**FVL and ITEP Advance**

**By VFS Staff**

As this issue was being completed, three key steps were made in advancing next-generation US military rotorcraft. On Jan. 23, the Bell V-280 Valor reached 280 knots; on Jan. 31, the Sikorsky-Boeing SB>1 Defiant team officially released a video of the aircraft conducting ground runs; and on Feb. 1, the Department of Defense announced that General Electric had been selected for the Improved Turbine Engine Program (ITEP).

**Bell Valor**

The Bell V-280 Valor successfully achieved its “optimal” cruise speed of 280 kt (519 km/h) true airspeed on Jan. 23 at the company’s Flight Research Center in Arlington, Texas. Bell is demonstrating the Valor as part of the US Army-led Joint Multi-Role Technology Demonstrator (JMR-TD) program, which is being conducted as the science and technology initiative of Future Vertical Lift (FVL). According to Bell, “Building on a full year’s worth of testing and more than 85 hours of flight time, Bell’s V-280 Valor reached its namesake cruising speed of 280 knots true airspeed this week.”

At the same time, Bell stated that the Valor’s flight test achievements include:
- More than 85 flight hours and more than 180 rotor turn hours
- In-flight transitions between cruise mode and vertical takeoff and landing mode
- 45-degree banked turns at 200 kt (370 km/h) indicated airspeed
- 4,500 ft/min (1,371 m/min) rate of climb and sustained flight at 11,500 ft (3,500 m) altitude
- Single flight ferry of over 320 nm (600 km)
- Demonstrated low- and high-speed agility with fly-by-wire controls

Bell said that the next stages will expand the performance envelope highlighting further low-speed agility maneuvers, angles of bank and autonomous flight. “Bell and Team Valor continue to methodically and very successfully expand the flight envelope. The aircraft continues to prove its performance is well beyond legacy rotorcraft and will deliver revolutionary capability for warfighters as part of the Future of Vertical Lift (FVL) program.”

The news site BreakingDefense.com said on Feb. 1 that the Valor had reportedly achieved a maximum speed of 296 kt (548 km/h).

**Sikorsky-Boeing SB>1 Defiant**

Sikorsky, a Lockheed Martin company, provided the first look at the Sikorsky-Boeing SB>1 Defiant with static photos of the JMR demonstrator on Dec. 26, 2018. These were the first official photos released since December 2016 when Swift Engineering delivered the fuselage to Boeing in Mesa, Arizona.

Lockheed Martin released a video on Jan. 31 showing that the Sikorsky-Boeing team was advancing through ground runs of its SB>1 Defiant JMR demonstrator at the Sikorsky Development Flight Center in West Palm Beach, Florida.

As reported in the last issue (“Defiant, Valor and the Knife Fighter”), the Sikorsky-Boeing team had experienced delays due to manufacturing challenges regarding the aircraft’s rotor blade spars and transmission gears. By press time, the flight-test aircraft had not yet run up to full speed. However, the ground-based Defiant Propulsion System Test Bed installed at the Development Flight Center did reach 100% rpm last year.

The Defiant and Valor demonstrators and the JMR-TD program are intended to inform the decision for FVL Capability Set 3 and the Army’s Future Long-Range Assault Aircraft (FLRAA).

**GET901**

The US Army selected General Electric to continue into the next phase of the 3,000 shp (2,240 kW) class ITEP following more than 20 years of development.

GE Aviation’s selection to continue its T901 engine into the ITEP engineering and manufacturing development phase over the competing T900 proposed by the Advanced Turbine Engine Company (ATEC), a joint venture of Honeywell and Pratt & Whitney, was posted in the perfunctory contract announcement on Feb. 1:

General Electric Aviation, Lynn, Massachusetts, was awarded a $517,375,800 cost-plus-incentive-fee and firm-fixed-price contract for the engineering and manufacturing development phase of the Improved Turbine Engine Program. Two bids were solicited via the internet with two bids received. Work will be performed in Lynn, Massachusetts, with an estimated completion date of Aug. 1, 2024. Fiscal 2019 research,
development, test and evaluation funds in the amount of $130,000,000 were obligated at the time of the award. U.S. Army Contracting Command, Redstone Arsenal, Alabama, is the contracting activity (W58RGZ-19-C-0003).

ITEP was originally conceived in the late 1990s as the Army’s Common Engine Program (CEP) for the Black Hawk and Apache, but wasn’t funded until fiscal 2008 as the Advanced Affordable Turbine Engine (AATE) science and technology effort. GE and ATEC conducted advanced component and rig testing, followed by complete engine testing that began in 2012 of their GE3000 and HPW3000 engines, respectively. Preliminary design contracts were finally made in August 2016 (see “Engine Hat Trick,” Vertiflite, Nov/Dec 2016), and the two companies completed preliminary design reviews in April 2018.

The GE T901 will replace the company’s T700 engine in the Army’s UH-60 Black Hawk and AH-64 Apache. The stated ITEP goals compared to the T700 include 50% more power, 20% longer engine life and a 25% improvement in specific fuel consumption.

In its announcement, General Electric stated that the company “has invested $9 billion in maturing technologies applicable to the T901 and more than $300 million to develop and test turboshaft-specific technologies. Additionally, GE has invested more than $10 billion in their supply chain over the past decade, including eight new facilities, ten plant expansions and one-and-a-half million square feet [140,000 m²] of new, advanced manufacturing space in the U.S.”

In addition to the Black Hawk and AH-64 Apache, the Army has also designated ITEP for use on the Future Attack Reconnaissance Aircraft (FARA), which is the Army’s solution to the FVL Capability Set 1. The T901 could also replace the T700 in other applications, as well as the Navy’s Seahawk and heavier FVL Capability Set 2 aircraft, and should have a bright future for eventual commercial and international sales as well.

HPW3000. The program is also focused on reducing operational and life cycle costs, and the logistical footprint for both the engine and future rotorcraft. ATEC plans to demonstrate a power turbine speed range of 55–105% at altitudes from sea level to 25,000 ft (7,600 m) altitude. The ACE program also requires an engine life exceeding 6,000 hours.

In addition, GE also continues work on the Army’s Future Affordable Turbine Engine (FATE) program to demonstrate technologies applicable to 5,000–10,000 shp (3,700–7,400 kW)-class turboshaft engines both for FVL (such as the heavier Capability Set 3/FLRAA), and for upgrades to current rotorcraft, such as the CH-47 Chinook.

Not just a bigger version of ITEP, FATE is to demonstrate even greater improvements over current engines, including an 80% improvement in power-to-weight; 20% improvement in design life; 35% reduction in specific fuel consumption; 45% reduction in production and maintenance costs; and 20% reduction in development cost. GE began testing two FATE engines in 2017.

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