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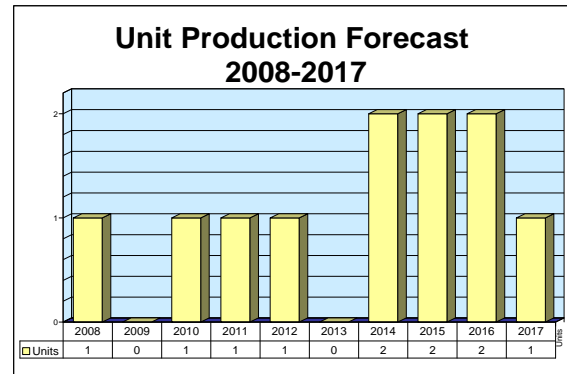
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BPS-15K/BPS-16(V)4

Outlook

- In addition to new production, Northrop Grumman continues to receive contracts to upgrade and maintain radars already in service
- Production of the BPS-16 is expected to be low but steady over the next 10 years
- New-production BPS-16s will equip SSN-774 Virginia class submarines



Orientation

Description. The BPS-15 and BPS-16 are submarine surface navigation radars.

Sponsor

U.S. Navy
 Naval Sea Systems Command (NAVSEA)
 1333 Isaac Hull Ave SE
 Washington Navy Yard, DC 20376
 USA
 Tel: + 1 (202) 781-0000
 Web site: <http://www.navsea.navy.mil>

Application. The BPS-15(V) is installed on SSBN-726 Ohio class submarines, while the BPS-16(V) was selected for SSN-688 Los Angeles class submarines, SSN-21 Seawolf class submarines, and SSN-774 Virginia class submarines.

Price Range. When it was in production, the BPS-15 cost about \$1.2 million. Based on FY08 U.S. budget documents, the BPS-16 ranges in price from \$5.3 million to \$5.5 million.

Status. In production; ongoing logistics support and mechanical upgrades.

Contractors

Prime

Northrop Grumman Sperry Marine	http://www.sperry-marine.com , 1070 Seminole Trail, Charlottesville, VA 22901-2827 United States, Tel: + 1 (434) 974-2000, Fax: + 1 (434) 974-2259, Prime
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 Contractors are invited to submit updated information to Editor, International Contractors, Forecast International, 22 Commerce Road, Newtown, CT 06470, USA; rich.pettibone@forecast1.com

BPS-15K/BPS-16(V)4

Technical Data

	<u>Metric</u>	<u>U.S.</u>
Dimensions		
Antenna Weight	76 kg	168 lb
Radar Display Weight	90.7 kg	200 lb
Transceiver Weight	90.7 kg	200 lb
Characteristics		
Range		
Minimum	23 km	25,153 yd
Maximum	over 32 km	20 mi
Resolution	27/91 m	30/100 yd
Frequency	9.41 GHz \pm 30 MHz (frequency agile)	
Tuning	Auto with manual override	
Power	25 kW	
PRF	3,200, 1,600, 640 Hz	
Pulse Width	0.08, 0.25, 0.40, 1.0 μ sec	
Beam Width	3 deg x 13 deg	
Scan Rate	9.5 rpm	
Antenna Horn Array	40 in (1.02 m) aperture	
Units	Receiver/Transmitter Video processor Radar set control unit Antenna control unit Mast and antenna	
Features	Surface surveillance Limited low-flying aircraft detection Clutter-suppressed, real-time picture of surface targets and geographic features	

Design Features. The BPS-15K/BPS-16(V)4 submarine radar is an advanced mechanical array navigation sensor that incorporates state-of-the-art video processing, touchscreen radar controls, embedded trainer scenarios, on/off-line fault monitoring, and a unique hydraulic driven raise/rotate mechanism. Although it is optimized for submarine applications, the BPS-16(V) can also be used aboard major surface combatants, replacing conventional navigation radars. It operates with Sperry Marine's Voyage Management System (VMS) and Electronic Chart Display and Information System (ECDIS).

A commercial off-the-shelf (COTS) version is available for other classes of combatants.

Operational Characteristics. The BPS-16(V) submarine navigation radar provides submarines with a surface search capability for navigation and general surface operations, as well as detection of low-flying aircraft. It is used for avoiding other ships and land masses while operating on the surface, especially while entering and exiting ports during bad weather and in areas of poor visibility.

Variants/Upgrades

BPS-15K. Installed on Trident submarines.

BPS-16(V)3/4. The mechanical array was made more reliable and the system is more compatible with modern navigation systems. The COTS version features a high-resolution color radar display, low-cost radar monitoring, and an antenna control system. Radar control is via a user-friendly touchscreen monitor. It is based on a space-efficient, shock-isolated, and EMI-shielded two-

cabinet system. Features include a 10-target Manual ARPA Plotting Capability and 20-target Automatic Radar Plotting Aid (ARPA). There are full-function front control panel and system fault monitors. Navigation features include VRM/EBL, parallel index lines and time-to-go interfaces with the ship's heading, NMEA 0183 GPS position, speed log, and pedestal position synchro systems.



BPS-16(V) radar on SSN-70.

Source: U.S. Navy

Program Review

The original BPS-15(V) began service in the early 1970s. In FY86, the U.S. Navy decided to develop a new submarine radar and in April 1987, chose (then) Norden to develop and produce the new sensor. The contract called for installing the BPS-XX (later dubbed the BPS-16) aboard all SSBN-726 Ohio class, selected SSN-688 Los Angeles class, and SSN-21 Seawolf class submarines.

Procurement of additional BPS-16(V) radar sets in FY97 avoided a production break and the startup costs associated with the procurement of additional radar sets as included in the future years' defense program.

After similar complaints in FY97, Congress complained that the FY98 Navy budget request included no funds for the procurement of BPS-16(V) or BPS-15H submarine navigation radar. The conferees authorized \$9 million for BPS-15H radar navigation sets.

In December 1998, the submarine USS *Hyman G. Rickover* (SSN-709) completed successful sea trials with a new automated navigation and electronic chart

system. This was the first U.S. submarine fitted with the Sperry Voyage Management System and Electronic Chart Display and Information System (VMS-ECDIS). A similar system was installed on the USS *Augusta* (SSN-710). The VMS-ECDIS would be backfitted on all of the SSN-688 class submarines as part of the BPS-15H/K radar system.

The equipment fitted on the *Rickover* in September 1998 included a Sperry Rascar X-band radar and VMS-ECDIS with two operator stations, plus display stations in the commanding officer's stateroom and on the open bridge. The VMS-ECDIS took digital inputs from the vessel's radar, inertial gyrocompass, speed log, GPS, and other sensors and provided a constantly updated picture of the submarine's precise position and movement on a color electronic chart display.

The VMS-ECDIS incorporated a direct chart reader, which permitted the system to access Digital Nautical Charts™ from the cartographic database of the National Imagery and Mapping Agency (NIMA).

BPS-15K/BPS-16(V)4

The FY99 Defense Authorization included a Navy budget increase of \$9 million for BPS-15H software and hardware upgrades.

The FY00 Defense Appropriation added \$8 million to the budget for BPS-15/H/16(V) upgrades.

The FY01 budget funded several submarine communication suite improvements. The procurement and installation of high-data-rate antennas and improved multifunction antennas, along with radio room

automation efforts, increased the throughput and operational flexibility of submarine radio rooms.

Production Continues for SSN-774

Throughout the 2000s, the U.S. Navy has continued to fund procurement of the BPS-16 for its SSN-774 Virginia class submarines. The Navy is expected to buy more of the submarines in the years ahead, and therefore will continue to require BPS-16 radar systems.

Funding

U.S. FUNDING

	FY06 <u>QTY</u>	FY06 <u>AMT</u>	FY07 <u>QTY</u>	FY07 <u>AMT</u>	FY08 <u>QTY</u>	FY08 <u>AMT</u>	FY09 <u>QTY</u>	FY09 <u>AMT</u>
Procurement (U.S. Navy)								
Virginia Class Submarine Electronics AN/BPS-16	1	5.3	1	5.4	1	5.5	-	-

All \$ are in millions.

Source: FY 2009 U.S. Budget Documents

Contracts/Orders & Options

<u>Contractors</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Northrop Grumman	13.3	Jun 2004 – FFP letter contract for the procurement of two BPS-16(V) radar sets and two BPS-15K radar conversion sets. Completed Dec 2005. (N00024-04-C-4300)
Northrop Grumman	65.3	Sep 2004 – FPAF contracts for logistics support of the WSN-7(V) and BPS-15/16(V) weapons systems. Includes three options that could bring the total to \$115,943,990. To be completed Oct 2009. (N00104-04-D.ZD51)
Northrop Grumman	7.8	Mar 2005 – FFP modification to a contract for the procurement of one BPS-16(V) radar set and two BPS-15K radar conversion sets. Contract includes provision of COTS material, and the development, integration, and test of the ARPA change to the BPS-16(V)4 software, plus technical manuals and provisioning. Completed Feb 2008. (N00024-04-C-4300)
Northrop Grumman	15.3	Jan 2008 – Delivery order for the fourth year of a five-year contract to provide technical, logistics, and material support for submarine inertial navigation systems and BPS-15 and BPS-16 radar systems.

Timetable

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	1984	Development initiated
	1986	Development completed
	1988	First delivery
	1993	BPS-16(V) contract
	FY96	SSN-23 procurement

<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	FY97	Congressional add-on for retrofits to the SSN-688 fleet
Dec	1998	Sea trials of the radars with the VMS-ECDIS navigation system
	FY00	Initial production for Virginia class submarine

Worldwide Distribution/Inventories

This is a U.S.-only program.

Forecast Rationale

Production of the BPS-16 is expected to be low but steady over the next 10 years. FY09 budget documents released by the U.S. Department of Defense request that one unit be produced each year to match the production of new Virginia class submarines.

Defense officials believe that submarines are needed to counter the threat from powers such as China, as well as to defend against the possibility of terrorists gaining access to an advanced submarine. Congress wants to protect the jobs that submarine construction creates, especially in Connecticut and Virginia, where the submarines are manufactured. Because these subma-

rines need navigation radar, the BPS-16 should continue to be produced for many years to come.

Maintenance Generates Contracts

In addition to new production, Northrop Grumman continues to receive contracts to upgrade and maintain radars already in service. These radars are expected to be operational for many years and so are expected to be a source of new contracts during that time.

A total of 11 systems are projected to be produced during the forecast period. Production will most likely continue until a newer system is developed.

Ten-Year Outlook

ESTIMATED CALENDAR YEAR UNIT PRODUCTION												
Designation or Program	High Confidence					Good Confidence			Speculative			Total
	Thru 2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Northrop Grumman Sperry Marine												
BPS-16 <> United States <> Navy <> SSN-774												
	5	1	0	1	1	1	0	2	2	2	1	11
Total	5	1	0	1	1	1	0	2	2	2	1	11