

BRABS: Bringing Retired Aircraft Back to the Skies

DSE Symposium 2026 | Group 32

13-7-2026



What Happens to Aircraft After Flying?



United States, Arizona



Spain, Teruel

Context

- Current fleet and annual growth rate
- Primary aluminium production
- What is done now?
- Decommissioned aircraft – 13,000



Transavia (2025)

Goal

- Closed-loop system
 - Aerospace-grade material
 - Waste reduction
 - CRM - EU independence
- Proof-of-concept aircraft



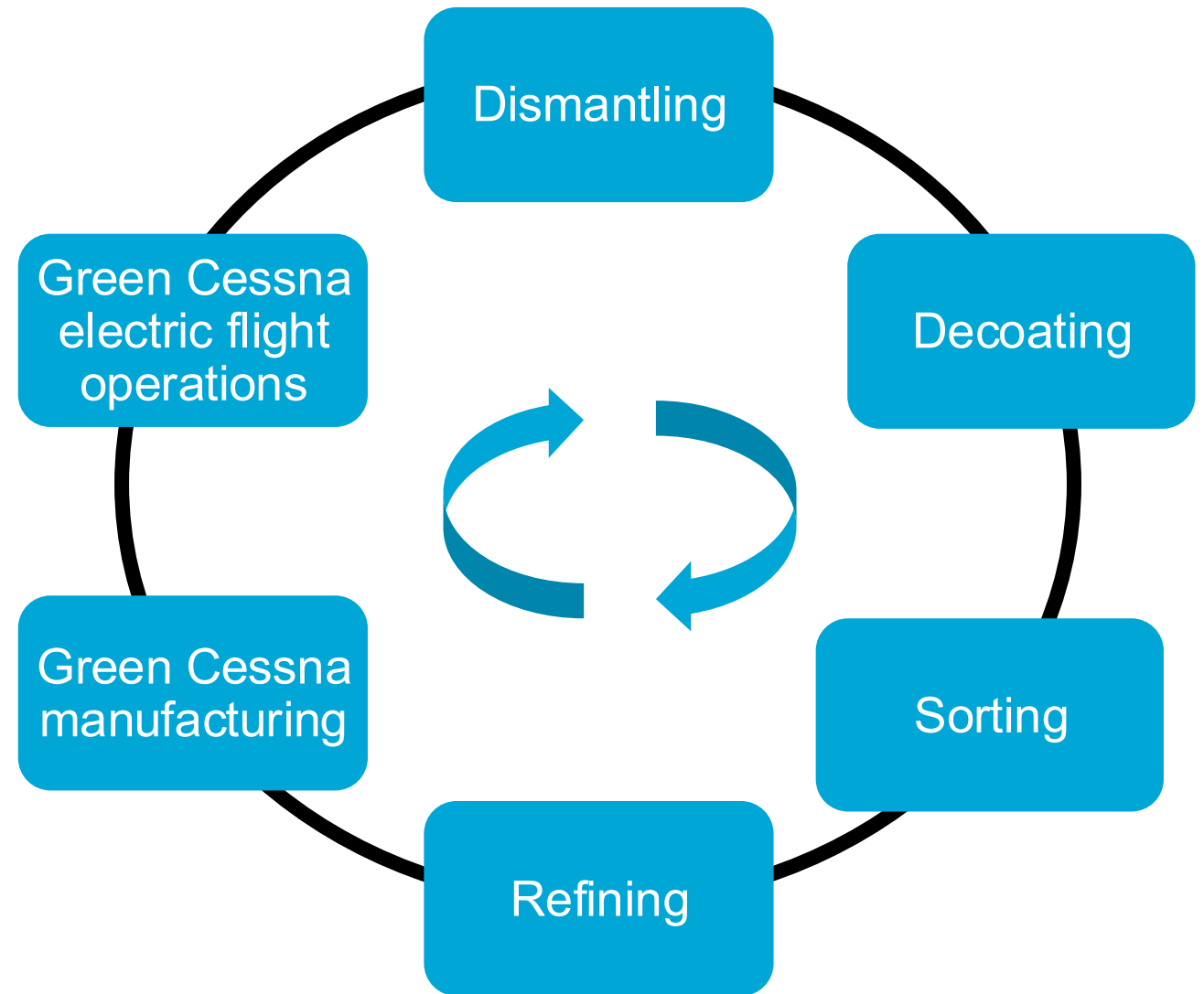
Requirements

- CO₂ reduction of 70%
- Maximum embodied energy 2.5kWh/kg in foundry
- Competitive pricing
- Use of recycled alloys in the retrofit Cessna whilst maintaining similar handling



Process Overview

- Foundry process
- Cessna design
- Business case





Aluminium Alloy Recycling

Challenges

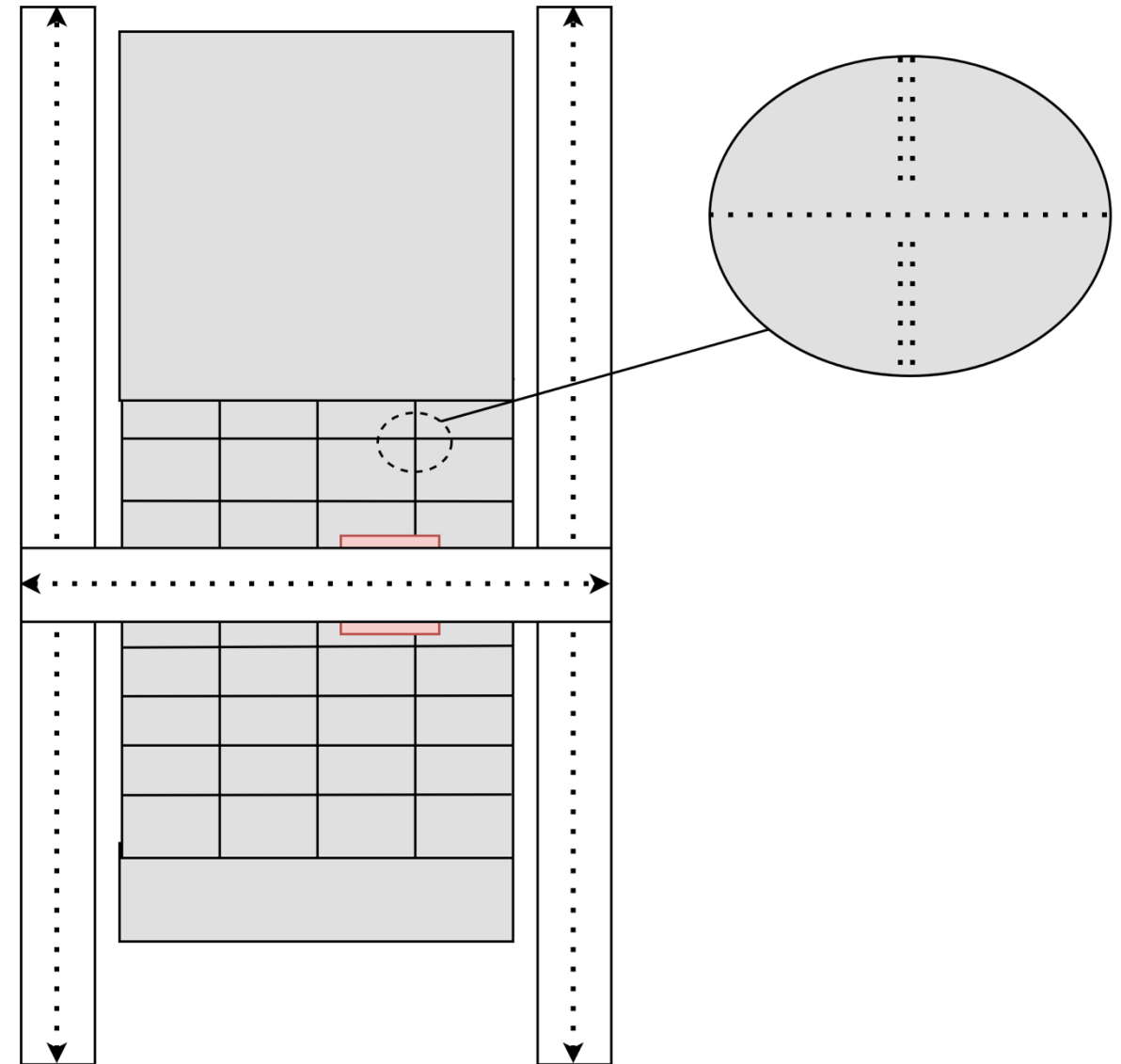
- Currently: aircraft downcycled
- Upcycling for aerospace comes with challenges



Popular science (2017)

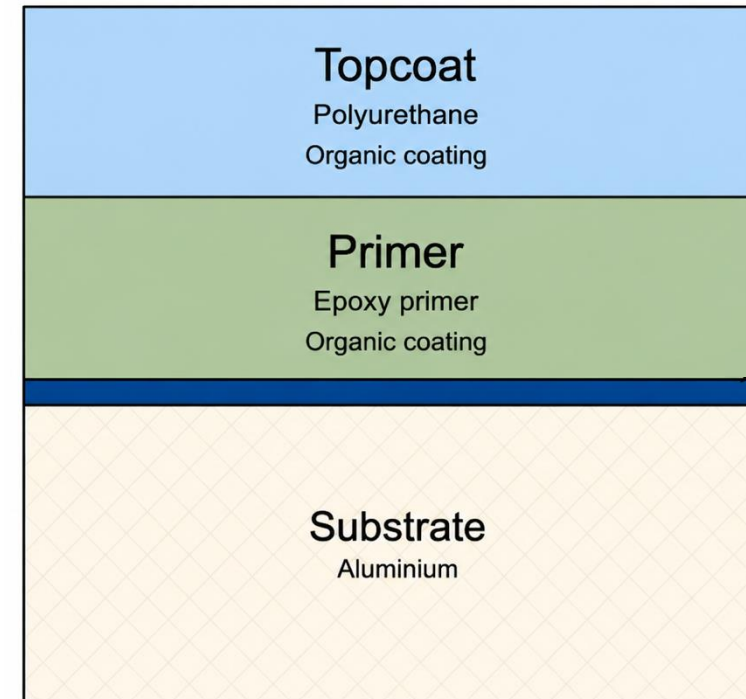
Fleet Dismantling

- Challenge:
 - Obtaining evenly-sized plates
 - Separate materials and alloys
- Solution:
 - Wire-saw into manageable sections
 - Laser-cutter tracing rivet lines
 - Final product no bigger than 80 x 30cm



Decoating Process

- Challenge:
 - Remove the coatings from the plates
- 3 layers
- Chromium VI
- Chemical bath sequence

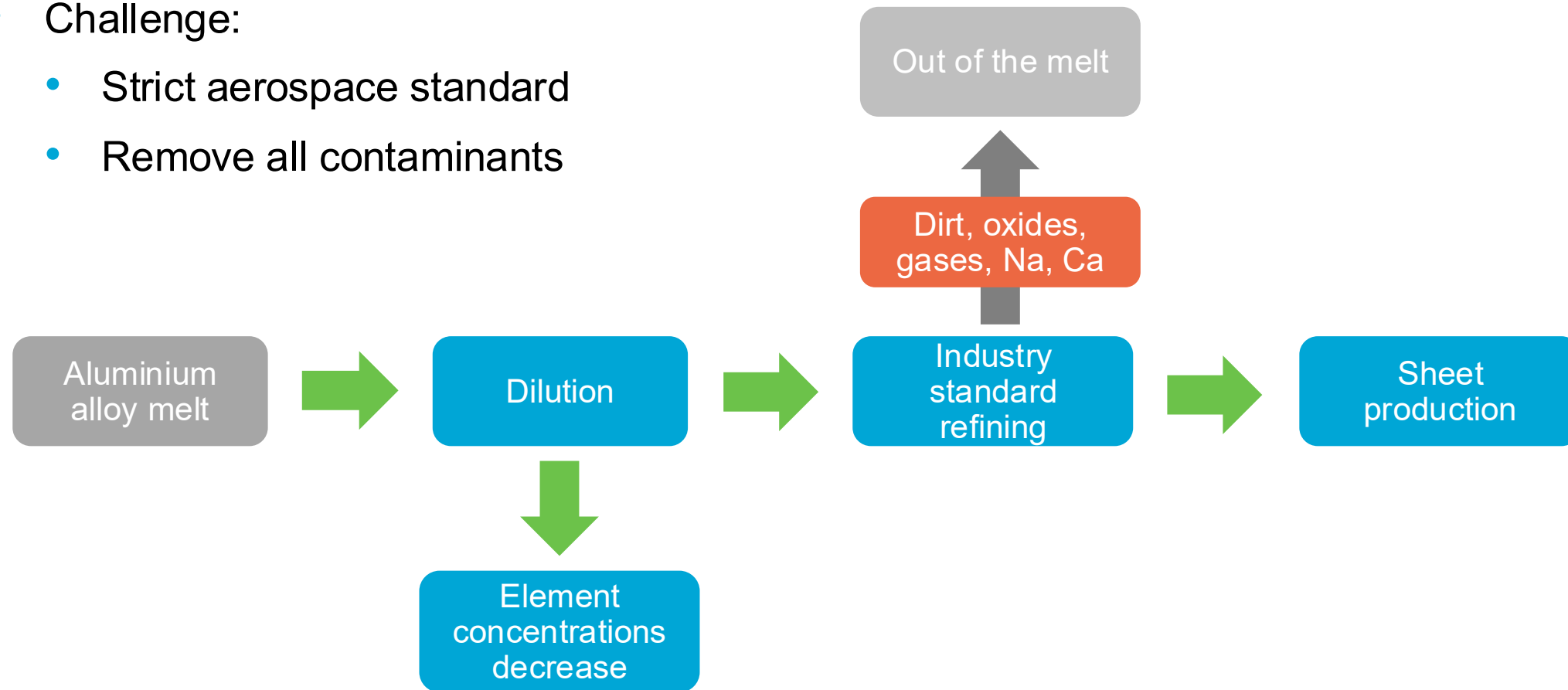


Alloy Mixing?

- Challenge
 - Sorting aluminium alloy plates
- Sorting separately too expensive
- 2 batches to create AA2024 and AA7075 (most common in aerospace)

Melt Refining

- Challenge:
 - Strict aerospace standard
 - Remove all contaminants



Sustainability

- Key advantages
- Electric energy requirement

Energy: 58% reduction

CO2 emissions: 98% reduction



MG metals (2026)



Closing the Loop: Retrofit Cessna

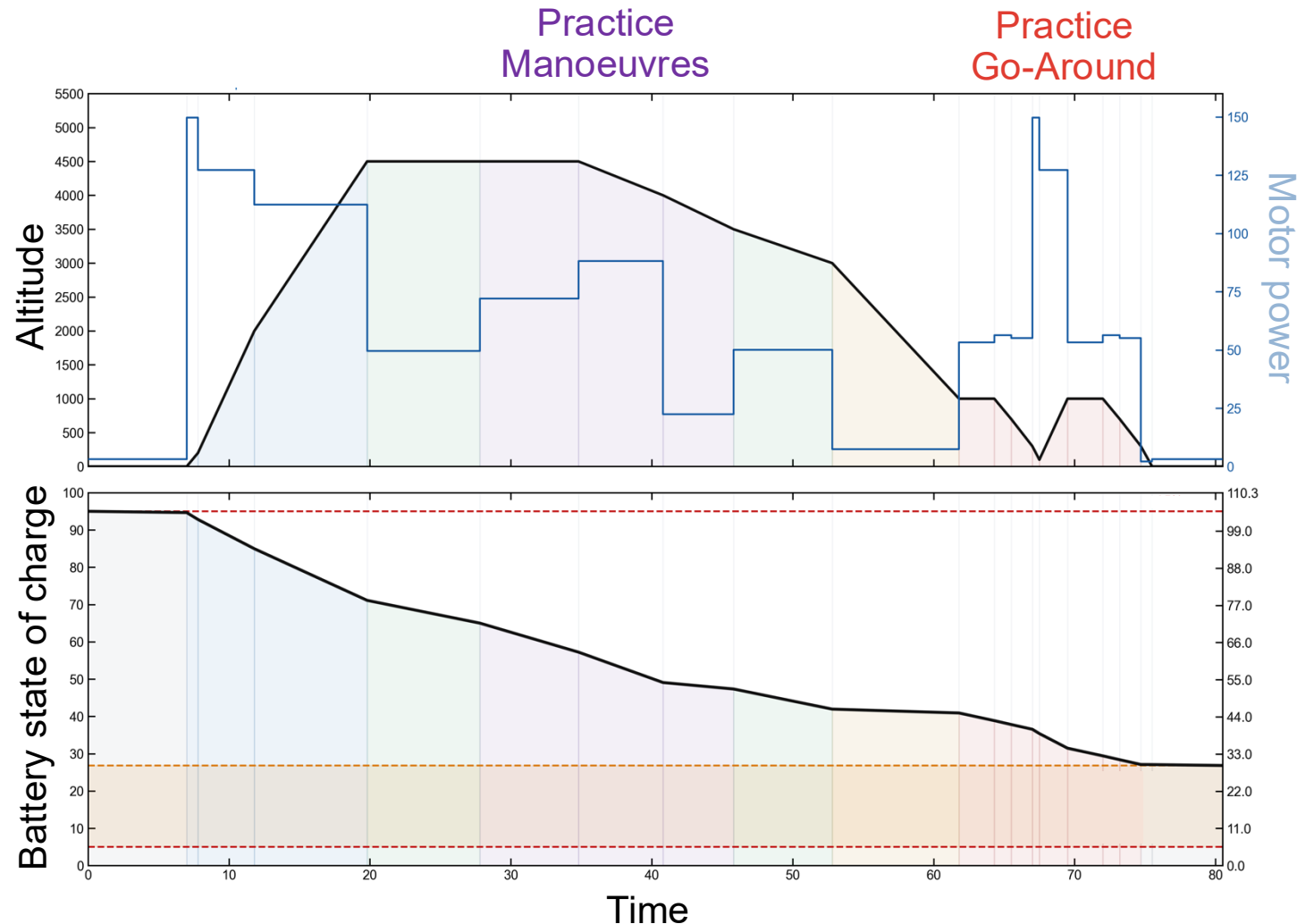
Why Retrofit a Cessna?

- Aviation industry is pushing for sustainability
- Retrofit Cessna 172 demonstrates:
 - Closed-loop aviation
 - Use of recycled aluminium alloys
 - Zero-emission electric propulsion



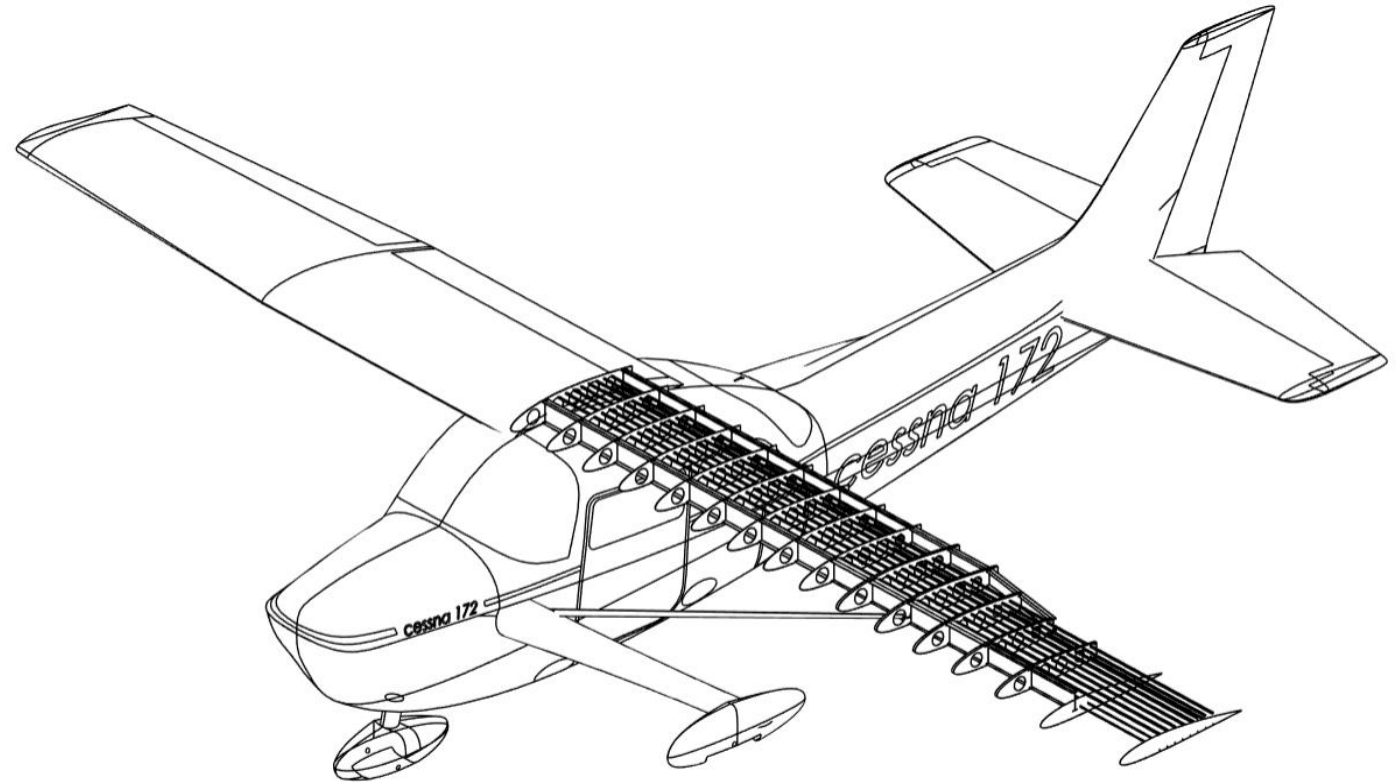
The Ideal Use Case: Training Flights

- Cessna 172 is the most used training aircraft
- Training flights are short and frequent: high emission impact
- Retrofit has:
 - Just enough endurance
 - Far lower emissions
 - Sufficient recharging speed



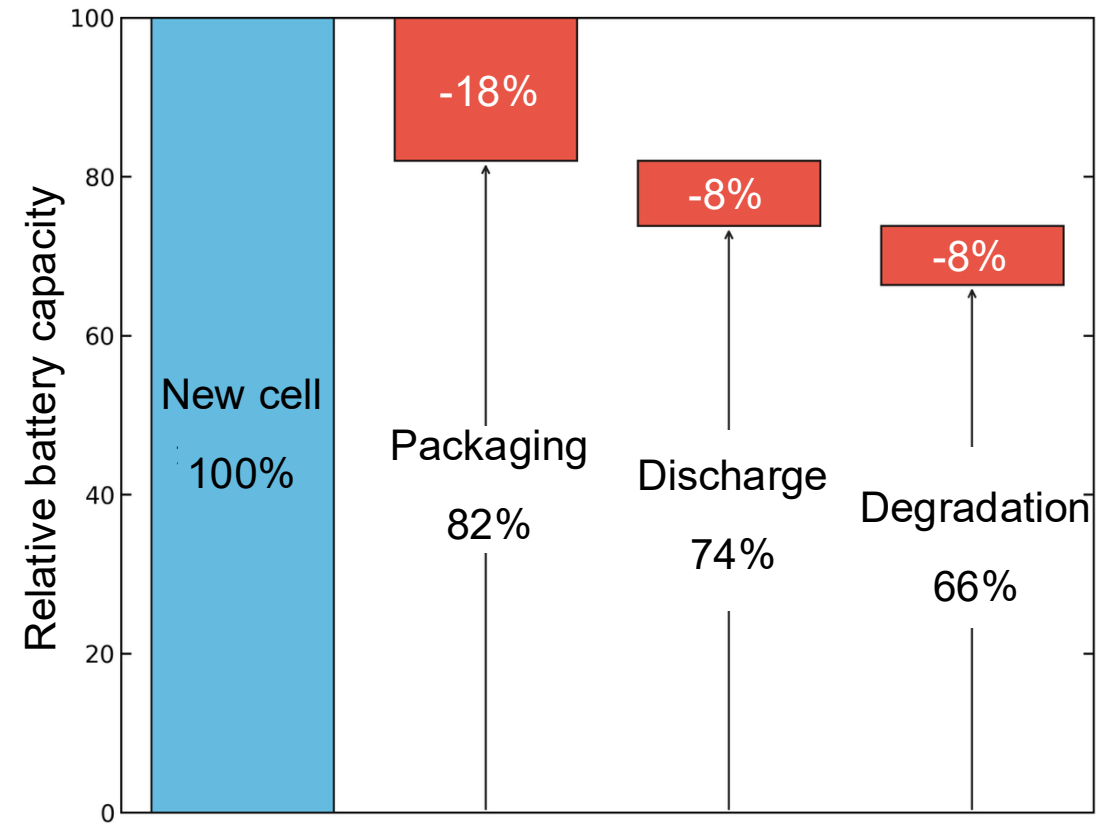
Using the Recycled Aluminium Alloys

- Redesigned wing:
 - Choice between recycled aluminium alloys
 - Designed to accommodate heavy batteries
 - Full structure can go back to recycling process



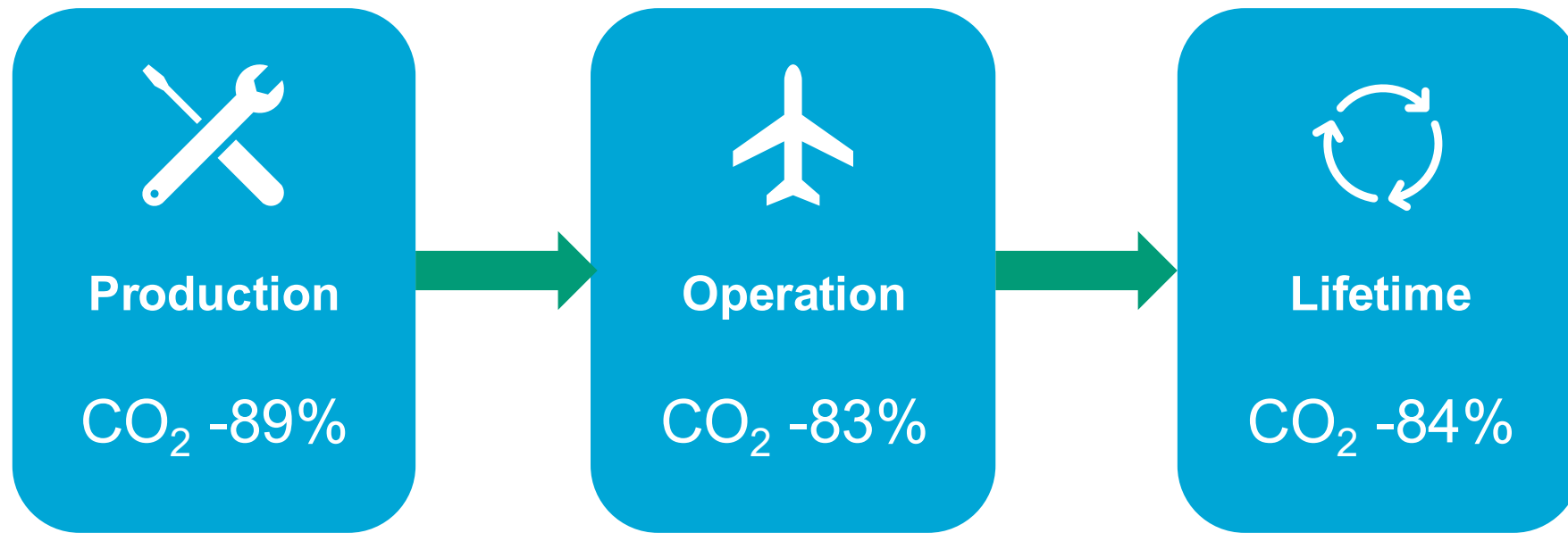
Electrifying the Propulsion System

- Batteries are very heavy: can we fit enough?
- Electric propulsion benefits:
 - Zero operating emissions
 - >200% more efficient
 - 50% less noise
- ✓ Requirement: similar handling/performance



How Sustainable Aviation Could Be

- Massive CO₂ decrease:
 - Use of recycled alloy
 - Zero-emission electric propulsion (only battery replacements)





Business Case

A Strong Environmental Case...



- 98%

CO₂ emissions



- 58%

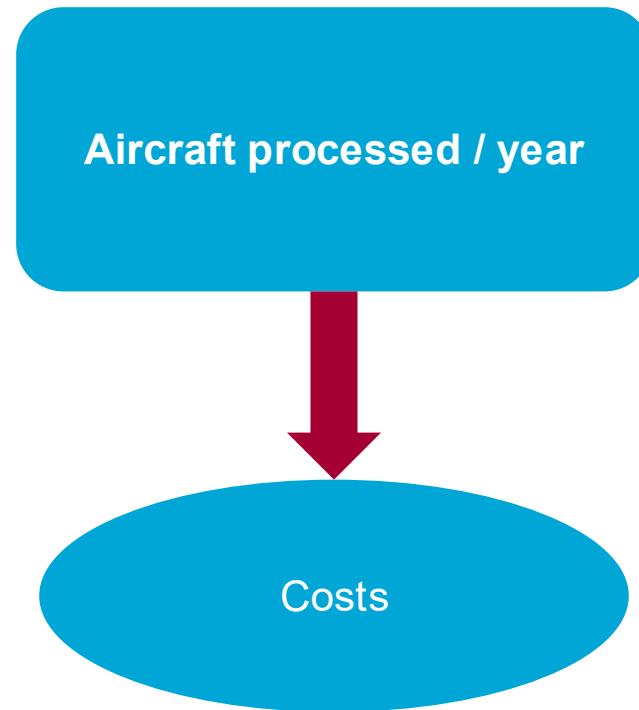
Energy use

...what about the economic one?

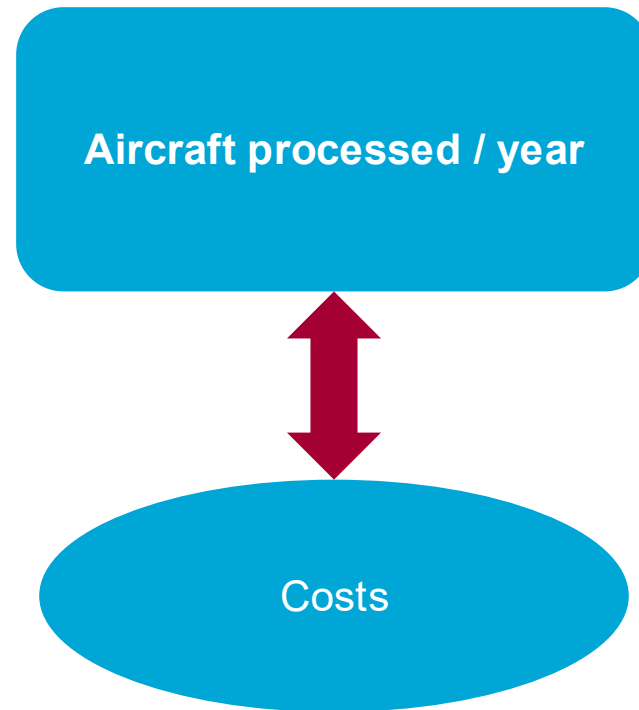
Scale for Viability

Aircraft processed / year

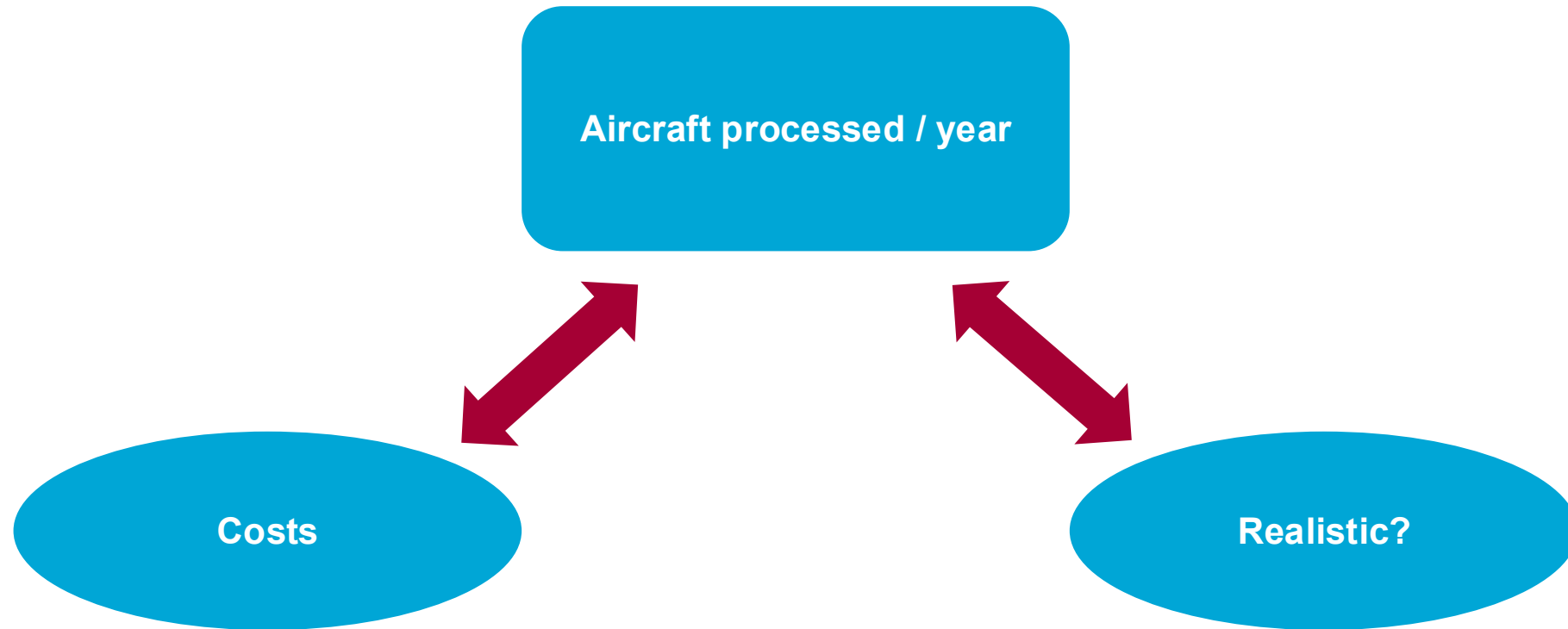
Scale for Viability



Scale for Viability



Scale for Viability



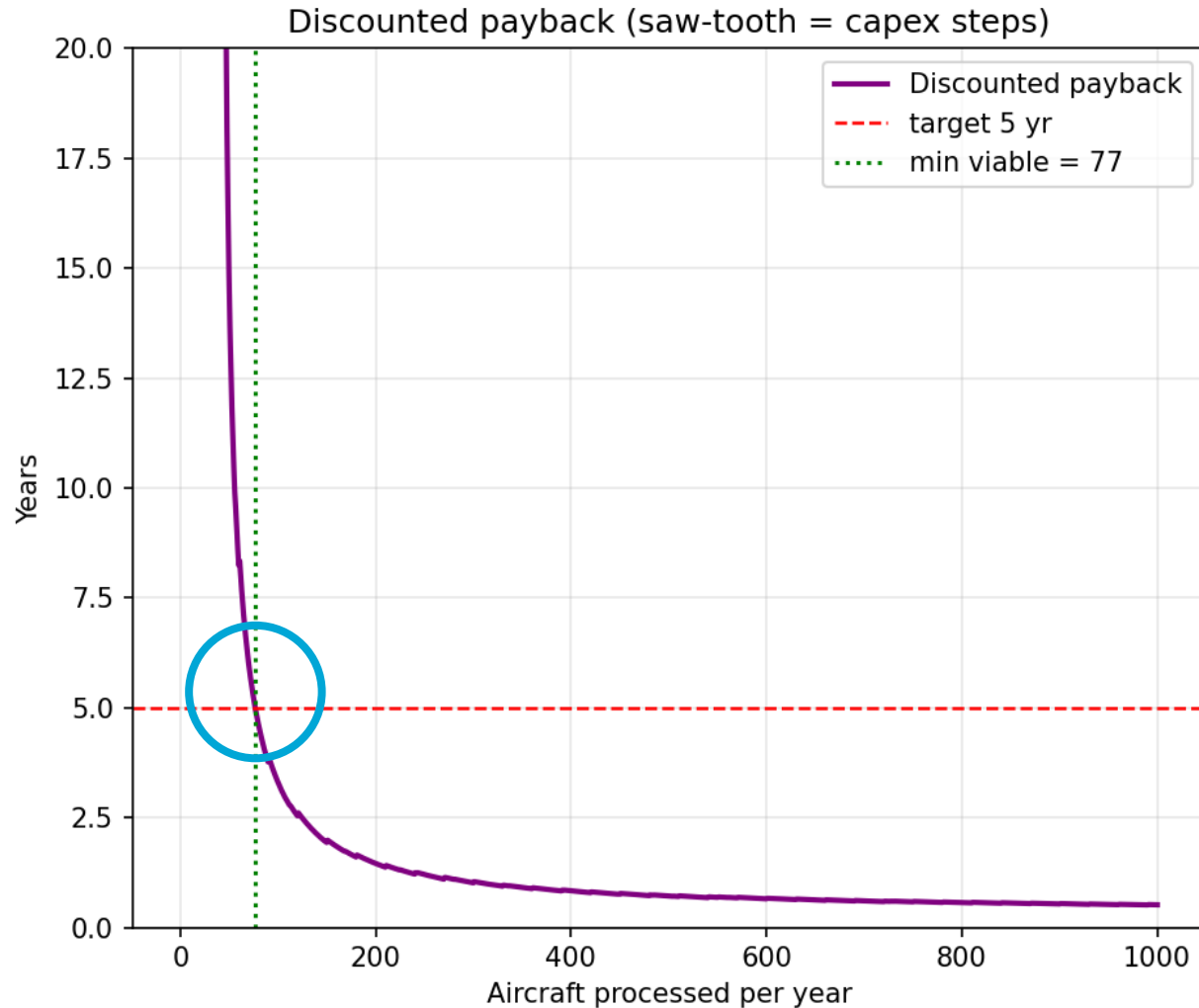
Scale for Viability



Scale for Viability

77 aircraft
=
12% yearly
retirements

Realistic!



Scale for Viability

Profit and Loss (P&L) Statement

77 aircraft

Minimum viable fleet

Scale for Viability

Profit and Loss (P&L) Statement

Aerospace-grade aluminium alloy sheets Revenue	€7.53M
Scrap metal Revenue	€1.78M

77 aircraft

Minimum viable fleet

Scale for Viability

Profit and Loss (P&L) Statement

Aerospace-grade aluminium alloy sheets Revenue	€7.53M
Scrap metal Revenue	€1.78M
Less: OPEX	€6.0M
Depreciation Expense	€0.60M

77 aircraft

Minimum viable fleet

Scale for Viability

Profit and Loss (P&L) Statement

Aerospace-grade aluminium alloy sheets Revenue	€7.5M
Scrap metal Revenue	€1.8M
Less: OPEX	€6.0M
Depreciation Expense	€0.6M
Net profit	€2.7M

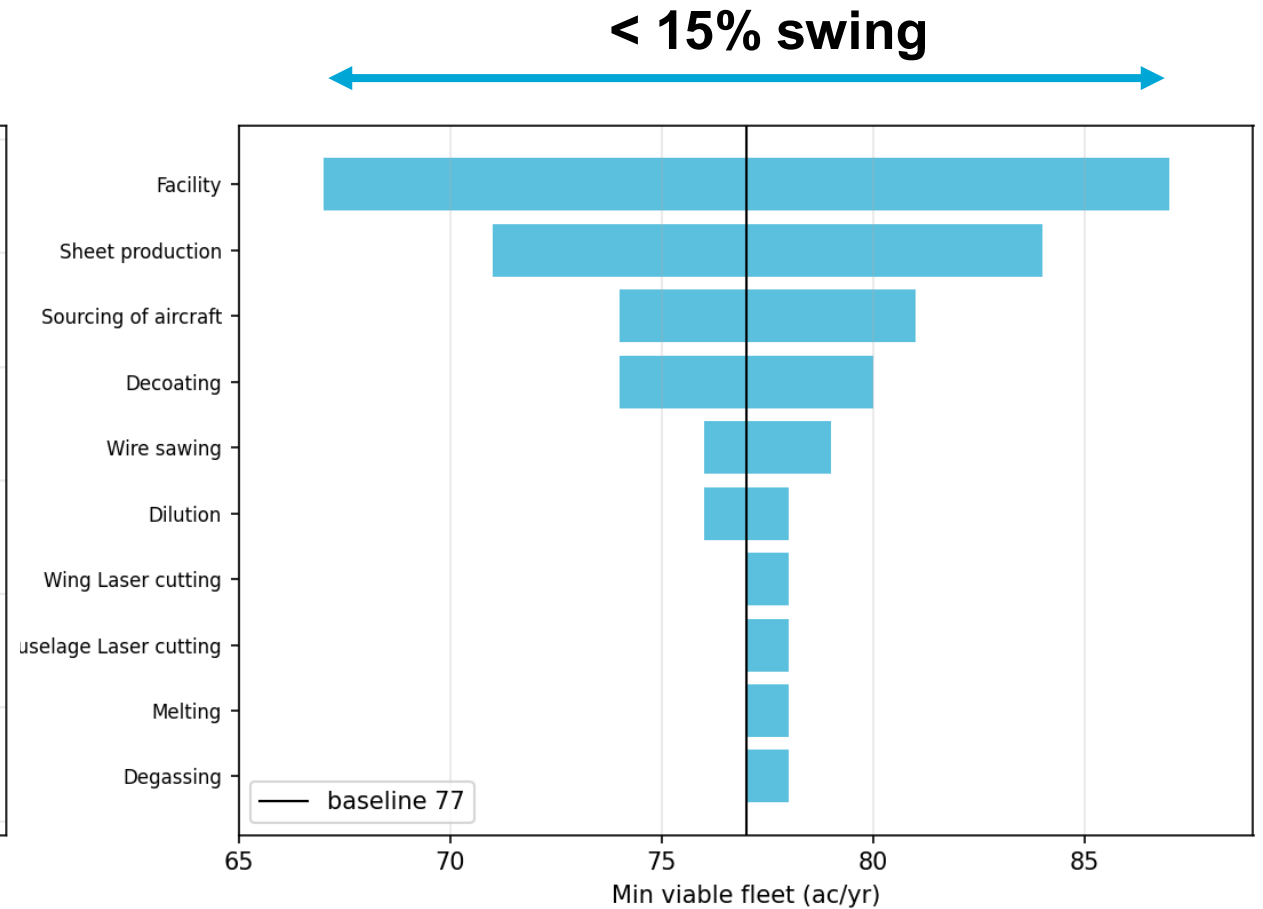
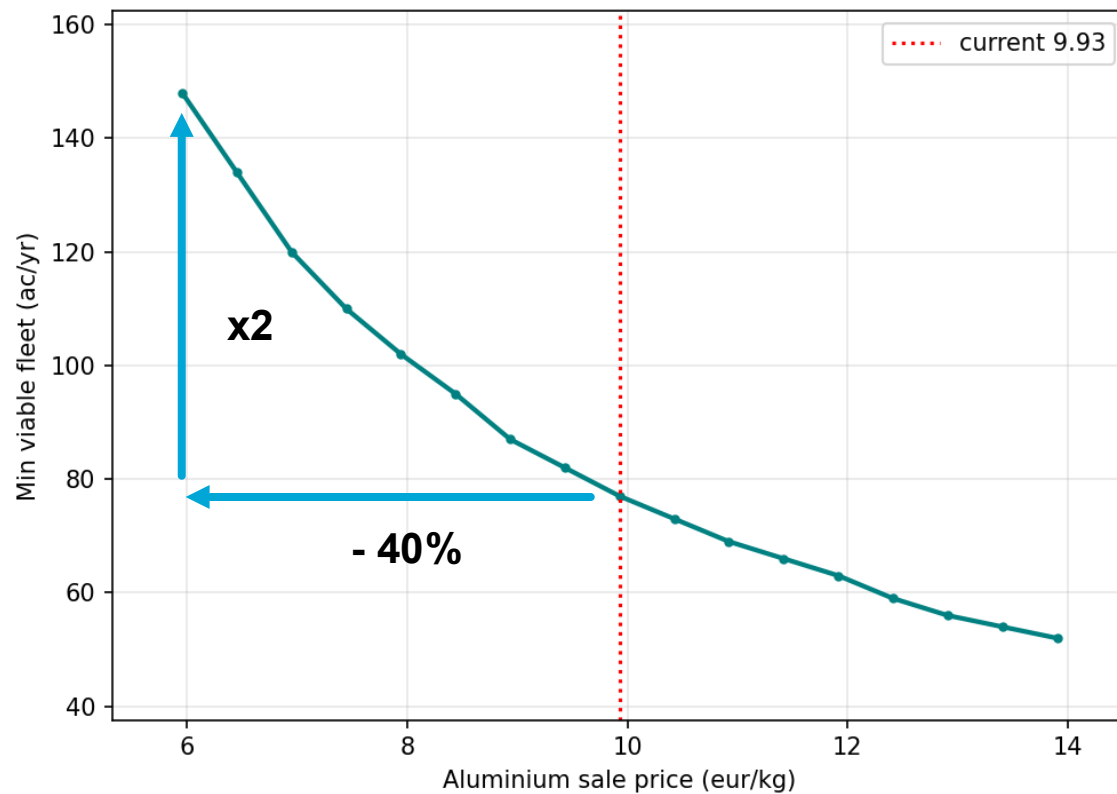
77 aircraft
Minimum viable fleet

+400% ROI
Over 20-year horizon

29% net margin
x6 compared to scrap

Sensitivity Analyses

FY2025: aluminium max. volatility $\pm 25\%$



Business Expansion

Lifetime

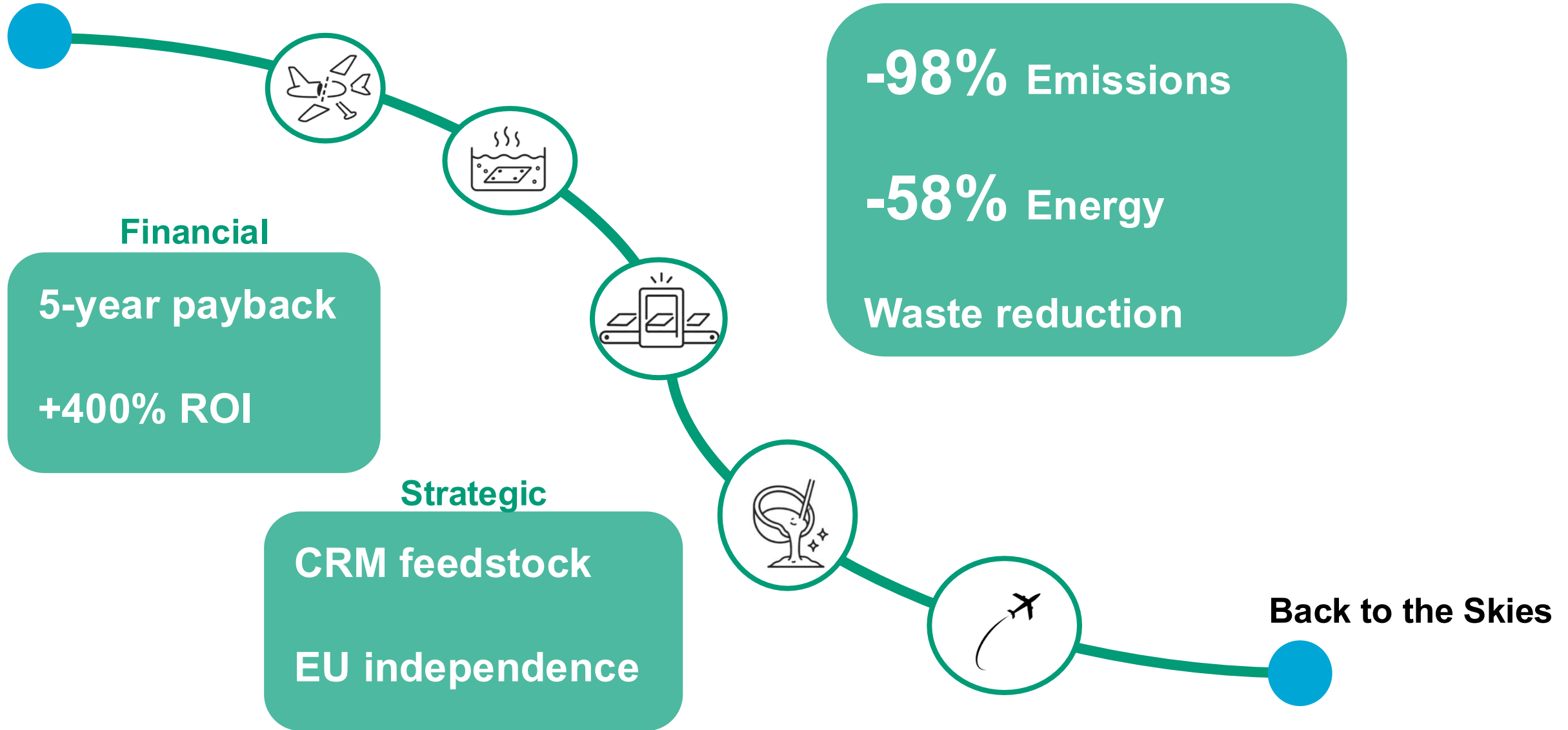
Cost: -64% / -21% (EU / US)

- **Goal:** sell 28 aircraft in year 5, growing 19% per year
 - Tens of tonnes of aluminium vs. 600 tonnes produced
- €50M investment certification + testing

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Conclusion

Bringing Retired Aircraft



Thank you!
Any questions?



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Hidden Slides

AA2024 Group		AA7075 Group	
AA2014	✓	AA2014	X
AA2017	✓	AA2017	X
AA2024	✓	AA2024	X
AA2219	X	AA2219	X
AA5083	✓	AA5083	X
AA6061	✓	AA6061	X
AA7050	X	AA7050	X
AA7150	X	AA7150	X
AA7075	X	AA7075	✓
AA7178	X	AA7178	✓
AA7475	X	AA7475	✓

