

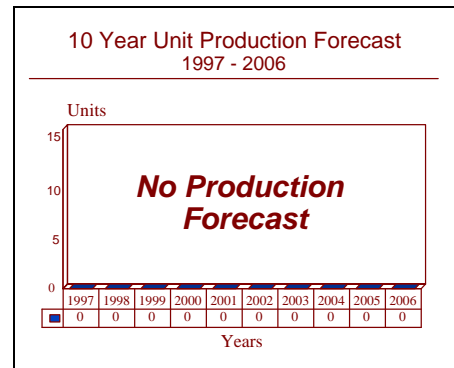
ARCHIVED REPORT

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WLR-8(V) - Archived 10/97

Outlook

- Production complete
- To be replaced by new submarine ESM system
- Limited upgrades to keep up with mission requirements



Orientation

Description. Submarine Tactical Electronic Warfare and Surveillance receiver.

Sponsor

US Navy
Space & Naval Warfare Systems Command
(SPAWAR)
Crystal Park, Building #5
Arlington, Virginia (VA) 22202
USA
Tel: +1 703 602 8954

Contractors

GTE Government Systems Corp
400 John Quincey Adams Rd
Taunton, Massachusetts (MA) 02780-4466
USA
Tel: +1 508 880 4466
Fax: +1 508 880 4316
(Prime)

ARGOSystems Inc

430 N. Mary Ave
PO Box 3452
Sunnyvale, California (CA) 94088
USA
Tel: +1 408 524 1771
Fax: +1 408 737 9236
(Receiver)

Lockheed Martin Corp
6801 Rockledge Drive
Bethesda, Maryland (MD) 20817
USA
Tel: +1 301 897-6711
Fax: +1 301 897-6800 fax
(Improvements)

Status. In service, ongoing logistics support.

Total Produced. An estimated 96 systems have been produced.

Application. The WLR-8 Surveillance Receiver is a tactical electronic warfare and surveillance receiver for submarines. It performs a Signal Intelligence (SIGINT) mission.

Price Range. Estimated unit cost is US\$550,000 (\$FY90).

Technical Data

Frequency range: 50 MHz to 18 Ghz
 WLR-8(V)2: 500 Mhz to 18 Ghz

Design Features. The WLR-8(V) is a digitally controlled, spectrum scan and analysis receiver. It is made up of seven superheterodyne RF tuners, all of which are YIG-tuned, with the exception of a vector-tuned lower band. Outputs from RF tuners are analyzed on a first come, first served basis by the processor. In order to minimize the intercept time and maximize the probability of intercept, the system uses a programmable frequency search strategy with parallel tuning across multiple bands.

Two computer systems serve as the functional and processing center of the WLR-8(V) system. A GTE PSP-300 computer performs system control, automatic signal acquisition, and analysis. A PSP-200 micro-computer provides hardware control functions.

The solid state system uses digital techniques throughout. It can report data directly to onboard Navy Tactical Data Systems (NTDS). Depending on the installation and variant, one or more display consoles provide the operator with visual threat displays, including the direction of arrival of a received signal.

The console contains the control, display and processing unit. Two oscilloscope traces can be switched to any tuner for PAN or time display. Two time-band traces and one PAN trace are used for Amp/Demod analysis display. The WLR-8(V) can expand its frequency or signal-handling capability through hardware additions and software changes.

The system's modular design facilitates the replacement of components during repair or upgrade. Expansion modules are available to increase the capabilities of an installed system. The direction-finding of the WLR-8(V) can be accomplished through a number of

existing antenna designs, and the entire system can be integrated into other onboard defensive systems.

The WLR-8(V) is not a standard fit, since not every boat in a class is equipped with the system. It is compatible with the Navy Tactical Data System (NTDS).

Operational Characteristics. The WLR-8 can sequentially or simultaneously scan over its frequency range. It measures the direction of arrival, frequency, modulation, PRF, pulse width, amplitude and scan interval of received signals and can be set to search frequency segments of interest and trigger threat warnings if certain signals are detected. It is primarily an ESM receiver, since it does not automatically direct countermeasures or weapons systems.

The WLR-8(V)'s operational facilities include:

- Automatic measurement of signal direction of arrival.

- Signal recognition and classification.

- Simultaneous or sequential scanning over a wide frequency range.

- Signal activity detection for threat warning.

- Analysis of signal parameters such as frequency, PRF, modulation, pulse width, amplitude, and scan rate.

- Logging of signal parameters for display and hard copy printout.

- Built-in test equipment.

- Directed priority searches of specific frequency segments.

Variants/Upgrades

The system is built in various configurations for submarines and large surface ships. There are four basic versions:

WLR-8(V)1 The basic system, never built in this variant.

WLR-8(V)2 For SSN-688 class submarines. Added automatic signal acquisition, parameter measurement, and threat-alarm capability.

WLR-8(V)3 Was the surface ship variant; only three were produced.

WLR-8(V)4 Mod 1 Included a Threat Early-Warning Mode and more automation. Changes capitalized on submarine experience and many of the features were included in the (V)2.

WLR-8(V)5 For *Ohio*-class submarines.

WLR-10 A threat warning system deployed with WLR-8.

Program Review

Background. The WLR-8(V) was developed in the late 1970s to combat the threat of radar-guided anti-ship missiles, and to address the Navy's need for a cost-effective threat warning system that could supply both automatic detection and analysis from a single console. It was designed for fitting into both surface ships and submarines.

The initial work on the WLR-8 started with the (V)2 variant in 1971, five sets for submarine operation. The first system passed its at-sea tests and received approval for use in 1973.

The WLR-8(V)4 unit incorporated both hardware and software changes from the WLR-8(V)2 to provide additional capabilities for large surface ships. Three (V)4 units were produced; one was used for shore-testing, and another was installed on the *USS Enterprise* for at-sea testing.

In September 1983, the Navy canceled plans to procure the WLR-8(V)4 and instead decided to buy additional WLR-1H systems. In testimony before the House Appropriations Defense Subcommittee, the Navy said that while the performance of the two systems was comparable, procuring the WLR-1H would save considerable procurement money.

In addition, the Navy said "a shipyard availability is required to install the WLR-8(V)4 system but not the WLR-1H." The Navy also said "the WLR-1H was expected to demonstrate superior reliability and maintainability."

However, a *Commerce Business Daily* notice issued in December 1986 mentioned that the US Navy was planning to spend US\$150 million for the WLR-8(V) in the FY88 to FY93 time frame.

In 1991, ST Research was awarded a contract to develop and produce High Probability of Intercept (HPI) Field Change Kits for the WLR-1H and WLR-8. The US\$31 million contract was to be completed in May 1995. Work began in February 1991 with the first deliveries scheduled in August 1992.

An interesting factor of this contract is that it was competitively procured as a small business set-aside. Company officials noted that their efforts to get the procurement targeted for a small business was unusual. Typically, a major program of this type is awarded to a large, rather than small company.

The HPI kits are especially important in improving the radar-detecting capability of SSN-688 Fast Attack and SSBN 726 *Trident* submarines.

Funding

Funding is from O&M accounts.

Recent Contracts

No recent contracts over US\$5 million recorded.

Timetable

	1971	Development began
	1977	Initial development completed
	1978	Initial testing conducted on <i>USS Enterprise</i>
Jan	1979	First production order
Apr	1984	Navy requested WLR-1(V) in lieu of WLR-8(V)
	FY86	Funding resumed. Completion of WLR-8(V)2 upgrade
	1991	High Probability of Intercept kit development awarded
Aug	1992	First HPI kit deliveries
May	1995	HPI development complete

Worldwide Distribution

This is a US only program.

Forecast Rationale

The Navy is now very interested in systems that combine signal interception and identification for the highly specialized, submarine surveillance mission. This is important in the evolving operational climate faced by today's Navy. At the present, the ability to monitor and verify treaty compliance is very important. Operation Desert Shield/Desert Storm proved the viability of using submarines in conjunction with surface ships for intelligence gathering for conventional and contingency operations.

Because of their stealthiness and independence, submarines can more actively perform intelligence gathering for theater commanders. Their ESM equipment will be very important in widespread undersea operations, a change from the former limited strategic nuclear deterrence and Soviet anti-submarine role.

The WLR-8 is an old, but adequate design; newer systems, with higher processing speed and power, will overshadow the WLR-8 and eventually take over its mission. The recent High Probability of Intercept development, however, will establish an enhanced capability to accomplish a variety of signals-intercept missions, extending its operational life.

Production of the WLR-8(V) is complete. The most recent new-production order for this customized system was for new-build SSN 688 *Los Angeles*-class attack submarines and SSBN 726 *Ohio*-class ballistic missile boats. The last deliveries were completed in 1993.

The WLQ-4(V), instead of the WLQ-8, is programmed for the SSN-21 *Seawolf*-class submarines. The next-generation submarine planned for the end of the decade will use new ESM equipment yet to be developed.

Ten-Year Outlook

No further production expected.

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