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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 efforts to transform U.S. military forces.[1] Recent U.S. military operations have highlighted the potential of UVs to significantly improve and reshape U.S. military capabilities.[2] 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), 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).

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.

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[1] For more on military 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 UVs, see CRS Report RL31872, *Unmanned Aerial Vehicles: Background and Issues for Congress*, by Elizabeth Bone and Christopher Bolkcom; CRS Report RL31014, *Unmanned Combat Air Vehicles: Issues and Outlook*, by Robert E. Chapman II; and CRS Report RL30727, *Airborne Intelligence, Surveillance & Reconnaissance: The U-2 Aircraft and Global Hawk UAV Programs*, by Richard A. Best, Jr., and Christopher Bolkcom.

Long-dwell, Standoff ISR. Phase I of DON's efforts 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. Phase II is called the **Broad Area Maritime Surveillance (BAMS)** UAV. It envisages procuring perhaps 25 to 35 UAVs, using information gained from Phase I. Competitors for Phase II include the Global Hawk, the Mariner (a maritime version of the Predator B UAV), and UAV derived from the Gulfstream G550 business jet. The Navy's decision in the competition was expected in the second quarter of FY2005. A February 2004 report on UAVs and UCAVs from the Defense Science Board (DSB) recommended merging the Air Force Global Hawk and Navy BAMS programs into a common-use high-altitude endurance (HAE) UAV system for both services.[3] The Navy had earlier planned on procuring a total of 14 BAM UAVs in FY2007-FY2011,[4] but the FY2006-FY2011 Future Years Defense Plan (FYDP) reduced planned procurement to four units in FY2011.

Penetrating Surveillance/SEAD/Strike. DON's work in this mission area had 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. Boeing and Northrop are competing for the program. A December 2004 DOD budget-planning document reduced planned funding for the program by about 25 percent and transferred management of the program to the Air Force, with participation by the Navy.[5]

Tactical Surveillance and Targeting. The Navy wants to procure a **Vertical Tactical UAV (VTUAV)** that would take off and land vertically from Navy surface combatants or other ships. The Navy's main VTUAV effort has been the Northrop Grumman **Fire Scout UAV**, which is an unmanned helicopter. As part of its FY2003 budget request, the Navy announced that it would to stop the 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 aboard its planned Littoral Combat Ships (LCSs).[6] The February 2004 DSB report on UAVs and UCAVs recommended that "the Secretary of the Navy direct a near term procurement of a small force of Fire Scout Vertical Take-off UAV (VTUAV)

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[3] U.S. Department of Defense, Office of the Under Secretary of Defense for Acquisition, Technology, and Logistics, *Defense Science Board Study on Unmanned Aerial Vehicles and Uninhabited Combat Aerial Vehicles*, Feb. 2004, p. vi.

[4] Christopher J. Castelli, "Navy's Big Budget Cuts To BAMS UAV Program Expected To Stand," *Inside the Navy*, Jan. 10, 2005.

[5] Amy Butler, "Amid DoD Cuts, A Drastic U-Turn For Combat Drone Development, Management," *Defense Daily*, Jan. 5, 2005.

[6] 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 DD(X) and LCS Ship Acquisition Programs: Oversight Issues and Options for Congress*, by Ronald O'Rourke.

systems in order to provide the Fleet and Fleet Marine Force with a modern automated, ship-based VTOL UAV for developing operational concepts and requirements for a future naval ship-based VTOL tactical UAV system, and to serve as a potential contingency response resource." The report also recommended that the Navy and Marine Corps "form a VTUAV tactical development squadron to serve as the Fire Scout operating entity in time to meet a proposed Initial Operating Capability (IOC) date of early 2006. The Coast Guard should be invited to participate."[7] The FY2006-FY2011 FYDP includes the planned procurement of 40 VTUAVs, with three in FY2006, another three in FY2007, five in FY2008, seven in FY2009, and 11 per year in FY2010 and FY2011.

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) 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 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.[8] The Marine Corps also absorbed the Navy's 10 **Predator UAVs**, consolidating them with the Marine Corps' own fleet of 37 Predators, and has proposed upgrading the capabilities of the consolidated Predator fleet to support operations at ranges of more than 50 miles. The DSB report on UAVs and UCAVs recommended that, pending development of a common Navy-Marine Corps VTOL system, the Marine Corps should procure **Shadow 200 UAVs** (currently used by the Army) to replace Pioneer UAVs as needed to alleviate operational inventory shortages.[9] The Marine Corps is reportedly revisiting the idea of acquiring a UAV that would bridge the gap between the service's larger Predators and its smaller Dragon Eyes.[10]

Senior Navy officials reportedly have expressed interest in making sure that the Navy takes full advantage of UAVs being developed by other services or other branches of government, and in possibly consolidating Navy and Marine Corps UAV efforts.[11]

Naval USV Programs. 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

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[7] *Defense Science Board Study on Unmanned Aerial Vehicles and Uninhabited Combat Aerial Vehicles*, Feb. 2004, p. vi.

[8] Aarti Shah, "Marines In Iraq Praise Dragon Eye UAVs, Service May Buy Hundreds More, *Inside the Navy*, Nov. 8, 2004.

[9] *Defense Science Board Study on Unmanned Aerial Vehicles and Uninhabited Combat Aerial Vehicles*, Feb. 2004, p. vi.

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

[11] Andrew Koch, "US Navy Urged To Reassess Drone Plans," *Jane's Defence Weekly*, Jan. 19, 2005, p. 10.

accelerated deployment of Spartan; the first system was deployed in October 2003.[12] The Lockheed Martin **Remote Minehunting System (RMS**), to be operated from Navy surface combatants, 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 ships. Additional RMSs are now to be deployed from LCSs. The first deployment of an operational RMS is scheduled for FY2005. Since it is a semi-submersible, the RMS is sometimes considered a UUV. 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. 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 of different lengths, widths, and configurations.[14] The new master plan organizes Navy UUVs into four broad categories:

- **Man-portabable 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.

The new master plan also stresses the need for commonality, modularity, and open-architecture designs for Navy UUVs.[15]

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[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] Aarti Shah, "Navy Updates UUV Master Plan To Focus On Four Key Categories," *Inside the Navy*, Oct. 18, 2004.

[15] Christopher P. Cavas, "U.S. Navy Refines UUV Roles, Missions," *Defense News*, Jan. 31, (continued...)

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

Naval UGV Programs. The Marine Corps has two principal UGV acquisition programs. The **Gladiator** is a radio-controlled, armored vehicle 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 Carnegie-led team was competing against a team led by Lockheed Martin.[16] The Marine Corps in 2004 considered but decided against sending concept validation models of the Gladiator to Iraq. The first Marine Corps unit is scheduled to be equipped with production Gladiators in the third quarter of FY2009.[17] The **Dragon Runner** UGV 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 Dragon Runner prototypes

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[15] (...continued)
2005, p. 14 and Aarti Shah, "Updated UUV Master Plan Categorizes Vehicles Into Four Groups," Jan. 31, 2005.

[16] "Gladiator Duel Ends," *Inside the Navy*, Feb. 14, 2005.

[17] Jason Ma, "Gladiator UGV Was Considered For Deployment, But Deemed Not Ready," *Inside the Navy*, Dec. 6, 2004.

were reportedly sent to Iraq in June and October 2004.[18] **Other kinds of UGVs** have reportedly been sent to Iraq for use by the Army and Marine Corps, particularly for disposing of improvised explosive devices (IEDs).[19]

Issues for Congress

Naval Force Structure and Operations. What implications might UVs have for future naval force structure — the required numbers, characteristics, and groupings of naval ships and manned aircraft — and future naval concepts of operations?[20]

Urgency and Scale of UV Programs. 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." The Navy UCAV program and Gladiator UGV program will likely fall far short of meeting these goals. At a March 24, 2004, hearing before the Airland subcommittee of the Senate Armed Services Committee, Vice Admiral John Nathman, the Deputy Chief of Naval Operations for Warfare Requirements and Programs, when asked by Senator Sessions whether the 2010 goal was achievable or "pie in the sky," stated that it was "pie in the sky, sir."[21] Should the Navy UCAV and Marine Corps UGV programs be accelerated and expanded so as to come closer to meeting these goals? Should the legislated goals be modified to reflect progress in UCAV and UGV development since enactment of P.L. 106-398?

VTUAV. The Navy experimented with operating unmanned helicopters from Navy destroyers as early as 1957. Given this long history, why is it taking the Navy so long to develop and procure a fleet of VTUAVs?

J-UCAS. How will DOD's decision to create the J-UCAS program office, and to transfer the J-UCAS program to the Air Force, affect the Navy UCAV program, particularly given the somewhat different mission orientations and operational environments the Navy and Air Force originally had in mind for their respective UCAVs?

Marine Corps Programs. 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?

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

[19] Jason Ma, "U.S. Military Orders More Unmanned Vehicles To Dispose Of IEDs," *Inside the Navy*, Aug. 2, 2004.

[20] For an article discussing this issue, see Christopher P. Cavas, "U.S. Fleet Of Mother Ships," *Defense News*, Nov. 15, 2004.

[21] Malina Brown, "Nathman: Warner's Goal For Unmanned Aviation Force Is 'Pie In The Sky,'" *Inside the Navy*, Mar. 29, 2004.