



aerodays2015

Aviation in Europe – Innovating for Growth

The 7th European Aeronautics Days



L O N D O N



20 – 23 OCTOBER 2015



aerodays2015

Aviation in Europe – Innovating for Growth

The 7th European Aeronautics Days



Composite fan blades for large turbofan engines; verifying and manufacturing the future

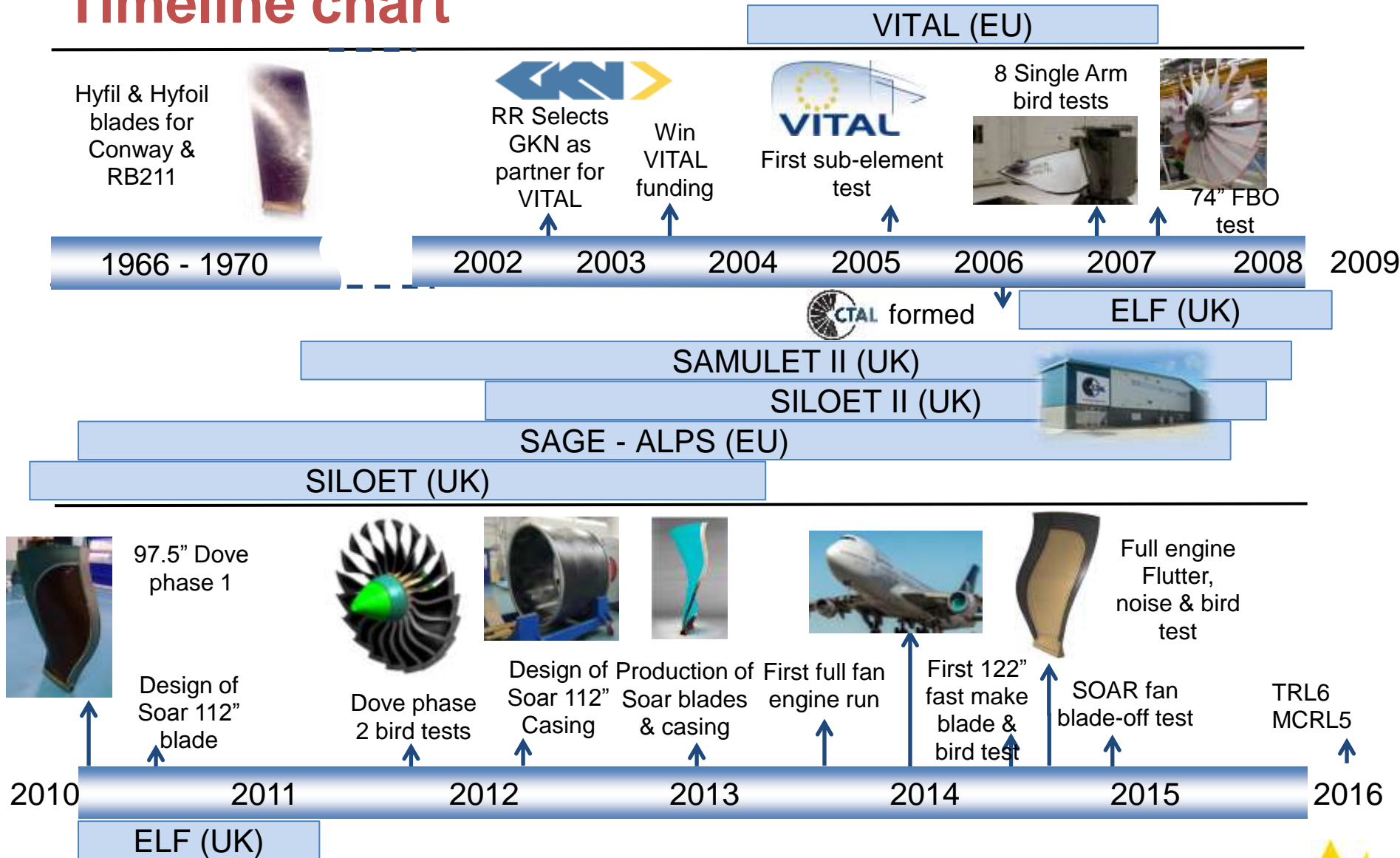
Justin Dalton

Chief Project Engineer and Head of Programmes
Composite Fan.

The Journey So Far....



Timeline chart



Developing C Tests Compl

Rolls-Royce

Rolls-Royce

Rolls-Royce

Rolls-Royce

University of BRISTOL

SULZER

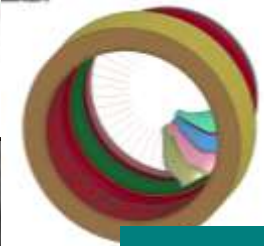
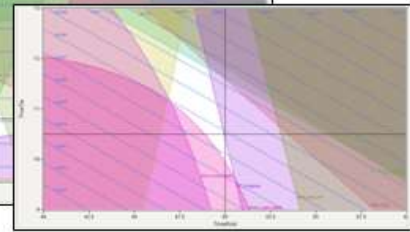
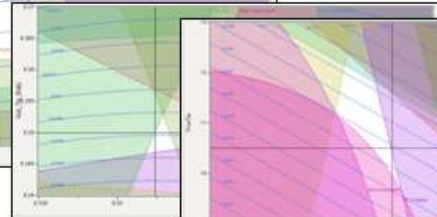
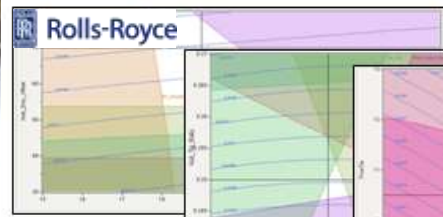
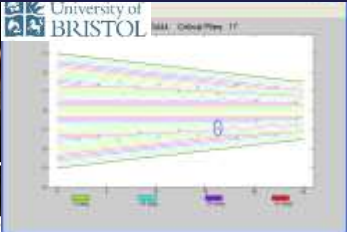
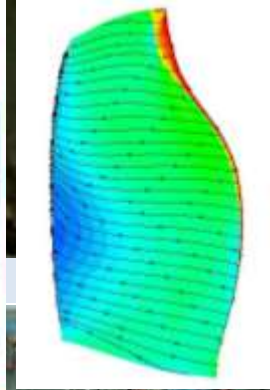
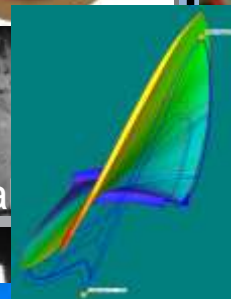
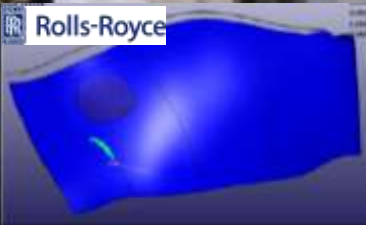
University of BRISTOL

Example 1

Example 2

Quasi-static
High Rate

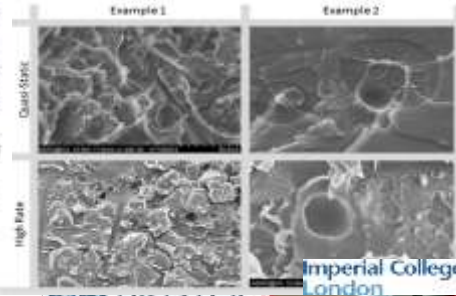
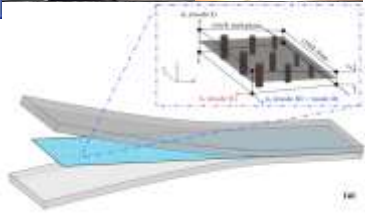
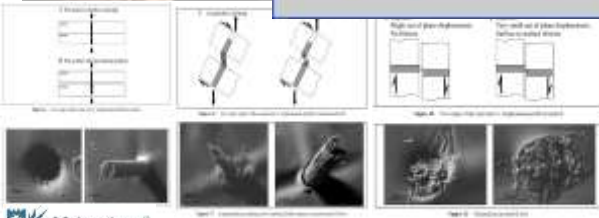
Imperial College London



Light r

Root p

Liner impact



SAB (Single Arm Bird testing)



Four generations of blade development



Vital Blade
715mm, 74"



Dove Blade
925mm, 97"



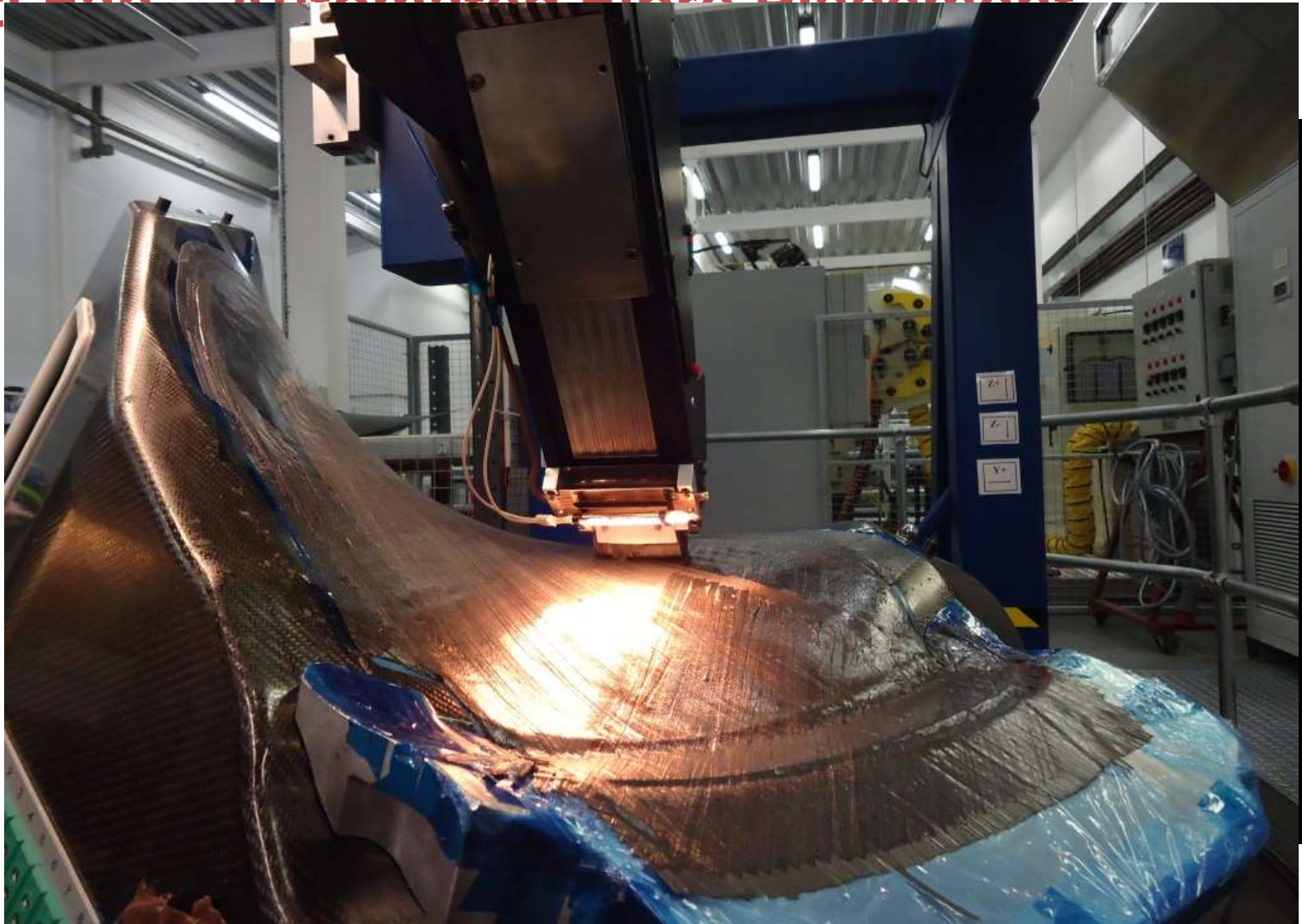
Soar Blade
1111mm, 112"



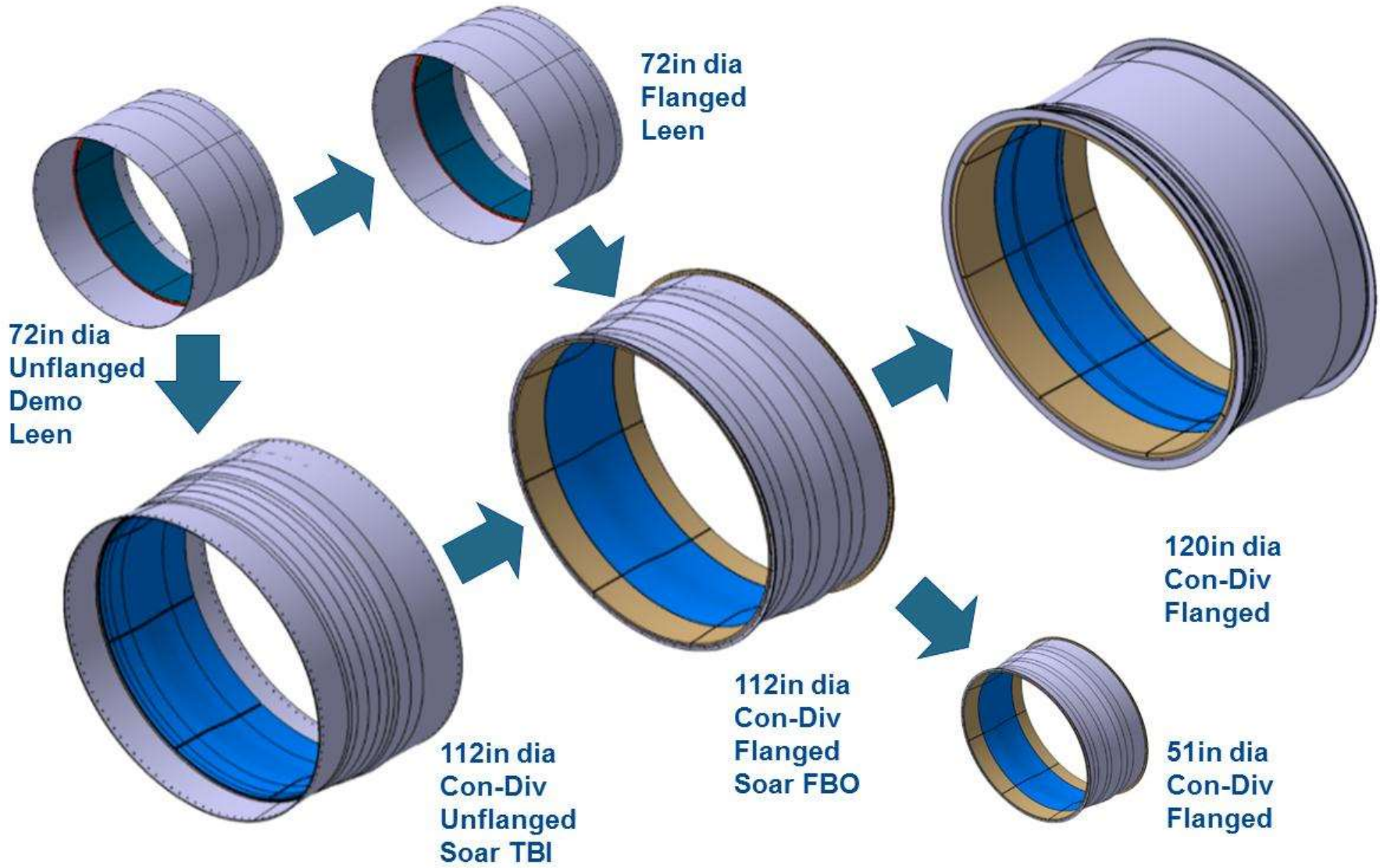
Fast Make Blade
1205mm, 122"



Cti Fan Automated Fibre Placement



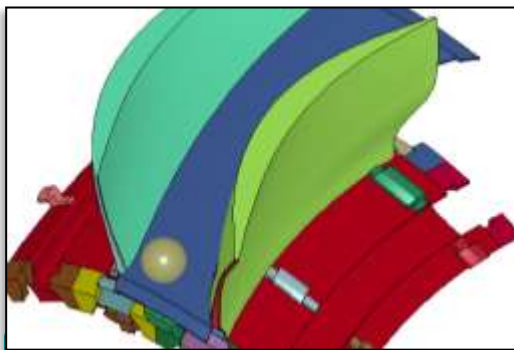
Case Standards



Composite Fan Case



Annulus Filler – CFP - Call for Proposal



- Collaboration formed with FACC to develop capability
- Damage tolerance testing completed
- Components tested on ALPS engine.
- TRL6 review held
- Future exploitation strategy currently being developed



Rolls-Royce



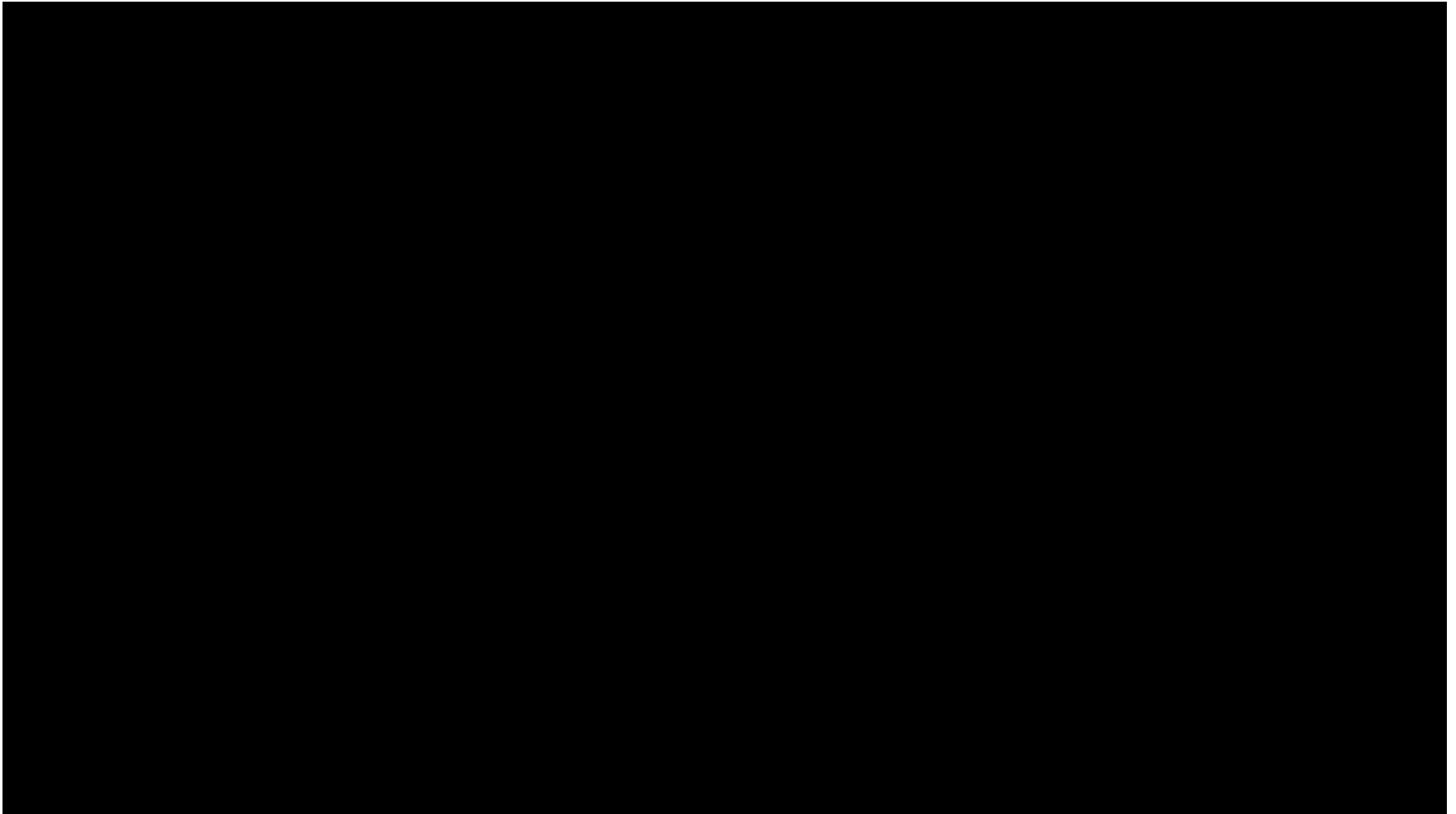
ALPS composite fan testing

- Indoor testing
 - Blade untwist
 - Tip clearance studies
 - Indoor flutter mapping
 - Nozzle calibration
 - Initial performance curves
- Outdoor ground testing
 - Cross-wind testing
 - Noise
 - Outdoor flutter mapping
 - Long blade tip rubbing test
 - Bird strike run-on test
 - Icing
 - Bird ingestion test



ALPS Flight Test Video

1
3





aerodays2015

Aviation in Europe – Innovating for Growth

The 7th European Aeronautics Days



And still more to do!

Thankyou