

PLANNING AND EXECUTION OF BLIND PILOTAGE AND ANCHORAGE

¹SIVRIU GEORGIANA, ²GEORGESCU STEFAN

^{1,2}Constanta Maritime University, Romania

ABSTRACT

Blind pilotage means the navigation of the ship through restricted waters in low visibility with little or no recourse to the visual observation of objects outside the ship. The principal non-visual aid to navigation that enables this to be done is high-definition warning-surface radar, but all available nonvisual aids are employed. The organisation to achieve this is called the blind pilotage organisation, comprising a BP team, led by a BP Officer (BPO).

Keywords: *blind pilotage, blind anchorage.*

1. INTRODUCTION

Assessment of the risk involved in a blind pilotage passage

Although normally the accuracy of blind pilotage is such that a ship can be taken to an open anchorage and anchored within 50 yards of the desired place, the degree of risk involved, particularly in restricted waters, must be carefully assessed. Congestion due to other shipping, the consequences of failure of radar or other vital aids once the ship has been committed to her passage, and the number and quality of fixing marks must be taken into account.

Parallel index technique

The key to blind pilotage is the principle of the parallel index. The running of a parallel index line provides real-time information on the ship's lateral position relative to the planned track. On the chart (Fig. 1), a line is drawn from the edge of a radar-conspicuous object, parallel to the planned track. In the radar display (Fig. 2), a broken line is drawn from the radar echo of the object, parallel to the planned track. The perpendicular distance from the object to the track is then measured. The range strobe on the radar is then set to this range, and a solid chinagraph line drawn on the display parallel to the planned course on a scale appropriate to the range in use. Positions 1, 2 and 3 on the chart and radar display show the ship on track at various instances up to the time that the island is abeam to starboard. Positions 4 and 5 show the ship off track to port. The exact distance off track can be measured by dividers from the radar echo of the island to the nearest point of

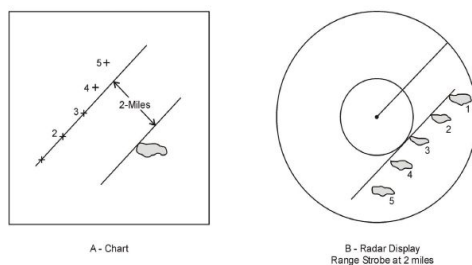
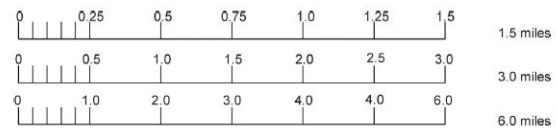


Fig. 1. Parallel index

The perpendicular distance (or cross-index range) from the object to the track is then measured. The range strobe on the radar is then set to this range, and a solid chinagraph line drawn on the display parallel to the planned course on a scale appropriate to the range in use. Positions 1, 2 and 3 on the chart and radar display show the ship on track at various instances up to the time that the island is abeam to starboard. Positions 4 and 5 show the ship off track to port. The exact distance off track can be measured by dividers from the radar echo of the island to the nearest point of

the chinagraphed parallel index line at the scale of the display. This can be made easier by constructing scales for each range setting, as shown below, and mounting them adjacent to the display. (The crosses on the chart do not represent fixes and only appear in order to illustrate the example.)



Radar clearing ranges

Radar clearing ranges (Fig. 2) are similarly drawn at the maximum or minimum distances from the radar-conspicuous objects to keep the ship clear of dangers. These are drawn as broken lines: _____.

Course alterations

'Wheel over' positions are calculated and plotted on the chart as for visual pilotage. A radar-conspicuous mark is selected as close as possible to the 'wheel over' position. A pecked line - - - - - is then drawn through the 'wheel over' position (Fig. 2A) parallel to the new course, and the cross-index range measured. This 'wheel over' range is plotted on the display as a pecked line parallel to the new course. When the selected mark reaches this line, the wheel should be put over and the ship brought round to the new course, by which time the mark should be on the firm line denoting the parallel index for the new course.

Responsibilities

In normal circumstances, the Navigating Officer is the pilot of the ship although, if he is not a navigation sub-specialist, the duty of pilotage devolves on the Captain, who may either perform it himself or, at his discretion, depute any officer of the ship's complement to do so. No matter what the blind pilotage organisation may be, the sub-specialist Navigating Officer (NO) is always the pilot of the ship, and thus he should also be the Blind Pilotage Officer (BPO).

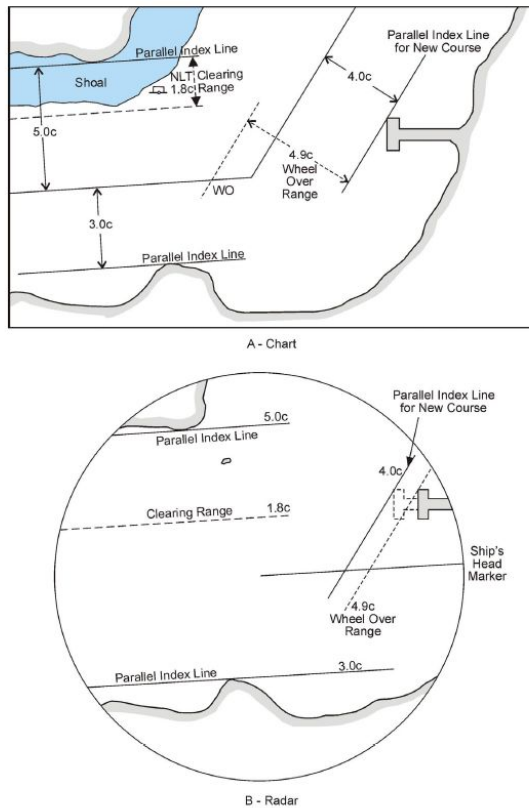


Fig. 2. Clearing and 'wheel over' ranges on the chart and the radar display

Where no navigating sub-specialist is borne, the officer appointed for navigating duties should also be the Blind Pilotage Officer in normal circumstances. However, as responsibility for pilotage is clearly vested in the Captain, he may wish to delegate the blind pilotage duty to some other officer. If so, the Captain must also clearly set out in his standing orders the circumstances envisaged, to ensure that it is absolutely clear who is

responsible and when. These orders must also take into account the organisation for blind pilotage in various circumstances envisaged; the organisation described below may have to be modified.

It must also be decided who is responsible for informing the Captain of the collision risk with other ships. The NO/BPO will be fully employed navigating the ship; therefore it is essential that the officer in charge of the operations room, who already has an anti-collision plot running, should be made responsible for advising the Captain and OOW on this aspect of safety.

The conduct of blind pilotage

The Navigating Officer should remain on the bridge in poor visibility and conduct the blind pilotage from there. It is essential to have another officer, who is suitable by training and experience, as a Blind Safety Officer (BSO) in the operations room, where he can monitor the blind pilotage and back up the Navigating Officer on the bridge. The BSO will need to be in touch

with the surface plot to assist with the identification of radar contacts.

The essence of this arrangement is that members of the team do not change position if the visibility changes. The Navigating Officer conducts the pilotage from the bridge whatever the weather or visibility. In good visibility, the BSO acts as a useful check on the visual plan and builds up confidence in his team and the Command. In marginal visibility, the bridge team continues to make use of any visual information to supplement information from the radar.

In nil visibility, the NO conducts the blind pilotage from the bridge radar display, monitored by the BSO. If reports from the NO and BSO disagree, immediate action to stop the ship may be necessary until the position has been accurately determined.

The Navigating Officer should not move from the bridge to the operations room in order to conduct the pilotage from there. This will cause delay and perhaps confusion, and can be particularly undesirable in marginal visibility, when a mixture of visual and blind techniques is required.

There may well be circumstances, particularly in large ships, where the Navigating Officer has already taken or wishes to take the con and therefore charge of the ship from the Officer of the Watch, in order to conduct the pilotage where a blind pilotage situation has already arisen or arises subsequently. In such a situation, it may be undesirable for the NO to move to the bridge radar display as indicated above. The composition and duties of the blind pilotage team must therefore have sufficient flexibility built in to cope with such circumstances. The NO may continue to con the ship from the pelorus, taking full account of the navigational and collision avoidance information he is receiving from the operations room, the bridge radar display (which should be manned by a competent officer such as the NO's assistant) and other sources, e.g. the bearing lattice team, lookouts, etc. Despite being at the con, the NO is still the pilot and the Blind Pilotage Officer of the ship and retains full responsibility for these.

Blind pilotage team and duties

Blind pilotage requires a high degree of organisation and team work, so that not only are the responsibilities of individuals clearly defined but also all relevant factors may be considered while assessing the ship's position and her future movements. Suitable arrangements to achieve this are set out in Table 1; these may have to be adjusted depending on the class of ship, the personnel available, and the above comments.

PLACE	PERSONNEL	DUTY
Operations room	Blind Safety Officer (BSO)	Monitors ship's position as a check on the ship's navigational safety, using the most suitable display. Co-ordinates navigational and anti-collision information to bridge. Although he does not supervise surface plot, he must keep an eye on shipping situation.
Operations room	Blind Safety Officer's assistant	Plots radar fixes and other radio aids (e.g. Decca) as appropriate. Generates DR/EP. Assists in identification of marks, ships. Checks E/S reports with charted depths.
Operations room	Anti-collision plot	A suitably experienced officer or the most experienced Ops(R) Senior Rate in charge. Passes anti-collision information to bridge, co-ordinated by BSO.
Sonar control room	Sonar controller	Reports sonar information as ordered.

Table 1. Blind pilotage organisation

Planning and execution of blind pilotage

General principles

To ensure success, the ship must be accurately navigated along a pre-arranged track. In comparatively unrestricted waters, this is best done by constant fixing using radar in conjunction with other aids such as Decca and echo sounder.

In narrow waters and during the final stages of an anchorage, the delays inherent in fixing are unacceptable to the BPO. It is therefore necessary, for anti-collision and navigation in these conditions, to work directly from the radar display using a prepared Note Book; but it is still necessary to pass radar information for fixing at regular intervals as a safety check and as an insurance against radar failure.

The following principles apply:

1. The Navigating Officer should navigate or pilot the ship.
2. The Captain should have easy access to the blind pilotage position and the NO.
3. The ship should be conned from the compass platform because it is only on the bridge that the 'feel of the ship' can be retained.
4. The Captain, Blind Safety Officer, OOW and the officer in charge of the anti-collision plot should all be carefully briefed before the passage by the NO, so that they are all entirely familiar with the visual/blind plan.
5. Navigational charts with the NO's prepared visual/blind plan must be available on the bridge and in the operations room.
6. The whole pilotage team should be exercised as frequently as possible in clear weather in visual and blind techniques. Only in this way can the necessary confidence in the system be built up which will allow runs of some complexity to be conducted safely in blind conditions.
7. The BSO should be closed up on all occasions of entering and leaving harbour and passages through narrow waters when special

sea duty men are closed up; the BP team should be regarded as part of special sea duty men.

8. There should be good communication between the blind pilotage position and the BSO and personnel manning navigational aids fitted elsewhere.

9. All members of the team should be encouraged to admit any doubts they may have regarding the information acquired from sensors.

Blind pilotage planning

1. Normal planning considerations for selection of tracks apply. Blind and visual tracks should be the same, to enable the transition from visual to blind or vice versa to be made at any time and also to allow one plan to be used to cross-check the other.

2. The number of course alterations should be kept to a minimum to reduce the work load in redrawing parallel and 'wheel over' lines.

3. Always try to have two parallel index lines where possible, one on each side of the track. These provide a check on measurement, mark identification and can reveal index or linearity errors.

4. Objects to be used both for parallel index lines and for fixing must be carefully selected. They should be radar-conspicuous and unchanged by varying heights of tide. Clearly mark on the chart the objects to be used for fixing and brief the assistant. Avoid if possible fixing by radar range and bearing on a single mark.

5. The range scales to be used require careful consideration. Accuracy is greater at shorter ranges but marks pass more quickly than at a distance, requiring more lines to be drawn. When operating on short-range scales, it is essential that the BPO frequently switches to longer ranges to keep aware of developing situations. Changes of range scales and parallel index marks should be pre-planned and marked in the Note Book. The stage at which charts will be changed must also be carefully considered.

6. Tidal streams and currents should be worked out and noted for calculation of courses to steer and for the calculation of EP. These should be displayed on the chart and recorded in the Note Book.

7. Expected soundings (allowing for height of tide and calibration of echo sounder) should be noted for each leg. The possibility of being early or late should also be borne in mind.

8. All hazards along the track should be boxed in by clearing ranges and their cross-index ranges listed in the Note Book.

9. Details of all lights and fog signals should be taken from the Admiralty List of Lights/chart and entered in the Note Book.

10. The chart should be drawn up using standard symbols, see Table 2.

Blind pilotage chartwork	Symbol
Parallel index lines to stay on track	
Clearing ranges	
'Wheel over' (WO) ranges	

Table 2. Blind pilotage symbols

Use the same conventions as above for cross-index ranges.

The term dead range (Figs. 4, 5) is used to describe the range of a mark ahead when anchoring in a chosen position. The term may also be used when measuring the progress of a radar-conspicuous object along a parallel line, as shown in Fig. 25.

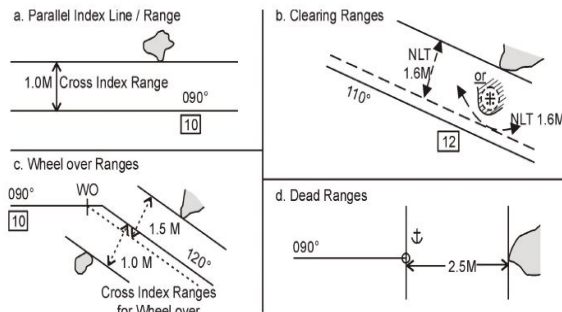


Fig. 4. Blind pilotage symbols

Radar-conspicuous objects such as buoys should be highlighted to enable the BPO to have a clear mental picture of what he expects to see on the display.

11. The Note Book should contain the full plan, neatly and legibly recorded in chronological order. Sketches of both chart and radar display (Fig. 23) can be of great assistance to the BPO in evaluating the picture. A suitable Note Book layout supplementing Fig. 23 is shown in Fig. 24 as a guide to blind pilotage planning.

12. Tracks plotted for entering and leaving harbour should not appear on the same chart simultaneously, otherwise confusion will arise.

13. Clearing range should be simple, safe and easily interpreted.

14. Objects used for 'wheel overs' should be conspicuous, easily identifiable and suitably located adjacent to the track.

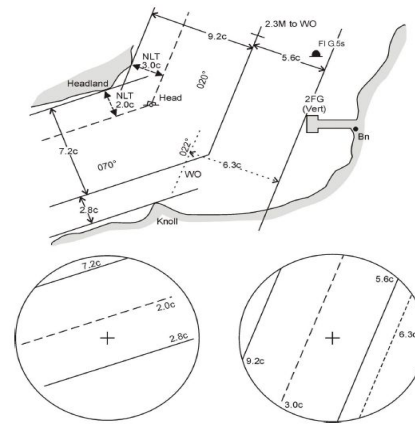


Fig. 3. Blind pilotage: preparation of the chart and displays

Blind pilotage execution

1. Carry out a time check to synchronise clocks and watches.
2. On the radar display, keep one set of parallel index lines drawn up ahead of those in use. Any more will clutter the display excessively. Rub out lines as soon as they are finished with.
3. Identify contacts early (by range and bearing from charted object). An accurate EP is a most useful aid in identification.
4. Fix at frequent intervals and immediately after a change of course. DR/EP ahead. A suitable fixing procedure is:

BPO assistant 'Stand by fix in 1 minute'
 BPO 'Roger using points A, B, C'
 BPO assistant writes these in Note Book.

Course	Remarks	Distance to Wheel-over (W.O.) Miles	Minimum Depth (metres)
	Approach Speed 12 knots		
070°	on Pier Root Beacon // Port Headland 7.2c // Stbd. Headland 2.8c Head Buoy ⊥ Port 5.2c	0.1M to W.O.	14m
W.O to 020° (15° port Helm)	Headmak 022° // Stbd. Jetty 6.3c		
020°	on Headmark // Port Headland 9.2c // Stbd. Jetty 5.6c Stbd. Hand Buoy ⊥ stbd. 5c Change to 6 M range scale // Stbd. New Head 6.7c	2.3M to W.O.	15.6m

Fig. 4. Blind pilotage: layout of Navigating Officer's Note Book

BPO/BPO assistant 'Fix now.' BPO marks the point on face of the display.
 BPO assistant notes the time.
 BPO then ranges off the marks drawn on display and passes these to BPO assistant.

BPO assistant Records the ranges, plots the fix and generates fresh DR and EP.

This procedure cuts the time to take a fix and reduces the risk of a 'cocked hat' due to ship movement. It may be quicker to interpolate from the range rings rather than use the range strobe, although the latter will be more accurate.

5. Ship's speed. One of the factors affecting the choice of ship's speed will be the rate at which the BPO and his assistant are capable of dealing with the radar information.

6. Commentary and conning advice. Maintain a steady, unhurried and precise flow of information to the Command:

Distance off track/on track/course to maintain or regain.

Distance and time to next 'wheel over', new course.

Present/new course clear of shipping.

Adjacent marks or hazards, expected lights and sound signals.

Expected depth and echo sounding. Minimum depths.

When fixing and result of fix. EP to next alteration.

Manoeuvring limits (e.g. 5 cables clear to stbd, 1 cable to port).

If in any doubt, say so and if necessary stop the ship.

7. It must be appreciated that, whatever the technique employed, a drift off line is likely to be detected less readily by radar than by visual methods.

8. It is vital to pay attention to the echo sounder and the least depth expected. The nearest land is usually the bottom.

Blind pilotage exercise

To improve the reality of BP exercises in clear weather, the following points should not be forgotten:

Safe speed should be maintained.

Fixes should be recorded and plotted at the same frequency as for actual blind pilotage.

A full de-brief should take place on completion of the practice.

Blind anchorages

A blind anchorage should be planned in the same way as a visual anchorage but remember to allow 'stem to radar' instead of 'stem to standard' when plotting the 'let go' position. As shown in Fig. 25, parallel index lines should be used to guide the ship to the anchorage position and she must stay boxed in by clearing ranges. Distances to run can be obtained by using a dead range on a suitable object ahead, or by measuring the progress of a radar-conspicuous object along a parallel index line. Full details must be shown on the chart and in the Note Book. Distances to run must be marked on the face of the display.

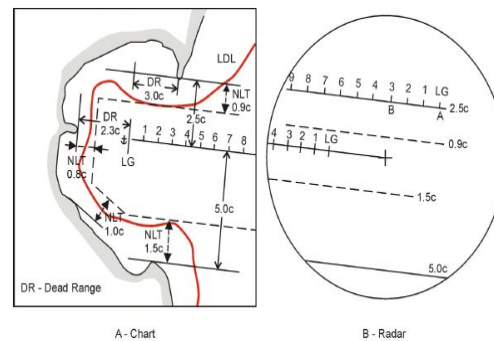


Fig. 5. Blind anchorage execution

These can be backed up by the range strobe, but reliance on the strobe alone is dangerous because the reference is lost as soon as the strobe is required for any other measurement.

In Fig. 25, the dead range of the point of land ahead when anchoring is 2.3 cables. The distance to run to the anchorage position may be obtained by subtracting the dead range from the actual range of the point. For example, if the range of the point is 7.3 cables, the distance to the anchorage is $7.3 - 2.3 = 5$ cables.

Fig. 25 also shows that the dead range of the point of land on the starboard side when anchoring is 3 cables. On the radar display, this point of land should 'move' along the parallel index line drawn $2\frac{1}{2}$ cables to starboard of the approach track. When the ship reaches the 'let go' position, the point of land should have reached point A, 3 cables beyond the abeam position B. The distance AB equals the dead range (3 cables).

Navigational records

When carrying out a blind pilotage passage, the Navigating Officer/BPO will be too busy to maintain a continuous written record. It is essential that such a record should be kept, and in comparatively unrestricted waters it is normally sufficient for this record to be kept on the chart itself by plotting fixes and noting the positions and times of alterations of course and speed and other relevant data, in addition to the record in the Navigational Record Book.

This procedure, involving thorough and methodical chartwork, is in fact no different from that which should be practised during any pilotage passage.

In more restricted conditions, however, the Navigating Officer/BPO's running commentary to the Captain should be recorded on tape if possible, for example:

'No. 7 buoy fine on port bow, 8 cables ship 50 yards to port of track steer 136 to regain.'

In conjunction with the Navigating Officer/BPO's prepared Note Book, the chart, the recorded fixes and courses and speeds, this record should suffice for any subsequent analysis required.

Horizontal displays

Where horizontal displays are available in the operations room, the whole passage may be prepared in advance on a series of overlays, the BSO's assistant changing these at appropriate times. The drawback of this method is that all tracking and other additional marks made by the BSO are lost at each change. With most horizontal displays in use in the Royal Navy, the picture is not sufficiently precise for accurate blind pilotage and should not be used.

2. CONCLUSIONS

For merchant ships, the regulations for pilotage are laid down by the national authority or the shipping company, and in the orders for the port concerned. Recommendations on pilotage are also made from time to time by IMO.

Regulations for merchant ships frequently require compulsory pilotage, although Masters who have considerable knowledge of a particular port may be exempted for that port, as may be certain ships regularly trading on the coast concerned. In most ports, it is the

usual practice for the pilot to take full control of the handling of the ship between the pilot boarding place (usually shown on the chart) and the berth. Despite the duties and obligations of a pilot, his presence on board does not relieve the Master or the Officer of the Watch from his duties and obligations for the safety of the ship.

The general aim of the Master should be to ensure that the expertise of the pilot is fully supported by the ship's bridge team. The Officer of the Watch is required to co-operate closely with the pilot and keep an accurate check on the vessel's position and movements. If there is any doubt as to the pilot's actions and intentions, these should be clarified immediately. If any doubt still remains, it is up to the Master and/or the Officer of the Watch to take the appropriate action to ensure the safety of the ship.

3. REFERENCES

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