Refining FLRAA

By Mike Hirschberg, VFS Director of Strategy

Since Bell got the go-ahead from the US Army to proceed with the Future Long Range Assault Aircraft (FLRAA) Weapon System Development contract in early 2023 (see "FLRAA Tilts to Bell," *Vertiflite*, Jan/Feb 2023), the company and the service have been focused on execution.

The physical aircraft and its digital environment are both being refined with a modular open systems approach (MOSA) as the "digital backbone" (see "MOSA Basics," pg. 19).

In April, Bell completed a successful preliminary design review (PDR) and this summer received approval for the FLRAA program to enter the Engineering and Manufacturing Development (EMD) phase (see "FLRAA Soars through Milestone B," *Vertiflite*, Sept/Oct 2024). The next major milestone is the critical design review (CDR), planned for mid-2025. This will set the configuration of the FLRAA weapon system, which evolved since the V-280 Valor technology demonstrator first flew in 2017.

From Demonstrator to Combat Aircraft

At the AUSA meeting on Oct. 16, Defense News ran a Future Vertical Lift (FVL) panel of US Army leaders, sponsored by Bell (available at **www.DefenseNews.com/videos**). The Army's FLRAA Project Manager Col. Jeffrey Poquette noted that people "see the V-280 Valor, which is an experimental aircraft — it's not a combat aircraft. They see what they think FLRAA is going to be. And yes, FLRAA is going to be a tiltrotor, and it will look similar from the outside," but the operational aircraft will be very different. He noted, for example, that Valor had cockpit doors, while the FLRAA aircraft will not.

A model displayed in April (see "Path Ahead for FLRAA," *Vertiflite*, July/Aug 2024) had several notable differences from the V-280 Valor demonstrator, but Frank Lazzara, Director of Advanced Vertical Lift Systems Sales and Strategy at Bell, noted at the Association of the United States Army (AUSA) Annual Meeting in October that this model was already about two years old, and the design would continue its refinement through CDR to meet the Army's requirements. The future weapon system is expected to receive an official Army designation and name at a future time — i.e., the operational FLRAA will not be known as the "V-280 Valor."

Poquette noted, "That's why I very rarely use the term V-280 or FLRAA — the name of the aircraft will be different, and the nomenclature will be different. The changes are significant."
Bell will deliver the first flying prototype to the Army in 2026 but is delivering virtual prototypes this coming February, which Poquette said would be "a simulator of sorts that combines the flight dynamics model of the aircraft, with a lot of real hardware and some simulated hardware." It will be "the first major materiel delivery for the program."

FLRAA Project Manager Col. Jeffrey Poquette, US Army. (Army photo)

The Army will have one virtual prototype for the Aviation Center of Excellence at Fort Novosel (previously known as Fort Rucker), in southeastern Alabama, and one at Redstone Arsenal in northeastern Alabama, home of the Army's Combat Capabilities Development Command (DEVCOM), he said. The virtual prototype "will inform doctrine, it will inform training, it will expose Army aviators to tilt-rotor technology — which they haven't done before — and it will be a design tool for Bell and the program office to iterate on and get to the point where we can fly."

The virtual prototype also allowed the FLRAA program to be accelerated. Poquette referred to the middle tier of acquisition (MTA) approach, established in the fiscal 2016 National Defense Authorization Act, which requires a prototype to be delivered for early testing. The virtual prototype allows Army Aviators to evaluate "how the aircraft flies and how it reacts to conditions and inputs," Poquette said. "How do I do an air assault with an aircraft that's going nearly 300 kt [555 km/h]? That's something that Army Aviators have never done before … It's a different mindset."

The Army is working on how to train its pilots for high-speed rotorcraft operations, using lessons learned from the Marine Corps and Air Force Special Operations, who use their Osprey's for similar missions. "Normally, simulators lag the aircraft; we build the aircraft and then try to build a simulator for training purposes that replicates what the aircraft does," he said. "The virtual prototype comes ahead of that" and will help in the final design of the aircraft. "How do we offload tasks and reduce task saturation on the pilot? We'll be able to do that long before we have a physical prototype. So, the virtual prototype is going to be a really powerful tool."

The level of engagement with Bell by the Army in the design reviews, the digital environment and the virtual testing will ensure that the physical prototypes are as close to the Army's needs as possible. "FLRAA is expensive; it's the largest program

in Army history. We can't afford to make a big mistake," Poquette said. "We can't build four or eight prototypes that miss the mark on the thing that's important to the Army. The two things that are most important to the Army are: go twice as far/twice as fast [as today's UH-60 Black Hawk] … and MOSA."

Soldier Touch Point

In early September, Poquette and his team visited the 25th Combat Aviation Brigade at Wheeler Army Airfield, Hawaii, to showcase a basic mockup of the FLRAA cabin. This demonstration gave the flight crews a unique opportunity to familiarize themselves with the platform and provide feedback on the aircraft's design and functionality.

The cabin mockup was equipped with augmented reality (AR) glasses that superimposed a complete virtual model of the aircraft over the physical mockup. This allowed the pilots and flight crews to visualize things like the seating configuration and controls, onboard storage and maneuverability within the cabin.

Poquette highlighted that the Bell/Army FLRAA team "spent a week out there with them, iterating on the two configurations we wanted to test. We started with one, the one actually that we thought we were going to choose, the seat configuration. We ran the soldiers through, you know, without any combat gear. And then we added weapons, then we added body armor and then we added MOPP gear" — Mission Oriented Protective Posture gear is personal protective equipment used by military personnel against chemical, biological and radioactive exposures. "What we found out is that the soldiers really liked the second configuration better [because] it was more comfortable, it was faster and they weren't tripping over each other."

Future FLRAA

Over the past few months, there have been some additional details that have come out about the operational design.

Spirit AeroSystems built the fuselage for the Valor demonstrator and was planned to be the production manufacturer. However, with Boeing taking over Spirit AeroSystems, Bell announced in June that it would reevaluate the fuselage supplier for FLRAA. Bell has decided to build the FLRAA fuselage in-house, *Breaking Defense* reported from the AUSA meeting. "The transfer of work on the Army's highest priority aviation program is the direct result of Bell's concerns that financial and operational instability at Boeing … could have an adverse impact on the FLRAA program," the article said. "Bell has full responsibility for the fuselage scope of work, as we do with many of our product lines," a Bell spokesperson told the news site. "Bell's Amarillo facility remains the final assembly site for the FLRAA aircraft."

The Valor demonstrator used two T64-GE-419 engines (each generating 4,750 shp) from the Marine's CH-53E Super Stallion. Although Bell announced in 2021 that its operational FLRAA would use Rolls-Royce AE 1107 engines, the engine company highlighted in October that it is delivering "a complete propulsion solution for the tiltrotor aircraft, featuring two Royce AE 1107F engines and a fully integrated system design." The AE 1107C engine (military designation T406) is used on the V-22 Osprey tiltrotor and produces up to 7,000 shp; it's built at Rolls-Royce's plant in Indianapolis, Indiana. The overall AE-family of engines has 88 million flight hours worldwide, including 1.4 million over two decades of service on the V-22.

The 25th Combat Aviation Brigade tested different FLRAA cabin configurations. (Army photo)

The first increment of FLRAA will be an aircraft that has high-speed, long-range assault capabilities, built on a MOSA backbone and supporting self-deployment and the Army's medevac mission. Also on the panel, Brig. Gen. Cain Baker, the Army's director of the FVL Cross Functional Team (CFT), provided some insights into the second increment to keep up with "the fast pace of technology change." MOSA facilitates updates to the basic aircraft, he said. "The way we wrote the requirements for the open system approach [and] the intellectual property data rights that came with that, allows us to iterate on FLRAA — not just as the first version comes out, but the ability to add upon that very quickly based off of the threat."

"We're already looking at what is the next increment for FLRAA, because we know we can quickly adapt it at an affordable rate," he added. Panelists noted that Increment 2 will look to address the future complexities of the battlespace, particularly in terms of the congested and contested airspace. These will likely be capabilities like additional sensors, advanced avionics, automation, launched effects [LE] and counter-uncrewed aircraft systems [C-UAS].

Breaking Defense reported that Baker indicated elsewhere at the AUSA meeting that the Army's requirements are still being developed. "Baker said it will likely take another year to draft FLRAA version two requirements, and those will then need to be moved up the chain for approval."

More information on FLRAA and the FVL initiative is available at **www.vtol.org/fvl**.