

07 - Navigation

Competence (Skills)	Knowledge, Understanding and Proficiency	Level Required		Methods for Demonstrating Competence (Qualification Standard)	Criteria for Evaluating Competence (Performance Standard)
		Coxswain Captain	Crew		
Legal aspects and requirements of small vessel operations		X		<ul style="list-style-type: none"> • Understand the scope, purpose and limitations of the Small Vessel Operator certificate • Define vessel, chartered vessel, fishing vessel, passenger-carrying vessel and pleasure craft and understand applicable requirements when a vessel is not considered a pleasure craft • Knowledge of the voyage classifications • Knowledge of the Transport Canada's Small Vessel Inspections and Monitoring Program • Master's responsibility – safety (life, environment and property) and commercial aspects 	
The Canada Shipping Act, 2001 and the Canadian Regulations		X		Basic knowledge of the Canada Shipping Act, 2001 A basic understanding of the provisions of the: <ul style="list-style-type: none"> • Small Vessel Regulations 	

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				<ul style="list-style-type: none"> • Parks and Marine mammals Protection legislations if applicable • Prevention of Pollution from ships and for Dangerous Chemicals Regulations • Small Commercial Safety Guide 	
Documents required for small vessels		X	X	<ul style="list-style-type: none"> • Knowledge of the application for Vessel registration and documents required • Licensed vessels • Vessel markings • Knowledge on who to notify in case of any changes on the certificate of registry • Knowledge of Insurance requirements 	
Ensure application of navigation rules and regulations		X	X	<ul style="list-style-type: none"> • Respect steering and sailing rules for vessels in any condition of visibility • Respect steering and sailing rules 	

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				for vessels in sight of one another <ul style="list-style-type: none"> • Respect steering and sailing rules for vessels in restricted visibility • Understand exemptions to the navigation rules and regulations • Understand sound and light signals • Understand lights and shapes required to indicate ship status and orientation • Respect VHF radiotelephone practices and procedures regulations 	
Regulations & Publications	<ul style="list-style-type: none"> • Be aware of important information in appropriate documents that pertain to specific tasks (including collision regulations, harbour rules, piloting, etc.) • Given various situations, use all relevant publications to collect and Interpret the correct/safe action. 	X	X	Demonstrate a good working knowledge of the collision regulations including the Canadian Notifications and local regulations. Be able to explain them to others and interpret the rules in effect in a given situation. Be aware of the Canada Shipping Act and Boating Restriction Regulations.	Adhere to the spirit of the rules and the best practices of seamanship at all times, and foster the crew's knowledge in this area.
Rules of the Road	Each crewmember during the course of operating the vessel, will demonstrate the application of the rules of the road when	X	X	<ul style="list-style-type: none"> • Vessels in sight of each other overtaking another vessel from an angle of more than 22.5 	

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	presented with approaching power driven vessels from either side, when overtaking, when meeting another vessel head on. Each crewmember will also recognize sailing vessels and give way appropriately. They will observe the practices of good seamanship by passing astern where practicable and making bold, early alterations.			degrees above the beam <ul style="list-style-type: none"> • Power driven vessels meeting head on • When one power driven vessel has the other on her starboard side • Sailing. define determination of tack while under sail • Two vessels sailing on different tacks; starboard tack right of way. • Two vessels on the same tack • When one sailing vessel on port tack sees another sailing vessel but cannot determine which tack they are on they shall give way 	
Navigation	Chartwork <ul style="list-style-type: none"> • chart instruments; • chart information; • buoyage system; • compass; • relevant nautical publications 	X	X	Given applicable navigation equipment and publications	Describe and perform the use of chart work in CCGA activities
Basic Navigation		X	X	<ul style="list-style-type: none"> • Find Lat & Long • Chart out one Lat & Long to 	

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				another Lat & Long <ul style="list-style-type: none"> • Determine TVMDC and Course Heading to the above Lat & Long • Given a speed and determining a distance – Determine Time to Destination • Given a Distance and Time - Determine a speed. • Students will define and chart out the 4 Point Method on the chart • Students will chart out a search pattern chosen by the Instructor 	
Use of marine charts and nautical publications to plan and execute a voyage		X	X	<ul style="list-style-type: none"> • Demonstrate ability to plot a position on the nautical chart • Understand the requirement to carry nautical charts on board • Demonstrate basic nautical chart reading, course and position plotting • Demonstrate the use of nautical publications (List of Lights, Canadian Tide and Current 	

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				Tables, Notices to Mariners) <ul style="list-style-type: none"> • Voyage planning • Voyage planning stages • Putting the plan into action • File a sail plan • While underway 	
Navigation and Chart work	<ul style="list-style-type: none"> • Demonstrate a comprehensive knowledge of charts and chart work, and be able to plot positions using latitude and longitude, visual bearings and radar ranges, simultaneous bearings or bearings taken over time. • Demonstrate ability to use ships head compass, and deviation charts, plot courses and calculate set and drift to plot course made good or course to steer. • Demonstrate ability to compute dead reckoning and estimated positions, and plot using standard chart symbols. 	X	X	<ul style="list-style-type: none"> • Have a comprehensive knowledge of Mercator charts, chart work theory and techniques, including plotting, symbols, and standard markup. • Demonstrate understanding of all related nautical publications including Notices to Mariners, Notices to Shipping, Sailing Directions, • Tide/Current Tables and understand how to use these in conjunction with paper and electronic charts. 	Navigate in all conditions with due regard for the best practices of seamanship.
Charts, Symbols and Nautical Publications		X	X	Each crewmember shall identify the following publications and their uses:	

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				<ul style="list-style-type: none"> • Tide tables. list of lights and radio aids, notice to mariners and Chart no.1 • Each crewmember shall identify it's chart block and compass as well as the chart scale and the following chart symbols: <ul style="list-style-type: none"> • rock awash • rock which covers and uncovers at drying height • dangerous underwater rock • submerged wreck • current symbols/arrows • boat ramp • lifeboat station 	
Practice safe navigation	Understand basic pilotage and navigation practices	X	X	<ul style="list-style-type: none"> • Demonstrate basic chart work in relation to RHIB • Discuss the importance of passage planning • Adapt principles of navigation and chart work to passage planning on RHIB 	

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	Utilize electronic navigational aids effectively			<ul style="list-style-type: none"> • Explain the risks associated with being dependent on electronic aids to navigation • Describe the use of waypoints in RHIB electronic navigation • Describe the use of mapping in RHIB electronic navigation • Describe the use of cross trail-errors in RHIB electronic navigation • Describe the use of sounding lines in RHIB electronic navigation • Describe the use of alarms in RHIB electronic navigation • Describe the use of parallel indexing in RHIB electronic navigation • Explain the advantages and disadvantages of using electronic charts • Explain the accuracy of various navigational systems 	

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	Safe navigation and collision prevention	X	X	<p>A basic understanding of the Collision Regulations:</p> <ul style="list-style-type: none"> • The terms “making way”, “underway”, “risk of collision”, “stand on vessel”, “give way vessel” and “safe speed” • Responsibilities for collision avoidance • The need to keep a proper lookout • Recognition of the signs, lights and shapes carried by vessels • Sound Signaling equipment • International and Canadian distress signals • The benefit and requirement to use a radar reflector • Actions to be taken in sight or out of sight of other vessels in good visibility and in reduced visibility • Navigation lights • Describe navigation lights for small vessels including masthead 	

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				light, sidelights and the stern light <ul style="list-style-type: none"> • Understand the role and use of all-round navigation lights • Understand the role and use of anchor lights • Sound signals • The role and use of shapes on own vessel and observed 	
Latitude and Longitude and Fixing a Position	<ul style="list-style-type: none"> • Each crewmember shall transfer the coordinates chart feature to numbers and vice versa. Each crewmember shall use the latitude scale to measure distances. • Given a set of coordinates, each crewmember will find that position on the chart. 	X	X	<ul style="list-style-type: none"> • Each crewmember shall use the standard formula for writing Lat. and Long. N 48° 51.5', W 123° 44.8' Seconds. • Each crewmember shall identify the interval differences between the latitude scale and longitude scale. 	
Drawing a Course Line	Each crewmember shall take a course from the magnetic rose and transfer that course to a navigable area on the chart. Each crewmember shall take course line and transfer that line to the compass rose and determine its true and relative bearing.	X	X	Each crewmember shall identify the following elements of the compass rose and explain their use in navigation: <ul style="list-style-type: none"> • Magnetic and true rose rings • Area variation and annual 	

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		Coxswain Captain	Crew		
				<ul style="list-style-type: none"> • variation change information • Reciprocal bearings 	
Calculating Time, Speed, and Distance (ETA)	Each crewmember shall measure a distance between two points and calculate an ETA at a given speed for that distance. Each crewmember will use the 6-minute finger method for calculating quick ETAs for speeds in the 12-35 knot range.	X	X		
Chart work Intermediate	Determine position by bearings. Transits or GPS and plot that position on a given chart. Plot a DR position and calculate a course to steer for safe passage counteracting for wind and current, calculate a true course from a magnetic, identify charted features from the picture on the radar.	X	X	<ul style="list-style-type: none"> • Correctly identify chart symbols for land and bottom features, light characteristics, tog signals. • Use the relevant publications for the local areas. 	Consistently use visual geographical cues and chart information for position fixing and verification of information obtained by electronic navigation equipment.
The Canadian buoyage system	Understand the Canadian buoy system	X	X	<ul style="list-style-type: none"> • Demonstrate using vessel models (or equivalent) how to navigate a channel marked by lateral buoys • Demonstrate using vessel models (or equivalent) how to navigate a waterway marked by day beacons • Explain fairway, bifurcation, cautionary, isolated and special 	

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				<p>purpose buoys</p> <ul style="list-style-type: none"> • Explain how cardinal buoys indicate the preferred passage • Understand the significance of Scuba diving buoys and the “diver’s flag” 	
Lateral Buoyage System	Each crewmember shall identify the lateral markers and channel markers in their local area and locate any hazards related to those marks.	X	X	<p>Each crewmember shall identify the following:</p> <ul style="list-style-type: none"> • Lateral markers and buoys Port, Starboard, • Bifurcation and lights and shapes <p>Each crewmember shall explain the correct actions around these navigation aids.</p>	
Cardinal Buoyage System and Special Buoys	Each crewmember shall identify the cardinal and special buoys in their local area and indicate any hazards related to those marks.	X	X	<p>Each crewmember shall identify all of the cardinal buoys, their light and top mark characteristics for North, South, East and West. Each crewmember shall identify an isolated danger marker as well as the following special buoys:</p> <ul style="list-style-type: none"> • cautionary buoy, diving buoy, danger buoy, keep out control 	

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				buoy, hazard buoy, swimming buoy Information buoy	
Aids to Navigation Light Characteristics and Fog Signals	Incidental demonstration only. When operating at night each crewmember shall identify the lit navigation aids in their area by determining their characteristics visually and by chart.	X	X	<ul style="list-style-type: none"> Each crewmember will identify all of the light characteristics in their local area of operation. Each crewmember will identify all (if any) of the fog signals in their patrol area. 	
Navigation Lights	Each crewmember will check and turn on the navigation lights of the SRU at night. Each crewmember shall apply the correct collision regulations when presented with lights on an approaching power vessel, sailing vessel, or small vessel.	X	X	Use overheads or flash cards to display the different light combinations for vessels including: <ul style="list-style-type: none"> Light combinations for a power driven vessel under 50 metres under way and at anchor Small vessels under 12m Display three different combinations for the small powerboats, and vessels using oars Display the options for sailing vessels under 20m and sailing vessels under 7m 	
Navigation Lights - Special Working Vessels		X	X	<ul style="list-style-type: none"> Power driven 	

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				<ul style="list-style-type: none"> • Vessels engaged in fishing • Vessel at anchor • Vessels engaged in trawling • Vessel engaged in towing • Pushing • Towing >200m • Towing <200m • Barge (all sizes) • Tow width .25m • Partially submerged object • Vessels restricted in their ability to manoeuvre • Vessels not under command • Vessels engaged in minesweeping 	
Marine weather and marine forecasts		X	X	<ul style="list-style-type: none"> • Understand the origin and reliability of a marine forecast and where one can be obtained • State the marine wind speed categories • Understand the significance and difference of the marine weather warnings, small craft warnings, gale, and storm warnings 	

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				<ul style="list-style-type: none"> • Association between wind shift and the movement of a barometer • Know small vessel operating procedures in bad weather • Understand the significance of the various sea states and how they affect small vessel operation including land effects and deflection • Understand the danger associated with thunderstorms, squall line recognition • Understand the conditions that lead to Icing • Associate the forecasted weather effect with loading a small vessel 	
Meteorology	<p>Identify oncoming weather through observation of weather maps, forecasts and observable weather such as approaching warm and cold fronts.</p> <p>Interpret the current and forecasted weather will have on the vessel, crew, and preparations</p>	X		<p>Read weather maps and identify systems that present a possible hazard to safe passage. Read surface charts and determine significant wave heights and wind speeds. Describe local hazards, e.g. tide rips, outflow</p>	<p>Operate the vessel with due regard to present and predicted weather conditions. Understand the vessel's and crew's weather limitations while assessing the risk levels according to SRU priorities.</p>

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	needed prior to departure. Identity and use caution when operating in known weather hazards like outflow winds, tide rips, and currents.			winds, icing conditions.	
Tides and Weather	Each crewmember will use basic recorded tide information and apply secondary port corrections and daylight saving if applicable to obtain local tidal information.	X	X	<ul style="list-style-type: none"> Each crewmember will obtain the weather and identify the best source for marine weather for their area. They will also identify any local weather hazards for the area. Each crewmember will locate and record the local tidal information. 	
Use of radar for navigation safety		X	X	<p>Knowledge of the basic principle of radar and its functioning:</p> <ul style="list-style-type: none"> Start-up procedure Function and effect of main commands Interpretation of the radar image <p>Ability to use radar for positioning. Identification of radar marks useful for navigation</p> <ul style="list-style-type: none"> Bearing-taking and distance measurement by radar Understanding the use of radar 	

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				for collision avoidance	
Determination of a vessel's position using electronic navigation aids		X	X	<p>Ability to correctly use the GPS:</p> <ul style="list-style-type: none"> Starting procedure and functioning of the device Correct use of data supplied by the instrument Recognizing possible errors, lack of reliability and the need to double check 	
Use of a magnetic compass for taking bearings and for steering	<ul style="list-style-type: none"> Each crewmember shall receive and confirm a compass course helm order. Each crewmember shall steer that course effectively while keeping a lookout for traffic and dangers. Each crewmember will receive a course change and confirm and apply that change. Each crewmember shall apply the principles of rule 5 collision regulations and keep a lookout using all available means. Each crewmember shall identify types of 	X	X	<p>Know how to use a magnetic compass and its application to the nautical chart of the operational area</p> <p>Compass deviation.</p> <p>Each crewmember shall define the following aspects of the compass</p> <ul style="list-style-type: none"> True bearing (North Pole) Variation Magnetic Deviation Compass/ships course <p>Each crewmember shall explain the types of objects that would create</p>	

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	vessels spotted and give an estimate of range and aspect of those vessels.			magnetic fields on the vessel and increase compass deviation.	
Radar	<p>Each crewmember shall turn on the radar, let it warm up and switch it to transmit. Each crewmember will follow 5 steps:</p> <ul style="list-style-type: none"> • Adjust the brilliance • Turn off the rain and sea clutter. • Adjust the gain for best re1urn • Set the range to 3nm or greater. • Tune the radar or set the auto tune feature <p>The crewmember must activate and manipulate the basic tools tar determining the range and bearing of targets on the Radar. The crewmember must identify the values assigned to the tools. Critical Actions/Steps:</p> <ul style="list-style-type: none"> • Activate VRM read values • Activate EBL read values • Use cursor (if present) 10 establish range and • BRG <p>The crewmembers will be able to use the VRM</p>	X	X	<p>Each crewmember shall identify the controls and their purpose in setting up the radar.</p> <ul style="list-style-type: none"> • ON/OFF • Transmit • Brilliance • Gain • Tuning • Range • Rain clutter • Sea clutter <ul style="list-style-type: none"> • Each crewmember shall describe what happens to the objects on the screen when the vessel turns part or starboard (un-stabilised head-up mode) • Each crewmember will identify the VRM, range rings and EBI controls and describe their purpose and accuracy. Each 	<p>Using a simulator or radar each crewmember will identify the controls of the radar listed in the Knowledge section and explain the use and purpose of each one. Each crewmember will explain the use and effect of the following controls:</p> <ul style="list-style-type: none"> • Gain • Rain Clutter (FTC) • Sea Clutler (STC) <p>Each crewmember will describe what happens to targets when too much rain or sea cluster is used. Given a functioning radar or radar simulator in any condition of Visibility, each crewmember shall activate the radar and transmit a radar signal. They will then demonstrate the 5 steps listed In the skill section and adjust the radar controls to provide a well-lit, clear display of the objects and land mass</p>

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	and EBL or cursor to measure a distance off of a point of land and determine a course change to maintain that distance off of land. Each crewmember will track a moving target and determine if a risk of collision exists.			<p>crewmember shall know the main differences between true motion and relative motion on targets on a radar screen.</p> <ul style="list-style-type: none"> • Crewmembers will explain the difference between relative motion and true aspect. Crewmembers will state the significance of a target with a steady bearing and decreasing range. Each crewmember will identify the following situations when the radar will provide scanty information. 	within a six mile range.
GPS/DGPS	<p>Each crewmember will be able to activate the GPS and DGPS and set up the following functions:</p> <ul style="list-style-type: none"> • Assess the number of satellites tracked and • identify HOOP on the satellites • Select the best DGPS station (or auto select correctly) • Select the appropriate chart datum for the 	X	X	<p>Each crewmember shall be familiar with the GPS satellite based system Begin the initialization procedure for the acquisition of an accurate fix. Each crewmember will be able to explain the meaning HOOP and the effect it has on accuracy. Each crewmember will explain DGPS and how it increases accuracy.</p>	<p>Given a GPS/DGPS and operators manual each crewmember will use the operators manual to determine the stops in checking the accuracy of the GPS fix and DGPS input. When asked, the crewmember will explain the significance of a hi or low HOOP. Given the operators manual and/or the GPS each</p>

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	<p>paper chart of the area.</p> <ul style="list-style-type: none"> • Enter a waypoint and connect to a second waypoint • Activate a route • Use the NAV screen to follow that route 				crewmember will list the steps involved in checking the geographic datum that the GPS is set to. Given a functioning and familiar GPS and/or DGPS unit, each crewmember will set up and activate the functions listed in the skill section.
Electronic Chart Plotter	The crewmember: must manipulate, select and display the proper chart for the area and use the other NAV aids to fix the location of the vessel on that chart. If the GPS is integrated into the plotter then crewmembers shall use the basic tools entering waypoints and creating routes.	X	X	Each crewmember will identify the type of electronic chart displayed (chart, map, raster or vector) and the datum that the chart is using. Each crewmember will compare the paper chart datum with the GPS and plotter datum.	Given the planer and/or operator's manual each crewmember shall identify the charts loaded in the plotter and classify them. Each crewmember will identify the chart datum and compare to the paper chart datum. Given a familiar and functioning electronic chart plotter and the operator's manual each crewmember shall activate and set-up the unit to display an appropriate chart for the area. If the GPS is integrated into the plotter then crewmembers shall use the basic tools entering waypoints and creating routes.

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Depth Sounder	Each crewmember will activate the depth sounder and set it up to read the appropriate range in feet or metres.	X	X	Each crewmember will explain the limitations and accuracy of the depth sounder In certain circumstances: <ul style="list-style-type: none"> • Aeration of water • High Speed 	During a practical demonstration each crewmember will identify when the depth sounder is giving erroneous information. Given an operating depth sounder each crewmember will activate the unit and set it to the appropriate range and measure (feet or metres). Each crewmember will call out the depth when necessary.
Basic Electronic Piloting and Monitoring	<ul style="list-style-type: none"> • The crewmember shall use the radar GPS and or chart plotter plus all available means to establish a safe course and steer the vessel on that course. • The crewmember shall identify land mass and targets on the radar and take appropriate actions to avoid incident. <p>Critical Actions/Steps:</p> <ul style="list-style-type: none"> • Set-up waypoint and WPT display on screen • Give courses 10 helm and start vessel on leg • Steer vessel to waypoint 	X	X	<ul style="list-style-type: none"> • Crewmembers will identify the strengths and limitations or the electronic equipment on-board of their vessel. • They will identify when the radar and GPS are most likely to give erroneous or misleading information and describe how to check the accuracy of the electronic data. • Crewmember will be familiar with the function and purpose of the controls of the radar as well as the functions and controls of the 	<ul style="list-style-type: none"> • Given a familiar functioning radar and GPS along with operator 's manuals each crewmember will explain, list, or describe the following. • Each crewmember will state examples of when the following electronic equipment is vulnerable to significant error: <ul style="list-style-type: none"> ○ Radar ○ GPS ○ DGPS ○ Electronic chart ○ Depth sounder

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	<ul style="list-style-type: none"> • Select a change in destination whilst on a passage and modify the sail plan to accommodate this • Identify targets (steer to avoid stop if necessary), Identify landmass • Identify position on chart (within one cable) • Identify WPT values for DTG and BRG vs. HOG • Set range so WPT is on screen and easily steered to. 			<p>GPS/DGPS and plotter (if present).</p> <ul style="list-style-type: none"> • Each crewmember will explain the importance of using all available means for lookout and navigation and identify the dangers involved in relying on only one or two sources of Information 	<ul style="list-style-type: none"> • Each crewmember will describe how to check the accuracy of the GPS, chart plotter, and DGPS. Each will describe the capabilities of the radar in regards to fixing a position.
Passage Planning and Conning	<ul style="list-style-type: none"> • Operate the vessel through a planned route to destination while maintaining positive control of vessel by helm orders and lookout reports. • Use transits and clearing lines to keep the vessel in clear water. Maintain an effective lookout by radar. GPS, chart plotter and sounder as well as by physical senses. • Determine and monitor error in all navigation instruments and recognize common instrument errors. • Identify charted land masses and objects 	X	X	Plan a safe passage (route) on a chart and using the tools (radar, GPS, chart plotter), as well as visual references that are intended to verify the position and keep the vessel in navigable waters throughout the voyage.	<ul style="list-style-type: none"> • Monitor primary crew tasks such as lookout and helm. • Maintain continuous information flow from crew positions on the vessel. • Maintain a regime of constant information verification using all available means paying special regard to a paper chart. • Slow or stop without hesitation when information is in doubt.

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	on the radar.				
Radar Navigation	<ul style="list-style-type: none"> Adjust the radar to provide the best signal return using gain, rain, and sea clutter. Detect false information such as ghost echoes and lobe error. Determine position by ranges and bearings. Identity vessels underway and determine an estimated CPA, identify charted geographical features on the radar screen. 	X	X	<ul style="list-style-type: none"> Explain the concept of relative motion in relation to a moving target on the radar screen. Describe the target's new path on a radar screen after an own vessel alteration. Define CPA and TCPA and explain how Collision Regs apply to vessels detected by radar alone. Explain the interface capabilities at other carried equipment onboard the vessel and its connectivity with the radar. Be able to explain effects of terrain, ships in close proximity, rain, snow, and waves on the radar display and the limitations of the vessels radar to discriminate - detect small targets and obstructions. 	<ul style="list-style-type: none"> Crewmembers shall conduct the vessel in a manner that demonstrates practices at good seamanship by taking early and substantial action when another vessel is first detected at long range. Crewmembers shall monitor the radar constantly yet not make decisions based on scanty radar information.
Electronic Chart and GPS	<ul style="list-style-type: none"> Activate and set up GPS and chart plotter to acquire a fix according to correct chart datum and acceptable HOOP error. 	X	X	<ul style="list-style-type: none"> Identify the quality of GPS information in regard to correct chart datum and degree of error. 	<ul style="list-style-type: none"> Operate the vessel using all available means for lookout and navigation.

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	<ul style="list-style-type: none"> Plan a route on a paper chart and set up electronic chart to acceptable scale and enter waypoints in by coordinate and cursor placement to a planned route that is safe and easily run. 			<ul style="list-style-type: none"> List the errors that can degrade position and primary vector information. Understand all functions, menus and parameters of the GPS system, equipment and problems that may occur. Be able to explain settings for clock, units of measure, chart datum, zoom, scale, waypoints, routes, etc. and the inherent dangers with plotting over hazards between waypoints. 	<ul style="list-style-type: none"> Navigate cautiously without relying on a sole source of information such as GPS and E-Chart. Verify primary vector values by means of visual references or bearings, radar, range and bearings and paper chart.