

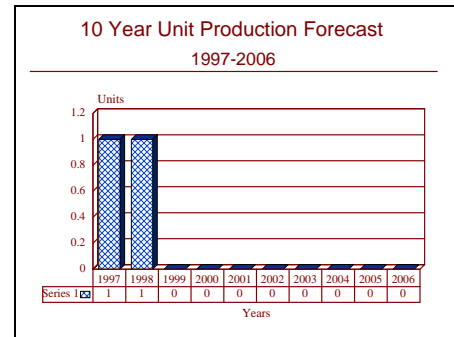
# ARCHIVED REPORT

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## WLR-1H(V) - Archived 10/97

### Outlook

- Limited procurement for submarine force
- Upgrades to continue to support new submarine missions
- ESM has become important in the littoral environment



### Orientation

**Description.** This is a passive radar detection set.

**Sponsor**

US Navy

Space & Naval Warfare Systems Command  
(SPAWAR)

Crystal Park, Building #5  
Arlington, Virginia (VA) 22202  
Tel: +1 703 602 8954

**Contractors**

ST Research Inc

8419 Terminal Rd  
Newington, Virginia (VA) 22122  
USA

Tel: +1 703 550 7000

Fax: +1 703 550 7470

(Production)

ARGOSystems Inc

430 N. Mary Ave  
PO Box 3452  
Sunnyvale, California (CA) 94088  
USA

Tel: +1 408 524 1771

Fax: +1 408 737 9236

(Signal processor)

Sanders, a Lockheed Martin Co

95 Canal St  
Nashua, New Hampshire (NH) 06060  
USA

Tel: +1 603 885 4321

Fax: +1 603 885 3655

(Test equipment)

**Status.** In service, continued production, ongoing logistics support.

**Total Produced.** Through 1995, an estimated 133 units had been produced.

**Application.** The WLR-1H(V) is installed on a variety of submarines, cruisers, destroyers, and frigates.

**Price Range.** The cost of an upgrade kit is estimated to be US\$900,000 (FY83\$).

## Technical Data

Frequency range:	550 MHz to 20 GHz (in 6 bands)
Dynamic range:	60 dB
Band scan:	100°sec (all bands simultaneously)
Limits:	
Pulse width	1 - 50,000° sec
PRF	20 Hz - 2 MHz
Bandwidth	20 MHz
Signal tracking:	300 emitters
Display:	54 lines (80 alphanumeric characters each)
Sweeps:	6 (one per band)
Alarms:	Audio and visual
Automatic Analysis:	Frequency PRI Pulsewidth Angle of arrival Scan type Scan period Pulse amplitude Beamwidth
Library:	80 threats 300 radars 1500 radar modes 150 platforms
DF Modes:	Automatic Manual Back-up

**Design Features.** The WLR-1H(V) is the standard radar warning receiver for the US Navy and consists of the Signal Acquisition System (SAS) and/or upgraded Acquisition System (USAS), the Signal Processing Unit (SPU), the Emitter Classification Unit (ECU), Built-in-Test Equipment (BITE), and Direction Finding Enhancement Modules (DFEM). It incorporates a variety of antennas to cover the threat spectrum.

The enhanced system uses a faster scanning technique than the original WLR-1, which was manually tuned. It can capture and analyze many emitters simultaneously. Tuners are microprocessor-controlled by a central processor management system. The system library stores parameters for 80 threats, 300 radars, 1500 radar modes, and 150 platforms. Received signals are digitized and up to three can be interleaved in each band. This makes it possible to analyze and display six sweeps and store up to eight frequencies for display.

Current efforts are designing High Probability of Intercept field change kits for this and the WLR-8 ESM receiver.

**Operational Characteristics.** The WLR-1(V) was designed to receive and detect the radar transmissions used to guide anti-ship missiles. The WLR-1(V) is a passive receiver tied into active jammers and defensive missile fire-control systems. The system was originally designed to work against the Soviet *Styx* shipborne surface-to-surface missile, but has since been enhanced to intercept the signals associated with a wide variety of threats.

The ESM system has a built-in threat library and automatic search and identification capability which compares received signals to the characteristics of those in the library. The WLR-1H retains the individual signal manual-analysis capability of the older units.

The Direction Finding (DF) modes provided by the system are: automatic, manual, and backup. The system automatically analyzes the frequency, PRI, pulse width, angle of arrival, scan type, scan period, pulse amplitude and beamwidth characteristics of received signals.

## Variants/Upgrades

All original WLR-1 variants have been phased out. The WLR-1G was the top-line original version, covering nine bands by analyzing only one signal at a time.

WLR-1H(V)1 is the current standard.

WLR-1H(V)3 uses a new set of fixed antennas with servo-controlled spinners. The fixed units obtain course

DF data (by amplitude and phase, interferometer, comparison). This variant features long-range and high sensitivity as well as improved probability of intercept because of its computer-controlled receivers, automatic signal analysis and threat warning, as well as automatically tasked monopulse DF.

## Program Review

**Background.** The WLR-1 has been in service for nearly 25 years. The program has been kept alive by technology insertion, or what is now commonly known as Pre-Planned Product Improvement (P<sup>3</sup>I). The Navy has been upgrading the WLR-1 by redesigning subassemblies on a form, fit, and function basis.

In 1979, contracts were let to ST Research and ARGOSystems to upgrade the WLR-1 with improved signal processing equipment and other upgraded WLR-1 components. The eventual result was the WLR-1H.

During 1981, ST Research began to upgrade the WLR-1G signal acquisition interface. At the same time, ARGOSystems began developing improvements to the WLR-1G upgrade signal processing units (ADMs) as a result of integration and sea tests.

The Navy reported in 1980 that it wanted to replace the WLR-1 with the SLQ-17 and SLQ-32 electronic countermeasures system. The service requested no funding for the WLR-1 from FY80 through FY84. However, problems with the SLQ-17 and SLQ-32 systems led the service to reconsider its position and re-initiate funding for the WLR-1 in FY85.

In September 1983, the Navy canceled plans to procure the WLR-8(V)4, opting instead to buy four more WLR-1H(V)s. In testimony before the House Appropriations Defense Subcommittee, the Navy said that, "while the performance of the two systems is comparable, procuring the WLR-1H(V) would save considerably." A WLR-1H(V) costs about US\$0.9 million compared to the US\$1.9 million unit cost of the WLR-8. In addition, the Navy said "a shipyard availability was required to install the WLR-8(V)4, but is not required to install the WLR-1H(V).

In 1988, there were reports that the US Navy was again considering using the WLR-1H(V) instead of the

WLR-1H(V) because of problems with the latter. There was a notice in a September 1988 issue of the *Commerce Business Daily* which said the Navy intended to hold a limited competition procurement between ARGOSystems and ST Research for the fabrication of one WLR-1H(V)3 and four WLR-1H(V) systems, with options for six WLR-1H(V)s, one upgrade WLR-1H(V), and three WLR-1H(V)3s, plus engineering, technical services and associated data.

In April 1989, ARGOSystems was awarded a contract for an unspecified number of systems. Some of the units had been sold for foreign applications, since the WLR-1(V) has proved to be popular overseas, particularly in equipping ex-US *Gearing* class destroyers transferred to such nations as the Republic of Korea, Pakistan, Spain, Taiwan, and Turkey. It is also used on *Guppy*-class submarines in several international navies.

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. The first deliveries were scheduled for 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 will be especially important in improving the radar-detecting capability of SSN-688 Fast Attack and SSBN-726 Trident submarines.

In the Fall of 1994, the Navy announced a solicitation for four WLR-1H(V)3 systems, excluding the Single Package Antenna. The contract was to be awarded sole source to ARGOSystems.

## Funding

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	US FUNDING							
	FY94		FY95		FY96		FY97 (Req)	
	QTY	AMT	QTY	AMT	QTY	AMT	QTY	AMT
<u>Procurement</u> (USN)								
WLR-1	-	3.7	-	6.8	-	2.8	-	0.2

All US\$ are in millions.

## Recent Contracts

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No recent contracts over US\$5 million listed.

## Timetable

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	1960s	Initial system developed
	1979	WLR-1(H) variant development began
	1991	HPI Upgrade development begins
	1992	First HPI deliveries
Sep	1994	Solicitation for four WLR-1H(V)3
	1995	HPI contract complete

## Worldwide Distribution

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The WLR-1(V) is in widespread use with navies all over the world, particularly onboard ex-Gearing class destroyers that the US Navy has transferred out of US inventory over the years.

**Australia.** Carries three WLR-1(V)s on its *Adams*-class destroyers.

**Brazil.** Carries six WLR-1s on its *Garcia*-class destroyers.

**Germany.** Carries the system on its four *Rhine* missile boat tenders.

**Greece.** The Greek Navy uses the WLR-1(V) onboard its two ex-*Guppy* class submarines and one ex-*Sumner* FRAM II class, one ex-*Gearing* FRAM II and six ex-*Gearing* FRAM I class destroyers.

**Indonesia.** Three ex-*Claud Jones* class frigates transferred from the US use the WLR-1C.

**Iran.** WLR-1 onboard two ex-*Sumner* class FRAM II destroyers transferred in 1972 from US inventory.

**Republic of Korea.** The Korean Navy uses the WLR-1(V) onboard its nine ex-*Gearing* FRAM I and II destroyers transferred from the US Navy.

**Mexico.** The Mexican Navy uses the WLR-1(V) onboard its two ex-*Gearing* FRAM 1 and one *Gearing*- class destroyers transferred from US inventory.

**Pakistan.** The Pakistani Navy uses the WLR-1(V) onboard its seven ex-*Gearing* FRAM I and *Garcia*-class destroyers, all transferred from US inventory.

**Peru.** Carries a WLR-1 on its *Guppy*-class submarine.

**Philippines** Carries one system on a *Cannon*-class frigate.

**Spain.** The Spanish Navy uses two WLR-1(V)s on its *Paul Revere*-class transports.

Taiwan. The Taiwanese Navy uses the WLR-1(V) on board its two ex-*Guppy* II class submarines and four ex-*Gearing* FRAM I and II destroyers.

Thailand. The WLR-1(V) is in use onboard only one ship, an ex-US *Cannon* class frigate.

Turkey. Turkey carries the WLR-1(V) onboard two ex-*Carpenter* FRAM I class, eight ex-*Gearing* FRAM I and II, one ex-*Sumner* FRAM II, and one ex-*Robert Smith* class destroyers — all transferred from US inventory — as well as two Turkish-built *Berk* class frigates.

US. The US Navy carries the WLR-1 on one AGI *La Salle*, three *Leahy*-class cruisers, two guided missile cruisers, three *Nimitz*-class carriers, one on the aircraft carrier *John F. Kennedy*, one on the carrier *America*, two Knox frigates, twelve *Hamilton*-class Coast Guard Cutters, and three *Los Angeles*-class attack submarines.

## Forecast Rationale

The WLR-1 has served the fleet for well over two decades, with the enhanced WLR-1H version the standard for the missions it performs. The Navy is now more interested in systems that combine signal intercept and identification with active jamming capability, such as the SLQ-32 and its probable follow-on Advanced Intelligence and Electronic Warfare System (AIEWS) for surface ships.

These signal intercept systems will become increasingly important for monitoring and verifying treaty compliance. Operation Desert Shield/Desert Storm proved the viability of using submarines and surface ships in combination for intelligence gathering to support conventional and contingency operations.

The Navy is changing basic submarine missions from anti-Soviet maritime operations to contingency support and littoral operations. Because they are stealthy, submarines will be more actively involved in intelligence gathering for theater commanders, the ESM equipment will be used in widespread operations instead of a limited strategic nuclear deterrence and anti-submarine role.

Major new procurement of the system is unlikely, although upgrade activity could be significant as foreign navies struggle to improve military capability with limited

budgets. WLR-1H(V) missions have been taken over by newer electronic countermeasures equipment, such as the SLQ-32 and variants. These newer systems can detect and analyze a wider range of threats and often incorporate a jamming capability; but they cannot replace the highly specialized submarine equipment.

The submarine force is becoming more and more important in signals-intercept operations. The need for dedicated ESM equipment will increase as the submarine mission transitions from strategic deterrence to contingency mission support. Limited production is to meet existing requirements, not the start of a major new or on-going procurement. Newer systems can be designed to take advantage of technology and software developments.

In-service WLR-1H(V)s will continue to be used for specialized mission-support backup in larger navies and as sole EW equipment in others. This will support an international spare and repair parts requirement, at least through the end of the decade. The level of support will fall as older hulls are retired or are totally refitted.

Technology insertion and upgrade modifications will continue through at least the middle of the reporting period.

## Ten-Year Outlook

ESTIMATED CALENDAR YEAR PRODUCTION

Designation	Application	High Confidence Level				Good Confidence Level				Speculative		Total 97-06	
		thru 96	97	98	99	00	01	02	03	04	05		06
WLR-1H(V)	VARIOUS (VARIOUS)	135	1	1	0	0	0	0	0	0	0	0	2
Total Production		135	1	1	0	0	0	0	0	0	0	0	2