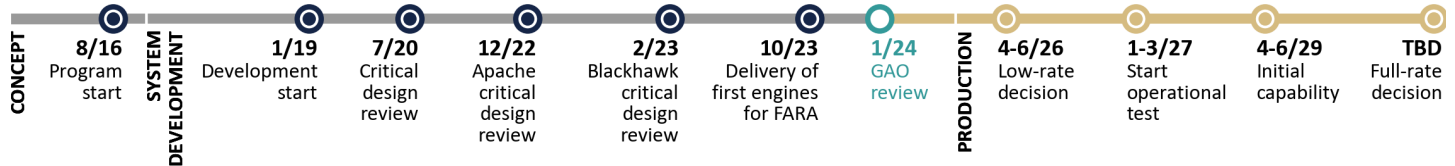




### Improved Turbine Engine Program (ITEP)

The Army's ITEP is developing a next generation turbo-shaft engine for the Black Hawk, Apache, and Future Attack Reconnaissance Aircraft (FARA) fleets. The program includes engine development, manufacturing, platform integration, and qualification. According to requirements approved by the Army, the improved turbine engine needs to fit inside the existing engine compartments of Black Hawk and Apache helicopters; be compatible with FARA; and provide power, fuel efficiency, reliability, and sustainment improvements.

Source: U.S. Army. | GAO-24-106831



### Program Performance fiscal year 2024 dollars in millions

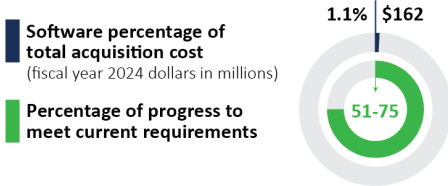
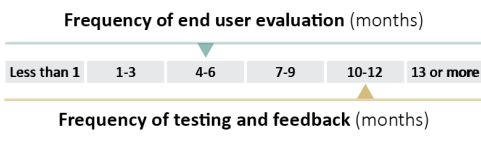
	Total Acquisition Cost <small>dollars in millions</small>			Unit Cost <small>dollars in millions</small>	Quantities <small>number</small>	Cycle time <small>in months</small>
First Full Estimate <small>(12/2019)</small>	\$2,376	\$12,018	\$14,484	\$2.3	6,258	102
Reported in 2023 <sup>a</sup> <small>(12/2021)</small>	\$2,298	\$11,623	\$13,927	\$2.2	6,258	102
Current Estimate <small>(8/2023)</small>	\$2,519	\$11,855	\$14,379	\$2.3	6,258	123

Development cost
  Procurement cost
 % Percent change since 2023<sup>a</sup>

Total quantities comprise 69 development quantities and 6,189 procurement quantities. The graphic bars depict only research and development and procurement costs. However, total acquisition costs may also include costs for military construction as well as acquisition operation and maintenance.  
<sup>a</sup>GAO-23-106059.

### Software Development as of January 2024

Approach: Agile and Incremental



The program reported that costs increased from last year due to the inclusion this year of software costs related to integration of the engines with the Black Hawk and Apache helicopters. Prior reported software costs included only engine software development costs.

### Program Essentials

Prime contractor: GE Aerospace  
 Contract type: CPIF

### Attainment of Product Knowledge as of January 2024

	Development Start	Current Status
<b>Resources and requirements match</b>		
Demonstrate all critical technologies in a relevant environment	●	●
Demonstrate all critical technologies in a realistic environment	○	○
Complete a system-level preliminary design review	●	●
<b>Product design is stable</b> <span style="float:right">Design Review</span>		
Release at least 90 percent of design drawings	●	●
Test a system-level integrated prototype	○	●
<b>Manufacturing processes are mature</b> <span style="float:right">Production Start</span>		
Demonstrate critical processes on a pilot production line	NA	NA
Test a production-representative prototype in its intended environment	NA	NA

● Knowledge attained ○ Knowledge not attained ... Information not available NA - Not applicable

We did not assess ITEP's manufacturing maturity because the program has yet to reach production.

## ITEP

### Technology Maturity and Design Stability

ITEP's three critical technologies are approaching maturity, with no progress reported since our last assessment. As we noted last year, further maturation is not expected until the engine completes substantial flight testing in an operational environment.

The engine design meets leading design stability practices. Nevertheless, until the program fully matures its technologies, it risks issues emerging during testing that could require redesigns, further disrupt testing and aircraft integration, and delay engine qualification.

Acceptance testing of the first two prototype FARA engines concluded in October 2023. Both engines were delivered to the FARA program in October 2023, a delay to the originally planned date of January 2022. As we reported last year, the Army attributed this delay to parts manufacturing challenges, which persist.

The delays in GE Aerospace receiving parts from suppliers delayed the start of preliminary flight rating testing for other engines by 3 months, to September 2023. If these delays continue, program officials expect them to delay additional engine assemblies intended for Apache and Black Hawk platforms, which in turn could delay flight testing in early fiscal year 2025 and engine qualification in 2026 on both platforms. According to program documentation, the program originally anticipated completing engine qualification testing prior to production start.

Despite these delays, ITEP continues to make progress on platform integration. It completed the critical design review for Black Hawk integration in February 2023, and Apache laboratory risk reduction activities are ongoing.

### Production Readiness

According to program officials, GE Aerospace and its suppliers have struggled with staffing critical manufacturing positions. Specifically, insufficient staff and experience levels combined with new manufacturing processes have contributed to parts quality issues, resulting in rework and delays. Program officials have developed corrective actions for at-risk vendors and are implementing mitigations, such as identifying alternate vendors and assessing the cost and schedule impacts of alternate sourcing.

Engine production start is currently scheduled for the third quarter of fiscal year 2026, but, as described above, GE Aerospace is behind schedule in completing activities required prior to production start. GE Aerospace's ability to meet the planned date is dependent on the above discussed management of their immature manufacturing processes,

including additive manufacturing, and quality performance of GE Aerospace and its suppliers.

### Software and Cybersecurity

Multiple software releases planned for 2022, 2023, and 2024 were delayed. The primary driver was the delay of engine control hardware that required software rework. According to program officials, ITEP is experiencing challenges hiring and retaining software professionals, including software engineers with specialized airworthiness experience. Additionally, they noted a significant turnover of contractor software staff due to the competitive nature of the industry.

Two developmental cybersecurity tests of the engine, originally scheduled for 2023, are now planned for the end of fiscal year 2024 and start of fiscal year 2025. These delays could make it harder to address any issues discovered during testing. Our past work has shown that early discovery of vulnerabilities makes them easier to fix and reduces schedule risk.

### Other Program Issues

In March 2023, the milestone decision authority approved ITEP's new program baseline following Army Contracting Command's letter of concern regarding GE Aerospace's schedule slips and cost growth. ITEP's new baseline moved initial operational capability from 2027 to 2029.

In June 2023, in its response to the letter of concern, GE Aerospace acknowledged its role in the delays and cost growth but stated that the government directly contributed to cost and schedule growth by expansion of in-scope effort, risk-inducing contract modifications, and an unwillingness to accept industry test analysis standards. In June 2023, GE Aerospace submitted a new schedule, designed to address the continued schedule degradation, that is currently under review by the program. According to program officials, ITEP is currently on track to meet the revised baseline set in March, but continued hardware delays could likely shift developmental testing and subsequent major milestones by an additional 6 to 12 months.

### Program Office Comments

We provided a draft of this assessment to the Army for review and comment. The Army provided technical comments, which we incorporated as appropriate. The Army stated that it continues to manage cost, schedule, and performance of ITEP to field the new engine for platforms by fiscal year 2027. It added that engine testing to date has achieved maximum power and validated performance and operability model predictions. According to the Army, the Aviation Turbine Engines program office continues to aggressively assess the delivery dates amid global supply chain issues.