



vertiflite Commentary

ITEP: The Next Leap in Capability and Affordability

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The development of the General Electric T700 turboshaft engine – begun in the late 1960s – was a turning point in helicopter history. It was a leap in capability that provided 25% lower specific fuel consumption (sfc) and 50% greater power-to-weight ratio than the turboshaft engines of the day. Originally developed by the U.S. Army to power the Sikorsky UH-60 Black Hawk and Boeing AH-64 Apache, the T700 family of engines is now used in more than 20 applications and 50 countries, and has delivered more than 60 million flight hours. From an initial rating of 1,622 shp (1,210 kW) in 1973, today's most powerful model, the YT706-GE-700 for the MH-60M, produces 2,638 shp (1,967 kW).

The Army performed careful and deliberate analyses of lessons learned from the Vietnam conflict and the future threats it then faced. It defined the size and capabilities required for the replacement utility and attack helicopters, which dictated the size of the engine needed. The Army then considered available technology of the day, which indicated the feasibility of the technology leaps in sfc and power to weight. It also recognized the importance of designing an engine that could be easily maintained in the field. Game-changing maintainability requirements were established, which together with the sfc and weight improvements, set the stage for the development of the T700.

The world has changed in the past 45 years. Fuel, maintenance and support, and logistics – and their associated costs – are now even more important than ever. Supply lines have to be stretched to reach austere environments. The price of a barrel of oil, even accounting for inflation, has increased more than tenfold from the late 1960s to the height of the conflicts in Iraq and Afghanistan, when more than 50,000 barrels of fuel were consumed each day. Clearly, increasing oil prices and the expense of getting it to where it is needed demand for another revolution in engine efficiency and performance.



Now is the time to take the next leap in turboshaft capability. Just as the T700 was a step change in capability beyond current models, the U.S. Army's Improved Turbine Engine Program (ITEP) promises not only a new lease on life for current aircraft, but enabling technologies for the next generation of rotorcraft. The ITEP engine is conceived to be a replacement for the T700 engine for the Black Hawk and Apache, providing 50% more power, a 65% improvement in power-to-weight ratio, a 20% longer engine life, a 25% improvement in sfc, and 20-25% lower production and maintenance costs over the T700.

The higher performance means improved high and hot lift capability, higher payload, longer range and more time on station. For the Black Hawk, it would increase the range by about one third, reducing the number of refueling points, and allowing a 50% increase in payload at 6,000 ft/95°F (1.8 km/35°C). For the Apache, it would mean more than an hour of additional reconnaissance time and a 3,300 lb (1,500 kg) increase in payload to its full fuel and weapons load.

Two competing 3,000 shp (2,235 kW) demonstrator engines are currently being developed under the Army's Advanced Affordable Turbine Engine (AATE) science and technology program. The Army initiated the AATE program in 2007 after

several years of component and technology development, such as ceramic matrix composite (CMC) materials, innovative cooling configurations and advanced aerodynamic designs.

General Electric began testing its GE3000 demonstrator in July 2012 and continues testing its second engine with good results. The Advanced Turbine Engine Company (ATEC) – a joint venture between Pratt & Whitney and Honeywell – successfully completed its first HPW3000 demonstrator engine in July 2013, while the second began performance and sand-ingestion testing in September. ATEC estimates that the 25% improvement in fuel efficiency could yield a savings of 50 million gallons (190 million liters) per year; this would be a cost savings on the order of \$200M per year.

ITEP is currently in the Materiel Solution Analysis (MSA) Phase of the defense acquisition system, with the Analysis of Alternatives (AoA) to be completed in early 2014. The AoA is critical as it assesses potential materiel solutions to satisfy the capability gaps identified in the approved Initial Capabilities Document (ICD) and is required to support a Milestone A decision, which is expected at the end of April 2014. Upon a successful decision, a Request for Proposal (RFP) would be released soon afterwards in a full and open competition for the Technology Development Phase.

Even in the current funding environment, the ITEP effort has received widespread support from the U.S. industry, military and Congress. ITEP will provide game-changing performance and efficiency, ensuring that today's legacy fleet will remain capable until it is replaced by Future Vertical Lift (FVL) in the middle of the century. Furthermore, ITEP may be well positioned to be the propulsion system basis for FVL-Medium and/or FVL-Light. Weighing the remaining investment versus the leap in capability and affordability, ITEP is really a no-brainer.

