

# Product safety and quality

## Delivering engines to power three out of every four of the world's commercial aircraft<sup>15</sup> is a major responsibility.

In 2023, GE Aerospace had zero engine-caused events that resulted in serious risk to an aircraft, improving on a strong five-year record of 0.04 incidents per million departures.<sup>16</sup>

### Our Safety Management System

Our strong product safety focus is incorporated in our Safety Management System (SMS). In 2013, we became the first aerospace manufacturer to voluntarily implement an SMS, 10 years before the U.S. Federal Aviation Administration (FAA) proposed requiring it. In 2017, GE Aerospace's SMS was the first established by a product original equipment manufacturer (OEM) to be accepted by the FAA. Our SMS applies across all our product lines, not just those parts of the business operating under the privileges of FAA authorizations, including Defense and Systems, Propulsion and Additive Technologies, and aero-derivative businesses, as well as other affiliates and subsidiaries.

Our SMS is founded on four key tenets, following the International Civil Aviation Organization (ICAO) standard:

**Policy:** Embedding top-down commitment to safety in our policies

**Promotion:** Creating a positive safety mindset through training, education, and awareness

**Risk management:** Executing independent risk assessments that follow the approved FAA process

**Assurance:** Validating the effectiveness of risk-control strategies in design, manufacturing, quality, and product performance

Running alongside our SMS is our Quality Management System (QMS), making sure we produce quality parts to specification every time, while complying with all regulations. We seek to drive continuous improvement in all of our processes within our SMS and QMS—including deploying FLIGHT DECK, our proprietary lean operating model—to continue to raise the bar on safety.

### Raising safety concerns

GE Aerospace encourages employees to report safety concerns voluntarily and confidentially without fear of retaliation. Our open reporting system provides multiple options for employees to raise safety concerns. We value safety concerns submitted from our employees and want everyone to raise any concerns they may have.

Every employee can report safety concerns through a range of channels, including directly through their supervisor, using an anonymous hotline, and via the Safety Program Management Teams (SPMTs). Employees with a computer also have access to a direct link to a product safety toolbox with detailed information on where and how to report safety concerns. A dedicated team evaluates these concerns and escalates those that require action.

### Soliciting employee feedback

GE Aerospace regularly invites employees to participate in surveys to gauge knowledge of the importance of safety across our operations and business units. Participants help identify areas that are working well and highlight opportunities to increase education and take action. Participation in the 2023 survey increased by 300% compared to 2022.

“Putting safety first requires that all of us at GE Aerospace create and uphold a strong safety culture. That means one where employees are encouraged to raise concerns and feel comfortable doing so. It’s in this spirit that we seek to continuously improve our products, processes, and operations.”



**Chris Lorence**  
Chief Engineer,  
GE Aerospace

<sup>15</sup> Includes equipment made by GE Aerospace and joint ventures.

<sup>16</sup> Continued Airworthiness Assessment Methodology (CAAM) Level 3+ events, engine-caused.



GE Aerospace employee at our Singapore component repair site following our operating framework that puts safety first.

### Our holistic approach to product safety and quality

Product safety and quality are top priorities for GE Aerospace. Given the central importance of flight and product safety to the company, our Board of Directors provides regular oversight of and engagement on safety and quality.

Our uncompromising commitment to safety is strengthened through our organizational structure that is intentionally designed to create checks and balances with engineering teams reporting independently to the CEO from product management teams.

Furthermore, our Chief Engineer's Office serves as a technical resource for the business as well as an internal technical audit function, providing another layer of internal oversight separate from the product management teams. The Chief Engineer's Office also includes our Flight Safety Office, which provides full flight safety and operational readiness support for both new and existing commercial and defense programs.

Dedicated cross-functional product safety rhythms further support our commitment to safety, including:

**Safety Program Management Teams (SPMTs):** Each engine product line reviews and addresses potential model-specific product safety concerns across all aspects of manufacturing, field performance, maintenance, and repair, ensuring potential emerging trends are evaluated, and identified actions are implemented.

**Enterprise Safety Program Management Team (ESPMT):** This enterprise-level team ensures potential product safety concerns reviewed in product-level SPMTs are "read across" all product lines to understand if a potential issue could impact other product lines.

**Product Safety Review Board (PSRB):** The PSRB independently monitors the progress of investigations and corrective action plans defined by the individual SPMTs and the ESPMT, ensuring closure actions are completed.

Externally, GE Aerospace regularly participates in safety forums with regulators, other manufacturers, and industry associations to support [our approach to risk management](#) and to help the industry continue to improve its safety performance.

#### Safety spotlight

GE Aerospace actively participates in key forums addressing safety issues, including the FAA and other industry groups:

#### FAA Aviation Rulemaking Committees (ARC)

- Change Product Rule (CPR)
- Instructions for Continued Airworthiness (ICA)
- Transport Category Airplane Continued Operational Safety Agreements

#### FAA Aviation Rulemaking Advisory Committees (ARAC)

- Engine and Powerplant Interface Working Group (EPIWG)
- Ice Crystals Icing Working Group (ICIWG)

#### Industry groups

- Aerospace Industries Association (AIA)
- General Aviation Manufacturers Association (GAMA)
- Aerospace, Security and Defense Industries Association of Europe (ASD)
- Aviation Supply Chain Integrity Coalition (ASCIC)
- Aerospace Engines Supplier Quality Group (AESQ)
- International Aerospace Quality Group (IAQG)
- International Aerospace Environmental Group (IAEG)
- International Audit Practice Consortium (IAPC)
- National Safety Council (NSC)

“Every two seconds, an aircraft with a GE Aerospace or partner engine takes off. It’s a tremendous responsibility that we take seriously.”



**H. Lawrence Culp, Jr.**  
Chief Executive Officer,  
GE Aerospace

### Our product quality framework

All new aircraft engines and component parts are manufactured under production quality systems that are approved by military and commercial aviation authorities and certified to conform to their type design. Similarly, fielded engines and component parts serviced within GE Aerospace shops are maintained to original manufacturer requirements using original manufacturer component parts and repairs, then returned to service under applicable commercial aviation maintenance organization approvals.

Underlying these commercial aviation regulatory approvals, our quality framework drives actions that include:

- Developing our people through continuing education
- Creating a mindset that strives for, but doesn’t assume, zero defects, with the right processes in place and an advanced product quality planning (APQP) toolkit for managing change
- Optimizing our quality and business management processes

#### Spotlight

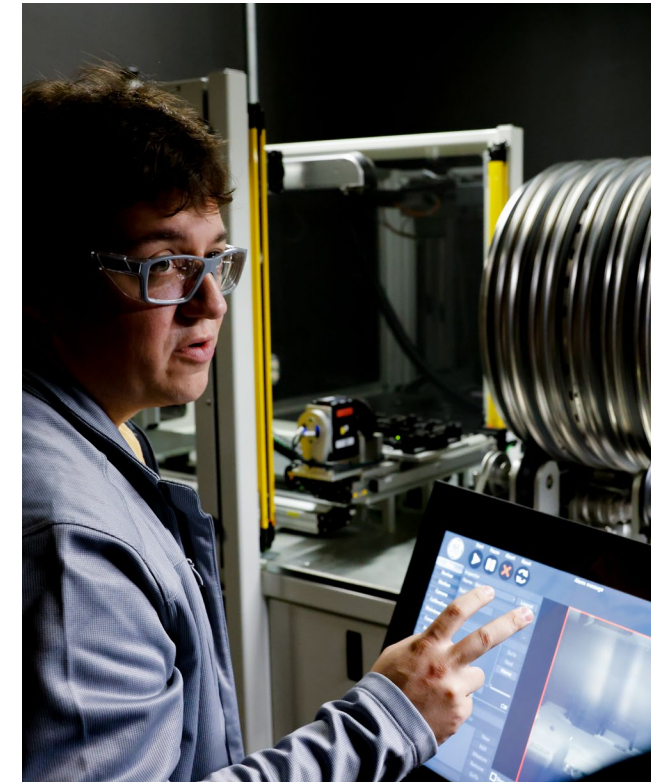
Through our Quality Excellence Program (QEP), we are focused on building aviation industry expertise. This involves a combination of robust customized training, knowledge application, and certification. Individuals obtaining a QEP certification become internal leaders able to provide training and mentorship across the organization.

### Inspection technology and innovation

We have a suite of advanced imaging technologies and methods that help us address safety and quality while driving faster, more efficient, and more sensitive aircraft engine inspections. These include ultrasound, X-ray, computed tomography scans, flash thermography, eddy current testing, fluorescent penetrant inspection, and dimensional metrology.

These modalities are commonly used in combination during part manufacture and subsequent field inspections to help the engineer best determine both initial quality and continued serviceability. Image-processing algorithms are developed for each inspection method to improve the accuracy and consistency of data interpretation.

Since 2019, we have voluntarily completed more than 6,300 enhanced inspections of in-service critical rotating parts. In 2023, we enhanced our ultrasound inspections of critical rotating parts during production. Our researchers have also pioneered new inspection technologies for use while engines are on-wing.



The Deep Cavity Inspection System is a fully automated, enhanced surface inspection solution for finished and fielded engine spool assemblies.



Combating unauthorized parts in the supply chain

In February 2024, leaders from across the aerospace industry in the United States and Europe announced the creation of a coalition to help prevent unauthorized parts from entering the aviation supply chain and to strengthen the supply chain's overall integrity. Founding members of the Aviation Supply Chain Integrity Coalition include senior representatives from Airbus, American Airlines, Boeing, Delta Air Lines, GE Aerospace, Safran Aircraft Engines, StandardAero, and United Airlines.



“One bad actor is one too many in an industry so focused on quality and safety. We look forward to collaborating with leaders across the aviation industry to find meaningful solutions we can implement quickly to prevent this from happening again.”



**Phil Wickler**  
Chief Transformation Officer,  
GE Aerospace

**Teaming with suppliers**

We have an oversight system and tools in place to verify that suppliers meet our standards and are part of our efforts to continue to improve quality and create a philosophy that strives for, but doesn't assume, zero defects.

- In 2023, we launched a Partnership for Safety program with suppliers of raw materials for key rotating parts, targeting defect detection and continuous improvements.
- We developed a digital thread solution providing part traceability for rotating life-limited engine parts. This digital solution extends across approximately 95 suppliers since the inception of the tool, and enables tracing of part serial numbers produced from each batch of raw material to specific engine serial numbers where those parts are installed.
- In 2024, we will invest \$100 million in our external supplier base, with a prime focus on specific tools and customized dies needed to produce castings and forgings for engine components. This investment ensures suppliers are using the newest tools to produce parts, further reducing the possibility of manufacturing defects.

<sup>17</sup> Includes two facilities operated by CFM International partner Safran Aircraft Engines.

**Working with commercial customers**

We work closely with airlines around the globe to ensure they have the information needed to safely operate and maintain the products we produce throughout their useful lifetimes.

**In-region customer support teams**

We support our customers around the globe 24/7, through a global network of dedicated aviation professionals, training centers, web centers, On Wing Support (OWS) technicians, and more.

**Customer training**

We provide maintenance training and aids to serve our customers. These include training modules available on our Customer Technical Education Center (CTEC) University website, as well as maintenance videos posted on YouTube to help the aircraft maintainer with everyday engine maintenance tasks. Additional Digital Training Aids are available through dedicated customer web portals and hands-on, instructor-led maintenance courses at six global training facilities.<sup>17</sup> In a typical year, we train more than 6,000 customer mechanics across all our commercial product lines and training centers.

We also offer a detailed Powerplant Engineers Course that provides basic knowledge of jet engine design and how the engine hardware and systems work together.

Learn more about GE Aerospace's training. [➔](#)

**\$650<sub>M</sub>**

intended investment in manufacturing facilities and supply chain operations in 2024

**Diagnostics and prognostics**

We monitor real-time data from operators' fleets to identify early signs of potential issues that could lead to operational disruptions. Using advanced analytics, including artificial intelligence (AI) and machine learning, we leverage data from 181 million annual flight records to provide operators with appropriate and timely recommendations to keep engines reliable.

**Flight Operations Team**

We have a team of pilots with engineering expertise whose flight ratings cover nearly every commercial aircraft type powered by GE Aerospace or GE Aerospace partnership engines. This team enables direct pilot-to-pilot dialogue, ensuring those who fly aircraft with engines we designed and produced have insights to augment their experience.

**24/7**

global customer support