2024 ICAO REGIONAL SEMINAR ON ENVIRONMENT

In collaboration with

DINAC

European Union

EASA

ACT SAF

CORSIA

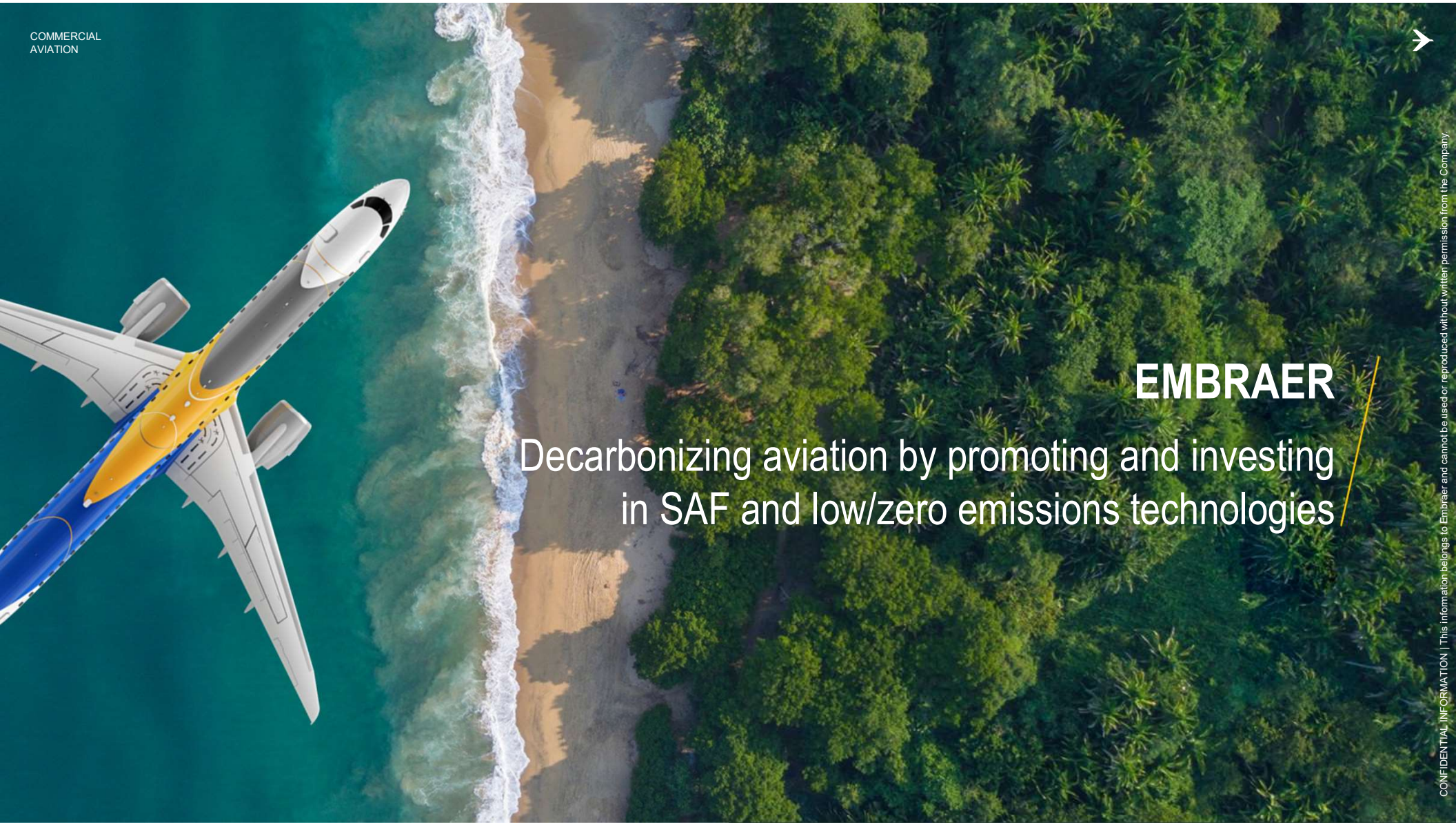
NACC & SAM Regions

20 to 21, August 2024

Asunción, Paraguay

ICAO ENVIRONMENT

COMMERCIAL
AVIATION



EMBRAER

Decarbonizing aviation by promoting and investing in SAF and low/zero emissions technologies

Better access to financing for aviation decarbonization projects

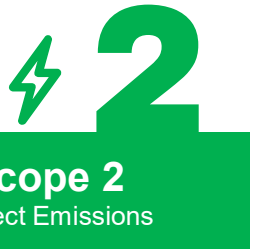
01 OFFTAKE AGREEMENTS

02 POLICY SECURITY

03 CAPEX BALANCE

EMBRAER'S ENVIRONMENTAL COMMITMENTS

Scope 1
Direct Emissions



Scope 2
Indirect Emissions

Scope 3
Product Lifecycle Emissions

Carbon Neutral Growth from 2022, and **Carbon Neutral** from 2040

Regular usage of SAF from 2021 at Embraer's units

Reaching 25% of SAF in our operations by 2040

100% energy from Renewable Sources by 2030

Brazil facilities - 100% energy from Renewable Sources by 2024

Solutions to net zero emissions in aviation by 2050

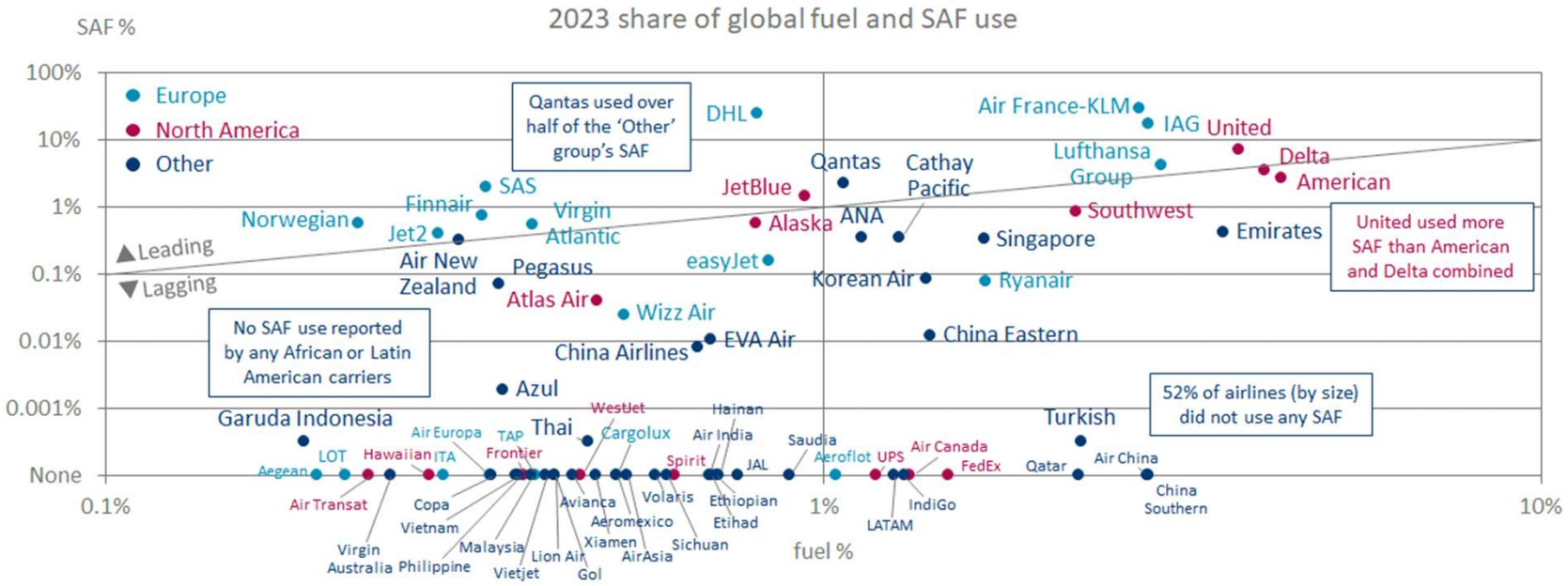
Aircraft 100% compatible with SAF by 2030

SAF advocacy and collaboration to **expand production**

Keep **improving the efficiency** of our current portfolio

New Green Technologies for future products

SAF use and offtakes need to increase significantly to attract more investors and financiers

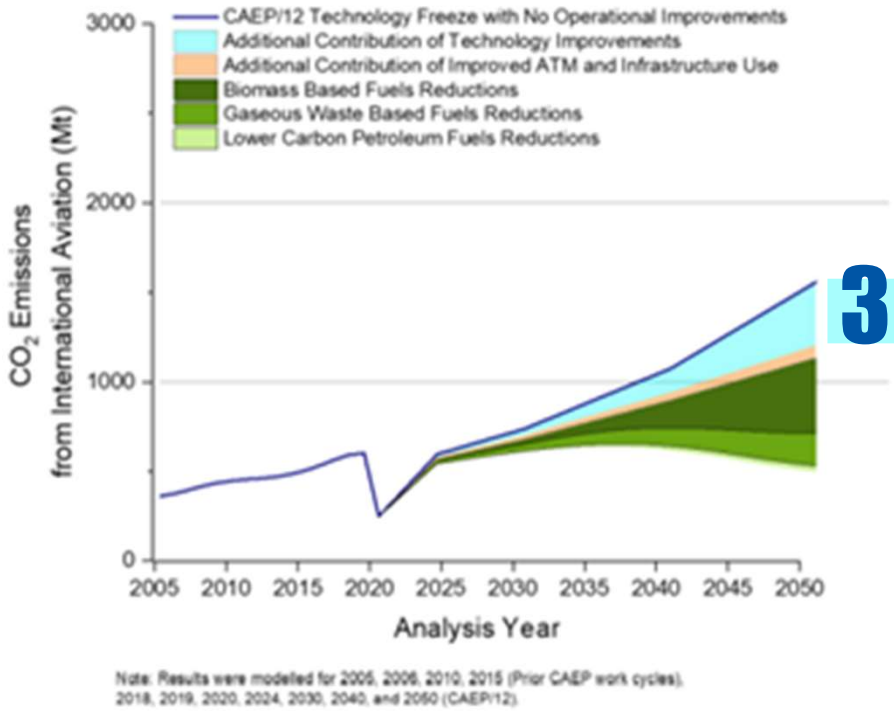


Global SAF use:

77% European carriers | **16%** North American carriers | **3%** OEMs | **4%** Rest of the world

Source: Aaron Robinson, Vice President of Sustainable Aviation Fuel at IAG
Source: voluntary reporting of top 60+ airlines globally representing 78% of 2023 global jet fuel consumption, as analysed by IAG
Airlines that did not report fuel use are estimated using their scheduled capacity and IATA's estimated global fuel efficiency
OEMs not shown for clarity—all are <0.1% of fuel use

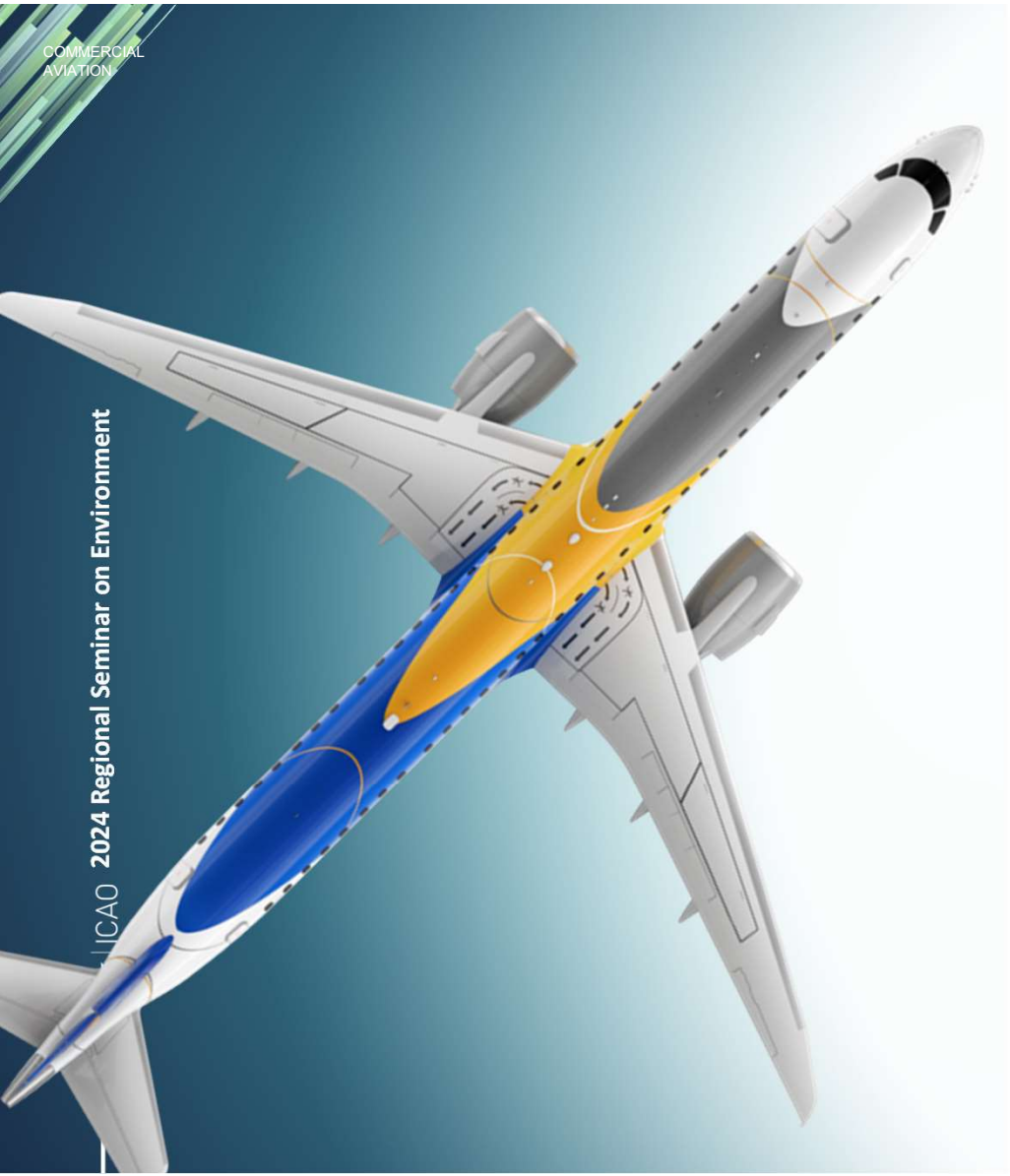
Trends in Aircraft Fuel Burn and CO_2 Emissions



Additional Contribution of Technology Improvements, including **FLEET RENEWAL**

Figure 3. CO_2 Emissions from International Aviation, 2005 to 2050, Including Alternative Fuels Net Life-Cycle Emissions Reductions.

Source: ICAO



LOWER FUEL BURN, LESS EMISSIONS

According to ICAO and ATAG, **Fleet Renewal** can reduce emissions by an average of **20%** in a short timeframe

Up to **-25%**

LOWER FUEL BURN PER SEAT

E195-E2 vs. E195-E1

HAMONIZED AND FAIR CARBON EMISSION POLICIES ARE NEEDED FOR SECURING MORE AND CHEAPER FINANCING

Canada**

Effective 1 Jan 2024, carbon intensity reduction of 10% by 2030.

USA**

Reduce GHG emission by 20% in 2030
3 billion gallons SAF per year by 2030
Have 100% SAF demand by 2050

- IRA (Inflation Reductio Act) tax credit to SAF that achieves a lifecycle GHG reduction of at least 50% compared to conventional jet.
- From 2025-2027, the Clean Fuel Production Credit (CFPC) will replace the SAF blenders tax credit. The base credit is $0.35/gallon for aviation fuel, multiplied by the "emissions factor" of the fuel
- Continuous funding opportunities to support SAF projects and fuel producers.

UK

Mandate
2% SAF in 2025 (100% HEFA)
10% SAF in 2030 (71% HEFA)
22% SAF in 2040 (35% HEFA)
e-Fuel Obligation:
0.2% in 2028 and reach 3.5% in 2040 of total jet fuel demand.

EU

Mandate
2% SAF in 2025
6% SAF in 2030 (Incl. 1.2% e-Fuel)
6% SAF in 2032 (Incl. 2% e-Fuel)
20% SAF in 2035 (Incl. 5% e-Fuel)
34% SAF in 2040 (Incl. 10% e-Fuel)
42% SAF in 2045 (Incl. 15% e-Fuel)
70% SAF in 2050 (Incl. 35% e-Fuel)

Brazil*

Proposed mandate: 1% reduction in CO2 emission in 2027 and gradual increase to 10% in 2037.

Chile*

Reach 50% SAF usage by 2050 (proposal).

India*

Proposed mandate: 1% SAF in 2025, could rise to 4-5% if more volume is available.

Singapore*

Proposed mandate: 1% SAF in 2026, could rise to 3-5% by 2030

Japan

10% SAF mandate in 2030 for International flights

Australia

Reduction of CO2 emission per flight by an average of 10% by 2030.

*** Under legislature consideration.**
**** Non-mandate SAF policy incentives.**

ICAO

1ST ETHANOL POWERED

IPANEMA crop duster

1ST CERTIFIED BIOFUEL AIRCRAFT IN THE WORLD

The world's first and only ethanol-powered aircraft

+300 THOUSAND

tons of CO2 avoided in the atmosphere

EMBRAER BUILDING A SUSTAINABLE FUTURE

Chartering the path towards a sustainable aviation

2004

EMB 202 Ipanema
1st Certified Biofuel
aircraft in the world

2011

Embraer, GE
E170, Camelina oil

2012

Azul E195 Sugarcane-
Ethanol blend

2016

KLM 80 E190 flights
using Camelina 25%
SAF blend

2021

PW signs a MOU with
Embraer to fly a 195E2
on 100% SAF

2022

E195-E2
100% SAF Flight

VERO BEACH REGIONAL AIRPORT
100% HEFA-SPK NON-DROP-IN

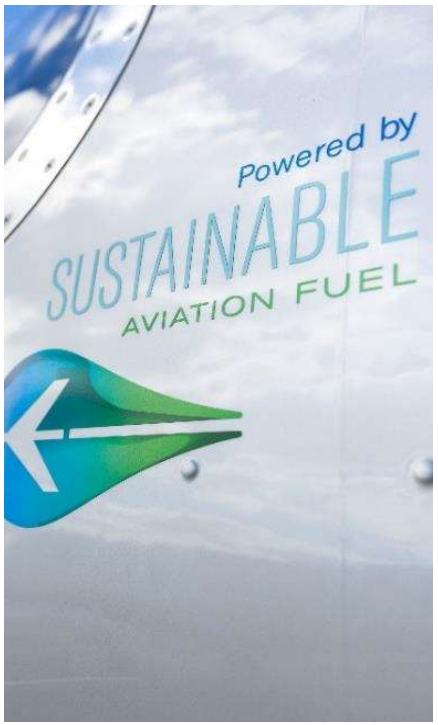
SAF INVESTMENTS

Sustainable Flight Fund

UNITED AIRLINES VENTURES

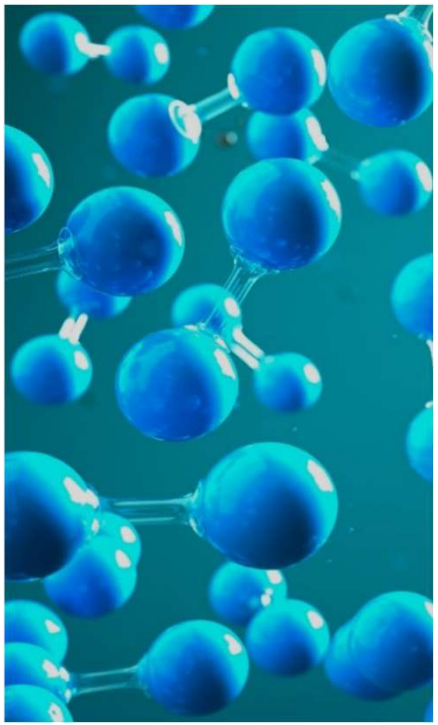
"Embraer is proud to join United Airlines Ventures Sustainable Flight Fund, which is aligned with our commitment to develop and support innovative solutions to address the growing need for a clean energy transition in aviation," said Leonardo Garnica, head of corporate innovation at Embraer. *"In a joint collaborative effort with our partners, we can accelerate large-scale SAF production as the aviation industry progresses toward the goal of net-zero emissions by 2050."*

Sustainable aviation – Research areas



Sustainable Aviation Fuels (SAF)

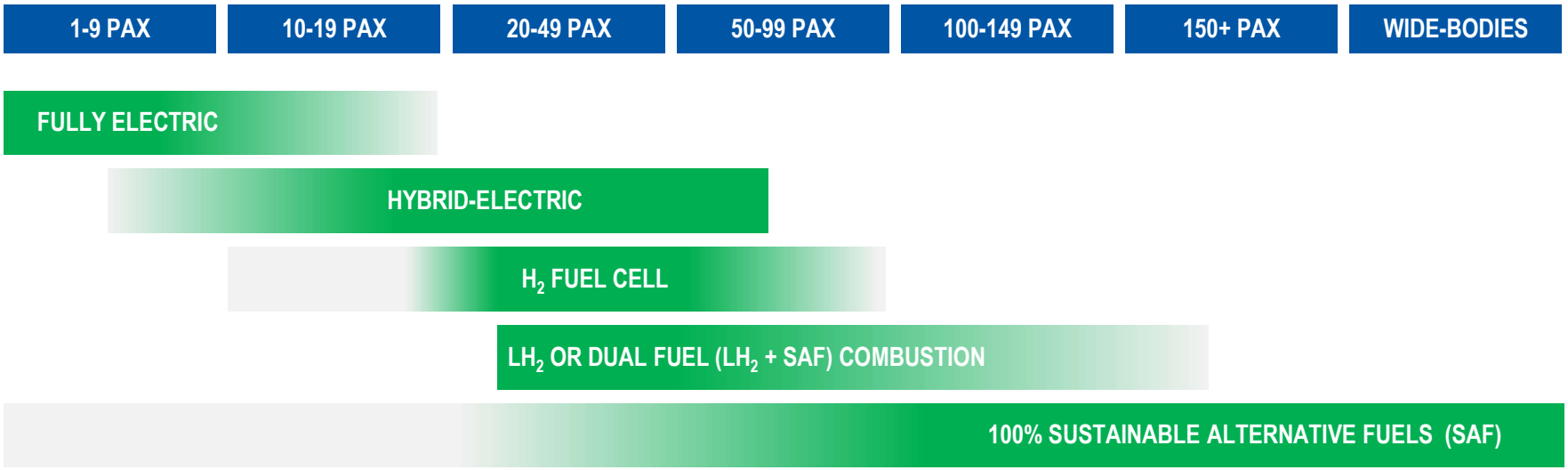
Electrical & Hybrid-electrical Propulsion



Hydrogen (Fuel Cell & Internal Combustion)

Aero-propulsive Integration & Advanced Materials

Technology applicability



"THE MISSION DEFINES THE ARCHITECTURE"

Understand the mission to efficiently reduce aviation emissions

ELECTRIC DEMONSTRATOR

IPANEMA modified as test bed

2021 - FIRST FLIGHT 100% ELECTRIC

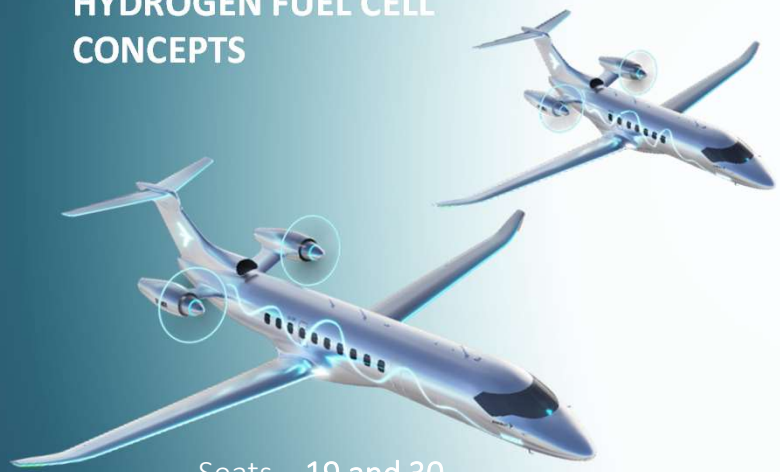
Technology flight demonstrator to accelerate the knowledge on the integration of electric power systems

Initial focus

19-30 SEATS FAMILY

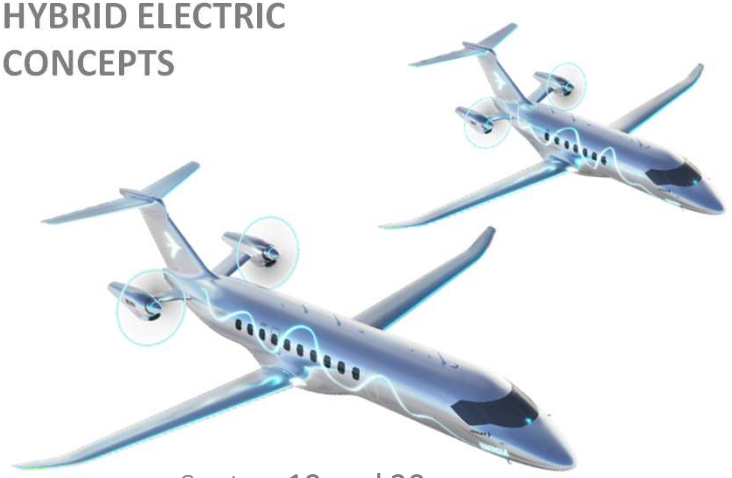
Emphasis on hybrid electric and hydrogen electric

HYDROGEN FUEL CELL CONCEPTS



Seats	19 and 30
Range	200 nm
CO2 Reduction	100%
Tech Readiness	2035

HYBRID ELECTRIC CONCEPTS



Seats	19 and 30
Range	500 nm
CO2 Reduction	25% (90% with SAF)
Tech Readiness	2030+

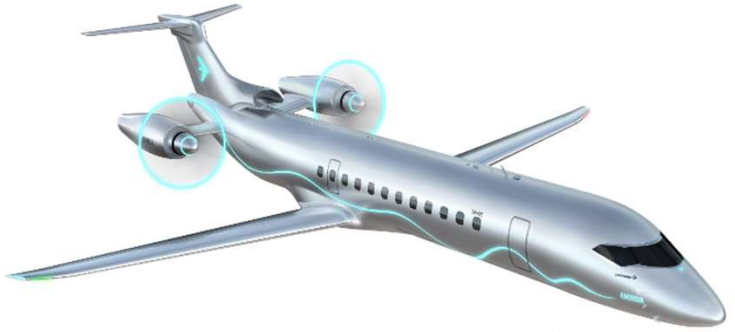
Studies extended to include 50 seaters concepts

ENERGIA HYBRID-ELECTRIC

Tech Readiness	2030+
Range	600 nm
Δ $CO_{2\ 250nm}$	-25% (90% if SAF)

ENERGIA HYDROGEN / DUAL FUEL GAS TURBINE

Tech Readiness	2038
Range	600 to 900nm
Δ $CO_{2\ 250nm}$	-100%



ENERGIA FUEL CELL

Tech Readiness	2035
Range	600 nm
Δ $CO_{2\ 250nm}$	-100%

ENERGIA ADVISORY BOARD

American Airlines | KLM | TAP AIR PORTUGAL | JAPAN AIRLINES

DELTA | AIRFRANCE | LOT POLISH AIRLINES | AIR NEW ZEALAND

Alaska | Lufthansa | widerøe | cebu pacific

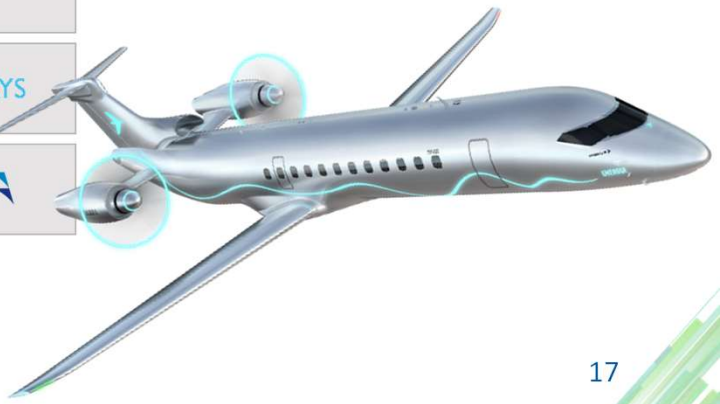
AIR CANADA | BA CITYFLYER | AIR CORSICA | rex.

Republic Airways | FINNAIR | Loganair Scotland's Airline | SKSAIRWAYS

JSX | SAS | AMELIA | AIRCASTLE

Azul | ICELANDAIR | AIR ALSIE

Strong interest in low/zero emissions technology



EMBRAER'S SUSTAINABILITY ROADMAP

Decarbonizing aviation through SAF, hybridization, electrification and hydrogen

TODAY

E2 - Most efficient single-aisle aircraft

25% reduction in emissions per pax

Energia Hybrid- Electric
(E19HE / E30HE / E50HE)

Energia H2 Gas
Turbine/Dual Fuel
(E50H2GT/DF)

E2 H2

2025 2030 2035 2040 2045 2050

E2 100% SAF

Energia H2 Fuel Cell
(E19H2FC / E30H2FC /
E50H2FC)

EMBRAER

THANK YOU

ICAO