

AFLONEXT FINAL CONFERENCE

Integration of landing gear noise reduction devices,
the challenge of moving from wind tunnel to flight demonstrator



AFLoNext

2ND GENERATION
ACTIVE WING

ILA Berlin 2018

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The logo for AFLoNext, featuring the text 'AFLoNext' in a grey sans-serif font. The 'o' is lowercase and has a blue underline that extends to the right and then curves back under the 't'.

AFLoNext

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Integration of landing gear noise reduction devices,
the challenge of moving from wind tunnel to flight demonstrator

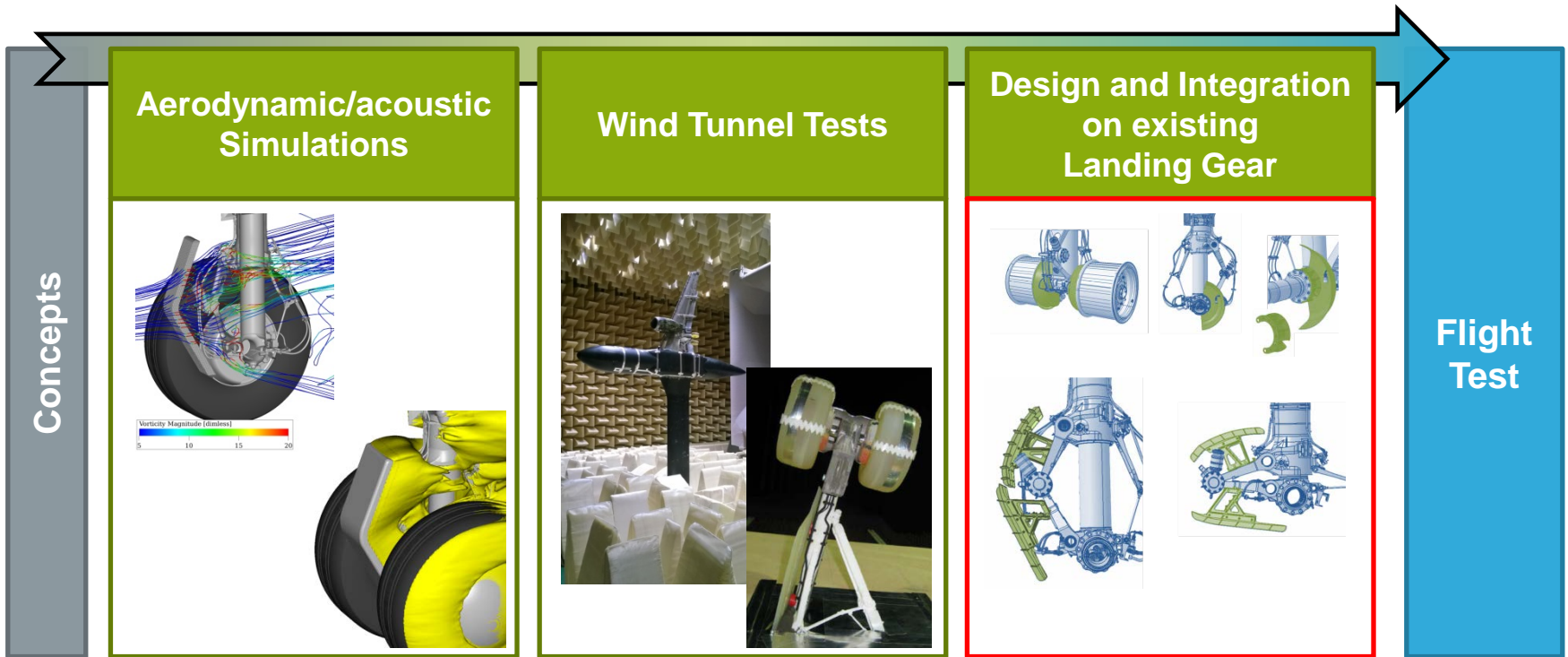
On the Integration of landing gear noise reduction devices...

Low-noise devices on Main Landing gear of an Airbus A320



... the challenge of moving from wind tunnel to flight demonstrator

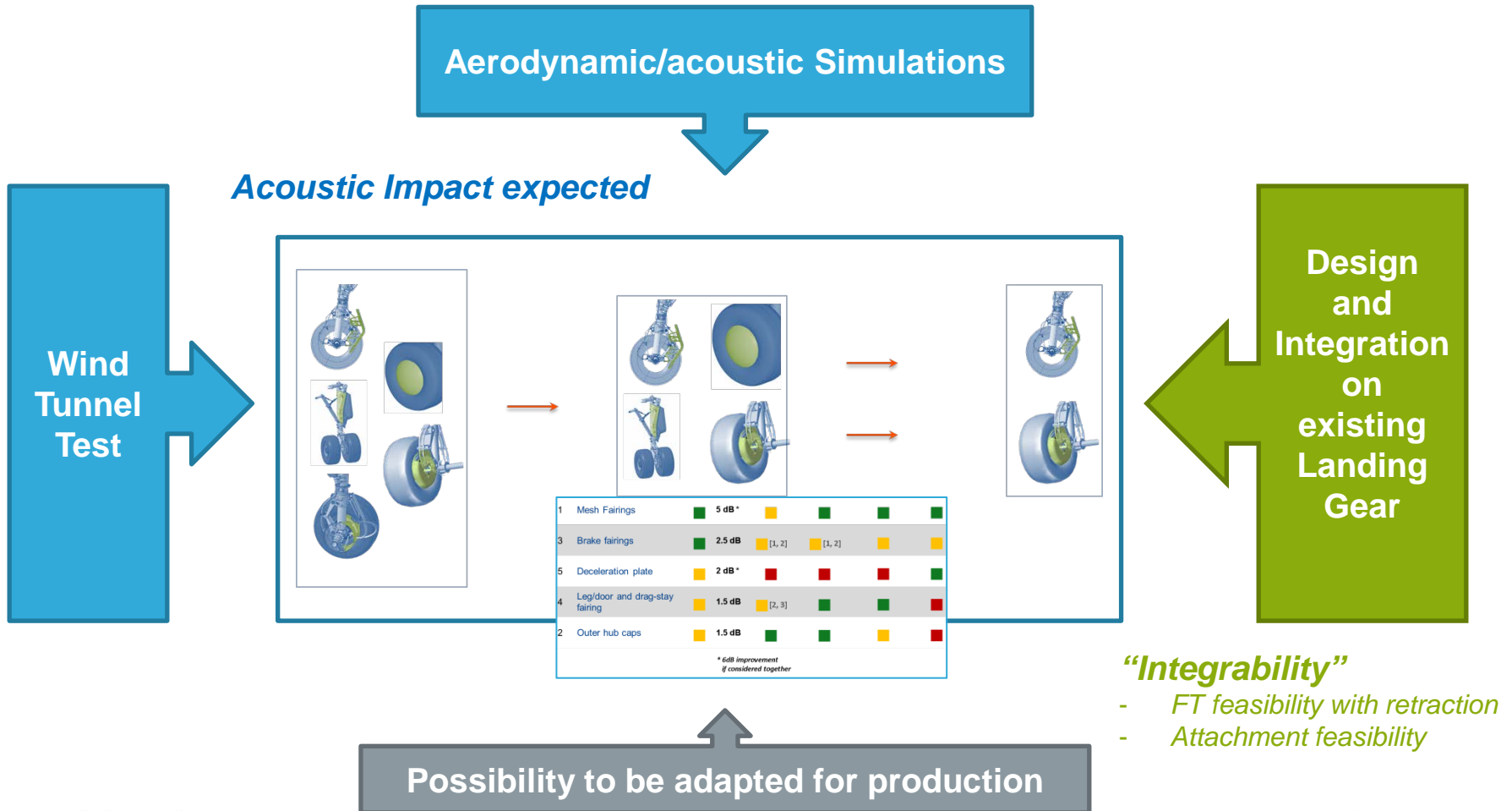
Flight Test on A/C is the last building block in our way to evaluate the impact of noise reduction devices



MAJOR CHALLENGE

Concept Selection Phase

Two final concepts were selected after down selection phase



Small Scale Landing Gear Noise Tests: Objectives

- Evaluate influence of landing gear size

1. Effect of noise reduction devices (DNW-LLF):
1:7.5 scaled LG model vs full scale
2. Evaluate noise generation:
1:11 scaled AFLoNext LG in isolated setup

to prepare noise test on gear wake flap interaction noise on 10ACOUS model

v

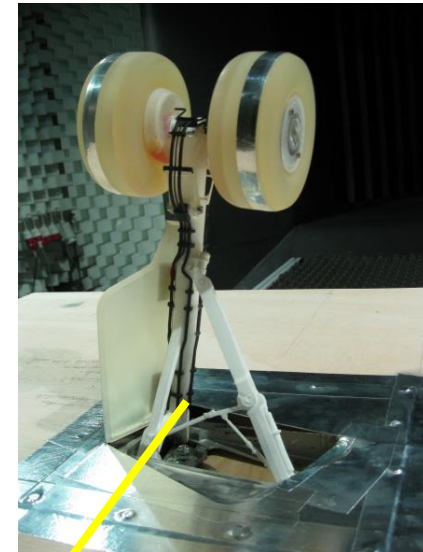
- Investigation on Gear Wake Flap Interaction Noise

- 10ACOUS model, scale 1:11
- new 1:11 scaled landing gear model
- test conducted in DNW-NWB
- test supported by CFD (Airbus HB)

OPENAIR 1:75 scale



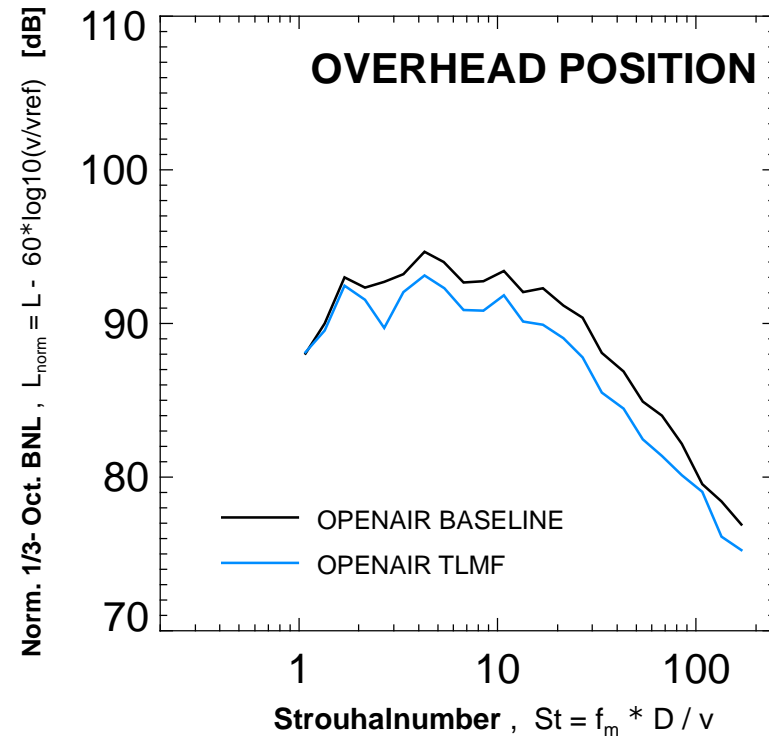
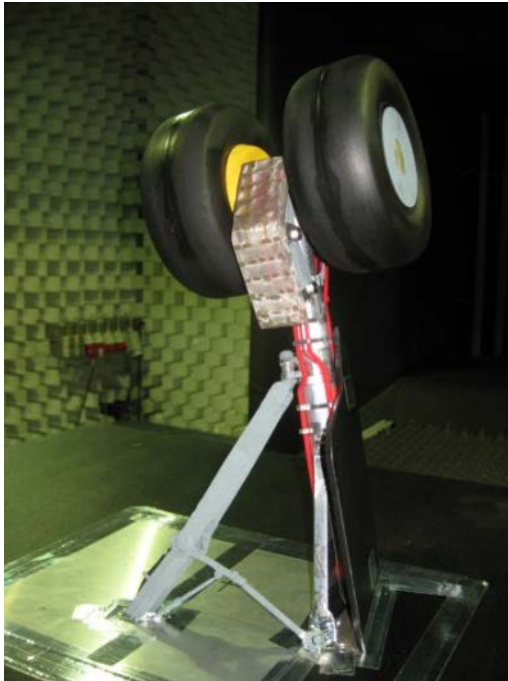
AFLoNext 1:11 scale



10ACOUS semi span model in DNW-NWB

Effect of the Torque Link Mesh Fairing

1:7.5 Scale

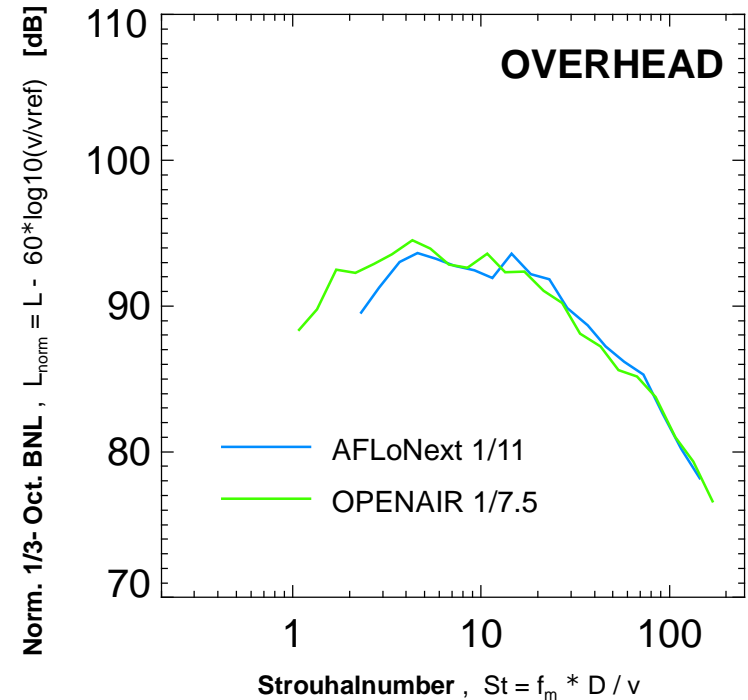


- Noise reduction as obtained at full scale was also measured in 1:7.5 (small) scale
- Further investigations can be conducted at 1:7.5 scale

Effect of model scaling

1:11 Scale Landing Gear Model

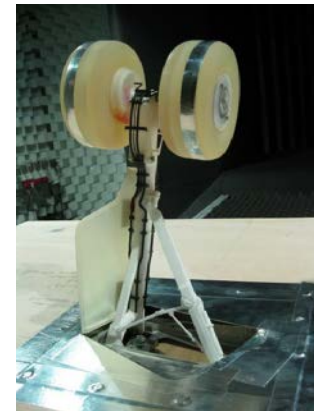
- Sound pressure level spectra compare reasonably well for the baseline configurations when tripped at similar positions
- Data collapse becomes worse for very low frequencies
- 1:11 scaled model is representative and can be used at 10ACOUS model



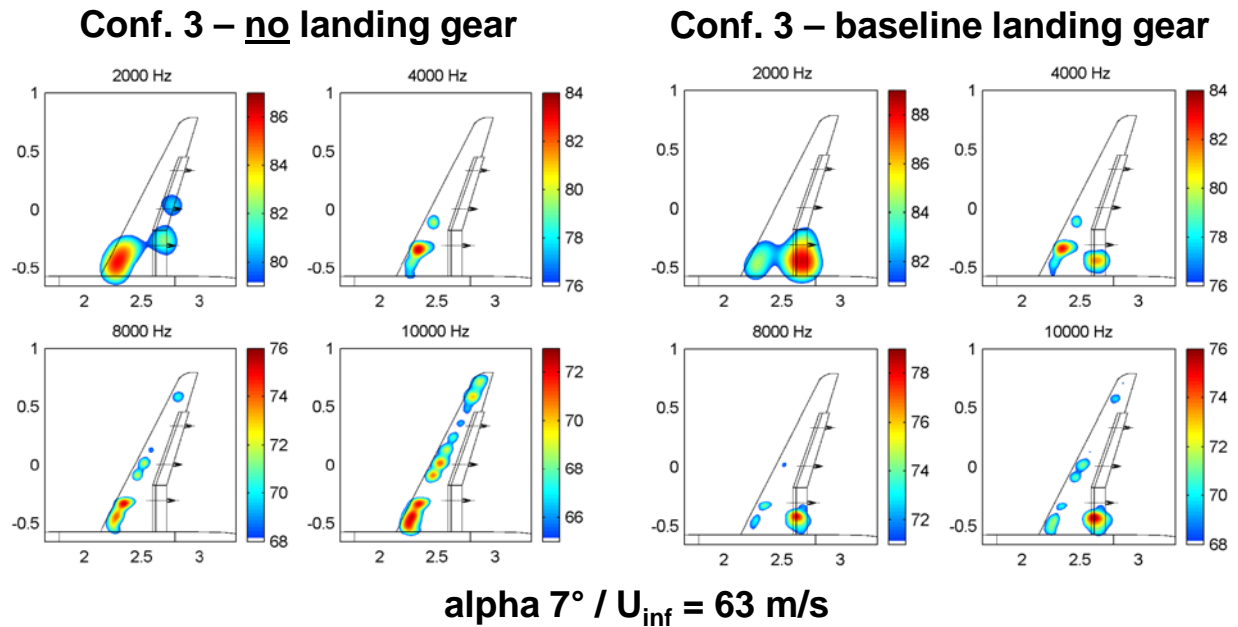
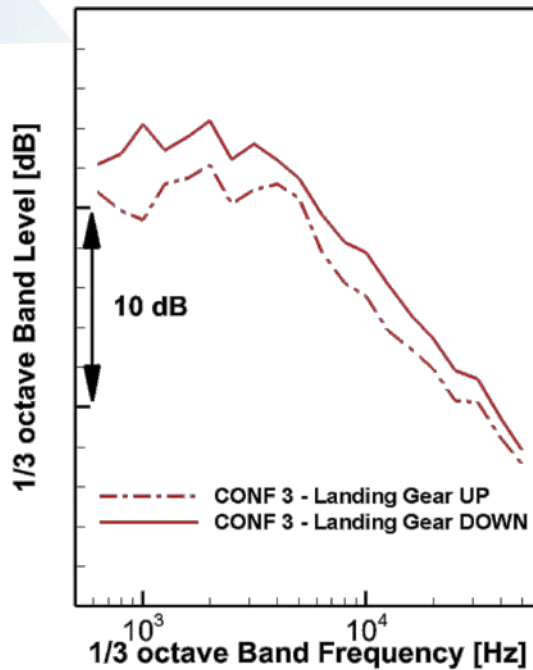
OPENAIR 1:75 scale



AFLoNext 1:11 scale



Effect of Landing Gear on Airframe Noise



- Landing gear noise exceeds high lift noise (non representative bay)
- Difference diminishes from Conf. clean to Conf. full
- Gear Wake Flap Interaction Noise shows significant effect at low frequencies, effect diminishes to medium and high frequencies

Development of Concepts

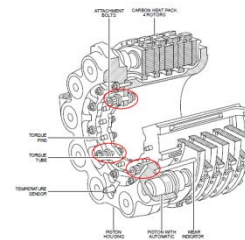
Facing constraints to integrate devices on a existing leg which is optimized for other functions

TEMPERATURE
OF BRAKES



ACOUSTIC
FRIENDLY
SHAPES

SPACE AND
CLEARANCES UNDER
DEFORMATION



ATTACHMENTS

Development of Concepts

Facing technical constraints to integrate devices on a existing leg which is optimized for other functions

**EVALUATION OF THE
IMPACT OF COVERS ON
BRAKES**



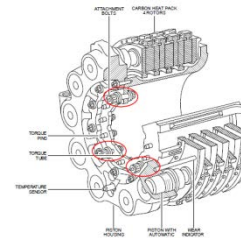
**ACOUSTIC MODELLING
AND DESIGN
PRACTICES**



**SEVERAL (> 5)
MOCK-UP SESSIONS**

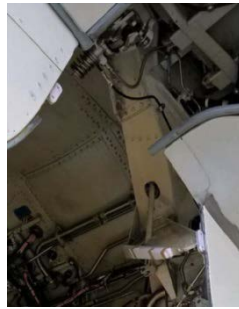
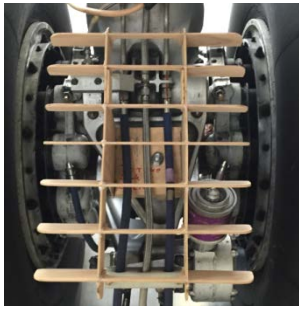


**MOCK-UP SESSIONS
AND TEST SPECIMENS**



Development of Concepts

Facing constraints to integrate devices on a existing leg which is optimized for other functions

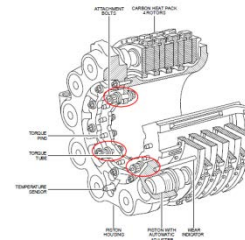
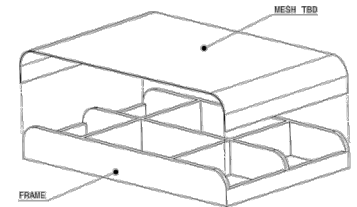
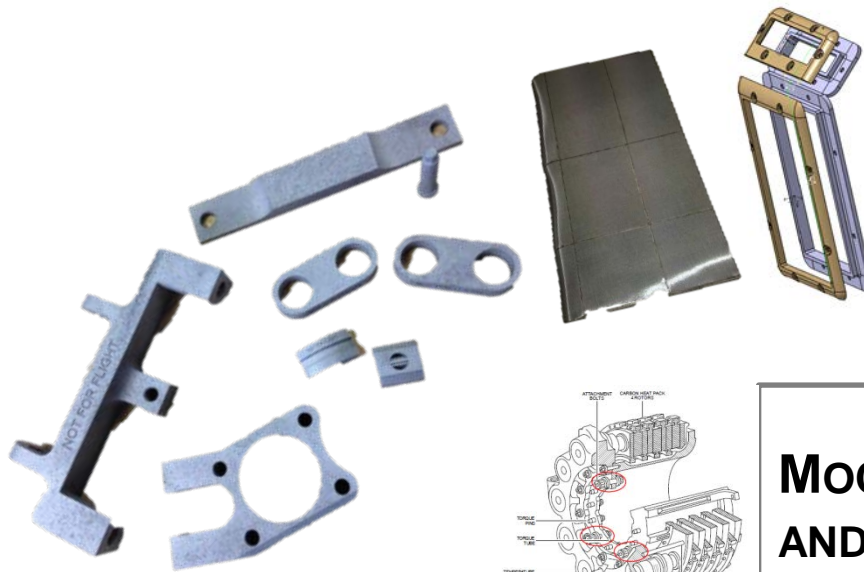


**SEVERAL (> 5)
MOCK-UP SESSIONS**



Development of Concepts

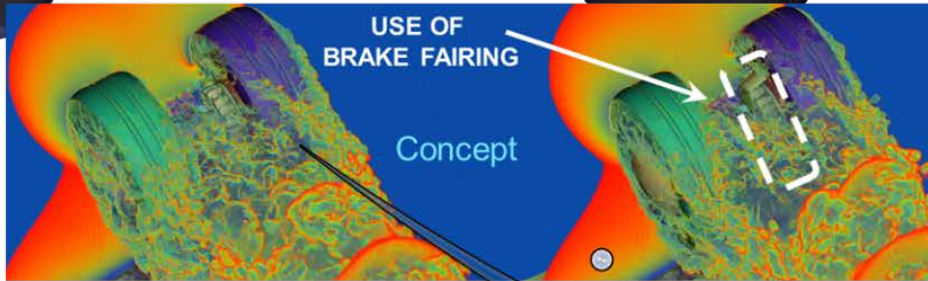
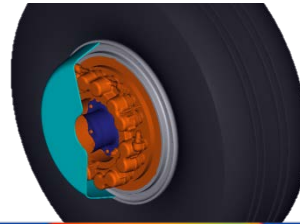
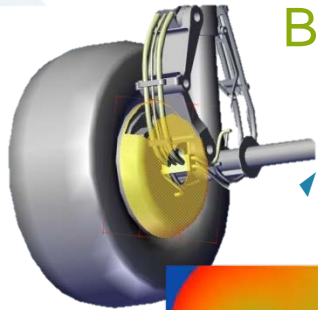
Facing constraints to integrate devices on a existing leg which is optimized for other functions



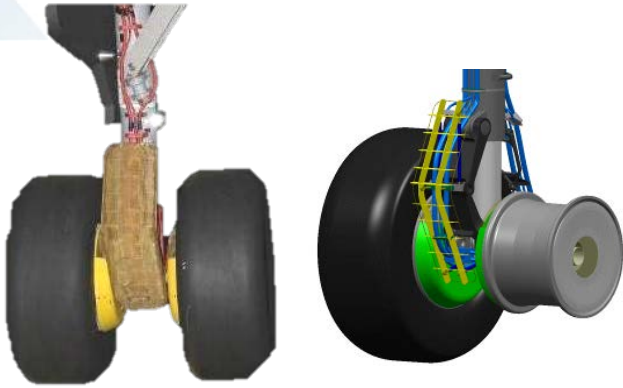
**MOCK-UP SESSIONS
AND TEST SPECIMENS**

Overview of final parts installed on aircraft

Brake Cover



Overview of final parts installed on aircraft



Torque Link
Mesh Fairing

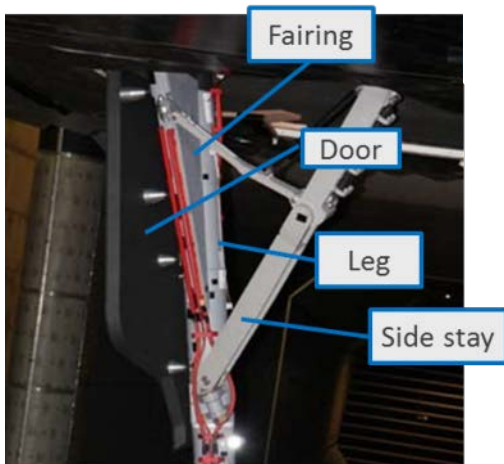


Overview of final parts installed on aircraft

Leg Door Fairing

- Gap between main leg and leg-door is known as noise source
- Gap shall be closed during flight tests

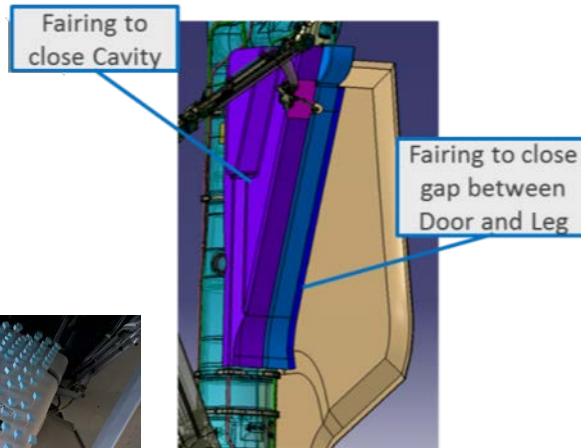
Noise Reduction Concept



Dummy for
clearance
checks at
ATRA



Low Noise Device



Final Part for Flight Test

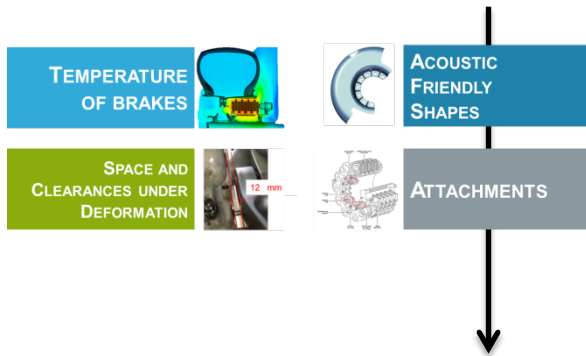


From Concepts to in Flight low-noise devices

Acoustic simulations
Wind tunnel tests
Feasibility studies

Approaches to support acoustic concepts **down selection**

Low level of constraint



Important gap due to integration on real landing gear

Flight tests
in July 2018

to Confirm the acoustic efficiency of low noise devices in flight

Highly constrained



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