



GE Aerospace

# Product and Technology Update

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October 8, 2025

## Caution concerning forward-looking statements:

This document contains "forward-looking statements" – that is, statements related to future events that by their nature address matters that are, to different degrees, uncertain. For details on the uncertainties that may cause our actual future results to be materially different than those expressed in our forward-looking statements, see [www.geaerospace.com/investor-relations/important-forward-looking-statement-information](http://www.geaerospace.com/investor-relations/important-forward-looking-statement-information) as well as our annual reports on Form 10-K and quarterly reports on Form 10-Q. We do not undertake to update our forward-looking statements. This document also includes certain forward-looking projected financial information that is based on current estimates and forecasts. Actual results could differ materially.

## Non-GAAP financial measures:

In this document, we sometimes use information derived from consolidated financial data but not presented in our financial statements prepared in accordance with U.S. generally accepted accounting principles (GAAP). Certain of these data are considered "non-GAAP financial measures" under the U.S. Securities and Exchange Commission rules. These non-GAAP financial measures supplement our GAAP disclosures and should not be considered alternatives to the corresponding GAAP measures. The reasons we use these non-GAAP financial measures and the reconciliations to their most directly comparable GAAP financial measures are included in our earnings releases and our earnings presentations as applicable.

## Additional information:

Amounts shown on subsequent pages may not add due to rounding. Charts shown on subsequent pages are not to scale.

CFM International is a 50/50 JV that produces CFM56 and LEAP engine families. RISE is a program of CFM International. CFM RISE is a registered trademark. CFM RISE is a technology demonstrator program, not a product for sale. Engine Alliance is a 50/50 JV that produces the GP7200 engine.

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- GE Aerospace  
Research Center  
overview

# GE Aerospace Research Center



## America's first industrial research lab

125 years of innovation ... solving the world's toughest challenges

## Multidisciplinary teams

750+ researchers, 31 labs, 50 scientific capabilities

## The industry's first ...

Composite fan blades, CMCs<sup>(a)</sup>, 3D printed engine parts, supercomputing

## Long-term investment in innovation

>300 invention disclosures per year ... materials, power electronics, AI portfolio

## Network for expanded intellectual capital

>50 academic, government lab and agency partnerships

# Developing cutting-edge capabilities to support our engine platforms

## Advanced Materials



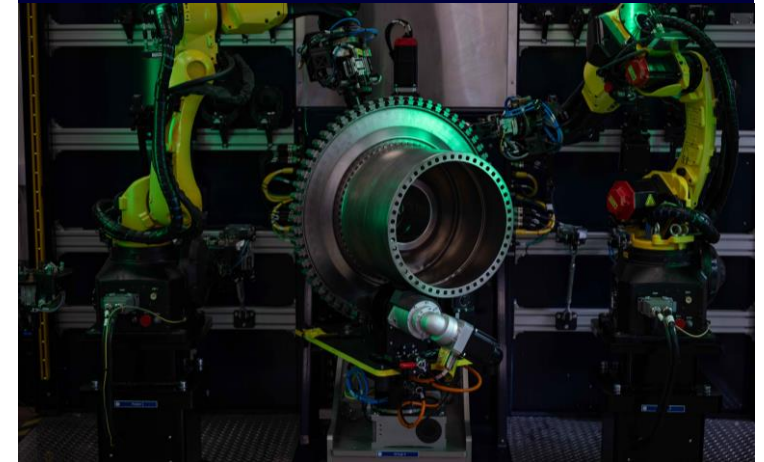
Discover, develop, and pilot new materials, coatings and manufacturing processes

## Electrification



Demonstrate critical hybrid electric components for the aerospace industry

## AI + Supercomputing



Improve time-on-wing, revolutionize product design cycles

Applying science and technology to deliver differentiated outcomes for our customers

# – Key Messages

# Technology objectives to deliver customer value

**Design**: Launch engine programs at mature levels of time-on-wing and enhanced efficiency

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**In-service**: Deliver reliability, predictability and time-on-wing commitments

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**Aftermarket**: Advance services technology to reduce turnaround time and cost of ownership

# Differentiated experience and investments

## Decades of engineering expertise

**78K engines** powering the worlds largest fleet

**2.3B flight hours**

**7 new commercial engine families**  
certified in last 20 years

## Advancing technology leadership

**~\$3B annual R&D** fueling technology leadership and innovation

Engine architecture, material science, supercomputing and advanced manufacturing

**Applying learning to accelerate**  
next-gen programs

Prioritizing safety, quality, delivery and cost

# Systematic approach to running our company

## TODAY

Ramping services  
and equipment

## TOMORROW

Expanding capacity  
and capabilities

## FUTURE

Inventing the  
future of flight

**FLIGHT DECK**

**Behaviors + Fundamentals**

CULTURE

Operational  
results

Financial  
performance

Breakthroughs  
(Hoshin  
Kanri)

A customer-driven culture for today, tomorrow and the future

# – Safety and Quality

# Positioning GE Aerospace to identify and mitigate risks to safety and quality

## Product Safety and Quality team

## Impact

Aligns our Quality Management System (QMS) with our Safety Management System (SMS)



Accelerates proactive safety improvements backed by the best technical talent in the company

Extends technical expertise deeper into Operations and Quality functions



Forward-deploys resources to the point of impact to better deliver for our customers

Develop and strengthen technical talent across the company



Expands opportunities for talent development and growth in engineering and manufacturing

Enabling proactive identification of issues and improved processes

# Our safety framework

## Safety continuum

	Reactive	+	Proactive	+	Predictive
<b>Foundational:</b> Decades of industry-leading safety culture	Organization Designation Authorization (ODA) consistently rated green on FAA's ODA Scorecard		First voluntary Safety Management System (SMS) in '13		Strong open reporting culture
<b>Continuous improvement:</b> Driving safety technology further up the value chain	FLIGHT DECK driving improved efficiency in safety investigations and corrective actions		Extend enhanced inspections to module level across engines and aftermarket		AI-enabled next generation inspection technologies

Safety, quality and continuous improvement are cornerstones of GE Aerospace

# Proactive inspections to identify and address concerns

GE Aerospace enhanced sub-surface inspection technologies

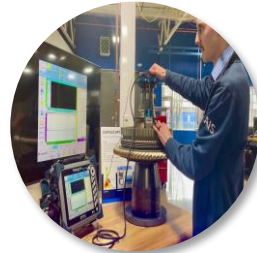


Field inspections  
focused on external  
surfaces



**2016**

“Dirty White Spot”  
*Uncontained disk  
event in Chicago*



**2018 - 2024**

Enhanced Inspection  
Field Sub-Surface  
Part Inspections



Moving from surface to  
internal views; zero in  
on anomaly signals



**2025**

Module-Level  
Inspections  
More parts earlier in  
the process



Scale up from part-  
level inspections



**Future**

Multi-zone, multi-  
angle with single  
probe



Improve accuracy and  
productivity

7K+ turbine disks inspected to date supporting safety and time-on-wing

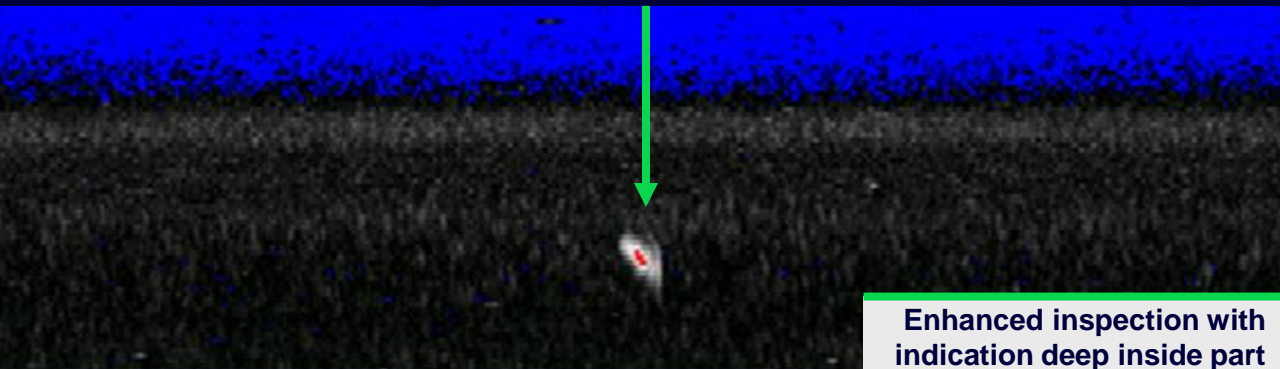
# Customer example: enhanced inspections enabling quick action

## Findings

Anomaly detected during proactive shop visit inspection

Discovered powder metal contamination during manufacturing

Potentially impacted **~3.4K parts (~4% of fleet)**



## Actions

- 1 Change at supplier and alignment with regulators
- 2 Conducted focused field inspections
- 3 Damage tolerant design reduced impacted population
- 4 Data analytics used to customize service bulletin

## Results

- 1 Reduced suspect population to **~1.3K parts**
- 2 Removed **~50 engines** from service
- 3 Revised shop visit plans for remainder

Ensuring safety and minimizing customer disruption ... sharing learnings across industry

# Safety is our priority

**Strive for zero defects, but don't assume it**

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**Leverage advancements in technology to move from  
reactive to proactive to predictive**

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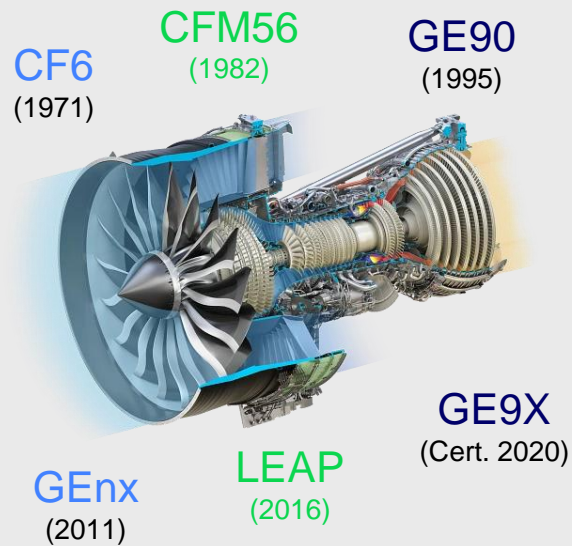
**Support customer operations with minimal disruption**

# – Durability progress

# Durability begins with engine design

## Simple architecture = best durability

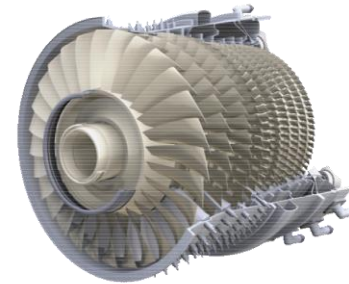
2-spool architecture driving durable engines  
for over 50 years  
(EIS)



Fewer parts / modules and failure sources

## Enabled by industry leading technology

### Aerodynamic design



### High Temperature / Low Weight Materials



### Differentiation

Compressor delivering  
highest performance  
with maximum efficiency

Material science allows  
for better fuel burn at  
lowest weight

Foundation of technical expertise proven over decades

# Drivers of engine removals

## Top causes of engine removals

### 1 Planned removals

- Life limited parts (LLP)
- Analytics based maintenance (ABM)
- Customer Notification Record
- Engine Monitoring and Diagnostics

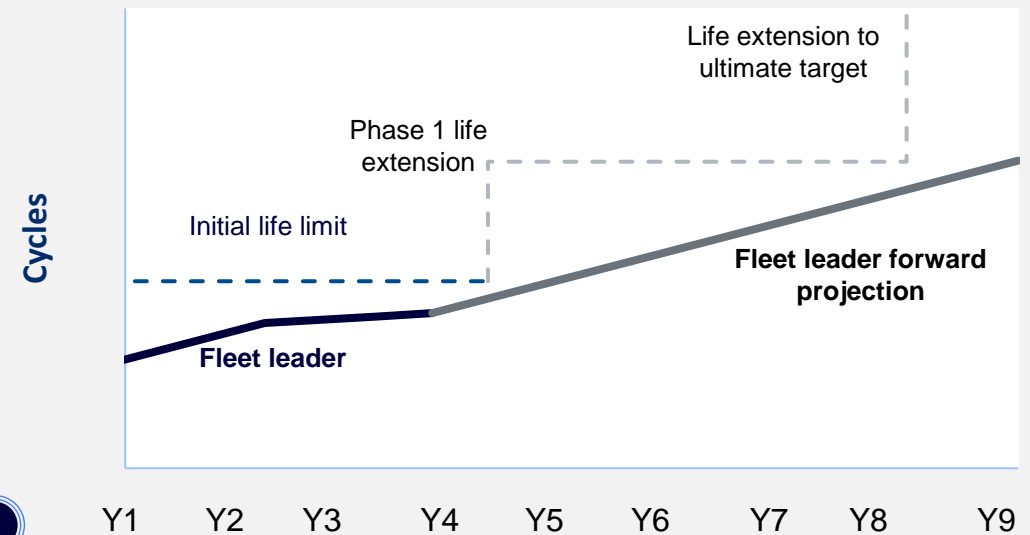
### 2 Unplanned removals

- Premature part distress
- Foreign object damage
- Oil and fuel leaks
- Borescope findings

## LLP life extensions

### Illustration of Life Limit Extension Process

Low pressure rotating LLP



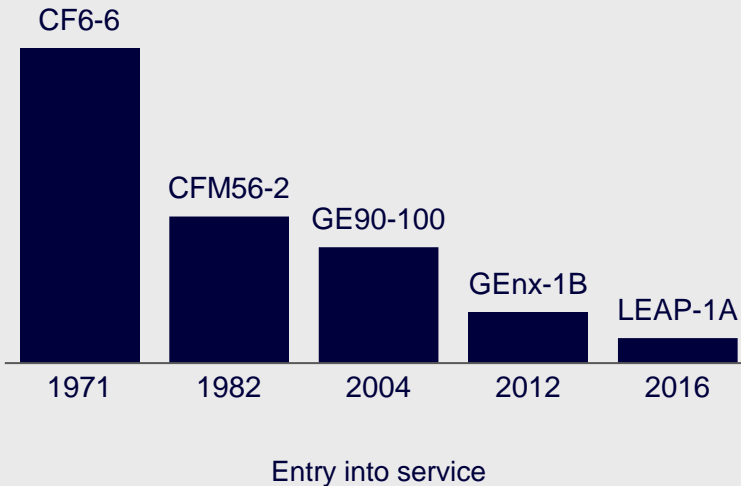
Optimizing time-on-wing with LLP life extensions a key part of early engine maturity

# Why we're confident in durability progress

## Field experience

Leveraging five decades of field experience and 2.3B flight hours

Removal rate per 1K hours  
First 5 years of service



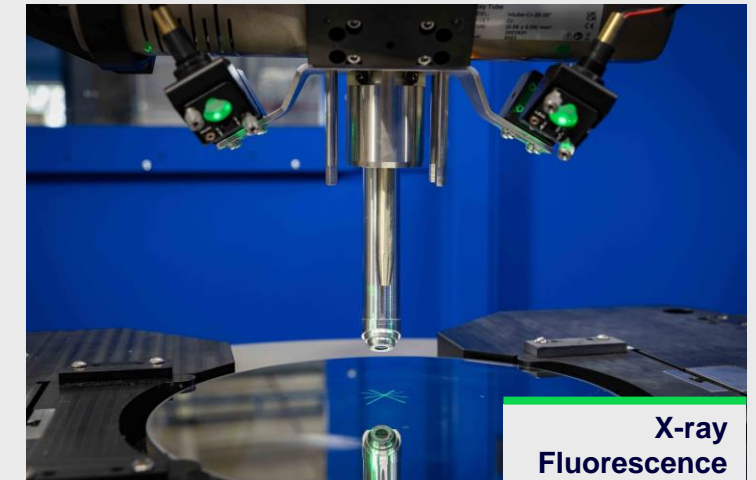
## Testing and validation

Testing earlier and more often for each new engine generation



## Investment

Investing in technology and talent with ~\$3B annual R&D spend



# GENx durability journey

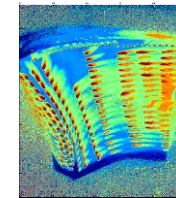
## Initial design

**Initial blade**

**Field performance**

## Issue validation

- Model validation using fleet data combined with component testing
- Ability to simulate field experience with dust testing capability
- Robust engine test validation



**Pressure sensitive paint**



**Dust Injection System**

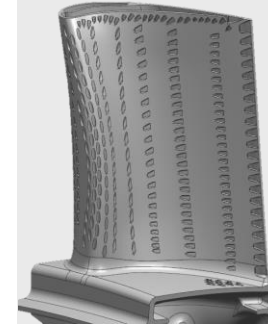


**Robust testing**

## Improved durability

**Upgraded blade**

- Increased and optimized cooling
- Added geometry contour



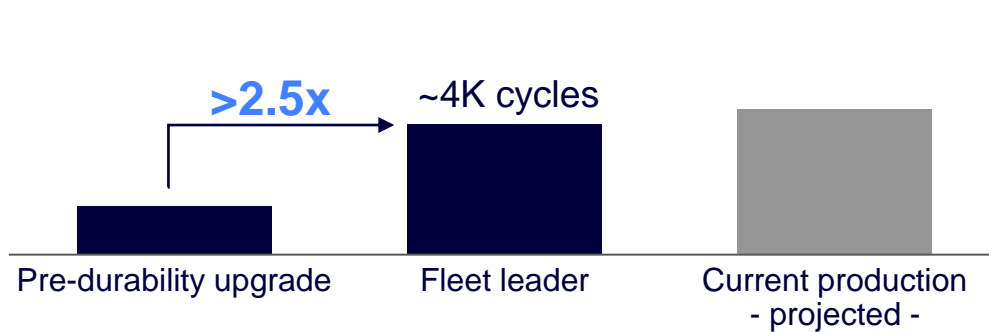
**Field performance**

Field learnings and validation process yielded 2x blade improvement

# Seeing results ... GEnx-1B durability upgrades improve time-on-wing

## Harsh environment

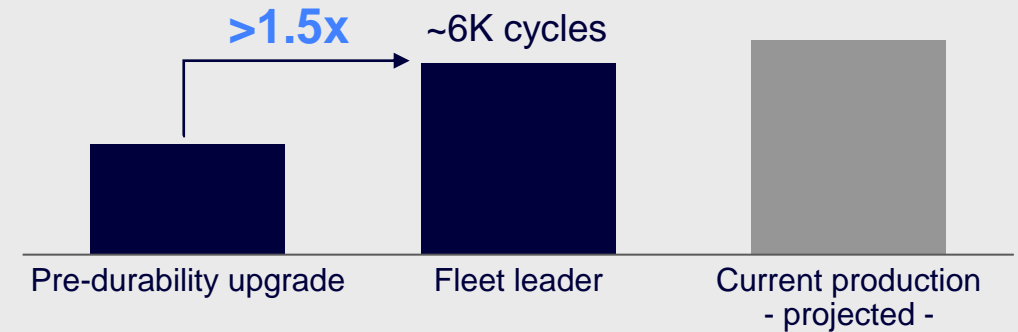
### Time-on-wing (cycles)



- Pre-durability upgrade: ~2 years to 1st shop visit<sup>a)</sup>
- Current configuration: ~5 years to 1st shop visit<sup>a)</sup>

## Neutral environment

### Time-on-wing (cycles)



- Pre-durability upgrade: ~5 years to 1st shop visit<sup>a)</sup>
- Current configuration: ~8 years to 1st shop visit<sup>a)</sup>

# Current generation engines flying hotter with higher pressure

## Design

Advanced aerodynamics and thermal management

- Pressure ratio: 1.7x higher, thermal efficiency
- Exhaust gas temperature: Max >10% higher, operational flexibility
- Combustor ... Increased durability, 30% lower emissions

## Materials

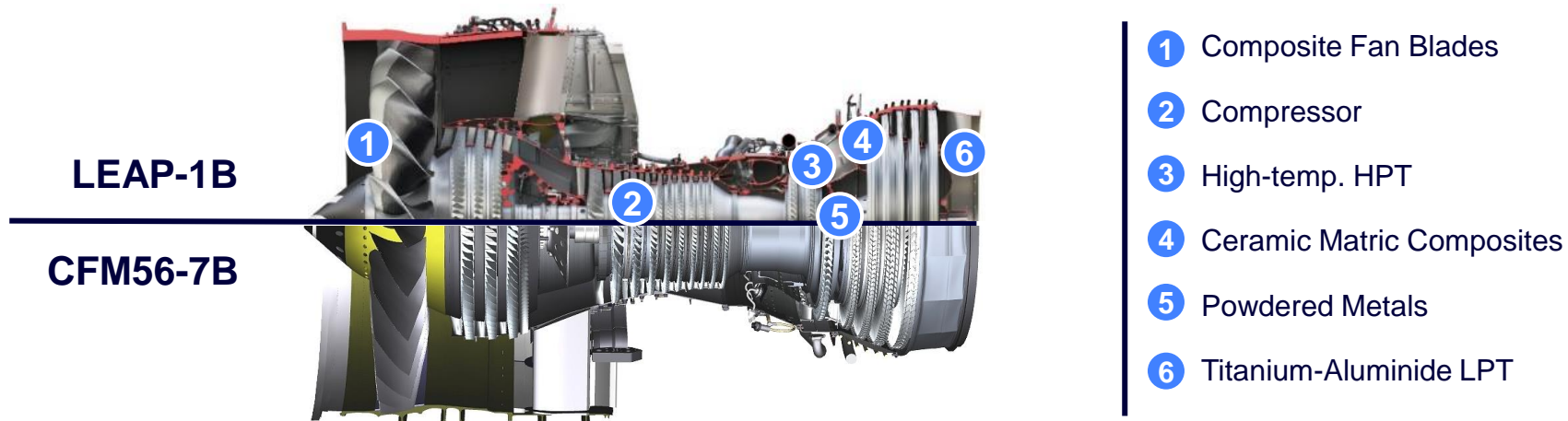
Design optimization reducing weight

- Ceramics: >20% thermal capability, 1/3 weight
- Composites: Safran fan blades 50% of weight, more durable
- Ti-Aluminide: Safran LPT, 50% of weight

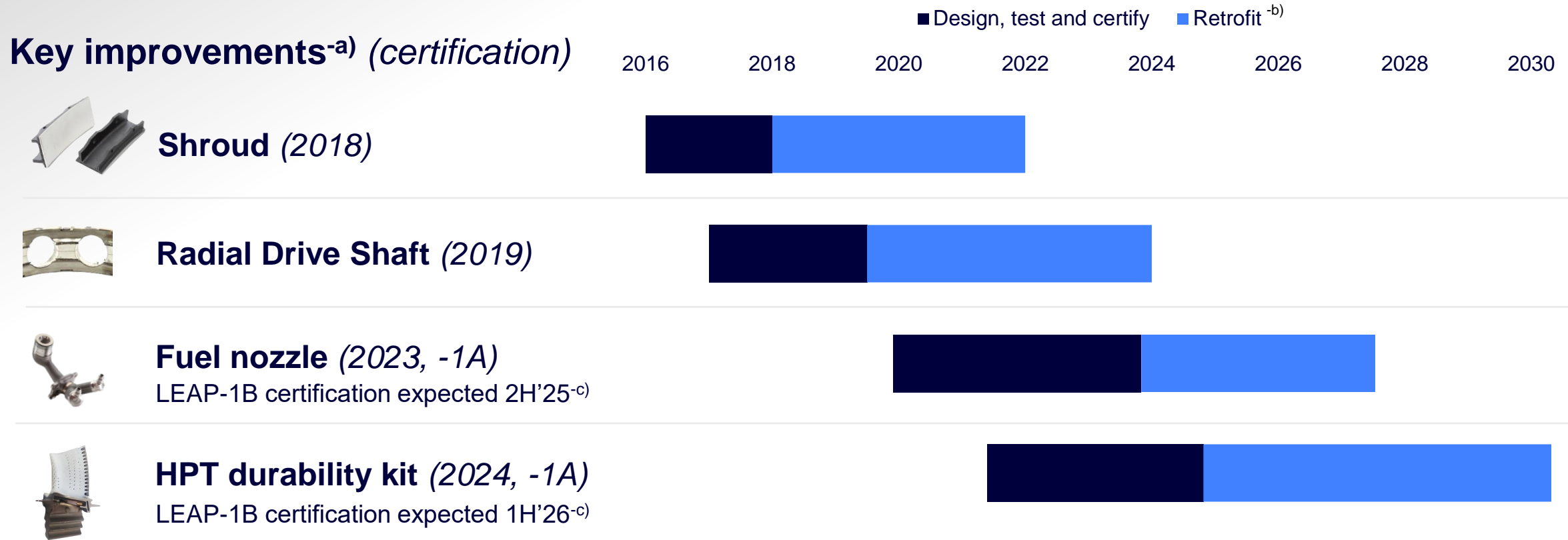
## Operating parameters

LEAP flying longer and harder

- Flight length: ~30% longer, requires higher thrust
- Environment: Middle East and India, higher ambient temps, more and harsher dust



# Four improvements resulting in LEAP equivalent to CFM56 time-on-wing



Remaining retrofits completed at next planned shop visit limiting customer disruption

(a- Timeline: Shroud -1A; Radial Drive Shaft -1B; Fuel nozzle -1A; HPT durability kit -1A  
 (b- >90% of fleet  
 (c- Engine certification

# LEAP time-on-wing progress

## Harsh environment

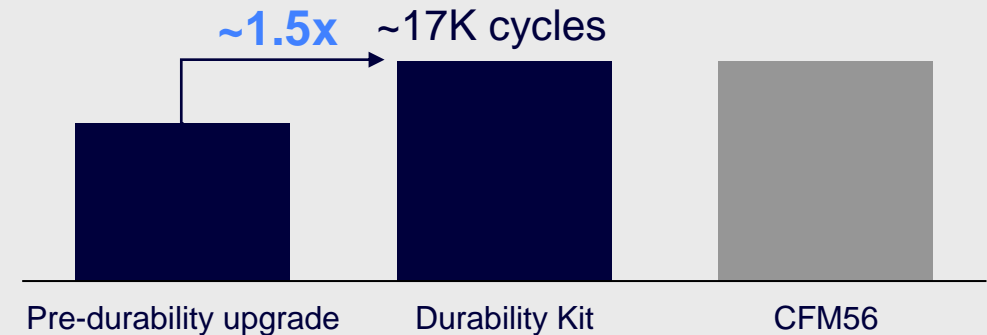
### Time-on-wing (cycles)<sup>-a)</sup>



- Pre-durability upgrade: ~1.5 years to 1st shop visit<sup>-b)</sup>
- Current configuration: ~4 years to 1st shop visit<sup>-b)</sup>

## Neutral environment

### Time-on-wing (cycles)<sup>-a)</sup>



- Pre-durability upgrade: ~6 years to 1st shop visit<sup>-b)</sup>
- Current configuration: ~8 years to 1st shop visit<sup>-b)</sup>

(a- Low-thrust LEAP-1A  
(b- Assumes ~2K cycles / year



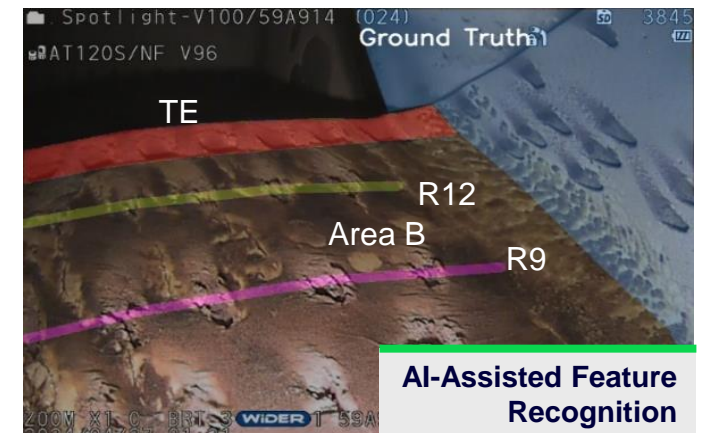
- Three bar charts illustrating performance metrics:

  - Document Quality:** 20% increase (indicated by an upward arrow).
  - Lead time reduction:** 6.9X decrease (indicated by a downward arrow).
  - Document Throughput:** 313% increase (indicated by an upward arrow).

- Initial focus: leverage AI to review documents for non-conformance and suggested actions for human review
- Impact: improved quality and speed of certification document review and workforce productivity
- Initial results: showing  **95%** document review timing ... manual pdf review (2-4 hours) vs utilizing AI tool (5 min)

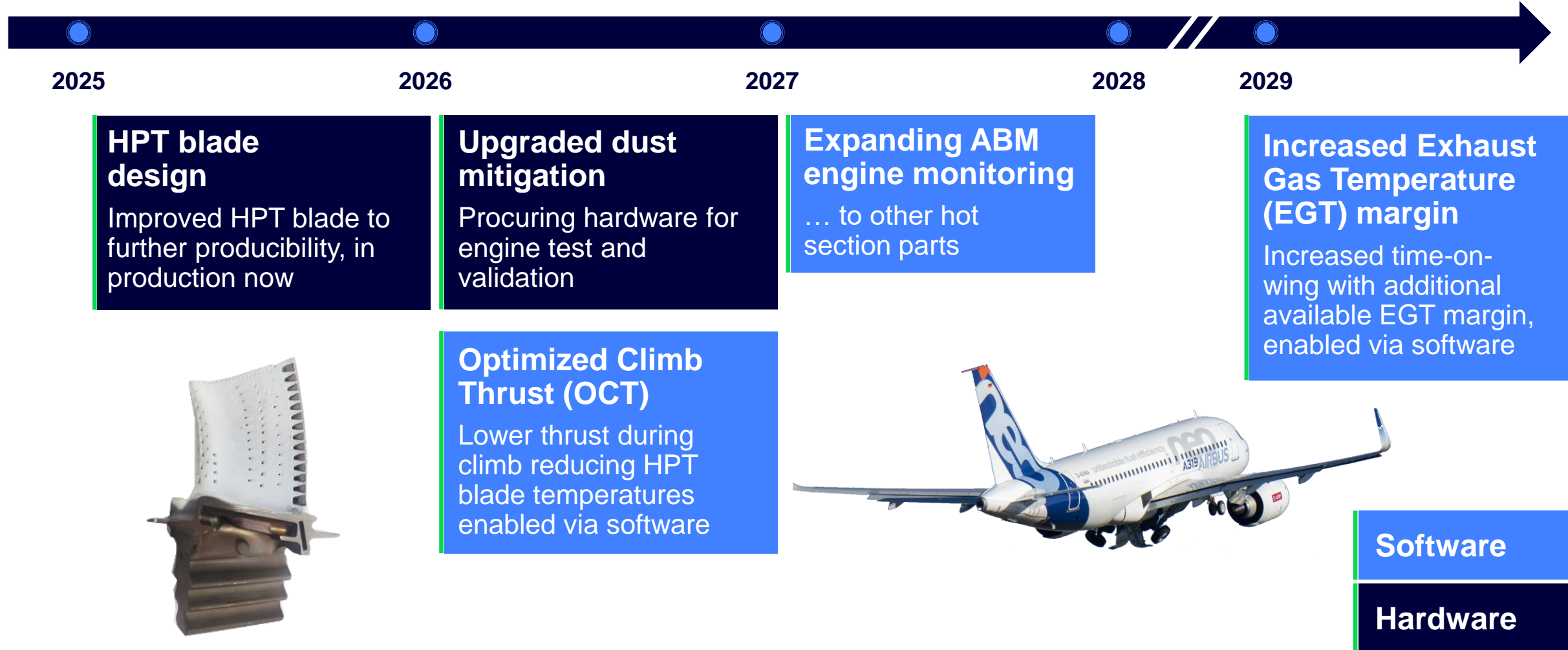
# Customer impact: IndiGo utilizing Analytics Based Maintenance (ABM.ai)

<b>Application</b>	ABM predicts optimal time for preventative maintenance, reducing engine removals and increasing time-on-wing
<b>Approach</b>	Analytics model + Visual Inspection + AI
<b>Input</b>	Borescope images of HPT blade taken while engine is on wing
<b>AI benefits</b>	2 hours to review and verify image results vs 1-2 days prior with ~80% accuracy ... decision always vetted by the human
<b>Impact</b>	Improved predictability, no significant events for Indigo since Jun-'24, down ~75%
<b>Next Steps</b>	Expanding to all LEAP hot and harsh customers in October '25, and then neutral



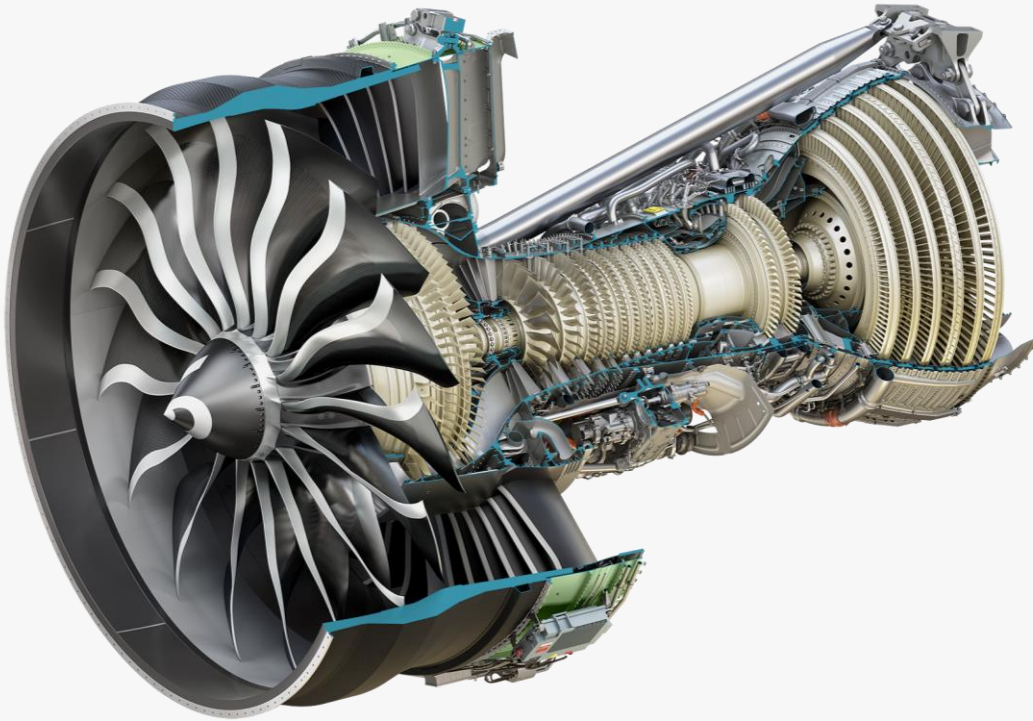
ABM.ai achieves speed, scale, predictability and accuracy

# Next steps on LEAP durability roadmap



Continuously investing in durability and leveraging learnings from RISE technologies

# GE9X: performance and durability validated with proven GE Aerospace technology



## **Unshrouded HPT Blades**

Leveraged in GE Aerospace/CFM engines since 1970s

## **Composite Fan Blades**

Innovation dating back to GE90 in the 1990s

## **Lean-burn combustion**

High performance fielded engines since 2010s

## **Ceramic matrix composites**

>85M fielded flight hours and growing, mid-2010s EIS

GE9X design builds upon learnings from over five decades of engines

# GE9X: most tested engine in our history

## Testing progress

- >30K cycles of testing, including >9K endurance cycles
- ~1.6K cycles of dust ingestion tests, 2<sup>nd</sup> dust ingestion test underway
- 11 engines, 5 aircraft with successful flight tests
- 777X: >1.5K flights and >4K flight hours, including crosswind, brakes, takeoff, and stability and control testing

## Testing and iterating design earlier

	Years (before)/after EIS		
	<u>GEnx</u>	<u>LEAP</u>	<u>GE9X</u>
1 <sup>st</sup> blade improvement	3	0.5	(2)
Fuel nozzle improvement <sup>a)</sup>	n.a.	7	0
1 <sup>st</sup> endurance test	(1)	(1)	(4)
1 <sup>st</sup> dust test	3	1	(4)
2 <sup>nd</sup> dust test	6	5	(1)
Testing prior to EIS	1K hours 2K cycles	4K hour 9K cycles <sup>b)</sup>	19K hours / 40K cycles

Invested in technical maturity and lessons learned from rigorous testing

(a- Reverse bleed system  
(b- LEAP-1A

# GE9X engine performing well

## Key program milestones

2020

Engine  
certification



2024

1<sup>st</sup>  
production  
engine  
delivered



2025

3K  
Cycle ETOPS  
test and FAA  
layout complete



## Preparing for EIS ...



- >1K GE9X engines on order ... ramping deliveries 2H'25
- 2<sup>nd</sup> GE9X dust test and Boeing flight testing ongoing
- Supply chain readiness ... new plant and process to produce fiber for integrated CMC supply chain 1H'26
- Engine ETOPS testing complete to support aircraft certification

# Experience and investments to deliver for customers

**Unmatched 2.3B flight hours, combined with investments to advance each generation**

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**Continuously improving reliability, predictability and time-on-wing  
throughout engine lifecycle**

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**Preparing for 9X EIS by focusing on time-on-wing**

- Customer driven

# Delivering customer value

## RELIABILITY

## PREDICTABILITY

## TIME-ON-WING

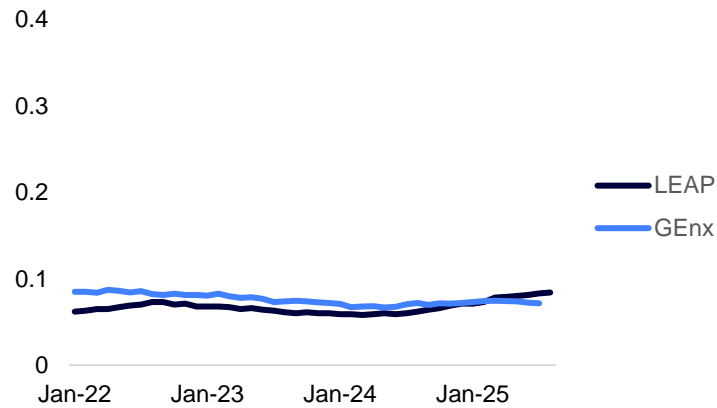
## COST OF OWNERSHIP

- 
- On-time departures drive revenue and trust
  - Proven track record strengthens airline partnerships
  - Fewer unscheduled removals minimize disruption
  - Airlines can plan maintenance with confidence
  - Time-on-wing improvement increases asset utilization
  - Better durability commands higher residual value
  - Faster turnaround time gets engines back into service generating revenue
  - Global MRO network reduces downtime
  - Alternative material options at lower cost

# Differentiated experience for GEnx and LEAP customers...

## Reliability

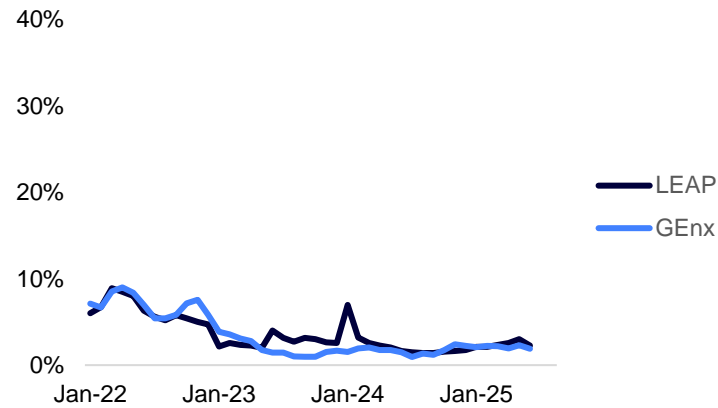
### Best-in class reliability



- < 0.1 engine removal rate per 1K flight hours

## Aircraft on ground (AOG)<sup>a)</sup>

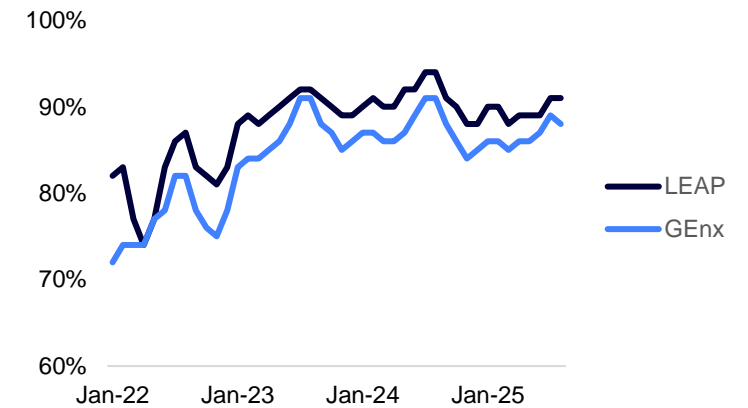
### Working towards 0 AOG



- ~3% of fleet AOG with 5 to 10 days to recover

## Utilization

### Delivering revenue advantage



- > 85% days flown annually

(a- Source: Cirium, in-storage AC)

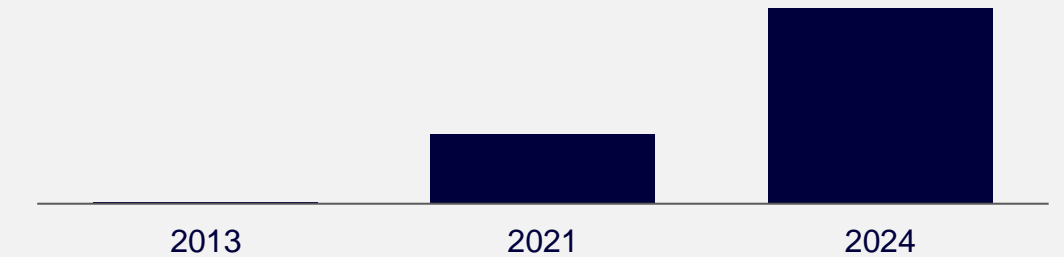
... better cost of ownership that is mutually beneficial

## Delivering customer value...

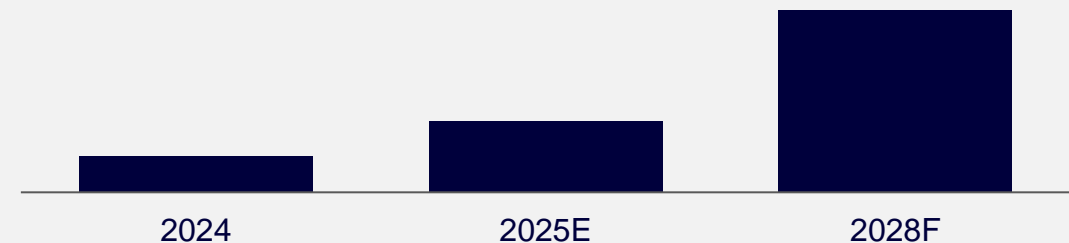
- Higher utilization and reliability allow operators to plan confidently and generate higher revenue
- Reduced operational disruption and need for spare engine support
  - LEAP spare engine ratio currently LDD program to date
- More durable engines command higher residual values
- Open MRO network drives competition

## ...and services profit with maturity

### GE<sub>Enx</sub>

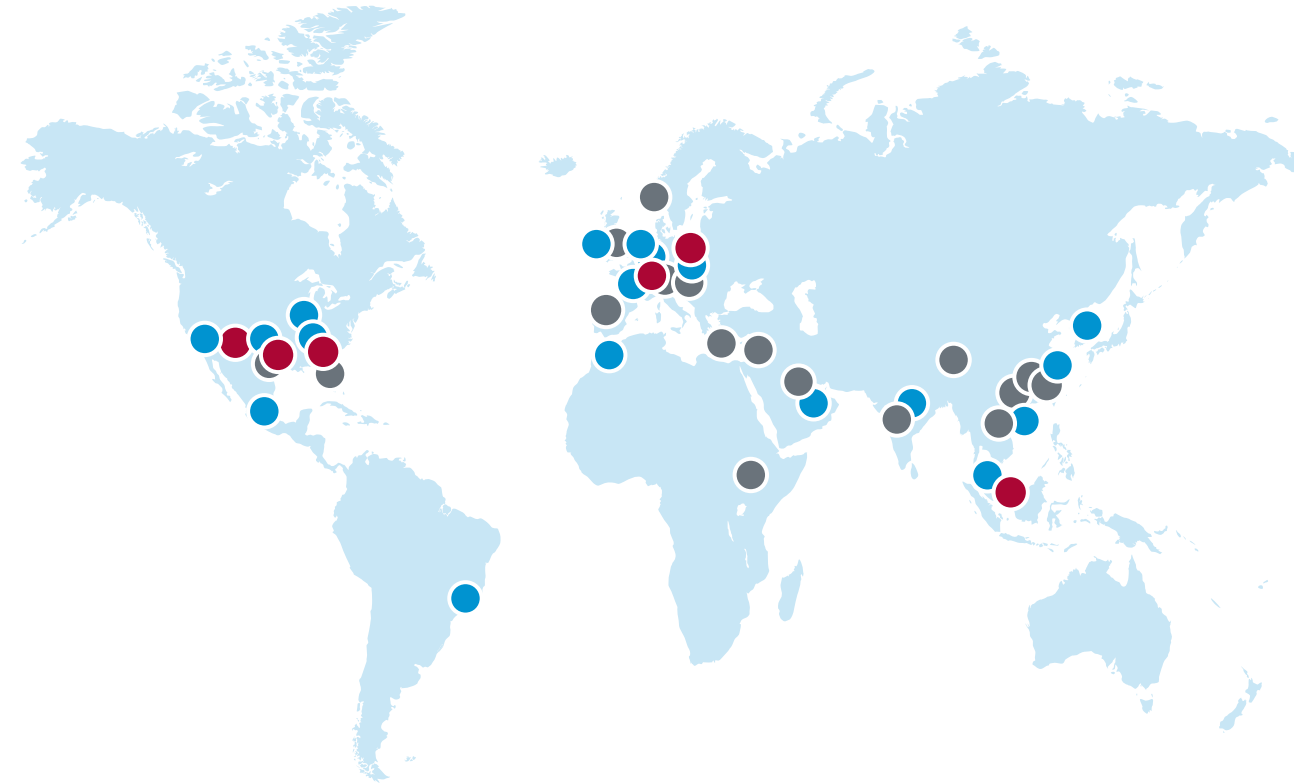


### LEAP



Durability improvements support customers and aftermarket profitability

# Global open MRO network advantage



● GE / CFM Shop ● Premier MRO -a) ● Other

## Benefits of open network

**Flexibility:** geographic optionality with customizable service solutions

**Performance:** OEM support, engine manual access and on-site training

**Cost:** competition drives productivity that reduces cost and improves turnaround times

A competitive ecosystem that reduces maintenance cost over the lifecycle

(a - Premier MRO have LEAP CFM Branded Service Agreement licenses

# MRO investments supporting durability and turnaround time

Restoring performance

Inspecting accurately

Optimizing Workscopes

## 360 Foam

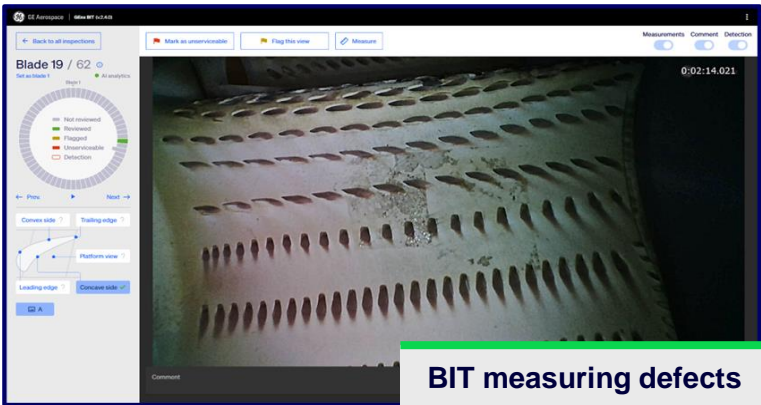
- Recovering performance >2.5x more than water wash
- Improving TOW and fuel efficiency
- Lowering CO<sub>2</sub> emissions



Foam Wash in process

## AI-Blade Inspection Tool (BIT)

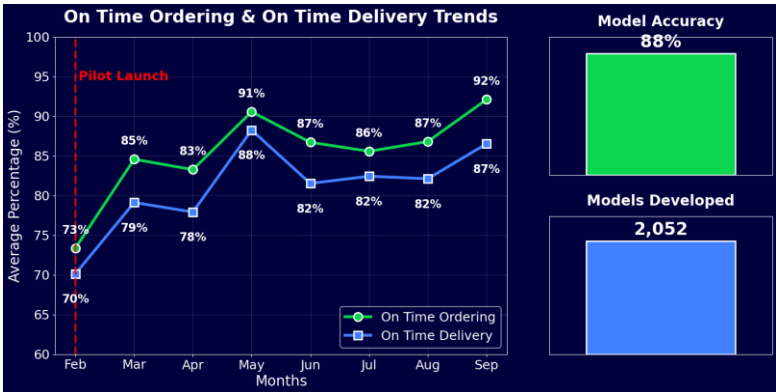
- Improving image quality during on-wing inspection
- Feeding better data analytics for shop visit workscoping
- Reducing inspection time > 50%



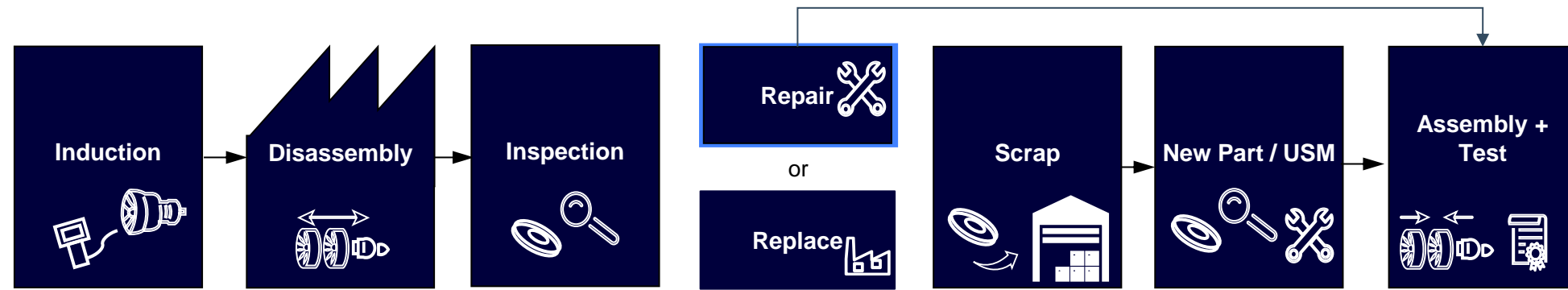
BIT measuring defects

## AI-Material Assistant

- More accurate forecasting before shop visit enabling earlier part orders
- Improving workscope accuracy
- Resulting in ~5-day avg TAT reduction



# Component repair in our MRO network



## Benefits

### Keep the fleet flying

- Improves turnaround time (TAT) by reducing need for new material
- Co-locating repair capability within MRO to improve TAT

### Lower cost of ownership

- Creates alternative material solutions
- Drives competition and innovation

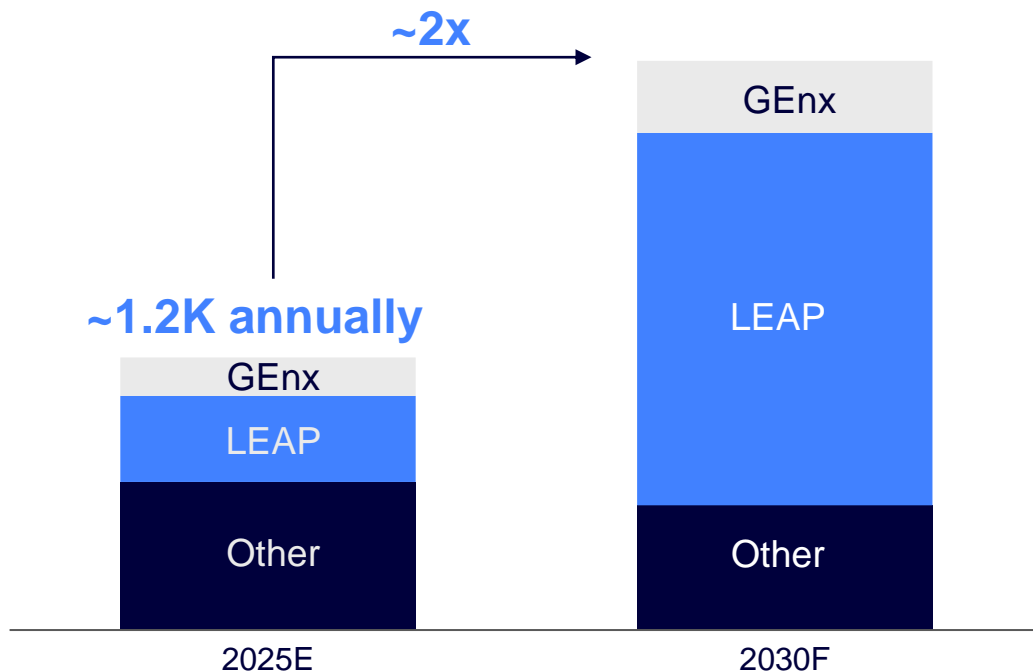
### Drive profitability

- Optimizes global network
- Lowers shop visit costs

Component repairs deliver a differentiated competitive advantage

# Accelerating investment in repairs

## Growing repair capabilities



## Targeted investments

- Services Technology Acceleration Center driving improvements across MRO network
- Leveraging OEM advantage for technology development... ~70% of repair are high IP
- Ramping LEAP and GEnx repairs at ~30% CAGR through the decade
- >25K repair catalog, ~50% lower cost than new-make

Building repair catalog to support lower cost of ownership and turnaround times

# Improving turnaround times (TAT) with **FLIGHT DECK**

## What's working well

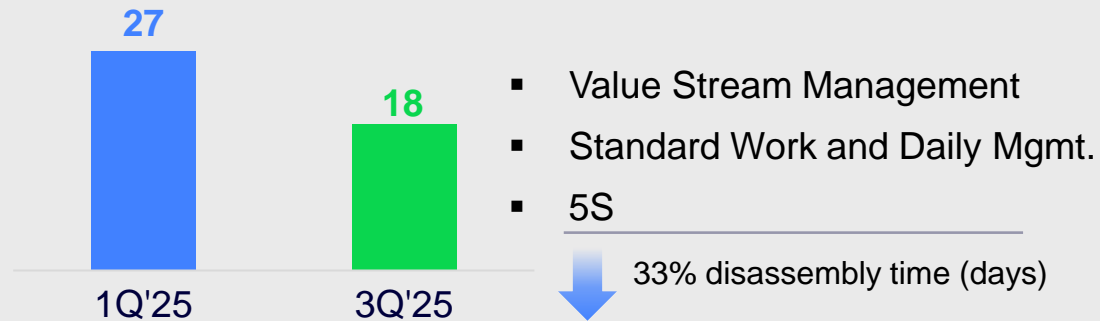
- Establishment of product flow lines ... ~30% reduction in CFM56 TAT at Wales
- Implementation of operating cadences that drive shop visit launch

## Opportunities to improve

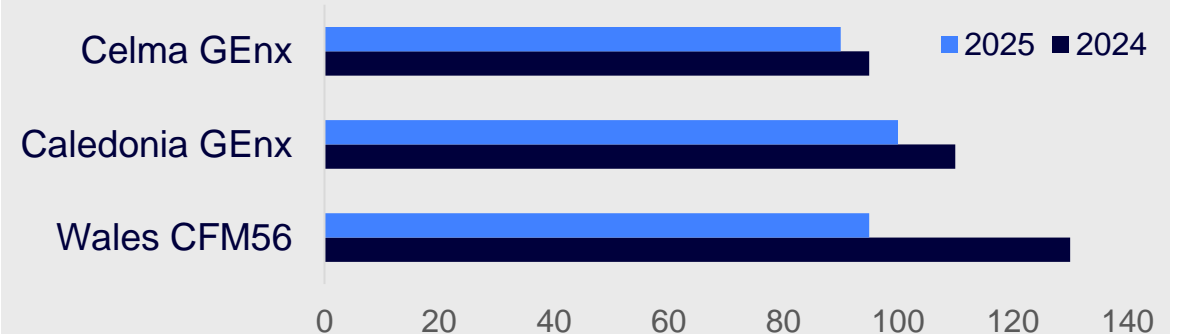
- Scale product flow lines across MRO network
- Transform material availability, including repair
- Leverage FLIGHT DECK to maximize existing capacity and drive targeted capital deployment

### LEAP disassembly TAT

Transition from bay to flow disassembly in Malaysia



### TAT (days)



Starting to see improvements ... need to drive additional progress

# Customer value supporting higher win-rates and installed base growth

## Recent commercial wins

**IAIG** INTERNATIONAL AIRLINES GROUP

32 787



**CATHAY PACIFIC**

14 777-9

**WESTJET**

60 737

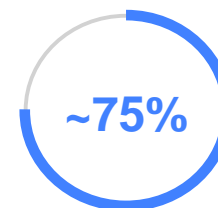
**QATAR**  
AIRWAYS القطرية

30 777-9 | 130 787

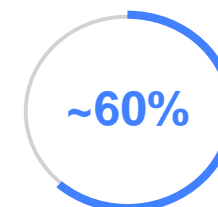
**SkyWest**  
AIRLINES

60 E175

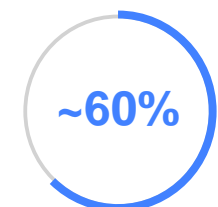
## Win rate



GEnx life of program win rate on 787



LEAP-1A life of program win rate on A320 family

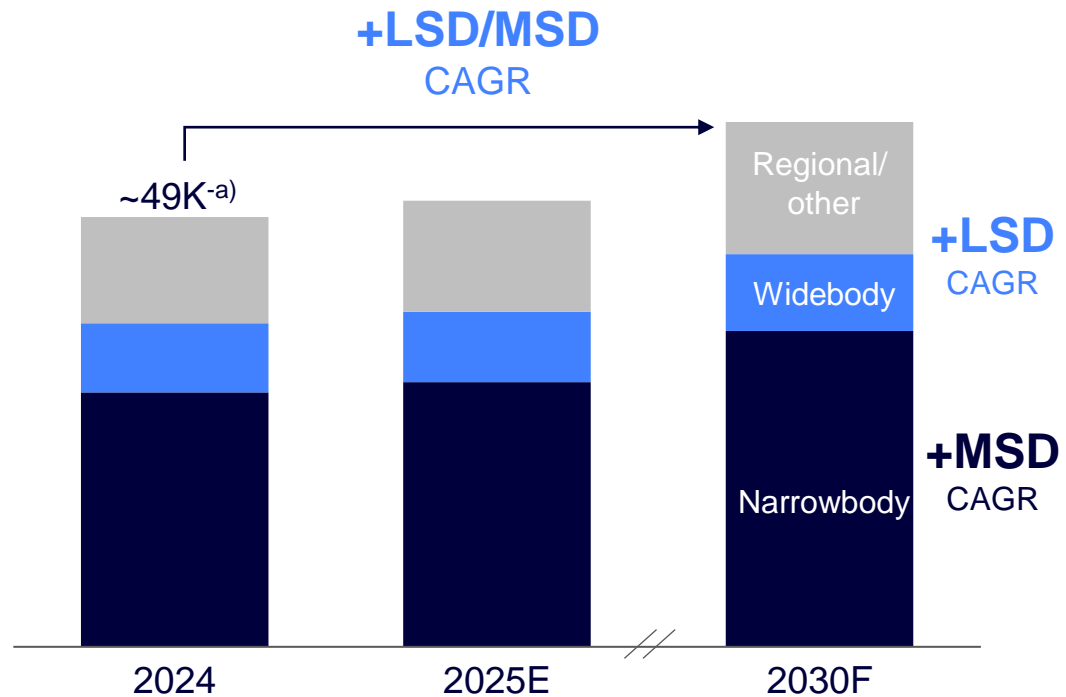


777X/GE9X life of program win rate vs. A350<sup>a)</sup>

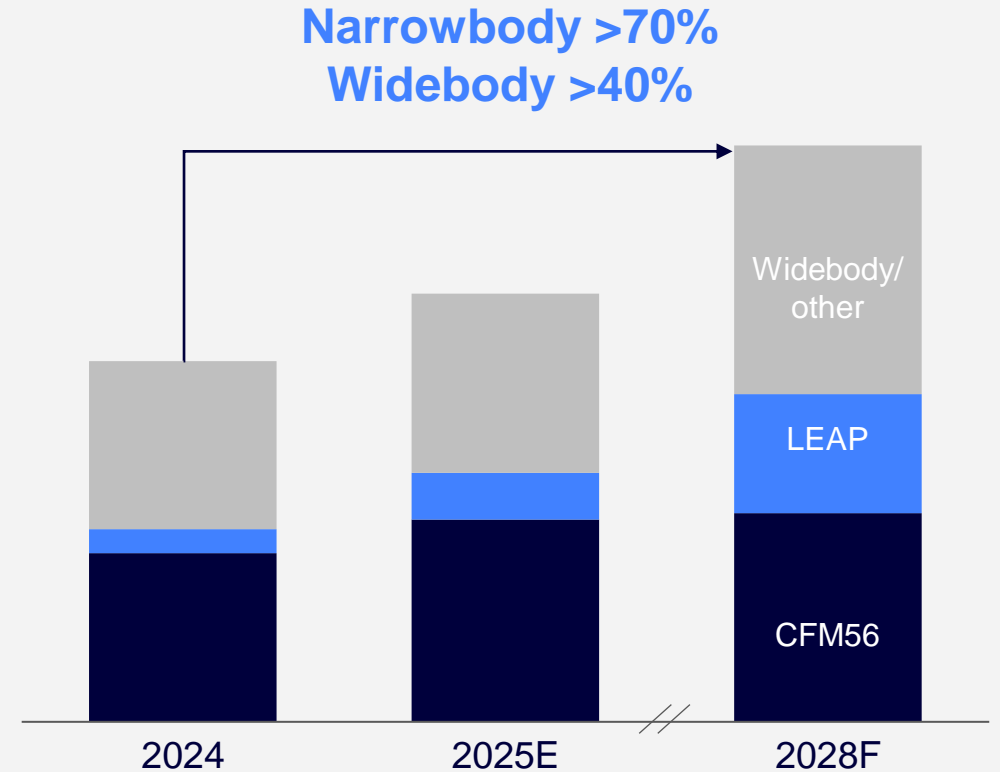
(a- A350-1000/freighter/ XWB-97)

# CES is well positioned for growth

## Growing installed base<sup>a)</sup> ...



## ... supporting services profit growth



(a- Source: Cirium as of 12/31/24; includes fleet in service and parked aircraft)

# Delivering value for customers

**Delivering differentiated outcomes for our customers through reliability and predictability**

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**Investing in services technology and leveraging FLIGHT DECK to improve turnaround times and cost of ownership**

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**Leading to higher win-rates and services revenue and profit growth**

# – Future of flight

# Launch engine programs at mature levels of time-on-wing and enhanced efficiency

## Uncompromising commitment to safety first



Slower fan speed supports  
safe flying experience

## Designing early for durability and maintainability



Larger fan diameter enhances  
efficiency without pushing  
core to higher temperatures

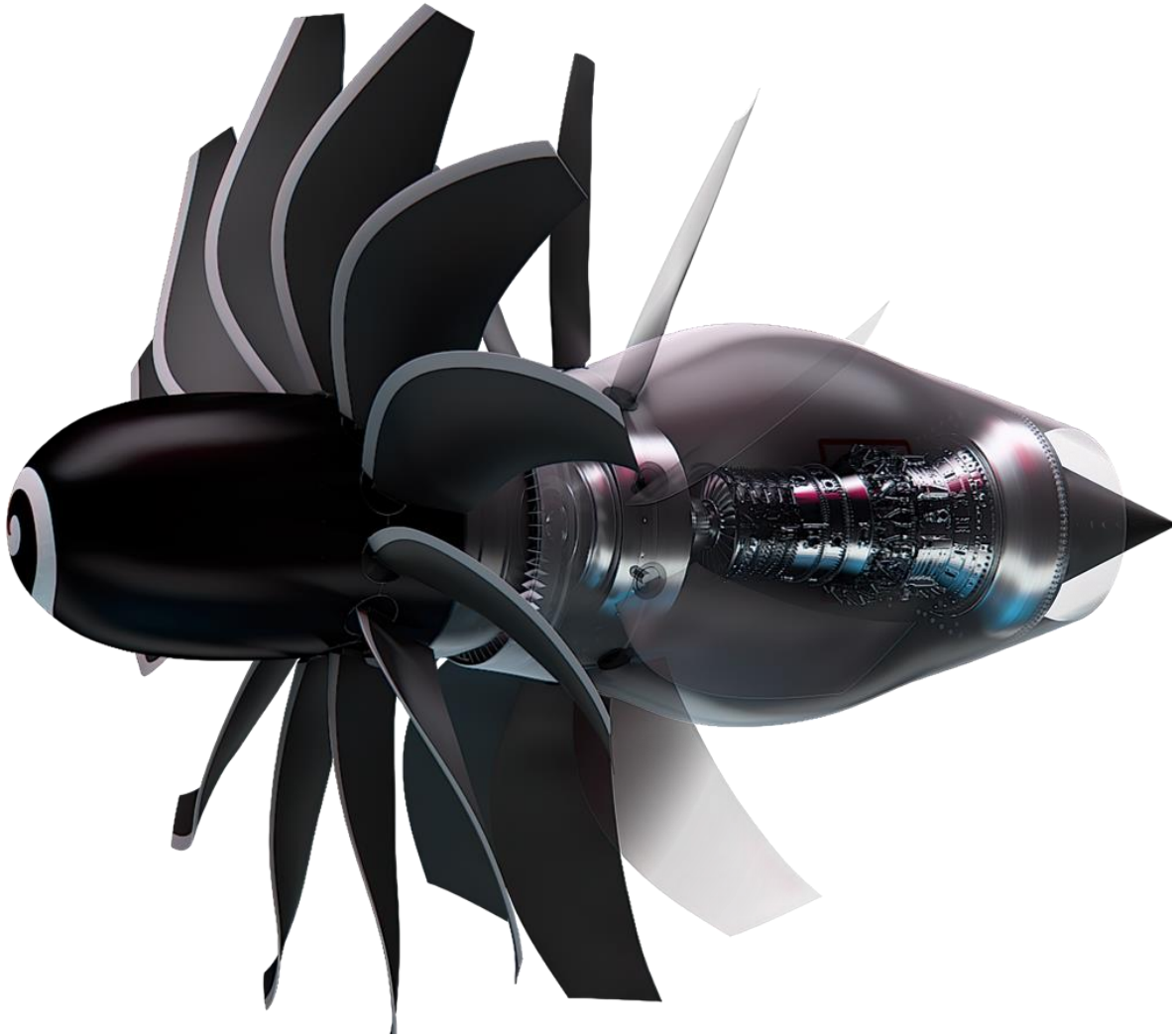
## 20%+ target fuel burn improvement by unlocking propulsive efficiency



Meet customer needs for next  
generation investment

Delivering equal or better durability and >20% improvement in fuel efficiency versus today's engines

# Advancing suite of technologies with CFM RISE program



## **Open Fan**

Largest fuel burn and durability improvement from propulsive efficiency

## **Compact core**

Compressor, combustor and material technologies to improve thermal efficiency and durability

## **Hybrid electric**

Integrating propulsion and power systems for commercial and defense applications

## **Alternative fuels**

Testing 100% SAF compatibility, advancing hydrogen combustion

# Progressing key technologies

## Compact Core



- Next-gen cooling: New blade technology tested and applicable to today's engines
- HPT testing: >3K endurance cycles complete, dust testing started
- Gathered emissions flight data to inform the next-gen combustion designs

## Hybrid Electric



- Collaboration w/ NASA and Boeing to develop MW-class motor generators and kV system ... nearing ground test demo
- Testing power extraction from narrowbody-architecture core ... key step towards enabling hybrid flight
- BETA Technologies partnership to develop hybrid electric turbogenerator for AAM<sup>-a)</sup>

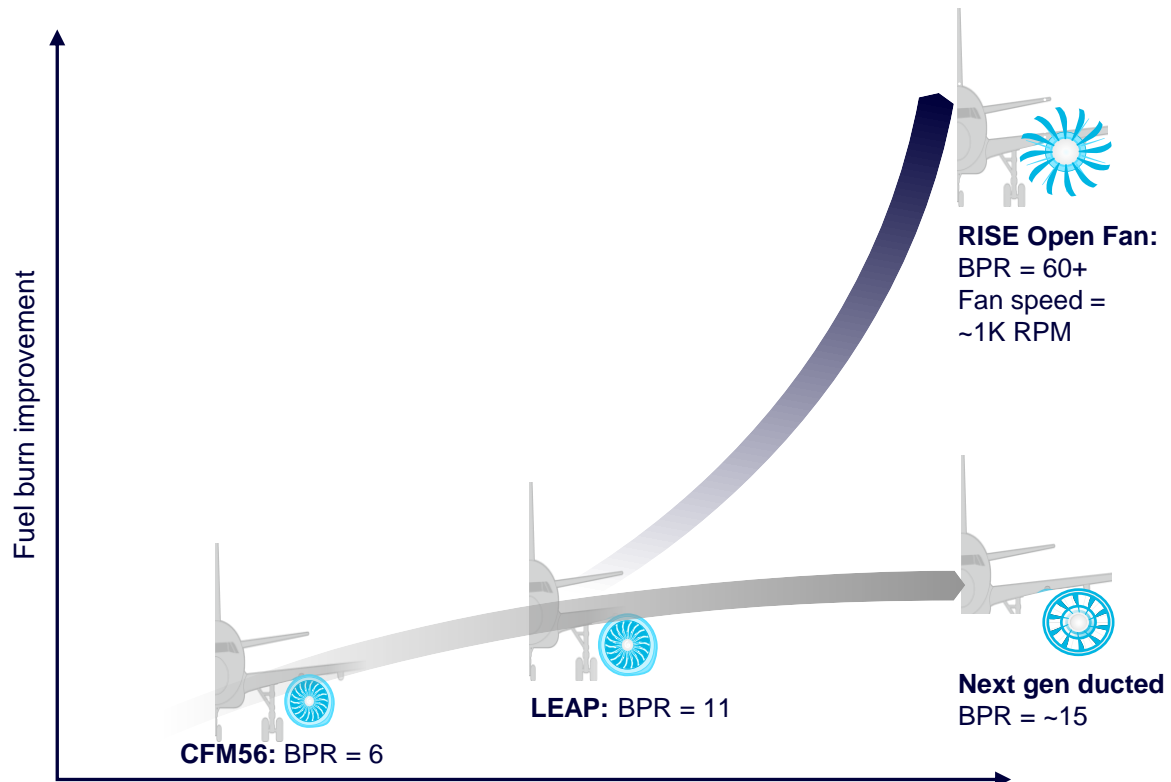
RISE program technology advancement supports today's engines and future of flight

(a- Advanced Air Mobility (AAM))  
(b- Image courtesy of Aurora Flight Sciences)

# Why Open Fan engine design is best path for safety, durability and efficiency

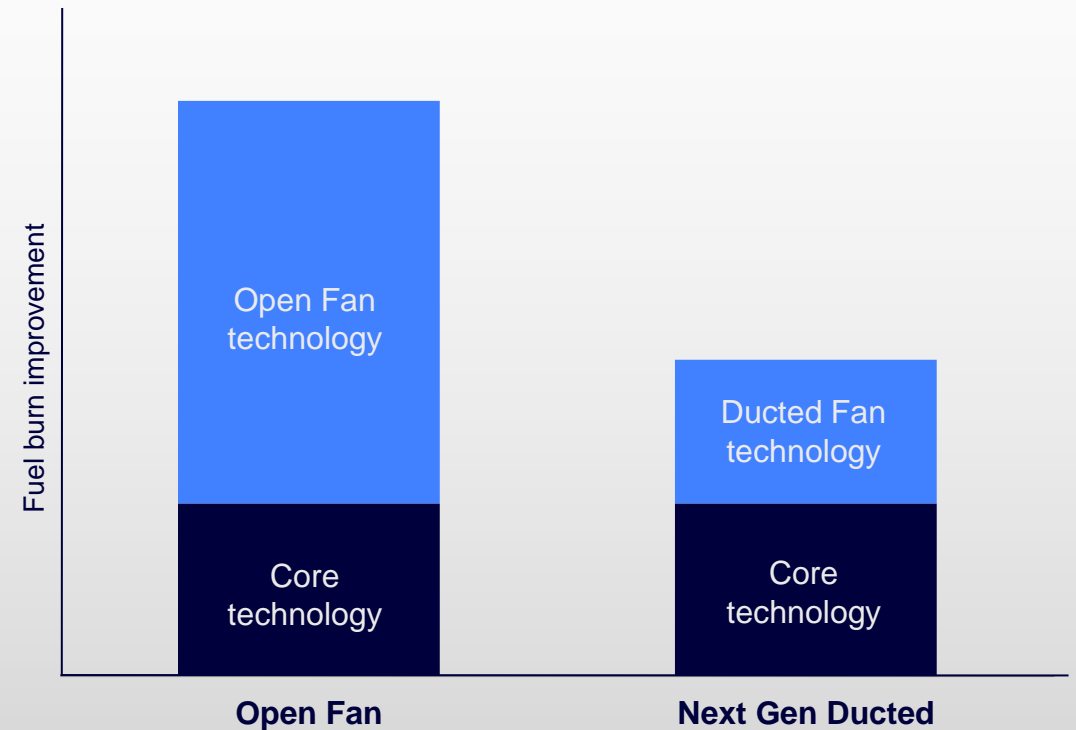
## Unlocking propulsive efficiency ...

RISE Open Fan significantly improves bypass ratio (BPR) compared to next-generation ducted engine

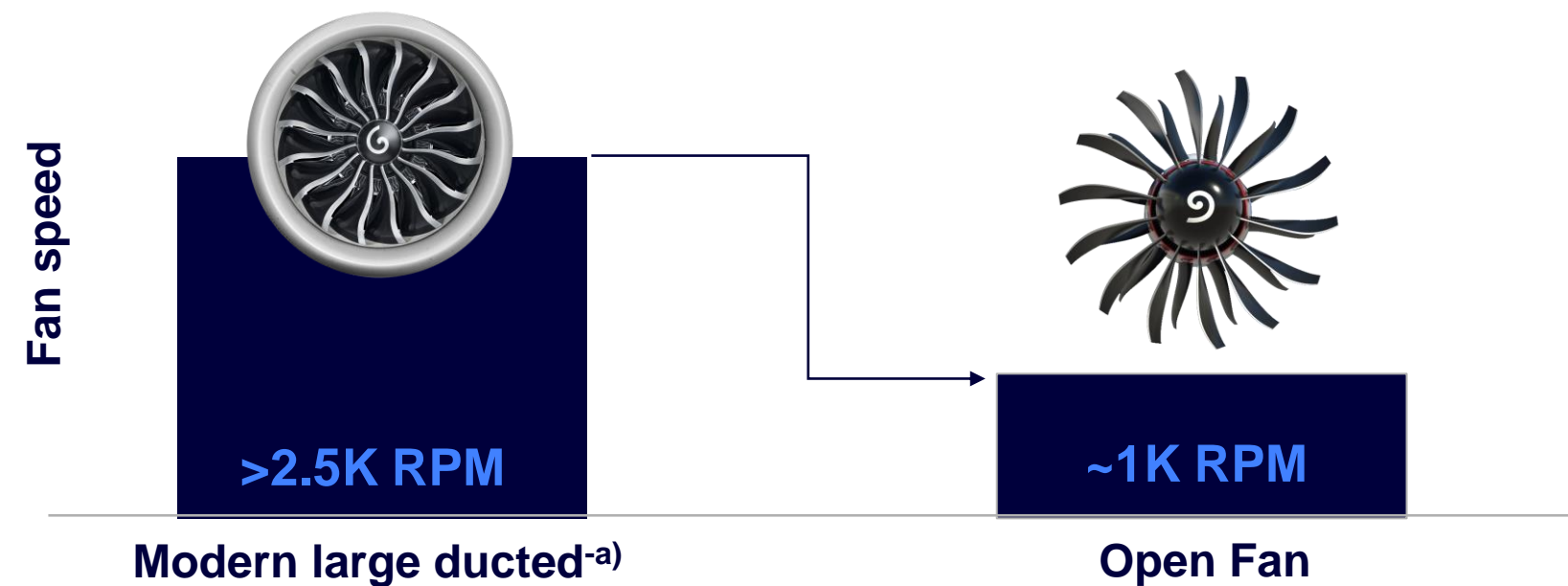


## ... with lowest risk path

Open Fan enables significantly better fuel burn improvement for a given hot-section temperature



**Safety:** lighter, slower spinning fan than advanced ducted engines today



### Key advantages

- Lower temperature core for better durability
  - Reduced noise levels and vibration
  - Lighter-weight engine system and fuselage reinforcement
- vs. next-gen ducted engines*

### Composite fan blade

Approaching **three decades** of continuous innovation with **~300M flight hours**



### RISE Open Fan

Unducted variable pitch and other advanced features

Maintains same flight speeds as turbofans today

(a- reference to GE9X)

# Durability: Open Fan design reduces dust ingestion vs. engines today

## Open Fan design benefits for durability ...

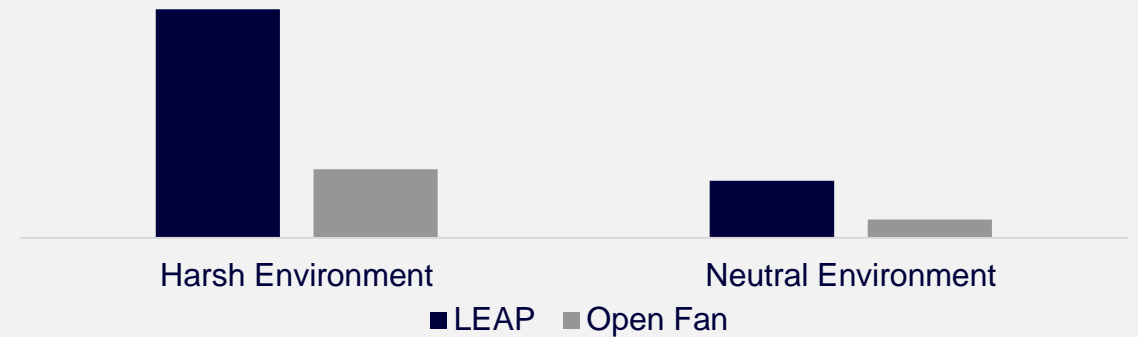
Open Fan has large variable bypass and multiple extraction points in air flow



- Greater bypass air around vs. through core
- Particle separator ... aerodynamics reduce ingestion
- More effective extraction ... adaptive cycle enables additional air streams for dust to exit engine

## ... Reduces particle amount in core

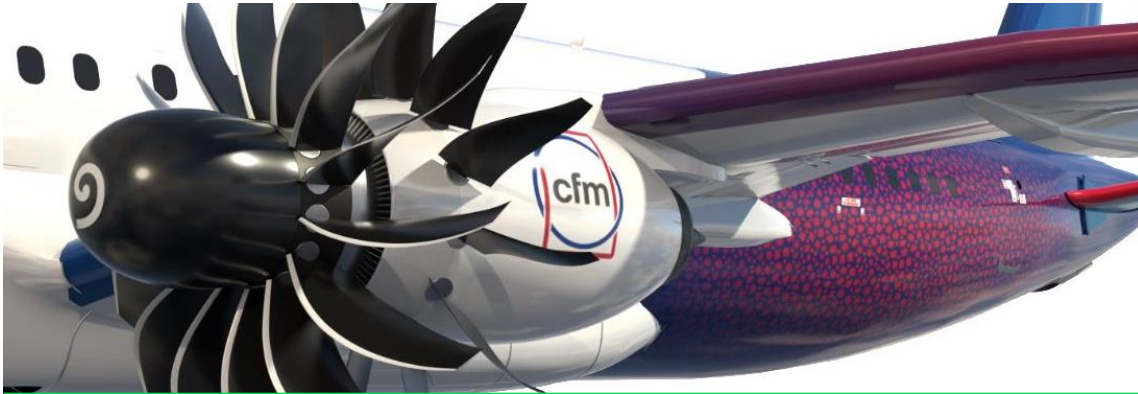
Projected total dust entering core with Open Fan architecture vs. LEAP



- Leads to less part erosion and deposit build-up within high-pressure compressor and turbine
- Extends time-on-wing & reduces unplanned maintenance
- Targeting Open Fan harsh environment core durability near LEAP in neutral environment

Open Fan has inherent durability advantages vs. next-generation ducted

# How we're advancing RISE program technologies



**Named Chief Mechanic for Open Fan ... first for GE Aerospace during tech development to prioritize durability and maintainability**



**Completed 3K endurance cycles of new HPT technologies and started dust ingestion tests, marking earliest ever durability tests for new technology**



**Ground test of first hybrid electric commercial engine demo to better understand controls and integration**



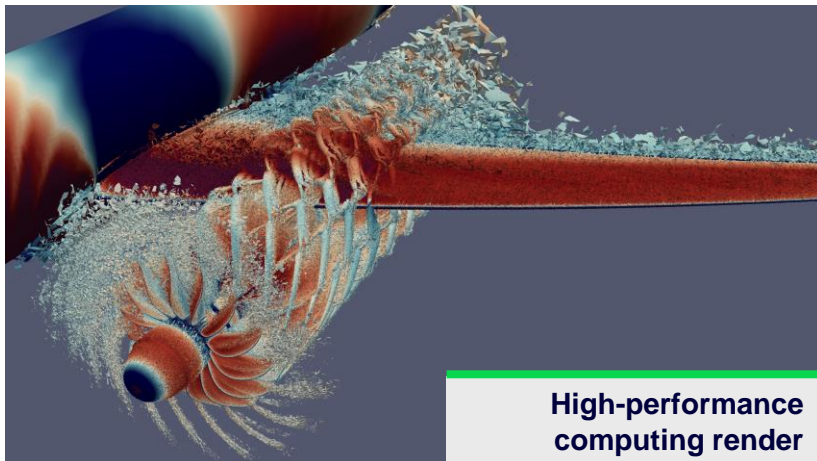
**Testing full-size Open Fan blades and vanes ... building on composite expertise for lighter blade, leveraging Dowty Propeller experience for blade attachment**

**Unprecedented investment to mature technology readiness**

# Airframer engagement builds confidence

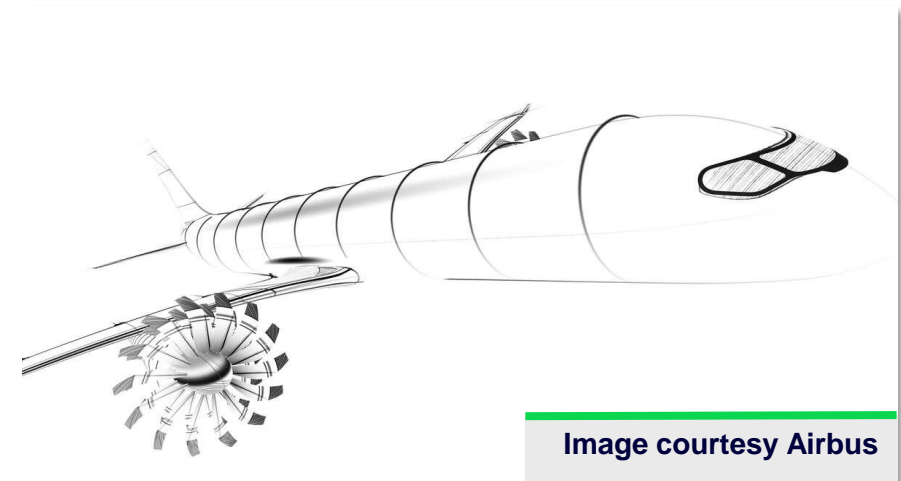
## Successfully modeled full scale Open Fan on wing for first time

- GE Aerospace, Boeing, NASA and U.S. Dept. of Energy study modeling Open Fan-airplane integration
- Using world's fastest supercomputers to refine engine designs



## Progressing toward flight tests this decade with Airbus

- Ongoing Airbus and CFM integration work
- Flight tests to assess aircraft engine integration, aerodynamics and noise



Optimizing Open Fan airplane installation to provide performance advantage vs. ducted

# Meeting customer needs for the future of flight

**Uncompromising commitment to safety first**

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**Open Fan architecture offers inherent opportunities for durability and efficiency unmatched by ducted architecture**

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**RISE is incorporating a focus on durability earlier than ever in technology maturation, including full endurance and dust testing**

# – Wrap

# Technology objectives to deliver customer value

**Design**: Launch engine programs at mature levels of time-on-wing and enhanced efficiency

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**In-service**: Deliver reliability, predictability and time-on-wing commitments

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**Aftermarket**: Advance services technology to reduce turnaround time and cost of ownership