35th Congress of ICAS
Sydney, Australia
September 14-17, 2026

Global Sustainable Aviation (GSA2)






Dr. Richard A. Wahls (Rich)
National Aeronautics and Space Administration (Retired)

Axel Krein
EU – Clean Aviation Joint Undertaking

Dr. Paul Vijgen
Boeing (Retired)

Gaudy M. Bezos-O'Connor
Federal Aviation Administration



Overview

- Intent
  - Share global activities and progress towards sustainable aviation
- Guiding Principles
  - Cover entire aviation eco-system from airplane and propulsion systems and technology to improved operations and future energy landscapes (environmental, economic, and societal considerations)
  - Consider concepts, technologies, and approaches with near-to-mid (2030s) and mid-to-far term (2050s) EIS potential
- 20 presentations in 7 sessions across 3 days at one site
  - Encourage Q&A and discussion



Overview – Global Sustainable Aviation (GSA2) – Track 1

Session (100 mins each)	Title	Speakers				Co-Chairs	
1 Monday 14 Sept 09:55	Setting the Stage with Global Airlines	Axel Krein, Clean Aviation	Masami Suzuki, JAL	Matt Hudson, Qantas	PANEL	**Rich Wahls, NASA (Retired)**	Axel Krein, Clean Aviation
2 Monday 14 Sept 13:30	Perspectives & Progress Towards NextGen Airliners	Michael Drake, Boeing	**Veronique Roca, Airbus**	Vinicius Di Nucci Pereira, Embraer	PANEL	Axel Krein, Clean Aviation	Paul Vijgen, Boeing (Retired)
3 Monday 14 Sept 16:30	Perspectives & Progress on NextGen Propulsion for Future Airliners	Andrew Murphy, P&W	**Alan Newby, RR**	Christine Andrews, GE	Eric Dalbies, SAFRAN	Frank Haselbach, Airbus	Michael Drake, Boeing
4 Tuesday 15 Sept 11:00	Perspectives & Progress on Airliners for 2050+ Energy Landscapes	**Jim Hileman, Boeing**	Frank Haselbach, Airbus	Nateri Madavan, NASA Markus Fischer, DLR	PANEL	Dimitri Mavris, GaTech	Björn Nagel, DLR
5 Tuesday 15 Sept 13:40	Regional Airliners: Electrified/H2 Prospects & Demonstrations	Gaudy Bezos-O'Conner FAA	Ben Loxton, magniX	**Christine Andrews, GE**	PANEL	Gaudy Bezos-O'Conner, FAA	Herb Schlickenmaier, hs-AdvConcepts
6 Tuesday 15 Sept 16:40	Future Sustainable Aviation Infrastructure: Prospects & Challenges	Rob Sharp, Airservices Australia, Jeff Connolly, Thales Australia	Edward Mason, Jet Zero Australia	**Claire Waghorn, Christchurch Airport**	PANEL	Roland Gerhards, ZAL	Jim Hileman, Boeing
7 Wednesday 16 Sept 10:50	Super Panel: Pathways to Global Sustainable Aviation	Reflections and discussion on topics from previous six GSA2 sessions with one representative from each session: **Waghorn, Andrews, Hileman, Newby, Roca, Wahls**				Nateri Madavan, NASA	Markus Fischer, DLR



ICAS Sydney 2026 Declaration
Shaping Global Sustainable Aviation for Society

- We, the ICAS 2026 Congress participants from airlines, manufacturers, airports, air-navigation-service providers, regulators, research and innovation institutions, and universities, affirm that the future of aeronautics depends on worldwide collaboration across the entire industry – with all stakeholders working together in a spirit of trust and shared responsibility.
- We recognise aviation's important contributions to connecting our world through rapid, safe, sustainable, efficient and resilient transport of people and goods, enabling economic opportunities and cultural exchanges with a positive impact on the daily lives of people across the globe.
- We acknowledge the need to transform aviation towards long-term sustainability while supporting the evolving needs of society. This requires global partnerships, continued technological advancement with unwavering commitment to the highest safety standards.
- For global aviation to flourish sustainably and safely, continuous support is needed for the aeronautical sciences, engineering, manufacturing, operational and regulatory communities – to enable key contributions by all participants, ranging from new students and apprentices to the leaders who set direction and policy.
- Working together, through inclusive, transparent and coordinated actions, we can ensure that aviation continues to connect and inspire the world.



Support the
ICAS Sydney 2026 Declaration →

Session 1.1 – Setting the Stage with Global Airlines

Session Chairs: Rich Wahls (NASA Retired)

Axel Krein (EU – Clean Aviation JU)

Monday September 14: 0955 – 1135 (25-minute slots)

- Axel Krein (EU – Clean Aviation Joint Undertaking)
- Masami Suzuki (JAL)
- Matt Hudson (Qantas)
- Q&A with Panel of Speakers



Support the
ICAS Sydney 2026 Declaration →

Setting the Stage for the Global Sustainable Aviation Track



Axel Krein
Executive Director
Clean Aviation Joint Undertaking

ICAS Congress Sydney, 14 September 2026



What makes up sustainability? The 3 Ps

01

PROFIT



Building resilience

A commercially viable, economically sustainable ecosystem across the entire aviation ecosystem.

ECONOMIC IMPACT

02

PLANET



Decarbonising flight

Cutting aviation's environmental footprint through disruptive technologies, SAF, operational and market-based measures .

-100% NET CO_2 BY 2050

03

PEOPLE



Growing our talent

Building and maintaining a skilled workforce ready to design, build and operate the next generation of aircraft & ATM & infrastructure.

MASTER THE CHALLENGES

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Profit

If aviation were a country...

…it would be the 20th **largest economy** in the world!

86.5 M

Jobs supported by air transport

$ 4.1 T

Global Economic Impact (3.9% of global GDP)

33%

Of global trade value transported by air, representing $8 trillion in goods in 2023

4.4 B

Passengers in 2023 travelling for business, leisure, education and healthcare

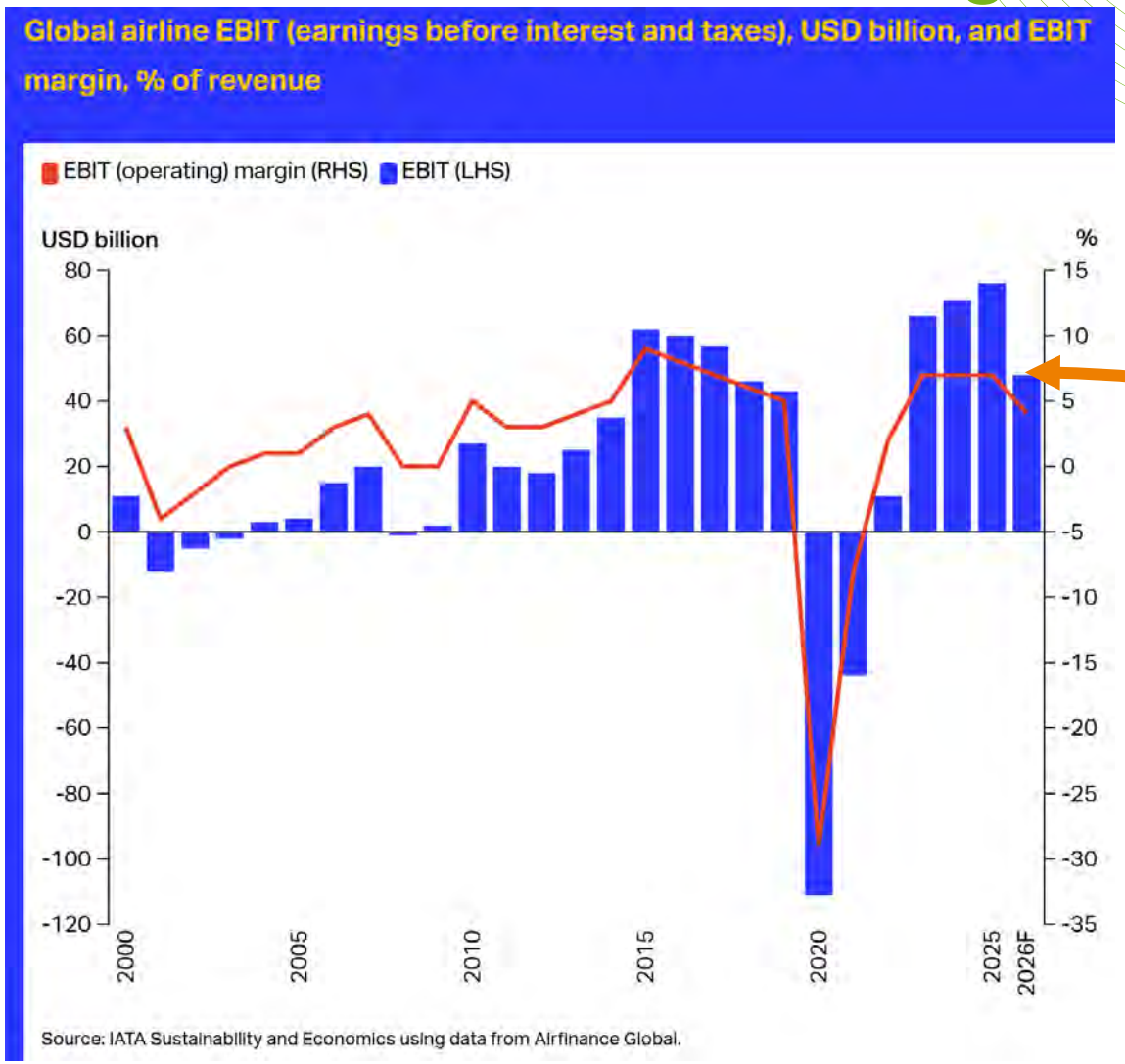
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Source: ATAG 2025

However, economic pressure for airlines is high ...





Strait of Hormuz closure

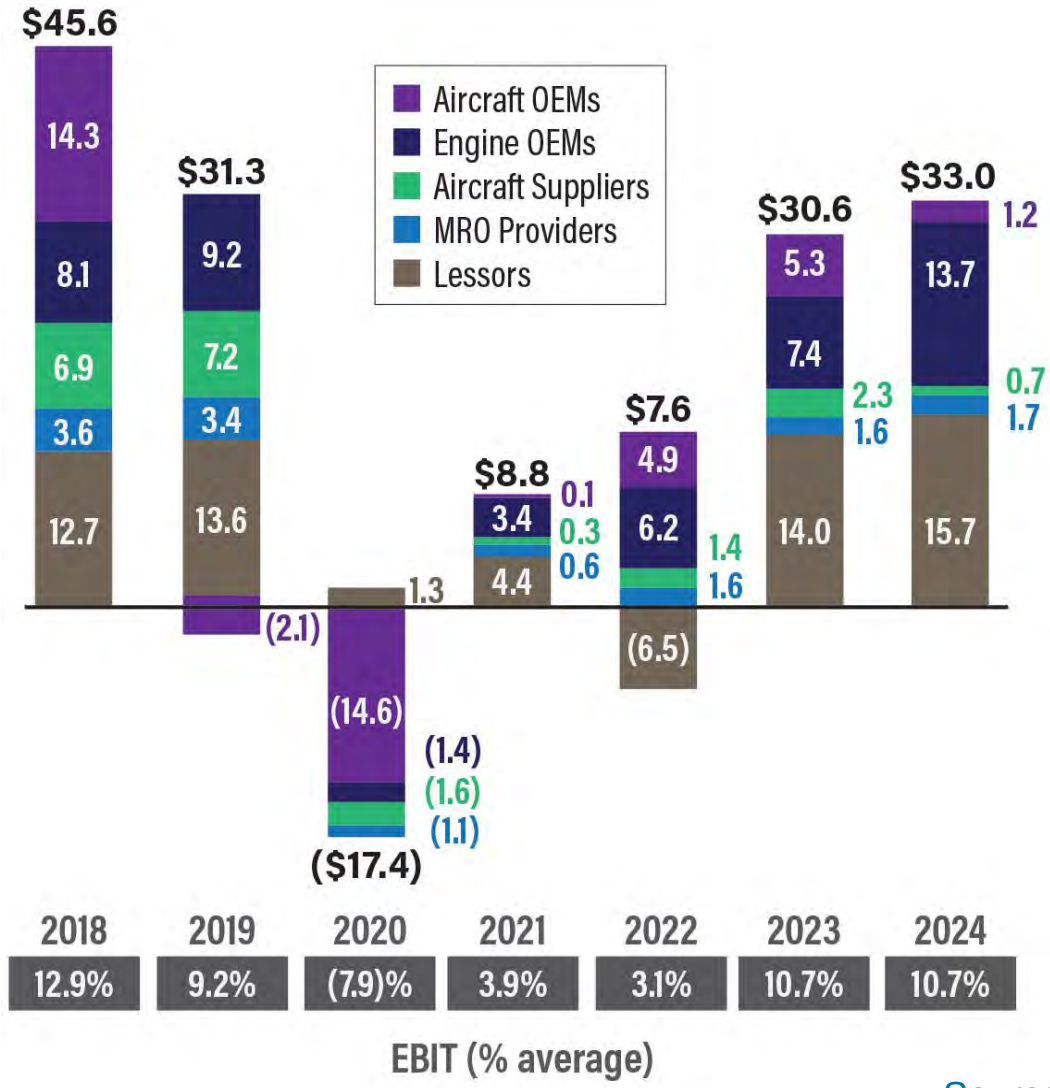
EBIT in USD (blue bars)

EBIT margin as a percentage of revenue (red line)

Source: IATA

… and profits in the aeronautics industry are imbalanced

… and will be **not sustainable** in the longer term!

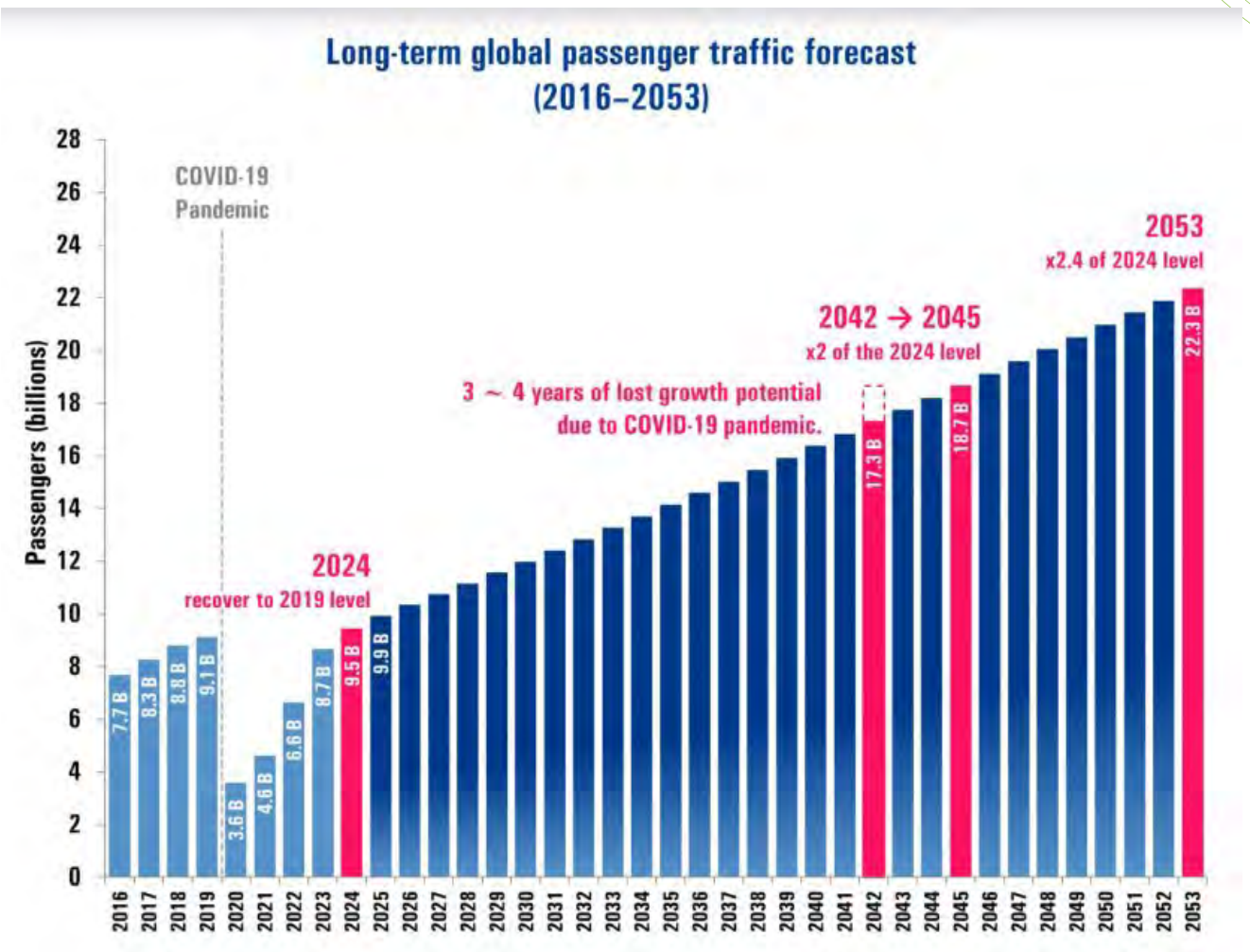


Source: Alix Partners 2025

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Significant increase in passenger traffic forecast …

Aviation industry's **opportunity!**

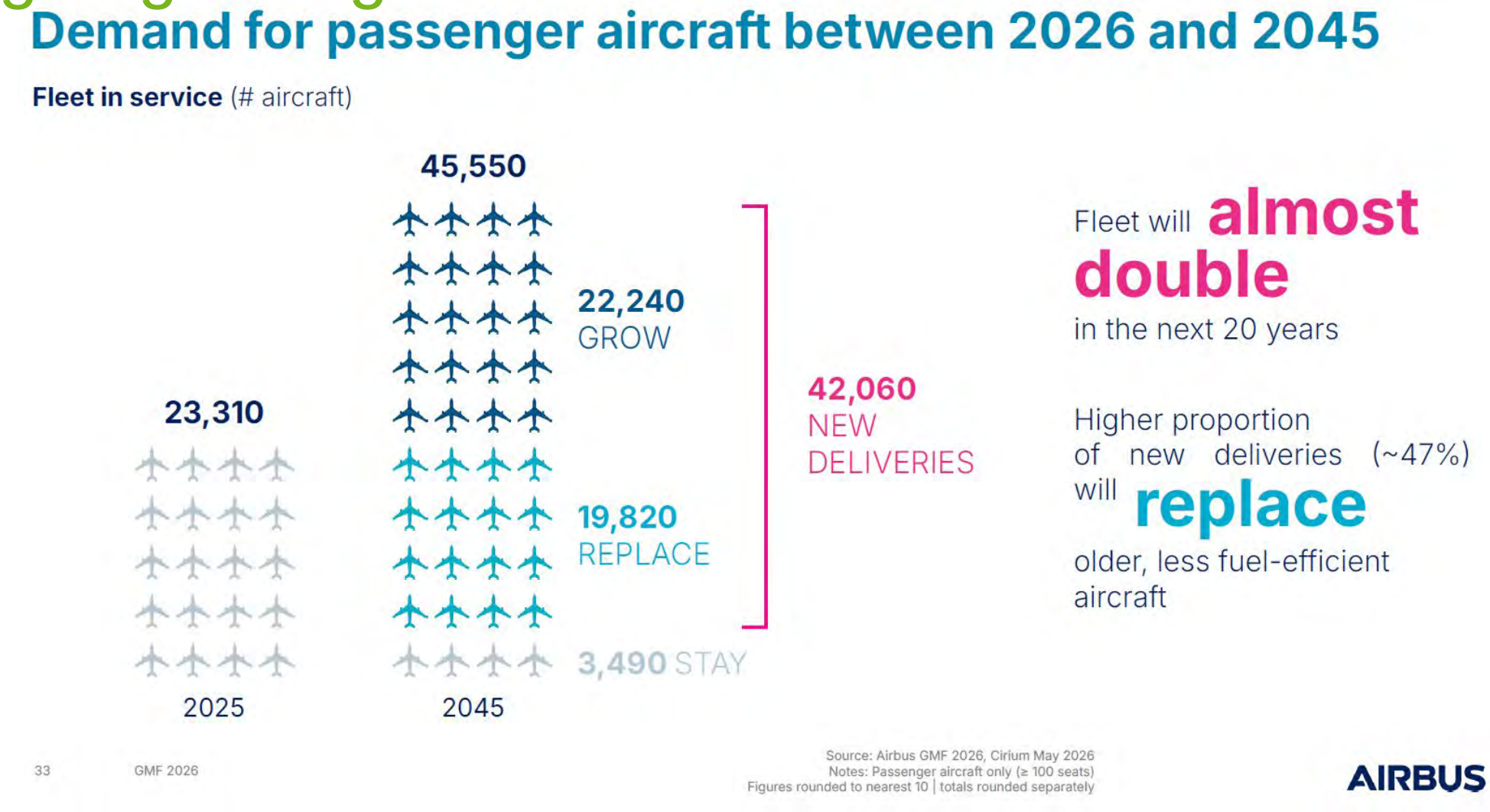


Source: ACI 2026

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… leading to growing aircraft demand

Is the aviation **industry prepared** for this?

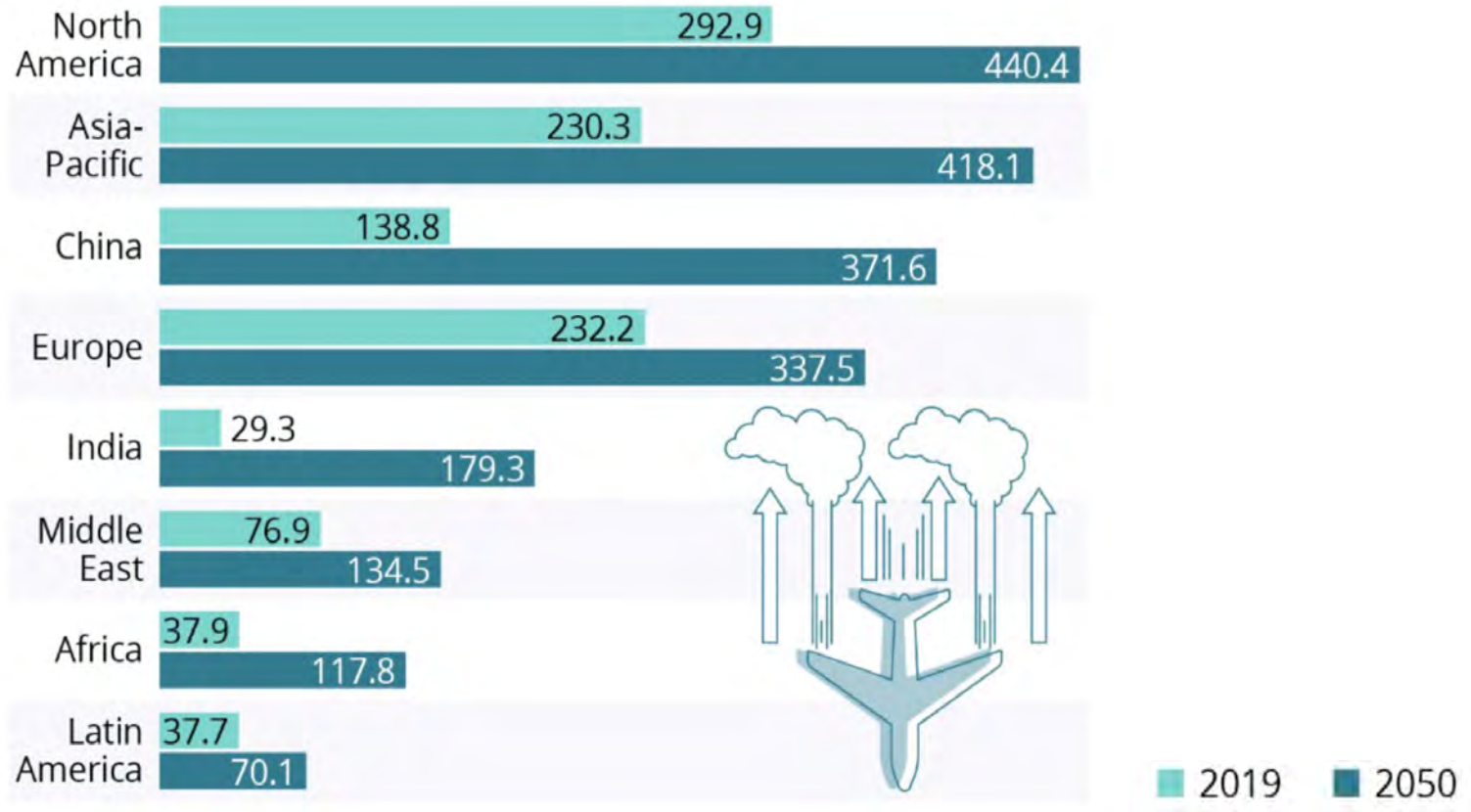


Source: Airbus 2026

… and skyrocketing emissions

Ageing fleets and increased **passenger demand** will lead to increased **emissions!**

Carbon emissions from aviation by world region
(in million metric tons CO_2 equivalent)



Source: ACI 2025

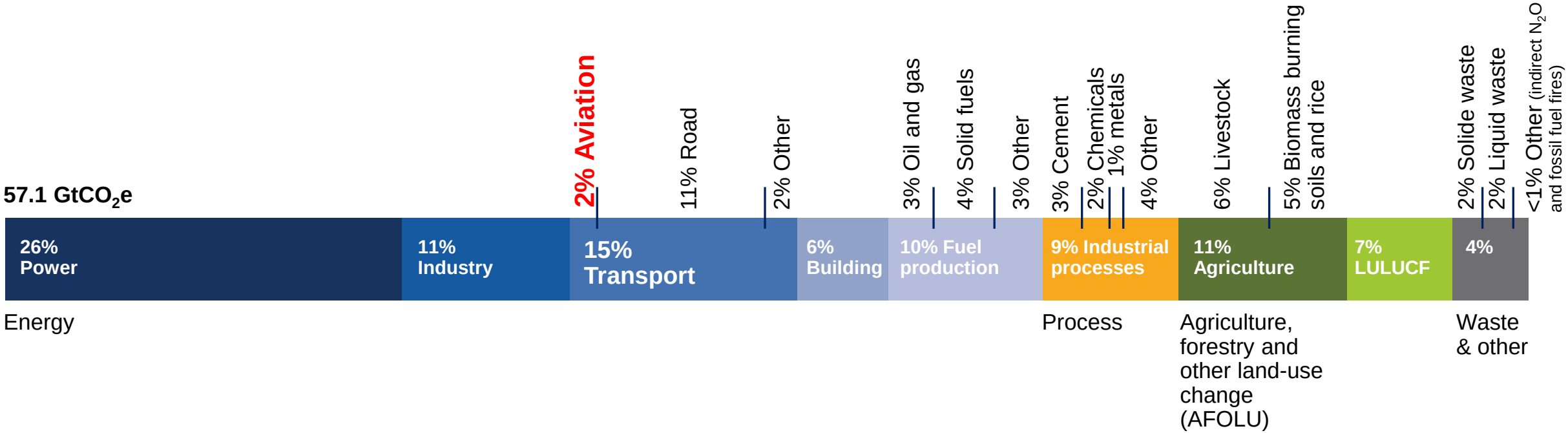
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Planet

If aviation were a country ...

… it would be the 11th largest CO_2 emitter in the world



… and don't forget non- CO_2 effects!

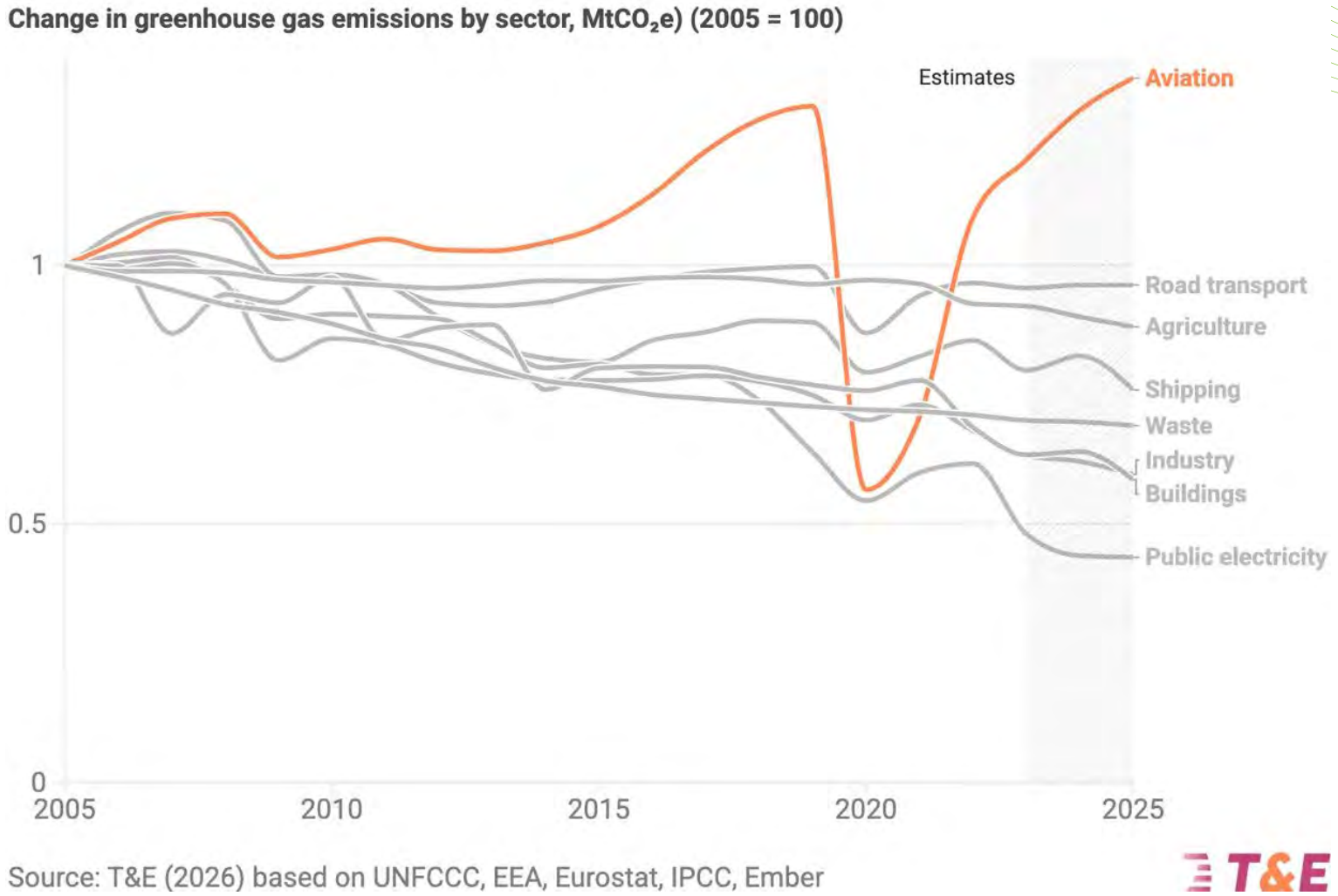
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Source: ATAG 2024

Aviation is the EU's fastest growing source of emissions

Emissions have **risen by 30%,** while CO_2 from other sectors has declined!



Source: T&E (2026) based on UNFCCC, EEA, Eurostat, IPCC, Ember

T&E

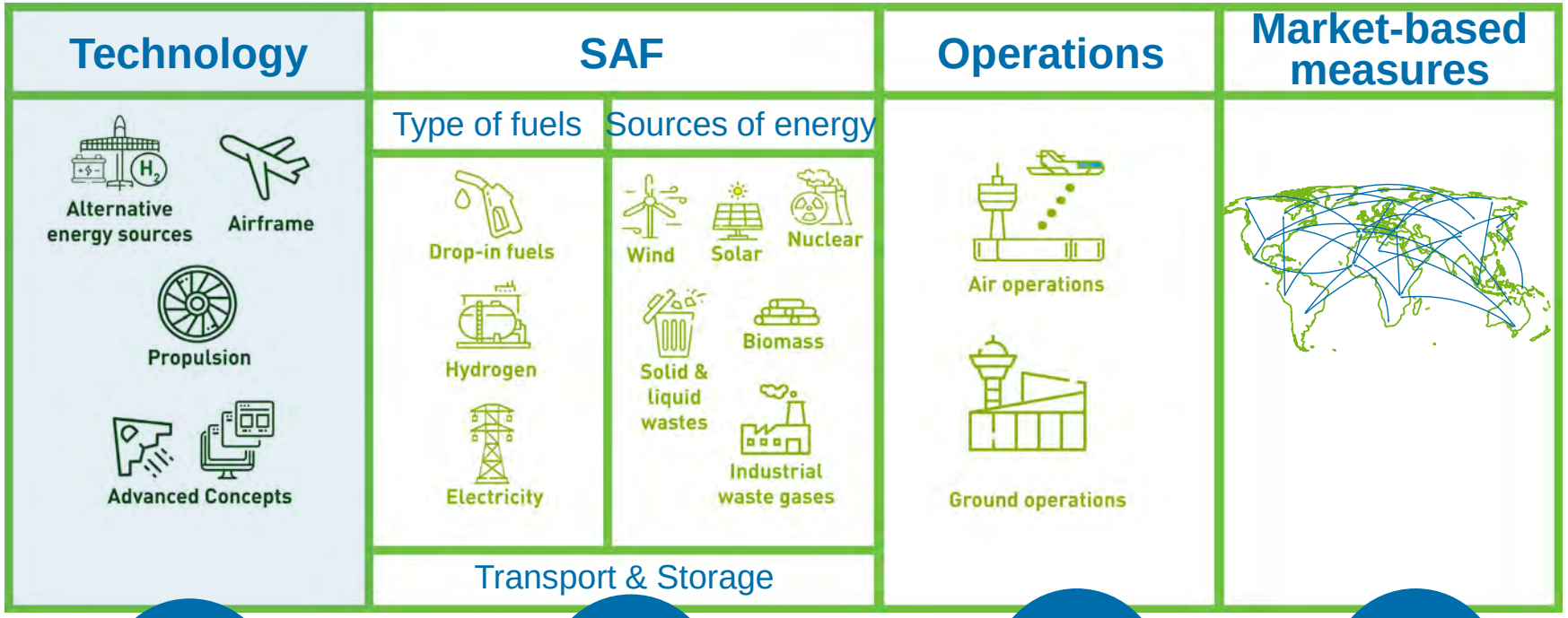
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The CO_2 contribution reduction panorama by 2050

Breakthrough in CO_2 reduction will mainly be triggered by disruptive **technologies** & **SAF!**

ICAO WORK ON LONG-TERM ASPIRATIONAL GOAL

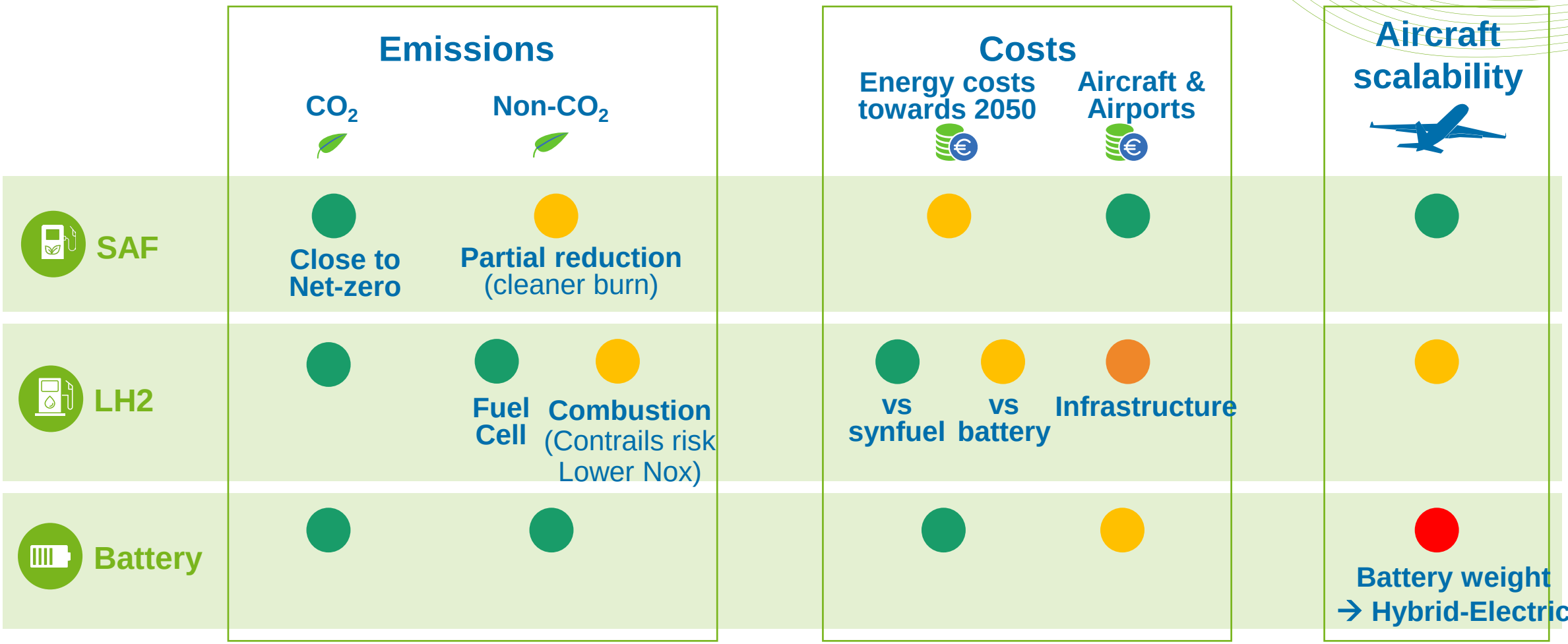


Source: ATAG Waypoint 2050 (2021),
Scenario 3: aspirational and aggressive technology perspective

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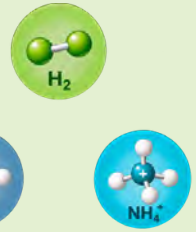
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How to replace fossil kerosene?



Examples of new technologies …

01



ALTERNATIVE ENERGY CARRIERS: H_2, CH_4, NH_3

02



NEW ENGINE ARCHITECTURES

03



AERODYNAMICS

04



NEW CONFIGURATIONS

05



HYBRID-ELECTRIC

06



ALL-ELECTRIC

07



SUPERSONIC

08



ATM TECHNOLOGIES

9

….

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Short and medium-range aircraft

- **240** passengers
- Design mission range = **2500 nm**
- EIS: **2035**

-30% CO_2*

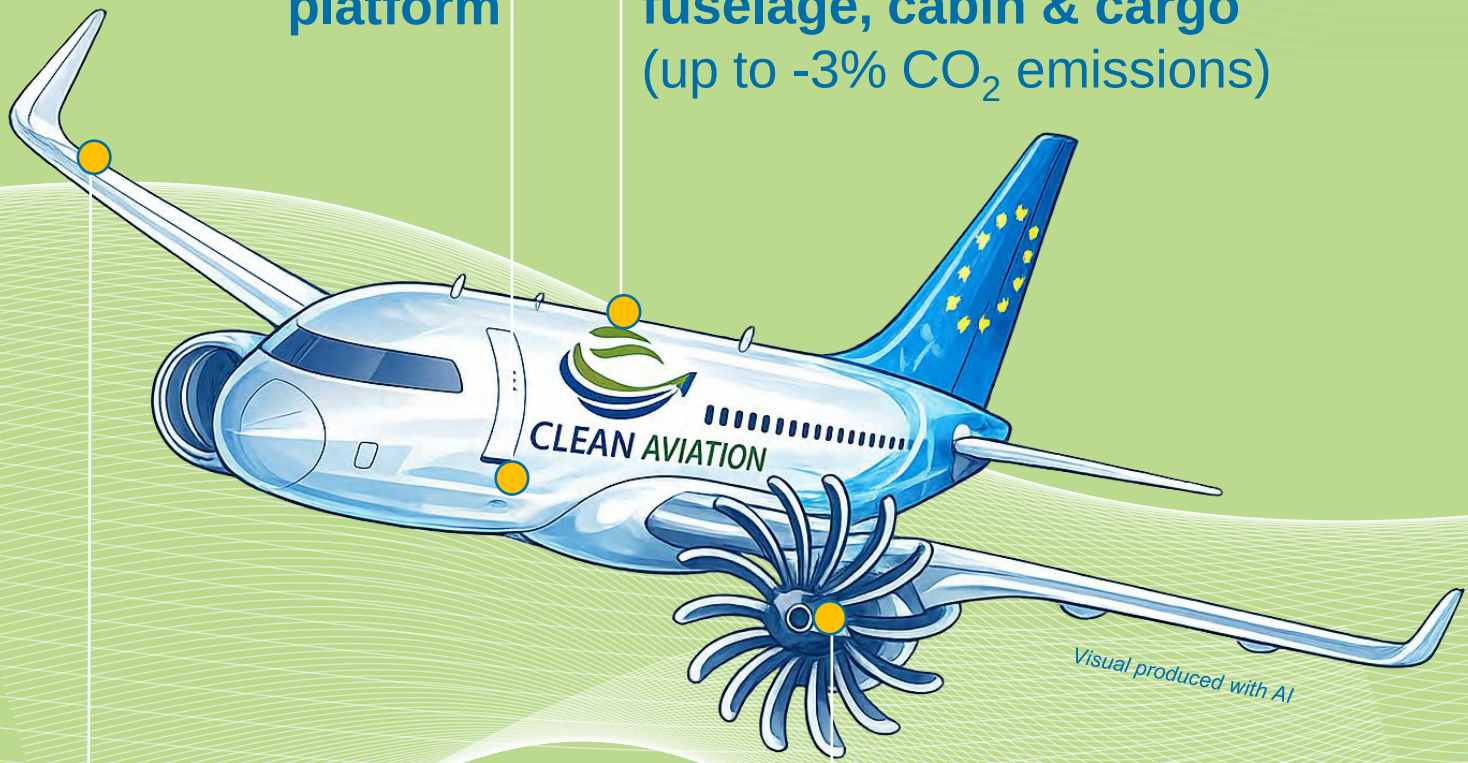
-90% net CO_2* incl. **SAF**

SAF

* non-CO_2 effects not yet quantified

Advanced systems platform

Integrated & rear end fuselage, cabin & cargo (up to -3% CO_2 emissions)



Ultra performing wing with high aspect ratio (up to -15% CO_2 emissions)

Ultra-efficient propulsion & propulsion integration (up to -20% CO_2 emissions)

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Hybrid-electric Regional aircraft

- **50-100** passengers
- Design mission range = **500 nm**
- EIS: **2035**

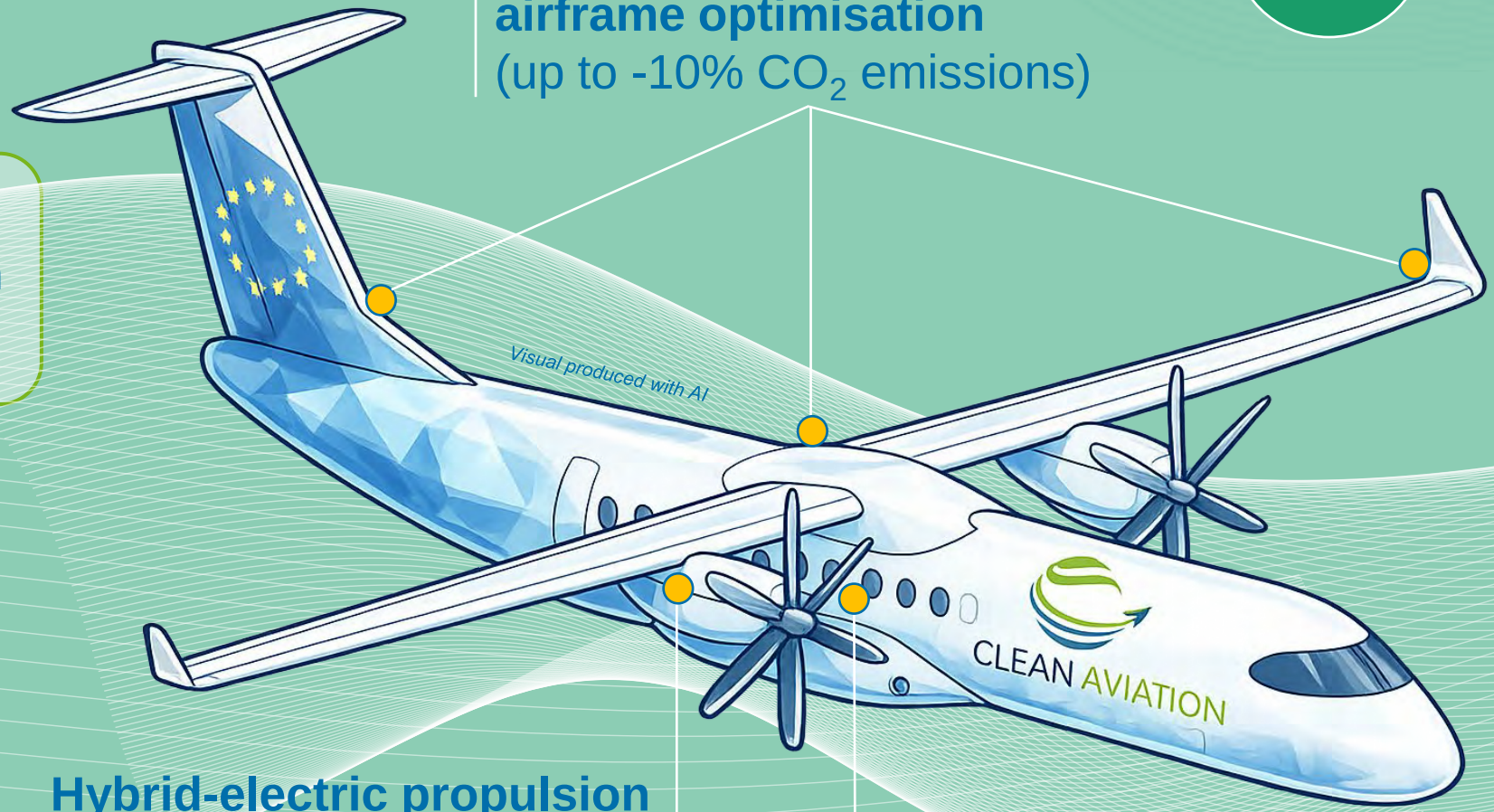
-30% CO_2*

-90% net CO_2* incl. **SAF**

SAF

* non-CO_2 effects not yet quantified

Aerodynamic and airframe optimisation
(up to -10% CO_2 emissions)



Hybrid-electric propulsion with batteries
(up to -20% CO_2 emissions)

Advanced electrical systems

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Hydrogen-powered aircraft

H2

- **100-150** passengers
- Design mission range: **1000-1400 nm**
- EIS: **2040+**

-100%
CO_2*
H2

Fuel cell system:
High power density (1.5kW/kg), reliable, low drag

LH_2 distribution:
safe, reliable incl. leakage management



Visuals produced with AI

LH_2 storage:
Higher energy density (>40% gravimetric index)

H_2 turbines:
low NO_X emissions (between -30 and -70% reduction)

Fuselage & empennage technologies:
tank installation, crashworthiness

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People

Air transport is the source of millions of jobs …

86.5 million jobs supported by air transport worldwide

11.6 million	**Direct jobs** Airports, airlines, civil aerospace & navigation	**13%**
20.4 million	**Indirect jobs** Supported through the supply chain	**24%**
17.2 million	**Induced jobs** Supported by spending of wages	**20%**
37.3 million	**Tourism catalytic jobs** Supported by aviation-enabled tourism	**43%**

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Source: ATAG 2024

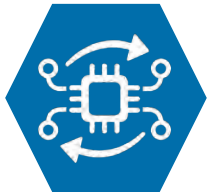
… but must deal with 3 key workforce challenges

RETIREMENT WAVE



An ageing workforce is driving major replacement needs across the aviation sector.

TECHNOLOGICAL SHIFT



“Unconventional” aircraft technologies plus AI, digitalisation and connectivity are reshaping aviation.

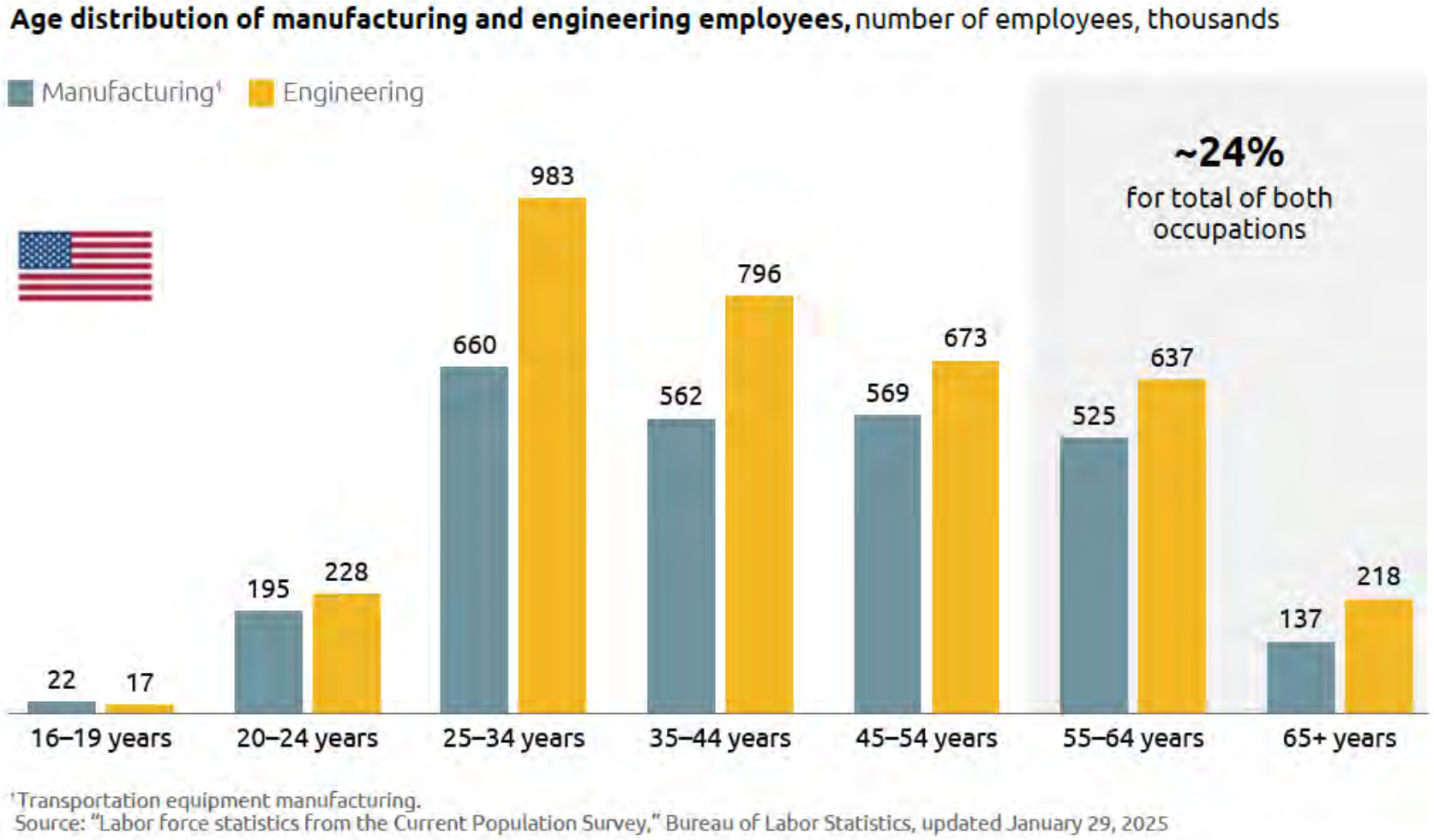
ATTRACTING YOUNG TALENTS



A stronger STEM talent pipeline is essential to secure aviation’s next generation.

Retirement wave poses a deficit in critical knowledge

A&D organizations retain an aging talent base, where **nearly a quarter** of Engineering & Manufacturing employees **are 55 years or older!**



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Call to Action

Call to Action: to all aviation stakeholders

01

PROFIT

Strengthen

Strengthening and consolidating our industry to prepare for the coming expansion

ANTICIPATE

02

PLANET

Invest

Investing in disruptive technologies to become more efficient and sustainable

ACCELERATE

03

PEOPLE

Focus

Ensuring that we foster the current & next generation of skilled aviation experts

ATTRACT