FAPESP France Week 2025

BRAZILIAN SILENCE AIRCRAFT PROGRAM

EESC · USP
São Carlos School of Engineering

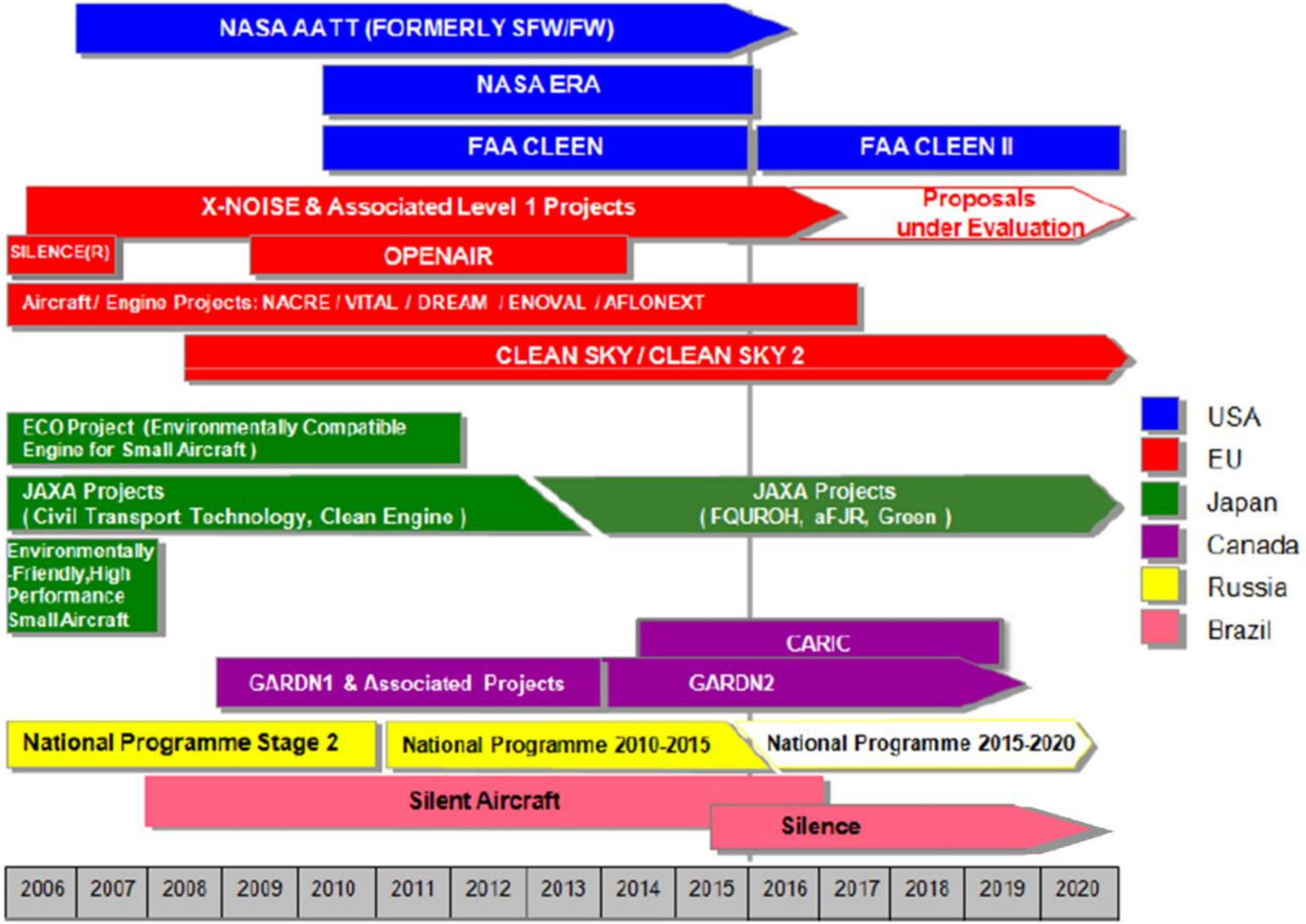
ENGENHARIA AERONÁUTICA
USP · SÃO CARLOS

EMBRAER

Finep
INOVAÇÃO E PESQUISA

FAPESP

International Noise Technology Research Programmes





- The Team

Who is involved

MEMBERS

FAPESP - São Paulo Research Foundation

USP–University of Sao Paulo

EESC · USP
São Carlos School of Engineering

UFSC - Federal University of Santa Catarina

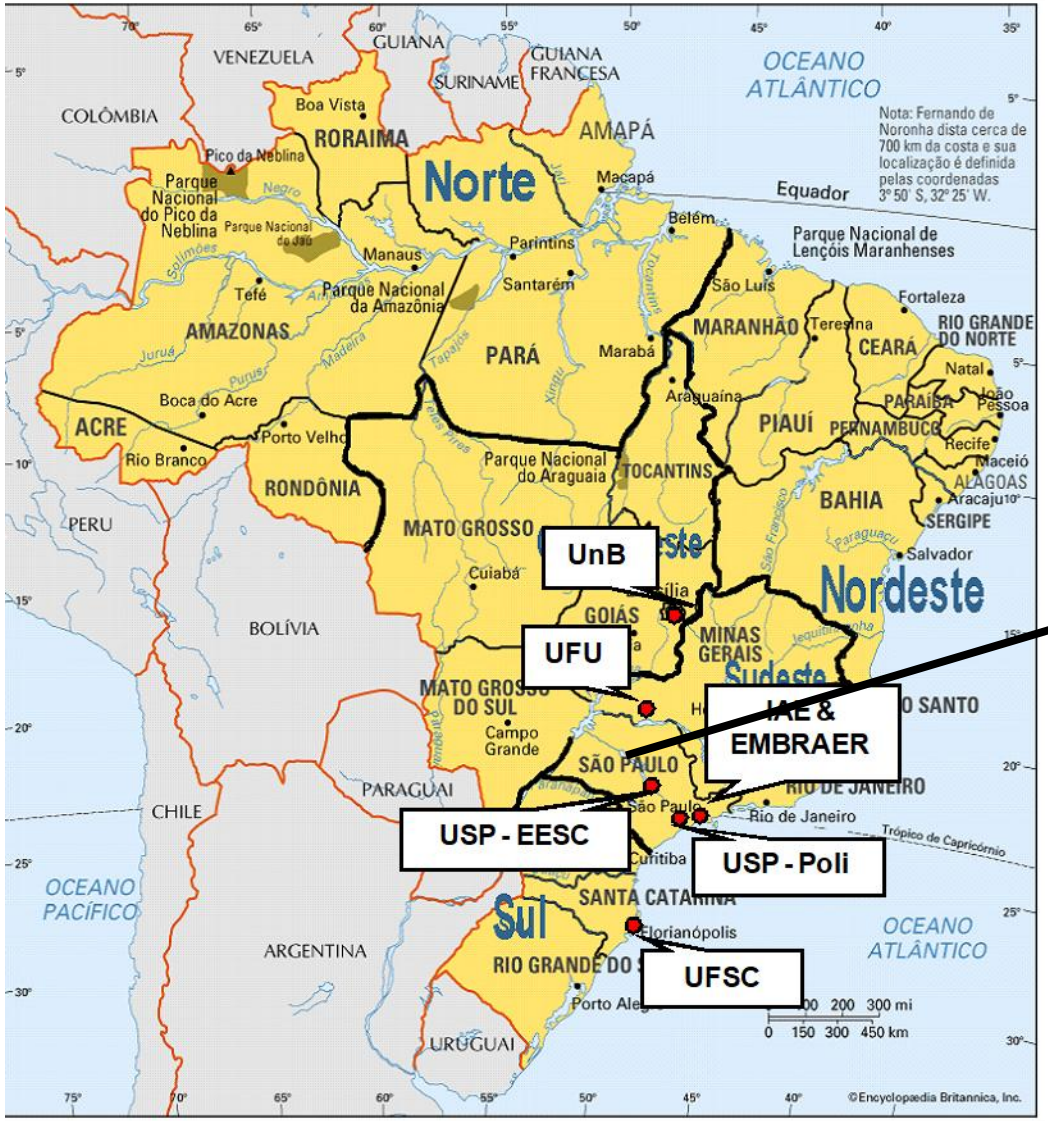
Poli – Polytechnic School

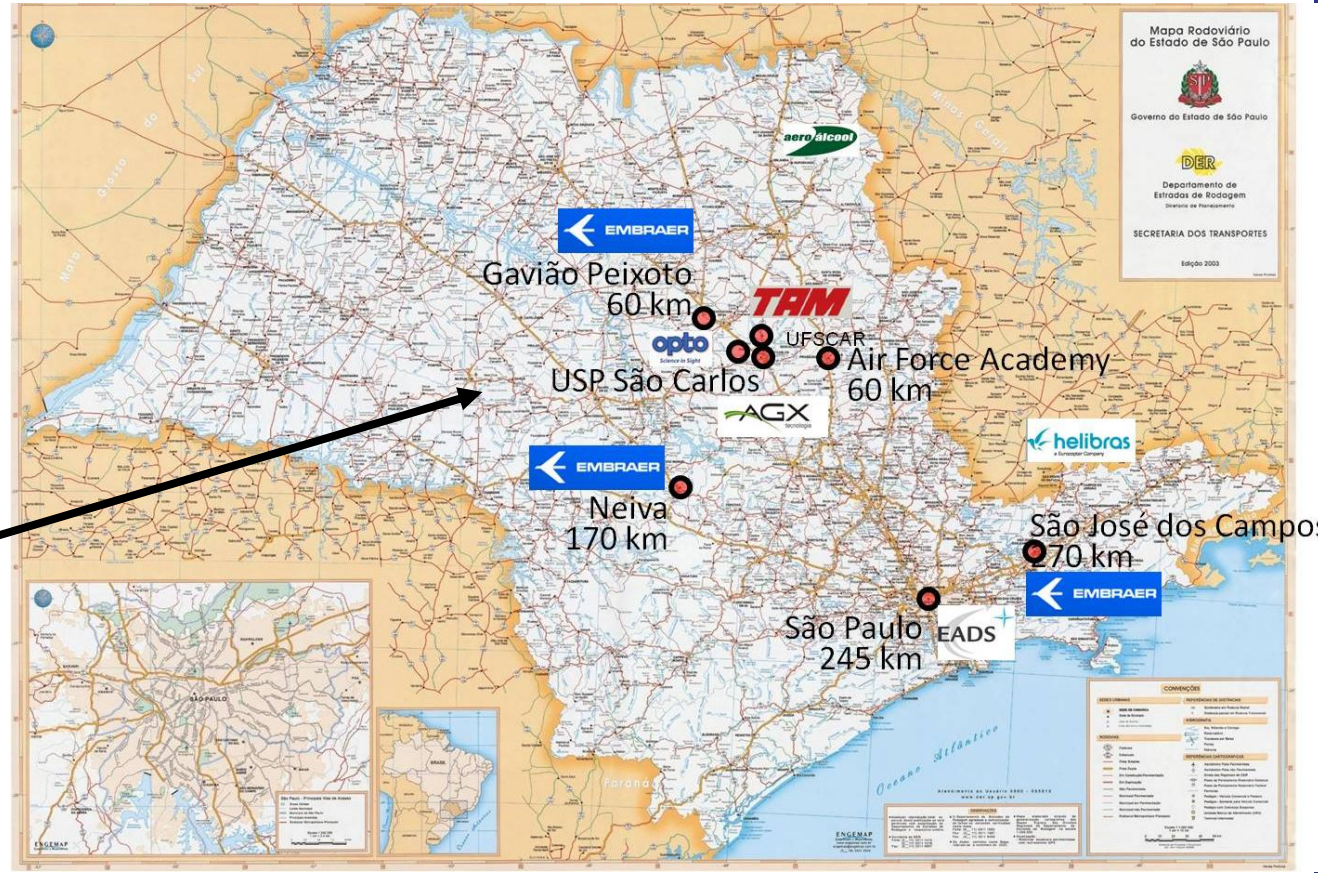
IAE - Brazilian Institute of Aeronautics and Space

UFU - Federal University of Uberlandia

UnB - University of Brasilia

Localization





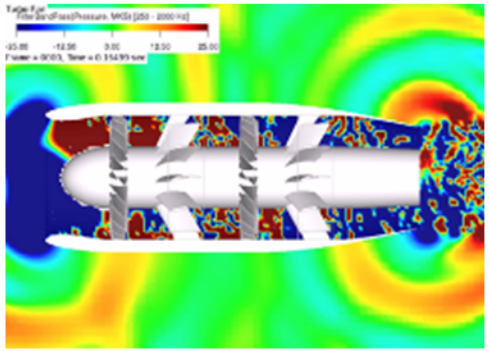
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Jet noise prediction and testing



Fan Nosie prediction and testing





Finep

EMBRAER

FAPESP

USP

USP–University of Sao Paulo

UFSC - Federal University of Santa Catarina

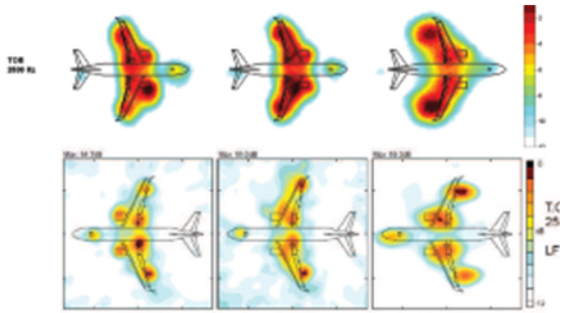
Poli – Polytechnic School

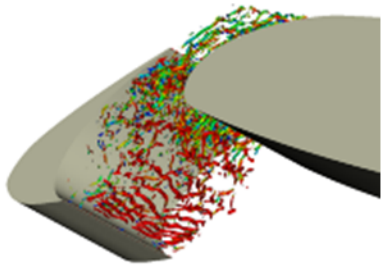
EESC · USP São Carlos School of Engineering

UnB - University of Brasilia

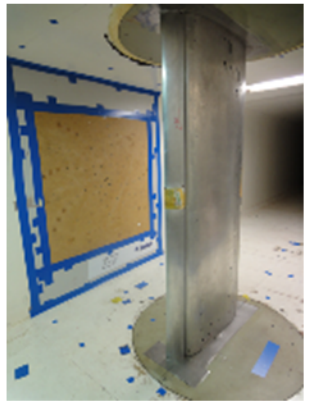
IAE - Brazilian Institute of Aeronautics and Space

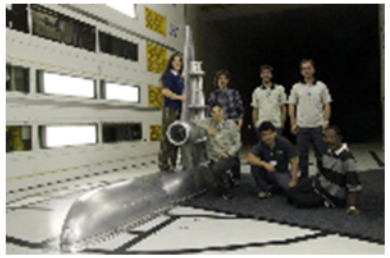
UFU - Federal University of Uberlandia





Wind tunnel and Flying testing and

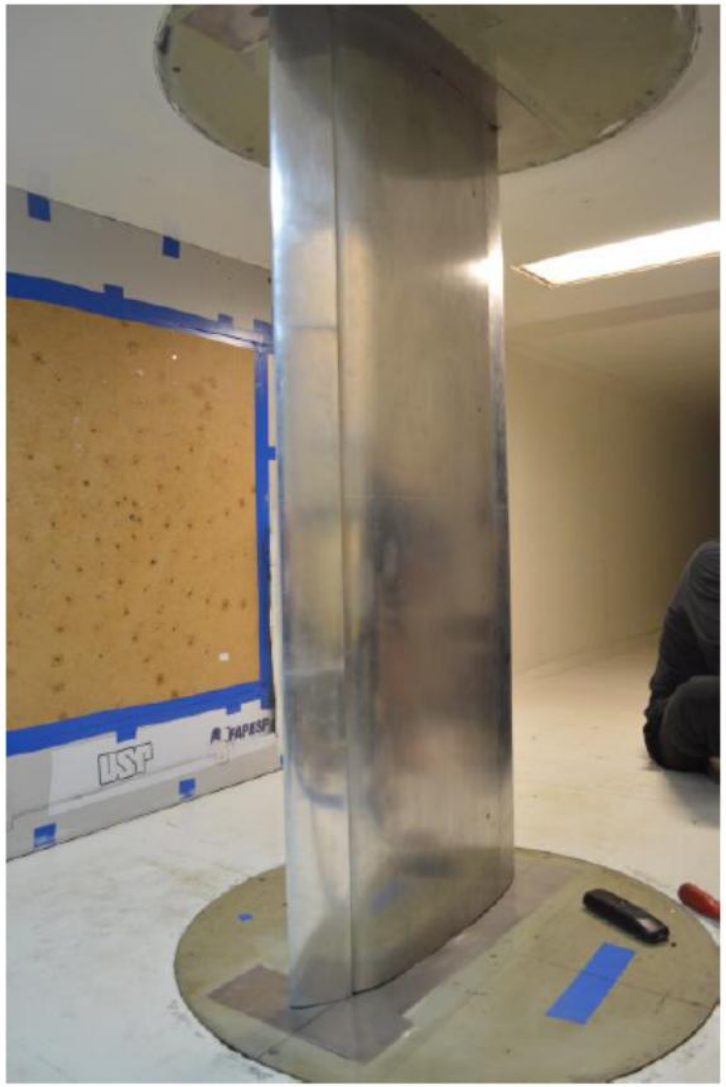




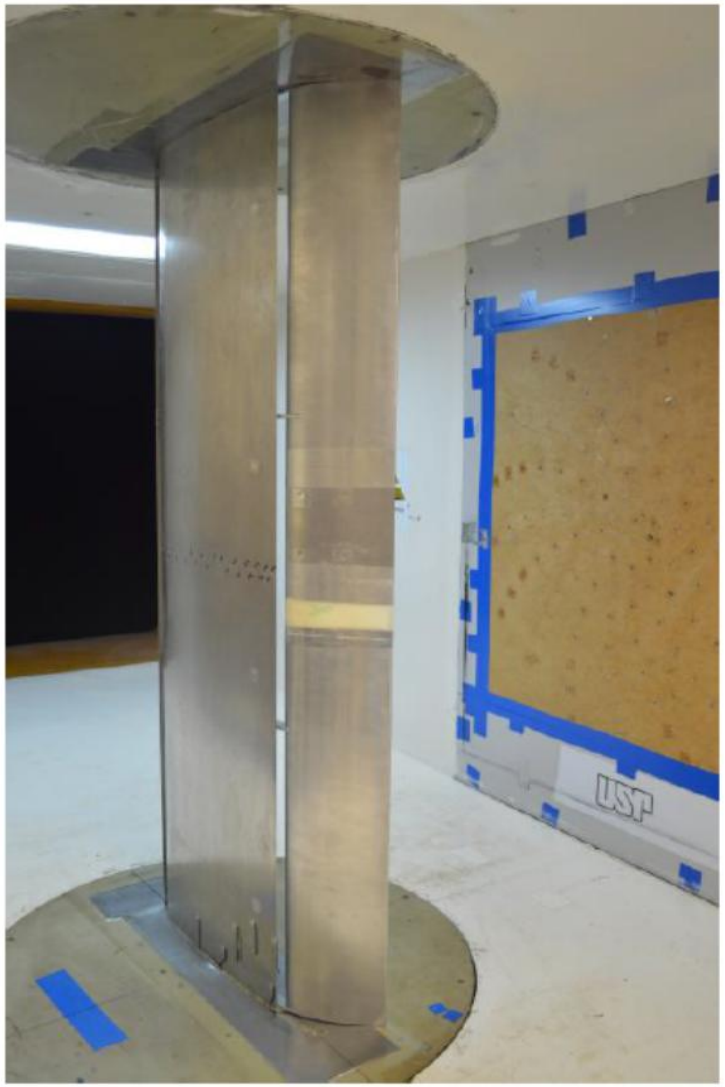
Airframe noise prediction and testing

Boeing Proprietary

AEROACOUSTIC WIND TUNNEL TESTS 2-D High lift model



(a) Flap Retraído



(b) Flap Full



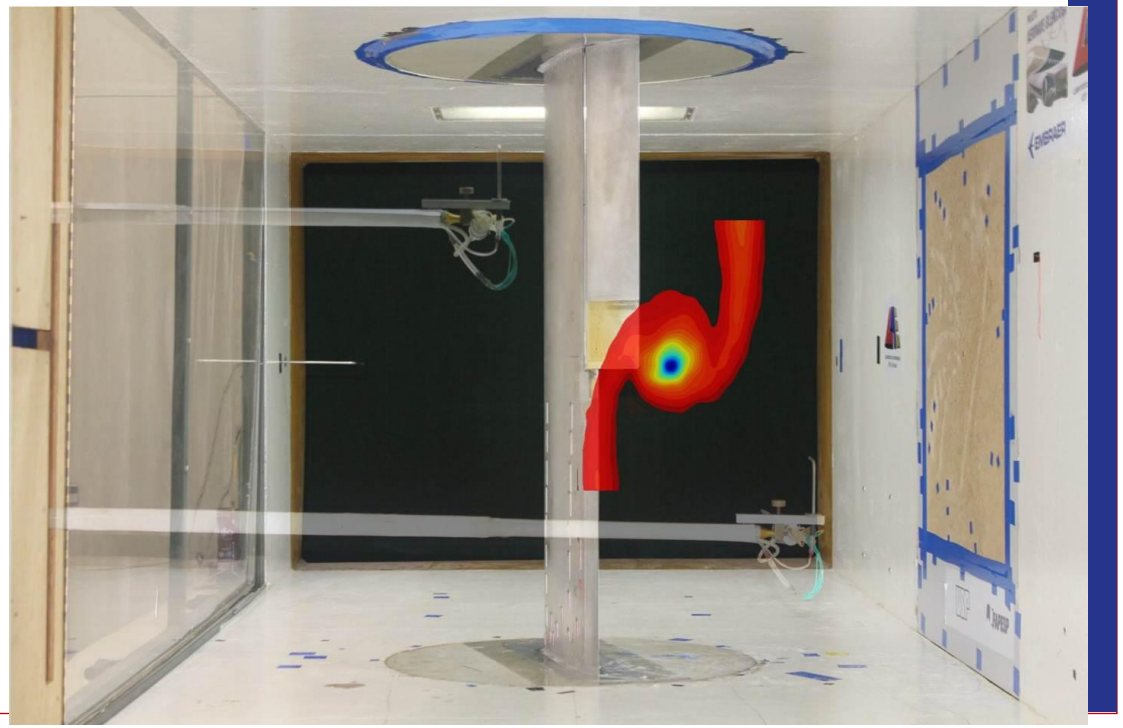
(c) Flap Side Edge

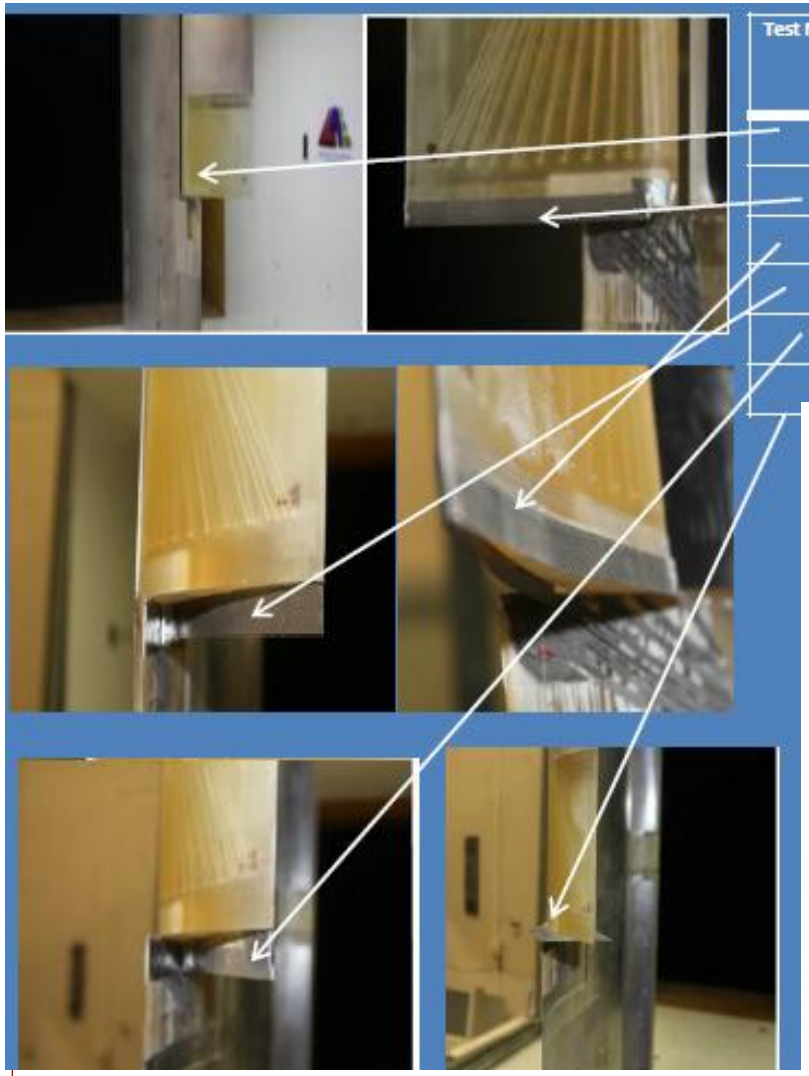
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Flap side edge noise reduction

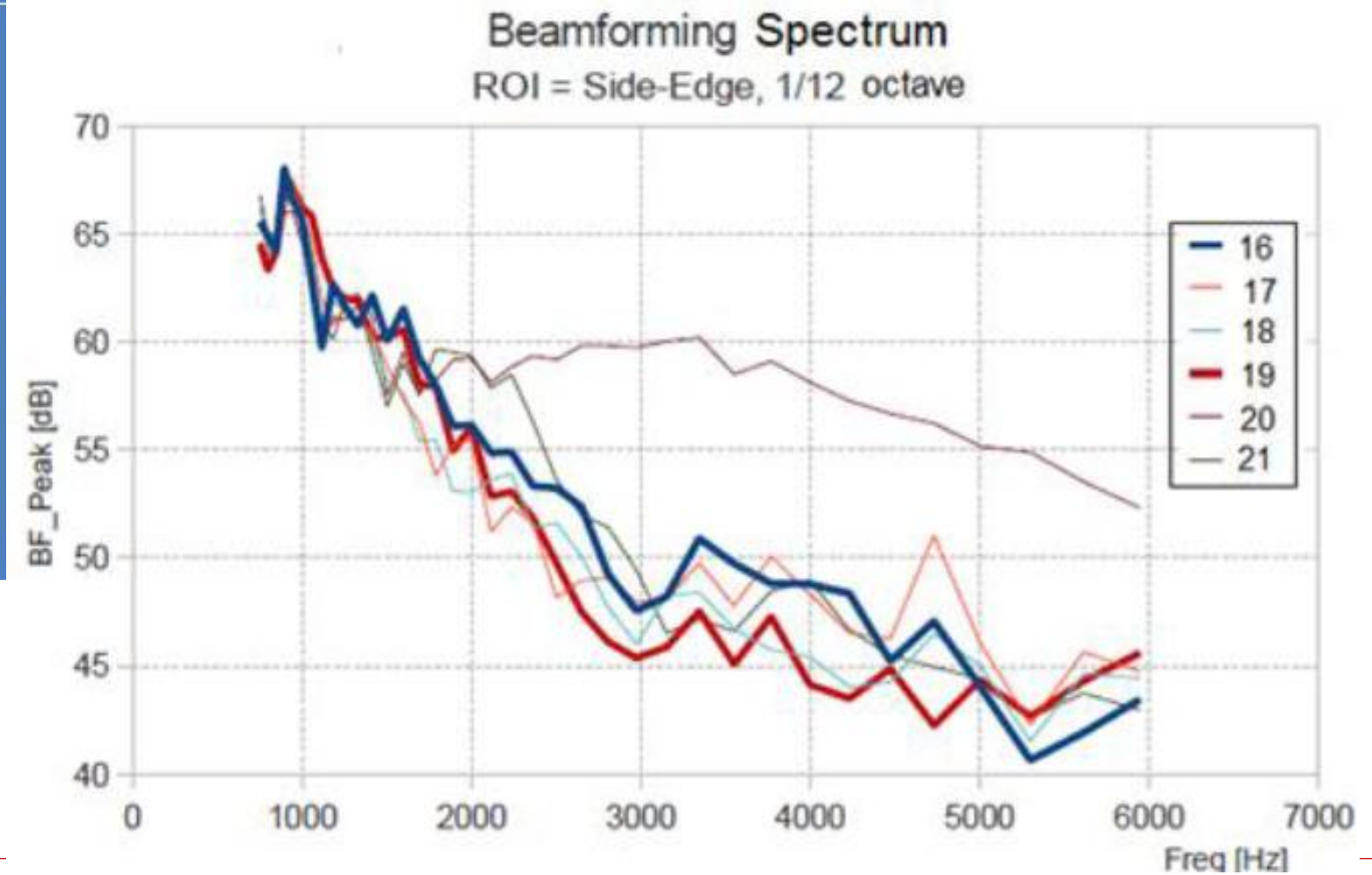




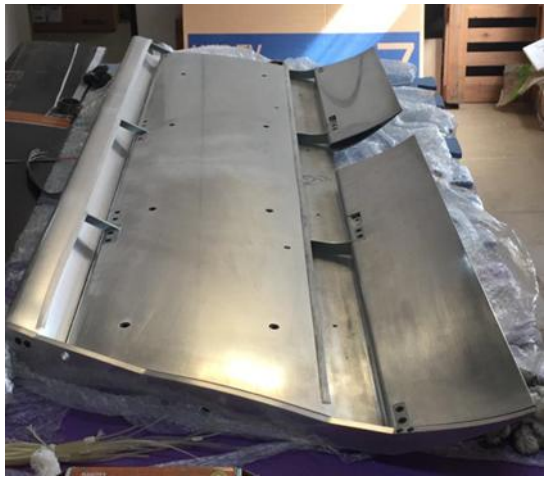


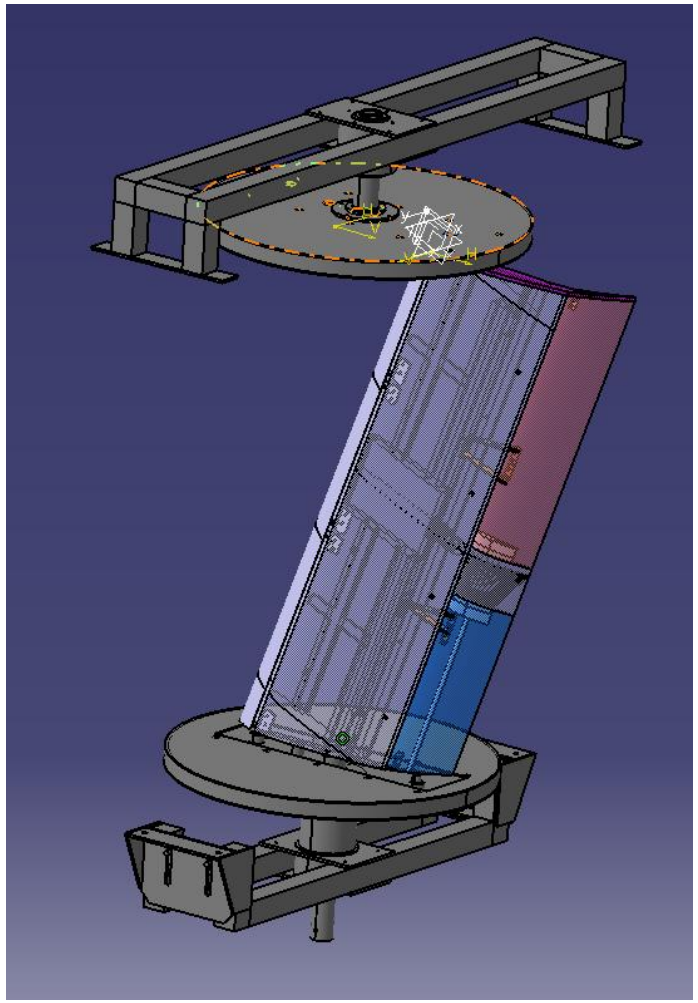


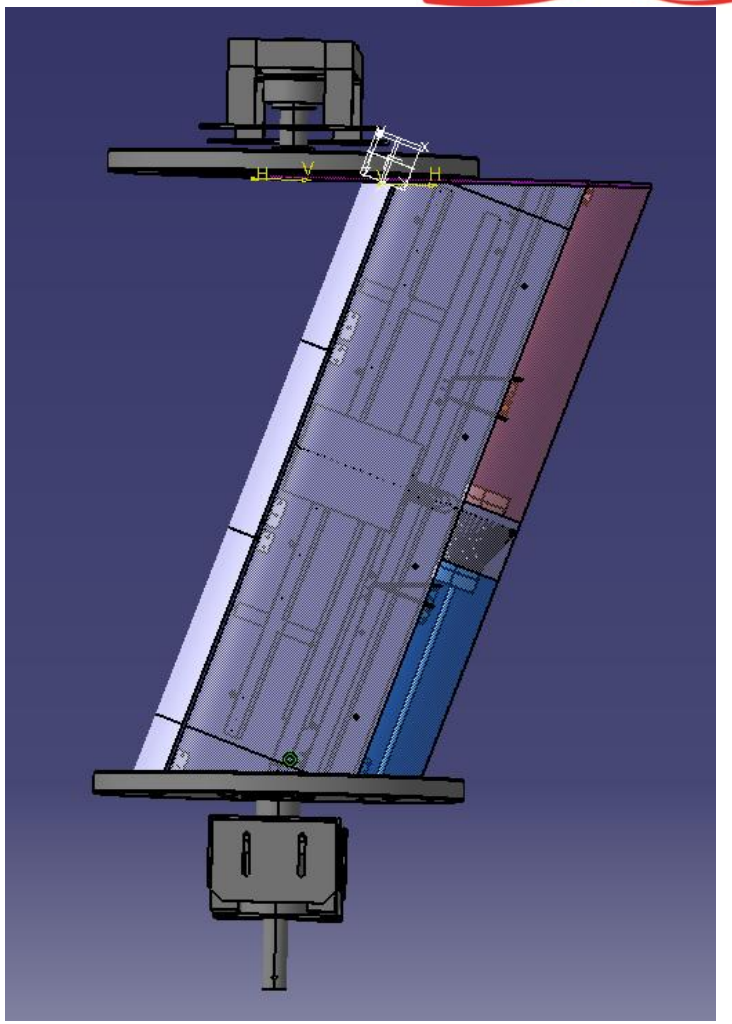
Test Number	Type Of Experiment	Location	Incidence Angle
16	Baseline		12º
17	Porous plate	Flap side edge bottom surface	12º
18	Porous plate	Flap side edge bottom and upper surface	12º
19	Porous plate	Flap side edge bottom surface (bigger plate, 15mm)	12º
20	Non porous plate	Flap side edge upper surface (bigger plate, 15mm)	12º
21	Split plate	Flap side edge	12º



Sweep back 2-D high lift wing model.

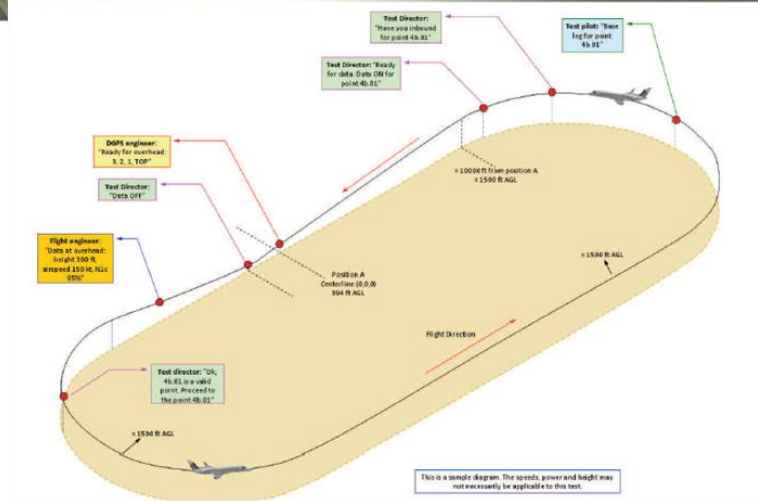




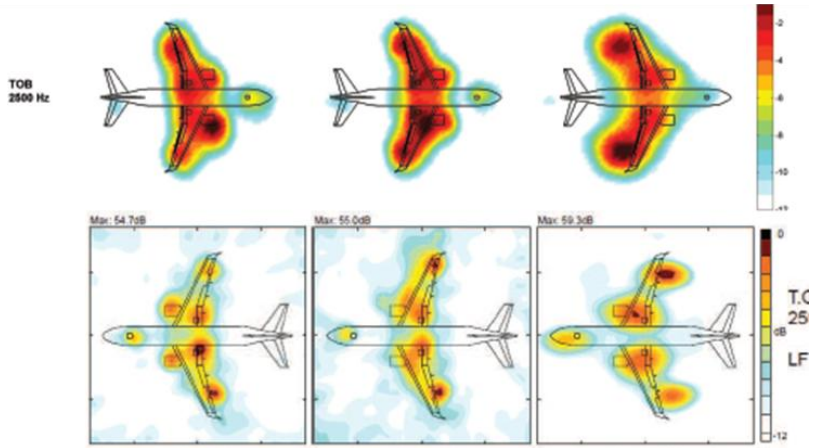


Flyover measurements

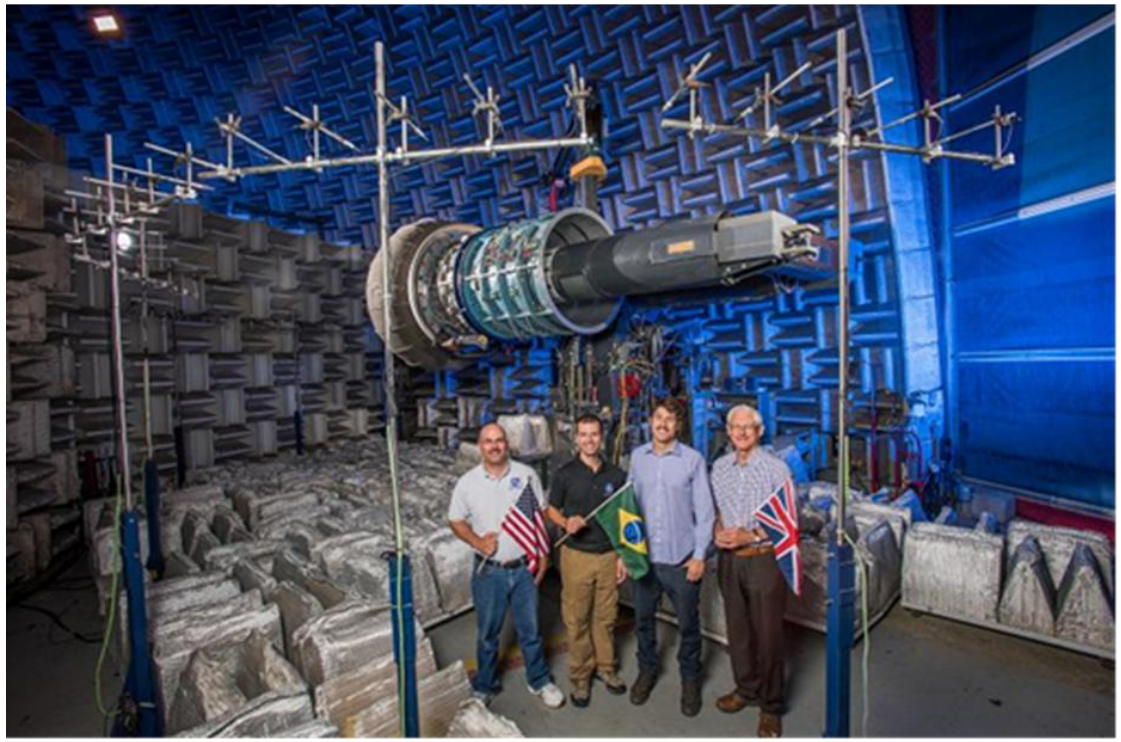








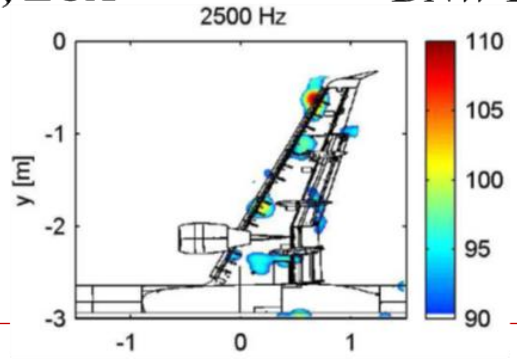
Large Scale Aeroacoustics Testing

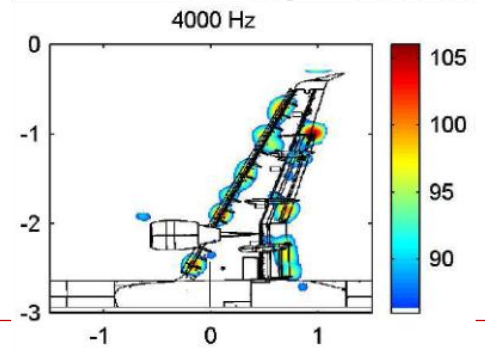


Testing at NASA Glen Fan Rig ANCF, EUA



DNW LLS EMB-170 Half-model aeroacustic testing.



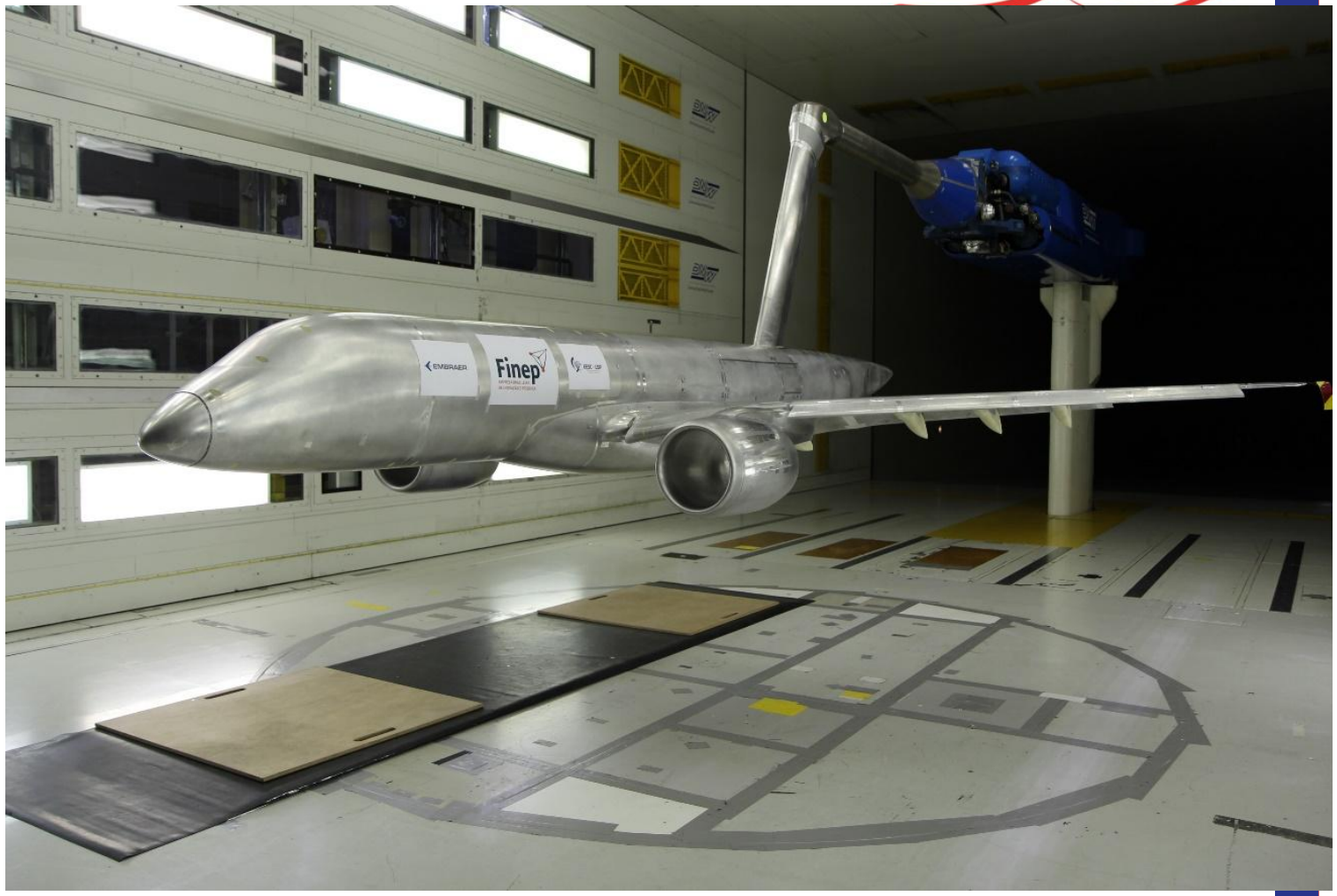


Large Scale Aeroacoustics Testing

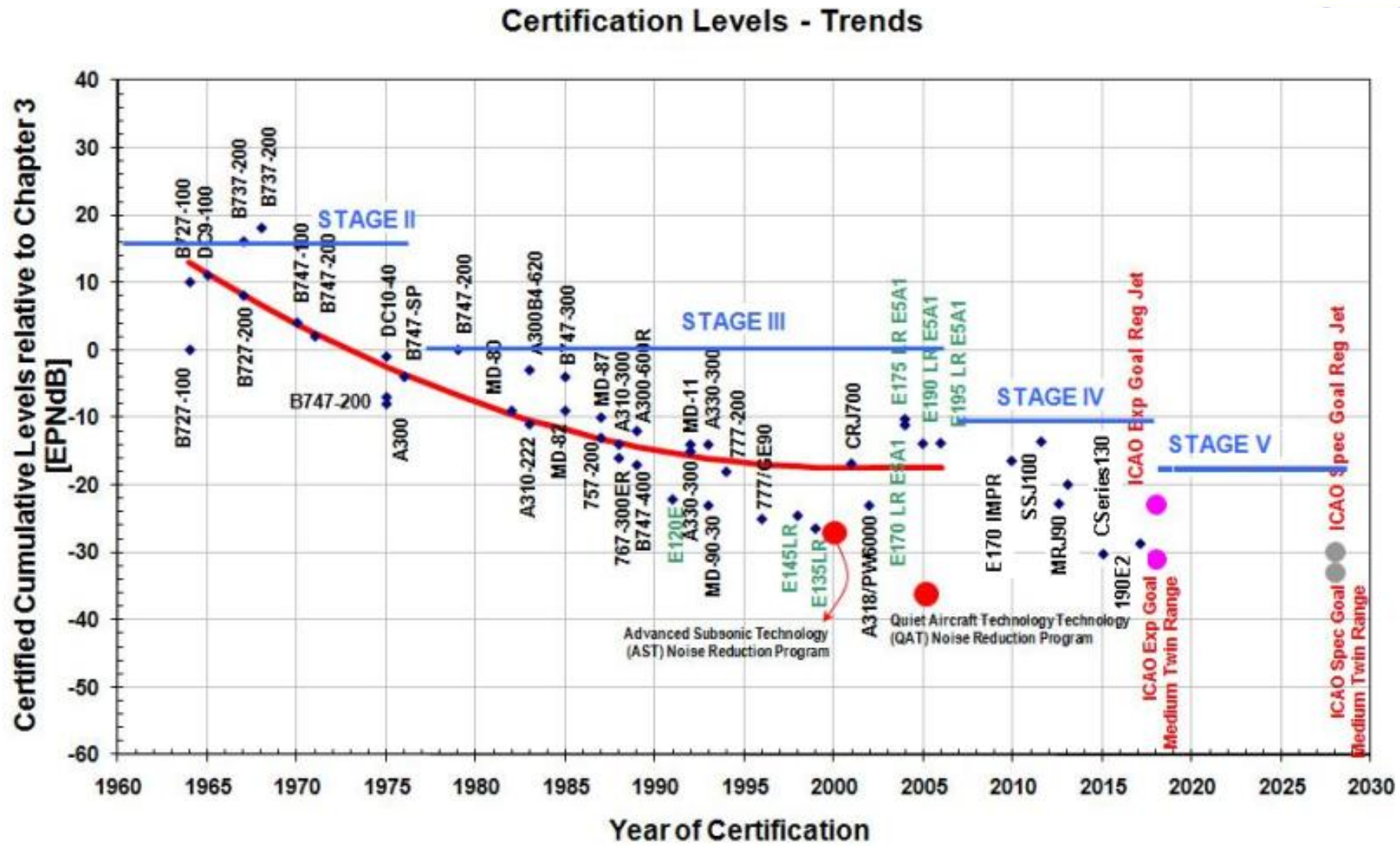
DNW LLF Wind Tunnel testing a full model Embraer 190E2

- 6m span model, M=0.15-0.33
- Single and double slotted flap, flap vane.
- 24 NRT for slat .
- 10 NRT for flap side-edge





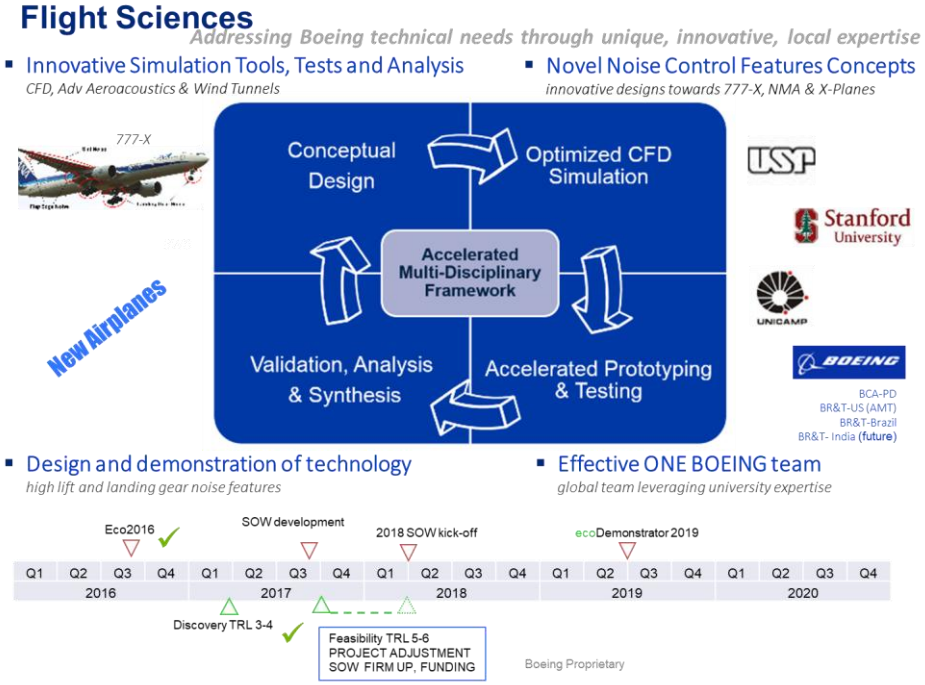
Results

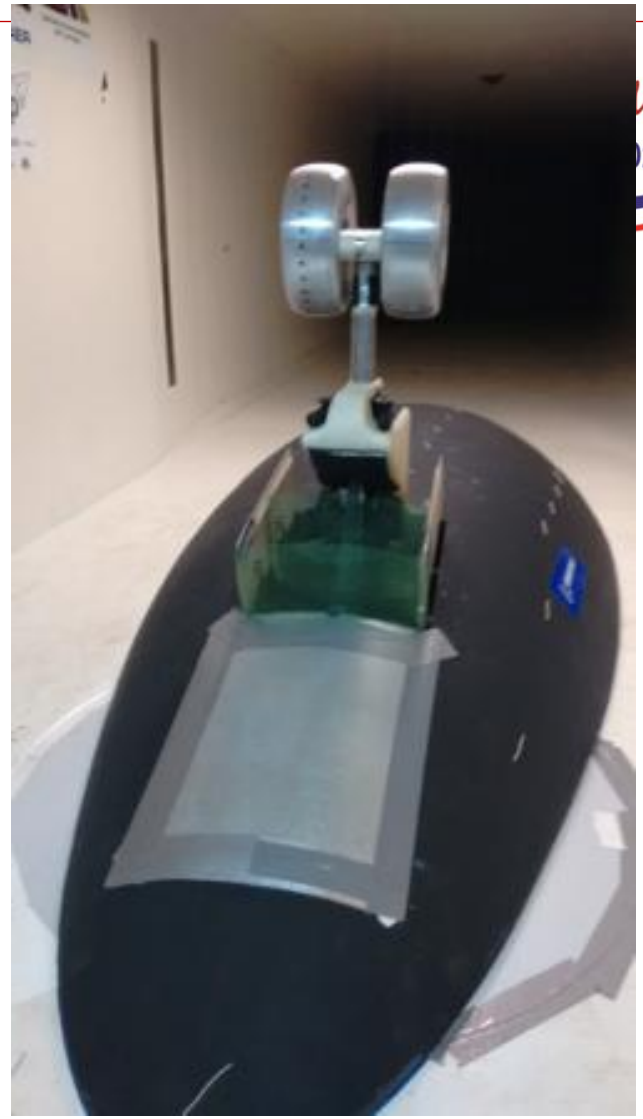


New Technologies have been produced significant noise reductions at noise source.



Complex NLG B777 model 1:6 scale

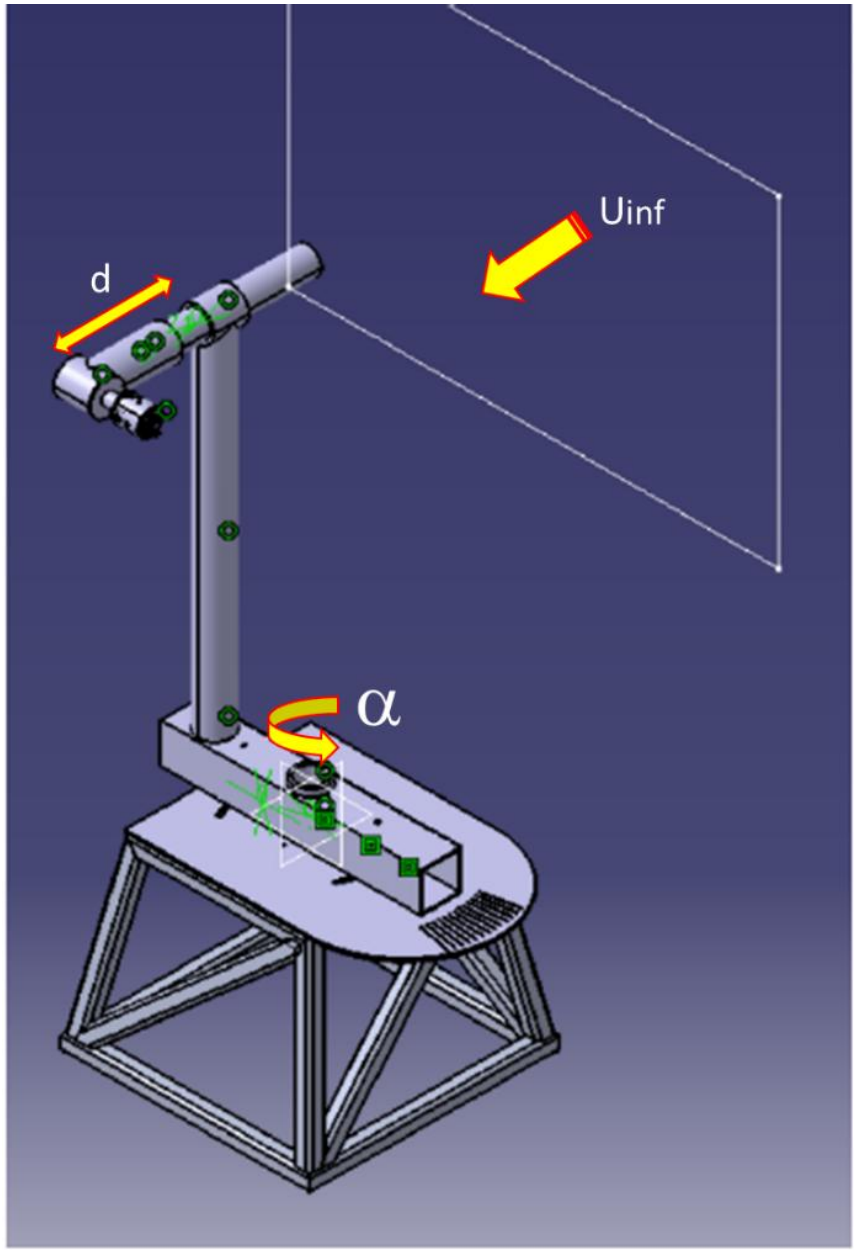


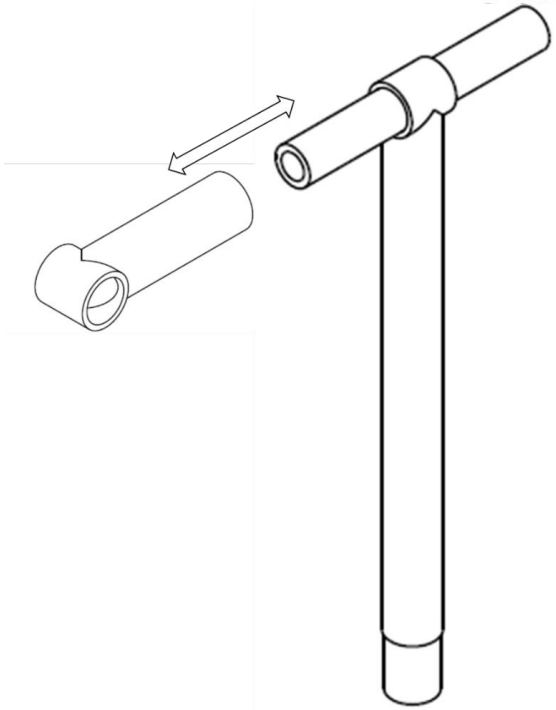


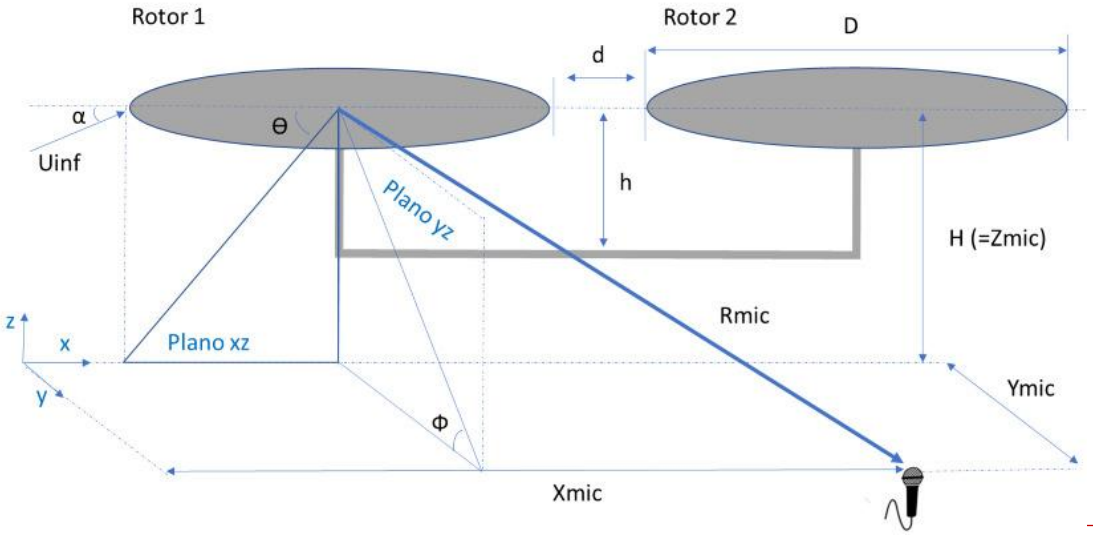
More than 100 hours of Wind tunnel testing both aeroacoustic and aerodynamics; 7 NRTs developed and tested with reductions up to 5 dB

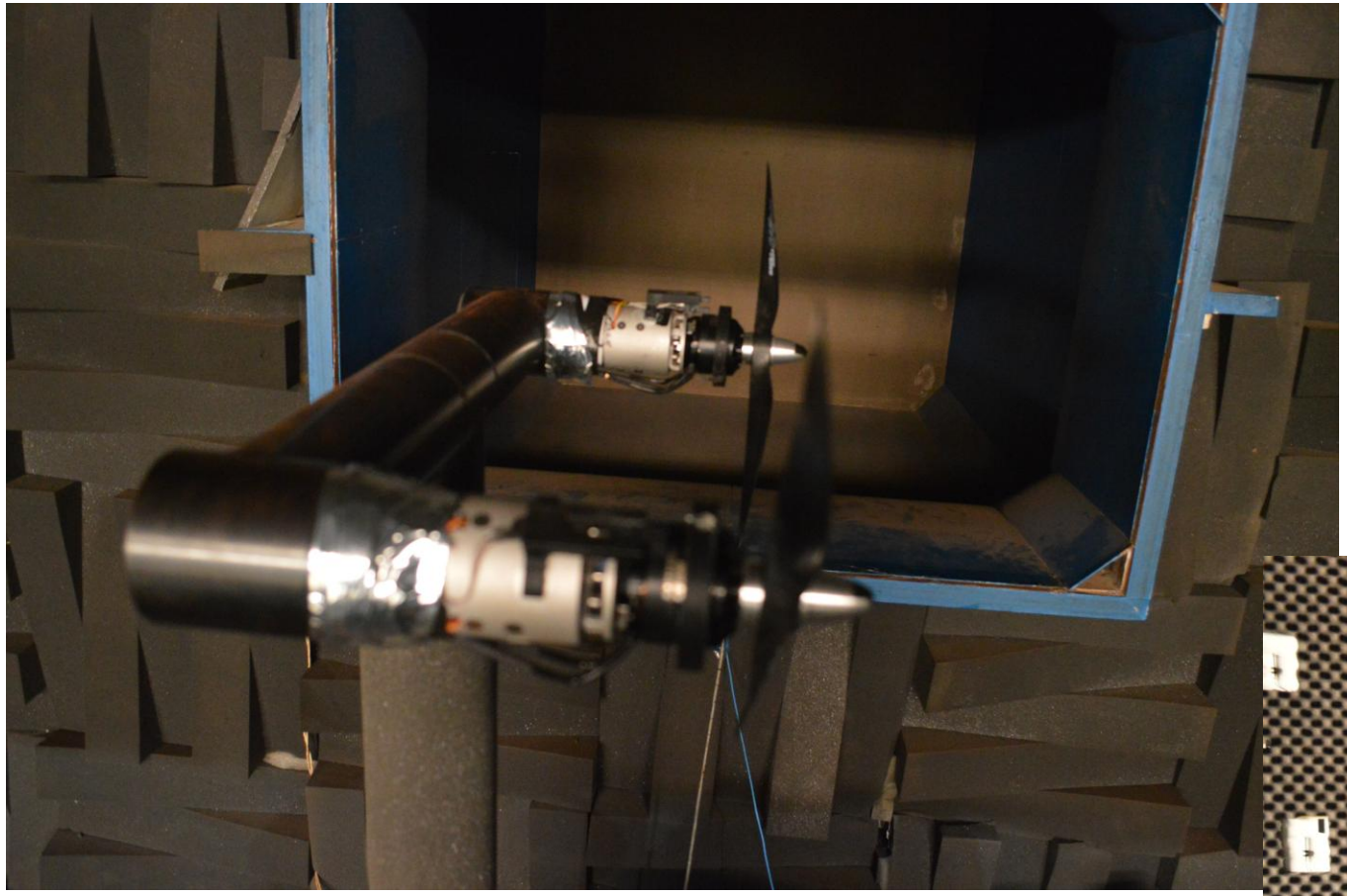
Boeing Proprietary

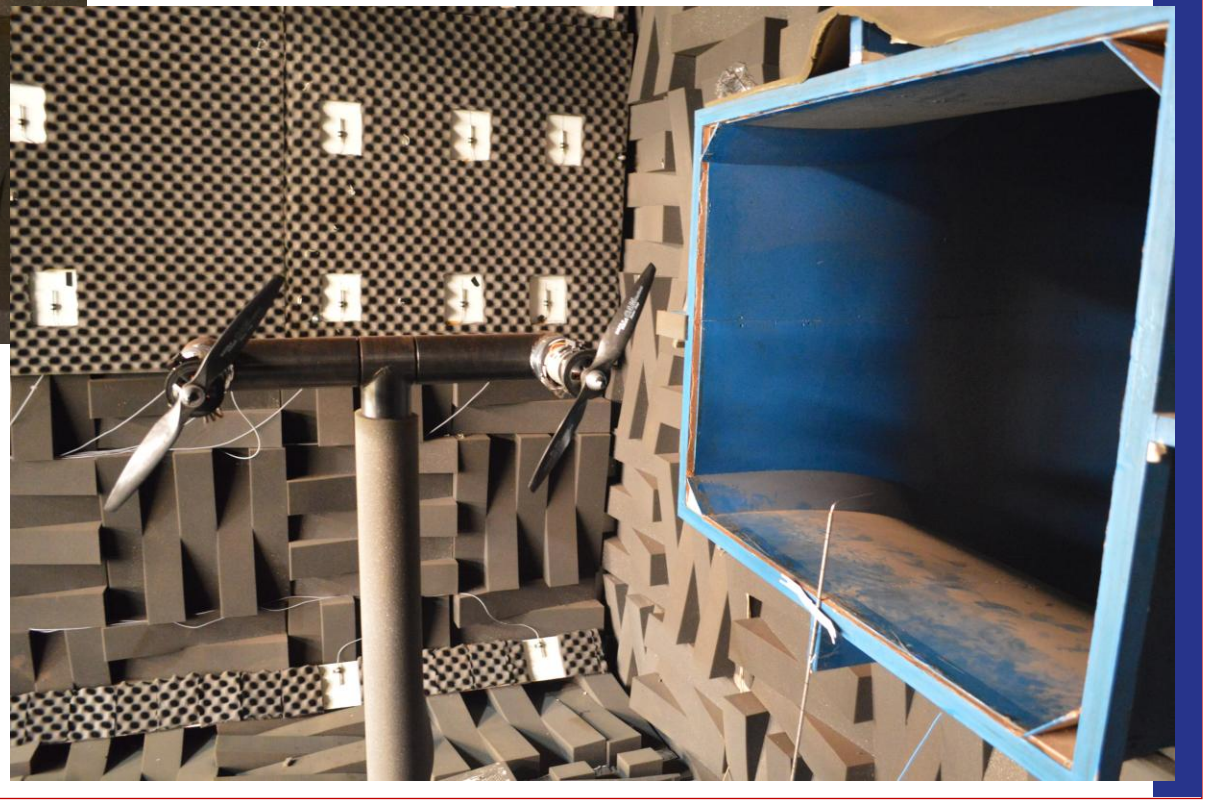
Rotor testing and Aeroacoustcs measurements



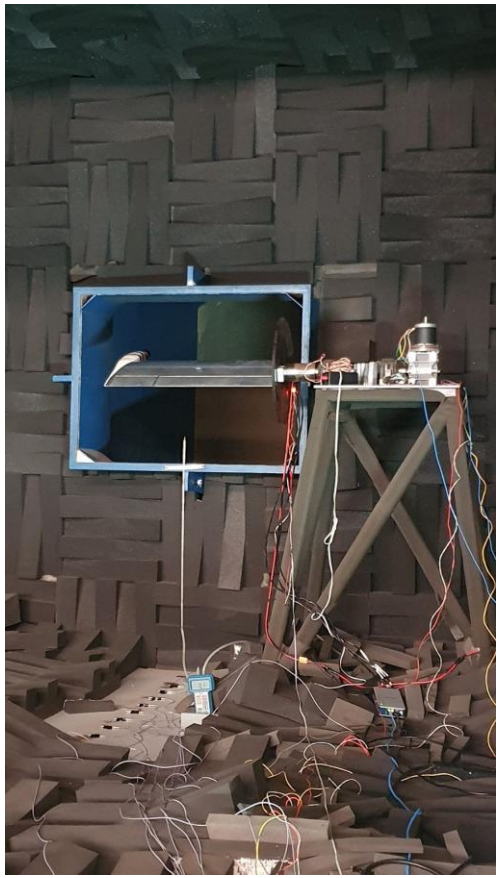




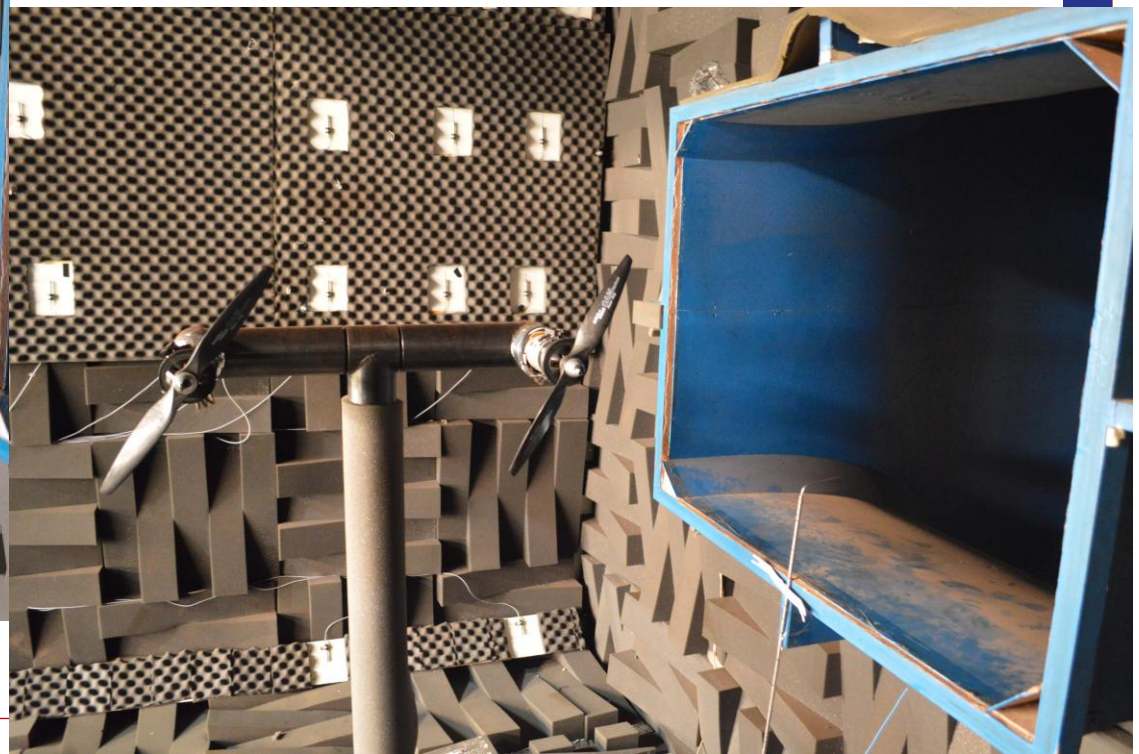


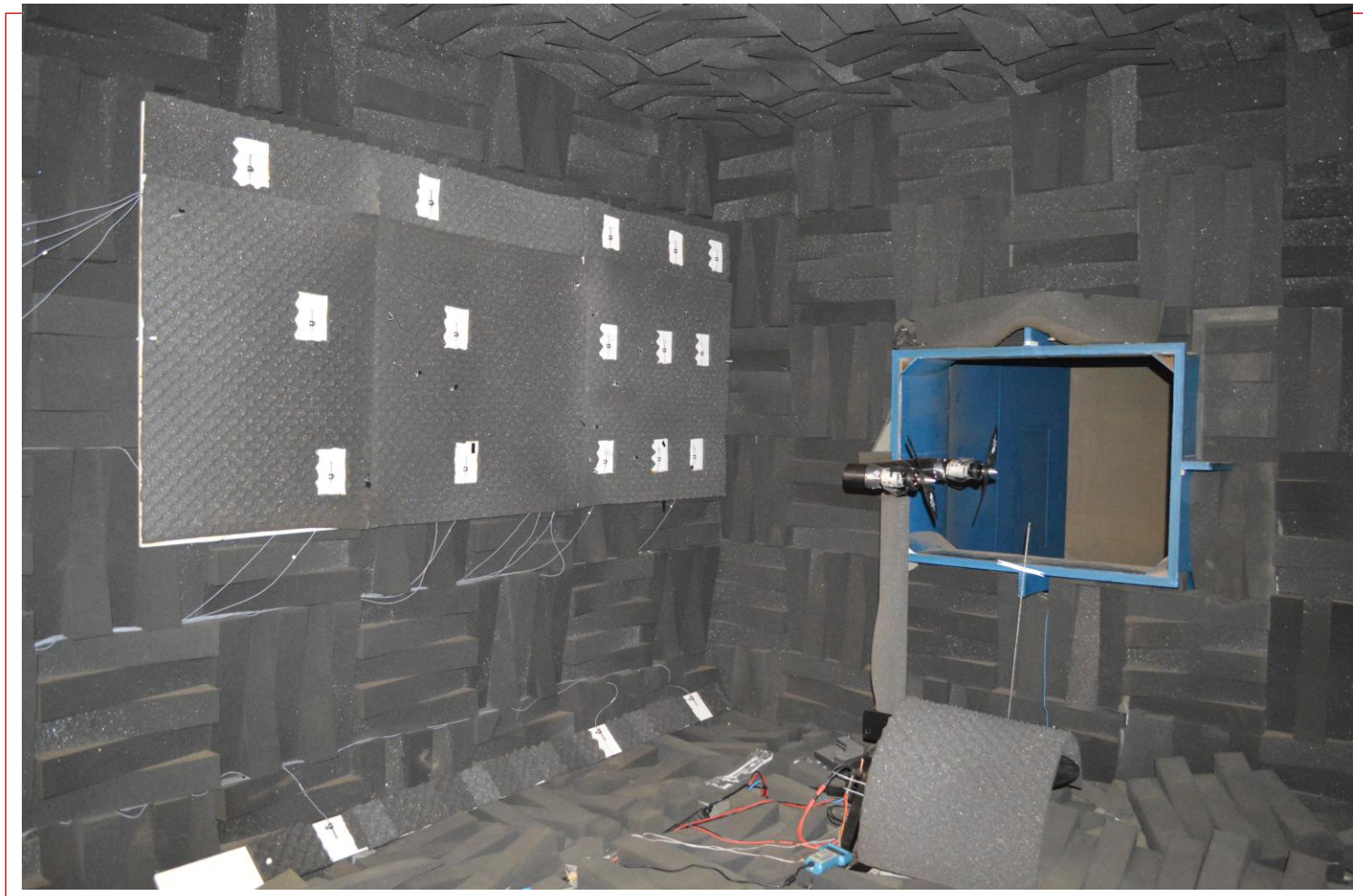


The proposal for measuring noise for t propulsion platform includes positioning the grazing microphones on a smooth surface without acoustic treatment. 10 microphones were positioned at a distance of 1.36 m from the center line of the tunnel with a horizontal distance of 0.15 m between the microphones, the first of which was aligned with the propeller actuation disc. This configuration did not present any problems regarding noise measurement due to the incidence of airflow turbulence.

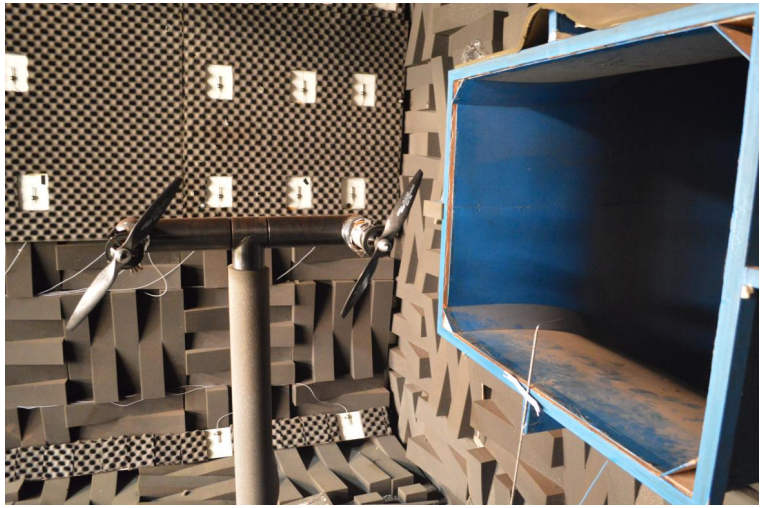






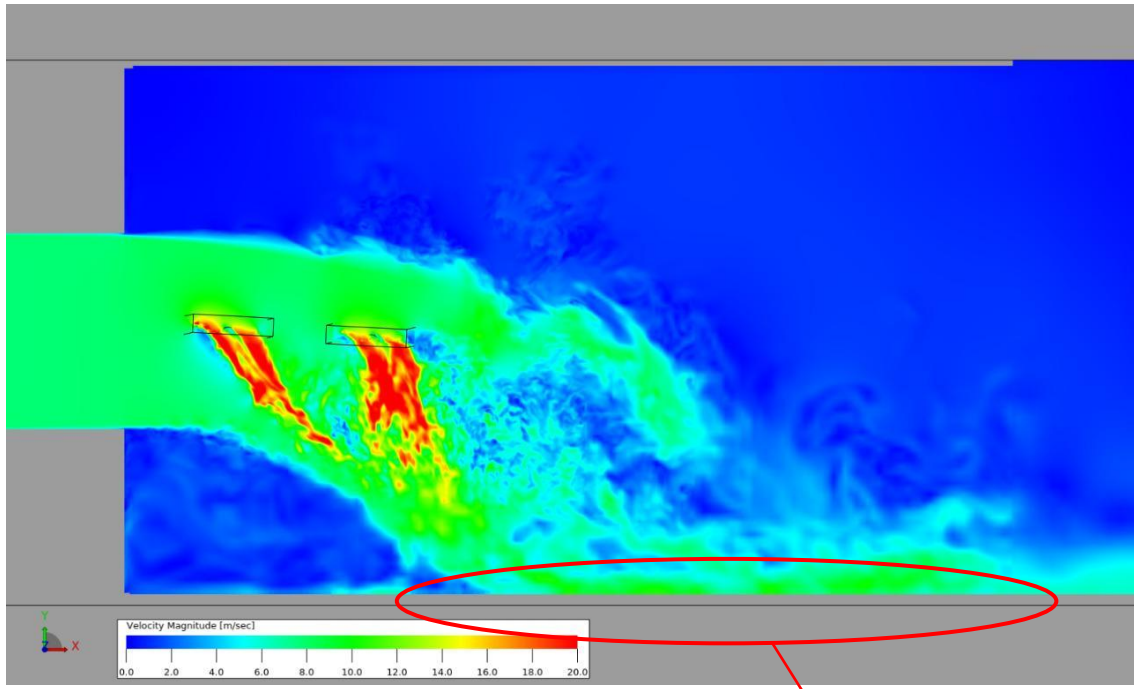






Rig de ensaios de rotores

Aerodinâmico: caracterização do escoamento Análise da interferência do slipstream:



Case 1 - WT 90, Propellers are rotated 90º to benefit from the larger dimension of the WT outlet. AoA 3 deg, V=7,7m/s, Velocity m/sec.

Efeito nos microfones

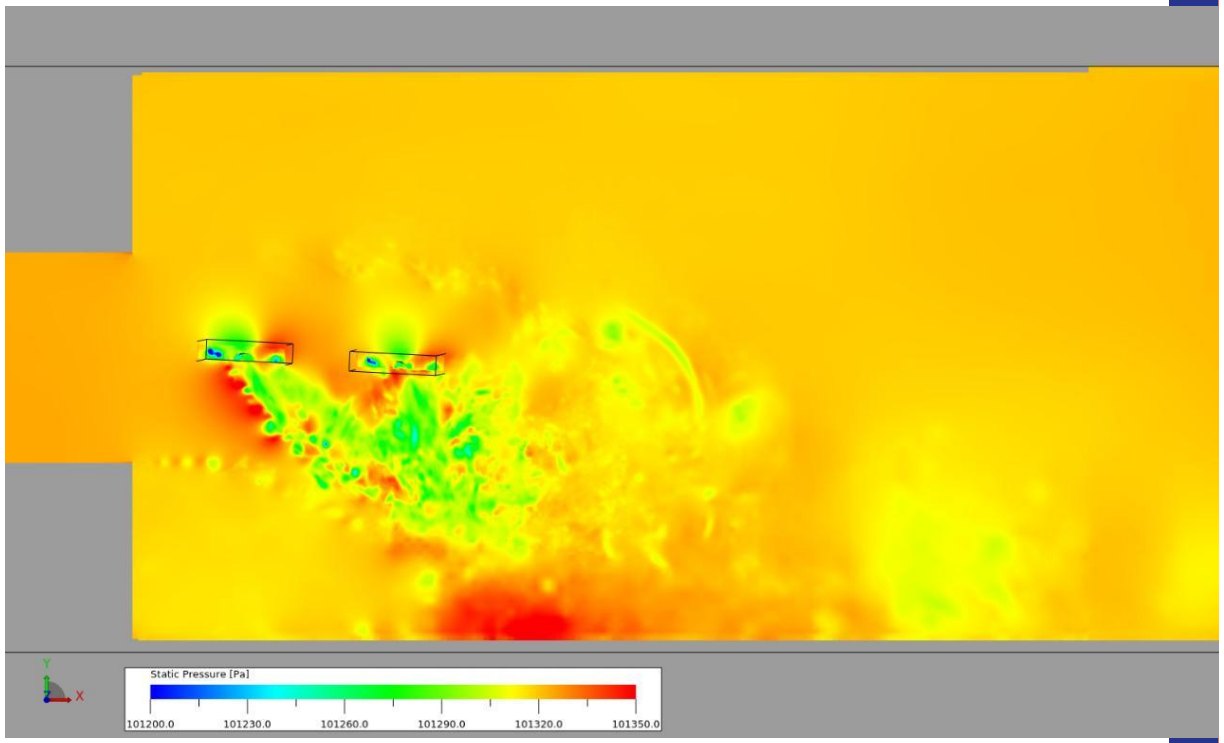


Figura 10 - Case 1 - WT 90, Propellers are rotated 90º to benefit from the larger dimension of the WT outlet. AoA 3 deg, V=7,7m/s, static pressure(Pa)

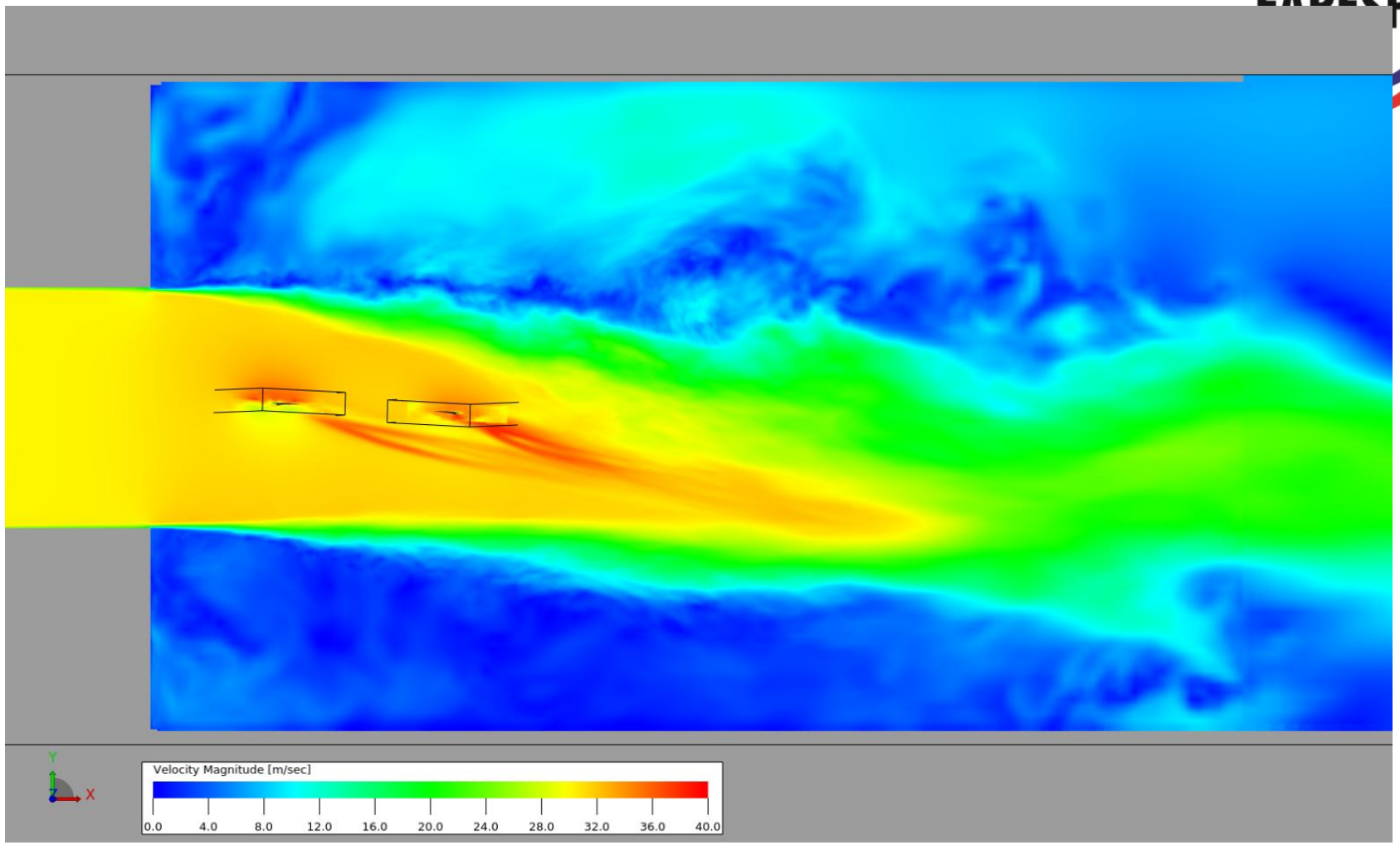
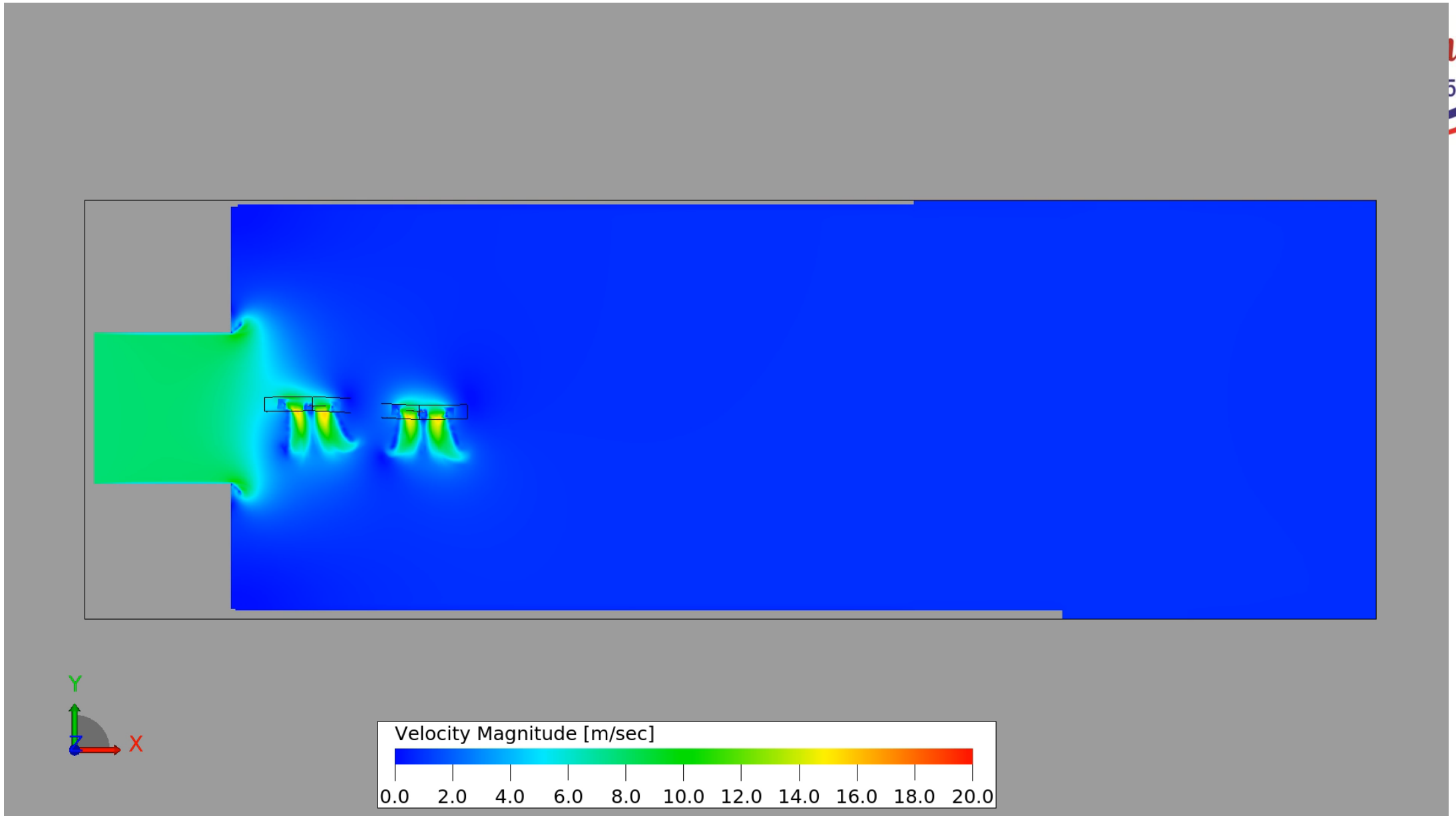


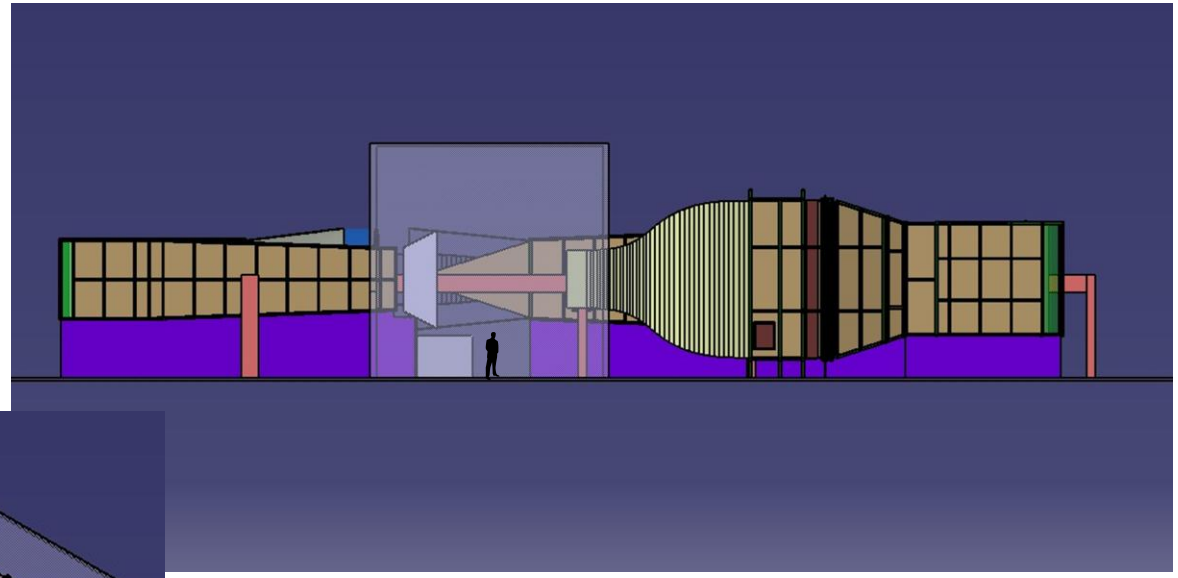
Figura 18 - WT 90, Propellers are rotated 90º to benefit from the larger dimension of the WT outlet. AoA 3 deg, V=30m/s, velocity m/sec.

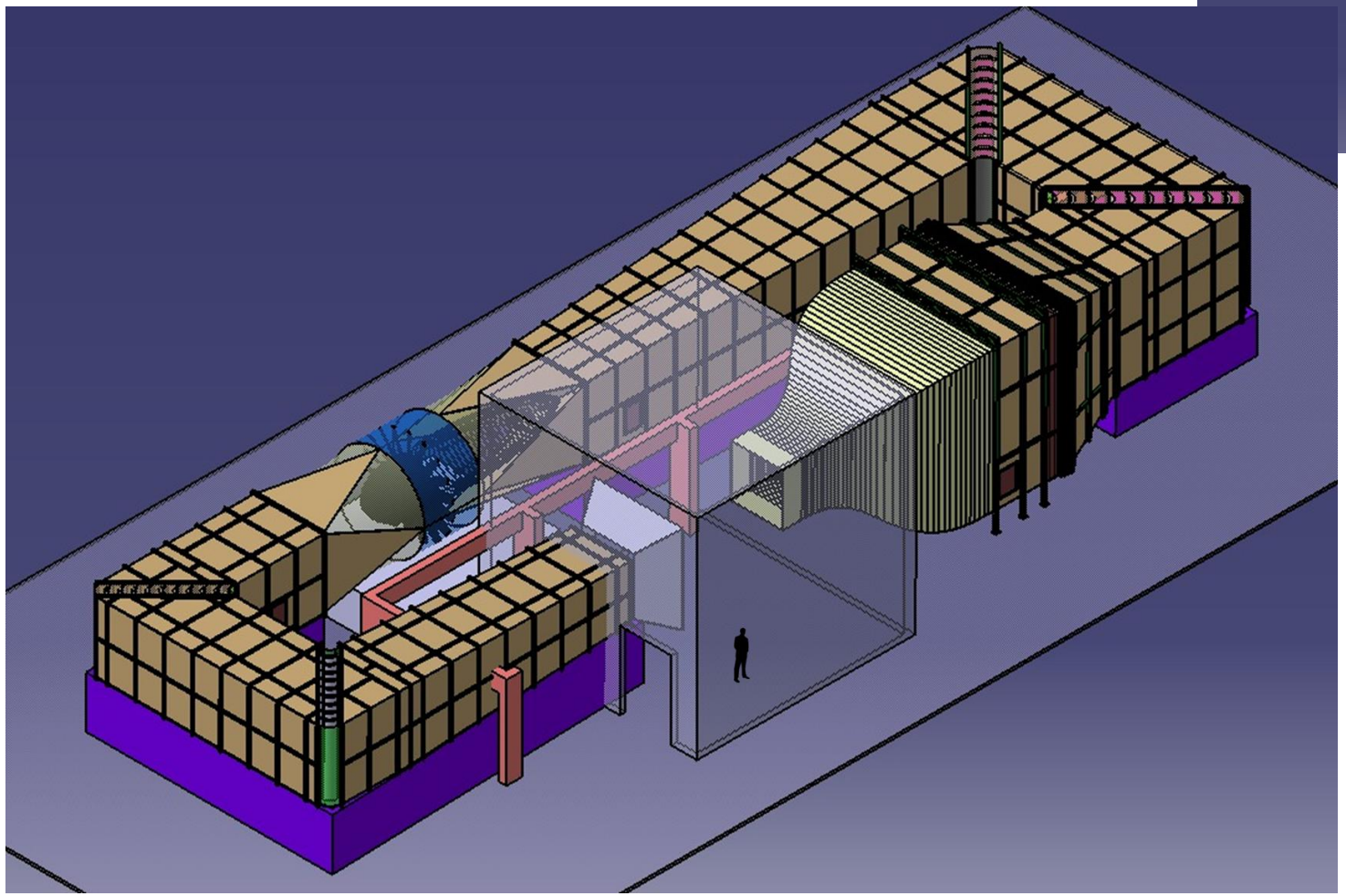

Y
X
Velocity Magnitude [m/sec]
0.0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0 18.0 20.0

Wind Tunnel for aeroacustics testing

2023

Type 100%
EMBRAER/EESC-USP/FIPAI





Thank You!

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AERONAUTICAL ENGINEERING - USP São Carlos

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