



SUBSONIC WIND TUNNEL



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The UAS wind tunnel is one of the largest and most modern subsonic circuit tunnels present in Italy. For UAS it represents a useful tool for analyzing the aerodynamic characteristics of various UAVs with a wide speed range in order to simulate different flight conditions.

There are two test chambers: one high speed tests and one low speed tests. The air flow is generated by a 4-blade turbine powered by a 250 kW motor with a diameter of 2.26 meters located just before the diffuser downstream of the two chambers.

The UAS tunnel open circuit and allows tests to be carried out even in the presence of combustion engines because the exhaust gases are expelled outside.



Test chamber characteristics

The two test chambers allow different tests to be carried out: the low speed chamber is suitable for hosting large models.

The high-speed chamber, on the other hand, allows tests where it is necessary to simulate a flow at greater speed.



High speed camera

Section width and height, in meters 2.0 x 1.0
Length, in 4.0 meters
Maximum speed, in meters per second 75

Low speed camera

Section width and height, in meters 2,5 x 2,0
Length, in meters 5.0
Maximum speed, in meters per second 30



Quality of vein

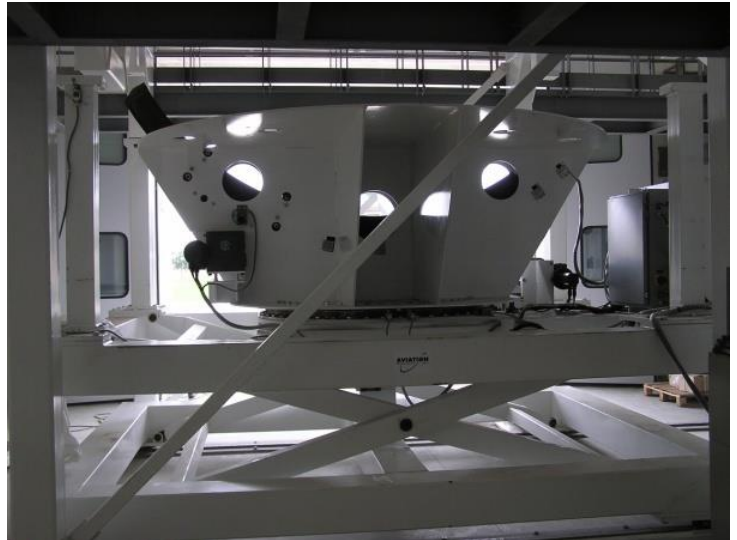
The quality of the fluid vein of the UAS tunnel is ensured from every point of view: spatial uniformity of the speed in the test chambers shows a deviation of less than 1% compared to the average reference value, in the central area of the test chamber (80% of the section). The directional deviations of the flow are less than 0.25 °. Finally, the intensity of the turbulence is less than 0.5%.



Model support system

The model support system is mounted on a mobile structure, it can be moved easily from one test chamber to another.

On request, customized supports can be made for particular configurations. The system, in addition to supporting the models to be tested, is able to vary the angles of incidence and derivatives considerably thanks to the remotely controlled actuators and the position sensors.



Low speed camera

Pitch excursion from -15° to $+30^\circ$
Yaw excursion $\pm 30^\circ$

The angular accuracy is 0.25° in both test chambers while in dynamic terms the rotation speeds are 1° per second both in incidence and in drift, thus making it possible to also analyze unstationary aerodynamic coefficients.

High speed camera

Pitch excursion $\pm 5^\circ$
Yaw excursion $\pm 3^\circ$

Permissible forces and moments

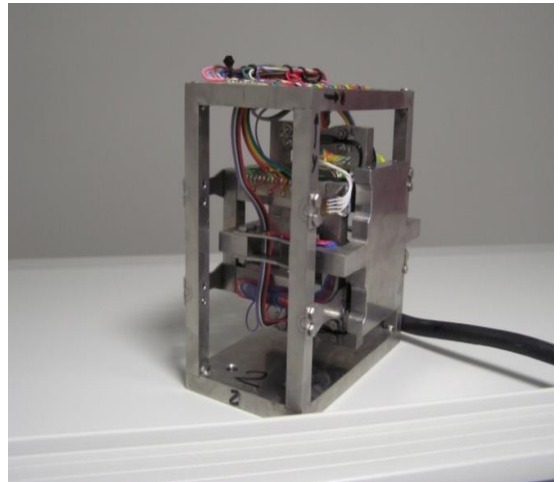
Lift, KN 2.2
Side load, KN 0.4
Axial load, KN 0.4
Pitching moment, Nm 270
Yaw moment, Nm 15
Rolling moment, 75 Nm



Instrumentation

UAS has completely developed the system for the acquisition and processing of different types of data; this is possible thanks to the use of sophisticated instrumentation.

For the aerodynamic loads UAS has patented a strain gauge balance to 6 components, can be made in different formats according to requirements and can also be positioned within the structure of the models placed in the gallery.



Kulite miniature pressure sensors, together with the acquisition system real time data with over 400 channels, allow to evaluate the pressure distribution around a body in stationary conditions and unstationary.

Thanks to the hot wire technology, local turbulence measurements are also possible, while the quality of the vein is assessed using 5-hole Pitot connected with differential pressure sensors, for a wide range of values (from 0.1 to 50 mbar) up to 64 pneumatic channels.

Thanks to a smoke generator it is possible to carry out flow visualization tests, indicated above all to evaluate aerodynamic interference between several bodies or between different parts of the same object.



UAS know-how

UAS has the necessary knowledge, expertise and technology to support the wind tunnel in carrying out the tests.



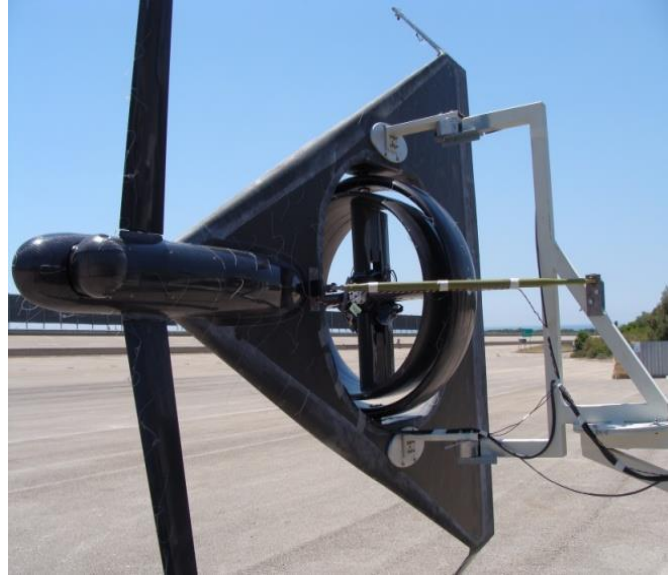
For the creation of the models to be placed in the tunnel, UAS uses CAD designers able to draw the necessary components by making them using a five-axis numerical control machine or using an original machine developed in the company, which allows the rapid prototyping directly from polyester foam with cut hot wire.



Types of tests

Thanks to the dimensions of its test chambers, the UAS wind tunnel has a versatility that allows it to carry out different types of tests:

- ✓ Aerodynamic and aeroelastic tests of small-scale models of large aircraft and mini-UAVs in 1:1 scale
- ✓ Aerodynamic and aeroelastic tests of scale models of cars, trains and their components
- ✓ Aero-structural interaction tests in the civil field (suspension bridges, skyscrapers, stadium and fair coverings etc.
- ✓ Aerodynamic and aeroelastic tests for power generation systems such as wind turbines
- ✓ Aerodynamic tests in sports, where interaction with the wind is relevant (cycling, bobsleigh, sledding etc.)



Services provided

UAS also offers several services that may be of interest to wind tunnel customers:

- ✓ realization of the models to be tested and the particular equipment as needed
- ✓ Design and ad hoc realization of instrumentation based on technology strain
- ✓ Design and construction of systems automatic for data acquisition and control of aerodynamic and propulsive tests
- ✓ Experimental data processing and parametric identification (derivatives of stability control etc)

The UAS wind tunnel is also available to the customer for autonomous testing. Rental terms and conditions will be available on request.

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