

# ARCHIVED REPORT

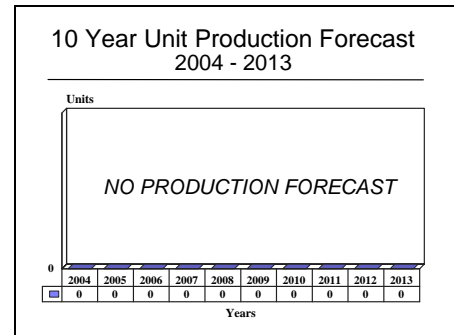
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## S-3 WSIP - Archived 11/04

### Outlook

- Program reaching completion, primary RDT&E funding has been scheduled to stop after FY03
- Barring any future developments this report will be archived in 2004



### Orientation

**Description.** The S-3 Weapons System Improvement Program (WSIP) is a series of modular improvements to improve the S-3 aircraft's effectiveness against current and future threats.

#### Sponsor

U.S. Navy  
Naval Air Systems Command  
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Washington, DC 20361-0001  
USA  
Tel: +1 202 692 2260

Naval Air Warfare Center  
Aircraft Division Warminster  
Warminster, Pennsylvania (PA) 18974  
USA

#### Contractors

Lockheed Martin  
Aeronautics Company  
86 South Cobb Drive  
Marietta, Georgia (GA) 30063-0264  
USA  
Tel: +1 770 494 4411  
Web site: <http://www.lmaeronautics.com>

Cubic Corporation  
Cubic Defense Systems  
9333 Balboa Avenue  
San Diego, California (CA) 92123

USA  
Tel: +1 858 277 6780  
Web site: <http://www.cubic.com>  
(ARS-4 sonobuoy bearing receiver sets)

BAE Systems  
Advanced Systems-Greenlawn  
(formerly Marconi Aerospace Systems Inc)  
One Hazeltine Way  
Greenlawn, New York (NY) 11740-1600  
USA  
Tel: +1 631 261 7000  
Fax: +1 631 262 8002  
Web site: <http://www.as.na.baesystems.com>  
(ARR-78(V) advanced sonobuoy communications link)

L3 Communications  
(formerly Lockheed Martin Display Systems)  
600 Third Avenue  
New York, New York (NY) 10016  
USA  
Tel: +1 212 697 1117  
Web site: <http://www.l-3com.com>  
(Display generators)

Boeing Co  
7755 East Marginal Way South  
Seattle, Washington (WA) 98108  
USA  
Tel: +1 206 655 2121

Web site: <http://www.boeing.com>  
 (AWG-19(V)3 Harpoon armament control system)  
 DRS Technologies  
 Corporate Headquarters  
 5 Sylvan Way  
 Parsippany, New Jersey (NJ) 07054  
 USA  
 Tel: +1 973 898 1500  
 Fax: +1 973 898 4730  
 Web site: <http://www.drs.com>  
 (AQH-7 recorder/producer)

Northrop Grumman  
 (formerly Litton Guidance & Control Systems)  
 21240 Burbank Boulevard  
 Woodland Hills, California (CA) 91367-6675  
 USA  
 Tel: +1 818 598 5000  
 Web site: <http://www.northropgrumman.com>  
 (Communications control groups)

Raytheon Company  
 2501 S. Highway 121  
 PO Box 405  
 Lewisville, Texas (TX) 75067  
 USA  
 Tel: +1 972 462 6500  
 Web site: <http://www.raytheon.com>  
 (APS-137 ISAR, radar test sets)

**Status.** Continued enhancements.

**Total Produced.** Not applicable, as this is a funding program.

**Application.** Modifies the S-3A to S-3B configuration by retrofitting improved avionics and weapon subsystems to improve battle group outer zone anti-submarine warfare capability to meet current threats.

**Price Range.** The S-3A to S-3B upgrade costs approximately US\$5 million per aircraft.

## Technical Data

**Design Features.** The major activity under the S-3 Weapons System Improvement Program (WSIP) is the development of acoustic and non-acoustic equipment to improve the S-3 aircraft's mission effectiveness against current and projected threats.

Under the WSIP program, the Lockheed Sanders OL-82A acoustic processor has been updated for integration with the IBM UYS-1 processor; the Unisys AYK-10 general-purpose computer has been updated; the ARR-76 sonobuoy communications link has been replaced with the Hazeltine ARR-78 ASCL (Advanced Sonobuoy Communications Link); the Texas Instruments (now Raytheon) APS-116 radar has been upgraded to incorporate inverse synthetic aperture radar capability (redesignated APS-137); and the Loral ALE-39 chaff/flare dispenser has been modified with the addition of the McDonnell Douglas Harpoon missile system.

The S-3 WSIP project was initiated as part of the S-3 Block Upgrade I (OSIP 109-87) program. In addition to the WSIP, the Block Upgrade I encompasses avionics improvements such as a new display generator unit for the ASA-82 tactical display system; an inter-communication system communication control group; an improved off-line on-top position indicator; and a memory stack replacement for the AYK-10 general-purpose airborne digital computer.

The original S-3B's avionics suite has consisted of the following:

- ARC-153 HF Radio Transceiver Set
- ARC-156 UHF Radio Transceiver Set
- ASA-84 Navigation Control
- ASN-170 Inertial Navigation System
- APN-200 Doppler Radar, Navigation System
- APN-201 Radar Altimeter & Altitude Warning System
- APN-202 Radar Beacon
- ARN-83 Automatic Radio Direction Finder
- ARA-50 UHF Automatic Radio Direction Finder Set
- ARN-84 Tactical Airborne Navigation Set
- APX-72 IFF Transponder Set
- APX-76 IFF Interrogator Set
- OR263 Forward Looking Infrared (FLIR) Set
- OK185 Search Stores Control Group
- ASQ-81 Magnetic Anomaly Detector Set
- ARS-4 Sonobuoy Reference System

ASQ-147 Integrated Control System

APR-76 Sonobuoy Receiver Set

ASA-65 Magnetic Compensator Set

ASW-33A Automatic Flight Control Set

New or upgraded equipment for the S-3 WSIP includes:

OK497 Intercommunication & Communication Control Set

OR89/OR263 Infrared Imaging System

ASA-82 Tactical Display System

AYK-10 General Purpose Airborne Digital Computer System

AWG-19(V) Harpoon Armament Control System

ASH-27 Analog Magnetic Tape Unit

ALR-76 Electronic Countermeasures System

ALE-39 Chaff, Flare Dispenser Set

ARS-2 Sonobuoy Reference System

OL-82A/AYS Acoustical Data Processor

OL-320/AYS Data Processing Memory Group

OU78/AP Radar Set Converter Control System

RD348/ASH Digital Magnetic Tape Unit

CV2830/AYC Data Terminal Set

OA8770 Video Recorder

OK183 Armament System Control Group

APS-116/APS-137 ISAR

ARR-78(V) Sonobuoy Receiver

AQH-7 Analog Tape Recorder

UYS-1 Signal Processor

ALR-47 ECM System



U.S. Navy S-3B Viking

Source: U.S. Navy

## Variants/Upgrades

This program upgrades the S-3A to the S-3B.

## Program Review

**Background.** Under this program, 1970s-vintage S-3A anti-submarine warfare (ASW) aircraft are modified with improved avionics and weapon subsystems. With the enhancement, carrier battle group outer-zone ASW capability will be able to meet current threats.

The S-3 WSIP received initial funding (US\$41.7 million) in FY82. The U.S. Navy received US\$75.9

million and US\$60.2 million in FY83 and FY84, respectively. These funds were used to develop two S-3B full-scale engineering development aircraft, the first of which was delivered to Lockheed in November 1983 for conversion to the WSIP standard. It made its first flight in September 1984, followed by the second prototype, which flew the following year. Lockheed

conducted flight trials with both prototypes through August 1985, after which the S-3Bs were delivered to the U.S. Navy for further evaluation tests, which were completed in FY87.

**CPMU Project.** After a period of stagnation, modification efforts were rechanneled into a new project, one aimed at continuing previous modification plans and incorporating others. A new focus on heightened multimission operational capability prompted a development effort in conjunction with Canada to produce the Co-Processor Memory Unit (CPMU) open-architecture hardware. An aim of the project was to complete integration of this new CPMU and to test and rewrite Tactical Mission Program code into Ada high-order language.

The S-3 WSIP project reportedly entailed extensive CPMU-related testing. Developmental testing of the CPMU Engineering Demonstration Model hardware was performed in FY95. Follow-on test and evaluation of the CPMU was performed in FY96. Combined developmental and operational CPMU testing by the U.S. Navy was conducted in FY97.

Also found within the U.S. DoD 1999/2000 Biennial RDT&E Descriptive Summary was PE#0604261N – Acoustic Search Sensors. Under this program, funds have been put aside to ensure that sensors are interoperable with S-3 WSIP programs. It was unknown how much of the funds went toward S-3 programs.

Activities for 1998 and 1999 within PE#0604217N, S-3 Weapon System Improvement – Project H0489 S-3 WSIP included the continued development of Ada software for the CPMU and continued software/hardware development and integration, including the aviation depot level repair.

Throughout 2000 and 2001, a number of contracts were awarded by the U.S. Navy to Lockheed Martin for various projects related to S-3 aircraft. In FY00, software for the Surveillance System Upgrade (SSU) project was developed and integrated, and SSU-related integration was undertaken and testing conducted.

Support of Ada operational software development and testing continued throughout 2002.

## Funding

<b>U.S. FUNDING</b>									
	<u>FY02</u>		<u>FY03</u>		<u>FY04(Req)</u>		<u>FY05(Req)</u>		
	<u>QTY</u>	<u>AMT</u>	<u>QTY</u>	<u>AMT</u>	<u>QTY</u>	<u>AMT</u>	<u>QTY</u>	<u>AMT</u>	
<b>RDT&amp;E (U.S. Navy)</b>									
PE#0604217N									
S-3 Weapon System Improvement <sup>(a)</sup>									
Project H0489									
S-3 WSIP									
	-	0.4	-	0.4	-	0.0	-	0.0	
	<u>FY06(Req)</u>		<u>FY07(Req)</u>		<u>FY08(Req)</u>		<u>FY09(Req)</u>		
	<u>QTY</u>	<u>AMT</u>	<u>QTY</u>	<u>AMT</u>	<u>QTY</u>	<u>AMT</u>	<u>QTY</u>	<u>AMT</u>	
<b>RDT&amp;E (U.S. Navy)</b>									
PE#0604217N									
S-3 Weapon System Improvement <sup>(a)</sup>									
Project H0489									
S-3 WSIP									
	-	0.0	-	0.0	-	0.0	-	0.0	

All US\$ are in millions.

Source: U.S. DoD FY2004/2005 Budget Item Justification (RDT&E)

<sup>(a)</sup>PE#0604217N - S-3 Weapon System Improvement (WSIP) is a continuation of a series of progressive modular improvements implemented in 1993 that initiated Phase I of the WSIP modification intended to bring S-3A models to S-3B configuration.

## Recent Contracts

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<u>Contractor</u>	<u>Award (\$ millions)</u>	<u>Date/Description</u>
Lockheed Martin	5.4	Jun 2001 – Modification to previously awarded contract (N0019-00-C-0119) for full-rate production of 11 AYK-23 data processing sets, interim spares, Ada retrofit kit, and maintenance trainer engineering development model upgrade kit, and for end-of-life parts buy for the S-3B aircraft.
Litton	17.9	Jan 2002 – Ceiling-priced modification to previously awarded FFP contract (N00019-99-C-1128) to exercise an option for the Communications Control Group (CCG) upgrade modifications for the S-3B Viking aircraft. Work is expected to be completed by April 2004. The Naval Air Systems Command, Patuxent River, MD, is the contracting agency.
Raytheon	6.6	May 2002 – FFP contract for procurement of ARC-187 radio components for the P-3C and S-3B aircraft. The components include 78 RT-1571A receivers and transmitters; 78 AM-7373 amplifiers; 78 HD-1166 coolers; and 83 C-12435 controls. Work is to be completed by October 2004. Contract funds in the amount of US\$90,840 will expire at the end of the current fiscal year. The Naval Air Systems Command, Patuxent River, MD, is the contracting authority. (N00019-02-C-3183)

## Timetable

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<u>Month</u>	<u>Year</u>	<u>Major Development</u>
	FY74	First S-3A production aircraft delivered to Fleet
	FY75	S-3A Initial Operational Capability
	FY78	Last S-3A delivered
Aug	FY81	Full-scale development of WSIP program ordered
	FY83	First developmental S-3B FSED aircraft delivered
Sep	FY84	First flight of S-3B prototype
	FY85	Two S-3B prototypes delivered
	FY88	First S-3B conversion kits delivered
	FY88	S-3 WSIP RDT&E program terminated; Block Upgrade I program initiated
	FY93	Advanced Development Model (ADM) hardware Program Design Review and Critical Design Review completed
	FY94	TMP Ada and CPMU (formerly referred to as Mass Memory Unit) software development
	FY94	Last of S-3A conversions to S-3B standard
	FY95	Initial testing of CPMU and other software
	FY98	CPMU Milestone III reached in the fourth quarter
	FY99	Final kit installations
	FY00	CPMU fleet introduction
	FY01	US\$450,000 in U.S. DoD funding for S-3 WSIP program
	FY02	Continued support of Ada operation software development and testing
	FY03	Last year of funding for program

## Worldwide Distribution

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The S-3 WSIP and Block Upgrade I programs are exclusive to the **U.S. Navy** S-3B fleet.

## Forecast Rationale

With the nearing completion of the U.S. Navy's primary requirement, direct RDT&E funding for the S-3 Weapon System Improvement Program (WSIP) is scheduled to draw to a close by the end of FY03. Over the roughly 20-year history of the program, more than US\$500 million has been spent by the U.S. Navy on the various improvements and upgrades that have comprised the S-3 WSIP program.

Charged with the development of acoustic and non-acoustic equipment to improve the Navy's S-3 aircraft mission effectiveness, the S-3 WSIP program has brought S-3A model aircraft to the S-3B configuration.

Improved avionics and weapon subsystems have been designed and retrofitted to improve battle group outer zone anti-submarine warfare capability. S-3B's avionics suite includes such systems as the ARC-153 HF radio transceiver set, ASW-33A automatic flight control set, and ASA-84 navigation control, among many others.

In accordance with the FY04/05 U.S. defense budget, which shows the last year of minimal funding occurring in FY03, the funding forecast for the remainder of the decade has been zeroed-out. Barring any future developments, this report will be archived in 2004.

## Ten-Year Outlook

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Production for this program has ceased.