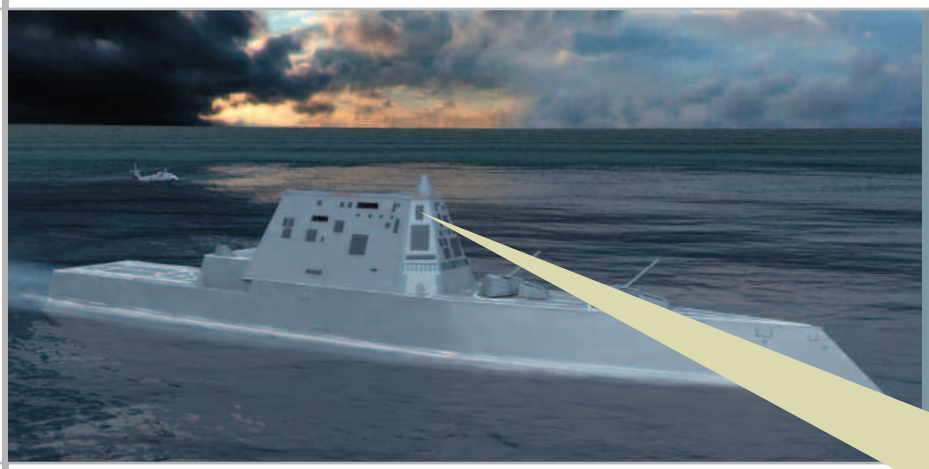
Raytheon

DDG 1000 Dual Band Radar (DBR)



The DDG 1000 Dual Band Radar (DBR) provides unprecedented performance to the warfighter with near-zero maintenance and manning requirements

Benefits

- Meets next-generation naval radar challenges by performing multiple functions automatically and simultaneously, including detecting and tracking advanced high and low altitude anti-ship cruise missiles
- Replaces 6 to 10 legacy radar antennas and interfaces with one 6-faced radar (3 faces at X-band, 3 faces at S-band), controlled by one interface to the ship's command and control system
- Provides near-zero maintenance with no dedicated operator or display console
- Supports stealth operations with low radar cross section (RCS) and infrared (IR) signatures and passive search and track during no-radiate operations

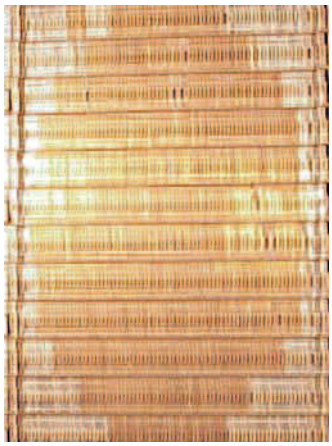
The Dual Band Radar (DBR) combines the functionality of the X-Band AN/SPY-3 Multi-Function Radar with that of an S-Band Volume Search Radar (VSR).

X-band advantages include superior low-altitude propagation effects, narrow beam width for best tracking accuracy, widest frequency bandwidth for effective target discrimination and submarine periscope detection, and the necessary target illumination frequency for SM-2 and Evolved Seasparrow Missiles (ESSM).

S-band advantages include a high-power aperture for effective search functionality, acceptable propagation loss regardless of weather, and sufficiently small beam width to resolve and track targets accurately.

Both bands are capable of providing effective uplink/downlink capabilities to interface seamlessly with the ship's surface-to-air missile systems.

Operating simultaneously over two electromagnetic frequency ranges (X-band and S-band), the DBR marks the first time this functionality has been achieved using two frequencies coordinated by a single resource manager. As a result, the system delivers capabilities and flexibility not possible with earlier generations of land and maritime radar systems.



AN/SPY-3 Antenna

Frequency Diversity and Resource Sharing
Many of the search and track functions can be allocated to either or both frequencies. Horizon search (to detect anti-ship cruise missiles) and precision track (to provide high update rate, fire control quality data) are examples.

Since environmental phenomena affect different frequencies in different ways, the ability to bring both frequencies to bear increases performance during multipath and anomalous propagation. In addition, in situations where one band becomes taxed (such as when supporting multiple missiles in flight), the other band can effectively share the workload.

Improved Reliability
As a class, phased array radar systems have done much to improve reliability, essentially by their absence of moving parts in the antenna. The DBR takes this to the next level: The active electronically steered arrays have been engineered to offer graceful degradation, thereby minimizing the possibility of system-wide or single-point failures.

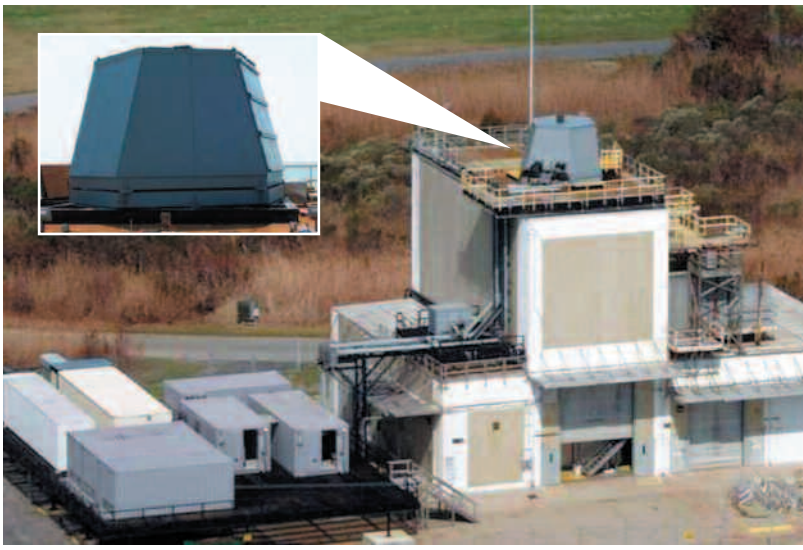
Built-in redundancy ensures system operability if radar component failures occur. The DBR is designed to operate 24/7 over a very long mission time at an operational availability better than 95%.

Easier Maintenance
The DBR contains a robust fault detection/fault isolation system, which notifies the ship system of any required maintenance. Replacement of components for the DBR arrays, subsystems, computers and other ancillary equipment typically involves swapping out circuit cards, solid state transmit/receive integrated multichannel modules (TRIMMS), or other modular components, all of which keep potential down time to a minimum.

Access to all antenna components is from the rear, which will permit servicing from within the ship. The DBR is being designed to require fewer than 100 hours of corrective and preventive maintenance per mission-year and has a mean time to repair (MTTR) of less than 30 minutes.

Unmanned Operation
The DBR requires no dedicated operator and has no manned display consoles. The system automatically senses the complex man-made and natural environment and adjusts its processing accordingly.

Specific tactical radar behavior is governed by doctrine, entered by a tactical action officer or sensor supervisor within the ship's Total Ship Computing Environment (TSCE) or host command and control system. Being fully automated, the DBR takes the reaction time associated with manual operator action out of the loop and eliminates the potential for human error associated with manual radar settings.

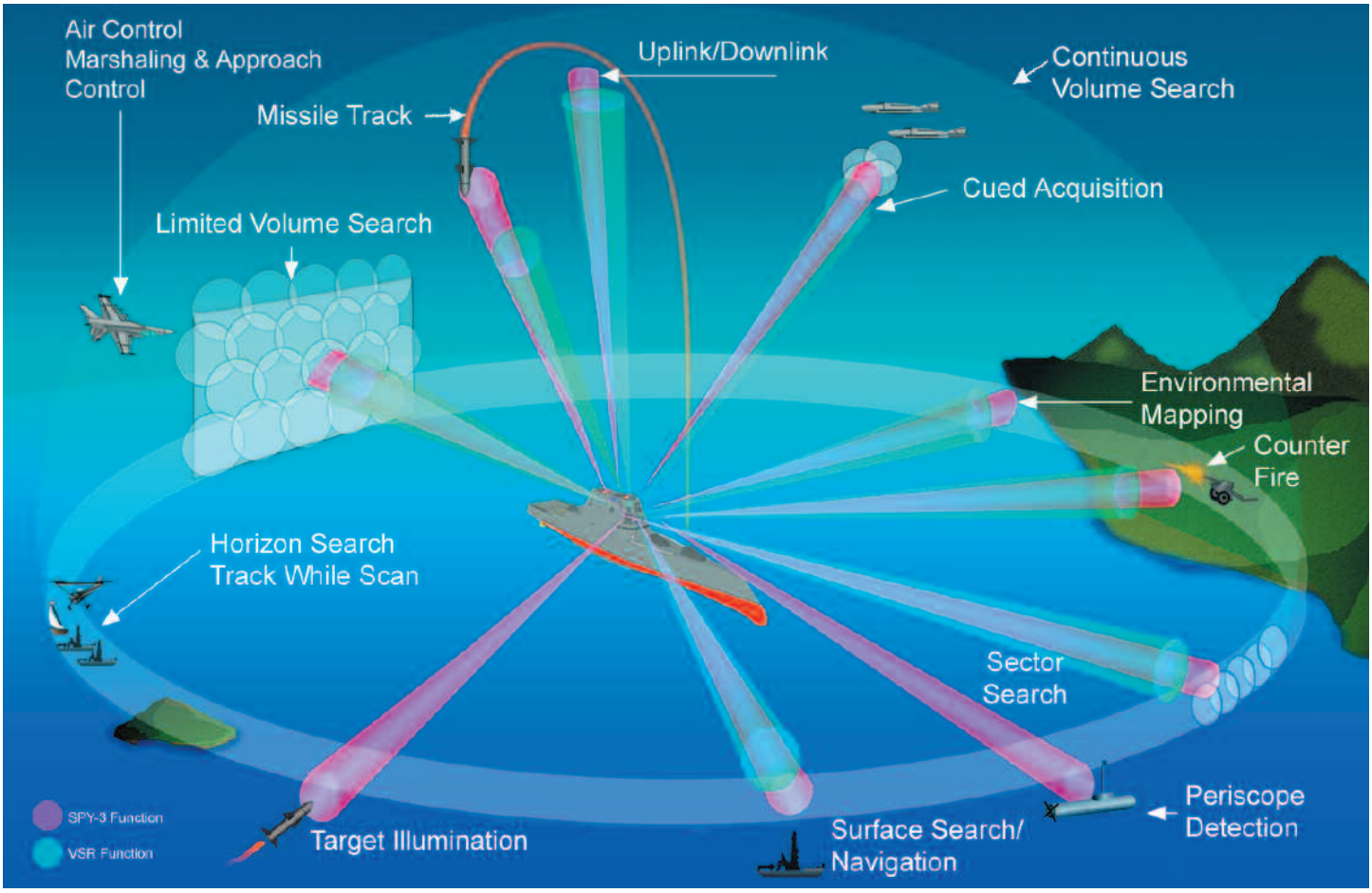


The AN-SPY-3 Multi-Function Radar EDM-1 undergoing land-based testing at Wallops Island, VA.

The only human interaction involves maintenance and repair activities, performed by technicians using a maintenance local area network (LAN) that allows them to take control of the radar and to run offline tests.

First COTS Computing Solution for Naval Radar
The DBR is the first radar for which complex signal and data processing is done entirely in a Commercial-off-the-Shelf (COTS) computer. Computing products from IBM, Hewlett-Packard and Sun Microsystems all offer competitive, capable solutions. All DBR software has been designed using object-oriented techniques and is written in the widely used C++ and Java languages.

DBR software is fully interoperable with the TSCE, an Open Architecture (OA) solution that integrates all of the ship's computer functions into a single enterprise network. The TSCE also serves as a basis for the Navy standard combat system, designed for fleet-wide use.



The DBR can perform all of these functions simultaneously; many at either X-band or S-band.

Physical Characteristics

	X-Band SPY-3 Array	S-Band Volume Search Radar (VSR) Array
Height	107 in.	160 in.
Width	82 in.	152 in.
Depth	25 in.	30 in.
Weight	5,500 lbs.	22,500 lbs.
Total Weight Below Decks	45,025 lbs.	62,909 lbs.
Total DBR Power Consumption	2,000 KW	
Total DBR Chilled Water Consumption	900 gpm@11°C	
Total DBR Heat Load	1,350 KW	

DDG 1000 Dual Band Radar (DBR)

Modes and Capabilities

	SPY-3	VSR	Both
Search/Track			
Horizon Search/TWS	X		
Volume Search/TWS		X	
Precision Track			X
Cued Acquisition			X
Counterfire/Naval Surface Fire Support			X
Limited Volume/Sector Search			X
Periscope	X		
Mine Detection	X		
Surface Search/Navigation	X		
Slow Air Target Search and Track	X		
Passive Search and Track			X
Engagement Support (ESSM)			
Missile Illumination	X		
Uplink/Downlink	X		
Radiation Control			
EMCON, RadHaz Zones, Sector Blanking			X
Environmental Sensing			
Passive Survey			X
Clutter Survey			X
Weather Mapping		X	
Threat Assessment			
Target Recognition	X		
Maneuver Estimation			X
Kill Assessment			X
Infrastructure			
DBR Suite Control			X
State/Start-Up/Shutdown			X
Battleshort			X
Doctrine/Communications			X
Data Collection			X
Operational Assessment and Alignment			
Auto Battery Alignment			X
Auto Online Fault Monitoring			X
Diagnostics and Fault Isolation			X
Test Assist			X

Chuck Larrabee
978.858.4259 phone
978.858.9414 fax
chuck_s_larrabee@raytheon.com

Integrated Defense Systems
50 Apple Hill Drive
Tewksbury, Massachusetts
01876 USA

www.raytheon.com

Raytheon

Customer Success Is Our Mission