Flexible Airplanes?

Achieving higher fuel efficiency by continuously adapting wing geometry

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Problem

Climate Emergency
Severe consequences for the environment

Commercial Aviation Growth Forecast

- Billions of Passengers
- Megatons of Fuel

2.5% of total CO₂ was emitted by aviation industry in 2019
120% increase in fuel burn by 2045

Technical Problem

High Drag
Caused by surface discontinuities & gaps

Higher Fuel Consumption & Noise

Hinged flap
Sharp, discrete and discontinuous changes in wing geometry

Technical Solution

Camber Morphing
Smooth & continuous changes in wing geometry

Fish Bone Active Camber (FishBAC) device

How can it deflect continuously?
Combination of stiff and rigid components (e.g. carbon fibre plate) with flexible ones (e.g. silicone rubber sheet)

How was it made?
Manufacturing techniques: 3D printing, machining, composite hand layup

How do you simulate its behaviour?
Developed novel & bespoke structural and aerodynamic mathematical models during PhD

How was it tested?
Structural and wind tunnel experiments to study its structural & aerodynamic behaviour

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SABRE
Shape Adaptive Blades for Rotorcraft Efficiency

Video here!