SABOT

TRAINING

GUIDE

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NINTH DISTRICT, EASTERN REGION
OFFICE OF SURFACE OPERATIONS

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Subject: SABOT Training Guide

REFERENCES:

Boat Crew Seamanship Manual, COMDTINST M16114.5 (series)

Auxiliary Boat Crew Training Manual, COMDTINST M16794.51 (series)

Auxiliary Boat Crew Qualification Guides, COMDTINST M16794.52-54 (series)

Auxiliary Operations Policy Manual, COMDTINST M16798.3 (series)

Navigation Rules, International-Inland, COMDTINST M16672.2 (series)

USCG Addendum (CGADD) to the National Search and Rescue Supplement (NSS), COMDTINST M16130.2 (series)

Team Coordination Training Material

Ninth District SAR Plan, d9 INST M16100.1E

SABOT Job Aid

General: This guide extracts information from the above referenced manuals as it pertains to the Standardized Auxiliary Boat Operations Training (SABOT) Program. Also, this guide adds input from experience with non-standard Auxiliary Surface Facilities. The material contained in this guide is intended as a guide for SABOT instructors and as a guide for Auxiliary Boat crews. This guide also contains information to assist facility owners in how best to equip their boat as an Auxiliary facility for surface operations.

In writing this guide it is assumed that the members using this guide are qualified in the Auxiliary Boat Crew program as crew or Coxswain. This material should be helpful in raising the level of training for all members. Suggestions are made for classroom training and for underway exercises. Much of the information can and should be presented in a classroom and then practiced underway.

The first three chapters pertains marlinspike, uniforms and the equipping the Auxiliary Surface Facility while the other chapters pertain to crew functions. Chapter 15 contains

illustrations of various tow rigs found on many Auxiliary facilities which should assist the facility owner to determine what would work best on their vessel.

Purpose:

1. To serve as an aid for SABOT Instructors when conducting classroom and underway SABOT training.

2. To consolidate SABOT training information and references in one document.

3. To give suggestions and guidance to members wishing to equip their boat as an Auxiliary Operational Surface Facility.

4. Guidance on line types and minimum sizes and lengths are suggested for facility owners.

5. Emphasizes readiness and standardization as an ongoing process starting in the classroom.

6. Improve boat crew safety and proficiency through the use of standardized procedures taught in the classroom.

7. Promotes the use of “Check Lists” for performing various evolutions.

8. Provide a uniform method of measuring unit readiness and compliance with program standards as presented in the SABOT Job Aid.

9. Regular use of these standardized procedures taught in this program should strengthen the Order Issuing Authority’s confidence in the Auxiliary’s ability to execute Surface Operations missions and enhance active duty and Auxiliary interoperability.

10. Suggestions are made for various types of lines to equip an Auxiliary Facility.

I hope that you find this guide a helpful training tool for the SABOT program.

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DSO-OP / CQEC
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CHAPTER 1 MARLINESPIKE

1.1 GENERAL:

This chapter deals with line types, use, and maintenance. Also included is the use of basic knots, hitches and splicing.

Not enough can be said about lines on a facility. Each facility must have sufficient lines onboard to complete any mission with which it may be tasked. There should be lines dedicated for mooring, doing an alongside tow, an astern tow, anchoring, heaving lines, rescue lines, etc. Anchor lines should not be used as tow lines as you may have to anchor while doing a tow. Also, consideration should be given to different size lines required to work with boats of varying sizes. If the fittings on another vessel are too small for your lines, you should have short, smaller sized lines to be used when connecting them.

Much thought should be given to the type, style, size, and length of these lines as well as their intended use. With the modern synthetic lines that are available today we won't even consider manila other than to use it as a reference for comparing other types of synthetic lines. Natural fiber line is very susceptible to abrasion, rot, mildew, and it may lose up to 50% of its strength in a year. Once wet it is nearly impossible to completely dry, which leads to rot and mildew.

1.2 TYPES OF LINE:

There are two methods for typing line. The first is by the type of material used to construct the line, natural and synthetic. The second method is by type of construction, stranded or braided. All natural fiber line is constructed as stranded line while the synthetic may be twisted strands or braided.

The most common type of braided line has a braid cover with a core of woven or twisted yarn made from synthetic fibers (Double Braided line). The fibers in the cover and core are not always the same. Some types of line were developed for specific purposes. Braided line has a smooth feel to it, is round and has less of a tendency to kink. Braided line is much more difficult to splice than three-strand.

The most common twisted strand type is three-strand. The rope is constructed by twisting fibers into yarns, then twisting the yarns into strands. The strands are then twisted into a rope/line. At each stage the direction of twist is reversed from the previous stage. This helps to hold the rope/line together. Stranded line is easy to splice. The strands can untwist unless the ends are whipped. The strands can kink which weakens the line. Because of the speed of their manufacturing, twisted lines tend to be less expensive than the braided style.

Braided lines take on a round form and are generally smooth. This feature allows them to be used in high friction situations such as winches and pulleys. Several

different ways of braiding provide different qualities. Solid braid is a complex braid that may have a filler core. Diamond braids rotate fibers over and under one another in opposing directions. A filler is usually placed in the center of this line. Double braided lines can actually be understood as a line within a line. One braid is formed over another to share the load evenly. Double braid is a favorite of boaters and can be spliced but it is more difficult than stranded line.

The most common types of synthetic lines are nylon, polyester, and polypropylene. The following lists each of these types with the advantages and disadvantages of each:

1.3 MATERIALS USED TO CONSTRUCT LINES:

1.3.1 Cotton: A natural fiber line that is soft, light, inexpensive and is easily stretched. It is inexpensive and makes for an excellent heaving line. It should be wetted before use to make it slippery and when through it must be thoroughly dried to prevent rot and mildew. The only other use for cotton line is for decorative purposes.

1.3.2 Sisal: A natural fiber line that is inexpensive and coarse. It is not commonly used in the marine environment as it, like all other natural fiber lines, is susceptible to rot and mildew.

1.3.3 Manila: Another natural fiber line that is the strongest of the natural fiber lines. It is less susceptible to decay than cotton and sisal but great care must be used with it to prevent rot, mildew and wear. Manila line was very common years ago but has for the most part been replaced by synthetics. When used it must be kept clean or the dirt will cause it to wear. When used in the marine environment it is usually replaced every year or two due to wear, rot and mildew. Manila line strength is the common standard against which other lines are measured for strength and stretch.

1.3.4 Nylon: Nylon is very near the all-purpose line. It is the best choice for mooring pendants, anchor lines, and all types of dock lines. A good “Rule of thumb” is to use it where strength and stretch go together. Size for size, it has about three times the working strength of manila line, but also about three times the stretch or elasticity. Nylon has a fairly high resistance to the effects of sunlight and weather. It does tend to stiffen with age. It will not rot or become weaken by mildew, and it can be stored wet. It does not lose strength when wet, but remains pliable and easy to handle. Size for size, it is more expensive than manila line, but when considering the breaking strength nylon will cost less per pound of working load. Nylon, like all types of line will lose between 10% and 15% of its safe working load at a splice, and up to 65% at a knot. This is important to remember and to apply to your seamanship. Nylon is fairly easy to work and splice. The lay of the yarn quickly unravels and will fray. Nylon can be a challenge for the novice about to make their first splice. Nylon is somewhat more resistant to chafe and abrasion

than manila, but still should be adequately protected at all wear points. It is fairly dense and will not float. When considering the types of line for use as a towline, nylon does have a couple of drawbacks:

a. Its extreme elasticity (good for shock absorption) makes it dangerous to personnel if it should part under extreme load. See Table 1.1.

b. Its density causes it to quickly sink in the water. It is heavier than other comparable lines of the same size.

c. Cost. (Approximately double that of manila and polypropylene)

Like all lines, nylon should be inspected regularly to be sure that it remains safe and serviceable for its intended use. It should be kept clean and free of abrasives (dirt).

1.3.5 Dacron: Dacron is used in synthetic fiber lines for both braided and twisted or cable-laid cordage. It can be obtained in either a hard finish or a soft spun form. Size for size, its strength is only slightly less than nylon, (approximately 80% the strength of the same size nylon) . It is less resistant to sunlight than nylon but it has a somewhat higher resistance to chafe and abrasion. Like nylon, dacron is not affected by mold or mildew and it does not rot or decay. It is more dense than nylon and sinks rapidly in water. It can be stored wet. The stretch or elasticity factor of dacron is only slightly higher than manila. (it will only stretch 10% of its original length).

1.3.6 Polyethylene: This type of line is only available in smaller diameters (1/4" and 3/8" are common). Normally polyethylene comes braided. It is about equal to nylon in its resistance to chafe, abrasion, and all environmental factors including sunlight, weather, dampness, and mildew. It is approximately 1 ½ times as strong as manila and only costs about half as much as manila. It is literally waterproof and it floats. It is commonly used as a water ski towline.

1.3.7 Polypropylene: Polypropylene line is unique, even among all synthetic counterparts. Many confuse polypropylene with polyethylene. Polypropylene comes in a wide variety of sizes and colors (yellow is common). It is commonly found as a twisted three strand line. Of all the common synthetic lines available (except kevlar) polypropylene is the most chafe and wear resistant. It floats and does not lose strength when wet. A drawback is that it can become stiff when cold or exposed to sunlight over a period of years. Also, Polypropylene line lacks stretch memory; that is, once stretched it doesn't return to its original size (length). This leaves the line weaker. Also, when abrasion occurs, the line can melt at the wear point. It is relatively light and is easy to splice for a novice. Polypropylene has over twice the strength of manila and is rated just below dacron. Polypropylene is slightly slippery and needs to be tied with a secure knot.

Polypropylene is a good choice as a towline as it floats and is relatively inexpensive. It does have some serious drawbacks as a towline in that once stretched it will not return to its original size and strength, it may melt at abrasion points, and it will get stiff when left exposed to sunlight over a period of years.

NOTE: If you use polypropylene line for towing, you should record the length of the line when new and then measure it again after use, especially if it is used under a heavy load. Once stretched you may want to consider replacing the line.

1.3.8 Polyester: Good for outdoor use. It wears well and is resistant to chaffing and sunlight. It is as strong as nylon but has much less stretch. It can be purchased pre-stretched. Because of its lack of elasticity, it does not make a good towline.

The following table gives the "Safe Working Loads for different line types:

TABLE 1.1

TYPE	DIA	BREAK'G STRENGTH	SAFE WORKING LOAD		
			GOOD	AVG.	POOR
	5/8	9,000	3,000	2,250	1,500
	11/16	14,062	4,678	3,515	2,343
NYLON	7/8	17,015	5,671	4,253	2,835
	1	20,250	6,750	5,062	3,375
POLYPROP-	5/8	5,040	1,008	840	630
-YLENE	11/16	7,875	1,575	1,312	984
	7/8	9,528	1,905	1,588	1,191
	1	11,340	2,268	1,890	1,417
POLYESTER	5/8	7,200	2,400	1,800	1,200
DACRON	11/16	11,250	3,750	2,812	1,875
	7/8	13,612	4,537	3,402	2,268
	1	16,200	5,400	4,050	2,700

1.4 TOWLINES, PENDANTS AND BRIDLES:

1.4.1 Towline: Selecting the type of towline and pendant to use is a choice of the facility owner/coxswain. Normally, the choice is between polypropylene and nylon. Cost is a big item to consider. Elasticity is a major safety factor if a line should part. However, nylon with its higher elasticity also provides greater shock absorbency than any of the other line types. If you expect to be towing at or near your maximum capacity, you may want to consider a larger line size as a safety factor. If cost is a major concern then there is nothing wrong with polypropylene if you take added precautions such as not overloading the towline and measuring and recording the towline length when new and after use. It is a good idea to avoid the use of metal fittings (shackles) in a towline so that, in the event of a line

parting, the metal fitting doesn't become a flying missile coming back at the crew. The make-up of a tow rig is discussed later. Refer to Tables 1.1 to help you select the best line for your facility. Table 1.1 will help you determine the proper towline size and minimum length.

1.4.2 Pendants: A pendant is a short length of line attached at the end of the towline. It is used to take the wear from fittings on the vessel being towed. When the pendant shows signs of wear (abrasion, etc.) it can be replaced without the cost of replacing the entire length of the towline.

At times the cleats on a vessel to be towed are too small for the size of towline that you have. In this case you will need a smaller diameter line for the pendant.

1.4.3 Bridles: Bridles are used to keep a towline centered on the stern of the towing vessel. A bridle may be used on the towing vessel, the towed vessel, or both vessels. The bridle also distributes the load between fittings where the towline is attached on either vessel. The bridle is made up of equal lengths of line at least twice the distance between the deck fittings to which they are attached. The size of the lines used to make up the bridle should be strong enough that when combined, it is at least equal to that of the towline.

Some facilities always use a bridle on their stern for attaching a tow. This is done to keep the tow centered on the stern of the towing vessel, to distribute the load between cleats, and/or to keep the towline clear of outboard engines or other objects located on the stern of the towing vessel.

If the vessel to be towed doesn't have a single cleat forward on the center-line but has a cleat on each side forward, a bridle is used to center the tow on the towline. A bridle is made up of two short equal lengths of towline to attach to the forward cleats on a vessel to be towed.

At times the cleats on a vessel to be towed are too small for the size of bridle that you have. In this case you will need to make up another bridle of smaller diameter line.

1.4.4 Comparison: The following table gives a comparison of the various types of line to help you select what would work best for you:

TABLE 1.2

COMPARISON OF MARINE LINE TOWING FACTORS

FACTOR	NYLON	DACRON	MANILA	POLYPROP--YLENE
STRETCH	3X	1.2X	1X	1.3X
DURABILITY	4.5X	4.2X	1X	5X

Even though you may correctly determine the Safe Working Load (SWL) of lines, shackles and hooks, there are many variables affecting the equipment. In actual use it is not always possible to operate within the SWL. Sometimes you can't match appropriate hardware to a particular line.

It is necessary to keep a constant eye on a line under stress. The unpredictable, unforeseen and often dangerous forces in the marine environment will catch you by surprise unless you are always on guard. By using good judgment you can usually make adjustments to correct for these adverse forces.

Try to keep the tension on the line and equipment well within their SWL. It is difficult to tell when the SWL is reached or surpassed. A sudden surging (pulling) of a towline may cause the tension on the line and hardware to approach their breaking points. This is when the danger of parting becomes a safety hazard.

The moment you connect your towline to a distressed vessel's deck fittings, your entire towing system assumes an unknown Breaking Strength (BS) and SWL factor. You often can not get a reliable estimate of the BS and SWL even when you can attach the proper equipment to the disabled craft. Because this is the weak link in towing, you must keep the towline and the boat in tow under constant observation.

1.4.5 Safety recommendations for towing loads, equipment, and speeds:

TABLE 1.3

RECOMMENDED TOWING RIG SIZES

AUX. FACILITY		MINIMUM RECOMMENDED TOWLINE LENGTH		MINIMUM RECOMMENDED LINE SIZE		RECOMMENDED MAXIMUM SIZE OF TOWED VSL		
DISP-LACE-MENT	LEN-GTH	OCEAN/ GREAT LAKES	IN-LAND WATERS	POLY-PROPY-LENE	NYLON	DISP-LACE-MENT	LEN-GTH	MAX. SAFE TOW SPD.
800	13’	70’	30’	1 / 4”	1 / 4””	1400	16’	4.0K
1300	16’	80’	40’	5/16”	5/16”	2100	20’	5.0K
1800	18’	90’	50’	3/8”	3/8”	2800	23’	5.3K
2400	22’	100’	60’	7/16”	7/16”	3600	24’	5.6K
3000	23’	110’	70’	1/2"	7/16”	4500	25’	6.0K
2600	24’	120’	80’	9/16”	1/2”	5400	26’	6.3K
4200	25’	130’	90’	5/8”	9/16”	6400	27’	6.6K
5600	26’	140’	100’	3/4”	5/8”	8500	28’	7.0K
7300	27’	150’	100’	7/8”	3/4”	11000	32’	7.2K
9300	29’	160’	100’	1”	7/8”	14000	34’	7.4K
10800	30’	170’	100’	1 1/8”	1”	16500	35’	7.6K
13000	33’	180’	100’	1 ¼”	1 1/8”	19500	38’	7.8K
17000	35’	190’	110	1 ½”	1 1/4”	28000	45’	8.0K
32000	50’	200’	110’	1 ¾”	1 1/2”	60000	65’	9.0K

NOTE: The maximum recommended towing speed is “SPEED THRU THE WATER”. Do not use your GPS to determine the speed if heading into the current.

1.5. DEFINITIONS:

a. Bight: The line is doubled into a loop

b. Braided Line: Line or rope formed by weaving or braiding fibers together. Braided line usually can not be spliced.

c. Crossing Turn: The same as a loop except the line crosses itself

d. Dipping: Passing the eye of one line through the eye of a second line. Dipping method is commonly used when two vessels are sharing a mooring post or cleat; the second line is passed through the eye of the first before dropping it over the mooring post/cleat. If a line is passed back through its own eye it becomes an excellent way to temporarily join lines.

e .Double Braided Line: Line that has a woven cover over a core of woven or twisted fibers. Can be spliced but it is difficult to master this skill.

f. Fibers: The basic building block of a line/rope. The fibers are twisted together into yarns, and yarns are twisted together into line.

g. Line: Another name for a rope. Rope used on a boat is called a line.

h. Loop: The line is formed into a loop without crossing itself

i. Round Turn: The line makes a 360 degree or more turn around an object.

j. Running End: The end of the line on which you are working (The end on which you are making a knot.) (Same as Working End)

k. Splice: The joining of two lines by weaving the strands together. A splice can be used to form a loop in a line by weaving the strands back onto itself.

l. Standing End: The end of the line on which you are not, the opposite of the “Working End”.

m. Three Strand: Line formed by twisting three strands together. Each strand is made up of fibers that are twisted together into yarns, the yarns are twisted together into strands. The easiest type of line to splice.

n. Turn: The line makes a turn around an object.

o. Working End: The end of the line on which you are working (The end on which you are making a knot.) (Same as Running End)

p, Yarn: Part of the make-up of a line. Yarns are twisted together into strands which are twisted together into line/rope.

q. Rope: A term used to describe a line when not used on a boat.

1.6 KNOTS, HITCHES, AND SPLICES: See Seamanship Manual page 7-25 to 7-93

The Boat Crew Qualification Guide for CREW, COMDTINST 16794.52(series), (Volume I) only requires that a qualified Auxiliary crewperson master the following four basic knots and hitches:

Bowline	Used to place a temporary loop in a line
Clove Hitch	Used to attach a line around a fitting or object.
Sheet Bend	Used to join two lines together (bending lines together)
Round Turn with 2 Half Hitches	Used to attach a line to an object (anchor, pole, etc.)

Each member in a boat crew should be able to tie these knots and hitches in the dark for night operations. Practice doing these knots in the dark, blindfolded or behind your back. See the Boat Crew Seamanship Manual for instructions on how to tie these knots and hitches.

In addition, all qualified crew should know how to attach a line to a cleat using a "Round Turn" and at least three figure-eight turns around the horns of the cleat. If there are three or more figure-eight turns around the cleat there is no need to lock the line on the cleat with a "Weather Hitch" (a half hitch on each horn of the cleat). If the towline is attached to a cleat **never** use a Weather Hitch as this may tighten and hinder you from doing a quick disconnect of the towline in an emergency.

All knots will weaken a line. If practical, use a splice to place a permanent loop in a line or dip the eyes of two lines to connect them. Most books on marlinspike will show how to splice lines.

When connecting a bridle or a pendant, dip the loop on the end of the bridle or pendant through the loop on the end of the towline. This is much stronger than using a knot or a metal fitting.

When mooring two vessels to the same mooring post or cleat, dip the eye of the second line through the eye of the first before dropping it over the mooring post/cleat. When one of the vessels leaves the mooring, the second line doesn't have to be removed. It doesn't matter which vessel leaves first.

1.7 LINE MAINTENANCE:

As a matter of practice, lines should be kept clean and dry. Most synthetic lines are not affected by mildew but you don't want to promote the growth of mold or mildew on a boat, for sanitary and allergic reasons. Whenever practical, allow lines to dry in the open air. If lines pick up dirt they should be scrubbed, as dirt becomes an abrasive when it works its way between the fibers of the line. You may have to wash a line with a hose and scrub brush at times. You may be able to clean a line by towing it through the water but, care should be taken that you don't foul your prop or the prop of another boat.

The ends of a line should be whipped to prevent unraveling. Temporary whipping can be done with tape or by burning/melting the ends. Permanent whipping is done by using whipping twine wrapped tightly around the end of the line for at least 1 ½ times the diameter of the line. A good book on marlinespike will show you how to whip a line.

1.8 Storing Lines: Try to store your lines so that they are it is readily available and can pay out easily without kinking or fouling. The line could be faked on the deck or in a large container or bin. The line could be stored hanging in coils. If you are using braided line coil the line into figure-eight loops to balance the left and right-hand twists of its strands. If using three-strand line, coil the line into loops in a clockwise direction. After coiling, the coil may be secured by using the end of the line to tie a clove hitch around the coil.

CHAPTER 2 AUXILIARY SMALL BOAT CREWS

2.1 UNIFORMS:

It is a Coast Guard requirement that all members of an Auxiliary Boat Crew be dressed in the same uniform. Please refer to chapter 10 of the Auxiliary Manual, COMDTINST M 16790.1(series) for a description of the uniforms that may be worn on a patrol.

The Operational Dress Uniform, (ODU) is commonly used (both the tucked and un-tucked version). Some districts allow the wearing of the Hot Weather Uniform. The uniform worn normally follows local CG policy and is selected by the coxswain.

All people on the facility must wear a PFD at all times while out of the cabin. Section 2.2 of this chapter covers the types of PFD and the equipment that must be attached to the PFD by boat crew members.

2.2 Personal Protective Equipment (PPE)

2.2.1 PFDS: All people on a facility operating under orders must be wearing a type I, II, III, or V PFD. The PFD must be international orange or yellow in color and equipped with reflective tape. It is preferable, but not necessary, that these PFDs be marked "USCG AUXILIARY". If the member is on a facility that is capable of speeds of 35 MPH or higher the PFD must have a rating of 50MPH or higher. Auxiliary members are not to wear a PFD marked "USCG".

Some members may choose to wear a Boat Crew Survival Vest over their PFD. This has the advantage of providing additional pockets to hold the required PPE gear.

2.2.2 PPE Gear on your PFD: All Auxiliarists operating under orders must have the following equipment attached to their PFD or Survival vest:

a Emergency Signaling Mirror (Locate in the lower front right pocket of the vest)

b. Signal Whistle (Locate in the lower right pocket of the vest)

c. Distress Signal Light (Locate on the upper right shoulder. Also, b e able to break it free of the vest to hold in the air for greater visibility)

d. Survival Knife (Locate in the upper left pocket of the vest) A folding lockable knife may be used in place of the survival knife.

e. Personal Locator Beacon (PLB) (Locate in the lower left pocket of the vest. Also, be able to hold it in the air for greater range and performance.)

f. A Small flashlight is not required but would be useful in the dark.

g. Rubber gloves are not required but would be useful in a medical emergency.

NOTE: All of these items (a – e) must be attached to the Survival vest or PFD with parachute cord. These cords should be at least 36" long after they are attached.

2.2.3 PPE Maintenance:

At least once a year all PPE gear should be inspected and inventoried. Equipment that is no longer serviceable should be turned in and replaced.. A report of each inspection should be submitted to the person in charge of inventory maintenance for the unit.

Batteries on lights should be replaced at least annually. Batteries on PLB must be replaced every five (5) years. All PLBs must be re-registered every two (2) years and copies of the registration form given to the OTO.

2.3 CREWS:

2.3.1 Crew Size: The minimum boat crew is specified in the Auxiliary Operations Policy Manual, COMDTINST M 16798.3(series), Table 1.1. These minimums are just what they say; MINIMUMS. Coxswains must give consideration to the mission planned and the number of crew required to effectively perform the mission. For example, the minimum crew size for facilities under 26' is two, (1 coxswain and 1 crew); however, to effectively perform a search or towing mission you should have 2 or 3 crew members in addition to the coxswain.

When doing a search you will probably want at least two lookouts in addition to a helmsman and someone following the track and time. When doing a tow you may want two crew for passing a heaving line, one ready with a back-up line should the first attempt miss. Also, extra hands may be required when transferring to an alongside tow. You may want to consider a forward lookout in addition to your tow watch. Consider how you would do a "Man-Overboard" recovery if one of your crew fell overboard.

2.3.2 Crew Selection: Consider the mission when selecting your crew. Look at the experience level of each crew person. Consider how nimble each crew member is for moving about the boat. How would you recover a person from the water? Is your crew strong enough? This could involve someone's life! Look at the physical condition and capabilities of each crew member when putting a crew together. How much experience the crew has working with each other and on the designated facility. We are encouraged to take new members on patrols to get them involved and to train them. Training new people is excellent but, you should also think of the mission and its requirements. You may want to back up less experienced members with experienced members.

Questions to ask yourself when putting a crew together:

a. Age of each crew member

b. Physical condition of each crew member

c. Experience of each crew member.

d. How rested is each crew member, were they up working all night, etc.

e. How familiar is the crew with working with the team that makes up your crew?

f. How familiar is the crew member with the facility?

g. Personalities of each crew member (How well do they take direction and/or get along with others)

h. Does the member like to follow the rules or do they look for short cuts or their own way of doing things?

i. Does each member have the required PPE gear for the conditions expected?

CHAPTER 3 FACILITY

3.1 GENERAL:

Be sure there is a current "Offer-of-Use" form on file in the OTO's office or with the Director. Under REMARKS please be sure to include the operating limitations for the facility as to sea state, wind conditions, and visibility. The Auxiliary Operations Policy Manual, COMDTINST M 16798.3(series), (1.F.6, 1.H.7, and 1.I.6) requires this information to be indicated on the "Offer-of-Use" form. Be sure to inform the crew of these facilities' limitations.

3.2 EQUIPPING THE FACILITY:

The check list on the back side of the "Offer-of-Use", form (ANSC 7003) lists the minimum required equipment that must be carried onboard. Also included on this list are several optional items. This equipment should be checked periodically to ensure that it is in good operating condition and not out of date. The following is a list of guidelines for some of these items (From ANSC 7003 "Offer-of-Use" form):

ITEM DESCRIPTION

3. Registration or Documentation - Must be onboard.
6. First Aid Kit – There is no specific type of first aid kit that must be carried. It may be one that you make up on your own. Suggestions on what minimal items should be in it:
   - 1" compresses
   - Antiseptic
   - Antacid tablets
   - Aspirin or other pain reliever
   - Gauze pads (compresses (Suggest 4")
   - Tape
   - Q-Tips
   - Roller bandage
   - Elastic roller bandage
7. Lantern or flashlight – Large enough for practical use on the boat
8. * Loud Hailer/Megaphone – Strongly suggest an electronic type for ease of communicating with another vessel in windy conditions. May be portable or fixed.
12. Navigation lights
13. Search light
14. Sound producing device
17. RPM Table – Should be made up and kept handy on the facility for use in determining speed for running search patterns and other navigation problems.
18. Navigation Rules, COMDTINST M16722.2 (series)
20. National Ensign

ITEM DESCRIPTION

21. Patrol Signboards and Patrol Ensign
22. SAR Incident Reports (blank forms) – Required for reporting SAR cases (Keep several on hand)
23. Towline and bridle – Of sufficient size and length for the facility and in good condition.
24. Heaving lines – Suggest 70’ to 100’ of cotton clothesline with a monkey fist or other soft weighted object on the end to facilitate throwing. Suggest 2 sets with a carabineer on the standing end (See LINES following this list).
24. Mooring lines – Of sufficient size and quantity to moor your vessel plus a disabled vessel.
25.* Tide Tables
26. Compass (Minimum of 4” diameter)
27. Deviation Table – Should be made up for the individual facility. Suggest checking against your GPS.
28.* Light List – Keep a copy for your area. Suggest having your flotilla make copies of pages pertaining to your AOR for each of its facilities.
29. Navigation Plotting instruments – At a minimum you should have a soft pencil, eraser, compass and a means of moving a line to/from the compass rose and extending a line on a chart. NAV Rules book, Light list, and Pilot for your AOR if applicable.
30.* Search Pattern Plotting Guide – A wheel for computing headings for a SS and a VS search pattern. In the Coast Guard catalog of forms (COMDTINST M5213.6(series), see item CG-5259, stock number 753001GF29010.
31. Charts of operating area
32. Adequate fenders – There should be fenders of sufficient size and quantity to protect the facility at a dock and to fender a disabled vessel in an alongside tow. (See FENDERS following this list.)
33. Alternate propulsion (Only for vessels under 16 feet LOA)
34. Anchor and Anchor line – Anchor shall be of adequate size for the facility. Anchor line shall be of sufficient size and length to hold the facility. Line should be at least 7 times the depth of water in which operating.
35.* Extra anchor and line – Duplicate item 34 above.
37. Blanket
38. Binoculars
39. Boat hook – Should be of sufficient size and length for the size of the facility. You may want to consider more than one.
40. Boarding ladder – May be portable or fixed. Required to retrieve a person from the water.
41. Depth sounder, leadline, sounding pole – Suggest an electronic depth sounder but other means is adequate for shallow areas. (Suggest marking depth on a boat hook)

ITEM DESCRIPTION

42. Bilge pump or dewatering device – An automatic electric bilge pump is handy to have for the facility. A 5 gallon bucket will move a lot of water quickly from a boat.
43. Fire extinguishers – Must be at least a BC rating. Required primarily for your facility.
44. Extra fire extinguisher – See # 43 above.
45.* Kicker (Skiff), hook – A snap hook specially constructed to be attached to the towing eye of a boat using a pole or boat hook. Towline is fastened to the hook.
46. Knife – knife with a 3" blade. May be carried by the crew as part of their PPE gear. A good idea to keep one handy in the area where you attach the towline when towing.
47. PFD Speed rated and one for each crew person
48. PFDs You must carry at least 2 over what is required for the facility. (The extras do not need to be speed rated)
51.* Portable pump or means of dewatering – Consider a bucket (or a hand pump for small boats) but remember that a 5 gallon bucket will quickly and easily remove a lot of water.
53. Stern and bow cleats thru hull w/back plates
54. Tools – required for emergency repairs. Consider a set of screw drivers, electrician pliers, electrical tape, wire cutters, slip joint pliers and a set of wrenches.
55. Watch or clock
56. Communications capability per Operations Policy Manual

NOTE: In addition to the above I would strongly recommend a GPS or a GPS/chart plotter and a VHF-FM Marine radio (or other radio if no marine coverage in your area). A radar unit would be another optional item that would prove useful but space and cost is a major factor.

NOTE: * indicates item is optional. Requirement is set by CG District.

3.3 LINES, FENDERS, AND FITTINGS:

3.3.1 Lines: Should be provided of sufficient number, size, and length to accomplish whatever mission may be tasked.

a. Stern Towline: See Table 1.2 for the minimal recommended size and length of towline for a stern tow. Also read chapter 1 to help you select the type of line to use.

b. Side Tow Lines: Each facility should have four lines dedicated for alongside towing. These lines should be long enough to reach the length of your vessel and be of sufficient size to handle another vessel up to 50% larger than the towing vessel. The line going from your bow toward the

stern of the vessel being towed (#2 line or the "Towing Strap") will take most of the towing load.

c. Mooring Lines: You should have sufficient lines dedicated to mooring your vessel. At a minimum you should have at least two lines dedicated to mooring your vessel. The lines should be long enough to handle your vessel in most mooring situations that you would expect to encounter.

d. Anchor Line: You should have a dedicated anchor line of sufficient size to hold your vessel in heavy weather conditions. This line should be at least seven (7) times the depth of the water in which you might expect to anchor. That is; if you normally operate in water with a depth of 50 feet you should have at least 350 feet of anchor line available. (This should not include your towline.) The anchor line does not have to be in a single piece. In the example above, you may want to have an anchor line of 200 feet for normal conditions and have another 150 foot line available that could be connected to give you the 350 feet. Also, a length of heavy chain on the anchor end of the anchor-line would increase the holding power of the ground tackle.

e. Miscellaneous: If you find that you may be towing vessels much smaller than your own, you may want to consider having several short lengths of smaller diameter line to use between your towline/bridle/ pendant and the smaller vessel. Also, you may find a need to do the same for doing an alongside tow. These short lines should have an eye spliced on both ends so that they could be simply connected to your lines by dipping the eye.

3.3.2 Fittings: It is convenient to have a variety of fittings on the facility. This would include a skiff hook for attaching to the trailer towing eye of a vessel to be towed. The skiff hook should be equipped with a bracket to hold it to a pole/boat hook and then released once snapped onto the towing eye.

In addition it is recommended that you have a large (heavy) shackle that would be placed around an anchor line from a disabled vessel that has a fouled anchor. This shackle would also be attached to the towline and allowed to slide down the anchor line to the anchor and then the tow boat could pull it from the angle opposite from the direction it was set.

3.3.3 Fenders: An Auxiliary facility can never have too many or too large of fenders. The limiting factor with fenders is storage space on the facility. Remember that the fender is what protects your boat against a dock or when doing an alongside tow. Too many facilities get damaged because their fenders are not large enough or there are too few of them. Remember if doing an alongside tow you must not only adequately fender between the boats but also fender alongside the dock when mooring. Consider what you paid for your boat and what a few larger fenders would cost. It is a good idea to have a variety of fenders. You may

want to have a mixture of cylindrical and ball style fenders so as to best protect your vessel. The purpose of fenders is to cushion your boat and hold it away from a dock or another vessel.

3.4 PREPARATION:

Be sure that all of the required boat equipment is operating properly.
Does each crew member know where everything is located and how to operate the facility and all of its equipment? Check to be sure that the facility is in good operating condition. Be sure to do a thorough facility inspection before getting underway. Is the facility the proper one to conduct the mission, in the expected environmental conditions?

Fuel tanks are to be full when starting a patrol. If they are not, top them off before starting the mission. Check oil levels and belts. Test all equipment with your crew before getting underway.

Properly display all required Auxiliary Patrol signs and flags to indicate an Auxiliary facility operating under orders. (Be sure to remove such signs and flags when the patrol is completed unless the facility will be used on another mission the next day. Give thought on the need to display an Auxiliary Aircraft Identification sign on the top of the facility if there is a chance of working with an Auxiliary or Coast Guard Aircraft.

Keep the facility clean and neat as it represents the USCG. Crew members should help to keep the facility clean and neat while underway. Garbage should be properly stored until it can be properly disposed.

Have an adequate supply of drinks and food to care for the needs of the crew while underway. The owner/operator is normally given a stipend (the Coast Guard's cost for a meal) to help cover the cost of meals but, this does not preclude the crew from supplementing these stores with additional drinks and snacks.

3.5 LOCATING AND INSTRUCTIONS ON THE USE OF EQUIPMENT:

The facility owner/operator should walk the crew through the facility to familiarize them with the location of all equipment and instruct them on its proper use. This should be done even with those members that have crewed on the facility before as something may have been moved or misplaced. This also offers a good opportunity to check the operating condition of all this equipment.

Time should be taken to place type IV PFDs where they can be immediately put into service if an emergency occurs. Lines should be laid out where they are readily accessible for use in an emergency. This includes having the towline positioned so that it could be quickly placed into service without having to untangle it or get it out from a hard to reach compartment. Have "Rescue and

Heaving lines readily accessible and ready for quick use. Have fenders readily available for use if and when they are needed during the patrol.

Instruct the crew on the use of the radio and have a note pad and pencil/pen available to write information if it needs to be recorded. Instruct the crew on the use of the SAR Summary form (CG-4612) and instruct one of the crew on the responsibility of recording this information. The CG-4612 has an instruction included and each member of the crew should be familiar with how to complete this form. Completing the CG-4612 would be a good subject for training after a flotilla meeting.

CHAPTER 4 STABILITY

4.1 GENERAL:

Safety of both the boat crew and persons in distress is of paramount importance during any emergency evolution. Mishaps resulting in death or injury have occurred while Coast Guard boat crews attempted to assist vessels in distress. Accident investigation reports reveal that injury or property damage often result from lapses in common sense and safety awareness during the pressing urgency of an emergency. If in the process of trying to assist another mariner you are injured or your vessel is damaged, you become part of the problem instead of the solution to it.

4.2 RISK ASSESSMENT AND MANAGEMENT PLAN:

Risk assessment starts with understanding why mishaps occur. Responsibility for identifying and managing risk lies with every member of the boat crew. Realistic training based on standard techniques, critical analysis, and debriefing missions will help every person in a boat crew to contribute to developing and implementing a Risk Management Plan. A Risk Management Plan identifies and controls risk according to a set of preconceived parameters:

* Make the best attempt to account for all persons.

* Attempt to have all lines, rigging, etc. removed from the water around the vessel to avoid fouling the props.

* Have all required equipment ready and test run pumps.

All of the entire crew must constantly watch for any loss of stability in their own vessel and that of the distressed craft. Do not assume that the coxswain has been able to observe all of the warning signs. Advise the coxswain of any warning signs he/she may have overlooked. Use the following elements in your Stability Risk Management Plan:

* Observe the roll of your own boat and, observe the roll of the distressed vessel as you approach it initially and while it is under tow.

* Be aware of external forces – wind, waves, and the effect of water depth.

* Be aware of loading – the amount of weight and its placement on all vessels involved. Rearrange loading if necessary.

* Attempt to keep your equipment aboard your vessel when dewatering the vessel.

* Attempt to tow the distressed vessel only after the loss of any stability has been corrected.

* Adjust course, speed, or both as necessary to decrease rolling or listing.

* Avoid sharp turns or turns at high speed when loss of stability is possible.

* Maintain communication between the coxswain and crew.

* Keep the operational commander or parent unit informed of the situation through regular and frequent reports.

WARNING: When a vessel is visibly unstable (i.e., listing, trimmed down to the bow/stern or when down-flooding occurs) never make your vessel fast to or tow the distressed vessel. A flooded vessel may appear stable when it is in fact not. Compare the distressed vessel's reaction to sea conditions with your own boat's movement.

4.3 STABILITY:

When a vessel is heeled over in reaction to some external influence, other than damage to the vessel, it tends to either return to an upright position or continue to heel over and capsize. The tendency of a vessel to remain upright is its stability. The greater the tendency to remain upright, and the stronger the force required to heel the vessel over in any direction, the more stability the vessel achieves. The stability of a vessel in the water is very important to the safety of all members of a boat crew. Being able to anticipate how your vessel and the vessel you are assisting will react in any given set of circumstances is dependent on your knowledge of stability. Weight and buoyancy are the two primary forces that affect the stability of a floating vessel. Weight is the force that pushes a vessel down into the water. Buoyancy is the force that pushes up from the water to keep the vessel afloat. The interaction of these two forces determines the vessel's stability.

The center of gravity is the point at which the weight of the boat acts vertically downwards. Thus, the boat acts as though all of its weight is concentrated at the center of gravity. Generally, the lower the center of gravity, the more stable the vessel.

The center of gravity is fixed for stability and does not shift unless weight is added, subtracted or moved. When weight is added, for example when a vessel takes on water, the center of gravity moves toward the added weight. When the weight is removed, the center of gravity moves in the opposite direction.

If a vessel has been damaged so that water is flowing in and out of a hole below the waterline, known as free communication with the sea, the result is a loss of

buoyancy which generally means a significant reduction in stability.

4.4 EQUILIBRIUM:

When a boat is at rest, the center of buoyancy acting upwards/vertically is below the center of gravity acting downwards. A boat is considered to be in equilibrium. Equilibrium is affected by movement of t he center of gravity or center of buoyancy or by some outside forces, such as wind and waves.

When a boat rolls, the force of the center of gravity will move in the same direction as the roll. The downward force of gravity is offset by the upward force of buoyancy and causes the boat to heel.

In heeling, the underwater volume of the boat changes shape causing the center of buoyancy to move. The center of buoyancy will move towards the part of the hull that is more deeply immersed. When this happens the center of buoyancy will no longer be aligned vertically with the center of gravity. The intersection of the vertical line through the center of buoyancy and the vertical centerline of the boat is called the metacenter. When the metacentric height (distance between center of gravity and metacenter) is positive, the forces of buoyancy and gravity will act to bring the boat back to its upright position. In this case, the center of buoyancy is outboard of the center of gravity and the boat is considered stable. If the center of buoyancy is inboard of the center of gravity, that is the metracentric height is negative, the forces of buoyancy and gravity will tend to roll the boat further towards capsizing.

If the center of gravity is not on the centerline of the boat, the boat will heel until equilibrium is reached with the center of buoyancy and the center of gravity in alignment. This condition is referred to as list.

4.5 TYPES OF STABILITY:

A boat has two principal types of stability: longitudinal and transverse. Because a boat is longer than it is wide the longitudinal plane (fore and aft) is more stable than the transverse plane (beam).

The longitudinal stability tends to balance the boat, preventing it from pitching end over end. Vessels are designed with enough longitudinal stability to avoid damage under normal circumstances. However, differences in vessel design create boats with different longitudinal stability characteristics. Some vessels suffer excessive pitching and offer a very wet and uncomfortable ride in rough sea and weather conditions. Such an uncomfortable ride often affects the endurance and capability of people on vessels you are assisting.

Transverse stability tends to keep the boat from rolling over (capsizing). Additional weight above the boat's center of gravity increases the distance between the center of gravity and the center of buoyancy. As a result, stability is decreased. Removal of weight from below the boat's center of gravity also decreases stability. If the loaded center of gravity is raised high enough, the boat will become unstable.

4.6 STATIC AND DYNAMIC FORCES:

Unless acted on by some external force, a boat that is properly designed and loaded remains on an even keel. The two principal forces that affect stability are static and dynamic forces. Static forces are caused by placement of weight within the hull. Dynamic forces are caused by actions outside the hull such as wind and waves.

It is essential that boat crew members understand these forces. Watch the time required for a complete roll from side to side. The time should remain about the same regardless of the severity of the angle of roll. If the time increases significantly or the boat hesitates at the end of a roll, the boat is approaching or past the position of maximum righting effect. Take immediate action to decrease the roll by changing course or speed or both.

4.7 LOSING STABILITY:

A vessel may be displaced from the upright position by certain internal and external influences such as:

* Waves
* Wind
* Turning forces when the rudder is put over
* Shifting of weight onboard
* Addition or removal of weight
* Loss of buoyancy

These influences exert heeling moments on a vessel causing it to list (permanent) or heel (temporary). A stable boat does not capsize when subjected to normal heeling moments due to the boat's tendency to right itself (righting moment).

4.8 FREE SURFACE EFFECT:

Compartments in a vessel may contain liquids as a matter of design or as a result of damage. If a compartment is only partly filled, the liquid can flow from side to side as the vessel rolls or pitches. The surface of the liquid tends to remain parallel to the waterline. Liquid that only partly fills a compartment is said to have free surface and water in such a compartment is said to be loose water. When

loose water shifts from side to side or forward and aft due to turning, speed changes, or wave action, the vessel does not want to right itself. This causes a loss of stability. This can cause the vessel to capsize or sink.

NOTE: The area of free surface is very important and in particular its width. If the free surface area doubles in width, its adverse effect on stability will change by a factor of four.

Corrective action includes:

* Minimize the number of partially filled tanks (fuel, water, or cargo); ballast with sea water as necessary.
* Maintain fish wells completely empty or filled at all times.
* Prevent cargo such as fish from rolling back and forth on the deck.

4.9 FREE COMMUNICATION WITH THE SEA:

Damage to the hull of a vessel can create free communication with the sea, the movement of sea water into and out of the vessel.

Corrective actions include:

* Patch the hull opening.
* Place weight on the high side to decrease the list toward the damaged side.
* Remove weight above the center of gravity on the damaged side.

4.10 EFFECT OF DOWN-FLOODING:

Down-flooding is the entry of water into the hull resulting in progressive flooding and loss of stability. Vessels are designed with sufficient stability and proper righting moments as long as they are not overloaded. These design features can not compensate for the carelessness of a boat crew who fails to maintain the watertight integrity of a vessel and allow it to needlessly take on water.

Corrective actions include:

* Keep watertight fittings and openings secured when a vessel is underway.
* Pump out the water.

4.11 EFFECT OF WATER ON THE DECK:

Water on the deck can cause stability problems by:

* Increasing displacement (increasing draft and decreasing stability and trim).
* Contributing to free surface effect.
* Amplifying the rolling motion of the vessel which may result in capsizing.

Corrective actions include:

* Decrease trim, increase freeboard.
* Change course, speed or both.
* Ensure drain openings are unobstructed.

CHAPTER 5 PREPARING TO GET UNDERWAY

5.1 THE MISSION:

What is the mission? Review what the mission is with the crew and be sure everyone understands what it is. Ask for questions and discuss any foreseeable contingencies that might arise. Have you had sufficient time to plan the mission and to review any foreseeable contingencies? Do you have a copy of your orders onboard with you? See chapter 23.2 for a pre-mission brief check list. Also, see Section A of the SABOT JOB AID.

5.2 RISK ASSESSMENT:

Do a complete "Risk Assessment" for the mission with the crew. Develop a GAR (Green, Amber, Red) score for the mission and be prepared to update this risk assessment during the mission. Use a score of 1-10 for each of the six (6) GAR score categories. The following are the categories and suggestions for computing the GAR score: (See 23.3 for a sample GAR Worksheet)

SUPERVISION: Used to weight the supervisor level for the mission. Give consideration to the experience and skill level of the coxswain. For example; add points if the coxswain is not the facility owner (+5). Add additional points if the coxswain hasn't much experience (+4 if under 3 years and +2 if less than 6 years). Add points if the coxswain is not familiar with the AOR (+4).

PLANNING: How much planning went into the mission? Is there enough food and drinks for the mission? How familiar is the crew with the facility? Add points if not everything is known about the mission. For example; add points for a training mission or check ride. Add +3 if a night mission, +3 for each trainee onboard.

CREW SELECTION: How much skill and experience does the crew have? For example; add +3 if experience is under 3 years and add +3 for each crew member that is new to the facility.

CREW FITNESS: What is the physical fitness of the crew? Consider age, mobility, and physical condition of the crew? Is any crew on medications that could affect their performance (Diabetic, etc.)? For example; any of the crew fatigued? Add: +5, +3 if on medications, +1 if any between 50 – 59, +2 if between 60-69, +3 if between 70-79, and ++4 if 80 or over. Add points if exceeding "Crew Fatigue" limits.

ENVIRONMENT: What are the environmental conditions that you will be operating in? What are the wind, sea state, and visibility conditions? For example; add: +10 if any conditions exceed facility limitations, +3 if night operations, etc.

MISSION How complex is the mission? For example; add to score if a training mission or check ride (+3-6). Add: +(1-3) if a routine mission, +(4-6) if mission is moderately complex, + (7-10) if mission is very complex.

The above is a guideline and does not necessarily mean you have to add these specific numbers to the score. The purpose of this is to ensure that you consider all of the parameters when computing the GAR score.

Compute the total score of the six categories above; if the total is 44 to 60 you are in the RED which is a "**NO GO**" condition. Go back to your controlling unit and find another resource where the score is lower.

If the total score above is between 24 and 43 you are in the AMBER which requires you to make changes that would lower the score to under 24. It may be necessary to find another resource.

If the total score above is between 6 and 23 you are considered in the GREEN and should be okay to conduct the mission. If there are things you could do to lower the score even if in the GREEN you should give it consideration.

If any single category is 10, consider being in the RED which is a "NO GO" score. Take action to lower the GAR score.

The facility limitation should be listed on the Facility "Offer-of Use" form and should be reviewed with the crew before establishing the GAR score.

If anything happens during the mission, the GAR score should be recalculated to include the change (Come upon a disabled vessel, change in environmental conditions, health of the crew, extended operations beyond those originally planned, etc.).

Be sure that every crewmember understands that if they are not comfortable or don't understand something, they must speak up to clarify the situation before an accident occurs.

This GAR score should be passed to your controlling unit prior to commencing the patrol and every time there is a change in the mission.

5.3 ASSIGN DUTIES TO CREW:

Assign duties to each member of the crew and explain what these duties are and what your expectations are. Make sure each crewmember understands what their duties are. Assign Lookouts, will someone be responsible for radio communications (OPS and Position reports) and recording the information? Who will be at the helm? Periodically rotate crew duties to give everyone experience at each job and to help keep everyone alert.

5.4 STANDARD COMMANDS:

The following is a list of standard line commands which all crew members should understand:

a.	PUT OVER LINE	Pass the line to the indicated pier or vessel.
b.	HOLD LINE (_____)	Do not allow anymore line to go out. Line handlers who feel a line may part should get away from it, but shall never check or ease a line on their own initiative.
c.	CHECK LINE (____)	Hold heavy tension on the line, but provide the minimum slack necessary to prevent parting.
d.	EASE LINE (____)	Reduce tension, but not to the point of slacking the line.
e.	SLACK LINE (____)	Let the line hang loose with a catenary.
f.	TAKE THE SLACK OUT OF LINE (____)	Remove all catenary from a line.
g.	TAKE IN LINE (__)	Line handlers onboard should provide enough slack for the line to be removed from the fitting on the pier and take in the line quickly once it is removed from the pier.
h.	DOUBLE UP LINE (____)	Pass an additional line so that there are two pieces of mooring line running to the pier.
i.	SINGLE UP LINE (____)	Take in all but one strand of mooring line from the indicated fitting.

5.5 CONTROLLING UNIT:

You should always consider the controlling unit (Coast Guard Station) a part of your team the same as you do your crew. The controlling unit should monitor your position and status as your patrol progresses. They also provide you with connectivity to SAR controllers who can be a major resource to call on for advice and help. Normally you should give the controlling unit and "OPS & POSITION" report every half hour. Included in this report should be your heading or where you are intending to go. In inclement weather, or while towing, these reports should be every fifteen (15) minutes or less if so directed.

The purpose of these reports is to know where to search for you if you fail to report. This is for the safety of the facility and crew should anything go wrong. For these reasons it is extremely important that you make these reports in a timely manner. It is the responsibility of both the facility and the controlling unit to record these "OPS & POSITION" reports.

CHAPTER 6 GETTING UNDERWAY:

6.1 LEAVING THE MOORING:

After everything has been checked and the crew understands their duties the engine compartment has been ventilated and sniff tested, the engines may be started and allowed to warm up. When ready to get underway the coxswain should test the controls while still attached to the dock to ensure that the boat can be shifted into forward, neutral, and reverse. Once free of the dock is not the time to discover a shifting problem.

Have your lookouts check that it is clear to leave your mooring before letting go all of the mooring lines. When clear, use standard line commands to have the crew release the facility from its mooring and sound one prolonged blast on your horn to signal that you are leaving your slip.

Notify the controlling unit that you are underway, the number of POBs and your GAR score.

6.2 UNDERWAY:

Once underway, the crew should stow the mooring lines and fenders to keep them out of the way. All personal gear should be stowed out of the way until needed. Set your lookouts.

The crew should lay out everything you may need while underway on your mission. It is a good idea to have your towline readily accessible for quick use should it be needed. Towlines, pendants, and bridles should not be stored tangled in buckets below deck or in a compartment.

You may want to consider hanging some of your short lines from a rail or hooks on the facility to provide for ready access. Some keep their towlines faked in an open plastic container ready for use with the pendant or bridle attached. You may want to consider a similar arrangement for rescue and heaving lines as well as your type IV PFD.

Remember, no cell phone use without permission of the coxswain and not by anyone operating the boat.

6.3 LOOKOUTS:

Lookouts must keep the coxswain and the helmsman, if not the coxswain, informed of any boating traffic or other dangers that could affect the safe operation of the facility. The lookout must exercise some good judgment and not be calling off every vessel within a mile. Only notify the coxswain of those objects in the immediate area.

Lookouts should be trained to watch for boats with engine covers off, people congregating around the engine or engine compartment, vessels anchored in unusual locations where people don't normally anchor or fish. Watch the shoreline where disabled vessels may drift. When such a vessel is spotted, check them out. If they are not in any difficulty you will still make them feel good about the Coast Guard's concern for their well being.

6.4 HELM WATCH:

The coxswain or one of the crew may be standing the helm watch. If the helm is manned by a crew member, the coxswain should be supervising. The helmsman should steer on whatever course given by the coxswain using a compass course or a point of reference to steer toward (Use of Seaman's Eye). When a compass course is given, the helmsman should use this for the initial heading and then check for a reference on the horizon for which to aim (Seaman's eye). On small boats the helmsman can steer a much straighter course using seaman's eye than by chasing the compass.

6.5 CREW ROTATION:

Duties should be rotated among your crew to keep them from getting bored or fixated causing a loss of "Situational Awareness". In addition, it is a good idea for everyone to be able to perform all of the duties including running the boat. If something happens to the coxswain the crew should still be able to safely bring the facility back. Also, it is a good idea to have more than the minimum number of crew on board so as to be able to rest crewmembers and to have sufficient crew to conduct a search or recover a man overboard. For example, if you are on a facility under 25 feet in length and have a minimum crew of 1 plus the coxswain, how do you recover a "Man-over-board"? If you are on the same facility how do you run a search pattern? If the crew is the lookout the coxswain must steer the boat, time the legs, compute the headings and be aware of all going on in the area.

CHAPTER 7 UNDERWAY:

7.1 GENERAL:

Once underway on a patrol it is important to keep all members of the crew aware of what is going on in the area (boating traffic, etc.) and focused on the mission. Everyone in the boat crew should be aware of keeping track of the time so as not to miss or be late for an "OPS and position" reports. It might be a good idea to rotate duties every time you do an "OPS & position" report as it will help to track the time for calling in. The crew should be familiar with everything in the AOR and report anything unusual, for example boats in areas where there is normally no traffic, boats that may have drifted close to shore due to a problem, boats with engine compartments open, people where they are not supposed to be, etc.

If you have a trainee onboard someone should be assigned as their mentor to explain what is going on and to demonstrate how tasks should be done. It is a good idea to conduct training if you are not tasked to a specific activity/mission. Train the entire crew on how to operate all the electronics onboard as well as how to operate the boat. It might be a good idea to have each of the crew practice maneuvering around a buoy or a floating object to simulate it being another vessel that you want to approach. Try making approaches from different directions so that everyone knows how the boat handles going into, with or across the wind or current. Simulate the floating object being a boat on fire and you want to take the POBs from it.

Practice doing MOB and PIW recoveries, don't forget you will be one crew member short in a MOB! Practice station keeping with the bow into the wind/seas/current and practice with the stern into these forces. Let everyone experience how the boat handles in each and which is best on this particular boat! The most important skill that all should master is the ability to "Station Keep". Practice these tasks in calm seas and then when the opportunity presents itself, repeat these tasks in heavier seas (heavier seas for the particular facility or crew). Practice what you would do if one of the crew or a person on another boat got injured. Does everyone know where the first aid kit is? Do they know how to use it?

If there is a CG boat or another Auxiliary boat (operating under orders) you may want to practice taking them into a stern tow and then transferring them to an alongside tow and moor them. Let all members of the crew rotate jobs during these drills. It is especially important to let them handle the boat during these towing evolutions. If for no other reason it lets the crew understand all the dynamics which will make them a better crew person. Remember that when doing these evolutions and when mooring, it should be done at low or minimum speeds.

Conduct drills on what you would do if you had another boat taking on water. Remember to get the POBs (that are not needed off before trying to dewater or get everyone off the flooding vessel). Practice using your onboard dewatering equipment. (You can move a lot more water, faster using a bucket than with a hand pump.)

On all patrols everyone in the crew should be alert to what is going on around them. Everyone should be observing and looking for anything abnormal in the AOR. The following is a list of some of the things to watch for:

a. Boats where there normally are not any boats.

b. Vessels anchored along a windward shore that may be disabled and drifted there before anchoring.

c. Vessels with their engine hatch or cover open (possible mechanical problem)

d. A power vessel with a paddle or oars in use.

e. Unsafe operation of a vessel

f. Bow riding (Dangerous and in some states illegal)

g. Minors not wearing a PFD (Illegal in some states)

h. Vessels anchored in a channel or under a bridge. (Against the law)

i. People taking photographs of installations

j. People that may be attempting to enter the country illegally)

k. Anything that strikes the observer as being out of place or unusual.

Any observations should be reported to the coxswain for investigation or for reporting to the controlling station or the appropriate law enforcement agency. There is nothing wrong with a Auxiliary patrol cautioning a boater when observing unsafe or illegal activity. You can **not** take any action other than explaining regulations and Rules of the Road to the boater. If unsafe operations are observed you are allowed to explain to the boater what they are doing is unsafe and why, that if observed by a law enforcement agency they could be subject to legal action. At all times be courteous and polite. Never threaten the boater.

CHAPTER 8 BOAT HANDLING

8.1 GENERAL:

In this chapter we will look at the factors involved in boat handling. We will look at the characteristics of different types of boats including their style and propulsion systems, the forces that act on a boat and how to manage all of these. For exercises use the SABOT JOB AID, Section B for reference.

8.2 FORCE:

The first fundamental a coxswain should understand is FORCE. Forces encountered in towing can be placed into two distinct classifications designated as STATIC, where the vessels are not in motion, but strain or tension, exists in the towing rig, and DYNAMIC, where both vessels have some actual way on, up to optimum towing speed and beyond.

These forces act upon: (a) the towing vessel, (b) the towed vessel, and (c) the towing rig. All of these forces result in strain on both vessel's hulls, their fittings, and the towing rig(towline, bridle and pendant). Understanding these forces; and their causes will enable the coxswain on the towing vessel to avoid exceeding the physical stress limits of the equipment or vessels and prevent unnecessary damage or personal injuries from such failures.

8.2.1 Static Forces: The static forces result from overcoming inertia. It takes force to get a body at rest into motion or to change direction if the body is already in motion. This force depends upon the mass (weight) of the body to be moved, as well as the acceleration imparted to it.

Additionally, force is required to turn a towed vessel into line with the towing vessel (change in direction). In this case, the force brings about an acceleration in angular motion, as the vessel rotates about its "Center of Lateral Stability" (CLS).

In both cases, starting the towed vessel into motion and turning it into line, results in force. Total static force is highest initially, when the acceleration goes from zero, instantly, to some positive value of initial static load, which then drops as the towed vessel reaches towing speed.

Static force load can be substantial. It can approach with relatively heavy vessels, such as those with large displacement hulls, a value equal to the weight of the towing vessel. For many small craft, an attempt to tow a larger, heavy vessel is like trying to tow a brick wall. Forces which exceed the breaking strength of the towline or deck fittings of either vessel, can be encountered in short order without even getting the tow underway.

8.2.2 Dynamic Forces: Dynamic force is encountered during motion, from the time the

vessel starts to move and continuously until the vessels reach optimum towing speed and beyond. Dynamic force includes stress caused by any or all of the following factors:

a. Change in velocity.

b. Frictional resistance of a hull to the water.

c. Frictional resistance of the hull to air and wind (Drag).

d. Intermittent resistance due to waves and/or sea state.

e. River currents.

8.2.2.1 Stress Due To Changes In Momentum: This force is the same as that discussed under static force. Minimize by always changing speed slowly.

8.2.2.2 Stress Due To Frictional Resistance Of The Hull To The Water: As the vessel moves through the water, the water layer immediately next to the hull moves along with it (called the "Boundary Layer). This layer varies from a few molecules at the bow to several feet at the stern of heavy displacement types of moving vessels. Imparting and maintaining the motion of this "Water Jacket" with the vessel requires energy and results in the stress known as "Frictional Resistance". Frictional resistance is directly proportional to the total wetted surface and approximately to the square of the speed.

The force to overcome this frictional resistance manifests itself on both the towing and the towed vessels. It is overcome by the towing vessel's propulsion power. The total frictional resistance that must be overcome is the sum of the individual resistances for each vessel. Note that if both vessels are moving at the same speed, the total wetted surface of each vessel is important. If the towed vessel's hull has a large wetted area, such as a deep-hulled sailboat, and the towing speed is high, the frictional resistance can be such as to exceed the physical limits of either the towing or towed vessel and/or the tow rig.

8.2.2.3 Forces Due To Frictional Resistance Of The Hull To Air And Wind (Drag): Air resistance, which is the resistance of the hull, due to its speed through the air, is small. It varies in a range of 1.5 to 3 percent of the total water resistance of the vessel at maximum speed. Simple air resistance can be neglected, but wind resistance (Drag) can't be overlooked. Drag can become substantial, affecting not only tension in the towing rig, but also control, speed and efficiency of the tow.

It is important to realize that the wind resistance is directly proportional to the square of the wind velocity and the total cross-sectional area of the vessel into the wind.

8.2.2.4 Intermittent Force Due To Waves And/Or Sea State: Wave load due to continual swells, chop, waves and surface irregularities such as wakes, can cause large loads on the towing vessel, towed vessel, and towing rig. These loads are shock loads caused by the towed vessel plowing through or riding over the waves as a tow proceeds.

The shock loading varies with the frequency and height of waves, speed of the vessels and length of the towline. A long towline acts as a shock absorber and helps to control transient loading. With a short scope transients of only a few seconds can result in stress loads of over several hundred pounds. A longer scope reduces the effect of these shock loads to as much as one fourth of that experienced under a short scope.

Shock loading can do severe damage to both towing and towed vessels as well as over stressing the towing rig. When heavy waves are encountered, shock can best be controlled by reducing speed and quartering into the waves, wind, and sea.

8.3 PROPULSION AND STEERING:

Propulsion and steering are considered together for two reasons. Applying thrust has no use if you can't control the vessel's direction, and often the device providing the propulsion also provides the steering. There are three common methods to transfer power and provide directional control:

A rotating shaft and propeller with a separate rudder (IN).

A movable (steerable) combination as an outboard motor (O/B) stern drive (I/O).

By an engine driven pump mechanism with directional control, called a water (Jet Drive).

8.3.1 Shaft, Propeller, and Rudder: The shaft usually penetrates the bottom of the hull at an angle to the vessel's designed waterline as the engine has to be inside the hull while the shaft and propeller must be outside and beneath the hull. For a single screw vessel, the shaft is generally aligned to the centerline of the vessel. However, in some installations, a slight offset (approximately one degree) is used to compensate for the shaft torque. The rudder is usually mounted directly astern the propeller. On twin screw vessels the shafts are mounted parallel to the centerline with a rudder directly behind each propeller.

8.3.2 Propeller Action: When rotating in a forward direction, a propeller draws its supply of water from every direction forward of and around the blades. Each blade's shape and pitch develop a low pressure area on the forward face of the blade and a high pressure area on the after face of the blade, forcing a thrust of water toward the stern which in turn pushes the vessel forward.

Most single screw vessels (not all) use a right hand screw. That is, when viewed from astern, the propeller is seen to turn in a clockwise direction when in forward. A left hand screw will operate the opposite. Twin screw vessels normally have a right hand turning screw on the starboard side and a left hand turning screw on the port side

If the propeller rotates too fast a partial vacuum causes air bubbles (boiling water) at the tips of the propeller blades. This is called cavitation and it causes a loss of lift or thrust. This can also occur when trying to get a stopped propeller to spin at maximum speed rapidly going from ahead to astern (or vice versa), or by operating in aerated water where the bubbles are dragged into the propeller flow. Cavitation occurs more readily when trying to back, as the suction screw current draws water from behind the transom, and air at the waterline mixes with the water and is drawn into the propeller. This is even more common with I/Bs and I/Os with a through hub exhaust.

Once cavitation occurs most thrust (in either direction) is lost and the quickest way to correct this is to slow down. Cavitation may occur anytime there is any interference with the water flow over the propeller blades (weeds, etc.). You may have to stop and find/correct the reason for cavitation before continuing. If excessive cavitation continues over a period of time the leading edge of the propeller will become pitted and eroded This can damage the propeller.

8.3.3 Side Force: In addition to the thrust along the axis of the shaft, another effect of propeller rotation is side force. This force causes the following reaction:

A right hand turning screw when moving forward will tend to move the vessel to the starboard and when operating in reverse will move the stern to port.

A left hand turning screw when moving forward will tend to move the vessel to port and when in reverse will move the stern to starboard.

A twin screw vessel with counter-rotating propellers (right hand on the starboard and left hand on the port sides) cancels this side force.

Therefore it is easier for a single screw vessel with a right hand propeller to turn to starboard when in forward at low speed and will naturally tend to back to port. This action is important when maneuvering at low speeds (docking and coming alongside another vessel, etc.).This force is much more prevalent at slow speeds and tends to disappear as speed is increased.

8.3.4 Rudder: You normally use the rudder to change the vessel's heading when moving through the water. As the hull moves forward and the rudder is held steady amidships, pressure on either side of the rudder is relatively equal and the vessel will usually maintain a straight track. When you turn, the rudder pressure decreases on one side and increases on the other. This force causes the stern to move (or slide) to one side or the other. As the stern moves in one direction, the bow moves in the other because a vessel rotates about its pivot point.

The speed of the water flowing past the rudder greatly enhances the rudder's force. The thrust or screw discharge current from a propeller operating ahead increases the water flow speed past the rudder. When you turn the rudder to a side, about one half of the propeller thrust is directed to that side adding a major component of force to move the stern.

When operating astern, the rudder is in the screw suction current. The rudder, therefore, can not direct any of the propeller thrust. Because the screw suction current is neither as strong nor as concentrated as the screw discharge current, water flow past the rudder does not increase as much. The combined effects of screw current and rudder force when operating astern are not nearly as effective as when operating ahead.

As rudder force is determined by water flow along it, a rudder loses some of its effectiveness if the propeller cavitates and aerated water flows along the rudder.

8.3.5 Outboards and Stern Drives: Outboards and stern drives are equipped with small steering vanes below the propellers. The housing above the gear case is generally foil shaped. Though these features help directional control, particularly at speed, the larger amount of steering force is based upon the ability to direct the screw discharge current at an angle to the vessel's centerline. This directed thrust

provides extremely effective directional control when powering ahead.

O/Bs and I/Os usually allow a level of vertical thrust control. Trim systems control the angle of attack between the propeller's axis of rotation and both the vessel's waterline and the surface of the water. Vertical thrust control, especially applied aft of the transom, changes the attitude of the vessel hull relative to the water. Use small amounts of trim to offset for extreme loading conditions or to adjust how the vessel goes through the chop.

In addition to trim, a vertical component of thrust develops in another situation. Depending on the type of hull, if a vessel is forced into an extremely tight turn with power applied, thrust is directed sideways while the vessel heels, actually trying to force the transom up out of the water, causing a turn to tighten even more.

WARNING – In lightweight or highly buoyant O/Bs, use of full power in tight turns can cause loss of control or ejection of crew. The helmsman should always attach the engine KILL switch lanyard to himself, if available.

8.3.6 Cavitation: Cavitation frequently occurs when backing with O/Bs. As through-hub exhaust gas bubbles are drawn forward into the propeller blades, the aerated water increases the possibility of cavitation. Through hub units are equipped with anti-cavitation plates above the propeller. Always take care to limit cavitation, particularly when backing or maneuvering, using large amounts of throttle.

8.4 BASIC MANEUVERING:

8.4.1 General: When you step up to the controls of any vessel for the first time, immediately familiarize yourself with any physical constraints or limitations of the helm and engine controls. Ideally controls should be designed and mounted to allow a wide range of operators of different arm length and hand size, thought this is not always the case. Check for any obstructions to hand or arm movement to the helm and engine controls. Take the helm through a 360 degree turn to see if anything prevents the use of the spokes on the wheel. Check for the ease of shifting gears and of advancing and retarding the throttles. The throttle and gear shifting controls should operate smoothly without any binding. These controls should be checked while still moored with the engines secured. Learn where all the controls are before getting underway and check for anything that you could snag your clothing on or bang a knee or elbow in heavy seas.

While the vessel is still secured to the dock, check to see the controls will shift properly into forward and reverse and back to neutral.

8.4.2 Determine the Helm Limits: The following are some guidelines for determining the helm limits:

a. Determine the amount of helm from full right rudder to full left rudder.

b. Check for any binding, play, or slop in the helm and at what angle it occurs.

c. Ensure the helm indicates rudder amidships.

d. Ensure that a rudder angle indicator accurately matches rudder position and matches a centered helm.

8.4.3 Check Engine Control Action: Examine the following when checking engine control action:

a. Is the throttle separate from the shifting/direction mechanism?

b. Any detent, notch or stops that separate neutral from forward and reverse?

c. How much force is required to shift from neutral to forward and reverse?

d. Any binding or excessive looseness at any stage of the throttle control?

e. Is neutral easy to find without looking at the control handle?

f. Do the controls stay put or do they tend to slide back?

g. Does the Kill-Switch lanyard allow adequate but not excessive range of motion?

h. Does an engine shut-down handle work properly?

i. Is the idle speed adjusted properly?

Smooth, positive operation of the engine and helm controls is absolutely necessary for safe boat operation. Do not accept improper control configuration, mismatched equipment, or improper maintenance as a reason for poorly operating controls. Poor control operation causes unsafe boat operations.

8.5 MOVING FORWARD:

8.5.1 General: When moving forward in a straight line, advance the throttle gradually and firmly. If the vessel is single screw the propeller side force will tend to move the stern slightly to starboard (for right hand turning screws). Offset this with a

slight starboard helm.

Note: When starting out don't ram the throttles forward. As the engines try to transfer the excessive power, the stern will squat, raising the bow and decreasing visibility and the propellers or impellers may cavitate.

8.5.2 Use Helm to Control Direction: Use small amounts of helm to offset any propeller side forces or the effects of winds, seas, and current. Develop a practiced eye and steer on a geographic point. Apply small and early corrections to stay on course rather than large corrections and drifting well off course. Don't over-steer leaving a snake-like wake. At low speeds, helm corrections will move more frequently than at higher speeds.

8.5.3 Leave a Margin of Power: Always leave a margin of power available for emergencies. Determine the best speed for your vessel. Many vessels will not exceed or will only marginally exceed a given speed, regardless of the power applied. At some point the only effect of applying more power is increased fuel consumption with no increase in speed. A good normal operating limit for semi-displacement vessels is usually 90% of maximum power, allowing the remaining 10% for emergency use or to get out of a tight spot.

8.5.4 Maintain Safe Speed for Ability and Conditions: A boat at high speed has a large amount of force. With an untrained operator, this force can be dangerous. Consider different factors to determine safe speed:

a. High Seas: Slow down as wind and seas increase. The boat will handle more easily. Pounding or becoming airborne fatigues the hull and could injure the crew or cause them chronic skeletal problems. It takes tremendous effort just to hang on, the crew will be spent and not able to perform their jobs. Minimize taking spray and water on deck.

b. Traffic Density: Don't use high speed in high traffic density areas. A safe speed allows you to respond to developing situations and minimize risk of collision, not only with the nearest approaching vessel, but with others around it.

c. Visibility: If you can't see where you're going, slow down. Fog, rain, and snow are obvious limits to visibility, but there are others. Geographic features and obstructions (river bends, piers, bridges, and causeways), along with heavy vessel traffic, can limit the view. Darkness or steering directly into the sun lessons ability to see objects or judge distances. Prevent spray on the windscreen as much as possible and clean the windscreen regularly. Spray on the windscreen is particularly hazardous in darkness or glare.

8.5.5 Shoal Waters: In extremely shallow water, slow down. The bottom has an effect on the movement of the vessel. In extremely shallow water, the vessel's stern tends to "Squat" and actually move closer to the bottom. If equipped with an O/B or I/O consider raising the drive unit but be careful not to raise the water intake from the water. Have a crew forward with a sounding pole to keep the helmsman aware of the depth. Most depth finders on recreational vessels have their transducers on the transom which warns the operator too late!

Being "On-plane" will not let you cross a shoal that would ground your vessel in the displacement mode. At high planing speed, the stern will "Squat" as it gets in shallow water, possibly grounding at a very damaging speed.

8.5.6 Watch Your Wake: All vessels are responsible for their wake and any injury or damage it causes. A large, unnecessary wake, particularly in enclosed waters or near other, small craft, ruins a professional image.

8.6 TURNING THE BOAT WITH THE HELM:

8.6.1 General: To move in a straight line, small, frequent, momentary helm inputs adjust the position of the stern and bow to head in the desired direction. To change the vessel's heading, use larger, more sustained helm movement.

NOTE: Whenever you maneuver, keep the crew informed, especially if rapidly accelerating, turning or slowing. A quick warning shout can prevent injury.

Develop a working knowledge of your vessel's turning characteristics. This will allow you to decide whether to attempt a particular maneuver in the available space or whether other maneuvering is needed. Learn when to ease the helm to avoid over steering a course change.

8.6.1 Navigating in a Current:

1. Head Current through a Bend: Minimize the effect of a head current by steering along the inside quarter of the channel. Make sure you avoid shoals. If the bow gets into the area of greater current, it may begin to sheer towards the outside of the bend. Counter it by moving the helm towards the inside of the bend and by getting the stern directly down-current from the bow. Gradually work back to the inside quarter of the channel.

2. A following Current through a Bend: Approach the turn on a course just to the outside of the middle of the channel. This will avoid the strongest currents at the outside edge while still getting a reasonable push. As you turn, the strongest current will accentuate the swing to the outside of the

channel. Because of this, and because the following current tends to carry the boat toward the outside, begin the turn early in the bend.

8.7 STOPPING THE BOAT:

8.7.1 General: If you pull back on the throttle to neutral, the vessel will begin to lose forward motion. For heavy displacement boats, once propulsion has stopped, the vessel will continue to move forward for some distance. The vessel carries its momentum without propulsion. For a semi-displacement hull or a planning hull, as you retard the throttle the boat quickly comes off plane. As the vessel reverts to a displacement mode, the resistance of the hull going through the water instead of on top of the water slows the boat. The vessel still carries some way, but only a fraction of the original speed. Experiment with your boat and see how rapidly the boat slows after going from cruising speed to neutral. Know the amount of head reach your boat carries from different speeds. This is very important when maneuvering. Practice stopping your boat alongside an anchored object like a buoy so as to master stopping your boat from different speeds.

8.7.2 Use Astern Propulsion to Stop the Vessel: Slowing the boat's forward movement won't always work for a quick stop. Accomplish this by applying a quick burst of astern propulsion while the vessel is still moving forward. First slow the vessel as much as possible by retarding the throttle. After the boat starts to lose way, apply astern propulsion firmly and forcefully. This must be done at greater than clutch speed to prevent engine stall. On a single screw vessel (with a right hand turning prop), the stern will want to swing to port. After all way is off return the throttle to neutral.

At low forward speeds, astern propulsion is frequently used to maneuver, both to check forward way and to gain sternway.

Though many vessels are tested and capable of going from hull speed to full reverse, this crash stop technique is extremely harsh on the drive train and may cause the engine to stall. Though much of the power goes to propeller cavitation, this technique can be effective in a true emergency.

WARNING: The crash stop is an emergency maneuver. It may damage the drive train as well as stalling the engine. In most cases, with high levels of crew professionalism, skill and situational awareness, this maneuver is not necessary.

8.7.3 Use Full Helm to Stop Forward Way: Light displacement, high powered boats, will stop quickly by applying maximum helm at high speed. To fully stop, throttle down to neutral after entering the skid. If done properly, no astern propulsion is required.

8.8 BACKING THE VESSEL:

8.8.1 General: Control while making sternway is essential. Many boats do not back well as they are designed to go forward. Due to higher freeboard and superstructure forward (increased sail area), many vessels will back into the wind. Know how the environmental forces affect your boat when backing.

Besides watching where the stern goes, keep track of the bow. The stern will move in one direction about the pivot point, and the bow in the opposite direction. As a vessel develops sternway, the effective pivot point moves aft and the bow may swing through a greater distance. Keep firm control of the helm to prevent the rudder or drive from swinging to a hard-over angle.

CAUTION: Don't back in a way that allows water to ship over the transom. Be careful with boats with very low freeboard aft. Outboard powered vessels, with low cut-outs for motor mounting and a large amount of weight aft are susceptible to shipping water while backing, particularly in a chop. Stability is jeopardized if shipped water does not drain immediately.

8.8.2 Single Screw Vessels: Propeller side force presents a major obstacle to backing in the direction you want. The rudder does not have much effect until sternway is made, and even then, many boats will back into the wind despite your best efforts. You should know at what wind speed the boat will back into the wind without backing to port (right hand turning screw).

For right hand turning props:

1. Before starting to back, apply full rudder to get any advantage available.

2. A quick burst of power astern will cause the stern to swing to port, but use it to get the boat moving.

3. Once moving, reduce power somewhat to reduce propeller side force and steer with the rudder. As sternway increases, less rudder will be needed to maintain a straight track astern.

4. If more sternway is needed to improve steerage, increase power gradually; a strong burst astern will quickly swing the stern to port.

5. If stern swing to port can not be controlled by the rudder alone, use a burst of power ahead for propeller side force to swing the stern to starboard. Don't apply too much power as to stop sternway or to set up a screw discharge current that would cause the stern to swing farther to port. (As the vessel backs, it uses sternway water flow across the rudder to steer.)

6. If this fails, use a larger burst of power ahead, with helm to port. Sternway will probably stop, but propeller side force and discharge current across the shifted rudder will move the stern to starboard. Then try backing again.

8.8.3 Twin Engine Vessels: Back both engines evenly to offset propeller side force. Use asymmetric power (one engine at a higher RPM than the other) to help steer the stern. Asymmetric power will also give unequal propeller side force that will help to steer.

1. Apply astern power evenly, keeping the rudders amidships.

2. If the stern tends to one side, first try to control direction with a slight helm adjustment. If not effective, either increase backing power on the side toward the direction of veer or decrease power on the opposite side.

   As with all boat handling techniques, learn the use of asymmetric thrust first in calm weather, in open water and at low speeds.

8.8.4 O/Bs and I/Os: Use the directed thrust to pull the stern to one side or the other. Avoid cavitation especially if the engine exhausts through the prop.

8.8.5 Waterjets: There is no propeller side force and thrust is directed. There is no control unless thrust is being applied and directed.

8.9 TURNING A TWIN SCREW WHILE UNDERWAY:

8.9.1 Rotate about a Pivot Point: This is a low speed maneuver. It is important because you will face situations in which you need to change the boat's heading or to move the bow or stern in a limited area. Oppose the engine to turn in a very limited space. Practice this maneuver in calm open water to master it. You should be able to turn the boat 360 degrees in it's own length.

Develop your boat handling knowledge and skills to know the degree of throttle splitting or asymmetric thrust for best results in any situation. Do not maneuver near the face of a breaking wave as it may require opposing engines at one-third or more of their available RPM. While maneuvering near a pier, it may only require a short burst on one engine to bring the bow through the wind. Experiment with your vessel.

All crew members must pay close attention to throttle changes and vessel movements. Firmly hold onto the vessel during these maneuvers.

8.9.2 Turning and Dragging One Propeller: An effective technique for a twin screw boat is to have one propeller act as a brake. This creates a drag on the side toward which you are turning and reduces the turning diameter.

1. Put the helm hard over.

2. Bring the throttle on the engine in the direction of the turn to "Clutch

Ahead". Do not bring it to neutral as the propeller would "Free-Wheel:" and the drag would be lost.

8.9.3 Turn and Split Throttles: (Also called a Heavy Weather Turn) This practice also is more effective with shaft, propeller and rudder arrangement than with directed thrust drives (O/Bs and I/Os). One propeller will still be providing forward thrust while the other will be backing. Cavitation will be pronounced on the backing screw, but the vessel's forward motion keeps advancing this screw into relatively undisturbed (non-aerated) water.

1. Put the helm hard over.

2. Bring the throttle of the engine on the side of the turn firmly to neutral.

3. Momentarily pause and shift to astern propulsion and gradually increase power.

4. As the vessel completes its turn, reverse this procedure. Shift the backing engine to neutral and momentarily pause before shifting into forward..

8.10 TURNING A SINGLE SCREW VESSEL:

8.10.1 General: A single screw vessel never has the ability to use asymmetric propulsion. Turning a single screw vessel can not be done in the same limited space as a twin screw vessel.

8.10.2 Back and Fill: The "Back and Fill" technique can be used to turn a vessel in a little more than its own length. At some point, you will need to rely on these concepts when operating a boat, particularly in close quarters maneuvering. To back and fill, rely on the tendency of a vessel to back to port (Right hand turning props) and then use the rudder to direct thrust when powering ahead. Decide the radius of the circle where you want to stay (at most 25% to 30% larger than the vessel's overall length), and the intended change in direction (usually no more than 180 degrees) before starting. For initial training turn through at least 360 degrees.

From dead in the water:

1. Put the helm at right full rudder and momentarily throttle ahead, being careful not to make much headway.

2. Before gaining much headway quickly throttle astern and shift the helm to left full rudder.

3. Once sternway begins, simultaneously shift helm to full right and throttle ahead.

4. Repeat steps until vessel has come to desired heading, then put helm amidships and apply appropriate forward power.

   The number of back and fill steps used will depend on the size of your turning area and the desired amount of change in heading. Wind will also be a factor in this maneuver as the boat will tend to back into the wind especially if the vessel has a large sail area forward

8.11 STATION KEEPING:

8.11.1 General: Station keeping is one of the most important skills for a coxswain to learn and master. The ability to station keep in a variety of wind, seas and current is a true measure of a coxswain's skill. Keeping station means you maintain your distance, position and aspect to or from an object. If your vessel is equipped with twin screws you should develop these skills at any aspect to an object in most conditions. Single screw boats are much less maneuverable but you should still be able to station keep with practice. It is important that you practice station keeping to learn and maintain this skill in various levels of wind, seas and current.

When station keeping always keep the centerline of your vessel at a right angle to the predominant forces acting on your boat. It is much safer and easier on the crew to work while the boat is pitching fore and aft than when rolling (sometimes violently) from side to side.

NOTE: All coxswains of twin screw vessels must practice frequently for single screw operation so as to be able to function if you lose one engine.

8.11.2 Maneuvering Zone: Each operational situation requires a safe maneuvering zone. The vessel must be maneuvered to an optimal position near the target object so an evolution can be conducted safely and effectively, i.e., equipment transfer, object recovery, surveillance, connecting a tow, etc.. Before you keep station, get the "Big picture:"

1. Evaluate the environmental conditions and how they affect the situation.

2. Determine if obstructions on the object or in and above the water limit your safe maneuvering zone.

3. Account for them and keep the environment in mind.

4. Avoid vessel outriggers or hull protrusions, loose pier camels or broken pilings, ice guards, shoals, rocks, heavy weed areas or other submerged obstructions, low overhead cables or bridge spans.

5. Define the maneuvering zone by distance, position and aspect to the target. Put limits on each element and maneuver to stay within those elements.

   CAUTION: When station keeping, always have a safe escape route to get clear of the object or any hazard. As you keep station, ensure the escape route stays clear. This may require changing position to establish a new escape route. Discuss your maneuvering zone limits/area and your planned escape route with your crew. Keep the entire crew informed.

8.11.3 Distance: Keep station close enough to complete the mission or evolution, yet far enough away to prevent collision. Factors in determining this distance are:

1. Use a practiced eye and ranging techniques.

2. Use identifiable keys such as boat length or beam.

3. Use your knowledge of your vessel.

4. If the coxswain's station on your vessel does not allow a clear view of the object and the area, use points on your vessel (windscreen, brackets, antennae or fittings) to set up range clues.

5. Position: The angle from the object to your vessel is termed position. To keep station with another vessel, particularly one that is disabled and adrift, use the angle your vessel makes relative to the other vessel's centerline. When keeping station on a moored or anchored object, use geographic or compass bearings.

6. Aspect: The relative "face" your vessel shows to the other object; for example, bow-to, stern-to, beam-to, etc. You may have to keep the object at a certain aspect to pass equipment such as a pump or towline or to maintain surveillance.

8.11.4 Keeping Station on a Free Drifting Object: Object size and type range from small to other large vessels. Free drifting objects will present a different drift rate from that of your vessel. Develop station keeping techniques by first matching your drift rate to the object, then overcoming the difference.

Have another vessel maintain a steady course and low speed. Pace your vessel and then maneuver around it. Pacing your movement to the other vessel is critical before safely going alongside.

No Leeway: Practice with a floating ballasted object that does not drift with the wind. (A weighted mannequin with a PFD would simulate a PIW.) The object's

drift rate would be limited to the surface current, while your vessel will respond to currents and wind.

Other Drifting Vessel: Become proficient at station keeping on a variety of vessel types (sail boats, planning hulls, etc.) including one like your own. Different vessels react differently to environmental forces. Learn how other vessels drift compared to your own. Note how different vessels lie to the wind, then maneuver your vessel to an optimum position for observation, coming alongside or passing a tow rig.

In heavy weather (heavy weather will be different for each vessel) most recreational boats will handle and station keep better with their stern into the prevailing environmental conditions. This is almost always true for single screw boats. If the facility is an outboard with a low transom, you will be much more limited in sea conditions than other types of vessels. For this reason it is important to know the limitations of the station keeping vessel. Recreational vessels used by Auxiliarists should always practice this type of approach so as to be better able to function in relatively heavier seas.

8.11.5 Keeping Station on an Anchored Object: Anchoring limits much of the object's movement due to wind and current, but the object will often surge and swing. Your vessel will react freely to the wind and current. The object will ride with its mooring into the strongest environmental force affecting it., while the combination of forces on your vessel may cause it to take a different aspect..

Practice station keeping on an anchored object helps you to learn where you can and can not maneuver. Upstream of a buoy, strong current could easily carry you down on it. On the other hand, the only safe approach to a disabled vessel, anchored off a lee shore, may be from "Dead to the weather."

In general, attempt to approach a moored buoy or float from down-current or down-wind, bow to the object. To train, keep station at various distances and angles to an object. Pick something totally surrounded by safe water. Next, maneuver up-current or up-wind.

Different sizes and types of vessels at anchor will ride differently. Develop skills to station keep at all distances and angles. Vessel with a deep draft will make a vessel ride with the current, while high freeboard and superstructures may make a vessel tend downwind. Evaluate the combination of forces as you keep station. Take note of how the presence of your vessel affects the way the anchored vessel rides..

Station keeping on a pier, seawall, or breakwater will be different. View this as a step before mooring. You may need to transfer someone to an object or evacuate someone from rocks. Station keeping on fixed objects affects your boat but not the object. Often, the fixed object affects the environmental forces by funneling,

blocking, or changing direction of the current or wind.

8.12 MANEUVERING:

8.12.1 General: Station keeping will usually require frequent to near continuous applications of power and helm to stay in the safe maneuvering zone. While using power and helm to compensate for and to overcome wind and current, use the wind and current to your best advantage.

8.12.2 Stem the Forces: To stem the forces means to keep the current or wind directly on the bow or stern and hold your position by setting the boat's speed to equally oppose the speed of drift.

8.12.3 Crab the Boat Sideways: To do this, use the environmental forces to move the boat at a right angle to the forces. Put the bow at a shallow angle (20 or 30 degrees) to the prevailing force and use ahead propulsion and helm to prevent your boat from being set backward. Maintain this shallow angle to the prevailing force.

8.12.4 Open and Close: Make your vessel "open" and "close" the distance on the object at various angles, both to leeward and to weather. You need only to compensate for the fore and aft drift rate and to maintain a steady heading when the target object is on the bow or stern directly up-drift or down-drift from you. The more difficult scenario is opening or closing when the target is abeam:

1. Use a combination of control and environmental forces: side force, ahead and astern thrust, rudder force, leeway, and current drift.

2. Remember to account for pivot point when moving the bow or stern.

3. Use reasonable limits and stay within them.

8.13 MANEUVERING IN ROUGH WEATHER:

8.13.1 Use caution at all times. Never underestimate the power of the winds and waves and what they can do to your vessel or crew. The following concepts will increase the level of safety at which you operate.

8.13.2 Know Your Vessel: Be familiar with your vessel's operating characteristics and limitations to safely and confidently handle conditions that approach those limits.

WARNING: DON'T EXCEED ANY VESSEL LIMITATIONS.

The Auxiliary Operations Policy Manual, COMDTINST M16798.3 (series) requires that the facility owner state on the "Offer-Of-Use" form the facility's

limitations. This should be indicated in the "REMARKS" space. This is a requirement. If the owner is not the operating coxswain, the owner must make the coxswain aware of these limitations. All coxswains are required to know these limitations and any other vessel idiosyncrasies before starting a patrol.

8.13.3 Learn the Vessel's Motions and Peculiarities: Develop a working knowledge of the vessel's response to waves and winds. Excessive boat motion is very fatiguing and can cause motion sickness.

1. Learn the motions of your boat in response to the seas. Determine if the vessel has any distinctive tendencies, for instance, attaining a dangerous heel while cresting a wave in high winds, burying the bow in all but the longest swells, or lightness to the stern in quartering conditions.

2. Learn and develop techniques to minimize vessel motion in all conditions. Remember your crew.

3. On smaller boats, keep crew weight centered around the helm position.

4. Don't take on missions beyond the limitations of the vessel or crew.

8.13.4 Know Your Area: Learn your area's tide rips, bars, gorges, coastal currents and local waters before you must maneuver there in rough weather. Pay attention to weather forecasts and get the big picture.

Observe before you act. Evaluate on-scene conditions before committing to a maneuver.

8.13.5 Know Yourself and Your Crew: You and your crew limitations. Know what they are. Be aware of human factors and clues associated with "Risk Management." False bravado or over-confidence in rough weather will not compensate for inexperience or fear. The following are guidelines to follow:

1. When in doubt, DON'T.

2. Understand your responsibilities. You are responsible to bring your crew and facility back safely!

3. Know when to end an evolution. This is particularly true in training.

4. Perform as a Team. While the coxswain concentrates on the detailed maneuvering, the crew must act as additional eyes and ears.

8.14 NEGOTIATING HEAD SEAS:

8.14.1 General: Use your vessel's inherent capabilities. Bow flare provides additional

buoyancy to help lift the bow, but you must meet larger seas much slower than you would smaller ones. A slower speed gives the bow more time to rise and meet the waves.

NOTE: Keep in mind that aerated, broken, sloughing, or white water will not provide as much buoyancy as green water. Also, propulsion and helm response will be sluggish. Aerated water favors cavitation..

8.14.2 Maneuver Constantly: Look and steer for the path of least resistance. The best way to get through waves is to avoid as many as possible. Anticipate patterns and take advantage of them. Pick your way around breaking waves. Take advantage of any lulls between the higher series of waves. Look for gaps or windows in the breaking waves, but watch to see if they close before you approach. Don't try to steer a perfectly straight course. Avoid the highest crests. Stay away from waves that begin to peak in a triangular fashion. A square wave leaves no room to maneuver, and the trough behind is much deeper than others.

Work your way over each wave individually. Vary the speed and angle of approach to account for differences in each wave.

1. Slow down and approach at an angle.

2. Stay ready to maneuver.

3. Continually adjust your boat's speed.

4. Don't drive the bow into the wave.

NOTE: If you must go through a breaking wave, keep headway. Just as the breaking sea hits the bow, increase power to lift the bow so the sea will not spill on deck, then immediately reduce power.

8.14.3 Manage Your Power: Keep one hand on the throttle controls.

8.14.4 Heavier Vessels: Use the following procedures:

1. Use only enough power to get the bow sections safely over or through the crest.

2. Let momentum carry, and cut back on power to let the boat slide down the backside of a swell.

3. Increase speed in trough to counteract the reversed water flow and maintain directional control as the next wave approaches.

4. Slow down again as the next wave approaches.

8.14.5 Lighter Vessels: Use the following procedures:

1. Use enough power to get the entire boat safely over or through the crest. Lighter craft will not carry the momentum so constant application of power is required.

2. Keep a slight bow-up angle at all times.

3. Once through a crest, a slight, bow-up angle, will let the after sections provide a good contact surface if the boat clears the water. A bow-up attitude will help to approach the next wave.

4. Increase speed in the trough to counteract the reversed water flow and
` maintain directional control as the next wave approaches.

5. Slow down again and approach the next wave.

8.14.6 Stay in the Water: Don't fly through the crest. Avoid this at all costs. If airborne coming through a wave you risk serious injury to the crew and you could damage the vessel. Always keep the aft section in the water (prop and rudder). If these come out of the water you loose control of your vessel and seriously stress the drive train when you re-enter the water.

8.14.7 Hold on but Stay Flexed: Everyone in the crew should keep a firm hold onto the controls or hand holds. Don't rigidly brace yourself or stay tense. This will fatigue you quickly. If standing, keep your knees flexed.

8.15 RUNNING BEFORE A SEA:

8.15.1 General: A following sea does not present the high relative closure rate of head seas, but keeping the vessel control and stability is probably more challenging. Operation in a following sea, especially a breaking sea, involves the risk of having the stern lifted up and forced forward by the onrushing swell or breaker. Surfing down the face of a wave is nearly impossible to control. Quite often, surfing will force the boat to broach and capsize or to pitch-pole end over end. Through proper boat handling, a skilled coxswain may be able to keep a vessel ahead of breaking seas while maintaining control of both direction and speed. In this situation the safest place to ride is on the back side of a wave and NEVER go over the top. If the wave dies out, ride the back of the next wave.

8.15.2 Ride the Back Side of the Swells: Be very careful when running in a large following sea. In the waves with a regular pattern, ride the back side of swells. Use your throttle and helm to keep your position. NEVER allow the boat to go over the top of a breaking wave as you could pitch-pole end over end or broach and roll over.

CAUTION: Don't let a wave break over the transom of the boat. Be extremely careful in small outboards. You could get swamped by a breaking wave and capsize unless equipped with a self bailing cockpit.

Watch ahead as well as the wave approaching from the stern. You want to stay on the back side of these waves.

8.15.3 Keep Reserve Power: Some large seas run at over 20 knots. Keep a reserve of power so that you can apply a burst of power to stay ahead of a braking wave.

8.16 TRAVERSING BEAM SEAS:

8.16.1 General: In large beam seas, the wave action will cause the boat to roll. The rolling will cause asymmetric hydrodynamic forces and will affect steering. Do your best to keep your propeller and rudder in the water.

8.16.2 Breaking Waves: Minimize the number of breaking waves you encounter. If traversing near a surf zone, go farther out into deeper water.

8.16.3 Use Local Knowledge: Avoid areas that break when no other area does. Stay away from shifting sand bars.

8.16.4 Keep an Eye on the Waves:

1. Look for a lull in the series to cross seas.

2. Use caution to avoid a forming beak.

3. Never get caught broadside to a breaking wave.

4. Don't get trapped. If the boat gets into closer and closer seas, look for an out. If shallow water or a current against the seas is on one side, work your way in the other direction.

8.17 TRANSIT WHEN CURRENT OPPOESE THE SEAS:

This presents the most challenging situation near an entrance. The current has the effect of shortening the wavelength without reducing the wave height.. This makes the waves much more unstable and closer together.

1. When going into the seas the current will push the boat into the seas.

2. Reduce the effect by slowing down.

3. Don’t let the current push the boat into a large cresting wave. In an entrance maneuvering room is often limited. The only safe water may be where you have just been. Stay ready to back down and avoid a breaking crest.

4. In a following sea and a head current, the situation can become critical. The waves will overtake at a higher rate and become unstable more quickly. The current will slow your speed over ground exposing you to more waves.

5. As with a following sea, stay on the backside of the wave.

6. Keep a hand on the throttle and continuously adjust power.

7. Stay extremely aware of any wave combinations and avoid spots ahead where they tend to peak.

8. The crew must stay alert and pass information about any approaching waves freely.

8.18 TRANSIT WHEN SEAS AND CURRENT COINCIDE:

In this condition the current has the effect of lengthening the waves. Longer waves are more stable, with the crests farther apart, but caution is still needed.

1. When going into the seas and current, progress over the ground will be less. Increased speed may be warranted.

2. Do not increase speed so that negotiating the waves becomes hazardous.

3. With a following sea and current the speed over ground will increase. The task of riding the backside of the waves should be easier as the wavelength is longer.

4. As with a following sea, stay on the backside of the waves and don’t become lulled into a false sense of security.

5. Keep your hand on the throttle and adjust the speed constantly.

6. Look for spots ahead to avoid. Maneuver early as the waves and current will carry the boat.

7. The crew must keep an eye on the situation and pass information freely.

8.19 AVOID SEVERE WEATHER:

If at all possible, avoid severe weather.

If caught in severe weather and you have to “Heave To”, consider using a sea anchor to keep your bow into the seas. If using a sea anchor use as much scope as possible and deploy from the bow..

CHAPTER 9 ANCHORING

9.1 GENERAL:

The basic elements of proper anchoring technique include:

1. Availability of proper equipment
2. Knowledge to use that equipment
3. Ability to select a good anchoring area

See 23.5 for anchoring and weighing anchor check list. Also, refer to the SABOT JOB AID, Section D.

9.2 TERMS AND DEFINITIONS:

Anchor: A device designed to engage the bottom and through its resistance to drag maintain a vessel within a given radius.

Anchor Chocks: Fittings on the deck of a vessel used to stow an anchor when it is not in use.

Ground Tackle: A general term for the anchor, anchor rodes, fittings, etc. used for securing a vessel at anchor.

Hawspipe: A cylindrical or elliptical pipe or casting in a vessel's hull through which the anchor rode runs.

Horizontal Load: The horizontal force placed on the anchoring device by the vessel to which it is connected.

Mooring Bitt: A post or cleat through or on the deck of a vessel used to secure an anchor rode or other line to the vessel.

Rode: The line connecting the vessel to the anchor.

Scope: The ratio of the length of the anchor rode to the vertical distance from the bow chocks to the bottom.

Vertical Load: The lifting force placed on the bow of the vessel by its anchor rode.

9.3 REASONS FOR ANCHORING:

The most important reason for anchoring is safety:

1. Engine failure

2. Need to stay outside of a breaking inlet or bar

3. To weather a storm

4. To hold your position while passing gear (including towline) to a disabled vessel.

9.4 ANCHOR TYPES:

There are different types of anchors, each with its own advantages. The type of anchor and size (weight) of anchor uses depends upon the size of the boat. It is advisable for each boat to carry at least two anchors. A working or service anchor should have the holding power to equal approximately 6% of the boat's displacement. A storm anchor should be at least 150-200 percent as effective as the service anchor.

DANFORTH ANCHOR MAX BOAT LENGTH	WORKING ANCHOR	STORM ANCHOR
20 feet (aprox. 7 meters)	5 lbs	12 lbs
30 feet (aprox. 10 meters)	12 lbs	18 lbs
40 feet (aprox. 12 meters)	18 lbs	28 lbs

9.5 DANFORTH ANCHOR

The most common type of anchor is the Danforth. It is relatively light and relies on its ability to dig into the bottom or to foul on the bottom for securing the boat. The main parts of this type of anchor are:

1. Shank: The long stem that runs from the line attachment point to the base of the anchor. Adds its weight to the ability for the anchor to set in the bottom.

2. Fluke: Large flat blades on each side of the anchor. The flukes are designed to bury into the bottom providing most of the anchor's holding power.

3. Stock: A bar that runs across the bottom of the anchor from which the flukes protrude.

4. Crown: Connects the shank to the stock. It also lifts the rear of the flukes, and forces the flukes into the bottom.

9.6 LINE AND CHAIN:

The most common type of line used for the anchor rode is nylon. This line should be in good condition as when an anchor is used it very often is to keep the vessel safe. The stretch ability of nylon helps to absorb the shock load of the vessel riding in rough weather. It is helpful if the anchor line is marked every foot or fathom.

Chain should be added between the anchor and the anchor line. The advantages of doing this are:

1. It lowers the angle of pull as the chain tends to lay on the bottom.

2. It helps to prevent chaffing of the line on the bottom.

3. It does not suffer the problems of line when sand penetrates strands of the line's fibers. It keeps the line higher up on the anchor rode.

4. Sand doesn't stick to the chain.

5. Mud is easily washed off the chain. Nylon can get very dirty in mud.

Chain diameter starts at one-quarter inch for small boats, (under 20 feet) and gets much larger for larger vessels.

The scope for an anchor rode should range between 3:1 up to 7:1. For heavy weather use 10:1.

9.7 FITTINGS

There are various methods for securing the rode to the anchor ring. With fiber line, the preferred practice is to work an eye splice around a thimble and use a swivel to join it to the chain. You may also secure the anchor line to the swivel using an "Anchor Hitch" or other suitable secure knot.

9.8 SELECTING AN ANCHORAGE AREA:

Sometimes it may be possible to choose a sheltered anchorage area in shallow water (under 40 feet).

1. Check charts to ensure there are no submerged cables or other obstructions in the area.

2. Be careful not to anchor too close to other boats in the area.

3. Never drop your anchor within the swing area of another vessel.

4. Always approach the anchorage into the wind or current.

9.9 ANCHORING:

NEVER anchor by the stern especially with small boats... Weather, seas, and strong current may swamp the boat. Follow the procedures outlined in the SABOT Job Aid as follows:

1. Brief the crew on the evolution

2. Assign duties to the crew

3. Note the force of wind and/or current acting on the vessel.

4. Prepare the ground tackle. Everything should be properly connected and the anchor line faked on the deck ready for use. Be sure that all shackles are safety wired and that the end of the anchor line is secured to the mooring bitt.

5. If possible, use two crew members on the bow. Be sure to warn them to keep their limbs free of the line as it is paying out.

6. Coxswain slowly brings the boat into the wind or current

7. Coxswains directs the crew to slowly lower the anchor rode hand-over-hand until the proper scope is paid out.

8. Secure the line to the mooring bitt.

9. Coxswain sets the anchor by backing.

10. Coxswain and/or crew takes bearings and ranges to verify the anchor is holding.

11. Coxswain or crew periodically check bearings and ranges to ensure the anchor is continuing to hold.

9.10 WEIGHING ANCHOR:

When ready to weigh anchor use the following steps as out lined in the SABOT Job Aid:

1. Brief the crew on the evolution

2. Assign duties to the crew

3. Position crew on the bow

4. Very slowly power the boat forward as the crew takes in the slack in the anchor rode.

5. When the anchor line is vertical stop the vessel and have the crew member lift the anchor from the bottom and bring in the anchor line while the coxswain holds position..

6. Crew should inform the coxswain as soon as the anchor is clear of the bottom.

7. Crew places the anchor line in the boat as it is brought in.

8. Crew cleans the anchor and chain before bringing aboard.

9. Crew secures the ground tackle (Line may have to be dried before permanently storing)

If the anchor refuses to break free snub the anchor line around a forward bitt or cleat and advance the boat a few feel. If this doesn't work, circle the anchorage in a wide circle while keeping a strain on the anchor line. Caution, do not get the anchor line tangled in the screws. If all else fails, tie a float to the anchor line and return later to try freeing the anchor.

Another way to break an anchor free is to use a trip line if one is rigged during the anchoring. A trip line is a line strong enough to take the pull of a snagged anchor. Attach the trip line to the crown of the anchor and the other end to a float on the surface. You should be able to pull the fouled anchor free by pulling it into the force that was acting against the anchored boat. The trip line pulling in this manner should un-plug the anchor from the bottom.

CHAPTER 10 MOB/PIW RECOVERY

10.1 GENERAL:

All crewmembers must be prepared at all times to recover a "Man-Overboard" (MOB) as a crew member could fall overboard at anytime. The skills used for a MOB recovery are identical to recovering a "Person-in-the-Water", (PIW). The only difference is a MOB is a person from your own vessel while the PIW may be from any source. The procedures taught in SABOT is for rough weather conditions and with the assumption that the MOB is unconscious. The brain of an unconscious person, face down in the water starts to die after three minutes without oxygen. For this reason, we train to recover a MOB in under three minutes from the time the MOB alarm is given. Refer to Section C of the SABOT Job Aid.

10.2 ALARM (FIRST SIGHTING:

The action taken in the first few seconds after a MOB occurs determines the success of the recovery. An alert crew member can do much to save the life of someone who might otherwise drown. It is extremely important that everyone in the boat crew be aware of each person's location on board at all times. The first actions should be swift and certain. The first person to realize a MOB has occurred should:

1. Verbally sound the alarm in a loud voice for all to hear: "MAN OVERBOARD, _____SIDE" .

2. Throw a ring buoy (with a strobe light attached if at night) or anything that floats toward the person in the water. Be sure not to hit them with the floatation device.

3. Maintain sight of the MOB and continuously point (with an open hand), to the MOB while carefully moving to a position where you can be seen by the coxswain or the crew at the helm. Give clear, loud verbal directions to the coxswain .

10.3 COXSWAIN ACTIONS:

The coxswain should take the following actions in the following order:

1. Immediately push the MOB button on the GPS to electronically mark the location of the MOB.

2. Look to be sure the MOB is not still hanging onto the boat.

3. Note the geographical location if possible.

4. Slow the vessel and sound the “DANGER” signal on the horn. This is important even if there are not any other boats in the area as it lets the MOB know they have been missed and a search and recovery is commencing.

5. Stop the boat, locate the MOB and determine the drift of the MOB.

6. Assign crew duties for the search or recovery evolution. Have crew continue pointing to the MOB until the coxswain has them in sight.

7. Maneuver the boat smartly to make an approach from down wind or down current (whichever is the predominant force).

8. As the crew prepares for the recovery (deploy a boarding ladder, prepare a Rescue line and boat hook) slow the boat to clutch speed as you approach the MOB.

9. Maneuver the boat to bring the PIW right alongside the hull on the side that will keep the boat’s drift against the PIW. (You don’t want the PIW to drift away from you during the recovery. You want the boat held alongside the PIW.)

10. As you make your approach one of the crew should be watching the PIW and calling out the PIW’s relative position as the coxswain will lose sight of the PIW due to the flare of the boat. Crew should call out the PIW’s position as follows: “Alongside the bow”, “ Along side the first stanchion”, “PIW amidships”, “PIW at recovery point”.

11. When the PIW is at the recovery point the coxswain should give the vessel a burst of reverse to bring the vessel to a complete stop and turned slightly to keep the boat alongside the PIW.

12. Notify the operational commander of the MOB incident once the PIW is recovered or under control if they can’t be brought onboard. (You don’t want to use recovery time informing the station when this time would be better spent recovering the MOB in under 3 minutes)

13. Once the PIW is recovered and onboard treat for shock and provide any other first aid that may be required.

The PIW is considered recovered once alongside and under control so that their face can be kept out of the water. At times there is not enough crew to manually pull an unconscious person onto the boat. If this is the case, attend to the PIWs needs, breathing, etc. and radio for help.

10.4 MOB NOT IMMEDIATELY LOCATED:

Notify the operational commander immediately if the MOB is not immediately found. The operational commander should immediately launch other resources to assist with the search and broadcast the emergency call signal “PAN, PAN, PAN” on channel 16 of the VHF-FM Marine Radio. You should immediately commence a “VS” or “SS” search pattern. If you are not sure when the MOB occurred you should back-track using a “TL” or “CS” search pattern.

CHAPTER 11 LOCKING PROCEDURES:

11.1 GENERAL:

There are many common locking procedures. Local regulations can vary. The boat crew must check or know what these local regulations are. Refer to Section "F" of the SABOT Job Aid. See 23.6 for lock Check list:

11.2 PRECAUTIONS:

Precautions to take in locking include:

1. If the lock is equipped with a VHF-FM radio, contact the lock-master on channel 16. Normally, the lock-master will have you switch to their working channel (usually channel 12 or 13).

2. Do not come closer than 400 feet of the lock gate until the lock-master instructs you to enter.

3. Be sure that everyone on deck has their PFD secured.

4. Have the crew wear gloves while handling lines in the lock chamber as the lines may very well get coated with slime and/or oil.

5. Hold your boat to the side of the lock wall as directed. Some locks will have lines hanging along the lock wall for you to tie up while others require you to use your own lines for mooring. If using your own mooring lines, they should be at least 50 feet long with a 12 inch eye splice.

6. DO NOT tie mooring lines to your boat; tend the lines as the water level changes.

7. Shut down your engines in the lock chamber as the heavy carbon-monoxide gas will hold at the water's surface. You don't want your crew to be absorbing these fumes.

8. Be prepared to cast off these mooring lines in an emergency; a small, sharp hand axe or sharp knife should be immediately available.

9. Use fenders between your boat and the lock wall (concrete is very abrasive) or between your boat and another that may be rafted alongside.

10. DO NOT moor to ladder rungs embedded in the lock wall.

11. Wait for the lock-master's signal (horn) to depart the lock chamber.

12. Depart the lock in the same order that you entered.

13. Steer for the channel and keep a sharp lookout for craft approaching from the other direction.

14. Watch for debris floating in the gate area as you leave the lock chamber.

15. Stay clear of the intake ports in the lock wall on the upstream side of the lock. These ports can create a strong suction that would be dangerous to small craft.

16. During the filling and emptying process, a strong undercurrent, suction, or turbulence is created in the lock chamber.

11.3 LOCK SIGNALS:

The following are the general light and sound signals:

1. FLASHING RED light: Stand clear, do not enter lock.

2. FLASHING AMBER: Approach lock under control.

3. FLASHING GREEN light: Enter lock.

4. FLASHING AMBER and GREEN lights: Enter lock with caution.

5. One prolonged blast on an air horn: Enter lock.

6. One short blast on an air horn: Leave lock.

11.4 GENERAL REGULATIONS:

Priorities for going through a lock are as follows:

1. U.S. Military craft

2. Vessels carrying U.S. mail

3. Commercial passenger vessels

4. Commercial tows

5. Commercial fishing vessels

6. Recreational craft

Under certain conditions, boats may be locked through with other crafts having a higher priority. This occurs only when there is no delay and neither craft is placed in jeopardy.

Lockmasters have the same authority over a vessel in a lock as traffic police have over an automobile. Always obey the lockmaster's instructions.

Every facility should carry a copy of, and the crew should be familiar with, the regulations governing navigation on rivers in its AOR.

Stay clear of danger zones, 600 feet above and 100 feet below dams.

Approach dams at a reduced speed, along the shore at the lock.

CHAPTER 12 THE TOWING RIG

12.1 GENERAL:

The towing vessel's fittings are affected by the forces depending on the towing rig**.** See chapter 15 for details on various rigs**.** A proper rig provides for adequate load distribution. This is very important for the relatively fragile hulls of Auxiliary facilities. The rig also provides for directional control and shock absorbency. The forces transmitted to the towing vessel's fittings are the result of tension in the towline. The forces due to acceleration, frictional resistance, drag, and shock loading on the towing vessel itself can be transferred by t he towing rig to the towed vessel. These forces can also occur on the towed vessel's hull and are ultimately transferred back to the towing vessel through the towing rig. The towing rig is literally the transmission line conducting all the force factors which affect either vessel and itself is subject to heavy loading.

The towing rig experiences the resultant of all the forces on the towed vessel which have been transmitted by that vessel's fittings. The towed vessel experiences all of the forces described previously and transmits these forces through the towline, to the towing vessel. These forces can be substantial and well beyond the strength of both vessels' fittings and the towing rig. They are always minimized by prudent boat-handling.

12.2 TOWLINE:

See Chapter1 for how to select the towline type, size and length. The principal component of the small boat towing rig is the towline. Safety and good seamanship dictate that an Auxiliarist's rig be right for the tasks for which it will be used. The final choice must be made by each individual Auxiliarist as the rig is put together. The following considerations should be made when selecting a towline for use on a facility:

a. High safe working load ratio and strength with respect to line size.

b. Chafe and abrasion resistance.

c. Ease of working, handling, splicing, etc.

d. Light weight and relative buoyancy.

e. Rot and mildew resistant, impervious to affects of environment, i.e. temperature, wet storage, salinity, humidity, sunlight, etc.

f. An adequate stretch factor, sufficient to insure shock absorbency, for the recommended towline length, but without such an excess of elasticity that recoiling would result in the towline parting.

g. Durability for long service life.

h. Acceptable cost factors and material expense.

TABLE 12.1

AVERAGE TENSILE STRENGTH RATINGS

LINE DIAMETER	NYLON	DACRON	MANILA	POLYPROP-YLENE
5/16”	2900	2650	1000	2450
3/8”	4000	3600	1350	3400
7/16”	5400	4800	1750	4300
1/2“	7100	6100	2650	5300
5/8”	10500	9000	4400	7600
3/4"	14200	12500	5400	10000
7/8”	19000	16000	7700	13000
1”	24500	20000	9000	16500
1 ¼”	38000	27000	13500	23000
1 ½”	55000	36000	18500	31500

12.3 PENDANT:

The pendant is a short length of line used on the end of a towline (at the towed vessel end) to take the wear and tear from the fittings on the towed vessel. When wear appears on the pendant it can be replaced without having to replace the entire towline. It is much less expensive to replace a short line (usually 10 to 15 feet) than the entire towline.

12.4 BRIDLE:

The bridle is two lines that form a “V” between the towing and/or towed vessel and the towline. The bridle is used at the towed vessel end to center the tow on the stern of the towed vessel and to equalize the strain between the two aft cleats (one on each side). The bridle is used on the towed vessel where there is no center cleat or post from which to tow but instead has two cleats (one on each side) near the bow. The bridle on the bow of the towed vessel also helps to keep the towed vessel centered on the towline and equalizes the strain between these two bow cleats.

12.5 TOW RIG COMPONENTS:

Towing rigs may use a variety of component parts in addition to line. For example, many Auxiliarists use snap hooks and shackles to provide a means for quick connect and disconnect of the towline from a bridle and harness arrangement. Other common metal parts in towing rigs include rings of various diameters, screw shackles, and lengths of chain and thimbles to support small eye splices. Almost all metal parts in towing rigs are associated with the make up of the towing bridle or as a means of connecting to a pendent. Some specialized towing rigs may even employ sailboat snatch blocks to act as a traveler for the towline at the bridle. This might seem like a good idea, but could cause excess stress at one of the tow points for the bridle because of unequal load distribution. This is not a recommended arrangement in towing rigs. In the use of all such parts as this in the towing rig, it is well to remember that the entire rig is equivalent to a chain, in respect that the chain is only as strong as the weakest link. It does no good to use 7000 pound test line in a tow rig where it's attached to the bridle with a metal snap hook only rated at 2000 pounds. If this is the case, then the strength of the entire towing is limited by this low strength component, to no more than 2000 pounds tensile strength.

It is a good idea to match all parts of the towing rig carefully to insure both a reserve margin of strength and a high safety factor. A good rule of thumb in this respect is to keep the use of such metal or other component parts in the tow rig to an absolute minimum. Another good reason is economics. High tensile strength metal parts are expensive, especially if the parts are sailboat fittings or of stainless steel. Some pins in shackles will start to deform at 40% of tensile strength! This supports the rule of thumb for setting safe working load limits at 50% of the rated tensile strength. Also, remember that a thimble in an eye splice can deform well below the breaking strength of the line.

In relation to component strength, size for size, materials will rate as follows:

(a) Titanium: This is the most expensive, at about twice the cost of stainless. Generally, these are hard to find.

(b) Stainless Steel: The most durable parts will be stainless steel or K-Monel, but their high cost is worth the investment for both strength and safety in big tow rigs.

(c) Galvanized Steel: Inexpensive, but relatively strong. Best choice for short lengths of chain, screw type shackles and line thimbles in smaller size tow rigs.

(d) Bronze: Cost is similar with stainless steel size for size. Their average strength, however is only about the same as galvanized or one half of stainless. Because of the relatively low tensile strength with respect to cost

of other materials, bronze is not normally recommended for purchase.

Caution in selecting components can't be stressed enough.

Table 12.2 lists the approximate tensile strength for several sizes of stainless and galvanized steel screw shackles typical of those used in towing rigs. The pin dimension is the critical dimension at the point where the shackle is likely to fail.

TABLE 12.2

TYPICAL SHACKLE TENSILE STRENGTH (T/S)

SHACKLE PIN DIAMETER	GALVANIZED STEEL (T/S – LBS)	STAINLESS STEEL (T/S – LBS)
3/16"	1000	2500
1/4 "	1600	3500
5/16"	2000	6000
3/8 "	3000	9000
7/16"	4000	11000
1/2"	6000	15000
5/8 "	9000	19000
3/4 "	12000	25000

Note: For components larger than those listed above, consult manufacture's specifications. Such larger parts are not generally available for small craft.

Caution in selecting components can't be stressed enough. All towing rigs should be inspected regularly, especially after a heavy or hard tow. Inspect the lines for wear, fraying, pulled yarns, dirt (will cause abrasion), and size (remember polypropylene does not return to its original size once stretched), and melted fibers at wear points on polypropylene. Deck fittings should be inspected for security and rough edges. Shackles, skiff hooks, and snap hooks should be inspected for bent parts and rough edges.

12.6 RECOMMENDED SAFE TOWING CRITERIA:

The average Auxiliary facility is not designed or constructed for towing operations. The hulls and superstructure of pleasure craft are relatively fragile when compared with towboats, tugs, and Coast Guard craft which are designed for towing operations. The fittings of special and strengthened tow points on recreational vessel hulls does not equip these craft to withstand the strains and stresses commonly experienced on boats designed to do this type of work. By

establishing certain operational guidelines which insure an adequate safety margin, not only for the Auxiliary facility, but also for towed vessels as well, practical limits result that will promote safe and effective towing performance for the majority of Auxiliary craft.

12.7 RECOMMENDED MAXIMUM TOWING LOADS:

The first guideline that must be fully understood is that of the maximum towing load. This load must consider all possible sea states, current, and other water conditions, as well as weather and environmental factors that the Auxiliarist might encounter on a patrol. To insure adequate control of the situation and provide for safety of personnel, within the limits of propulsion and hull structure on both vessels in the towing ensemble, Auxiliary facilities should limit towing assists to vessels which do not exceed approximately 150% of the facilities own displacement in weight. This figure of 150% is based on all of the theory presented in Chapter 12 of this Guide as well as numerous small boat design considerations. The Auxiliarist on patrol can readily estimate the normal displacement of small craft within a safe margin by using Table 12.3.

TABLE 12.3

RECOMMENDED TOWING RIG SIZES

AUX. FACILITY		MINIMUM RECOMMENDED TOWLINE LENGTH		MINIMUM RECOMMENDED LINE SIZE		RECOMMENDED MAXIMUM SIZE OF TOWED VSL		
DISP-LACE-MENT	LEN-GTH	OCEAN/ GREAT LAKES	IN-LAND WATERS	POLY-PROPY-LENE	NYLON	DISP-LACE-MENT	LEN-GTH	MAX. SAFE TOW SPD.
800	13’	70’	30’	1 / 4”	1 / 4””	1400	16’	4.0K
1300	16’	80’	40’	5/16”	5/16”	2100	20’	5.0K
1800	18’	90’	50’	3/8”	3/8”	2800	23’	5.3K
2400	22’	100’	60’	7/16”	7/16”	3600	24’	5.6K
3000	23’	110’	70’	1/2"	7/16”	4500	25’	6.0K
2600	24’	120’	80’	9/16”	1/2”	5400	26’	6.3K
4200	25’	130’	90’	5/8”	9/16”	6400	27’	6.6K
5600	26’	140’	100’	3/4”	5/8”	8500	28’	7.0K
7300	27’	150’	100’	7/8”	3/4”	11000	32’	7.2K
9300	29’	160’	100’	1”	7/8”	14000	34’	7.4K
10800	30’	170’	100’	1 1/8”	1”	16500	35’	7.6K
13000	33’	180’	100’	1 ¼”	1 1/8”	19500	38’	7.8K
17000	35’	190’	110	1 ½”	1 1/4”	28000	45’	8.0K
32000	50’	200’	110’	1 ¾”	1 1/2”	60000	65’	9.0K

NOTE: The maximum recommended towing speed is “SPEED THRU THE WATER”. Do not use your GPS to determine the speed if heading into the current.

The displacement data of a large number of small craft, including runabouts, cruisers, sailboats, trawlers and sport fisherman was used to develop this curve. The average error that might exist in an individual case will be more than compensated for by the recommended strength in the proposed towing rigs and safety margins established at 150% of the displacement. Use Table 12.3 and check the average displacement shown for the length of your facility. Multiply this value by 1.5 and find the maximum length vessel which you should limit your towing assists to. If you know the exact displacement of your facility, follow the same procedure to determine your maximum safe towing load. These values include considerations for the normal amount of people, equipment, fuel, and water carried on each type of boat. These factors are included in all the recommendations contained in this guide, and the coxswain will not be required to compute his load ratings by adding in such figures.

12.8 RECOMMENDED TOWING RIG TENSILE STRENGTH:

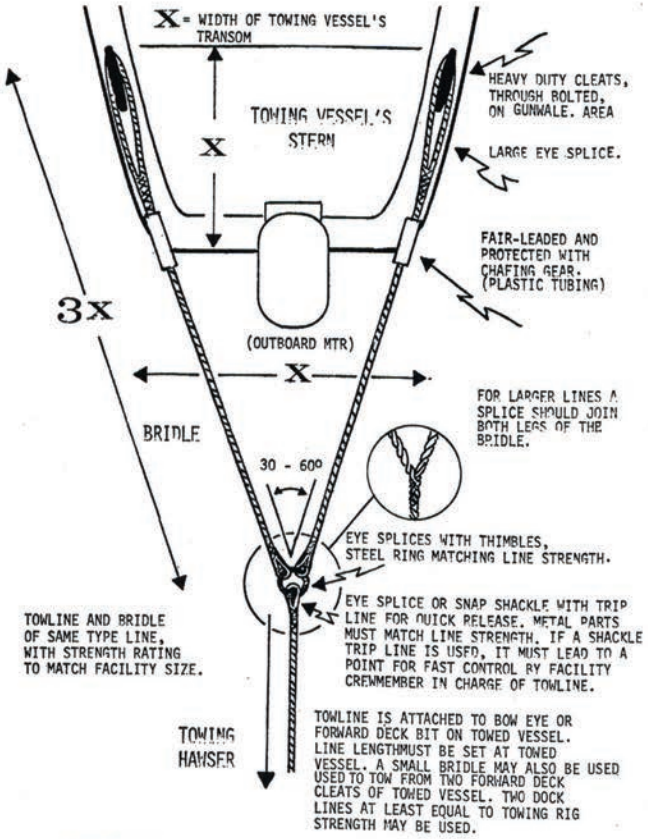
The next guideline that must be understood is that of the minimum tensile strength that is required in the towing rig to handle the maximum recommended towing load. As with the towing load, this factor must insure an adequate margin of safety under all conditions. To meet any requirement that might develop during a towing evolution, the minimum tensile strength (TS) of the towing rig should equal or exceed 120% in tensile strength (TS) of the displacement for the maximum size that the facility should attempt to tow. With a ratio of 120% in tensile strength to displacement there would be little or no likelihood of the towline parting in operations where the towing facility does not exceed the maximum safe towing speed, or for any conceivable situation that might develop during a towing evolution. This value of 120% was developed in consideration of the factors discussed in Chapter 8 and all other design criteria of recreational craft hulls. Control limits of 150% in displacement for vessels towed and 120% in tensile line strength emphasize and promote good seamanship and safety. Within these limits, Auxiliary operational readiness will be measured by SAFETY FIRST for all concerned at a high and professional level of performance. Table 12.3 may be used as a guide for towing operations, as discussed above. To use this table, the Coxswain should select the data for a facility displacement that is the value closest to that of the facility being used. The facility length in feet shown in parenthesis opposite the displacement figure are only approximations to the nearest probable value.

The critical value shown is own facility’s displacement. If the coxswain is in doubt, use the next higher value shown. Facilities over 50 feet are not covered by this guide.

Table 12.3 may be used by coxswains with assurance for all data on small craft up to 65 feet in length. All of the values in the table provide sufficient margins of safety for the use procedures described above. Table 12.3 also lists recommended towing rig lengths, which include the bridle or pendant within the rig, for the principal area patrolled by the facility. Dimensions of appropriate towing line size for each facility class is also shown. All data in Table 12.3 are based on the towline being in new, or serviceable, condition with any metal component parts matched to line strength. It includes provisions for up to 15% loss of line strength at various splices. The controlling factor in the use of this table is the displacement of the Auxiliary facility (towboat). The towing rig size is based on the size of the towing vessel. Exceptions to this rule and in an emergency are covered in chapter 5. The recommended towing speeds are only for the specified disabled or towed vessel size. The towed vessel controls the maximum safe towing capability. The intent of safety limitations for Auxiliary operations is to never have a parted towline. The constraints in Auxiliary towing operations are intended to insure that all facilities will both safely and effectively accomplish their mission well within the practical limits of these vessels.

12.9 RECOMMENDED TOWING RIGS:

Figure 12.1 illustrates a recommended towing rig arrangement. In the diagram shown, the rig is considered typical for that which might be used with ½" or 5/8" polypropylene. As the rig line size increases much beyond 1", metal components, except eye splice thimbles, become impractical. They are generally not available, or too small in strength rating to do the job. For these larger vessels a single towline should be used employing a Sampson post aft. The Sampson post should be located as far forward of the rudder as the transom width if possible. If a bridle is required, splice at the junction of the bridle to the towline, splicing directly, line-to line. This will avoid low strength metal parts. Auxiliarists should select that rig which is most appropriate to their area of operations and expected towing tasks. Considerations for each rig are outlined on each applicable diagram. No matter which rig is chosen, there are some important points to remember. Take care of your equipment. Keep it neatly made up and stowed, ready for use. Although synthetic lines are nearly impervious to the elements, most of them will lose strength if exposed to the ultra-violet rays of the sun over a long period of time. Dacron and polypropylene are the most susceptible. Keep your tow rigs in ready line lockers or other covered stowage when not in use. Remember that splices will reduce line strength by up to 15% but this factor was considered when developing Table 1.3 for recommended line sizes. A knot can reduce line strength by up to 60% but this factor was not considered in table 1.3. What will you use? Will you use any knots in your rig? What are the requirements for a good towline? Do any metal parts match line strength? It is your facility and the decisions are yours.



Recommended Arrangement for Make-UP Of Towing Bridle

Figure 12.1

CHAPTER 13 INTRODUCTION TO TOWING

13.1 GENERAL:

Towing is one of the U. S. Coast Guard Auxiliary's primary operational missions tasks. The Auxiliary coxswain who is underway in their facility should always be operationally prepared to provide a towing assist to a disabled craft, providing all the circumstances of the occasion will permit. Refer to the SABOT JOB AID, Section H for a step by step procedure.

Since towing is a primary operational mission task, the Auxiliary coxswain should be an expert in its practical application. Towing is a common type of assist made on the water by Auxiliarists and boaters alike and also the most controversial. The towing task can be a safe and controlled procedure which is carried out in a coordinated and seaman like manner. Towing can also quickly become an uncontrolled evolution leading to the possibility of serious personnel injuries and/or severe property damage or loss. The qualified Auxiliary coxswain will know when circumstances will permit a towing assist. This practical application of knowledge exists whether about to tow a 16 foot runabout or a 35 foot Auxiliary Sloop. Some of the factors which the Auxiliary coxswain must consider when about to undertake a towing assist are:

a. Safety of all personnel on board both the Auxiliary Facility and the assisted craft. Always consider the safety of the personnel before the boat.

b. All personnel on both vessels should be properly wearing a type I, II, or III PFD.

c. The necessity for reliable communications between the towing and towed vessels.

d. Safe operating limitations of the Auxiliary Facility and those of the assisted craft for towing.

e. Weather and sea conditions and their effect on towing.

f. Safe load ratings for all of the components in the towing rig.

g. The reliability of fittings on both vessels.

h. Safe towing speeds for prevailing conditions and the concept of hull speed.

i. Approximate handling characteristics of the vessel about to be towed.

j. The stability of the vessel to be towed.

k. The number of passengers on the towed vessel. Should any be transferred to the towing facility for their safety or for the stability of the vessel to be towed..

l. The placement of passengers in the cockpit of the towed vessel during the towing evolution.

m. The position of the rudder on the vessel being towed.

The above list is by no means complete. The Auxiliary boat crew might be confronted by an overturned boat, a swamped sailboat, or a heavily listing cabin cruiser. The Auxiliary Boat Crew should always first look after the safety of the personnel on the vessel in need of assistance. It must be remembered that the Coast Guard and Coast Guard Auxiliary normally do not perform salvage. The point is to always be ready for any situation that might occur in your patrol area. This requires not only practical experience, but a thorough working knowledge of the technical aspects of towing. This goes far beyond knowing whether or not you should replace a year-old frayed towline. Do you know the recommended line size and length for towing with your class of facility? This includes the diameter, length, and type of line. What are the conditions for using polypropylene for the bridle and towline as opposed to nylon or other types. These are just a few of the factors which are discussed in this guide. See 23.4 for a towing check list:

13.2 TERMINOLOGY:

The “Towing ensemble” consisting of the TOWING VESSEL, the TOWED VESSEL, and the TOWING RIG that links them together. The main part of the towing rig is the TOWLINE The towline may include a pendant at the towed vessel end or a bridle at one or both ends The length of the towing rig between the towing and towed vessel (point to point) is called the SCOPE. The curve in the towline due to its continuous weight along the line is called the CATENARY. With these few basic terms under our belts, we are now ready for a brief study of towing theory and fundamentals.

Remember, static forces are experienced before and as the towed vessel begins to move to overcome inertia and to head the vessel into its new course. These can be substantial. They are minimized by starting a tow off at a slow speed and picking up the speed gradually up to the optimum towing speed.

For the above reasons it is important, if at all possible, to start a tow in the direction in which the towed vessel is headed. Changing the direction of the towed vessel at the same time as starting the tow should be avoided if at all possible.

13.4 STRAIN ON TOW ENSEMBLE:

It is useful to examine each stage and the effects of all forces on various components of the towing ensemble. The result of the forces encountered in towing operations are those affecting:

a. The towing vessel's fittings.

b. The towed vessel's fittings

c. The towing vessel's hull.

d. The towed vessel's hull.

e. The tow rig.

In summary, towing forces result in strain on the hulls of both vessels. This must be recognized and the strength of both of these vessels has to be considered in any and all towing situations. Even with modern materials of superior strength, the crafts used by the majority of Auxiliarists on patrol are relatively fragile when compared with Coast Guard vessels, and are not designed for routine towing. As a rule of thumb for safety, Auxiliary vessels should not attempt to tow any vessel which is approximately 1 ½ times greater than their own boat's displacement (not length). Excessive hull strain and structural failure may occur. Strengthening of deck fittings by through-bolts and backing plates is a must for Auxiliary facilities engaged in towing operations, but can't substitute for adequate design and construction of a vessel built expressly for towing purposes. Modification of Auxiliary facilities to retrofit them as full fledged tugboats is considered beyond the means of the average Auxiliarist. By following the guidelines established herein, and staying within the safe limits of their equipment, they can, however, make a real contribution to effective Auxiliary patrol work.

13.4.1 Strain on Vessel Fittings: The towing forces acting on the vessel's fittings and the resulting strain placed on these fittings are important. We will examine two typical fittings used for towing operations, the deck cleat and the Sampson Post, or Towing Bit.

13.4.2 Forces on A Cleat: Most towing by relatively small Auxiliary facilities is performed using a bridle attached to cleats mounted on either side of the deck, forward of the transom. The forces of towing act on the towing vessel's hull through the cleats. Depending on the geometry of the cleat and its mounting, force can be magnified.

Knowledge of the forces acting on the cleats and the hull structure to which they are attached can prevent over-stress of such fittings which could lead to physical failures during the towing operation.

A cleat used in towing must be fastened securely to a strong deck structure with through-bolts and adequate backing plates.

If the force is from the side of the cleat rather than along its major axis, it is magnified. Pulling on a cleat from the side, can lead to extremely high values of stress and possible mechanical failure of the through-bolt or the deck structure. this condition will exist whenever the towline is sideways in relationship to the cleat. This might occur at a bridle with too great an angle between the bridle legs or when a quick change in course is made and the towline leads out from the side.

13.4.3 Forces On A Sampson Post: Some small craft are fitted for towing with a Sampson Post or Towing Bit. These must be mounted securely in the deck and fixed to the keel. They must further be braced at the deck level and keel with adequate supports. The forces due to tension in the towline which act on a towing bit can reach very high values and may even exceed the tension in the towline. If the vessel and post structure are not designed, braced, and built to meet towing stresses, the fittings will carry away. Even under modest towing loads, the geometry of the setup can magnify the compression forces at the deck.

As the towline gets closer to the deck the force on the keel approaches zero and the compression force on the deck becomes equal to the tension in the towline. For this reason, towing bits should be as low as possible to the deck. The towline should also be secured as low as possible on the towing bit, but must be clear of all obstructions.

The same forces act as if the mast of the towed vessel is used as a towing bit. If the towline is not kept close to the deck, the forces actually may multiply and carry away deck and/or hull structures. Understanding these forces can help you prevent unnecessary damage to the vessel.

13.4.4 Strain on the Towing Rig: The strain developed within the towing rig determines the type of rig to be utilized for a particular towing situation, i.e., towed vessel, towing vessel, sea conditions, etc. A towing vessel designed and constructed for towing operations, equipped with a towing bit, will normally employ a towing rig that consists of a single towline leading from the towing vessel aft, toward the towed vessel. For any vessel not specifically designed for towing, (i.e. most Auxiliary facilities) it is necessary to more evenly distribute the towing strain by use of towing bridles. A bridle may also be required for control. An example is the outboard or inboard/outboard equipped boat.

Depending on the condition, design and/or construction of the towed vessel, it may be possible to use a single line, or necessary to use a second bridle on the towed vessel’s bow.

A basic understanding of the strains involved in the various towing rigs will assist

the Auxiliarist to choose the best rig for the situation and vessels involved.

13.4.5 Strain On The Single Leg Towline: The stresses existing in the single leg towline are the easiest to resolve and understand. All the forces acting on the towed vessel are passed directly to the towing vessel. The strain, or tension, on the single leg low-line is the same at all points on the line. It is equal to the force required to move and to keep the assisted vessel in tow.

13.4.5 Strain On The Bridle: A towing bridle provides for distribution of the strain in the towing rig to point fittings on the towing vessel. It also facilitates control in the case of an outboard motorboat where the propeller (and thus the steering force) is aft of the transom and/or deck cleats. The bridle can take the form of a "Y" or a "V". In each case, the tension of the towline is split and shared by the bridle's component parts. Splitting this is not a simple process. This action also creates other strains, which act upon the deck cleats. In some cases, these can be magnified a considerable amount and be much larger than the original tension of a single line.

13.4.5.1 The "Y" Bridle: The "Y" bridle is extremely useful in safe towing with small craft. It divides the tension in the towline equally among fittings, and is most often used to provide directional control to outboard motorboats, where a towing bit is impractical. The "Y" bridle also has the potential of creating almost infinite side forces on the cleats if the angle of the "Y" approaches a "T".

The key to controlling tensions in the "Y" bridle is the angle between the two legs. We call this angle "O". The backward force on each cleat is half of the tension in the main towline. Additionally, there is side force on each cleat.

Consider the case where O=0 degrees, i.e. the bridle is closed, then each cleat experiences exactly one half the tension in the towline. At the optimum angle, O = 60 degrees, between the cleats and the stern. An interesting and dangerous situation can develop in the forces present pulling in on the cleats. Consider when O = 180 degrees, when the bridle becomes a "T", then the inward force becomes infinite. For this reason, should the "Y" bridle be made too small, or become a "T" bridle accidentally, tremendous forces, far in excess of the tension force and aft in the tow–line can develop. The deck fittings or the line itself could part with little additional fore and aft tension. Note that if the "Y" bridle is fixed to the towed vessel, the forces act in a similar manner on the towed vessel.

13.4.5.2 The "V" Bridle: The "V" bridle is a simple extension of the "Y" bridle, with the lower leg of the "Y" missing as the apex of the "Y" is extended to the towed vessel. The forces are the same, but the angle is smaller, thus the tension in each line is smaller and so are the side forces on the deck cleats. Realizing all of this, a logical question is: "Why not use a "V": bridle all of the time?" The answer is simple. "V" bridles require double the length of towline. Its quite suitable for relatively short towing rigs, here the length of the "V" is from 3 to 5 times the

distance between the deck cleats. For long towlines, a double towline is ineffective and simply not worth the expense of the extra towline. The “V” bridle is an excellent towing rig for rivers and other confined waters.

13.5 OPTIMUM TOWING SPEED:

Optimum towing speed is determined by the length of the waves produced by the vessel as it moves through the water at displacement speeds. The maximum practical speed (hull speed) a displacement hull will move through the water occurs when the distance between the bow and stern waves produced by the hull moving through the water (distance from crest to crest) is just about equal to the length of the vessel.

At hull speed, propulsion power required to keep the vessel moving is only moderate. Any attempt to increase speed causes the vessel to begin to ride up on its bow wave, i.e., trying to plane. As a towed vessel enters this initial planing stage, it becomes very unstable. Tension on the towing rig can become enormous because extreme power is required to reach this state. Where about 1/3 of the propulsion power may be required to reach hull speed, it may, typically take all of a vessel’s power to reach this next stage, or the onset of planing.

Additionally when the vessels slow down to the maximum displacement hull speed, the stern wave can catch up with the towed vessel and may even swamp it. It can also cause a shock load in excess of the strength of the tow rig. An optimum towing speed will always be about 10% less than the maximum displacement or hull speed. Towing at this speed provides an overall balance between frictional resistance, stability, economy and the maintenance of safe control. Table 12.1 illustrates hull and towing speeds as a function of waterline length. Note, for a boat with a designed displacement hull, such as a sail boat, the vessel becomes unstable at speeds above hull speeds, since the vessel is entering, or in, a planing state for which it was not designed.

Note, even if the vessel is relatively small and designed as a planing hull, for safety’s sake, it should be towed at its displacement hull speed to reduce tension on the towing rig. Also, towing at speeds in excess of 10 knots, regardless of hull length is not recommended. (See Table 12.1)

TABLE 13.1

Optimum and Maximum Towing Speeds as a Function of Towed Vessel's Length in Displacement Mode

	SPEEDS		
LENGTH	OPTIMUM	MAXIMUM	UNSTABLE
10'	3.0k	3.7k	Over 3.7k
15'	3.6k	3.9k	Over 3.9k
20'	4.2k	5.2k	Over 5.2k
25'	4.7k	5.8k	Over 5.8k
30'	5.3k	6.5k	Over 6.5k
35'	5.8k	7.1K	Over 7.1k
40'	6.5k	7.7k	Over 7.7k
50'	7.0k	8.5k	Over 8.5k

Note: The above are averages based on length of vessels in a displacement Mode

13.6 TOWING POSITION:

Shock loads can also be reduced by towline length through proper placement of the tow on one of the stern waves of the towing vessel, preferably the second or subsequent waves, and keeping the tow just on top of the wave. In this manner, the towing vessel's wake also smoothes out the ride. The towline length for the second and third stern waves is illustrated as a function of towing speed in Table 12.2.

TABLE 13.2

OPTIMUM TOWLINE LENGTH FOR IN STEP TOWING ON SECOND AND THIRD STERN WAVES OF THE TOWING VESSEL

	TOWLINE LENGTH IN FEET	
SPEED (KNOTS)	2nd WAVE	3rd WAVE
1	1.1*	1.8*
2	4.4*	7*
3	10	16
4**	18	28
5**	28	44
6**	40	64
7	54	87
8	71	113
9	90	136

* At these low speeds the stern waves are not large enough (for small vessels) to be effective.

** Typical Auxiliary assist towing speeds. The table is provided for information

as an approximation to show how much towline to expect for the various speeds. The actual towing speed should be developed on the shortest hull in the towing combination and the length of the line determined by the optimum speed of this shortest hull. The length of towline desired should be set out, depending on the anticipated towing speed. After getting underway, the towline may need adjustments made, or, as an alternative, the vessel's speed may be reduced (or increased) slightly until the proper position is obtained. The optimum towing speed should not be exceeded. Sea state can also affect the length of towline used.

13.7 CONTROL:

In order to conduct a towing operation safely, the towing vessel must have adequate directional control at all times over the tow. Placement of the towing rig determines the amount of directional control the towing vessel has. To ensure adequate maneuverability, a single towline without bridle must lead from forward of the propeller and rudder of the towing vessel. In this manner, the towing vessel may still turn under the line and change direction. If the line were led directly from the stern of the towing vessel, the vessel would not be able to maneuver, but could only pull forward, at the mercy of the seas, currents, wind, etc. Any attempt to change direction would only result in the towing vessel being set sideways.

A towing bridle can be used directly off the stern if a towing bit forward of the rudder/propeller is not available. In the case of the outboard and inboard/outboard, the bridle leads from each side of the towing vessel and maneuverability is maintained, as the towing point is effectively translated forward of the turning force and continues to move forward as the vessel turns.

13.8 USE OF A SKIFF HOOK:

Trailerable boats are equipped with a trailer towing eye located on the leading edge of the keel where the trailer winch line can be easily attached to pull a boat onto a trailer. This trailer eye is constructed to Department of Transportation (DOT) specifications and is strong enough to lift the weight of the boat.

A Skiff Hook is a special snap hook that attaches to the end of a tow line and fits into a bracket on the end of a pole (usually a boat hook). The towline is connected to the ring on the skiff hook. To attach the towline with a skiff hook the coxswain must maneuver the towing vessel close enough to the bow of the disabled vessel so that a crew member can reach the trailer towing eye with the pole that has the skiff hook attached. When the crew member places the skiff hook over the trailer towing eye, all they have to do is pull back to disconnect the pole from the skiff hook as the skiff hook snaps onto the trailer eye.

This is a strong attachment point on smaller boats that allows the pull to be made close to the waterline to help keep the bow high when towing into seas. There are

two disadvantages to using a skiff hook. The first is that the coxswain must maneuver in close to the disabled vessel which can be very hazardous in heavy seas. The second disadvantage is that it is difficult to remove the skiff hook (especially on boats with a large flare) and usually has to be done after the boat is tied up.

After the towline is passed and the tow rig connected on the disabled vessel, the crew of the disabled vessel must return to the cockpit area and be seated before the tow can safely start. The tow boat should maneuver to start towing the disabled vessel in as close as possible to the direction it is facing before making slow corrections in direction of the desired heading.

13.9 RECOMMENDED MAXIMUM TOWING LOAD:

The first guideline that must be fully understood is that of the maximum towing load. This load must consider all possible sea states, current, and other water conditions, as well as weather and environmental factors that the Auxiliarist might encounter on a patrol. To insure adequate control of the situation and provide for safety of personnel, within the limits of propulsion and hull structure on both vessels in the towing ensemble, Auxiliary facilities should limit towing assists to vessels which do not exceed approximately 150% of the facilities own displacement in weight. This figure of 150% is based on all of the theory presented in Chapter 8 of this Auxiliary Towing Guide as well as numerous small boat design considerations. The Auxiliarist on patrol can readily estimate the normal displacement of small craft within a safe margin by using Table 13.3.

The displacement data of a large number of small craft, including runabouts, cruisers, sailboats, trawlers and sport fisherman was used to develop this curve. The average error that might exist in an individual case will be more than compensated for by the recommended strength in the proposed towing rigs and safety margins established at 150% of the displacement. Use Table 13.3 and check the average displacement shown for the length of your facility. Multiply this value by 1.5 and find the maximum length vessel which you should limit your towing assists to. If you know the exact displacement of your facility, follow the same procedure to determine your maximum safe towing load. These values include considerations for the normal amount of people, equipment, fuel, and water carried on each type of boat. These factors are included in all the recommendations contained in this guide, and the coxswain will not be required to compute his load ratings by adding in such figures.

TABLE 13.3

RECOMMENDED TOWING RIG SIZES

AUX. FACILITY		MINIMUM RECOMMENDED TOWLINE LENGTH		MINIMUM RECOMMENDED LINE SIZE		RECOMMENDED MAXIMUM SIZE OF TOWED VSL		
DISP-LACE-MENT	LEN-GTH	OCEAN/ GREAT LAKES	IN-LAND WATERS	POLY-PROPY-LENE	NYLON	DISP-LACE-MENT	LEN-GTH	MAX. SAFE TOW SPD.
800	13’	70’	30’	1 / 4”	1 / 4””	1400	16’	4.0K
1300	16’	80’	40’	5/16”	5/16”	2100	20’	5.0K
1800	18’	90’	50’	3/8”	3/8”	2800	23’	5.3K
2400	22’	100’	60’	7/16”	7/16”	3600	24’	5.6K
3000	23’	110’	70’	1/2"	7/16”	4500	25’	6.0K
2600	24’	120’	80’	9/16”	1/2”	5400	26’	6.3K
4200	25’	130’	90’	5/8”	9/16”	6400	27’	6.6K
5600	26’	140’	100’	3/4”	5/8”	8500	28’	7.0K
7300	27’	150’	100’	7/8”	3/4”	11000	32’	7.2K
9300	29’	160’	100’	1”	7/8”	14000	34’	7.4K
10800	30’	170’	100’	1 1/8”	1”	16500	35’	7.6K
13000	33’	180’	100’	1 ¼”	1 1/8”	19500	38’	7.8K
17000	35’	190’	110	1 ½”	1 1/4”	28000	45’	8.0K
32000	50’	200’	110’	1 ¾”	1 1/2”	60000	65’	9.0K

NOTE: The maximum recommended towing speed is “SPEED THRU THE WATER”. Do not use your GPS to determine the speed if heading into the current.

CHAPTER 14 OPERATIONAL PROCEDURES FOR TOWING SMALL CRAFT

14.1 INTRODUCTION:

This chapter will present the basic small craft towing scenario. The typical situations that might confront an Auxiliarist on routine safety patrol are presented in step-by-step sequence. The first thing to remember is that there is no typical situation; that is, there is usually something different with every assist and the Auxiliary Boat Crew must not become complacent.

Basic procedures are covered including the location of the disabled vessel, passing the towline, picking up and proceeding with the tow, and delivering the tow safely to a safe haven. Gathering data from the disabled and completing reports are also included. The situations discussed in this chapter will, of necessity, be general in nature. It is the responsibility of each Auxiliarist to become familiar with special district requirements. Auxiliarists must be qualified and certified in the Coast Guard's Auxiliary Boat Crew Qualification Program. This program provides the member with the minimum standards, skills, and knowledge required to participate in the Auxiliary Operations program. Towing should never be considered routine and each member is highly encouraged to hone their seamanship skills and knowledge. When on patrol, we should always be trying to practice and hone these skills as well as to learn new or improved techniques.

14.2 LOCATION AND APPROACH TO A DISABLED VESSEL:

The procedures for searching are beyond the scope of this guide. Refer to the Boat Crew Seamanship Manual, COMDTINST M16114.5 for search information.

When you have located a disabled vessel that you intend to assist, notify your Station (OPCON) as soon as possible and pass all pertinent information. Be sure the OPCON does not have a higher priority mission before assisting the disabled vessel. Close on the disabled vessel to a safe position from which you can communicate with the skipper of the disabled vessel. Initially gather the following information:

a. Determine the nature of distress

b. Is the disabled vessel anchored or adrift.

c. Determine if there are any medical emergencies onboard.

d. Determine the type of assistance needed.

e. Have all of the persons on board don PFDs. Do NOT allow the disabled vessel to drift into further immediate danger while waiting for its crew to

don their PFDs. If the disabled doesn't have enough PFDs, lend them from your reserves.

Note: The priority consideration upon arriving on scene is removing the occupants from immediate danger. If POBs must be removed from a vessel **DO NOT** wait for them to don their PFDs, get them off first!

f. Determine the condition of the disabled vessel; is it taking on water, listing, sitting low in the water. What is the physical and mental condition of persons on board? Are there any children onboard?

g. Determine the optimum position to station keep while making a towing connection.

h. Do a Risk Assessment

i. Determine if you are capable of rendering assistance, are you capable of towing?

j. Inform your OPCON of the situation and your intentions

14.3 CONNECTING THE TOW:

If you and the OPCON determine that you may render assistance (tow), take the following steps:

a. Determine the strength and direction of the forces acting on your vessels; that is, wind, waves, and current.

b. Circle the disabled vessel to determine its stability, location and condition of deck fittings required for towing.

c. If conditions warrant and the opportunity is presented, it may be desirable to remove some or all of the personnel from the disabled vessel and place an Auxiliary crewmember onboard. The determining factors would be the overall safety of the POBs, sea conditions, the need to come alongside, and concurrence of the people involved. The distribution of weight on both vessels should be kept in mind. Do not attempt this transfer if it means putting anyone in the water.

d. Determine if you need to transfer personnel from the disabled vessel to the Auxiliary facility.

e. Is there a need to place one of your crew onboard the disabled vessel?

f. Establish a means of communicating with the skipper of the disabled

vessel during the tow. Consider lending a portable radio if available or establishing hand signals.

g. Determine the best position for passing the towline either directly or with a heaving line.

h. Inform the skipper of the disabled vessel what you intend to do and what you need to have done on their vessel. Will you be using a single leg tow, bridle connected to two bow cleats, or will you be connecting a skiff hook to the trailer towing eye.

i. If necessary have the skipper of the disabled vessel place a person on the bow of their boat to receive the heaving line and towline.

j. Pass the heaving line or towline while tending any lines in the water away from your screws. Caution should be taken to keep these lines in the water as any light strain (even on the heaving line) will draw the two vessel together which may cause damage to one or both.

k. Observe the crew person on the disabled vessel to be sure they make the proper connections and clear any fittings (rails, anchor chokes, etc.).

l. After the towline and/or bridle have been connected to the bow of the disabled vessel have all POBs on the disabled be seated in aft portion of the vessel and have them set their vessel's rudder to amidships.

m. Slowly pay out the towline to the desired length before making the line fast on the towing vessel.

n. If at all possible, start the tow in the direction that the disabled vessel is heading. Turns at sharp angles may cause swamping or capsizing of the towed vessel.

o. Accelerate slowly to the desired towing speed.

p. Slowly come up onto the desired heading.

14.4 RIGGING THE TOWLINE:

The selection of the towing points on both vessels is an important factor that cannot be overemphasized in determining the safety and success of the towing operation. Use extreme caution in deciding the best possible towing procedure, anticipating the strain and stress during towing. The hazard presented by poor strength characteristics of cleats and fittings aboard many pleasure craft is a very real one. A cleat pulled loose from the deck can act like a projectile, capable of causing serious injury. Your towline should be terminated in a large eye splice. If

there is a suitable bit, or other strong cleat on the middle of the foredeck of the towed vessel, this may be the best place to attach your tow rig. A bridle between the end of the towline and two forward cleats will help to distribute and balance the load. The towline should be made fast as far forward and as low to the deck as practicable on the towed vessel. The bow trailer towing eye (if equipped on the disabled vessel) is frequently the best towing point. The towline on the towing vessel should be made fast forward of the rudder but not off-center. Using a bridle on the towing vessel may be advisable to center the towline. The rule of thumb for the length of the bridle on the towing vessel is three times the width of the towing vessel's transom. The best control will be achieved with the bridle attached to cleats located at least as far forward of the rudder as the width of the transom. When using bridles on the towing vessel, you may not be able to adjust the towline length. A long towline should be used and should never be made fast in such manner that would prevent it from being cast off or cut on an instant's notice. Long towlines tend to ease towing because the sag relieves sudden strain or shock. In rough seas (rough for the vessel being towed can be very different from the towing vessel) it is advisable to use a long towline even for light craft. When starting out take up the slack in the towline slowly, or have someone pay out the line by hand. A sudden burst of speed would cause a surge on the line and may damage the tow rig, or either of both vessels. Deploy the towline to the proper length for the conditions. Before taking a strain on the towing vessel and setting the towline length consider the size of the towed vessel with regard to the towing vessel and determine if the weather is getting rough. These two factors should be considered, because the exception to the rule of a long tow is: in rough weather, when a very large vessel is towing a small vessel, a short towline will keep her close in the towing vessel's wake and out of the heavy seas. When practicable, the towline should allow both vessels to be on a wave crest or in a trough at the same time. This is called keeping the boats "In step." When the towline is rigged and the proper length has been set, you are ready to proceed with the tow.

14.5 PROCEEDING WITH THE TOW:

When the towline is rigged and all final checks are completed, signal the disabled vessel that you are ready to start towing. Make sure that the disabled vessel's rudder is set amidships. The disabled vessel should not attempt to steer itself unless directed to do so by the Auxiliary coxswain. If at all possible, start the tow (slowly) in the direction the disabled vessel is heading and then slowly bring it around to the desired heading. Increase the speed gradually to your desired towing speed.

Towing too fast is one of the most frequent causes of towing accidents. It is easy for a larger vessel to tow a smaller vessel too fast, causing it to yaw and capsize. Although a boat's maximum speed is limited by its length and hull design, the towing speed should be limited to a moderate one, making full allowance for adverse conditions of wind, seas, and current. For displacement hulls, an increase

in power over that needed to reach maximum hull speed produces higher bow and stern waves, and puts a tremendous stress on the hull. These boats can be destroyed by towing them even in flat calm. As a rule, no boat should be towed faster than a speed derived from the formula, 1.2 times the square root of the waterline length. These speeds must be reduced as the seas get rough. Decreasing towing speed to about ¾ of a best value will result in a great decrease in the pull on the towline as well as reducing the danger considerably. When towing, the speed through the water is significant while the speed over the ground is not, as there may be a current in one direction or the other. A table of speed for towing can prove helpful, and should be carried on board your facility as a reference for towing operations. Table 14.1 is provided for this purpose and can be used during patrols as a ready guide for safe and maximum towing speeds.

TABLE 14.1

BEST TOWING SPEEDS, MAXIMUM NON-PLANING SPEEDS, ROUGH WEATHER SPEEDS COMPARED WITH WATERLINE LENGTHS OF TOW

WATER-LINE LENGTH	BEST TOWING SPEED	MAXIMUM TOWING SPEED	ROUGH WEATHER SPEED
10	3.2K	3.8K	2.4K
15	3.9K `	4.6K	2.9K
20	4.5K	5.4K	3.4K
25	5.0K	6.0K	3.8K
30	5.5K	6.6K	4.1K
35	5.9K	7.1K	4.4K
40	6.3K	7.6K	4.7K
45	6.7K	8.0K	5.1K
50	7.1K	8.5K	5.5K
55	7.4K	8.9K	5.6K
60	7.7K	9.3K	5.8K

NOTE: The speeds indicated in Table 14.1 above is "SPEED THROUGH THE WATER"

NOTE: If you do not have an accurate knotmeter or speed measuring device, use your RPM Table and set engine RPMs for the next lowest whole value of the facility's speed in knots.

NOTE: The above is speed through the water and not over the ground. Do not use your GPS speed which measures speed over the ground.

When towing, both boats should be "In Step" by adjusting the length of the towline so that both boats are riding on a wave crest or trough of the seas at the

same time. The general principal here is to prevent, if possible, a situation where the tow alternately runs ahead and surges back on the towline with a heavy strain. If there is any degree of uniformity to the waves, the strain on the towline will be minimized by adjusting it to the proper length. This length should include a sag in the towline, or "Catenary" to help relieve excessive strain on the towline and deck fittings. Insure that the tow is not too close as this can further complicate matters and pose a potentially dangerous situation. A small boat in tow should preferably be trimmed by the stern. Trimming by the head (bow) may cause the tow to yaw, and can result in the bow becoming submerged.

Remember a towline is always a potential danger to anyone near should it break and whip into the vessel, particularly nylon which has considerable stretch under strain. This applies to both the towing and towed vessels, so keep a constant vigil on the towline, and stay clear from directly behind it. A member of the towing crew should always watch the towline and towed vessel. After arriving in protected and quiet waters and near your destination, take in on the scope of the towline to allow better handling at close quarters.

Remember, always swing as wide as possible around buoys, boats, or channel turns, allowing for the towed vessel to follow.

When in protected and quiet waters consider transferring the tow to an alongside tow for better control in maneuvering to moor the disabled vessel,

14.6 ALONGSIDE TOWING:

An alongside tow is used to give positive control of a vessel in tow for mooring. The transfer from a long tow to an alongside tow should only be done in calm and protected waters to minimize the chance of injury or damage to the vessels involved.

14.6.1 Preparation For Alongside Towing: When preparing to do an alongside tow the following steps should be followed:

a. Brief the crew of the towboat on what has to be done. Redo your risk assessment (GAR score)

b. Place adequate fenders alongside the towboat to protect both vessels from damage.

c. Break out lines for connecting the two vessels together. There should be four lines for this connection plus lines for mooring.

d. Brief the crew on your plans for the alongside tow. Determine which side you want to place the towed vessel and note how and where you plan to moor the tow.

e. Warn the crew of the towed vessel to keep their hands and limbs out from between the boats.

14.6.2 Types of Alongside Tow Connections: There are two methods for accomplishing this transfer. In one method the towline is used as the Number One line (bow to bow). In the second method the long tow is completely disconnected and the towboat makes a free approach to come alongside the disabled vessel.

a. Towline left connected: The coxswain of the tow boat brings the tow to a stop and slowly backs down alongside the disabled vessel while the crew take in the towline to keep it out of the screws. The towline is passed forward on the towboat and used as the Number One line (bow to bow). This is always the first line connected in an alongside tow as it keeps the bows together and the towed vessel is kept under control.

b. Free Approach: The coxswain brings the tow to a stop and has the towline disconnected from the towed vessel. The towboat then backs down or comes about to make a free approach to the disabled vessel

14.6.3 Connecting the Alongside Tow: Regardless of the method used above the following steps must be followed:

a. Position the fenders along the side of the towboat to best protect both vessels. The fenders can never be too large. The fenders should be as large as possible and size and number are governed by the storage area on the towboat.

b. Position the two vessels together so that the stern of the towed vessel is forward of the stern of the towboat. This distance is approximately 1/3 of the length of the towboat. That is; if the towboat is 24 feet long the towed boat should be approximately 8 feet forward of the towboats transom. This is to provide responsive control to the towboat for maneuvering.

c. The first line to be connected is the Number One Line, which is bow to bow.

d. The second line is the Number Two Line, which connects the forward part of the towboat to the aft portion of the towed boat. This line is used for towing in forward propulsion.

e. The third line is the Number Three Line, which connects the side of the towboat to the aft end of the towed boat. This line is used to keep the two sterns together.

f. The fourth line is the Number Four Line and it connects the stern of the two boats together. This line is used for pulling in reverse propulsion.

g. Tighten the Numbers One and Two Lines first. If you have to get the tow moving this allows you to move forward.

h. While the tow is moving forward tighten the Numbers Three and Four Lines.

i. Place the tow in Reverse Propulsion to further tighten the Number Two Line.

NOTE: It is desirable to have all the alongside tow lines as tight as possible to minimize the movement between the two boats.

ALTERNATE: In many cases, especially if the towed boat is small, you may be able to combine the Numbers Three and Four Lines. This is done by connecting the far aft cleat on the towed boat to the close aft cleat on the towboat.

14.6.4 Maneuvering with an Alongside Tow: After the alongside tow is made up the coxswain should test turning the vessels both to port and starboard to determine how well the tow responds. It is always easier to turn toward the towed boat than away from it in forward. To turn away from the towed boat it is usually easier to go into reverse and pivot around the stern of the towed boat.

When approaching the mooring it may be necessary to place a crewmember forward or on the towed vessel to call off distances and angles to the coxswain as the coxswains visibility may be limited by the placement of the tow. If the towboat is larger than the towed boat consider placing the towboat against the dock. If the towed boat is larger, consider placing the tow against the dock. The crew of both vessels should be ready with mooring lines as the approach is made to the dock. All maneuvering should be done with only enough speed to control the tow.

14.7 TOWING – GENERAL REGULATIONS:

The Coast Guard and Coast Guard Auxiliary will, when towing, take a vessel to the nearest safe haven. The nearest safe haven is defined as a place that can accommodate and will accept the safe mooring of the vessel, and has a means of communication, normally a telephone. There is no obligation to take a vessel to its home port or a marina where full repair services are available.

Coast Guard Auxiliary Facilities operating under Coast Guard orders are not to pull a grounded vessel. If the vessel is lightly grounded and the “Order Issuing Authority” gives permission you may make an attempt to free it. At no time

should you apply high power to pull a grounded vessel as you may capsize your own vessel. Grounded vessels normally are considered salvage and should be left for commercial salvagers to handle. The Auxiliaries focus in these cases should be the protection of life and to assist in preventing a situation from deteriorating. If in doubt the coxswain should consult with the order issuing authority for direction.

The U.S. Coast Guard Addendum to the United States Search and Rescue Supplement (NSS) to the IAMSAR Manual, (COMDTINST M16130.2E) states in paragraph 4.1.6.4 “When an Auxiliary vessel on routine safety patrol or otherwise on orders discovers a vessel requesting assistance, but not in radio contact with the Coast Guard, the Auxiliarist will relay the request for assistance to the Coast Guard operational commander and may undertake to provide assistance, if capable. If a tow is undertaken, The Auxiliary vessel is required to notify the operational commander of the identity of the vessel, the location of the vessel, and the destination to which the vessel is being towed. No Auxiliary vessel may undertake the tow of another vessel unless the Auxiliarist is reasonably assured of the safety of both vessels and the persons onboard. If the Auxiliary vessel cannot safely tow a disabled vessel that is standing into danger, it may endeavor to remove the persons from the threatened vessel and stand by until a more capable resource arrives on scene.” It further states that “The notification of the SMC is a courtesy.”

Paragraph 4.1.5.8 of the NSS manual also states” Coast Guard resources or Auxiliary facilities may be used to help Auxiliary facilities in need of assistance at any time.”

The NSS Manual further states in paragraph 4.1.5.3 “The three principles that guide assistance to vessels not in distress are:

(a) The first responder on scene with the vessel requesting assistance normally will provide assistance,

(b) If a Coast Guard resource or Auxiliary facility takes a disabled vessel in tow, the tow will normally terminate at the nearest safe haven, and

(c) Once undertaken, there is no requirement to break the tow as described below in paragraph 4.1.6.6, “Relief of Tow”.

4.1.6.6 Relief of Tow. In cases involving towing by the Coast Guard or Coast Guard Auxiliary where no emergency exists, the assisted vessel may be released to another provider who appears capable, provided that:

(a) The SMC and coxswain of the assisting vessel determine that a hand-off can be carried out safely; and either

(b) Alternative assistance is desired and arranged by the operator of the vessel being assisted; or

(c) The operational commander has a higher need for the Coast Guard resource or Auxiliary facility.

CHAPTER 15 TYPES OF TOWING RIGS

15.1 INTRODUCTION:

This chapter is a discussion of various towing rigs used on Auxiliary facilities. Included is the advantages and disadvantages of each. The coxswain/owner should study and experiment with each rig to determine which will work the best for their facility and conditions.

15.2 GENERAL

To have maximum control of a long tow it is desirable to have the towed vessel track directly behind the towing vessel. Therefore, a rig that keeps the tow centered on the stern of the towing vessel should be selected. Things to consider are:

(a) How to minimize the strain on the towboat's fittings and tow rig.

(b) Are there any obstructions on the back of the towboat that will present a problem (O/B engines that are higher than the transom of the towboat)?

(c) Ease of use.

(d) Ease of adjusting the towline.

(e) Expense in configuring the towboat for towing?

(f) Safety

(g) Size and capacity of equipment

Also, it should be remembered that you should try to minimize or eliminate the use of metal fittings (Shackles, rings, snap hooks, etc.) in the tow rig. Should the towline part, these fittings could become flying missiles.

Be sure to keep the crews of both the towing and towed boats from being in-line with the towline. If it would part they could be injured.

It is better to use too heavy of a towline or oversized fitting to insure the safety and integrity of the tow rig under stress.

Be sure to do a "Risk Assessment before undertaking a tow and when shifting from a stern tow to an alongside tow.

Use of a Safety Light (Alternating yellow and red flashing light) is not a "Tow Light" and should not be used as such. Safety lights are to be used for short periods for the purpose of identification.

15.3 "Y" BRIDLE:

The "Y" Bridle is probably one of the most commonly used on Auxiliary facilities. The "Y" is formed by two lines extending from an aft side cleat on each side of the towboat to a junction point with the towline. The bridle may be joined to the towline with a splice or a shackle. The splice is the safer method. The length of each leg of the bridle should be at least as long as the distance between the two towing cleats and should be long enough to clear anything on the stern of the towboat (O/B engines, ladders, etc.). The cleats used should be located well forward of the rudder or outdrive to provide control for turns. See Figure 15.1.

The advantage of this arrangement is that it equalizes the load between two cleats located on each side of the towing vessel. If the tow cleats are located far enough forward this type of rig will allow you to easily turn the tow.

The disadvantages of this type of rig is that you can not make adjustments to the towline. Also, when making a turn, the cleat on the outside of the turn will be carrying the full load of the tow and may be subject to overload. If the bridle is permanently spliced into the tow rig it may make it more difficult to connect and keep clear in storage and it fixes the length of the towline. Remember, you should avoid the use of knots in your tow rig.

15.4 MODIFIED "Y"BRIDLE:

A modification of the "Y" arrangement calls for a short length of line with an eye spliced in one end and a large snap hook on the other. This short line (bridle) is 5/8 the distance between the two towing cleats located on each side of the towboat. A single tow line is connected to one of the side towing cleats and the bridle to the one on the opposite side. The large snap hook on the bridle is then snapped over the towline and the towline will be kept centered behind the towboat. See Figure 15.2.

The advantage of this arrangement is that the towline can be adjusted from the towboat.

The disadvantages are: the angle of the "Y" will place more side force on the towing cleats which could cause them to could fail. If used with an O/B where the engine(s) is higher than the transom, the towline will rub on the top of the engine(s). Also, when turning a tow, the strain may shift to a single cleat. Some Auxiliarists install a towing bar over the O/B engines to prevent the towline from rubbing on the engine covers. Do not connect this rig directly to the transom as you will lose your ability to maintain control for maneuvering.

TOWING RIG: SINGLE TOWLINE WITH "Y" BRIDLE

ILLUSTRATION:

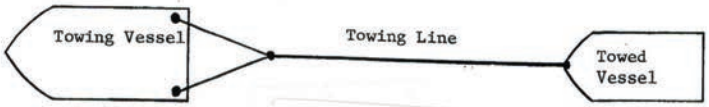


Figure 15.1

ADVANTAGES:

Can be used with out board and inboard/out board motorboats as towing vessels
Good control if bridle is lead forward of propellers (as is with an OB or an IB/OB
Good for off shore towing
Good for shock absorbancy
Distributes load on towing vessel
Can (and should) be made up in advance

DISADVANTAGES:

Requires strong deck cleats
Cannot be easily lengthened or shortened on towing vessel

REMARKS:

This is an excellent rig for out board and inboard/out board motorboats without towing bits.

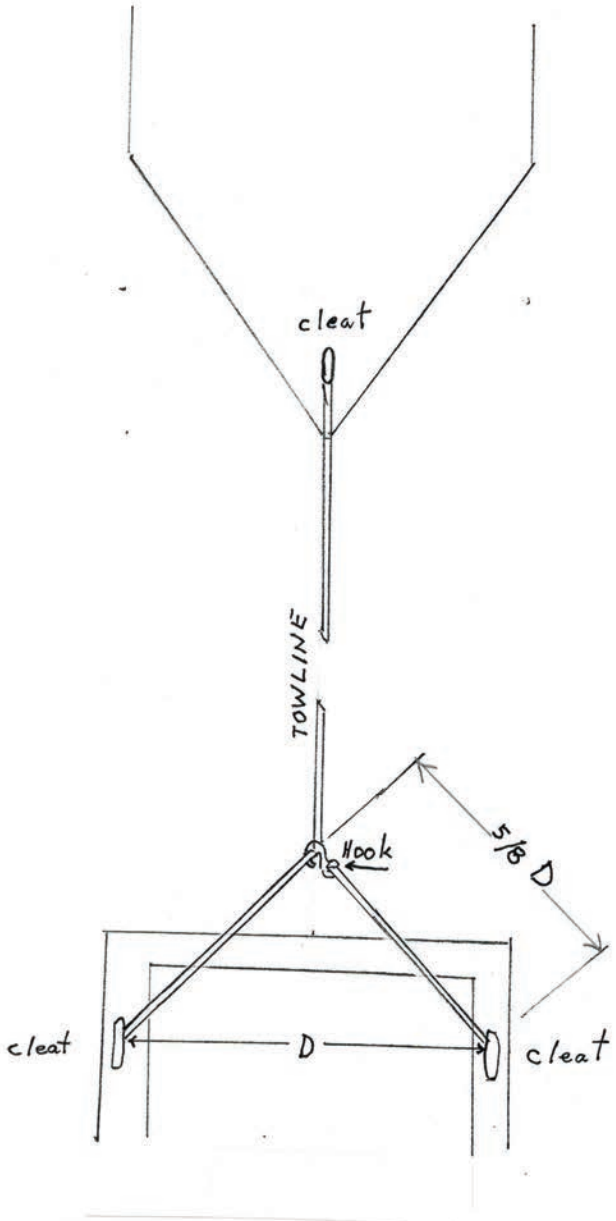


Figure 15.2

15.5 "V" BRIDLE:

The "V" Bridle is towline that runs from a side cleat near the aft end of the towboat to the vessel being towed and back to a side cleat on the opposite side of the towboat. The "V" Bridle is simply an extension of the "Y" bridle with the lower end of the "Y" missing. It is very suitable for relatively short towing rigs where the length of the "V" is from 3 to 5 times the distance between the cleats. See Figure 15.3A and 15.3B.

The advantages of the "V" Bridle are:

(a) It gives good control for short tows.

(b) The length of the towline can be adjusted easily.

(c) It is excellent for towing in rivers and other confined waterways.

The disadvantages of the "V" Bridle are:

(a) Requires twice as much towline (cost).

(b) Not very effective for long tows.

(c) More towline to handle and have out in the towboat.

TOWING RIG: "V" BRIDLE

ILLUSTRATION:

Figure 15.3B

ADVANTAGES:

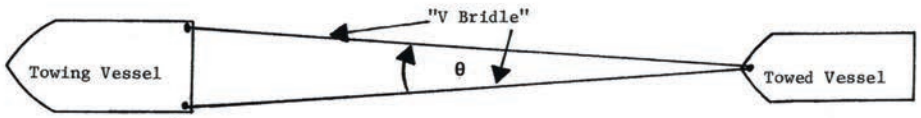
Good control in confined waters
Can be lengthened or shortened on the towing vessel
Distributes load on towing vessel

DISADVANTAGES:

Unsuitable for tows where long towline is required
Requires limited speed

REMARKS:

"L" should be from 3 x "W" to 5 x "W" long, no more.
Excellent rig for river towing or for other confined waters where good control is required.



NOTE: FOR $\theta = 30^{\circ}$ OR LESS, TENSION IN EACH ARE APPROXIMATELY EQUAL TO T/2 THE " V " BRIDLE

Figure 15.3A

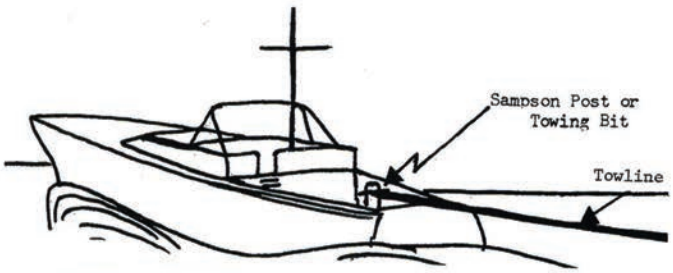
15.6 SINGLE POINT:

Some boats are equipped with a single center point for connecting a tow rig. Usually this would be a Sampson Post. This arrangement gives the maximum amount of control if the Sampson post is located far enough forward of the rudder or lower unit drive. The towline is simply wrapped around the Sampson post in a series of Figure Eights. See Figure 15.4A and 15.4B.

The advantage of this arrangement is the ease of making the hook-up and it allows for excellent control of a long tow.

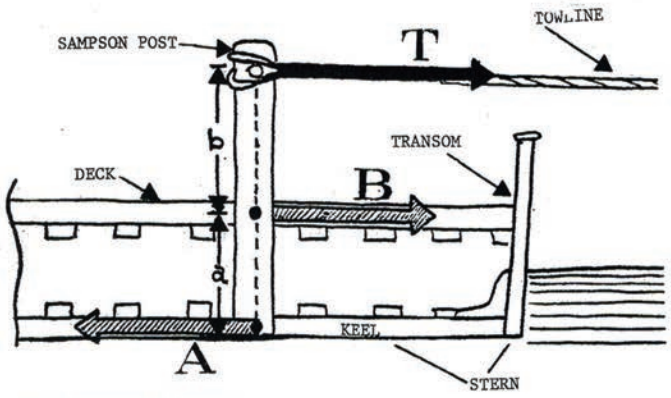
The disadvantage is that the Sampson post should be anchored on the keel and braced at the deck. This is usually not available on most recreational boats used by the Auxiliary. Also, all the stress is concentrated at a single fitting on the towboat.

Care should be taken with any other single point fitting (cleat or a deck mounted post) to insure that it is of sufficient strength and that it is properly attached and back plated. Attachment points installed on pleasure craft for water skiing are normally not strong enough to be used for towing other than for the smallest of boats.



. Forces on Vessel Fittings, The Sampson Post or Towing Bit

Figure 15.4A



T = Tension in Towline

a = Distance between Center of Effort and Keel Center of Effort

A = Shearing Force on Keel Fastening to Sampson Post

b = Distance between Towline Center of Effort and Deck Center of Effort

B = Compression Force on Deck Frames

TOWING FORCES ON SAMPSON POST (TOWING BIT)

Figure 15.4B

15.7 TOW BAR WITH CENTERING PINS:

Some members have installed a bracket across the width of the towboat and forward of the rudder or O/B. The bar is heavy enough to take the full stress of the tow but it does allow for some of the load to be shared with a deck cleat. The bar is 3" to 4" diameter aluminum (Stainless steel could be substituted but the cost would be considerably more) and is raised above the gunwale enough to give clearance between the towline and O/B engines. Centered on the tow bar are two aluminum 1" thick solid vertical pins approximately 3" high and spaced about 1½" apart. This bar arrangement is through-bolted to the gunwale on each side and re-enforced with a back plate. After the towline is paid out it is laid between the two vertical pins and made fast to a deck cleat. See Figure 15.5.

The advantages of this arrangement are:

(a) Allows for a quick and easy hook-up of a single leg towline

(b) Allows the length of the towline to be easily adjusted in both directions

(c) Allows the strain of the tow to be transferred to the towboat at 3 different points, the two points where the tow bracket is attached and the cleat where the towline is made fast.

(d) Allows for the towline to clear the O/B engine(s) or any other appliance on the aft end of the boat.

(e) Provides a convenient location to hang heaving lines, rescue lines, short lines for docking and alongside towing.

The disadvantages are:

(a) The cost of having the tow bracket custom made.

(b) Finding a shop to fabricate the tow bracket.

(c) Once installed the bracket is permanent and may limit the access to the very back of the boat.

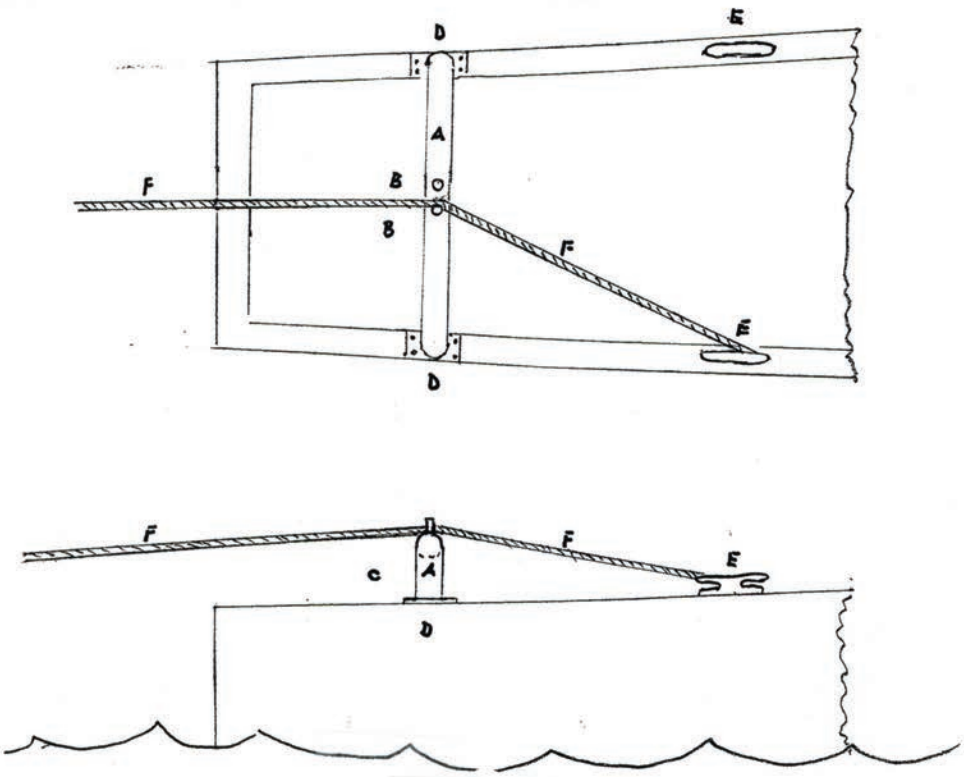


Figure 15.5

Top and Side View of Towing Bracket to clear O/B engines and to keep towline centered.

KEY

A 2" to 4" Aluminum pipe. Raised high enough to clear O/B engine(s) or other obstructions. (Keep as low as possible.)

B 1" Solid Aluminum pins welded to top of larger pipe.

C 2" to 4" Aluminum pipe only high enough for horizontal pipe to hold towline clear of any stern obstructions (O/B engine(s)).

D 8" flat Aluminum mounting plate (approximately ¼" thick). Use 4 ¼" bolts to hold to gunwale. Use lock washers and "Backer Plate".

E Cleats

F Towline

15.8 TOW BAR TO CLEAR OUTBOARD ENGINES:

This arrangement provides a bar across the stern of an outboard powered boat to hold the towline above the engines. The purpose of this is to keep the towline from rubbing on the engine covers. A “Y” bridle would normally be used with this arrangement. (See Figure 15.6)

The advantages with this arrangement are:

a. Allows the towline to clear the O/B engines

b. Ease of making the connection

c. Allows the strain of the tow to be distributed to three points, the tow-bar and the attachment points of the bridle.

d. Does provide a convenient location to hang lines.

The disadvantages with this arrangement are:

a. The cost of having the tow-bar custom made.

b. Finding a shop to manufacture the tow-bar.

c. Requires a bridle to keep the tow centered.

d. The length of the tow-line can not be easily adjusted.

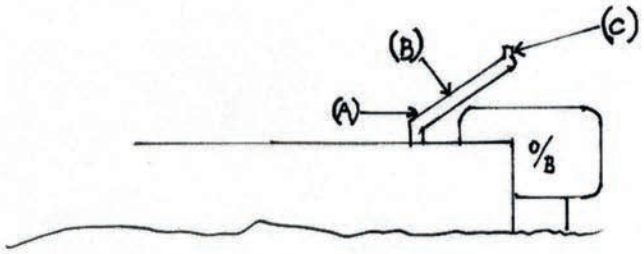


Figure 8.6
Side View

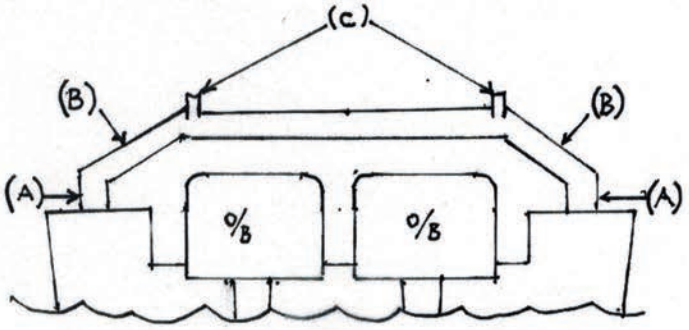


Figure 15.6
Stern View

NOTES

(A) Stainless steel tubing 1 ½" – 2" diameter

(B) Sloped at approximately 45 degrees

(C) Sockets for flags also used to keep towline from slipping off the sides. Approximately 2" high.

15.9 EXPANDING BRIDLE:

The expanding bridle is actually a combination of a “V” and a “Y” bridle. The “V” portion of the “Y” bridle extends from the stern of the tow boat to a single leg forming the “Y”. The “V” portion of the rig is adjusted out or in to control the distance to the towed vessel. At the towed vessel another bridle can be used or the towline can be connected directly to a centered cleat on the bow. See figure 15.7. This is a combination of the “V” and “Y” bridles with the same advantages and disadvantages of

each.

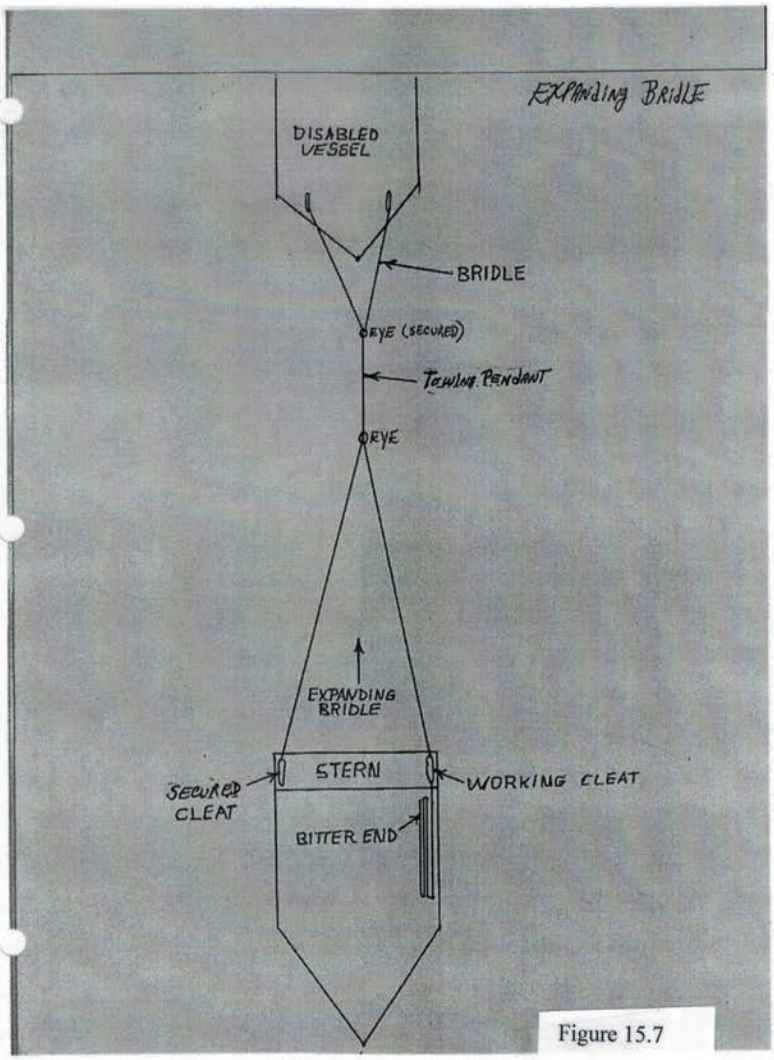


Figure 15.7

CHAPTER 16 ADVANCED TOWING TECHNIQUES

16.1 INTRODUCTION:

The techniques covered in this chapter are provided to enable the Auxiliarist to properly conduct advanced towing problems. A clear understanding of the principles involved will result in a minimum of hazards to the boats involved, the Auxiliary crew, and the personnel on the vessel being assisted. The techniques presented herein constitute more difficult tasks than the basic small craft towing problems presented in chapter 5. For this reason, the advanced techniques discussed in this chapter should not be attempted until the material in the first six chapters is mastered along with considerable operational experience which will help develop the requisite basic skills.

16.2 STATION KEEPING:

When first approaching a disabled vessel, determine it's relative set and drift. The approach of the Auxiliary Facility should be bow or stern into the prevailing conditions. The tow boat should have better sea keeping conditions bow into the seas but, most Auxiliary facilities (especially single screw vessels) will handle better with their stern into the prevailing conditions. This method is called crossing the "T". The Auxiliary facility forms the vertical leg of the "T" with respect to the waves caused by the prevailing conditions. It is important for the safety of the crew working on the back of the tow boat to have the tow boat riding up and down along the longitudinal axis of the boat. This will give the crew working the lines in the back of the tow boat better stability rather than rolling back and forth from port to starboard.

The towing vessel should be placed so that the working area of the tow boat is closest to the bow of the disabled vessel. The coxswain must maintain this optimal position using opening and closing maneuvers to keep the two vessels at a safe distance during the hook-up. Boat crews should continually practice throwing the heaving line so as to become proficient at making this connection in any expected sea conditions.. With higher winds the tow boat may want to stay a little upwind of the optimum position to facilitate throwing the heaving line so that the wind will carry it across the disabled vessel.

16.3 TOWING UNDER ADVERSE CONDITIONS (Heavy Weather Towing):

Perhaps one of the most difficult and dangerous skills to master is heavy weather towing. The material covered in the "Standardized Auxiliary Boat Operations Training" (SABOT) program is based on heavy weather techniques. Learning how to perform these techniques should enable you to function in many conditions. Learning the skill to "Station Keep" in the optimum position will go a long way toward keeping you out of trouble. Maintaining control of your vessel

and keeping it in a safe and workable position is most important. You must learn to control the towing and towed vessel to avoid overstressing the towing rig, the deck fittings, and to assure personal safety of both vessels and to maintain adequate communications between the two vessels.

Heavy weather is different for each facility and crew. The size, and design of the hull along with the experience of the crew determines what heavy weather is for each facility and crew. Generally, Auxiliarists should **avoid** operations in heavy weather conditions. This is beyond the scope of the Auxiliary's mission.

The key to controlling the situation is to station keep in the optimum position. This is done by using the method called Crossing the "T". The Crossing the "T" method places the Auxiliary facility as the bottom leg of the "T" with its bow or stern into the prevailing force (usually wind and seas). The bow being the highest and most streamlined point makes this the most seaworthy and preferred position. However, most Auxiliary facilities (which are pleasure craft by design) are single screw and do not handle well station keeping in heavy weather conditions with their bow into the prevailing force as they tend to naturally want to turn their stern into this force (usually wind). It is extremely difficult for a single screw and many twin screw pleasure craft to maintain position on a drifting vessel by keeping their bow into the prevailing force. Even many twin screw Auxiliary facilities will have a difficult time station keeping with their bow into the prevailing conditions. Because most Auxiliary facilities have to keep their stern into the prevailing force to station keep will probably become the limiting factor in the conditions in which the facility can safely operate! Coxswains should constantly practice station keeping in various sea conditions so that they know their limitations and that of the facility. With practice the coxswain should know how to best set up to station keep in the optimum position in relatively heavy weather conditions. It requires regular practice to maintain this skill once it is mastered. Remember, heavy weather is different for each crew and facility.

Control can be maintained by proceeding at slower speed than normal towing speeds and by quartering into the wind and waves. The towline should be lengthened as much as possible but not to the point that the tow is not in step. Watch the tow that its bow doesn't plow through the waves. Yawing and surfing of the towed vessel can be avoided by using a drogue deployed from the stern of the towed vessel. Lowering the lower unit on O/B or I/O would help to control yawing. (Even in calmer seas O/Bs and I/Os usually tow better with their lower units in the down position) Moving the weight of cargo and people as far aft as possible, and keeping this weight as low as possible will help. The deployment of a drogue or any object (a bucket, a PFD, a fender, etc.) from the stern of the towed vessel should help. It is important to understand the purpose of a drogue is to hold back on the stern of the towed vessel to keep it from yawing. The towed vessel can also stream lengths of line behind it. Tying objects to these lines (i.e. blankets, PFDs, buckets, clothing, etc.) would add to the drag and help to control the yaw the same as a "Sea Anchor".

Reduced speed and correct placement of the tow are the most effective methods of reducing any overstress on the towing rig and fittings. Extra chafing and extra turns around secondary tow points will also help prevent towline failure and provide an extra toe hold in the event of a fitting failure.

Personnel safety must be maintained at all times. If possible to do safely during rough weather, personnel should be transferred from the towed vessel to the towing vessel. Personal Floatation Devices (PFDs) must be worn at all times by all personnel on both vessels. All personnel should keep clear of the towline on both vessels to prevent injury due to whipping in the event of rig failure.

If the coxswain of the Auxiliary facility considers that weather and sea conditions are overwhelming and the towing operation is unsafe, then discontinue the tow and stand by the disabled vessel until a more suitable resource can arrive on scene or until conditions improve. If the towed vessel is not expected to survive either the delay or the tow in heavy weather, transfer its personnel and abandon the tow. UNDER NO CIRCUMSTANCES SHOULD LIVES BE RISKED TO SAVE PROPERTY.

An Auxiliary facility engaged in towing must maintain communications with the towed vessel and the operational commander at all times in any type of weather conditions. In adverse conditions, assure adequate backup communications are available and that their meanings are clearly understood. The frequency of communication updates with the operational commander should be increased in adverse conditions. This could shift to an “Operational condition and position check every 10 minutes or less! The towing vessel should keep in communications with the towed vessel and know the condition of all personnel onboard as well as the condition of the towed vessel. Communications with the towed vessel should be calm, firm, positive and reassuring to instill confidence and prevent panic in the personnel aboard the towed vessel.

16.4 TOWING IN SURF CONDITIONS:

It is Coast Guard policy that Auxiliary facilities are not to enter or tow in the surf. Surf operations require special training and the use of Surf Boats. This is beyond the scope of Auxiliary training and must be avoided.

16.5 TOWING IN A STRONG CURRENT:

The problem of towing in a strong current is one of prudent, quick boat control, as well as to make satisfactory headway. The problem can be broken down into against the current (Upstream) and with the current (Downstream) conditions.

16.6 TOWING UPSTREAM IN A STRONG CURRENT:

Towing upstream in a strong current is really a problem of making headway. It is important to note that the speeds indicated in Table 14.1 “RECOMMENDED TOWING SPEEDS” are “SPEED THROUGH THE WATER”. Do not use your GPS to determine towing speed when towing into a strong current. You must use an accurate knotmeter or an RPM/Speed Table. It is very easy to over-speed a tow when heading into a strong current. You may want to look for an alternate destination which would not require towing in these conditions. If you are forced into towing into a strong current look for ways of reducing the risk. Consider transferring personnel from the towed vessel to the towing vessel. Try towing from the trailer towing eye to keep the bow on the towed vessel as high as possible. Extreme caution should be exercised in these conditions. The strain on the towing rig will be very high. It might be advisable to consider using a more suitable resource with a heavier tow rig.

When changing direction to go across current the towed vessel will tend to be set down current. The solution is to shorten the towline (the “V” bridle is suggested) and proceed upstream at an acute angle beyond the desired turning point, enough so that, as the vessels cross the current, they drift down together under control, until the vessels enter slower waters at the edge of the current.

16.7 TOWING DOWNSTREAM IN A STRONG CURRENT:

Towing down steam in a strong current can be a very difficult operation. In this case, the towed vessel can drift down upon the towing vessel during course changes across stream and collide and/or cause the towline to slacken and possibly foul the propellers of the towing vessel. A short towline, such as the “V” bridle, should be used, and observed constantly. In addition, if the towed vessel has a tendency to drift down current faster than the towing vessel, consideration should be made to tow up stream at a speed less than that of the current. This would allow the towing vessel to control the drift of the towed vessel going downstream. Placing the tow into an alongside tow may work if there is not a lot of wave action. A drogue off the stern of the towed vessel could be utilized to increase the tension on the towline and insure control. High speed should not be used to keep tension on the towline.

Keep in mind that the towed vessel will continue to drift downstream when any attempt is made to go across current. For this reason, each move should be planned in advance. Pull into quieter waters, if possible, before changing course.

16.8 TOWING A VESSEL WITH A FOULED ANCHOR:

At times a disabled vessel may not be able to raise its anchor when you are ready to start the tow. There are a couple of approaches:

a. The easiest is to have the disabled vessel cut its anchor line and abandon the anchor.

b. The disabled vessel can tie a float to mark the anchor for later recovery.

c. Attach a large heavy shackle to the anchor line and the towline. Allow the shackle to sink to the anchor. Pay out sufficient towline to give a shallow angle to the towline and attempt to pull the anchor free by pulling in the direction that the anchor line is set. This should free the anchor and allow the towboat to recover the anchor. If you are successful in recovering the anchor, attach the towline directly to the disabled vessel. If the anchor line is strong enough and attached correctly to allow the towed vessel to track the towing boat properly you may attempt to tow with the anchor line. If you can not free the anchor, recover your shackle and have the disabled vessel cut the anchor line as noted in (a) or (b) above.

16.9 SALVAGE OPERATIONS:

Generally speaking the Auxiliary does not perform salvage. Section 4.3 (General Salvage Policy (Other than Towing) of the NSS states:

"4.3.1 General

When commercial salvors are on scene performing salvage, Coast Guard units may assist them within the unit's capabilities, if the salvor requests. When no commercial salvage facilities are on scene, Coast Guard units should only engage in salvage other than towing when limited salvage operations (e.g., un-grounding, pumping, damage control measures, etc.) can prevent a worsening situation or complete loss of the vessel. **Any salvage operations shall be performed at the discretion of the unit CO/OINC.**

Note: Coast Guard units and personnel shall not be unduly hazarded in performing salvage.

4.3.2 Small Craft

4.3.2.1 This policy applies to small craft that need salvage other than towing. However, when no commercial salvage companies are available within a reasonable time or distance, the District commander may modify the policy to provide for refloating a grounded boat which is not in peril of further damage or loss if:

(a) the Coast Guard units are capable of rendering assistance,

(b) the owner requests the assistance and agrees to the specific to be made, and

(c) Coast Guard units and personnel are not unduly hazarded by the operation.

4.3.2.2 Prudent actions include:

(a) Allowing the next high tide to refloat the vessel,

(b) Helping the mariner set anchors,

(c) Evacuating passengers,

(d) Helping the mariner determine the vessel's seaworthiness.

4.3.3 Operator Insistence

Occasionally an operator will insist that the Coast Guard take action, such as pulling a vessel from a reef, which Coast Guard personnel on scene consider unwise. The Coast Guard is under no obligation to agree to any such request or demand. If a decision to comply with such a request is made, it should be made clear that the operator is assuming the risk of the operation. The fact that the action is undertaken at operator's request, and is against Coast Guard advice, should be logged."

16.10 TOWING OFF A BEACH OR REFLOATING A GROUNDED VESSEL:

Coast Guard policy is that the Auxiliary does **NOT** tow grounded or beached vessels. In the rare cases where permission to un-ground a lightly grounded vessel is given by the CO/OINC of the operational unit, extreme care must be exercised. It is normally best to leave these operations to salvors. Remember if the vessel is beached the passengers can safely get out and walk on dry land. If the OPCON has you tow a grounded vessel, the procedure must be supervised by an experienced and knowledgeable member of the towing crew who should be placed ashore to supervise the refloating operation.

Before attempting the re-floating of any vessel, an inspection should be made of the grounded vessel's hull, and take certain precautions to insure:

(1) The vessel's hull is not holed and is free of water and leaks, or

(2) Determine if the vessel's hull is holed. If temporary repairs can be effected, do so to ensure water tight integrity. If not, do **NOT** make any attempt to re-float the hull.

Inspection of the hull is necessary to determine its water tight integrity. If there is any doubt as to the vessel's ability to remain afloat after it is re-floated, then make no attempt to re-float the vessel. COAST GUARD PERSONNEL SHOULD NEVER ATTEMPT TO REFLOAT ANY VESSEL IN WHICH THERE IS NOT TOTAL ASSURANCE THAT THE REFLOATING CAN BE CONDUCTED IN COMPLETE SAFETY AND SUCCESS. If it is determined that the vessel will remain afloat, then further actions must be planned carefully to avoid unnecessary and excessive stressing of the vessel's hull and/or towing rig, as well as endangering the towing vessel or its crew. The following items must be considered:

(1) Does the towing vessel have enough power to do the job?

(2) Is the towing rig strong enough to take the static load?

(3) Are the fittings and hull structure of both vessels adequate?

(4) What are the sea conditions?

(5) What is the wind direction and speed?

(6) What is the stability of the grounded vessel?

(7) Are there any obstructions (rocks, etc.) behind the grounded vessel?

(8) Does the coxswain understand that too much power may cause the towing vessel to "Chine Walk" and capsize?

(9) Does the operation require the Auxiliary facility to enter the surf zone? (Auxiliary vessels are not allowed to operate in the surf!)

16.11 TOWING OFF ROCKS:

Normally Coast Guard policy does not allow Auxiliary vessels to tow a vessel aground on rocks without permission of the operational unit's CO/OINC!

Vessels stranded on rocks present a special hazard in that the vessel may be holed as the tow is taken up. As in the case of towing a grounded vessel, first send a knowledgeable and experienced crewmember to the scene to supervise the salvage operation. Inspect the vessel thoroughly. If possible, make temporary repairs to all hull damage which could lead to flooding. Remove all water and excess weight.

The rock on which the vessel is stranded should be examined closely to determine just how to remove the vessel without additional damage. If possible, wait until maximum tide before attempting to refloat the vessel.

Plan ahead. When the vessel is ready for refloating, carefully maneuver the stranded vessel off the rocks, taking special care not to damage it further. Under no circumstances should the stranded vessel be jerked off the rocks.

If and when a stranded vessel is re-floated, it should be inspected for any leaks and damage sustained during the re-floating. Repairs should be made if possible before towing to a safe haven.

16.12 RIGHTING CAPSIZED VESSELS

Any capsized vessel that an Auxiliary facility would be expected to assist would be a small boat. Normally capsized vessels should be left to salvors to handle. The Auxiliary crew's first responsibility should be to the safety of the passengers onboard the capsized vessel.

Exercise extreme caution when maneuvering around any capsized vessel as there may be lines and other objects in the water which could damage the Auxiliary facility including fouling of its propellers. This is an even bigger concern when the capsized vessel is a sailboat. Remove the people from the water and assist them in recovering any of their possessions that may be floating in the area.

16.13 SWAMPED BOATS

If a boat is swamped and it can not bail the water with its onboard pumps you may have to pass them a portable pump. Most Auxiliary facilities do not have powered portable pumps onboard. One of the first considerations should be to lighten the load on the swamped vessel by removing most or all of it's passengers. The use of a 5 gallon pail may work a lot faster than a portable hand pump for bailing the water. After most of the water has been removed, the crew may go aboard to finish using small pails, sponges and bailers. In all probability, the vessel will have to be taken in tow to the nearest safe haven.

If the vessel sinks, you should mark it with a float. Mark the wreck with your GPS for a future reference for salvage operations. Take note of any oil or fuel floating on the surface and pass this information to your operational commander (OPCON).

Do not hesitate to call for assistance. A powered pump on scene can remove a lot of water quickly. Remember that the operational unit is a part of your team and you should call on them for assistance when necessary.

16.14 APPROACHING A BURNING VESSEL

Approaching a burning vessel should never be undertaken by an Auxiliarist unless the fire is a small one without danger of explosion, and only when it is to save people who could not be rescued from the water, or prevent the burning craft from drifting into anchored or docked boats nearby.

The average Auxiliary facility is not equipped to cope with fire, which requires specialized fire fighting equipment and training.

When it is absolutely necessary to take an injured or unconscious person from a burning boat, make the approach and departure without a second's loss.

Break out all fire fighting equipment and have it ready for protection of the Auxiliary facility.

The approach to the burning vessel should be from upwind to keep clear of smoke, flames, or sparks. String fenders, extra life jackets, cushions, or whatever padding may be onboard, on a line and hang it over the bow to serve as a bow fender, which will be the contact point with the side of the burning vessel. Do not exert pressure or push the burning vessel, as such may result in bringing the burning vessel around and broadside to the rescue craft. Accomplish the mission with all possible speed and get away fast, leaving upwind of the fire.

POBs on vessels that are burning badly should be instructed to don life jackets and jump overboard, on the windward side, and be taken onboard the rescue vessel from the water. Conditions which would trap the victims against the boat would alter the departure side of the burning vessel.

The Auxiliary facility should protect the area around the burning vessel to keep other vessels safely away. The main objective is to protect the surrounding vessels and people from injury or damage.

16.15 WHEN NOT TO TOW

Towing can be a dangerous undertaking, as well as an expensive one, if not done properly. If you are not equipped to do a proper towing job, stand by the disabled vessel. It may, however, be feasible to put a line across and assist by holding the other craft's bow into the seas, or at a comfortable angle, while waiting for a more suitable towing vessel. If there is the slightest doubt in the Auxiliary coxswain's mind as to whether the tow can be undertaken safely, then the Auxiliary coxswain should NOT tow. Call for additional help if necessary, and if no other resource is available, assist the disabled vessel to anchor until additional help arrives. Remove the people from the disabled vessel if possible. One of the most important measures of your ability in seamanship will be to decide when NOT to attempt an evolution that may be beyond your limits.

Seamanship is an art which requires considerable experience for an individual to become proficient. The implementation of procedures, as presented in this guide requires good judgment by the on-scene Auxiliary coxswain. Particular attention should be paid to the use of TCT principles and the constant application of risk assessment.

CHAPTER 17 TOWING SAFETY PRECAUTIONS

17.1 INTRODUCTION:

This chapter presents the Auxiliarist with an in-depth discussion of safety precautions for towing evolutions. The Rules of the Road are marine safety precautions in a direct and applied context and will also be discussed as they relate to towing operations. An Auxiliary Coxswain's specific responsibilities under the Rules of the Road will be spelled out in detail. Safe operations also require reliable communications, particularly when towing. Recommended communications procedures and methods to employ when engaged in towing are also included in this chapter.

Marine accident investigations and reviews of operational mishaps during SAR cases indicate that many of these problems occur during towing evolutions. These problems have been localized into three basic areas:

a. Most recreational type boats do not have suitable deck fittings to be towed.

b. The boating public in general has both a limited knowledge and practice of good seamanship.

c. Boating personnel have sometimes failed to conform to the practice of good seamanship, through inexperience and/or expediency.

The Coast Guard Auxiliary conducts towing activities as one of its major operational activities in support of the Coast Guard. Therefore, Auxiliarists involved in towing activities must know how to recognize the causes of towing mishaps and be able to plan actions which will avoid these problems before they can occur. The causes of typical towing mishaps will be examined, and appropriate safety recommendations will be developed for each problem area.

17.2 PERSONNEL SAFETY:

In all towing evolutions the primary objective is to insure personal safety. The objective is to save lives and avoid personal injury. Saving property is secondary and should never take the place of assuring the safety of the boating public and that of our boat crews. This is the reason that we have mandatory requirements for Team Coordination Training and for doing a "Risk Assessment" before starting a patrol and before doing a towing evolution. We have to constantly ask ourselves if we are capable of performing the tasked mission. This includes all towing evolutions.

When undertaking a towing evolution there are some basic guidelines to follow:

a. Are there any medical emergencies onboard? These must be addressed before towing.

b. Is everyone on the disabled vessel properly wearing a PFD? Do they have enough PFDs? Do you have to supply any PFDs to the Disabled vessel? (Don't allow the disabled vessel or it's POBs to become further endangered while waiting for them to find and don PFDs.

c Did you update your Risk Assessment? Did you review your GAR score?

d Has the disabled vessel taken on water? Is the disabled vessel stable?

e What is the size of the disabled vessel to be towed? Is your vessel capable of towing it?

f What fittings are available on the disabled vessel for towing? Are they strong enough for towing?

g Can you communicate clearly with the crew of the disabled vessel for them to safely handle the lines on their vessel?

h Is there a reason to place one of your crew onboard the disabled vessel?

i If you have to place a crewmember on the disabled vessel, can you do it safely?

j Do you have to transfer any of the personnel from the disabled vessel to your vessel?

k. Did you establish a clear system of communicating with the disabled vessel? Did you, or can you supply a hand-held radio for their use if the disabled doesn't have a radio?

l. Can you safely "Station Keep" on the disabled vessel while making tow connection?

m. When passing a towline directly or with a heaving line, throw it across the disabled vessel ahead of its personnel.

n. Before starting to tow, clear all personnel from the bow of the disabled vessel.

o. Secure the towline on the towing boat after you adjust the length of the Tow-line.

p. When starting a long tow, if possible start towing in the direction the disabled vessel is facing. After you have the tow underway, make gradual course corrections to the desired heading. Avoid sharp turns. If a sharp turn is required, do it at as low a speed as possible while maintaining control.

q. Set a tow watch on the towing vessel.

r. Do you know where you are taking the tow?

s. Do you know how you will moor the disabled vessel?

t. Does the crew of the disabled vessel understand what you are going to do, transfer to a side tow for mooring?

17.3 MECHANICAL FAILURE OF TOWING RIG AND FITTINGS:

Failure of the towing rig and/or deck fittings on either the towed or towing vessels should be considered. The forces involved in these components have been discussed in chapter 2 and are more thoroughly discussed in chapter 8. The strength of line, weak parts in the towing rig, and displacement versus speed considerations were discussed in chapter 3. These three chapters point out that the towing rig and/or fittings can be overstressed beyond normal limits by such factors as:

a, Excessive acceleration and speed for sea conditions, and/or displacement

b. Use of deck fittings which are not adequately reinforced or fastened to a suitable hull structure

c. Use of weak components such as snap swivels or rings in the towing ensemble

d. Poor seamanship.

Observation of proper safety precautions will help to prevent mechanical failure of the towing rig and/or deck fittings during a towing evolution.

The following safety precautions are recommended as a minimum for towing evolutions to prevent mechanical failures:

17.3.1 Deck Fittings:

a. All deck fittings on the Auxiliary Facility must be adequately installed with through bolts and backing plates.

b. Deck fittings used in towing must be fixed to a suitable hull structure and located sufficiently forward of the transom area to handle the physical forces expected in towing as well as to provide for good vessel control.

c. Assume that all fittings on the towed vessel to which the towline may be fixed can fail if they are exposed to the strain expected at the towing facility's fittings. If in doubt use the base of the mast on sailboats or a skiff hook on the towing eye on trailerable powerboats. If possible on larger powerboats use a bridle between two of the front cleats.

d. Keep the towline attachment point as low as possible to the deck or t he waterline.

17.3.2 Towing Rig

a. Use a towline type with adequate working strength for expected conditions.

b. Periodically inspect your towline and bridles to insure they are in good condition. Do NOT use a towed vessel's line unless there is no other alternative and it is in good condition and of the proper size. If not, advise the Coast Guard Operational Commander (OPCON).

c. Make sure all metal fittings or parts such as cleats, shackles, rings, etc. are rated at to handle the force that will be applied while doing the towing evolution. These fittings should at least match the tensile strength of the towline.

d. If at all possible, avoid the use of hardware in the towing rig. Use splices, rope to rope connections to make bridles and other line connections.

e. Do not use knots to join towlines unless you significantly reduce, by at least ½, the expected strain on the towing rig. If excessive strain is put on a knotted tow-line, it may be overstressed without parting but then fail during a future evolution.

f. Do not tow an excessive load. If there is doubt, standby and request additional assistance from the Coast Guard.

g. Avoid excessive acceleration, speed, and sharp turns in picking up and maneuvering with a tow.

h. Use chaffing gear wherever appropriate.

i. Keep the towline free of the towing facility's propellers. This is a prime responsibility of the line handlers. It is important that all lines be controlled and brought in quickly to prevent fouling the propeller. The line handlers should be informing the coxswain on the status of any lines, especially those in the water.

17.4 CAPSIZING AND OTHER CATASTROPHIC FAILURES:

Capsizing or excessive yawing and/or pitching of the towed vessel may cause serious injury and/or death, as well as equipment damage and vessel loss. Such mishaps are caused by excessive towing speeds for the conditions and can be avoided by following these basic recommended safety precautions:

a. Before undertaking a tow the coxswain and crew should conduct a "Risk Assessment" to insure that they are capable of conducting the tow. Use of the "GAR" model in making this risk assessment is highly recommended. It is also recommended that the GAR score for the towing evolution be passed back to the Operational Command (OPCON).

b. Avoid excessive towing speeds.

c. Position the tow at a secondary wave, or even a further back wave in the towing vessel's wake.

d. Use a drogue off the stern of the towed vessel if required to help keep the towed vessel in line.

e. Set the rudder of the towed vessel amidships, and secure it in that position. Make no attempt to steer the towed vessel except in an emergency, or when directed by the coxswain of the towing vessel.

f. In rough weather, quarter into the waves rather than meeting them head on. This will also help to reduce pounding and stress on the towing rig, fittings, and on each vessel.

g. Keep the towed vessel trimmed aft, or down somewhat at the stern.

h. For towing small vessels, personnel remaining aboard the towed vessel must situate themselves as low and as far aft as is safely possible in the boat in order to lower the center of gravity, which will increase the stability of the towed vessel.

i. If the coxswain on the towing boat is apprehensive in rough weather about the adequacy of the Auxiliary facility to handle a tow in a given situation,

then do NOT undertake the tow. Stand by the disabled vessel, and advise the Coast Guard Operational Commander (OPCON) of the situation.

CHAPTER 18 RULES OF THE ROAD FOR TOWING OPERATIONS

18.1 GENERAL:

Auxiliary vessels under order engaged in towing operations enjoy no special privileges or freedom from the "Rules of the Road." Auxiliary coxswains are obligated to follow these Rules of t he Road. All Auxiliary coxswains are required to know these Rules of the Road and to stay current by passing examinations on these Rules. Auxiliary crew members are also encouraged to know these Rules of the Road even though passing the Rules of the Road is not a requirement.

18.2 STEERING AND SAILING RULES

Auxiliary facilities engaged in towing operations enjoy no special exceptions from the steering and sailing rules covered in Rule 18 of COMDTINST M16672.2(series). If the towing vessel is "Restricted in Ability to Maneuver" due to the tow, all vessels underway shall keep out of the way. See pages 34 and 35 of the Rules of the Road.

18.3 LIGHTS AND SHAPES:

If practical Auxiliary vessels may be equipped with towing lights and shapes however, they are exempted from this requirement in Rule 24 of COMDTINST M16672.2(series). Please refer to pages 70 and 71 of the Rules of the Road. The Rules state that vessels engaged in towing that are not normally used in towing are exempt from displaying towing lights or shapes when engaged in towing a vessel in distress or otherwise in need of assistance. However, the towing vessel shall take all possible measures to indicate the nature of the relationship between the towing vessel and the vessel being assisted.

Rule 36 covers Sound and Light Signals to attract attention. If necessary to attract the attention of another vessel, any vessel may make light or sound signals that can not be mistaken for any signal authorized elsewhere in the Rules of the Road, or may direct the beam of her searchlight in the direction of the danger, in such a way as not to embarrass any vessel.

During periods of dark and reduced visibility, Auxiliary facilities exercise extreme caution if undertaking a towing operation. A thorough Risk Assessment must be completed before undertaking a tow in such conditions.

18.4 SOUND SIGNALS:

Rule 35 of the Rules of the Road require special sound signals for vessels towing in restricted visibility. Vessels towing in these conditions are to sound one prolonged blast followed by short blasts at least once every two minutes. The vessel under tow, or the last vessel in a tow must sound one prolonged blast followed by three short blasts immediately after the towing vessel's signal.

The coxswain should be ready to use the DANGER signal when other vessels are maneuvering near the tow or in such a manner as to endanger the tow.

All Auxiliary boat crew members are encouraged to thoroughly understand all the Rules of the Road as they pertain to towing. It is also highly recommended that as far as practical, each coxswain should maneuver as if other vessels do not know or understand the Rules of the Road.

18.5 COMMUNICATIONS FOR TOWING EVOLUTIONS:

Auxiliary personnel must maintain adequate communications with the towed vessel and it's Operational Command (OPCON).

Radio communications (VHF-FM) are the preferred method of communicating between the towing and towed vessels during the tow. The Auxiliary facility if equipped may want to consider passing a hand-held VHF-FM radio to the disabled vessel for communicating with the towing vessel. Lacking this ability, a set of hand signals should be established between the vessels. Coxswains may want to consider printing and plastic coating a set of hand signals that can be passed to a disabled vessel.

At all times during a towing evolution, a crewmember on the towing vessel must keep a constant eye on the towed vessel for dangers or attempts by the vessel under tow to communicate. This tow watch should keep the coxswain updated at all times on the status of the tow as well as any communications with the vessel being towed.

The controlling Coast Guard Station should be informed at every step of the evolution; that is, on-scene situation when discovered, when the decision is made to tow, when the tow starts, every fifteen minutes during the tow, when the tow is transferred from a long tow to an alongside tow, and when the tow is secured. Also, if anything out of the ordinary happens (damage, injury, etc.) during the evolution, the OPCON should be immediately informed.

CHAPTER 19 RADIO COMMUNICATION

19.1 GENERAL

Radio communication is an essential part of all Coast Guard Operations. It is important enough that Coast Guard policy states that any Surface craft underway on orders must be in radio communications with a land based station. There are several reasons for this:

a. Safety: The safety of our boat crews is extremely important. The radio provides a communications link for our facilities to get help in an emergency.

b. Coordination: At times it is necessary for facilities to coordinate their activities with other Auxiliary or Coast Guard facilities. The radio is what connects you to everyone else in "Team Coast Guard".

c. Tasking: It is important for the "Order Issuing Authority" (OIA) to contact the underway facility to assign or change a mission.

d. Distress Calls: It is important for our facilities to monitor/guard the Distress and Calling channels for any distress traffic.

e. Direction: At times it is important for our crews to be able to get direction in how to handle a situation, (medical emergencies, etc.).

19.2 VHF-FM SYSTEM:

The VHF-FM radio system is the back-bone of the Coast Guard's small boat radio communications system. These radios are limited to 25 watts of output power and have a limited range primarily controlled by the antenna line of sight. All VHF-FM Marine radios have a dual power output, one at one watt for short range communications and the 25 watt setting. All communications should be first attempted on the low power setting so as to minimize interfering with other stations' traffic.

All VHF-FM radios used by the Auxiliary should be equipped to work on channels 16 and 9 as well as all Coast Guard's working channels (21, 22, 23, 81 and 83). Coast Guard stations normally monitor channel 16 plus their assigned working channel. Owners of Auxiliary facilities should find out what these channels are and how the stations want you to use these channels.

Today's modern VHF-FM radios are equipped with Digital Selective Calling and can be paired with a GPS unit to give a display of latitude and longitude as well as

speed and heading. In the event of an emergency on the facility, a switch can be operated on the radio that broadcasts a distress signal along with the unit's latitude and longitude.

19.3 OTHER RADIO SYSTEMS

In areas where there is no VHF-FM radio system, Auxiliary facilities may use other radio systems such as Citizen Band (CB). The Coast Guard's requirement is that all Auxiliary facilities on patrol must have constant reliable radio communications with a shore station to operate on an ordered patrol. The term "Reliable" means that the shore station has a radio guard all the while the facility is underway.

19.4 CG RADIO PROCEDURE

All facilities while operating under orders must maintain radio communications with their controlling shore station. This means that both the facility and shore station must be guarding their assigned channels at all times.

The Auxiliary Operations Policy Manual, COMDTINST M16798.3 (series) states that an Auxiliary Surface Facility must contact their controlling shore unit at least once an hour and provide them with their status and position. This is normally called an OPS and POSITION report. The reason for this is for safety. If something were to happen to the facility and they missed their OPS and POSITION report, the controlling unit would know where to start searching to find them. Most CG stations require all vessels operating under their control to make these reports every half hour and when there is a major change to their heading and position. When towing and in inclement weather these reports should be made every 15 minutes or less if so directed by the controlling shore unit.

19.5 HOW TO SPEAK ON A RADIO

It is important to remember a couple of simple basic rules when using a radio:

a. Stop and think what you want to say before starting to transmit. At times it helps to have the information you are going to broadcast written down.

b. Stop and listen and make sure there isn't another conversation going on that you would interrupt.

c. After keying the microphone, pause for a second before starting to speak. Some people have the bad habit of starting to talk before keying the microphone.

d. Hold the microphone a couple of inches from your mouth when speaking.

e. Speak slowly and if possible with a low voice. People with a deep voice are much easier to understand on the radio.

f. Say the name of the station you are calling first. For example, “Coast Guard Sector Buffalo this is Auxiliary 241204, over.” Wait several seconds to give the receiving station time to answer. Note: only say the name of the station you are calling once; if there is a lot of radio traffic and your call is not answered in a reasonable time you may want to say the name of the called station two or three times. There is no need to say the name of the called station three times on every call!

g. Use PROWORDS as much as possible. It helps for the receiving station to understand you and it minimizes the amount of time that the radio channel is tied up.

h. ALWAYS yield the radio channel to priority traffic, (MAYDAY or distress). If there is a distress call in progress the controlling Coast Guard station will say “MAYDAY SEE LONS”. This means there is a mayday in progress on that channel and all other non-emergency traffic must stay off the radio and not interfere with the distress traffic. At the end of the emergency the controlling station will broadcast a message “ MAYDAY FEE NEE” meaning that the mayday situation is over and the radio is free for other use.

19.6 PROWORDS AND ABREVIATIONS

The following is a list of commonly used PROWARDS and abbreviations that should be used on the radio:

AFFIRMATIVE: means yes.

ALL AFTER: The portion of the message to which I make reference is all which follows.

ALL BEFORE: The portion of the message to which I make reference is all which comes before.

BREAK: I hereby indicate the separation of text from other portions of the message. It is **not** to be used to interrupt another conversation.

CORRECT: You are correct, or what you have transmitted is correct.

CORRECTION: An error has been made in this transmission. Transmission will continue last word correctly sent. The correct version is .....

ETA: Estimated time of arrival.

ETD: Estimated time of departure.

ETR: Estimated time of return or repair.

FIGURES: Indicates numbers or numerals to follow. Used when numbers occur in the text.

`FROM: The originator of this message.

I SPELL: I shall spell the next word phonetically.

NEGATIVE: No.

OPS NORMAL: Used to say the patrol is normal in all respects, “Operations normal.”

OUT: Used following the last line of the message transmitted, signifying the end of the transmission and nothing follows. No reply is required or expected.

OVER: Used following a transmission when a response from the other station is necessary. It is an invitation to the other station to transmit.

ROGER: I have received your transmission satisfactorily.

SAY AGAIN: I am repeating transmission or the portion indicated, or you should repeat your transmission or the portion indicated.

SILENCE: Spoken 3 times and pronounced “SEE LONS”. Cease all transmissions immediately. Silence will be maintained until lifted. Used to clear routine transmissions from a channel only when an emergency is in progress.

SILENCE FINI: (Pronounced “SEE LONS FEE NEE”. Silence is lifted. Indicates the end of an emergency and resumption of normal traffic.

THIS IS: This transmission is used from the station whose designator immediately follows. (Identifies the calling station.)

TO: The addressees immediately following are for addressed action.

UNKNOWN STATION: The identity of t he station which is being called is unknown.

WAIT: I must pause for a few seconds.

WAIT OUT: I must pause more than a few seconds.

WILCO: I will comply with your last order or request.

WORD AFTER: The word to which I have referenced is that which follows.

WORD BEFORE: The word to which I make reference is that which precedes.

WRONG: Your last transmission was not correct. The correct version is .....

19.7 PHONETIC ALPHABET:

The phonetic alphabet is used so as to make it easier to understand letters and numbers when given on the radio. They are as follows:

LETTER	PHONETIC ALPHABET	PRONOUNCED
A	ALPHA	AL-PHA
B	BRAVO	BRAH-VOH
C	CHARLIE	CHAR-LEE
D	DELTA	DEL-TAH
E	ECHO	ECK-O
F	FOXTROT	FOKS-TROT
G	GOLF	GOLF
H	HOTEL	HOH-TEL
I	INDIA	IN-DE-AH
J	JULIETT	JEW-LEE-ETT
K	KILO	KEY-LOH
L	LIMA	LEE-MAH
M	MIKE	MIKE
N	NOVEMBER	NO VEM-BER
O	OSCAR	OSS-CAR
P	PAPA	PAH-PAH
Q	QUEBEC	KAY-BECK
R	ROMEO	ROW-ME-OH
S	SIERRA	SEE-ASIR-RAH
T	TANGO	TANG-GO
U	UNIFORM	YOU-NEE-FORM
V	VICTOR	VIK-TAH
W	WHISKEY	WISS-KEY
X	XRAY	ECKS-RAY
Y	YANKEE	YANG-KEY
Z	ZULU	ZOO-LOO

NUMBER	SPOKEN
0 `	ZE-RO
1	WUN
2	TOO
3	THUH-REE
4	FO-WER
5	FI-YIV
6	SIX
7	SEVEN
8	ATE
9	NIN-ER
Decimal	DAY-SEE-MAL

19.8 EMERGENCY COMMUNICATIONS:

When an emergency occurs, use the proper pro-words to show the degree of urgency. Hearing one of these urgency calls should trigger specific responses in a listener, such as, preparing to collect information on an emergency or refraining from transmitting on the frequency until all is clear. The meaning of each urgency call is:

MAYDAY: A MAYDAY is a distress call of the highest priority. Spoken three times, it shows that a person, boat, or aircraft is threatened by grave or imminent danger and requires immediate assistance. /This is broadcast on channel 16. A MAYDAY call has absolute priority over all other transmissions and shall not be addressed to a particular station.

PAN-PAN: Broadcast on channel 16. This urgency signal consists of three repetitions of the group word ”PAN-PAN”. It means that the calling station has a very urgent message to transmit concerning the safety of a ship, aircraft, vehicle, or person.

SECURITE: Pronounced “SEE-CURE-IT-TAY” and is repeated three times on channel 16. It indicates a message on the safety of navigation, or an important weather warning.

19.9 RECEIPT OF DISTRESS MESSAGES:

When a distressed unit is in your vicinity, acknowledge receipt of the message immediately. However, if the unit is determined to be some distance from you, pause a few moments to allow ships or stations nearer the scene to answer. In the areas where communications with one or more shore stations are practicable, ships should wait a short period of time to allow them to acknowledge receipt of the call.

The receipt of distress messages should be acknowledged in the following manner:

The distress signal MAYDAY

The call sign of the unit in distress (spoken three (3) times).

The words “THIS IS (spoken once)

The call sign of your unit (spoken three (3) times).

The words “ RECEIVED MAYDAY”.

Use SAR Incident check-off sheet

Request essential information needed to effect assistance, (position, number of POBs, nature of distress, and vessel’s description). Obtain less important information in later transmissions.

The pro-word “OVER”.

Inform the distress unit of CG assistance being dispatched and to stand-by.

Vessels should forward the information to the Operations Center (OPCEN).

Set a continuous radio watch on frequencies of the distressed unit.

Maintain communications with the distressed unit.

Maintain a log of all the distress traffic.

Keep the OPCEN informed of new developments in the case.

Inform the distressed unit of response action.

Provide the distressed unit with an ETA for help.

Keep the distressed unit informed of the speed of advance of help.

19.10 RADIO ALARM SIGNAL:

The radio alarm signal consists of two audible tones of different pitch sent alternately, producing a warbling sound. If used, the alarm continuously sends the signal for not less than 30 seconds or more than one minute, and the recipient of the signal should follow the signal by the radio distress signal and message. There are two primary reasons to use a radio alarm signal:

To attract attention of listeners on the frequency.

To actuate the automatic listening devices found on large ships and at Coast Guard at shore stations.

CHAPTER 20 NAVIGATION

20.1 GENERAL:

This chapter assumes that you know the basics of small boat navigation. Reference should be made to the SABOT Job Aid, Section "E". It is important that your facility be equipped with a GPS system or a GPS with a Chart Plotter in order to navigate your facility to the degree of accuracy required. It is the intent that all SABOT trained members be able to plot an accurate course on a chart, enter the destination and route into the GPS and get underway in under 30 minutes. When underway the coxswain should be able to make all turns within +/- 50 yards and arrive at the destination within 100 yards and within +/- 5 minutes of the estimated time of arrival (ETA).

20.2 TEAMWORK:

Boat crews should work as a team to plot the location and route to a destination on a chart and enter this information into the GPS or GPS/Chart Plotter. The entire boat crew should be familiar with the workings of the GPS unit and be able to assist the coxswain in entering the required data.

When responding to a SAR case time is important but safety is even more important. The boat crew must work together to efficiently get underway while maintaining vigilance of everything going on around them as well as watching out for each other. This is not the time for "Short cuts" that sacrifices safety to save time. Be sure to obey all of the "Rules of the Road" and be sure not to endanger other vessels.

While underway, one of the crew should be checking the actual progress against the plotted course.

20.3 SAROP PRINTOUTS:

The coxswain and crew must be able to read a SAROP printout and get their required data from this document. Work with local Coast Guard stations or Sector SAR controllers to get SAROP printouts for exercises and drills. If you choose to make your own exercise, it should be printed in the same format as the SAROP printout so that all members of the boat crew are familiar with reading this document.

The following is a sample of a SAROPS print-out. You can modify this with your own data to use as an exercise:

SABOT-PILOTING-DRILL

TRACK LINE SEARCH

NAME	:	SABOT PILOTING DRILL
PASSES	:	1
TRACK SPACING	:	0.10 NM
FIRST TURN	:	RIGHT
CSP	:	41-25.837N 071-04.900W
MAG VARIATION	:	15W
MAGVAR CALCED	:	YES

WAYPOINTS
1: 41-25.837N 071-02.250W
2: 41-20.850N 071-02.000W
3: 41-16.350N 071-04.900W

+---------------------------+
| ACTUAL SEARCH |
+---------------------------+

PERCENT COMPLETED	:	100.00 %
TRACK LENGTH	:	9.99 NM
ESP	:	41-16.350n 071-04.900W
AREA SEARCHED	:	1.01 SQNM
POS	:	

+---+
| CALCULATE PERCENT COMPLETED |
+---+

TOTAL NUMBER OF LEGS	:	2
NUMBER OF LEGS COMPLETED	:	2.00
PERCENT COMPLETED	:	100.00%

SRU

SRU ID (TAIL/HULL)	:	AUX FAC
COMMAND	:	CGD9
SRU TYPE	:	SMALL BOAT (< 65 FT)

+--------------------+
| PRE-SEARCH |
+--------------------+

CST	:	
ON SCENE ENDURANCE	:	
EST	:	
SEARCHY SPEED	:	
SENSOR	:	

+----------------------------------+
| SEARCH OBJECTS |
+---------------------------+

NAME	SWEEP WIDTH

SABOT-PILOTING-DRILL

+----------------------+
| POST SEARCH |
+----------------------+
ACTUAL CST :
ACTUAL EST :
TIME SEARCHED :
AVERAGE SPEED :

SORTIE SUMMARY

+----------------------------------+
| STARTING TRANSIT LEG |
+----------------------------------+
START POSITION :
START TRANSIT SPEED :
START TRANSIT DISTANCE :
START TRANSIT TIME :
START TIME :
+-----------------+
| ON SCENE |
+--------------+
CSP : 41-25.837N 071-02.250W
CST :
TRACK LENGTH : 9.99 NM
ON SCENE TIME :
ESP : 41-16.350N 071-04.900W
EST :
+---------------------------------+
| ENDING TRANSIT LEG |
+---------------------------------+
END PSITION :
END TRANSIT SPEED :
END TRANSIT DISTANCE :
END TRANSIT TIME :
END TIME :
+--------------+
| TOTALS |
+--------------+
TOTAL DISTANCE : 9.99 NM
TOTAL TIME :

EVALUATE

SAROPS RUN STATUS : NO SAROPS RUN ASSIGNED
DETAILS : NO SAROPS RUN ASSIGNED

+----------------------------+
| SEARCH OBJECTS |
+----------------------------+

TYPE	CONDITIONAL POS	INITIAL PROBABILITY	JOINT POS

TOTAL POS : 0.00%
REVIEWED :
COMMENTS :

SORTIE DETAILS

LEG	POSITION	COURSE T	MAGCSE M	LEG DIST NM	TOTAL DIST NM	LEG TIME	TOTAL TIME
1	41-25.837N 071-02.250W	178	193	4.99	4.99	----------	
2	41.20.850N 071-02.000W	206	221	5.00	9.99	----------	
3	41-16.350N 071-04.900W	----------	----------	----------	9.99	----------	

20.4 EXERCISES:

Piloting drills should be run regularly. It is only by practice that boat crews become proficient at piloting. Practice entering a destination into your GPS, calculate your ETA and then use the "GO TO" function on the GPS to set a course following it (avoiding hazards and obstructions). Check how close you come to your ETA. See the SABOT JOB AID, Section E for step by step procedures.

After mastering the ability to enter a destination and follow your GPS to the destination, practice entering a route that involves entering multiple waypoints and following the route to the destination.

Now take the sample copy of the SAROPS print-out and change the data on it to conform to your exercise. The SAROPS print-out shown in paragraph 19.3 uses a track-line no return (TLN) to get to a destination. Once at the destination another search pattern could be run if indicated.

This type of drill can and should be run while on a patrol without a specific mission. It is this type of drill that will make a boat crew proficient at navigation.

20.5 "6-2-1" RULE:

To compute distance on a chart and convert from seconds to tenths of a Nautical mile and distance in yards and feet use the following table:

SEC.	YARDS	FEET	N.M.
6	200	600	.1
12	400	1200	.2
18	600	1800	.3
24	800	2400	.4
30	1000	3000	.5
36	1200	3600	.6
42	1400	4200	.7
48	1600	4800	.8
54	1800	5400	.9
60	2000	6000	1.0

Note: One second on a chart is equal to 33 yards or 100 feet.

CHAPTER 21 SEARCH AND RESCUE

21.1 GENERAL:

The Coast Guard is responsible for maritime Search and Rescue which includes:

* interior river systems,
* inland waterways,
* coastal waters and
* parts of the high seas.

U.S. law states that the Coast Guard shall develop, establish, maintain, and operate search and rescue facilities and may render aid to distressed persons and protect and save property. It also states that the Coast Guard may utilize its resources to assist other federal and state entities.

21.2 OBJECTIVES:

Two SAR program objectives are of direct importance to boat crews:

* To minimize the loss of life, personal injury, and property loss and damage in the maritime environment.
* To minimize search duration and crew risk during SAR missions.

The majority of SAR cases occur within 20 miles of shore.

21.3 SAR MISSION COORDINATOR (SMC):

The Coast Guard is designated the SAR coordinator (SC) for the maritime area. Each SAR operation is carried out under the guidance of a SAR Mission Coordinator (SMC). The SMC is usually the district RCC or the Sector Operations Center (OPCEN). The SMC has several duties and responsibilities:

21.4 ON SCENE COMMANDER (OSC):

The On Scene Commander (OSC) is designated by the SMC to coordinate the activities of all units when two or more “Search Rescue Units” (SRUs) are on scene for the same incident. The first unit on scene usually assumes OSC until the SMC directs that the person be relieved. The OSC should be the most capable unit, considering SAR training, communications capabilities, and the length of time that the unit can stay on scene.

As the OSC has several responsibilities as a subordinate of the SMC:

* Inform the SMC through periodic situation reports (SITREPs).

* Coordinate the efforts of all SRUs on scene

* Implement the search action plan from the SMC

* Control all on-scene communications between the SRUs

* Monitor the endurance of all SRUs and call for replacement units as needed

* Provide initial briefings and search instructions to arriving SRUs

21.5 SEARCH AND RESCUE UNIT (SRU):

An SRU is a unit with trained personnel and provided with equipment for SAR operations. The SRU responsibilities include:

* Efficiently execute assigned SAR duties.

* Establish and maintain communications with the OSC or SMC, as appropriate, prior to arriving on scene and until released from the case.

Unless you are designated OSC, or are the single SRU on scene, you will report to the OSC. If you are designated OSC or are the single SRU on scene, assume the duties of OSC and report to the SMC.

Communications and information flow is critical to good SAR planning and conducting of SAR operations. SRUs must continually keep the OSC or if an OSC is not assigned, the SMC informed of any changes on scene so that proper, timely, and accurate changes can be made to the search plan.

21.6 SAR EMERGENCY PHASES:

Three emergency phases have been established for classifying incidents and to help in determining the actions to take: These are:

* Uncertainty
* Alert
* Distress

An Uncertainty phase exists when there is knowledge of a situation that may need to be monitored, or have more information gathered, but does not require dispatching resources. The key to this phase is that "Doubt" exists.

An alert phase is assigned when an aircraft, ship, or other craft or person on board are having difficulty and may need assistance, but are not in immediate danger. The key to this phase is that "Apprehension" exists. An extended communications search (EXCOM) is normally conducted during the alert phase.

The distress phase exists when there is reasonable certainty that an aircraft, ship, or other craft or persons on board are in danger and requires immediate assistance. The key to this phase is "Danger".

21.7 FLARE INCIDENTS:

The Coast Guard responds to many flare sightings. Red and orange flares are recognized around the world as marine and aviation emergency signals and must be treated as distress. It is critical that correct, descriptive, and accurate information be obtained from persons sighting a flare. Flares of other colors should also be investigated to insure the safety of the unit operating the flare.

21.8 MARITIME SAR ASSISTANCE POLICY:

The Coast Guard's primary concern to any SAR operation is that proper, timely, and effective assistance be provided. A key issue is that it is always a Coast Guard priority to remove people from danger.

Immediate response will be initiated for any situation when a mariner is known to be in imminent danger. This response may be provided by active duty or Auxiliary resources, or resources belonging to other federal, private, state, local or commercial entities; volunteers or good samaritans. The SMC may use all sources of assistance in a distress situation without concern for conflict with private enterprise. Private organizations (non-commercial), state and local organizations, and Good Samaritans are acceptable sources of SAR assistance.

For non-distress cases when specifically requested assistance, such as a commercial firm, marina, or friend is not available, a marine assistance (MARB) may be broadcast. If a commercial provider is available and can be on scene within a reasonable time (usually 1 hour or less) or an offer to assist is made by any of the resources listed above, no further action by the Coast Guard, beyond monitoring the incident, will be taken. If a commercial provider and the boater in need of assistance do not reach agreement, the Coast Guard must continue to monitor the case.

Coast Guard resources normally do not provide immediate assistance in non-distress cases where there is alternative assistance available. A Coast Guard resource may assist in a non-distress situation when no higher priority missions exist and no other capable resource is available.

For a non-distress situation where an Auxiliary facility discovers a vessel requesting assistance but which has not contacted the Coast Guard, refer to the National SAR manual and the Auxiliary Operations Policy manual for guidance. (See COMDTINST M16798.3E (4.E.9.a) and COMDTINST M16130.2E (4.1.6.4).

21.9 GENERAL SALVAGE POLICY (Other than towing):

Coast Guard units and resources are employed for SAR, not for salvage operations. During a SAR operation, boat crew and SAR planners should be alert to see if the situation is changing:

* Has the incident changed from a distress (e.g., people are rescued) to an effort that is now more of a salvage operation?

* Will salvage by the Coast Guard reduce the threat of loss of life or the vessel becoming a hazard to navigation? What can be done to prevent a worsening condition or total loss of the vessel?

* Is there a threat of injury to boat crew members or damage to the boat that would prevent the SRU from responding to another distress?

When commercial salvagers are on scene performing salvage, Coast Guard units may assist them if the salver requests, and the assistance is within the unit's capabilities. However, salvage operations shall be performed only at the discretion of the unit CO/OIC.

This policy applies to small craft which need salvage other than towing. However, when no commercial salvage companies are available within a reasonable time or distance, the district commander may modify the policy to provide for refloating a grounded boat which is not in peril of further damage or loss if:

* The Coast Guard units are capable of rendering the assistance;
* the owner requests the assistance and agrees to the specific effort to be made; and
* Coast Guard units and personnel are not unduly hazarded by the operation.

21.10 SEARCH FOR BODIES:

Coast Guard regulations state that, when it has become definitely established, either by time or circumstances, that persons are dead, the Coast Guard is not required to conduct searches for bodies. If, however, requests are received from responsible agencies, such as local police, military commands, etc., Coast Guard units may participate in body searches provided that these searches do not interfere with the primary duties of the units. Since boats are not provided the specific gear or training to conduct searches for bodies, their involvement is usually either as a surface search unit or support platform for other agencies to use their equipment. Auxiliarists are cautioned against recovering, touching, or handling of bodies.

21.11 INITIAL SAR INFORMATION:

Initial notification that an emergency exists may come from many sources. When recording emergency information calm the reporting party if they seem excited:

1. Calm the individual enough to collect enough accurate, essential information.
2. Be courteous and show concern.
3. Be confident and professional, but not overbearing.
4. Speaking calmly will help ease people's concerns and assure them that the situation is well in hand.
5. Be prepared to write down information (have a check list and pen within reach).

Always get the name and contact information of the reporting party. The most vital information required is:

1. Location
2. Description of the craft
3. Number of persons on board
4. Nature of distress
5. Name, radio call sign of distressed craft

The identity of the distressed vessel should be established:

* Vessel name
* Vessel Numbers
* Vessel type
* Vessel call sign
* Name of person calling
* Number of persons on board
* Condition of POB's

The type of emergency must be clearly and completely understood. Determine the exact nature of the distress: Aground, sinking, collision, fire, disabled, overdue, or medical.

The location of the emergency must be clearly established in the most detailed terms possible. This should include any or all of the following:

* Position (latitude and longitude)
* Bearing and distance from the incident to any points of land, landmarks, or aids to navigation that are known.
* Last known position of the incident or distressed vessel
* Vessel's last known course and speed
* Date and time of last know position
* Length of the time that the vessel has been drifting/disabled/aground.

It is important to always have all people on board the distressed vessel don their PFDs as soon as possible.

In addition to the above other data may be important:

* Medical data
* On-scene weather
* Overdue data

For overdue vessels the following data should be collected:

* Period of time the vessel has been overdue
* Vessel's departure point and destination
* Places the vessel planned to stop en-route
* Navigation equipment onboard
* Number of POBs, their names, age, sex, and general health
* Personal habits of POB (e.g., dependability, reliability, etc.)
* License plate number and description of vehicle, trailer, etc.
* Communications equipment onboard
* Additional points of contact
* Pending commitments (work, appointments, etc.)

21.12 DATUM FOR SEARCH PLANNING:

The term "Datum" refers to the most probable location of the distressed vessel, corrected for drift over a given period of time. Depending on the information available and its accuracy, datum may be:

* A point
* A line
* An area

A datum point is the center of the area where it is estimated that the search object is most likely located. The datum line is the intended trackline or line of bearing plotted on a chart. The datum area is developed when you cannot determine either the exact position of the distress or a datum line. The datum area is developed based on many factors, but including as a minimum:

* Fuel endurance of the distressed vessel
* Vessel's maximum cruising range
* Wind and currents which affect the search object.
* Operator's intent

21.13 SEARCH AREA DESCRIPTION:

When response times are short, the SMC may use a standard radius, adjusted for physical surrounding. Where a search can begin in less than six hours, a six mile radius around a datum adjusted for drift is usually large enough to include most search objects.

Search areas may be described by many methods including the following:

CORNER POINT: in this method the latitude and longitude (or geographic features) of each corner of the search area are given.

TRACKLINE: The latitude and longitude of the departure point, turn points, and destination point are given with a specific width along the track.

CENTER POINT (CIRCLE): The latitude and longitude of datum are given along with a radius around datum.

CENTER POINT (RECTANGLE): The latitude and longitude of datum are given with the direction of major (longer) axis plus the length and width of the area.

CENTER POINT – LANDMARK (RECTANGLE, BEARING AND DISTANCE): The center point or datum, may also be designated by a bearing and distance from some geographic landmark.

LANDMARK BOUNDARIES: Two or more landmarks are given as boundaries of the search area along a shoreline.

21.14 SEARCH PATTERNS:

Refer to the SABOT JOB AID, Section G for step by step procedures.

Once a search area has been determined, a systematic search for the object must be planned. The following should be considered when determining the search pattern to use:

* Weather conditions
* Size of the search area
* Size of the search object
* Number of search units involved
* Search area location
* Time limitations

Search patterns are designated by letters. The first letter indicates the general pattern group:

T = Trackline
C = Creeping Line
P = Parallel
V = Sector
S = Square, Expanding
X = Barrier

The second letter indicates the number of search units:

S = Single unit
M = Multiunit

The third letter indicates specialized SRU patterns or instructions, for example on a trackline pattern:

R = Return
N = Non-return

SQUARE PATTERN: The square search pattern is used when the last known position of a search object has a high degree of accuracy, the search area is small, and a concentrated search is desirable. In the SS pattern for boats, the first leg is normally in the direction of the search object's drift and all turns are made 90 degrees to starboard. Every other search leg has one track space added to it. The SM pattern is used when two units are available. The second unit begins on a course 45 degrees to the right of the first unit.

SECTOR PATTERN: Sector search patterns are used when datum is established with a high degree of confidence but the search object is difficult to detect, such as a person in the water. The search unit passes through datum several times, each time increasing the chances of finding the search object. The pattern resembles a wheel with the center of the wheel at datum. Datum should always be marked by the first SRU on scene with a Data Marker Buoy (DMB) or other floating object. By marking the center of the search pattern, the coxswain has a navigation check each time the boat passes near the center of the search area. This pattern consists of nine legs. There are two types of sector search patterns:

* (VS): The VS pattern is used by a single boat. The first leg begins in the same direction that the search object is drifting. All legs and cross legs of this pattern are the same length. All turns are to120 degrees to the starboard. The third leg returns to datum and the fourth leg continues on the same heading for one additional track space. The same is true for the sixth and seventh legs. The ninth (last) leg simply returns to datum.

* (VM): The VM search pattern is used when a second SRU is available. The second SRU starts at the same datum, but begins the first leg 90 degrees to the left of the first SRU and doesn't start until the first unit reaches its first turn point. The search is then the same as for the first unit. Both SRUs run at the same speed.

Course and leg identifiers should be carried in each SRU to calculate courses and times for each expanding square and sector search pattern. The course and leg identifiers can easily be obtained through the federal stock system, Stock Number 7530-01-GF2-9010.

PARALLEL PATTERNS: Parallel track patterns are used when there is an equal probability that the search object could be anywhere in the search area. It is a good pattern to use when the approximate location of the search object is known and uniform coverage is desired. You steer straight courses on all legs. Each leg is one track space from the other. The legs are parallel to the long side (major axis) of the search area. All turns are 90 degrees. The commence search point (CSP) is ½ track space inside a corner of the search area. All turn points are ½ track space from the edge of the search area. This means that the first and last legs are ½ track spacing inside the search area boundary. There are two types of parallel track patterns:

* (PS): The PS is run by a single SRU. The first leg of the search is run parallel to the long side of the search area as would every other odd numbered leg. Each of the odd numbered legs would be run on a course 180 degrees opposite. The even number legs require a 90 degree turn and are always run in the same direction.

* (PM): The PM is run when there are multiple SRUs available. Each SRU is separated by one track space and run its major axis at the same time and speed. The turns are also made at the same time and each SRU moves one track space distance for every SRU running the pattern. That is; if there are three SRUs, they all turn 90 degrees at the same time and move three track spaces distance before starting their next reciprocal leg.

CREEPING LINE PATTERNS: The creeping line search pattern is used when the probable location of the search object has been determined to be more likely at one end of the search area than at the other. Creeping line search patterns are run similar to the parallel patterns except that the legs are run parallel to the minor axis of the search area. There are two types of creeping line search patterns:

* (CS): The CS pattern is used when only a single SRU is available. The commence search point (CSP) is also ½ track space in from the edge of the major and minor axis and each leg is run parallel to the minor axis.

* (CM): The CM pattern is used when there are multiple SRUs running the search. Again, each SRU is one track space apart and when moving along the major axis each SRU travels one track space for every SRU running the pattern. That is; if there are two SRUs each SRU would move two track spaces before running the reciprocal course.

TRACKLINE SINGLE UNIT NON-RETURN PATTERN (TSN): This pattern is used when only the intended course is known and you will probably run a different search pattern at the destination. The TSN is run over the intended course of the search object.

TRACKLINE SINGLE UNIT RETURN PATTERN (TSR): The TSR is run when only the intended course of the search object is known. When running a TSR pattern the outgoing leg is ½ track space to one side (the side toward which the target would drift) of the intended course and the return leg is ½ track space to the opposite side of the intended course.

BARRIER PATTERN: The barrier pattern is used in areas with strong current, such as rivers. The search lies along the path of the current. The SRU moves back and forth over the same track. This can be done by steering on an object on each side of the river. The SRU moves from one side of the river to the other and lets the current carry the search object to it. Multiple SRUs may also be used on this pattern with each SRU moving in the same direction at the same time and making its turn and running the return legs at the same time. The search area is divided up between the number of SRUs participating.

Another method of running the XM pattern is for each SRU to hold its position in the current and staying equally spaced apart. Once again the search object would be allowed to drift to the SRUs.

21.15 INITIAL RESPONSE:

Whenever a case occurs which has a SRU on scene and the object of the distress is not immediately seen or located, report the situation to the SMC by the quickest means possible. The SMC will immediately start planning and then develop a search action plan . In the meantime, the SRU shall be conducting either an expanding square or a sector search using the radius of 6 NM. If the search object is not located on arriving on scene, the SRU is to assume it is adrift, if the distressed boat did not indicate it was at anchor. Proceed with the following:

1. Draw a circle with a 6 NM radius centered at the last known position (LKP). If drift is considered to be significant, the SRU should estimate the drift based on local knowledge/on scene conditions, and center the 6 NM circle around the drifted LKP.

2. Communicate and confirm the new datum with the SMC.

3. Draw the search pattern within the tangent of the circle. Datum is the CSP.

4. Orient the search area in the same direction of drift, that is, the same direction as the total drift vector.

Many times when starting to run a PS pattern the SAR Controller will have you start at the far corner of the area so that you have to run diagonally across the area to reach the commence search point (CSP). Often the target is found while making the initial diagonal run to the CSP.

When a surface facility is working with an aircraft doing a search the SAR controller may position the surface facility mid-way on the first leg of the pattern and instruct the facility to move to the mid-point on the second leg when the aircraft passes overhead. This maneuver would be repeated every time the aircraft passes overhead. The reason for this is two fold:

1. If the aircraft goes down, the surface facility would be positioned for rescue.

2. When the aircraft (which is much faster than a surface facility) spots the target, the surface facility would be positioned for a quick response for the rescue.

Keep the SMC updated.

21.16 SEARCH AREA COVERAGE:

The sweep width (W) is the distance measured on both sides of the SRU. A sweep width of one mile means ½ mile to starboard and ½ mile to port. Sweep width is determined by:

* Search object type, size, and construction
* Environmental conditions
* Sensor (visual or radar)

The track spacing is the distance between adjacent parallel legs within a search area. These tracks may be conducted simultaneously by multiple units separated by fixed intervals, or they may be the result of successive sweeps conducted by a single SRU.

INITIAL TRACK SPACING (NM)

	Good Conditions		Poor Conditions	
Search	Wind	<14 Kts	Wind	> 15 Kts
Object	Seas	< 3 ft.	Seas	> 3 ft.
PIW		.1 NM		.1 NM
< 15 ft.		.5 NM		.2 NM
> 15 ft.		1.0 NM		1.0 NM

21.17 SEARCH PREPARATION:

Answers to the following questions will help determine if you have done everything you need to do before getting underway:

* How many people are involved?
* What is the assigned search area?
* What are the circumstances of the distress?
* What search pattern will be used?
* What is the desired search speed?
* What special equipment is required?
* What radio frequencies (channels) will be used?
* Are other units assigned? If so: what kind?
    * What are their search areas?
    * What are their search speeds?
    * What search patterns will they be using?
    * What radio frequencies (channels) will they be using?
* Do you have all the required charts aboard?
* What are the weather and sea conditions?

* Who is the OSC?
* What unusual circumstances may be encountered? How will you correct for them?

Crew members must be briefed before getting underway. Make sure all crew members:

* Understand the mission.
* Know what they are looking for.
* Know where the search will be conducted.
* Understand how the search will be conducted.

CHAPTER 22 PAPERWORK

22.1 GENERAL:

There are a few forms that all boat crews should be familiar with, these include the following:

1.	CG-5132	Coast Guard Auxiliary Patrol Order
2.	ANSC 7030	Mission Activity Report
3.	CG-4612	Auxiliary SAR Incident and MISLE Case Data Entry Report
4.		GAR Worksheet
5.		Facility Log

Completion of these basic reports are essential to the management of the Auxiliary Surface Operations program.

22.2 CG-5132 COAST GUARD AUXILIARY PATROL ORDER:

This form is the document which authorizes the Auxiliary patrol mission. Usually this form is completed on-line by the coxswain or facility owner requesting the mission. This document when approved by the "Order Issuing Authority" (OIA) allows the Auxiliary members and facility to perform the mission as a part of the Coast Guard. It is also the proof that in the event of damage, injury or death this is a Coast Guard authorized mission. A copy of this patrol order should normally be onboard the facility when taking on the mission. An exception to this is if the mission were being conducted under verbal orders.

The "On-line" system used to request these orders is called "AUXDATA Order Management System", which is pronounced "Ohms". Please go to the documentation for this system for procedures on its use.

22.3 ANSC 7030 MISSION ACTIVITY REPORT:

Without completion of this form the member doesn't get credit for their mission. This form records the member's name, number of hours on the mission, and the type of mission. This information is recorded in the AUXDATA system which keeps track of each member's qualifications. Many members end up in a REYR status because the 7030 form was not completed and submitted to the Information Systems (IS) officer. The AOM system will automatically complete this form when the patrol order is completed in the system.

Please see the following for the codes for operational missions:

NAVIGATION SYSTEMS

CODE	USE
03	NAV SYS Patrol
30	ATON – Federal
31	PATON – Private
32	Bridge Administration

AUXILIARY MARITIME PATROLS

CODE	USE
01A	Maritime Observation (MOM)
01B	Trailering
02	Regatta/Safety Zone Support
22A	Operational Training
54A	Logistics Mission
55A	Vessel Intercept

CG OPERATIONAL SUPPORT

CODE	USE
07A	Watchstanding
07B	QE Shoreside checks
07C	QE Underway Checks
07D	Operational Support (Other)
20B	Radio Watchstanding
22B	Operational Training
22C	Instructor for CG Courses
22D	Sector Coordinator
26	Crew Augmentation

SEARCH and RESCUE

CODE	USE
23A	SAR Standby – Bravo Status
24	SAR Prosecution

GOVERNMENT SUPPORT

CODE	USE
41	Other Agency Support
42	State Support
43	Local Support

MEMBER TRAINING INSTRUCTOR

CODE	USE
06A	Operational Training

MARINE SAFETY and MEP

CODE	USE
28G	Initial Pollution Response
70B	MEP Response/Detection
70C	CG Support
70F	Waterway Management Support Program
70G	Containers
70H	Assist Port State Control
70M	MS Observation Mission
70T	Facilities
70V	America's Waterway Watch Program

Please see the ANSC 7030 form Instructions on pages 2 through 9 of the form.

22.4 AUXILIARY SAR INCIDENT AND MISLE CASE DATA ENTRY:

This form is used to report the data from any SAR Incident that an Auxiliary Boat Crew works on, even if they do not locate or render assistance. This form should be completed and submitted to the SAR Controller anytime any action is taken by an Auxiliary Facility, even if it is called off the case before any response is made.

Please see the CG-4612 form. The instructions for completing the form are included with the form.

22.5 RISK ASSESSMENT WORKSHEET:

The following Risk Assessment Worksheet should be completed before any patrol or mission is started and it should be redone anytime the mission or any of the parameters change. This form is commonly referred to as the GAR Score Worksheet. The form does not need to be submitted to anyone, however, the score must be reported to station or SMC at the start of the patrol or mission or any time the score changes.

RISK ASSESSMENT – GAR WORKSHEET

Assign a risk code of 0 for no risk through 10 for maximum risk to each element

ELEMENT	EXPLANATION	SUGGESTED ADJUSTMENTS	SCORE
SUPERVISION	What is the experience of the coxswain? Amount of SMC supervision needed?	+2 if 3 to 6 years +4 if 0 to 3 years +5 if not facility owner	
PLANNING	How much planning went into the patrol/mission?	+3 for a training mission +3 for night operations +3 for a check ride	
CREW SELECTION	How experienced is the crew?	+3 if any under 3 years +3 if any are new to facility	
CREW FITNESS	What is the fitness of the crew? Consider the age of the crew. Consider the mobility of the crew.	+5 if any of crew is fatigued +2 if any of crew age is 50-59 +4 if any crew age is 60-69 +6 if any crew age is 70-79 +8 if any crew age is 80+	
ENVIRONMENT	What is the wind, sea state, and visibility? Is it raining? what are the limitations of the facility?	+10 if conditions exceed facility limitations. +3 for rain +3 for night operations +3 for limited visibility	
MISSON COMPLEXITY	How complex is the mission? Endurance of facility and crew?	Low Complexity = 1-3 Moderate Complexity = 4-6 High Complexity = 7 - 10	
TOTAL SCORE			

TOTAL SCORE	COLOR CODE	RISK LEVEL
	Green	Low Risk
	Amber	Moderate Risk. Consider actions to minimize.
	Red	High Risk. Implement measures to eliminate risk

FACILITY LIMITATIONS

NO.	ELEMENT	LIMITATION
1.	MAXIMUM SEAS	
2.	MAXIMUM SUSTAINED WIND	
3	NIGHT OPERATIONS	
4.	RESTRICTED VISIBILITY	

22.6 FACILITY LOG:

Each Auxiliary Operational Facility should keep a log of its activities. This log should be in a bound binder and indicate the following information:

1. Facility Name
2. Radio Call Sign (Assigned by the OTO for each district/region)
3. Facility description: (information on “Offer-of-Use” form)
4. Start and end date of each trip
5. Time start and end
6. CG ordered mission or recreational outing
7. SAR activity details
8. Any maintenance and periodic service performed to the facility.
9. Facility limitations as to seas, wind, Night Operations, Restricted Visibility

The above information should be accurate as it may be required to document a claim for major casualty reimbursement or as a legal document in the event there is a claim against the Coast Guard or if required at a trial or hearing.

This log shall be maintained for as long as you own the facility. In the event of a major casualty while on a non-Coast Guard trip, the Coast Guard may reimburse you based on the percent of use for the Coast Guard. For example; if you can prove that you use your vessel 75% of the time for ordered Coast Guard missions, the Coast Guard may pay for 75% of the claim.

CHAPTER 23 CHECK-LISIS

23.1 GENERAL:

This chapter provides various check lists for use by Auxiliary Boat Crews before commencing a mission or an evolution or at the completion of a mission or evolution. These check lists should be studied and modified to suit the requirements of individual facilities, conditions, and areas. You are encouraged to use check lists to insure your thoroughness in preparation for an mission or an evolution and to provide an analysis tool at the conclusion of the mission or evolution. These check lists are provided as a guide in establishing your own check lists. Each check list is printed on an individual page to facilitate your copying it and keeping it on your boat.

23.2 PRE-MISSION BRIEF CHECK LIST:

1. What is the type of mission? (Safety patrol, Regatta, ATON, MOM, etc.)

2. What should crew be watching for?
    a. Disabled craft
    b. Unsafe boating
    c. Children W/O PFDs on
    d. Boats anchored in a channel or under a bridge
    e. Pollution
    f. Anything unusual

3. What are the environmental conditions?

4. What are the facility limitations?

5. Frequency of communications checks

6. GAR model (If any category is 10, consider being in the RED)

7. Updates to GAR as mission progresses or changes.

8. Any health concerns with the crew?

9. Assign duties to crew and rotate periodically.

10. Brief crew on location and use of equipment.

11. Any training during the mission? (All crew should be able to run the boat)

12. Need to write any important information.

13. Cell phone use during a mission. (Requires permission of coxswain)

14. Any need for breaks/rest during the mission?

23.3 GAR WORKSHEET

RISK ASSESSMENT - GAR WORKSHEET

CATEGORY	EXPLANATION	RANGE	ADJUSTMENTS	SCORE
SUPERVISION	What is the experience of the coxswain?	1 - 10	+2 if 3 to 6 years +4 if 0 to 3 years +5 if not facility owner	
PLANNING	How much planning went into this mission?	1 - 10	+3 for a training mission +3 for night operations +3 for a check ride	
CREW SELECTION	How experienced and skilled is the crew?	1 - 10	"+3 if experience <3 years +3 if any are new to facility	
CREW FITNESS	What is the fitness of the crew? Consider the age of the crew? Consider the mobility of the crew	1 - 10	+5 if any of crew is fatigued +1 if any crew age is 50-59 +2 if any crew age is 60-69 +3 if any crew age is 70-79 +4 if any of crew is 80+	
ENVIRONMENT	What is the wind, sea, and visibility? What is the maximum seas for the facility?	1 - 10	+ 10 if seas exceed FAC limit +3 for night OPS +3 for limited visibility +3 if waves are >2 feet +3 if winds are >20 knots +3 if current is >3 knots	
MISSION COMPLEXITY	How complex is the mission?	1 - 10	Routine : 1 - 3 Moderate 4 - 6 Complex 7 - 10	

If any category is 10, consider being in the red

WHAT IS THE LIMITATION OF THE FACILITY?		TOTAL SCORE	
1. MAX. SEAS			
2. MAX WIND			
3. NIGHT OPS			
4. RESTRICTED VISIBILITY			

GREEN	SCORE 6 to 23	GREEN: Okay to go
AMBER	SCORE 24 to 43	AMBER: Make adjustments
RED	SCORE 44 to 60+	RED: NO GO

23.4 DISCOVERY OF A VESSEL REQUESTING ASSISTANCE:

1. Nature of requested assistance?
2. Any medical concerns?
3. Are POBs wearing PFDs? (Have them put PFDS on)
4. Are they taking on water?
5. Does the vessel look stable?
6. What is the overall condition of the vessel?
7. What is the condition of the operator and POBs?
8. Notify controlling unit of conditions and your intentions.
9. Update your GAR score as necessary.

23.5 TOWING CHECK LIST:

(STERN TOW):

1. Is the vessel stable?
2. What is the condition of the POBs? (Are they capable of rendering assistance?)
3. What is the condition of the vessel?
4. Where are the cleats located?
5. Do you need to use a “SKIFF HOOK”?
6. Where will you be towing the vessel? (Nearest safe harbor)
7. Can the POBs follow your instructions?
8. Is there a need to place a crewmember aboard?
9. Is there a need to transfer POBs from the disabled?
10. Establish a means of communicating with the disabled.
11. Brief your crew on what you plan to do.
12. Brief operator of D/V what you will be doing and when.
12. What type of tow rig will you use?
13. Coxswain, hold facility in optimum position for passing and connecting lines.
14. Pass towline and any required equipment.
15. After lines are connected on the D/V have all POBs sit in the vessel’s aft end.
16. No one should be left on the bow of the disabled.
17. Pay out proper length of towline while keeping out your screws.
18. Secure towline on towboat.
19. Do not start towing until all POBs on D/V are seated in the aft of the boat.
20. If disabled is anchored determine how you will raise it or leave it.
21. Commence tow at slow speed and in the direction disabled is heading.
22. Assign a “TOW WATCH”.
23. Avoid making sharp turns.
24. Report to controlling unit (station) “TOW UNDERWAY”.

23.5 TOWING CHECK LIST (cont'd):

ALONGSIDE TOW:

1. Only done in calm and protected waters.
2. Brief your crew on what you will be doing and assign jobs.
3. Brief crew of disabled on your plans:
4. Break out fenders and alongside tow lines
5. Place fenders.
6. Determine set and drift
7. Determine if you will break the tow for a free approach or back down.
8. Instruct POBs on disabled to keep limbs from between boats.
9. Have crew keep lines clear of your props.
10. Make free approach or back down using towline as the #1 line.
11. Place disabled 1/3 of the way forward of your stern for maximum control.
12. Number one line connected first.
13. Number two line connected second. (Can then commence towing)
14. Connect lines number three and four.
15. Adjust fenders as needed
16. Adjust lines and tighten to maximum by going forward and reverse.
17. Proceed at slow speed. (Only enough speed to maintain control)
18. Have crews prepare docking lines and fenders.
19. Decide if D/A or facility will be against the dock.
20. Moor
21. Report mooring to controlling unit

23.6 ANCHORING CHECK LIST:

LOWERING THE ANCHOR

1. Select anchorage area if possible.
2. Brief crew on duties.
3. Break out ground tackle and prepare to deploy.
4. If possible have 2 crew on bow.
5. Secure any loose gear around the anchor line.
6. Have crew keep feet clear of anchor line.
7. Secure end of anchor line to a cleat.
8. Stop the boat heading into the wind/current.
9. On coxswain's command crew slowly lowers anchor and line.
10. Crew notifies coxswain when anchor is on the bottom.
11. Coxswain allows boat to drift down from anchorage for the proper scope.
12. When the proper scope is let out secure the anchor line.
13. Take bearings to be sure the anchor is holding.
14. Assign an "Anchor Watch" to keep track of vessel's position.

23.6 ANCHORING CHECK LIST (CONT'D):

RAISING THE ANCHOR:

1. Brief crew on procedures.

2. Have 2 crew (if possible) go forward.

3. Crew indicates direction of anchor line to the coxswain.

4. Coxswain brings the boat forward as crew takes in the line until line is vertical.

5. Crew informs the coxswain when line is vertical.

6. At coxswain's command crew lifts anchor free of bottom and brings line in.

7. Crew informs coxswain when anchor is free.

8. Crew informs coxswain when anchor is at the surface.

9. Crew cleans anchor if necessary before bringing anchor aboard.

10. Crew stows anchor and line. (Line may be left out to dry)

11. Crew returns to cockpit area.

12. Coxswain is now free to get underway.

NOTE: If anchor is fouled, secure the line and circle while keeping the anchor line under stress. If the anchor can not break free tie a float to the anchor line and return later to work on it.

23.7 LOCKING:

1. Make arrangements with the lockmaster for locking using VHF-FM radio or other signals.

2. Brief crew on procedures.

3. The crew must have their PFDs on securely.

4. Break out mooring lines if not provided by the lock.

5. Fender the boat.

6. It is a good idea for the crew to wear gloves for line handling.

7. At the proper signal enter the lock slowly.

8. Coxswain should exercise caution when entering as there is often debris floating at the lock gates. You may want a crew on the bow with a boat hook to keep debris clear of the boat.

9. Proceed as directed and hold the mooring lines from the top of the lock wall to the boat. (DO NOT SECURE THE LIONE TO THE BOAT)

10. Shut down engine to eliminate carbon monoxide in the lock chamber.

11. There may be a lot of turbulence in the lock chamber while filling. Have the crew hold the boat firmly in place.

12. The lockmaster will signal when it is clear to exit the lock.

13. Vessels exit in the order they entered the lock.

14. Start the boat's engines.

15. Push the boat clear of the lock wall.

16. Exit at slow speed.

17. Have a crew on the bow with a boat hook to keep any debris clear of the boat.

23.8 POST MISSION/EVOLUTION DEBRIEF:

Debrief always should start with the least experienced member of the crew. Coxswain should go last.

1. What was the goal and objective of the mission/evolution?

2. Were these goals met?

3. If not, why, where and how?

4. What went wrong if anything?

5. What went well or right?

6. What could have been done differently/better?

7. What did the crew learn?

23.9 "6-2-1" RULE:

To compute distance on a chart and convert from seconds to tenths of a Nautical mile and distance in yards and feet use the following table:

SEC.	YARDS	FEET	N.M.
6	200	600	.1
12	400	1200	.2
18	600	1800	.3
24	800	2400	.4
30	1000	3000	.5
36	1200	3600	.6
42	1400	4200	.7
48	1600	4800	.8
54	1800	5400	.9
60	2000	6000	1.0

Note: One second on a chart is equal to 33 yards or 100 feet.

CHAPTER 24 **STANDARD COMMANDS**

1. STANDARD LINE COMMANDS

1.1 "PUT LINE _____ OVER": Pass the line indicated to the pier.

1.2 "HOLD LINE _____": Do not allow any more line to go. Line-handlers who feel a line may part should get away from it, but shall never check or ease a line on their own initiative.

1.3 "CHECK LINE _____": Hold heavy tension on the line, but provide the minimum slack necessary to prevent parting.

1.4 "EASE LINE _____": Reduce tension, but not to the point of slacking the Line.

1.5 "SLACK LINE _____": Let the line hang loose with a catenary.

1.6 "TAKE THE SLACK OUT OF LINE _____": Remove all catenary from a line.

1.7 "TAKE IN LINE _____": Line-handlers onboard should provide enough slack for the line to be removed from the fitting on the pier and take in the line quickly once it is removed from the pier.

1.8 "DOUBLE UP LINE _____": Pass an additional line so that there are two pieces of mooring line running to the pier.

1.9 "SINGLE UP LINE _____": Take in all but one strand of mooring line from the indicated deck fitting.

1.10 "CAST OFF LINE _____": Line-handlers will take lines off the fitting to be left at the pier. Different from "TAKE IN" whereas the lines are brought onboard the boat.

2 BASIC COMMANDS:

2.1 "AYE, AYE": I understand and will comply.

2.2 "AFFIRMATIVE": That is correct, yes.

2.3 "NEGATIVE": Permission not granted, no.

2.4 "SAY AGAIN": Repeat your last.

3 ANCHORING COMMANDS

3.1 “MAKE THE ANCHOR READY FOR LETTING GO”: Command to prepare to drop the anchor.

3.2 “ANCHOR IS READY FOR LETTING GO”: Notification from crew that the anchor is ready for letting go.

3.3 “STANDBY THE ANCHOR”: Command from coxswain to crew at the ready position for letting go the anchor.

3.4 “STREAM THE ANCHOR BUOY”: Command from the coxswain to deploy anchor buoy and coiled line before anchor is deployed in order to avoid fouling or damaging the buoy.

3.5 “LET GO THE ANCHOR”: Command to crew to drop the anchor .

3.6 “MAKE READY TO HEAVE THE ANCHOR”: Command to the crew to make preparations to take in the anchor.

3.7 “HEAVE AROUND ON THE ANCHOR”: Command to the crew to commence taking in the anchor.

3.8 “AVAST HEAVING ON THE ANCHOR”: Command to the crew to stop taking in the anchor.

3.9 “BRING THE ANCHOR TO A SHORT STAY”: Command to the crew to heave around the anchor and bring to a short stay.

3.10 “CHAIN TENDS ____ O’CLOCK UNDER (LIGHT< MODERATE OR HEAVY STRAIN)”: Reference point passed from crew to coxswain as to what direction the anchor line tends including degree of strain. 12 o’clock is the bow, 3 o’clock is the starboard beam, 6 o’clock is directly astern, and 9 o’clock is on the port beam.

3.11 ANCHOR IS AT SHORT STAY”: Information from crew that the anchor has rotated to near vertical position and is commencing to dig itself out.

3.12 “BREAK FREE THE ANCHOR”: Command to the crew to heave around on the anchor once it is at short stay.

3.13 “LINE IS UP AND DOWN”: Anchor line is vertical.

3.14 “ANCHOR’S AWAY”: Information from the crew that the anchor is free of the bottom.

3.15 “ANCHOR IS IN SIGHT”: Information from crew that the anchor can be seen.

3.16 “ANCHOR IS (CLEAR, FOULED, SHOD)”: Information from the crew that the anchor is (CLEAR – has no foreign objects entangled with it), (FOUL – some object such as a cable, line, or other object is attached that will prevent the anchor from being placed on board), or (SHOD – anchor has mud, etc. in/on it but not foul).

3.17 “ANCHOR IS AT WATER’S EDGE”: Information from the crew that the anchor is no longer in the water.

3.18 “ANCHOR IS HAWSED”: Information from the crew that the anchor is positioned in its pocket.

3.19 “MAKE THE ANCHOR READY FOR SEA”: Command to the crew to secure the anchor for sea.

3.20 “ANCHOR IS SECURED FOR SEA”: Information from the crew that the anchor is secured for sea.

4 STANDARD HELM COMMANDS

4.1 Command: “COME (RIGHT?LEFT) TO _____”:
Response: “COME (RIGHT/LEFT) TO _____, AYE, AYE”:
Execution: Put over the rudder (left or right) and steady on the specified course. You must use the compass to complete this command.

4.2 RESPONSE: “STEADY ON COURSE ____”
RESPONSE: “VERY WELL or AYE, AYE”

4.3 Command: “RIGHT/LEFT _____ DEGREES RUDDER”:
Execution: Turn the wheel until rudder is placed at the number of degrees ordered.

4.4 Command: “RIGHT/LEFT STANDARD RUDDER”:
Execution: Put the rudder over right or left for the vessel to make a standard diameter turn (usually 15 or 20 degrees).

4.5 Command: “RIGHT/LEFT FULL RUDDER”:
Execution: Put the rudder over for the vessel to make a reduced diameter turn (usually 30 degrees).

4.6 Command: “HARD RIGHT/LEFT RUDDER”:
Execution: Put the rudder over to the maximum allowed.

4.7	Command:	"RIGHT/LEFT HANDSOMELY":
	Execution:	Turn the rudder a small amount for a very slight course change.
4.8	Command:	"INCREASE YOUR RUDDER TO _____ DEGREES":
	Execution:	Increase the rudder to _____ degrees.
4.9	Command:	"EASE YOUR RUDDER TO _____ DEGREES":
	Execution:	Decrease your rudder angle to the specified number of degrees.
4.10	Command:	"RUDDER AMIDSHIPS":
	Execution:	Put the rudder on the zero degree mark on the rudder indicator.
4.11	Command:	"MEET HER":
	Execution:	Use enough opposite rudder angle to stop the swing of the vessel without steadying on a particular course.
4.12	Command:	"SHIFT YOUR RUDDER":
	Execution:	Change from right or left an equal amount. For example, if the rudder is 15 degrees left then you shall shift right 15 degrees.
4.13	Command:	"STEADY, or STEADY AS YOU GO":
	Execution:	Steer the course on which the vessel is heading when the command is given.
4.14	Command:	"MARK YOUR HEAD":
	Execution:	Sound off the vessel's heading at the time of the command.
4.15	Command:	"HOW IS YOUR RUDDER?":
	Execution:	This is a question requesting the rudder position.
4.16	Command:	"MIND YOUR HELM":
	Execution:	A warning that the vessel is swinging off course because of bad steering.
4.17	Command:	"NOTHING TO THE (RIGHT/LEFT) OF":
	Execution:	Command used to advise the helmsman not to steer to the (RIGHT/LEFT) of the course ordered. The command is given when there is a danger present on one side of the vessel.

4.18	Command:	“KEEP HER SO”:
	Execution:	Continue to steer the present course, or to maintain the rudder in its present position.
4.19	Response:	“AYE AYE”:
	Definition:	The order was understood, and you will complete the action required to carry out the order.
4.20	Response:	“COMMAND”:
	Definition:	Response when the command is unclear or misunderstood.
4.21	Response:	“VERY WELL”:
	Definition:	Given to the helmsman to let the helmsman know the report was understood.

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