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At the Forefront of Your Defence Needs

The Use of IFF and Other Transponders in the Naval Environment

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Aim

The aim of this presentation is
to emphasize the roles of transponders
(and in particular secure IFF)
within the naval environment and
to identify its characteristics and attributes
pertinent to Electronic Warfare.

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Scope

1. Basic transponder theory
2. X-Band (NATO I-Band) transponders
3. Search and Rescue Transponders (SARTs)
4. Automatic Identification System (AIS) transponders
5. Identification Friend or Foe (IFF) transponders
6. Practical application of IFF transponders in the naval environment
7. Electronic warfare aspects
8. Current implementation of IFF within the SA Navy domain
9. Propose some usage concepts
10. Questions

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Basic Transponder Theory

Radar Transponder General Description:

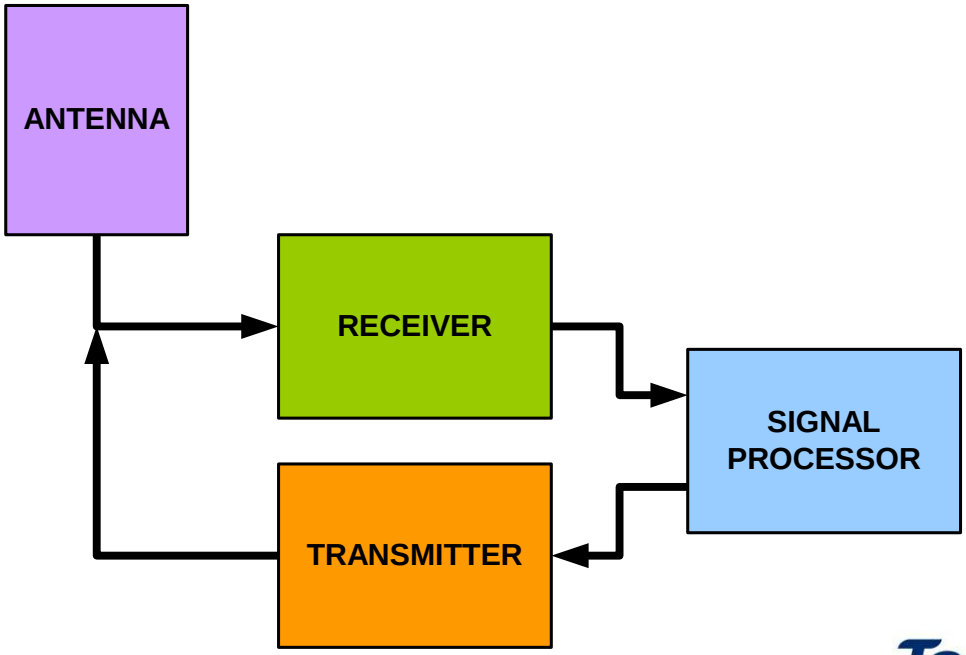
There are four major functional elements

Antenna

Receiver

Signal processor

Transmitter



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X-Band (NATO I-Band) Transponders

X-Band Transponder:

- Common in maritime applications
- Enhances the safety of aircraft operations
- Interoperability between surface and airborne systems
- Beacon mode
- Demarcates helicopter landing decks
- If fitted with a transponder, a helicopter may be tracked by a vessel
- RTCA DO-172 standard
- Clutter rejection
- 4 pulse identification codes
- XBT-2000P designed and manufactured by Tellumat

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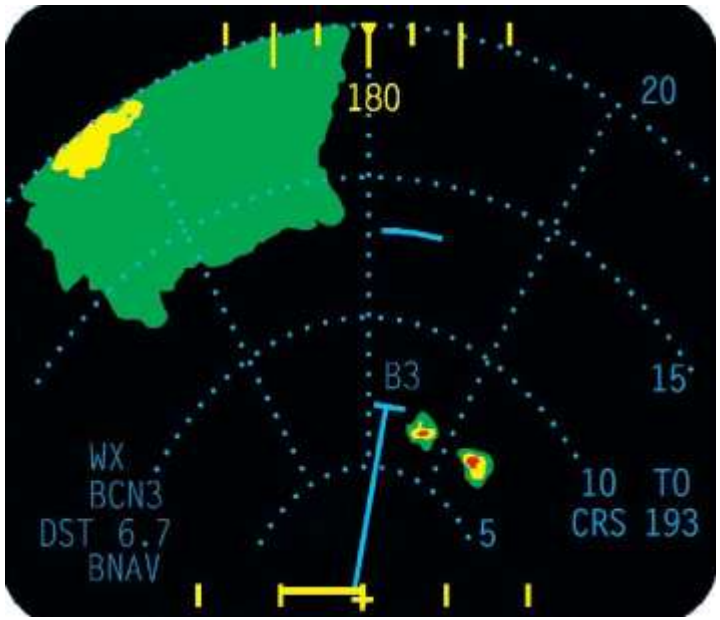
X-Band (NATO I-Band) Transponders

XBT-2000P and aircraft radar display



Search and Rescue Transponders (SARTs)

Search and Rescue Transponders:

- Locate survival craft or distressed vessels
- Will only respond to X-band (NATO I-band) radar
- Specifications based on IMO 697 (17) and IEC 61097-1
- Range of approximately 8 nautical miles
- Rapid and slow sweeps
- 12 dots equally spaced by about 0.64 nautical miles will be shown
- Could be used to decoy / confuse hostile navigation radars

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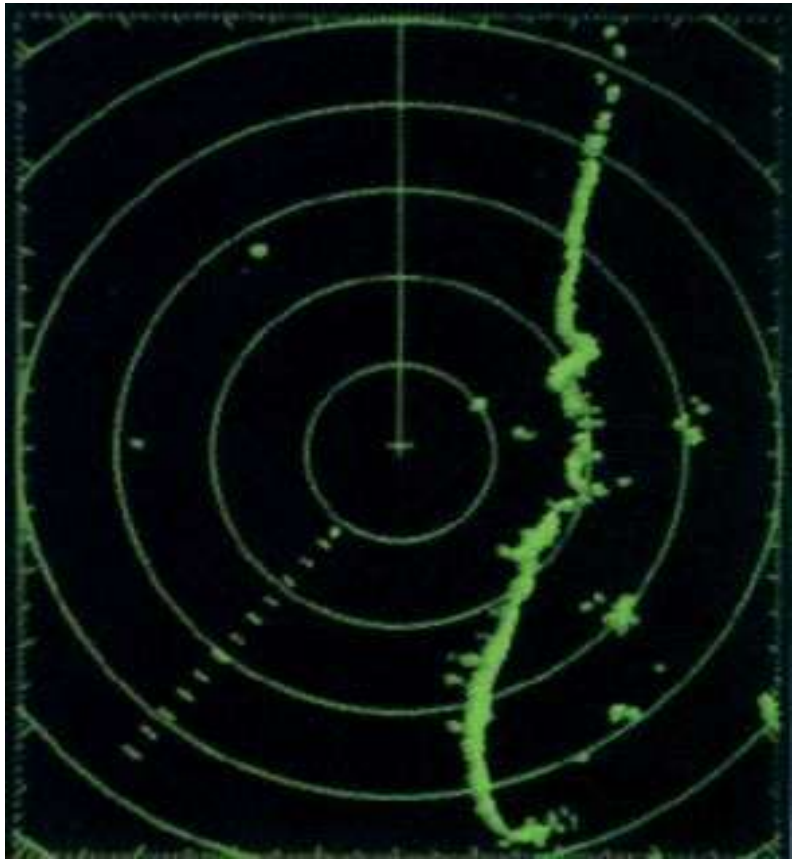
Search and Rescue Transponders (SARTs)

SART and radar display



Automatic Identification System (AIS) Transponders

Automatic Identification System:

- Automatically broadcasts ship information obtained from ships sensors
- Signals are received by AIS transponders fitted on other ships or on land based systems
- AIS standard comprises several sub-standards called "types"
- Useful to military platforms
- Helicopter over-the-horizon platform identification capability
- “Receive Only” mode interesting for EMCON
- Alignment of ESM and ELINT antennas

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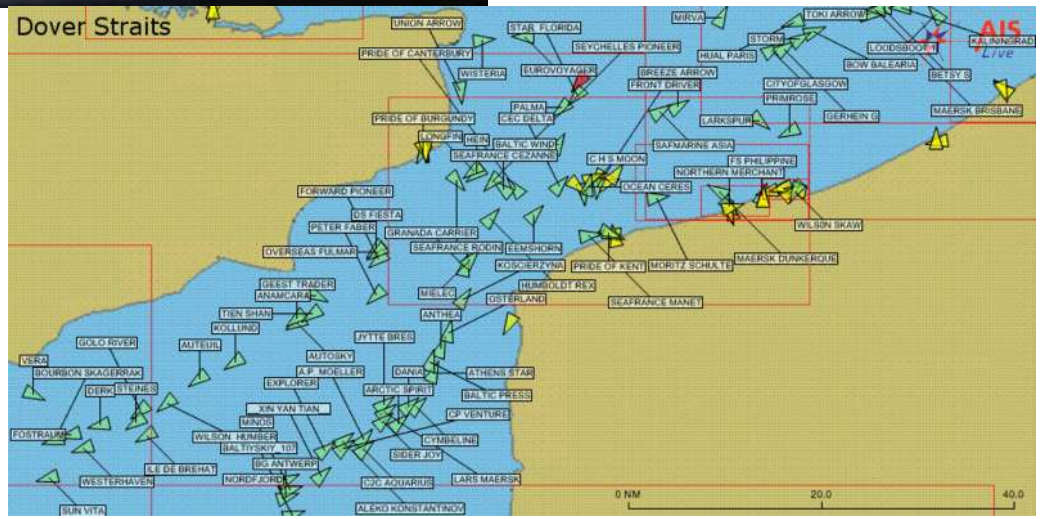
Automatic Identification System (AIS) Transponders

AIS equipment and display



Identification Friend or Foe (IFF) Transponders

- Surveillance role – situational awareness
- Weapon fire role – secure positive friend identification
- NATO standard STANAG 4193
- Usually co-located with a primary radar
- Several IFF modes
  - Mode 1
  - Mode 2
  - Mode 3/A
  - Mode C
  - Mode S
  - Mode 4 (or National Secure Mode)
  - Mode 5
- Frequencies

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Identification Friend or Foe (IFF) Transponders

IFF transponder and control panel

Electronic Warfare Aspects

IFF Aspects wrt Electronic Warfare:

Operates in the L-Band

Uses PAM in the ATCRBS and secure modes

Mode S uses DPSK

Relatively high output power

Low PRF

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IFF Considerations wrt Electronic Warfare

Disadvantages:

Fixed frequency - spot noise jamming

Easily associated with primary search radar

Advantages:

Alternative to direct weapons / effectors under jamming conditions

Radar horizon limitation

Passive decoy immunity

Secure IFF data cannot be extracted

Dual frequency and secure mode IFF PPM

Mode 5 – spread spectrum

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Proposed Usage of Secure IFF

Secure IFF use should be standard practice

Secure IFF organisational management

Assignment of the military IFF modes

Assignment of Mode 2 codes per platform

Secure IFF operational management

Continuous training

“Train as you Fight and Fight as you Train!”

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Question / Answer Time

Questions?

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