


TWICE AS FAR, TWICE AS FAST

by Cheryl Marino

The FLRAA program, powered by digital engineering, is set to revolutionize Army aviation with a faster, more adaptable aircraft designed to meet the demands of modern warfare.

EXCEEDING EXPECTATIONS

The FLRAA team shows Col. Matthew Scher, the 25th Combat Aviation Brigade commanding officer, what his Soldiers can expect from the FLRAA in the 3rd Battalion, 25th Aviation Regiment hangar on September 9, 2024. A tiltrotor aircraft, FLRAA will have the hybrid capabilities of both planes and helicopters. (Photo by Spc. Charles Clark, 25th Infantry Division)



As the battlefield evolves, so must the aircraft that support and protect Soldiers on the ground. The Army's Future Long Range Assault Aircraft (FLRAA) aims to do just that—ushering in a new era of speed, range and adaptability. Backed by cutting-edge digital engineering, FLRAA isn't just a new rotorcraft, it's a leap forward in how the Army plans, flies and fights in tomorrow's conflicts.

"It's a game-changing capability in terms of speed and range," said Col. Jeffrey Poquette, FLRAA project manager at Program Executive Office (PEO) for Aviation. He characterized the next-generation tiltrotor assault aircraft (designed by Bell Textron) as "twice as far, twice as fast" at the annual Association of the U.S. Army Global Force Symposium, held in Huntsville, Alabama, in March 2025. The implementation of digital engineering will be "a digital engineering pathfinder for the Army," serving as a model for how digital engineering can be adopted and implemented by the Department of Defense (DOD) acquisition enterprise to improve efficiency, reduce costs and accelerate the development and test of capabilities. The challenge, he said, is that this is new territory, but the level of insight that the government gets into the design is unprecedented and "what we get from that is ensuring that we build the right thing."

Gone are the days of building something, setting it aside and forgetting it. Digital engineering allows the Army to leverage the power of technology to create a design digitally and determine the impact of changes to that design prior to bending metal.

"Digital engineering isn't magic," said Poquette. "It's just a really deep look in a common environment where we have a single source of truth. We never don't know what the design is today. I can take my phone out right now and look at the design and see where we are ... that's powerful."

Poquette said when prototypes are built and tested, often things are found that have to be fixed. Some of those fixes could be big, some could be expensive, and they inevitably will extend the timeline of the acquisition because the test program gets much longer.

"I'm not even going to say that digital engineering is faster upfront. It's an investment in time. It's an investment in intellectual capital. But when we build the prototypes we're going to be so confident that anything we need to fix should be small, should not be expensive, and that we can quickly fix those prototypes, continue on with the test program and get the capability into Soldiers' hands as soon as possible," Poquette stated. "Together [with industry] collaboratively, we're going to build the aircraft that meets the Army's requirements and is truly going to change the nature of the assault aviation platform."

FLRAA COMES TO FRUITION

The science and technology (S&T) effort behind FLRAA began in 2013 as the Joint Multi-Role Tech Demonstrator program, which was aimed at proving out a platform that could fly twice as far, twice as fast and be sized appropriately for the Army. As the S&T effort transitioned to an acquisition program, the question became

how to approach the program differently and succeed.

“We went and looked at published lessons learned from various programs, not just Army, but across the DOD. We identified a theme that [the] lack of upfront systems engineering attributed to increased cost and schedule on many programs,” explained Michelle Gilbert, technical management division chief at PEO for Aviation FLRAA Project Management Office (PMO). She and her team were then tasked with developing a strategy that would ensure rigorous upfront systems engineering while supporting an accelerated program schedule beyond historical timelines. “That’s what initiated the development of our digital engineering strategy. We found that if we did some upfront investment in digital engineering, it would

give us some of the tools that we needed to help support those two objectives.”

Initially, a technology demonstrator (constructed as a proof of concept) was built to demonstrate “twice as far, twice as fast” capabilities, but it was not fully compliant with all requirements. The FLRAA program is currently executing a detailed design to ensure that the FLRAA system meets all requirements (survivability, sustainability, integrated mission systems, etc.).

As part of the Engineering and Manufacturing Development (EMD) phase, Gilbert said, Bell Textron will build six prototype aircraft, as well as two “limited user” test aircraft—the prototypes will be used to verify that the system meets performance and airworthiness requirements

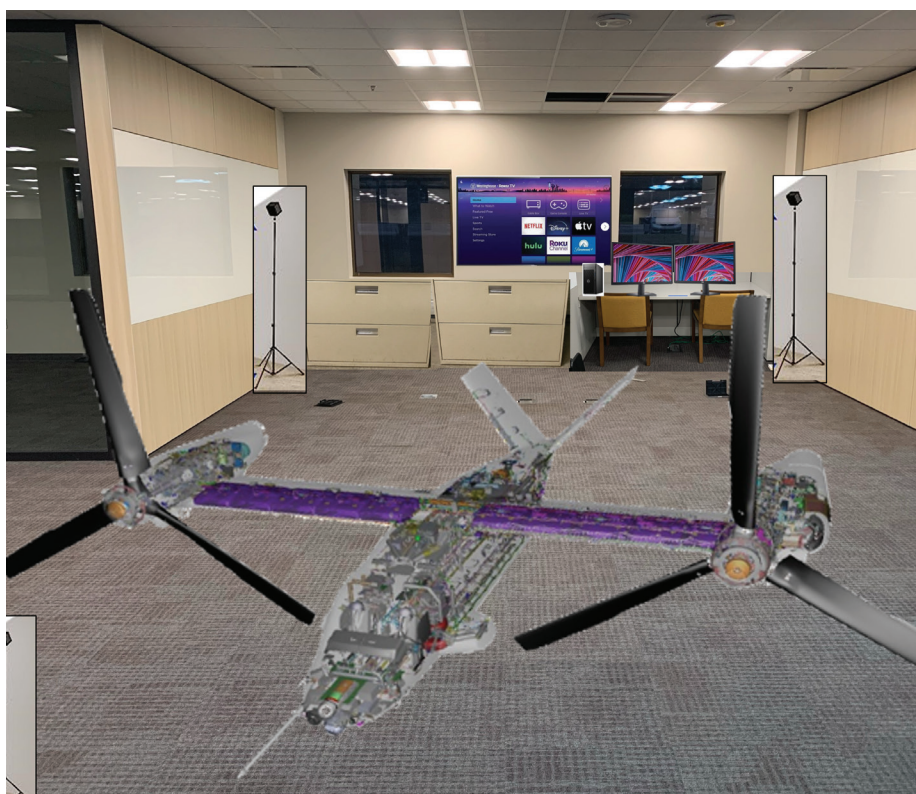
and to validate operational effectiveness, suitability, safety and survivability. There are also virtual prototypes, which are like aircraft simulators that accommodate a pilot and co-pilot, with surrounding screens that emulate the view and behavior of the system itself. These virtual prototypes are used to help inform the design as well as the development of operator tactics, training and procedures.

THE DAWN OF NEW DIGITAL

Digital engineering enhances FLRAA missions by enabling faster, smarter and safer operations. This includes the use of model-based systems engineering tools like Cameo—a collaborative environment for defining, tracking and visualizing all aspects of a system through models and diagrams. Additionally, 3D models support design, manufacturing and assembly processes, streamlining development from concept to execution.

Gilbert explained that FLRAA is using model-based systems engineering to create the digital models of the systems architecture and requirements, merging them into a digital twin that defines the system, demonstrates its behavior and predicts performance. “[This is] establishing a digital thread which captures the relationship between system and program data. The digital thread provides the PMO, stakeholders and Bell [Textron] with a better understanding of the system. We are also utilizing a collaborative digital environment to enable near real-time access to this data.”

The performance models are used to emulate and simulate the performance of the FLRAA aircraft to understand the behavior and tweak flight control laws (modifications to the flight control system’s algorithms, which govern how pilot inputs translate into aircraft control surface movements).



GRASPING REALITY

The mockup design of FLRAA’s extended reality lab. (Photo by U.S. Army)



FOR GOOD MEASURE

A member of the FLRAA team measures a 25th Infantry Division Soldier for improvements for the FLRAA in the 3rd Battalion, 25th Aviation Regiment hangar on September 9, 2024. (Photo by Spc. Charles Clark, 25th Infantry Division)

“We can also use it to help ensure that from a user interface standpoint everything is correct and suitable before we go and actually build the system, [and] we’re doing all of this digitally,” she explained. “We have a lot of digital models that represent our system that have allowed us to reduce the risk before we go and bend metal on our prototypes.”

The digital engineering strategy, Gilbert noted, is incremental. She and her team are currently focused on using digital engineering to design and document the system during development. As the program progresses, these efforts will expand into testing, eventually incorporating sensor data from the aircraft and linking it to various enterprise sustainment tools. For now, the priority remains on building a solid digital foundation before moving into test and evaluation.

“Using our digital environment to link test data together with the system design of the aircraft can help make the verification process more efficient. It can help correlate information together, where before there wasn’t a linkage between information, and

provide easier access to all supporting program data,” Gilbert said. “For our stakeholders who are trying to qualify our system, that’s very helpful. And then our digital engineering efforts will expand beyond that to support sustainment. Conceptually, every single aircraft in the field could have its own digital representation.”

Gilbert noted that one outcome they’ve already encountered from using the digital tools is that it forces both Bell and the U.S. government “to have a deeper understanding of the system and how onboard systems interact with each other.”

Additionally, the digital tools have enabled the team to create linkages to all of the data. Before this, Gilbert explained, “we were dealing with siloed pieces of information, so you weren’t able to make those correlations. By utilizing these tools, we’re finding things like architecture concerns that we may not have found before, just because now it’s all connected and it’s easier for us to consume and assess if the design meets our objectives.”

Crews also benefit from immersive virtual training, accelerating readiness for unfamiliar or high-risk scenarios. This makes FLRAA more agile, reliable and adaptable to the demands of future battlefields.

“We have a virtual reality [VR] capability that’s here in our office and it’s updated regularly to reflect the system under design,” Gilbert said. “We have monitors set up; we have the VR headsets. It doesn’t take a lot of infrastructure and that capability is there for us to utilize whenever we want it. This is truly a revolutionary capability that informs engineers or logisticians and any stakeholders who need to understand the system better.”

During system design, acquisition engineers may not fully grasp design specifics, such as how the hydraulic system will fit into the system, Gilbert said. “It doesn’t exist yet in physical form, but we are able to go in, put on a virtual reality headset and they can see exactly where it is in the current design. Our engineers or maintainers can look at it and say, ‘I’m never going to be able to maintain that system with the way it is now.’ We’re able to catch things like that earlier and influence a design change.”

GETTING THE MOSA FOR YOUR MONEY

While digital engineering provides the tools to design, simulate and evolve systems faster, a Modular Open Systems Approach, or MOSA, ensures those systems are built in a way that allows rapid, flexible upgrades.



DEMONSTRATOR IN FLIGHT

Bell's V-280 technology demonstrator in forward flight. (Photo courtesy of PEO Aviation)

According to Gilbert, the MOSA is an approach to achieving certain objectives, not just through open standards but by following specific design processes to ensure the architecture supports those goals. She and her team developed an architecture framework to guide how the system should be built and analyzed to confirm it meets MOSA objectives. Examples are enabling third-party upgrades without full reliance on the prime contractor or rapidly fielding a capability update with minimal delay. The framework defines these expectations and the prime is required to comply.

“The other thing that we’re doing is we put in a requirement for an infrastructure on our aircraft that we call the digital backbone. The digital backbone is the onboard network that’s responsible for all

data exchanges between different components. Any component integrated on the system must follow the defined open standards,” she said. “And what that does is it allows for easier integration by not

having to update multiple systems on the aircraft when upgrading a capability.” This concept is similar to the MOSA plug-and-play concept.

MOSA offers a modular and scalable solution for aircraft upgrades, eliminating the

integration complexities associated with legacy systems. This approach significantly reduces downtime and modification work by enabling the rapid installation and interchangeability of components.

“It’s a game-changing capability in terms of speed and range.”

“For FLRAA, we ensure we have robust processes and requirements in place to design and analyze our architecture and the onboard digital backbone. This, coupled with a robust intellectual property strategy that ensures the right level of data rights are acquired by the

PMO, summarizes the FLRAA open systems approach,” she explained. “To ensure that, we do have an open architecture on our platform.”

This, she said, will make it easier and more affordable to upgrade and sustain, with the ability to do some of that sustainment on the government side or with third parties. Because of how the system is architected, there’s less reliance on the prime contractor, which can help with sustainment costs.

SOLDIER TESTING AND TIMELINES

Soldier testing and feedback are crucial when implementing new digital technology to ensure it meets real-world operational needs. Direct input from end users helps identify usability issues, improve functionality and ensure the technology enhances mission effectiveness and Soldier readiness.

For the FLRAA program, there are two ways of achieving Soldier feedback. One is through special user evaluations, or Soldier touch points, using mockups of the aircraft to ensure optimal seat configurations and whether users can egress and ingress from the aircraft safely, etc. A user evaluation in spring 2025 observed how Soldiers conduct mission planning on the system, which will impact the software requirements for mission planning.

Another Soldier touch point is through virtual prototype simulation.

“We’re using the virtual prototype to help us get user feedback that can either support changing the user interfaces, our flight control laws, etc.,” Gilbert said. “We’re planning on using the virtual prototypes as part of special user evaluations all the way through our development stage. This will support iterative user feedback through development until we have physical aircraft prototypes.”

CONCLUSION

The FLRAA program has come a long way since April 2024, when FLRAA took a hybrid approach with a preliminary design using a middle tier of acquisition pathway and developed virtual prototypes. In July 2024, at Milestone B, it transitioned to a major capability acquisition program and program of record.

“We’re going to be focused on the detailed design in the near term, but our acquisition strategy is such that we don’t wait to complete our detailed design before we begin building our prototypes. We deliberately did that when we set up our acquisition

strategy so that once a subsystem reaches the appropriate level of maturity, it can immediately move into build and assembly,” Gilbert said. “Even though the design and supporting analysis may not be fully documented, we can begin building those subsystems with an informed level of risk. This helps support schedule objectives while maintaining rigor.”

Currently, the Army is scheduled to begin equipping the first Army unit in fiscal year 2030 and completing the first unit equipped in fiscal year 2031. “Our current focus is on getting the design right, which is crucial for successfully prototyping and future production,” Gilbert said. “We are building and testing prototypes to make a production decision by Milestone C, which is currently scheduled in 2028.”

“It [development] takes a few years, especially on an aviation platform because there’s a lot we have to do from an airworthiness perspective to ensure it’s safe,” Gilbert said. “We have a lot that we have to do before a Soldier can begin operating the system. That’s why using things like the virtual prototype and other things like mockups are so important to us—because it’s a way of getting them in early while we’re still proving out the airworthiness of the aircraft itself.”

For more information, go to <https://www.army.mil/PEOAviation>.

CHERYL MARINO provides contract support to the U.S. Army Acquisition Support Center at Fort Belvoir, Virginia, as a writer and editor for Army AL&T magazine and TMGL, LLC. Before USAASC, she served as a technical report editor at the Combat Capabilities Development Command Center at Picatinny Arsenal for five years. She holds a B.A. in communications from Seton Hall University and has more than 25 years of writing and editing experience in both the government and private sectors.