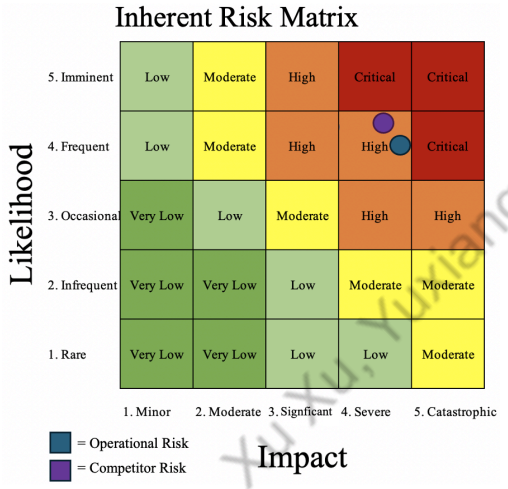
I. Introduction

RTX Corporation is an American multinational aerospace and defense conglomerate headquartered in Arlington, Virginia. It was established in 2020 from the merger of Raytheon Company and United Technologies Corporation. RTX has three primary business segments: Collins Aerospace; Pratt & Whitney; and Raytheon. The firm supplies advanced systems and services for commercial aviation, defence and space including jet engines, avionics, cybersecurity and missile systems. With an international footprint, RTX is among the biggest aerospace and defense contractors in the world, serving government and commercial customers.

In 2023, Pratt & Whitney, one of the core subsidiaries of RTX, identified that certain PW1100G Geared Turbofan (GTF) engines, primarily used in Airbus A320neo aircraft, were manufactured with contaminated powdered metal between the fourth quarter of 2015 and the third quarter of 2021 (Insinna et al., 2023). This can introduce microscopic contaminants in vital engine parts, especially the high-pressure turbine (HPT) discs, causing microfissures and component failure that puts passengers' safety at risk (Josephs, 2023). To solve the issue, the company initiated a massive recall and inspection scheme that incurred massive losses to many airlines as they needed to change their operation plans, with reducing flights (Singh & Hepher, 2023). The financial compensation paid to the impacted airlines comprised large sums and placed a cornerstone economic burden on Pratt & Whitney (Hardee, 2025; TipRanks, 2025). While this event exposed RTX to various risks such as financial, compliance, legal, and reputational risks, the most significant impact was the heightened competitor risk

II. Inherent Risk Assessment



Risk Event - Operational Risk: This risk arises from failures in people, process and technology along the metallurgy‑inspection chain. If there are not any action management taken to control, it is believed that the risk likelihood will be medium to high, considering the complexity of the aviation engine architectures and historical precedent with blade separations. The impact of this event is also not neglectable, as the multi-year grounding program, significant financial losses, safety concerns, and other consequences all represent threats to the enterprise.

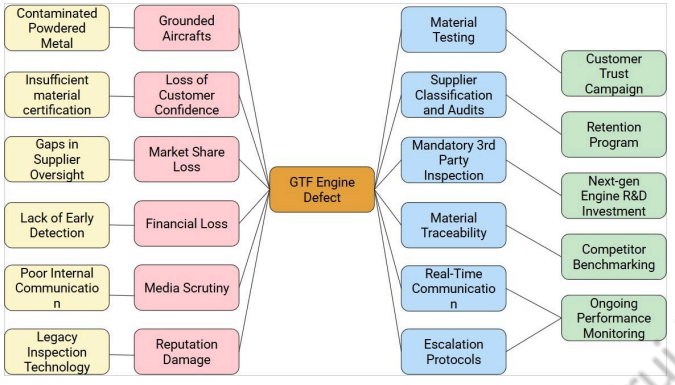
Risk Exposure - Competitor Risk: RTX is potentially at greater risk from competitors, such as Rolls-Royce, who stand to benefit from reliability concerns. Market share does not automatically migrate, but such an event gives the competitors a powerful commercial talking point, which they will make the most of this opportunity through highlighting their engine platforms as safer and more reliable alternatives. Any market share hit on the narrow-body engine side could translate into billions of dollars in after-market revenue loss within 20 years. Therefore, the likelihood and impact of this risk exposure are medium to high.

III. Root Cause Analysis & Risk Event: GTF Engine Recall

The recall of the GTF engine resulted from multiple factors instead of a single failure. The direct cause was contaminated powdered metal used in key engine components like high-pressure turbine disks, which evaded detection for years due to gaps across design, supplier quality, and internal communication. Although these components were manufactured by external suppliers, and the materials were in the production system for years, the Information related to the material characteristics were not identified

during the manufacturing process. Once installed, the engines operated normally for an extended period. Thus, the material defection was not immediately identified during routine inspections and maintenance.

By using the six-category Fishbone analysis, the causes of issues across multiple areas. Root causes included inadequate oversight of suppliers and insufficient material certification protocols (materials), testing methods and capabilities (measurement), lack of timely cross-functional communication (manpower), outdated inspection technology(machinery) and lack of a standardized incident escalation process (methods). In addition, unclear environmental conditions during manufacturing, delayed reporting of maintenance observations, and slow data sharing between teams made it harder to detect the issue at an early stage (environment). These process and system deficiencies ultimately let contaminated metal powder enter and persist in the production process leading to the global recall.



III. Risk Exposure: Competitor Risk

One of the deeper risks revealed by the GTF engine recall is RTX's exposure to competitor risk. In the aerospace industry, competition moves fast and trust moves even faster. When reliability issues show up, customers don't just ask for repairs; they start looking for alternative providers. For RTX, this means direct exposure to the risk of losing long-term customer relationships and future contracts. And rivals like GE and Rolls-Royce would have the opportunity to replace the market.

The GTF recall brought competitors an unexpected advantage. As Pratt & Whitney engines were pulled from service, grounded aircraft disrupted airline schedules and harmed the trust in GTF engine capabilities. Competitors responded quickly and promoted their engine platforms as safer and more reliable options. This wasn't just about gaining new sales in the short term, it also changed customer expectations and shifted perceptions of the brand's reliability. Airlines that used to take RTX as a default option might now be evaluating other options in mind. This shift indicates the core of competitor risk: it shows up gradually, builds on perception and expectation, and is difficult to reverse once it happens.

To mitigate this exposure, RTX must move beyond immediate damage control and pursue a long-term strategic response. Because in a market like this, once customers switch platforms, the lost ground is rarely recoverable. Mitigation plans may help preserve what's left, but regaining previous levels of dominance typically requires rethinking the future, not repairing the past. The company should invest in next-generation engines that address both performance and environmental imperatives. By taking a leadership role in these areas, RTX can catch up to its competitors and also set the agenda for the future of commercial aviation.

Competitor risk is not a one-time threat, it's an ongoing challenge that requires sustained strategic attention. The GTF engine recall demonstrated how quickly market changes can be when a company failed to respond to both performance issues and competitor advances.

VI. Corrective Action Plan and Risk Mitigations:

Plan 1: Strengthen Supplier Oversight and Quality Control

Objective: Address operational risk arising from contaminated powdered metal entering the production process due to weak supplier oversight, inadequate quality controls, and poor communication channels.

Actions:

1. Launch a supplier risk classification program to identify and monitor high-risk vendors, especially for critical materials like powdered metals (*Led by Supplier Quality and Strategic Procurement Teams*).
2. Mandate third-party certification and advanced non-destructive testing (e.g., X-ray CT, AI-based defect detection) for all incoming materials. The review of past inspection failures should be conducted. (*Led by Materials Engineering and Quality Assurance Teams*).
3. Standardize the escalation process for cross-functional communication on material issues and inspection anomalies (*Led by Operations Excellence and Quality Control Teams*).
4. Implement a centralized data-sharing platform to enhance visibility across engineering, procurement, and quality control teams (*Led by IT Systems, Engineering Operations, and Data Governance Teams.*)

Timeline: Initiate supplier classification and technology upgrades by end of Q2 2025, with full protocol standardization and data platform launch by Q4 2025.

Risk Owner: Chief Operating Officer (COO), responsible for overseeing supplier management, engineering integration, and quality assurance protocols.

Expected Outcome: Reduced likelihood of future recalls through early detection of material flaws and improved supplier accountability, strengthening overall manufacturing reliability.

Plan 2: Rebuild Market Position and Mitigate Competitor Risk

Objective: To mitigate the strategic exposure to competitor gains caused by diminished trust in RTX engines and rising customer interest in rival platforms.

Actions:

1. Launch a global campaign to rebuild confidence in RTX engines by highlighting transparency, remediation efforts, and future commitments (*Led by Corporate Commercial Sales Team*)
2. Conduct a formal benchmarking study against GE and Rolls-Royce engine platforms to identify gaps in performance, maintenance, and sustainability (*Led by Engineering and Strategy Teams*).
3. Reallocate R&D budget toward the development of ultra-efficient, low-emission sustainable engines that exceed current performance and environmental standards (*Led by CTO and Innovation Task Force*).
4. Launch a retention program for at-risk airline clients with tailored support, maintenance credits, and early access to upgrades *(Led by Commercial Strategy Teams)*

Timeline: Initiate campaign, benchmarking, and customer retention efforts in Q2 2025. Product R&D roadmap in place and competitive insights reporting live by Q4 2025.

Risk Owner: Chief Commercial Officer (CCO), responsible for competitive recovery, customer strategy, and long-term positioning.

Expected Outcome: Improved customer perception, reduced churn to competitors, and reestablished trust that supports sustained market leadership.

VII. Key Risk Indicators

1. **Supplier quality control failures (Risk Event: Operational Risk)**

Key Risk Indicator: Percentage of critical engine components (e.g., high-pressure turbine disks) failing incoming quality control (QC) tests.

Key Threshold: 2% failure rate on high-risk parts triggers escalation (red). 1% is the alert threshold for monitoring (yellow).
Definition & Rationale: This indicator measures the effectiveness of supplier quality and screening processes. In the GTF case, contaminated powdered metal entered the supply chain undetected, highlighting lapses in both supplier testing and RTX's incoming inspection. Monitoring failure rates helps preempt systemic issues and strengthens supplier accountability.

2. **Maintenance Turnaround Delays (Risk Event: Operational Risk)**

Key Risk Indicators: Average engine repair turnaround time (TAT) compared to standard.
Key Threshold: TAT > 150 days (red), TAT > 120 days (yellow)
Definition & Rationale: This measures the capacity and efficiency of the maintenance and repair network. A TAT exceeding 150 days signals severe backlogs in shop visits, which can disrupt fleet availability and airline schedules, as seen during the GTF crisis (300 days). This would require immediate escalation to senior leadership and cross-functional crisis teams.

3. **GTF Engine Reliability Metrics (Risk Exposure: Competitive Risk)**

Key Risk Indicators: Monitor two core metrics:

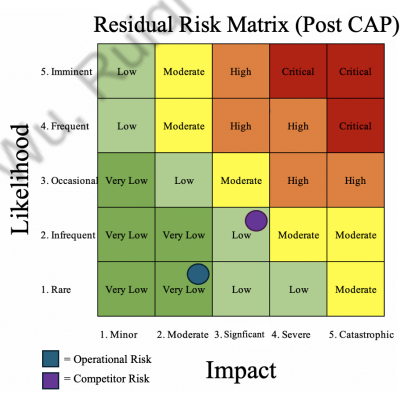
1. Unscheduled Engine Removals (UERs): Engines removed from service earlier than expected.
2. Average Time Between Shop Visits (ATBSV): Time between major engine maintenance cycles.

Key Thresholds: 1. UERs increase > 10% over industry average for two consecutive quarters 2. ATBSV drops > 5% below industry average for similar engines
Definition & Rationale: These metrics reflect the reliability of RTX's GTF engines. A rise in UERs or drop in ATBSV signals declining durability, risking customer dissatisfaction. Ongoing underperformance against peers may lead to competitive loss, especially in the narrow-body segment where alternatives like CFM Leading Edge Aviation Propulsion (next-gen jet engine developed by GE and Safran exist.

4. **KRI – Number of Patents Filed by Competitors (Risk Exposure: Competitive Risk)**

Key Risk Indicators: Track the number of new patents filed annually by direct competitors in key aerospace and defense fields (e.g., propulsion, radar, avionics, autonomy).
Key Threshold: A competitor files > 20% more patents than RTX in relevant domains over a 12-month period
Definition & Rationale: The number of patents filed by key competitors indicates long-term innovation competitiveness. If a competitor (e.g., GE, Lockheed, Rolls-Royce) files over 20% more patents than RTX in areas like propulsion, radar, avionics, or autonomy within 12 months, it signals that RTX may be falling behind technologically.

VIII. Residual Risk Assessment and Measurement post CAP



For Operational Risk, the residual risk is assessed as "**very low"** after the CAP. The likelihood is rated "**rare"** due to the implementation of stronger supplier oversight, mandatory non-destructive testing, and standardized escalation protocols. This greatly reduces the chances of contaminated materials re-entering production. While the likelihood has been greatly minimized, the "**moderate"** impact remains due to the complexity of RTX's global supply chain and manufacturing systems, which could still cause operational disruption if a failure occurs. The effectiveness rating is "**strong"** as risk moved from High to Very Low, indicating a **major reduction** due to highly effective controls.

The competitor market loss residual risk is considered "**low"** after CAP. The likelihood is rated **"infrequent"**, as RTX's mitigation strategy includes customer trust rebuilding campaigns, competitive benchmarking, and investment in next-generation engine technologies. These measures help prevent further customer attrition, but full market recovery will take time. The **"significant"** impact remains due to the potential long-term consequences of losing airline contracts and market leadership in a highly competitive industry. The risk was reduced from **High to Low**. Given the notable improvement but remaining strategic exposure, the effectiveness rating is **"Reasonably Strong"**.

IX. ERM Gap Analysis and 18 Month Action Plan

RTX's Enterprise Risk Management (ERM) framework provides excellent governance practices and risk ownership throughout the engineering and operational functions. Unfortunately, the GTF engine recall revealed four serious gaps. Firstly, risk identification and assessment are limited to internal engineering and operational assessments. Risks associated with the supplier-and material-based risks, particularly high-risk materials, are currently only assessed at the procurement stage. This reactive system leaves latent supply-chain vulnerabilities to go unchecked until the quality of the product or timelines are at risk. Secondly, there are no integrated communication systems set up between Engineering, Quality Assurance and Supply Chain. As a result, these functional teams continue to operate in silos. Without a centralized platform that stores real-time risk information, the function teams cannot jointly recognize emerging threats nor respond collectively and quickly.

The third gap relates to risk monitoring. RTX conducts periodic non-destructive testing and audits, however, it is noted that RTX's antiquated NDT methodology lacks the resolution to assess micro-level defects in mission-critical engine components. With no continuous performance metrics and advanced analytical function, RTX will miss early warnings of critical component degradation, elevating the risk of failures in service. Fourth, incident responses are tops down and mostly reactive. Current protocols still operate independently and within departments. As a result, escalation paths are fragmented and corrective actions inconsistent. As a group, these gaps undermine RTX's ability to proactively uncover vulnerabilities, organize responses throughout the enterprise, and maintain operational continuity in high-stakes situations.

To close these gaps, RTX will implement a structured 18-month plan of action based on five overlapping phases. In Months 0-6, RTX will tighten supplier risk controls to include more robust certification processes, mandatory end-to-end materials traceability, and to develop a risk-scoring method to quantify risk exposure for all high-impact vendors. By Month 6, at least 100 percent of the high-impact vendors will be assessed against risk and mitigation plans as needed will be developed with verification against supplier risk profiles. During Months 3-9, RTX will deploy an enterprise Risk Management Information System (RMIS) that will capture and provide real-time risk monitoring related to all relevant functions. It will also identify newly emerging risks and conduct bi-weekly cross-functional risk workshops between Engineering, Quality Assurance and Supply Chain so that both functions can collaborate to monitor and respond to issues as they arise. It is anticipated that by Month 9, the RMIS will be fully operational.

Between Months 6-12, RTX will pilot new monitoring technologies - AI-driven defect detection algorithms & X-ray computer tomography, on all critical production lines. The pilots will subsequently be deployed for every production line achieving completion by Month 12. Between Months 9-15, incident-management workflows will be restructured to clarify decision rights, establish automated escalation thresholds and include timely notifications to defined stakeholders by workstream. All risk

professionals will be certified on protocols following a comprehensive training in time for Month 15. Finally, in Months 12-18, an independent ERM audit will assess the effectiveness of the controls implemented, along with compiling lessons learned and updating policy to ingrain a culture of continuous risk improvement

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