Collins Aerospace

SUSTAINABILITY

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SUSTAINABILITY AT COLLINS AEROSPACE

Perspective changes everything

As one of the largest aerospace companies in the world, we are in a unique position to lead a positive impact on the future.

Sustainability is at the core of how we operate, and now we are committed to doing more.

COLLABORATION

Inspiring our people, communities, customers and industry to work together for a brighter future

RESEARCH AND DEVELOPMENT

Investing in R&D to pioneer more sustainable technologies

PRODUCT SOLUTIONS

Innovating safer, smarter and more resilient solutions

ENVIRONMENTAL IMPACT

Driving resource-efficient practices throughout aviation

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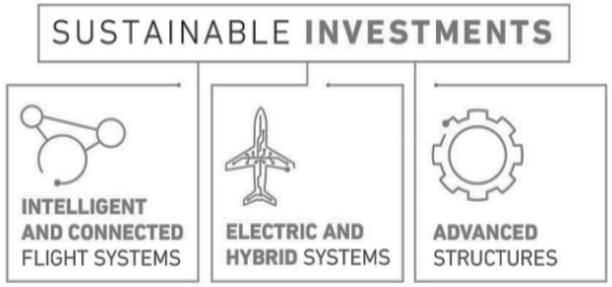
SUSTAINABILITY AT COLLINS AEROSPACE

Customer Collaboration

- In 2019, we joined 23 other leaders in aerospace, research organizations and associations across Europe to sign the Clean Sky 2 Joint Declaration of European Aviation Research Stakeholders to lead the way toward the **decarbonization of aviation by 2050**.
- As part of a unique, long-term collaboration with Airbus, Emirates Airlines, GE *Aviation and Thales, and in partnership with the Dubai* Future Foundation, **we co-created Aviation X Lab to focus on technological innovations in aviation**, including those enabling the next era of sustainable air travel.
- In 2015, Collins Aerospace joined the **Continuous Lower Energy, Emissions, and Noise (CLEEN) Program**, the FAA's principal environmental effort to accelerate the development of new aircraft and engine technologies.
- October 2022 signed declaration for **Commitment to Fly Net Zero 2050**

Research & Development



Sustainability in flight

- Connected Ecosystem: seamless connectivity and enhanced experience for all stakeholders – is essential if aviation is to become more sustainable.
- Electric Systems: By replacing traditional hydraulic and pneumatic systems with electric systems, we can reduce bleed air required from the engine and enable greater engine efficiency and lower fuel consumption.
- Lighter Materials: Through forward-thinking design and science-based materials selection, we're working to reduce aircraft weight for greater fuel efficiency, as well as employ more environmentally responsible materials in aircraft components..
- Optimized Flight Paths: leveraging real-time environmental information, air traffic, and aircraft performance to optimize and aircraft's path reduces fuel burn, carbon emissions and improves operational efficiency.

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INDUSTRY NEEDS

OVERVIEW

Fuel Emissions and Consumption

- Researchers have been attempting to reduce aircraft fuel consumption for decades to minimize aviation's emissions to the atmosphere. Various approaches have been used to reduce the environmental impact of aviation: the use of biofuels to improve aircraft environmental performance , the development of more efficient engines to decrease emissions and to reduce noise, improvements to aircraft frames and wings, and **the optimization of flight trajectories**

Pilot / Flight Crew Challenges

- The main sources of optimum flight path information today are the operational flight plan (OFP) and the flight management system (FMS). But the OFP is usually several hours old, having been calculated and filed with ATC well in advance of the flight, which carries the risk that some of the underlying assumptions may have changed even before take-off.
- And once airborne, the FMS's limited computational power only allows a basic trajectory recalculation when flight conditions change. The lack of adequate technical tools and methodologies for operational efficiency management and decision support on board forces pilots to rely either on rule of thumb, gut feeling or experience gained on the job – not ideal!

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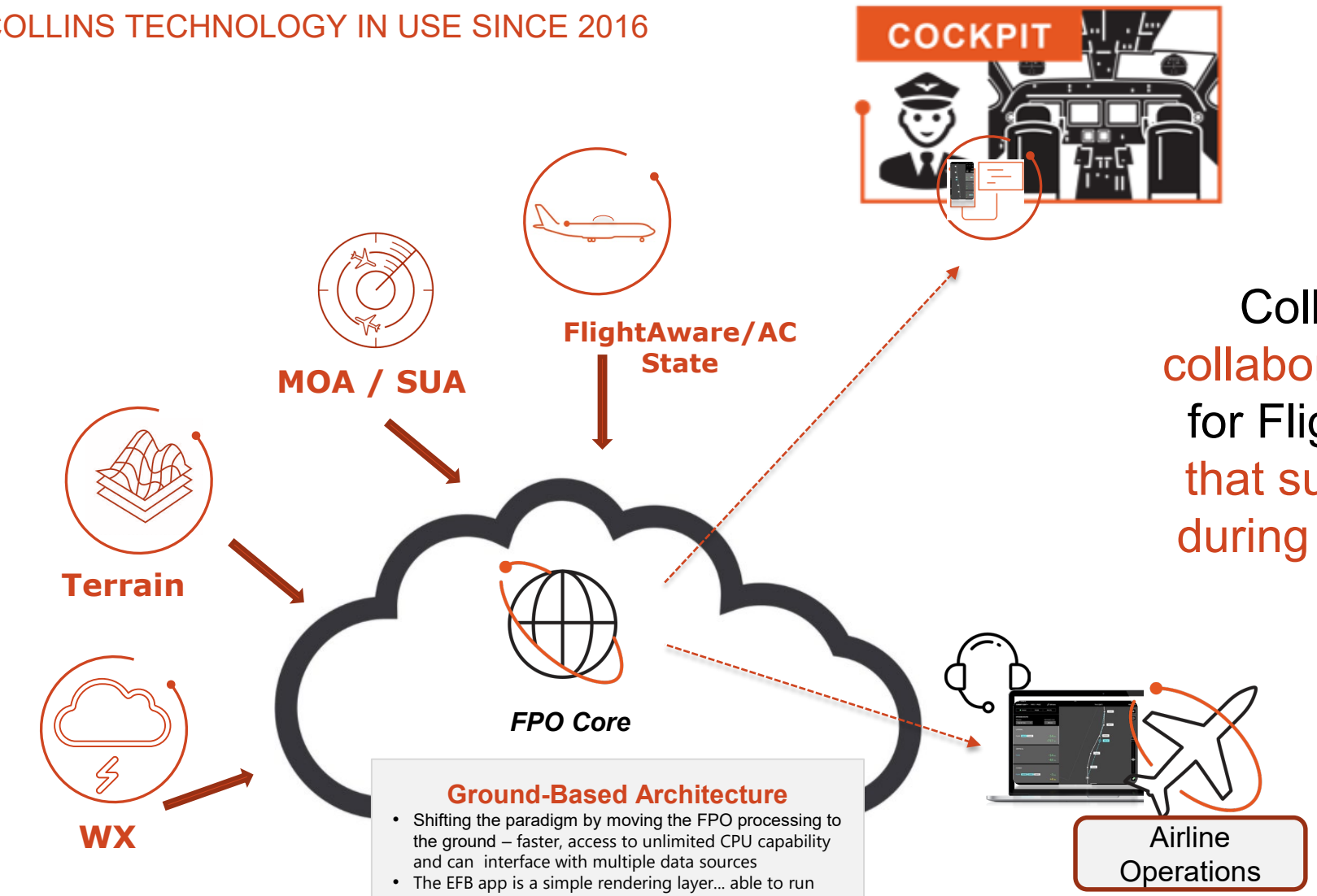
FPO GROUND BASED APPROACH

COLLINS TECHNOLOGY IN USE SINCE 2016



Collins FPO is an advanced collaborative real time decision tool for Flight Crews and Dispatchers that suggests new optimal routes during flight to save fuel, time and CO_2 for airlines

Ground-Based Architecture

- Shifting the paradigm by moving the FPO processing to the ground – faster, access to unlimited CPU capability and can interface with multiple data sources
- The EFB app is a simple rendering layer… able to run the service on devices with limited processing power.

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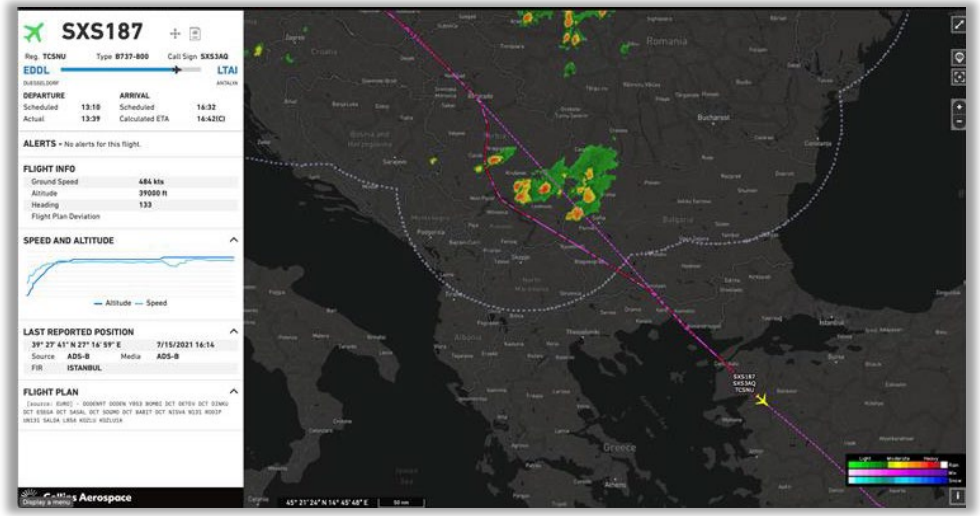
FLIGHT PROFILE OPTIMIZATION

- ***Innovative Ground-Based Architecture enabling significant benefits:***
  - ***Enhanced airline network collaboration (e.g.; Pilot – Dispatcher)***
  - ***Enables faster airline ROI (no extensive/prolonged AC installations)***
  - ***Fully pre-integrated with the Collins Aerospace Connected Ecosystem (Datalink, AIDs...)***



- Tactical advisory tool for pilots and dispatchers that suggests new optimal route during flight
- Goal: Save ‘tangible’ fuel, time and CO2 for airlines
- Recommends Lateral AND Vertical route changes
- Most effective for flights over 2 hours
- Uses input data from numerous aircraft and ground sources

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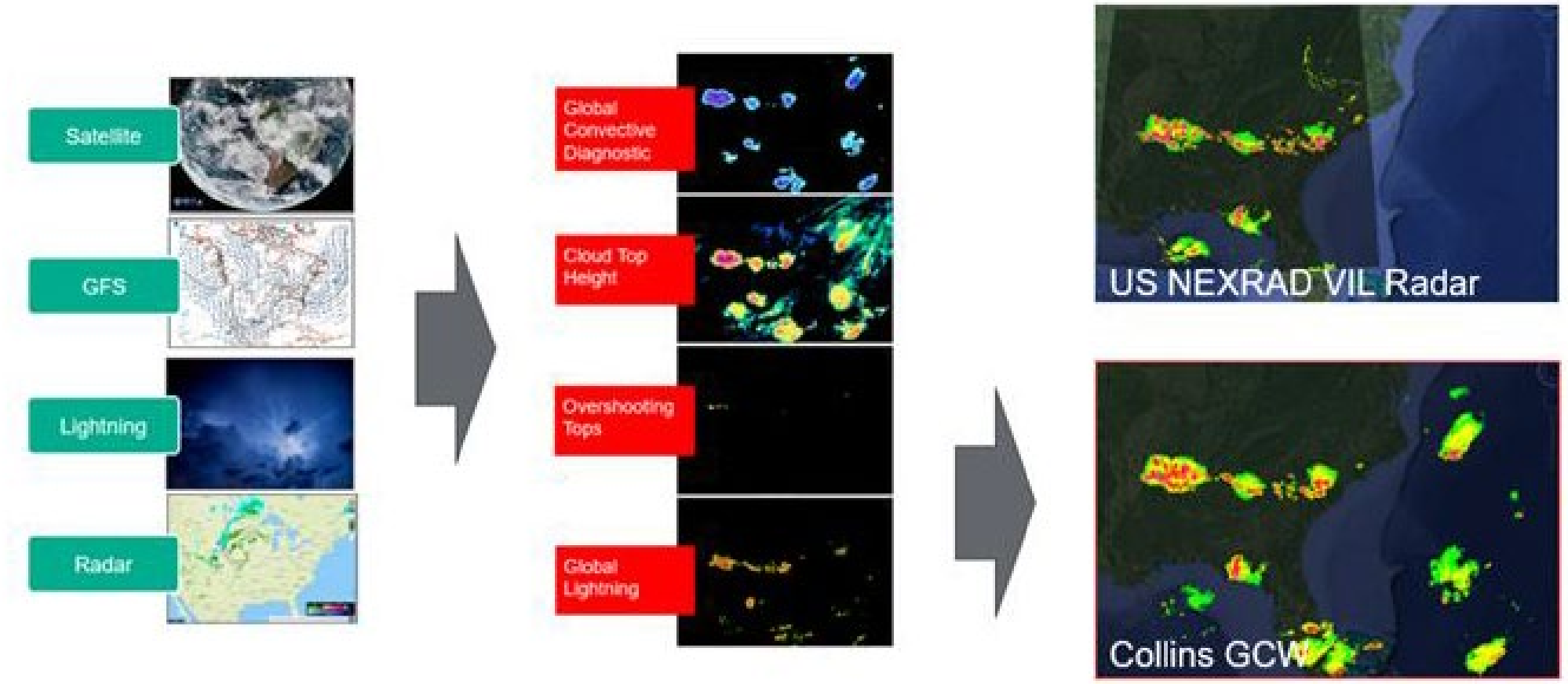
EXAMPLE FPO INPUT

GLOBAL CONVECTIVE WEATHER PRODUCT



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THANK YOU

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