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# Flying Green

Cranfield Showcase: 20<sup>th</sup> Sept 2022

# Executive Summary

- Cranfield Aerospace Solutions (CAeS) is developing a conversion of the BN Islander aircraft to hydrogen fuel cell propulsion
- Phase 1 of a multi-phase Fresson programme to produce a range of green aircraft up to c.75 seats



seeking to develop the world's first zero emissions, regulatory-certified commercial passenger aircraft

- CAeS is partnered with the OEM, Britten-Norman to modify the existing airframe
- Flight demonstrator 2023
- Commercially available product by 2025 (STC & line fit)



Size matters



# Ambition

## Fresson Programme – Disrupting the Aerospace Industry



1

(Underway)

Critical first step to get fully integrated zero emissions aircraft certified – Accelerates later phases

- Conversion of 9-seat Britten-Norman Islander to hydrogen fuel cell propulsion
- £6.3m grant-funded by Aerospace Technology Institute (ATI) to produce demonstrator aircraft (flight-ready by Q1,2023)
- Commercial product by Q1, 2025



2

(Commences 2022)

Switch to liquid H2 is vital to commercial viability and de-risked by Phase 1 certification

- Conversion of 19-seat aircraft to hydrogen fuel cell propulsion (600 kW system)
- Main airframe candidates are Cessna 208 and DHC Twin Otter
- Likely to require use of liquid, rather than gaseous, hydrogen



3

(Commences 2023)

Optimising aircraft design around the propulsion system and airline use cases – de-risked and accelerated by Phase 2

- Design and production of new, 19-seat aircraft optimised for hydrogen-electric propulsion
- In collaboration with other aerospace players



4

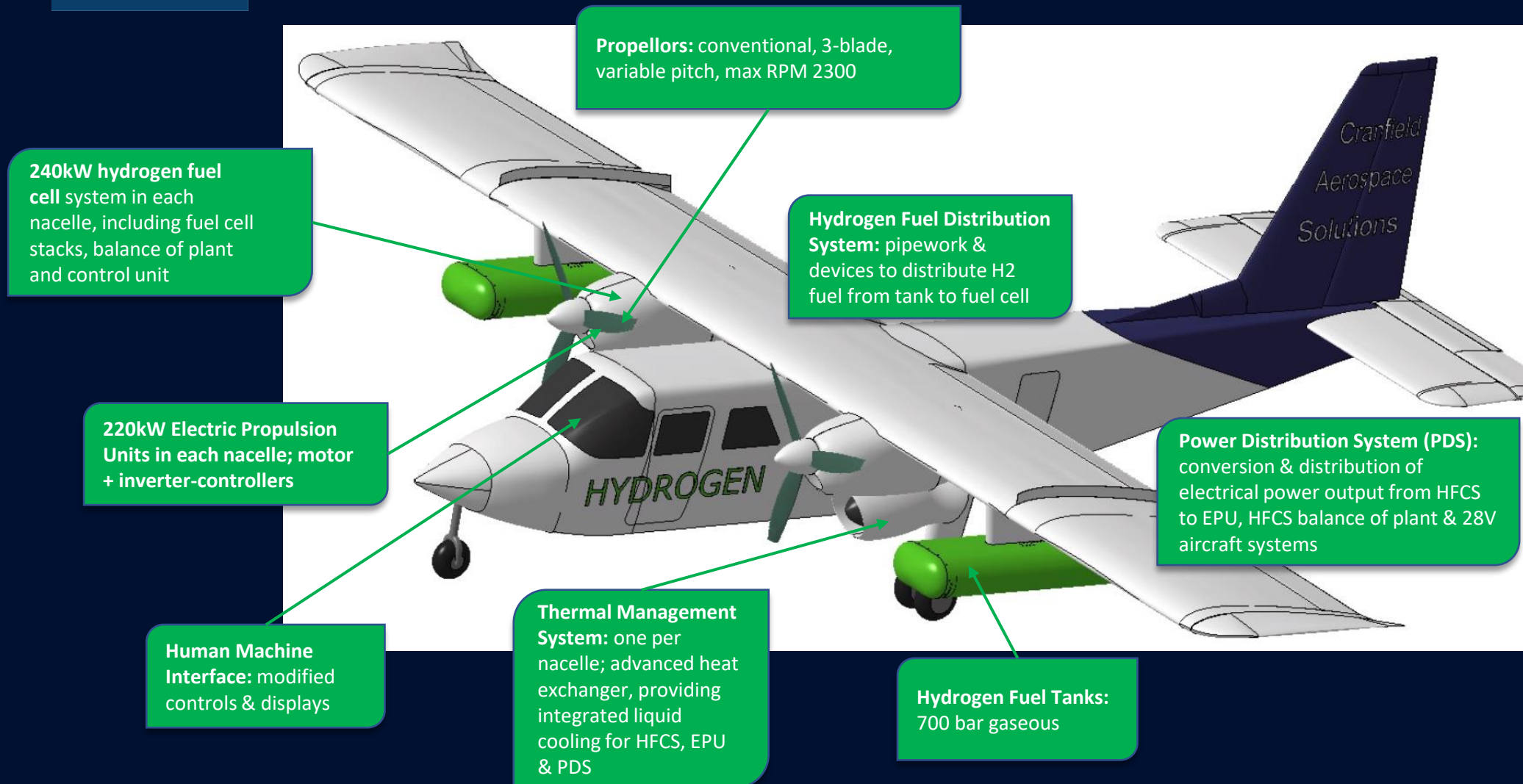
(Commences 2029)

Aerospace market disruption – will challenge the operating models of existing OEMs in speed to market and commercial/environmental viability

- Design and production of new, 75-seat aircraft optimised for hydrogen-electric propulsion
- In collaboration with other UK aerospace players



# The Technology





# FRESSON Hydrogen Fuel Cell Propulsion

## Why is this difficult?

**We are not only trying to demonstrate the technology, we are developing a certifiable commercially viable product:-**

### Key Design Challenges

- Mass
- Packaging
- Thermal management
- Drag

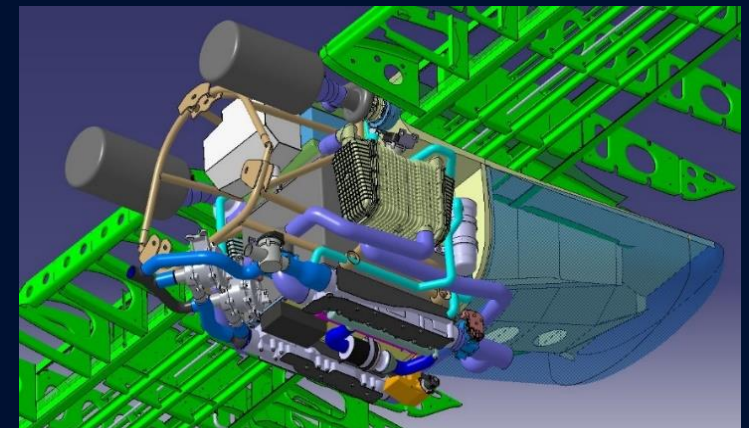
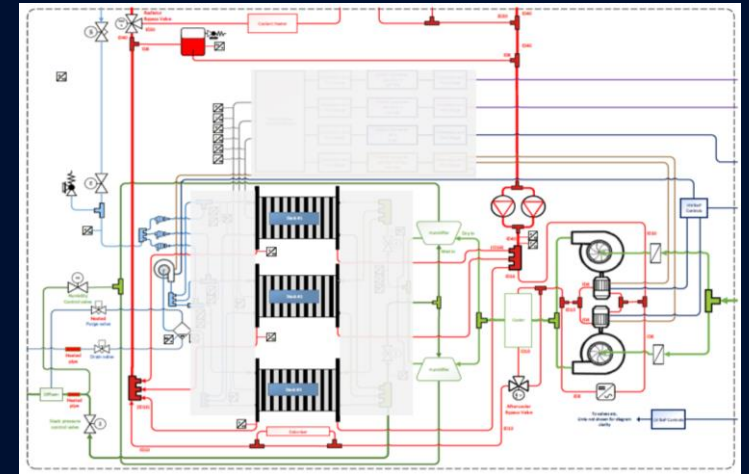
These are the key problems the aerospace industry needs to solve. With project Fresson, CAeS is starting to solve these problems in a real aircraft development.



# FRESSON Hydrogen Fuel Cell Propulsion

## Foundation for zero carbon emissions aircraft design

- FRESSON delivers applicable and scalable hydrogen fuel cell powered, electric propulsion for 9- to 19-passenger commercial aircraft (and larger)
- Builds foundation for CAeS whole-aircraft design, for new, zero-emissions aeroplanes:
  - Experts in zero-emissions propulsion system architecture and integration
  - Intelligent customer for zero-emissions propulsion sub-systems and components
  - Building valuable IP in the design and integration of zero emissions propulsion systems.
  - Gaining an understanding of how this new technology will affect new airframe design.







Hydrogen





HYDROGEN

Hydrogen Solutions



Thank you

