Vertical Integration

A New Generation of Marine Corps Vertical-lift Platforms Comes of Age

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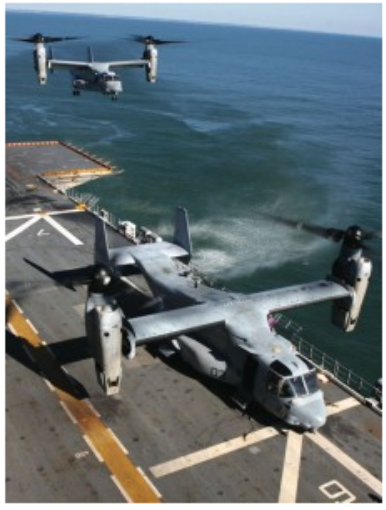
Pilots with Marine Light Attack Helicopter Training Squadron 303, Marine Aircraft Group 39, 3rd Marine Aircraft Wing, turn to make another pass over a target while conducting a gun shoot with a UH-1Y Venom belonging to the squadron, at Marine Corps Base Camp Pendleton, Calif. The new Venom is capable of carrying an interchangeable armament of the GAU-16 .50-caliber machine gun, M240 medium machine gun, and GAU 17 7.62 mm six barrel mini-gun. U.S. Marine Corps photo by Lance Cpl. Christopher O'Quin.

As the second decade of the new millennium commences, Marine Corps rotary-wing forces are beginning to more broadly reap the benefits of helicopter and vertical lift aircraft upgrade/replacement programs begun years and even decades ago.

The efforts dovetail with a "rebalancing" of the U.S. defense posture launched by the Obama administration and the Department of Defense (DoD) in the 2010 DoD budget. Carried forward in the 2011 DoD budget request and 2010 Quadrennial Defense Review, the plan stresses the need to prepare for future conflicts but also emphasizes capabilities needed for success in current hostilities.

Increases in funding for special operations personnel and equipment, electronic warfare capabilities, and unmanned vehicles are accompanied by more than $9.6 billion in funding for the acquisition of modern rotary-wing aircraft and for the training of additional air crews. Nearly one-third of the money devoted to rotary-wing procurement for 2011 is directed toward the Bell-Boeing V-22 Osprey, with the Marine Corps as the prime beneficiary. USMC MV-22s have already served in both Iraq and Afghanistan, replacing the venerable CH-46E.



Two MV-22 Ospreys from Marine Generated by www.PDFonFly.com at 1/31/2011 6:35:58 PM

Funding remains in place for the H-1 upgrade program begun 15 years ago. Initially aimed at upgrading AH-1W Super Cobras and UH-1N Twin Hueys via the remanufacture of the airframes to AH-1Z Viper and UH-1Y Venom configurations, the original program was modified to include manufacture of the improved versions as completely new aircraft. The UH-1Y is already operational, while the AH-1Z will achieve IOC in 2011.

The only active developmental rotorcraft procurement program in the DoD is the CH-53K Heavy Lift Replacement program. Sorely needed to replace the Marine Corps' aged fleet of CH-53D and

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CH-53E medium- and heavy-lift helicopters, the CH-53K is slated to achieve IOC in 2018.

(Reinforced), 24th Marine Expeditionary Unit (24th MEU), land on the flight deck of the amphibious assault ship USS Nassau (LHA 4). U.S. Marine Corps photo by Sgt. Alex C. Sauceda.

Early in 2010, the Department of the Navy, the Office of the Secretary of Defense, and the White House Military Office announced that the VXX Presidential Helicopter program, canceled in May 2009, would be re-launched with a new Request For Information (RFI) released in February. Rotary-wing transport of the president, vice president, cabinet members, and other VIPs is a Marine Corps mission performed by Marine Helicopter Squadron One (HMX-1). Midway through 2010, proposals had been received from two manufacturer teams, but any decision on procurement looked to be at least two years away.

Meanwhile, the USMC's legacy helicopters, including the CH-46E, UH-1N, AH-1W, CH-53D/E, VH-3D, and VH-60N continued to perform both at home and abroad. Knitting together operations as legacy aircraft retire and the new generation of vertical-lift platforms become operational has been a major feature of Marine Corps rotary-wing aviation in 2010. Here then is a look at this work of vertical integration.

MV-22B

The introduction of the Marine Corps version of the Bell-Boeing V-22 Osprey is already well advanced. The MV-22's first combat deployment came in the late summer of 2007 as VMM-263 (the first operational MV-22 unit) headed to Al Asad Air Base, Iraq. The unit remained in Iraq for six months, flying 2,500 missions. Two more MV-22B squadron deployments (VMM-162, VMM-266) followed in 2008-2009 in support of Operation Iraqi Freedom (OIF). In all, the three units logged 9,000 flight hours, carried over 40,000 passengers and lifted over two-million pounds of cargo while flying every mission profile assigned by the Multi-National-Force-West Commander in Iraq.

The Osprey's first combat deployment to Afghanistan came two years later, in November 2009, with VMM-261. In less than a month the type flew its first offensive combat mission, assisting Marines and Afghan troops disrupting the Taliban in Now Zad Valley, Helmand province. The squadron returned home after the successful deployment on July 16 with all aircraft and Marines.

An MV-22B Osprey assigned to the Golden Eagles of Marine Medium Tiltrotor Squadron (VMM) 162 takes off from the amphibious transport dock ship USS Mesa Verde (LPD 19). Mesa Verde was part of the Nassau Amphibious Ready Group supporting maritime security operations and theater security cooperation operations in the U.S. 5th Fleet area of responsibility. U.S. Navy photo by Mass Communication Specialist 1st Class Steve Smith.

"The V-22 was used [in Afghanistan] to exploit its capabilities to the maximum extent," said Maj. Timothy Miller, executive officer for VMM-261. "We were able to range the entire country. We flew to places that could only be ranged by plane, but only be landed by helicopter."

The same month, the Osprey completed its first shipboard deployment aboard USS Bataan (LHD 5) as part of a Marine Expeditionary Unit (MEU) with VMM-263 aircraft, capping the deployment by flying 510 miles from Bataan to Camp Bastion, Afghanistan. There they conducted a relief in place with another squadron to begin support of Operation Enduring Freedom (OEF).

As of summer 2010, the MV-22B had replaced just about half of the Marines' CH-46E fleet, and according to the Marine Corps, "The program continues full rate production with on time deliveries, has surpassed 70,000 operational flight hours, and is midway through its first multi-year procurement."

The transition from CH-46E to MV-22B is exemplified by Marine Medium Helicopter Squadron 166, which deactivated as HMM-166 at the end of June and redesignated as VMM-166. The "Sea Elks" experience with the "Phrog" stretches back to 1985, or just about halfway through the medium lift helicopter's 46-year (and counting) service in the Marine Corps. The squadron joins seven other units which have already adopted the MV-22B and become operational.

Two MV-22B units are currently deployed; one serving shipboard with an MEU and the second based in Afghanistan. Readiness rates continue to improve, with deployed aircraft achieving between 60 and 70 percent mission-ready rates. Overall, the Marine Corps seems pleased with the leap in capability the MV-22B provides (speed, range, lift) over its predecessor.

Capt. Craig W. Thomas, a media officer in the USMC's Division of Public Affairs at the Pentagon, added the following.

"During OIF and then again on its first ship-based MEU deployment, due to its speed and range, life-saving casualty evacuation missions were conducted by the Osprey that would not have been possible with legacy rotorcraft.

"Most recently, in Operation Enduring Freedom, the MV-22B exhibited its ability to withstand battle damage during combat operations in Afghanistan," he continued. "In two separate incidents involving three separate aircraft, Marine MV-22B Ospreys sustained machine gun and rocket-propelled grenade damage, and were back on the flight schedu

approaching and departing a landing zone while carrying combat troops and the third aircraft withstood attack while carrying VIPs to remote sites."

So far, 114 of the program of record 360 MV-22Bs have delivered. The 2011 DoD budget sets aside $2.7 billion for procurement of 35 V-22s and development of follow-on block upgrades.

UH-1Y/UH-1N & AH-1Z/AH-1W

As mentioned, the H-1 upgrade program launched in the mid-1990s is reaching maturity. The new Yankee and Zulu versions of the UH-1 and AH-1 now being introduced feature glass cockpits, advanced sensors and advanced helmet-mounted sight and display systems. Future growth plans call for the inclusion of a digitally aided Close Air Support (CAS) system designed to tie both airframes, their sensors and weapons systems together with ground combat forces and fixed-wing aircraft. Other weapons systems, including the Advanced Precision Kill Weapon System II (APKWS II), will add lethality.

An AH-1Z Cobra helicopter assigned to Rotary Wing Aircraft Test Squadron (HX) 21, based in Patuxent River, Md., approaches the amphibious assault ship USS Wasp (LHD 1). The helicopter features a larger engine and has two more blades than the Cobra's original two, giving it more power and maneuverability. Wasp was chosen as the platform to evaluate the limits and capabilities of newer models of aircraft. U.S. Navy photo by Mass Communication Specialist 1st Class Rebekah Adler.

With 84 percent commonality between the UH-1Y and AH-1Z, lifecycle costs and logistics footprints are expected to be significantly reduced while mission readiness rates rise. The 2011 Defense Budget allocates $60 million in RDT&E (research, development, test and evaluation) for continued product improvements and $827 million for procurement of 31 H-1 upgrades aircraft (18 UH-1Y, 13 AH-1Z). The planned total buy will provide the Marine Corps with 123 UH-1Y and 226 AH-1Z aircraft through a combination of remanufacturing and new production.

"Yankee" and "Zulu" procurement actually increases the Marine Corps' inventory of light attack helicopters by 69 aircraft over the previous number of UH-1Ns and AH-1Ws, falling into line with the Pentagon directive to increase active-duty Marine HMLA squadrons from six to nine.

The UH-1Y Venom achieved IOC in August 2008 and full-rate production (FRP) in September 2008. The Venom program was given priority to replace the aged and underpowered UH-1N fleet as quickly as possible. The aircraft incorporates a new composite four-bladed rotor system and more powerful T700-GE-401C engines, yielding a 125 percent greater payload than the UH-1N, and nearly 50 percent more range and cruise speed. The airframe is capable of sustaining higher G-loads in tactical and evasive maneuvers, complementing its advanced electronic warfare self-protection suite and new, crashworthy fuel system.

The UH-1Y has already been deployed aboard ship and tested in combat in Afghanistan. In January 2009, three UH-1Ys deployed with the 13th MEU aboard the USS Boxer (LHD 4), flying more than 320 hours in support of numerous maritime special-purpose force missions which included the rescue of a merchant ship captain (Capt. Richard Phillips of the M/V Maersk Alabama) detained by Somali pirates.

In November 2009, HMLA-367 took nine Yankees to Afghanistan. Over the first three months of the deployment the squadron posted mission capable rates in excess of 77 percent while flying 40 flight hours per aircraft per month – more than twice the planned utilization rate of 18.9 hours per aircraft per month.

"During that deployment, the aircraft logged more than 2,980 flight hours, carried 2,716 passengers and moved 37,158 pounds of cargo," said Thomas.

The squadron played a critical role in providing troop and cargo transport, command and control, aerial and armed reconnaissance, armed escort, and close air support during Operation Cobra's Anger in the Now Zad valley of Helmand province.

The success of the UH-1Y so far has whetted the USMC rotary-wing community's appetite for the new AH-1Z Viper. An additional 58 will be built to meet the increased inventory goal stated above. This exceeds the number of existing AH-1W airframes available for remanufacture, so new production will be instituted to reach the objective.

Thomas reported that the final operational evaluation of the AH-1Z was completed on June 30, 2010.

"All indications are the aircraft performed exactly as expected, with high aircraft reliability and weapons accuracy," he affirmed. "The final test report is due at the end of September in support of a full-rate production decision at the end of October 2010. AH-1Z crews successfully engaged targets with autonomous Hellfire missiles out to 8,050 meters using the aircraft's highly capable Target Sight System [TSS]. The AH-1Z can engage targets at ever

System [TSS]. The AH-1Z can engage targets at over two times the distance as compared to its legacy predecessor with the same level of accuracy."

Like the Venom, the Viper brings together proven AH-1W airframe reliability, a new composite four bladed rotor system and more powerful T700-GE-401 engines. Virtually identical front and rear cockpits with fully integrated weapons, avionics, and communications systems endow the AH-1Z with the some of the most lethal tools and advanced aircraft survivability equipment in the world.

Pilots with Marine Light Attack Helicopter Training Squadron 303, Marine Aircraft Group 39, 3rd Marine Aircraft Wing, maneuver a AH-1Z Viper belonging to the squadron during training aboard Marine Corps Base Camp Pendleton, Calif. The new Viper can carry twice the number of missiles while being able to travel almost twice as far. U.S. Marine Corps photo by Lance Cpl. Christopher O'Quin.

A wide variety of weapons can be employed, including AGM-114A, B, C and F Hellfire missiles (up to 16 total), 70 mm rockets in 19 or seven-shot pods (up to 76 total), the AIM-9 Sidewinder, Mk. 77 fire bombs, a 20 mm cannon, and LUU-2A/B nighttime illumination flares. These are complemented by the new "Top Owl" Helmet Mounted Sight and Display (HMS/D) system which supports improved communication and reduced cockpit workload. Marine Corps plans currently call for AH-1Z IOC in the second quarter of fiscal year 2011, with the aircraft's first deployment taking place near the end of the year.

The UH-1N and AH-1W remain in service for now, both providing essential capability. "The UH-1N continues to provide outstanding support and deploys on MEUs from both coasts," Thomas said. "The USMC began to retire the UH-1N in January of 2010 and continues to do so at a two-per-month pace. MARFORPAC [Marine Forces Pacific] transition to the UH-1Y will be complete at the end of FY 2012. MARFORCOM [Marine Forces Command] will fully complete transition in FY 2014."

AH-1Ws are set to serve until 2020. As such, the Marine Corps is continuing upgrades to the helicopter, including the incorporation of the Night Targeting System Upgrade (NTSU), Tactical Video Data Link (TVDL), and the Helmet Display and Tracker System (HDTS).

A U.S. Marine Corps UH-1Y Venom utility helicopter with Marine Medium Helicopter Squadron (HMM) 163, 13th Marine Expeditionary Unit (MEU) lifts off during flight operations aboard USS Boxer (LHD 4) July 3, 2009, in the Pacific Ocean. U.S. Marine Corps photo by Lance Cpl. Jesse D. Leger.

"These capabilities ensure that the aircraft will continue to provide the very best Offensive Air Support to our Marines on the ground," Thomas explained. "The AH-1W was a significant contributor in OIF and will continue to provide a sustained, forward deployed presence in Afghanistan. HMLA-369 is currently in theater with a mix of 18 AH-1W and nine UH-1Y aircraft, flying approximately 2.5 times the normal peacetime utilization rate from both Camp Bastion and FOB [Forward Operating Base] Dwyer."

CH-53D/E & CH-53K

The Marine Corps' heaviest vertical lift asset, the Sikorsky CH-53, is also one of its most intensively utilized helicopters. Currently, there are 36 CH-53Ds and 152 CH-53Es on active duty. CH-53Ds are currently forward deployed to Afghanistan in support of medium-lift combat assault missions. CH-53Es are supporting heavy-lift combat operations in Afghanistan and the Horn of Africa while simultaneously supporting Marine Expeditionary Units around the globe.

First introduced in 1966, the Corps' Sea Stallions and Super Stallions are in demand constantly, providing lift to Marine Air-Ground Task Forces (MAGTF) around the globe. So busy are they that the CH-53 community is among the most stressed in Marine Corps aviation. A snapshot of recent operations shows the strain.

Since ramping up operations in Afghanistan in May 2009, CH-53s have flown nearly 11,000 hours, carried more than 62,000 passengers, and moved over 10 million pounds of cargo in support of coalition forces while flying well above their programmed rates in austere, expeditionary conditions. According to the Pentagon, units deployed in support of Overseas Contingency Operations are flying close to 300 percent above CONUS-based squadron utilization rates.

The strain on the Sea Stallion/Super Stallion fleet is showing. Delays in the CH-53K program have caused IOC for the new helicopter to slip until 2018. The result is that the new platform that will replace both older airframes will not be on hand in numbers soon enough. Thus, the Marine Corps has been forced to acknowledge that it will not be able to meet its heavy lift requirement in the near term.

"The fleet is 48 heavy-lift aircraft short of our 202K requirement [the helicopter lift required to support the future end strength of 202,000 Marines]," Thomas confirmed. "The USMC is currently meeting its heavy lift requirement, but at the expense of increased utilization and operating costs. The rugged terrain, distances traveled, and constant IED threats encountered in Afghanistan and the Horn of Africa keep CH-53s in heavy demand. Reliability, maintainability, and the total cost of ownership of the CH-53E are not acceptable. The lift requirements and distances are only growing as our warfighting concepts mature, necessitating more capable aircraft."

An example of the diverse demands put on the CH-53 community was illustrated at the end of June when HMH-466, stationed at Camp Bastion, Afghanistan, was tasked with the recovery of a Royal Air Force Mk. 3 Merlin

466, stationed at Camp Bastion, Afghanistan, was tasked with the recovery of a Royal Air Force Mk. 3 Merlin (EH-101) helicopter which went down in a non-hostile event.

The mission, known as TRAP (Tactical Recovery of Aircraft or Personnel) is one Marines train for routinely, but very few real world TRAP missions have ever been executed. HMH-466 got the job done with less than 18 hours' notice, preparing for the 18,000-pound lift with the aid of the entire unit.

A CH-53E Super Stallion helicopter lifts off from the flight deck of the amphibious assault ship USS Nassau (LHA 4) during a Composite Unit Training Exercise (COMPTUEX). The CH-53s are the Corps' heaviest lift rotary-wing assets and also its most heavily used. U.S. Navy photo by Mass Communication Specialist 1st Class Brien Aho.

"In order for it to go down," said Lt. Col. Mitch Cassell, the HMH-466 commanding officer, "it required the entire squadron to throw themselves behind the lift."

The squadron's entire maintenance department sprang into action, pulling off 2,000 pounds' worth of gear from a "Wolfpack" CH-53E, including the auxiliary fuel tanks, fuel probe, troop seats, ramp, cargo winch, and utility hoist. "We had to remove all that equipment from our aircraft to make it light enough to lift the stricken Mk. 3 Merlin," Cassell explained.

Cassell also noted that pilots and crew in the ready room who weren't even flying the mission planned it. Amazingly, it was the second TRAP mission for the squadron in just over a month's time. In May, HMH-466 recovered a U.S. Army MH-47G Chinook helicopter which had made a hard landing near Kandahar.

To help keep CH-53Ds/Es viable, the 2011 Defense Budget requests $62.1 million for near- and midterm enhancements, including the Force XXI Battle Command Brigade and Below system, Integrated Mechanical Diagnostic System, T-64 Engine Reliability Improvement Program kits, and Directional Infrared Countermeasures (DIRCM).

"The Integrated Mechanical and Diagnostic [IMDS], Directional Infrared Countermeasures and the upgraded power and performance of the GE-T64-419 are just a few of the efforts on-going to sustain the CH-53E until the arrival of the CH-53K," Thomas said.

"CH-53Es are also undergoing key structural improvements that will increase the service life of the aircraft from 6,120 flight-hours to 10,000 flight hours," he added. "CH-53Ds are undergoing a Service Life Assessment Program, which on a case-by-case basis, extends aircraft service life from 10,000 to 12,500 flight-hours. Testing is also ongoing to outfit the CH-53D with the Improved Rotor Blades (IRBs) currently flown on the CH-53E. Ongoing installation of the GE-T64-416 engine has provided increased power and performance for the CH-53D, a necessary measure in the high, hot environment of Afghanistan."

Suffice it to say the CH-53K cannot arrive soon enough for the USMC heavy-lift community. The 2011 Defense Budget requests $577 million in RDT&E to continue SDD (System Development and Demonstration) of the CH-53K. Production of long-lead items in preparation for building test articles is under way and the platform's Critical Design Review was ongoing as of this writing. In 2011, assembly of static and fatigue test articles and a ground test vehicle begins.

A Marine CH-46E helicopter assigned to the "Evil Eyes" of Marine Medium Helicopter Squadron (HMM) 163 (REIN) lands aboard the amphibious transport dock ship USS New Orleans (LPD 18), clearly showing why the venerable CH-46 is affectionately known as the "Phrog". U.S. Navy photo by Mass Communication Specialist 2nd Class Daniel Barker.

The advantages of the CH-53K are many, according to the USMC, including lift, range, and ease of maintenance. "The CH-53K will be capable of externally transporting 27,000 pounds to a range of 110 nautical miles," said Thomas. "This nearly triples the current CH-53E lift capability under similar high, hot environmental conditions. The increased payload and high, hot capability will reduce the number and frequency of ground convoys, helping to mitigate exposure to the IED threat.

"The CH-53K maintains the same shipboard footprint as the CH-53E but provides much improved lift capability with significant reductions in operating and maintenance costs. The new build CH-53K is the only shipboard compatible aircraft that can fulfill 100 percent of current and future USMC heavy-lift requirements and remains the sole active developmental rotorcraft program within the DoD."

CH-46E

Sunset for the much-loved "Phrog" is scheduled for 2018. First introduced in 1964, the CH-46 was retired from U.S. Naval service in 2004, but carries on with the USMC. More than half a century will have passed when it retires, but until then, the USMC will sustain its medium-lift stalwart as necessary.

retires, but until then, the USMC will sustain its medium-lift stalwart as necessary.

The 2011 Defense Budget includes $17.7 million for replacement of worn equipment and aircraft components to ensure the health and viability of the airframe as the transition to the MV-22B reaches completion. At this writing, eight active CH-46E squadrons remained.

HMX-1: VH-3D, VH-60N, & VXX

Marine Helicopter Squadron One (HMX-1) is tasked with a dual mission, including the transport of the president of the United States, the vice president, cabinet members, and VIPs, and as an operational test and evaluation squadron for assault support helicopters and related equipment.

Headquartered at Marine Corps Air Facility Quantico, Va., the unit's Executive Flight Detachment flies unique, VIP-configured Sikorsky VH-3D Sea Kings and VH-60N Blackhawks. The 14-passenger VH-3D began service with the squadron in the late 1970s, replacing the VH-3A. The 11-passenger VH-60N entered service with the squadron in 1988. With the president aboard, either type uses the call-sign Marine One. The squadron also operates a small number of CH-53Es and CH-46Es for utility missions.

A VH-60 helicopter with Marine Helicopter Squadron 1 lands in front of the Capitol during the 56th Presidential Inaugural Rehearsal Jan. 11, 2009. A new competition has been launched to replace the aging VH-3Ds and VH-60Ns. USMC photo by Lance Cpl. Bryan G. Carfrey.

The aforementioned VXX Presidential Helicopter program is an effort to replace the Executive Flight Detachment's aging fleet of VH-3Ds and VH-60Ns. The original effort, launched in 2003, selected the Lockheed-Martin VH-71 or US101 (a derivative of the Agusta-Westland EH101) in 2006 as the winner of the first competition. But the program was terminated in May 2009 due to mismanagement, cost overruns, production delays and political opposition to the fielding of a foreign-designed aircraft.

As 2010 began, the Department of the Navy, the Office of the Secretary of Defense, and the White House Military Office re-launched the VXX program with a new Request For Information (RFI). The president's 2011 defense budget sets aside $94.7 million for the settlement of the VH-71 termination and $65.1 million for continuing efforts on the follow-on program. Reportedly, Pentagon officials hope to purchase a fleet of 23 to 28 helicopters at a cost of $6 billion to $10 billion.

Halfway through 2010, two candidates have emerged. In early June, Boeing announced that it was acquiring "full intellectual rights" to Agusta-Westland's medium-lift EH101, and will submit a proposal using the aircraft for the new VXX competition to build a presidential helicopter fleet. The proposal marks the third airframe Boeing has offered for the VXX program, having already submitted pitches based on its CH-47 Chinook helicopter, and, with its partner, Bell, the V-22 Osprey tilt-rotor aircraft.

In April, Sikorsky submitted a proposal featuring its S-92 model. Curiously, the company is partnered with Lockheed-Martin (which won, then lost the original competition) as a major systems supplier.

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