

# FLRAA Tilts to Bell

The US Army chooses the Bell tiltrotor solution for its Future Long Range Assault Aircraft and orders digital models to get ready for the real thing.

By Frank Colucci

**O**n Dec. 6, the US Army announced that it had awarded Bell Textron the weapon system development contract for its Future Long Range Assault Aircraft (FLRAA). The “best-value” decision settled the competition between the Bell V-280 Valor advanced tiltrotor and the Sikorsky-Boeing SB>1 Defiant compound helicopter concepts for a speedy Black Hawk helicopter successor.

The contract award also launched a 19-month initial effort to complete FLRAA preliminary design and deliver high-fidelity digital models that will support milestone decisions on physical prototypes and low-rate initial production (LRIP). According to a spokesman for the Army Program Executive Office (PEO) Aviation, Army plans call for FLRAA preliminary design through 2023, detailed design and the start of six prototype aircraft in 2024, and a first flight in 2025.

FLRAA plans are subject to review and refinement, but the Army expects LRIP in 2028 and a first unit equipped in 2030. Future Vertical Lift (FVL) Cross-Functional Team director Maj. Gen. Walter Rugen said a production FLRAA will enable the service “...to claw back a very large capability gap that we have

in the Army, and that is to conduct a brigade air assault in a period of darkness.” Today’s combat aviation brigade typically has three assault helicopter battalions with 10 Black Hawks each to haul soldiers and equipment. An infantry squad carrier twice as fast as today’s helicopter promises to double troop lifts per night. Greater-than-helicopter range should also enable FLRAA to span a brigade area of operations from one corner to the other without forward arming and refueling points (see “Paying for Speed,” *Vertiflite*, May/June 2014).

FLRAA is the biggest piece of the Future Vertical Lift initiative begun by Congress in 2008 to remedy US military capability gaps and revitalize America’s vertical industry (see “The Calculus of Future Vertical Lift,” *Vertiflite*, July/Aug 2021). The Joint Multi-Role (JMR) Technology Demonstration gave the Army flight test data for informed FLRAA requirements. Technology Investment Agreements (TIAs) and Other Transactions Authority (OTA) agreements provided the contracting instruments to expedite technology demonstrations.

The Bell V-280 Valor with off-the-shelf General Electric T64 engines flew for the first time in December 2017. In a 214-hour flight test program, the demonstrator dashed at 305 kt (565 km/h) in airplane mode and cruised efficiently on its fixed wing. Bell promotional videos subsequently emphasized the potential reach — speed and range — of a product-improved Army tiltrotor refined by Marine Corps/Air Force V-22 Osprey experience. A production FLRAA with optimized Rolls Royce AE1107F engines promises the Army long legs to self-deploy over water in the Indo-Pacific Command area of operations.



Forecast International estimates the FLRAA program has a potential value of around \$70B, depending on the size of the total Army buy and potential foreign military sales. (Bell)

Air assaults in contested airspace also require helicopter agility in terrain masking flight and at landing zones. With fly-by-wire flight controls, proprotor tilt and differential cyclic, the Valor demonstrated Level 1 (safe, low workload) handling qualities in a hover, delivered external sling loads and exercised hands-off flight control autonomy. The V-280 tested the Pilotage Distributed Aperture Sensor (PDAS) system that could help crewmembers clear a landing zone or give airborne soldiers better situational awareness before they disembark (see “Eyes All Over,” *Vertiflite*, July/Aug 2019). Significantly, Bell videos acknowledged the importance of Black Hawk-like ruggedness and slope landing capability for their tiltrotor demonstrator.

The 30,000-lb (13.6-metric-ton)-class Valor and Defiant JMR demonstrators modeled transformational troop carriers and gave the Army solid information for FLRAA decisions (see “Getting Smart for FVL,” *Vertiflite*, Sept/Oct 2017). Competitive demonstration and risk reduction (CD&RR) contracts called on Bell and Sikorsky to generate preliminary designs. During CD&RR Phase 1, Bell gave the Army V-280 design data to show it could execute a program of record and used model-based systems engineering (MBSE) to support FLRAA trade studies. Phase 2 generated initial preliminary designs for major FLRAA subsystems and the overall weapons system. Army requirements finalized in Phase 2 are not public, but PEO Aviation Maj. Gen. Robert Barrie noted the Army drew on JMRTD “touchpoint” events with pilots, infantry soldiers, medics and other users to refine FLRAA requirements.

### More Modeling

Army experimental test pilots from Redstone Test Center flew the V-280 in September 2020 to prepare for FLRAA testing. Despite its impressive performance, the tiltrotor demonstrator was never meant to be a production prototype with hardened structures, fuel-efficient engines and mission avionics integrated around a modular open system approach (MOSA). Pending physical prototypes, the initial portion of the FLRAA development contract aims to give the Army digital models of the real thing.

The initial \$232M development award buys high-fidelity digital models of the true FLRAA weapon system. With the development award, Barrie said, “Embracing model-based systems engineering [MBSE] in this digital environment is a cornerstone of this program. What we wanted to do is leverage the modeling activity that went into a preliminary design review and use that in the future, both to assess the design itself, as well as to assess, potentially, training and sustainment of the system.”

MBSE relies on digital models rather than documents to design complex systems, and it aims to provide a single source of truth to share models across disciplines and through the product life cycle. Bell first adopted three-dimensional computer design tools for the V-22 tiltrotor and expanded their use to run a digital thread through the design, tooling and production planning for the commercial Model 525 helicopter (see “Strands, Threads, Strings and Models,” *Vertiflite*, May/June 2022). The



The Bell V-280 Joint Multi-Role Technology Demonstrator showed the potential of an improved tiltrotor for the FLRAA mission. (Bell photo by Jay Miller of the first flight on Dec. 18, 2017)

company is now hiring model-based systems engineers to work the requirements, design, analysis, verification and validation effort around FLRAA.

Systems Modeling Language (SysML) uses system decomposition, functions, interfaces and performance to analyze complex systems and software. The Bell Manufacturing Technology Center in Fort Worth, Texas, has implemented a design-as-built methodology in its digital environment to share singular source data to save manufacturing time and cost. Bell also applies MBSE to aircraft in operational environments. The company has suggested, for example, using real-time vehicle health monitoring technology from the commercial Model 525 on the military FLRAA, subject to military security considerations. Throughout the FLRAA life cycle, the digital thread of MBSE is meant to maintain up-to-date configuration control and help manage fleet support.

FLRAA contract options through LRIP are worth around \$7.1B to Bell. Full-rate production buys will depend on future budget decisions, and Army officials cannot estimate the potential FLRAA market, including foreign military sales and joint-service derivatives to fit ships or other customer requirements. The current H-60 multi-year production contract gives the Army more than 2,100 Black Hawk helicopters for air assault, medevac, Special Operations, and command and control missions with deliveries through 2028. Given the notional cost of a bigger FLRAA and realistic production rates, the ultimate mix of utility platforms is still to be determined.

Also still to be determined is the winner of the Army’s Future Attack Reconnaissance Aircraft (FARA) program with Bell and Sikorsky building competitive prototypes to fly this year. FVL envisions a family of scalable vehicles, and the 14,000-lb (6.4-t) FARA provides another starting point for high-value Future Vertical Lift.