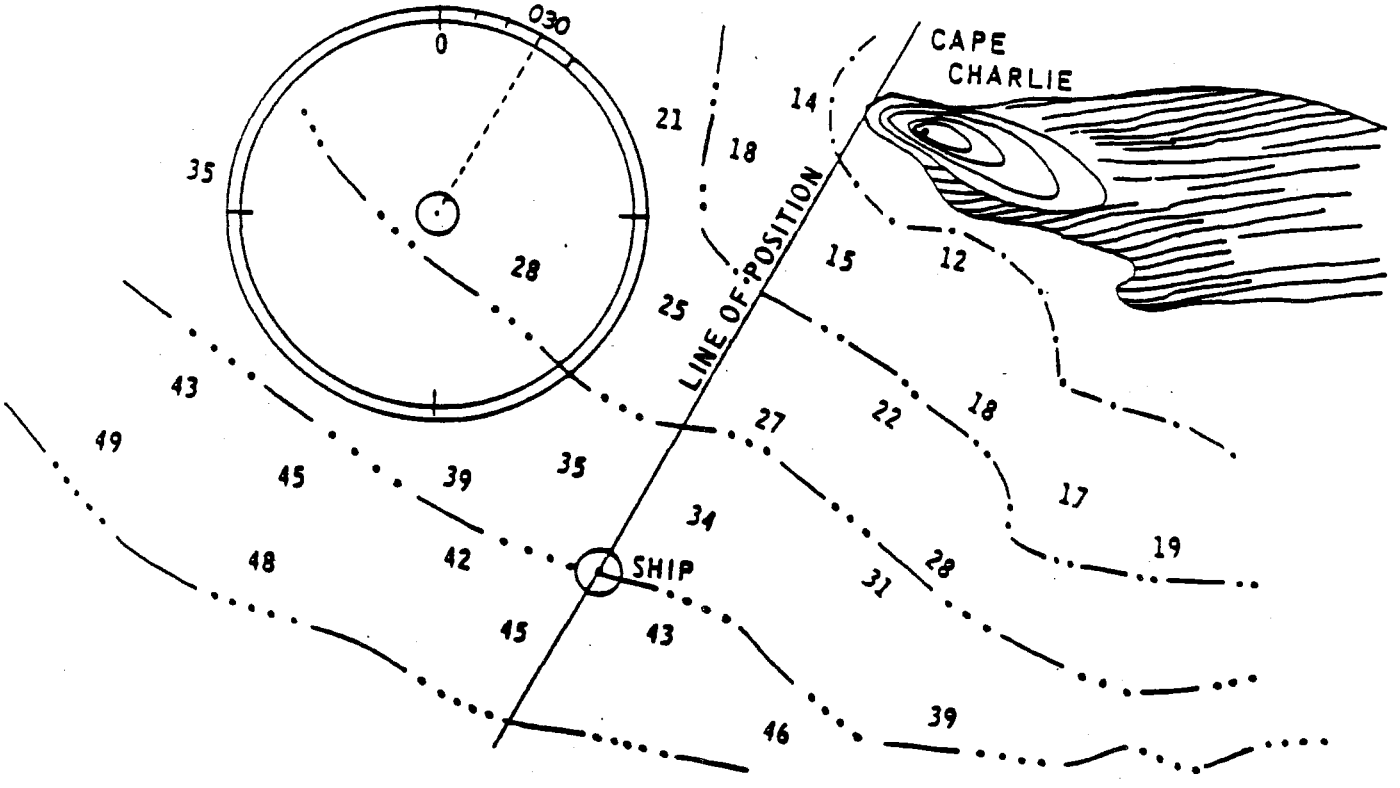
2. **With a parallel ruler, establish the bearing line on the compass rose on your chart. Carry the bearing line over to the landmark or navigation aid symbol on your chart.**

3. **Draw a line along the ruler to lay off your position line.**

4. **Take a depth sounding. Factor in the tide height.**

5. **Mark your position at the point along your position line that coincides with your depth sounding.**

Example On the chart below, the pilot established a 30° position line to Cape Charlie. His sounding gives him a water depth of 40 fathoms. Therefore, the pilot marked his position at the point along the position line where the depth of the water was 40 fathoms.



13. Position Using a Line of Soundings

Learning Objective

After this section, you should be able to find your current position with a line of soundings.

Testing Conditions

Given a boat in typical marine conditions on at least 3 occasions. Given all the necessary charts and instruments.

Passing Criteria

Find the boat's position on each occasion using a line of soundings.

Key points Finding a position by using a line of soundings.

Training aids Transparency 14, *A Line of Soundings*.
A boat.
All necessary charts and instruments.

Line of Soundings

You can plot your position on a chart by taking a line of soundings.

The method is useful when navigation aids can't be seen or easily identified, such as in fog, heavy rain, or at night.

This method works only if you maintain a steady course and speed.

Here are the steps to follow:

1. **Take your course bearing, convert it to a true bearing, and make sure you stay on course.**

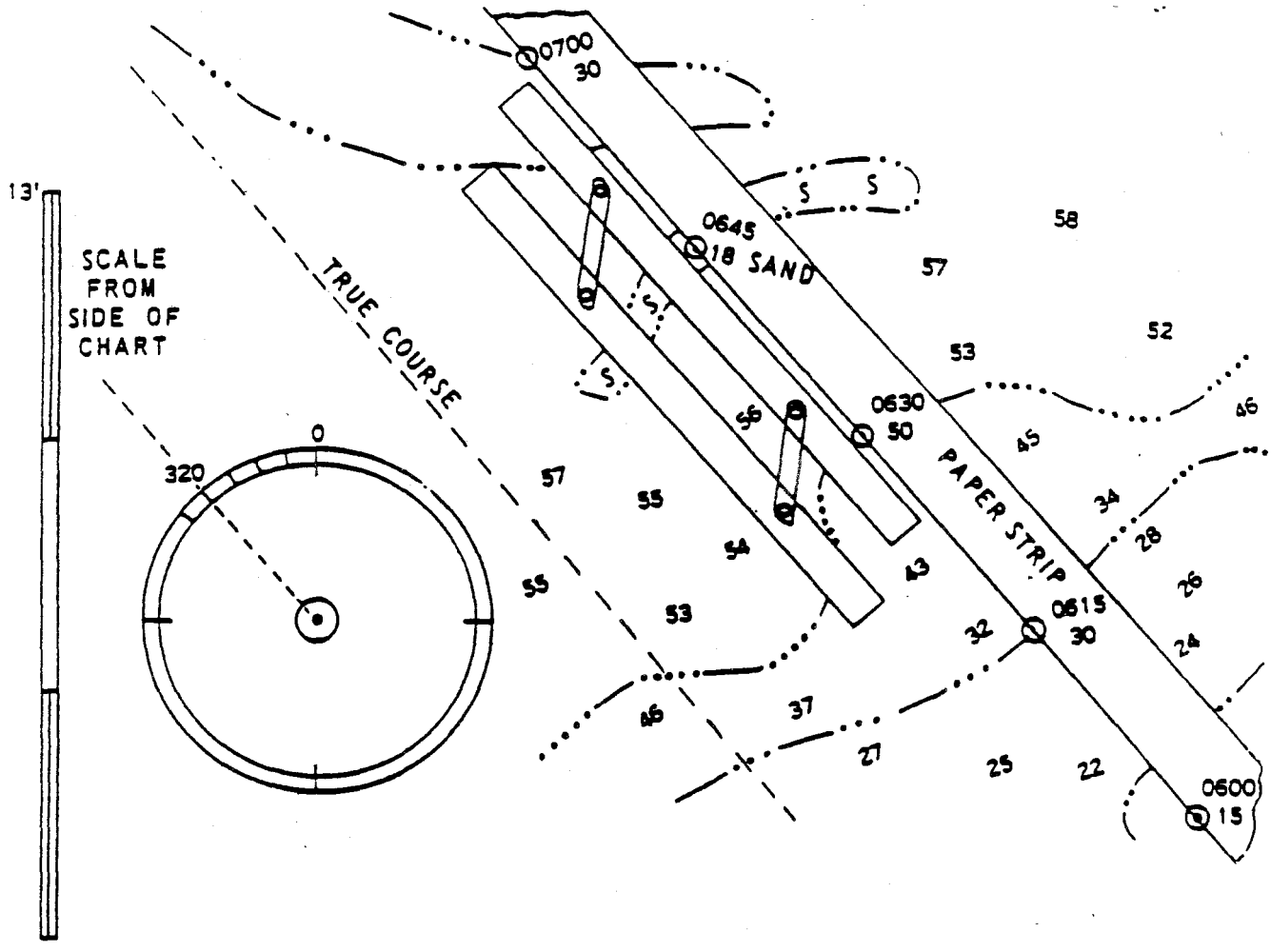
2. **Over a period of time, take a series of depth soundings, factor in the tide height and note the time of each sounding.** Let's say you took 4 soundings over a period of 1 hour.

3. **After the last sounding, determine the distance you travelled while taking the soundings.** If your speed was 4 knots, you travelled 4 nautical miles in that hour.

4. **Mark off 4 minutes of latitude with the dividers,** a distance representing the distance you travelled during the hour.

5. **Use the dividers to transfer the distance to a strip of paper.**

6. **Mark the strip of paper with the times and results of the soundings as shown below.**



7. **With a parallel ruler, establish the true course bearing found in Step 1 on the compass rose on your chart.**

8. **Place the strip of paper against the parallel ruler.**

9. **Slowly slide the parallel ruler over the chart.**

10. **Stop when the soundings on the strip of paper match the soundings on the chart.**

11. **Mark your position at the point along the strip of paper where you took the last sounding.**

Useful Terms

buoy	a floating device that tells you where hazards lie as well as where the safest or deepest water is located.
cable	a measure of distance equal to one tenth of a nautical mile, or 608 feet.
cardinal buoy	a navigation aid pointing to the safest or deepest water with one of the 4 cardinal points of the compass: North, South, East or West.
chart datum	another word for *datum*.
compass rose	a circular design printed on the chart that helps you calculate your position.
coordinates of a position	the location of a position expressed in degrees of latitude and longitude.
datum	the height below which the water in a particular area of the ocean seldom falls. The datum is the depth listed on navigational charts.
daybeacon	a fixed, lightless structure located on a prominent site that helps pilots navigate safely or fix their position during the daytime.
degrees of latitude	imaginary lines running parallel to the equator. The degrees go from 0 to 90 -- 0 at the equator, 90 at the north and south poles.
deviation	compass error caused by on-board interference from sources such as the metal in the engine, the anchor, the equipment, and the hull.

deviation card a list of how much each compass heading deviates from the accurate magnetic heading.

differences the specific numbers you must add to tide times and heights at a *reference port* to get the tide times and heights at a *secondary port.*

dividers metal chart instrument with sharp points for measuring off distances.

duration the length of time between high and low tide.

equator the imaginary line around the earth halfway between the north and the south poles.

fathom a depth measure equalling 6 feet.

lateral buoy a navigation aid indicating the side where passage is safe.

lightstation a fixed structure equipped with a light and located on a prominent site that helps pilots navigate safely or fix their position day and night.

meridians of longitude the imaginary vertical lines that run around the world from the north pole to the south pole.

minutes the units dividing each degree of latitude and longitude. Each degree has 60 minutes.

nautical mile a measure of distance equal to 6076 feet, or 1852 metres. Represents one minute of a degree of latitude on a chart.

navigation aids devices external to the boat that help you determine your position and course, warn you of dangers or obstructions, and advise you which route is best.

parallels of latitude	imaginary horizontal lines running parallel to the equator.
parallel ruler	a chart instrument consisting of two rulers connected by moving straps.
range	the height difference between the high and low tides.
reference ports	selected coast ports for which the Canadian Tide and Current Tables list the times and heights of high and low tide on each day of the year.
secondary ports	ports for which the Canadian Tide and Current Tables does not list daily tide predictions. To get a prediction for a secondary port, you have to add *differences* to the predictions of the nearest *reference port.*
sounding	a measure of the water's depth.
special buoy	a buoy that gives information not intended for navigation.
statute mile	a land measure of distance equal to 5128 feet.
tide height	the height of the water. Added to the *datum* to get the depth of the water.
variation	the difference between the magnetic bearing and the true bearing caused by the fact that the magnetic north pole is not located at the true north pole.

Further Reading

To find out more about this subject, see the following government sources:

Catalogues of Nautical Charts. Catalogue 2 lists the available charts for the Pacific coast and where you can order them.

Lists of Lights, Buoys and Fog Signals. Published annually. Contains information on the characteristics and position of shore lights, lighted buoys and fog signals.

Annual Notice to Mariners. Information on navigation aids, marine regulations, nautical charts, and more.

Weekly Notices to Mariners. Up-to-date information on navigation aids, new hazards, amendments to nautical charts, and more.

Canadian Tide and Current Tables. Published annually. Contains tide and current information.

Exercises

Complete this exercise by yourself. Work from memory as much as possible. Do not consult your notes or the references unless necessary.

You have 1 hour to complete the exercise.

1. Find the true bearings:

Compass bearing	Deviation	Variation	True bearing
38°	12°W	22°E	
81°	10°E	16°E	
180°	6°E	21°E	
99°	6°W	6°E	
270°	8°W	20°E	
305°	12°E	16°E	
298°	10°W	19°E	
201°	4°E	7°E	

2. Find the compass bearings:

True bearing	Variation	Deviation	Compass bearing
300°	20°E	5°E	
164°	16°E	8°W	
78°	15°E	5°W	
241°	19°E	6°W	
87°	15°E	11°E	
283°	11°E	7°W	
355°	10°E	5°E	

Aboriginal Fisheries

Training Program

SERIES 10 - Small Boat Safety

MODULE 10-6

Nautical Rules of the Road

Reference Manual

Contents

Introduction

The Aim of this Module

This module is designed to teach you the nautical rules of the road.

You should learn from the training activities, not from the manual. As the name implies, the Reference Manual is for reference purposes only: use it only when you need to refresh your memory.

Learning objectives

The course is divided into sections with different **learning objectives.**

A **learning objective** is a task you should be able to perform at the end of each section. The learning objective is contained in a grey box at the start of each section.

Evaluation

Testing conditions and **passing criteria** follow the learning objective. They tell you how you will be evaluated. There will be no surprises or trick questions during the evaluation.

How to Use this Manual

To get around in the manual, consult the table of contents.

To know where you are in the manual, check the top and bottom of each page. Start from the upper left corner of the page and move in a clockwise direction. This will tell you:

- what module this is
- what section you're in
- what page you're on.

Introduction to Nautical Rules of the Road

When you drive a car, you follow certain rules of the road. These rules allow many different people to share the roadway safely. For example, a red light means stop. If this was not a rule, and some drivers thought a red light meant go, while others thought a green light meant go, there would be a lot more accidents.

Similarly, boaters must follow nautical rules of the road so they can share the waterways safely. These rules are laid out in the International Maritime Organization's International Collision Regulations. The Collision Regulations describe:

- the rights of way
- lights that boats should carry
- sound signals that boats should give.

This module explains these nautical rules of the road, including how to identify a collision course and how to change course to avoid collision or to give the other vessel the right of way.

1. Identifying a Collision Course

Learning Objective

After this section, you should be able to identify a collision course.

Testing Conditions

Given at least 10 different actual or simulated vessel encounters.

Passing Criteria

Correctly identify the encounters that fall within the definition of a collision course.

Key points

Transparency 1, *View from the Bridge.*
Definition of a collision course.
Types of encounters: head on, crossing, overtaking, crowded waters, ocean-going ships.

Collision Course Defined

You are considered on a collision course whenever you approach another boat on a steady bearing.

Types of Encounters

Here are the most common encounters where a collision can occur:

- head on
- crossing
- overtaking
- crowded waters
- ocean-going ships.

Head on 2 vessels head straight for each other.

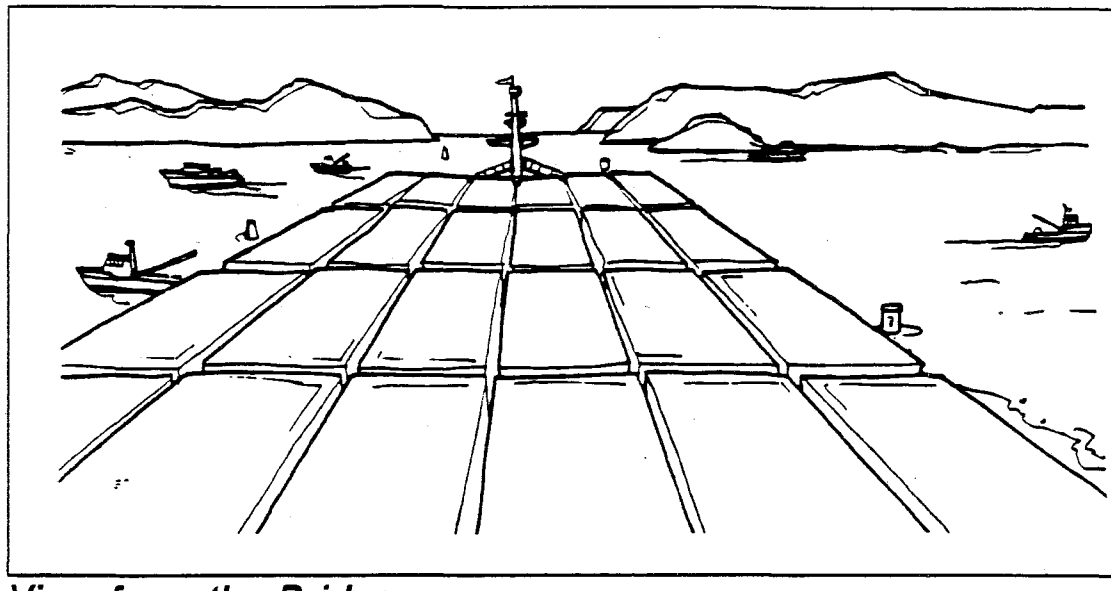
Crossing The paths of 2 vessels cross.

Overtaking One boat approaches another from behind.

Crowded waters Boats are too tightly packed together for anyone to make a proper turn. This situation can occur during a busy salmon run.

Ocean-going ships The pilot of an ocean-going ship often sets a course and holds it through waters congested by small craft. Because of the tremendous headway of these big ships, the pilot cannot easily maneuver around small craft.

Keep in mind the pilot of a large container ship can't see what's directly in front of the ship:



View from the Bridge

2. Identifying the Right-of-Way

Learning Objective

After this section, you should be able to identify the right-of-way in different situations.

Testing Conditions

Given at least 10 different actual or simulated vessel encounters.

Passing Criteria

Correctly state the right-of-way in each situation.

Key points Who has the right-of-way in each type of encounter?

Training aid Transparency 2, *Rights-of-Way.*

Right-of-way

A **right-of-way** is the right to proceed without making course adjustments.

Under the nautical rules of the road, who has the right-of-way in each situation outlined in the first learning objective?

Head on

If 2 boats are heading straight for each other: neither craft has the right-of-way.

If a sailboat is involved: the sailboat has the right-of-way.

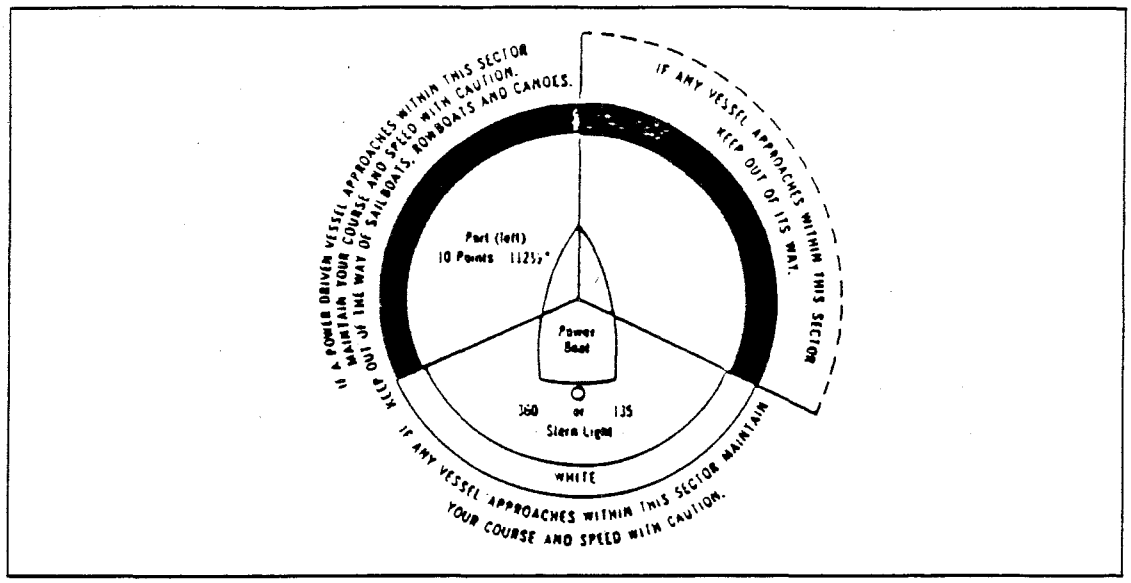
Crossing

The right-of-way is determined by the direction from which the other boat approaches you.

If the other boat is coming at you from the port side: you have the right-of-way.

If the other boat is coming at you from the starboard side: the other boat has the right-of-way.

Here is a diagram of the correct rights-of-way in a crossing situation:



Rights-of-Way

Overtaking

If you are being overtaken by another boat: you have the right-of-way.

If you are overtaking another boat: the other boat has the right-of-way.

Crowded waters

If there is not enough room for proper turns: **nobody has the right-of-way.** Ignore the rules of the road for now and do whatever's necessary to avoid collisions.

Ocean-going ships

If you meet a large ocean-going ship: the ship has the right-of-way.

3. Changing Course

Learning Objective

After this section, you should be able to make the correct course adjustment when you meet another vessel.

Testing Conditions

Piloting a vessel in at least 10 simulated or actual encounters.

Passing Criteria

Respond correctly to each encounter.

Key points The course adjustments required in each type of encounter.

Training aid A boat trainees can pilot.

Course Adjustments

Here are the correct course adjustments in each type of encounter:

Head on

In a head on situation, each boat must turn to starboard and pass safely port-to-port.

Crossing

If you have the right-of-way, proceed on course.

If you don't have the right-of-way, take evasive action.

Overtaking

If you have the right-of-way, proceed on course.

If you don't have the right-of-way, take evasive action.

Note: One boat has the right-of-way during the *entire* encounter. For example, if the slower boat moves into your port zone as you overtake it, you don't get the right-of-way, as you would in a crossing situation.

Crowded waters

Abandon the rules of the road temporarily and take evasive action whenever necessary.

Ocean-going ships

If you are on a collision course with a big ship, make a *large, early* course change. That way, the pilot of the ship sees you at all times and knows exactly which way you're heading.

In strong currents, give ocean-going ships extra room. Lateral currents can cause a ship to bear down on you even if it initially appeared to be headed safely past.

If you are being overtaken by a big ship at night, use a **flare-up light** to warn the ship's pilot of

your position. Never shine the light at the ship's bridge or you may temporarily blind the pilot.

A **flare-up light** is a hand-held spotlight.

4. Running Lights and Day Signals

Learning Objective

After this section, you should be able to interpret running lights and visual day signals.

Testing Conditions

Given examples of common visual signals.

Passing Criteria

Correctly state what each signal means.

Key points Running lights and day signals of power-driven vessels, fishing boats and tugs.

Training aids Transparency 4, *Power Driven Vessels.*
Transparency 5, *Fishing Vessel Lights.*
Transparency 6, *Tugs.*
Examples of common visual signals.

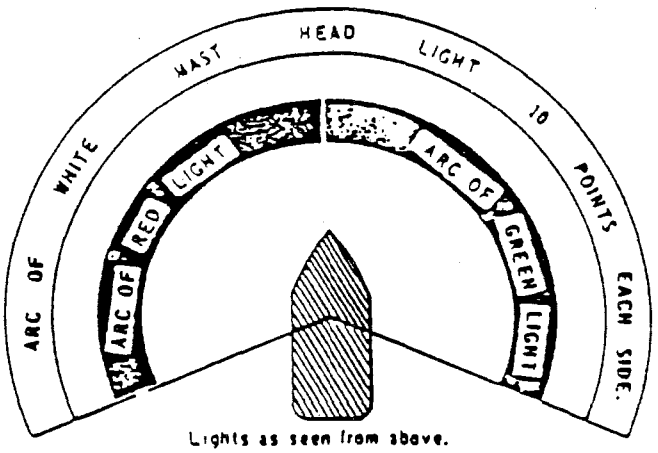
Running Lights and Day Signals

The law requires that each boat show certain colored lights. The lights must be visible in specified arcs over specified distances. The law also tells you where to position the lights on the boat.

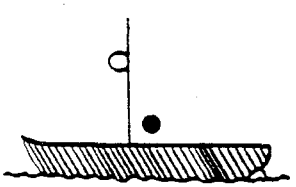
This section illustrates the running lights and day signals of:

- power-driven vessels
- fishing vessels
- tugs.

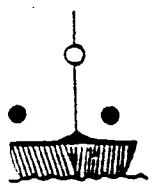
Power Driven Vessels



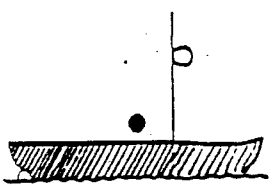
Lights as seen from above.
Power Driven Vessel.



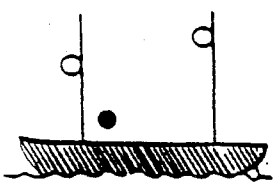
Port Side



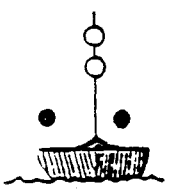
End on View



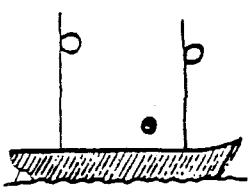
Starboard Side



Port Side

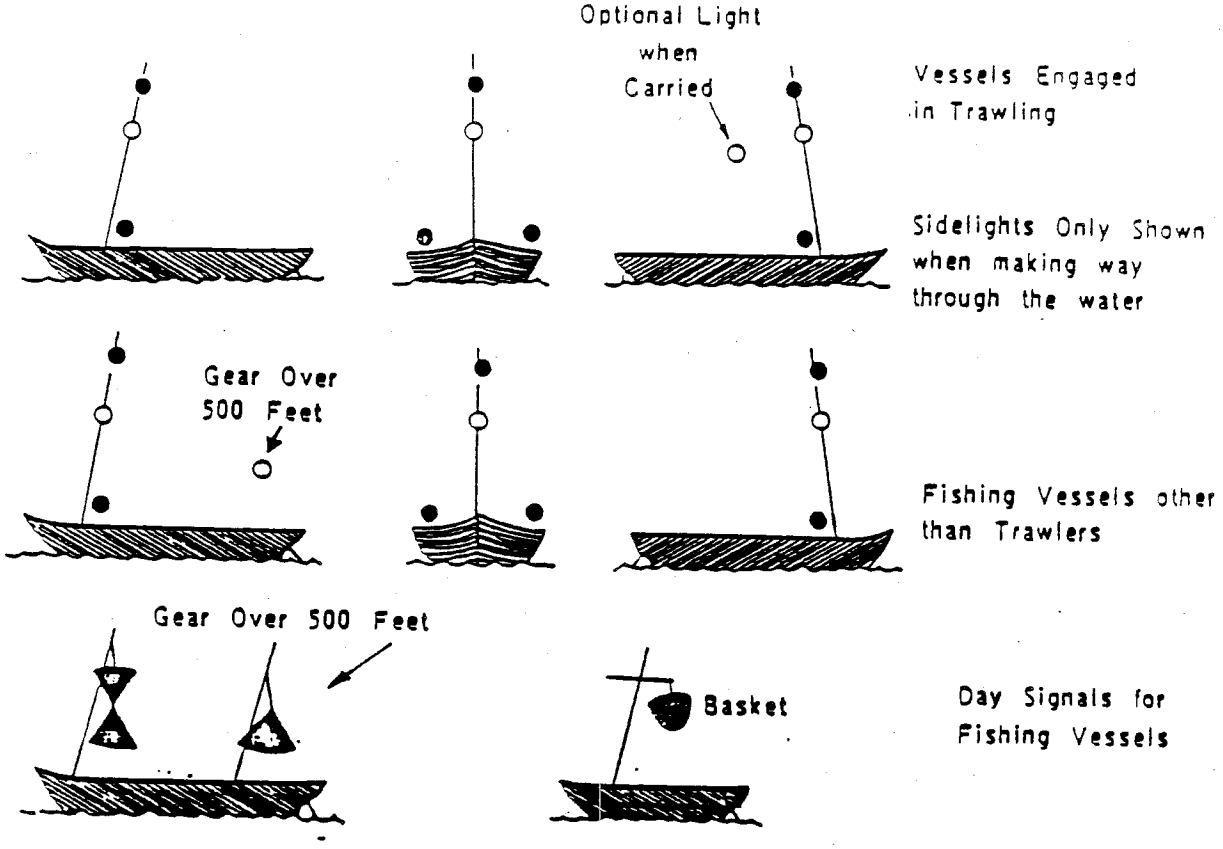


End on View

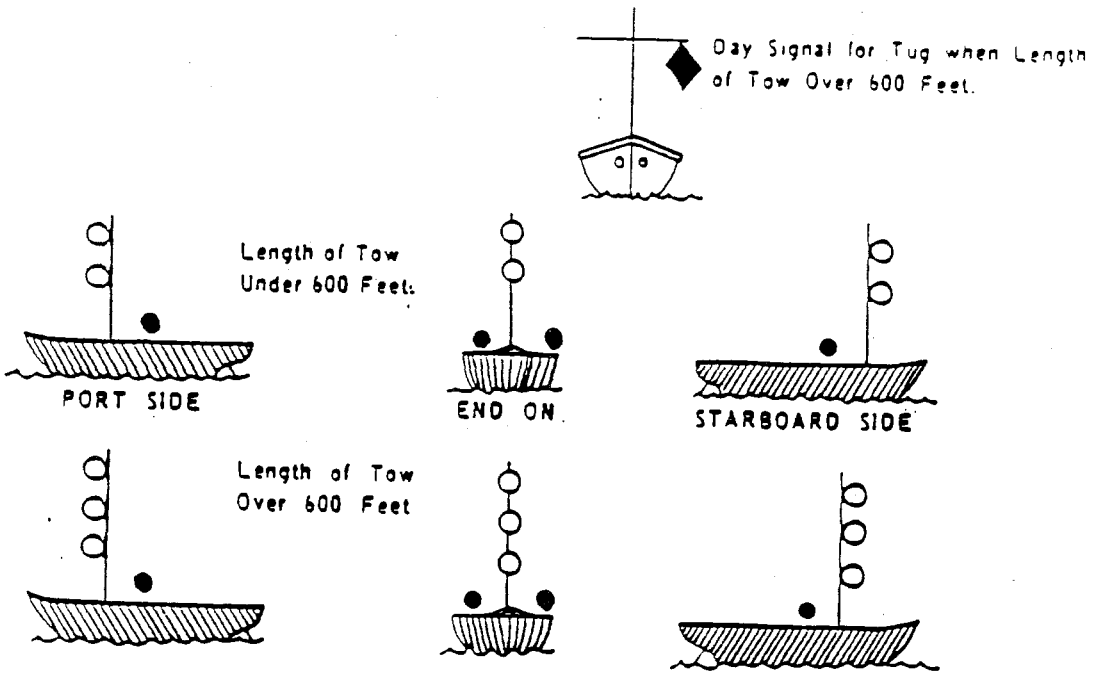


Starboard Side

Fishing Vessel Lights



Tugs



*NOTE:- *The number of vessels towed is not specified. The small white light has no distance specified and it can be seen from abaft the beam to right astern, as against a stern light, which is 2 points abaft the beam.*

5. Sound Signals

Learning Objective

After this section, you should be able to interpret common sound signals in good visibility and in fog.

Testing Conditions

Given actual or simulated sound signals in typical marine conditions.

Passing Criteria

Correctly state what each signal means.

Key points

Basic sound signals in good visibility.
Basic sound signals in fog.

In Good Visibility

Here are the basic sound signals in good visibility:

Sound	Meaning
1 short blast.	I am altering course to starboard.
2 short blasts.	I am altering course to port.
3 short blasts.	My engines are running astern: I am going forward.
4 short blasts.	Danger.
5 or more short blasts.	What are you doing?
1 short blast, 1 long blast, and 2 short blasts.	Stop your vessel.

In Fog

Here are the basic sound signals in fog:

Sound	Meaning
1 long blast every 2 minutes.	Indicates a power-driven vessel is underway.
1 long and 2 short blasts every 2 minutes.	Indicates one of the following: • a tug • a fishing boat • a vessel not under command • a vessel constricted by its draft • a vessel restricted by its ability to maneuver.
2 long blasts.	Indicates a vessel is underway but not making way.

Useful Terms

collision course approaching another boat on a steady bearing.

flare-up light a hand-held spotlight.

right-of-way the right given to proceed without making course adjustments.

Exercises

Complete this exercise by yourself. Work from memory as much as possible. Do not consult your notes or the references unless necessary.

You have 45 minutes to complete the exercise.

1. What are two reasons to be especially cautious when boating near large ocean going vessels?

2. Which craft has the right-of-way in each of the following situations?

   a) Two boats are heading straight for each other.

   b) A sailboat and a motorboat are heading straight for each other.

   c) A boat is coming straight at you from the port side.

d) A boat is coming straight at you from the starboard side.

_____

e) You are being overtaken by another boat.

_____

f) Waters are crowded and there is not enough room for proper turns.

_____

g) You meet a large ocean-going ship.

_____

h) A boat moves into your port zone as you overtake it.

_____

3. What precaution should you take if you are being overtaken by a large ship at night?

_____
_____
_____
_____
_____
_____

4. Describe the position of the running lights and day signals for the following vessels:

a) power driven vessels

_____

b) trawling fishing vessels

_____

c) tug with length of tow over 600 feet

5. Basic sound signals (good visibility) are in the left column. The meaning of the sound signals are in the right column. Put the letter of the correct meaning in front of the appropriate sound signal.

Basic Sound Signals	Meanings
4 short blasts	a) I am altering course to starboard.
1 short blast	b) What are you doing?
3 short blasts	c) I am altering course to port.
1 short blast, 1 long blast and 2 short blasts	d) Danger.
2 short blasts	e) My engines are running astern; I am going forward.
5 or more short blasts	f) Stop your vessel.

6. What is indicated by 1 long blast, and 2 short blasts every 2 minutes in foggy conditions?

Aboriginal Fisheries

Training Program

SERIES 10 - Small Boat Safety

MODULE 10-7

Emergencies at Sea

Reference Manual

Contents

Introduction

The Aim of this Module

This module is designed to train you to respond to emergencies at sea.

You should learn from the training activities, not from the manual. As the name implies, the Reference Manual is for reference purposes only: use it only when you need to refresh your memory.

Learning objectives

The course is divided into sections with different **learning objectives**.

A **learning objective** is a task you should be able to perform at the end of each section. The learning objective is contained in a grey box at the start of each section.

Evaluation

Testing conditions and **passing criteria** follow the learning objective. They tell you how you will be evaluated. There will be no surprises or trick questions during the evaluation.

How to Use this Manual

To get around in the manual, consult the table of contents.

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1. Logging Information Before Leaving

Learning Objective

After this section, you should be able to identify the information you must log before leaving shore.

Testing Conditions

Given 5 examples of incomplete pre-trip logs.

Passing Criteria

Correctly identify all missing information in the logs.

Key points What is a sailing plan?
What to include in the sailing plan.

Training aids 5 examples of incomplete sailing plans.

Sailing Plan

Before leaving port, prepare a sailing plan and leave a copy with a responsible person on shore.

If anything should happen to you, then the person can send help. The search and rescue team in turn can use the sailing plan to find you.

Include this information in your sailing plan:

- your departure date & time
- how long your boat can stay under power, in hours & days
- your proposed route
- your estimated time of return
- the number of persons on board
- the times you'll call in
- the probable port of refuge in case of emergency.

Contact the person on shore at least once during the day, and immediately after any unscheduled change in your plans.

2. Weather and Water Information Sources

Learning Objective

After this section, you should be able to identify useful sources of information on weather and water conditions.

Testing Conditions

Given 1 oral or written short-answer question asking you to list the sources.

Passing Criteria

Correctly list all sources.

Key points

Marine forecasts on the radio.
Weather warning flags and lights.

Training aids

Transparency 1, *Weather Warning Flags.*
Transparencies 2 and 3, *Weather Warnings.*
An oral or written short-answer question requiring trainees to list the sources of information.

Marine Forecasts

Here are the most useful sources of marine weather information:

- VHF channels 21B and WX1, WX2, WX3
- Environment Canada's "Weatheradio" VHF broadcasts from Vancouver
- regular AM and FM radio weather forecasts
- the Marine Weather Services Bulletin, obtained by calling the nearest Environment Canada weather office.

The following pages give a detailed list of where to get marine weather information in different areas.

Strait of Georgia and Howe Sound

Marine Weather Reporting Stations

East Point	Point Atkinson	First Narrows
Active Pass	Hood Point	Cassidy Airport (Nanaimo)
Tsawwassen	Pam Rocks	Sisters Island
Sand Heads	Squamish	Entrance Island
Vancouver Int'l Airport	Merry Island	Thrasher Rock
Jericho	Ballenas Island	
Burrard Bridge	Halibut Bank	

		SS/VHF Channels	Continuous Marine Broadcast
Coast Guard Radio	Vancouver	2182/2054/16/22A/26	
	Bowen Island	16/22A/26	WX3: 162.475 MHz
	Mt. Parke	16/22A/26	21B: 161.65 MHz
	Cape Lazo	16/22A/26	WX1: 162.55 MHz
	Watts Point	16/26	
	KAP100	84	
	24 hour telephone access to Continuous Marine Broadcasts Vancouver 270-7411, Comox 339-0748		
Local Weather Office	Vancouver	664-9032	
	Comox	339-5044 (Taped Message)	

Vancouver, Victoria and Comox Coast Guard Radio stations collect marine weather observations, as part of the MAREP program, from vessels in the Strait of Georgia. The reports can be passed on VHF channels 26 and 84 and are broadcast over Coast Guard Marine Radio, if significantly different from other available observations.

Juan de Fuca Strait

Marine Weather Reporting Stations

Victoria Int'l Airport		Discovery Island
Trial Island		Race Rocks
Sheringham Point		Port Angeles
Whidbey Island		

		SS/VHF Channels	Continuous Marine Broadcast
Coast Guard Radio	Victoria	2182/2054	2054 kHz at 0220 0520,0820,1120, 1420,1720,2020, 2320 PST
	Mt. Helmcken	16/22A	WX3: 162.475 MHz
	24 hour telephone access to Continuous Marine Broadcasts Vancouver 270-7411, Comox 339-0748		
Local Weather Office	Victoria	363-6629 (taped marine forecast 656-7515 or 656-2714)	

MAREP weather reports can be passed to Victoria Coast Guard Radio on VHF channels 26 or 84.

Johnstone Strait

Marine Weather Reporting Stations	Alert Bay Helmcken Island Campbell River		Chatham Point Cape Mudge
		SS/VHF Channels	**Continuous Marine Broadcast**
Coast Guard Radio	Alert Bay	2182/2054 4125 2458(2340)	WX1: 162.65 MHz
	Discovery Mtn	16/22A/84	21B: 161.55 MHz
	24 hour telephone access to Continous Marine Boradcasts Comox 339-0748		
Local Radio	Campbell River Port Hardy	CFWB AM CFNI AM	1490 kHz 1240 kHz
Local Weather	Port Hardy Victoria	949-6559 (0715-1715 local time) 363-6629	

MAREP weather reports can be passed to Alert Bay Coast Guard Radio on VHF channels 26 or 84.

Queen Charlotte Strait

MAREP Station	Cape Scott		VHF channel 69/10/78A
Marine Weather Reporting Stations	Pine Island Scarlett Point Pultney point Alert Bay		Herbert Island Port Hardy Haddington Island Chatham Point
		SS/VHF Channels	**Continuous Marine Broadcast**
Coast Guard Radio	Alert Bay	2182/2054 4125 2458(2340)	WX1: 162.65 MHz
	Holberg Calvert	16/26 16/22A/84	21B: 161.65 MHz WX2: 162.40 MHz
	24 hour telephone access to Continuous Marine Broadcast Comox 339-0748		
Local Radio	Port Hardy	CFNI AM	1240 kHz
Local Weather Offices	Port Hardy Victoria	949-6559 (0715-1715 local time) 363-6629	

MAREP weather reports can also be passed to Alert Bay Coast Guard Radio on VHF channels 26 or 84.

West Coast Vancouver Island North

MAREP Stations	Cape Scott Kyuquot		VHF Channel 69/10/78A VHF Channel 69/10/78A
Marine Weather Reporting Stations	Sartine Island Solander Island East Delwood Seamount buoy		Amphitrite Point Quatsino
		SS/VHF Channels	**Continuous Marine Broadcast**
Coast Guard Radio	Tofino	2182/2054 4125 2458(2840)	2054 kHz at 0150 0450 0750 1050 1350 1650 1950 2250 PST
	Holberg	16/26	21B:161.65 MHz
	Eliza Dome	16/22A/26/84	WX1:162.55 MHz
	Nootka	16/22A/84	WX2:162.40 MHz
Local Weather Offices	Port Hardy Victoria	949-6559 (0715-1715 local time) 363-6629	

MAREP weather reports can also be passed to Tofino Coast Guard Radio on VHF channels 26 or 84.

West Coast Vancouver Island South

MAREP Station	Kyuquot		VHF Channel 69/10/78A
Marine Weather Reporting Stations	Nootka Lennard Island Amphitrite Point Pachena Point La Pérouse buoy		Estevan Point Tofino Airport Cape Beale Carmanah Point
		SS/VHF Channels	**Continuous Marine Broadcast**
Coast Guard Radio	Tofino	2182/2054 4125 2458(2840)	2054 kHz at 0150 0450 0750 1050 1350 1650 1950 2250 PST
	Eliza Dome	16/22A/26/84	WX1:162.55 MHz
	Nootka	16/22A/84	WX2:162.40 MHz
	Mt. Ozzard	16/22A/26/84	21B:161.65 MHz
	Alberni	16/22A/26	WX2:162.40 MHz
Local Weather Offices	Port Hardy Victoria	949-6559 (0715-1715 local time) 363-6629	

MAREP weather reports can also be passed to Tofino Coast Guard Radio on VHF channels 26 or 84.

Queen Charlotte Sound

MAREP Station	Cape Scott	VHF Channel 69/10/78A	
Marine Weather Reporting Stations	Cape St. James Sartine Island Cape Scott	East Dellwood Seamount Buoy West Sea Otter Group Buoy South Hecate Strait Buoy	
		SS/VHF Channels	**Continuous Marine Broadcast**
Coast Guard Radio	Alert Bay	2182/2054 4125 2458(2340)	WX1: 162.65 MHz
	Prince Rupert	2182/2054	2054 kHz at 0205 0505 0805 1105 1405 1705 2005 2305 PST
	Calvert Island	16/22A/84	WX2: 162.40 MHz
	Klemtu	16/22A/84	WX1: 162.55 MHz
24 hour telephone access to Continuous Marine Broadcasts Prince Rupert 624-9009			
Local Weather Office	Port Hardy Victoria	949-6559 (0715-1715 local time) 363-6629	

MAREP weather reports can also be passed to Prince Rupert Coast Guard Radio on VHF channels 83 or 22A.

Central Coast

MAREP Station	Cape Scott		VHF Channel 69/10/78A
Marine Weather Reporting Stations	Boal Bluff Addenbroke Egg Island Herbert Island Pine Island Cape Scott		Cathedral Point McInnes Island Ivory Island Dryad Point West Sea Otter Group Buoy South Hecate Strait Buoy
		SS/VHF Channels	**Continuous Marine Broadcast**
Coast Guard Radio	Alert Bay	2182/2054 4125 2458(2340)	WX1:162.65 MHz
	Calvert Island	16/22A/84	WX2:162.40 MHz
	Klemtu	16/22A/84	WX1:162.55 MHz
24 hour telephone access to Continuous Marine Broadcasts Prince Rupert 624-9009			
Local Weather Office	Port Hardy Victoria	949-6559 (0715-1715 local time) 363-6629	

MAREP weather reports can also be passed to Prince Rupert Coast Guard Radio on VHF channels 83 or 22A.

Hecate Strait and Douglas Channel

MAREP Station	Bonilla Island		VHF Channel 69/10/78A
Marine Weather Reporting Stations	Rose Spit Bonilla Island Sandspit Ethelda Bay South Hecate Strait Buoy		McInnes Island Boat Bluff Cape St. James Nanakwa Shoal Buoy
		SS/VHF Channels	**Continuous Marine Broadcast**
Coast Guard Radio	Prince Rupert	2182/2054	
	Mt. Hays	16/22A/84	21B:161.65 MHz
	Cumshewa	16/22A/84	WX3 162.475 MHz
	Mt. Gil	16/22A/26	WX2:162.40 MHz
	Klemtu	16/22A/84	WX1:162.55 MHz
	Barry Inlet	16/22A/84	WX2:162.40 MHz
	24 hour telephone access to Continuous Marine Broadcasts Prince Rupert 624-9009		
Local Radio	Prince Rupert	CFPR AM 860 kHz CJPW FM 101.9 MHz	
	Sandspit	FM 104.9 MHz FM 92.9 MHz	
Local Weather Offices	Terrace	635-3224	
	Port Hardy	949-6559 (0715-1715 local time)	

MAREP weather reports can also be passed to Prince Rupert Coast Guard Radio on VHF channels 83 or 22A.

Dixon Entrance East

MAREP Station	Bonilla Island		VHF channel 69/10/78A
Marine Weather Reporting Stations	Rose Spit Grey Islet Green Island		Prince Rupert Holland Rock Triple Island
		SS/VHF Channels	**Continuous Marine Broadcast**
Coast Guard Radio	Prince Rupert	2182/2054	2054 kHz at 0205 0505 0805 1105 1405 1705 2005 2305 PST
	Dundas Island	16/22A/84	WX2: 162.40 MHz
	Mount Hays	16/22A/84	21B: 161.65 MHz
	Naden Harbour	16/22A/84	WX2: 162.40 MHz
	24 hour telephone access to Continuous Marine Broadcasts Prince Rupert 634-9009		
Local Radio	Prince Rupert	CFPR AM CJPW FM	860 kHz 101.9 MHz
	Masset	FM FM	103.9 MHz 92.9 MHz
Local Weather Office	Terrace	635-3224 (0710-1700 local time)	

MAREP weather reports can also be passed to Prince Rupert Coast Guard Radio on VHF channels 83 or 22A.

Dixon Entrance West

Marine Weather Reporting Stations	Langara Island West Dixon Entrance Buoy Rose Spit Green Island		Kindakun Rock Grey Islet Triple Island
		SS/VHF Channels	**Continuous Marine Broadcast**
Coast Guard Radio	Prince Rupert	2182/2054	2054 kHz at 0205 0505 0805 1105 1405 1705 2005 2305 PST
	Naden Harbour	16/22A/84	WX2: 162.40 MHz
	Van Inlet	16/22A/84	WX1: 162.55 MHz
	Dundas Island	16/22A/84	WX2: 162.40 MHz
24 hour telephone access to Continuous Marine Broadcasts Prince Rupert 624-9009			
Local Radio	Prince Rupert	CFPR AM	860 kHz
		CJPW FM	101.9 MHz
	Masset	FM	103.9 MHz
		FM	92.9 MHz
Local Weather office	Terrace 635-3224 (0710-1700 local time)		

MAREP weather reports can be passed to Prince Rupert Coast Guard Radio on VHF channels 83 or 22A.

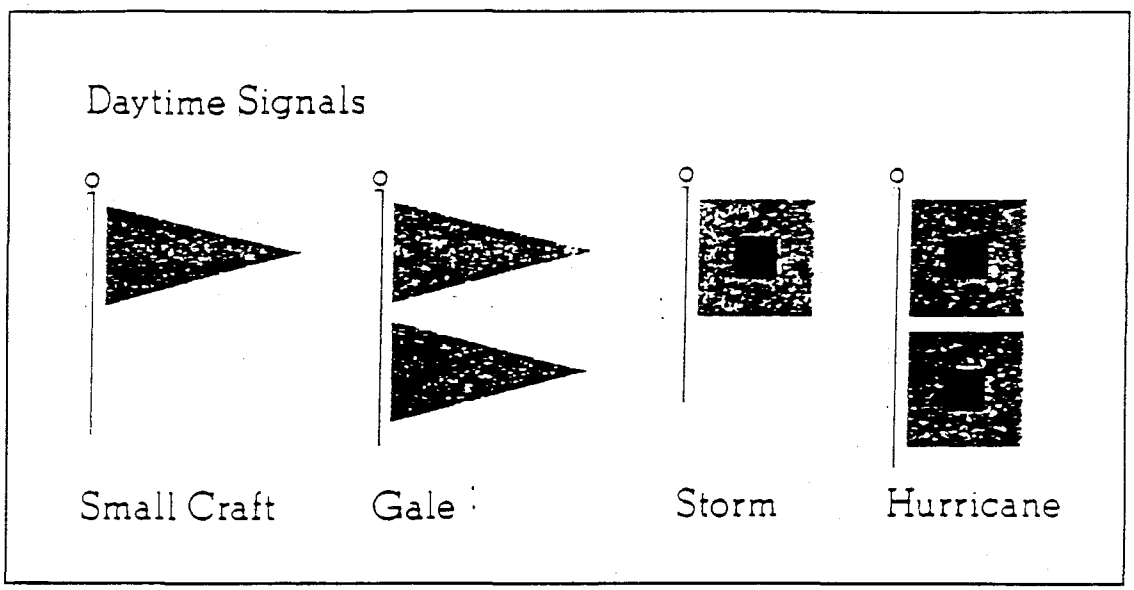
West Coast Charlottes

Marine Weather Reporting Stations	Kindakun Rock Langara Island	West Moresby Buoy Cape St. James	
		SS/VHF Channels	**Continuous Marine Broadcast**
Coast Guard Radio	Prince Rupert	2182/2054	
	Van Inlet	16/22A/26	WX1: 162.55 MHz
	Barry Inlet	16/22A/26	WX2: 162.40 MHz
Local Weather office	Terrace 635-3224 (0710-1700 local time)		
24 hour telephone access to Continuous Marine Broadcast Prince Rupert 624-9009			

MAREP weather reports can be passed to Prince Rupert Coast Guard Radio on VHF channels 83 or 22A.

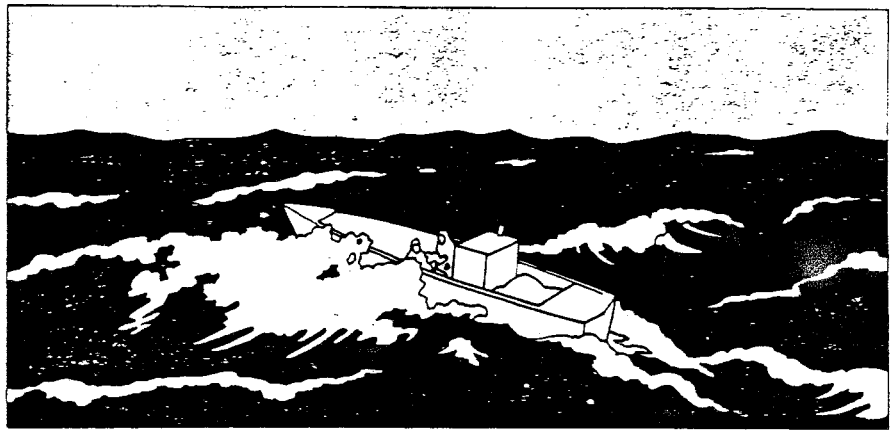
Warning Flags and Lights

Look for these weather warning flags at Coast Guard stations, launching sites and marinas:



Warning Flags

Small Craft Warning **Day**: a red triangular pennant.
Night: a red light set above a white light.

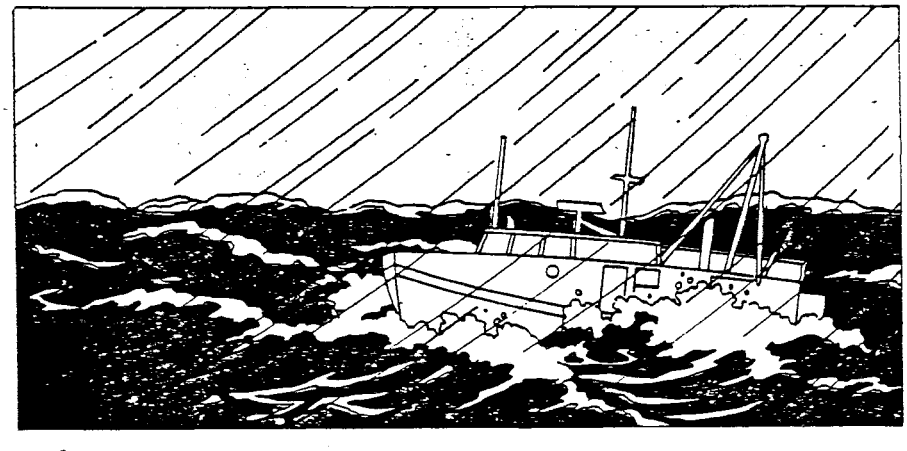


Small Craft Warning

Winds 20-33 knots Wave Heights 2-3 metres

Small Craft Warning

Gale Warning **Day**: 2 red triangular pennants.
Night: a white light set above a red light.

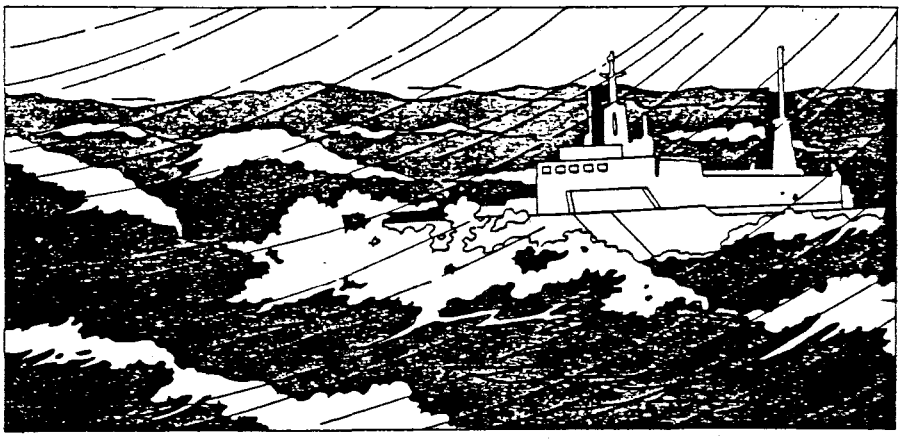


Gale Warning

Winds 34-47 knots Wave Heights 6-9 metres

Gale Warning

Storm Warning **Day**: a square red flag with a black center.
Night: 2 red lights, one above the other.



Storm Warning

Winds 48-63 knots Wave Heights 9-16 metres

Storm Warning

Hurricane Force Warning **Day**: 2 square red flags with black centers.
Night: a white light between 2 red lights.

Hurricane Force Warning

Winds 64 knots and over Wave Heights over 16 metres

Hurricane Force Warning

3. Preparing for Rough Weather

Learning Objective

After this section, you should be able to prepare a boat for rough weather.

Testing Conditions

Given a simulated threat of rough weather while at sea in typical marine conditions.

Passing Criteria

Take all the recommended measures to prepare the boat for rough weather.

Key points

Steps to take when the weather threatens to turn bad.
Flotation devices: life jackets, PFDs, throwable devices, immersion suits, life rafts.

Training aids

Transparency 4, *Life Jacket.*
Transparency 5, *Personal Flotation Device.*
Transparency 6, *Throwable flotation devices.*
Transparency 7, *Immersion Suit.*
Transparency 8, *Life Raft.*

Steps

Take these steps when the weather threatens to take a turn for the worse:

Put on a life jacket.

Make sure the boat is watertight. Batten down the hatches. Make sure the bilge pump works.

Clean up and tie down. Secure all loose gear on deck and in the cabin. Make sure the bow anchor is secure. If you have a galley, remove pots and pans from the stove and stow securely.

Prepare for an emergency. Make sure exposure suits, safety harnesses, flares and emergency repair gear are readily accessible.

Find your position on a chart. This might be your last chance to do so for a while. Update your chart and radio in your position.

Make sure you have full control of your boat. Shut down and start the engine. Test the rudder. Prepare the emergency tiller and sea anchor.

If you're on deck, tie yourself to a lifeline or safety harness.

If you're at the helm, attach the kill switch. If you're thrown from the controls, the kill switch will automatically shut down the engine.

Take a seasickness pill, if necessary.

Head for the nearest port.

Flotation Devices

To prepare your vessel for rough weather, you must equip it with flotation devices to use if anyone falls overboard or if you must abandon ship.

There are 5 kinds of flotation devices:

- life jackets
- personal flotation devices (PFDs)
- throwable devices
- immersion suits
- life rafts.

"Approved" flotation devices have been approved by the Canadian Department of Transport.

By law, you must have on board:

- 1 approved life jacket or PFD approved for each person on the boat **and**
- at least 1 approved throwable flotation device.

Life jackets

Life jackets are u-shaped flotation devices that have ties at the neck and waist.

Life jacket

To use a life jacket:

1. Put the jacket on over your head.
2. Tie the neck straps.
3. Tie the waist straps around your waist, not around the jacket.
4. Before entering the water, hold the neck piece down with both hands.
5. Jump feet first into the water.

Note: Never wear clothing over your life jacket.

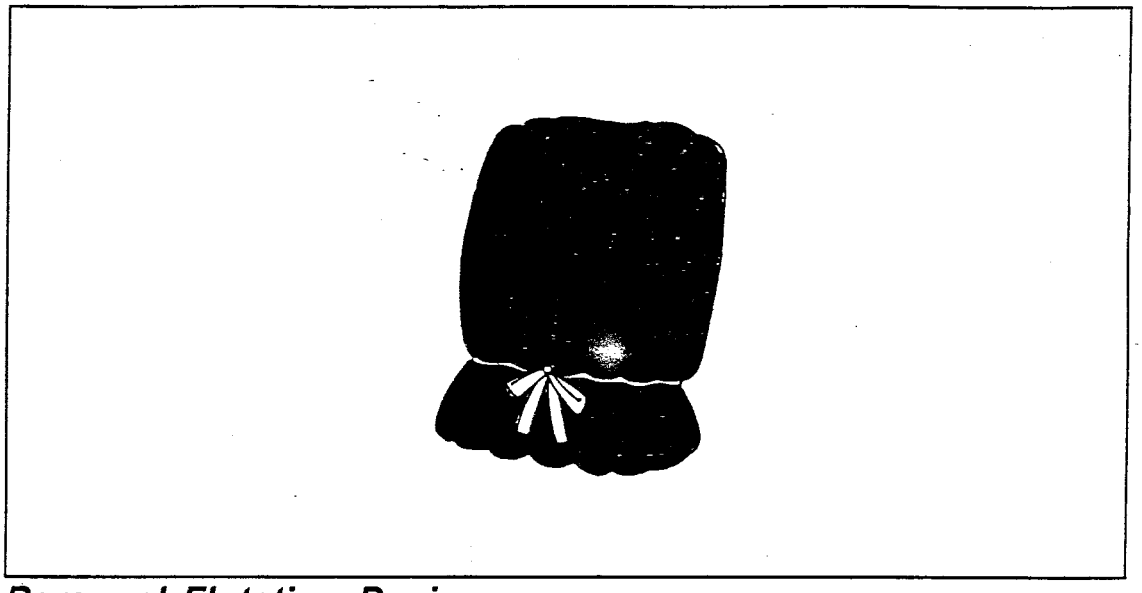
Caring for a life jacket

- Make sure the jacket is dry before storing it.
- To dry a life jacket, hang it up in a well-ventilated area. Do not dry it in front of radiators or other heat sources.
- Store the jacket in a cool, dry, well-ventilated area.
- Inspect the jacket regularly for tears. Fix a torn jacket immediately or replace it.
- If the inside of the jacket is waterlogged, the jacket is no longer usable. Replace it.
- Do not use the life jacket as a seat cushion, boat fender or kneeling pad, it may rip.

Personal flotation devices

Personal flotation devices (PFDs) are vests or jackets that have a thin, buoyant lining. Since they are lighter and less bulky than life jackets, PFDs are designed for constant wear while on a boat.

PFDs require the same care as life jackets.



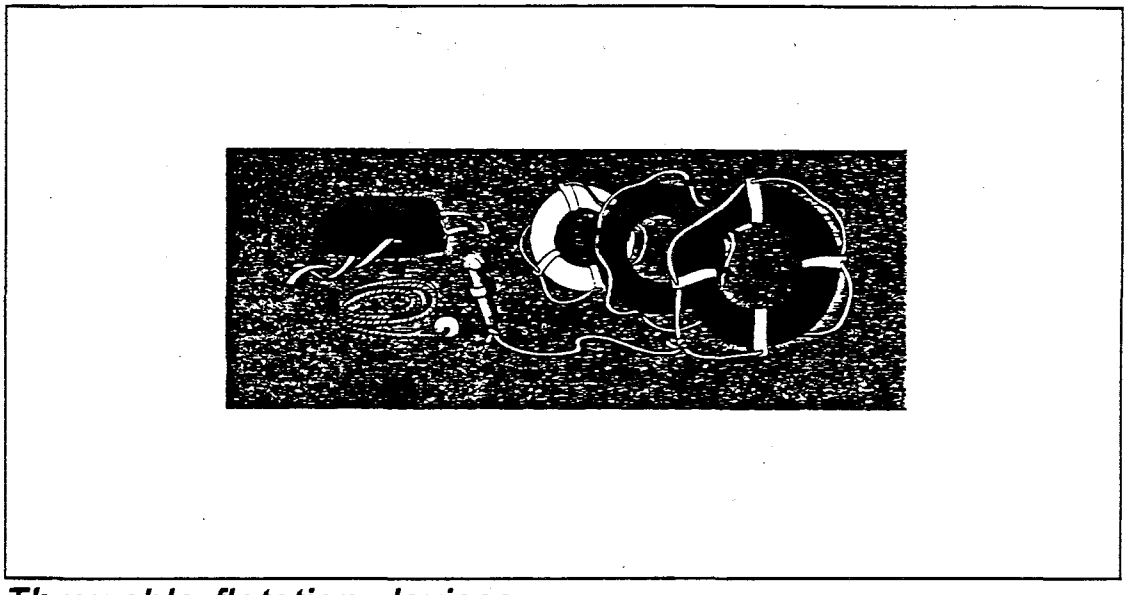
Personal Flotation Device

Throwable devices

Flotation devices that you can throw to someone in the water include:

- approved lifesaving cushions
- buoyant heaving lines
- approved lifebuoys.

The Canadian Department of Transport does not approve horseshoe-shaped lifebuoys.

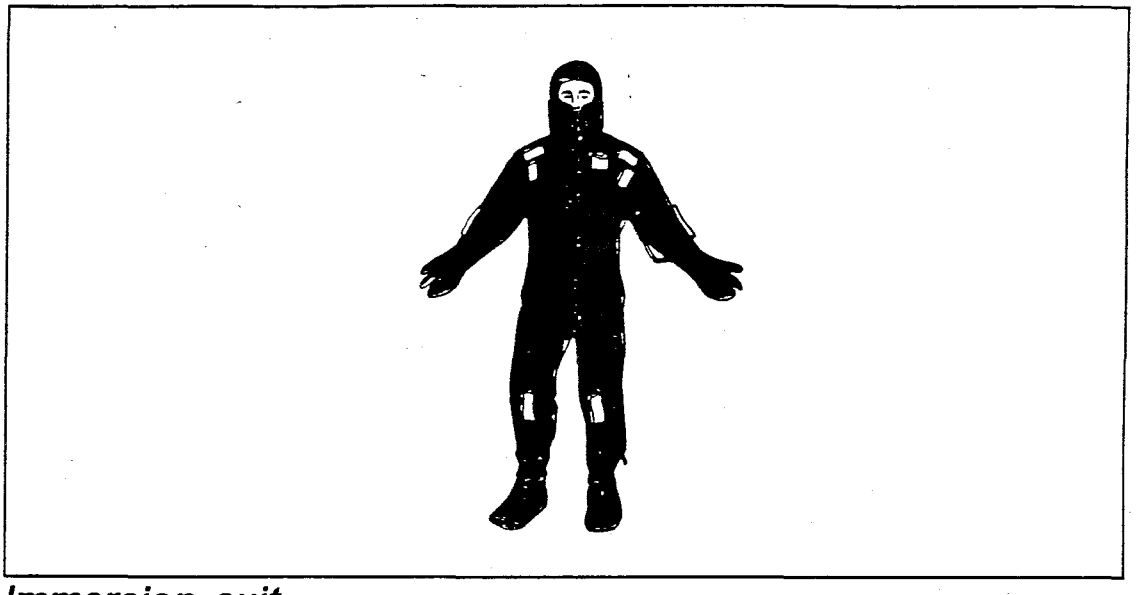


Throwable flotation devices

Immersion suits

Immersion suits are full-body wetsuits designed to protect the wearer from cold and exposure to the water. They are made of a buoyant material and may have an inflatable life ring attached. Only use approved suits.

Important: Always try the suit out first. Do not wait until an emergency to see how it works.



Immersion suit

To use an immersion suit:

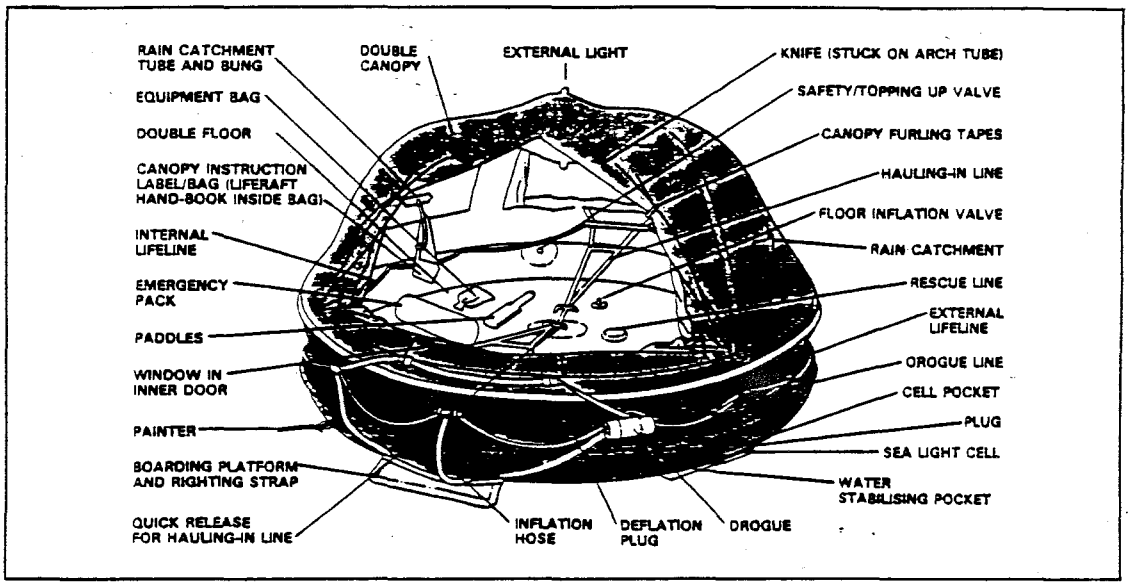
1. Take the suit out of the container.
2. Pull the suit on like you would overalls.
3. Pull the hood over your head.
4. Pull the zipper closed.
5. Close the face cover.
6. Cross your arms and hold onto your shoulders.
7. Jump feet-first into the water.

8. If your suit has a life ring, inflate it after you are in the water.

Caring for an immersion suit

- Take the suit out of storage occasionally to air it out and to lubricate the zipper.

Life rafts **Life rafts** are small, inflatable, rubber boats.



Life raft

When storing a life raft:

- Install the raft where it can be launched easily, but will float clear if the ship sinks before launching.

- Do not install the raft vertically. The gas cylinder inside will fall to the bottom and chafe the fabric.

- Make sure the **painter** is secured to a strong part of the vessel. The painter is the line that you pull to inflate the raft.

- Make sure the raft is not exposed to paint, exhaust, smoke, sparks, heavy seas or spray.

- Have the raft inspected and repacked and the **hydrostatic release** tested according to the recommendations and requirements of the Canadian Coast Guard and the manufacturers.

  The hydrostatic release is the mechanism that allows the raft to detach itself from a sinking boat.

Make sure everyone on board knows how to launch the raft properly.

To launch a life raft:

1. Clear the launching area of people and obstructions.

2. With one person holding each end of the container, toss it over the lee side of the vessel.

3. Pull the painter until the raft inflates.

4. If the raft inflates upside down, turn it right side up before boarding.

4. Man Overboard Procedures

Learning Objective

After this section, you should be able to respond to a man overboard incident.

Testing Conditions

Given at least 3 surprise simulated man overboard incidents in typical marine conditions, while in control of the boat or as a crew member.

Passing Criteria

Respond correctly to each incident.

Key points

Steps to take when somebody goes overboard.
Recovery maneuvers in different situations.
Helping the victim on board.

Training aids

Transparency 9, *Anderson Turn.*
Transparency 10, *Race Track Turn.*
Transparency 11, *Y-Backing.*
Transparency 12, *Williamson Turn.*

Steps

Here are the steps to take if somebody goes overboard:

Make sure the stern of the boat is clear of the victim. Swing the stern away from the person with full rudder.

Attach the person to the boat by throwing a ring buoy, buoyant heaving line or rope with a loop in the end to the person.

If the victim does not have a flotation device, throw a buoyant cushion, ring buoy or life jacket near the victim.

Assign somebody to keep an eye on the victim.

Maneuver the boat to come alongside the victim. Choose the maneuver appropriate for the situation. See below for the different kinds of recovery maneuvers.

Place a boat hook, paddle or other long object within reach of the victim.

Once the victim takes hold of the object, pull them in.

Help the victim aboard.

Recovery Maneuvers

Here are the basic recovery maneuvers. Choose the maneuver most appropriate to the situation.

For a quick turnaround In cold water where fast recovery is critical, use the **Anderson turn** or the **race track turn.**

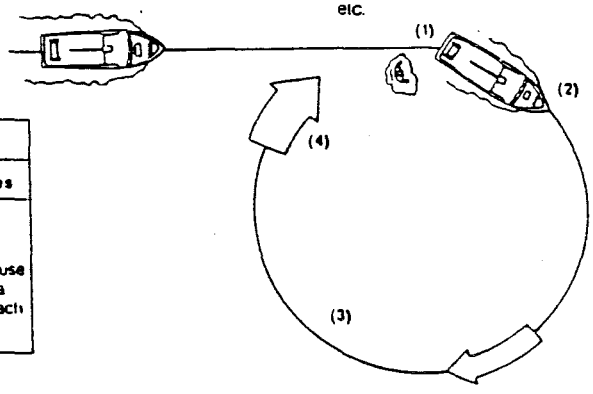
Explanation:

1) Put the rudder over full in the same direction as the man (this swings the stern away from him). For example, if a person fell over the starboard side, put the rudder over full to starboard. Stop the engine.

2) When clear of the man, go ahead full. Continue using full rudder.

3) When about two thirds of the way around, back the engine 2/3 or full. Stop the engines when the man is within about 15 degrees of the bow, then ease the rudder and back the engines as required to attain the proper final position (same as that for the Williamson method).

4) Many variations of this method are used. They differ primarily in the use of one or both engines on twin screw vessels, and the moment at which they are stopped and backed to return to the man and lighten the turn. The variation used should reflect individual vessel characteristics, sea conditions, personal preferences, etc.



PRIMARY USE	ANALYSIS	
	Advantages	Disadvantages
Used by vessels which have considerable power available and a tight turning circle	Fastest recovery method.	Requires very skillful ship-handling because of the lack of a straight approach to the man

Anderson Turn

Explanation:

1) A variation of the one-turn method which provides a desirable straight final approach to the man.

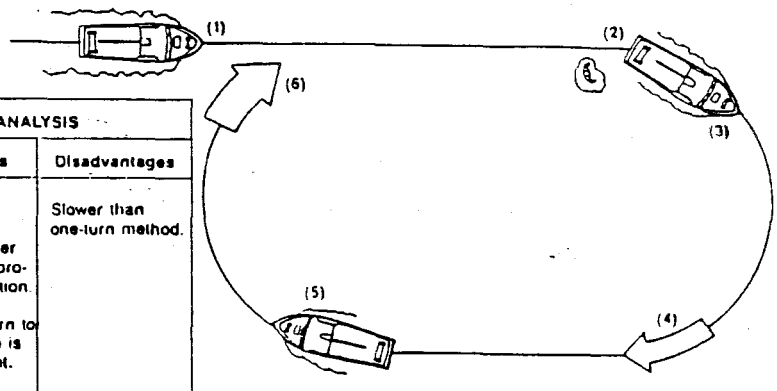
2) Put the rudder over full in the same direction as the man (this swings the stern away from him). For example, if a person fell over the starboard side, put the rudder over full to starboard. Stop the engine.

3) When clear of the man, go ahead full and continue using full rudder until you come to the reciprocal of the original course. For example, if your original course was 090 degrees, steady up on 270 degrees after turning.

4) Hold the reciprocal course long enough so you can make a straight final approach to the man on the original course.

5) Use full rudder to turn to the man.

6) Use the engine and rudder to get in the proper final position (the same as for other recovery methods).



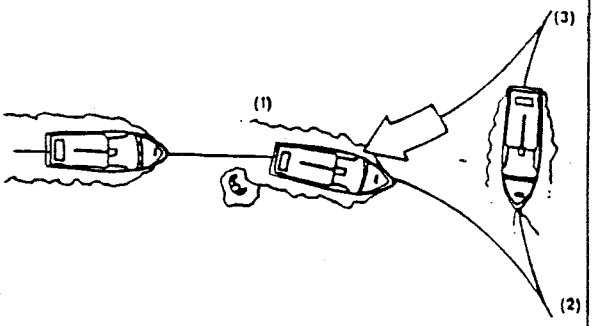
PRIMARY USE	ANALYSIS	
	Advantages	Disadvantages
Used in good visibility when a straight final approach leg is desired.	Straight final approach leg makes it easier to attain the proper final position. Ship will return to the man if he is lost from sight. Reasonably fast. Effective when wind was from beam on original course.)	Slower than one-turn method.

Racetrack Turn

Larger ships For larger ships with lots of backing power, use the **Y-backing** maneuver.

Explanation:
1. Put the rudder over full in the same direction as the man (this swings the stern away from him). For example, if a person fell over the starboard side, put the rudder over full to starboard. Stop the engine.
2. When clear of the man, back the engine with full power, using opposite rudder.
3. Go ahead, using the engines and rudder to attain the proper final position (same as for the other recovery methods).

PRIMARY USE	ANALYSIS	
	Advantages	Disadvantages
Used by vessels with low height of eye. The vessel remains comparatively close to the man, making it easier to keep him in sight.	The vessel remains comparatively close to the man.	Backing into the wind and sea may result in poor control of the vessel.



Y-Backing

Poor visibility At night or in low visibility, use the **Williamson turn.**

Explanation:

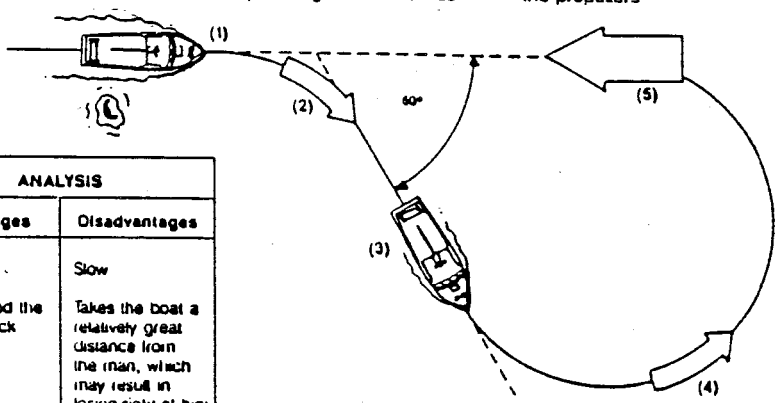
1) Put the rudder over full in the same direction as the man (this swings the stern away from him). For example, if a person fell over the starboard side, put the rudder over full to starboard. Stop the engine.

2) When clear of the man, go ahead with the engine. Continue using full rudder.

3) When the heading is 60 degrees beyond the original course, shift the rudder to full over in the opposite direction without having steadied on a course. 60 degrees is proper for many vessels, but the exact amount must be determined through trial and error.

4) Come to the reciprocal of the original course, using full rudder. For example, if your original course was 090 degrees, steady on 270 degrees after turning.

5) Use the engines and rudder to get into proper final position: vessel upwind of the man and dead in the water with the man alongside, well forward of the propellers.



PRIMARY USE	ANALYSIS	
	Advantages	Disadvantages
Used in reduced visibility because it makes good the original track. Used when it is believed that a man fell overboard some time previously but he is not in sight.	Simplicity Makes good the original track	Slow Takes the boat a relatively great distance from the man, which may result in losing sight of him

Williamson Turn

Helping the Victim Aboard

To bring the victim on board, you can:

- if you have enough people, pull in the line then haul the person on board by hand. Always pull the person in over the side. Pulling somebody over the side is safer than pulling them over the stern, where they can slip and injure themselves on the propeller.

- use a winch to pull in the line if the victim is too heavy.

- if you have a boat ladder and the victim is physically able, have the victim climb up the ladder.

- take a dinghy out to the person, bring the person aboard the dinghy, then back to the boat.

- if the person in unconscious and has a life jacket on and there are enough people on the boat to help, send another person into the water with a life jacket on and a safety line attached to bring the victim to the boat, then pull them both in over the side. **This is a last resort.**

5. Fire Prevention

Learning Objective

After this section, you should be able to carry out procedures to reduce or prevent fire hazards at sea.

Testing Conditions

Given a boat with a potential or developing fire hazard, in typical marine conditions and with no advance warning.

Passing Criteria

Identify and correct the potential or developing fire hazard on board.

Key points List of common fire hazards on a boat.

Training aids A "planted" fire hazard on board.

Fire Hazards

Correct any fire hazard immediately.

Here are common fire hazards on a boat:

- ruptured fuel line
- oil-soaked rags
- smoking in unauthorized areas
- light bulbs without protective cages
- damaged electrical cables
- wires running in bilge water
- faulty switches
- too many devices plugged into electrical outlets
- bridged fuse
- arcing motors
- heavy tools dropping on metal surfaces
- grease or soot build-up in the stove exhaust hood, filters and duct work
- unattended towels or wash cloths hanging above the stove to dry.

6. Fire Fighting at Sea

Learning Objective

After this section, you should be able to respond appropriately to a fire at sea.

Testing Conditions

Given a simulated fire on a boat in typical marine conditions and no advance warning.

Passing Criteria

Take the correct measures to fight the fire.

Key points

Fire fighting tactics.
When to retreat.
Fires on outboards.

Fire Fighting

Attack the fire immediately. Any delay allows the fire to build and spread.

Before opening any door, test it with the back of your hand. If the door is hot, cool it down with water and make everybody stand back before opening it.

Fight the fire from a position where you have both:
- unrestricted access to the fire
- an immediate escape route.

Stay calm and work from a crouching position. The lower you are, the less smoke and heat you have to endure.

Use your fire extinguisher. Remember, by law, all 18-26 ft boats must have at least one 5 lb, dry chemical fire extinguisher (Class BI).

Retreat

Get out of the boat immediately if:

- the situation becomes too dangerous
- your escape route is in danger of being cut off
- the fire continues to grow
- gas cylinders or explosives are close by.

Outboards

In an outboard boat, disconnect the portable gas tank and toss it overboard.

7. Surviving in Cold Water

Learning Objective

After this section, you should be able to describe the measures that increase your chances of survival in cold water.

Testing Conditions

Given a simulated incident involving exposure to cold water.

Passing Criteria

Correctly list and describe all appropriate steps to increase the chances of survival.

Key points

What is hypothermia?
Cold water survival positions.
Treating hypothermia victims.

Training aids

Transparency 13, *HELP and Huddle Positions.*
Transparency 14, *Treating Hypothermia Victims.*

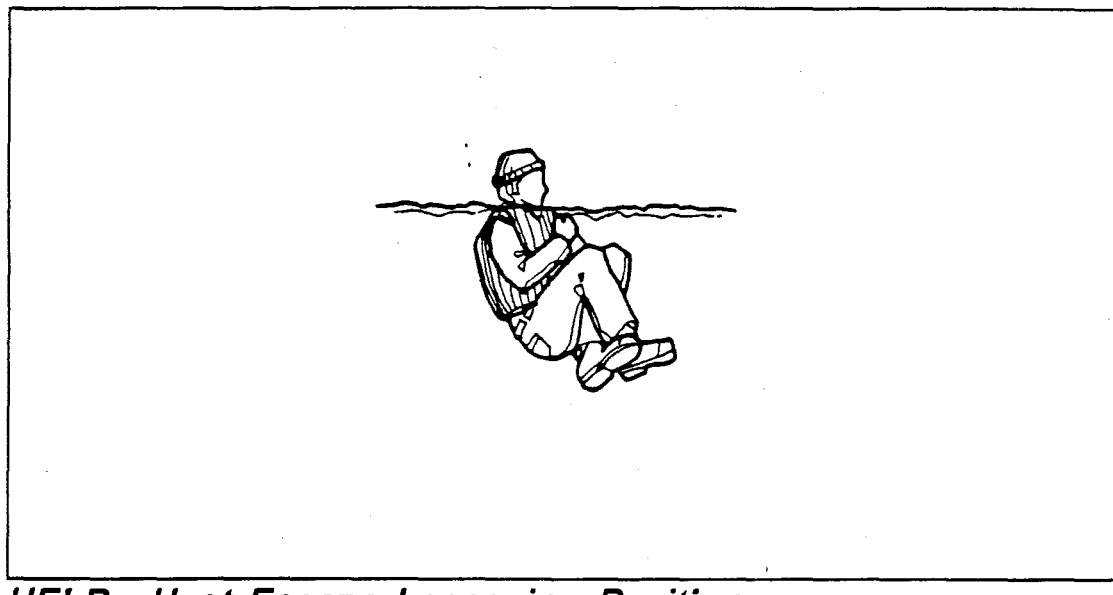
What is hypothermia?

Hypothermia is the loss of body heat. As the body loses heat, body functions slow down. This is a situation that can quickly lead to death.

Hypothermia is the Number 1 survival threat for persons adrift in cold water. Water literally robs the body of heat.

Surviving cold water

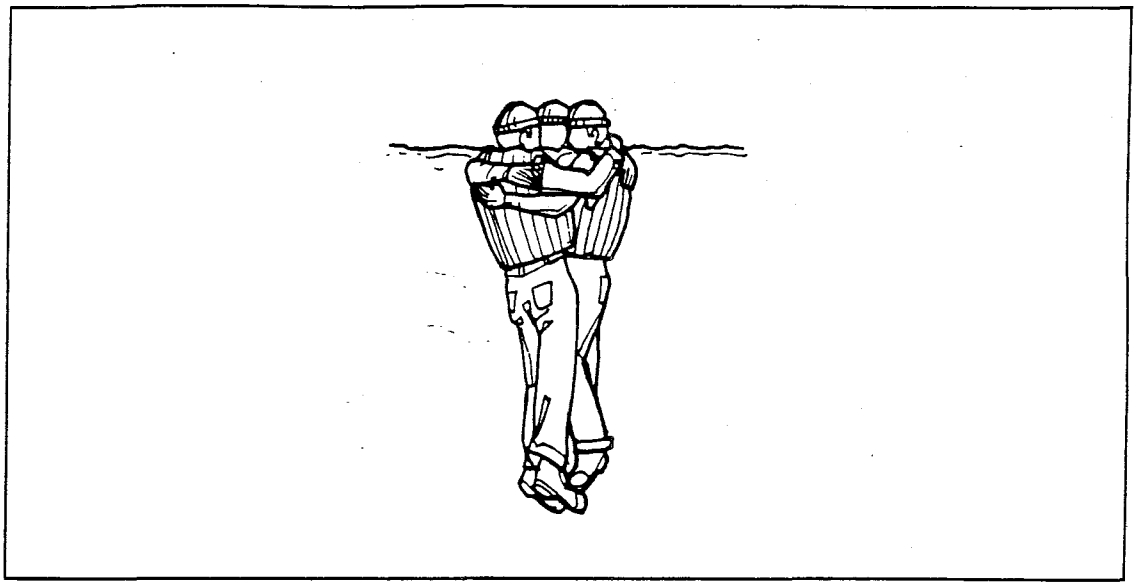
If you're alone in the water, get into the following position:



HELP - Heat Escape Lessening Position

Heat escapes fastest from the head and neck region, the sides of the chest and the groin region. The HELP position protects those areas.

If you're in the water with other people, huddle together like this:



Huddle Position

Treating hypothermia

Here's how to treat hypothermia victims:

- Handle hypothermia victims gently, avoiding jolts that could damage the heart.
- Get the victim out of the water to a dry, sheltered place.
- Remove wet clothing *only* if dry clothing is available or if the environment is warm.
- Prevent further heat loss by covering the head and neck. Wrap the victim in blankets.
- Do not rub the surface of the body.
- Use Rescue Breathing if the victim's breathing has stopped.
- Do not lift the victim by arms or legs. Elevating the limbs could cause a heart attack.
- Apply heat (40 degrees Celsius) slowly and gently to increase the victim's body temperature. Use things like warm towels, water bottles or hand warmers applied to the head, neck and trunk. **Be careful to avoid burns.**
- In severe cases, rescuers could remove their upper clothing and huddle with the victim in blankets or a sleeping bag.
- Give warm drinks such as coffee, tea or cocoa—not alcohol—**only if the victim is conscious and alert.**

- The condition is critical if the victim is getting stiff, is unconscious or showing signs of unconsciousness, such as slurred speech—even though the victim may not be shivering. Get medical assistance immediately.

8. Storing and Using Flares

Learning Objective

After this section, you should be able to describe how to store and use flares correctly.

Testing Conditions

Given at least 5 short-answer questions orally or in writing.

Passing Criteria

Correctly answer all the questions.

Key points

Storing flares.
When to use flares.
Using flares.

Training aids

5 short-answer questions, orally or in writing, on flare storage and use.

Storing flares

Store flares in a watertight container in a cool, dry place.

Flares are good for 4 years from the date they were manufactured.

To dispose of old unused flares, contact the local fire department or police for advice. *Do not throw the flares out.*

When to use flares

Use flares only when there is immediate danger or potential danger to the people on board.

Wait until another boat or a plane is in sight before sending up a flare. Flares are designed to attract attention. If there is no one around to see it, you've wasted the flare.

Hand-held or buoyant smoke flares are for daytime use only. They produce thick orange smoke.

Using flares

The following table lists the different types of flares, how to use them and what precautions to take while using them.

Type of Flare	How to Use	Precautions
Launched	Aim downward at an angle of roughly 60 degrees above the horizon. Aim higher in strong winds.	Never aim directly upwards; never aim so that the flare falls on your boat or another boat. Flares are very hot and will damage or start a fire on the boat. Never aim directly at planes or other vessels searching for you.
Hand-held	Hold the flare in your hand downwind and well clear of the boat.	Don't look directly at the flare while it's burning. Hold the flare away from the boat. Flares are very hot and may damage or start a fire on the boat.
Buoyant or hand-held smoke	Follow the manufacturer's instructions.	Use only on clear days with light wind. Heavy winds will disperse the smoke, making the flare useless.

CAUTION

Launched and hand-held flares have many of the same characteristics as firearms. Handle them with extreme care.

9. Using the Radiotelephone to Get Help

Learning Objective

After this section, you should be able to describe how you can get help using the radiotelephone.

Testing Conditions

Given at least 5 short-answer questions orally or in writing.

Passing Criteria

Correctly answer all the questions.

Key points

The emergency radio channels.
What is VHF Channel 16?
Calling for help.
Calling for help in less dangerous situations.

Training aids

Transparency 15, *Sending a Distress Call.*
5 short-answer questions, orally or in writing, on using the radiotelephone to get help.

You must qualify for a VHF radio licence. This teaches you how to use a radio in emergencies.

Emergency channels

The Canadian Coast Guard monitors two radio channels 24 hours a day for distress calls. The channels are:

- VHF Channel 16 (156.8 MHz)
- MF 2182 kHz.

As well, all boaters with radiotelephones monitor VHF Channel 16 continuously.

VHF Channel 16

VHF Channel 16 is the calling channel used to:

- establish routine radio contacts
- send out distress signals.

Except for distress calls, no conversation is allowed on Channel 16. Once you establish radio contact with somebody, you must switch immediately to another channel and conduct your business there.

In the case of distress calls, you can stay on Channel 16 for as long as it takes.

Calling for help

Here is how to call for help in a life-threatening situation:

1. **Select VHF Channel 16.** Use MF 2182 kHz as a backup if Channel 16 doesn't work or is busy.

2. **Repeat "Mayday" 3 times.**

3. **State the following information:**
   - the name of your vessel
   - your position
   - the trouble you're in
   - your radio call sign

- the number of persons on board
- the help you need.

4. **Wait for a response.** If you don't hear anything, repeat the message until you get an answer.

Less serious problems

If there is no immediate danger to life or property but you still need assistance, repeat "pan pan" 3 times instead of "Mayday."

10. Responding to Distress Calls

Learning Objective

After this section, you should be able to respond appropriately to distress calls.

Testing Conditions

Given a surprise simulated distress call in typical marine conditions.

Passing Criteria

Take the steps required to respond to the distress call.

Key points

Responding to distress calls.
Towing a disabled boat.

Training aids

Transparency 16, *Responding to a Distress Call.*
A simulated distress call.

Responding to distress calls

Your radio must be tuned in to VHF Channel 16 at all times. Make sure the volume is loud enough so you can hear any incoming call.

If you hear a distress call:

1. **Listen -- do not transmit yet.**

2. **Determine if you are you the closest, best equipped boat available to come to the rescue.**

3. **If you decide you are *not* the logical boat to come to the rescue, maintain radio silence.** Keep monitoring the frequency closely for further developments.

4. **If you decide you *are* the logical boat to come to the rescue, transmit a reply.** Acknowledge the other boat, give your boat's name and radio call sign, and state: "Received Mayday."

5. **When the other boat acknowledges your call, give them your position, your estimated time of arrival, and speed towards the scene.**

6. **Start taking notes to include in your log later.**

Towing a Disabled Boat

If you need to tow a disabled boat, follow this procedure:

1. Make sure everyone on the disabled boat has a life jacket on.

2. Approach the disabled boat so your boat is facing the wind to avoid drifting into the boat or overshooting it.

3. When you cross the disabled boat's bow, pass or accept the towing line.

4. Attach the towing line to a strong point on your boat.

   The other end of the towing line should be attached to the disabled boat's **towing bridle**. A towing bridle is a chain harness attached to the bow of a boat.

5. Once the tow line is attached, make sure everyone is off the bow of the disabled boat.

6. Move ahead slowly, gradually letting out the towing line until it is taut. Find out what the disabled boat's maximum speed is. Don't exceed that speed.

7. Once in tow, make sure someone is steering the disabled boat.

8. Maintain communication with the disabled boat while under tow.

9. Position one person at the stern to make sure the line stays taut so it won't get caught in your propeller. This person can also accept hand signals from the disabled boat.

Useful Terms

HELP position	for Heat Escape Lessening Position. A curled up position recommended in cold water. Designed to slow the loss of body heat and increase chances of survival.
hydrostatic release	the mechanism that allows a life raft to detach itself from a sinking boat.
hypothermia	a life-threatening medical condition brought on by loss of body heat.
immersion suit	a full-body wetsuit designed to protect the wearer from cold and exposure to the water.
kill switch	a switch attached to the helmsman. If the helmsman is thrown from the controls in rough seas, the kill switch automatically shuts down the engine.
life jacket	a u-shaped flotation device that has ties at the neck and waist.
life raft	a small, inflatable, rubber raft.
Mayday	a distress call. Life or property in immediate danger.
painter	the line on a life raft that you pull to inflate it.
pan pan	a distress call. Life or property in no immediate danger.

Personal Flotation Device (PFD)	a vest or jacket that has a thin, buoyant lining. Designed for constant wear while on a boat.
sailing plan	a log filled out giving details of a planned boat trip. Left with a responsible person on shore in case of an emergency.
towing bridle	the chain harness at the bow of a boat being towed that the towing line is attached to.

Further Reading

To find out more about emergencies at sea, see the following pamphlets and books:

The Boating Emergency Manual, written by Tony Meisel, published by Collier Books: New York, 1989.

Cold Water Survival, published by the Canadian Red Cross Society.

Fire Extinguishers, published by Transport Canada.

A Guide to the Radiotelephone Operator, published by the Department of Communications.

Marine Pyrotechnic Distress Signals, published by Transport Canada.

Marine Weather Hazards Manual: A Guide to Local Forecasts and Conditions, published by Environment Canada.

Safe Boating Guide, published by the Canadian Coast Guard.

The Small-boat Handbook, written by David Richey, published by Thomas Y. Crowell, Publishers: New York, 1979.

Small Fishing Vessel Safety Manual, published by the Canadian Coast Guard.

Using Environment Canada's Marine Weather Services, published by Environment Canada.

Vessel Safety Manual, published by the North Pacific Fishing Vessel Owner's Association.

Illustration Credits.

From David Richey: Warning Flags, page 82.

From *Marine Weather Hazards Manual*: Marine weather forecasts, page 7-12.

From *Small Fishing Vessel Safety Manual*: Small Craft Warning and Gale Warning, page 73; Storm Warning and Hurricane Force Warning, page 74; HELP and Huddle Positions, page 89.

Exercise 1

Complete this exercise by yourself. Work from memory as much as possible. Do not consult your notes or the references unless necessary.

You have 45 minutes to complete the exercise.

1. What information is missing from the following sailing plan?

   Departure date and time, number of hours or days your boat can stay under power, estimated time of return, times you'll call in.

2. Where can you find marine forecasts?

3. What does a red triangular pennant on the water stand for?

4. While boating at night, you see a white light set above a red light. What does it mean?

5. Describe a storm warning flag.

6. What does a white light between 2 red lights stand for?

7. What steps should you take when bad weather threatens?

8. When you are attempting to bring the boat alongside a victim in the water, how do you decide which maneuver is appropriate?

9. If you must pull a victim out of the water into the boat, what is the safest place to do this?

10. What procedure is required if your outboard boat is on fire at sea?

11. Why is it important to fight a fire from a crouching position?

12. What can you do to improve your chances of survival if you are adrift in cold water?

Exercise 2

Complete this exercise by yourself. Work from memory as much as possible. Do not consult your notes or the references unless necessary.

You have 45 minutes to complete the exercise.

1. When should you use flares?

2. How should you aim a launched flare?

3. What kind of flare should you use at night?

4. When should you use VHF Channel 16?

5. What should you do if VHF Channel 16 doesn't work or is busy and you need to call for help?

6. What information should you give when calling for help?

7. In what situations do you repeat "pan pan" 3 times?

8. If you hear an incoming distress call, in what situation should you transmit a reply?

9. What should you reply to an incoming distress call?

10. If a boat in distress acknowledges your call, what should you do next?

Aboriginal Fisheries

Training Program

SERIES 10 - Small Boat Safety

MODULE 10-8

Docking and Dropping Anchor

Reference Manual

Contents

Introduction

The Aim of this Module

This module is designed to help you properly moor or anchor a boat.

You should learn from the training activities, not from the manual. As the name implies, the Reference Manual is for reference purposes only: use it only when you need to refresh your memory.

Learning objectives

The course is divided into sections with different **learning objectives.**

A **learning objective** is a task you should be able to perform at the end of each section. The learning objective is contained in a grey box at the start of each section.

Evaluation

Testing conditions and **passing criteria** follow the learning objective. They tell you how you will be evaluated. There will be no surprises or trick questions during the evaluation.

How to Use this Manual

To get around in the manual, consult the table of contents.

To know where you are in the manual, check the top and bottom of each page. Start from the upper left corner of the page and move in a clockwise direction. This will tell you:

- what module this is
- what section you're in
- what page you're on.

1. Nylon and Polypropylene Ropes

Learning Objective

After this section, you should be able to compare nylon with polypropylene rope in terms of the advantages, uses and limitations of each.

Testing Conditions

Given at least 5 short-answer questions orally or in writing.

Passing Criteria

Correctly answer 4 of the 5 questions.

Key points Advantages and disadvantages of nylon and polypropylene rope.

Training aids 5 short-answer questions comparing nylon rope with polypropylene rope.

Nylon Rope

Advantages

- strong
- lightweight
- recovers when stretched
- resistant to fuel and oil
- doesn't float; can be used for an anchor line.

Disadvantages

- expensive.

Polypropylene Rope

Advantages

- strong
- lighter than other synthetic fibers
- easy to work with
- easy to store
- inexpensive.

Disadvantages

- doesn't recover as well as nylon when stretched
- floats; should not be used as an anchor because it tends to counteract the anchor.

2. Rope Care

Learning Objective

After this section, you should be able to describe how to take good care of ropes.

Testing Conditions

Given a typical dock.

Passing Criteria

Identify the lines that were not cared for properly.

Key points Rope care guidelines.

Training aids Transparency 1, *Parts of a Block.*

Rope Care Guidelines

Here are guidelines to follow in caring for ropes:

Know the strength of the rope and don't strain it excessively. As a rule, choose a rope 5 times as strong as you need.

Avoid sudden shocks and jerks. A sudden shock or jerk can snap a rope that could otherwise withstand the load with no difficulty.

Wrap anti-chafing material such as electrician's tape or short piece of hose around the rope where it rubs against the boat and other equipment. Constant rubbing and scraping can wear out and even snap the rope.

Make sure the blocks and the grooves in the sheaves are the right size for the rope. The rope shouldn't rub unintentionally against parts of the blocks.

Regularly inspect and lubricate the blocks.

Never put a load on a kinked rope, or pull a kinked rope through a block. You will seriously damage the rope fibers.

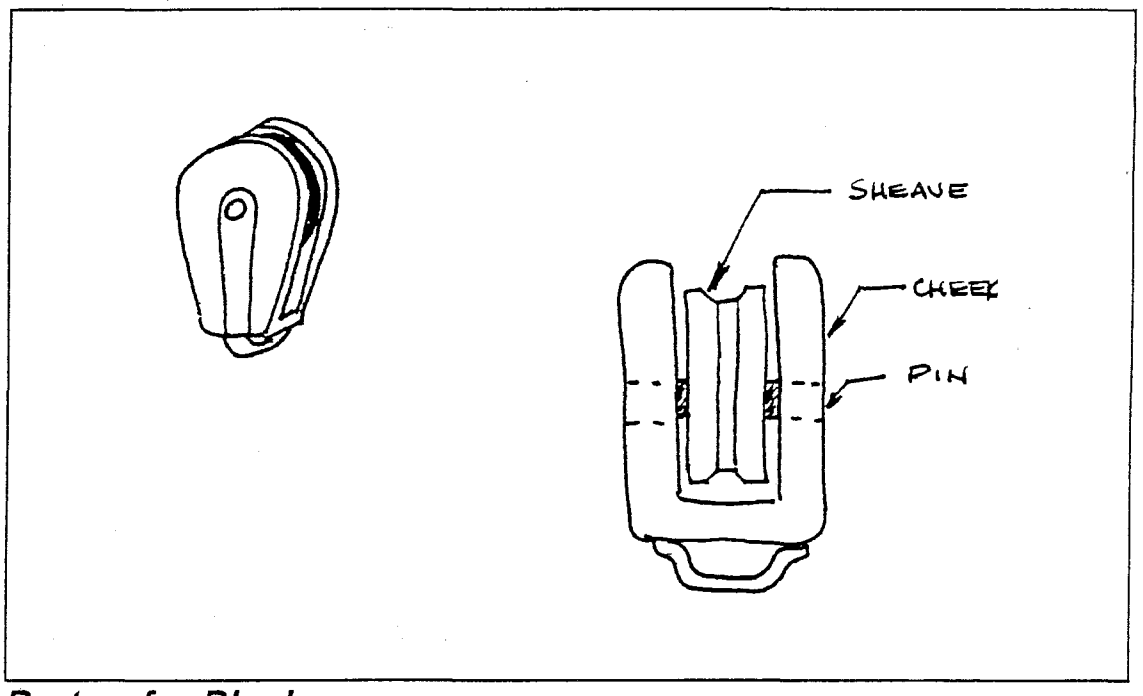
After heavy wear, switch the ends of the rope around. This way, the less worn part of the rope gets the heavier duty. **Note:** Cut off the ends of the rope before you make the switch.

Don't expose the rope to oil, gasoline, paint or other chemicals.

Keep the rope clean. Dirt can act as an abrasive and damage the rope fibers.

Store the rope out of direct sunlight and the elements. Sunlight rots the synthetic fibres.

Avoid excessive heat or cold. Heat can melt synthetic ropes. Ice crystals can act as an abrasive and damage the rope fibers.



Parts of a Block

3. Common Rope Splices and Knots

Learning Objective

After this section, you should be able to make and use common splices and knots.

Testing Conditions

Given ropes and tools in typical marine conditions.

Passing Criteria

Correctly make and use at least 5 common knots and splices selected at random by the trainer.

Key points

Common knots.
Common splices.

Training aids

Transparency 2, *Common Knots.*
Transparency 3, *Splices.*

Knots and Splices

A **knot** is used to:

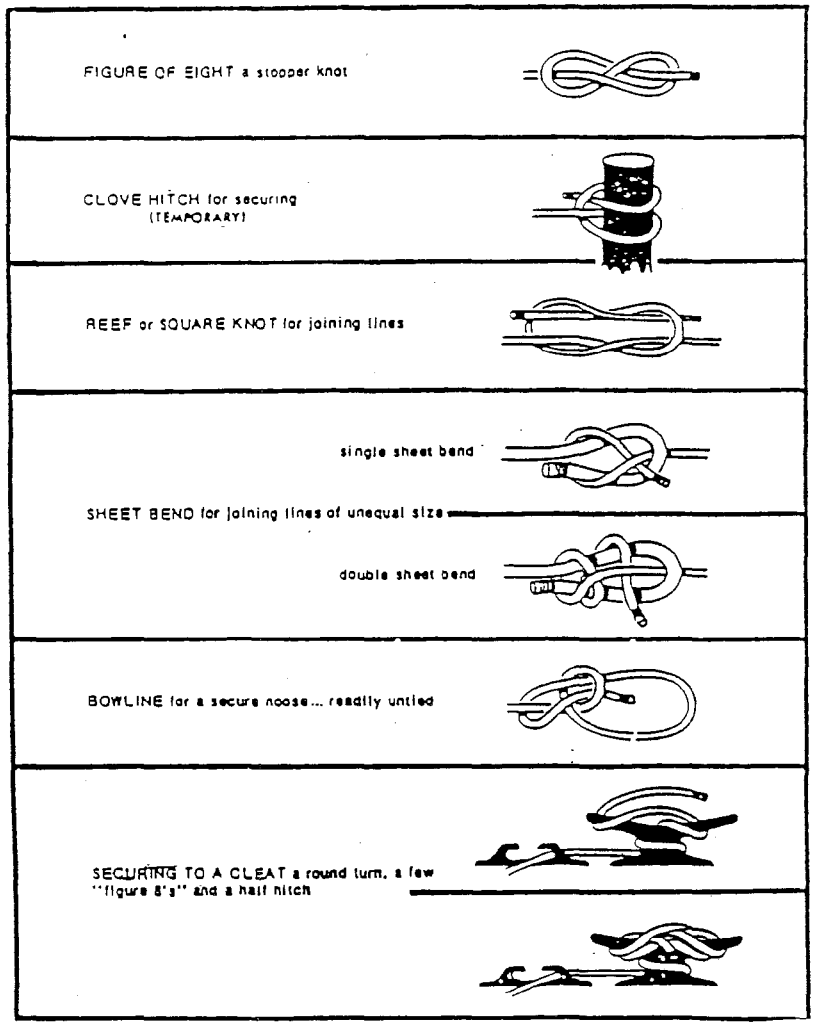
- form a temporary loop at the end of a line
- put a stopper in the line
- secure a vessel
- join 2 lines of equal or unequal size temporarily.

A **splice** is used to:

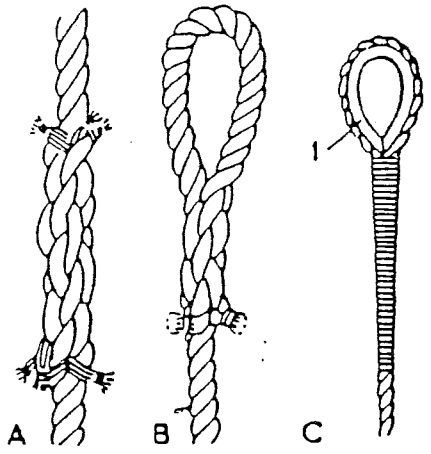
- join 2 ropes together permanently
- form a permanent loop at the end of a line.

Knots

Here is a diagram of common knots:



Splices Here is a diagram of 3 common splices:



A. SHORT SPLICE. B. EYE SPLICE.
C. THIMBLE EYE

4. Docking

Learning Objective

After this section, you should be able to moor a boat to a dock under varying wind and current conditions.

Testing Conditions

Given a boat in at least 3 different docking situations.

Passing Criteria

Correctly moor the boat to the dock in each situation.

Key points

Docking guidelines.
Docking procedures.
2 kinds of moorings.
Undocking procedures.

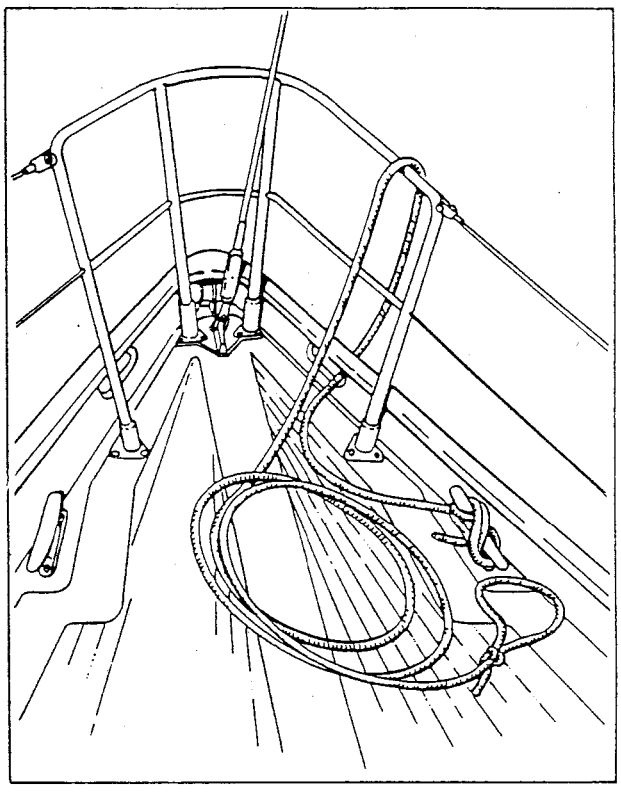
Training aids

Transparency 4, *Docking.*
Transparency 5, *Mooring.*
Transparency 6, *Undocking.*
Transparency 7, *Cleating a Line.*

Docking guidelines

Get the mooring lines ready. Secure the lines to deck **cleats** then pass them through the **hawses** and back over the **bulwarks.** Leave the line loosely coiled on deck, ready for use.

It's the same old story: A yacht approaches its mooring amid hectic scrambling. The mooring line is clawed out of the rope locker and passed to the dock. Naturally the line is all twisted and fouled up and in the scramble the end of the line goes overboard into the water because the skipper completely forgot to belay his end...



...That's why the first commandment, prior to docking, is: Clear the mooring lines! The lines are carefully belayed and then passed through the chock or hawsehole and over the lifeline and neatly coiled on the deck. As a matter of course, the mooring lines are made fast on the dock with the boat alongside, using the least amount of line. Haul the major portion back aboard and make it fast on deck.

Specific terms: A **cleat** is a horn-shaped fitting around which a rope can be secured. **Bulwarks** are the sides of a boat above the upper deck. A **hawse** is the pipe or hole in the bulwarks through which mooring and anchor lines pass.

Always approach the dock dead slow at an angle.

Approach the dock into the wind or into the current, whichever has the greater effect on the boat.

If you have a right-hand propeller, dock the boat on the port side. A **right-hand propeller** turns clockwise when viewed from astern. At slow speeds in reverse gear, right-hand propellers tend to swing the rear of the boat to port. Left-hand propellers tend to swing the rear to starboard in reverse gear. Use this effect when docking: angle in the bow and let the propeller swing the rest of the boat up against the dock.

For mooring lines, use only spliced loops. Do not use knotted loops.

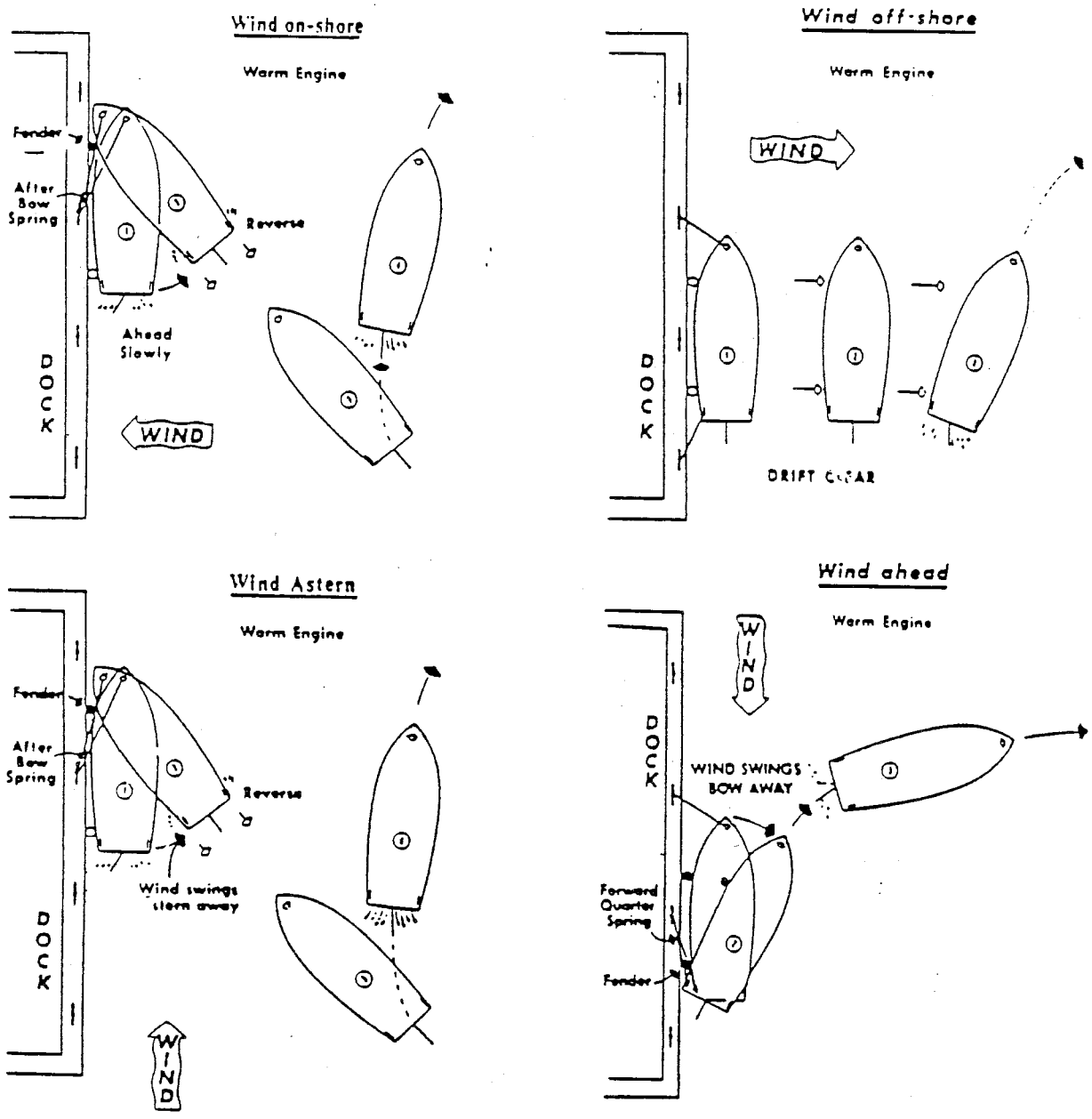
In tidal waters, leave enough slack in the mooring lines to allow for low or high tide.

Keep the engine running until the boat is secured to the dock.

Undocking procedures

Here is how to undock a boat in 4 wind situations.

Note: The same procedures apply to currents if the current has a greater effect on the boat than the wind.



5. Using Cleats, Rings, Rails, Pilings and Fenders

Learning Objective

After this section, you should be able to correctly use cleats, rings, rails, pilings and fenders.

Testing Conditions

Given a typical fishing dock.

Passing Criteria

Correctly identify the items that fishermen used incorrectly.

Key points

How to tie up to cleats.
How to tie up to pilings.
How to tie up to bollard and rings.
How to tie fenders.

Training aids

Transparency 7, *Cleating a Line.*
Transparency 8, *Lines on Piles.*
Transparency 9, *Bollards and Rings.*
Transparency 10, *Fenders.*

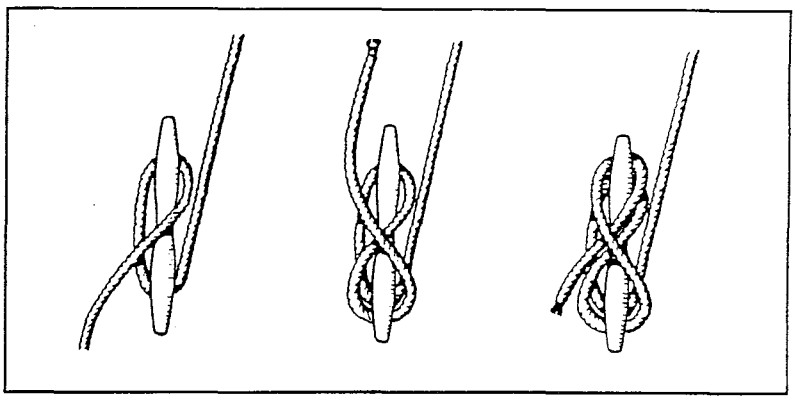
Cleats

Here's how to tie up properly to a cleat:

1. Make at least one full turn around the base of the cleat with the rope before going over the horns.

2. Criss-cross the rope over the horns in a figure-eight.

3. Finish with a half-hitch over one horn.



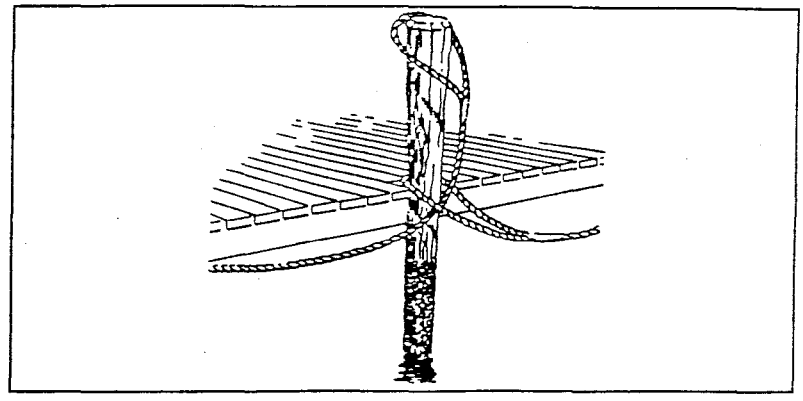
Cleating a Line

There should be no knots or hitches in the line that could jam under tension in the cleat.

Pilings

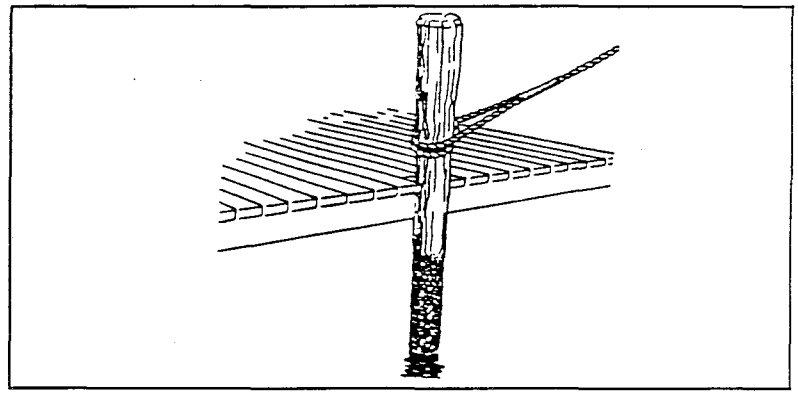
A **piling** is a long, slender column driven into the ground to support the dock. It is known as a **pile.**

If another boat is moored to a piling you want to use, slip the eye of your line up through the eye of the other line, like this:



By securing your line this way, the skipper of the other boat doesn't have to wait for you to cast off.

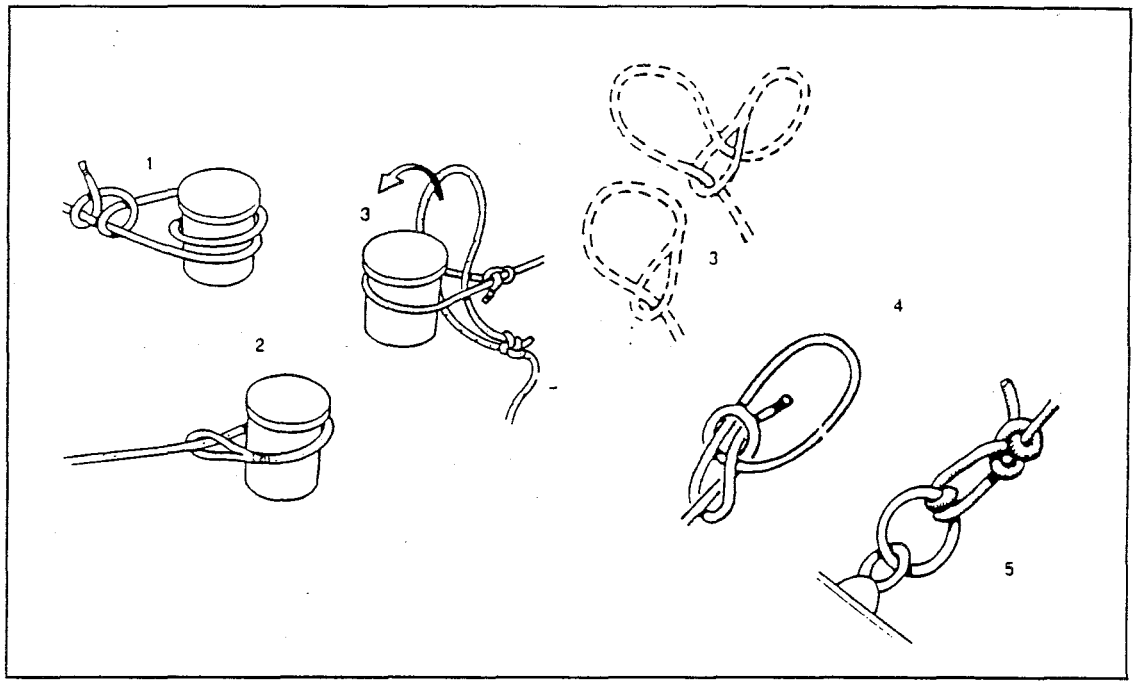
If you expect the tide to come in, or the piling is low relative to your hawses, the line may slip over the top of the piling. In that case, make an extra turn around the piling with the *eye* of your line, like this:



Bollards and rings

A **bollard** is a post on the dock around which a rope can be secured.

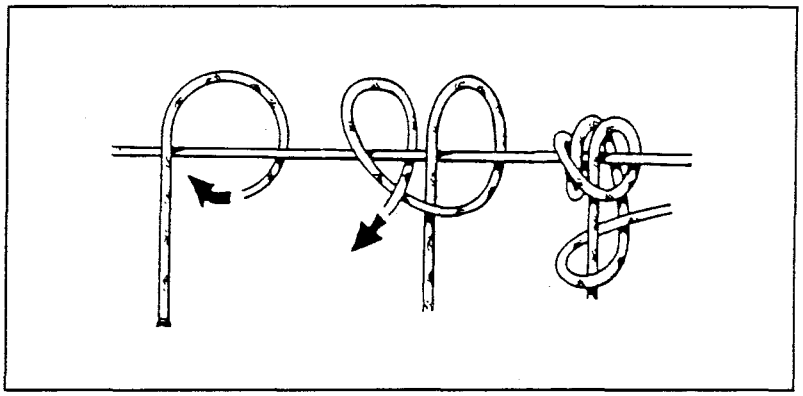
Here are 5 ways to tie up to bollards and ring bolts:



Fenders

A **fender** is a protective device placed between a boat and a dock or between 2 boats to prevent them from bumping and scraping into each other. Fenders are usually round and made of rubber or foam.

Hang at least 3 fenders over the side of the boat before docking. In normal weather conditions, you can tie the fenders to the railings along the side of the boat. Here are the correct ways to tie fenders to a railing:



Tying Fenders

If you don't have railings, or if the forecast calls for big swells, tie the fenders to sturdy deck gear such as cleats or **bitts.**

A **bitt** is a metal or wooden post fixed on the deck of a boat for securing lines.

6. Ground Tackle

Learning Objective

After this section, you should be able to use different forms of ground tackle.

Testing Conditions

Given at least 5 short-answer questions.

Passing Criteria

Correctly answer 4 of the 5 questions.

Key points

Ground tackle: rode and anchor.
Gear to secure the rode: bow roller, riding chocks, wildcat, capstan, chain locker.

Training aids

5 short-answer questions on ground tackle.
Transparency 11, *Scope and Lights*.
Transparency 12, *Types of Anchors*.

Ground Tackle

Ground tackle is all the gear necessary to anchor a boat. It consists mainly of:

- a rode
- an anchor.

Rode

The **rode** is all the gear between the boat and the anchor. The rode includes rope lines or chains, and connecting swivels or shackles.

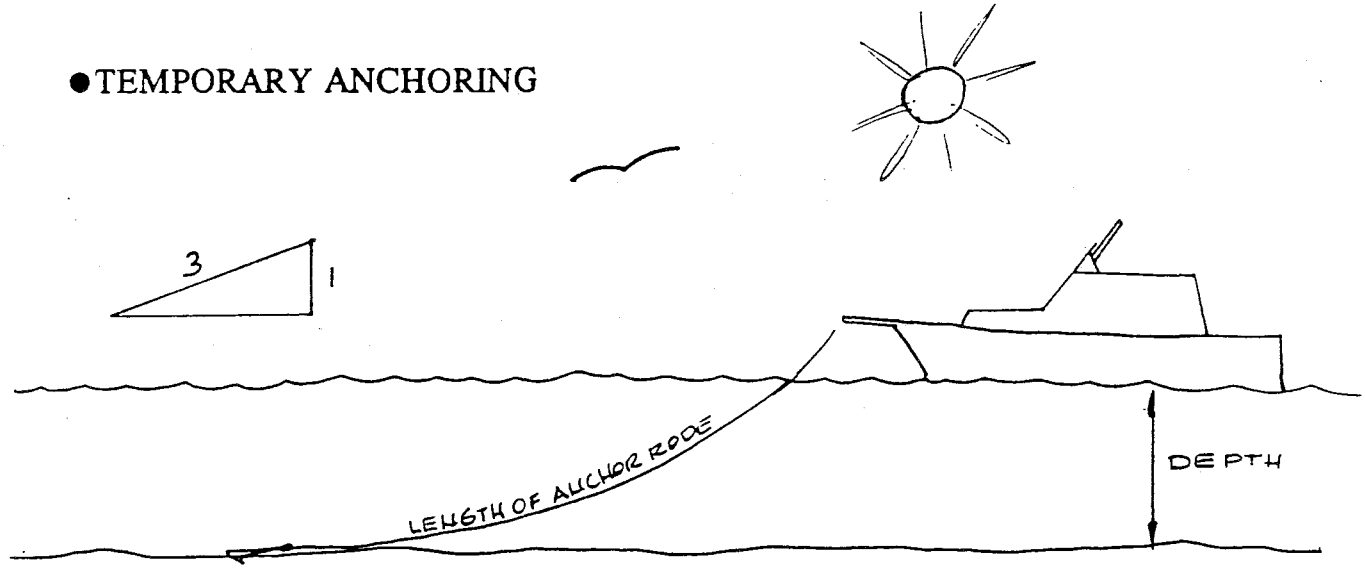
The **scope** is the length of a rode, measured from the hawse or bow roller to the anchor, compared to the depth of water. Too little scope and the pull of the boat may lift the anchor off the bottom.

A 3 to 1 scope is the minimum required for a temporary anchorage. In 10 feet of water put out 30 feet of rode.

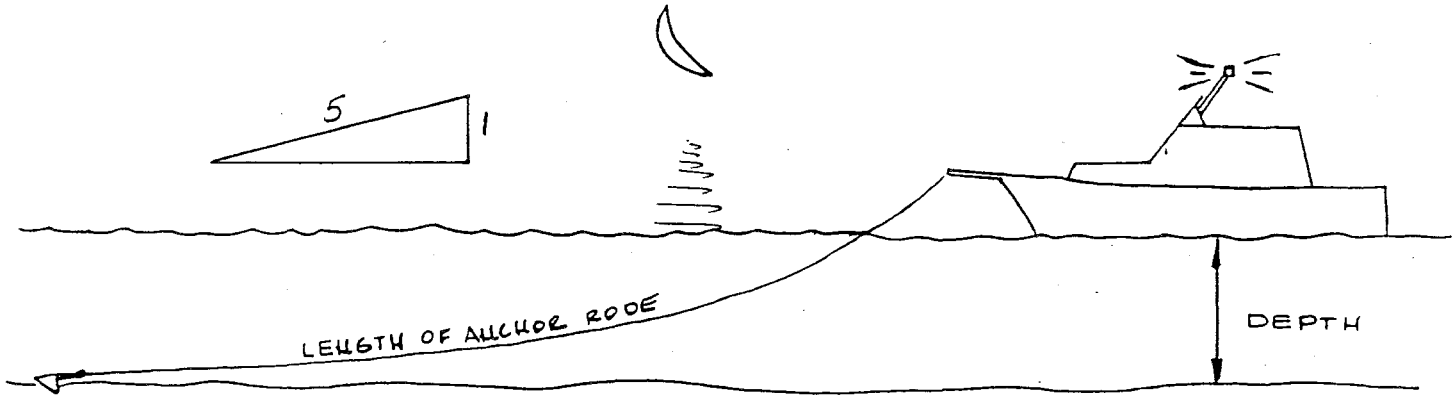
A 5 to 1 scope is the minimum required for an overnight anchorage. In moderate to severe weather conditions, increase the scope to 8 to 1 or even 10 to 1. Always choose your scope for the maximum depth expected during your stay. **Remember:** The life of your boat lies in the length of your rode.

Scope and Lights

- TEMPORARY ANCHORING



- OVERNIGHT ANCHORING



You'll use the following gear to secure the rode:

- bow roller
- riding chocks
- wildcat
- capstan
- chain locker

A **bow roller** is a device in the bow that allows the rode to be paid out or heaved in. It also serves to secure the anchor when the vessel is underway.

A **riding chock** is a device attached to the anchor chain or line that takes the strain off the winch when the vessel is riding at anchor. Also known as a **stopper** or a **dog**.

Attach these devices to the anchor chain once you set the anchor.

A **wildcat** is the sprocket wheel that engages the anchor chain as it is being hauled in.

Always lock the wildcat when the boat is riding on the chain.

A **capstan** is the vertical or horizontal drum fitted to a winch to take the line or chain. Also known as a **gypsy head**.

When you're working near a capstan, stand as far back as possible and watch your hands. Where possible, stand at right angles to the direction of the pull.

A **chain locker** is a container that accepts the line or chain after it passes over the capstan.

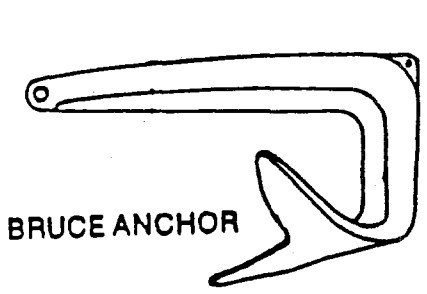
Make sure the end of the line or chain is securely fastened to the chain locker to prevent losing the ground tackle overboard.

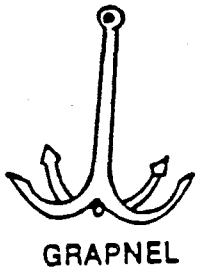
Anchor

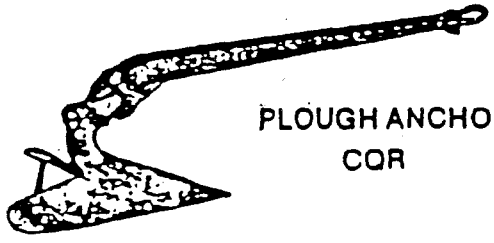
Here is an overview of common types of anchors:

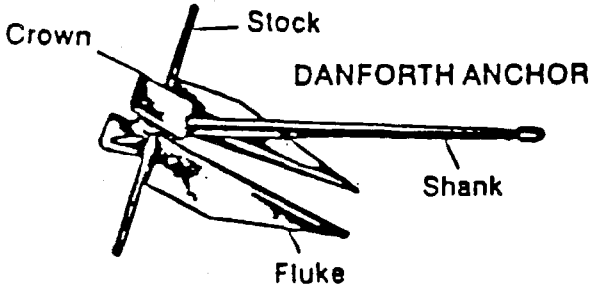
- **Bruce anchor** - all purpose.
- **Grapnel** - for rock, coral, matted weed.
- **Plough anchor or 'burying' anchor** - for sand, soft mud, gravel.
- **Fisherman's anchor or 'Yachtsman's' anchor** - for any kind of bottom.
- **Danforth anchor** - for sand or mud.

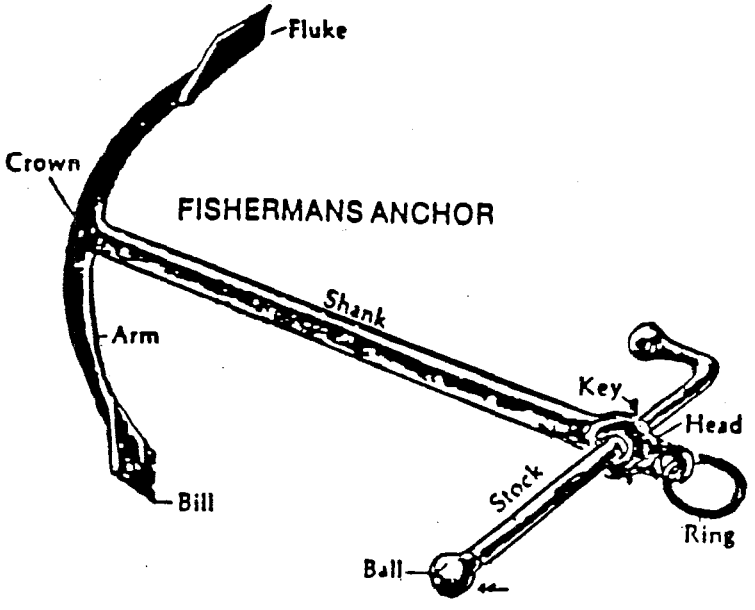
Types of Anchors











7. Where to Drop Anchor

Learning Objective

After this section, you should be able to select an anchorage.

Testing Conditions

Given actual marine conditions and no advance warning.

Passing Criteria

Tell the good anchorage sites from the bad sites.

Key points Finding a suitable anchorage.

Finding a good anchorage site

Here are some guidelines to find a suitable place to drop anchor:

Study your charts. Charts are your best guide to finding good sites.

Here is what to look for on your charts:

Find a site with a good holding bottom for your anchor.

Find a site protected from the wind and current.

Avoid water that's too deep or too shallow. In deep water, you'll have a harder time getting the anchor to set. In shallow water, the outgoing tide may leave you high and dry. Choose water that measures from 10 to 50 feet deep.

Avoid areas where you'll interfere with boat traffic.

Make sure you have enough swing room to allow for a change in the direction of wind or current.

Finding a Good Anchorage

- Good holding bottom
- Adequate water depth
- Swing room
- Protection from current, weather and traffic

8. Setting and Retrieving Anchors

Learning Objective

After this section, you should be able to correctly set and retrieve anchors.

Testing Conditions

Given control of a boat with the appropriate ground tackle on a least 2 occasions in different circumstances.

Passing Criteria

Correctly follow the procedures to set and retrieve anchors.

Key points Setting an anchor.
Retrieving an anchor.

Training aids Transparency 13, *Setting an Anchor.*

Setting an anchor

Here is how to set an anchor:

Point the bow of the boat upstream or upwind, whichever has the most effect on the boat.

Lower the anchor until it touches bottom.

Determine the water's depth from the anchor chain or line or with the boat's depth sounder, if it's fitted for a suitable scope.

Calculate how much rode you need for a suitable scope. Example: For a 7 to 1 scope, in 10 feet of water, you need a 70-foot-long rode.

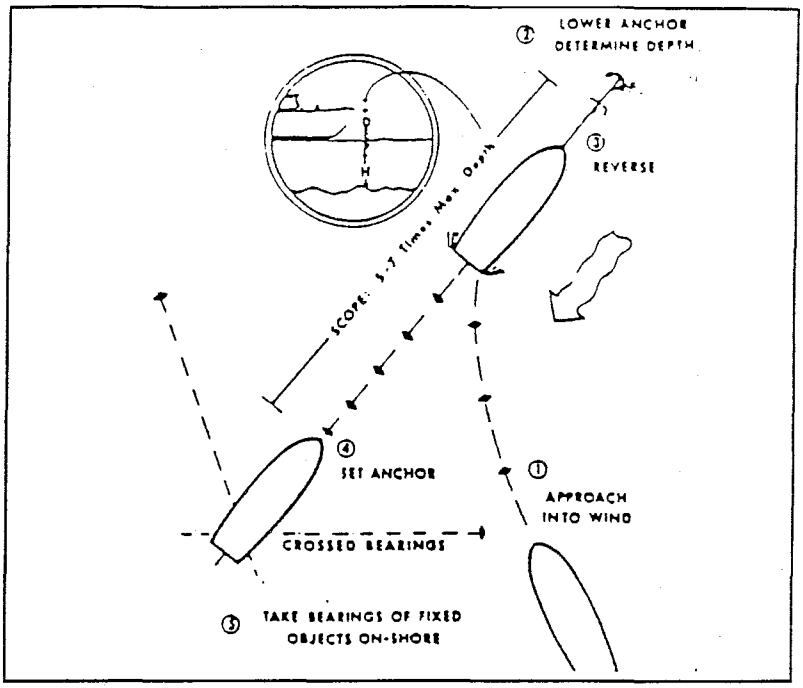
Back the boat up slowly as you pay out the rode.

After paying out the proper length of rode, come to a stop.

Attach a riding chock to the anchor chain or line and lock the wildcat. Operate the engine slow astern until the anchor holds.

Shut down the engine.

While you're at anchor, stay alert to make sure the anchor doesn't drag or come free unnoticed. Use landmarks as reference points.



Setting an Anchor

Retrieving an anchor

Retrieving an anchor is also known as **weighing anchor**. Here is how to weigh anchor:

Detach the riding chock from the anchor chain or line. Unlock the wildcat.

Move towards the anchor slowly under power.

Pull in the anchor line or chain as it slackens.

Once you're over the anchor, pull it up. Be careful not to hit the anchor against the hull.

If the rode had a nylon line, coil the line up loosely on deck and leave it to dry. Don't expose it to sunlight longer than necessary.

9. Beaching a Boat

Learning Objective

After this section, you should be able to beach and unbeach a boat.

Testing Conditions

Given control of a boat in typical near-shore conditions.

Passing Criteria

Correctly follow the recommended procedures to beach and unbeach a boat.

Key points Beaching procedure.

Beaching procedure

First, consider whether beaching your craft is a good idea. Is the boat beachable? Are you skilled enough to pull it off safely? Are the waves too big? *Never attempt to land on a rocky shore when there are breakers or a big swell.*

Approach the beach carefully. Make sure you are in control of your craft at all times.

Keep the boat at right angles to the breakers.

Land in a comparatively sheltered spot. Look for the lee of a cliff, rock or pier.

In a small outboard boat in choppy seas, approach the shore stern first. Let the bow take the oncoming waves. Ship the engine and maintain control with oars. You can also drop anchor and pay out the line until you reach shore.

If you leave your beached boat unattended for any amount of time, check the tide table for the area. See Module 10-4, Learning Objective 4, for more information on tide tables.

Beaching at high tide

If you beached your boat at high tide, the surf may be a long way from the boat by the time you get back. If the boat is too heavy to drag back to the water, consider anchoring it, stern shoreward, in chest- or hip-deep water before leaving it. See Module 10-4, Learning Objective 2, for information on how to anchor a boat near shore.

Beaching at low tide

If you beached your boat at low tide, rising water might sweep it away by the time you get back. Pull the boat above the shoreline on the beach, if you can, or anchor the boat in shallow water. See Module 10-4, Learning Objective 2.

Approaching Shore

Here are the steps to follow to approach shore in heavy surf:

1. Start from relatively smooth seas just clear of the surf line.

2. Drop the anchor.

3. Make sure you know where swimmers, divers or surfers are relative to your position.

4. Put the engine into neutral.

5. Pay out the anchor rope and let the boat drift backwards toward the shore. The anchor will keep the surf from dashing the boat against the rocks.

6. Take the following precautions as you approach the shore:
   - always keep an eye out for what's behind you
   - be careful not to let your engine hit bottom
   - be prepared to abort the approach at a moment's notice.

Leaving Shore

To abort an appoach, or to go back out to sea:

1. Apply forward throttle.

2. Retrieve the anchor rope as you go.

3. Recover the anchor.

Useful Terms

bitt a metal or wooden post fixed on the deck of a boat for securing lines.

bollard a post on the dock around which a rope can be secured.

bow roller a device in the bow of the boat that allows the rode to be paid out or heaved in. It also serves to secure the anchor when the vessel is underway.

bulwarks the sides of a ship above the upper deck.

capstan the vertical or horizontal drum fitted to a winch to take the anchor line or chain. Also known as a **gypsy head**.

chain locker a container that accepts the anchor line or chain after it passes over the capstan.

cleat a horn-shaped fitting around which a rope can be secured.

dog see **riding chock**.

fender a protective device placed between a boat and a dock or between 2 boats to prevent bumps and scraping.

ground tackle all the gear necessary to anchor a boat.

gypsy head see **capstan**.

hawse the pipe or hole in the bulwarks through which the anchor line or chain passes.

knot used to form a temporary loop at the end of a line, or to put a stopper in the line, to join 2 lines temporarily or to secure a vessel.

riding chock a device attached to the anchor chain that takes the strain off the winch when the vessel is riding at anchor. Also known as a **stopper** or a **dog**.

rode all the gear between the boat and the anchor. It includes the rope line or chain and connecting swivels or shackles.

scope the length of a rode, measured from the hawse or bow roller to the anchor, compared to the depth. For a scope of 7 to 1 pay out 7 feet of rode for every 1 foot of depth.

splice a method used to join 2 ropes together, or to form a loop.

stopper see **riding chock.**

weighing anchor to retrieve an anchor.

wildcat the sprocket wheel that engages the anchor chain or line as it is being hauled in.

Further Reading

To find out more about the subject, see the following sources:

Practical Seamanship Illustrated, written by Robert Das & Harald Schwarzlose, published by Seven Seas Publishing Co.: Camden, Maine, 1987.

Piloting, Seamanship & Small Boat Handling, written by Elbert S. Maloney, published by Hearst Marine Books: New York, 1991.

Exercise 1

Complete this exercise by yourself. Work from memory as much as possible. Do not consult your notes or the references unless necessary.

You have 45 minutes to complete the exercise.

1. True or False?

   a) Nylon rope is cheaper than polypropylene rope.

      T F

   b) Nylon rope can be used for an anchor.

      T F

   c) Nylon rope recovers better than polypropylene rope after stretching.

      T F

   d) Nylon rope is less resistant to fuel and oil than polypropylene rope.

      T F

   e) Ropes should be stored in any convenient place.

      T F

f) A rope 5 times as strong as you need is generally the best choice.

T F

g) Ropes should not be exposed to oil, gasoline, paint or chemicals.

T F

h) Pulley blocks and the grooves in them can accommodate any size of rope.

T F

i) You can use either a knot or a splice to form a loop at the end of a line.

T F

2. Why is it important to wrap anti-chafing material around ropes where they rub against the boat and other equipment?

3. When should you switch the ends of a rope around?

4. How would you join two ropes together?

5. What is involved in getting mooring lines ready for docking?

6. If your boat has a right-hand propeller, how should it be docked?

7. How should you leave mooring lines in tidal waters?

Exercise 2

Complete this exercise by yourself. Work from memory as much as possible. Do not consult your notes or the references unless necessary.

You have 45 minutes to complete the exercise.

1. What is the general rule for deciding how much rode you need for anchoring your boat?

2. What might happen if a boat is anchored with less than the required scope?

10. What is the first thing to do in weighing anchor?

11. How should you position your boat when attempting to beach it?

12. How should you approach the shore in a small outboard in choppy seas?

3. What is a bow roller used for?

4. What position should the wildcat be in when a boat is riding on the chain?

5. Where should you stand when working near a capstan?

6. Why is it important to be concerned with the depth of the water when anchoring a boat?

7. In what direction should you point the bow of a boat when setting anchor?

8. If you are setting anchor in 12 feet of water, how much rope do you need for a temporary anchorage?

9. What should you be alert to while your boat is at anchor?

10. What is the first thing to do in weighing anchor?

11. How should you position your boat when attempting to beach it?

12. How should you approach the shore in a small outboard in choppy seas?