

Bell V-280 Ready For First Flight

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The next-generation tiltrotor that Bell Helicopter says should replace the 1970s-era UH-60 Black Hawk is about to take flight in Amarillo, Texas.

The U.S. Army operates approximately 2,300 Sikorsky Black Hawks, and hundreds more are either flying or in development for the Navy, Air Force, U.S. Special Operations Command and dozens of militaries around the world.

Looking at what comes next, the Army is considering revolutionary new rotorcraft designs from AVX Aircraft Co., Bell, Karem Aircraft and Sikorsky/Boeing under the Joint Multi-Role (JMR) Technology Demonstrator initiative, a precursor to Future Vertical Lift (FVL).

The two leading contenders are the Bell V-280 Valor third-generation tiltrotor and Sikorsky/Boeing SB-1 Defiant, a coaxial rotor and pusher-prop configuration.

From Bell's perspective, tiltrotor technology is the "future of vertical lift," and the V-280 is the ultimate Black Hawk replacement, with the capability of flying about twice as fast and three times as far. The company began designing the aircraft in 2012 using Catia V6 digital 3D design software, and construction started on June 26, 2015. Now the company has begun restrained ground testing, including powering on, lighting the engines and turning rotors. The next step is an unrestrained powered test, during which Valor will probably lift off the ground, which counts as the unofficial first flight.

Bell V-280 program manager Chris Gehler says the true first flight milestone will occur sometime in late October or early November, when the aircraft hovers about 20-30 ft. off the ground for about 1-2 hr. of powered hover testing.

Valor will probably fly about 6-9 months ahead of its competitor, the SB-1 Defiant, which is taking form at Sikorsky's rotorcraft development center in West Palm Beach, Florida.

Sikorsky and Boeing might have fallen behind Bell, but they remain stoic in their pursuit of, and belief in, the X2-based SB-1 configuration as the ultimate Black Hawk successor.



Bell's V-280 Valor is a candidate for the Army-led Future Vertical Lift program, which would replace the Black Hawk and Huey series of helicopters. Credit: Bell Helicopter

During a media tour of the V-280 at the Bell production facility in Amarillo on Sept. 28, Gehler said he wishes Sikorsky and Boeing well, but he believes Valor will prove to be the more mature and capable platform. He says a family of tiltrotors would best meet the Army's needs under Future Vertical Lift, scaling from the light and middleweight classes up to a super-heavy Boeing CH-47 Chinook or Lockheed Martin C-130 replacement.

"[V-280] will revolutionize military operations through its speed, range and payload," says Vince Tobin, Bell's executive vice president for military business. "The V-280 will be an excellent complement to the V-22 already fielded."

The U.S. Marine Corps was the first service to adopt tiltrotor technology, enduring deaths, delays and cost overruns to finally field the Bell-Boeing V-22 Osprey in 2007.

With an average flyaway cost of \$70-90 million each, the Osprey has been a tough sell, despite its capability to carry 24 troops over 400 nm unrefueled, up to a maximum cruise speed of 270 kt. To date, the program of record stands at 360 MV-22s for the Marine Corps, 50 CV-22s for the Air Force, 17 MV-22s for Japan and potentially anywhere from 40-90 CMV-22s for the Navy's carrier logistics mission.

V-22s are not going away anytime soon, and remain in active production at Boeing's plant in Philadelphia and Bell's Amarillo site. But Bell says the V-280 will take tiltrotor technology to a whole new level. Using lessons learned from the V-22, Valor has been designed from scratch to be more ergonomic, producible, maintainable, repairable and less expensive, with a flyaway price roughly equivalent to the Boeing AH-64 Apache.



Bell's V-280 is undergoing ground testing ahead of first flight in late October or early November. Credit: Bell Helicopter

The V-280 is being promoted for utility, attack and combat search-and-rescue missions, Bell officials say.

Bell efforts to improve on the V-280 configuration using digital modeling as the prototype have come together. Bell feels confident it could skip another round of technology maturation and roll straight into a full-scale development program for production and fielding by the mid-2020s.

The nearest opportunity to make Valor a reality is Future Vertical Lift Capability Set 3 (CS3), a procurement being jointly pursued by the Army and Marine Corps to replace the Black Hawk and Bell H-1 Huey/Cobra series by the mid-2030s.

Bell will try to convince the Defense Department to compress the FVL CS3 schedule and jump straight into engineering and manufacturing development by validating Valor's design through hundreds of hours of flight testing.

Bell will initially check off seven different test cards over about 7 hr. of hover and traffic-pattern testing before picking up speed and transitioning into airplane mode with propellers tilted forward. The conversion takes place between 70-120 kt.



Spirit AeroSystems produced the V-280 Valor fuselage “ahead of schedule and under cost,” according to Bell. Credit: Spirit AeroSystems

Gehler expects to move into airplane mode by year-end, before beginning flight envelope expansion up to 280 kt. and perhaps beyond to 304-305 kt. next year. A cadre of five Bell test pilots and three Army pilots will be putting the aircraft through its paces, first in the Valor flight simulator and system integration laboratory (SIL) and then in the actual demonstration aircraft.

Having lost two test pilots and one of its Bell 525 Relentless civil helicopters in a tragic test mishap in 2016, Bell wants to ensure V-280 flight testing goes as smoothly and safely as possible. The company has laid out a test schedule, but will not rush to arbitrary milestones. “We only have one airplane and the crew’s lives are important to us, which is why we have a methodical testing regime planned,” Gehler says. “We’ve done failure injections into the SIL to prepare pilots for any issues and concerns.”

Gehler is confident that the V-280 will cruise past its advertised maximum airspeed of 280 kt. to perhaps greater than 300 kt., as desired by the Army and Marines. Its optimal long-range cruise speed is 230 kt., the company says.

Bell also hopes to beat the minimum performance requirement in high and hot conditions (6,000 ft./95F (35C)) by going up to 8,000 ft./95F.

The prototype is powered by two 5,000 shp-class General Electric T64-419A engines borrowed from the Sikorsky CH-53E Super Stallion. Other candidate engines for the V-280 include the V-22’s Rolls-Royce AE1107 and the CH-53K King Stallion’s newly certified GE38/T408, which at 7,500 shp would probably be overpowered on the V-280.

Gehler says engine manufacturers are working on lighter and more efficient models in the optimal 5,000-6,000-shp range that could be available in the 2019-20 time frame.

For Bell V-280 Build Team Manager Jeff Josselyn, the past two years of construction have been a labor of love. He hopes to see Valor eventually be adopted by the U.S. military.

"There won't be a dry eye once she flies," Josselyn says. "We're really looking forward to getting air underneath these tires.

"We're all very proud of this aircraft," he adds. "We understand what it means, not just to Bell Helicopter and our partners, but also what it means for our customer. We believe this is the future of vertical lift."