

November, 2017



# AVIATION CARBON PROPELLERS

## DUC Hélices Propellers

Villefranche-Tarare Airflied (LFHV)

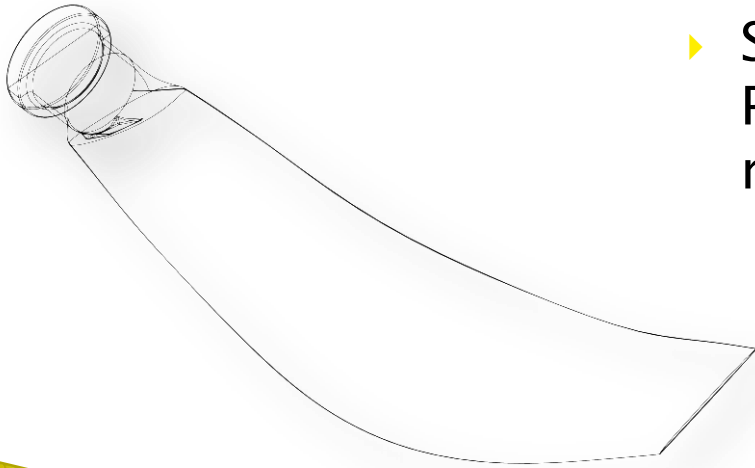
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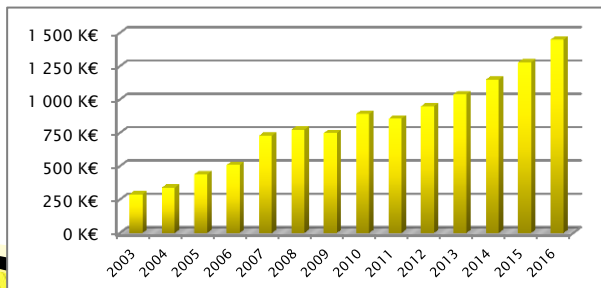
# The company

- ▶ Founded in 1997, the DUC Propeller develops, manufactures and sales composite propellers for aviation from 40 to 180hp
- ▶ Skills (Design and Engineering, Production and Marketing) can respond quickly to customer needs
- ▶ +35 aircraft manufacturers use DUC Propellers in series



# The company

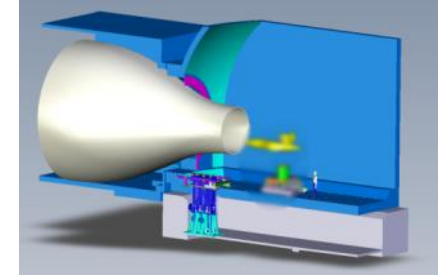
- ▶ Localization: Frontenas (69), FRANCE
- ▶ Surface: 1700 m<sup>2</sup>
- ▶ Employees: 13 persons
- ▶ Average production:  
3800 blade/year ⇔ 1500 prop/year
- ▶ Sales 2016: 1,3M€  
75% prop | 25% R&D  
70% export prop (Europe & Worldwide)
- ▶ Regular growth on the last years



# Know-how



- ▶ Manufacture of propellers and accessories in Epoxy/Carbon prepreg using specific and innovating technologies:
  - Blade / Hub / Spinner & mounting plate / ...
- ▶ Prepreg composites material of Aerospace and Industrial grades (Thermo-set UD tape and weave tape)
- ▶ R&D programs partner:
  - Models for wind tunnel testing
  - Military (UAV, Qualification according to MIL-STD-810-F, ...)



- ▶ ISO 9001:2008 certified  
& Aviation certifications (Part 21G)

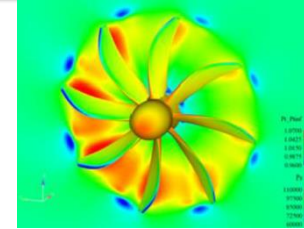
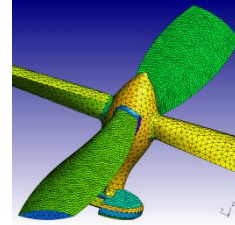




# Engineering

ANSYS®

- ▶ Propeller design
  - Aerodynamic calculation & blade design
  - CFD simulation with ANSYS Fluent
- ▶ Definition of composite structures
  - FE calculation with ANSYS Composite PrepPost & Mechanical
  - Experimental qualification by testing
- ▶ Mastering of the acoustic footprint
  - Simulation of the acoustic emission in ANSYS Fluent
  - Theoretical and Experimental Validation
- ▶ Molding tools design
  - Configuration according own process
- ▶ Development of specific manufacturing equipment
  - Design & Adaptation of hydraulic presses



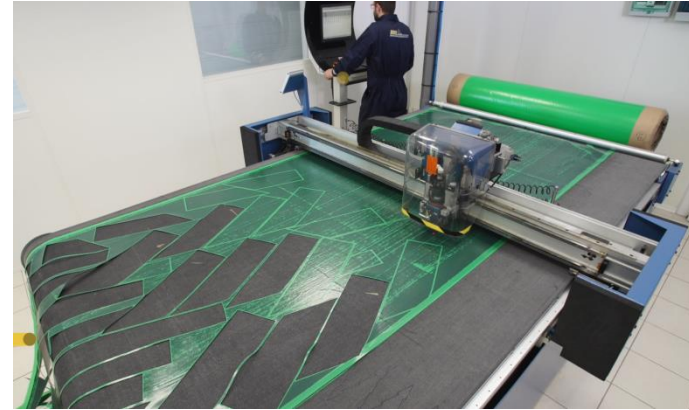
# Equipment (1 / 10)

- ▶ Cold room
  - Raw material storage
  - Traceability and tracking material batches
  - Monitoring & Recording of the °C



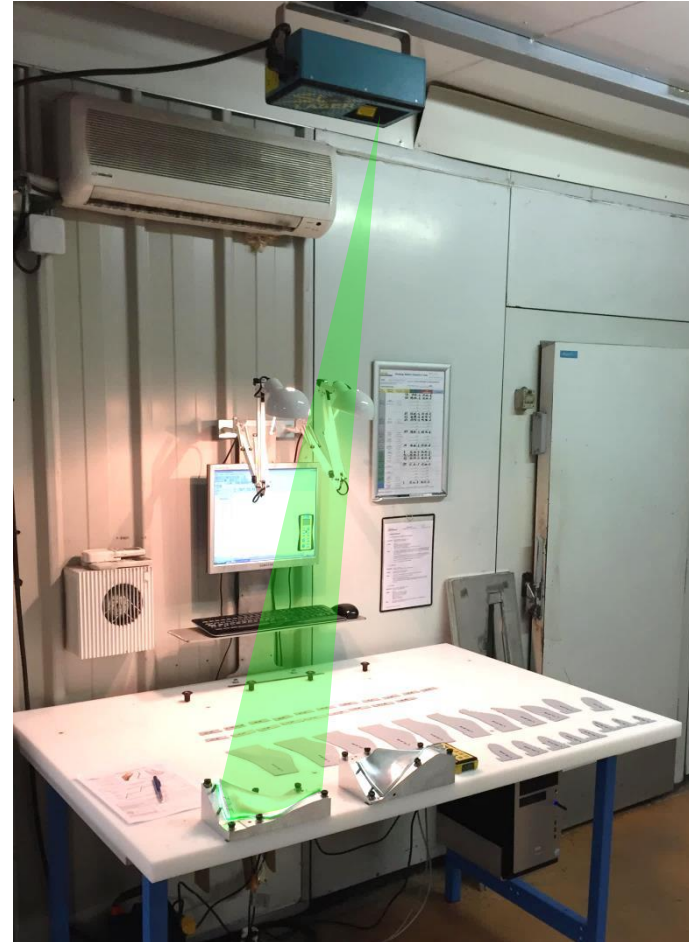
# Equipment (2 / 10)

- ▶ Vector cutting layer
  - According the engineering spec. on CNC cutting machine
- ▶ Draping in controlled atmosphere
  - Conducted by qualified operators in a closed room with controlled temperature



# Equipment (3 / 10)

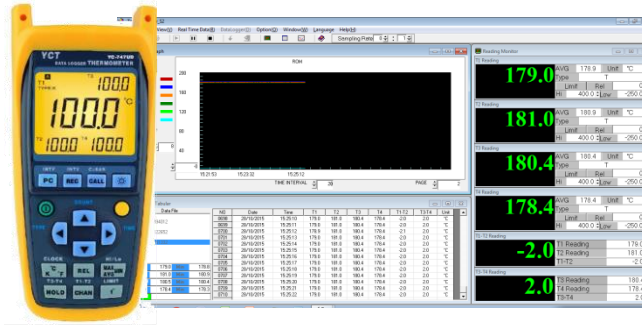
- ▶ 3D laser projector
  - 3D projection for layers placement
  - High repeatability production
  - Optimized draping quality





# Equipment (4 / 10)

- ▶ Manufacturing by compressing
  - 7 hydraulic presses with controlled parameters
  - Acquisition of curing cycles
  - More than 30 production molds



# Equipment (5 / 10)

## ► Machining Park

- 5-axis CNC milling machine (Composite)
- 3-axes CNC milling machine (Metallic)
- Turning machine (Metallic)
- Grinding (Composite)
- Drill press



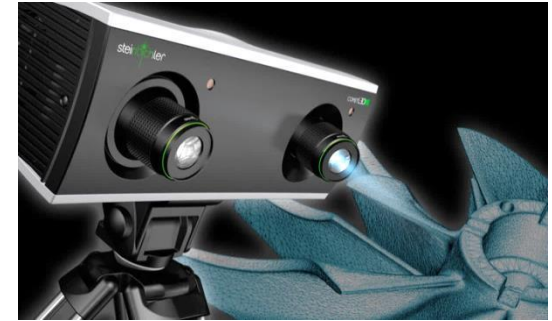
# Equipment (6/10)

- ▶ Marking machine
  - On aluminum part
  - Permanent traceability & fire resistant



# Equipment (7 / 10)

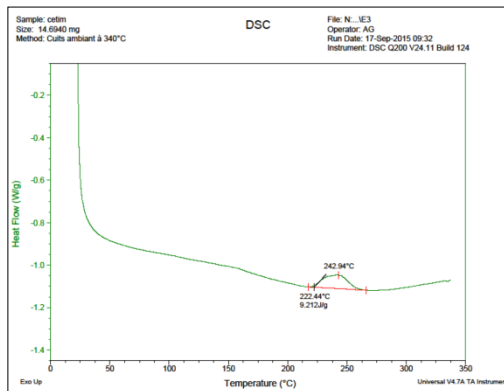
- ▶ Control & Test (1 / 2)
  - 3D scanning shape
  - Vibration test (Ping test, fatigue...)
  - Mechanical test bench  
(Traction, Bending, Torsion...)





# Equipment (8/10)

- ▶ Control & Test (2/2)
  - Dynamic test bench (60hp; 0 to 24 000 rpm)
  - NDT structure analysis
  - Destructive Structure Analysis (micro section, DSC, TVF, ...)



# Equipment (9/10)

- ▶ Balancing
  - Static
  - Dynamic on bench or on aircraft



# Equipment (10/10)

## ► Test aircraft



# DUC products

FLASH



SWIRL



WINSPOON



FLAIR





# DUC products

## FLASHBLACK/-2

In-Flight adjustable propeller

2-blade: 4.9kg (10.8lb) - 3-blade: 6.5kg (13.2lb)

Tractor & Pusher

Carbon/Titanium



# DUC products



- ▶ EASA certification since August 2016
- ▶ Agreement/Certificates:
  - Production Organization Agreement (POA)
  - 2x Propeller Type Certificates (TC) :
    - Towing 180hp: 5-blade **FLAIR-2** propeller
    - Aircraft 100→160hp : 3-blade **FLASH-R** prop.
  - 3x Supplemental Type Certificates (STC)
  - Maintenance Organization Agreement (MOA)

→ Soon



# DUC products

- ▶ Helicopter composite blades
  - Main rotor & Tail rotor





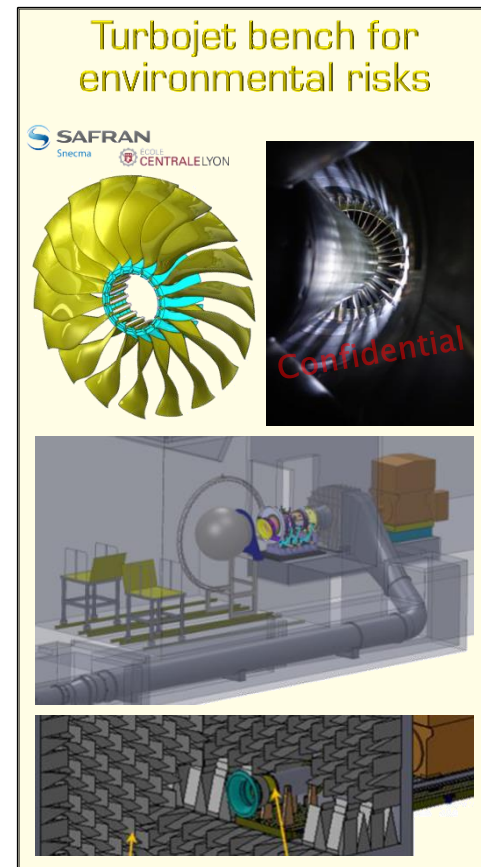
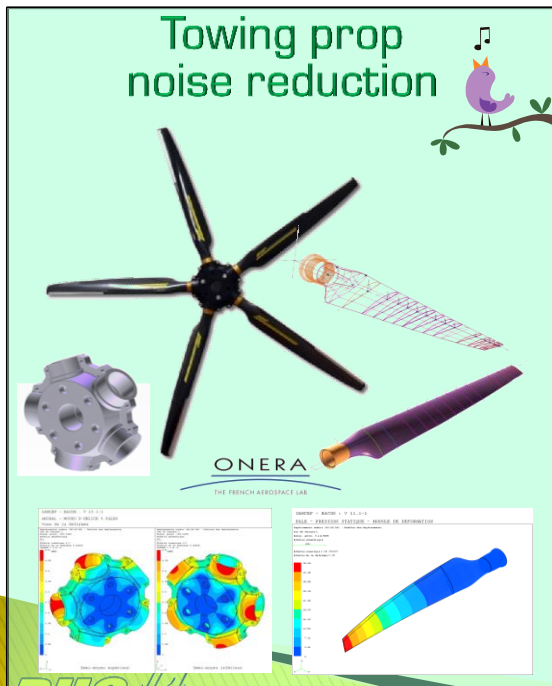




>> R&D programs partner

# R&D programs partner

## ► Projects Quick Views



CONFIDENTIAL INFORMATIONS

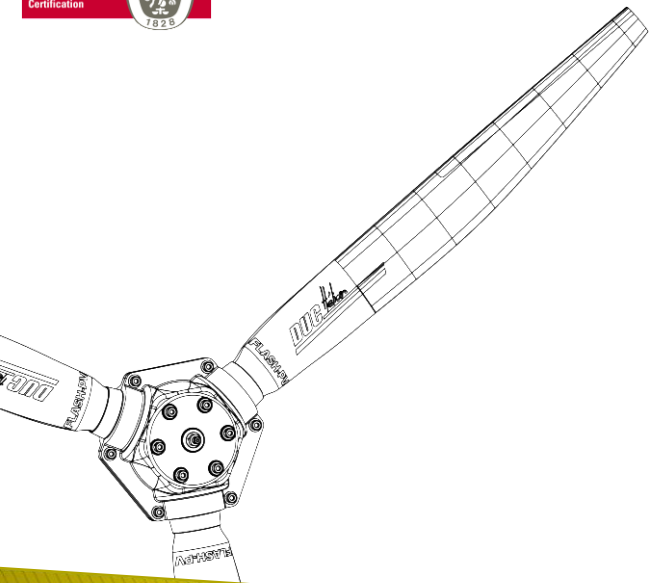
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# R&D programs partner

## ► Electric Aviation Projects





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Thank you for your attention

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