University of BRISTOL
Bristol Composites Institute (ACCIS)

ADVANCED COMPOSITES COLLABORATION FOR INNOVATION & SCIENCE

EPSRC
Engineering and Physical Sciences Research Council

University of BRISTOL
EPSRC Centre for Doctoral Training in Advanced Composites for Innovation and Science

Flexible Airplanes?

Achieving higher fuel efficiency by continuously adapting wing geometry

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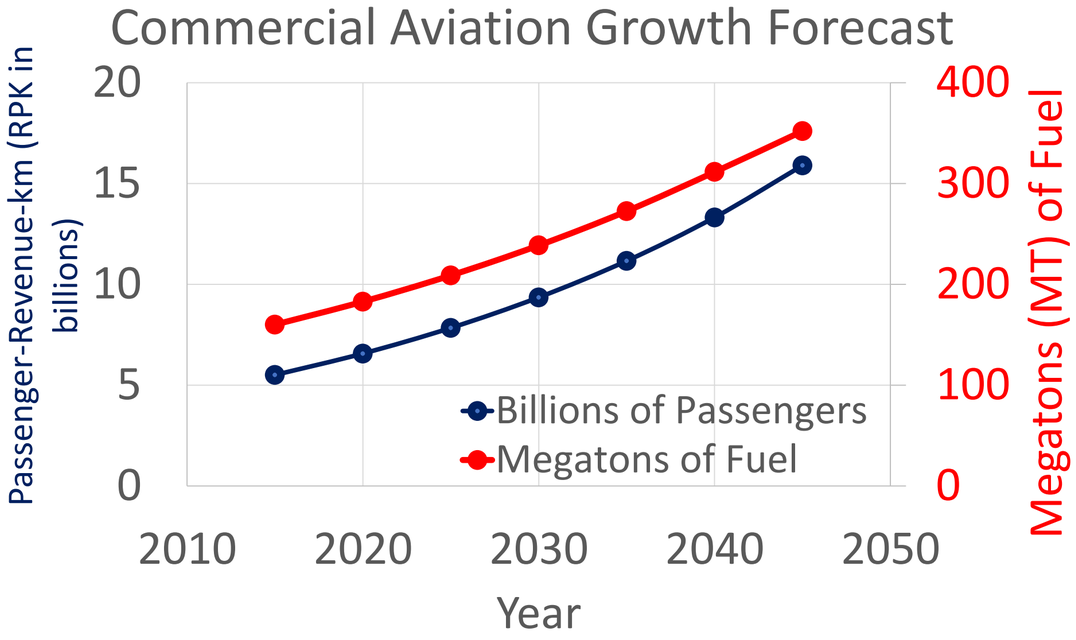
Problem

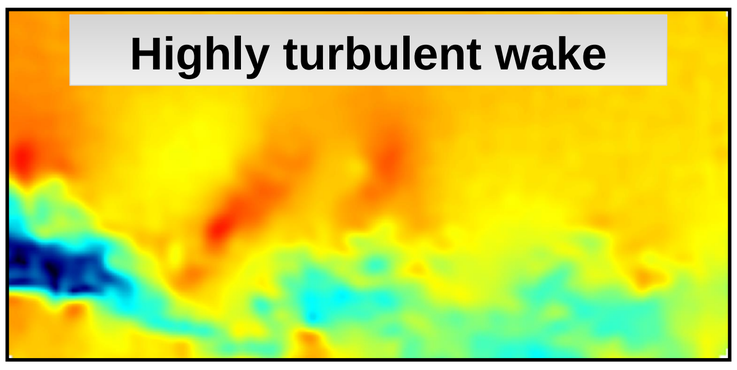


2.5%
of total CO_2 was emitted by aviation industry in 2019

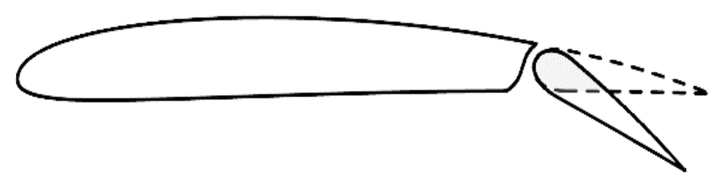
120%
increase in fuel burn by 2045

Climate Emergency
Severe consequences for the environment

Technical Problem



Hinged flap



Sharp, discrete and discontinuous changes in wing geometry

High Drag
Caused by surface discontinuities & gaps → **Higher Fuel Consumption & Noise**

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

16% to 50% lower drag
Compared to a hinged flap

3% to 6% lower fuel burn
If implemented in commercial airliners

More research is needed
To scale technology up to meet industrial standards

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SABRE
Shape Adaptive Blades for Rotorcraft Efficiency

Video here!