Imperial College Supersonic Wind Tunnel

TS4

Location: London

Designation: Intermittent hybrid blow-down / suck-down arrangement

Owner(s):
Imperial College Aeronautics,
Exhibition Road,
London SW7 2AZ

Performance:
Mach Number: 0.6 - 3
Maximum Flow Speed: 600 ms^{-1}
Reynolds No: 2-20 x 10^6 m^{-1} (variable)
Total Pressure: 1 x 10^5 Pa (max, variable)
Dynamic Pressure: ~ 1 x 10^5 Pa (max, variable)
Total Temperature: 290K
Turbulence intensity: 1% (estimated, tbc)
Run Time: 10 s
Typical Recharge Time: 20 min

Test Section Size: 0.15 m x 0.15 m x 2 m (max)
20:1 contraction ratio.

Operational Status: In construction, due for commissioning in March 2017

Number and Type of Staff:
Scientific: n/k
Technical Support: 1 technician

Test support:
Fully equipped workshop for wind tunnel model design, CNC 4-axis mill, CNC 3-axis mill, CNC Lathe, CNC etching and cutting, a range of rapid prototyping manufacture and modification capability, 3D CAD support and drafting.

Testing Capabilities:
Modular working section: Fully configurable test section with variable length to accommodate range of models and facilitate tests with variable boundary layer thicknesses.
Control system & data acquisition: National Instruments (LabVIEW) PID tunnel controller and DAQ system.
Measurement hardware: 32 channel low speed (500 Hz) pressure, 8 channel high speed (50 kHz+) pressure, pressure sensitive paint, high speed schlieren, surface oil-flow and integrated seeding system for LDA and PIV.

Specialist Rigs (planned):

- **Seeding:** Integrated, adjustable seeding system for solid (TiO2) & liquid droplet (Oil) flow seeding
- **Adaptive flow control:** Computer-controlled deployment of variable geometry (active) flow control devices (e.g. shock control bumps using multiple actuators using LabVIEW)
- **Unsteadiness:** Mechanism for generating unsteady pressure pulses upstream and downstream of test section (amplitude: 1-5 % p_0, frequency range 10 Hz – 10 kHz)
- **Gas injection:** Test section module for moderate flow rate injection of various (Air, He, CO_2, tbc) configurable (e.g. for scramjet fuel mixing studies)