# Hannibal's revenge

## *Italy plans new aerospace R&D center*

In its effort to become one of Europe's major aerospace powers, Italy has begun beefing up its research and development infrastructure. One important step is the creation of an Italian Space Agency, which should be operational by the end of the year. Another big event is the birth of the Italian Aerospace Research Center, CIRA.

The center, to consist of at least four wind tunnels and a supercomputer complex, is to be constructed on a 170-ha site in Capua, a small town north of Naples whose major claim to fame until now was Hannibal's stopover there during the Punic Wars. Initially employing 50 people, it will eventually have a staff of 600 to 800, a range felt by the Italian scientific community to represent the critical mass necessary for any serious national aeronautics program.

An appropriations bill presently pending before the Italian parliament would provide an initial budget of L600 b ($2.2 b) for the complex, which could be supplemented by a special development fund earmarked to develop predominantly rural southern Italy. No construction schedule can be announced until funding has been finalized.

The wind tunnels would include two low- and two high-velocity units.

The first of the low-velocity tunnels, a 3 MW-unit, would have two interchangeable test sections measuring 4.5 x 3.5 m and 6 x 5 m. The maximum air velocity for each would be 110 and 55 m/s, corresponding to a Reynolds number close to $2.7 \times 10^6$.

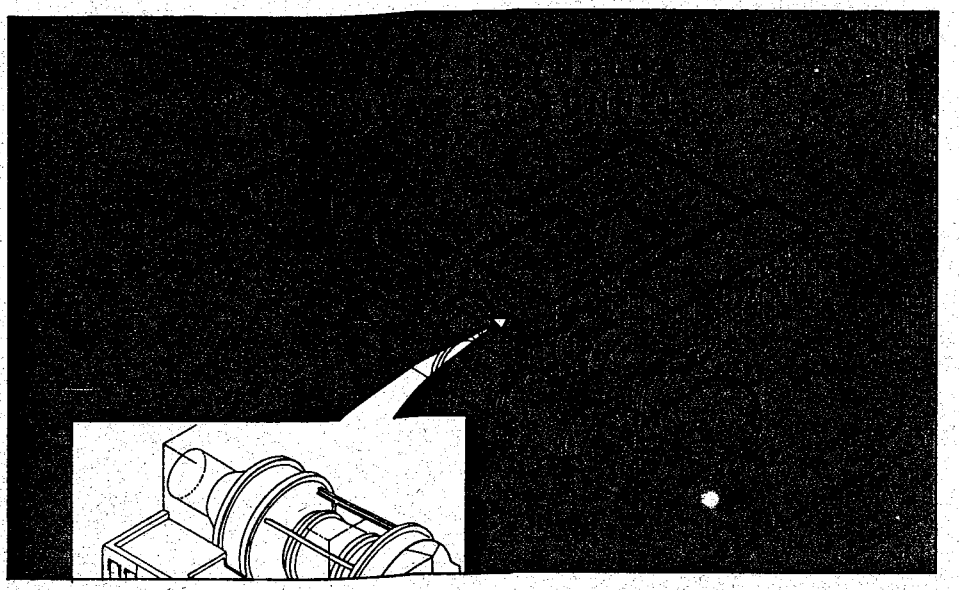
The second, a high-Reynolds-number unit, whose design is based on Onera's F1 wind tunnel in France, would be a variable-density tunnel, pressurized to between 0.5 and 6 bar. The 12-MW unit would have a 4.5 x 2.5 m experimental section capable of achieving velocities of 200 m/s (Mach 0.5) at 0.5 bar and 100 m/s at 6 bar, corresponding to a Reynolds number of up to $11 \times 10^6$.

The high-velocity wind tunnels would both be experimental.

One would have real-time computer control to modify the profile of the wind tunnel or the model being tested. The facility would use holographic technology to compare profiles.

The other would be a low-temperature wind tunnel intended to keep Italy on a par with countries participating in the European Wind Tunnel (EWT) project. Italy also has backing from Esa and Cnes to perform a feasibility study for a 4-MW hypersonic arc facility.

CIRA would benefit from computer resources at least as sophisticated as those used by its European neighbors. By 1989, it would have a Cray MP-series or CDC ETA 10 supercomputer, depending on the outcome of a planned evaluation program. The computer center would have high-capacity data links with other European research centers in Toulouse, Munich, Darmstadt and Farnborough for the transmission of data and drawings.



**The High Reynolds Number Tunnel, one of four units planned at CIRA, is an outgrowth of Onera's F1 wind tunnel in France**

The CIRA organization was founded in 1984 to design and build the research complex. Currently employing about fifty persons in Naples, it should be transferred to Capua by the end of the year.

CIRA's goal would be to perform applied experimental and analytical research, provide industrial assistance, certify aeronautical equipment, offer educational programs and provide documentary and coordination services at the Capua complex. In addition, it would officially represent Italy in international organizations.

It would be active in the fields of aerodynamics, flight mechanics, structural mechanics, robotics and artificial intelligence.

The organization has already started research using a CD 930-31 computer and a link to a Cray XMP-48. Sometime this year it plans to acquire a superminicomputer and start experimenting with satellite communications.

One of the big concerns at CIRA has been recruiting top-level research personnel and technicians. It hopes to woo a number of Italian scientists away from other organizations. CIRA also intends to recruit from training institutions in other Nato countries. □

### Nasa breakthrough in vortex-burst simulation

Pilots of delta-wing aircraft can sit easier in their seats, thanks to an aerodynamics simulation breakthrough by a Nasa research engineer.

The bursting of the vortices that form on the upper surface of delta wings at high angles of attack can generate sudden variations in pitch and roll moments, which have an adverse effect on the aircraft's handling qualities.

Until recently, no one had come up with a computational technique to simulate this phenomenon. However, Nasa reports that Dr. Kuzo Fujii, of the Ames research center, has now managed to reproduce spiral- and bulb-type vortex bursts on realistic wing configurations.

Fujii's method is based on the resolution of Navier-Stokes equations in relation to an 850,000-point mesh.

The results obtained by Fujii, which remain to be corroborated, show that spiral bursts occur in the presence of a viscous, parietal boundary-type layer.