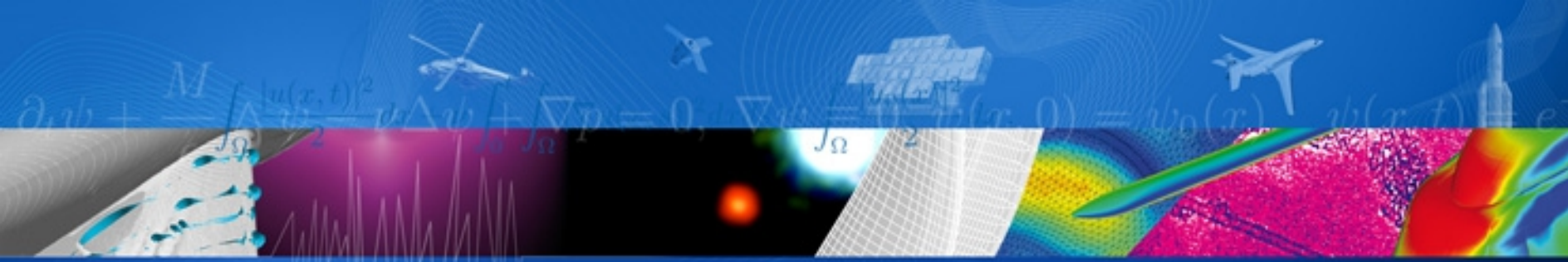


ONERA

THE FRENCH AEROSPACE LAB

retour sur innovation

www.onera.fr

The MORPHO Project

TANGO Meeting Barcelona
may 2013

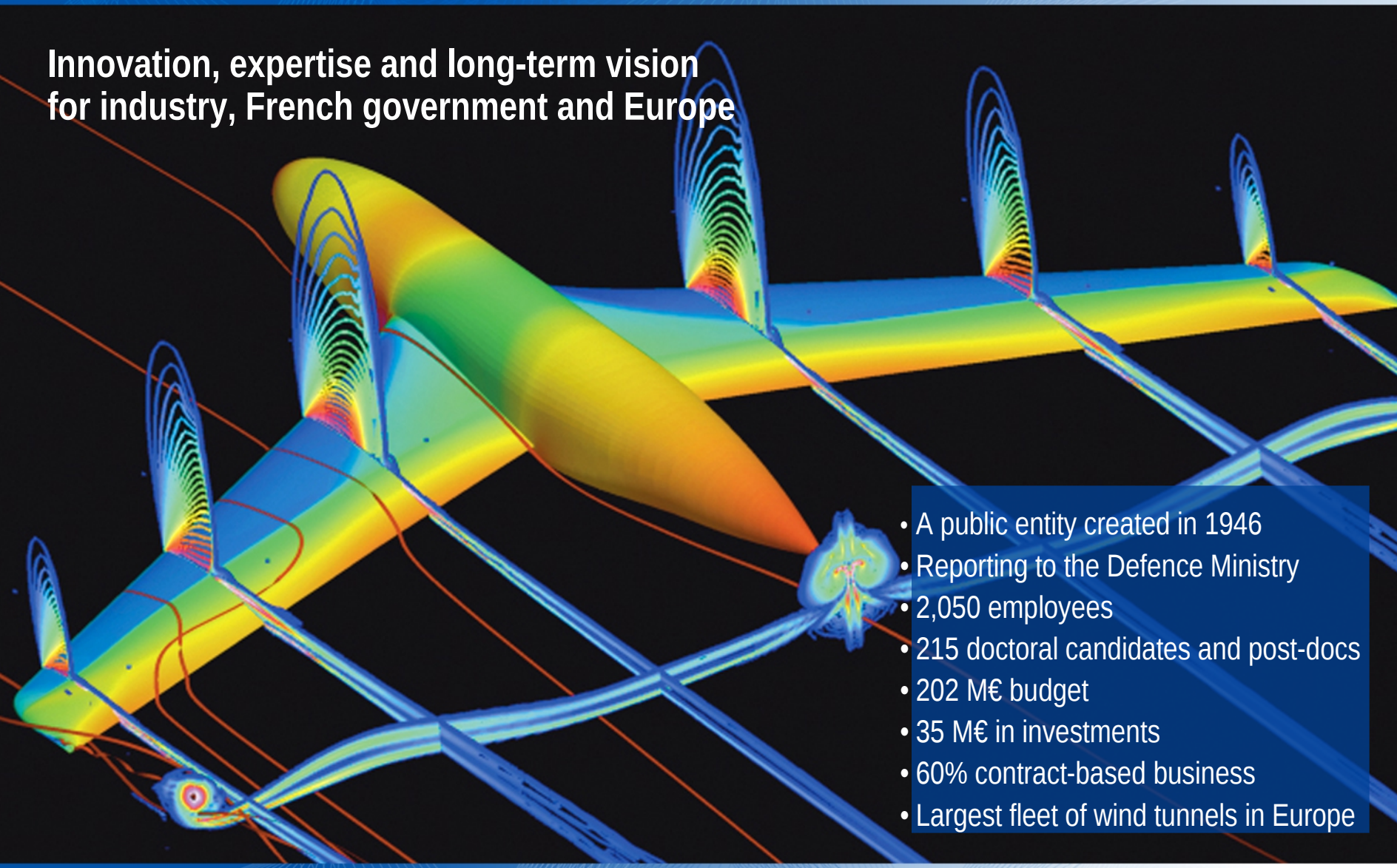
ONERA
THE FRENCH AEROSPACE LAB

MORPHO

retour sur innovation

ONERA: the French Aerospace Lab

Innovation, expertise and long-term vision for industry, French government and Europe



- A public entity created in 1946
- Reporting to the Defence Ministry
- 2,050 employees
- 215 doctoral candidates and post-docs
- 202 M€ budget
- 35 M€ in investments
- 60% contract-based business
- Largest fleet of wind tunnels in Europe

ONERA's Windtunnel Facilities

ONERA Centers

Large Wind Tunnels

ONERA Wind Tunnel Division Main Facilities

Modane Center

S1MA	continuous ø 8 m	--> Mach 1.0	atmospheric
S2MA	continuous 1.8 x 1.8 m^2	0.2 < Mach < 3.1	$P_T max \leq 2.5$ bar
S3MA	blow down 0.76 x 0.80 m^2	0.2 ≤ Mach ≤ 5.5	$P_T max \leq 7$ bar
S4MA	blow down ø 0.68 m / 1 m	Mach = 6.4 / 10 / 12	$P_T max \leq 150$ bar, $T_T max = 1850$ K

TURMA and various dedicated facilities (thrust measurement…)

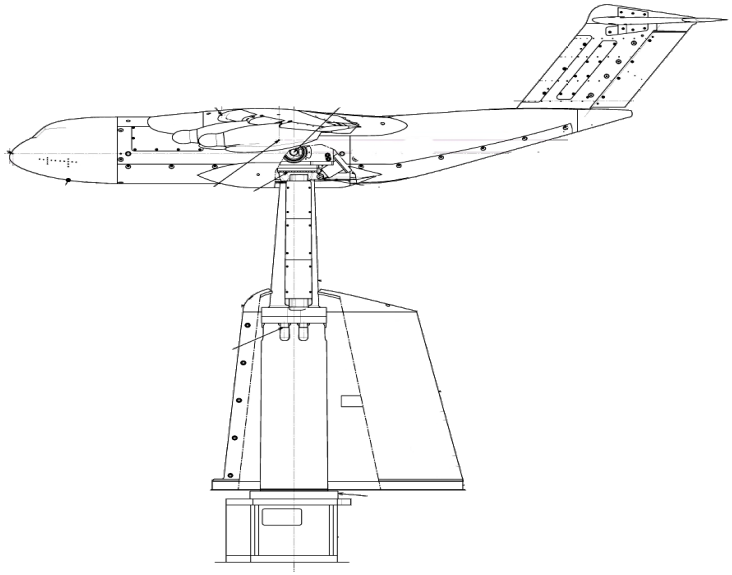
Le Fauga-Mauzac Center

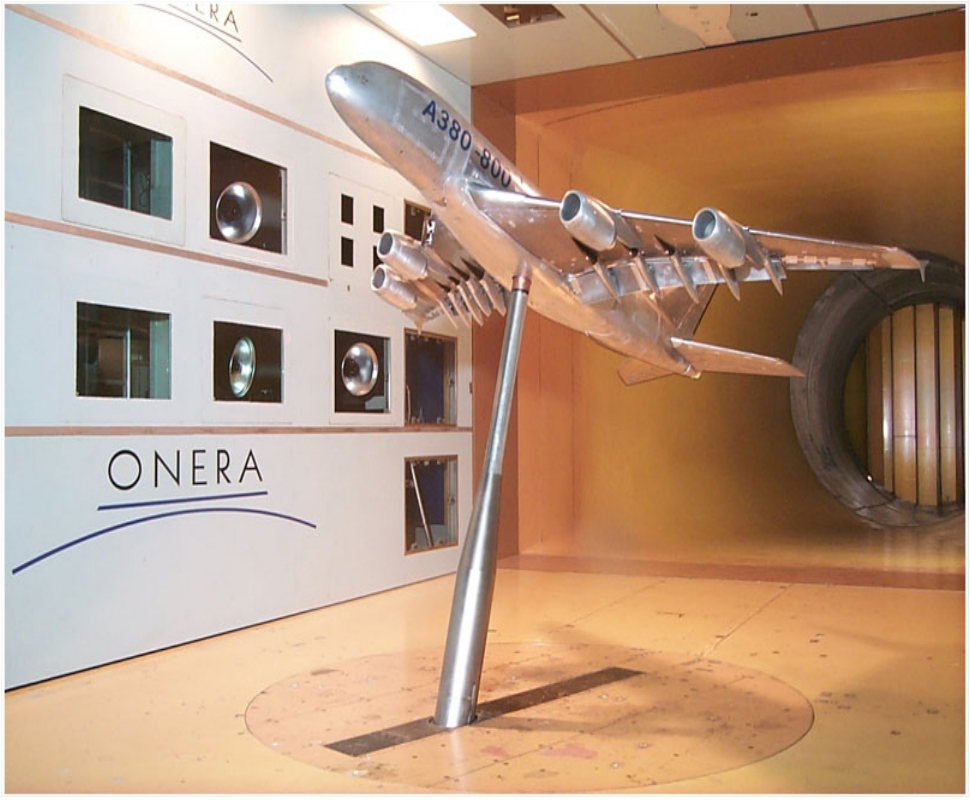
F1	continuous 4.5 x 3.5 m^2	--> Mach 0.36	$P_T max \leq 4$ bar
F2	continuous 1.4 x 1.8 m^2	--> Mach 0.30	atmospheric
F4	arc jet high ø 0.43 / 0.67 /0.93 m high enthalpy	Hi / Tra = 200	$P_T max \leq 800$ bar

Saclay (DGA-EP)

CEPRA 19	continuous, ø 2 m / 3 m free jet	60 - 120 m/s	aeroacoustic

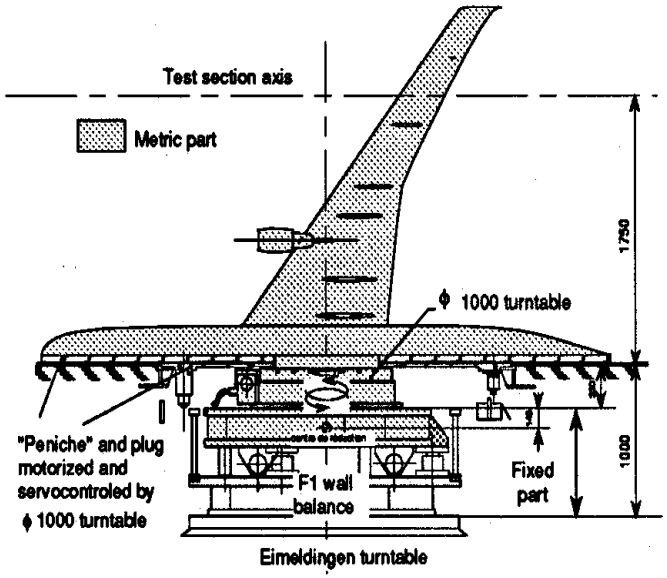
Full-Model





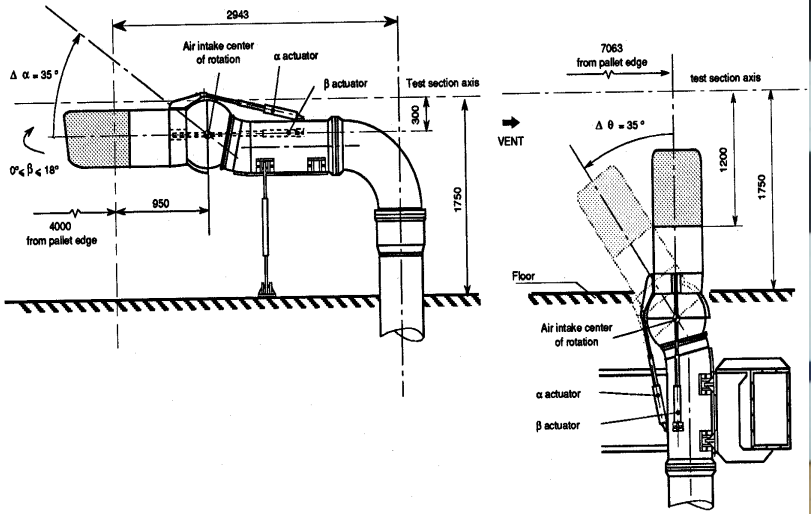
Airbus A380 in F1

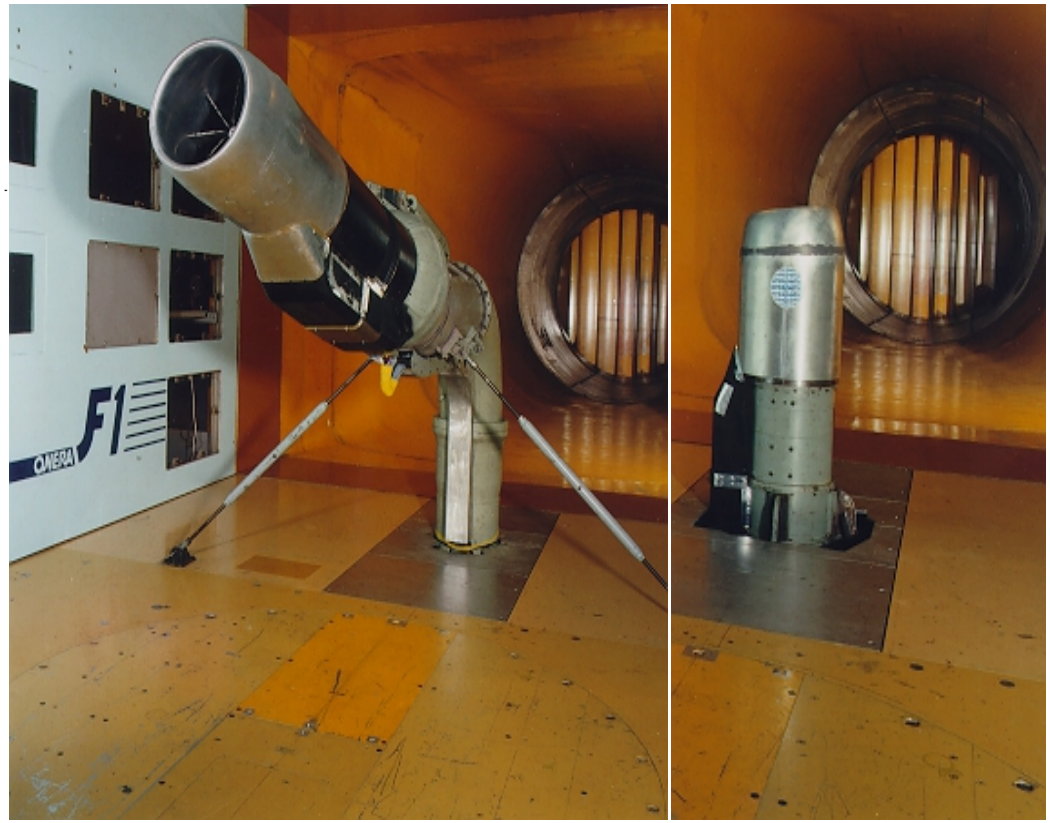
Half-Model



Airbus A340 in F1

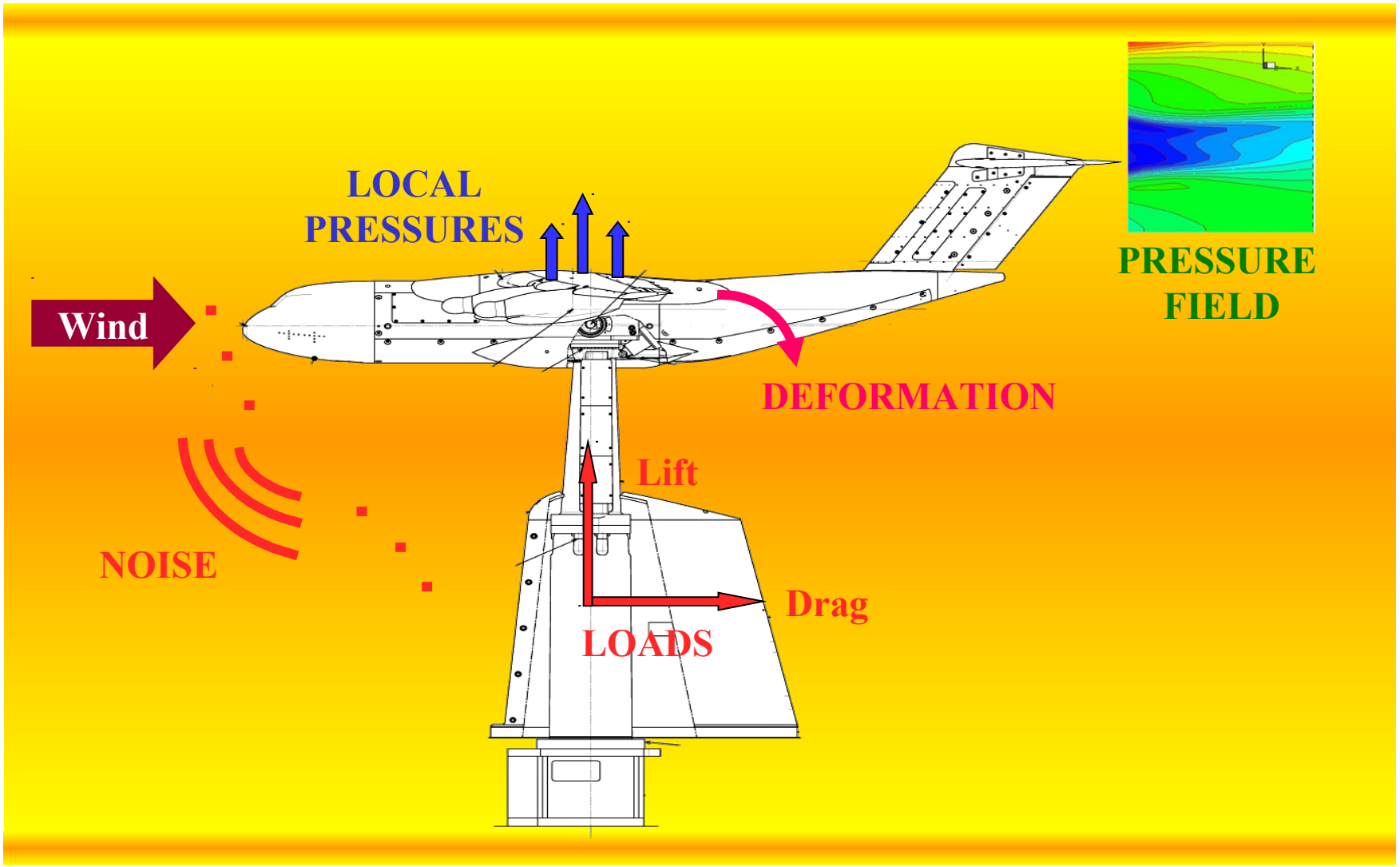
Air Inlet Model





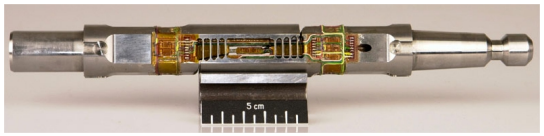
Air Inlet face and side wind

Main Measurement Data

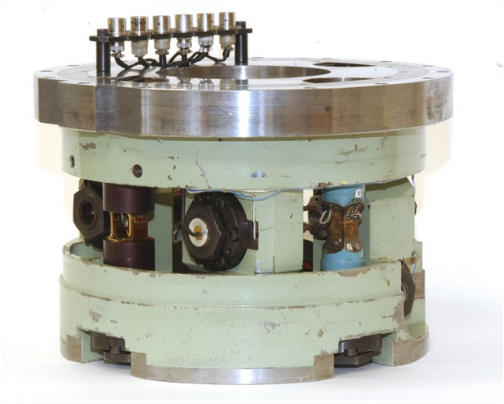


Model Load Measurement

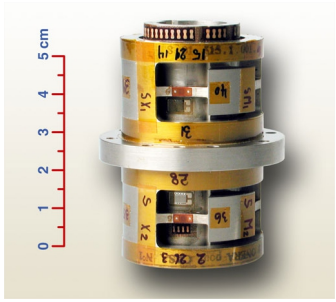
Balance



Sting Balance
Range of diameter from 8mm to 210mm, Normal Force capacities ranging from 60N to 220,000N and axial force capacities from 100N to 27,000N



Assembly Balance



Rotating Balance

Model Pressure Measurement

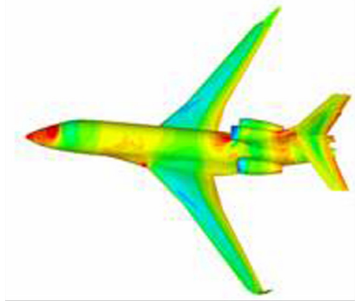
Static Pressure Taps

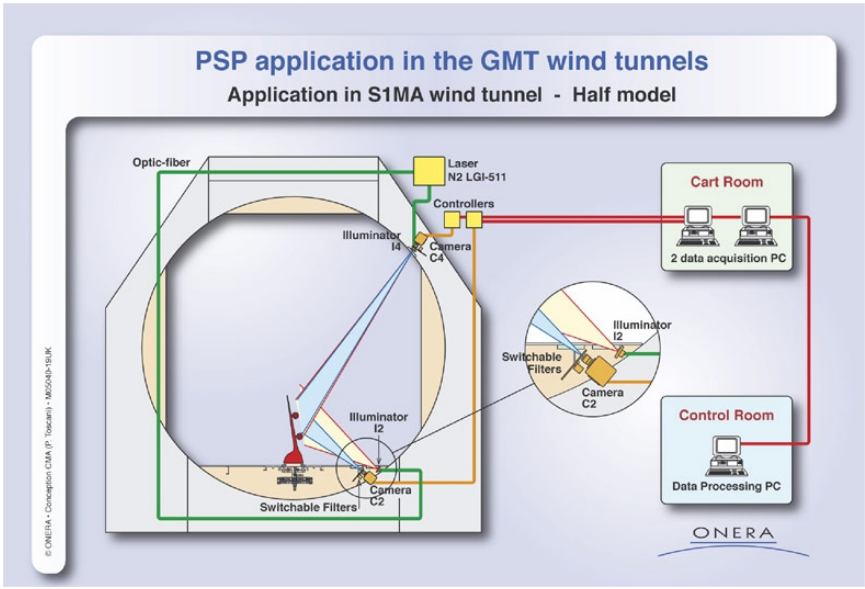
More than 1000 taps on the models

Sensors :

- Druck, Entran, Bell and Howell, Digiquartz with the range from 1PSI to 3,500 PSI.
- PSI units (48 and 64 ports) with a range 5, 15 and 30 PSI.
- Kulite, thermally compensated for sensitivity and zero drift.

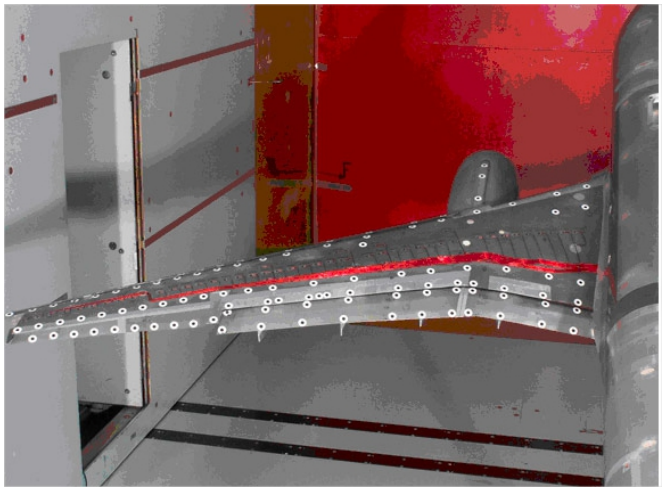
Pressure Sensitive Paint

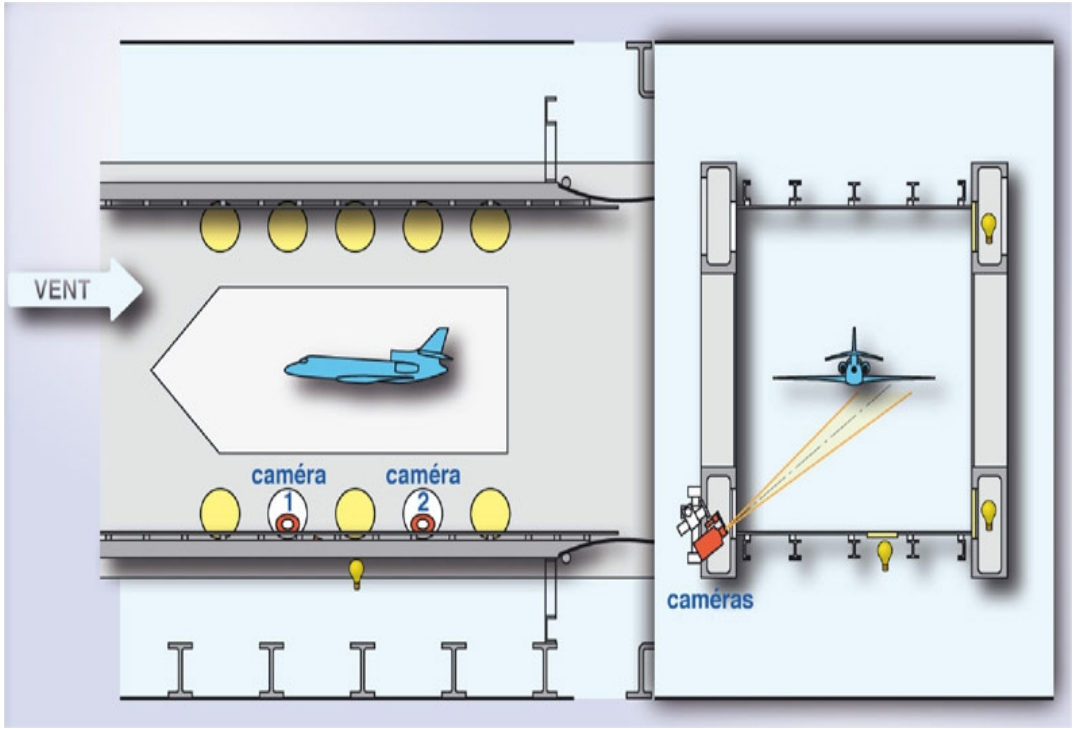




Model Deformation Measurement

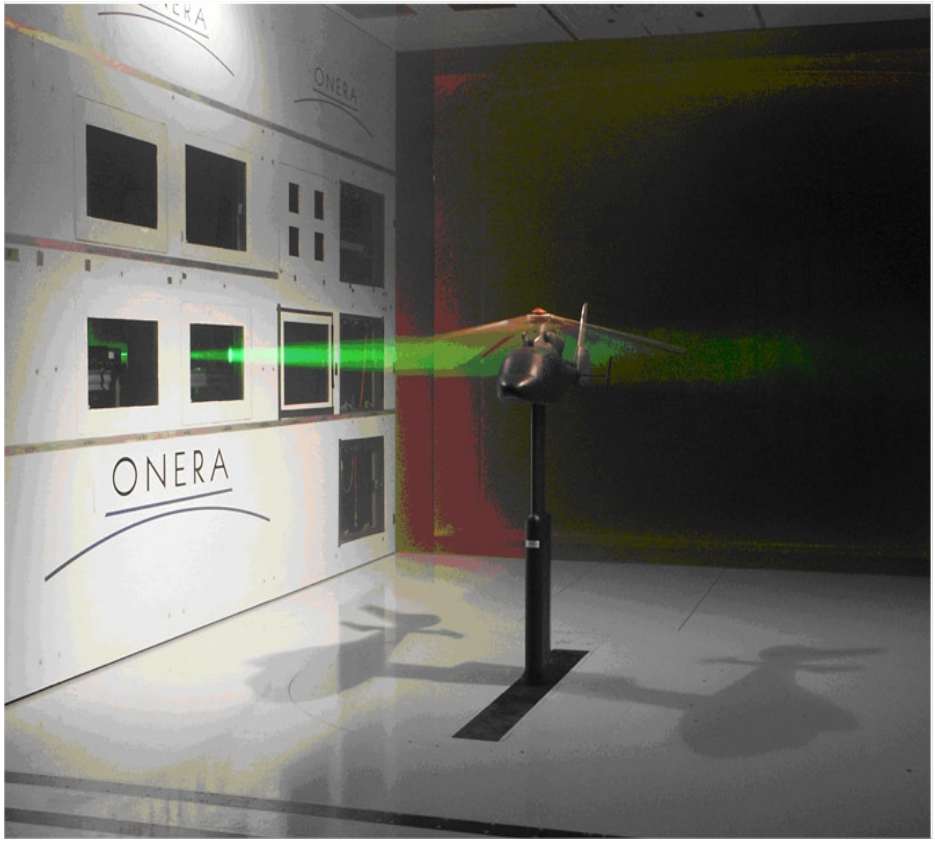
Real-time 3D localisation of Model's Markers

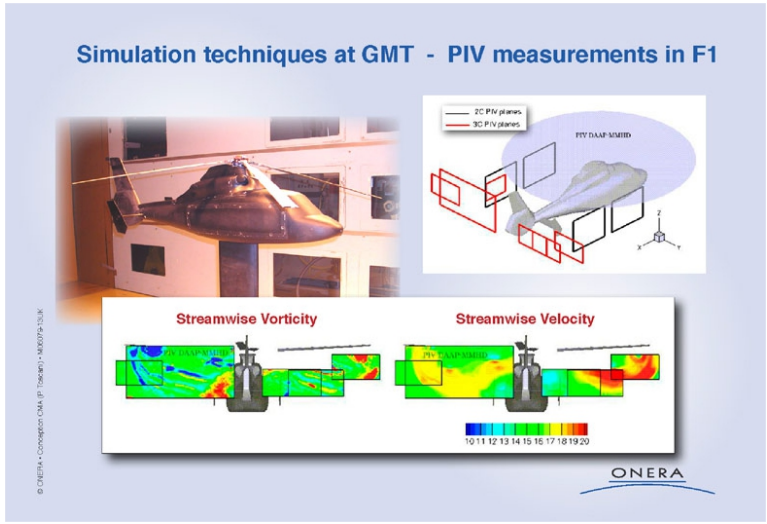




Flow Field Measurement

Particle Image Velocimetry





MORPHO Project

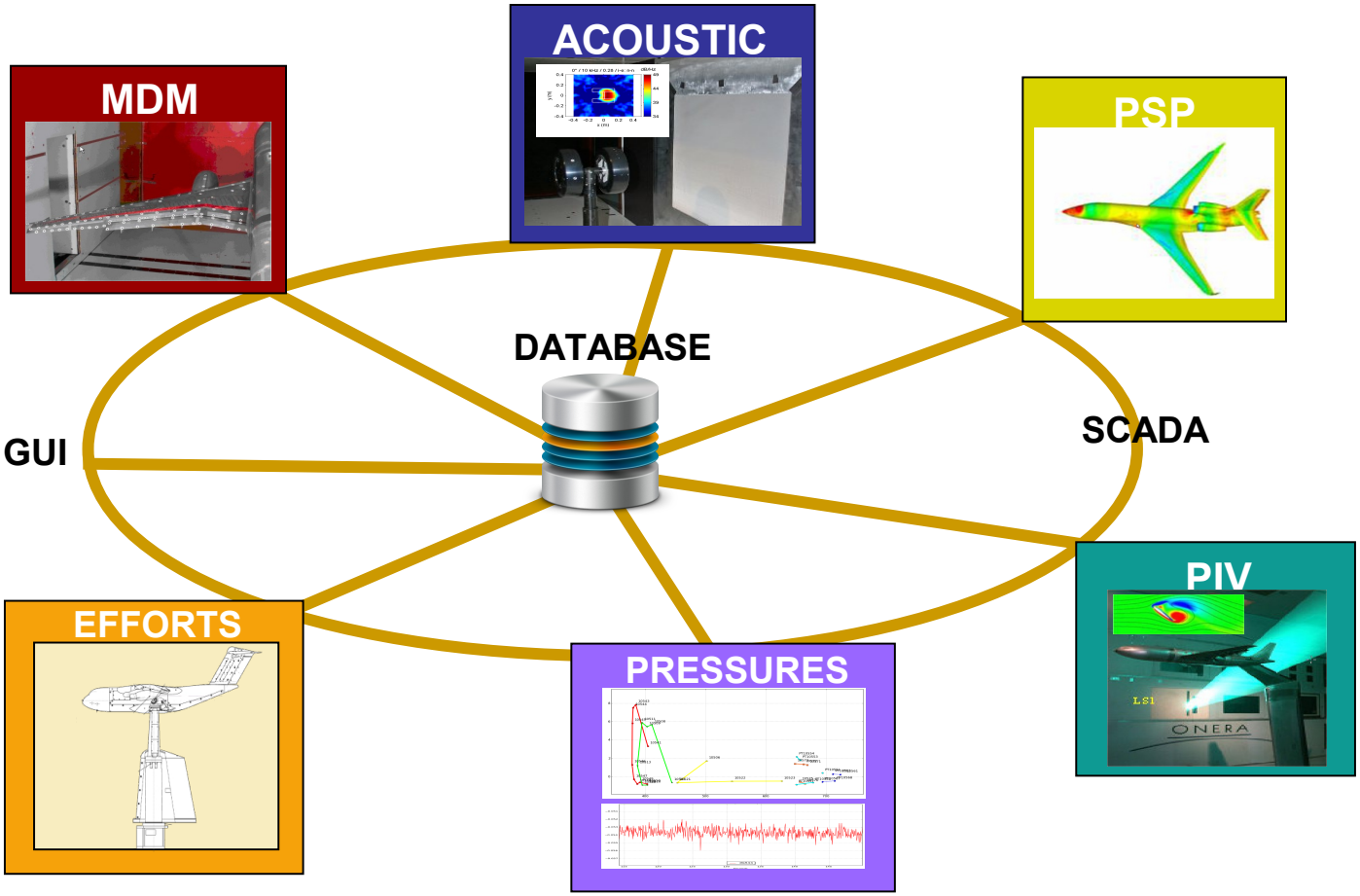
- **Objective:** Build an open, generic, flexible, extendable, new software environment for all GMT's Test facilities.

- **Main features:**
  - Test Preparation
  - Test Execution
  - Test Monitoring
  - Test Data Management

- **Customer's Benefits:**
  - Simpler and better integration of « innovative measurement systems » (PIV, PSP, MDM, Acoustic, Wireless, etc.)
  - Increase productivity: extensive use of « Men Machine Interfaces » allows less « manual operations » and shorter system configuration time.
  - A greater flexibility: generic device interfaces allow quick reconfiguration and "on the fly" system integration.
  - A greater reactivity: "on line" access to current and previous test data helps the Test Engineer to take the right decisions.

Why TANGO ?

- SCADA
- DATABASE
- GUI



SCADA Market

MORPHO

Open Source :

EPICS	Office of Science U.S. Department of Energy; Los Alamos NATIONAL LABORATORY; iter the way to new energy; BESSY GmbH
TANGO	ALBA; DESY; elettra; ESRF; SOLEIL SYNCHROTRON
GAIUS	DNW German-Dutch Wind Tunnels

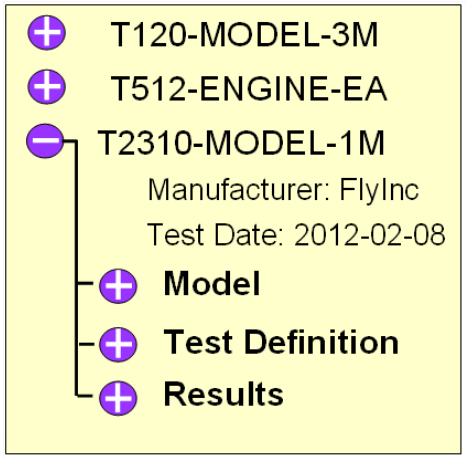
Commercial products :

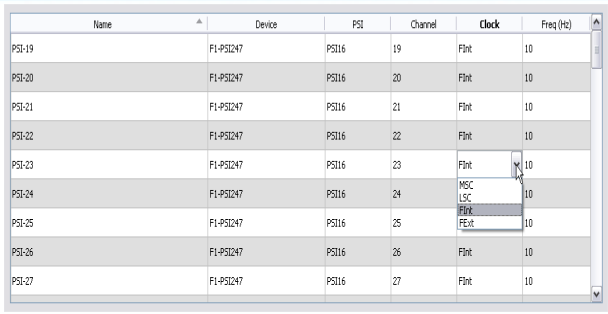
DAVIS werum SOFTWARE & SYSTEMS	Audi; Mercedes-Benz; DLR; AIRBUS
PVSS by ETM	LHCb; Large Hadron Collider beauty experiment; European Organization for Nuclear Research; CERN

Direction - Conférence

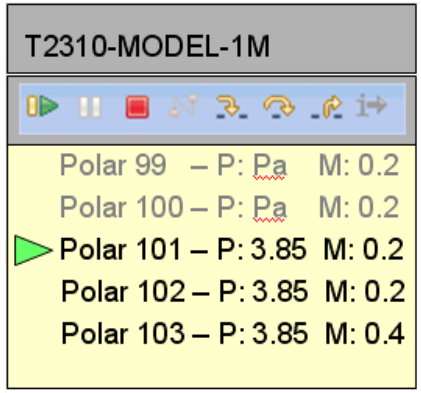
ONERA

GUI : an Integrated Test Environment





CHANNEL EDITOR



TEST MANAGER

TEST DATABASE

MODEL DATA

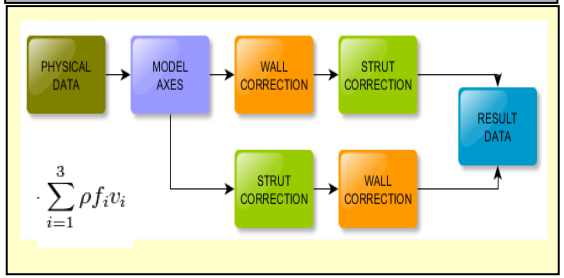
TEST PLAYER

DATA PROCESSING TOOL

WT DATA

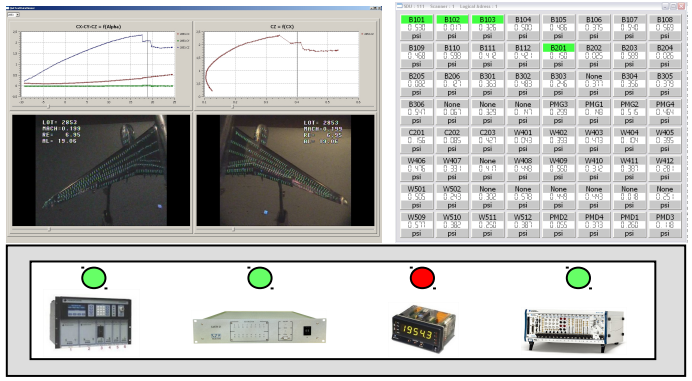
MONITORING TOOLS

main calculation workflow



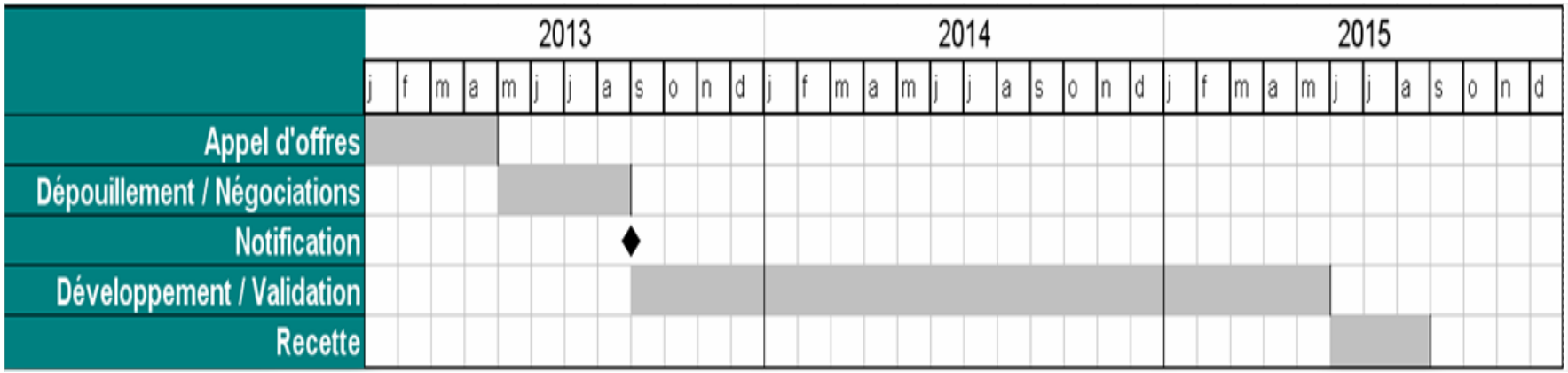
EXPORT TOOLS

WDF
TARDIS
Tecplot
Etc.



MORPHO Project Status

- SCHEDULE
  - First development step in F1 WindTunnel.
  - Call for tenders in progress until July 2013
    (4 proposals received all based on TANGO)
  - Progressive deployment to GMT from third quarter 2015.



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TIME FOR QUESTIONS