

## IMO

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### OPERATION OF MARINE RADAR FOR SART DETECTION

1. At its thirty-ninth session (6 to 10 September 1993), the Sub-Committee on Safety of Navigation (NAV) prepared guidelines on the Operation of marine radar for SART detection given, at SN/Circ. 161.
2. To avoid misinterpretation of guidance on the use of certain controls, as originally promulgated, the NAV Sub-Committee, at the forty-third session (14 to 18 July 1997) revised and expanded the text of the aforementioned guidelines, as given in the annex.
3. Member Governments are invited to bring this information to the attention of all entities concerned so that they may use it during search and rescue operations.
4. SN/Circ.161 is revoked.

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## ANNEX

### OPERATION OF MARINE RADAR FOR SART DETECTION

**WARNING: A SART will only respond to an X-Band (3 cm) radar. It will not be seen on S-Band (10 cm) radar.**

#### Introduction

1. A Search and Rescue Transponder (SART) may be triggered by any X-Band (3 cm) radar within a range of approximately 8 n.miles. Each radar pulse received causes it to transmit a response which is swept repetitively across the complete radar frequency band. When interrogated, it first sweeps rapidly (0.4 usec) through the band before beginning a relatively slow sweep (7.5 usec) through the band back to the starting frequency. This process is repeated for a total of twelve complete cycles. At some point in each sweep, the SART frequency will match that of the interrogating radar and be within the pass band of the radar receiver. If the SART is within range, the frequency match during each of the 12 slow sweeps will produce a response on the radar display, thus a line of 12 dots equally spaced by about 0.64 nautical miles will be shown.

2. When the range to the SART is reduced to about 1 n.mile, the radar display may show also the 12 responses generated during the fast sweeps. These additional dot responses, which also are equally spaced by 0.64 nautical miles, will be interspersed with the original line of 12 dots. They will appear slightly weaker and smaller than the original dots.

#### Radar Range Scale

3. When looking for a SART it is preferable to use either the 6 or 12 nautical mile range scale, This is because the total displayed length of the SART response of 12 (or 24) dots may extend approximately 9.5 nautical miles beyond the position of the SART and it is necessary to see a number of response dots to distinguish the SART from other responses.

#### SART Range Errors

4. When responses from only the 12 slow frequency sweeps are visible (when the SART is at a range greater than about 1 n.mile), the position at which the first dot is displayed may be as much as 0.64 nautical mile beyond the true position of the SART. When the range closes so that the fast sweep responses are seen also, the first of these will be no more than 150 metres beyond the true position.

#### Radar Bandwidth

5. This is normally matched to the radar pulse length and is usually switched with the range scale and the associated pulse length. Narrow bandwidths of 3-5 MHz are used with long pulses on long range scales and wide bandwidths of 10-25 MHz with short pulses on short ranges.

6. A radar bandwidth of less than 5 MHz will attenuate the SART signal slightly, so it is preferable to use a medium bandwidth to ensure optimum detection of the SART. The Radar Operating Manual should be consulted about the particular radar parameters and bandwidth selection.

### **Radar Side Lobes**

7 As the SART is approached, side lobes from the radar antenna may show the SART responses as a series of arcs or concentric rings. These can be removed by the use of the anti-clutter sea control although it may be operationally useful to observe the side lobes as they may be easier to detect in clutter conditions and also they will confirm that the SART is near to own ship.

### **Detuning the Radar**

8 To increase the visibility of the SART in clutter conditions, the radar may be detuned to reduce the clutter without reducing the SART response. Radars with automatic frequency control may not permit manual detune of the equipment. Care should be taken in operating the radar in the detuned condition as other wanted navigational and anti-collision information may be removed. The tuning should be returned to normal operation as soon as possible.

### **Gain**

9 For maximum range SART detection the normal gain setting for long range detection should be used i.e., with a light background noise speckle visible.

### **Anti-clutter sea control**

10 For optimum range SART detection this control should be set to the minimum. Care should be exercised as wanted targets in sea clutter may be obscured. Note also that in clutter conditions the first few dots of the SART response may not be detectable, irrespective of the setting of the anti-clutter sea control. In this case, the position of the SART may be estimated by measuring 9.5 nautical miles from the furthest dot back towards own ship.

11 Some sets have automatic/manual anti-clutter sea control facilities. Because the way in which the automatic sea control functions may vary from one radar manufacturer to another, the operator is advised to use manual control initially until the SART has been detected. The effect of the auto sea control on the SART response can then be compared with manual control.

### **Anti-clutter rain control**

12 This should be used normally (i.e. to break up areas of rain) when trying to detect a SART response which, being a series of dots, is not affected by the action of the anti-clutter rain circuitry. Note that Racon responses, which are often in the form of a long flash, will be affected by the use of this control.

13 Some sets have automatic/manual anti-clutter rain control facilities. Because the way in which the automatic rain control functions may vary from one radar manufacturer to another, the operator is advised to use manual initially until the SART has been detected. The effect of the auto rain control on the SART response can then be compared with manual control.

### **Note:**

The automatic rain and sea clutter controls may be combined in a single 'auto-clutter' control, in which case the operator is advised to use the manual controls initially until the SART has been detected, before assessing the effect of auto.