ECO-EFFICIENT WINGTIP

Competence Boost 2025

Structure . AI | AM . Part 21J

Smart Efficiency / Smart Life For (Legacy) Aircraft – TODAY!

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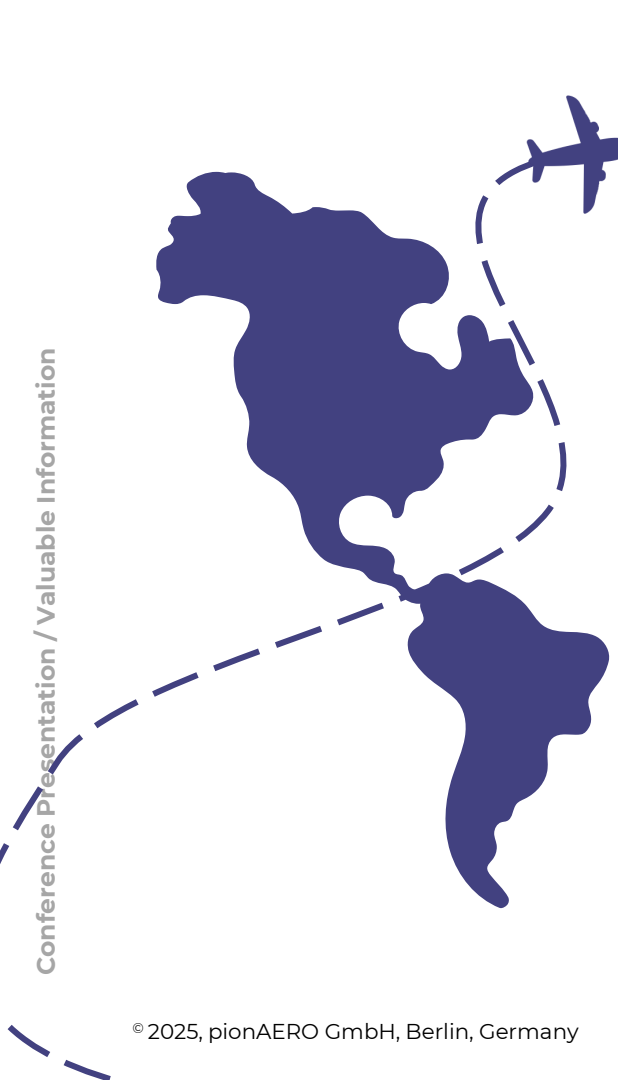

Company Purpose

Leading provider of OEM independent **eco-efficient modifications** and retrofit solutions (support by AI and AM) for **legacy aircraft.**

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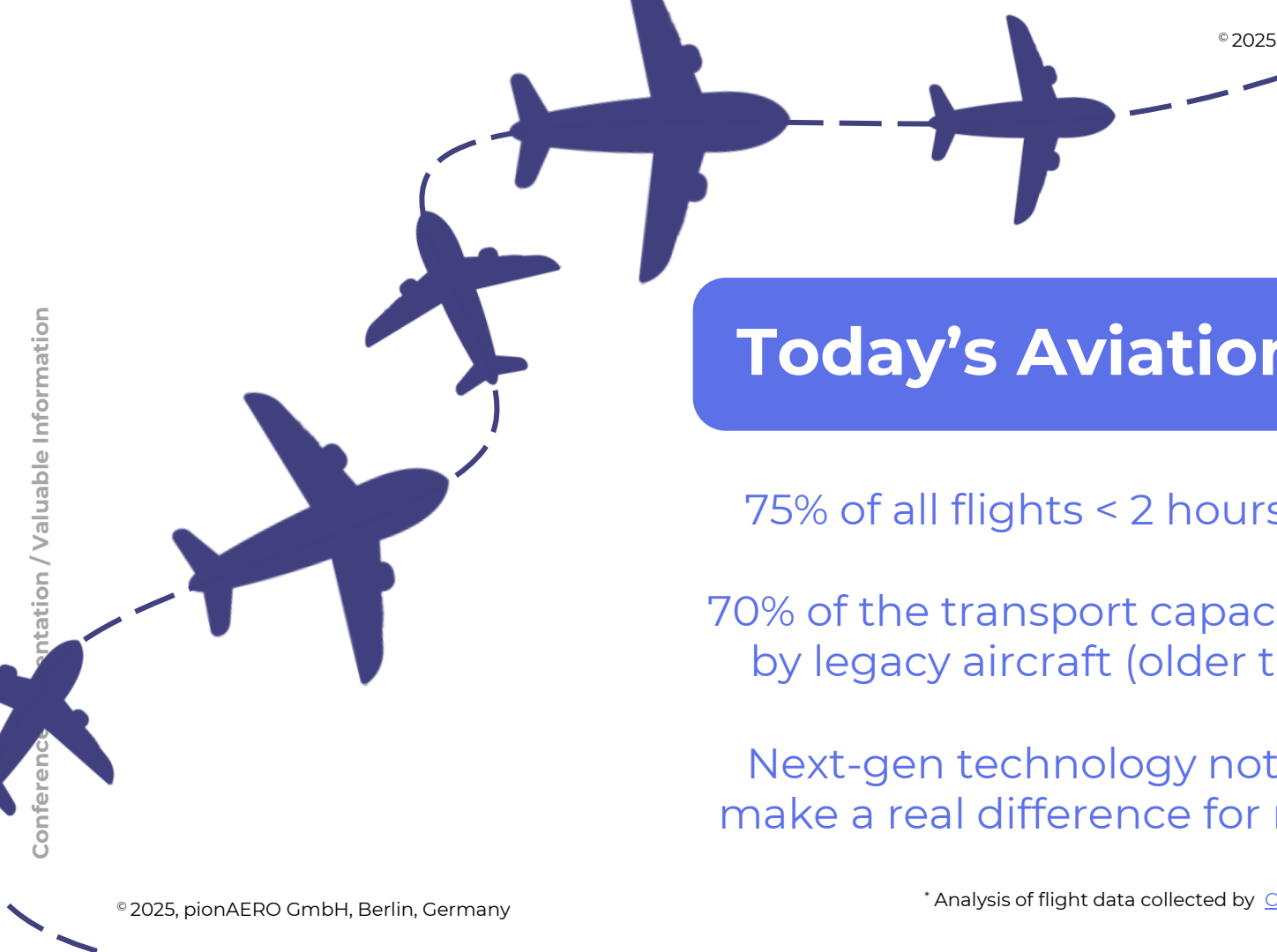

Today's Aviation Reality

75% of all flights < 2 hours or 1,000nm

70% of the transport capacity is provided by legacy aircraft (older than 5 years)

Next-gen technology not available to make a real difference for net zero 2050

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* Analysis of flight data collected by OAG, 1nm = 1 nautical mile = 1,852 km

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The Challenge

Airlines face cost and transition pressure ...

- High fuel prices
- Increasing CO_2 offset cost
- Demand for efficient aircraft / next-gen aircraft
- Airlines wait more than 10 years* for new aircraft

Note: Status of 01/2025 and assuming that Airbus and Boeing prodution rates ramp up quickly.

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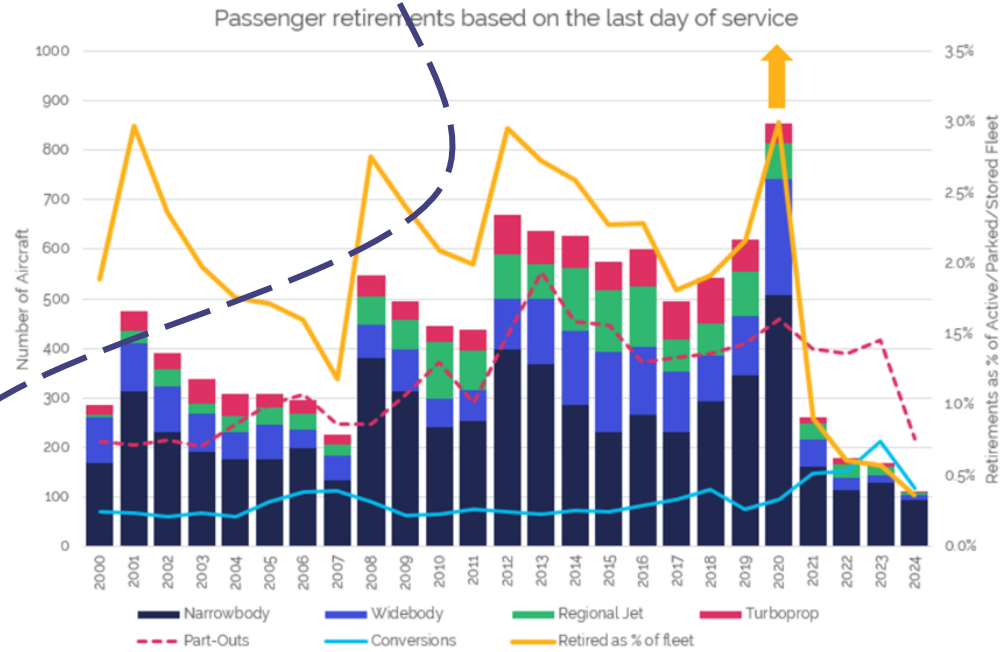
“Aircraft Retirements”



Source: IBA Insight, January 2025

Less than **100 aircraft** (fleet size: > 20.000) **retired 2024**

Trend has **intensified since 2020**

Value of “legacy” aircraft is **rising** sharply

No spare parts due to lack of retirement

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Smart Solutions

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- Type-specific and eco-efficient optimization (aerodynamics and structure) of (legacy) aircraft.
- **Spare part fabrication (as third party) – reducing aircraft downtimes by more than 80%.**
- Operations optimization (altitude/speed) for max. or customized/ESG driven fuel savings.

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Note: Foreseen aircraft types - A320^{ceo}/A330^{ceo} family, B737-800, B767 and B777

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Background Information

15,000+

Legacy aircraft of the A320^{ceo}/B737NG family are still in operation.

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Our Development Plan

Parts and components

Prototype changes, proof of concept

-3 years

Demonstrator

Build and fly effective options on Airbus A320ceo

today

System provider

Full scope eco modifications

+3 years

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FORESEEN AIRCRAFT TYPES: A320^{CEO}/A330^{CEO} FAMILY, B737-800, B767 AND B777.

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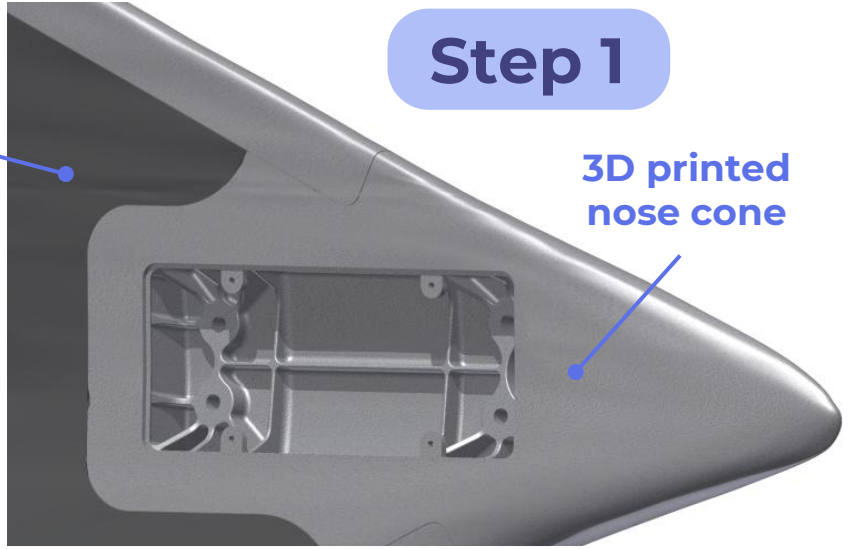
A320 Wingtip Fence Retrofit

GFRP-Composite

Step 1

3D printed nose cone



Prototyping finished!

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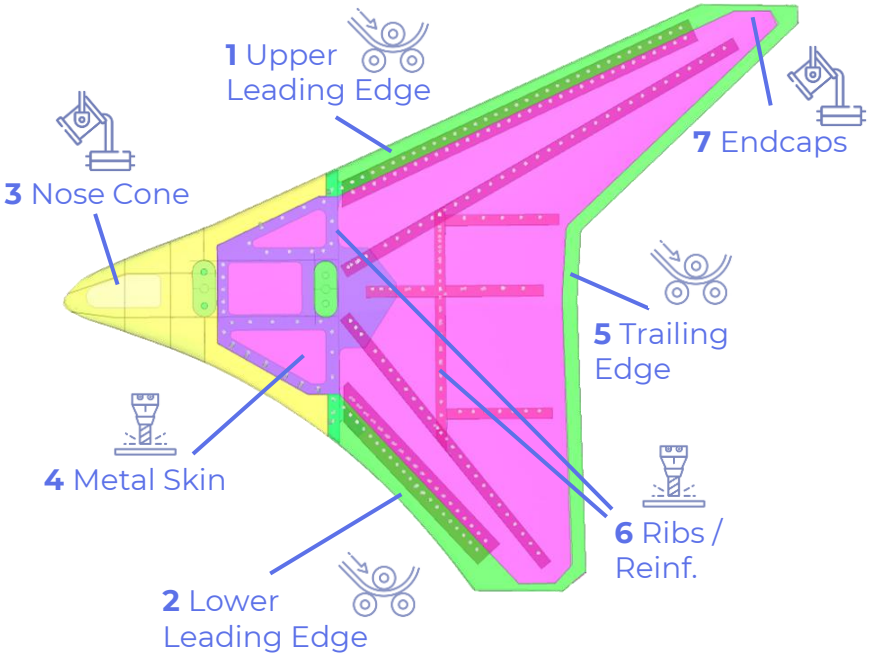
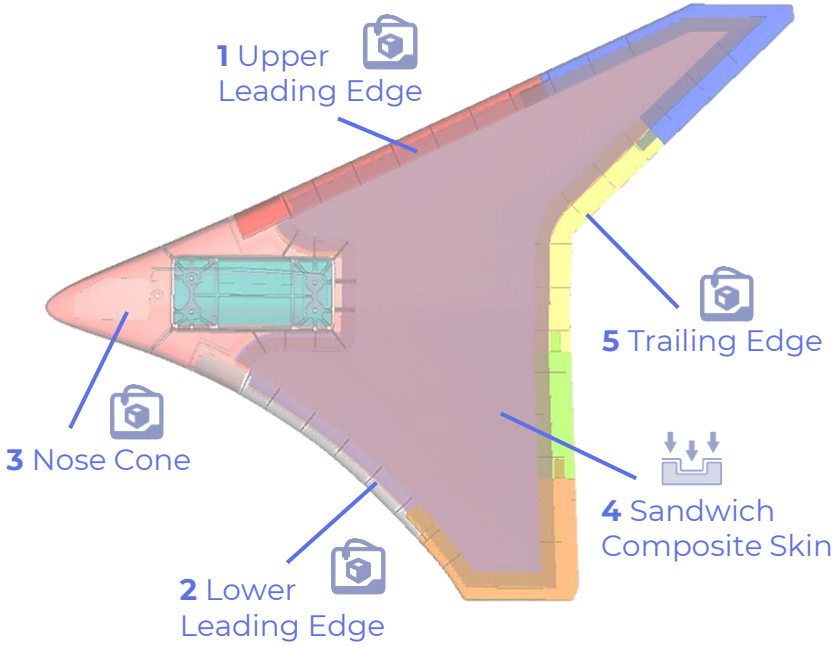
Reference vs. Retrofit

Legacy A320ceo WT-Fence



Retrofit A320ceo WT-Fence



Dimensions approx. H 1250 x W 970 x D 120 [mm]

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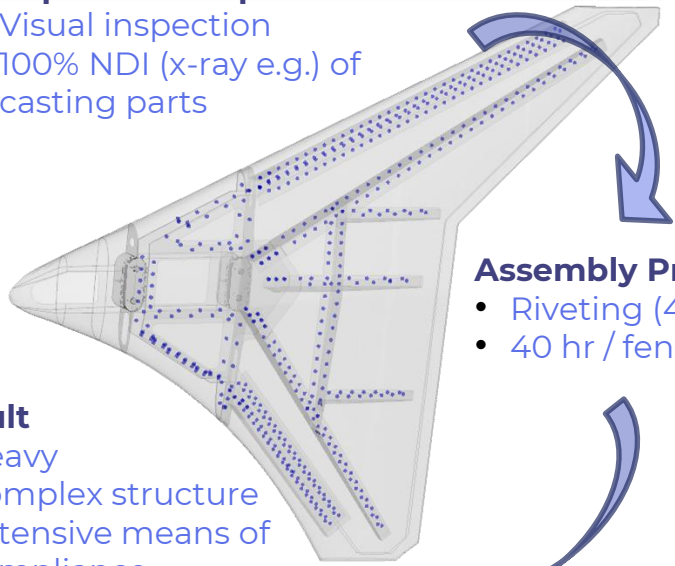
Reference vs. Retrofit

Legacy A320ceo WT-Fence

Components Inspection
- Visual inspection
- 100% NDI (x-ray e.g.) of casting parts

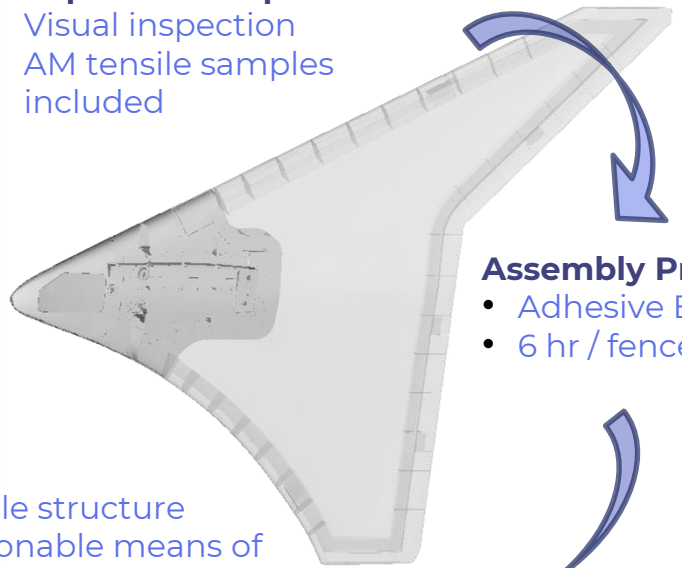


Assembly Process
- Riveting (470 pcs)
- 40 hr / fence

Result
- Heavy
- Complex structure
- Extensive means of compliance
- High manufacturing cost

Retrofit A320ceo WT-Fence

Components Inspection
- Visual inspection
- AM tensile samples included



Assembly Process
- Adhesive Bonding
- 6 hr / fence

Result
- Light
- Simple structure
- Reasonable means of compliance
- Moderate manufacturing cost

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Resumee – Retrofit Wingtip Fence

Requirements

Re-engineering of existing part.
Design optimization related to struture and production.

Technology

Implementation of innovative manufacturing and bonding processes.

Certification

Individual time-consuming process.
Complex demonstration of means of complience.

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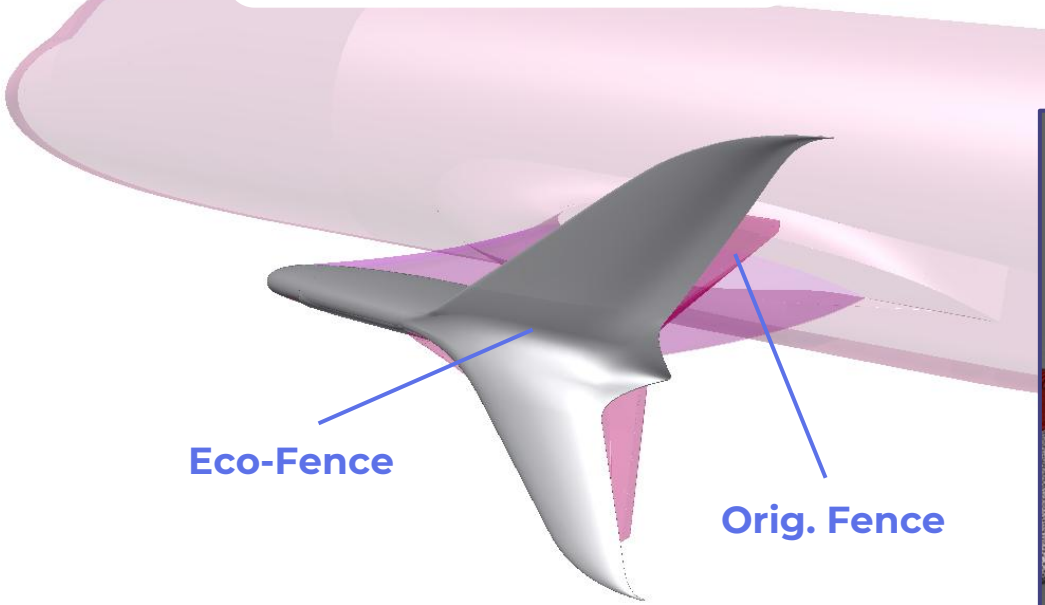
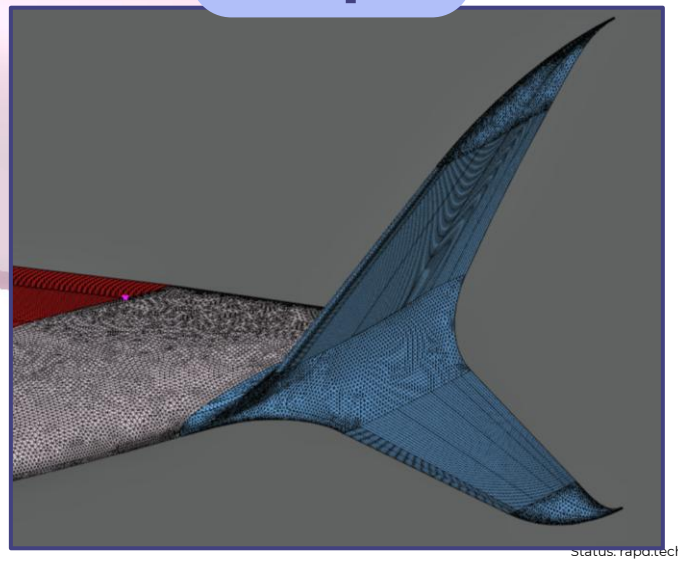
Next Step – A320ceo ECOfence

+2% Efficiency

Wingtip modification



Step 2



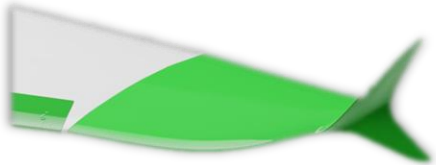
“Near-term” Product Range

A320^{eco} retrofit kit(s) (FAA/EASA STC`s)

Laminar slat

Improvement*: ~ 1%

Available from 2025



Laminar wingtip, ext.

Improvement*: > 4%

Available from 2025

Mini Trailing Edges

Improvement*: > 4%

Available from 2026

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Making “small” to “BIG”

Small technical change with a big impact on the environment

Yearly saving(s) per modified aircraft:

350 tons of fuel / Jet A1 – EUR 300.000

1.000 tons of CO_2 emissions – EUR 50.000

Calculation model: Airbus A320eco with laminar slat and ECOfence modification.
3 trips per day (@330 days) with 1.000 NM distance.
Block fuel: Total fuel for taxiing, takeoff/landing/cruise and reserves.

Calculation model: EUR 815 per ton as average Jet A1 fuel price in 2024.
(IATA, Jet Fuel Price Monitor)

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Thanks

Do you have any questions?

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