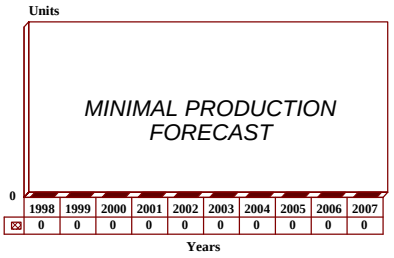
SPS-64(V) - Archived 5/99

Outlook

- In service, ongoing logistics support will extend well into the next decade
- Future upgrades may include integration with other systems, such as navigation system, DGPS, GPS, Loran-C etc
- The US Coast guard is developing a new surface search radar, the SPS-73

10 Year Unit Production Forecast
1998-2007



Orientation

Description. Naval Navigation and Surveillance Radar.

Sponsor

US Coast Guard
Coast Guard Supply Center
707 E. Ordnance Road
Baltimore, Maryland (MD) 21226-1741
USA
Tel: +1 410 508 7057

US Navy
Naval Sea Systems Command (NAVSEA)
2531 Jefferson Davis Highway
Arlington, Virginia (VA) 22202
USA
Tel: +1 703 602 3381

Contractors

Raytheon Marine Company
46 River Road
Hudson, New Hampshire (NH) 03051
USA
Tel: +1 603 881 5200
Fax: +1 603 881 4756

Status. In service, in production, ongoing logistic support.

Total Produced. Through 1997, an estimated 690 units had been produced. The commercial version of the radar is in service on over 5,000 vessels worldwide.

Application. Surface combatants, patrol craft, and auxiliaries.

Price Range. The approximate cost of an SPS-64 ranges from US$25,000 to US$68,000.

Technical Data

	Metric	US
Dimensions		
Antenna:		
Size	1.2 m (X-Band only)	4 feet
	1.8, 2.7, 3.7 m	6, 9, 12 feet
Weight	63.6, 150.7 kg	140, 332 pounds

Characteristics

	X-Band	S-Band
Frequency:	9375 ± 25 MHz	3030 ± 25 MHz
Peak power:	10, 25, 50 kW	60 kW
PRF (pps):	900, 1800, 3600	900, 1800, 3600
Range:	20 yds to 64 nm	30 yds to 64 nm
Pulse width (µsec):	0.06, 0.5, 1	0.06, 0.5, 1.0
Scan rate:	33 rpm	33 rpm
Beam width:	0.7°, 0.9° 1.25°, 1.9°X 22°	2° X 25°
MTBF:	3,000-4,000 hr	

Design Features. The SPS-64(V) is the primary navigation radar onboard Coast Guard vessels, Army ships and naval auxiliaries as well as the secondary surface search/navigation radar on many naval combatant vessels.

The SPS-64 is a modular system designed for adaptability in meeting specific mission requirements. There are 18 variations of the basic sensor, designated SPS-64(V)1 through SPS-64(V)18, using a building-block approach that permits users to choose the components that best meet their radar requirements and combat system integration needs.

The radar provides exceptional range and azimuth resolution for navigation and pilotage. An ESM interface prevents interference from other ship radars. A fire control interface distributes video, trigger and azimuth information to ship fire control systems.

Advanced design techniques minimized size, weight, and power consumption, while maximizing reliability and performance. The system combines high transmitter power, high pulse repetition rate, narrow antenna beamwidth, a sensitive receiver and a digitally enhanced display. It can provide data to one or more SPA-25 indicators, a blanking signal to the SLA-10 Blanker/ Video Mixer Group, and accept ship's gyro inputs.

System Components:

High-powered S-band search radar
12-foot antenna array (AS-3195)
Drive pedestal (AB-1248)
60 kW S-band receiver-transmitter (RT-1241A)
50 kW X-band receiver/transmitter (RT-1342B)
optional 20 kW available
High-resolution X-band navigation radar
six-foot antenna array (AS-3194)
9 and 12-foot arrays are available
Interswitch unit (SA-2308)

Indicators:

RAYCAS V CIC 16-inch Bright Display (target tracking, navigation, and tactical data)

RAYPATH 12- or 16-inch Bright Display (radar information, collision avoidance, navigation data)

The RT1246A Receiver Transmitter operates at 9.3 MHz, with a peak power output of 20 kW. The Antenna Array (AS-3194) and Antenna Pedestal (AB-1247A) provide 33 rpm rotation, with a 1.2° horizontal bandwidth. Contact data are updated every two seconds.

The Interswitch Unit (SA-2308) makes it possible to select any Indicator/Receiver/Transmitter combination. For example, in the CIC, the RAYCAS V indicator could be connected to the S-band radar and the Bridge RAYPATH indicator to the X-band radar. The X-band system provides better resolution in standard weather conditions and is more suitable for harbor and river navigation. In good weather conditions, the S-band radar provides better range performance on low-lying targets just above sea level.

As a backup, either radar can be connected to either indicator. This can be an advantage in adverse weather conditions. Because of the characteristics of the operating frequency, the S-band radar has been shown to give 30-60 percent better range performance than the X-band system in heavy rain. The reflected energy from a choppy sea is 19 dB greater in the X-band than in the S-band. As a result, S-band radars display small targets in dense sea clutter at two to three times greater range than the X-band.

The ESM Interface (AM-6933) provides two blanking pulse outputs, one for each radar transmitter, which can be connected to any ESM system or used to prevent interference with other radars.

A Fire Control Interface conditions and distributes radar video, trigger, and azimuth information to the ship's fire control system. The FCS can use the SPS-64 as a backup or alternate sensor. The interface also allows the fire control radar data to be displayed on the RAYCAS V or RAYPATH indicators. There is a synchronization mode which allows the X-band navigation radar transmitter to be slaved to the fire control radar to prevent interference.

Operational Characteristics. The system is adapted for close-in navigation in harbor channels and congested waterways, as well as longer-range surveillance as needed. The radar provides all-weather performance. Display choices include relative, true motion, and collision

avoidance modes. The displays feature direct daylight viewing or effective night operations without a hood. The display can also be offset to extend the forward view up to 70 percent.

The True Motion Unit electronically plots and shows the true or relative course of up to eight selected targets. The Anti-Collision Unit (CAS) automatically evaluates a target's track to instantaneously determine a collision avoidance course (or target intercept course).

The RAYPATH 12-inch PPI is used with the (V)11 version of the system and can automatically track up to 20 targets within 20 nm of the ship. It displays target CPA, course/speed, bow crossing distance, and warning of targets which violate CPA/TCPA (Closest Point of Approach/Time to CPA) thresholds set by the operator.

The RAYPATH display can be selected to show target true or relative vectors, and has a true-motion and trial maneuver capability which makes it possible to analyze proposed evasion maneuvers. An Autodrift capability corrects for errors in own-ship speed and heading, and stabilizes the scope presentation.

The RAYCAS V 16-inch PPI was designed for operations in a Combat Information Center (CIC). It is used with the (V)6 and (V)10 versions of the radar and is able to automatically track up to 20 targets within 40 nm of the ship. It provides direct readouts of target range/bearing and course/speed, automatically calculating intercept course and speed. True or relative target vectors can also be displayed.

The RAYCAS V system can display up to 20 ground-stabilized true marks for on-screen marking or reference. It can also display up to 16 ground-stabilized navigational segments for boundaries, danger zones, etc. The display has an automatic Constant False Alarm Rate (CFAR) capability and an optional ability to display up to 1500 geographic data points. Indicator control functions provide selectable range scales out to 64 nautical miles, fixed-range rings for target range estimation, digital LED readouts of exact target range and bearing, and the ability to offset the carrying ship's position on the display. With a gyro input, the indicator will provide a continuous digital readout of the ship's true course and the option of a stabilized “North-up” presentation.

Variants/Upgrades

The variants are combinations of the basic radar with different antennas, displays and interface units tailored to the needs of the ships carrying them.

SPS-64(V)1 Coast Guard system with the six-foot X-band antenna, a 20 kW transmitter and a single 12-inch display. Civil equivalent, RM 1220 6X.

SPS-64(V)2 Coast Guard system with the six-foot X-band antenna, two 20 kW transmitters, one 12-inch and one 16-inch display. Civil equivalent, RM 1220 6X.

SPS-64(V)3 Coast Guard system with two six-foot X-band antennas and two 20 kW transmitters, two 12-inch and one 16-inch display. Civil equivalent, RM1220 6X or RM 1220 6X RM16.

SPS-64(V)4 Coast Guard system with one six-foot X-band antenna, one 12-foot S-band antenna, one 20 kW X-band, one 60 kW S-band transmitter, one 12-inch and two 16-inch displays. Civil equivalent, RM 1220 6X or RM1660 12S RM16.

SPS-64(V)5 Army system using one six-foot X-band antenna and 20 kW transmitter, with one 16-inch display. Civil equivalent, TM 1620 6X.

SPS-64(V)6 Coast Guard system with one six-foot X-band antenna, one 12-foot S-band antenna, one 50 kW X-band and one 60 kW S-band transmitter, with one 12-inch and one 16-inch display. Civil equivalent, RM 1250 6X or RAYCAS 1660 12S.

SPS-64(V)7 Coast Guard system with one six-foot X-band antenna, a 20 kW X-band transmitter and one 12-inch display. Civil equivalent, RM 1025 6X.

SPS-64(V)8 Coast Guard system with one six-foot X-band antenna, a 20 kW X-band transmitter and one 16-inch display. Civil equivalent, RM 1025 6X.

SPS-64(V)9 Navy system with one six-foot X-band antenna and a 20 kW transmitter, with one 12-inch display. Civil equivalent, RM 1220 6X.

SPS-64(V)10 Coast Guard system with two six-foot X-band antennas, two 20 kW X-band transmitters, one 12-inch and one 16-inch display. No civil equivalent listed.

SPS-64(V)11 Coast Guard system with one six-foot X-band antenna, one 20 kW X-band transmitter and one 12-inch display. Civil equivalent, RAYPATH 1225 6X.

SPS-64(V)12 Army system with a 10 kW X-band transmitter and one 12-inch display. Civil equivalent, 1210 4X.

SPS-64(V)13 Army system with a 10 kW X-band transmitter and one 10-inch display. Civil equivalent, 1010 E 4X.

SPS-64(V)14 Army system with one 10 kW transmitter and radome, with one 10-inch display. Civil equivalent, 1010 E D.

SPS-64(V)15 Navy system with one six-foot X-band antenna and a 50 kW transmitter, with one 16-inch display. Civil equivalent, RM 1650 6X or RAYCAS V.

SPS-64(V)16 Army system using one six-foot X-band antenna, a 50 kW transmitter and one 16-inch display. It includes the Collision Avoidance System. Civil equivalent, RAYPATH 1650 6X.

SPS-64(V)17 Army system with one 12-foot S-band antenna and 60 kW transmitter, with one 16-inch display. Civil equivalent, RAYPATH 1650 12S.

SPS-64(V)18 Navy system, using one 9-foot X-band antenna, a 50 kW transmitter and one 16-inch display. Civil equivalent, RAYCAS 1650 9X NWU-51.

FPS-121 This is a basic SPS-64 installed by the Coast Guard in the Houston-Galveston shipping channel for vessel traffic control.

Program Review

Background. Development of the SPS-64 began in 1976. There has been a steady market for the system, with some older models being upgraded or replaced by newer ones.

Raytheon continues to work on modifications and improvements to the SPS-64. The Navy is retrofitting the Computerized Collision Avoidance System to many early model radars in service and retrofitting SPS-64s to ships that lack the system.

In February 1991, the US Coast Guard issued a sources-sought announcement to determine availability of marine surface search radar equipment "should the US Coast Guard consider modernization of the present system SPS-64."

In February 1996, the Coast Guard awarded the Hughes Aircraft Company a multi-year contract to design, fabricate, and install advanced surface search radar systems on Hamilton-class (WHEC-378) High Endurance Cutters and WPB-110 Island-class Patrol Boats. The contract contained options for up to 791 systems over four years. The SSR would become the next-generation USCG and USN and provide improved performance by incorporating advanced digital technologies. It would be specifically designed to better incorporate and integrate a ship's full sensor suite and control systems.

Eventual use on 14 classes of ships as well as shore-based vessel control radars. Larger ships would be configured with X- and S-band sensors and share radar image/track information on several color raster-scan displays. The new consoles would incorporate the newest interface designs and include International Maritime Organization compliant automatic radar plotting aid (ARPA) display.

Furuno USA and Offshore Systems Ltd. were teamed with Hughes Aircraft Company (now Raytheon Systems Company, Sensors & Electronic Systems) on the project. The SPS-73 radar is going into production.

Funding

Funding is from shipbuilding accounts and not broken out separately.

Recent Contracts

No recent DoD contracts over US$5 million recorded.

Timetable

Year	Major Development
1976	Development began
1981	Entered Operational Service
1996	USCG procurement of replacement SPS-73 begins

Worldwide Distribution

The system is in worldwide use. Known distribution is:

Australia. 10 systems
Germany. more than 180 systems
Spain. 8 systems
Republic of South Korea. 25 systems in service
Thailand. 2 systems
Turkey. 24 systems
United States.

US Coast Guard:
WHEC 715 Hamilton class high-endurance cutters
WHEC 901 Bear class medium-endurance cutters
WMEC 615 Reliance class medium-endurance cutters
WMEC 38 Storis class medium-endurance cutters
WMEC 76 Cherokee class medium-endurance cutters
WMEC 167 Diver class medium-endurance cutters
WAGB 4 Glacier class icebreakers
WAGB 10 Polar Star class icebreakers
WLB 291 Balsam class buoy tenders
WPB Point class large patrol craft
WPB Cape class patrol craft
WPB Island class patrol craft
WSES Sea Bird class patrol craft
WTGB 101 Katmai Bay class ice breaking tugs
WIX 327 *USCGS Eagle* sail training ship

US Navy:
Various non-combatants and combatants, over 245 units

US Army:
Various ocean-going tugs, 35 units

The commercial version of the radar is in use on over 5,000 vessels worldwide.

Forecast Rationale

The SPS-64 series of radars, and their civilian counterparts, are very successful and one of the standard primary or secondary naval navigational radars worldwide. Aside from its popularity in the United States, the system has been successful in the foreign market, where it is in service with at least six navies. The success in the export market is an outgrowth of the radar's reputation for quality, since it is in competition with many commercial/naval radars manufactured by international companies.

Since this is a navigational rather than combat radar, there is less need to update its capabilities to keep abreast of a particular threat, reducing the requirement for major upgrades or replacement. Minor and routine upgrade modifications have focused on enhancing specific performance areas or interfaces with outside data users.

The Coast Guard, in mid-July 1993, issued a notice that it was integrating the Electronic Chart Precise Integrated Navigation System (ECPINS) with the SPS-64. ECPINS integrates a ship's position and the radar image of the ship's radar display. It interfaces with the Differential GPS, GPS, Stepper or Synchro GYRO, and Loran-C.

The US Navy and Coast Guard SPS-64 procurement and retrofit programs are essentially complete. Raytheon continues to market the system to foreign clients, with three Third World navies continuing discussions which may lead to a limited procurement.

Research and development on some modifications and upgrades will continue, but there is no pressing need for major upgrades. Support requirements, because of the large number of systems in use, will be heavy through the

life of the radar, which will extend well into the next century.

The Coast Guard originally expressed an interest in market sources for a similar radar, not because of dissatisfaction with the existing systems but rather the prudent step of determining if there is any new technology available for application to their vessels.

The SPS-64 is older technology and replacement makes it possible to take advantage of today's digital information processing advances. Acquiring a new radar with the appropriate capabilities is more cost effective than trying to adapt the old system. The SPS-73 program does just that. It will replace a tried and true system with a truly new generation sensor better adapted to interfacing with a ship's control system.

Ten-Year Outlook

Minimal further production of the SPS-64 expected. The commercial versions will remain active on the market.

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