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Advanced Seal Delivery System

Outlook

- ASDS-1 laid up following battery fire and explosion
- SWCS program inaugurated to provide replacement for Mk VIII Swimmer Delivery Vehicle
- Joint Multimission Submarine proposed as ASDS replacement

Orientation

Description. The Advanced Seal Delivery System (ASDS) is a manned combatant mini-submarine capable of stealthily delivering SEAL personnel and their equipment in a high-threat environment. The host submarine transports the vehicle to the mission area, where the ASDS leaves its host and delivers the SEALs to their specific mission site and later returns with them to the host.

Sponsor

U.S. Navy
Naval Sea Systems Command (NAVSEA)
1333 Isaac Hull Ave, SE
Washington Navy Yard, DC 20376-1080
Tel: + 1 (202) 781-0000

Status. Program terminated.

Total Produced. One submarine of this type has been completed.

Pennant List

Number & Name	Builder	Commissioned
ASDS-1	Northrop Grumman	5/2000

Mission. The Advanced SEAL Delivery System was designed to reduce the risk to Navy Special Operations forces (SEALs) when making the transit from a submarine to shore. ASDS permits long-range Special Forces operations, and enhances the effectiveness of the insertion teams by delivering them to their destination rested and better equipped. ASDS also provides the means to conduct shore surveillance prior to landing. The ASDS was to have been carried by six specifically modified Los Angeles class SSNs, all Virginia class SSNs, and the new converted Ohio class SSGNs when they become operational.

Price Range. The original price estimate for this program was $527 million for six ASDS submarines plus two shore-based support facilities. The last GAO estimate prior to program cancellation increased the program cost to around $2 billion.

Contractors

Prime

Columbia Research Corp	http://www.columbiaresearch.com/, Maritime Plaza Office, 1201 M. St SE, Suite 010, Washington, DC 20003 United States, Tel: + 1 (202) 546-1435, Consortium Member
Northrop Grumman Electronic Systems	http://www.es.northropgrumman.com, 1580-A W Nursery Rd, Linthicum, MD 21090 United States, Tel: + 1 (800) 443-9219, Email: ES_Communications@ngc.com, Prime
Pacific Northwest National Laboratory, Battelle Memorial Institute	http://www.pnl.gov, PO Box 999, 902 Battelle Blvd, Richland, WA 99352-0999 United States, Tel: + 1 (888) 375-7665, Email: inquiry@pnl.gov, Consortium Member

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Technical Data

	Metric	U.S.
Dimensions		
Length, overall	21.3 m	65 ft
Beam	2.2 m	6.75 ft
Draft	2.7 m	8.25 ft
Displacement	56 tonnes	55 tons
Performance		
Maximum speed		
Range		125 nm @ 8 kt
Crew		2 + 8 SEALs

	Type	Quantity
Electronics		
Sonar – forward-looking	Natural/man-made obstacle detection	1
Sonar – side-scanning	Bottom mapping, mine detection	1
Periscope	Non-penetrating	1
Communications	Comms/GPS	1
Machinery		
Electric motor	67 hp	1
Propeller – main	Controllable pitch	1
Auxiliary propulsion	Thrusters	2

Design Features. The ASDS was a SOCOM-sponsored effort to develop a dry combatant submersible with combat swimmer lock-in/lock-out capability. The system has the necessary host vessel interface and support equipment for U.S. Navy SEAL teams.

The vehicle is approximately 65 feet in length and 8 feet in diameter, and weighs 60 tons in air. It is electronically propelled, with a main propulsion capability for high-speed transit and a thrusting capability for low-speed maneuverability. The 14 original batteries were carried in individual external titanium cylinders; the batteries would later be replaced with longer-lasting lithium-ion batteries. The retractable electric maneuvering thrusters are mounted in an X-configuration fore and aft. The vehicle also has a submerged anchoring capability.

The steel pressure hull for the first was fabricated by Chicago Bridge and Iron, Kankakee, Illinois. This facility is now closed. Bow and stern fairings are made of composites. The ASDS program used a substantial amount of HY-80. The ASDS-1 pressure hull and hemi-heads were fabricated from HY-80, which was also planned for the hull cylinders of ASDS-2. HY-100 was considered by Northrop Grumman for the bow and stern hemi-heads of the second hull to reduce weight. These requirements imposed a minimum material thickness for a cylinder. Therefore, it may not have been possible to reduce the weight of the pressure hull by converting from HY-80 to HY-100, because the hull thickness could not be reduced. Ballast tanks were fitted within each end of the pressure hull.

The details of the range and speed of the ASDS remain classified; however, reports indicate it can travel at approximately 8 knots to a distance of at least 125 miles. The ASDS is operated by a pilot drawn from the submariner community, alongside a SEAL navigator. Behind these crew members, between 8 and 16 SEALs can be accommodated, depending on how they are equipped. Exit from the ASDS is accomplished through a lock-in/lock-out chamber in the floor of the craft, which has also been manufactured so that it can dock with a parent submarine, much like a deep submergence rescue vehicle.

The ASDS was to have had an automated life-support system and an integrated control and display system. Two folding masts support communications antennas and a non-hull-penetrating electro-optical periscope.

Operational Characteristics. The Advanced SEAL Delivery System has a long-range submersible capability to deliver Special Operations Forces for clandestine missions. The ASDS provides improved range, speed, payload, and habitability for the crew and a SEAL squad. It was to be carried to its designated operational area by Los Angeles (SSN-688), Seawolf (SSN-21), and Virginia class submarines. ASDS as originally conceived would also be air transportable by either C-5 or C-17 aircraft.

Already optimized for use by Naval Special Warfare personnel with increased room for personnel and gear, the Virginia class SSNs will also be built with a nine-man lock-out/lock-in chamber for the insertion and recovery of Special Operations Forces. When, at some point, it is fitted with an ASDS-capable dry deck shelter (DDS), the Virginia class will be able to deliver a significant number of Special Operations Forces and their equipment quickly and quietly while remaining submerged and undetected.

ASDS-1 Advanced Seal Delivery System

Source: U.S. Navy

Variants/Upgrades

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New Battery Technology. Alliant Techsystems/ Valence Technology submitted a proposal to replace the current silver-zinc oxide batteries in three Navy underwater vehicle applications (Mk 30 target, Mk 8 SEAL Delivery Vehicle, and the ASDS) with commercial lithium-ion polymer batteries. Currently, these systems require more than $5,000 worth of batteries per year because the finite recharge cycles and wet life require their replacement every 12 to 18 months. Lithium-ion batteries would provide more than 10 times the cycle life of the silver-zinc.

Spiral Development. As a result of development problems, some requirements were delayed, reduced, or eliminated by the U.S. Special Operations Command. For example, the acoustic (noise level) requirement, which is part of the vehicle signature's key performance requirement, was deferred. The transportability parameter – although considered demonstrated by the Naval Sea Systems Command – was reduced. It no longer included transport by C-17 aircraft, amphibious ships, and the SSN-21 submarine. In addition, a degaussing system needed to lower the vehicle's magnetic signature was delayed and designated as a preplanned product improvement. Although a degaussing system was originally included in the ASDS design, the program used the funds for this system to cover other expenses.

Program Review

Background. The U.S. Navy SEALs have long made use of "wet" submersibles (SEAL Delivery Vehicles, or SDVs) for their medium-range undersea transportation. While the SDVs have served the Naval Special Warfare community with distinction, they have always suffered from one consistent drawback: All embarked members had to endure extended periods of time in frigid ocean waters with only a wet or dry suit to protect them from the elements. Experience has shown that human body performance degrades on a predictable scale in relation to the time spent in a given temperature. This has little consequence for the average person; however, for a commando who is expected to perform at an exceptionally high level for an unknown period of time in a potentially dangerous environment, the stakes are high.

ASDS Conceived

Essential to Naval Special Warfare is the ability to conduct clandestine insertions and extractions of SEAL squads into high-threat environments. The Advanced SEAL Delivery System was conceived as a manned, dry-interior, combatant submersible with the requisite range, endurance, speed, payload, and other capabilities for operations in a full range of hostile environments.

In August 1994, before development of the ASDS began, the U.S. DoD Inspector General reported serious problems with the program, including noncompliance with mandatory DoD acquisition guidance, and recommended increased senior-level DoD oversight and better coordination with the Joint Staff, the services, and defense agencies. However, the acquisition executive at the time disagreed, based on input from other sources, including the Naval Sea Systems Command's assessment that the program was technically sound and executable. Consequently, the Navy awarded an engineering and manufacturing development (EMD) contract to Westinghouse Electric Corp (which was acquired by Northrop Grumman in 1996), and the first boat was expected to be delivered in less than three years. The anticipated cost of developing the first six submarines and two base facilities was $527 million.

In 1997 and 1999, two Navy independent review teams identified continuing problems with the ASDS program, including cost growth, schedule delays, and, perhaps most importantly, a lapse in effective program management by both the government and the contractor.

Collectively, these problems necessitated developing a new baseline. Navy reviews identified several causes for the lapse in effective program management, which included:

- A lack of contractor experience in submarine design and construction.
- The government's lack of attention to the problems between the contractor and the subcontractors.
- A focus on the technical rather than the management aspects of the program by both the program office and the contractor.
- Ineffective oversight by the program office and little attention to the financial performance of the contractor.
- Frequent changes in the contractor's project management team.

As a result, the Navy created a management integrated product team to help deal with ASDS program problems comprising the Naval Sea Systems Command's Program Manager for the Deep Submergence Program Office; a Northrop Grumman senior vice president; the U.S.

Special Operations Command's Program Executive Officer, Maritime and Rotary Wing; and the Naval Special Warfare Command's Assistant Chief of Staff for Resources, Requirements and Assessments.

Troubled Development

In August 1999, Congress expressed its continuing concern over cost growth, development and testing activities, and level of oversight. It established the ASDS as an item of special interest that it would monitor closely. It also requested that, although ASDS did not necessarily meet the normal dollar threshold for automatic elevation to a major defense acquisition program (Acquisition Category I), the program be elevated to an equivalent level of DoD review because of the "troubled history" and "concern that this program may not be out of difficulty yet."

Initial dock trial testing at ATC's UNDEX Test Facility (UTF) was conducted from September 1999 through April 2000. This wet-test of the submersible manned with crew in a benign environment demonstrated the readiness of the submersible machinery equipment and systems to conduct at-sea tests. The submersible was tested for leak tightness, buoyancy, and thruster operability, its trim and ballast and underwater telephone were evaluated, and a sonar sensor demonstration and radiated noise survey were conducted.

Starting in December 2001, ASDS-1 successfully underwent an aggressive schedule of testing designed to demonstrate the capabilities of the ASDS and prepare it for an operational evaluation in mid-2003. These trials included docking and launching maneuvers on a stationary primary host simulator that replicated the mating structures on a host submarine, a demonstration of submerged anchoring ability, and the conduct of diver lock-in/lock-out operations.

Testing Program Details

These tests continued to prepare Boat 1 for dynamic launch and recovery operations from USS *Greeneville* (SSN-772) in the fall of 2002. *Greeneville* is especially equipped for submarine rescue. Capable of performing the mother submarine role for the Deep Submergence Rescue Vehicle (DSRV), she may fulfill bi-lateral and multi-lateral agreements with allies to assist in the rescue of a downed submarine. *Greeneville* was the designated Pacific test platform for the ASDS.

During this period, a number of improvements in the basic ASDS design were made, including a successful new anchor design, improved battery design, sonar system upgrades, improvements in configuration management control, renewed focus on ASDS logistics needs, completion of safety-critical software testing, and substantial progress in developing engineering drawings. For example, the original anchors were redesigned to hold the ASDS level enough to provide a stable dive platform during ocean swells. The program also succeeded in decreasing the operating temperatures of the silver-zinc batteries, which reduced the frequency of electrical shorts and improved battery performance. Nonetheless, there were still unresolved issues that prevented the vehicle from meeting its operational requirements.

Battery reliability and acoustics became the most critical issues facing the program. The silver-zinc propulsion battery limited the performance of the ASDS. The first attempts to use silver-zinc batteries in the ASDS resulted in unexpected shorting and premature failure. One of the reasons for the battery shorting was the high-temperature environment in which it operates. Through ongoing assessment and modifications, the Navy has been able to extend the endurance of a fully charged battery. Program officials have not determined whether the battery's endurance can be extended to support all missions. In addition, the battery's demonstrated life – the number of times it can be recharged before requiring replacement – is much shorter than expected. Currently, the battery can only be recharged two to three times before failing, whereas 20 recharge cycles were expected. If the battery cannot last through the expected recharge cycles, the impact on the submarine's availability and operation and support costs would be significant because replacing the battery requires the boat to return to its base facility and be taken out of the water and partially dismantled.

Although the Navy continues to mature the silver-zinc battery for the first boat, it is in the process of developing a lithium-ion battery. Program officials had expected the lithium-ion battery to be developed by the summer of 2004. Lithium-ion battery technology, like silver-zinc, is not new; however, the challenge lay in adapting the technology to ASDS' size and environment.

Although the ASDS has been canceled, experimental work with the existing boat continues in order to resolve the battery problem.

Further steps toward the goal of qualifying ASDS for service use were made in June 2002, when Northrop Grumman successfully completed 12 separate docking scenarios with the primary host simulator. The simulator is a replica of the topside of a submarine with latching mechanisms, located on the ocean floor off the coast of Hawaii. The successive and continuous number of dockings and launchings in one day further

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demonstrated the capability of the system in various undersea environments.

Important Steps Forward

In August 2002, Northrop Grumman completed another important step in delivering the first ASDS to the U.S. Navy by successfully completing its first operational mission as part of the Joint Forces Command's Exercise, Millennium Challenge 2002. During these exercises, ASDS-1 successfully delivered SEALs and their equipment during nighttime exercises to a precise drop-off point off the coast of Hawaii. Additionally, lock-out operations were completed, enabling the submerged departure of SEALs and their equipment. The last step was submerged recovery of SEALs at mission completion. The ASDS performed exactly as planned and participants praised the achievement. A month later, Special Operations Command accomplished the last significant test of the ASDS prior to its operational evaluation – the successful launch and recovery of the system from a host submarine. For this system test, ASDS-1 successfully completed multiple launch and recovery docking scenarios with the USS *Greeneville*.

In March 2003, the U.S. Government Accountability Office released a Defense Acquisitions Report on the ASDS program. This stated that while progress had been made in addressing technical difficulties with the first boat, some problems would need to be resolved and other capabilities demonstrated before the ASDS could meet all of its key performance requirements. For example, the Navy had not yet been able to develop an adequate propulsion battery. In addition, the final design of the ASDS would remain uncertain until technical problems were solved and testing was completed.

The report also stated that the ability of the ASDS to meet cost and schedule projections was problematic. The program had experienced major schedule delays and cost increases. The program was six years behind schedule, and, by the GAO's estimates, costs had more than tripled.

The GAO concluded that several underlying factors contributed to the ASDS' difficult development. In retrospect, the capabilities required of the boat outstripped the developer's resources in terms of technical knowledge, time, and money. Key problems with the battery and the propeller were discovered late in testing on the first boat, rather than in component or subsystem testing. Finally, the program suffered from insufficient management attention on the part of both the government and the contractor, which led to missed opportunities for righting the program as it proceeded. Moreover, the management attention that was exercised was hampered by outdated information.

More Sea Trials

Despite these criticisms, another round of sea trials began in April 2003. In support of these, the Naval Oceanographic Office (NAVOCEANO) collected high-resolution bathymetry data using several methods to gain a complete picture of the area. During the Scanning Hydrographic Operational Airborne LIDAR Survey (SHOALS) survey of the near-shore environment along Oahu, conducted in conjunction with the U.S. Army Corps of Engineers, the Fleet Survey Team conducted surveys within Pearl Harbor on hydrographic survey launches, and the USNS *Heezen* collected data in the deeper water near the approach to Pearl Harbor and naval exercise areas. Using these new datasets, the Tactical Charting Branch was able to update the navigational charts of the approach to Pearl Harbor with high-density contours.

Interestingly, the Special Operations community conducting the ASDS tests found that the current navigational charts of the approach to Pearl Harbor didn't provide the tactical picture needed for a successful clandestine mission. In response, NAVOCEANO updated the charts with the high-resolution bathymetry data and included the high-density contours, which provide a tactical picture of the approach to Pearl Harbor that can be used in mission planning, and can pinpoint navigation of the ASDS using terrain-following techniques. NAVOCEANO also provided a detailed three-dimensional image of the approach to Pearl Harbor that can be viewed by the customer from any given angle. The Special Operations community found these tools to be of such value that they will be required for other operational areas where the required data may not be so readily available.

Exploiting this new technology, the ASDS-1 underwent combat conditions testing for a 10-day period that ended May 9. The prototype ASDS-1 was carried piggyback on the attack submarine USS *Charlotte* for the trials, which went according to plan. "We were successful in completing the operational evaluation, and all of the missions were completed successfully," Maria Zacharias, a spokeswoman with Naval Sea Systems Command, said of the Hawaii testing. By the time these tests were completed, the ASDS-1 had made 115 dives, logging more than 1,000 hours under water. Following these trials, the ASDS-1 was handed over to the U.S. Navy on June 26, 2003.

Advance procurement money for the second ASDS was included in the FY04 budget. This request was approved by the House Appropriations Committee but the Senate Armed Services Committee rejected the request, transferring the money from advanced procurement to research and development. The committee also suggested reopening the ASDS program to competition. This was on the stated grounds that, while the senators saw a clear and urgent need for the ASDS, the technical problems with the craft remained unresolved. The U.S. Navy appealed this decision, stating that the requirement of a Milestone C decision prior to releasing funds would cause unacceptable program delays.

Financial Pressures Mount

It was pointed out that the operating trials of ASDS No. 1 had been successful, that Northrop Grumman was now meeting all technical and schedule targets, and that a GAO study highly critical of ASDS had used some questionable accounting practices. As a result, the Defense Authorization Conferees reversed the Senate decision and restored the advance procurement funding. However, the funds could not be released until Milestone C was approved, a decision that was postponed until June 2004. Consequently, the Milestone C decision was further delayed until September 2005, and the funds in question were reprogrammed into research and development.

Although a total of $71.7 million was allocated to advance procurement for the ASDS program in FY06, the Senate Armed Services Committee stated that it did not wish any of this money to be appropriated until a favorable Milestone C decision had been reached. This had been further postponed until December 2005. Although the SASC recognized the critical importance of the ASDS vehicle, it wished to see progress before committing funds to further production. As a result, in December 2005, when Milestone C had still to be attained, all ASDS funding was diverted to fixing the first prototype.

This proved to be a temporary situation. By April 2006 there was still no sign of progress with the ASDS program and the effort was canceled (see details below), all future funding being zeroed out. There was no mention of the program being put up for rebids at the time of this announcement. In the year after the program cancellation was announced, there were no attempts to revive or reinstate the ASDS program and it remained essentially defunct. However, the existing ASDS-1 has undergone work in an attempt to find solutions to the craft's problems. These test activities continued throughout 2006 and 2007 and were funded in the FY07 and FY08 budgets.

Navy conduct of the ASDS program was severely criticized in a June 2007 GAO report on ASDS. The findings of this report were that the Navy failed to effectively oversee the contracts intended to maintain, repair and upgrade the first ASDS submarine and failed to hold the contractor accountable for the results. Buried within this GAO report was the statement that the Navy was studying the SOCOM requirement that had led to the ASDS being designed with the implication that a successor craft was being designed.

A few months later, details of this new program started to emerge. The new craft was designated the Shallow Water Combat Submersible (SWCS) and would be a free-flooding craft with a crew of two and a dedicated cargo area exceeding 180 cubic feet. This is almost twice that of the ASDS. The crew of the SWCS would navigate the craft while wearing underwater breathing apparatuses for primary life support. The vehicle would be equipped with precision navigation and communications equipment. In effect it would be a halfway stage between the existing SDV and the ASDS but offering substantially larger carrying capacity than either.

By April 2008 it was revealed that maintenance and fault rectification work on the ASDS had cost more than $200 million. A review of the program at that point called for further design and procedural improvements in order to enhance the craft's reliability. Interestingly, at this point it was indicated that no decisions on the future of ASDS had yet been made, indicating that there was, at least, a school of thought that wished the program to continue, presumably in parallel with the SWCS.

This option was closed in November 2008 when the ASDS prototype suffered a serious battery fire and explosion at its support facility in Pearl Harbor, Hawaii. The accident took place while the lithium batteries on the vessel were being charged. The building was immediately evacuated. Seven trucks and 25 federal firefighters responded, but it took six hours to extinguish the fire and cool any remaining hot spots in the battery compartment. This effectively resulted in the ASDS program finally being terminated.

Lessons Learned

The GAO report on the ASDS program was scathing, condemning the contractors for failure to meet the program targets and castigating the navy for letting the contractors get away with it. Yet, for all its criticisms, the GAO report managed to completely miss the point. The basic problem with ASDS appears to have been reliability: When ASDS was good it was very good, but when it was bad it was horrid. The trouble was that it was bad all too often, and attempts to reduce the

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incidence of horrid performance were demonstrably unsuccessful.

A deeper look into the problems with ASDS suggests that there were three factors present right from the initiation of the program that caused its problems. These are conceptual rather than design or engineering deficiencies, and they tend to suggest that Northrop Grumman did as well as could be expected given the very trying circumstances.

The first problem was that the specifications for the craft pushed battery and motor design to the outer limits of the practical envelope. This stemmed from a perception that ASDS was either a scaled-up version of the existing underwater delivery vehicles or a scaled-down version of a conventional submarine. In fact, it was neither; it was an entirely new class of boat that presented design and construction problems all its own. This fundamental misconception of what was required also led to a large number of new technologies being introduced at once, a sure and certain recipe for failure.

The second problem was that ASDS was a craft tightly optimized for a single, highly specific role. The U.S. Navy has long believed that the construction of warships optimized for a single, tightly defined role is unwise. Experience has shown that it is much easier to adapt a multirole hull to a specific purpose than to give multirole capability to a tightly optimized design. ASDS may well have been more successful if the designers had been given a wider-ranging specification where benefits in one area could be traded against deficiencies in another. ASDS had no such flexibility. It was the lack of room for such trade-offs that finally doomed ASDS.

Finally, ASDS has driven home another important lesson – the compromises inherent in ship design mean there is no such thing as a simple, incremental change. What might appear to be a minor step forward may have design impacts out of all proportion to its initial scale. What seems to be a simple evolutionary development may be a giant and unpredictable leap into the unknown. The ASDS was a leap into the unknown, and the pitfalls that awaited the designers went unidentified until they were actually encountered.

Funding

Several organizations have been involved in the ASDS program. The U.S. Special Operations Command funded the program, and its Naval Special Warfare Command set the requirements and would be the user of the system. The Assistant Secretary of the Navy for Research, Development and Acquisition was responsible for approving each phase of the ASDS acquisition process. The Naval Sea Systems Command was the acquisition program manager, responsible for overseeing the prime contractor, Northrop Grumman.

Contracts/Orders & Options

Contractor	Award ($ millions)	Date/Description
Northrop Grumman	34.0	Jan 2003 – Contract from the U.S. Navy's Strategic Systems Programs (SSP) to adapt the missile tubes of SSBN for the launch of conventional cruise missiles and to allow two ASDS vehicles to dock, enabling SOF deployment to littoral theaters worldwide.
SAFT	1.5	Sep 2003 – Development of lithium-ion batteries for ASDS.
Yardney	1.5	Sep 2003 – Development of lithium-ion batteries for ASDS.

Timetable

Month	Year	Major Development
Aug	1994	Construction contract awarded
	1996	Northrop Grumman takes over construction
	1997	U.S. Navy design review
	1999	U.S. Navy design review
May	2000	ASDS-1 delivered

Month	Year	Major Development
Aug	2002	First sea trials deemed successful
Mar	2003	Critical GAO report
May	2003	Second set of sea trials completed successfully
Dec	2005	Milestone C decision expected but not reached
April	2006	ASDS program terminated
Nov	2007	SWCS program initiated
April	2008	Trials with ASDS/SSGN completed
Nov	2008	ASDS-1 severely damaged by battery fire and explosion
Jan	2009	Joint Multimission Submarine program initiated

Worldwide Distribution/Inventories

United States. One prototype craft reportedly laid up following accident.

Forecast Rationale

The battery fire and explosion that hit the single ASDS prototype in November 2008 have effectively administered the coup de grace to this troubled and controversial program. The mini-submarine burned for six hours following the explosion and had to be hosed down to eliminate hot spots once the main fire had been extinguished. The effect of such a fire on the steel used to fabricate the pressure hull is dire and will pretty much render the boat irreparable.

The inauguration of the SWCS program could be construed as an ASDS replacement, simplified by the acceptance of a free-flooding hull and enlarged to provide additional cargo space. Last year, we suggested that this might be an overly simplistic interpretation. The acceptance of a free-flooding design revives the problems of exhaustion and crew fatigue that drove the original concept of ASDS as a full mini-submarine. Our conclusion that SWCS is probably more of an SDV replacement intended as a shorter-range, higher capacity delivery system to complement ASDS – not replace it – has now been confirmed.

The true replacement for the ASDS is the new Joint Multimission Submarine (JMMS) program that was launched in January 2009. This will use much of the technology developed for the ASDS, and a report on the "lessons learned" from the ASDS program will be compulsory reading for all JMMS bidders. The Joint Multimission Submersible (JMMS) is a manned, dry combatant submersible that provides a clandestine mobility platform. It will be capable of operating in a wide range of littoral and threat environments and will be tactically transported by specially modified submarines. Three craft of this class are proposed with the first entering service in 2016.

The JMMS will provide improved performance over the Advanced SEAL Delivery System and will permit small, highly trained forces to operate in denied areas increasingly controlled by a sophisticated threat. The project provides RDT&E funds for analysis and technology development phase efforts. Research and development funding for this program of $43 million has been allocated in FY10. Funding is for pre-design, component development, and management support.

Ten-Year Outlook

The termination of this program makes a forecast inappropriate. This report, therefore, contains no forecast chart.

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