

CRS Report for Congress

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Unmanned Vehicles for U.S. Naval Forces: Background and Issues for Congress

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Summary

Unmanned vehicles (UVs) are viewed as a key element of the effort to transform U.S. military forces. The Department of the Navy may eventually acquire every major kind of UV. Navy and Marine Corps UV programs raise several potential issues for Congress. This report will be updated as events warrant.

Background

Introduction. Unmanned vehicles (UVs) are viewed as a key component of U.S. defense transformation.¹ Recent U.S. military operations have highlighted the potential of UVs to significantly improve and reshape U.S. military capabilities. Perhaps uniquely among the military departments, the Department of the Navy (DON), which includes the Navy and Marine Corps, may eventually acquire every major kind of UV, including unmanned air vehicles (UAVs),² unmanned air combat vehicles (or UCAVs, which are UAVs armed with weapons), unmanned surface vehicles (USVs), unmanned underwater vehicles (UUVs), and unmanned ground vehicles (UGVs).

Section 220 of the FY2001 defense authorization act (H.R. 4205/P.L. 106-398 of October 30, 2000) states, "It shall be a goal of the Armed Forces to achieve the fielding of unmanned, remotely controlled technology such that — (1) by 2010, one-third of the aircraft in the operational deep strike force aircraft fleet are unmanned; and (2) by 2015, one-third of the operational ground combat vehicles are unmanned."

A 2005 report by the Naval Studies Board (NSB) recommended that the Navy and Marine Corps should accelerate the introduction of UAVs, and UUVs, UGVs; develop

¹ For more on defense transformation in general, and naval transformation in particular, see CRS Report RL32238, *Defense Transformation: Background and Oversight Issues for Congress*, by Ronald O'Rourke, and CRS Report RS20851, *Naval Transformation: Background and Issues for Congress*, by Ronald O'Rourke.

² For more on UAVs, see CRS Report RL31872, *Unmanned Aerial Vehicles: Background and Issues for Congress*, by Harlan Geer and Christopher Bolkom.

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a long-dwell, standoff UAV for intelligence, surveillance, and reconnaissance (ISR) missions; evaluate a Vertical Tactical UAV (VTUAV) on an accelerated basis, develop requirements for a future sea-based tactical UAV; strengthen the Navy's UAV roadmap; encourage the establishment of a joint services UAV forum; help foster UAV flights in controlled airspace; pursue new concepts and technologies for UAVs, USVs, UUVs, and UGVs; integrate UVs into Navy concepts for network-centric warfare (NCW);³ and include level of mission autonomy as a required up-front design tradeoff in all UV system development contracts.⁴

Naval UAV and UCAV Programs. DON plans call for acquiring UAVs and UCAVs for three primary mission areas: (1) long-dwell, standoff ISR operations; (2) penetrating surveillance/suppression of enemy air defense (SEAD)/strike operations; and (3) tactical surveillance and targeting operations.

Long-dwell, Standoff ISR. The initial phase of DON's effort in this mission area was the procurement in FY2003 and FY2004 of two long-range **Global Hawk UAVs** to conduct experiments for developing payload concepts and concepts of operations. The next phase is called the **Broad Area Maritime Surveillance (BAMS) UAV**. The Navy wants to procure 110 BAMS UAVs. Potential competitors include the Global Hawk, the Mariner (a maritime version of the Predator B UAV), and a UAV derived from the Gulfstream 450 business jet. The Navy reportedly plans to issue a request for proposals (RFP) for the BAMS program in FY2007 and to award a contract for the program in the final quarter of FY2007. The Navy's FY2007-FY2011 aircraft procurement plan calls for procuring the first four BAMS UAVs in FY2011. The first BAMSs are expected to enter service in 2013.⁵

Penetrating Surveillance/SEAD/Strike. DON's work in this mission area originally focused on developing a stealthy, autonomous, carrier-based **Navy UCAV (UCAV-N)**. UCAV-N's initial mission focus was to be penetrating surveillance; the SEAD and strike missions would follow. The UCAV-N program was initiated in conjunction with the Defense Advanced Research Projects Agency (DARPA) and was structured to follow the Air Force's UCAV program so as to take maximum advantage of its technologies. In December 2002, the Department of Defense (DOD) decided to merge the Air Force and Navy UCAV programs into a Joint Unmanned Combat Air System (**J-UCAS**) program. In October 2005, management of the J-UCAS program was transferred from DARPA, which had managed the program since October 2003, to a joint Air-Force Navy office. In February 2006, DOD announced that it was restructuring the J-UCAS program into a Navy-oriented UCAV program. The Navy's proposed FY2007

³ For more on NCW, see CRS Report RL32411, *Network Centric Warfare: Background and Oversight Issues for Congress*, by Clay Wilson, and CRS Report RS20557, *Navy Network-Centric Warfare Concept: Key Programs and Issues for Congress*, by Ronald O'Rourke.

⁴ National Research Council, Naval Studies Board, *Autonomous Vehicles In Support Of Naval Operations*. Washington, The National Academies Press, 2005. 256 pp.

⁵ See also Jefferson Morris, "Navy Warns Industry BAMS Must Stay On Cost, Schedule," *Aerospace Daily & Defense Report*, May 18, 2006; "Navy Details Huge Unmanned Aerial Vehicle Program," *Congress Daily*, May 18, 2006; Jason Ma, "Navy Expects BAMS UAV Solicitation In FY-07, Contract Late In FY-07," *Inside the Navy*, Feb. 6, 2006.

budget includes \$239 million in research and development funding for this restructured **Navy UCAV** program; details about the program are being defined.⁶

Tactical Surveillance and Targeting. The Navy is procuring **Vertical Tactical UAVs (VTUAVs)** that take off and land vertically from Navy surface combatants or other ships. The Navy's main VTUAV effort is the **Fire Scout UAV**, which is an unmanned helicopter. As part of its FY2003 budget request, the Navy announced that it would to stop the Fire Scout program after completing the engineering and manufacturing development (EMD) phase and not put the Fire Scout into series production. The Navy later reversed itself and announced that the Fire Scout would be used by its new Littoral Combat Ships (LCS).⁷ Five Fire Scouts were procured in FY2006. The Navy's FY2007-FY2011 aircraft procurement plan calls for procuring four in FY2007, seven in FY2008, 11 each in FY2009 and FY2010, and 10 in FY2011. The Navy and Army are in the process of arming the Fire Scout. The Navy is also pursuing the Coastal Battlefield Reconnaissance and Analysis (**COBRA**) system, which is a UAV and a ground processing system for conducting surveillance of mine fields, obstacles, and camouflaged defenses in both the surf zone and inland areas.

The **Pioneer** UAV was first deployed by the Navy and Marine Corps in 1986. The Marine Corps absorbed the Navy's 10 Pioneers, consolidating them with the Marine Corps' own fleet of 37, and has proposed upgrading the capabilities of the consolidated Pioneer fleet to support operations at ranges of more than 50 miles. The Marine Corps views the **Eagle Eye VTUAV**, currently being developed by the Coast Guard as part of its Deepwater acquisition program,⁸ "as the best, near term UAV solution until a future Vertical Takeoff and Landing (VUAV) is developed.... Eagle Eye will fill capabilities gaps between Pioneer's sundown and the introduction of a future VUAV system. [Eagle Eye's] IOC [initial operational capability] is planned for FY2009."⁹ The Marine Corps is conducting an analysis of alternatives (AOA) for a longer-term replacement for the Pioneer.

Marine Corps tactical surveillance and targeting UAV programs include the **Silver Fox UAV**, a small UAV with an 8-foot wingspan that Marines (and Navy special operations forces) have used in Iraq; the **Dragon Eye UAV**, which is the size of a hobbyist's model airplane; and the **Dragon Warrior UAV**, a small unmanned helicopter now in development that is considerably larger than Dragon Eye and would conduct

⁶ John M. Doyle, "If Navy Successful, AF Could Revisit J-UCAS Program," *Aerospace Daily & Defense Report*, March 16, 2006; David A. Fulghum and Amy Butler, "Supposedly Dead J-UCAS Spawns New Designs," *Aerospace Daily & Defense Report*, March 23, 2006; John M. Doyle, "NAVAIR UAV Chief Say New Strategy Needed For Joint Development," *Aerospace Daily & Defense Report*, Apr. 19, 2006.

⁷ For more on the LCS program, see CRS Report RS21305, *Navy Littoral Combat Ship (LCS): Background and Issues for Congress*, by Ronald O'Rourke and CRS Report RL32109, *Navy DDG-1000 (DD(X)), CG(X), and LCS Ship Acquisition Programs: Oversight Issues and Options for Congress*, by Ronald O'Rourke.

⁸ For more on the Deepwater program, see CRS Report RS21019, *Coast Guard Deepwater Program: Background and Issues for Congress*, by Ronald O'Rourke.

⁹ Department of the Navy, *Naval Aviation Vision 2020*, Washington, 2005, p. 43.

missions at ranges of up to 50 miles. Reportedly, Marines using Dragon Eyes in Iraq have found the system very helpful, prompting the Marine Corps to plan for the procurement of hundreds more. The Marine Corps is reportedly revisiting the idea of acquiring a UAV that would bridge the gap between the service's larger Pioneers and its smaller Dragon Eyes.¹⁰ The Navy and Marine Corps are currently using the **Scan Eagle** UAV in the Iraq theater.

In addition to the previously mentioned \$239 million in research and development funding for the restructured Navy UCAV program, the Navy's proposed FY2007 budget includes a total of \$142 million in research and development funding for other UAVs.

Naval USV Programs. The Navy reportedly will complete a new USV master plan by June 2006.¹¹ The Navy's **Spartan Scout** USV program uses an unmanned, 23- or 36-foot boat capable of semi-autonomous operations that can be launched from surface ship or shore. The craft can be equipped with modular payload packages for mine warfare, ISR/force protection, port protection, precision strike against surface and land targets, and possibly antisubmarine warfare (ASW). The Navy accelerated deployment of Spartan; the first system was deployed in October 2003.¹² The Lockheed Martin **Remote Minehunting System (RMS)** is a high-endurance, semi-submersible vehicle that tows a submerged mine-detection and -classification sensor suite. The Navy originally envisioned procuring at least 12 systems for use on at least 12 DDG-51-class Aegis destroyers, but in FY2003 reduced the program to 6 systems for 6 DDG-51s. Additional RMSs are now to be deployed from LCSs. The Office of Naval Research (ONR) reportedly is developing two USV prototypes as future options for a common USV or family of USVs.¹³

Naval UUV Programs. The Navy reportedly is accelerating its sea trials of new UUVs.¹⁴ On January 21, 2005, the Navy released a new UUV master plan that replaced one issued in 2000. The new plan sets forth nine high-priority missions for Navy UUVs: (1) ISR, (2) mine countermeasures (MCM), (3) anti-submarine warfare (ASW), (4) inspection/identification, (5) oceanography, (6) communication/navigation network nodes (CN3), (7) payload delivery, (8) information operations, and (9) time-critical strike operations. A key purpose of the new master plan is to help the Navy organize and consolidate its various UUV efforts, which in late 2004 reportedly included 70 vehicles

¹⁰ Aarti Shah, "Marine Corps Revisits Idea Of Second-Tier Unmanned Aerial Vehicle," *Inside the Navy*, Apr. 11, 2005.

¹¹ Jefferson Morris, "Navy To Deliver Master Plan For Unmanned Surface Vehicles In June," *Aerospace Daily & Defense Report*, February 10, 2006: 2.

¹² For more on Spartan and other USVs, see Vittorio 'Vic' Ricci, "Spartan Unmanned Surface Vehicle, More Than A U.S. Navy 'Toy,'" *Naval Forces*, No. 6, 2004, pp. 62-63; Mark Hewish, "Littoral Warfare By Remote Control," *Jane's International Defence Review*, Oct. 2004, pp. 54-56, 59-63; and Richard Scott, "Nobody At The Helm," *Jane's Defence Weekly*, Aug. 4, 2004, pp. 26-29.

¹³ Jason Ma, "ONR Developing Two 'Unmanned Sea Surface Vehicle' Prototypes," *Inside the Navy*, July 26, 2004.

¹⁴ "Navy Accelerating Tests Of Unmanned Submersibles," *Aerospace Daily & Defense Report*, January 30, 2006.

of different lengths, widths, and configurations. The new master plan, which stresses the need for commonality, modularity, and open-architecture designs for Navy UUVs, organizes Navy UUVs into four broad categories:

- **Man-portable UUVs** with diameters of 3 to 9 inches and weights of 25 to 100 pounds, for use in special-purpose ISR, expendable CN3, very-shallow-water MCM, and explosive ordnance disposal (EOD);
- **Lightweight vehicles** with 12.75-inch diameters and weights of up to 500 pounds (the same as lightweight Navy torpedoes), for use in harbor ISR, special oceanography, mobile CN3, network attack, and MCM area reconnaissance;
- **Heavyweight vehicles** with 21-inch diameters and weights up to 3,000 pounds (the same as heavyweight Navy torpedoes), for use in tactical ISR, oceanography, MCM, clandestine reconnaissance, and decoys; and
- **Large vehicles** with diameters of 36 to 72 inches and weights of up to 20,000 pounds, for use in persistent ISR, ASW, long-range oceanography, mine warfare, special operations, EOD, and time-critical strike operations.¹⁵

The submarine fleet has a single **Near-Term Mine Reconnaissance System (NMRS)**. The system, which includes two UUVs linked to the submarine by fiber-optic cable, is deployed through the submarine's torpedo tubes and gives the submarine fleet an initial, limited mine-detection and -classification capability. The **Long-Term Mine Reconnaissance System (LMRS)**, also launched from the submarine's torpedo tubes, is an autonomous UUV that uses acoustic and radio-frequency links rather than a fiber-optic link. As part of its FY2003 defense budget, DOD accelerated to FY2003 the start of a program to develop a next-generation, fully autonomous **Mission-Reconfigurable UUV (MRUUV)**, which would be launched from submarines or surface ships and carry array of sensor payloads for performing a variety of information-gathering missions. Other Navy UUV projects have included the **Advanced Development UUV (ADUUV)**, the **large-diameter UUV (LDUUV)**, **Remus** (Remote Environmental Measuring Units),¹⁶ **BPAUV** (Battlespace Preparation Autonomous Underwater Vehicle), and **Manta**. The ADUUV is a prototype vehicle developed as a risk-reduction effort. The large-diameter UUV could be developed using lessons learned from Navy experiments deploying the 38-inch-diameter **Seahorse** UUV from Trident submarine ballistic missile tubes. Remus is a small UUV light enough to be carried by two people that can be launched by hand from boat or shore to survey a local port or harbor area for mines and other hazards. BPAUV is considerably larger than Remus and can survey a larger area. Manta, being developed by the Naval Undersea Warfare Center (NUWC), is a more futuristic, follow-on to the

¹⁵ Christopher P. Cavas, "U.S. Navy Refines UUV Roles, Missions," *Defense News*, Jan. 31, 2005, p. 14; Aarti Shah, "Updated UUV Master Plan Categorizes Vehicles Into Four Groups," Jan. 31, 2005; Aarti Shah, "Navy Updates UUV Master Plan To Focus On Four Key Categories," *Inside the Navy*, Oct. 18, 2004; Keith Jacobs, "U.S. Navy Master Plan For UUV Development," *Naval Forces*, No. 3, 2005: 96, 98-102.

¹⁶ "Navy Accelerating Tests Of Unmanned Submersibles," *op cit*, states that the Navy is accelerating in particular the testing of REMUS for shallow-water mine countermeasures missions.

MRUUV that would be armed with torpedoes or other weapons and attached to the outside of a submarine hull.¹⁷

Naval UGV Programs. The Marine Corps **Gladiator** is a radio-controlled, armored UGV that can carry a variety of modular payloads for missions such as reconnaissance, search, and target acquisition (RSTA), obstacle breaching, direct lethal machine-gun fire on enemy forces, crowd control (and self-protection) using non-lethal weapons; delivery of obscurants (e.g., smoke); and nuclear/biological/chemical (NBC) agent reconnaissance. On February 10, 2005, DOD announced that it had awarded a \$26.4-million contract to a team led by Carnegie Mellon University for system development and demonstration of the Gladiator. The first Marine Corps unit is scheduled to be equipped with production Gladiators in the third quarter of FY2009.¹⁸ **Dragon Runner** is a radio-controlled UGV about the size of a shoe box that is intended to support Marine units in urban combat operations by peering around corners and examining the next floor up in a building (it is designed to be tossed up a stairway). The first operational Dragon Runners might enter service around FY2006. A total of nine prototypes were reportedly sent to Iraq in June and October 2004.¹⁹ **Other kinds of UGVs** have been sent to Iraq for use by the Army and Marine Corps, particularly for disposing of improvised explosive devices (IEDs).

Issues for Congress

Potential issues for Congress regarding naval UVs include the following: What implications might UVs have for required numbers and characteristics of naval ships and manned aircraft, and naval concepts of operations? Since the current Navy UCAV and Gladiator UGV programs will likely fall far short of meeting the goals established by Section 220 of P.L. 106-398, should these programs be accelerated so as to come closer to meeting the goals? How will the restructuring of the J-UCAS program into the Navy-oriented UCAV program affect the Navy UCAV effort? Are the Marine Corps' UAV and UGV programs adequately coordinated with those of the Army? Is the Marine Corps' plan for using upgraded Pioneers as an interim tactical UAV the best approach?

Legislative Activity

Section 921 of the **FY2007 defense authorization bill (S. 2766)** would require DOD to develop a policy for acquisition of unmanned vehicles that includes "Requirements in order to satisfy the goals for unmanned air and ground systems established in section 220" of P.L. 106-398. This provision is discussed on pages 374-375 of S.Rept. 109-254 of May 9, 2006, the Senate Armed Services Committee's report on S. 2766.

¹⁷ For additional discussion of UUV programs, see Massimo Annati, "UUVs and AUVs Come of Age," *Military Technology*, No. 6, 2005: 72, 74-76, 78-80.

¹⁸ Geoff Fein, "Gladiator Unmanned Ground Vehicle Preparing For Testing In 2006," *Defense Daily*, September 15, 2005.; Gladiator Duel Ends," *Inside the Navy*, Feb. 14, 2005.

¹⁹ Aarti Shah, "Marine Corps Uses Dragon Runner Unmanned Ground Vehicles In Iraq," *Inside the Navy*, Nov. 8, 2004.