

March 2, 2022

# GE and CFM engines ... looking forward

## Tom Lodge Commercial Engines Marketing

CFM56 and LEAP engines are products of CFM International, a 50/50 joint company between GE and Safran Aircraft Engines.

#### SpeedNews Commercial Aviation Suppliers Conference

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## Departures by region ... global relaxing in restrictions supports recovery

Travel restrictions are easing across the globe





Rolling 7-day average through 19<sup>th</sup> Feb 2022. Each region indexed against same week in 2019

**North America:** US still not ready to lift the testing requirements for international travelers.

- **LATAM:** Departures increasing mainly due to high demand in domestic markets.
- MEA: UAE lifts entry ban from 12 African countries.
- **China:**. China strictly enforces Zero-COVID policy while hosting the Winter Olympics.
- **Europe:** Several EU countries have lifted travel restrictions. UK also lifts testing requirements for the vaccinated travelers.
- **APAC:** Important travel destinations are reopening in APAC. Australia announced to open its borders from 21<sup>st</sup> Feb.

#### Source: FlightAware, GE Analysis

## Technology renewal across the business



### Commercial

CFM LEAP ... 30K thrust class



**15%** lower fuelconsumption**18,000+** engine orders

### GEnx ... 70K thrust class



**15%** lower fuel consumption **2,800+** orders

### GE9X ... 100K thrust class



**10%** lower fuel consumption **700+** orders

### Military

**T408** ... 7,500 shp class



18% better SFC57% more power63% fewer parts

### **T901 ...** 3,000 shp class



25% better SFC
65% better power:weight
35% lower acq, mx cost

### XA100 ... next-gen fighter engine



25% better SFC30% better range20% more thrust

### **Bus. & Gen. Aviation**

H-Series ... up to 850 shp



9 applications 9 certifications

HF120 ... 2,000 lbs. thrust



4,000 FPM climb rate 500+ orders

Passport ... 20,000 lbs. thrust



17% lower fuel consumption 360 orders

### **Catalyst** ... 850 – 2,000 shp



~20% lower fuel consumption Textron Denali first flight '21

### **Systems**

**Power ...** positioned for more electric aircraft ... civil and military



777X electrical load management system

Silicon-carbide tech. developed with GRC

1-3% more efficient Higher power Lighter weight More reliable

Power integration labs in U.S. and UK

### Avionics ...

TrueCourse flight management system



Aviage JV with AVIC '17 First flight on C919 single-aisle airliner

777X common core computing system

## 795 GEnx-powered aircraft in service



-1B		-2B	
49	Total # operators		21
1502	Engines delivered*		669
23.8M	Hours		15.3M
3.9M	Cycles		2.5M
6,530	Highest Engine Cycle	S	8,836
35,159	Highest Engine hours	5	47,774
99.97%	Departure Reliability	,	99.94%

\*includes spares

# GE9X **performance** validated throughout certification testing with proven **GE technology**





## GE9X Program Update



### **Program fundamentals**

Part 33 Certification: Sept 25, 2020

2-spool architecture ... proven **reliability** Highest overall pressure ratio 60:1 ...

most powerful and efficient turbofan

Carbon fiber fan blades and CMC materials ... greater **durability** 

300+ additive parts ... improves weight, reliability & **maintainability** 

### 8 Customers, 700+ engines



### **Entry Into Service (EIS) Readiness**

Flight test ... four aircraft w/ >1300 flights

**Dust ingestion** testing complete ... hardware meets engineering expectations

Wales Maintenance, Repair and Overhaul readiness for EIS continues

Customer Technical Education Center (CTEC) ... ongoing **training courses** 







## LEAP maturity ... 15+ million engine flight hours since EIS





uniterent ( LEAP-1B: May 2017 EIS 700 LEAP-1B powered aircraft delivered ... 55 operators

2,400+ engines produced

3.4M+ hours, 1.3M+ cycles

Updated through 31Jan2022

## GE Aviation's breakthrough technology demonstrators



### Hybrid electric

MW-class hybrid electric propulsion system development with NASA ... builds on GE's experience with motors, generators, power convertors and power management systems

### Hydrogen

CFM International\* developing hydrogen combustion fuel systems for Airbus ZEROe aircraft project ... builds on 8M operating hours with hydrogen in our land turbines

### **CFM RISE**

GE and Safran Aircraft Engines program maturing advanced engine architectures like open fan, compact core and electric technologies for >20% better fuel efficiency vs. today's engines







### Ground and flight tests show technology readiness this decade for multigenerational upgrade by mid-2030s

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### TARGETING MORE THAN 20% LOWER CO<sub>2</sub> EMISSIONS

Advancing open fan architecture Same speed & cabin experience 200+ test vehicles for tech maturity Ground and flight tests mid-2020s Advanced materials Additive manufacturing 100% SAF, hydrogen capability Entry into service by mid-2030s





# Thank you