Symposium Aeroacoustics - NLR
Overview of noise reduction R&D activities at Fokker Technologies

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Contents

1. Fokker Technologies company presentation

2. Fokker Landing Gear
   ‘Silent Landing Gear’ project

3. Fokker Aerostructures
   AfloNext – WP4.2 Flap side edge

4. Fokker Aerostructures
   Cleansky SFWA WP3.5 ‘Shield’
Fokker Technologies
Global focus, local presence, creating strategic value for our customers

4 Business Units

AEROSTRUCTURES
ELMO
LANDING GEAR
SERVICES

Revenue 2013 > USD 1B

Revenu & #FTE’s Fokker Technologies

Global Presence

4 Fokker Engineering Centers: Netherlands, Romania, Canada & USA
Fokker Technology portfolio

Structures
Aircraft weight reduction

Engineering assist on:
- Boeing Large Cargo
- Freighter: Pressure bulkhead
- 747-8: Inboard and outboard flaps, wing landing gear door, inboard fixed trailing edge, spoiler beam
- 767-9: Pressure deck, keel beam, support wing to centerbox joint

Fokker Mexico: low cost manufacturing site
Thermoplastic Composites

Flight Control Surfaces

Landing Gear
Composite LG parts facility

Estimated Weight saving of 25% - 30% by applying Composite Drag Braces compared to Titanium Drag Braces

Conventional LG facility

State of the art machining and assembly

EWIS Solutions
Configuration Management

737 Build to Print
- Wing, Fuselage
- Junction boxes

777 Build to Print
- Wing Wiring, Fuselage Wiring

P-8A, P-8I Build to Print
- Wing, Fuselage, Mission System

State of the art design, manufacturing and configuration management
Supplier to most international aircraft/engine programs

Commercial Spares & Fleet Support
Strategic CMRO Provider for (EMEA) Region

Average TAT 25 days

Have provided various cost savings to our customers utilizing our in house developed repair schemes.

Component Support

Various QA audits performed with minor findings and immediate actions taken.

Continued support with interpretation of customer instructions and work scope requirements
Fokker Technologies & acoustics

- R&D activities for specific components:
  - Landing Gear
  - Empennage
  - Flaps

- Relation to product development:
  - Cavities
  - Fairings
  - Seals
  - etc
Fokker Landing Gear
Silent Landing Gear

Silent Landing Gear project:
Aerodynamic noise reduction of Landing Gear

- Investigation of Landing Gear contribution to Aircraft noise and options for noise reduction
- Investigated options:
  - streamlined Landing Gear
  - Fairings / Covers
  - Air curtain concept
Silent Landing Gear project:
**Air Curtain concept**
- Concept developed by Fokker Landing Gear
- Incoming airflow deflected by airscreen (bleed air or powered)
- Investigated by NLR: positive WTT results
- No follow-up by FLG
AfloNext WP4: Noise Control on Airframe

Noise reduction for 2 important sources:

- Landing Gear wake interaction with the Inboard Flap – WP4.1
  - Optimized Flap setting and Landing Gear covered with LG mesh fairings and blocker plates
- Flap side edge – WP4.2
  - Design and Manufacturing aspects of a porous outbd section and side edge of Flap
  - Both for Airliner and Business Jet

WP 4.2 Flap Side Edge / Main Work

- Large-scale WTT on a Airbus-type porous flap side edge (FSE)
- Airworthiness demonstration of a porous FSE.
- FT clearance and FT of FSE treatment on airliner to prove capability.
- Definition of an airworthy PFSE concept for a biz-jet platform.
Fokker Aerostructures
FP7 – AfloNext WP4.2

Options to be investigated for Business Jet Flap side edges:

1. Porous Skin panel
   - Aluminium or titanium skin panel with laser-drilled holes
2. Foam core
   A - Direct contact to OML (airflow):
       WT tested configuration / preferred option for noise reduction
   B - Metal bonded skin with low density foam core preferred option from structural point of view
3. Metal mesh

Manufacturing and maintenance aspects to be investigated:

- Structural aspects
  - load carrying capability of porous skin and/or metal foam
- Corrosion
- Water ingress
- Surface treatment / finishing
- Aesthetics
WP 3.5.2: Innovative Empennage large demonstrator
Dassault - Fokker - NLR - INCAS

- Part of technology stream: Integration of Innovative Turbofan Engines to Bizjets (IITE)
- Noise shielding innovative Empennage design
- Acoustic & thermal fatigue aspects of HTP skin panel
- Fokker: design & manufacturing of metal and CFRTP skin panels
- NLR: test support, instrumentation, allowables (a.o.)
Fokker Aerostructures enabling technologies
Innovation is the key to our success

Glare

Thermoset Composites

Metal Bonding

Driven by technology, affordability and weight

New programs

Technology position

Thermoplastic Composites

Global operations
Fokker roadmap for Thermoplastics Composites:
• Maturation of current technologies
• Explore new innovations

Key drivers for development
• Affordability
• Highly automation of production processes
• Weight reduction

Some of the new most promising innovations under development within TPRC, a consortium between Boeing, Fokker, University of Twente, Ten Cate.

Award winning break through of thermoplastic composites technology.

AW169 Horizontal Tailplane
15% Weight Reduction

G650 Rudder and Elevators