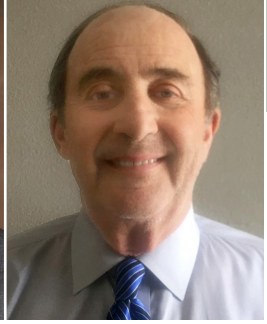
Open architecture drives U.S. Army's Future Vertical Lift program



By Mark Grovak and Chris Thomson
An industry perspective from Curtiss-Wright Defense Solutions

Prototype designs for the Future Vertical Lift (FVL) program, one of the U.S. Army's most important and game-changing initiatives, are fully embracing the open architecture design philosophy for the next-generation helicopters that will replace its fleet of OH58 Kiowa Warrior, AH64 Apache, and UH60 Black Hawk rotorcraft.

The Army is currently holding a competition to select the winning design for two of the new platforms being developed under FVL: the Future Attack Reconnaissance Aircraft (FARA) to replace the OH58 Kiowa Warrior and AH64 Apache and the Future Long Range Assault Aircraft (FLRAA) replacement for the UH60 Blackhawk. In March 2020, the Army announced that it had short-listed Lockheed Martin's Sikorsky Aircraft and Bell Textron Helicopter's designs for FARA and prototypes from Bell and a combined offering from Sikorsky and Boeing to compete for FLRAA. These programs represent a true milestone for the Modular Open Systems Architecture (MOSA) approach that is key to both FARA and FLRAA prototype designs.

The Army sees MOSA as the means to developing an objective architecture for both aviation and mission systems electronics that will deliver more control over the system-upgrade process. Moreover, MOSA will help the government achieve its goal of establishing commonality wherever possible between the two winning aircraft designs. This commonality will free the Army from having to rely directly on the prime contractor to upgrade a system. Instead, the subsystem architecture will be defined with sufficient granularity that the government will be able to satisfy upgrade requirements through third-party suppliers, which will help drive competition, interoperability, and cost reductions. Going forward, the MOSA approach will provide the Army with greater flexibility, reduce time to deployment, and deliver long-term savings.

Suppliers of commercial off-the-shelf (COTS) parts are well-positioned to support the FVL programs, leveraging packaging and integration advances to optimize the performance of the next-generation helicopters and realize the true benefits of the MOSA approach. For example, on helicopters, where every additional pound of weight impacts fuel usage and mission distance and duration, the ability to consolidate line-replaceable units (LRU) by integrating multiple functions into the same chassis will deliver huge weight and cost advantages. Instead of having separate subsystems for the aircraft's pitot-static probes, used to determine airspeed, and its air data computer (ADC), housing both of these functions in a single LRU will enable system designers to reduce both LRU count and overall weight. Similarly, most military helicopters carry a cockpit voice recorder, flight-data recorder, health and usage monitoring (HUMS), and sometimes a separate video recorder. Using COTS building blocks, all of these functions can be integrated into a single LRU. Even better, integrating voice recording, data recording HUMS, and image recording into a single chassis results in an elegant and efficient solution for military flight operations quality assurance (MFOQA) that provides HUMS capability in a size, weight, and power (SWaP)-optimized box.

Another leap forward for open architecture design is the planned use of "digital backbones" on the FARA and FLRAA aircraft. Segregating the digital backbone for the aviation system and the aircraft's mission systems mitigates the possibility that any future changes or upgrades to the mission systems will introduce the risk of adverse impacts on the aviation network. This approach promises to ease and speed technology refresh for these helicopters for years to come, reducing the need to recertify the entire aircraft bus architecture and the need for regression testing whenever new technologies or capabilities need to be integrated.

Another MOSA breakthrough is the improved ability to accommodate new emerging technologies such as remotely piloted flight and diminished visual environment (DVE) operation. Both the FARA and FLRAA rotorcraft designs support standard options for single pilot or unpiloted flight. COTS vendors that provide DO-254 safety-certifiable avionics solutions are well-positioned to support avionics that meet unpiloted flight requirements.

Likewise, the FVL aircraft will require highly secure COTS solutions that protect critical data from falling into the wrong hands in the event that an aircraft is lost. Proven COTS-based data recorder subsystems that support the NSA-sponsored Commercial Solutions for Classified (CSfC) program can be a cost-effective SWaP-optimized solution for protecting sensitive data aboard the new FVL platforms.

The COTS community is witnessing the realization of the promise of the open architecture approach, with the Army, Navy, and Air Force embracing open standards as never before. We're seeing it both in important initiatives such as the Sensor Open Systems Architecture (SOSA) and C4ISR/EW [electronic warfare] Modular Open Suite of Standards (CMOSS) and in programs like FVL that are leading the way in bringing the advantages of open architectures to the warfighter.

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