Looking Back from 2020:  
A Vertical Retrospective of 21st Century US Military Developments

By Mike Hirschberg, VFS Executive Director

With the dawn of a new decade, let’s take a look back at how things have changed since the beginning of the 21st Century, focusing on US military helicopter developments in this issue.

War Brings Production Highs and Development Lows

The year 2000 dawned full of promise. The specter of the Cold War was receding and Russia was part of a partnership for peace. Great power rivalries were fading and democracy was flowering.

With a diminished threat, military helicopter production was way down, but the development of the world’s most advanced helicopter, the fourth-generation Boeing-Sikorsky RAH-66 Comanche, was gathering steam, with the second prototype flying since 1999.

Then, the Sept. 11, 2001, terrorist attacks turned the world upside down. The subsequent invasion of Afghanistan, boosted by the March 2003 invasion of Iraq, sent military helicopter production rates skyrocketing to unheard-of levels. World military helicopter sales leapt from a low of $2.6B in 1997 to $19B in 2013, with Sikorsky building the H-60 on four different production lines across the US to meet demand.

However, the US went to war with helicopters that were ill-suited for the high altitudes, hot temperatures and dusty environments of Afghanistan and Iraq. The high operations tempo also took its toll on aviators and aircraft alike. More than 400 rotorcraft and 600 American lives were lost in that first decade of military operations — primarily due to accidents, such as landing in dusty degraded visual environments (DVE). Helicopter crashes were second only to roadside bombs in killing American troops. The Pentagon added billions to rush Mine-Resistant Ambush Protected (MRAP) vehicles into combat zones with questionable results... but terminated the Comanche program in February 2004 to fund modernization of its helicopters.

Canceling the stealthy Comanche sent shockwaves throughout the rotorcraft community that reverberated for more than a decade. However, Comanche’s funds were fielded in the UH-60M Black Hawk, the CH-47F/G Chinook and AH-64E Apache Guardian, providing the US Army with the most capable military helicopters in the world. The fielding of these upgraded rotorcraft saved lives. It was the right decision, but not without consequences.

The Comanche decision was followed later in the year with the cancelation of the Unmanned Combat Armed Rotorcraft (UCAR) demonstration program with the Army and the Defense Advanced Research Projects Agency (DARPA), leading to an industry Vertiflite commentary, “US Army Cancels Another Rotorcraft Program.” For want of a $40M Army investment, the whole development effort was scrapped. With the US fighting two counter-insurgency wars, development of high-speed, stealthy attack helicopters for potential conflicts with near-peer competitors wasn’t considered worth pursuing; they were canceled as the wrong aircraft for low-intensity conflicts lacking integrated air defense systems (IADS) that made low infrared and radar frequency countermeasures necessary.

The Army successfully replaced its stateside UH-1 Huey fleet with the non-developmental Mississippi-built UH-72 Lakota, selected in 2006. In 2019, Airbus delivered the 440th Lakota, with more than 200 used as trainers.

Trying to avoid lengthy and expensive development programs, however, backfired on several other military aircraft programs. Three rotorcraft procurements — all ostensibly off-the-shelf helicopters — collapsed in the early 2000s due to outsized requirements and missteps by both the government and industry. The Navy’s VH-71 Presidential Helicopter (VXX), the Air Force’s HH-47 Combat Search and Rescue (CSAR-X) and the Army’s ARH-72 Armed Reconnaissance Helicopter (ARF) acquisitions all left the US military with nothing; their successors are still in development today as, respectively, the VH-92, the HH-60W and FARA (see below).

The Best for the Marines

In contrast, the Marine Corps modernized its entire fleet of vertical flight aircraft over these same two decades, powering through difficulties and delays.

Following two fatal accidents by the Bell Boeing MV-22 in 2000, the Osprey was substantially improved and reached its initial operational capability (IOC) in 2007. Since then, the tiltrotor has performed admirably, albeit with enduring maintenance and availability challenges. To date, the aircraft has accrued more than 500,000 total flight hours in service with the US Marine Corps and US Air Force.

The 2001 decision declaring the Lockheed Martin F-35 Lightning II the winner of the Joint Strike Fighter (JSF) competition kicked off a lengthy and very expensive development period. Nonetheless, the short takeoff and vertical landing (STOVL) F-35B variant reached IOC with the US Marine Corps in 2015.
The Marines initiated their Heavy Lift Replacement program in 2004. The resulting CH-53K King Stallion is the world's most advanced helicopter today, with fourth-generation attributes like fly-by-wire, advanced engines and rotor blades, and significant composite structures. Four King Stallions are currently flying; IOC is now expected in 2023.

The Marines completed their vertical flight fleet upgrades by replacing their Bell Hueys and Cobras with their four-bladed descendants, the UH-1Y Venom (2008) and AH-1Z Viper (2010). Its sister service, the US Navy, neked down most of its rotorcraft models to Sikorsky MH-60S (2002) and MH-60R (2006) Seahawks, and selected the CMV-22 for its carrier onboard delivery (COD) missions — showing the ability of the tiltrotor to replace both vertical and conventional takeoff and landing platforms. In addition, after selecting the Teledyne Ryan/Schweizer RQ-8A Fire Scout in 2000, the Navy today has the only US unmanned rotorcraft in service, with the Northrop Grumman/Bell MQ-8C Fire Scout, which achieved its IOC in June 2019 (see “Fire Scouts in the Fleet,” pg. 20).

**Fifth Generation Rotorcraft at Last**

In 2008, as the latest upgrades to the Army's third-generation Black Hawks and Chinooks were being fielded, the Pentagon initiated the Future Vertical Lift (FVL) program, with assistance and ongoing support from VFS and its members.

Study contracts for Joint Multi-Role (JMR) Technology Demonstrators in 2011 were followed in 2013 by four awards for initial JMR designs to AVX, Bell, Karem and Sikorsky-Boeing. AVX and Karem later conducted subscale and component demonstrations, while Bell and Sikorsky-Boeing received funds to subsidize the costs of building and flying demonstrator aircraft. The Bell V-280 Valor first flew in December 2017 while the Sikorsky-Boeing SB>1 Defiant made its first flight 15 months later in March 2019 (see “JMR — Demonstrating Valor But Still Defiant,” pg. 14).

In 2018, after a decade of preparation, the Army initiated its next-generation Future Attack Reconnaissance Aircraft (FARA) and Future Long-Range Assault Aircraft (FLRAA) acquisition programs. Each of these programs is expected to select two competitors in 2020 to continue development. After final selections of a single concept for each program, the Army expects an IOC of 2028 for FARA and 2030 for FLRAA.

The geopolitical environment has changed dramatically since 2000, with Russia's incursions into Ukraine and Syria, China's geopolitical ambitions, and other rogue nations like North Korea and Iran. The proliferation of advanced IADS around the world reminded the US military of the need for stealthy attack helicopters. With a gap in capabilities (without a system like Comanche or UCAR), the Army prioritized FARA over FLRAA.

Behind the Army, the US Navy and Marines are also maturing acquisition plans for FVL aircraft, including the FVL-Maritime Strike, the Marine Air Ground Task Force (MAGTF) Unmanned Aircraft System (UAS) Expeditionary (MUX), and the Attack Utility Replacement Aircraft (AURA) initiatives.

Each of these programs — and additional FVL platforms to be defined in the future — will be fifth-generational rotorcraft with fly-by-wire controls, open systems architectures, increased levels of autonomy and improved supportability, and capable of higher speeds and longer range than today's helicopters.

**Perspective**

The first decade of the 21st century was one of great disappointment and frustration for the rotorcraft technical community. Helicopter production was up, but next-generation and “off-the-shelf” helicopter programs alike were being canceled (some multiple times over). All developmental programs — V-22, F-35, UH-1Y/AH-1Z, etc. — were suffering delays and overruns.

The Army was operating its helicopters to their breaking points in the wars in Afghanistan and Iraq with sometimes tragic results. From shootdowns to DVE accidents, we knew we could do better.

As major activities in Iraq and Afghanistan wound down in the following years, the second decade began to improve. Although helicopter production peaked in 2013, developmental funding continues to grow even today. Modern helicopters will soon fulfill the Presidential Helicopter (Sikorsky VH-92) and Combat Rescue Helicopter (Sikorsky HH-60W) missions, as well as replace the UH-1 in the US Air Force with the Boeing-Leonardo MH-139. The V-22 Osprey has also defied the critics and is providing unmatched capabilities.

Industry has also proven the benefits of next-generation technology with advanced rotorcraft like the CH-53K, S-97 Raider, V-280 and SB>1. These successes have bolstered the Pentagon's FVL initiative, with two acquisition programs (FARA and FLRAA) underway, and three others (FVL Maritime Strike, AURA and MUX) gathering momentum.

As the development efforts to date have required more than $1B in investments by industry — about four times greater than what the Army has provided — corporate coffers were being depleted at the exact time that investments for new commercial products have been needed and commercial sales were gravely diminished.

After painful layoffs in 2013–2016, the past few years have seen increased staffing and increases in workloads to handle the rapid return to feast from famine. Barring any unexpected changes, this will continue for the foreseeable future.

The 2020s promise to be an exciting and transformative period for military rotorcraft development. The next few years will be incredibly challenging for the rotorcraft technical community as the workforce must grow. These military efforts will have to compete for talent against commercial programs as well as electric aircraft from scores of startup companies.

VFS continues to support research and development funding for next-generation military and civil vertical flight aircraft, as well as workforce development, recruiting and nurturing tomorrow's vertical flight engineers and leaders.

*What do you think? Let me know at director@vtol.org.*