Defense Priorities for the New Administration

By Mike Hirschberg, AHS International Executive Director

The conflicts in Iraq and Afghanistan clearly demonstrated that tactical vertical lift aircraft (helicopters and tiltrotors) are among the most effective tools in the US combined arms arsenal. At the same time, insufficient US investment to advance vertical lift over the past 20 years threatens the long-term performance, maintainability, survivability and affordability of America's military rotorcraft fleet. In recent years, funding has been only sufficient for limited improvements to legacy aircraft. With the exception of the V-22 Osprey, all US rotorcraft deployed in these two conflicts were originally designed *during the Vietnam War era.*

This incremental modernization has kept legacy aircraft flying and engaged, but at high cost. In the decade following 9/11, more than 600 American lives and 400 rotorcraft were lost to hostile action and mishaps in Iraq and Afghanistan, plus untold losses among the supported forces due to the unavailability of rotorcraft assets in those extreme environments. This terrible cost in blood and treasure is simply unacceptable, and much of it could have been avoided if the Department of Defense (DoD) had been adequately investing in rotorcraft.

For more than two decades, the level of US government funding for rotorcraft research and development (R&D) has been inadequate to enable and deploy promising enhancements to safety and effectiveness. This has left the military rotorcraft fleet underdeveloped and overextended, and has stifled innovation.

DoD studies have found significant gaps in rotorcraft capabilities, including in performance shortfalls (speed, range, payload, endurance and altitude), unexploited autonomy/collaboration (reduced mission effectiveness), unacceptable survivability and situational awareness shortfalls (safety and threat losses, no common air or cockpit picture), and costly sustainment (supportability, maintainability, reliability and availability).

It is imperative that the incoming Administration of President-Elect Donald J. Trump act immediately to enable and accelerate modernization of the existing military rotorcraft, invest in improvements to keep them relevant for the ensuing decades, and accelerate Future Vertical Lift.

RECOMMENDATIONS FOR THE TRUMP ADMINISTRATION:

1. Modernize the existing US military rotorcraft fleet by fully funding acquisition programs currently underway. These near-term investments will significantly improve capabilities within this decade.

In the early 2000s, the DoD did not field several advanced rotorcraft weapons systems that were developed. These were missed opportunities to modernize key elements of the fleet. Additional investment must now be made to make up for this deficit and modernize the legacy force.

The RAH-66 Comanche was the most advanced helicopter ever built. First, inadequate R&D funding levels during the Clinton Administration stretched out its development over two decades. Then, with only two prototypes completed, the Comanche had to be sacrificed in 2003 to field upgrades to the existing US Army rotorcraft fleet so it would remain viable in Afghanistan and Iraq. The Comanche funds were used to field the latest models of decades-old helicopter designs, specifically: the CH-47F/G Chinook (the first Chinook prototype flew in 1961), the UH-60M Black Hawk (1974) and the AH-64E Apache (1975). Improvements were also made to the OH-58D Kiowa Warrior (which first flew in 1966) — the aircraft that Comanche was originally supposed to replace — to stem the losses and improve effectiveness. This terrible choice was necessitated by the lack of sufficient funds for vertical lift aviation.

After the Comanche and two other attempts to replace the OH-58 failed (the Armed Reconnaissance Helicopter and Armed Aerial Scout programs), the Army was forced to remove the Kiowa Warrior scout helicopter from service — stating cost and obsolescence as the driving factors — to minimize the number of types in service.

The development of the V-22 Osprey for the US Marine Corps was similarly inadequately funded. Political volleyball over a decade stretched out the program, leading to at least one of the fatal accidents, while the Marines continued to lose high numbers of the aircraft that the Osprey ultimately would replace, the CH-46 Sea Knight (first flight 1959). The Corps' other modernized rotorcraft, the UH-1Y Venom and AH-1Z Viper, have exhausted the alphabet for new models after the original prototypes first flew in 1956 and 1965 respectively. The Marines have been successfully developing the CH-53K King Stallion heavy-lift helicopter to replace the venerable Super Stallion (whose YCH-53 prototype first flew in 1964), but this too has been decelerated due to inadequate funds available. The US Navy is also narrowing down most of its rotorcraft to the MH-60R/H-60S Seahawks to reduce the number of aircraft types.

Meanwhile, the US Air Force is replacing its HH-60G Black Hawks with new HH-60W Black Hawks for search and rescue in lieu of a cancelled new aircraft program, and is

finally beginning the process of replacing its ancient UH-1N Hueys. The service has been trying to field replacements for these two systems for more than a decade, but has been hampered by contracting blunders and a lack of resources.

As the above history highlights, inadequate funding has hampered the timely deployment of a robust military rotorcraft fleet. Upgrades to the latest models of aircraft originally designed during Vietnam have been painfully slow, and not without its negative consequences in terms of aircraft and lives lost, missions unable to be executed, and extremely high maintenance costs due to the harsh operational environments.

Additional funding for military vertical lift aviation is desperately needed in order to restore and enhance our nation's military capabilities.

2. Fully fund next-generation engines and advanced sensors. These mid-term investments will advance military rotorcraft capabilities over the next two decades.

In the early days of the wars in Afghanistan and Iraq, American helicopters were outdated, underpowered and ill-equipped to fight in the high altitudes, hot temperatures and dusty/sandy environments. Many of the aircraft and lives lost during the conflicts were due to operating at high altitudes/temperatures that were far beyond those for which today's helicopters were designed. Issues such as poor pilot visibility/awareness and insufficient engine power were directly responsible for a significant portion of accidents, while a lack of adequate missile warning systems resulted in multiple shootdowns.

A new generation of advanced rotorcraft engines is now under development by the US Army. The last time the US military fielded an all-new engine design was for the V-22 Osprey (first flight 1989), though that engine was also a derivative of an older design. All fielded American helicopter engines today are based designs of the 1960s and 1970s.

The US Army now has three advanced turboshaft engine programs underway in different size classes and for different potential applications.

The Improved Turbine Engine Program (ITEP) is competing two revolutionary new designs for the Apache and Black Hawk, which will likely both continue flying until beyond 2050. In the 3,000 shp class, the engine will provide 50% more power and use 25% less specific fuel consumption. ITEP will save lives, fuel and money, and keep the Apache and Black Hawk relevant for decades to come.

The Future Affordable Turbine Engine (FATE) program will demonstrate technologies applicable to 5,000–10,000 shp engines that would be compatible with installation in the CH-47 Chinook. Demonstration goals include an 80% improvement in power-to-weight, 20% improvement in design life, 35% reduction in specific fuel consumption and 45% reduction in production and maintenance costs.

The Alternate Concept Engine (ACE) program will test an advanced variable speed turbine and other innovative technologies. The program is focused on reducing operational and life cycle costs, and the logistical footprint for both the engine and future rotorcraft.

Although the hazards of flying in dusty/sandy environments have been known for decades — and were major issues in Operation Desert Shield/Desert Storm in Iraq and Operation Restore Hope in Somalia — little has reached the field to address this serious problem. Additional training and improvements in cockpit displays helped reduce accidents in degraded visual environments (DVE), but no sensors or other equipment were ever fielded to permit greater DVE mitigation. This needs to be finally solved.

Inadequate awareness of the hostile terrain, obstacles and weather during cruise flight was also a problem. Controlled flight into terrain, inadvertently flying into bad weather, and hitting wires or other obstacles led to hundreds of accidents. Loss of situational awareness and other human factors in both hover and cruise accounted for nearly 80% of the losses of airframes and lives in the 2000s.

These hazards are exacerbated for aviators already experiencing high workloads using advanced systems in complex situations on an increasingly cluttered, dangerous environment. Enhancements to legacy systems has consistently increased the workload and so reduced the capability and flexibility of the crew. Our systems are approaching — or have passed the point — at which a new architecture and interface is required to reset the environment to capitalize on our operators' value.

Solutions to these non-hostile challenges have been studied for 15 years, but only limited ameliorations have been fielded, putting US forces in similar dangers in future conflicts with continued inadequate investments.

Development and fielding of additional self-protection systems to minimize the threats of missiles, rockets, small arms and automatic weapons — as well as other hostile actions and friendly fire — should also be accelerated.

3. Fully fund Future Vertical Lift to realize next-generation capabilities through the majority of the 21st Century.

Future Vertical Lift (FVL) is a bold multi-service initiative to replace all US military vertical lift aircraft with next-generation rotorcraft over the next several decades. The Pentagon has tried to take all the right steps to make up for its past failures.

Government and industry studies and analyses indicate a breakthrough in capabilities — including high speed, long range, high altitude and high availability — and the DoD has begun the acquisition process to field weapon systems in multiple capability sets/size classes: in April 2013, the Joint Requirements Oversight Council approved the FVL Initial Capabilities Document (ICD) calling for increased rotorcraft speed, range, payload, survivability, and affordability. The FVL program passed its Materiel Development Decision (MDD) in October 2016, allowing the military to begin its Analysis of Alternatives.

Two industry teams are building flying demonstrators under the Joint Multi-Role (JMR) technology demonstration effort, while two others are conducting large scale ground demonstrations. The DoD had desired to fund three different flying demonstrators under JMR, but in the end could only subsidize the research of two large industrial manufacturers. Industry is investing an estimated $750M in demonstrating the leap-ahead potential for FVL; the US Army, the lead service, is providing around $200M.

Due to the Pentagon's limited funding for vertical flight, the trend over the last two decades in government investment has been an increasing expectation and requirement for cost share by industry partners to maximize what can be achieved with the government funds. In the case of JMR, industry is likely paying 75% or more of the total cost of the two flying demonstration efforts in the hopes of winning production contracts under FVL and accelerating the program.

The initial operational capability (IOC) for the first mission capability set is 2030 or later. Industry is leaning forward and trying to do its part to reach IOC sooner, but current efforts are not resourced to move more quickly. Additional DoD funding is required to accelerate FVL and create a more robust R&D program for FVL that encompasses the full-range of high pay-off technical advancements — including next-generation rotors, drivetrains, engines, flight controls and sensors, and improved survivability.

A serious consequence of this dependence on industry self-funding military aircraft development is that companies must spend their limited internal R&D investment resources on government-defined efforts, which diminishes (and in some cases eliminates) the capability to innovate beyond the government's vision and tolerance for risk. Moreover, recent government initiatives, such as Better Buying Power 3.0, are limiting the intellectual property protections in cost-share agreements. Together these and other factors are dramatically dampening the extent of invention. An increase in investments in vertical flight aircraft for basic research, science and technology, and R&D is necessary to re-establish US prominence and revitalize innovation.

A doubling of what the Army is investing is needed to deliver these revolutionary capabilities to our warfighters faster, with greater innovation and competition for future military rotorcraft requirements — across the spectrum of light, medium, heavy and ultra-heavy FVL capability sets.

Payoffs for Generations

In addition to reducing the risks to America's service members from helicopter accidents and hostile action — and maintaining a strong, capable defense for the uncertainties in the coming decades — a leap-ahead in capability is realizable with next generation rotorcraft.

Accelerating current rotorcraft modernization efforts, improving rotorcraft systems like engines and sensors, and fully funding FVL will pay huge dividends for the security of the United States and its allies. This will also serve to restore America's global leadership in rotorcraft innovation and improve its standing in the increasingly competitive world market.

Note: a summary of this article appeared on AviationWeek.com on Nov. 11, 2016.

What do you think? Please send your comments on our Commentaries to **director@vtol.org**.