



# The Single Spool Core:

A proven design for performance and simplicity



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The Improved Turbine Engine Program (ITEP) is a US Army program that calls on industry to produce a new turboshaft engine that will provide 50% more power, 25% better specific fuel consumption, and reduce life cycle costs. The program was launched to provide more power to [Black Hawk](#) and [Apache](#) helicopters that have continued to grow in weight as new armor, ammunition, and avionics have been added to the airframes. This growth has provided increased survivability and capability to the helicopters, but has come at the sacrifice of payload and maneuverability. In addition, recent conflicts have increased the need for improved helicopter performance at hotter and higher conditions. The ITEP program will provide that power by giving the Warfighter a 3,000 SHP class engine that operates more efficiently and cost effectively.

In response to this call to action, GE Aviation developed the [T901-GE-900](#) (formerly the GE3000) to be the next generation turboshaft engine solution for US Army Aviation. More power, higher efficiency, and lower costs are the focus of this bold program that will equip the soldiers of tomorrow with the best engine our country has to offer. By building upon a trusted partnership with Black Hawk and Apache Warfighters, GE created an engine that delivers the performance required in combat without sacrificing the maintenance simplicity of the single spool core design. The single spool core architecture has been the backbone of Army Aviation and is the preferred design of all Army turboshaft engines currently in operation. Through the application of industry leading, proven technologies, the T901 is designed to easily integrate with the Army's existing helicopters while exceeding performance requirements.

One of the key assets of the T901 design is the single spool core architecture that maintains similarity with the rest of the US Army fleet and enables cost effective and combat flexible modular maintenance. A single spool core means that all rotating components in the compressor and the gas generator are on one shaft and rotate at the same speed. In contrast, a dual spool core splits the compressor into two independently spinning rotors that are each powered by a separate gas generator turbine on concentric shafts. Because of the added spool, an additional frame, additional shaft, and additional bearings are required, which add weight and complexity to the engine. Added complexity makes an engine with a dual spool core more difficult to disassemble, thus limiting its fix forward capability, driving up maintenance costs, and reducing fleet readiness. Added weight means reduced performance, a decrease in available payload, and the potential for greater challenges integrating the engine into the aircraft. In addition, the increased parts count of a dual spool engine results in lower engine reliability as more parts have a potential to fail.

To achieve the power required by the US Army and preserve the simplicity that enables modular maintenance, the T901 relies upon superior compressor technology. Building on achievements proven in the [Advanced Affordable Turbine Engine](#) (AATE) program, the T901 delivers the compressor pressure ratio, higher component efficiency, and improved stall margin required to achieve 3,000 shaft horsepower in a single spool architecture. These achievements, coupled with decades of proven experience in single spool core design, ensure the T901 is the low risk option for ITEP.

The T901-GE-900 is the clear choice to deliver performance and maintainability to the US Army while saving money and maximizing flexibility. The benefits of a single spool core have already been proven:

1. **Support Cost:** GE and US Army analysis has shown that modular maintenance saves money. Modularity is a feature the Army already utilizes on the current Black Hawk and Apache helicopters with the [T700](#) engine. It allows the engine to be quickly and easily disassembled into major operating components, known as modules. A damaged module can then be returned to the depot for repair on its own instead of sending back the entire engine, thus saving considerable cost and reducing operational impact. This fix forward capability provided by a simple design is essential to a future expeditionary Army that is under ever increasing budget pressure. By incorporating the latest diagnostic and prognostic tools and a modular design, the T901 will allow the Army to achieve low support costs.
2. **Operational Flexibility:** Supply chains and logistics footprints are just as critical to combat success as aircraft power and performance. Since the T901 allows the maintainer to replace modules in forward operating areas, the number of whole spare engines required to be in theatre can be reduced. A smaller footprint in hostile areas means less risk to the soldiers supporting and maintaining the aircraft. Of course, if operational environments prevent the fix forward capability, combat commanders can adjust their maintenance practices towards whole engine replacement. By enabling modularity, the T901 gives battlefield commanders the flexibility to adapt.
3. **Increased Reliability:** With fewer parts and a simpler design, a single spool core architecture is lighter weight and provides better reliability than comparable dual spool engines. Complexity creates more opportunity for an engine to require repair as more parts and components must work together to achieve required power. Additionally, the T901 incorporates the latest inlet particle separation technology Single Spool Core: Performance and Simplicity and durable erosion coatings into the engine. These features combined with a simple and powerful design provide operators confidence that the engine will perform in an array of conditions including harsh sandy environments.
4. **Growth:** The T901's single spool core architecture is well suited for future growth as requirements evolve and applications call for more power, durability, and performance. This has been proven on the T700 engine, which has achieved 25% more power, 3x better durability, and 10x better reliability since inception, providing today's Black Hawk and Apache pilots significantly more capability than their predecessors. The T901 incorporates similar growth potential to give the Army a versatile engine that can easily integrate into today's fleet as well as provide power for Future Vertical Lift.
5. **Low Risk Integration:** Subscribing to the way Army Aviation operates today, with a fleet of proven single spool engines, the T901 will minimize impact on logistics and maintenance practices by maintaining this well-known configuration. Retraining soldiers to understand the differences of dual spool core operations and maintenance will not be necessary. In addition, GE Aviation is the only engine manufacturer that has integrated engines in both the Apache and Black Hawk helicopters. This knowledge and experience is designed into the T901 to

ensure low risk aircraft integration and provide the Army with confidence in on-time program execution.

The best choice for the Army ITEP is a single spool core architecture engine that delivers power, reliability, and flexible maintenance at the lowest cost. The T901-GE-900 provides those capabilities in a low risk, high performance engine built around simplicity. By applying proven technology and compressor design expertise, the T901 achieves program goals without the need to add complexity. The future of Army Aviation is power and performance, delivered simply.



## About GE Aviation

GE Aviation, an operating unit of General Electric Company (NYSE: GE), is a world-leading provider of commercial and military jet engines and components as well as integrated digital, electric power, and mechanical systems for aircraft. GE Aviation also has a global service network to support these offerings.

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