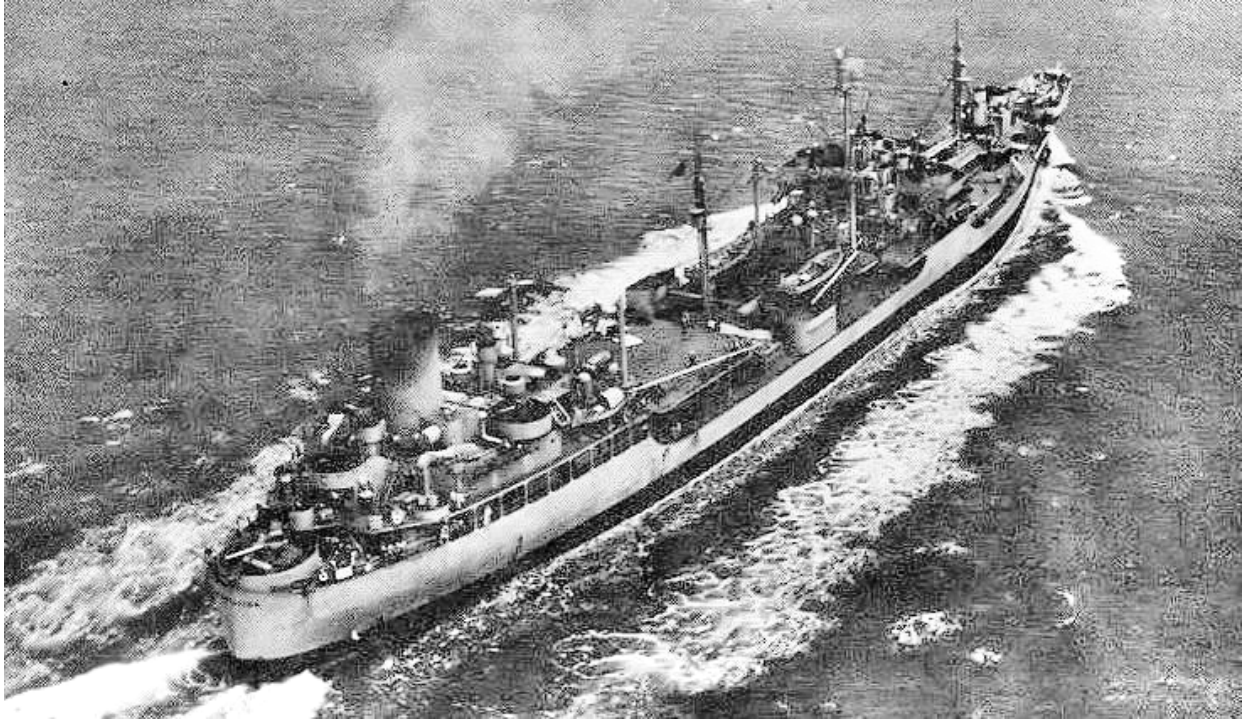


U.S.S. MISPELLION (AO-105)

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Special Aspects of Handling the Twin-Screw Replenishment Oiler (Cimarron Class)
(Author unknown, article discovered in the papers of
Capt. H.G. Munson, CO USS Mispillion, 1952-53)



1. General. These are large (25,520 gross tons at full load displacement), merchant type ships. They were designed for long voyages at speeds of 17-18 knots. As such they lack qualities of maneuverability which would be desirable to have in ships which operate in formation and which are frequently required to enter and leave crowded harbors unassisted, go alongside of other ships both underway and at anchor, and moor and berth at piers and quay walls without assistance. Their characteristics change very markedly as cargo is discharged so that, in effect, one sails from port on a replenishment voyage with one type of ship and returns with one of quite different characteristics. They have, in principle, the characteristics of any large, medium-speed twin—screw ship. Certain salient characteristics, however peculiar to the type must be noted. The first and most prominent is that the rudders are very, small. This feature of course contributes to high economy when they are steamed singly for great distances, as they were designed to. It is otherwise a constant liability which conning officers must keep in mind at all times. Additionally, the steering engines are rather unreliable mechanically; a number of serious and crippling derangements having occurred in the type, and the rudders are slow to respond. All have vertical steam steering engines and most are equipped only with hydraulic telemotor systems between the bridge and the pilot house. Trick wheel steering at the follow-up mechanism in the steering engine room is available. In an emergency the follow-up system may be disconnected and the ship steered by direct operation of the steering engine throttle.

Ships should occasionally drill by shifting to this method. The later hull numbers of the class are equipped with Sperry Hand electric telemotors incorporating the Gyro pilot (Iron Mike) feature. This system gives even somewhat less reliability than the hydraulic telemotor system but gives faster rudder action. This point is important in connection with replenishment operations at sea and will be discussed further.

The engineering plant is a twin-screw, cross-compound turbine, double reduction gear, medium-pressure superheated installation. There are four boilers of the totally-enclosed Bibcock and Wilcox straight-tube sectional header type in a separate fireroom. Nominal total shaft horsepower is 13,500. The machinery is rugged and reliable and responds well. Automatic combustion control is installed. Four hours notice is usually given but, in an emergency, bells can be answered in 20 minutes starting with a cold plant and one boiler on auxiliary load. The principal caution the COD must remember is to permit the engines to be spun by steam at least every three minutes when lying to in order to prevent warping of the turbine rotors.

The screws are so positioned that they exert a good turning moment and with care (and in the absence of strong winds and currents) the ship may be turned in place in a short space considering the size (553 feet overall length, 75 feet beam, and 32 feet 4.5 inches maximum draft at the currently-assigned maximum load). An accurate description of the maneuverability in this connection might be that the ships are handy but slow.

They are "very slow to turn at medium and slow speeds and below five knots can be counted upon not to respond to the rudder at all. They must be steered with the engines in conjunction with the rudder, and approaches to buoys, anchorages, or other ships to which you desire to moor alongside, must make allowance for this feature. In the full load condition, a drag of about two feet will contribute to ease of steering.

In the extreme light condition a drag of as much as eight feet will be found necessary. When unloaded, they should be ballasted to about 18 feet mean draft for maximum comfort and steering ease. The screws will break water in light swells with any draft aft less than 22 feet.

2. Crowded waters. Due to their sensitiveness to wind, their size, and relative helplessness at slow speed (particularly when confronted with a current or wind condition), no captain should feel embarrassed at taking tugs and a pilot. Even if you wish to handle the ship yourself (and you will find that very few pilots will handle the ship to your taste), take the pilot in order to handle the tugs through him. This is particularly important in foreign ports where a language barrier may exist. When using U.S. Navy tugs or U.S. commercial tugs, the point is not important as they use the standard tug signals. The author of this article has often handled U.S. Navy motor tugs with simple and obvious arm signals. When approaching docks, buoys, etc., remember that this class of ship carries its way for enormous distances. A backing bell of 1/3 will hardly be felt at all. When you back, use at least 2/3, do it early and slow or stop the backing engine(s) if you find that you will stop short of your mark. If not turning at the moment of commencing to back and one screw is backed firmly, the stern will fall off to the other side in the usual manner and this may often be used in correcting your alignment when making a landing or another ship. If swinging in the direction that the screw would force the stern, the effect will be magnified and can even be a hazard.

Contrariwise, if you back so as to stop an existing swing, very little effect of the engine will be noticed. Under this latter condition the only answer will be to use both engines in opposite directions with a speed differential and the rudder to apply an opposite twist simultaneously, give yourself backing power. As an example, suppose the ship is swinging right and it is desired to stop short and arrest the swing. The solution would be to back full with the port engine and go ahead 2/3 or standard with the starboard engine and put the rudder full left. Stop the ahead engine just as soon as the swing is arrested or the ship may turn radically to port and embarrass you. These effects tend to disappear with wind strengths over about 15 knots and the wind effects noted above take charge.

When changing course in restricted water such as following a winding channel, passing through anti-torpedo nets or b-on defenses at harbor entrances, etc, it will often be found advantageous to start the turn with more rudder than needed and even to stop the inboard screw momentarily to get her to swing. This is particularly true in the full load condition. Often at half load or lighter, the ship steers rather easily for one as long as this and no special precautions are needed.

Backing power is rather limited in all conditions and speeds in restricted waters, making landings and buoys, etc., must be held lower than corresponding ships of other types. It is best to anchor by coming to a dead stop over the ground at the point you wish to anchor and then pull the chain out by backing away. You are under much better control.

Once started swinging they have enormous angular momentum and great caution must be used that they do not overshoot the course. At low speeds you must assist the helmsman with the engines in meeting her.

Because of the sail area they will invariably back into the wind. This fact taken together with their very strong reluctance to turn down wind when going ahead must always be taken into account when anchoring or mooring.

When in the extreme light condition, such as when prepared to receive cargo, they are extremely "cranky" and yaw rather badly. With the wind forward of the beam, they tend to fall off until the wind is abeam. A wind suddenly springing up will throw them off course seriously and may cause the ship to take a dangerous sheer in narrow waters.

Going alongside another ship at anchor, or moored so as to be free to swing, come in wide and allow yourself plenty of room should the other ship start swinging her stem toward you. An oiler simply hasn't the acceleration to back off and try it again as does a destroyer. Run your lines over with boats or, if safe fire them with the line-throwing guns and "haul" the other ship to you. Your mooring winch aft and the anchor windlass have ample power to do this with any size ship to which you are likely to have to moor in this manner. Tugs are definitely recommended for this operation if available, but often the situation arises in remote areas where they operation must be carried out without assistance. Needless to say, three sets of triple cane or matting fenders should be provided and located well down near the water line in forward areas, and in particular in foreign ports, this class of ship is frequently required to moor to a buoy. Visibility is severely restricted ahead from the bridges of these ships and particularly when an object is, say, within about 150 feet of the bow.

A useful dodge in conning the ship in the final stages of the approach is to send a competent officer (the navigator or the executive officer) to the fore-castle head with orders to take the conn of the ship with him. He communicates by phone with the wheel house and is in an excellent position to bring the ship to a final stop, or twist if it is necessary to close the buoy. A tug is of great assistance in moving the bow laterally and if a severe current or wind condition prevails, the use of one will materially shorten the operation. It can also be directed, quite easily from the same position. The commanding officer remains on the bridge as safety handler but takes no part in the final approach to the buoy once it disappears from his view. It must be constantly kept in mind that, if you back while the ship is swinging, the swing will be accentuated. This point and its correction is 'discussed above.

Strangely enough, in light winds the ship may be backed down a channel for considerable distances and steered (to a rather rough degree). The maneuver is sometimes of assistance when the anchorage or buoy which you are leaving does not have sufficient water around it to permit casting in place and you wish to move to a turning basin or open water in order to head out. The maneuver is futile in winds above about 1½ knots as the ship will back into the wind. The ship may be turned in a short distance (final diameters of about 600 yards have been achieved by going ahead with one engine and backing hard on the other with the rudder against the backing engine. If there is any current or wind tending to set you onto a hazard, the maneuver is definitely not advised due to the length of time the operation takes and the relative helplessness of the ship should matters get out of hand. If wind or current are considered dangerous, send for a tug or wait until conditions improve. Incidentally, in a tight spot the stern may be swung clear of immediate danger by a short use of ahead standard on one engine, back full on the other, and with the rudder set against the backing screw. The ship will not gather much way and may easily be stopped when the stern is clear.

Steering is quite poor in very shallow water and to negotiate narrow shallow channels - where the wind, may embarrass you, one or two steering tugs on the bow are advisable.

3. Cruising. No particular problems or points of interest arise in straight ocean cruising. The type is quite easy to hold in position in formation; however, a caution regarding the slow turning characteristics must be borne in mind when turning in formation. At speeds of nine knots and below they are extremely difficult to turn down wind, i.e., to a course that puts the wind abaft the beam. Often in formation the only way they can be kept on any resemblance of station is to stop or back the inboard screw for a few seconds. With wind above about 15 knots this tendency is very pronounced and full rather than the approximately 20 degree standard rudder (1500 yard final diameter) should be used. Conning officers should not hesitate to start turns with full rudder, and to slow or even stop the inboard screw at the same time speeding up the outboard screw. Failure to take aggressive measures of this type will cause the ship to end up badly out of position on the completion of the turn if the formation speed is slow and a strong wind is blowing.

In order to reduce speed radically, such as in the situation when you have approached a station in formation too fast, "fishtail" using full rudder and swinging off course 30 to 40 degrees either side. It is quite surprising how fast the ship may be slowed in this way. In general, the enormous sail area of the after deck house and the somewhat oversize stack tend to make them lie to in the trough of the sea.

As a class, these ships are very seaworthy provided they are properly loaded or ballasted. In loading or ballasting, for sea, strict attention must be paid to the loading diagram and a stress calculation using the forms provided by the Bureau of Ships must be run to insure that undue strains are not placed on the ship's structure by hogging and sagging. Never permit the ship to be so light in a seaway that she can "slap" or pound forward. Very serious structural damage can result.

The decks and the forecastle head are constantly swept by boarding seas when heading into the wind in the loaded condition. It presents a real hazard to personnel and they should not be allowed on the main decks or forward of the bridge structure when these conditions prevail. Dry decks may almost always be produced by running down wind, if necessary to enter the forecastle structure or to send personnel to the main decks. Under conditions where boarding seas are being encountered, life lines should be rigged across the cargo deck and the 01 deck levels.

The ship may be used to pick up a man or an object such as a target sleeve without lowering a boat and usually the operation may be done with greater speed, and safety to personnel, in rough water than by using a boat. Endeavor to approach the object from an upwind position, reducing speed as necessary to come to a dead stop with the man or object about fifty feet abaft the bow, and so that the ship presents an "angle on the bow" of between 60 and 120 degrees to the wind. As you stop be sure that you "miss" the object by a slight amount upwind, The ship will drift down quite rapidly on the object and by forcing ahead slightly you can bring it to the well dock and recovery will be found quite easy and safe in your lee. You will invariably drift faster than either a man or any object, and pickup is guaranteed,

To recover a man-overboard or return along your track to inspect an object sighted, use the Williamson Turn. To carry it out, first put the rudder full left or right and let the ship's head fall off 60 degrees, then reverse the rudder, let one ship swing back to the reverse of the original course and you will find that in nearly all cases it will return along the original track. Officers-of-the-Deck should all be trained in this maneuver. In many cases it has often found that it returns the ship to the original point much faster than a boat can be lowered and returned.

4. Replenishment Underway. The characteristic operation of this class of ship is the replenishment of other types at sea. Generally speaking, if wind and sea are noticeable the wind should be brought about one point on the port bow, (This provision is made for the ease of handling of carriers. Some latitude is permitted with other types.) If the other ship is to come alongside the

oiler (by far the usual case), the main requirement of the oiler is close adherence to the ordered speed and course,

A very ticklish situation is set up when large combatant types (Carriers, cruisers and battleships) come alongside if their track is quite close to that of the oiler. A marked disturbance is set up between the two ships as a result of the venturi action caused by the water passing between the ships (it is the ships which are moving, of course, but the effect is one of relative motion, not of absolute); as a result, both ships are drawn towards each other. Due to their small rudders, the oilers are often drawn off course stern toward the approaching ships and at replenishment speeds of nine to twelve knots it is not uncommon for the oiler to have to use full rudder to hold course. The effect persists only for a minute or two until the ships settle down, but it must be looked for and guarded against. Even though the oiler is the guide for the operation, she can cooperate in avoiding sideswiping collisions by watching the other ship carefully and turning with her so as to remain parallel.

Frequently, and especially if the base course is not properly chosen, a change in wind, or carelessness on the part of either ship may result in their coming uncomfortably close with risk of sideswipe imminent. In these cases the oiler can and should cooperate in jointly extricating the two ships from their predicament by maneuvering with the other ship, opening out a degree or two if there is still room to permit your stem to swing in, or if there is not, by maneuvering to keep the two hulls parallel. This will turn most collisions of this type into a relatively harmless "kiss" and if the large fenders are properly placed, no more damage will result than would in, say, a somewhat rough mooring alongside another ship. All oiler OCD's standing watch during replenishment should be carefully instructed in these principles. Countless collisions have been avoided by their application.

Conversely, if the other ship goes out of control and opens so far that the hoses and rigging are endangered, the rig may often be saved by maneuvering the oiler to close the other ship until he regains control. The interbridge phone lines are of tremendous assistance in solving these situations. Upon one occasion the author experienced a complete steering failure while alongside another oiler for a consolidation operation. The OOD of the other ship (which was the guide for the operation) was advised and requested by phone to open and close the distance as necessary. Steering was shifted and control regained in about a minute; but for the cooperator of the other ship a serious and crippling collision would have resulted.

While other ships are alongside, the oiler is required to keep her own assigned station in the formation. Large ships coming alongside slow the oiler quite noticeably, in some cases as much as one half knot. When they leave the side of the oiler the effect is reversed and the oiler speeds up. The effect is due to interference with the screw currents. Speed may easily be changed in $\frac{1}{2}$ or $\frac{1}{4}$ knot increments with large ships. The ships alongside are first notified and the oiler speed is immediately changed. With destroyer types alone alongside, the increment may be 1 knot without undue station keeping difficulties. Similarly, minor changes in course may be quite easily made, the usual increment being one or two degrees. The position of the ship on the inside of the turn should be examined first to insure that she is not too close.

The course of the formation as a whole when ships are alongside is changed only by the OTC. The usual procedure is to order "TURN ANSWERING" or "ANSWERING TURN" by successive executive method until the desired total degree of turn is accomplished. The conning officer of the oiler should take position on the bridge wing, inter-bridge phone in hand and announce his course degree by degree to the ship alongside, holding up or reducing the amount of the turn if the other ship gets into difficulty or appears to come too close. This maneuver is frequently used to change the formation course when a shift in the wind has made conditions difficult for the ships alongside. Course changes by this method may be made to any degree desired. After a few successive 5-degree turns, the OTC should wait a few minutes before turning again to allow ships to settle down and regain proper positions alongside the replenishment ships.

With destroyer typos alone alongside, quite large changes of course and speed may be made rather rapidly. The rudder of the oiler is put at two or three degrees on the side to turn after first warning the ships alongside. The course changes are announced to each ship in five-degree increments and the next five degree course to which the oiler intends to turn is also furnished.

If the ships continue to remain alongside in good positions, the turn is continued repeating as above so that a continuous turn results. If they are in difficulties, the oiler is steadied until the ships alongside regain position and report they are ready to continue the turn. Speed changes may safely be made at the rate of 1 knot engine turn speed per minute. The speed for which you are making turns and the speed by log are announced to each ship at each change. In relatively smooth waters, both course and speed may be changed simultaneously.

Often for the comfort of the men working on deck on small ships, or for navigational reasons, fueling down wind is advantageous. If the oiler is yawing noticeably it cannot be safely done. With destroyers a very useful criterion is that the length of the seas be one quarter or less than the length of the destroyer. If this condition holds, the yaw of the destroyer will not be excessive and the operation may be safely performed. If in doubt, the destroyer may be advised to make a wide approach and the condition studied before shooting the lines over, with the destroyer at a comfortable distance for the existing conditions. Under light wind and sea condition it is hardly necessary to take wind and sea into account and the replenishment operation may be conducted on any course. Generally speaking, the lowest speed for moderate sea conditions is 8 or 9 knots. Increases up to 14 or 15 knots may be ordered if the destroyers steer badly. Because of the increased venturi or suction effect, distances between ships should be increased for higher speeds and approaches should be wider than normal.

Quite frequently oilers are required to go alongside other ships, generally other oilers, ammunition carriers or reefers, for cargo consolidation. The operation is not at all difficult if certain rules are kept in hand. The most comfortable track is one which passes about 150 to 200 feet abeam of the other ship. Due to the general unhandiness of these ships (as contrasted with higher-powered types; and the venturi effect coupled with the small rudders, distances closer than this for an approach track are not recommended. Distance can easily and quickly be closed to about 100 to 120 feet once alongside and the speeds matched. Determine your distance off the track by the rule of the sine. Take a bearing from the rear bridge pelorus of the near bridge of the ship you are approaching. The difference between this bearing and the base course divided by 60 and multiplied by the present range bridge to bridge (obtained by stadimeter) is the distance you will be, bridge to bridge, when alongside. Constantly measure this and adjust course as you come in, steering a few degrees right or left of the base course. As an example, you are approaching another ship on base course 300 and are coming in on the starboard side. When the range is 600 yards, the bearing of the other bridge wing is 295. You will be

$$300-295/60 \times 600 = 50 \text{ yards} = + - 250 \text{ feet of the distance}$$

is about right. The point at which to take the speed of the guide is important. Generally a loaded tanker "creeps" about 70 yards per knot of deceleration and a light tanker about 60 yards. The figures vary slightly with the trim and state of the sea. Assume that speed of the guide is 10 knots and you are approaching at 15 knots. If engine speed is decreased to 10 knots when the bridge to bridge range is 350 yards (loaded condition), the ship will match speed very close to the desired position.

If you appear to be slowing a little too fast, add a knot or two and take it off using the above rule. If coming up too fast, drop the engine speed to 1/3 as you pass the mainmast and resume base speed on the engines just before the relative speed appears to come to zero. Once in approximate position, the problem becomes one of normal station keeping close on another ship. Generally speaking, course and speed changes should be made in 1 degree and 1 turn changes. Each time you change, order the new course or speed as a new course or speed and not as an amount to be added or subtracted from the previous order. This latter practice can lead to an embarrassing misunderstanding.

If you overshoot when coming in, stopping the engines is not recommended in view of the decrease in rudder control. Overshooting by, say, 150 feet does no particular harm and does not introduce an appreciable delay. The lines will be shot over and messengers run while you are jockeying into position.

Usually the same principles for wind and sea direction and downwind replenishment apply for oilers as for combatant types. With care, however, on the part of both ships and remembering that a loaded oiler neither drifts as much nor yaws as badly as a light oiler, the consolidation operations may be conducted with surprising disregard for wind and sea direction. This is often an advantage since it permits the ships to advance in a given direction during an extended operation and the time saved may be important in allowing the ships to meet a future operational commitment. The author has consolidated with another oiler with a twenty knot beam sea without difficulty. Generally speaking, it will be somewhat safer to put the lighter ship (i.e. ship with the faster drift rate) downwind as then the tendency is for the ships to separate. Should the ships come together or "kiss", make every effort to take the blow broadside. In the majority of cases, provided the fenders are properly placed, there will be no damage. The inboard engines on both ships should be stopped to break the suction effect.

Clearing the side of another ship is best done by making a marked increase in speed, as much as practicable considering the available boiler power, and then, by very small changes of course, working your ship out from the other. Continue this until you have room for your stern to swing in, and then use standard rudder and open out rapidly.



By Chris Munson who found this very interesting paper in his Dad's files. It's a Driver's Manual for the Mispillion! Chris scanned then ran text recognition & cleaned it up. *Chris - aka Ship's Boy! 12-20-2011*