# Advanced Submarine Support Equipment Program (ASSEP)

## Outlook

- ASSEP funding zeroed out after FY10
- Will become a Military Intelligence Program as Program Element 0303562N beginning Fiscal Year 2011
- Significant part of new program will be black funding
- This report will be archived next year

## Orientation

**Description.** The goal of ASSEP is to increase submarine operational effectiveness (through advanced R&D) in the areas of threat warning/self-protection, situational awareness, and intelligence, surveillance, and reconnaissance. A continuing need exists to improve submarine radar, communications, and navigation capabilities. This U.S. Navy project is under the direction of PE#0603562N Submarine Tactical Warfare Systems.

**Sponsor**

United States Navy
Naval Undersea Warfare Center
New London, CT
USA

**Status.** Developmental, non-acquisition program.

**Total Produced.** Various prototypes and engineering development models have been produced.

**Application.** Next-generation electronic support measures system that will be used on Virginia class submarines, and potentially be backfit to the Seawolf and SSN-688I class submarines.

**Price Range.** Indeterminate, as this is a research and development program.

## Contractors

### Prime

| | |
|---|---|
| **BAE Systems Electronic Solutions** | http://www.baesystems.com/Businesses/EIS/Divisions/ElectronicSolutions/, 65 Spit Brook Rd, Nashua, NH 03061-0868 United States, Tel: + 1 (603) 885-4321, Fax: + 1 (603) 885-2772, Co-producer |
| **Bird Engineering Research Assoc** | 101 Church St NW, Vienna, VA 22180-4508 United States, Co-producer |

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|---|---|
| **Condor Systems Inc** | 2133 Samaritan Dr, San Jose, CA 95124 United States, Tel: + 1 (408) 371-9580, Fax: + 1 (408) 371-9589, Co-producer |
| **Lockheed Martin Maritime Systems & Sensors (MS2)** | http://www.lockheedmartin.com/ms2/, 199 Borton Landing Rd, PO Box 1027, Moorestown, NJ 08057-0927 United States, Tel: + 1 (856) 722-4100, Co-producer |
| **SCI Technology Inc** | 8600 S Memorial Pkwy, PO Box 1000, Huntsville, AL 35802 United States, Tel: + 1 (256) 882-4577, Fax: + 1 (256) 882-4652, Email: Chuck.white@sanmina-sci.com, Co-producer |

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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

# Technical Data

**Characteristics.** This program exists to improve Imaging and Electronic Warfare Support (ES) capabilities in view of the advancements in potential imaging counter detection, the need to support specialized missions, and the increasingly dense electromagnetic environment caused by the proliferation of complex radar, communications, and navigation equipment of potential adversaries. Improvements are necessary for submarine ES and imaging to be operationally effective in the following mission areas: Joint Littoral Warfare, Joint Surveillance, Space and Electronic Warfare, Intelligence Collection, Maritime Protection and Joint Strike. The program is divided into two project categories: Advanced Imaging Project Development and Advanced Electronic Warfare Support Project Development.

Both of these categories will allow for the evaluation of the vulnerability of submarine masts, periscopes and sensors to visual, radar, and infrared detection and the evaluation of state of the art technology to implement periscope/mast engineering improvements to reduce counter detection threats, the pursuit of technologies (such as PATRIOT LPI radar range finding and 360° imaging systems) to develop submarine unique improvements to mast, periscope, and ES electromagnetic and electro-optic sensors based on emerging technologies available from DoD exploratory development programs, industry independent research and development, academia, and other sources. Feasibility demonstration models (FDMs) are developed, evaluated, and validated in the lab and through at-sea testing.

The Advanced Imaging Project Development Projects. This includes the development of the 360° Imaging - Far Term Advanced System and the 360° Imaging - Near Term System. Also covered are the 360° Submarine Panoramic Infra-Red Imaging System and the 360° Affordable Modular Panoramic Periscope. Outside the 360° imaging area, other projects include the Low Cost Expendable Sensor, Advanced Head Window Water Shedding, Electro-Optic Diploops, and a Low Cost, Multi-Spectral, Grade A Head Window.

The Advanced Electronic Warfare Support (ES) Development Projects. This program includes the development of the PATRIOT Phase B - Low Probability of Intercept Radar, LPI Direction Finding equipment, Distant Electronic Surveillance Support and Remote Log-In, Specific Emitter Identification Improvements, ES Vulnerability Tool, Integrated ES and ECS Radio Frequency Distribution Unit, Multifunction Modular Mast Payloads, Mast Signature Reduction, and the PATRIOT Non-Scanning LPI Radar.

# Variants/Upgrades

This is a continuing technology research and development program. The development of enhancements, modifications, and upgrades is ongoing.

# Program Review

**Background.** The ASSEP project develops submarine electronic support measures (ESM) equipment and electronic warfare technology. Specific efforts include the development of the Advanced Submarine Tactical ESM Combat System (ASTECS),

radar cross-section reduction techniques, and periscope-mounted monopulse direction-finding (DF) techniques. The ASTECS is the next-generation ESM system to be used on the Virginia class SSNs, possibly adapted for backfit to the Seawolf and SSN-688 class submarines.

Project S0770 Advanced Submarine Surveillance Support was originally a part of PE#0603522N Submarine Arctic Warfare Support Equipment. The program was restructured at the end of the Cold War and has now disappeared as a separate entity. As this PE is a research and development program, the planned work is constantly changing with the emergence of new technology. In the late 1980s and early 1990s, much of the ASSEP work began to focus on ESM and electronic warfare. These fields remain the most prominently featured in development activities.

## *Milestone 0 Approval*

The ASSEP project received Milestone 0 approval in FY92 and began concept exploration and demonstration of ASTECS. Five study contracts were awarded for studies that would culminate in recommended alternatives from industry. Acquisition documentation was required for Milestone I approval, including a cost and operational effectiveness analysis, a test and evaluation master plan, and a life-cycle cost estimate.

In FY01, efforts focused on the development of mast signature reduction techniques and an investigation into the use of new or upgraded materials for this purpose. Other work included electronic surveillance vulnerability assessments, and the development of a passive surveillance radar, photonics imaging enhancement software, and low-band direction-finding software. Completed during the year was the development of the combat command system interface for the Los Angeles class submarines, as well as development of an integrated electronic surveillance workstation.

Work on the passive surveillance radar, the electronic surveillance vulnerability server, and imaging enhancement software continued unabated during FY02. New programs initiated during the year included the development of a low probability of intercept (LPI) receiver and efforts to extend the operating frequencies of existing equipment. Work on a head-up display for submarine periscopes was begun, as were efforts to equip periscopes with a real-time rangefinder. Finally, a program to develop and evaluate off-board sensors was initiated.

## *Program Completions*

Between FY03 and early FY05, a number of individual lines within the overall ASSEP program were completed. In FY03, these included the mast signature reduction (MSR) electro-optic/infrared mast signature characterization and the MSR RCS reduction over-water testing. Development of the MSR wake-reduction model followed in FY04. By early FY05, the development of the LPI receiver software had also been completed. As a result of these efforts, the contract for the low-band engineering development module was then awarded.

During this timeframe, some systems were transferred to fleet service on a temporary or trials basis. These included the engineering development module of an automated rangefinder that was released for temporary fleet installation. This, along with the at-sea testing of the EDM in a BLQ-10 system, allowed performance specifications to be drawn up that would be applied to improve the image processing capabilities of 360° periscopes. The resulting system then transitioned to production. System testing of the first production elements of these systems was to take place during FY05.

Other systems remain in development, such as a submarine common imaging workstation. This development effort was scheduled to be completed by FY09. Once development is completed, the appropriate activities will be transferred to other lines for tactical integration and service issue.

## *Situational Awareness*

FY06 financial documentation confirmed that a large number of the existing Situational Awareness development lines would be completed within the FY05 to FY07 timeframe. These lines included Patriot Rangefinder Phase A, the automatic identification system, the situational awareness buoy, the virtual periscope, and the CADF multiple-function antenna. Meanwhile, studies were initiated of the feasibility of the low-band radar direction-finding system.

The FY07 budget included funding for development of Phase B (Stealthy/Data Link), including a new Phase B antenna prototype and a prototype unit for use with the new photonics mast.

The FY07 budget also included funding to complete the development of a conceptual EDM under the Automatic Identification System effort, and to prepare for and conduct the at-sea testing program. Linked in with the photonic mast program is the Advanced Camera Technology (360° Imaging System) effort. FY07 funding was to include the development of specifications for the Advanced Camera Technology effort, and of an advanced engineering module that will be used to develop the tracking algorithms and grayscale correlator. This work was to continue until 2009.

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### *ISR De-emphasized*

The existing intelligence, surveillance, and reconnaissance enhancements efforts were essentially completed by FY07. One new start in FY07 was the Advanced EW Tuners program, under which feasibility studies are to be conducted. The focus of work in the 2007-2009 period was to support the passive surveillance radar testing program and testing of the communications acquisition direction-finding antenna.

In 2009, this program was reorganized into two primary thrusts, Advanced Imaging Project Development and Advanced Electronic Warfare Support Project Development. All programs funded in this project are non-acquisition category programs. The test articles identified consist of critical components that will be fully developed during engineering development into Engineering Development Models. ASSEP programs will eventually be broken down into initial and developmental research, for both imaging and electronic warfare. As a result, funding for this program line was zeroed out effective as of FY10 and the ASSEP Program will become part of a new Military Intelligence Program under the new Program Element 0303562N beginning FY11.

**Related Programs.** Another U.S. Navy program related to ASSEP is PE#0604503N Submarine Systems Equipment Development – Project F0775 Submarine Support Equipment. This PE will carry ASSEP projects through the engineering and manufacturing phase.

# Funding

**U.S. FUNDING**

| | FY09 QTY | FY09 AMT | FY10 (Req) QTY | FY10 (Req) AMT | FY11 (Req) QTY | FY11 (Req) AMT | FY12 (Req) QTY | FY12 (Req) AMT |
|---|---|---|---|---|---|---|---|---|
| **RDT&E (U.S. Navy)** | | | | | | | | |
| PE#0603562N | | | | | | | | |
| Submarine Tactical Warfare Systems: | | | | | | | | |
| Project F0770: ASSEP | - | 4.349 | - | 4.356 | - | 0 | - | 0 |

| | FY13 (Req) QTY | FY13 (Req) AMT | FY14 (Req) QTY | FY14 (Req) AMT | FY15 (Req) QTY | FY15 (Req) AMT | FY16 (Req) QTY | FY16 (Req) AMT |
|---|---|---|---|---|---|---|---|---|
| **RDT&E (U.S. Navy)** | | | | | | | | |
| PE#0603562N | | | | | | | | |
| Submarine Tactical Warfare Systems: | | | | | | | | |
| Project F0770: ASSEP | - | 0 | - | 0 | - | 0 | - | 0 |

All $ are in millions.

N/A = Not Available.

Source: U.S. Department of Defense FY09/FY10 RDT&E Biennial Descriptive Summary

# Timetable

| Month | Year | Major Development |
|---|---|---|
| | FY90 | Project focus shifts to ESM and electronic warfare technologies |
| Jan | 1992 | ASTECS Milestone 0 |
| Sep | 1992 | ASTECS CED contract awarded |
| Nov | 1993 | ASTECS Milestone I |
| | FY93 | Contract awarded for periscope monopulse DF antenna FDM |
| | FY94 | EMD phase started |
| | FY95 | Development of STIP laser signals detection system |
| | FY96 | ASTECS Milestone II |
| | FY01 | ASTECS Milestone III |
| | FY02 | ASTECS Initial Operational Capability |
| | FY03 | Initiation of communications-acquisition effort |
| | FY05 | Emphasis switched to situational awareness research efforts |

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| Month | Year | Major Development |
|---|---|---|
| | FY09 | Program reorganized into two primary thrust areas |
| | FY10 | Funding transferred to engineering and manufacturing phases |

## Worldwide Distribution/Inventories

This is strictly a **United States Navy** program.

## Forecast Rationale

According to the FY11 PEDs, funding for this program line has been zeroed out as activity shifts to engineering and production phase. In fact, it is unlikely that this program line has been completely discontinued, given the significance of the work and its importance to U.S. national security. It is more likely that either the work has passed into the black area and is no longer reported or it has been transferred to another PE number. Some of the activities previously listed under this program heading are now funded in PE#0604503N Submarine Systems Equipment Development – Project F0775 Submarine Support Equipment.

Other aspects of the ASSEP Program will become a Military Intelligence Program, and under a new Program Element 0303562N, beginning FY11.

Note: This program began to receive funding in FY89/90, when much of the information for this project started to become public. The cumulative funding for this project is actually much higher than shown here, as this project dates back many years.

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