

Training Circular No. 5 of 2004

No.11-TR(30)2003

Dated: March 22, 2004

Sub: Guidelines - Automatic Radar Plotting Aids (ARPA) Course

Maritime safety and efficiency is of utmost concern to the Directorate General of Shipping(DGS), the constituted authority of the Government of India for all maritime affairs.

It was noticed that some training institutes barely met the minimum standards set by the Directorate, while other provided training facilities that were world class. In order to bring about uniformity of training, amenities and equipment provided by all, old guidelines were revised and new ones formulated. This was done by the DGS in consultation with the training institutes and employers (shipowners and manning agencies). Draft guidelines were displayed on the website of the DGS and comments invited from interested parties, regardless of the position or office held.

Meetings of interested parties were held and modification made to the draft guidelines. In keeping with Government policy, the guidelines have been made in as transparent manner as practicable. The final guidelines for [Automatic Radar Plotting Aids \(ARPA\) Course](#) is attached herewith.

It is expected that training institutes would follow these guidelines in letter and spirit. The above guidelines shall come into force w.e.f. 01.05.2004.

This issues with the approval of the Director General of Shipping and ex-officio Addl. Secretary to the Government of India.

Sd/-

(Naresh Salecha)

Sr.Dy. Director General of Shipping

GUIDELINES FOR THE CONDUCT OF AUTOMATIC RADAR PLOTTING AIDS (ARPA) COURSE ISSUED BY THE DIRECTORATE GENERAL OF SHIPPING

To avoid unnecessary repetition, reference has been made herein to DGS Order no: 1 of 2003 (Guidelines for the conduct of Pre-Sea Training courses for Merchant Navy) wherever appropriate.

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RADAR OBSERVER SIMULATOR COURSE (ROSC)

1. **BASIC DETAILS OF THE COURSE**
 1. Aims
 2. This course provides training in the basic theory and use of radar for officers in charge of a navigational watch. It is based on the standards of competence as per Section A-II/1 of STCW 95.
Appendix M-II/1C of META Manual Vol. II & IMO Model Course 1.07 should be used in the preparation of material for this course.
Objectives:
 3. A student successfully completing this course and meeting the required performance standards will recognise when radar should be in use; will select a suitable mode and range setting for the circumstances; will be able to set the controls for optimal performance; and will be aware of the limitations of the equipment in detecting targets and in terms of accuracy.
Application:
2. Compliance with these guidelines shall be mandatory for all institutes from 1st May 2004.
3. **QUALIFICATION & ELIGIBILITY OF STUDENTS**
 1. Entry standards:
 2. This course is intended for students prior to certification as officers in charge of a navigational watch. Before being admitted to this course, students should have

completed a minimum period of twelve months at sea.

Required attendance:

3. 100% attendance is required for successful completion of the course. However, in exceptional circumstances, a student is allowed absence of up to one day subject to his attending the lectures missed out during the next course at the same institute. The institute shall keep proper records of such cases and intimate Chairman of respective Academic Council.

Course intake limitations:

4. The number of students shall not exceed 24 per class.

Course intake will be limited to not more than three students per available radar display to allow each student sufficient practice in the operation of the equipment.

5. INFRASTRUCTURE REQUIREMENT

1. The Radar Simulator equipment for this course shall be of a type approved or accepted by the DGS.
2. Paper charts for the exercise areas must be available.
3. Each Radar set shall be inside a soundproof cubicle (called an own ship) such that the discussions and orders given in one cubicle cannot be heard by other own ships.
4. Each own ship cubicle shall be not less than 4m² in area and have a chart table of appropriate size, chart table lamp and charts of the simulation areas.
5. There shall be a classroom of not less than 1.5m² per sanctioned strength of students for use for lectures and plotting practice.
6. Individual table (not less than 60 cm x 45 cm) and chair shall be provided per student. Writing tablets (chairs with attached writing surfaces) will not suffice for this course as radar plotting requires use of a textbook, plotting sheet, calculator and drawing/writing instruments.
7. Plotting Sheets, Parallel Rulers, Dividers, Compasses, etc.
8. Video Films/CDs/DVDs including "Bridge Watchkeeping Procedures".
9. Physical requirement for classrooms, black/white boards, overhead projector, screen, notice board, faculty room, study environment and teaching equipment etc are to be provided as per DGS order 1 of 2003.
10. The institute shall have a library-cum-reading room of not less than 36 m² in area
11. Additional infrastructure, equipment, Training Aids, Video Cassettes/CDs/DVDs and Reference Books etc., required for this course are as per Annexure 1

6. COURSE DETAILS

1. Course duration: 10 days
2. Course outline: As per Annexure 2
3. Detailed Teaching Syllabus: As per Annexure 3

7. HOLIDAYS

1. Sundays shall be holidays.
2. Independence Day and Republic Day shall be compulsory holidays.

8. FACULTY REQUIREMENT

1. Qualifications and experience of course in charge:
2. Certificate of competency, issued or recognised by the Government of India, as Master of a Foreign Going Ship
3. And At least 5 years service on Merchant ships
4. And At least one year in the rank of Master

5. Or One year as Chief Officer and one year as regular (full time) faculty member in ROSC, ARPA Course, RANSCO, SMS Course, Pre-sea degree courses for deck cadets or Competency Courses.

RADAR OBSERVER SIMULATOR COURSE (ROSC)

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Application:

2. Compliance with these guidelines shall be mandatory for all institutes from 1st May 2004.

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3. 100% attendance is required for successful completion of the course. However, in exceptional circumstances, a student is allowed absence of up to one day subject to his attending the lectures missed out during the next course at the same institute. The institute shall keep proper records of such cases and intimate Chairman of respective Academic Council.

Course intake limitations:

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Course intake will be limited to not more than three students per available radar display to allow each student sufficient practice in the operation of the equipment.

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1. The Radar Simulator equipment for this course shall be of a type approved or accepted by the DGS.
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5. There shall be a classroom of not less than 1.5m² per sanctioned strength of students for use for lectures and plotting practice.

6. Individual table (not less than 60 cm x 45 cm) and chair shall be provided per student. Writing tablets (chairs with attached writing surfaces) will not suffice for this course as radar plotting requires use of a textbook, plotting sheet, calculator and drawing/writing instruments.
7. Plotting Sheets, Parallel Rulers, Dividers, Compasses, etc.
8. Video Films/CDs/DVDs including "Bridge Watchkeeping Procedures".
9. Physical requirement for classrooms, black/white boards, overhead projector, screen, notice board, faculty room, study environment and teaching equipment etc are to be provided as per DGS order 1 of 2003.
10. The institute shall have a library-cum-reading room of not less than 36 m² in area
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 1. Qualifications and experience of course in charge:
 2. Certificate of competency, issued or recognised by the Government of India, as Master of a Foreign Going Ship
 3. And At least 5 years service on Merchant ships
 4. And At least one year in the rank of Master
 5. Or One year as Chief Officer and one year as regular (full time) faculty member in ROSC, ARPA Course, RANSCO, SMS Course, Pre-sea degree courses for deck cadets or Competency Courses.
- 9. Qualifications and experience of faculty members:**
 1. Qualifications and experience of faculty members:
 2. And At least 5 years service on Merchant ships of which at least one year should have been at management level.
 3. Radio Officer with Class II Certificate of Proficiency and with seagoing experience on merchant ships may be permitted to take classroom lectures pertaining to technical aspects of Radar.
- 10. Training of Trainers & Assessors Course:**
- 11. As per DGS Order no: 1 of 2003.**

Visiting faculty members:
Qualifications and experience of visiting faculty members should be the same as that of regular faculty as specified above
Age limit for regular faculty members:
As per DGS Order no: 1 of 2003.
- FACULTY STRENGTH**
- 12. Not less than one Master Mariner (inclusive of the course-in-charge who shall be on regular basis) for every three own ships.**

Additional faculty member/s (Master Mariner/s) may be on visiting basis.
A minimum of 50% of the entire portion must be covered by regular faculty.
- COURSE DURATION**
- 13. A total of 33 hours of lectures, practical training and assessment.**
- ASSESSMENT**

14. At the end of the course, there shall be assessment by practicals & oral examination on operation of ARPA and on ROR.QUALITY STANDARDS
15. As per DGS Order no: 1 of 2003.INSPECTIONS
16. As per DGS Order no: 1 of 2003.FEES TO GOVT.

As per DGS Order no: 1 of 2003.

Annexure
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TEACHING AIDS

Equipment

The following equipment shall be made available for conducting the course

- Overhead Projectors and Transparencies
- Navigation charts

Video Films/CDs/DVDs

The available video cassettes / films shall include following films:

- Automatic Radar Plotting Aids
- Bridge Watchkeeping Procedures

Publications

For implementation of this course, Institutes should, for reference and guidance use appropriate books and publications, which may include:

1. IMO Model Course 1.07 ' Radar Navigation, Radar Plotting and Use of Arpa
2. IMO Performance Standards for ARPA
3. The International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1995 (STCW 1995).
- 4.
5. Shipborne Radar & ARPA by Capt. H. Subramaniam.
6. Radar Observers Handbook For Merchant Navy Officers by W. Burger
7. Radar & Electronic Navigation by Sonnenberg.
8. ARPA by A. Bole

Annexure
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Course outline

Lecture hours	Simulator hours
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Description an ARPA System

ARPA Systems display characteristics	0.5	
IMO Performance Standards for ARPA	0.5	
Acquisition of targets	0.5	3
Tracking Capabilities and Limitations	0.5	
Processing Delays	1.0	
Operate an ARPA System		
Operate an ARPA System		1
Obtaining target information		1
Errors of Interpretation	1.0	
Errors in Displayed Data	1.5	1
System Operational Tests	0.5	1
Risks of Over-reliance on ARPA	1.0	16
Obtaining Information from ARPA Displays		
Application of COLREG 1972		
Total	7	23
Grand Total learning and practice	30	
Review and Final Assessment	03	
Total	33	

Annexure

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DETAILED TEACHING SYLLABUS

Learning Objectives (hours include lectures and simulator practicals)

1. Description an ARPA System (6 hours)
 1. ARPA Systems display characteristics (0.5 hours)
 2. describes different display characteristics:
 - Vectors
 - Graphics
 - digital read-out
 - potential points of collision (PPC)
 - predicted areas of danger (PAD)
 - describes the different ways in which targets may be acquired
- IMO Performance Standards for ARPA (0.5 hours)

3. states IMO performance standards for ARPA relating to accuracy
states the requirements for acquisition and tracking of targets
lists the operational warnings required
lists data which should be available in alphanumeric form
describes the effects of sensor errors for ARPA equipment complying with IMO performance standards
states performance standards for gyro and log inputs
states performance standards for range and bearing accuracy and discrimination of radar
Acquisition of targets (1.5 hour)
4. states criteria for target acquisition
states that the criteria for automatic selection of targets are given in the set's instruction manual
lists the criteria to be used for manual acquisition of targets
states that maximum number of targets which may be acquired
states that targets may be deleted if not posing a potential threat (when tracking limit has been reached)
describes appropriate use of suppression of target acquisition over certain areas
states that targets first appearing closer than the pre-set guard ring are not acquired and do not actuate alarms
Tracking Capabilities and Limitations (1.5 hour)
5. describes target tracking by ARPA
describes how target are "lost" and alarm activated
states common circumstances leading to "target swap"
describes the effect of "target swap" on displayed data
Processing Delays (2 hour)
2. explains why there is a delay in the display of processed ARPA data after target acquisition
explains the delay in the display of new data when the target ship manoeuvres
states that full accuracy of derived information may not be attained for up to three minutes after acquisition or manoeuvre of the target
3. Operate an ARPA System (24 hours)
 1. Setting Up and Maintaining Displays (1.0 hour)
 2. sets up an appropriate display presentation for the required task and current situation (stabilised relative motion and true motion displays)
adjusts radar controls for the optimum display of echoes
uses log and gyro compass inputs
manually selects, acquires and monitors critical targets
sets up automatic acquisition and exclusion areas
uses the appropriate time scale for vectors or graphics to produce information required
identifies differences between information shown in sea stabilised mode and the ground stabilised mode
selects the appropriate mode for the circumstances
sets up echo-referencing in the true motion mode
Obtaining target information (1.0 hour)
 3. operates display in true and relative modes to obtain true and relative vectors in each display mode
states the benefits of switching between true and relative vectors
uses the graphic display of PPC's and PAD's
determines threat of collision by forward extrapolation of vectors and by the use of PAD's

uses targets history display
 uses trial manoeuvres are (approximations depending on the model of ownship manoeuvring characteristics)
 refers to the equipment manual for a description of the manoeuvring characteristics model used
 sets and acknowledges operational warnings
 states benefits and limitations of operational warnings
 sets area rejection boundaries to avoid spurious interference
 Errors of Interpretation (1 hour)

4. identifies consistently vectors in the wrong mode (a common error)
 derives information from vectors with numeric display
 explains and re-acquired "lost target" may temporarily shown a course and speed suggesting an alteration when none has occurred
 states data from PADs and PPCs displayed apply only to "own ship" and targets and do not indicate mutual threats between targets
 states that the length of line from target to PAD or PPC is not an indicator of target speed
 states that history displays may not be in same mode as vectors
 states that a change of direction in the relative history display does not necessarily imply that the target has altered course
 explains that the incorrect interpretation of ARPA can lead to a dangerous misunderstanding
 Errors in Displayed Data (2.5 hours)
5. identifies bearing errors in the radar installation by:
 Backlash
 ship motion
 asymmetrical antenna beam
 azimuth quantisation
 explains errors in range generated by:
 rolling of "own ship"
 range quantisation
 explains that unreliable indications are given when smoothing filter in the tracker combined with alteration in "own ship's" course/speed
 explains the effects of heading and speed errors on derived information
 states that the smoothness of the displayed history track is an indication of satisfactory tracking by ARPASystem Operational Tests (1.5 hour)
6. uses self-diagnostic routines
 operates test programmes to check performance against known solutions
 demonstrates performance checks, including trial manoeuvre by manual plotting
 takes correct action malfunction of ARPAPrisks of Over-reliance on ARPA (3 hour)
7. demonstrates the use of ARPA explains the need to comply with basic principles in keeping a navigational watch
 reacts correctly to operational alarms
 avoids small predicted passing distances (CPA and bow crossing ranges)
 explains that sensor input alarms only operate on failure of input and do not respond to inaccurate input
 Obtaining Information from ARPA Displays (6 hours)
8. obtains information in both true and relative modes
 identifies critical targets
 determines relative course and speed of target
 determines CPA and TCPA of target

determines true course and speed of target

uses displays of past positions for detecting changes in course or speed of target

uses trial manoeuvre facility to check validity of intended alteration of course or speed

Application of COLREG 1972 (8 hours)

- 4. takes correct action to avoid close-quarters situations or potential collision situations
monitors subsequent situation and resumes original course and speed when safe to do so**
- 5. Review and Final Assessment (3 hours)**

Objective test on theory and principles

Test on manual plotting

Practical demonstration on simulator covering setting up of the display, plotting vessel's position, use of parallel indexing techniques, obtaining target information using ARPA