AEROSPATIALE MATRA
AIRBUS

" ESCT propulsion system integration: Review and Progress".

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The three major European Aircraft Manufacturers have agreed on a common configuration for the future Supersonic Transport Aircraft: the ESCT. The economic viability of such an aircraft requires ambitious aerodynamic performances. Owing to its large impact on aircraft performances, the aerodynamic design of the future supersonic transport aircraft propulsion system is of utmost importance. The use of efficient CFD methods proves to be very helpful and powerful in designing the whole propulsion system. Through this process, AEROSPATIALE MATRA AIRBUS has developed know-how on both the internal and external parts of the propulsion system.

Although the internal component of the propulsion system, i.e. the air intake, engine and nozzle have to be studied as a whole, the internal performance of a supersonic air intake is highly dependant on overall aircraft configuration. It requires special care in the trade off between internal performance and external drag. CFD tools, which are able to simulate intake operation characteristics, added to overall expertise on intake design, were used to define and test a supersonic air intake.

The external design of the nacelles and propulsion system integration results from careful analysis of the flow pattern on the wing's lower surface. A complete propulsion system has been obtained which minimises the total aircraft drag, while considering local flow conditions and the strong interactions of the nacelles. Experimental data are presented which confirm the overall design process.

The high level of information provided by modern CFD methods is a key point for both internal and external flow analysis, while the various levels of modelling provide an appropriate cost effective answer to each type of physical phenomenon. The level of performance achieved is encouraging for a second generation supersonic transport aircraft feasibility, and AEROSPATIALE MATRA AIRBUS is continuing its research effort on supersonic aircraft.

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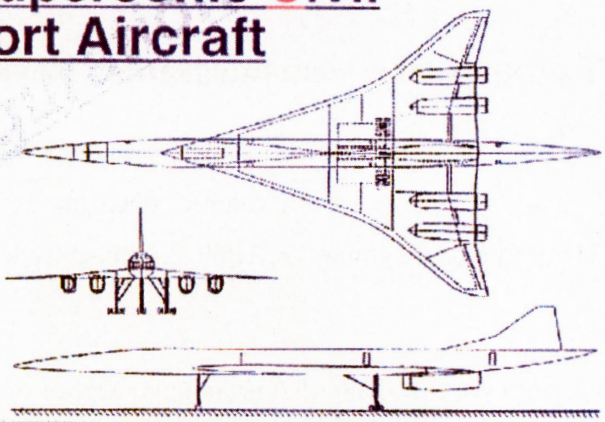
European Supersonic Civil Transport Aircraft

Wing Span : 42 m

Length : 89 m

MTOW : 340 t

250 passengers



Characteristics	Concorde	ESCT
Range (km/nm)	6300 / 3400	>10000 / 5400
Cruise Mach number	2.0	2.0
MTOW (t)	185	340
Passengers	100	250
Flyover Noise (EPNdB)	119.5	105.2
Consumption kg/(seat.km)	0.1	0.05

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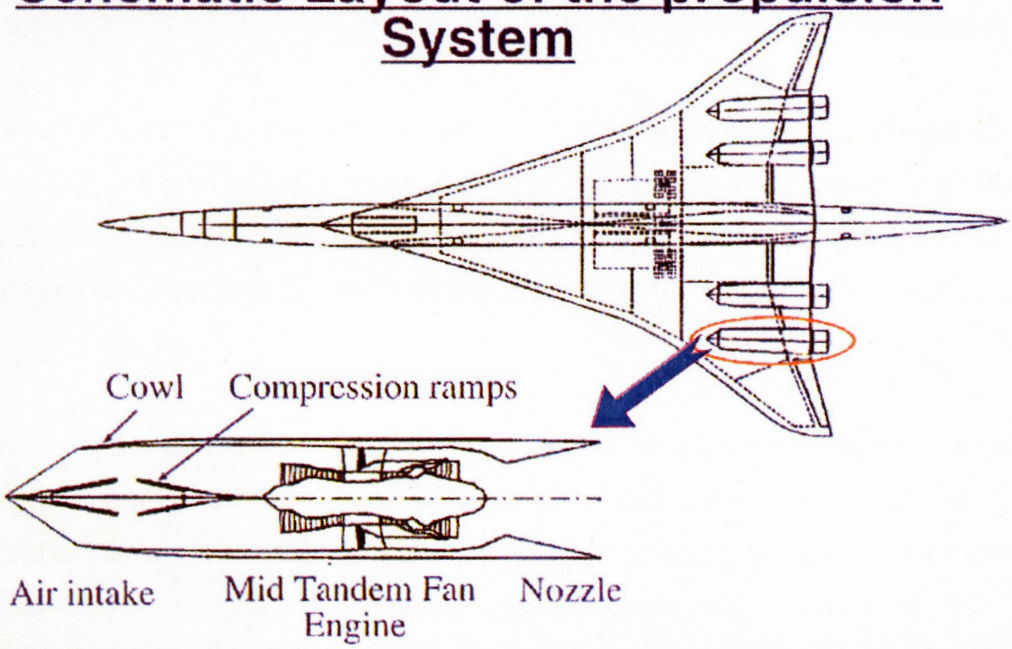
Internal Elements Design

Schematic Layout of the propulsion System



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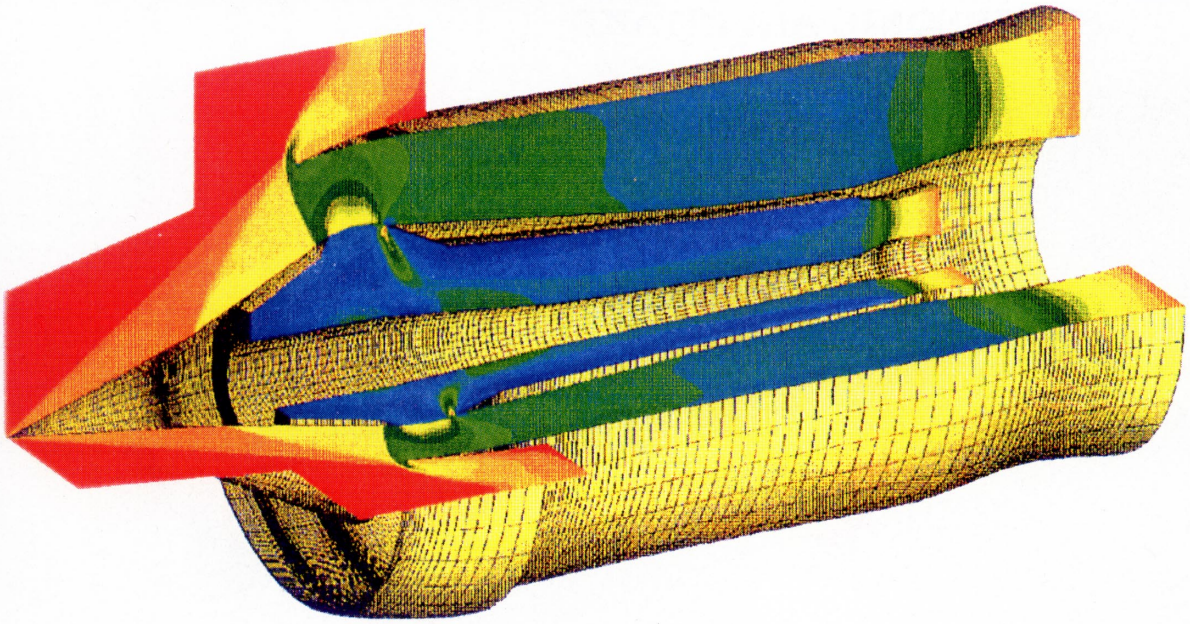
AXISYMETRIC AIR INTAKE



2nd SST - CFD workshop 17-19 January 2000 Tokyo

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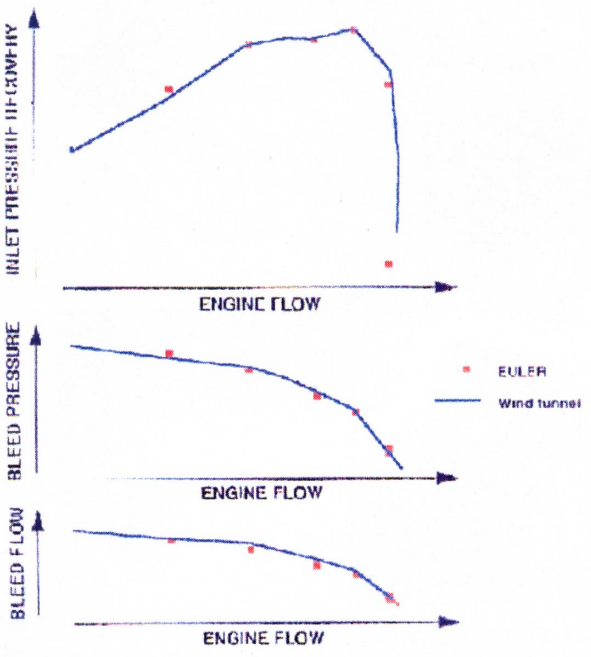
AXISYMETRIC INLET OPERATING CHARACTERISTIC



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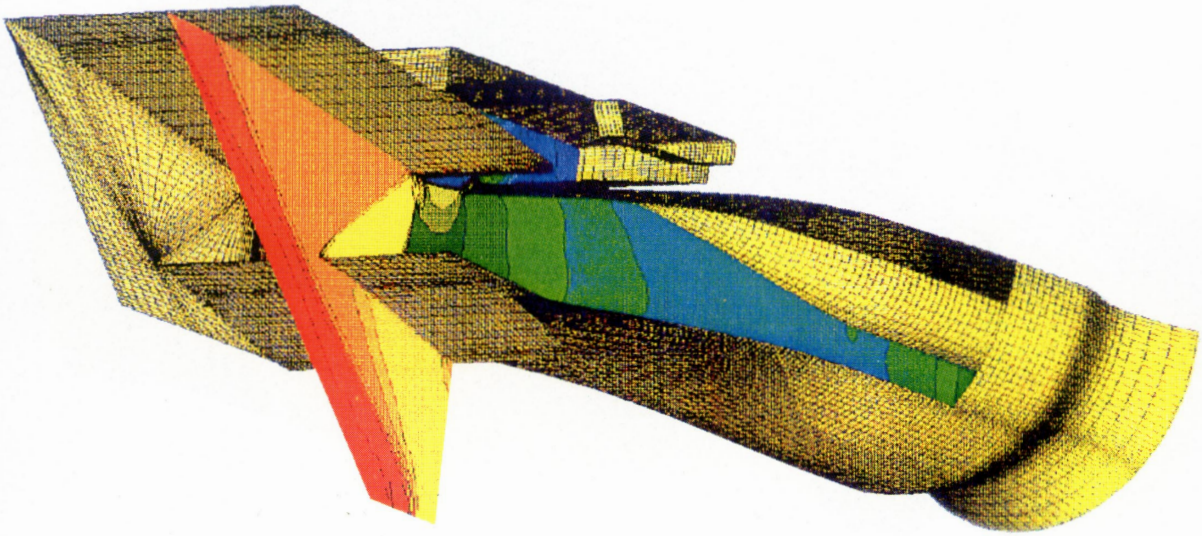
SUPERSONIC AIR INTAKE



SUPERSONIC AIR INTAKE

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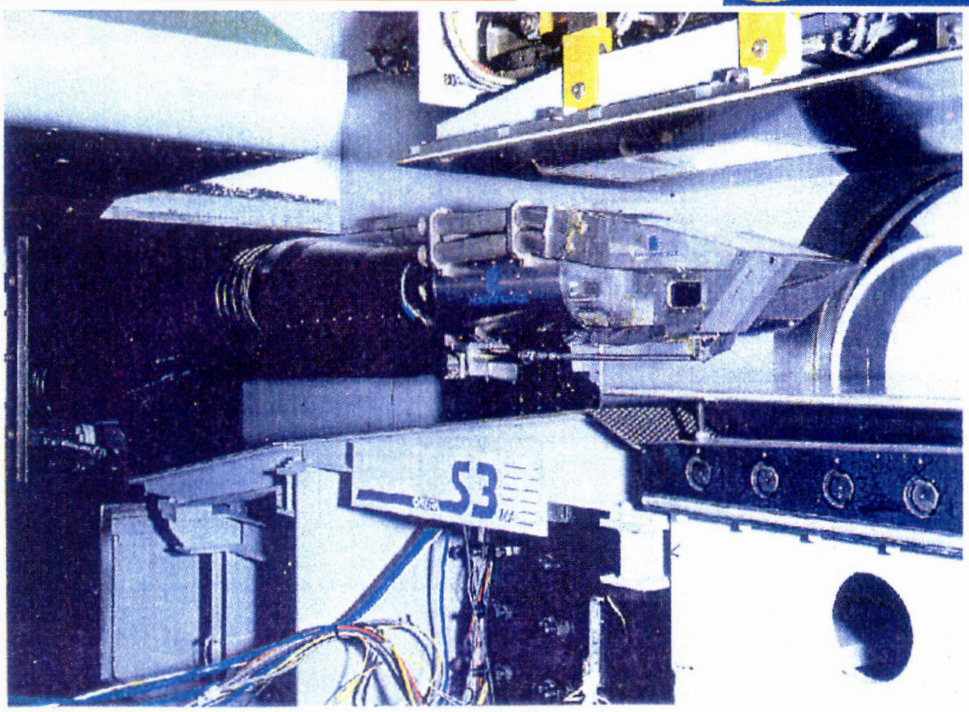
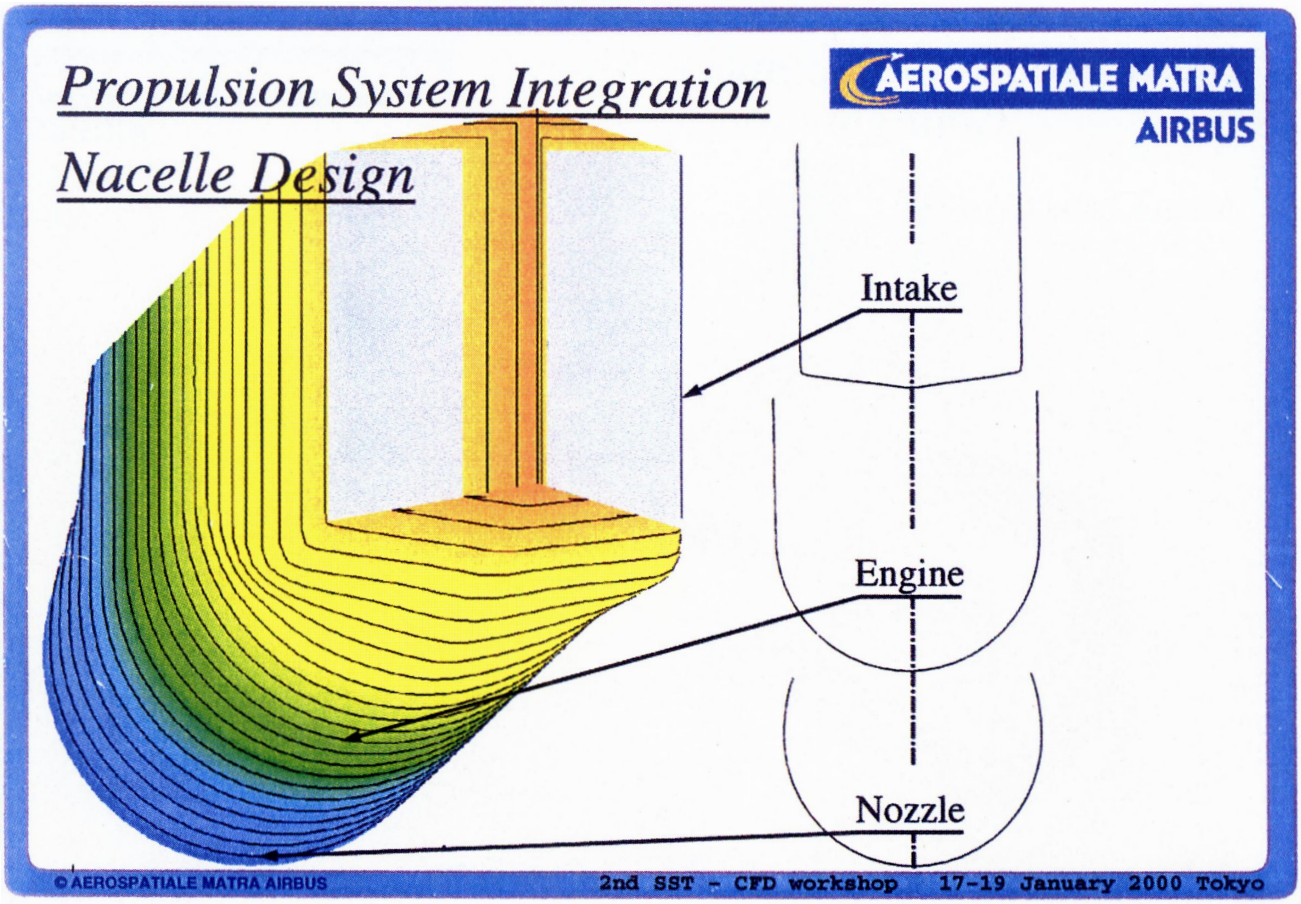
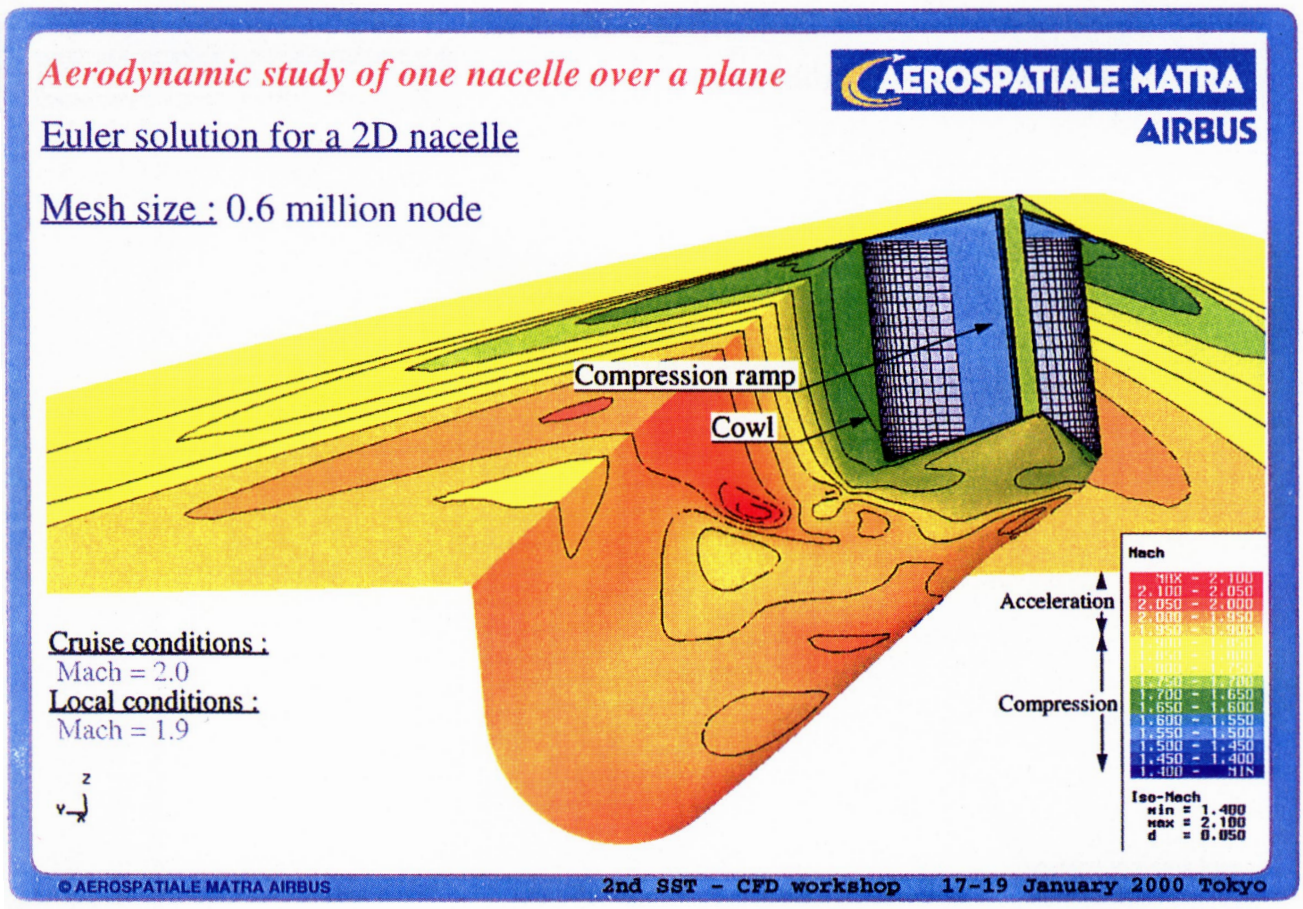
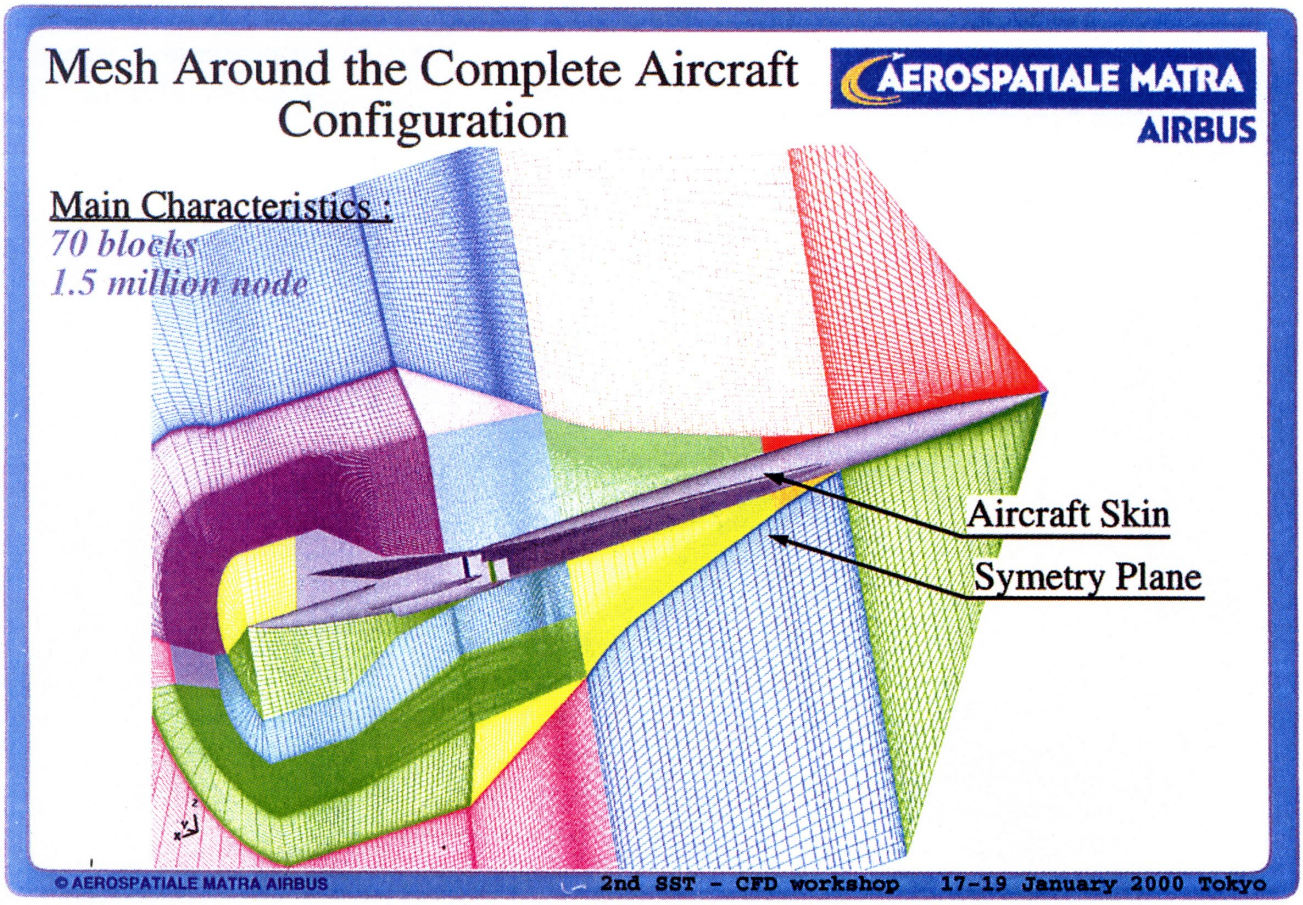
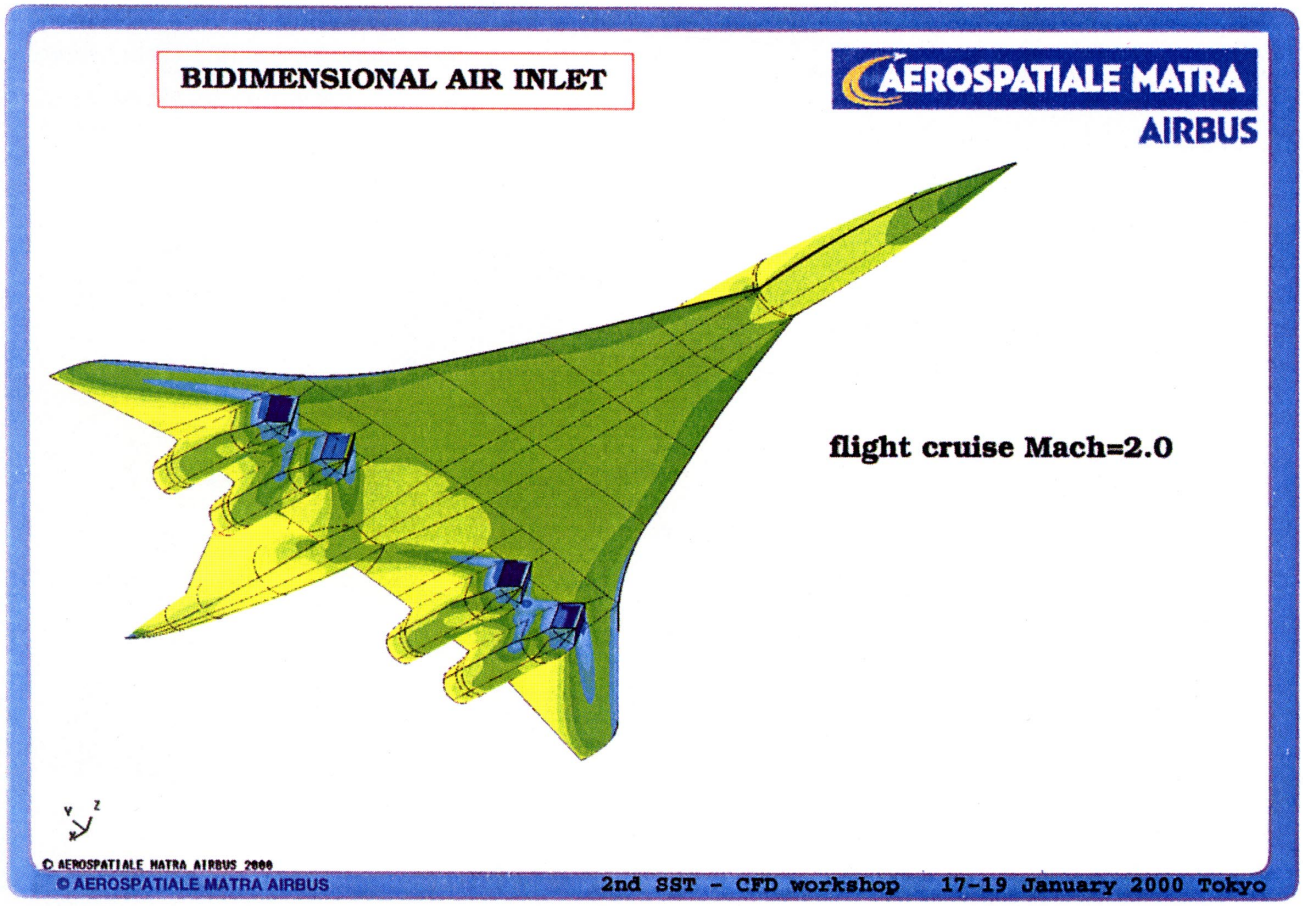


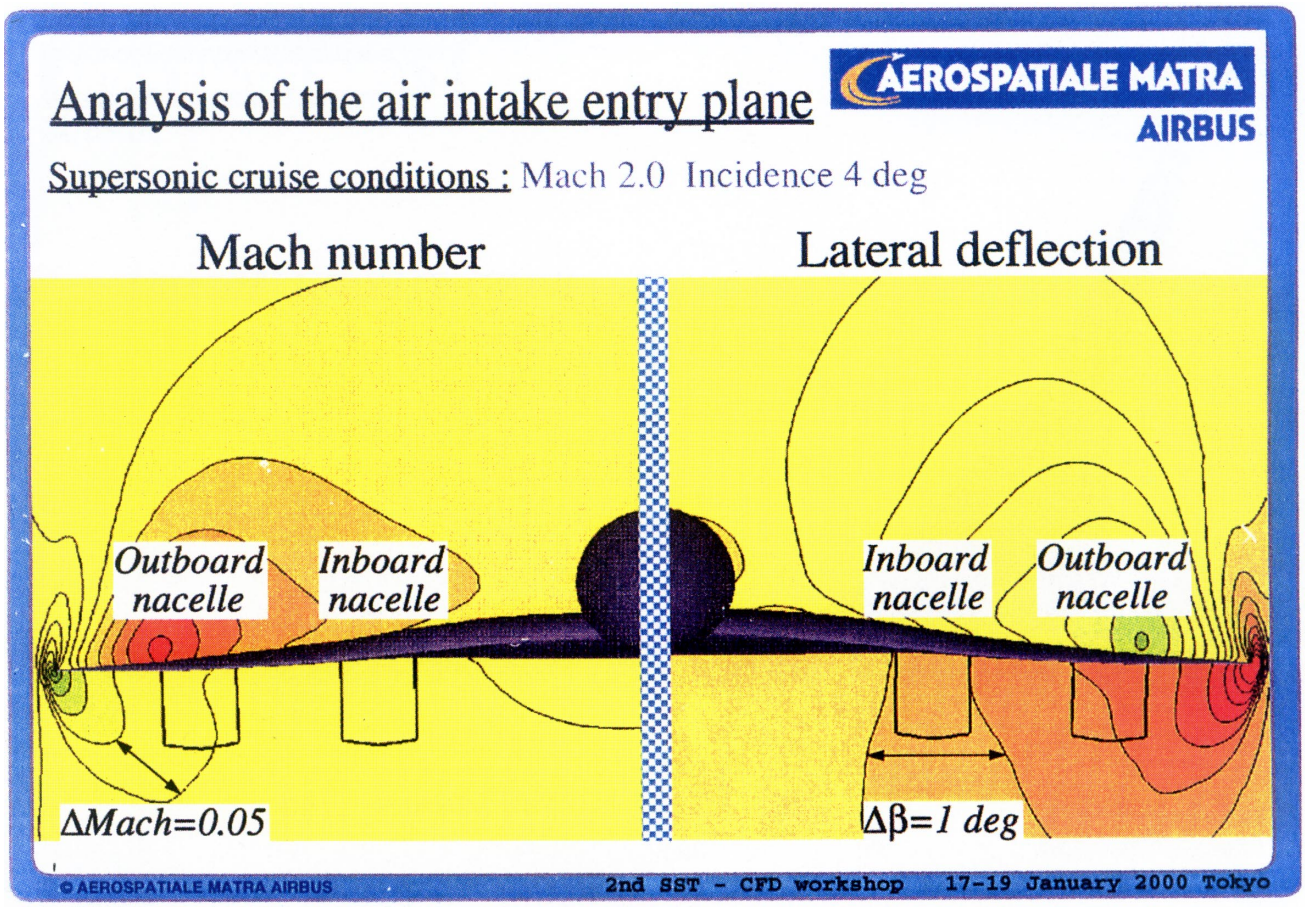
WIND TUNNEL S3 ONERA MODANE

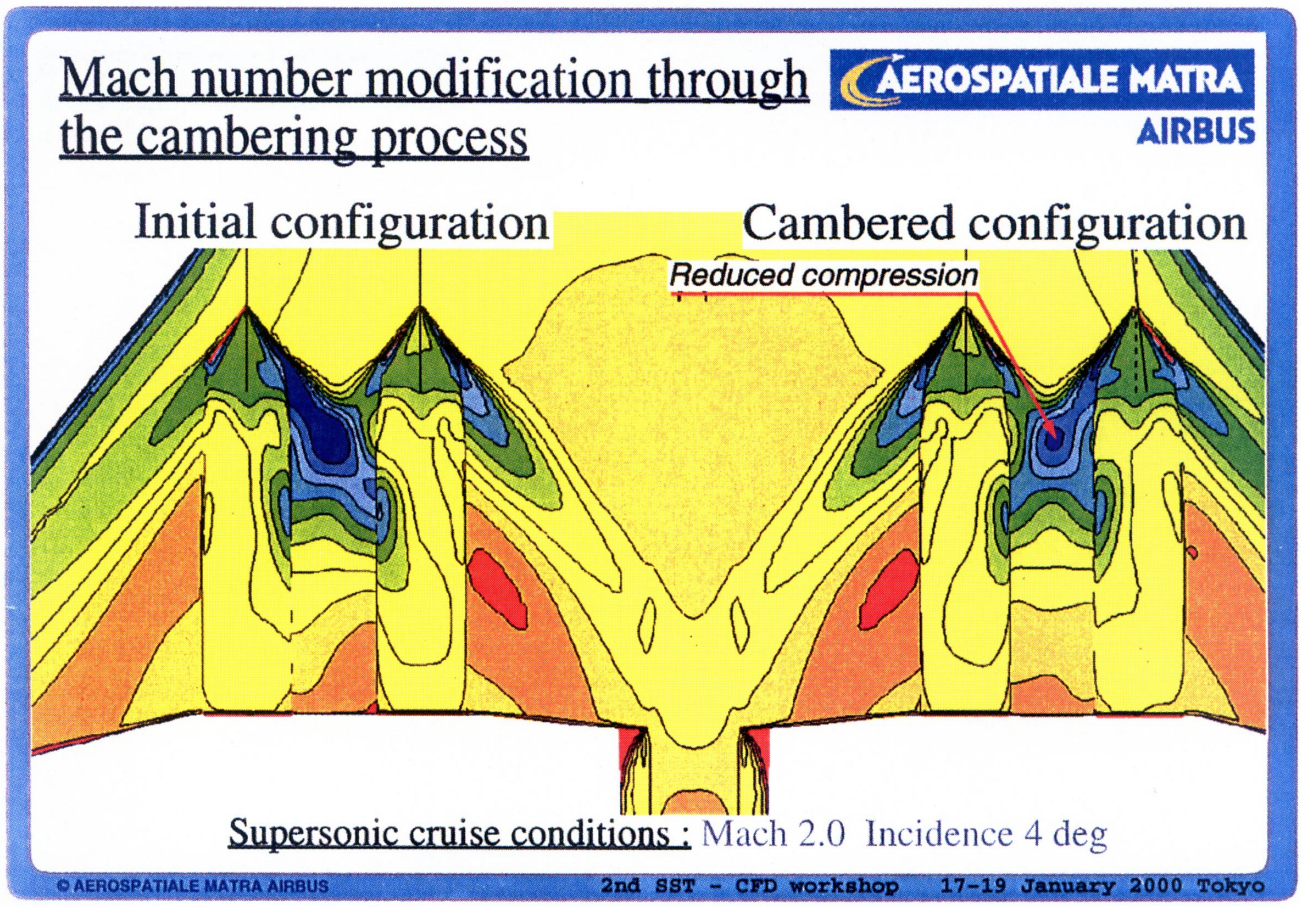












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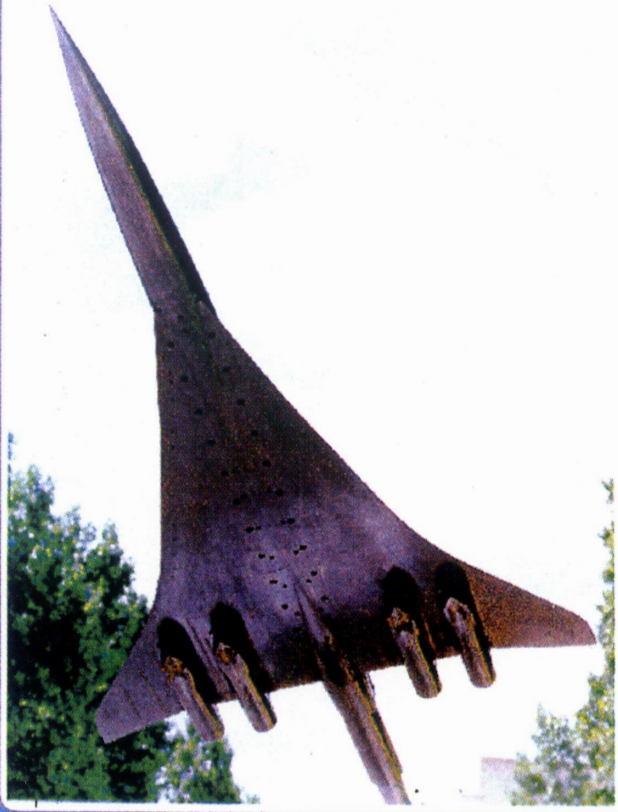

WIND TUNNEL MODEL

MODEL SCSALE: 1/40

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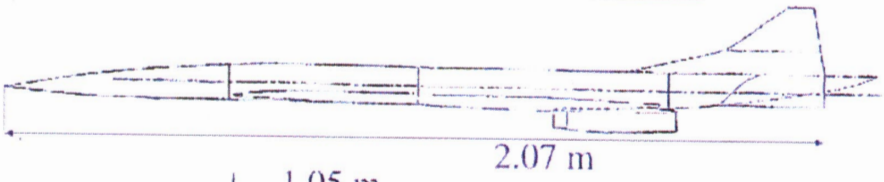
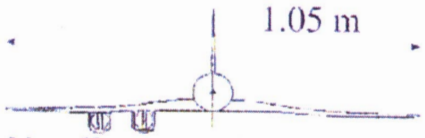
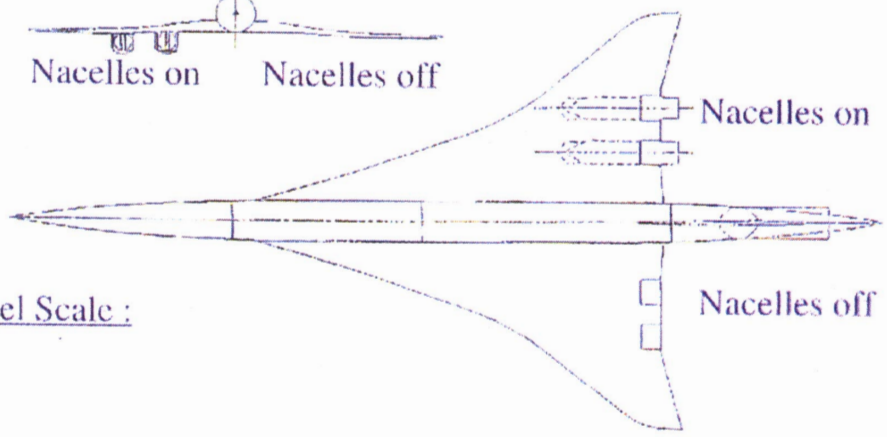
Wind Tunnel Model







Model Scale :
1/40

Comparison of CFD predictions to pressure data

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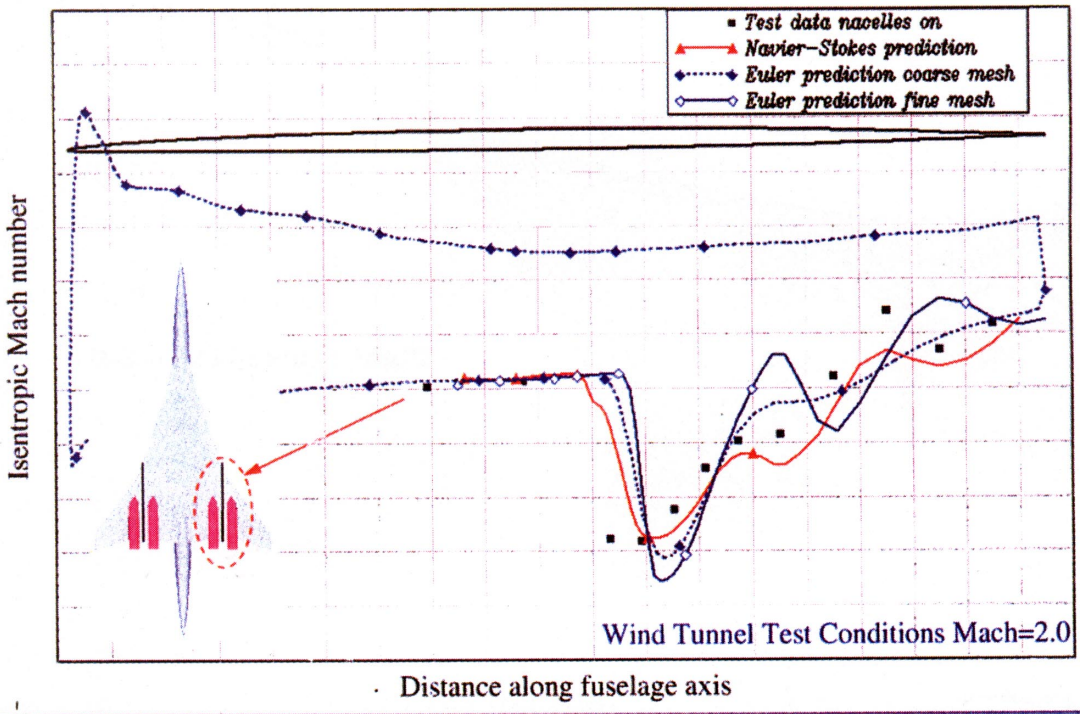
Chordwise cut between the two nacelles



Comparison of CFD predictions to experimental data on integral coefficients

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Wind Tunnel Test Conditions Mach=2.0