SMART-S

3D Multi-Beam Acquisition Radar for Targeting

GENERAL

Thales Nederland has developed a family of three-dimensional radars for the coming decades.

SMART-S is the F-band, medium-to-long range version of this 3-D radar family. It was successfully tested at sea in the spring of 1990 and is now fully operational with various navies.

SMART-S is capable of automatic detection of targets, followed by automatic track initiation and accurate tracking of these targets.

SMART-S has an impressive, multi-target tracking capacity. It simultaneously deals with high-priority targets such as very small and fast low-flying or high-incoming antiship missiles and all other types of air and surface targets.

SMART-S makes use of the latest radar and signal processing techniques, such as a multiple-stripline receiving antenna, digital FFT beam forming, and FFT doppler processing, which drastically reduces susceptibility to clutter and jamming.

SMART-S' 3-D capabilities are therefore virtually invulnerable to degradation from both natural environmental effects and intentional jamming.

This provides an essential contribution to the threat evaluation process, especially in multiple-attack scenarios. It results in an accurate and timely target information exchange with the weapon control systems, enabling them to perform the fastest possible lock-on.

SMART-S' antenna system is bi-axially stabilized, using a light-weight hydraulically controlled platform, which can be mounted at a high mast position.

Finally, the entire system has extensive automatic built-in test facilities and is easy to install and maintain.

MAIN CHARACTERISTICS

- Fully automatic detection, track initiation, tracking and target designation in 3-D for air and surface targets in operational environments
- Separate fire control channels for gun control support against surface targets
- Stripline receiving antenna
- 90° gapless elevation coverage
- Hydraulic bi-axial stabilization
- Automatically functioning built-in test facilities
- Very low side-lobe level

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FUNCTIONAL ASPECTS

SMART-S operates in the 10-cm band. The receiving antenna is an array, consisting of stripline antennas. The received radar energy is processed by 16 receiver channels. These channels lead into the beam forming network in which 16 virtual beams are formed. From this beam pattern, 12 beams are used for the elevation coverage of 0-90°.
SMART-S' output signals of the beam former are further handled by an FFT processor for target speed information, clutter rejection, and jamming suppression. Two general-purpose computers handle target track initiation and tracking. Tracking data are transferred to the command and control system via computer interfaces, providing weapon control systems with 3-D target information for fastest possible lock-on.

PERFORMANCE DATA

- Maximum free-space, single-scan detection range, at 50% probability of detection
  - 0.1 m^2 target SW 3 : 45 km
  - 1 m^2 target SW 1 : 75 km
  - 2 m^2 target SW 1 : 90 km

  Target speed: up to Mach 3.6
  Instrumented range: 120 km
- **Resolution**
  In bearing : 2°
  In range : 90 m
- **Tracking accuracy**
  In bearing : 0.25°
  In range : 40 m
  In elevation : 0.6°
- **Tracking capacity**
  - Air targets : 160
  - Surface targets : 40
  - Surface targets : 2 (gun-fire control accuracy)
- **ECCM and anti-clutter facilities:**
  - Fully coherent chain
  - Broadband frequency operation with the possibility of frequency Agility from burst to burst
  - High RF power output
  - Automatic RF and PRF selection
  - Very low antenna side-lobes, both on transmission and reception
  - 3-D radar featuring twelve reception pencil beams
  - Doppler FFT processing
  - Pulse compression
  - Automatic thresholding of clutter and jamming
  - Automatic jamming analysis sensor, indicating the direction of a jammer
  - Automatic setting of radar parameters such as AGC and STC
  - Sector emission capability
  - Emission control capability

TECHNICAL ANTENNA

- **Transmitting antenna**
  Vertical width of pencil beams :
  Type : horn array
  Polarization : horizontal
  Horizontal beamwidth : 2°
  Elevation coverage : 90°
- **Receiving antennas**
  Type : stripline array
  Number of striplines : 16
  Polarization : horizontal
  Horizontal beamwidth : 2°
  Elevation coverage : 90° (total)
  Number of pencil beams : 12
  Vertical width of pencil beams : 9°
  Side-lobe level (azimuth) : -50 dB rms
- **Antenna platform**
  Rotation speed : 27 rpm
  Roll range : ± 25° (± 35° reduced performance)
  Pitch range : ± 12° (± 20° reduced performance)
  Stabilization : hydraulic
  An IFF antenna can be integrated with the SMART-S antenna
- **Transmitter**
  Type : coherent /TWT/pulse compression
  Peak power : 150 kW
  RF frequency : F-band
  Transmission modes : fixed frequency, frequency agility over burst, sector scan, reducible RF power
- **Receivers and processors**
  Noise figure : 3 dB
  Compressed pulse length : 0.6 µs
  Beam formation : by FFT
  STC : automatic
  Video processing : doppler FFT, plot and track processing

DIMENSIONS AND WEIGHT

	width mm	height mm	depth mm	weight kg
Antenna system	ø5300 *	2050	-	1500
Transmitter cabinet	2060	1990	840	1300
Processing cabinet	1773	1925	766	710
Hydraulic power unit	640	1900	910	450
Waveguide drier	670	716	650	83

* Maximum rotating diameter

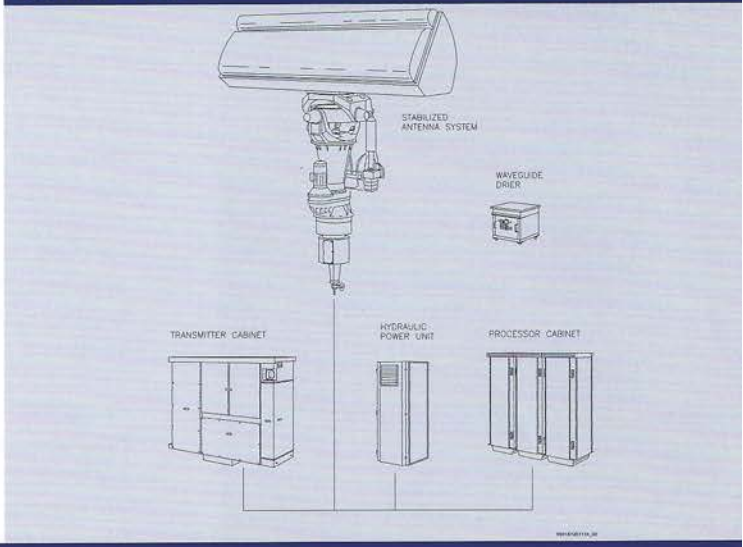
POWER REQUIREMENTS

Main equipment	440 V	60 Hz	3 ph	45 kVA
	115 V	60 Hz	1 ph	7.5 kVA
Anticondensation heating	115 V	60 Hz	1 ph	0.87 kVA
Ship's cooling water	49 l/min (max. temp. 9°C)			

ENVIRONMENTAL CONDITIONS

The design and construction of the equipment are based on current, international military standards for shipborne equipment.
Ambient temperatures : above deck -30° to +49°C
below deck 0° to +49°C
Relative humidity : up to 95%

SYSTEM OVERVIEW



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