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V-22 Osprey Tilt-Rotor Aircraft

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Summary

The V-22 Osprey is a tilt-rotor aircraft that takes off and lands vertically like a helicopter and flies like a plane by tilting its wing-mounted rotors to function as propellers. Combining a helicopter's operational flexibility with the greater speed, range, and efficiency of fixed-wing aircraft, the V-22 can perform such missions as troop/cargo transport, amphibious assault, special operations, and search and rescue operations.

Begun in FY1982 by the Army and now funded in part by the Air Force, the V-22 has been primarily a Marine Corps program funded by the Navy Department. The aircraft is produced by Bell Helicopter Textron and Boeing Helicopters, with engines produced by Rolls-Royce/Allison. Flight testing and operational evaluation of pre-production V-22s began in early 1997, with procurement of production aircraft approved in April 1997.

The future of the aircraft was at issue in 1989-92, when Secretary of Defense Cheney sought to cancel the program on grounds of affordability. Congress continued to fund the program, however, providing $16.4 billion through FY2004. As of December 31, 2003, the Defense Department estimated the program's total cost to be about $48 billion to develop and produce 458 aircraft.

The administration's FY2002 defense budget requested $3,278.3 million for the V-22 program. This included procurement of 12 MV-22s for the Marine Corps, modification of existing aircraft, and RDT&E. Appropriations conferees reduced the Navy procurement ($226 million and three airframes) and RDT&E. Air Force procurement was also cut, but R&D was increased ($180 million) to buy three EMD airframes. The Department of Defense included $1.9 billion in V-22 funding in its FY2003 budget request. The Department of Defense procured 11 MV-22 aircraft in FY2003, the minimum annual purchase required to keep the assembly lines intact. The Bush Administration's FY2004 budget requested $1.6 billion in overall V-22 funding, $1.1 billion to procure 11 aircraft (nine for the Marine Corps, 2 for the Air Force), and $543.9 million in R&D funding. This request was matched by appropriators, with a transfer of some R&D funding to the Special Operations Command. The Administration's FY2005 request included $1.6 billion in procurement and RDT&E funding for the V-22.

Congress has supported the V-22 as a new technology with multi-service military applications as well as various civilian uses (if derivatives of this tilt-rotor aircraft are developed for civil aviation) with potential commercial and foreign sales implications. Critics of the V-22 have questioned its affordability and argued that its performance would not justify the cost of procuring this new aircraft in the quantity projected. Also, in light of several accidents, and a reported cover-up, critics argue that the tilt-rotor technology is too risky, while supporters contend that risks are being adequately addressed under a revamped program. This report will be updated.

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V-22 Osprey Tilt-Rotor Aircraft

Background

The U.S. Marine Corps considers the V-22 its highest aviation priority. Lt. Gen. Frederick McCorkle, former Marine Corps Deputy Commandant for Aviation, has written "The Osprey's introduction to the Marine forces is of paramount importance to the Marine Corps as it epitomizes our philosophy of procuring and fielding leap-ahead, advanced technology systems to best employ our expeditionary forces." The Marine Corps believes that the Osprey will provide them an unprecedented capability to quickly and decisively project power from well over the horizon. Indeed, the Marine Corps considers the V-22 Osprey more than just an aircraft. Instead, the Osprey is viewed as an important foundation upon which its vision for projecting naval power ashore rests. The aircraft's promise, however, has been dimmed by a series of challenges to its affordability, safety, and program management.

The V-22 tilt-rotor design combines the helicopter's operational flexibility of vertical take off and landing with the greater speed, range, and fuel efficiency of a turboprop aircraft. The V-22 Osprey takes off and lands vertically like a helicopter but flies like a fixed-wing aircraft by tilting its wing-mounted rotors 90 degrees forward to function as propellers. This "...combination of increased payload with vastly improved speed and range," McCorkle writes, "make the Osprey the aircraft that defines the commander's area of influence as it relates to placing Marines on the ground."[1]

The V-22 is intended to perform a variety of Army, Navy/Marine Corps, and Air Force missions, including troop and equipment transport, amphibious assault, search and rescue, and special operations. The Marines' MV-22 version can transport 24 fully-equipped troops some 200 nautical miles (nm) at a speed of 250 knots (288 mi/h), exceeding the performance of the CH-46 medium-lift assault helicopters the MV-22 will replace. The Navy's HV-22 version will replace HH-3 helicopters now used for search and rescue. The Air Force's CV-22 version (with a range of 500 nm) will be used for special operations. Army officials have testified that the service has no requirement for the V-22, but the Air Force has expressed strong interest in the CV-22 for its Special Operations Command, which plans to buy at least 50 CV-22s.

Developed and produced by Bell Helicopter Textron of Fort Worth, TX, and Boeing Helicopters of Philadelphia, PA, the aircraft is powered by two T406 turboshaft engines produced by Allison Engine Company of Indianapolis, IN, a

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[1] Lt. Gen. Frederick McCorkle, "Transforming Marine Aviation," *Marine Corps Gazette*, May 2000, p.26.

subsidiary of Rolls-Royce North America. The contractors announced in August 1998 that the V-22 will be assembled in a new plant in Amarillo, TX.

Through FY2004, $16.4 billion had been provided for the V-22 program. The Defense Department's Selected Acquisition Report of December 31, 2003, estimated the total acquisition of a 458-aircraft program would be $48 billion., which translates into a program unit acquisition cost of $105 million per Osprey. The program acquisition cost includes funding for both development and production of the aircraft and related activities, whereas flyaway cost excludes research-development cost, thus making such estimates significantly lower than estimates of total program acquisition cost.

The V-22 program has proved controversial. Former Secretary of Defense Cheney tried to terminate the program in 1989-92, for instance, but Congress continued to provide funds for development of the V-22. The George H. Bush Administration's FY1990 budget requested no funds for the program. In submitting that budget to Congress on April 25, 1989, Defense Secretary Cheney told the House Armed Services Committee that he "could not justify spending the amount of money ... proposed ... when we were just getting ready to move into procurement on the V-22 to perform a very narrow mission that I think can be performed ... by using helicopters instead of the V-22."

Program Details

The V-22 program has been under development for over 20 years. Safety and maintenance concerns have arisen during this period, but the program has maintained support from many in Congress nonetheless. The program has undergone restructuring to accommodate recommendations from outside experts and DOD managers.

Development

The V-22 is based on the XV-15 tilt-rotor prototype which was developed by Bell Helicopter and first flown in 1977. The Department of Defense began the V-22 program in 1981, first under Army leadership but with the Navy/Marine Corps later taking the lead in developing what was then known as the JVX (joint-service vertical take-off/landing experimental aircraft). Full-scale development of the V-22 tilt-rotor aircraft began in 1986.

Like some other tactical aviation programs (such as the F/A-22 Raptor and Joint Strike Fighter), the total number of V-22 aircraft planned for procurement has decreased over time. In 1989, the Defense Department projected a 663-aircraft program, with six prototypes and 657 production aircraft (552 MV-22s, 55 CV-22s, and 50 HV-22s). As projected in 1994, however, the program comprised 523 production aircraft (425 MV-22s, 50 CV-22s, and 48 HV-22s). Procurement of these 523 aircraft was to continue into the 2020s, since the Defense Acquisition Board limited annual expenditures for Marine MV-22s to $1 billion (FY1994 dollars) when it approved entry into engineering and manufacturing development (EMD) in

September 1994. The Quadrennial Defense Review (QDR), released May 19, 1997, recommended accelerated procurement of 458 production aircraft (360 MV-22s for the Marines; 50 Air Force CV-22s; and 48 Navy HV-22s). Such a 458-aircraft program is now projected.

On March 19, 1989, the first of six MV-22 prototypes was flown in the helicopter mode and on September 14, 1989 as a fixed-wing plane. Two of these aircraft were destroyed in crashes. Prototype aircraft numbers three and four successfully completed the Osprey's first Sea Trials on the USS Wasp (LHD-1) in December 1990. The fifth prototype crashed on its first flight (June 11, 1991), because of incorrect wiring in a flight-control system; the fourth prototype crashed on July 20, 1992, while landing at Quantico Marine Corps Air Station, VA, resulting in loss of the aircraft and crew. This accident was caused by a fire resulting from component failures and design problems in the engine nacelles.

Flight tests were resumed in August 1993 after changes were incorporated in the prototypes. Flight testing of four full-scale development V-22s began in early 1997, when the first pre-production V-22 was delivered to the Naval Air Warfare Test Center in Patuxent River, MD. The first EMD Flight took place on February 5, 1997. The first of four low-rate initial production aircraft, ordered on April 28, 1997, was delivered on May 27, 1999. Osprey number 10 completed the program's second Sea Trials, this time from the USS Saipan (LHA-2) in January 1999.

Operational evaluation (OPEVAL) testing of the MV-22 began in October 1999 and concluded in August 2000. On October 13, 2000, the Department of the Navy announced that the MV-22 had been judged operationally effective and suitable for land-based operations. This finding moves the program one step closer to full-rate production, but a similar judgment is still required for ship-based operations. The Navy's Operational Test and Evaluation Command reported that the Osprey had yet to conduct more tests to demonstrate the MV-22's wing-folding mechanism. On November 15, 2000 the Marine Corps announced that the Osprey had successfully completed sea trials and had been deemed operationally effective and suitable for both land- and sea-based operations.

The V-22 Program Office reports the following flight test accomplishments: More than 2500 hours flown (over 1300 hours on EMD aircraft). Achieved speeds of 342 knots (402 mph); altitude of 25,000 ft; gross weight of 60,500 lbs., and a G maneuver load factor of +3.9 at 260 knots. External loads of 10,000 lbs have been carried at 230 knots. The Program Office reports that the MV-22 has flown more than 40 troop-lift missions and has carried more than 700 troops during OPEVAL flights. Other tests conducted during OPEVAL included land and ship-board operations, amphibious assault missions, over-water operations, night-vision goggle flights, low-level navigation, external load lifting on single and dual hooks, in-flight refueling with a C-130 tanker, and landings in difficult terrain.

Successfully completing OPEVAL should have cleared the way for full rate production of 28 aircraft a year, although the Marines prefer a rate of 36 annually. This decision was to have been made in December 2000, but was postponed indefinitely, due to fatal accidents, and a mixed report from DOD's director of operational test and evaluation.

Accidents and Fatalities Worsen

On April 8, 2000 another Osprey crashed near Tucson, Arizona during an exercise simulating a noncombatant evacuation operation. All four crew members and 15 passengers died in the crash. An investigation of the accident found that the pilot was descending in excess of the recommended flight envelope which may have caused the aircraft to experience an environmental condition known as "power settling" or "vortex ring state." According to Lt. Gen. Fred McCorkle, the pilot was descending more than a thousand feet per minute. The recommended descent rate is 800 feet per minute." Following a two-month suspension of flight testing, the Osprey recommenced OPEVAL in June 2000, with pilots flying a slightly tighter flight envelope. A July 27, 2000 report by the Marine Corps Judge Advocate General (JAG) (which had access to all non-privileged information from the safety investigation) confirmed that a combination of "human factors" caused the crash.

> "This mishap appears not to be the result of any design, material or maintenance factor specific to tilt-rotors. Its primary cause, that of a MV-22 entering a Vortex Ring State (Power Settling) and/or blade stall condition is not peculiar to tilt rotors. The contributing factors to the mishap, a steep approach with a high rate of descent and slow airspeed, poor aircrew coordination and diminished situational awareness are also not particular to tilt rotors."[2]

It was reported on June 28, 2000 that a draft DOD Inspector General study concluded that the V-22 would not successfully demonstrate 23 major operational effectiveness and suitability requirements prior to the December 2000 OPEVAL Milestone III decision to enter full rate production in June 2001. The Marine Corps agreed with DOD's assessment of the deficiencies, but said that they had been aware of these deficiencies before the beginning of OPEVAL. Furthermore, the Marine Corps said that they had an approved plan designed to resolve the deficiencies prior to the Milestone III decision.

On November 17, 2000, DOD's Director of Operational Test and Evaluation issued a mixed report on the Osprey; saying although "operationally effective" the V-22 was not "operationally suitable, primarily because of reliability, maintainability, availability, human factors and interoperability issues." The report recommended that more research should be conducted into the V-22's susceptibility to the vortex ring state blamed for the April 8, 2000 crash.

On December 11, 2000, a MV-22 Osprey crashed near Jacksonville, NC, killing all four Marines on board. This was the fourth Osprey crash since 1991 and the third lethal accident. The aircraft's pilot, Lt. Col. Keith M. Sweeney was the program's most experienced pilot and was in line to command the first squadron of Ospreys. The aircraft's copilot, Maj. Michael Murphy was second only to Sweeney in flying time on the Osprey.[3] The Marine Corps grounded the Osprey fleet pending a mishap

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[2] V-22 JAGMAN Executive Summary, United States Marine Corps, Division of Public Affairs, July 27, 2000, p.1.

[3] James Dao, "Marines Ground Osprey Fleet After Crash Kills Four," *New York Times*, Dec.

(continued...)

board investigation. On April 5, 2001, the Marine Corps reported that the crash was caused by a burst hydraulic line in one of the Osprey's two engine casings, and a software malfunction that caused the aircraft to accelerate and decelerate unpredictably and violently when the pilots tried to compensate for the hydraulic failure.[4] The Marine Corps report called for a redesign of both the hydraulics and software systems involved.[5]

Maintenance Falsification

In December 2000, an anonymous letter was mailed to the media by someone claiming to be a mechanic in the Osprey program. The letter claimed that V-22 maintenance records had been falsified for two years, at the explicit direction of the squadron commander. Enclosed in the letter was an audio tape that the letter's author claimed was a surreptitious recording of the squadron commander directing maintenance personnel to lie about the aircraft until the V-22 TRIP decision was made. On January 20, 2001 it was reported that the V-22 squadron commander admitted to falsifying maintenance records. The Marine Corps subsequently relieved him of command and reassigned him to a different position. The Department of Defense's Inspector General (IG) conducted an investigation. On September 15, 2001, it was reported that three Marines were found guilty of misconduct and two were reprimanded for their actions.

Reviews, Reassessments, and Revamp

On April 19, 2001, a Blue Ribbon panel formed by then-Secretary of Defense William Cohen to review all aspects of the V-22 program, reported its findings and recommendations.[6] These findings and recommendations were also discussed during congressional testimony on May 1, 2001. The panel recommended that the program continue, albeit in a restructured format. The panel concluded that there were numerous problems with the V-22 program — including safety, training and reliability problems — but nothing inherently flawed in basic tilt-rotor technology. Because of numerous safety, training, and reliability problems, the V-22 is not maintainable, or ready for operational use.

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[3] (...continued)
12, 2000.

[4] An un-redacted version of JAG investigation into the April 2000 V-22 crash indicates that investigators found three "noteworthy" maintenance "areas of concern", including the Osprey's hydraulics system. A Naval Safety Center presentation to the Blue Ribbon Panel brought to light several previously unreported maintenance problems — including hydraulics failures — that caused engine fires or other problems during the Osprey's operational testing.

[5] Mary Pat Flaherty, "Osprey Crash Blamed on Leak, Software," *Washington Post*, Apr. 6, 2001.

[6] This panel was chaired by retired Marine General John R. Dailey and included retired Air Force General James B. Davis, Norman Augustine, and MIT professor Eugene Covert.

The panel recommended cutting production to the "bare minimum" while an array of tests were carried out to fix a long list of problems they identified with hardware, software and performance. Cutting near term production should free up funds to pay for fixes and modifications. Once the changes had been made and the aircraft was ready for operational use, the Panel suggested that V-22 out year purchases could be made in large lots using multi year contracts to lower acquisition costs. Program officials estimate that the minimal sustainable production rate is 12 aircraft per year, which would be less than half the Ospreys once planned for FY2002.[7]

DOD appears to be taking managerial and budgetary steps to incorporate the Blue Ribbon Panel's recommendations. DOD's FY2001 supplemental funding request asked for a reduction of $475 million in procurement and an increase of $80 million in R&D funds. The additional R&D funding would be used to support initial redesign and testing efforts to address deficiencies, logistics, flight test, and flight test support for V-22 aircraft. The reduction in procurement funding reflects the need to reduce production to the minimum rate while the aircraft design changes are being developed and tested.

Secretary of Defense Rumsfeld's FY2002 budget amendment, unveiled June 27, 2001, included a request for the procurement of 12 Ospreys. DOD comptroller Dov Zakheim and Marine Corps Commandant Gen. James Jones both stated that the procurement of 12 aircraft in FY2002 would allow them to sustain the V-22 subcontractor base while simultaneously addressing the Osprey program's needs.[8]

Following the Blue Ribbon panel's recommendations, it was reported that DOD Under Secretary for Acquisition Edward "Pete" Aldridge had assumed acquisition authority for the V-22 program. Under Secretary Aldridge changed the V-22 program's status from an ACAT 1C program — which gives the Department of the Navy the highest required authority for production decisions — to an ACAT 1D program. Under the latter category, the Defense Acquisition Board (DAB) will decide if and when the program is ready to enter full rate production. Other ACAT 1D programs, for example, include the F-22 Raptor and the RAH-66 Comanche.[9]

Navy officials say they are considering a series of block upgrades to the Osprey to get the program back on track. Redesigns will be retrofitted onto aircraft already on the assembly lines. Nineteen existing MV-22s will be placed in deep storage, and

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[7] Adam Hebert, "Minimal Sustainable Rate Will Dramatically Cut Near-Term V-22 Buys," *Inside the* Air Force, Apr. 20, 2001.

[8] DOD News Briefing, Wed. June 27, 2001, 1:30PM and Kerry Gildea, "New V-22 Plan Sustains Lower Tier Contractors, Jones Reports," Defense Daily, May 15, 2001.

[9] "Navy Loses Osprey Authority," Washington Post, May 22, 2001 and Hunter Keeter, "Aldridge Maneuvers V-22 Acquisition Authority Away from Navy," *Defense Daily*, May 22, 2001 and Linda de France, "V-22 Osprey Production Authority Transferred from Navy to DoD," *Aerospace* Daily, May 22, 2001.

retrofitted later.[10] These upgrades may combine up to 120 "fixes" identified by DOD. Although purchases of the CV-22 variant have been postponed until the program is restructured, Air Force Special Operations Command officials have said that they are developing plans to accelerate future buys once the program is back on track. In October 2001, it was reported that Undersecretary Aldridge estimated that the V-22 would require at least two years of flight testing before DOD could conclude that the aircraft is safe, effective, and "worth the cost."[11]

A NASA-led review of the V-22 program, released November 6, 2001, concluded that there are no known aero-mechanical phenomena that would stop the tilt rotor's development and deployment. The study focused on several aero-mechanics issues, including Vortex Ring State, power problems, auto-rotation, and hover performance.[12]

In a December 21, 2001 memo to the Secretaries of the Air Force and the Navy, and the Commander-in-Chief, Special Operations Command, Undersecretary of Defense Aldridge gave his authorization for the V-22 to resume flight testing in the April 2002 time frame. Secretary Aldridge expressed support for range, speed, and survivability goals of the V-22. He noted, however that the program still had numerous technical challenges to overcome, and emphasized that the V-22 must demonstrate that "1) it can meet the needs of the warfighter better than any other alternative, 2) it can be made to be reliable, safe, and operationally suitable, and 3) it is worth its costs in contributing to the combat capability of U.S. forces." Secretary Aldridge approved the flight test program under the condition that the production rate be slowed to the minimum sustaining level, that it be comprehensive and rigorous, and that the restructured program is fully funded in accordance with current estimates.[13]

Mechanical adjustments slowed the V-22 test schedule, and the MV-22 took its first test flight on May 29, 2002. The Air Force CV-22 resumed flight tests on September 11, 2002. Flight tests are designed to explore both technical and operational concerns. Technical concerns include flight control software and the reliability and robustness of hydraulic lines. Operational concerns being explored include whether the Osprey is too prone to Vortex Ring State to make it a safe or effective aircraft, whether this potential problem is further exacerbated by multiple Osprey's flying in formation, and how well the V-22 handles at sea.[14]

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[10] Christian Lowe, "Navy to Store MV-22s For Up To Four Years," *Marine Corps Times,* Mar. 11, 2002.

[11] Tony Capaccio, "Textron-Boeing V-22 Needs Two years of Testing, Aldridge Says," *Bloomberg.com,* Oct. 16, 2001.

[12] Christopher Castelli, " NASA Review Panel Endorses Resumption of V-22 Flight Tests," InsideDefense.com,. Nov. 14, 2001.

[13] "Text: Aldridge Memo on V-22," *Inside the Navy*, Jan. 7, 2002.

[14] Thomas Ricks, "V-22 Osprey to Face Make or Break Tests," *Washington Post*, Dec. 25, 2002, p.14.

The principal difference between the aircraft that were grounded in 2000 and the aircraft that are being tested 17 months later are re-routed hydraulic lines and an improved caution and warning system.[15] Hydraulic failures have continued during the reinstated flight test program, once on August 4, 2003, (due to a mis-installed clamp) and again on September 5, 2003. Improvements to the production V-22 aircraft are expected to be implemented in three blocks.[16]

In conjunction with resuming flight testing, the Navy Department modified certain V-22 requirements. For instance, the V-22 is no longer required to land in helicopter mode without power (also known as "autorotation"), protection from nuclear, chemical and biological weapons has been eliminated. The V-22 is no longer required to have an "air combat maneuvering" capability; instead it must demonstrate "defensive maneuvering." Also, the requirement that troops be able to use a rope or rope ladder to exit the cabin at low altitudes has been eliminated.[17] Also concurrent with the resumption of V-22 flight testing, DOD began an in-depth study of alternatives to pursue in case the aircraft does not pass muster. Options reportedly include purchasing the S-92, or upgrading CH-53, or EH101 helicopters.[18]

After one year and 466 hours of flight testing, DOD reviewed the Osprey's progress. On May 15, 2003 Thomas Christie, DOD's Director of Operational Test and Evaluation (DOT&E) reportedly graded Bell-Boeing's improvements to the Osprey's hydraulics as "reasonable and appropriate" and "effective."[19] Christie also reportedly approved of the testing that had been completed and was satisfied with what had been learned about the V-22's susceptibility to Vortex Ring State. On May 20, 2003 the Defense Acquisition Board also reviewed the program approved of the flight test program's progress.

DOD currently plans on procuring the V-22 at 11 aircraft (the minimum sustainable rate) through its FY2005 budget request. Marine Corps officials had recommended increasing the production rate in FY2006 to 20 aircraft. However, in a August 8, 2003 memorandum, Undersecretary of Defense for Acquisition Michael Wynne announced that this acceleration "presents more risk than I am willing to accept." Instead, Wynne restructured the planned procurement, reducing the FY2006 purchase to 17 aircraft. "For subsequent years' procurement planning, production rates should increase by about 50% per year for a total of 152 aircraft through FY09," according to the August 8th memo. Wynne directed that the savings resulting from the reduced procurement (estimated at $231 million) be invested in improving the V-

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[15] Jefferson Morris, "Pilot: Resumption of V-22 Testing To Be Treated Like First Flight," *Aerospace Daily,* Apr. 29, 2002.

[16] Christopher Castelli, "Aldridge Reviews V-22, Clearing Way for Navy Decision to Resume Flight Tests," *InsideDefense.Com,* Apr. 25, 2002.

[17] Joseph Neff, "Eased Standards 'Fix' Osprey," *Raleigh News & Observer,* May 19, 2002, p.1.

[18] "Aldridge Makes Progress Check on MV-22 at NAS Patuxent River," *Defense Daily,* Feb. 11, 2003.

[19] Tony Capaccio, "Boeing-Textron B-22 Gets Favorable Review From Pentagon Tester," *Bloomberg.com,* May 19, 2003.

22's interoperability, by funding the Joint Tactical Radio System, Link 16 and Variable Message Format communication. Wynne also directed that a multi-year procurement (MYP) of the V-22 be accelerated. While some suggest that this restructuring will more quickly deliver high-quality aircraft to the Marines and Special Operations Forces, others fear that slowing procurement will inevitably raise the platform's cost.

In April 2004, it was reported that the CV-22 had fallen six months behind its flight test schedule. The V-22 program office reported that it had developed a plan to make up this lost time, and did not anticipate jeopardizing operational testing scheduled for January 2005.[20]

System Description

The V-22 is a tilt-rotor V/STOL aircraft, capable of vertical or short take off and landing, with forward flight like a conventional fixed-wing aircraft. About 65% of the airframe is made of graphite-epoxy composite materials. The Marine Corps's MV-22 version will have the following characteristics:

Propulsion:	2 T406 turboshaft engines
Crew:	3
Passengers:	24 combat troops
Max. vertical take off weight:	47,500 lb
Max. short take off weight:	55,000 lb
Speed at max. weight:	250 nmi/hour
Combat radius:	200+ nmi

The airframes of the Marine Corps MV-22 and the Air Force CV-22 variant for Special Operations Command will have some 90% commonality. The CV-22 will carry 18 troops, with auxiliary fuel tanks increasing combat radius to about 500 miles. This variant may carry a 50-cal GAU-19 nosegun for self defense. The Marine Corps is also evaluating the efficacy of a gun, primarily for self defense purposes.[21] The CV-22 will also carry advanced avionics, such as terrain-following radar, and directed infrared countermeasures, that will allow special operations forces to penetrate hostile areas in all weather and terrain. The CV-22 will also carry extra fuel for greater range.

The V-22's potential capabilities relative to conventional helicopters and turboprop aircraft are illustrated by two figures found on the USMC V-22 Website [http://www.navair.navy.mil/v22/]. The V-22 has the ability to carry considerably larger payloads much greater distances than the CH-46 helicopter that it will replace. The V-22 could carry three times the payload, or fly five times the range of the CH-

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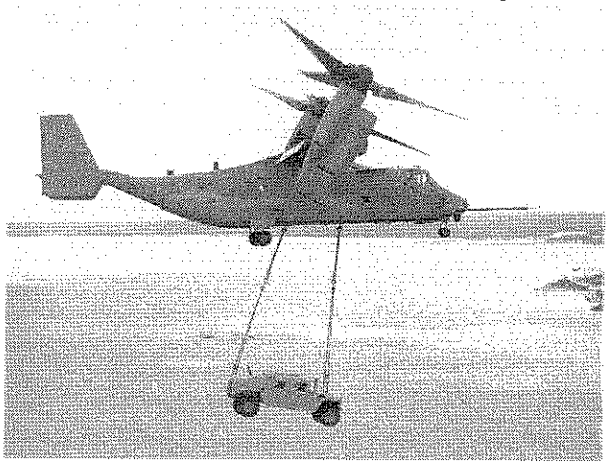
[20] Ron Laurenzo, "Testing of Special Ops V-22 Six Months Behind Schedule," *Defense Today,* Apr. 8, 2004.

[21] Hunter Keeter, ".50 Cal. Ramp Gun Interim Armament for V-22, Solution Follows OPEVAL," *Defense Daily,* Nov. 15, 2002.

46 (4,000 lbs and 132 nmi for the CH-46 respectively). While it will take off and land vertically like a helicopter, the V-22 will fly twice as fast. While the V-22's range, speed and payload capabilities are most frequently touted, the Bell/Boeing contractor team reports the Osprey exhibits the following survivability traits: The V-22 is up to 21 times less vulnerable to small arms fire than current helicopters, it is 75 percent quieter than helicopters, and it is the only U.S. tactical transport aircraft with designed-in radiological, biological, and chemical warfare protection.

Figure 1. V-22 Osprey in Flight



Key Issues

Should the Defense Department Procure the V-22 Aircraft?

Main arguments of those who say "Yes". The Defense Department should accelerate procurement of the V-22, which the Marine Corps considers its most important aviation program, in order to obtain these aircraft sooner and at more economical production rates. The V-22 is needed to replace aging military helicopters in all the services, which are costly to maintain and operate safely and effectively. The Army should reconsider its decision not to buy the V-22, which the Air Force wants to procure for its Special Operations missions and combat search and rescue. The Osprey represents a truly joint capability, as evidenced by the Navy's desire to purchase HV-22s for search and rescue, and other missions.

This tilt-rotor aircraft will provide the operational flexibility of a helicopter without the helicopter's inherent limitations of speed, range, and altitude. While there may be new helicopters that could replace and improve on today's military helicopters, V-22 proponents say that none of them would match the Osprey's capabilities. When landing on hostile shores in a third-world conflict (typically lacking important infrastructure such as airfields and roads), the V-22 would be critical for the transport of Marines from ship to shore. Senior DOD officials have testified that the V-22 would have, for example, made a significant contribution the to war on terrorism in Afghanistan.

The Osprey has been rigorously tested and its accident rate is consistent with other aircraft development programs, supporters say. While some technical problems

have been encountered, leading experts have testified that there are no technological barriers to the employment of tilt-rotor technology. Engineering-level modifications will, and have, put the Osprey program back on track.

Supporters of the V-22 also cite the tilt-rotor's potential value for civil aviation, law enforcement, and foreign sales by the U.S. aerospace industry.[22] The development of tilt-rotor aircraft for the armed services could have significant spin-off effects for civil aviation and U.S. technology, giving the U.S. aerospace industry a major competitive advantage in the international market.[23]

Main arguments of those who say "No". The V-22 is unaffordable in the present budgetary environment, when the cost of buying large numbers of these transport/cargo aircraft would most likely be at the expense of more critical defense needs. Ship-to-shore logistical operations can be performed by less expensive helicopters for the kinds of landing operations in which the Marines are likely to be involved, where the V-22's greater speed and range would not be needed. Moreover, Marine assault missions in an opposed landing would involve ship-to-shore movement of troops and equipment, which would require coordination with aircraft having less speed and range than the V-22. Further, some challenge claims made by V-22 supporters regarding how well the V-22 performs compared to legacy helicopters.[24]

As currently funded, the V-22 program is not the joint-service effort it was expected to be, despite Air Force use of the aircraft, and the Air Force may be partially backing away from its commitment to the program. Air Force Secretary James Roche has questioned the Osprey's ability to conduct combat search and rescue operations, and the Air Force is currently re-evaluating the Osprey's attractiveness for this mission.[25]

In light of several V-22 crashes, three involving fatalities, many argue that the tilt-rotor technology is not sufficiently mature to merit the Osprey's production and fielding. Studies suggest that tilt-rotor aircraft are more susceptible to airflow

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[22] Sen. Ted Stevens et al., "Continuation of the V-22 Aircraft Program," remarks in the Senate, *Congressional Record*, daily edition, Apr. 19, 1989, pp. S4507-S4509.

[23] The potential civil application of tilt-rotor technology is also considered by some a good reason to pursue the V-22 program. A February 1988 study by the FAA and NASA concluded that tilt-rotors could help relieve airport congestion by diverting commuters and short-distance passengers to vertiports in urban centers. The importance of U.S. production of a tilt-rotor aircraft for civilian purposes was the subject of a hearing on July 17, 1990, by the House Committee on Science, Space, and Technology's Subcommittee on Transportation, Aviation, and Materials. In 1992, Congress enacted legislation (H.R. 6168) directing the Secretary of Transportation to establish a "civil tilt-rotor development advisory committee" to evaluate the feasibility and viability of developing civil tilt-rotor aircraft and infrastructure necessary to incorporate tilt-rotor aircraft into the national transportation system.

[24] See, for example, Everest Riccioni, "Osprey or Albatross?," Defense News, Jan. 27, 2004.

[25] Richard Whittle, "Mission for V-22 Questioned," *Dallas Morning News,* Aug. 6, 2002.

instabilities that can cause Vortex Ring State than are traditional helicopters.[26] And our understanding of the kinds of airflow anomalies that have caused numerous deaths in V-22 flight testing are still very immature. Critics also argue that the Navy is "dumbing down" the V-22's requirements and making it a less effective aircraft.

Opponents cast doubt on the Osprey's operational capabilities and operational concepts. A January 12, 2001 presentation by the GAO to the V-22 Blue Ribbon Panel for instance said that the V-22's cabin may not be large enough to carry 24 combat-equipped Marines, and that the severe rotor down wash might impede the ability of troops to exit the aircraft and move into combat positions. Also, to avoid entering Vortex Ring State, Osprey's will have to descend slowly, which will make them vulnerable to ground fire in combat situations. Others have argued that the Osprey's hypothetical contribution to the war in Afghanistan is questionable due to the high altitude of that country, and the Osprey's inability to improve greatly over helicopter performance in this area. Whatever commercial value a tilt-rotor aircraft might some day have for civil aviation, the V-22's value as a military system is insufficient to justify its cost in these times of budgetary constraints and higher priority defense needs.

Congressional Action

Overview

The V-22 program was an issue in the 1992 presidential campaign, with Democratic candidates Clinton and Gore supporting development of the aircraft while the Bush Administration opposed the program until late October when Vice President Quayle announced a contract award to the development team. On October 22, 1992, the Navy awarded a $550-million contract to the Bell-Boeing team to build four new V- 22 derivatives and to modify two existing V-22 prototypes for evaluation of proposed design changes.

Throughout the program, supporters have called for accelerating procurement beyond the levels projected in the Administration's plan, arguing that this would reduce program costs over the long term and would get more aircraft in service sooner. V-22 detractors have urged caution, and tried to delay the V-22 program by cutting procurement funding. In addition to overseeing cost and schedule, Congress has requested studies into V-22 maintenance and testing issues.

FY2001-FY2005

The administration's FY2005 request included $1.6 billion in procurement and RDT&E funding for the V-22, and is summarized in Table 1 below.

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[26] Michael Dornheim, "Tiltrotor Wake 'More Complex' Than Classic Vortex Ring State," *Aviation Week & Space Technology,* July 15, 2002.

Table 1. Summary ov V-22 FY2005 Request
(Millions of dollars)

	USN	USAF	SOCOM
Procurement	846.6 (8 Aircraft)	305.6 (3 Aircraft)	-
Advanced Procurement	71.5	11.0	-
Modifications	3.4	.3	-
R&D	304.1	16.4	75.1
Total	379.0	27.7	75.1

The Bush Administration's FY2004 budget requested $1.6 billion in overall V-22 funding, $1.1 billion to procure 11 aircraft (nine for the Marine Corps, 2 for the Air Force), and $543.9 million in R&D funding. In their reports (S.Rept. 108-46, S. 1050) and (H.Rept. 108-106, H.R. 1588) House and Senate authorizers respectively matched the Administration's request for V-22 procurement and R&D funding. Conferees (H.R. 1588, H.Rept. 108-354) also matched the Administration's request.

House appropriators (H.R. 2658, H.Rept. 108-187) matched the Administration's request for V-22 procurement and R&D funding. Senate appropriators (S. 1382, S.Rept. 108-87) matched the overall funding request, but recommended a transfer of $34 million from the Navy's V-22 RDT&E account to Defense-wide RDT&E (SOCOM). Appropriations conferees (H.R. 2658, H.Rept. 108-283) supported the Senate's transfer.

The Department of Defense requested $1.9 billion in V-22 funding in its **FY2003** budget request, submitted February 4, 2002.[27] The Department of the Navy intends to procure 11 MV-22 aircraft in FY2003, the minimum annual purchase required to keep the Textron and Boeing assembly lines intact during two years of new flight tests.

House and Senate authorizers and authorization Conferees matched DOD's FY2003 request for Navy, Air Force, and SOCOM (Special Operations Command) R&D funding. House authorizers also matched all requests for procurement funding.

In their report (S.Rept. 107-151, S. 2514) Senate authorizers matched the Navy's procurement request but cut $9.2 million from Navy advanced procurement. The committee recommended this reduction to keep V-22 procurement at the minimum sustaining rate of 11 aircraft per year until operational testing has been successfully completed. (P.68). Senate authorizers also matched the Air Force's procurement request, but eliminated the $10.1 request for APCY. Again, Senate

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[27] Program Weapon Acquisition Costs By Weapon System, Department of Defense Budget for Fiscal Year 2003, Feb. 2003. p.i.

authorizers (p.97) recommended the reduction to keep procurement at the congressionally mandated rate of 11 aircraft per year. In their report (H.Rept. 107-772, H.R. 4546) Authorization conferees matched the request for Navy procurement, Air Force procurement, and Air Force advance procurement. Conferees cut $19.3 million from the Navy's advance procurement to fund procurement for 9 aircraft in FY2004, instead of 11 aircraft.

House and Senate appropriators and appropriations Conferees matched DOD's FY2003 request for Navy, Air Force, and SOCOM (Special Operations Command) R&D funding. In their report (H.Rept. 107-532, H.R. 5010), House appropriators cut the Navy's FY2003 procurement request by $20 million due to "unjustified cost resolution claim" (p. 125) and matched the request for advance procurement. House appropriators matched the Air Force's procurement and advance procurement requests. In their report (S.Rept. 107-213 , H.R. 5010), Senate appropriators followed Senate authorization by matching Navy and Air Force procurement requests, but cutting both requests for advance procurement. Appropriations conferees (H.Rept. 107-732, H.R. 5010) cut the Navy's FY2003 procurement request by $10 million due to "unjustified cost resolution claim" (p. 175). They also cut the Navy's advance procurement request by $18.4 million. Appropriations conferees matched the Air Force's request for procurement and advance procurement.

The Bush Administration's FY2002 funding request for the V-22 included $1 billion in Navy procurement for 2 aircraft. Navy procurement also included requests for $48.4 million for advanced procurement (current year) and $35 million for modification of in service aircraft. Air Force procurement totaled $95.1million (no aircraft to be built), for FY2002, and $15 million for advanced procurement (current year). Navy RDT&E funding of $546.7 million was requested. The Air Force requested $10 million for RDT&E.

On August 1, 2001 the House Armed Services Committee (HASC) reduced overall FY2002 funding for the V-22 program by $264.7 million. The HASC matched the Administration's request for: $1 billion to procure 12 MV-22s, $96.7 million for Special Operations Command CV-22 component development, and $10 million for Air Force CV-22 avionics development. House authorizers reported the Administration's request for: Navy RDT&E (-$100 million), Air Force CV-22 procurement (-$136.5 million), and Special Operations CV-22 procurement (-$28.2 million).

In S.Rept. 107-62 (S. 1416), dated September 12, 2001, the Senate Armed Services Committee (SASC) provided its oversight of the V-22 program. In terms of research and development, the SASC and HASC were largely in agreement. Like the HASC, the SASC matched the Air Force's request for CV-22 RDT&E, but the SASC reduced the Navy's RDT&E request by $95 million. The SASC and HASC were also largely in agreement regarding Air Force procurement, as the SASC zeroed out funds for procuring the CV-22, except for $295 million for spare and repair parts. The biggest difference between the authorizing committees was that the SASC reduced the Navy's procurement request, authorizing $783 million to procure nine Ospreys. Senate authorizers supported the Blue Ribbon Panel's recommendation that until the

V-22 program resolves reliability and maintainability problems, "the V-22 program should not move forward faster than the minimum sustaining production rate."[28]

In their report to accompany S. 1438 (H.Rept. 107-333), FY2002 authorization conferees cut $50 million from the Navy's procurement request, providing enough funding for 11 airframes rather than the 12 requested. House authorizers matched the Administration's request, Senate authorizers had cut $226.7 million to procure nine airframes. Conferees rejected the Administration's request for Air Force procurement funding, reduced the Navy's request for R&D funding by $100 million, and matched the Air Force's request for $10 million in R&D funding.

Authorization conferees also required DOD (Sec. 124, p. 514) to provide a report 30 days prior to any resumption of V-22 flight testing. The report will notify Congress of any waiver of any item capability or other requirement specified in the V-22 Joint Operational Requirements Document, along with justification for any such waiver. The report would also describe any hydraulics or flight control software deficiencies and corrective actions, action to implement the recommendations of the Senior Review Panel, and an assessment of the NASA report on tilt-rotor aeromechanics.

The House Appropriations Committee recommended that until the V-22 program completes its restructuring, the overall production rate should be held to no more than 11 aircraft per year. Accordingly, the committee cut $219 million and three aircraft from the Navy's FY2002 procurement request, and $100 million from the Navy's R&D account. Senate appropriators increased the Air Force's CV-22 request by $84 million to fund procurement of two aircraft, while zeroing out a $15 million request for advanced procurement. This transfer of budgetary resources to the CV-22 was intended to enable DOD to commence and accelerate initial operational testing of the special operations variant.

In their report to accompany H.R. 3338 (S.Rept. 107-109), the Senate Appropriations Committee cut $226.7 million and three aircraft from the Navy's FY2002 procurement request and zeroed-out the Air Force's procurement request of $95.1 million. Senate appropriators matched the Navy's RDT&E request, but denied the Air Force's $10 million R&D request.

In their report on H.R. 3338 (H.Rept. 107-350), FY2002 appropriation conferees cut the Navy's procurement request by $226 million, a reduction of three airframes. Like authorizers, appropriators rejected the Administration's request for Air Force procurement funding. However, appropriators increased Air Force R&D funding by $180 million to produce 2 CV-22 EMD (engineering, manufacturing and development) aircraft. $100 million was cut from the Navy's R&D request.

In June 2001, DOD submitted its request for FY2001 supplemental spending. To implement the Blue Ribbon Panel's recommendation on restructuring

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[28] U.S. Congress, *National Defense Authorization Act for Fiscal Year 2002*, report to accompany S. 1416, 107th Cong., 1st sess., S.Rept. 107-62, (Washington: GPO, 2001), p. 78.

the V-22 program, DOD requested $80 million in additional Navy RDT&E funds, and a reduction of $475 million in Navy and Air Force procurement accounts.

Congressional defense oversight committees made modifications to DOD's FY2001 supplemental spending request. On June 20, 2001, the House passed H.R. 2216, Making Supplemental Appropriations for the Fiscal Year Ending September 30, 2001 and for Other Purposes. In this bill the House supported the general thrust of DOD's adjustment to the V-22 program, but recommended additional appropriations of $40 million for Navy RDT&E (for a total of $120 million) in order to accelerate activities associated with fixing the V-22 program, such as risk reduction, part redesign, and continued operational testing. Because it disagreed with DOD assumptions on V-22 pricing, the House recommended additional reductions in Navy and Air Force V-22 procurement of $120 million (for a total recision of $595 million).

The Senate Appropriations Committee Report (S.Rept. 107-33, to accompany S. 1077) supported DOD's request to add $80 million to FY2001 V-22 RDT&E. Senate appropriators recommended a reduction of $513 million in Navy and Air Force V-22 production, as opposed to the DOD request to rescind $475 million in Navy and Air Force FY2001 production funds.

The Appropriations Conference Report (H.Rept. 107-148, H.R. 2216) Making Supplemental Appropriations for FY2001 concurred with the Senate appropriators desire to add $80 million for the correction of deficiencies, flight testing and flight test support. Appropriations conferees approved a reduction of $199 million for MV-22 procurement instead of the $235 million reduction proposed by DOD. Conferees also approved recision of $327.5 million from CV-22 procurement, delaying initial acquisition of this variant until deficiencies are corrected.

The Administration's FY2001 defense budget requested $1,843.1 million for the V-22 program — $1,314.9 million for procurement of 16 MV-22s for the Marine Corps, $380 million for procurement of four CV-22 versions for the Air Force, and $148.2 million in Navy R&D funding. In a February 9, 2000 letter to the House Armed Services Committee, the Marine Corps stated that its first unfunded priority was the $166 million procurement of two additional V-22s and spare parts, which would bring its total procurement to18 aircraft. For FY2001 the House and Senate defense committees consistently supported the V-22 by recommending authorizations and appropriations that matched or slightly exceeded Administration's request. Defense appropriations (H.R. 4576) supported the program with only minor modifications — a $4.5 million reduction in Force advanced procurement, current year. Additionally, authorization conferees required that "all V-22 Osprey aircraft be equipped with a state-of-the art cockpit voice recorder and a state-of the art flight data recorder..."(p.35, H.Rept. 106-945, H.R. 4205).

On February 7, 2001 Senator Russ Feingold introduced the "Osprey Safety, Performance and Reliability Evaluation Act of 2001." This bill would rescind all FY2001 procurement funding except for what would be required to maintain the V-22 production base, and delay the program one year. The bill also requires a report to Congress by the Secretary of the Navy regarding steps taken to ameliorate concerns expressed by DOD's Director of Operational Test and Evaluation. It also

requires a report to Congress by the DOD Inspector General on V-22 maintenance. Both reports must be submitted prior to the V-22 Milestone III decision. On March 5, 2001 Senator Feingold followed up this bill with a letter to Defense Secretary Donald Rumsfeld urging him to delay further procurement of the V-22 until all investigations into the program have been completed and until further testing has been completed to ensure that the Osprey is safe. Also, on April 24, 2001, Rep. Bob Filner introduced a bill that would mandate a one year moratorium on V-22 procurement. Both Senator Feingold's and Representative Filner's bills are pending in committee.

FY1994-FY2000

The Administration's FY2000 defense budget requested $1, 099.8 million for the V-22 program — $867.4 million in Navy procurement funding for 10 MV-22s, $49.5 million in Air Force advance procurement funding for the CV-22, and $182.9 million in Navy R&D funding. The FY2000 budget projected annual buys of 30 MV-22s beginning in FY2003.

The House version of the FY2000 defense authorizations bill (H.R. 1401), passed on June 10, 1999, approved procurement of 11 MV-22s; the Senate version of the bill (S. 1059), passed on May 27, 1999, authorized funds for procurement of 12 MV-22s. The House and Senate conferees agreed to a 12-plane buy, with an additional $9 million in R&D funding; their conference report (H.Rept. 106-301) was passed by the House on September 15 and by the Senate on September 22, 1999, and enacted as P.L. 106-65, October 5, 1999. The Senate version of the FY2000 defense appropriations bill (S. 1122), passed on June 8, 1999, funded procurement of 12 MV-22s, as authorized by the Senate, and provided an additional $9 million in R&D funds; the House version (H.R. 2561), passed on July 22, 1999, funded procurement of 11 MV-22s, as authorized by the House. House and Senate conferees agreed to fund a 12-plane buy in FY2000, and their conference report (H.Rept. 106-371), passed by the House on October 13 and by the Senate on October 14, 1999, enacted as P.L. 106-79, October 25, 1999, provided $1,168.8 million for the program ($976.9 million in procurement and $191.9 million in R&D funding).

The Administration's FY1999 defense budget requested $1,042.2 million for the V-22 program: $664.8 million in Navy procurement funds for seven MV-22s, $22.3 million in Air Force procurement funds for advance procurement of the CV-22 version, and $355.1 million in Navy R&D funding. The Senate version of the FY1999 defense authorizations bill (S. 2057; S.Rept. 105-189), passed on June 25, 1998, would fund the program as requested. The House version (H.R. 3616; H.Rept. 105-532), passed on May 21, 1998, authorized additional funding for procurement of eight MV-22s but would not authorize the $22.3 million in advance procurement funds for the CV-22, because "the Committee believes these funds can be deferred until FY2000." (H.Rept. 105-532: 61, 95-96.) House and Senate conferees agreed to authorize $1,097.9 million, including R&D funds and advance procurement funds for the CV-22 as requested and funding for procurement of eight MV-22s (H.Rept. 105-736, September 22, 1998) in the conference report to accompany H.R. 3616, passed by the House, September 24, and by the Senate, October 1, and enacted as P.L. 105-261 on October 17, 1998.

The House version of the FY1999 defense appropriations bill (H.R. 4103; H.Rept. 105-591), passed on June 24, 1998, provided funding for an 8-aircraft program as authorized by the House. On July 30, 1998, the Senate passed its version of the FY1999 defense appropriations bill (S. 2132; S.Rept. 105-200), which appropriated funding for a 7-aircraft program as requested and authorized by the Senate. House and Senate conferees agreed to appropriate $1,042.2 million in FY1999 development and procurement funding for seven MV-22s and the Air Force CV-22 version as requested by the Administration. (H.Rept. 105-746, September 25, 1998). The conference report on H.R. 4103, passed by the House on September 28 and by the Senate on September 29, 1998, was enacted as P.L. 105-262 on October 17, 1998.

The Administration's FY1999 budget requested funds for procurement of seven more MV-22s for the Marines and advance funding for the CV-22 version, to be procured by the Air Force beginning in FY2001. The FY1999 budget projected the following procurement plan: FY1999 — 7 MV-22s; FY2000 — 10 MV-22s; FY2001 — 16 MV-22s and four CV-22s; FY2002 — 20 MV-22s and six CV-22s; FY2003 — 27 MV-22s and nine CV-22s.

The FY1998 defense budget requested $1,071.2 million for the V-22 program ($541.7 million for procurement of five aircraft and $529.5 million in R&D funds), with projected funding of $948.8 million in FY1999 ($676.1 million in procurement and $272.7 million in R&D funds). On June 25, 1997, the House authorized $1,260.5 million in Navy procurement and R&D funds for seven aircraft, while the Senate authorized $1,161.2 million in FY1998 procurement and R&D funds for six aircraft on July 11, 1997. The Senate Armed Services Committee stated that "Noting the constrained circumstances in the near and far term, the committee is still persuaded that an addition to the procurement of MV-22s will result in efficiencies and increased capabilities for deployed Marines." (S.Rept. 105-29: 69) On July 15, 1997, the Senate appropriated $1,218.6 million for procurement of seven MV-22s vs. the five requested by the Administration. On July 29, 1997, the House appropriated funding as authorized by the House — $1,260.5 million for procurement of seven MV-22s. The FY1998 defense appropriations conference report (H.Rept. 105-265), agreed to by Congress on September 25, 1997, and enacted as H.R. 2266/P.L. 105-56 on October 8, 1997, included the amount provided by the Senate — $1,218.6 million for seven aircraft, which was also agreed to by conferees on the FY1998 defense authorizations bill (H.R. 1119) in H.Rept. 105-340, passed by the House on October 28 and the Senate on November 6, 1997.

The Administration's FY1998 budget projected procurement of five MV-22s in FY1998, with a buy of 24 in FY2003. Advocates of the V-22 viewed these procurement rates as inefficient and argued that such production rates would force the Marines to rely on aging and unreliable CH-46 helicopters. This view was reflected in the QDR's call for accelerated procurement of the MV-22 as well as in the actions of Congress, which authorized and appropriated funds for seven aircraft in FY1998 instead of the five requested.

The Administration's FY1997 budget requested $1,135.5 million for the V-22 program ($558.7 for procurement of four aircraft and $576.8 in R&D funds). During hearings on the FY1997 defense budget, supporters of the V-22 emphasized

the need to accelerate procurement beyond the levels projected in the Administration's budget, arguing that this would reduce program costs over the long term and would get more aircraft in service sooner. Secretary of the Navy Dalton indicated that if more procurement funding were available, the Navy would buy six V-22s in FY1997 versus the four requested by the Administration.

In May 1996, both the House National Security Committee and the Senate Armed Services Committee recommended procurement of six V-22s in FY1997. The House version of the FY1997 defense authorizations bill (H.R. 3230, passed May 15, 1996) included $1,414.5 million for the program ($613.8, R&D; $800.7, procurement). The Senate Armed Services Committee report (S.Rept. 104-267) noted that an increase of $302 million for procurement of six aircraft in FY1997 and advance procurement funds for 12 in FY1998 "would result in a cost saving of $32 million ... through fiscal 2001." The Committee also directed the program to make one Marine Corps MV-22 version available in 1999 for remanufacture as a CV-22 variant to be flight-tested by Special Operations Forces. The Senate bill (S. 1745, passed July 10, 1996) authorized $1,506.5 million for the V-22 in FY1997. House and Senate conferees agreed to authorize $1,474.5 million for the program in FY1997, with funding for procurement of the first six production V-22s (H.Rept. 104-724), passed by the House on August 1, 1996, and by the Senate on September 10, 1996.

The House version of the FY1997 defense appropriations bill (H.R. 3610, passed June 13, 1996) also provided $1,474.5 million for the program, including funds for a 6-aircraft buy in FY1997 and advanced funding for 12 V-22s in FY1998. The House Appropriations Committee report (H.Rept. 104-617) directed "that the FY1998 and subsequent budgets ... continue the ramp-up [of the V-22 program] to reach an economic rate of 36 aircraft per year not later than FY2000." The Senate version of the bill (S. 1894, passed July 18, 1996) appropriated $1,455.5 million for the program in FY1997, with procurement funds for six aircraft. House and Senate conferees agreed in September 1996 to appropriate $1,325 million for the V-22 program in FY1997: $749 million for procurement of five aircraft and $577 million for R&D (H.Rept. 104-863).

The Administration's FY1996 budget requested $810.6 million for the V-22 — $762.6 million in R&D funds and $48 million in advance procurement funds, to begin production in FY1997. The FY1996 budget projected a request of $1,275.3 million for the V-22 program in FY1997, including $692.8 million in procurement funds for production of four aircraft.

In the FY1996 defense appropriations bill (H.R. 2126, passed September 7, 1995; S. 1087, passed September 5, 1995), the House approved requested funds for the program (H.Rept. 104-208), while the Senate provided some $5 million less than was requested for the program without explaining the grounds for this reduction (S.Rept. 104-124). House and Senate conferees agreed to the Senate's lower figure of $805.6 million in H.Rept. 104-261, This amount was later authorized in a modified conference report on the FY1996 defense authorizations bill (H.Rept. 104-450) passed in January 1996 by the House (January 24, 1996) and Senate (January 26, 1996).

The Administration's FY1995 budget request of $496.9 million for the V-22 program was authorized by the House in the FY1995 defense authorizations bill (H.R. 4301, passed June 9, 1994) and by the Senate in its version of the authorizations bill (S. 2182, passed July 7, 1994). This figure was also contained in both the House version of the FY1995 defense appropriations bill (H.R. 4650, passed June 29, 1994) and the Senate version (passed August 11, 1994). House and Senate conferees reduced the FY1995 appropriation to $466.9 million while reaffirming "their strong support for this unique aircraft." The conferees expect DOD "to provide sufficient long lead procurement funds in the FY1996 budget request to commence low rate initial production of the V-22 in FY1997....for a V-22 initial operational capability in FY2001." (H.Rept. 103-747, passed September 29, 1994).

The Administration's FY1994 defense budget requested $82.3 million for the V-22 program. The House authorized FY1994 funds for the V-22 as requested. The Senate authorized $10 million (on grounds that unspent prior-year funds were adequate for the program in FY1994) plus $15 million for the CV-22 variant for special forces missions. House and Senate conferees agreed in November 1993 to authorize and appropriate $10 million for the program.