AERONAUTICAL WIND TUNNELS
EUROPE AND ASIA

A Report Prepared by the Federal Research Division,
Library of Congress
under an Interagency Agreement with the NASA Aeronautics Research Mission Directorate

February 2006

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Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
FEB 2006		**00-00-2006 to 00-00-2006**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Aeronautical Wind Tunnels Europe and Asia	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Federal Research Division,Library of Congress,Washington,DC,20540-4840**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT **unclassified**	b. ABSTRACT **unclassified**	c. THIS PAGE **unclassified**	**Same as Report (SAR)**	**363**	

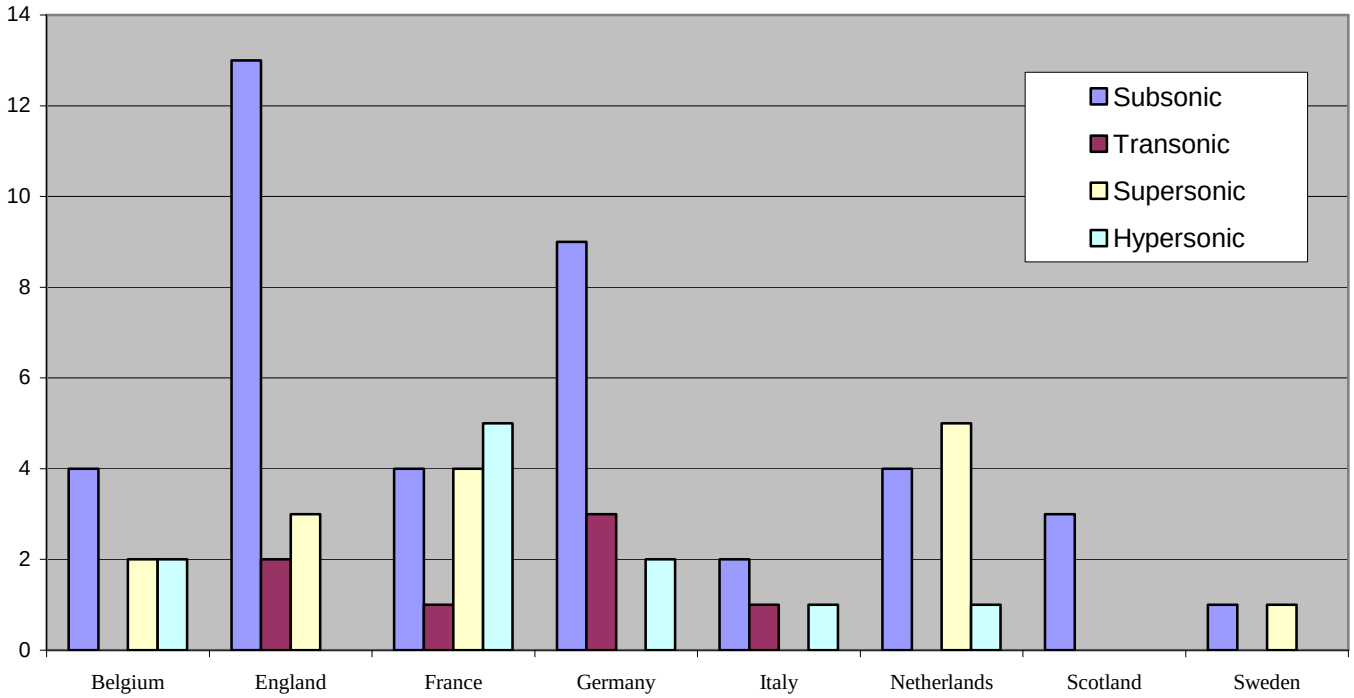
PREFACE

This catalog is a compilation of data on subsonic, transonic, supersonic, and hypersonic wind tunnels used for aeronautical testing in Europe and Asia. The countries represented in this catalog include Belgium, China, France, Germany, Indonesia, Italy, Japan, Malaysia, the Netherlands, the Republic of Korea (ROK, South Korea), Singapore, Sweden, and the United Kingdom. The catalog profiles a total of 155 wind tunnels. A distribution chart and bar charts immediately following this preface depict the number and types of tunnels operating in each country. The bulk of the catalog is made up of data sheets for each facility describing its name; the name of the installation where it is located; technical parameters such as size, speed range, temperature range, pressure, operational status, and Reynolds number; replacement cost and operation cost; testing capabilities; current programs; planned improvements; contact information; and schematics, when available. The report is divided into five sections, one for each speed (subsonic, transonic, supersonic, and hypersonic) as well as a section for those tunnels for which the speed is unknown. A table of contents heads each of these sections. In addition, cross-reference indexes with page numbers based on location, company name, facility name, and schematics are included at the end of the catalog as quick look-up tools. A bibliography is also included. Sources consulted include wind tunnel installation Web sites (in English and other languages), technical reports on wind tunnels published by Sverdrup Technology, RAND, NASA and in various technical journals as well as information provided by installation managers in response to direct inquiries. All web sites are current as of the publication date. If a Web site is no longer active, we recommend searching on the wind tunnel name or owner organization name to obtain the current Web address.

AERONAUTICAL WIND TUNNELS DISTRIBUTION
Asia and Europe

Location	Subsonic	Transonic	Supersonic	Hypersonic	Unknown
Belgium	4	0	2	2	
England	13	2	3	0	
France	4	1	4	5	
Germany	9	3	0	2	
Italy	2	1	0	1	
Netherlands	4	1	5	0	
Scotland	3	0	0	0	
Sweden	1	1	0	0	
Europe Subtotal	40	10	14	10	0
China	14	5	11	6	4
Indonesia	1	0	0	0	
Japan	3	0	8	5	1
Malaysia	1	0	0	0	
Singapore	0	1	0	0	
South Korea	21	0	0	0	
Asia Subtotal	40	6	19	11	5
Grand Total	**80**	**16**	**33**	**21**	**5**

Aeronautical Wind Tunnels-Europe



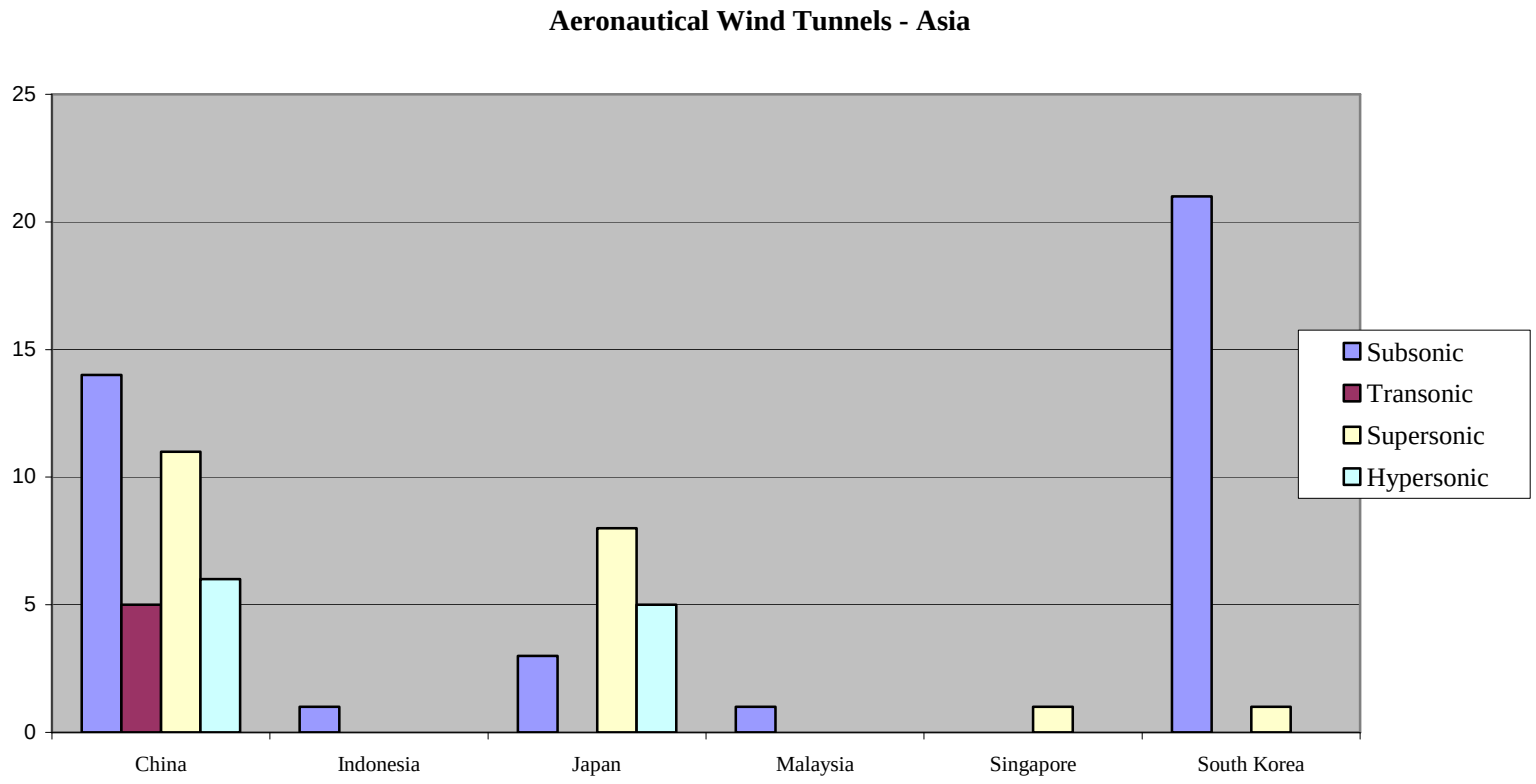

Aeronautical Wind Tunnels - Asia
25
20
15
10
5
0
China
Indonesia
Japan
Malaysia
Singapore
South Korea
Subsonic
Transonic
Supersonic
Hypersonic

TABLE OF CONTENTS
Subsonic Wind Tunnels

European and Asian Wind Tunnels

Subsonic | Belgium

Installation Name	**Test Section Size**	**Speed Range**
Von Karman Institute for Fluid Dynamics (VKI), Saint Genese, Belgium	100 x 117 x 800 mm (with flexible top and bottom walls)	80 m/s
		Temperature Range
	Date Built/Upgrade	120°K
Facility Name		**Reynolds Number (million)**
Adaptive Wall Low Speed Wind Tunnel T-3		0.2 to 1
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of September 2005	4 bar

Supplementary Technical Parameters

The T-3 was built as the pilot facility for the cryogenic T-2 transonic pressurized tunnel at VKI. It has 5-mm stainless steel walls and a 11,400-RPM fan speed. Injection. Under ambient conditions with a 7.5-kW motor, yields Mach 0.23 (80m/s) in the test section. Originally built by Onera for transonic operation.

Data Acquisition

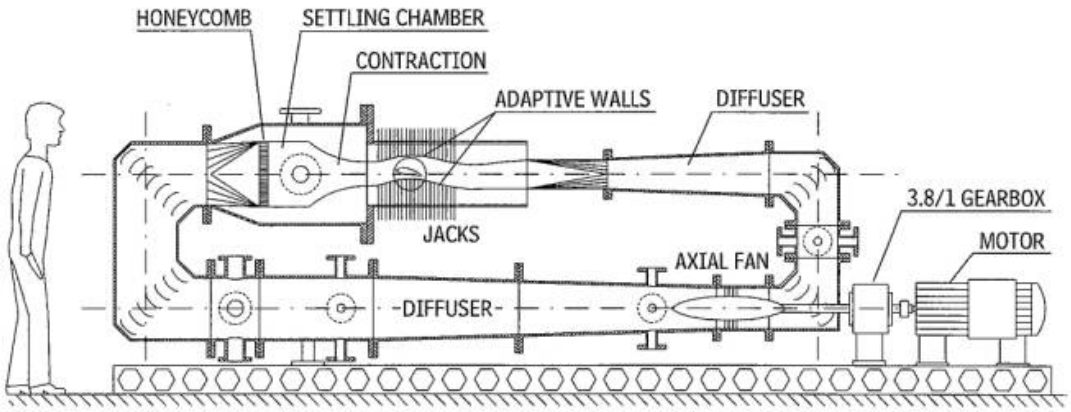
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Olivier Chazot, Von Karman Institute for Fluid Dynamics, B-1640 Rhode, Genese, Belgium.
Tel: (32) 02 359 96 11, Fax: (32) 02 359 96 00, Email: chazot@vki.ac.be, Web site: http://www.vki.ac.be/virtual/facility/pdf/t3.pdf.



Adaptive Wall Low-Speed Wind Tunnel T-3, Von Karman Institute, St. Genese, Belgium.

European and Asian Wind Tunnels

Subsonic | Belgium

Installation Name	**Test Section Size**	**Speed Range**
Von Karman Institute for Fluid Dynamics (VKI), Saint Genese, Belgium	0.1 x 0.3 x 1.6 m	70 m/s (max)
		Temperature Range
	Date Built/Upgrade	as low as –40°C
Facility Name		**Reynolds Number (million)**
CWT-1 Cold Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of September 2005	

Supplementary Technical Parameters

Low-speed, closed-circuit wind tunnel, 8-kW motor. Operates at sub-freezing temperatures. Built of wood and epoxy-fiberglass composite. Internally insulated with a 5-cm layer of polystyrene foam, covered by smooth epoxy lining. The settling chamber, fitted with a honeycomb, is followed by a 12.4:1 contraction ratio. The centrifugal fan is driven by a PC-controlled variable-speed 8-kW DC motor.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

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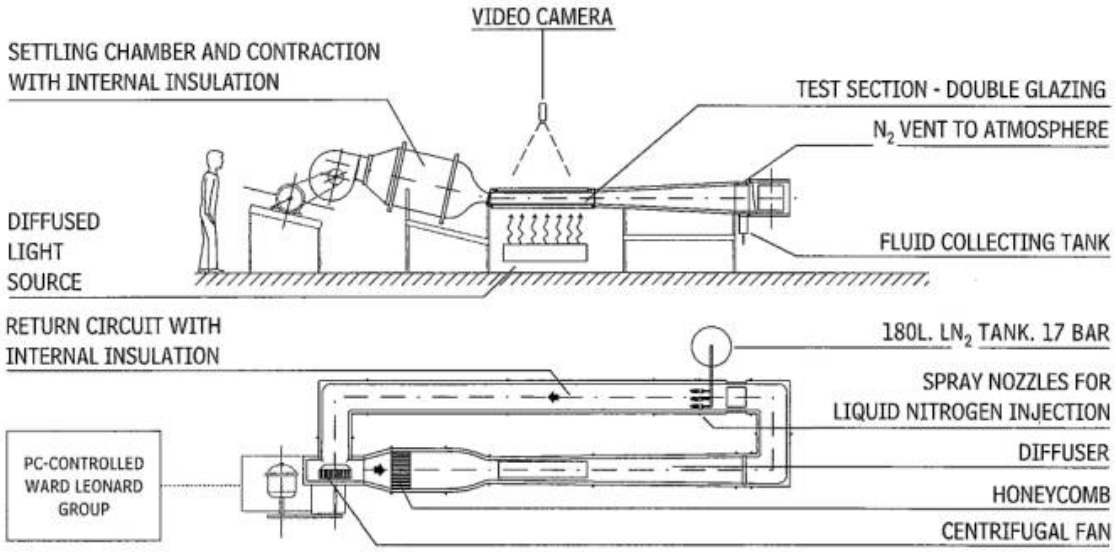
Tel: (32) 02 359 96 11, Fax: (32) 02 359 96 00, Email: chazot@vki.ac.be, Web site: http://www.vki.ac.be/facilities/pdf/cwt1.pdf.



CWT-1 Cold Wind Tunnel, Von Karman Institute, St. Genese, Belgium.

European and Asian Wind Tunnels

Subsonic | Belgium

Installation Name	**Test Section Size**	**Speed Range**
Von Karman Institute for Fluid Dynamics (VKI), Saint Genese, Belgium	3 x 4.5 m (free jet test section)	2 to 60 m/s
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
L-1A Low Speed Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of October 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Open-jet test section.Variable speed, 580-kW DC motor. Contraction ratio of 4:1. Typical turbulence level of 0.3%.

Data Acquisition

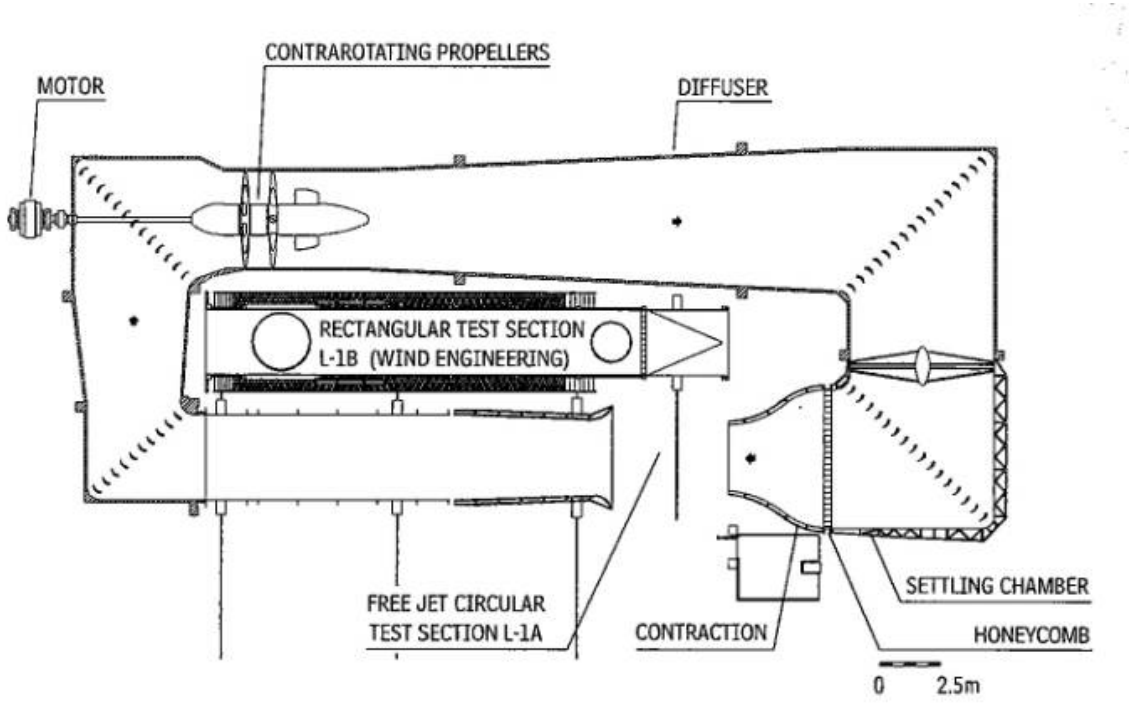
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Olivier Chazot, Von Karman Institute for Fluid Dynamics, B-1640 Rhode, Genese, Belgium.
Tel: (32) 02 359 96 11, Fax: (32) 02 359 96 00, Email: chazot@vki.ac.be, Web site: http://www.vki.ac.be/facilities/pdf/l1a.pdf.



L-1A Low-Speed Wind Tunnel, Von Karman Institute for Fluid Dynamics (VKI), St. Genese, Belgium.

European and Asian Wind Tunnels

Subsonic | Belgium

Installation Name	**Test Section Size**	**Speed Range**
Von Karman Institute for Fluid Dynamics (VKI), Saint Genese, Belgium	0.28 m (width) x 1.3 m (length)	45 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
L-2A Low Speed Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of September 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Low-speed, open-circuit wind tunnel having an air inlet, settling chamber circular cross-section with honeycomb and meshes, asymmetric 8:1 contraction ratio. A two-directional traversing mechanism located in the test section. Axial fan, at the end of a 1:4 diffuser, driven by a 9.9-kW variable speed DC motor. Turbulence level of 0.2 %.

Data Acquisition

Testing Capabilities/Current Programs

Research projects and laboratory training in turbulent boundary layers, aircraft wakes, vortex-strake interactions, three-dimensional velocity measurements and, with the addition of a smoke generator and of an air exhaust to outside, laser sheet flow visualizations.

Planned Improvements

User Fees

Contact Information

Olivier Chazot, Von Karman Institute for Fluid Dynamics, B-1640 Rhode, Genese, Belgium.
Tel: (32) 02 359 96 11, Fax: (32) 02 359 96 00, Email: chazot@vki.ac.be, Web site: http://www.vki.ac.be/facilities/pdf/l2a.pdf.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | China

Installation Name	Test Section Size	Speed Range
China Academy of Aerospace Aerodynamics (CAAA), Beijing, China AKA: Beijing Institute of Aerodynamics (BIA) or 701st Institute of the China Aerospace Science & Technology Corporation (CASC)	3 x 3 x 12 m	10 to 100 m/s
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Low Speed Wind Tunnel		6
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Stepless regulation of airflow speed.

Data Acquisition

Testing Capabilities/Current Programs

Measurement of pressure and forces on vehicle models, control tests of rudder hinge movements and aircraft dynamics at high angles of attack, external objects jettison (including ejection seats) and multi-body separation tests, folding wing deployment tests, simulation of jet interference and direct force, flutter and rotating model tests, tests of ground wind loads and ground effects on aircraft and buildings, drag chute performance tests, simulation tests of high-speed vehicles and ships, flow visualization

Planned Improvements

User Fees

Contact Information

Li Feng (Director), China Academy of Aerospace Aerodynamics (CAAA), 17 Yungang West Road, Fengtai District, Beijing 100074, China.
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NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | China

Installation Name	**Test Section Size**	**Speed Range**
China Aerodynamics Research and Development Center (CARDC), Mianyang City, Sichuan Province, China	#1: 12 x 16 m; #2: 8 x 6 m	#1: up to 0.07 Mach; #2: up to 0.30 Mach
		Temperature Range
	Date Built/Upgrade	Atmospheric
Facility Name	1979	**Reynolds Number (million)**
Large Low Speed Wind Tunnel		#1: 1.7, #2: 6.9
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005	Atmospheric

Supplementary Technical Parameters

Larger test section has a 2-D contraction ratio of 2.5:1. A 3-D contraction ratio of 4:1 between the test sections gives a total CR+10 for the smaller test section. Powered by three fans, 7800 kW total.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

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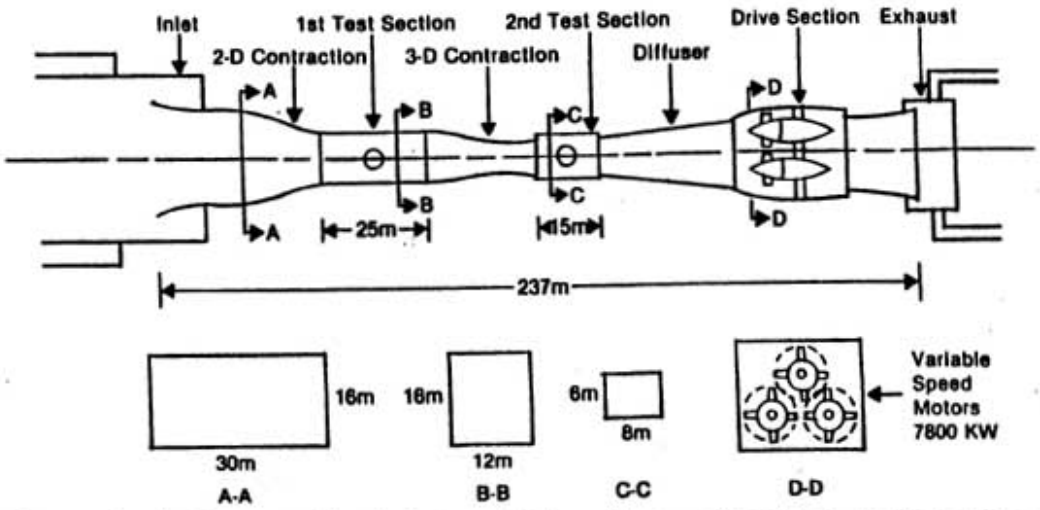

Open-circuit low-speed wind tunnel (two test sections) at the Low-Speed Aerodynamic Research Institute near Mianyang

Figure 4.1-3 CARDC Large Low Speed Wind Tunnel (12 x 16/ 8 x 6)

Large Low-Speed Wind Tunnel, China Aerodynamics Research and Development Center (CARDC), Mianyang, China.

Subsonic | China

Installation Name	Test Section Size	Speed Range
China Aerodynamics Research and Development Center (CARDC), Mianyang City, Sichuan Province, China	55 m (height), 5 m (diameter)	up to 50 m/s
		Temperature Range
	Date Built/Upgrade	
Facility Name	2005	**Reynolds Number (million)**
Large-Scale Vertical Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

China's first domestically designed and built vertical wind tunnel.

Data Acquisition

Testing Capabilities/Current Programs

Research on aircraft speed loss and tailspin and aerodynamic stability of satellites and manned spacecraft during recovery operations.

Planned Improvements

User Fees

Contact Information

Shang Shouhong (Dean), China Aerodynamics Research and Development Center Graduate School, PO Box 211, Mianyang City, Sichuan Province 621000, China. Tel: (86) 816 2463053, Fax: (86) 816 2463051, Email: ssh@cardcgs.com, Web site: http://www.cardcgs.com/cardcgs/index.asp, http://www.cardcgs.com/default2.asp.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | China

Installation Name	**Test Section Size**	**Speed Range**
China Aerodynamics Research and Development Center (CARDC), Mianyang City, Sichuan Province, China	4 x 3 m	100 m/s
		Temperature Range
	Date Built/Upgrade	Atmospheric
Facility Name	mid to late 1970s	**Reynolds Number (million)**
Low Speed Wind Tunnel		6
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005	Atmospheric

Supplementary Technical Parameters

Closed circuit, continuous flow, atmospheric.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Shang Shouhong (Dean), China Aerodynamics Research and Development Center Graduate School, PO Box 211, Mianyang City, Sichuan Province 621000, China. Tel: (86) 816 246 3053, Fax: (86) 816 246 3051, Email: ssh@cardcgs.com, Web site: http://www.cardcgs.com/cardcgs/index.asp, http://www.cardcgs.com/default2.asp.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | China

Installation Name	**Test Section Size**	**Speed Range**
Chinese Aerodynamics Research Institute of Aeronautics (CARIA), Harbin, Heilongjiang Province, China	1.5 m (diameter)	50 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1995	**Reynolds Number (million)**
FL-5 Low Speed Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Circular aperture, single return.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

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Tel: (86) 451 82539364, Fax: (86) 451 82838327, Email: cph@caria.com.cn, Web site: http://www.caria.com.cn.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | China

Installation Name	**Test Section Size**	**Speed Range**
Chinese Aerodynamics Research Institute of Aeronautics (CARIA), Harbin, Heilongjiang Province, China	3.5 x 2.5 m	up to 73 m/s
		Temperature Range
	Date Built/Upgrade	
Facility Name	1963	**Reynolds Number (million)**
FL-8 Low Speed Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Closed circuit, flat, octagonal-shaped test section.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Professor Yu Tao (Director), Chinese Aerodynamic Research Institute of Aeronautics (CARIA), PO Box 88, 2 Yiman Street, Harbin, Heilongjiang Province, 150001 China.
Tel: (86) 451 82539364, Fax: (86) 451 82838327, Email: cph@caria.com.cn, Web site: http://www.caria.com.cn.

NO SCHEMATIC AVAILABLE

Subsonic | China

Installation Name	**Test Section Size**	**Speed Range**
Chinese Aerodynamics Research Institute of Aeronautics (CARIA), Harbin, Heilongjiang Province, China	4.5 x 3.5 m	
		Temperature Range
	Date Built/Upgrade	
Facility Name	Scheduled for completion in 2006	**Reynolds Number (million)**
FL-9 Low Speed Continuous Pressurized Wind Tunnel	**Cost**	up to 8.5 (per meter)
		Dynamic Pressure
	Operational Status	0.4 Mpa
	Under construction	**Stagnation Pressure**

Supplementary Technical Parameters

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Professor Yu Tao (Director), Chinese Aerodynamic Research Institute of Aeronautics (CARIA), PO Box 88, 2 Yiman Street, Harbin, Heilongjiang Province, 150001 China.
Tel: (86) 451 82539364, Fax: (86) 451 82838327, Email: cph@caria.com.cn, Web site: http://www.caria.com.cn.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | China

Installation Name	**Test Section Size**	**Speed Range**
Chung Cheng Institute of Technology, Rotating Fluids and Vortex Dynamics Lab, Taiwan, China	400 x 400 mm	
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Open Loop Low Speed Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of August 2002	**Stagnation Pressure**

Supplementary Technical Parameters

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Pei-Yuan Tzeng (Director), Rotating Fluids & Vortex Dynamics Lab (RFD), Chung Cheng Institute of Technology, No. 190, Sanyuan 1st St., Tahsi, Taoyuan, Taiwan 33509, China.
Tel: (886) 33 800960, Fax: (886) 33 891519, Email: pytzeng@ccit.edu.tw, Web site: http://www.ccit.edu.tw/~RFVDLab/.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | China

Installation Name	**Test Section Size**	**Speed Range**
Nanjing University of Aeronautics and Astronautics (NUAA), Nanjing, Jiangsu Province, China	#1: 5.1 x 4.25 m; #2: 3.0 x 2.5 m	#1: 30 m/s; #2: 90 m/s
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Large-Scale Dual-Test Section Low Speed Wind Tunnel		#1: 1.8, #2: 5.4
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Data Acquisition

Testing Capabilities/Current Programs

Can be used as a low-turbulence wind tunnel, three-dimensional smoke wind tunnel, water tunnel, and jet flow test device. Used as six-component force and pressure measurements on airplane models. Also used to test wind loads on buildings, bridges, radar antennas, and television towers, and aerodynamic performance of windmills.

Planned Improvements

User Fees

Contact Information

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Tel: (86) 25 8489 3212, Tel (Dean): (86) 25 84891585, Fax: (86) 25 8489 1512, Email: office@nuaa.edu.cn; Email (Dean): xwxu@nuaa.edu.cn, Web site: http://www.nuaa.edu.cn.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | China

Installation Name	**Test Section Size**	**Speed Range**
Northwestern Polytechnical University (NWPU, NPU), Xi'an, Shaanxi Province, China	#1: 3 x 1.6 m (2-D); #2: 3.5 x 2.5 m (3-D); #3: 2.2 m (diameter) (propeller test section)	#1: 130 m/s (max); #2: 90 m/s; #3: 145 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	2002 or 2005	**Reynolds Number (million)**
NF-3 Low Speed Airfoil Wind Tunnel		#1: 7; #2: 5; #3: N/A
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**
		Atmospheric

Supplementary Technical Parameters

Asia's largest low-speed, air-foil wind tunnel. China's only low-speed wind tunnel with interchangeable test sections. The 2-D test section has a turbulence intensity of less than 0.05%. The 3-D test section can perform full-scale tests. The propeller test section is China's only propeller test section that can simulate the advance ratio and the Mach number of the propeller tip simultaneously.

Data Acquisition

Distributed control system: PSI8400 pressure measurement system, three-dimensional laser velocimeter, hotwire anemometer, infrared imager to measure flow transition, and automatic calibration of pressure and balance.

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

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Tel: (86) 29 8492222, Fax: (86) 29 8491000, Web site: http://www.nwpu.edu.cn.

NO SCHEMATIC AVAILABLE

Subsonic | China

Installation Name	**Test Section Size**	**Speed Range**
State Key Laboratory of Turbulence and Complex Systems (LTCS), Beijing University, Beijing, China	0.6 x 0.6 x 5 m	0.5 to 20 m/s
		Temperature Range
	Date Built/Upgrade	
Facility Name	Late 1980s	**Reynolds Number (million)**
Boundary Layer Wind Tunnel No. 1		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Direct-action type with temperature and velocity profilers.

Data Acquisition

Testing Capabilities/Current Programs

Basic research on turbulent boundary layers, flow separation, and vortex structures.

Planned Improvements

User Fees

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NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | China

Installation Name	**Test Section Size**	**Speed Range**
State Key Laboratory of Turbulence and Complex Systems (LTCS), Beijing University, Beijing, China	#1: 3.88 x 1.8 x 12 m; #2: 1.2 x 1 x 8 m	30 m/s (both test sections)
		Temperature Range
	Date Built/Upgrade	
Facility Name	Late 1980s	**Reynolds Number (million)**
Boundary Layer Wind Tunnel No. 2		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Data Acquisition

Testing Capabilities/Current Programs

Basic and applied research on environmental aerodynamics, especially experimental studies on simulating atmospheric boundary layers.

Planned Improvements

User Fees

Contact Information

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NO SCHEMATIC AVAILABLE

Subsonic | China

Installation Name	Test Section Size	Speed Range
State Key Laboratory of Turbulence and Complex Systems (LTCS), Beijing University, Beijing, China	2.25 m (diameter), 3.65 m (long)	55 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1958	**Reynolds Number (million)**
Large-Scale Low Speed Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005	

Supplementary Technical Parameters

Open circuit, circular test section.

Data Acquisition

Testing Capabilities/Current Programs

When it was first built in 1958, it was China's largest low-speed wind tunnel at the time and it was used for research and development of aircraft. In the 1970s it was used for simulating atmospheric boundary layers. Recently it has been used to conduct basic experiments to develop a theory of scale laws for turbulent layer gradations.

Planned Improvements

User Fees

Contact Information

Professor She Zhensu (Director), State Key Laboratory of Turbulence and Complex Systems, Beijing University, Beijing 100871, China.
Tel/Fax: (86) 10 62757944, Email (Director): she@mech.pku.edu.cn, Email (Lab): ltcs@pku.edu.cn, Web site: http://ltcs.pku.cn/cn.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | China

Installation Name	**Test Section Size**	**Speed Range**
State Key Laboratory of Turbulence and Complex Systems (LTCS), Beijing University, Beijing, China	0.3 x 0.8 x 3.2 m	0.3 to 23 m/s
		Temperature Range
	Date Built/Upgrade	
Facility Name	1983	**Reynolds Number (million)**
Low-Turbulence Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

A suckdown-type wooden structure, contraction ratio of 18.25:1, motor power of 7.5 kW. The two-dimensional closed-end test section with its large contraction ratio, honeycombs, and fine-meshed, four-wall screens can reduce the turbulence degree to 0.085.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Professor She Zhensu (Director), State Key Laboratory of Turbulence and Complex Systems, Beijing University, Beijing 100871, China.
Tel/Fax: (86) 10 62757944, Email (Director): she@mech.pku.edu.cn, Email (Lab): ltcs@pku.edu.cn, Web site: http://ltcs.pku.cn/cn.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | England

Installation Name	**Test Section Size**	**Speed Range**
Airbus, New Filton House, Bristol, England.	12 x 10 x 0 ft	
		Temperature Range
	Date Built/Upgrade	
Facility Name	1957/2004	**Reynolds Number (million)**
Airbus Filton Low Speed Wind Tunnel Facility		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of February 2006.	**Stagnation Pressure**

Supplementary Technical Parameters

Closed, single return circuit, 1.6 MW power, 6-component load cell balance, and 217.0 mph maximum wind speed.

Data Acquisition

SLA 7000 stereolithography system from 3D Systems Technology.

Testing Capabilities/Current Programs

Aircraft, ground vehicles.

Planned Improvements

Replacement of the current ageing control and data acquisition system, and improvements to the control room/tunnel and associated building works (as of November 2004).

User Fees

Contact Information

Alison Kearin, Filton-Airbus, Airbus, New Filton House, Filton, Bristol, BS99 7AR, England.
Email: alison.kearin@airbus.com.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | England

Installation Name	**Test Section Size**	**Speed Range**
BAE Systems Air Systems, Warton Aerodrome, Lancashire, England	12 x 10 x 25 ft (corner fillets)	0.25 Mach
		Temperature Range
	Date Built/Upgrade	Ambient to 45°C
Facility Name	1955	**Reynolds Number (million)**
Filton 12 x 10 ft Low Speed Wind Tunnel		1.4
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of February 2006.	Ambient

Supplementary Technical Parameters

Solid construction, return circuit, fan-powered, Scanivalve or ZOC's for "steady" pressures, floor and rood balances, belt/suction/blowing ground effects, 280 psi and 3500 psi air supply systems, and four lbs/second air mass flow.

Data Acquisition

IBM PC based, electro mechanical for forces and moments, dynamic signal acquisition and analysis by HP LMS sytem.

Testing Capabilities/Current Programs

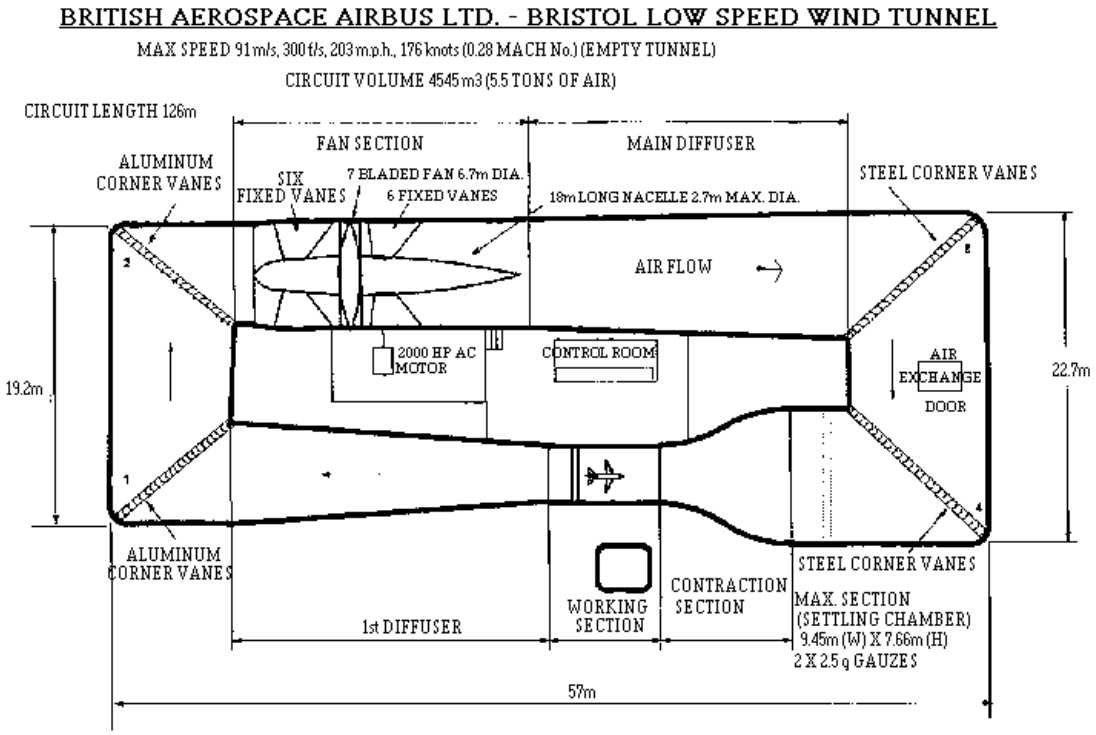
Aeronautics, ground transportation, buildings.

Planned Improvements

User Fees

Contact Information

Paul Earnshaw, BAE Systems Air Systems, Warton Aerodrome, Preston, Lancashire PR4 1AX, United Kingdom.
Tel: (44) 0 1772 855572, Email: paul.h.earnshaw@baesystems.com, Web site: http://www.baesystems.com/programmes/airsystems/.



Filton 12 x 10 ft Low Speed Wind Tunnel, BAE Systems Air Systems, Warton Aerodrome, Lancashire, England

European and Asian Wind Tunnels

Subsonic | England

Installation Name	**Test Section Size**	**Speed Range**
Department of Aerospace Engineering, University of Bristol, Bristol, England.	2.1 x 1.5 m octagonal section	60 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Large Low Speed Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as February 2006.	**Stagnation Pressure**

Supplementary Technical Parameters

Return section, 5.5 m x 2.6 m with a maximum speed of 12 m/s; used for rotor studies.

Data Acquisition

Testing Capabilities/Current Programs

Aerodynamics of aircraft, missiles, propellors, rotors and cars.

Planned Improvements

User Fees

Contact Information

Department of Aerospace Engineering, University of Bristol, Bristol, University Walk, Bristol BS 8 1 TR, England.
Tel: (44) 117 928 7704, Tel (Dept office): (44) 117 33 17025, Fax: (44) 117 927 2771, Email (General Inquiries): aero-office@bristol.ac.uk, Web site: http://www.aer.bris.ac.uk/research/facilities.shtml.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | England

Installation Name	**Test Section Size**	**Speed Range**
Department of Aerospace Engineering, University of Bristol, Bristol, England.	0.8 x 0.6 m (octagonal section)	100 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Low Turbulence Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
		Stagnation Pressure

Supplementary Technical Parameters

Turbulence level 0.05%.

Data Acquisition

Testing Capabilities/Current Programs

Fundamental Fluid mechancis and Aerodynamics.

Planned Improvements

User Fees

Contact Information

Department of Aerospace Engineering, University of Bristol, Bristol, University Walk, Bristol BS 8 1 TR, England.
Tel: (44) 117 928 7704, Tel (Dept. office): (44) 117 33 17025, Fax: (44) 117 927 2771, Email (General Inquiries): aero-office@bristol.ac.uk, Web site: http://www.aer.bris.ac.uk/research/facilities.shtml.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | England

Installation Name	**Test Section Size**	**Speed Range**
Department of Aerospace Engineering, University of Bristol, Bristol, England.	1.1 m (diameter)	40 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Open Jet Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
		Stagnation Pressure

Supplementary Technical Parameters

Data Acquisition

Testing Capabilities/Current Programs

Aerofoil charateristics, vibration and oscillation studies.

Planned Improvements

User Fees

Contact Information

Department of Aerospace Engineering, University of Bristol, Bristol, University Walk, Bristol BS 8 1 TR, England.
Tel: (44) 117 928 7704, Tel (Dept. office): (44) 117 33 17025, Fax: (44) 117 927 2771, Email (General Inquiries): aero-office@bristol.ac.uk, Web site: http://www.aer.bris.ac.uk/research/facilities.shtml.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | England

Installation Name	**Test Section Size**	**Speed Range**
Department of Aerospace Engineering, University of Bristol, Bristol, England.	0.6 x 0.6 m	35 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Open Return Low Speed Wind Tunnels (Two)		
	Cost	
		Dynamic Pressure
	Operational Status	
		Stagnation Pressure

Supplementary Technical Parameters

Data Acquisition

Testing Capabilities/Current Programs

Teaching and student projects.

Planned Improvements

User Fees

Contact Information

Department of Aerospace Engineering, University of Bristol, Bristol, University Walk, Bristol BS 8 1 TR, England.
Tel: (44) 117 928 7704, Tel (Dept office): (44) 117 33 17025, Fax: (44) 117 927 2771, Email: aero-office@bristol.ac.uk, Web site: http://www.aer.bris.ac.uk/research/facilities.shtml.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | England

Installation Name	**Test Section Size**	**Speed Range**
Farnborough Air Sciences Trust (FAST), Berkshire, England	24 ft (7.3 m) (diameter)	up to 165 ft/s (50 m/s)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1935/1992 (upgrade)	**Reynolds Number (million)**
No. 1 24-ft Low Speed Wind Tunnel (LST)		
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Closed in 1996, may be re-opened for use. Prospective operators being solicited as of January	

Supplementary Technical Parameters

Open-jet, single-return circuit, continuous flow. This facility has a mahogany six-bladed fan powered by a 2000-hp, 750-V DC motor. At full speed this facility can run at 1.5 MVA.

Data Acquisition

Testing Capabilities/Current Programs

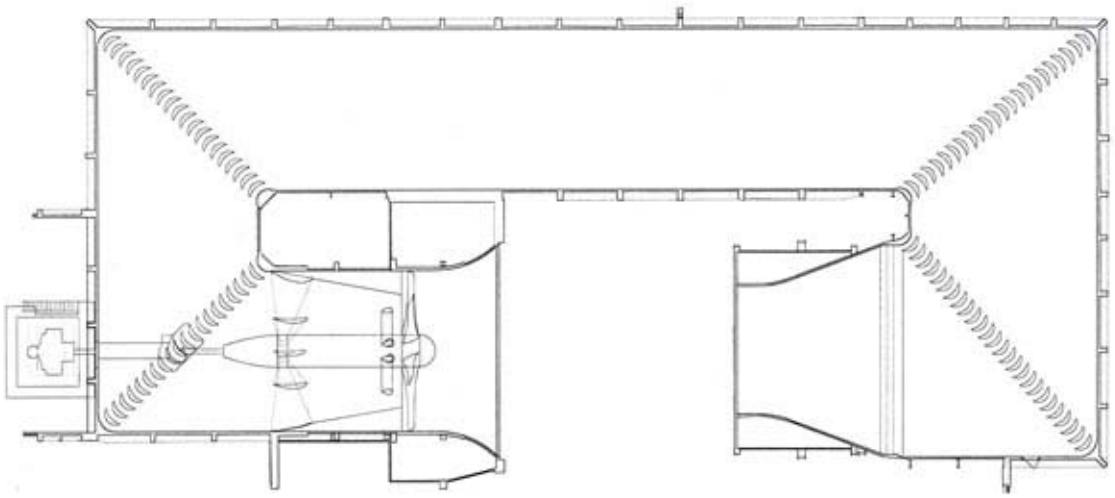
Full-size aircraft testing in 1930s; pitch behavior beyond stall for rear-engined aircraft (BAC111, VC10, Trident) testing in 1960s. Current testing includes: testing piston engines in their nacelles with propellers running, propeller noise research, nozzle noise testing, unmanned aircraft research, helicopter rotor testing, VTOL research, redesign of Britannia engine intakes to prevent engine cut-outs, parachute testing. Also used for testing conifers behavior, motorway barriers, full-size radar scanners, and full-size cars.

Planned Improvements

User Fees

Contact Information

Stephen Lord (Senior Development Manager), Farnborough Air Sciences Trust, Slough Estates plc, 234 Bath Road, Slough, Berkshire SL1 4EE, England, UK.
Tel: (44) 01753 213472, Email: Stephen.Lord@sloughestates.co.uk, Web site: http://www.airsciences.org.uk/.



No. 1 24-ft Low-Speed Wind Tunnel, Farnborough Air Sciences Trust (FAST), Berkshire, England.

European and Asian Wind Tunnels

Subsonic | England

Installation Name	**Test Section Size**	**Speed Range**
Farnborough Air Sciences Trust (FAST), Berkshire, England	3.4 x 2.6 x 6.1 m	200 ft/s (60 m/s) (max w/o cooling); 300 ft/s (90 m/s) (max @ 1.25MVA)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1942/1970 (upgrade)	**Reynolds Number (million)**
No. 2 Low Speed Wind Tunnel (LST)		
	Cost	
	Refurbishment estimate available upon request.	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Inactive since 1998. Prospective operators being solicited as of January 2006.	

Supplementary Technical Parameters

This facility has a three-component roof balance, six-component floor balance, sting support –10 +30° of incidence, with a maximum speed at 1.25 MVA.

Data Acquisition

Testing Capabilities/Current Programs

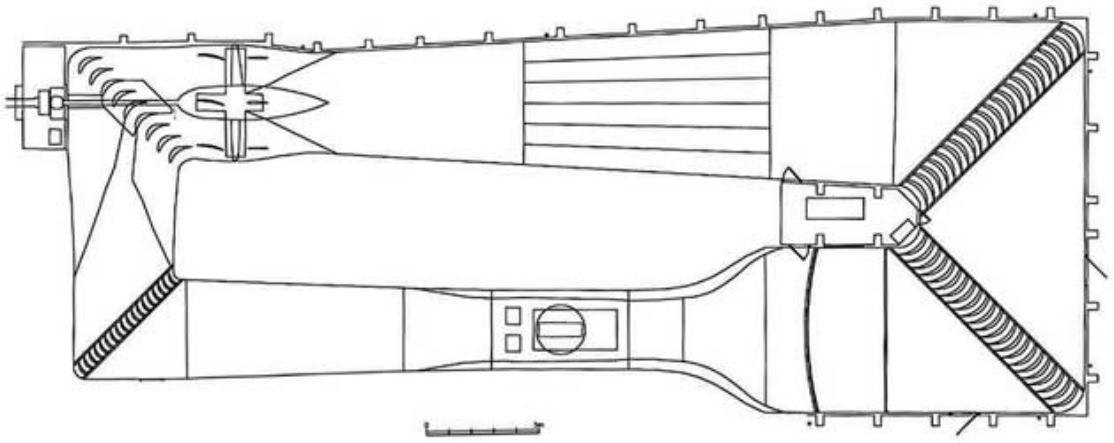
V/STOL research, including Harrier predecessors. Aircraft model tests. Combat aircraft research. Comet 3 wing tank development. Vortex flap research. Aircraft wake characteristics research. Swept wing stall behaviour research. Weapon systems research. Also used for oil cooler research for piston engines and testing of F1 racing cars, post office telegraph wires, bobsleighs, high-incidence canard delta tests, drag tests on Olympic skiers.

Planned Improvements

User Fees

Contact Information

Stephen Lord (Senior Development Manager), Farnborough Air Sciences Trust, Slough Estates plc, 234 Bath Road, Slough, Berkshire SL1 4EE, England, UK.
Tel: (44) 01753 213472, Email: Stephen.Lord@sloughestates.co.uk, Web site: http://www.airsciences.org.uk/.



No. 2 Low Speed Tunnel (LST), Farnborough Air Sciences Trust (FAST), Berkshire, England.

European and Asian Wind Tunnels

Subsonic | England

Installation Name	Test Section Size	Speed Range
Farnborough Air Sciences Trust (FAST), Berkshire, England	1.2 x 0.9 x 3.4 m	up to 280 ft/s (85 m/s)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1946/1990 (upgrade)	**Reynolds Number (million)**
No. 3 Low Speed Wind Tunnel (LST)		
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Inactive since mid-1990s. Prospective operators being solicited as of January 2006.	

Supplementary Technical Parameters

Continuous flow, closed circuit, octagonal cross section. The mahogany six-bladed fan is powered by a 200-hp DC motor. Has a three-component roof balance, traverse sting support, and contraction ratio of 32:1.

Data Acquisition

Testing Capabilities/Current Programs

Preliminary development work prior to investment in larger facilities. Research on boundary layer development and transition. High-performance glider wing sections. Development and calibration of aircraft instrumentation. Development of 2D testing techniques. Combat aircraft research. Vortex development research. Anemometer calibration. Testing of sharp edge M and W wings.

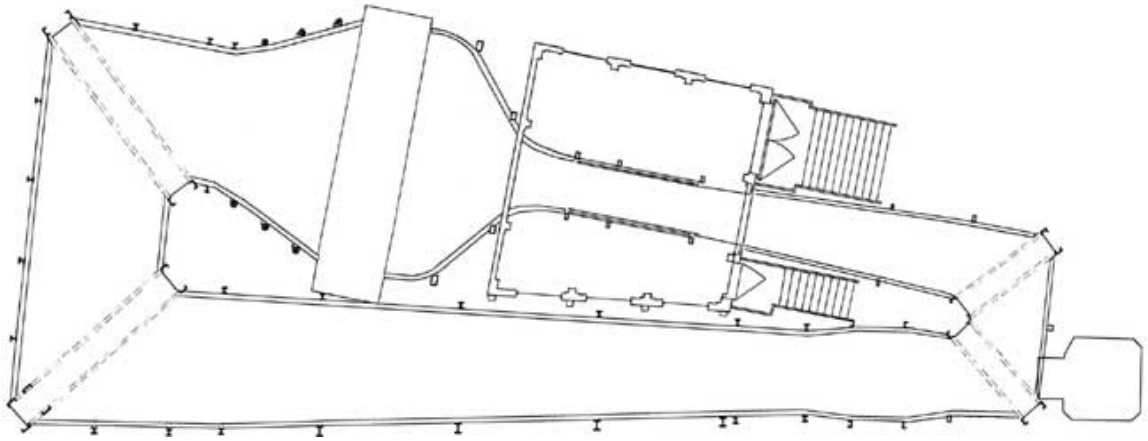
Planned Improvements

User Fees

Because of its simplicity, safety and low operating costs this tunnel is also ideal for educational use.

Contact Information

Stephen Lord (Senior Development Manager), Farnborough Air Sciences Trust, Slough Estates plc, 234 Bath Road, Slough, Berkshire SL1 4EE, England, UK.
Tel: (44) 01753 213472, Email: Stephen.Lord@sloughestates.co.uk, Web site: http://www.airsciences.org.uk/.



No. 3 Low-Speed Wind Tunnel (LST), Farnborough Air Sciences Trust (FAST), Berkshire, England.

European and Asian Wind Tunnels

Subsonic | England

Installation Name	**Test Section Size**	**Speed Range**
Flow Science Limited, Goldstein Research Laboratory, Manchester, England	0.5 x 0.5 x 3.0 m	up to 42 m/s
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
0.5 x 0.5 m Low-Turbulence Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of October 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Closed return circuit, 20:1 contraction ratio, <0.03% turbulence level.

Data Acquisition

Testing Capabilities/Current Programs

The tunnel is ideally suited for detailed flow investigations in such areas as laminar flow studies on aircraft wings.

Planned Improvements

User Fees

Contact Information

David Smith (Operations Director), Flow Science Limited, Goldstein Research Laboratory, Barton Airport Eccles, Manchester M 30 7RU, England, UK.
Tel/Fax: (44) 0161 787 8749, Email (Smith): david@fs1.ae.man.ac.uk, Email (General): Flowsci@fs1.ae.man.ac.uk, Web site: http://www.flow-science.eng.man.ac.uk/etdetail.htm.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | England

Installation Name	**Test Section Size**	**Speed Range**
Flow Science Limited, Goldstein Research Laboratory, Manchester, England	1.35 x 0.95 m	40 m/s (open jet), 50 m/s (closed)
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
1.35 x 0.95 m Blow-down Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of October 2005.	**Stagnation Pressure**

Supplementary Technical Parameters

Blow down to open jet or closed working section with diffuser. Test section turbulence level < 0.6%, flow velocity variation <0.2%. Double inlet centrifugal fan, 1.3 m diameter with 50-kW drive via magnetic clutch, two1.0-q and three 2.0-q screens, 6:1 contraction ratio.

Data Acquisition

Traverse gear, scanivalves, pressure transducers, custom made 5 and 7-hole pitot probes can be used to measure flow angles and speeds, hot wire probes, digital oscilloscopes, digital spectrum analyser for recording transient, unsteady or fluctuating flows or responsed.

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

David Smith (Operations Director), Flow Science Limited, Goldstein Research Laboratory, Barton Airport Eccles, Manchester M 30 7 RU England.
Tel/Fax: (44) 0161 787 8749, Email (Director): david@fs1.ae.man.ac.uk, Email (General): Flowsci@fs1.ae.man.ac.uk, Web site: http://www.flow-science.eng.man.ac.uk/etdetail.htm.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | England

Installation Name	**Test Section Size**	**Speed Range**
Flow Science Limited, Goldstein Research Laboratory, Manchester, England	2.75 x 2.23 x 5.5 m	up to 70 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1950s/1989 (acquired from British Aerospace, moved, refurbished)	**Reynolds Number (million)**
AVRO 9 x 7 ft Low Speed Wind Tunnel	**Cost**	
		Dynamic Pressure
	Operational Status	
	Presumed active as of October 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Closed return, occupying 39 x 15 meters floor space. Turbulence level of below 0.1%, honeycomb, two 1.2-q screens, 5:1 contraction ratio.

Data Acquisition

Scanivalves, pressure transducers, custom made 5 and 7-hole pitot probes can be used to measure flow angles and speeds, thermocouples, hot wire probes, digital oscilloscopes, digital spectrum analyser for recording transient, unsteady or fluctuating flows or responses, flow visualisation using tufts, fluorescent mini-tufts,

Testing Capabilities/Current Programs

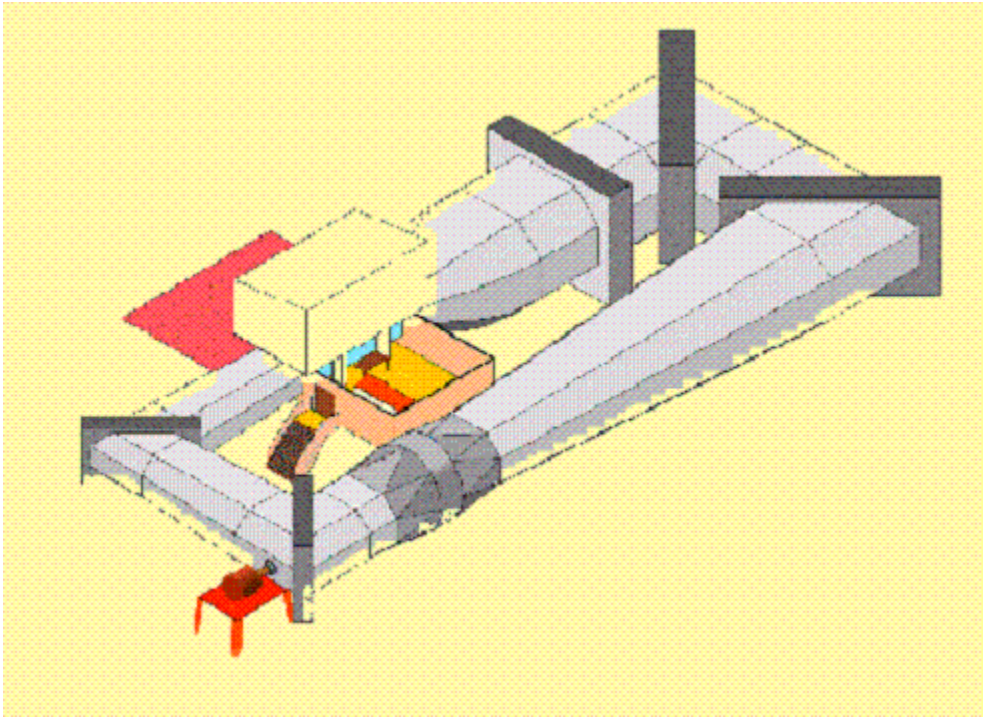
The facility is used extensively by industry, government agencies, and research establishments for obtaining aerodynamic performance data of scale-model flight and surface vehicles

Planned Improvements

User Fees

Contact Information

David Smith (Operations Director), Flow Science Limited, Goldstein Research Laboratory, Barton Airport Eccles, Manchester M 30 7RU, England, UK.
Tel/Fax: (44) 0161 787 8749, Email (Smith): david@fs1.ae.man.ac.uk, Email (General): Flowsci@fs1.ae.man.ac.uk, Web site: http://www.flow-science.eng.man.ac.uk/etdetail.htm.



AVRO 9 x 7 ft Low-Speed Wind Tunnel, Flow Science Limited, Goldstein Research Laboratory, Manchester, England.

European and Asian Wind Tunnels

Subsonic | England

Installation Name	Test Section Size	Speed Range
QinetiQ, Farnborough, England	4.2 x 5.0 x 8 m	0.05 to 0.34 Mach
		Temperature Range
	Date Built/Upgrade	Ambient
Facility Name	1977/continuous rolling refurbishment program	**Reynolds Number (million)**
5 m Low Speed Wind Tunnel		7.6
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of January 2006	3.0 bar

Supplementary Technical Parameters

Closed, single return. Solid constuction with tapered fillets, 13.6 MW maximum power (A.C. and D.C). PSI (8400 and ESP) pressure system. Two underfloor and various strain gauge balances. Variable height ground effects air supply. 100 bar air supply system. 8 kg/sec continuous 32 kg/sec for 6 minutes air mass flow.

Data Acquisition

DEC-Alpha/Vax, various

Testing Capabilities/Current Programs

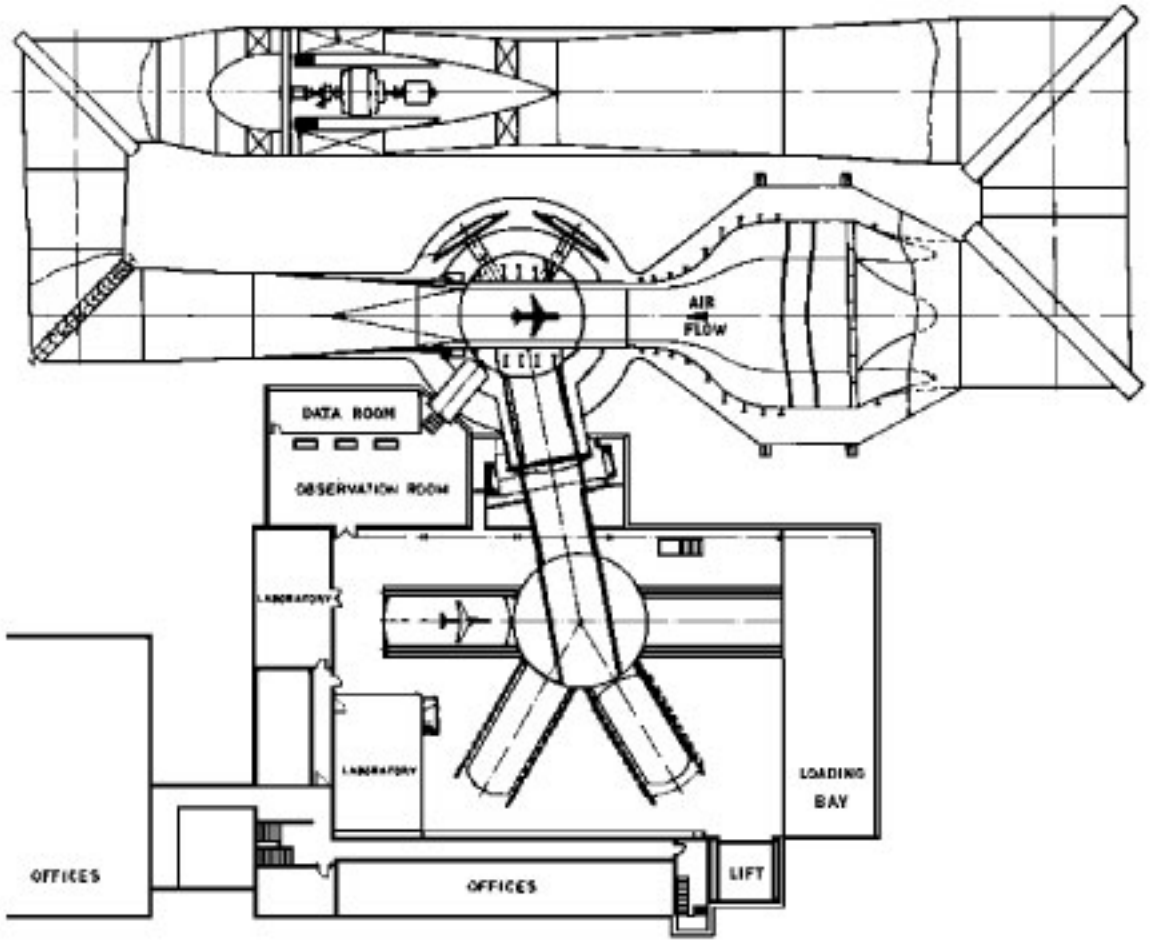
Modelling landing and take-off performance for civil and military aircraft. Also comes into its own with other tests applications on high-speed trains to rotor blades, radar to a range of aerofoil structures.

Planned Improvements

User Fees

Contact Information

QinetiQ, QinetiQ Customer Contact Team, Cody Technology Park, Ively Road, Farnborough Hampshire, GU 14 0LX, England, UK.
Tel: (44) 0 1252 392000, Fax: (44) 0 1252 393399, Web site: http://www.qinetiq.com.



5 meter Low-Speed Wind Tunnel, QinetiQ, Farnborough, England.

European and Asian Wind Tunnels

Subsonic | France

Installation Name	Test Section Size	Speed Range
CEPr and ONERA, Center for Engine Testing (CEPr), Saclay, France	#1: 2 m (open jet); #2: 3 m (open jet)	#1: 120 m/s; #2: 60 m/s
		Temperature Range
	Date Built/Upgrade	#1: 877°C; #2: 227°C
Facility Name	1976/1999	**Reynolds Number (million)**
CEPRA 19 Anechoic Wind Tunnel		#1: 1.3; #2: 0.8
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of September 2005	

Supplementary Technical Parameters

Open circuit, continuous atmospheric, aero-acoustic windtunnel. 7-MWA 12 x 9 m inlet featuring a dust filter, acoustic baffles, anti-turbulence screens and a honeycomb. Nozzle with 9-m diameter inlet, 2- or 3-m diameter outlet. Anechoic chamber roughly a quarter of a sphere, internal radius of 9.6 m. Flow collector fan silencer centrifugal fan driven by 7-MW asynchronous electric motor.

Data Acquisition

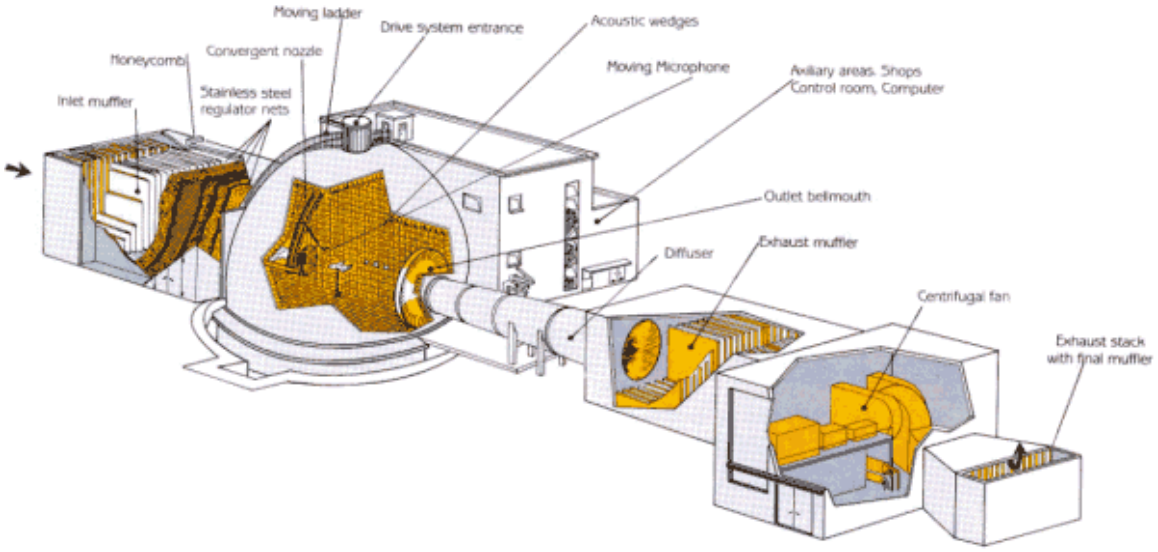
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Olivier Piccin (CEPRA19 Manager), Centre d'Essais des Propulseurs (CEPr), Saclay, France.
Tel: (33) 1 60 19 67 85, Fax: (33) 1 46 73 41 44, Email: Olivier.Piccin@onera.fr, Web site: http://www.onera.fr/gmt-en/wind-tunnels/cepra19.html, http://www.onera.fr/gmt-en/table.html.



CEPRA 19 Anechoic Wind Tunnel, ONERA French Aeronautics and Space Research Center, Saclay, France.

Subsonic | France

Installation Name	Test Section Size	Speed Range
French-German Research Institute of Saint Louis (ISL), Saint Louis, France	90 x 70 x 80 cm	0.126 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
S20 Subsonic Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of September 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Measurements taken include shadow or Schlieren photography, measurement of steady and transient pressures, force and moment measurements using wind tunnel balance, laser Doppler velocimetry, particle image velocimetry, Doppler picture technique, and visualization by means of holographic filters.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

French-German Research Institute of Saint-Louis (ISL), 5 rue du Général Cassagnou, 68300 Saint-Louis, France.
Mailing address: ISL, PO Box 70034, FR 68301 Saint Louis CEDEX.
Tel: (33) 3 89 69 50 00, (33) 3 89 69 50 02, Email: isl@isl.tm.fr, Web site: http://www.isl.tm.fr/en/generalite/intro_pres_e.html.

S20 Subsonic Wind Tunnel, French-German Institute of Saint Louis, St Louis, France.

European and Asian Wind Tunnels

Subsonic | France

Installation Name	Test Section Size	Speed Range
ONERA French Aeronautics and Space Research Center, Le Fauga Mauzac Center, Le Fauga Mauzac, France	4 model-carts: 4.5 x 3.5 m each	123 m/s (0.36 Mach)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1974	**Reynolds Number (million)**
F1 Continuous Pressurized Subsonic Wind Tunnel		8
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of September 2005	1 to 3.85 bar

Supplementary Technical Parameters

Internal balances: 80 available balances; special design on request. Wall balance may be equipped with high-pressure air crossing for turbine supply (propane or turbofan simulation). Turbine simulators for propellers. High-pressure air supply: mass flow up to 20 kg/s, pressure up to 120 bars, temperature up to 80°C. Rigs for propeller calibration tests, TPS, air intake, probing device for flow surveys around models. Boundary layer control by blowing on the floor for ground effect tests.

Data Acquisition

Flow visualization by laser sheet, colored oils, mini-tufts with UV light, transition visualization by acenaphtene sublimation or infrared camera.

Testing Capabilities/Current Programs

Propellar calibration tests.

Planned Improvements

User Fees

Contact Information

Jean-Claude Traineau (Director), Le Fauga-Mauzac Wind Tunnel Department, ONERA, Centre du Fauga-Mauzac, F-31410 NOE, France.
Tel: (33) 5 61 56 63 01, Fax: (33) 5 61 56 63 63, Email: Jean-Claude.Traineau@onera.fr, Web site: http://www.onera.fr/gmt-en/wind-tunnels/cepra19.html, http://www.onera.fr/gmt-en/table.html.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | France

Installation Name	**Test Section Size**	**Speed Range**
ONERA French Aeronautics and Space Research Center, Le Fauga Mauzac Center, Le Fauga Mauzac, France	1.4 x 1.8 m	up to 100 m/s
		Temperature Range
	Date Built/Upgrade	± 1°C ???
Facility Name	1974	**Reynolds Number (million)**
F2 Continuous Atmospheric Subsonic Wind Tunnel	**Cost**	1.1
		Dynamic Pressure
	Operational Status	
	Presumed active as of September 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Data Acquisition

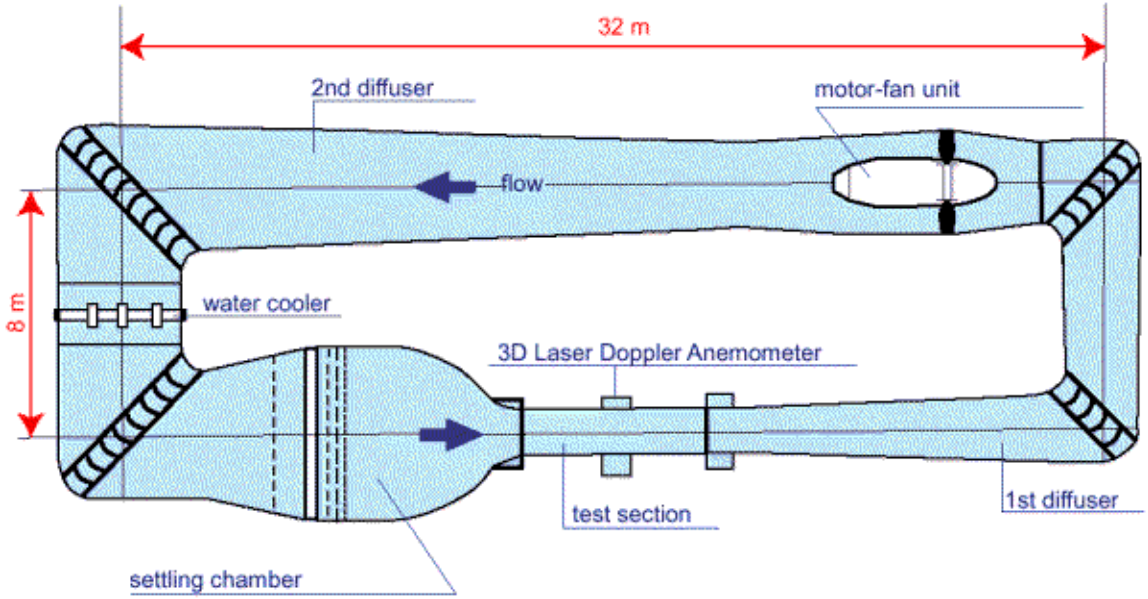
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Philippe Loiret (Installation Head), Jean-Claude Raynal (Chief), Wind Tunnel Research Unit, ONERA, Centre du Fauga-Mauzac, F-31410 NOE, France.
Tel (Loiret): (33) 5 61 56 63 73, Tel (Raynal): (33) 5 61 56 63 71, Email (Loiret): Philippe.Loiret @ onera.fr, Web site: http://www.onera.fr/gmt-en/wind-tunnels/cepra19.html or http://www.onera.fr/gmt-en/table.html.



F2 Continuous Atmospheric Wind Tunnel, ONERA French Aeronautics and Space Research Center, Fauga-Mauzac, France.

European and Asian Wind Tunnels

Subsonic | Germany

Installation Name	**Test Section Size**	**Speed Range**
Carolo-Wilhelmina Technical University at Braunschweig, Institute for Fluid Mechanics (ISM), Braunschweig, Germany	600 x 400 x 1500 mm	19 m/s
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Low Noise Low Speed Wind Tunnel (LNB)		low
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

The LNB is a continuous, atmospheric, Eiffel-type wind tunnel with a closed test section. It is driven by a 3-kW motor in suction mode. It has a rectangular cross section with a burger-type axial area. The contraction ratio is 16. Air passes through a 30-mm thick fleece mat followed by a honeycomb with a length of 133 mm.

Data Acquisition

Stereo-scopic-PIV, Multiplane-PIV and Time-Resolved PIV techniques.

Testing Capabilities/Current Programs

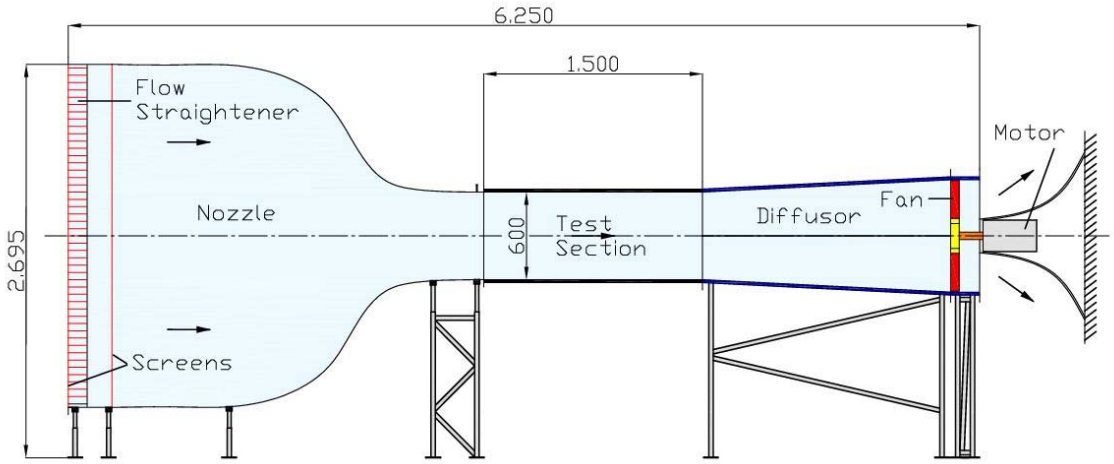
Research in low Reynolds number and unsteady aerodynamics, detailed flow investigations of laminar separation bubbles and interaction of coherent flow structures in turbulent boundary layers. Experiments on flapping wings at low Reynolds numbers also planned.

Planned Improvements

User Fees

Contact Information

Dr. Christian Käehler, Department of Mechanical Engineering, Institut für Strömungsmechanik, Bienroder Weg, 338106 Braunschweig, Germany.
Tel: (49) 531 391 2971, Fax: (49) 531 391 5952, Email: ckäehler@tu-braunschweig.de, Web site: http://www.tu-braunschweig.de/ism/institut/wkanlagen/hlb.



Low Noise, Low Speed Wind Tunnel (LNB), Carolo-Wilhelmina Technical University at Braunschweig (ISM), Braunschweig, Germany.

European and Asian Wind Tunnels

Subsonic | Germany

Installation Name	**Test Section Size**	**Speed Range**
Carolo-Wilhelmina Technical University at Braunschweig, Institute for Fluid Mechanics (ISM), Braunschweig, Germany	#1: 1300 x 1300 x 3000 mm; #2: 800 x 800 x 3000 mm	60 m/s (max)
		Temperature Range
	Date Built/Upgrade	10°C (max)
Facility Name		**Reynolds Number (million)**
Low Speed Wind Tunnel (MUB)		0.69
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

The MUB is a Göettinger-design closed-circuit atmospheric wind tunnel with three exchangeable measuring sections. The new heat exchanger in the calming chamber permits stable flow temperatures. It has flexible and optical measuring sections.

Data Acquisition

8400 DTC pressure measuring system. 3-component PIV system, 340Hz of indigo infrared camera system research underway to develop infrared heat transfer measurements, two six-component balances, KME 4 external balance.

Testing Capabilities/Current Programs

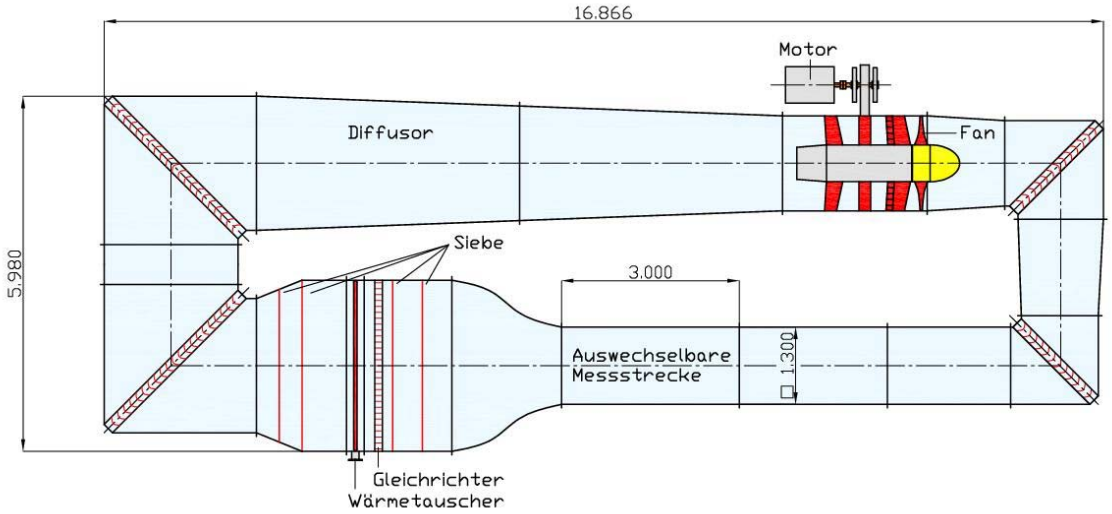
Research on airfoils, aircraft componets, and ground vehicles.

Planned Improvements

User Fees

Contact Information

Dr. Thorsten Möller, Department of Mechanical Engineering, Institut für Strömungsmechanik (ISM), Bienroder Weg, 338106 Braunschweig, Germany.
Tel: (49) 531 391 2971, Fax: (49) 531 391 5952, Email: t.möeller@tu-braunschweig.de, Web site: http://www.tu-braunschweig.de/ism/institut/wkanlagen/hlb.



Low-Speed Wind Tunnel (MUB), Carolo-Wilhelmina Technic University, University at Braunschweig, Institute for Fluid Mechanics (ISM), Braunschweig, Germany.

European and Asian Wind Tunnels

Subsonic | Germany

Installation Name	**Test Section Size**	**Speed Range**
Carolo-Wilhelmina Technical University at Braunschweig, Institute for Fluid Mechanics (ISM), Braunschweig, Germany	4997 x 2450 x 940 mm	65 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Small Wind Tunnel Braunschweig (KWB)		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

The small wind tunnel is continous with an open test section. It is driven by a 22-kW motor. The nozzle can be replaced with a burger-nozzle of bi-superelliptic shape. Has 505-mm open-jet diameter

Data Acquisition

Testing Capabilities/Current Programs

Educational. Used to investigate new measurement techniques and to study feasibility of new research concepts such as flow control.

Planned Improvements

User Fees

Contact Information

Dr. Christian Käehler, Department of Mechanical Engineering, Institut für Strömungsmechanik (ISM), Bienroder Weg, 338106 Braunschweig, Germany.
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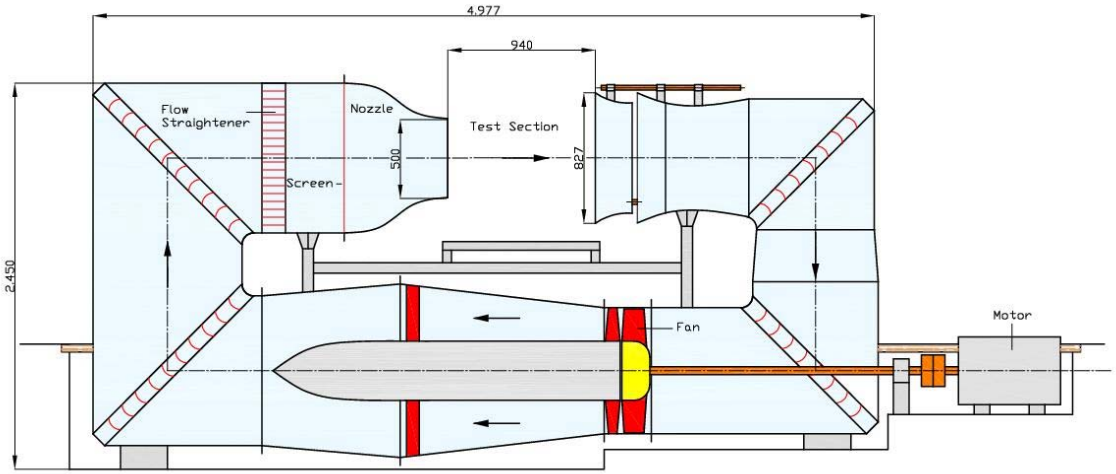


Small Continuous Atmospheric Wind Tunnel (KWB), Carolo-Wilhelmina Technic University, University at Braunschweig, Institute for Fluid Mechanics, Braunschweig, Germany.

European and Asian Wind Tunnels

Subsonic | Germany

Installation Name	**Test Section Size**	**Speed Range**
German-Dutch Wind Tunnels (DNW), Braunschweig, Germany	#1: 3.25 x 2.8 m (closed or slotted wall); #2: 3.25 x 2.8 m (open jet)	#1: 90 m/s; #2: 75 m/s
		Temperature Range
	Date Built/Upgrade	
Facility Name	1960/1980 (upgrade)	**Reynolds Number (million)**
Low Speed Continuous Atmospheric Wind Tunnel (NWB)	**Cost**	#1: 1.8; #2: 1.5
		Dynamic Pressure
	Operational Status	
	Presumed active as of October 2005	**Stagnation Pressure**

Supplementary Technical Parameters

The NWB is an atmospheric, low-speed, closed-circuit tunnel. The settling chamber is equipped with a honeycomb-type flow straightener and three fine mesh screens. 1.4-MV power supply maximum.

Data Acquisition

Up to 240 measurement channels, PSI system 8400 DTC for pressure. Measurement up to 1024 pressure points.

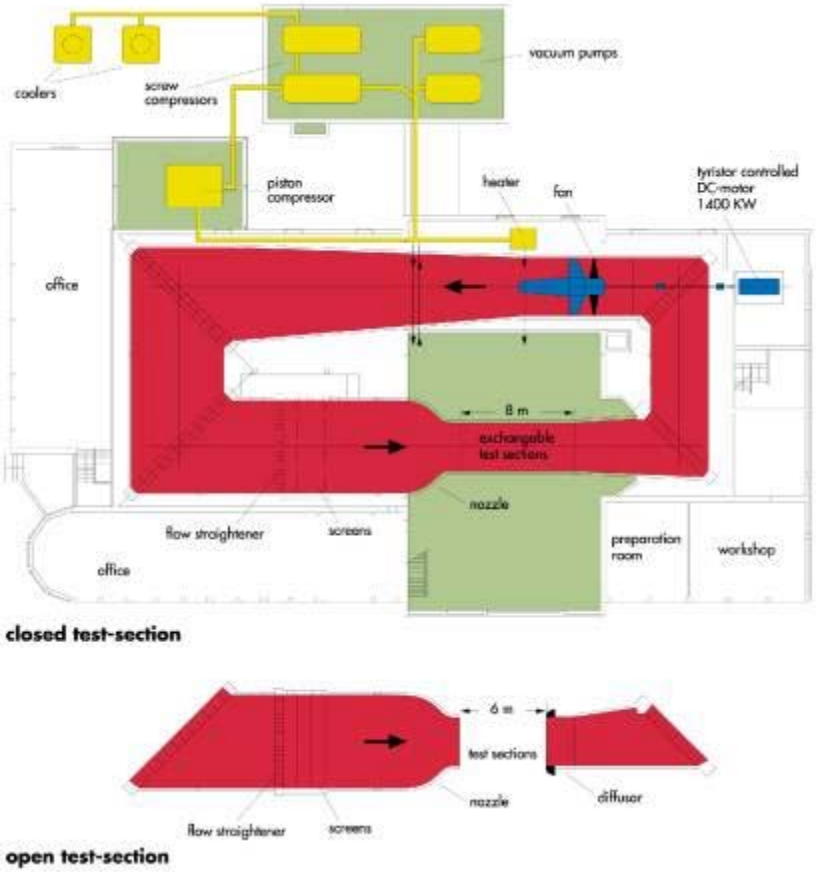
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr.-Ing. A. Bergmann, German-Dutch Wind Tunnels (DNW), Lilienthalplatz 7, 38108 Braunschweig, Germany.
Tel: (49) 531 295 2450, Fax: (49) 531 295 2829, Email: dnw-nwb@dnw.aero, Web site: http://www.dnw.aero.



Low-Speed Continuous Atmospheric Wind Tunnel (NWB), German-Dutch Wind Tunnels (DNW), Braunschweig, Germany.

European and Asian Wind Tunnels

Subsonic | Germany

Installation Name	**Test Section Size**	**Speed Range**
German-Dutch Wind Tunnels (DNW), Göttingen, Germany	0.6 x 0.6 m	35 m/s (max)
		Temperature Range
	Date Built/Upgrade	Ambient
Facility Name		**Reynolds Number (million)**
High-Pressure Continuous Subsonic Wind Tunnel (HDG)		12
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of September 2005	

Supplementary Technical Parameters

By pressurizing the air in the wind tunnel up to 100 bar, very high Reynolds numbers are obtained in incompressible flow with velocities up to 35 m/s. Models can be installed in different test sections. Test section exchange is provided by a special locking system without depressurizing the tunnel circuit. For long-term measurements the tunnel shell can be cooled by dripping water. Unique general arrangement.

Data Acquisition

Unix operating system.

Testing Capabilities/Current Programs

The HDG is used for investigations that require the simulation of the correct Reynolds number. Systematic steady and unsteady fluid-dynamic research into Reynolds effect on solid generic models such as spheres, cylinders, airfoils, etc. models as well as on high-speed trains, buildings, bridges, and other engineering structures.

Planned Improvements

User Fees

Contact Information

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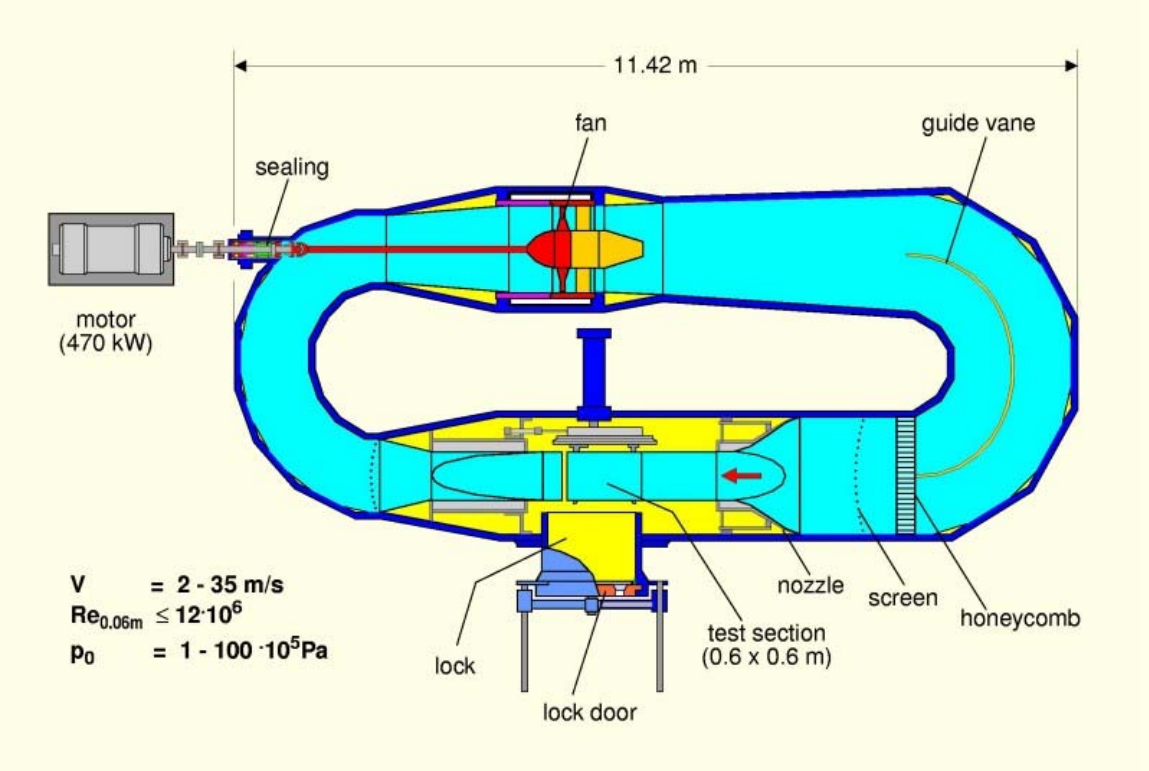
Tel: (49) 551 709 2820, Fax (49) 551 709 2888, Email: dnw-guk@dnw.aero, Web site: http://www.dnw.aero/.



High-Pressure Continuous Subsonic Wind Tunnel (HDG), German-Dutch Wind Tunnels, Göttingen, Germany.

European and Asian Wind Tunnels

Subsonic | Germany

Installation Name	Test Section Size	Speed Range
German-Dutch Wind Tunnels (DNW), Köln, Germany	2.4 x 2.4 m	0 to 0.38 Mach
		Temperature Range
	Date Built/Upgrade	116 to 300°K
Facility Name	?/1980-1985	**Reynolds Number (million)**
Cryogenic Continuous Wind Tunnel (KKK)		9.5
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of September 2005	Ambient

Supplementary Technical Parameters

The originally conventionally low-speed wind tunnel was changed to a high Reynolds-number cryogenic wind tunnel from 1980 to 1985 and entered service in July 1987. A continuously working, low-speed tunnel with a closed tunnel circuit. To achieve higher Reynolds numbers, the gas temperature in the tunnel circuit can be varied between 100 and 300°K by injecting liquid nitrogen. The Reynolds number can then be increased by a factor of 5.5, while the drive power remains constant.

Data Acquisition

Testing Capabilities/Current Programs

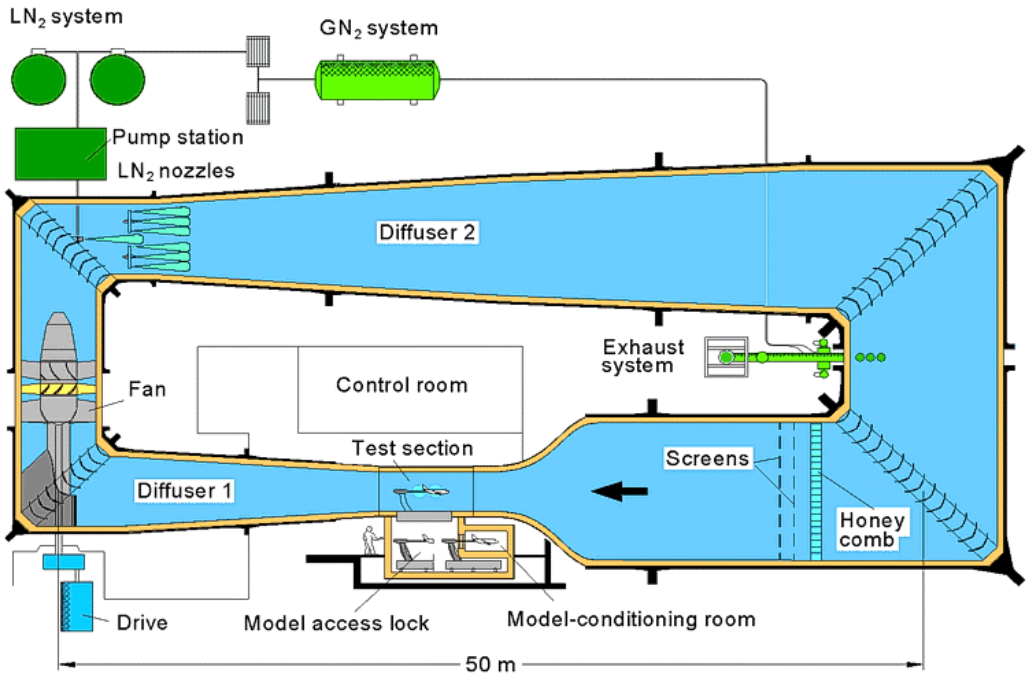
Due to the variation of the gas temperature, the influence of Mach number and Reynolds number on the aerodynamic coefficients of model measurements can be investigated separately.

Planned Improvements

User Fees

Contact Information

R. Rebstock, German-Dutch Wind Tunnels (DNW), KKK, Linder Höhe, 51147 Köln, Germany.
Tel: (49) 2203 601 3700, Fax: (49) 2203 695961, E-Mail: dnw-kkk@dnw.aero, Web site: http://www.dnw.aero/.



Continuous Cryogenic Wind Tunnel (KKK), German-Dutch Wind Tunnels (DNW), Köln, Germany.

European and Asian Wind Tunnels

Subsonic | Germany

Installation Name	**Test Section Size**	**Speed Range**
Institute for Aerodynamics and Gas Dynamics (IAG), University of Stuttgart, Stuttgart, Germany	0.73 x 2.73 x 3.15 m	90 m/s
		Temperature Range
	Date Built/Upgrade	
Facility Name	1962	**Reynolds Number (million)**
Laminar Wind Tunnel (LWK)		5 (max)
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of October 2005	

Supplementary Technical Parameters

Closed aerodynamic circuit. Long blow down. Closed measuring section and open air feedback (Eiffel-type), motor speed of 220 kW. A high contraction ratio of 100:1 as well as integrated filter mats u < 0.2%.

Data Acquisition

Scanivalves, PSI Vielfachdruckmesssytsten, MKS Baratron, boundary layer probe, infrared camera. Dynamometer infrared camera TH7102. Visualization flows can be done by coating methods, tufts or smoke probes, and laser light art.

Testing Capabilities/Current Programs

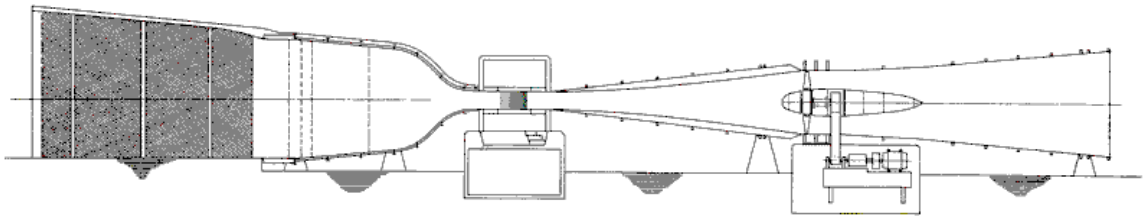
Measurement of two-dimensional models.

Planned Improvements

User Fees

Contact Information

Dr. W. Pepper, University of Stuttgart, Pfaffenwaldring 21, D-70569 Stuttgart, Germany.
Tel/Fax: (49) 0711 685 3470, Email: wuerz@iag.uni stuttgart.de, Web site: http://www.iag.uni-stuttgart.de/laminarwindkanal/&prev=/sear.



Laminar Wind Tunnel (LWK), Institute for Aerodynamics & Gas Dynamics (IAG), University of Stuttgart, Stuttgart, Germany.

European and Asian Wind Tunnels

Subsonic | Germany

Installation Name	**Test Section Size**	**Speed Range**
Institute for Aerodynamics and Gas Dynamics (IAG), University of Stuttgart, Stuttgart, Germany	0.373 x 0.6 x 0.8 m	30 m/s
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Model Wind Tunnel		0.03 to 0.4
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of October 2005	**Stagnation Pressure**

Supplementary Technical Parameters

The model wind tunnel has a long-blowdown, closed measuring section, open air feedback (Eiffel type). It has a 6-blade blower with 4-kW three-phase motor. Maximum stagnation pressure amounts to 75mmWC. Turbulence/flow rate of 2 x 10-4 to 7.5 x 10-4.

Data Acquisition

PC supported system with 12-bit AD Wandler.

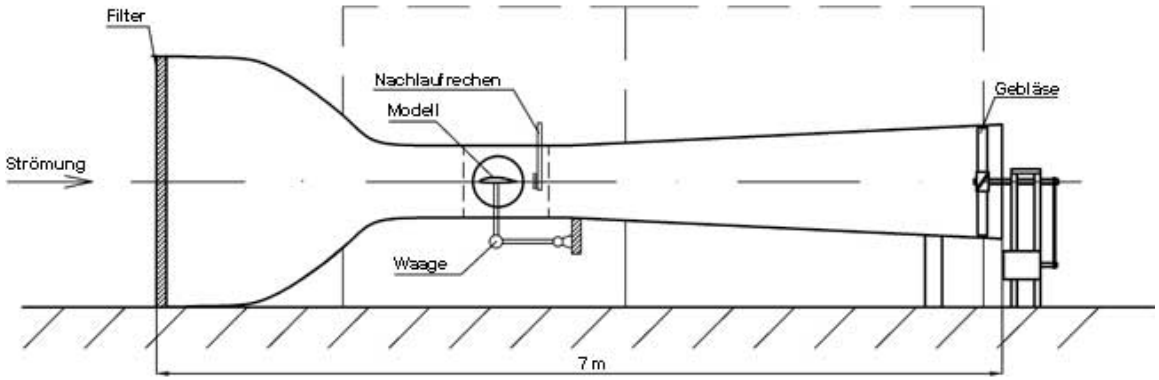
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. W. Pepper, Institute for Aerodynamics and Gas Dynamics (IAG), University of Stuttgart, Pfaffenwaldring 21, D-70569 Stuttgart, Germany.
Tel/Fax: (49) 711 685 3470, Email: wuerz@iag.uni-stuttgart.de, Web site: http://www.iag.uni-stuttgart.de/.



Model Wind Tunnel, Institute for Aerodynamics and Gas Dynamics (IAG), University of Stuttgart, Stuttgart, Germany.

European and Asian Wind Tunnels

Subsonic | Germany

Installation Name	Test Section Size	Speed Range
Technical University of Darmstadt, Darmstadt, Germany	2.2 x 2.9 x 4.3 m	68 m/s
		Temperature Range
	Date Built/Upgrade	Ambient
Facility Name	1937	**Reynolds Number (million)**
2.2 x 2.9 m Subsonic Wind Tunnel		1.14
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of October 2005	Ambient

Supplementary Technical Parameters

Closed, single return wind tunnel. 300-kW power, single stage axial fan, Amb/Amb stagnation pressure, PSI system, no ground effects, 50 bar air supply system, 500 kg air mass flow.

Data Acquisition

Micro Vax

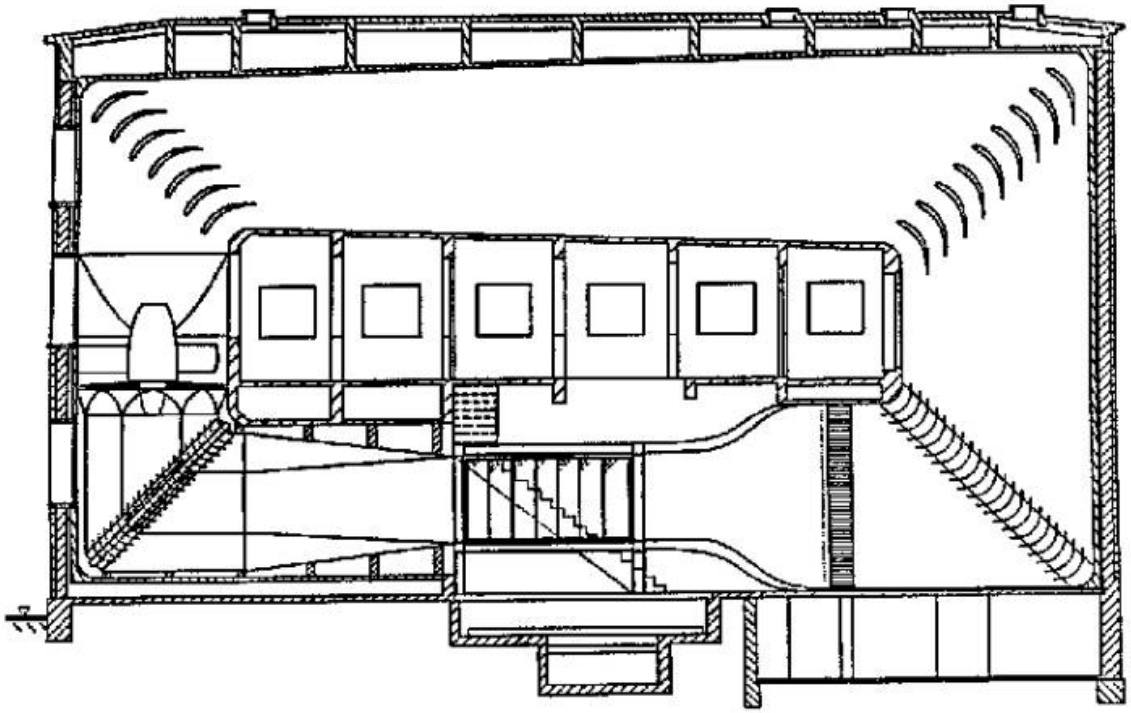
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Cameron Tropea, Strömungslehre und Aerodynamik, Fachbereich 16, Building/Room L101/473, Petersenstrasse 30, D-64287 Darmstadt, Germany.
Tel: (49) 6151 162854, Fax: (49) 6151 16 4754, Email: ctropea@sla.tu-darmstadt.de, Web site: http://tu-darmstadt.de.



2.2 x 2.9 m Subsonic Wind Tunnel, Technical University of Darmstadt, Darmstadt, Germany.

European and Asian Wind Tunnels

Subsonic | Indonesia

Installation Name	**Test Section Size**	**Speed Range**
Aero-Gas Dynamics and Vibration Laboratory (LAGG), Agency for Assessment and Application of Technology (BPPT), National Center for Research, Science and Technology (PUSPIPTEK), Serpong, Indonesia	4 x 3 x 10 m	110 m/s
		Temperature Range
	Date Built/Upgrade	
Facility Name	1987-1988	**Reynolds Number (million)**
Indonesia Low Speed Wind Tunnel (ILST)		6.5
	Cost	
	US$18 million (estimated construction cost)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Confirmed active as of 2004	

Supplementary Technical Parameters

Developed under bilateral technological cooperation between the governments of Republic Indonesia (BPPT) and the Netherlands National Aerospace Laboratory (NLR). Aeronautical and industrial aerodynamics circuit of a closed return type with atmospheric and closed walled test sections. Contraction ratio of 1:9. Equipped with a ground plane to enable aircraft landing and take off simulation, and with 200 m³ pressurized dry air of 60 bars to allow testing on air turbine powered engine

Data Acquisition

256 channels

Testing Capabilities/Current Programs

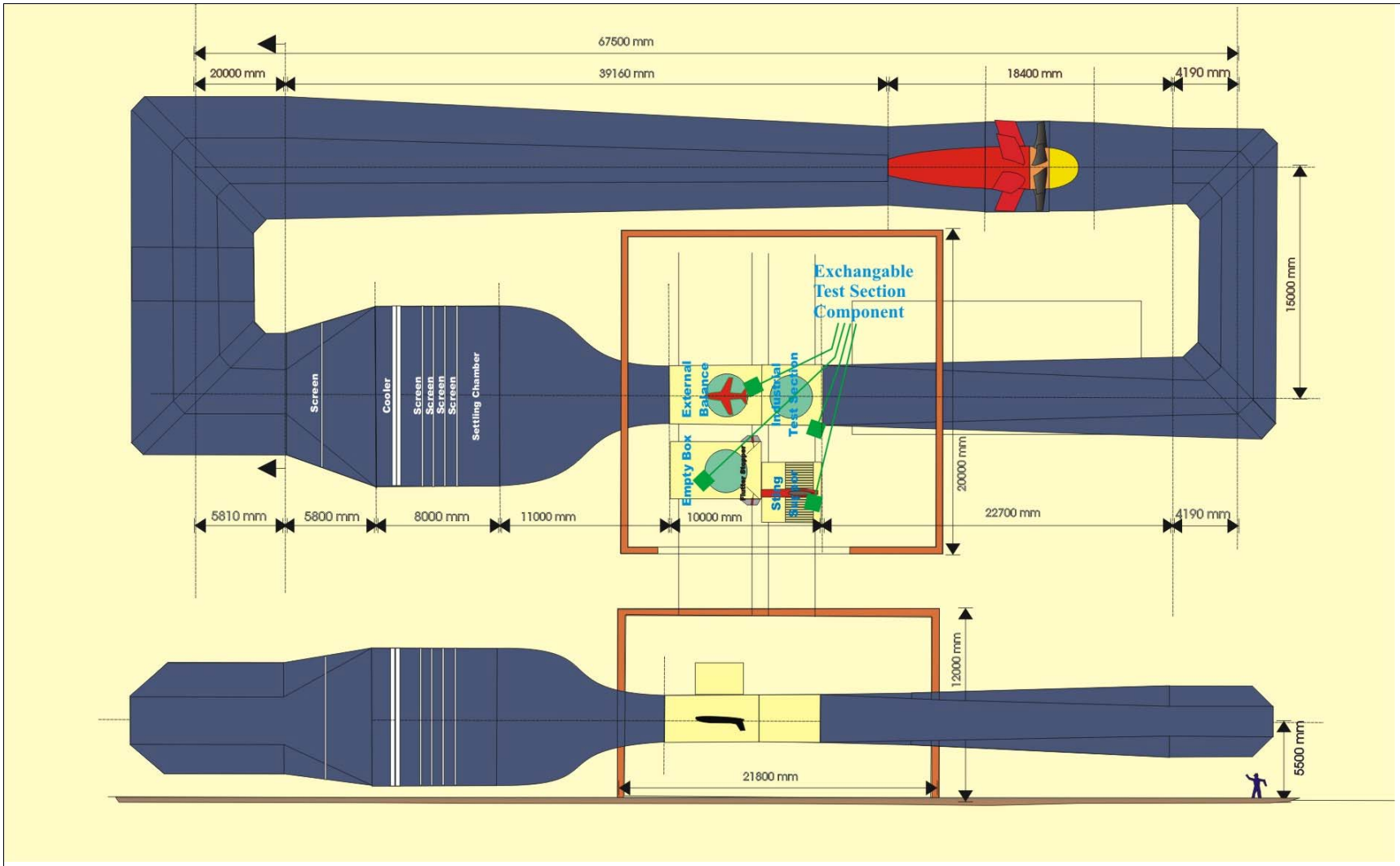
CN235 aircraft development testing (civil and military), N250 aircraft power test using rotating shaft balance, slipstream model research tests, industrial model testing (ships, wing-in-ground effect craft, long-span bridges), N250 flutter test using aeroelastic model, N2130 aircraft testing, UAV testing, aircraft landing and take off testing, air turbine powered engine simulators.

Planned Improvements

User Fees

Contact Information

Dr. Surjatin Wiriadidjaja, UPT-LAGG, BPP Teknologi, Puspiptek, Serpong, Tangerang 15310, Indonesia.
Tel: (62) 21 756 0205, Fax: (62) 21 756 0901, Email: lagg@idola.net.id, Web site: http://lagg.or.id/ilst.htm.



Indonesia Low-Speed Wind Tunnel (ILST), National Center for Research, Science and Technology (PUSPIPTEK), Serpong, Indonesia

European and Asian Wind Tunnels

Subsonic | Italy

Installation Name	**Test Section Size**	**Speed Range**
Galleria del Vento, Milan Polytechnic University (GVPM), Milan, Italy	#1: 4 x 3.84 m (aeronautics test section); #2: 3.84 x 13.84 x 36 m (civil test section)	#1: 55 m/s; #2: 14 m/s
		Temperature Range
	Date Built/Upgrade	
Facility Name	2001	**Reynolds Number (million)**
GVPM Subsonic Wind Tunnel		0.1 to 1.1
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of October 2005	**Stagnation Pressure**
		Ambient

Supplementary Technical Parameters

This facility is fitted with a 12-blade fan, 14 motors, arranged in two rows of seven, separated by 2 x 2 m ducts. Overall power of 1.4 MW and a maximum speed of 55 m/s (200 km/h). Closed circuit, single vertical return.

Data Acquisition

National instruments cards.

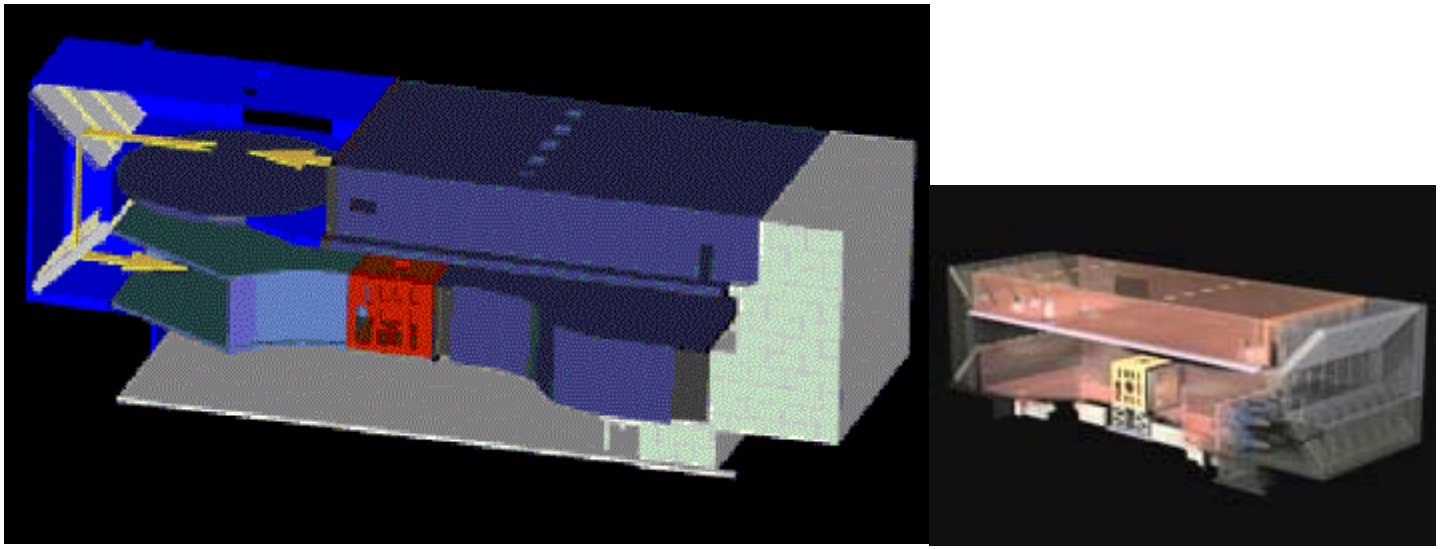
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Professor Giuseppe Gibertini, Department of Aerospace Engineering, GVPM, Campus Bovisa Sud, Via La Masa 34, 20156 Milan, Italy.
Tel: (39) 02 2399 8389, Fax: (39) 02 2399 8334, Email: giuseppe.gibertini@polimi.it, Web site: http://www.windtunnel.polimi.it/english/impianto/impianto.htm.



GVPM Subsonic Wind Tunnel, Milan Polytechnic University, Milan, Italy.

European and Asian Wind Tunnels

Subsonic | Italy

Installation Name	**Test Section Size**	**Speed Range**
Italian Aerospace Research Center (CIRA), Capua, Italy		0.25 to 0.7 Mach
		Temperature Range
	Date Built/Upgrade	-40°C to -35°C
Facility Name		**Reynolds Number (million)**
Icing Wind Tunnel (IWT)		
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of October 2005	up to 1.45 bar

Supplementary Technical Parameters

Closed circuit wind tunnel. The IWT is equipped with three different test sections and an open jet configuration for a total of four different configurations.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Italian Aerospace Research Center (Centro Italiano Ricerche Aerospaziali: CIRA), Via Maiorise, 81043 Capua, Italy.
Tel: (39) 0823 623001, Email: info@cira.it, Web site: http://www.cira.it/.

Icing Wind Tunnel (IWT), Italian Aerospace Research Center (CIRA), Capua, Italy.

European and Asian Wind Tunnels

Subsonic | Japan

Installation Name	**Test Section Size**	**Speed Range**
Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), Tokyo, Japan	2 x 2 x 4 m	3 to 60 m/s (continuous use), 67 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1971/1994 (upgrade)	**Reynolds Number (million)**
2 x 2 m Low Speed Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of December 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Continuous circulation type. Air blower: 250 kW. Gust wind tunnel: uniform air flow 3 – 30 m/sec. Gust generator: movable cascade pitch angle 0 ~ ± 0.15 radians; oscillations 0 – 20 Hz; gusts 0 ~ ± 4.5 m/sec for 0.05 seconds; waveforms: sine wave, triangular wave, square wave, and random wave. Robot model mount: 6 degrees of freedom; load capacity 1470 newtons; position accuracy ± 0.5 mm.

Data Acquisition

Testing Capabilities/Current Programs

Studies of wind loads on aircraft and spacecraft.

Planned Improvements

User Fees

Contact Information

Dr. Masashi Shigemi (Director), WINTEC, Japan Aerospace Exploration Agency, Institute of Aerospace Technology, Aerospace Research Center, 7-44-1 Jindaiji Higashi-machi, Chofu-shi, Tokyo 182-8522, Japan.
Tel: (81) 3 422 40 3000, Fax: (81) 3 422 40 3281, Email: wintec@chofu.jaxa.jp, Email (Director): shigemi.masashi@jaxa.jp, Web site: http://www.iat.jaxa.jp/res/wttc/b02.html.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Japan

Installation Name	Test Section Size	Speed Range
Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), Tokyo, Japan	6.5 x 5.5 m	1 to 70 m/s
		Temperature Range
	Date Built/Upgrade	
Facility Name	1965	**Reynolds Number (million)**
6.5 x 5.5 m Low Speed Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of December 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Continuous circulation type. Test section octagonal shaped with four 1-meter corners. Air blower: 3,000 kW, fan blade variable-angle type and rotation speed control type at the same time. Test section: strut-mounted pyramid six-component balance, sting-mounted internal balance, operating at 4 free angles. Ground effect test device: moving belt type, 50 m/sec.

Data Acquisition

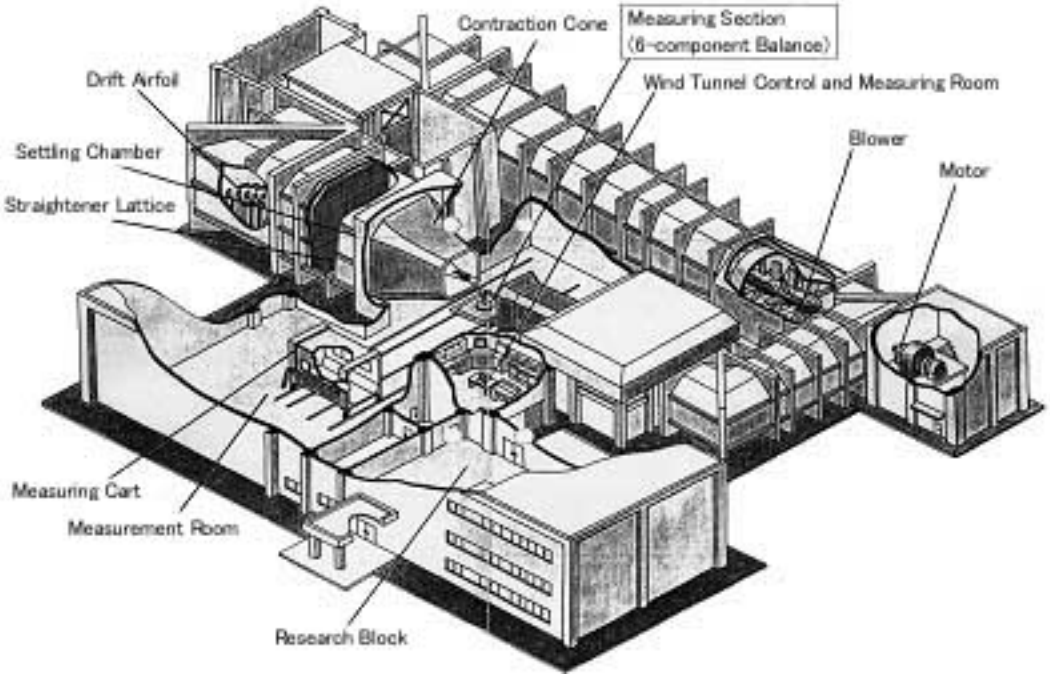
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Masashi Shigemi (Director), WINTEC, Japan Aerospace Exploration Agency, Institute of Aerospace Technology, Aerospace Research Center, 7-44-1 Jindaiji Higashi-machi, Chofu-shi, Tokyo 182-8522, Japan.
Tel: (81) 3 422 40 3000, Fax: (81) 3 422 40 3281, Email (WINTEC): wintec@chofu.jaxa.jp, Email (Director): shigemi.masashi@jaxa.jp, Web site: http://www.iat.jaxa.jp/res/wttc/b02.html.



6.5 x 5.5 m Low-Speed Wind Tunnel, Japan Aerospace Exploration Agency, Institute of Aerospace Technology, Aerospace Research Center, Wind Tunnel Technology Center (WINTEC), Tokyo, Japan.

European and Asian Wind Tunnels

Subsonic | Japan

Installation Name	**Test Section Size**	**Speed Range**
Kawada Wind Tunnel Research Center, Kawada Industries Inc., Tochigi, Japan	#1: 2.0 x 2.5 x 15.0 m; #2: 2.5 x 2.5 x 5.0 m	#1: 50 m/s; #2: 45 m/s
		Temperature Range
	Date Built/Upgrade	Ambient
Facility Name	1992	**Reynolds Number (million)**
Kawada Wind Tunnel		#1: 3.4; #2: 3.1
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of December 2005	#1: 156.25 kg/m² ; #2: 126.56 kg/m²

Supplementary Technical Parameters

Single return, open circuit. Powered by a 220-kW fan. Two external (one three-component and one six-component) balances. No air supply system, no air mass flow, and no ground effects.

Data Acquisition

HP 3852A, spring balance vibration data

Testing Capabilities/Current Programs

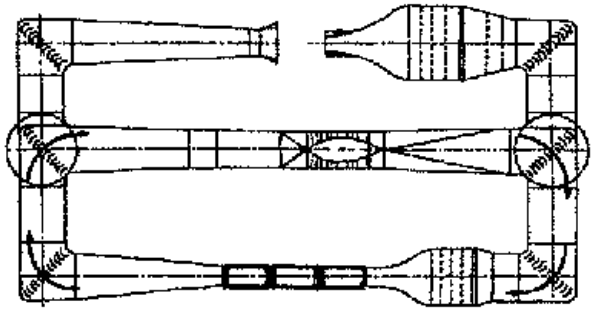
Planned Improvements

User Fees

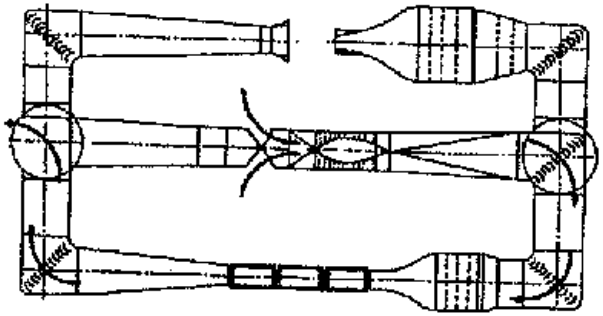
Contact Information

Katsuya Edamoto, Aircraft and Mechanical Systems Division, 122-1 Hagadai, Hagamachi, Tochigi, 321-3325, Japan.
Tel: (81) 28 677 1177, Tel (Edamoto): (81) 28 677 5707, Fax: (81) 28 677 4520, Email: mech@kawada.co.jp, Web site: http://www.kawada.co.jp/aircraft/.

THE CLOSED TEST SECTION IS USED AS A TWO DIM. TUNNEL. IT IS EQUIPPED WITH A THREE COMPONENT FORCE BALANCE AND A SPRING SUSPENSION BALANCE.
THE OPEN TEST SECTION IS A THREE DIM. TUNNEL, AND IS EQUIPPED WITH A SIX COMPONENT FORCE BALANCE.



CLOSED CIRCUIT



OPEN CIRCUIT

KAWADA Wind Tunnel, Kawada Wind Tunnel Research Center Kawada Industries, Tochigi, Japan.

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	**Test Section Size**	**Speed Range**
Agency for Defense and Development (ADD), Wind Tunnel Testing Laboratory, Taejo, Daejeon, Republic of Korea	3 x 2.25 x 8.75 m	10 to 120 m/s
		Temperature Range
	Date Built/Upgrade	
Facility Name	1998	**Reynolds Number (million)**
Low Speed Wind Tunnel		8
	Cost	
	US$12 million (estimated)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005	Atmospheric

Supplementary Technical Parameters

This wind tunnel features three interchangeable test sections, solid wall, open-jet, slotted wall, probe traverse system, external balance, upper turntable, and model handling sytem. It is closed-circuit, continuous-flow, atmospheric. Powered by a 2400-kW, 11-blade fan.

Data Acquisition

NEFF 471 128 channel

Testing Capabilities/Current Programs

Aerodynamic testing of aircraft, missiles, projectiles, and underwater vehicles. Testing capabilities: basic force and measurement, dynamic stability, aeroelasticity, rotary balance, ground effect, power-on simulation, control surface hinge moment, air intake performance, flow visualization, 2-D airfoil, rotary wing, aero acoustics.

Planned Improvements

User Fees

Contact Information

Wind Tunnel Testing Laboratory, Agency for Defense and Development (ADD), PO Box 35, Yuseong, Daejeon, ROK.
Tel: (82) 42 821 2011, Web site: http://www.add.re.kr/eng/wind.asp.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	**Test Section Size**	**Speed Range**
Chosun University, Department of Aerospace Engineering, Gwangju, Republic of Korea	1x 1 x 3 m (solid wall, square)	60 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1999	**Reynolds Number (million)**
Closed-Circuit Subsonic Wind Tunnel		
	Cost	
	US$253,900 (construction cost in 1999 KRW, Jan 2006 conversion rate: 1USD=981.392 KRW)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Assumed active per personal correspondence 1/15/06.	

Supplementary Technical Parameters

Contraction Ratio: 6. Fan: 1.5 m diameter, 132 kW.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Jaesoo Kim (Manager), Department of Aerospace Engineering, Chosun University, 375 Susuk-Dong, Gwangju, 501-759, ROK.
Tel: (82) 62 230 7080, E-mail: jsckim@mail.chosun.ac.kr, Web site: http://www.chosun.ac.kr/eng/sub_03/sub3_06.html.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	**Test Section Size**	**Speed Range**
Chunbuk National University, Department of Aerospace Engineering, Jeonju, Republic of Korea	0.6 x 0.45 x 1 m (open, rectangular)	35 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1988	**Reynolds Number (million)**
0.6 m Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Assumed active per personal correspondence 1/15/06.	

Supplementary Technical Parameters

Closed circuit. Contraction Ratio: 6.25, Fan: 0.9 m diameter, 22 kW.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Bongzoo Sung (Manager), Department of Aerospace Engineering, Chunbuk National University, Duckjin-Gu, Jeonju, 561-756, ROK.
Tel: (82) 63 270 3994/2468, Fax: (82) 63 270 2472, Email (Manager): bzsung@chonbuk.ac.kr, Email (Dept): aerospace@chonbuk.ac.kr, Web site: http://aerospace.chonbuk.ac.kr/eng_1.htm.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	**Test Section Size**	**Speed Range**
Chunbuk National University, Jeonju, Republic of Korea	0.6 x 0.6 x 1.3 m (solid wall, square)	60 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1991	**Reynolds Number (million)**
Closed-Circuit Subsonic Wind Tunnel		
	Cost	
	US$88,648 (construction cost in 1991 KRW, Jan 2006 conversion rate: 1USD=981.392 KRW)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Assumed active per personal correspondence 1/15/06.	

Supplementary Technical Parameters

Closed circuit. Contraction ratio: 7.1. Fan: 1.5 m diameter, 30 kW.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Byungjoon Rho (Manager), Chunbuk National University, 664-14 1-Ga Duckjin-Dong Duckjin-Gu Jeonju, Jeonbuk, 561-156, ROK.
Tel: (82) 63 270 2468, Fax: (82) 63 270 2472, E-mail: rhobj@chonbuk.ac.kr, Web site: http://www.cbnu.edu/, http://fluid.chonbuk.ac.kr, http://aerospace.chonbuk.ac.kr.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	Test Section Size	Speed Range
Chungnam National University, Department of Aerospace Engineering, Daejeon, Republic of Korea	1.25 x 1.25 x 4 m (solid wall/open, square)	70 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	2000	**Reynolds Number (million)**
Aero-Acoustic Wind Tunnel		
	Cost	
	US$305,811 (construction cost in 2000 KRW, Jan 2006 conversion rate: 1USD=980.999KRW)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Assumed active per personal correspondence 1/15/06.	

Supplementary Technical Parameters

Contraction Ratio: 5.76. Fan: 2.35 m diameter, 260 kW.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Jongsoo Choi (Manager), Department of Aerospace Engineering, Chungnam National University, 220 Gung-Dong, Yuseong-Gu, Daejeon 305-764, ROK.
Tel: (82) 42 821 6683, E-mail: jchoi@cnu.ac.kr, Web site: http://plus.cnu.ac.kr/eng/sub03_menu.jsp?code=0509.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	**Test Section Size**	**Speed Range**
Hanyang University, Department of Mechanical Engineering, Seoul, Republic of Korea	0.8 x 0.8 x 1.6 m (solid wall, square)	65 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	2001	**Reynolds Number (million)**
Small Subsonic Wind Tunnel		
	Cost	
	US$91,723 (construction cost in 2001 KRW, Jan 2006 conversion rate: 1USD=981.213 KRW)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Assumed active per personal correspondence 1/15/06.	

Supplementary Technical Parameters

Circuit: suction, Contraction ratio: 6.25, Fan: 1.8 m diameter, 55 kW.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Jinsoo Cho (Manager), Department of Mechanical Engineering, Hanyang University, 17 Haengdang-Dong, Sungdong-Gu, Seoul 133-791, ROK.
Tel: (82) 2 2290 0429, Fax: (82) 2 2281 4016, E-mail: jscho@hanyang.ac.kr, Web site: http://me.hanyang.ac.kr/eng.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	**Test Section Size**	**Speed Range**
Inha University, Department of Aerospace Engineering, Incheon, Republic of Korea	1 x 1 x 2 m (solid wall, octagonal)	70 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1978	**Reynolds Number (million)**
Aerospace Engineering Wind Tunnel		
	Cost	
	US$36,479 (construction cost in 1978 KRW, Jan 2006 conversion rate: 1USD = 981.392 KRW)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Assumed active per personal correspondence 1/15/06.	

Supplementary Technical Parameters

Contraction Ratio: 4. Fan: 1.6 m diameter, 75 kW.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Beomsoo Kim (Manager), Department of Aerospace Engineering, Inha University, 253 Young-Hyung-Dong, Nam-Goo, Incheon, ROK.
Tel: (82) 32 860 7355, E-mail: bskim@inha.ac.kr, Web site: http://aerospace.inha.ac.kr/.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	**Test Section Size**	**Speed Range**
Konkuk University, Department of Aerospace, Seoul, Korea	1 x 1 x 3.5 m (solid wall, square)	45.1 m (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	2000	**Reynolds Number (million)**
Multi-Purpose Wind Tunnel		
	Cost	
	US$3,368 (construction cost in 2000 KRW, Jan 2006 conversion rate 1USD = 979.928 KRW)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Assumed active per personal correspondence 1/15/06.	

Supplementary Technical Parameters

Contraction Ratio: 7.2. Fan: 2.25 m diameter, 90 kW.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Younghawn Byun (Manager), Konkuk University, Department of Aerospace, 1 Hwayang-dong, Gwangjin-Gu, Seoul, ROK.
Tel.: 82-2-450-3114 ,Web site: http://www.konkuk.ac.kr:8001/eng/, http://aerospace.konkuk.ac.kr/.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	**Test Section Size**	**Speed Range**
Korea Advanced Institute of Science and Technology, Aeronautics Department, Daejeon, Republic of Korea	1.016 x 0.712 x 1.52 m (solid wall, rectangular)	62 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1981	**Reynolds Number (million)**
Low Turbulence Open Circuit Wind Tunnel		
	Cost	
	US$71,460 (construction cost in 1981 KRW, Jan 2006 conversion rate: 1USD = 979.571 KRW)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Assumed active per personal correspondence 1/15/06.	

Supplementary Technical Parameters

Circuit: suction. Contraction ratio: 7.2. Fan: 1.575 m diameter, 112 kW.

Data Acquisition

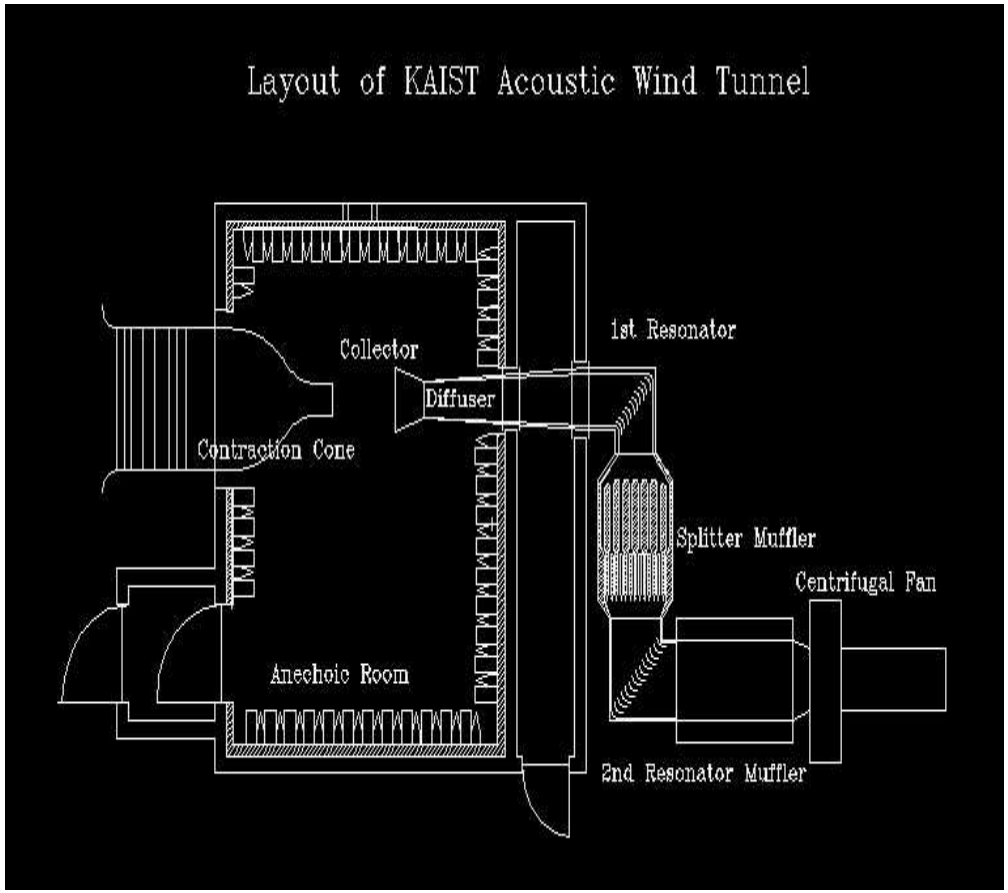
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Seung O Park (Manager), Korea Advanced Institute of Science and Technology, 373-1 Aeronautics Department, #2311 Gueong-Dong, Yuseong-Gu, Daejeon, 305-701, ROK.
Tel: (82) 42 869 3753, 3785, E-mail: sopark@sop1.kaist.ac.kr, Web site: http://sop25.kaist.ac.kr/index.html.



KAIST Anechoic Wind Tunnel, Korea Advanced Institute of Science and Technology, Daejon, South Korea (ROK).

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	**Test Section Size**	**Speed Range**
Korea Aerospace Research Institute (KARI), Daejeon, Republic of Korea	#1: 4 x 3 x 10 m (closed); #2: 6 x 4.5 x 13.5 m (slotted); #3: 4 x 3 x 8 m (open jet)	#1: 0.32 Mach; #2: 0.15 Mach; #3: 0.27 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	1999	**Reynolds Number (million)**
4 m Low Speed Wind Tunnel		#1: 7.4; #2: 3.5; #3: 6.2
	Cost	
	US$20 million (estimated)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of January 2006	Atmospheric

Supplementary Technical Parameters

Closed-circuit, continuous-flow, atmospheric. The 4-meter, low-speed tunnel is powered by 3740-kW fan, has external balances, zero ground effects, air supply of 7.8 bar, air mass flow of 270 l/s.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Eusup Sim (Director), Space Test Division, Korea Aerospace Research Institute, 45 Eoeun-dong, Yousung-gu 2234 Daejeon, 305-333 ROK.
Tel: (82) 42 860 2470, Fax: (82) 42 860 2234, Email: esim@kari.re.kr, Web site: http://www.kari.re.kr/.

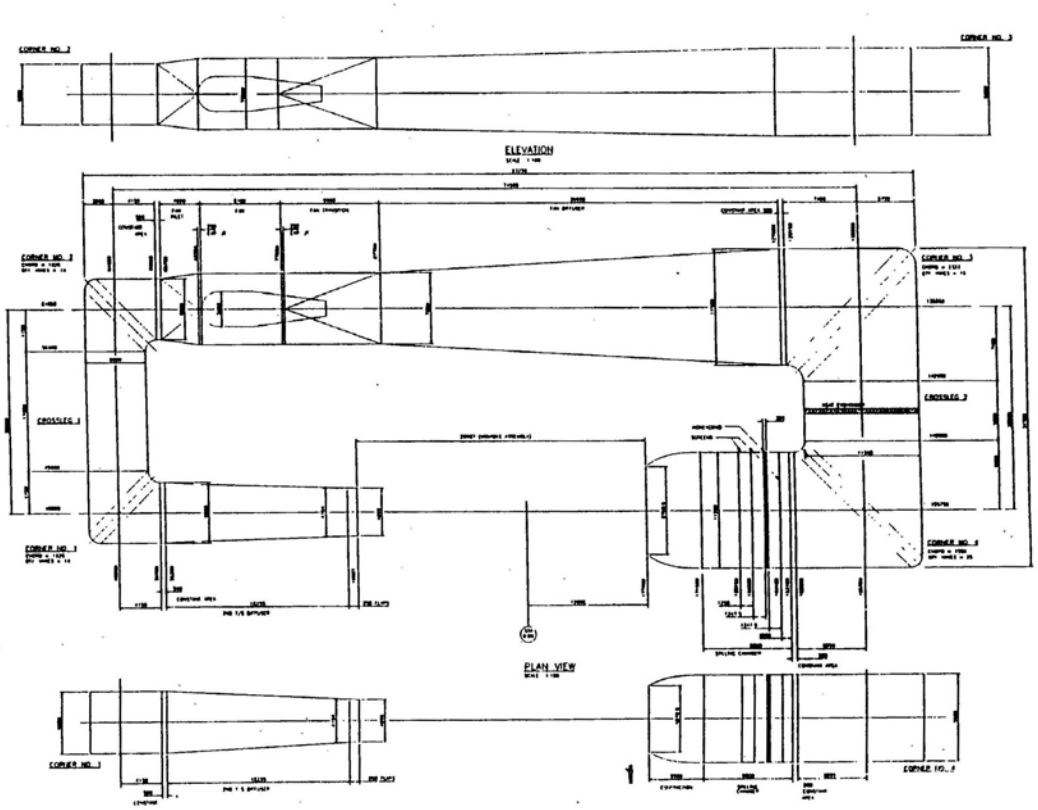


Figure 7.1-1 KARI – LSWT Schematic

4 m Low-Speed Wind Tunnel (LSWT), Korea Aerospace Research Institute (KARI), Daejeong, Korea

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	**Test Section Size**	**Speed Range**
Korea Aerospace Research Institute (KARI), Daejeon, Republic of Korea	1 x 0.75 x 2 m (solid wall, rectangular)	110 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1993	**Reynolds Number (million)**
KARI 1 m Wind Tunnel		
	Cost	
	USD $427,965 (construction cost in 1993 KRW, Jan 2006 conversion rate: 1USD=981.389 KRW)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Assumed active per personal correspondence 1/15/06.	

Supplementary Technical Parameters

Contraction ratio: 11.5, Fan: 2 m diameter, 250 kW.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Mr. Kijung Kwon (Manager), Korea Aerospace Research Institute, Korea Aerospace Research Institute, 45 Uh-Eun-Dong Eusung-Gu, Daejeon, ROK.
Tel: (82) 42 860 2318, E-mail: kjkwon@kari.re.kr, Web site: http://adg.kari.re.kr/index.jsp.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	**Test Section Size**	**Speed Range**
Korea Aerospace Research Institute (KARI), Dae-Jeon, Republic of Korea	4 x 3 x 10 m (solid wall, rectangular)	110 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1998	**Reynolds Number (million)**
KARI Low Speed Wind Tunnel (LSWT)		
	Cost	
	USD $17,612,356 (construction cost in 1998 KRW, Jan 2006 conversion rate: 1USD=981.697 KRW)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Assumed active per personal correspondence 1/15/06.	

Supplementary Technical Parameters

Contraction ratio: 8.24, Fan: 7 m diameter, 4100 kW.

Data Acquisition

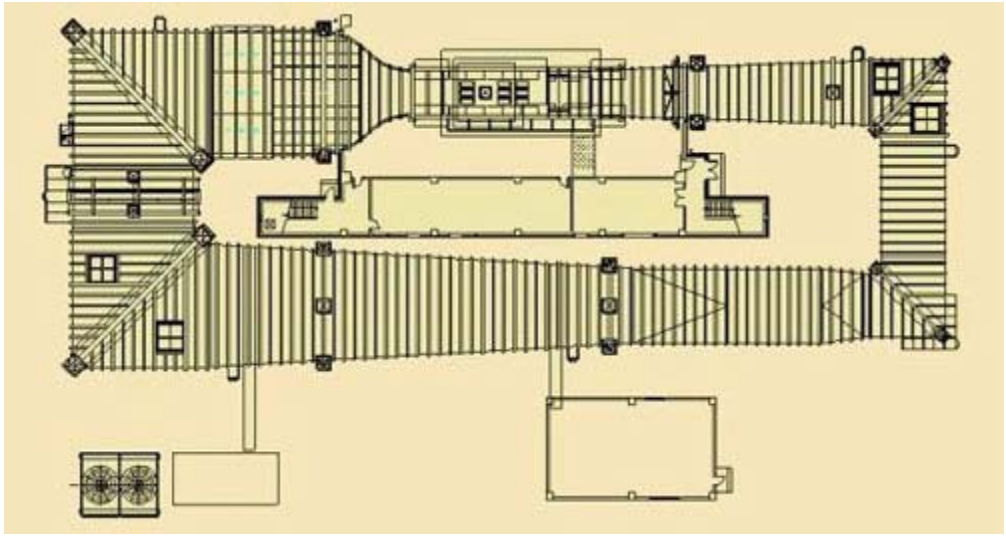
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Byeonghee Jang (Manager), Korea Aerospace Research Institute, 45 Uh-Eun-Dong Eusung-Gu, Daejeon, ROK.
Tel: (82) 42 860 2313, E-mail: cbh@kari.re.kr, Web site: http://adg.kari.kr.kr/index.jsp.



KARI LSWT, Korea Aerospace Research Institute, Daejon, South Korea (ROK).

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	**Test Section Size**	**Speed Range**
Korea Air Force Academy (KAFA), KAFA Subsonic Wind Tunnel Laboratory, Choongbuk, Republic of Korea	3.5 x 2.45 x 8.7 m (solid wall, rectangular)	92 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1999	**Reynolds Number (million)**
KAFA Low Speed Wind Tunnel (LSWT)		
	Cost	
	USD $12,768,179 (construction cost in 1999 KRW, Jan 2006 conversion rate: 1USD=980.093 KRW)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Assumed active per personal correspondence 1/15/06.	

Supplementary Technical Parameters

Circuit: closed. Contraction ratio: 7.26. Fan: 5.25 m diameter, 2100 kW.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Hyungsuck Chung (Manager), Department of Aerospace Engineering, Korea Air Force Academy, Choong-Book Chung-Won-Koon, Nam-Il-Myun Ssang-Soo-Ri, Sa Seo Ham 335-1, ROK.
Tel: (82) 043 290 6462/6176, Email: hschung@afa.ac.kr, Web site: http://www.afa.ac.kr/index_new.htm.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	**Test Section Size**	**Speed Range**
Korea Air Force Academy (KAFA), KAFA Subsonic Wind Tunnel Laboratory, Choongbuk, Republic of Korea	#1: 3.5 x 2.45 x 8.7 m (closed); #2: 5.25 x 3.67 x 13.0 m (closed)	#1: 0.27 Mach; #2: 0.11 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	August 5, 1999	**Reynolds Number (million)**
KAFA Subsonic Wind Tunnel		#1: 6.2; #2: 2.7
	Cost	
	US$15 million (estimated)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005	Atmospheric

Supplementary Technical Parameters

The KAFA Subsonic wind tunnel features a closed circuit with interchangeable test section, main section, future larger secondary test section, slotted wall and open-jet test sections, conservative airlines, honeycomb flow straightener, and anti-turbulence screens, fixed-location elevating external balance, model support strut, articulated sting, test section cart system, floor boundary layer removal, temperature control, heat exchange, flow survey mechanism, air exchange.

Data Acquisition

Jacobs Sverdrup's PC-based software

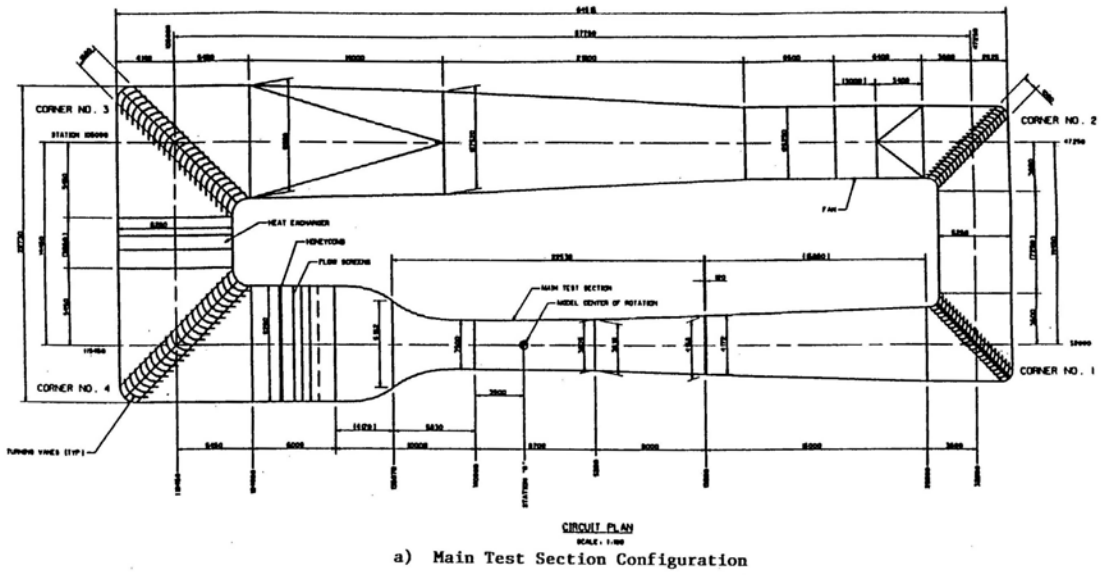
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Myong Sohn, KAFA Subsonic Wind Tunnel Lab, Sang Su-Ri 335-2 NamIl-Myun, Cheong Won-Gun Chung Buk 363-849, ROK
Tel: (82) 43 290 6160/6050, Fax: (82) 43 297 8109, Email: afalswt@mail.afa.ac.kr.



a) Main Test Section Configuration

Figure 7.1-2 KAFA Subsonic Wind Tunnel

Subsonic Wind Tunnel, Korea Air Force Academy (KAFA), KAFA Subsonic Wind Tunnel Lab, Choongbuk, Korea.

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	**Test Section Size**	**Speed Range**
Kyeongsang National University, School of Mechanical and Aerospace Engineering, Jinjoo, Republic of Korea	1 x 1 x 3 m (solid wall, square)	60 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	2002	**Reynolds Number (million)**
Multi-Purpose Small Wind Tunnel		
	Cost	
	US$3,564 (construction cost in 2002 KRW, Jan 2006 conversion rate: 1USD=981.392 KRW)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Assumed active per personal correspondence 1/15/06.	

Supplementary Technical Parameters

Contraction ratio: 7.2. Fan: 2 m diameter, 130 kW.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Sooyong Cho (Manager), School of Mechanical and Aerospace Engineering, Kyeongsang National University, Kyeongnam Jinjoo-Shi, Gagoa-Dong 900 Mechanical and Aerospace Engineering Unit BK21 660-701, ROK.
Tel: (82) 055 751 6106, E-mail: aero@gsnu.ac.kr, Email (Cho): sycho@nongae.gsnu.ac.kr, Web site: http://engine.gsnu.ac.kr.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	**Test Section Size**	**Speed Range**
Pohang University of Science and Technology, Pohang, Republic of Korea	1.8 x 1.5 x 4.3 m (solid wall, rectangular)	75 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1995	**Reynolds Number (million)**
Medium-Sized Subsonic Wind Tunnel		
	Cost	
	US$1,018,792 (construction cost in 1995 KRW, Jan 2006 conversion rate: 1USD=981.555 KRW)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Assumed active per personal correspondence 1/15/06.	

Supplementary Technical Parameters

Contraction ratio: 9. Fan: 3.4 m diameter, 260 kW.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Sangjoon Lee (Manager), Pohang University of Science and Technology, San 31, Hyoja-Dong, Nam Gu, Pohang, Gyungbuk, ROK.
Tel: (82) 54 279 0114, Fax: (82) 54 279 2099, E-mail: sjlee@postech.ac.kr, Web site: http://www.postech.ac.kr/new/e/.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	Test Section Size	Speed Range
Pohang University of Science and Technology, Pohang, Republic of Korea	0.72 x 0.6 x 2.5 m (solid wall, rectangular)	40 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1990	**Reynolds Number (million)**
Small Subsonic Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Assumed active per personal correspondence 1/15/06.	

Supplementary Technical Parameters

Contraction ratio: 9. Fan: 1.5 m diameter, 100 kW.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Sangjoon Lee (Manager), Pohang University of Science and Technology, San 31, Hyoja-Dong, Nam Gu, Pohang, Gyungbuk, ROK.
Tel: (82) 54 279 0114, Fax: (82) 54 279 2099, E-mail: sjlee@postech.ac.kr, Web site: http://www.postech.ac.kr/new/e/.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	**Test Section Size**	**Speed Range**
Pusan National University, Department of Aerospace Engineering, Pusan, Republic of Korea	0.7 x 0.7 x 2 m (solid wall, square)	60 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1992	**Reynolds Number (million)**
Subsonic Wind Tunnel		
	Cost	
	US$72,929 (construction cost in 1992 KRW, Jan 2006 conversion rate: 1USD=980.403 KRW)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Assumed active per personal correspondence 1/15/06.	

Supplementary Technical Parameters

Contraction ratio: 6.6. Fan: 0.68 m diameter, 75 kW.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Kyungchun Kim (Manager), Department of Aerospace Engineering, Pusan National University, Geum-Jeong-Koo, Pusan, 609-735, ROK.
Tel: (82) 51 510 2324, E-mail: kckim@pusan.ac.kr, Web site: http://aerospace.ae.pusan.ac.kr.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	**Test Section Size**	**Speed Range**
Sejong University, Seoul, Republic of Korea	0.3 x 0.3 x 1 m (open, square)	35 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	2000	**Reynolds Number (million)**
Small Subsonic Wind Tunnel		
	Cost	
	US$30,552 (construction cost in 2000 KRW, Jan 2006 conversion rate: 1USD=981.940 KRW)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Assumed active per personal correspondence 1/15/06.	

Supplementary Technical Parameters

Circuit: blowing. Contraction ratio: 9. Fan: 0.3 m diameter, 3.7 kW.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Kyungtae Lee (Manager), Sejong University, Kwang-Jin-Gu Goon-Ja-Dong, Choong-Moo-Kwan #410, 143-747, Seoul, ROK.
Tel: (82) 2 3408 3285, E-mail: kntlee@sejong.ac.kr, Web site: http://www.sejong.ac.kr/eng/, http://dasan.sejong.ac.kr/~slmarc/kntlee/.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	**Test Section Size**	**Speed Range**
Seoul National University, Department of Mechanical Engineering, Seoul, Republic of Korea	1.35 x 0.95 x 2.44 m (solid wall, rectangular)	70 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1961	**Reynolds Number (million)**
Aerospace Engineering Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Assumed active per personal correspondence 1/15/06.	**Stagnation Pressure**

Supplementary Technical Parameters

Circuit: closed. Contraction ratio: 6.16. Fan: 1.8 m diameter, 56 kW.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Chongnam Kim (Manager), Department of Mechanical Engineering, Seoul National University, Kwan-Ak-Koo Shin-Rhim 9-Dong San 56-1 Mechanical Engineering Unit301 #116,151-744, Seoul, ROK.
Tel: (82) 2 880 1915, Fax: 82 2 880 1910, E-mail: chongnam@plaza.snu.ac.kr, Web site: http://mae.snu.ac.kr/eng/default.asp.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Korea (South)

Installation Name	**Test Section Size**	**Speed Range**
Ulsan University, Ulsan, Republic of Korea	2 x 1.8 x 10 m (solid wall, rectangular)	35 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1999	**Reynolds Number (million)**
Multi-Purpose Wind/Water Tunnel		
	Cost	
	US$407,550 (construction cost in 1999 KRW, Jan 2006 conversion rate: 1USD= 981.392 KRW)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Assumed active per personal correspondence 1/15/06.	

Supplementary Technical Parameters

Circuit: suction. Contraction ratio: 4. Fan: 2.6 m diameter, 117 kW.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Donghwan Lee (Manager), Ulsan University, 680-749 San 29, Muger 2-Dong, Ulsan, ROK.
Tel: (82) 52 277 3101, E-mail: webmaster@mail.ulsan.ac.kr, Web site: http://www.ulsan.ac.kr/.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Malaysia

Installation Name	**Test Section Size**	**Speed Range**
Technological University of Malaysia, Faculty of Mechanical Engineering, Aeronautical Laboratory, Johor, Malaysia	1.5 x 2 x 5.8 m (solid wall, interchangeable)	3 to 80 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	May 2001	**Reynolds Number (million)**
UTM Low Speed Wind Tunnel (UTM-LST)		1
	Cost	
	US$7 million (estimated construction cost)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of December 2005	Atmospheric

Supplementary Technical Parameters

Closed-return type, continuous, atmospheric, horizontal-arrangement, contraction ratio 9.

Data Acquisition

Pacific Instrument PI 6000 Series Data Acquisition System, Pre-test, Test, Post-Test Analysis/Calibration, Windows 2000/NT OS.

Testing Capabilities/Current Programs

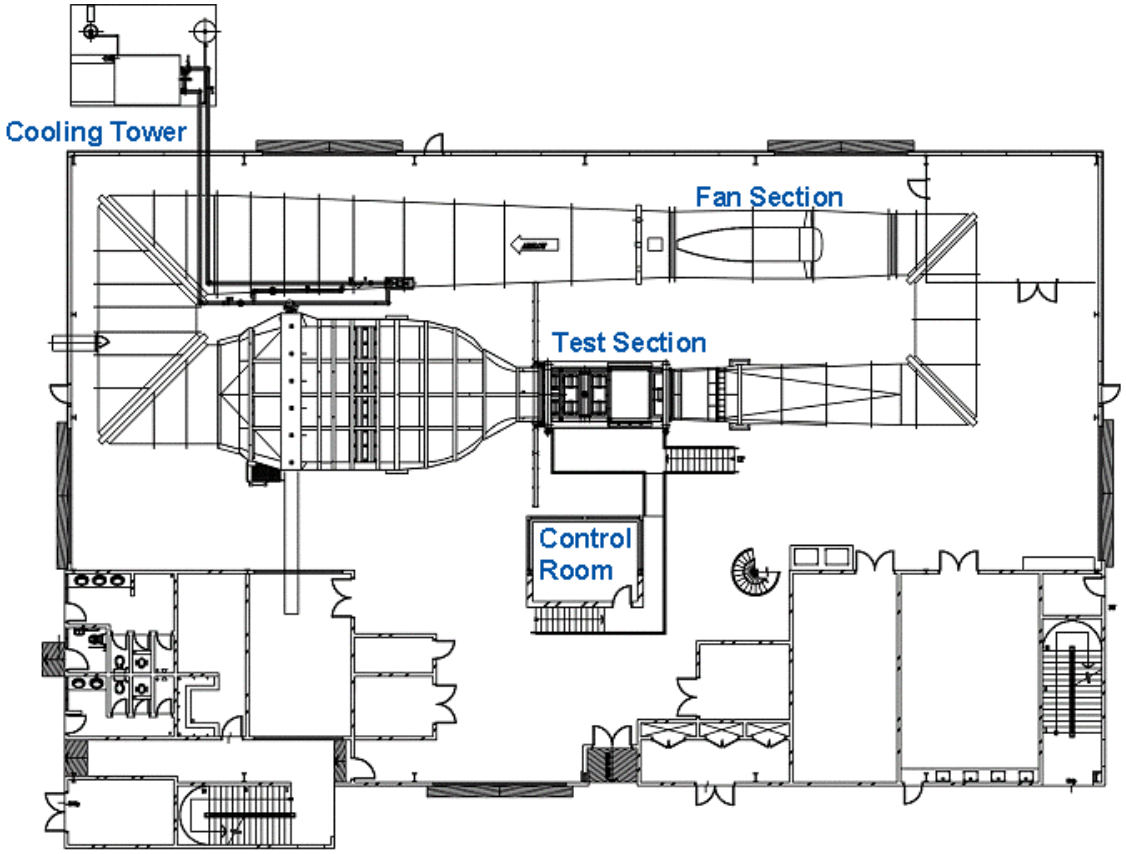
Static flight characteristics of aircraft in low speed regime, including computational fluid dynamics (CFD) code validation, determination of aircraft derivatives, and aerodynamics of special problems (automotive, building structures, etc). Support to aeronautical education. Aircraft aerodynamic (3-D model aircraft testing), automotive/ground vehicle aerodynamics wind engineering, half-model testing, airfoil testing, aerodynamic derivative testing.

Planned Improvements

User Fees

Contact Information

Mohd Khir Muhammad (Head of Aero Laboratory), Faculty of Mechanical Engineering, Universiti Teknologi Malaysia, 81310 UTM Skudai, Johor, Malaysia.
Tel: (60) 7550 5642/4857, Fax: (60) 7 556 6159, Email: aerolab@fkm.utm.my, Web site: http://www.fkm.utm.my/aerolab/.



UTM Low-Speed Wind Tunnel Aeronautical Laboratory, Technological University of Malaysia, Johor, Malaysia

European and Asian Wind Tunnels

Subsonic | Netherlands

Installation Name	**Test Section Size**	**Speed Range**
Delft University of Technology (TUDELFT), Delft, The Netherlands	1.25 x 0.25 m	0.15 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Boundary Layer Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of October 2005	**Stagnation Pressure**
		Gradient

Supplementary Technical Parameters

Closed-circuit, low-speed wind tunnel. Flexible wall with suction slits for control of pressure gradient.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Low-Speed Laboratory, Delft University of Technology (TUDELFT), Leeghwaterstraat 42, 2628 CA Delft, The Netherlands.
Tel: (31) 15 2781320, Fax: (31) 15 2783533, Web site: http://www.hsa.lr.tudelft.nl/ae_facilities_fr.html.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Netherlands

Installation Name	**Test Section Size**	**Speed Range**
Delft University of Technology (TUDELFT), Low Speed Laboratory, Delft, The Netherlands	1.25 x 1.80 m	0.35 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Subsonic Low-Turbulence Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of October 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Closed circuit. Turbulence level < 0.1%, six component balance, automatic multi-manometer.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Low Speed Laboratory, Delft University of Technology (TUDELFT), Leeghwaterstraat 42, 2628 CA Delft, The Netherlands.
Tel: (31) 15 2781320, Fax: (31) 15 2783533, Web site: http://www.hsa.lr.tudelft.nl/ae_facilities_fr.html.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Netherlands

Installation Name	Test Section Size	Speed Range
German-Dutch Wind Tunnels (DNW), NOP Business Unit, Emmeloord, The Netherlands	#1: 6.0 x 6.0 m (closed or slotted walls); #2: 8.0 x 6.0 m (closed or slotted walls); #3: 8.0 x 6.0 m (open jet); #4: 9.5 x 9.5 m (closed walls)	#1: 152 m/s (max); #2: 116 m/s (max); #3: 85 m/s (max) ; #4: 62 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1980	**Reynolds Number (million)**
Large Low Speed Wind Tunnel (LLF)		#1: 6.0; #2: 5.3; #3: 3.9; #4: 3.9
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of September 2005	

Supplementary Technical Parameters

Continuous, closed-return, atmospheric wind tunnel. Largest low-speed atmospheric wind tunnel in Europe. One open-jet configuration in large anechoic testing hall, single-stage fan with 8 non-adjustable blades of 12.35 m diameter. Direct drive, variable speed synchronous electric motor (12.65 MW, 225 rpm). Intermittent air exchange and throttle system.

Data Acquisition

On-/off-line static and dynamic data acquisition and processing systems. Image processing system. Acoustic data processing and analyzing system.

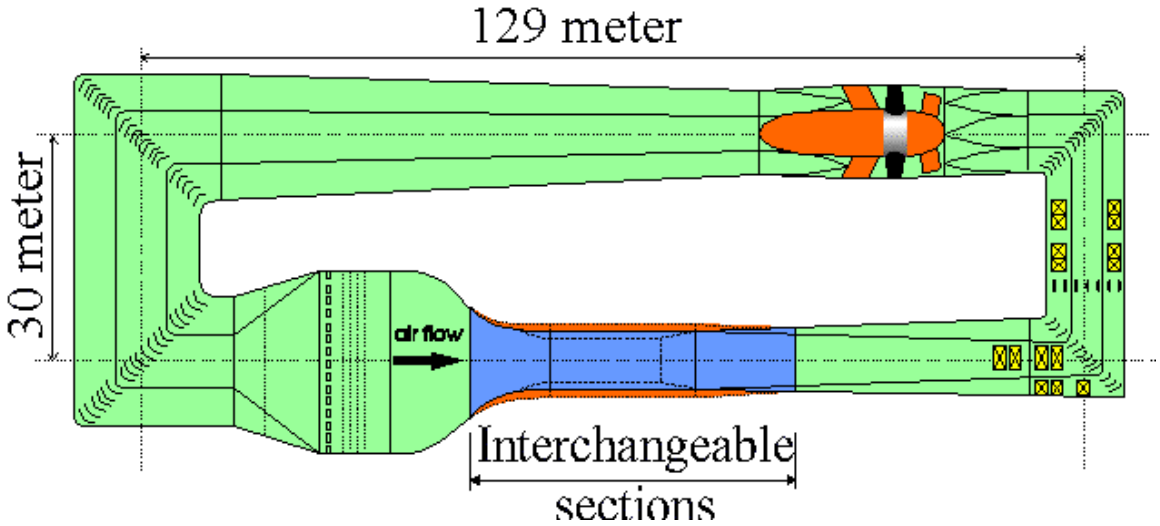
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Ir. G.H. Hegen, German-Dutch Wind Tunnels (DNW), PO Box 175, 8300 AD Emmeloord, The Netherlands.
Tel: (31) 527 24 8519, Fax: (31) 527 24 8582, Email: info@dnw.aero, Web site: http://www.dnw.aero/.



Large Low-Speed Wind Tunnel (LLF), German-Dutch Wind Tunnels (DNW), Emmeloord, The Netherlands.

European and Asian Wind Tunnels

Subsonic | Netherlands

Installation Name	Test Section Size	Speed Range
German-Dutch Wind Tunnels (DNW), NOP Business Unit, Emmeloord,The Netherlands	3.0 x 2.25 m (closed walls)	80 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1983	**Reynolds Number (million)**
Low Speed Wind Tunnel (LST)		1.4
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of September 2005	

Supplementary Technical Parameters

Continuous atmospheric wind tunnel. Closed return circuit, atmospheric pressure, two interchangeable test sections. Single-stage fan with eight non-adjustable blades. Direct drive, variable speed, 700-kW electric motor. Contraction ratio 1:9.

Data Acquisition

64 measuring channels.

Testing Capabilities/Current Programs

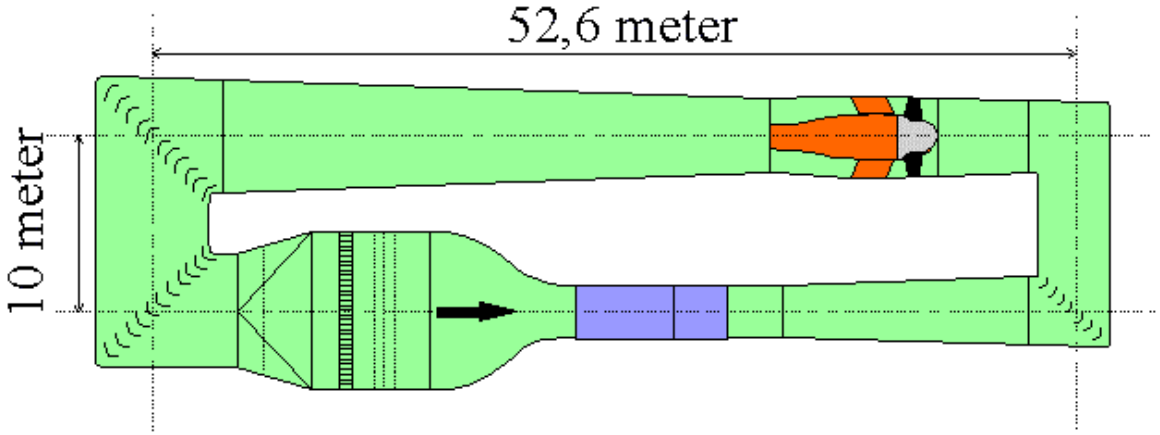
Testing of aircraft models, windfields around buildings or helicopter decks on ships. Ground effect simulation.

Planned Improvements

User Fees

Contact Information

Ir. G.H. Hegen, German-Dutch Wind Tunnels (DNW), PO Box 175, 8300 AD Emmeloord, The Netherlands.
Wind tunnel located at Voorsterweg 31, 8316 PR Markesse, Netherlands.
Tel: (31) 527 24 8519, Fax: (31) 527 24 8582, Email: info@dnw.aero, Web site: http://www.dnw.aero/.



Low-Speed Wind Tunnel (LST), German-Dutch Wind Tunnels (DNW), Emmeloord, The Netherlands.

European and Asian Wind Tunnels

Subsonic | Scotland

Installation Name	Test Section Size	Speed Range
University of Glasgow, Department of Aerospace Engineering, Glasgow, Scotland	1.15 x 0.95 m	30 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
1.15 x 0.95 m Low Speed Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of October 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Closed-return facility. Three-component mechanical balance. Rotary vortex generator for helicopter rotor wake simulation.

Data Acquisition

200-channel parallel data acquistion system, 50 kHz per channel. Automatic gain setting and offset removal for maximum sensitivity. Digital PIV sytem based on two Nd-Yag lasers and two Kodak Megaplus digital cameras. Three-channel TSI IFA 300 constant temperature anemoneter system w/ DISA probes and supports.

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. D.G. Thomson (Head), Department of Aerospace Engineering, University of Glasgow, James Watt Building, Glasgow G12 8QQ, Scotland, UK.
Tel: (44) 41 330-3575, Fax: (44) 41 330-5560, Web site: http://www.aero.gla.ac.uk/Research/LowSpeedAero/facilities.htm.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Scotland

Installation Name	**Test Section Size**	**Speed Range**
University of Glasgow, Department of Aerospace Engineering, Glasgow, Scotland	2.65 x 2.04 m	76 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Argyll Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
		Stagnation Pressure

Supplementary Technical Parameters

The Argyll is a closed-return wind tunnel with two interchangeable working sections. A yawing capability up to 10° included. Rotary vortex generator and a mechanical six-component balance.

Data Acquisition

200-channel parallel data acquistion system, 50 kHz per channel, automatic gain setting and offset removal for maximum sensitivity. Digital PIV system based on two Nd-Yag lasers and two Kodak Megaplus digital cameras. Three-channel TSI IFA 300 constant temperature anemoneter system w/ DISA probes and supports.

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. D.G. Thomson (Head), Department of Aerospace Engineering, University of Glasgow, James Watt Building, Glasgow G12 8QQ, Scotland, UK.
Tel: (44) 41 330-3575, Fax: (44) 41 330-5560, Web site: http://www.aero.gla.ac.uk/Research/LowSpeedAero/facilities.htm.

Argyll Wind Tunnel, University of Glasgow, Department of Aeronautical Engineering, Glasgow, Scotland.

European and Asian Wind Tunnels

Subsonic | Scotland

Installation Name	**Test Section Size**	**Speed Range**
University of Glasgow, Department of Aerospace Engineering, Glasgow, Scotland	2.13 x 1.61 m	60 m/s (max)
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Handley-Page Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of October 2005	**Stagnation Pressure**

Supplementary Technical Parameters

The wind tunnel features three-strut hydraulic system. Closed return.

Data Acquisition

200-channel parallel data acquistion system, 50 kHz per channel, automatic gain setting and offset removal for maximum sensitivity. Digital PIV system based on two Nd-Yag lasers and two Kodak Megaplus digital cameras. Three-channel TSI IFA 300 constant temperature anemoneter system w/ DISA probes and supports.

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. D.G. Thomson (Head), Department of Aeronautical Engineering, University of Glasgow, James Watt Building, Glasgow G12 8QQ, Scotland, UK.
Tel: (44) 41 330-3575, Fax: (44) 41 330-5560, Web site: http://www.aero.gla.ac.uk/Research/LowSpeedAero/facilities.htm.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Subsonic | Sweden

Installation Name	Test Section Size	Speed Range
Swedish Defense Reseach Agency, FOI, Stockholm, Sweden	3.6 m (diameter), 8 m (long)	0.23 Mach
		Temperature Range
	Date Built/Upgrade	Ambient
Facility Name	1940	**Reynolds Number (million)**
LT1 Subsonic Wind Tunnel		1.8
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of October 2005	Ambient

Supplementary Technical Parameters

Data Acquisition

64 channels, 15 bit AD, 180 kHz VAX 750 data system.

Testing Capabilities/Current Programs

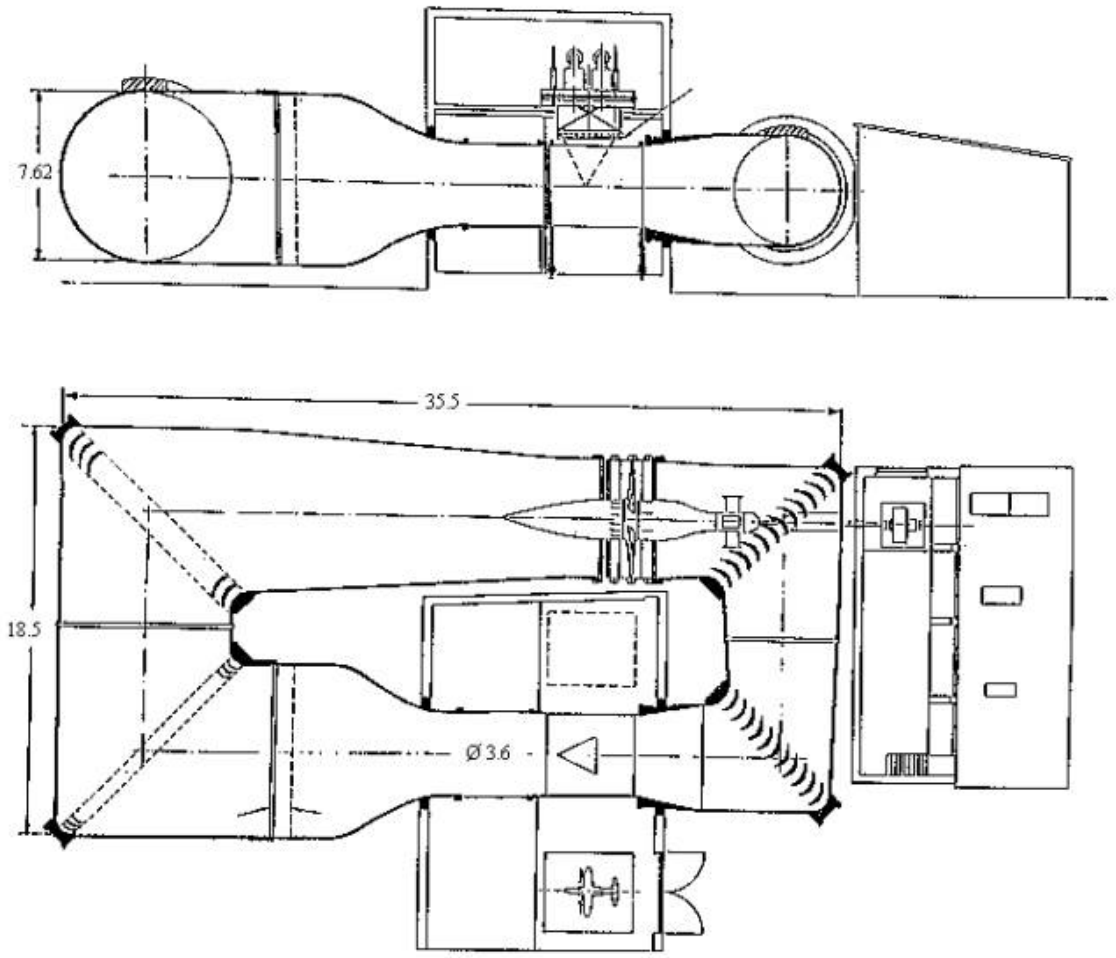
Aeronautics, ground transporation, buildings, roll rotation, intake suction.

Planned Improvements

User Fees

Contact Information

Bengt Hultqvist (Head), Experimental Aerodynamics, Swedish Defence Research Agency, SE-164 90 Stockholm, Sweden.
Tel (Hultqvist): (46) 8 555 043 39, Tel (Main): (46) 8 555 030 00, Fax: (46) 8 555 031 00, Email (Hultqvist): bengt.hultqvist@foi.se, Web site: http://www.foi.se/.



Subsonic Wind Tunnel (LT1), Swedish Defense Research Agency (FOI), Stockholm, Sweden.

TABLE OF CONTENTS
Transonic Wind Tunnels

European and Asian Wind Tunnels

Transonic | China

Installation Name	**Test Section Size**	**Speed Range**
Aerospace Science and Technology Research Center, National Cheng Kung University, Taiwan, China		**Temperature Range**
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Transonic Wind Tunnel	**Cost**	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005	

Supplementary Technical Parameters

Data Acquisition

Testing Capabilities/Current Programs

Aerodynamic characteristics of regional jets, development of high-speed gas dynamics, aerodynamic design of high-speed trains, CFD verification, shock and boundary layer interactions.

Planned Improvements

User Fees

Contact Information

National Cheng Kung University, No.1, Ta-Hsueh Road, Tainan 701, Taiwan, China.
Tel: (886) 6 275 7575, Web site: http://www.ncku.edu.tw/english/about_ncku/research_services.htm.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Transonic | China

Installation Name	**Test Section Size**	**Speed Range**
China Academy of Aerospace Aerodynamics (CAAA), Beijing, China AKA: Beijing Institute of Aerodynamics (BIA) or 701st Institute of the China Aerospace Science & Technology Corporation (CASC)	0.76 x 0.53 m	0.3 to 1.15 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Transonic Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Continuous flow with the flow field characterized by high uniformity, low turbulence intensity, low noise.

Data Acquisition

Testing Capabilities/Current Programs

Measurement of pressure and forces on aircraft models, flutter and buffeting tests, dynamic derivative tests, aircraft-missile interference tests, hinge moment measurement, and air inlet model tests.

Planned Improvements

User Fees

Contact Information

Li Feng (Director), China Academy of Aerospace Aerodynamics (CAAA), 17 Yungang West Road, Fengtai District, Beijing 100074, China.
Tel: (86) 10 68740603, Fax: (86) 10 68374758, Email: caaa@bia701.com, Web site: http://www.bia701.com/HRML/e_16_fd08_01.htm.

Transonic Wind Tunnel,
China Academy of Aerospace Aerodynamics (CAAA),
Beijing, China

European and Asian Wind Tunnels

Transonic | China

Installation Name	Test Section Size	Speed Range
China Aerodynamics Research and Development Center (CARDC), Mianyang City, Sichuan Province, China	2.4 x 2.4 m	0.3 to 1.2 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	1997/1998 (upgrade)	**Reynolds Number (million)**
2.4 m Transonic Wind Tunnel		40 to 70
	Cost	**Dynamic Pressure**
		4.5 atmospheric (max)
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005	

Supplementary Technical Parameters

Wind tunnel is 66 m long x 33 m wide. China claims this to be the largest transonic wind tunnel in Asia. Manufactured by Swedish Defense Research Agency (FOI), Stockholm, Sweden.

Data Acquisition

Testing Capabilities/Current Programs

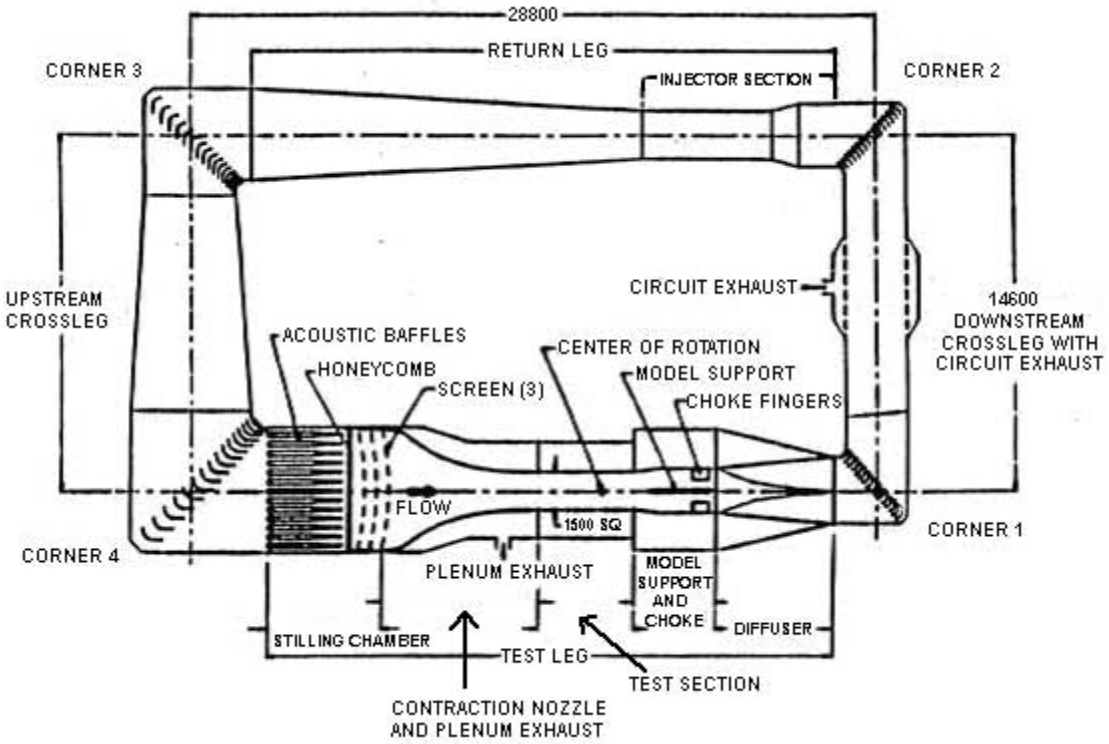
Research and development of aerospace flight vehicles.

Planned Improvements

User Fees

Contact Information

Shang Shouhong (Dean), China Aerodynamics Research and Development Center Graduate School, PO Box 211, Mianyang City, Sichuan Province 621000, China. Tel: (86) 816 246 3053, Fax: (86) 816 246 3051, Email: ssh@cardcgs.com, Web site: http://www.cardcgs.com/cardcgs/index.asp, http://www.cardcgs.com/default2.asp



Note: CARDC 2.4 m is a scaled version of the tunnel, FFA T1500 Transonic Wind Tunnel Circuit (Sweden) manufactured by The Swedish Defense Research Agency (FOI).

2.4 m Transonic Wind Tunnel, China Aerodynamics Research and Development Center (CARDC), Mianyang, China.

Transonic | China

Installation Name	Test Section Size	Speed Range
China Aerodynamics Research and Development Center (CARDC), Mianyang City, Sichuan Province, China		
		Temperature Range
	Date Built/Upgrade	100 to 148°K
Facility Name	1998	**Reynolds Number (million)**
Low Temperature Compressed Air Transonic Wind Tunnel	**Cost**	
		Dynamic Pressure
	Operational Status	
	Prototype, not yet operational	**Stagnation Pressure**
		10.6 bar

Supplementary Technical Parameters

Refrigeration system uses liquid nitrogen.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Shang Shouhong (Dean), China Aerodynamics Research and Development Center Graduate School, PO Box 211, Mianyang City, Sichuan Province 621000, China. Tel: (86) 816 2463053, Fax:(86) 816 246 3051, Email: ssh@cardcgs.com, Web site: http://www.cardcgs.com/cardcgs/index.asp, http://www.cardcgs.com/default2.asp.

NO SCHEMATIC AVAILABLE

Transonic | China

Installation Name	Test Section Size	Speed Range
Chinese Aerodynamics Research Institute of Aeronautics (CARIA), Harbin, Heilongjiang Province, China		
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
FL-3 High-Speed Air-Inlet Test Platform		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Test platform serves as a special-use experimental wind tunnel with a sub- and transonic air inlet.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Professor Yu Tao (Director), Chinese Aerodynamic Research Institute of Aeronautics (CARIA), PO Box 88, 2 Yiman Street, Harbin, Heilongjiang Province, China 150001.
Tel: (86) 451 82539364, Fax: (86) 451 82838327, Email: cph@caria.com.cn, Web site: http://www.caria.com.cn.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Transonic | England

Installation Name	**Test Section Size**	**Speed Range**
Aircraft Research Association Limited (ARA), Bedford, England	2.74 x 2.44 m	0.2 to 1.4 Mach
		Temperature Range
	Date Built/Upgrade	Ambient
Facility Name		**Reynolds Number (million)**
Transonic Wind Tunnel (TWT)		13, 17
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of October 2005. 24-hour operation.	0.8 to 1.2 bar

Supplementary Technical Parameters

Continuous-flow, closed-circuit tunnel driven primarily by the main fan with additional speed provided by a compressor. Incidence range of –10° to +40°, roll range 0° to 360°, maximum model length 1.83 meters (6 feet).

Data Acquisition

Schlieren and on-line computing facilities.

Testing Capabilities/Current Programs

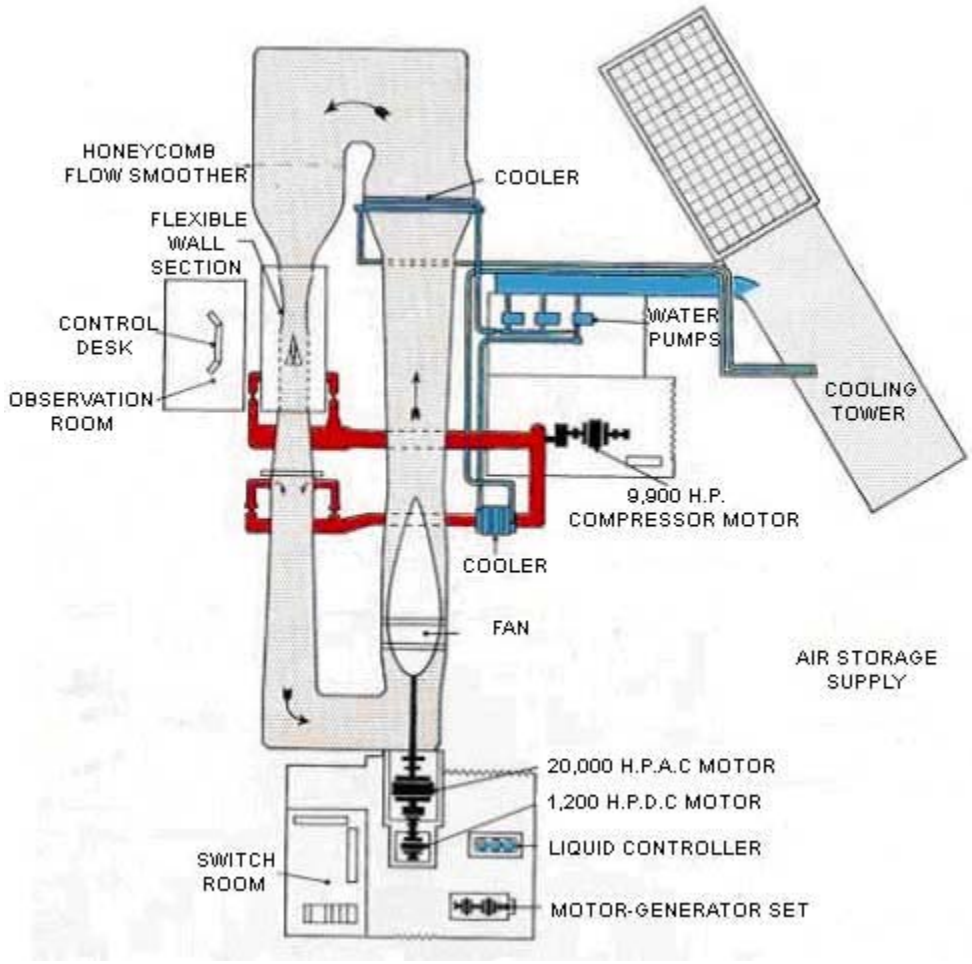
Has been involved in many test programs around the world and played a part in every major aircraft and weapons development program in which the UK industry has been involved. It has also made significant contributions in transonic aerodynamic research, notably in the field of scale effects.

Planned Improvements

User Fees

Contact Information

Aircraft Research Association Ltd, Manton Lane, Bedford, Bedfordshire, MK41 7PF, England.
Tel: (44) 0 1234 350681, Fax: (44) 0 1234 328584, Email: ara@ara.co.uk, Web site: http://www.ara.co.uk/transonic_wind_tunnel.htm.



Transonic Wind Tunnel (TWT), Aircraft Research Association Limited (ARA), Bedford, England.

European and Asian Wind Tunnels

Transonic | England

Installation Name	**Test Section Size**	**Speed Range**
Aircraft Research Association Limited (ARA), Bedford, England	0.20 x 0.46 m	102 to 296 m/s
		Temperature Range
	Date Built/Upgrade	Ambient
Facility Name		**Reynolds Number (million)**
Two-Dimensional (2D) Wind Tunnel		19
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005	1.5 to 4.0 bar

Supplementary Technical Parameters

The 2D wind tunnel is a blowdown tunnel, it has a run time of 20 seconds, -11 to +20° incidence range, roll range n/a and a maximum model length of 0.13 m.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Aircraft Research Association Ltd, Manton Lane, Bedford, Bedfordshire, MK41 7PF, England, UK.
Tel: (44) 0 1234 350681, Fax: (44) 0 1234 328584, Email: ara@ara.co.uk, Web site: http://www.ara.co.uk/z4t.htm.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Transonic | France

Installation Name	Test Section Size	Speed Range
ONERA French Aeronautics and Space Research Center, Modane-Avrieux, France	#1: 40 x 42.6 m (slotted walls); #2: 45 x 45 m (solid walls); # 3: 45.4 x 47 m (solid walls); #3: 38.5 x 38.5 (anechoic walls)	#1: up to 1; #2: up to 1; #3 (solid): up to 1; #3 (anechoic walls): up to 0.85 Mach
		Temperature Range
	Date Built/Upgrade	Ambient (-4 to 140°F)
Facility Name	1951	**Reynolds Number (million)**
S1Ma Continuous Atmospheric Sub/Transonic Wind Tunnel	**Cost**	#1: 7.3 to 7.5; #2: 7.7; #3 (solid): 7.7 to 7.9; #3 (anechoic): 6.7
		Dynamic Pressure
	Operational Status	
	Presumed active as of September 2005	**Stagnation Pressure**
		Atmospheric

Supplementary Technical Parameters

Continuous, high-speed, closed-circuit, atmospheric test facility, 88 MV. Three interchangeable test sections, 26 ft in diameter, 25 ft long. Slotted construction type. Return type circuit. Two counter rotating fans, 88 MW Pelton turbines. Channel to record up to 2000 pressures. External and internal balances. Rectangular closed circuit 155 m long x 40 m wide, maximum diameter of 24 m, test section diameter of 8 m.

Data Acquisition

DEC VAX 6320, up to 120 channels + 64 channels 20 kHz

Testing Capabilities/Current Programs

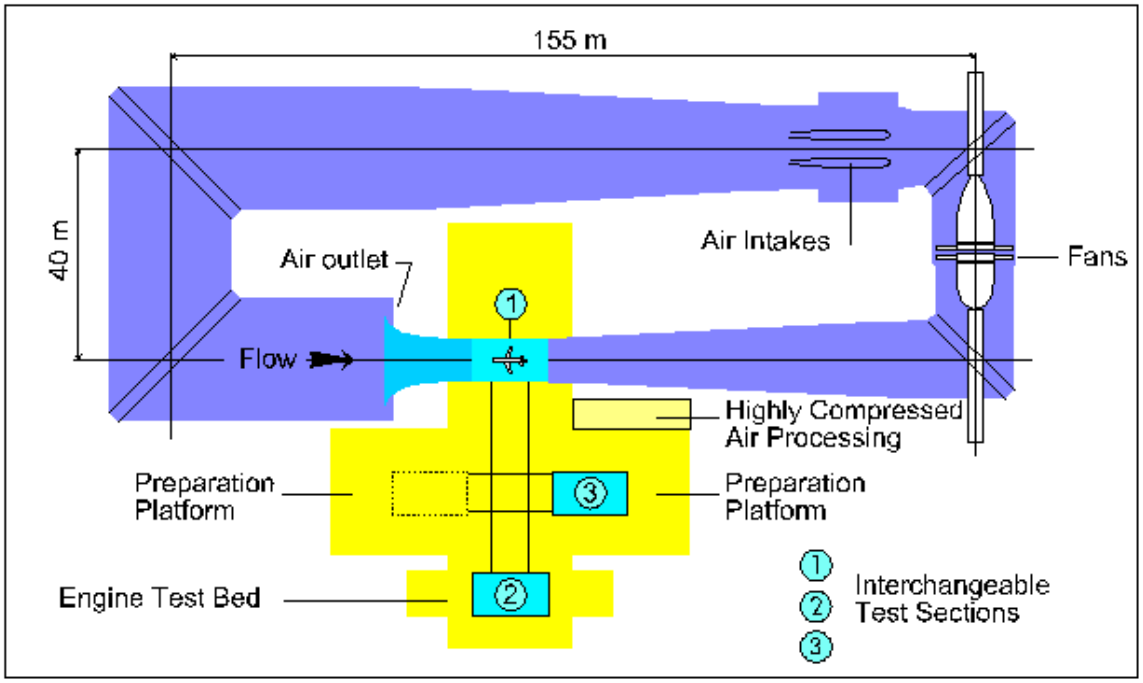
Aero, ground transportation, building, CTS, rotor and propeller test rigs, icing, real engines test types.

Planned Improvements

User Fees

Contact Information

Jean-Paul Bècle (Director), Modane-Avrieux Wind Tunnel Department, ONERA, PO Box 25, F-73500 Modane, France.
Tel: (33) 4 79 20 20 91, Fax: (33) 4 79 20 21 68, Email: becle@onera.fr, Web site: http://www.onera.fr/gmt-en/wind-tunnels/s1ma-bis.html.



S1Ma Wind Tunnel, ONERA French Aeronautics and Space Research Center, Modane-Avrieux, France.

Transonic | Germany

Installation Name	**Test Section Size**	**Speed Range**
European Transonic Wind Tunnel (ETW), Cologne, Germany	2.0 x 2.4 x 9.0 m	0.15 to 1.35 Mach
		Temperature Range
	Date Built/Upgrade	110 to 313°K
Facility Name		**Reynolds Number (million)**
2 x 2.4 m Cryogenic Wind Tunnel		up to 50 (full models), up to 85 (half models)
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of October 2005	1.25 to 4.5 bar

Supplementary Technical Parameters

Closed aerodynamic circuit wind tunnel, with an insulated stainless steel pressure shell. It has drive power up to 50 MW. A –160° C nitrogen flow is driven through two filling screens into the stilling chamber and through a honeycomb flow straightener and two anti-turbulence screens, with 12:1 contraction ratio.

Data Acquisition

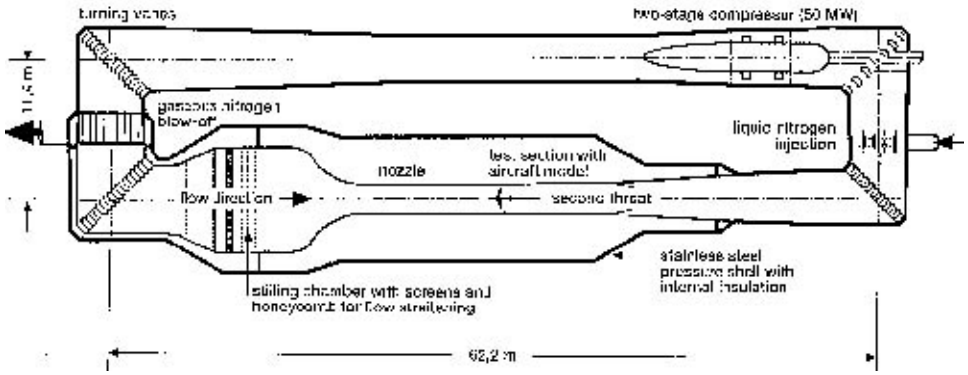
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

European Transonic Wind Tunnel, Ernst-Mach-Strasse, D-51147 Köln, Germany.
Tel/Fax: (49) (0) 2203/609, Email: manager@etw.de, Web site: http://www.etw.de/windtunnel/windtunnel.htm.



2 x 2.4 m Cryogenic Wind Tunnel, European Transonic Wind Tunnel (ETW), Cologne Germany.

European and Asian Wind Tunnels

Transonic | Germany

Installation Name	**Test Section Size**	**Speed Range**
German-Dutch Wind Tunnels (DNW), Göttingen, Germany	0.4 x 0.35 m	102 to 323 m/s
		Temperature Range
	Date Built/Upgrade	100 to 300°K
Facility Name	1982/1994 (upgrade)	**Reynolds Number (million)**
Transonic Wind Tunnel (KRG)		
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of September 2005	

Supplementary Technical Parameters

Intermittent Ludwieg tube (t = 0.6 s - 1.0 s).

Data Acquisition

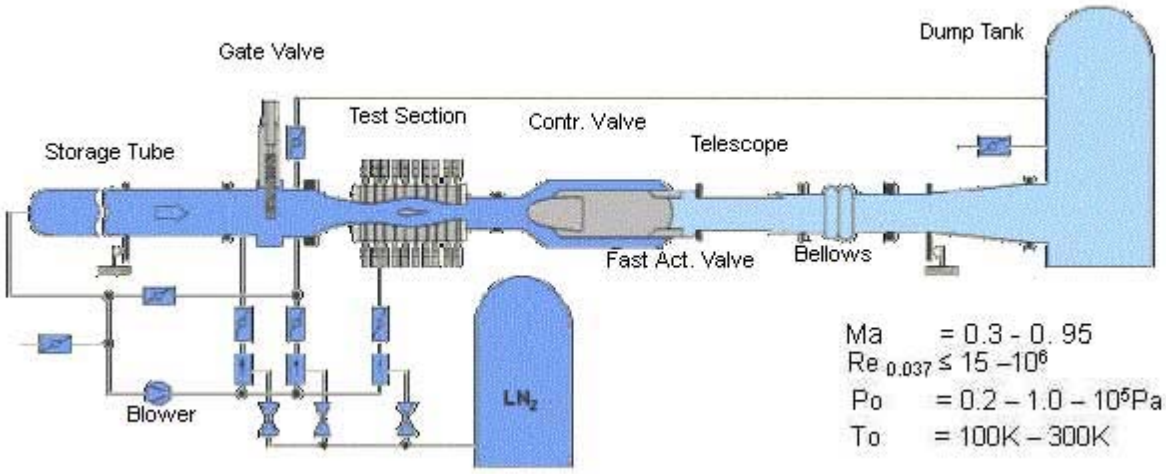
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr.-Ing. K.-W. Bock, German-Dutch Wind Tunnels (DNW), Bunsenstrasse 10, 37073 Göttingen, Germany.
Tel: (49) 551 709 2820, Fax (49) 551 709 2888, Email: dnw-guk@dnw.aero, Web site: http://www.dnw.aero/.



Transonic Wind Tunnel (KRG), German-Dutch Wind Tunnels (DNW), Göttingen, Germany.

European and Asian Wind Tunnels

Transonic | Germany

Installation Name	**Test Section Size**	**Speed Range**
German-Dutch Wind Tunnels (DNW), Göttingen, Germany	1.0 x 1.0 m	0.3 to 0.9 Mach (adaptive walls); 0.3 - 1.2 (perforated walls); 1.3 - 2.2 Mach (flexible Laval nozzle)
		Temperature Range
	Date Built/Upgrade	293 - 315°K
Facility Name	1991-1993	**Reynolds Number (million)**
Transonic Wind Tunnel (TWG)		1.8
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of October 2005	0.3 to 1.5 ???

Supplementary Technical Parameters

Continuous pressurized wind tunnel. The TWG is a continuously working wind tunnel with three exchangeable test sections for subsonic, transonic, and supersonic speed ranges. The 4 (or 8) stage axial compressor has an electric power supply of 12 MW. An auxiliary suction plant with radial compressors for the transonic test section (perforated walls) is also available.

Data Acquisition

150,000 lines of code unix operating system.

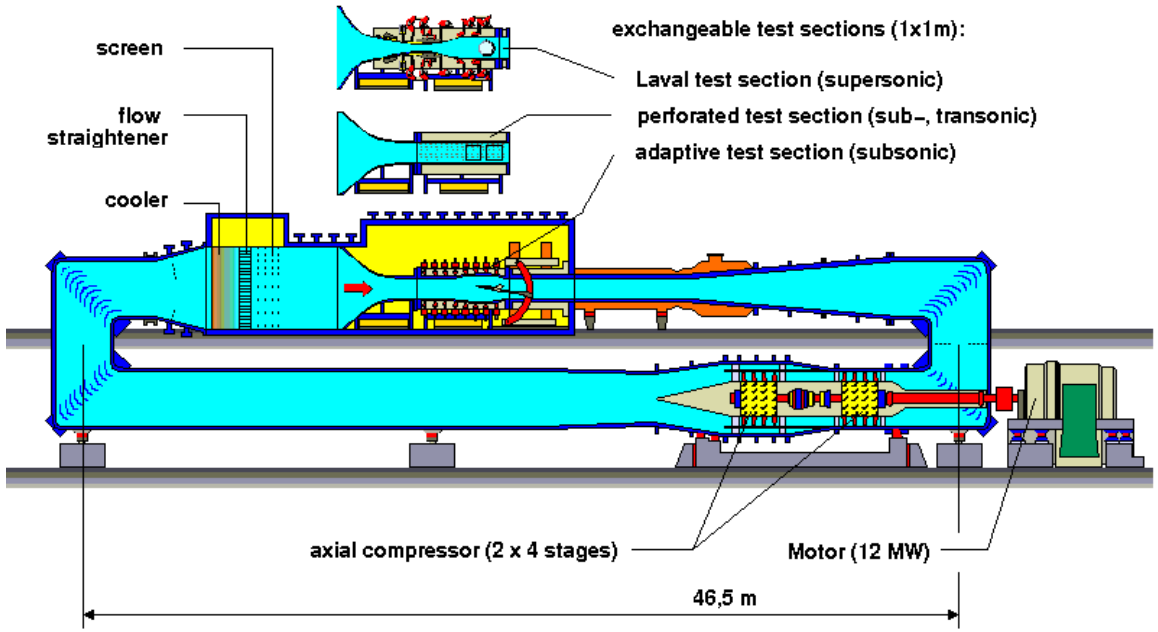
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr.-Ing. K.-W. Bock, German-Dutch Wind Tunnels (DNW), Bunsenstrasse 10, 37073 Göttingen, Germany.
Tel: (49) 551 709 2820, Fax (49) 551 709 2888, Email: dnw-guk@dnw.aero, Web site: http://www.dnw.aero/.



Transonic Wind Tunnel (TWG), German-Dutch Wind Tunnels (DNW), Göttingen, Germany.

European and Asian Wind Tunnels

Transonic | Italy

Installation Name	**Test Section Size**	**Speed Range**
Italian Aerospace Research Center (CIRA), Capua, Italy	0.35 x 0.45 x 0.6 m	up to .35 Mach (continuous, subsonic), up to 1.1 Mach (intermittent at subsonic and transonic), up to 1.4 Mach (supersonic)
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
PT-1 Transonic Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of October 2005	1.85 bar (max)

Supplementary Technical Parameters

The PT-1 is a pressurized wind tunnel facility with a continuous and intermittent flow in subsonic, transonic, and supersonic regimes. 145-kW speed fan. Powered by high pressure air-injection system. Runtime of 150 seconds.

Data Acquisition

Testing Capabilities/Current Programs

Aerodynamic and aeroacoustic tests on wing sections, rotor and turbine blades, missiles, launch vehicles at subsonic, transonic and supersonic regimes in support of industry and research.

Planned Improvements

User Fees

Contact Information

Italian Aerospace Research Center (Centro Italiano Ricerche Aerospaziali: CIRA), Via Maiorise, 81043 Capua, Italy.
Tel: (39) 0823 623001, Email: info@cira.it, Web site: http://www.cira.it/.

PT-1 Transonic Wind Tunnel, Italian Aerospace Research Center (CIRA), Capua, Italy.

European and Asian Wind Tunnels

Transonic | Sweden

Installation Name	**Test Section Size**	**Speed Range**
Swedish Defense Reseach Agency, FOI, Stockholm, Sweden	1.5 x 1.5 m	0.2 to 1.25 (slotted walls), 0.2 to 2.0 (solid walls)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1989	**Reynolds Number (million)**
T1500 Transonic Wind Tunnel		up to 80
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of October 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Closed-circuit, pressurized. Up to four runs per hour. Tests available in 10 minutes.

Data Acquisition

Unsteady force measurements, electronic pressure scanning systems, and flow visualization.

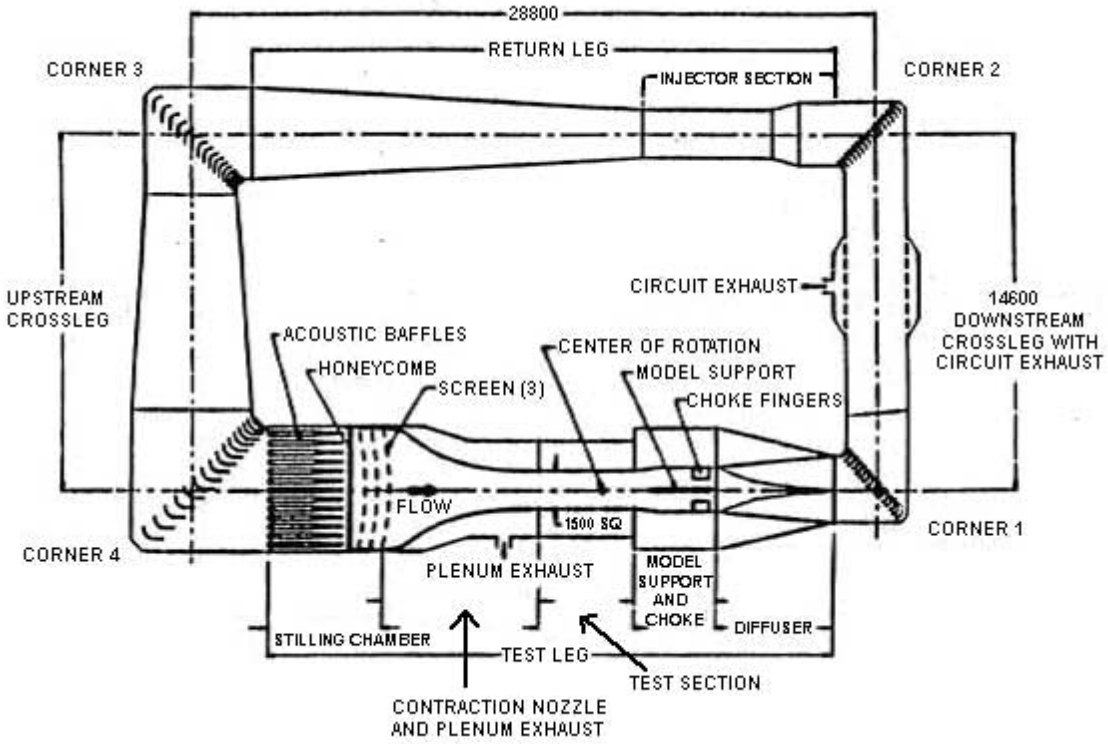
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Bengt Hultqvist (Head), Experimental Aerodynamics, Swedish Defense Research Agency, SE-164 90 Stockholm, Sweden.
Tel (Hultqvist): (46) 8 555 043 39, Tel (Main): (46) 8 555 030 00, Fax: (46) 8 555 031 00, Email (Hultqvist): bengt.hultqvist@foi.se, Web site: http://www.foi.se/.



T1500 Transonic Wind Tunnel, Swedish Defense Research Agency (FOI), Stockholm, Sweden.

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Supersonic Wind Tunnels

European and Asian Wind Tunnels

Supersonic | Belgium

Installation Name	**Test Section Size**	**Speed Range**
Von Karman Institute for Fluid Dynamics (VKI), Saint Genese, Belgium	Three 40 x 36 cm test sections	15 to 20 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
S-1 Supersonic Wind Tunnel		4
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Continuous, closed circuit. Ackeret type, driven by a 615 kW axial flow compressor. A solid half nozzle M=1.43 for shock wave/boundary layer studies. Three-degree traverse mechanism, variable incidence mechanism up to +/- 35 degrees.

Data Acquisition

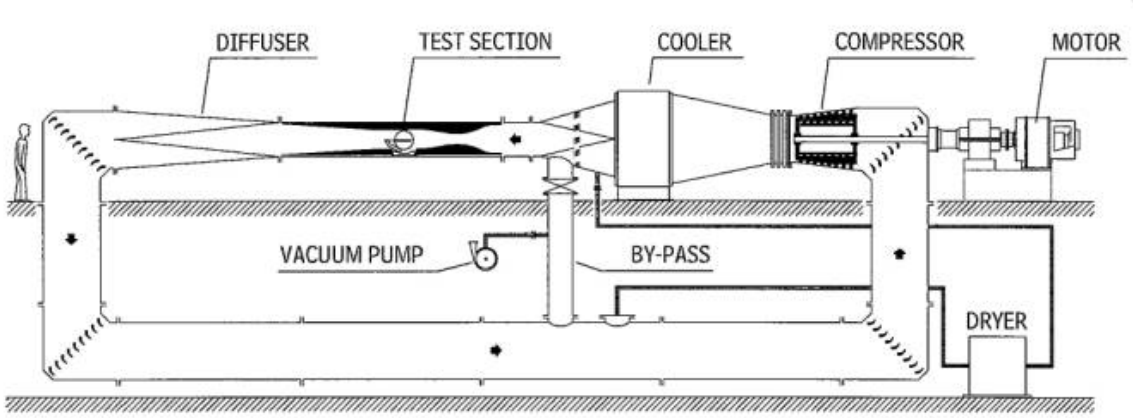
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Olivier Chazot, Von Karman Institute for Fluid Dynamics, B-1640 Rhode, Genese, Belgium.
Tel: (32) 02 359 11, Fax: (32) 02 359 96 00, Email: chazot@vki.ac.be, Web site: http://www.vki.ac.be/ar-dept/virtual/facility/s1/s1.html.



S-1 Supersonic Wind Tunnel, Von Karman Institute (VKI), St. Genese, Belgium.

European and Asian Wind Tunnels

Supersonic | Belgium

Installation Name	Test Section Size	Speed Range
Von Karman Institute for Fluid Dynamics (VKI), Saint Genese, Belgium	8 x 10 cm	3.5 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
S-4 Supersonic Wind Tunnel		50
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of September 2005	**Stagnation Pressure**
		3 to 18 bar

Supplementary Technical Parameters

Blow-down wind tunnel. Test times can be achieved in 8 to 25 minutes, depending on stagnation pressure. Model incidence range from –10 to +10 degrees. The S-4 is also equipped with shadow and schlieren systems.

Data Acquisition

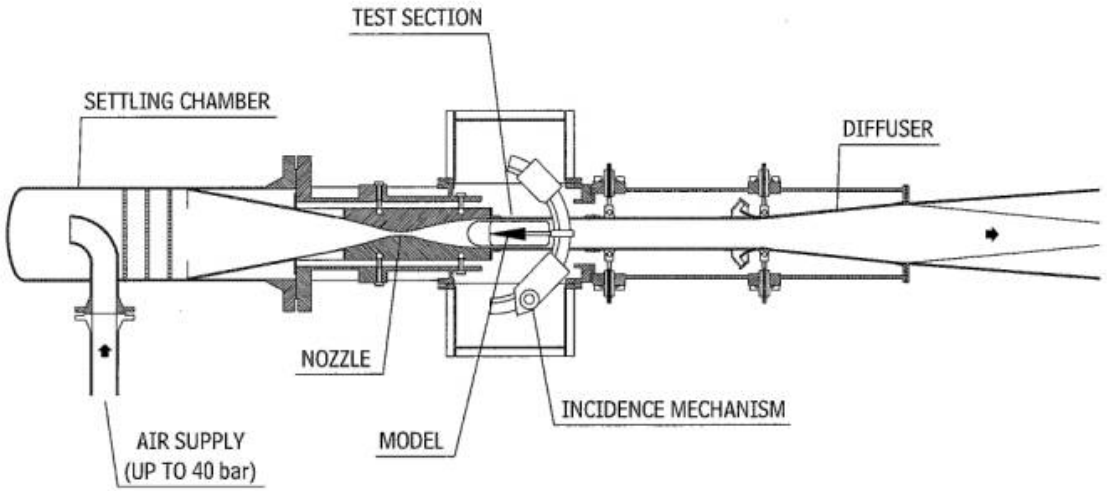
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Olivier Chazot, Von Karman Institute for Fluid Dynamics, B-1640 Rhode, Genese, Belgium.
Tel: (32) 02 359 96 11, Fax: (32) 02 359 96 00, Email: chazot@vki.ac.be, Web site: http://www.vki.ac.be/ar-dept/virtual/facility/.



S-4 Supersonic Wind Tunnel, Von Karman Institute (VKI), St. Genese, Belgium.

European and Asian Wind Tunnels

Supersonic | China

Installation Name	**Test Section Size**	**Speed Range**
China Academy of Aerospace Aerodynamics (CAAA), Beijing, China AKA: Beijing Institute of Aerodynamics (BIA) or 701st Institute of the China Aerospace Science & Technology Corp (CASC)	0.6 x 0.6 x 1.575 m	0.4 to 4.5 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Supersonic Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Intermittent semi-return.

Data Acquisition

Central integrated measurement, control, and processing by computers.

Testing Capabilities/Current Programs

Measurement of pressure and forces on full- and half-scale models, measurement of aircraft roll characteristics, air inlet model tests, jet flow interference tests, inter-stage separation and multi-body interference tests, Magnus effect tests, measurement of hinge moments on full- and half-scale models, tests on the dynamic and unsteady aerodynamic characteristics of aircraft, flutter and buffeting tests, model free flight tests, and flow and vortex visualization.

Planned Improvements

User Fees

Contact Information

Li Feng (Director), China Academy of Aerospace Aerodynamics (CAAA), 17 Yungang West Road, Fengtai District, Beijing 100074, China.
Tel: (86) 10 68740603, Fax: (86) 10 68374758, Email: caaa@bia701.com, Web site: http://www.bia701.com.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Supersonic | China

Installation Name	**Test Section Size**	**Speed Range**
China Academy of Aerospace Aerodynamics (CAAA), Beijing, China AKA: Beijing Institute of Aerodynamics (BIA) or 701st Institute of the China Aerospace Science & Technology Corp (CASC)	0.6 x 0.6 m (perforated wall)	0.4 to 4.5 Mach (using 10 fixed nozzle blocks)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1962	**Reynolds Number (million)**
BIA Trisonic Wind Tunnel FD-06		12 to 30
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005	up to ~15 atmospheric

Supplementary Technical Parameters

Semi-blowdown (ejector augmented), AGARD B models used to compare data with western tunnels.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Li Feng (Director), China Academy of Aerospace Aerodynamics (CAAA), 17 Yungang West Road, Fengtai District, Beijing 100074, China.
Tel: (86) 10 68740603, Fax: (86) 10 68374758, Email: caaa@bia701.com, Web site: http://www.bia701.com.

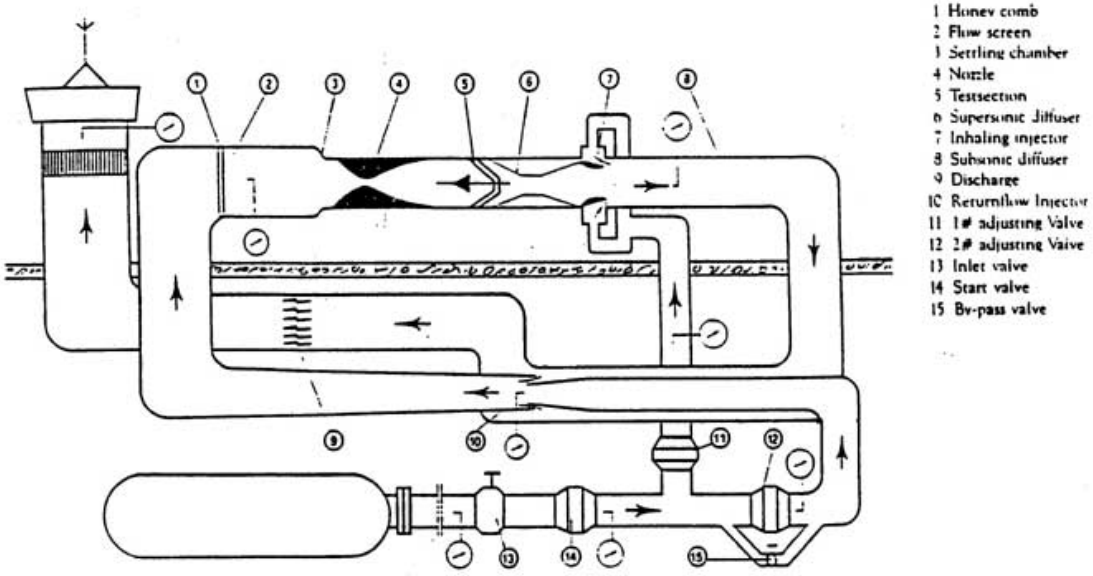


Figure 4.1-2 BIA Trisonic Wind Tunnel FD-06

BIA Trisonic Wind Tunnel FD-06, China Academy of Aerospace Aerodynamics (CAAA), Beijing, China.

European and Asian Wind Tunnels

Supersonic | China

Installation Name	**Test Section Size**	**Speed Range**
China Aerodynamics Research and Development Center (CARDC), Mianyang City, Sichuan Province, China	1.2 x 1.2 m	0.6 to 3.5 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	1979	**Reynolds Number (million)**
1.2 x 1.2 m Trisonic Wind Tunnel		35
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005. 3000 runs/year reported.	up to 4.5 atmospheric

Supplementary Technical Parameters

Run time 45 to 60 seconds. Named transonic by manufacturer.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

Improvements planned to flow quality.

User Fees

Contact Information

Shang Shouhong (Dean), China Aerodynamics Research and Development Center Graduate School, PO Box 211, Mianyang City, Sichuan Province 621000, China. Tel: (86) 816 246 3053, Fax: (86) 816 246 3051, Email: ssh@cardcgs.com, Web site: http://www.cardcgs.com/cardcgs/index.asp, http://www.cardcgs.com/default2.asp.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Supersonic | China

Installation Name	**Test Section Size**	**Speed Range**
Chinese Aerodynamics Research Institute of Aeronautics (CARIA), Harbin, Heilongjiang Province, China	0.6 x 0.6 m	0.35 to 4.0 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	1960	**Reynolds Number (million)**
FL-1 Supersonic Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

When testing at transonic speeds, the upper and lower walls are perforated walls with an open area ratio of 15 percent with pore diameters of ten mm and solid side walls. When testing at supersonic speeds, all four walls are solid walls.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Professor Yu Tao (Director), Chinese Aerodynamic Research Institute of Aeronautics (CARIA), PO Box 88, 2 Yiman Street, Harbin, Heilongjiang, China 150001. Tel: (86) 451 82539364, Fax: (86) 451 82838327, Email: cph@caria.com.cn, Web site: http://www.caria.com.cn.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Supersonic | China

Installation Name	**Test Section Size**	**Speed Range**
Chinese Aerodynamics Research Institute of Aeronautics (CARIA), Harbin, Heilongjiang Province, China	1.2 x 1.2 m	0.4 to 2.0 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	1993/1995	**Reynolds Number (million)**
FL-2 Supersonic Wind Tunnel		Variable
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Direct-action, intermittent blowdown, trisonic wind tunnel with a variable Reynolds number.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Professor Yu Tao (Director), Chinese Aerodynamic Research Institute of Aeronautics (CARIA), PO Box 88, 2 Yiman Street, Harbin, Heilongjiang Province, 150001 China.
Tel: (86) 451 82539364, Fax: (86) 451 82838327, Email: cph@caria.com.cn, Web site: http://www.caria.com.cn.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Supersonic | China

Installation Name	**Test Section Size**	**Speed Range**
Chinese Aerodynamics Research Institute of Aeronautics (CARIA), Harbin, Heilongjiang Province, China	0.64 x 0.52 m	0.2 to 1.5 Mach (continuously adjustable)
		Temperature Range
	Date Built/Upgrade	
Facility Name	1963	**Reynolds Number (million)**
FL-7 Supersonic Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Test section has four walls with perforated wall panels of variable open area ratio.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Professor Yu Tao (Director), Chinese Aerodynamic Research Institute of Aeronautics (CARIA), PO Box 88, 2 Yiman Street, Harbin,Heilongjiang Province, China 150001.
Tel: (86) 451 82539364, Fax: (86) 451 82838327, Email: cph@caria.com.cn, Web site: http://www.caria.com.cn.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Supersonic | China

Installation Name	**Test Section Size**	**Speed Range**
Key Laboratory of High-Temperature Gas Dynamics (LHD), Beijing, China		2.5 Mach
		Temperature Range
	Date Built/Upgrade	2,100°K
Facility Name	Lab founded in 1994, wind tunnel - unknown	**Reynolds Number (million)**
Directly Coupled Supersonic Combustion Test Platform	**Cost**	
		Dynamic Pressure
		1.5 Mpa
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005	

Supplementary Technical Parameters

Kerosene combustion uses atomized pilot hydrogen and wall cavities. Combustion efficiency is 90 percent and pressure recovery is over 50 percent.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Professor Jiang Zonglin (Director), Key Laboratory of High Temperature Gas Dynamics (LHD), No.15 Beisihuanxi Road, Beijing 100080, China.
Tel (Lab): (86) 10 62548132, Tel (Director): (86) 10 62545947, Fax (Director): (86) 10 62657081, Email (Director): zljiang@imech.ac.cn, Web site: http://www.lhd.cn.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Supersonic | China

Installation Name	**Test Section Size**	**Speed Range**
Key Laboratory of High-Temperature Gas Dynamics (LHD), Beijing, China	0.8 m (jet tube diameter)	3.5 to 6 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	1994	**Reynolds Number (million)**
Tube/Shock Supersonic Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Run time: 30-50 milliseconds.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Professor Jiang Zonglin (Director), Key Laboratory of High Temperature Gas Dynamics (LHD), No.15 Beisihuanxi Road, Beijing 100080, China.
Tel (Lab): (86) 10 62548132, Tel (Director): (86) 10 62545947, Fax (Director): (86) 10 62657081, Email (Director): zljiang@imech.ac.cn, Web site: http://www.lhd.cn.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Supersonic | China

Installation Name	**Test Section Size**	**Speed Range**
Nanjing University of Aeronautics and Astronautics (NUAA), Nanjing, Jiangsu Province, China	0.6 x 0.6 m	0.3 to 3.0 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	1970	**Reynolds Number (million)**
High Speed Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Angle of attack: -30° to +30°. Sideslip angle: -10° to +10°.

Data Acquisition

Testing Capabilities/Current Programs

Tests on aircraft, submersibles, engine intake and exhaust gas, and jet flows.

Planned Improvements

User Fees

User fees: force measurements, 800 Chinese Yuan ($100 USD)/hr; pressure measurement 800-1000 Chinese Yuan ($100-125 USD)/hr; special cases by negotiation.

Contact Information

Professor Xu Xiwu (Dean), College of Aerospace Engineering, Nanjing University of Aeronautics and Astronautics, 29 Yudao Street, Nanjing, Jiangsu Province, China 210016.
Tel: (86) 25 84891585, Email: xwxu@nuaa.edu.cn, Web site: http://www.nuaa.edu.cn.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Supersonic | China

Installation Name	**Test Section Size**	**Speed Range**
Nanjing University of Aeronautics and Astronautics (NUAA), Nanjing, Jiangsu Province, China	0.6 x 0.6 m	0.5 to 3.5 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Supersonic Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005	

Supplementary Technical Parameters

Data Acquisition

Testing Capabilities/Current Programs

Tests on aircraft and missiles: six-component force measurements, pressure measurements, hinge moment measurements, flutter and buffeting tests, and acoustic environment tests.

Planned Improvements

User Fees

Contact Information

Professor Xu Xiwu (Dean), College of Aerospace Engineering, Nanjing University of Aeronautics and Astronautics, 29 Yudao Street, Nanjing, Jiangsu Province, China 210016.
Tel: (86) 25 84891585, Email: xwxu@nuaa.edu.cn, Web site: http://www.nuaa.edu.cn.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Supersonic | China

Installation Name	**Test Section Size**	**Speed Range**
Northwestern Polytechnical University (NWPU, NPU), Xi'an, Shaanxi Province, China	0.3 x 0.3 m	0.3 to 4.5 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	2002 or 2005	**Reynolds Number (million)**
Small-Scale High-Speed Research Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005	

Supplementary Technical Parameters

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Northwestern Polytechnical University, School of Aeronautics, State Key Laboratory for Airfoil and Cascade Aerodynamics, No.127 West Youyi Road, Xi'an City, Shaanxi Province, 710072, China.
Tel: (86) 29 8492222, Fax: (86) 29 8491000, Web site: http://www.nwpu.edu.cn.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Supersonic | England

Installation Name	**Test Section Size**	**Speed Range**
Aircraft Research Association Limited (ARA), Bedford, England	0.23 x 0.20 m	0.3 to 1.3 Mach
		Temperature Range
	Date Built/Upgrade	Ambient
Facility Name		**Reynolds Number (million)**
Pilot Wind Tunnel Z4T		11
	Cost	
		Dynamic Pressure
	Operational Status	
	Pilot	**Stagnation Pressure**
		Atmospheric

Supplementary Technical Parameters

Small transonic induction. The Z4T is a small transonic wind tunnel that is 1/12 size of the transonic wind tunnel (TWT). Normal run time is up to 120 seconds, -10 to +18° incidence range, a fixed angle of roll range and maximum model length of 0.20 m.

Data Acquisition

Schlieren and on-line computing facilities.

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Aircraft Research Association Ltd, Manton Lane, Bedford, Bedfordshire, MK41 7PF, England, UK.
Tel: (44) 0 1234 350681, Fax: (44) 0 1234 328584, Email: ara@ara.co.uk, Web site: http://www.ara.co.uk/z4t.htm.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Supersonic | England

Installation Name	**Test Section Size**	**Speed Range**
Aircraft Research Association Limited (ARA), Bedford, England	0.69 x 0.76 m	1.4 to 3.0 Mach
		Temperature Range
	Date Built/Upgrade	Ambient
Facility Name		**Reynolds Number (million)**
Supersonic Wind Tunnel (SWT)		8 (Mach 3.0); 20 (Mach 1.4)
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005	0.4 to 1.4 bar

Supplementary Technical Parameters

The SWT wind tunnel has a continuous run time, -10 to +40° incidence range, maximum model length of 3.50 meters (11.48 feet).

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Aircraft Research Association Ltd, Manton Lane, Bedford, Bedfordshire, MK41 7PF, England, UK.
Tel: (44) 0 1234 350681, Fax: (44) 0 1234 328584, Email: ara@ara.co.uk, Web site: http://www.ara.co.uk/z4t.htm.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Supersonic | England

Installation Name	**Test Section Size**	**Speed Range**
Flow Science Limited, Goldstein Research Laboratory, Manchester, England	0.21 x 0.15 x 0.6 m (rectangular cross section w/slotted walls, transonic); 0.21 x 0.15. 0.8 m (rectangular cross section w/slotted wall)	0.3 to 2.0 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
0.21 x 0.15 m Transonic/Supersonic Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of December 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Blowdown into reservoir of 130 m^3, pressurised, intermittent flow, approximate run time 45 seconds, reservoir evacuation < 5 minutes, supersonic Mach 2.0 liners, upstream drier, quick operating valve.

Data Acquisition

Mach-Zehnder interferometer, schlieren systems, scanivalves, pressure transducers, digital oscilloscopes, digital spectrum analyser for recording transient, unsteady or fluctating flows.

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

David Smith (Operations Director), Flow Science Limited, Goldstein Research Laboratory, Barton Airport Eccles, Manchester M 30 7 RU England.
Tel/Fax: (44) 0161 787 8749, Email (Director): david@fs1.ae.man.ac.uk, Email (General): Flowsci@fs1.ae.man.ac.uk, Web site: http://www.flow-science.eng.man.ac.uk/etdetail.htm.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Supersonic | France

Installation Name	**Test Section Size**	**Speed Range**
French-German Research Institute of Saint Louis (ISL), Saint Louis, France	30 x 30 cm	1.5 to 4.4 Mach
		Temperature Range
	Date Built/Upgrade	320°K
Facility Name		**Reynolds Number (million)**
Supersonic Wind Tunnel S30		1.4
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of September 2005	0.2 to 1 Mpa

Supplementary Technical Parameters

Continuous four-stage 7-MW radial compressor.

Data Acquisition

Shadow or schlieren photography, measurement of steady and transient pressures, force and moment measurements using wind tunnel balance, laser Doppler velocimetry, particle image velocimetry, Doppler picture technique, and visualization by means of holographic filters.

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

French-German Research Institute of Saint-Louis (ISL), 5 rue du Général Cassagnou, 68300 Saint-Louis, France.
Mailing address: ISL, PO Box 70034, FR 68301 Saint Louis CEDEX.
Tel: (33) 3 89 69 50 00, (33) 3 89 69 50 02, Email: isl@isl.tm.fr, Web site: http://www.isl.tm.fr/en/generalite/intro_pres_e.html.

Supersonic Wind Tunnel S30, French-German Research Institute of Saint Louis (ISL), Saint Louis, France.

European and Asian Wind Tunnels

Supersonic | France

Installation Name	Test Section Size	Speed Range
ONERA French Aeronautics and Space Research Center, Fluid Mechanics and Energetics Branch, Meudon Center, Meudon, France	0.06 m	3 or 5 Mach
		Temperature Range
	Date Built/Upgrade	up to 400°K (variable stagnation temperature)
Facility Name		**Reynolds Number (million)**
R1Ch Supersonic Wind Tunnel		10 to 30
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of September 2005	variable up to 15 bar

Supplementary Technical Parameters

Long blowdowns from 10 to 60 seconds. Free test section that can be equipped with Mach 3 or Mach 5 nozzles with exit diameter of 0.326 m. Maximum mass flow rate of 80 kg/s.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

Silent Mach 3 version being developed.

User Fees

Contact Information

Bruno Chanetz, Lucien Morzenski, Meudon Center, ONERA – DAFE 8, rue des Vertugadins 92190 Meudon, France.
Tel (Chanetz): (33) 1 46 23 51 76, Tel (Morzenski): (33) 1 46 23 51 46, Fax: (33) 1 46 23 51 58, Email (Chanetz): chanetz@onera.fr, Email (Morzenski): morzenski@onera.fr, Web site: http://www.onera.fr/.

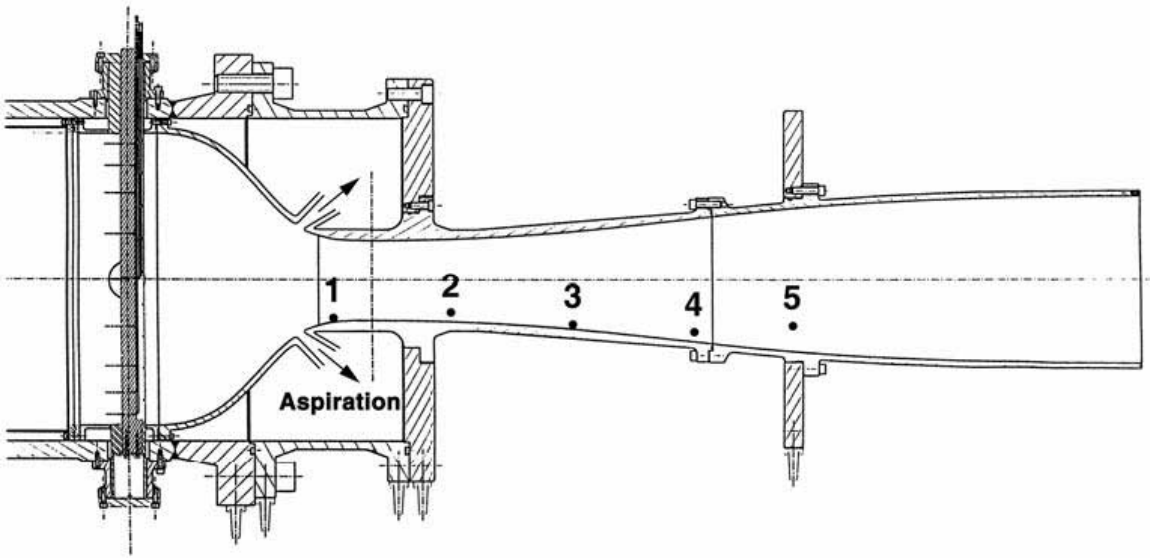


Figure 5 : Sketch of the R1Ch wind tunnel. 1,2,3,4,5 denote the hot film locations. Diameter of the nozzle exit: 30 cm.

R1Ch Supersonic Wind Tunnel, ONERA French Aeronautics and Space Research Center, Fluid Mechanics and Energetics Branch, Meudon Center, Meudon, France.

European and Asian Wind Tunnels

Supersonic | France

Installation Name	**Test Section Size**	**Speed Range**
ONERA French Aeronautics and Space Research Center, Modane-Avrieux, France	1.75 x 1.77 m (transonic), 1.75 x 1.93 m (supersonic)	up to 1.3 Mach (transonic); 1.5 to 3.1 Mach (supersonic)
		Temperature Range
	Date Built/Upgrade	313°K
Facility Name		**Reynolds Number (million)**
S2Ma Continuous Pressurized Sub/Trans/Supersonic Wind Tunnel		5.4 (transonic); 4.0 (supersonic)
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of September 2005	2.5 bar

Supplementary Technical Parameters

Variable pressure, closed circuit, continuous-flow wind tunnel. Sting holder: angle of attack range = 25°, roll range = 360°. Variable knuckle from - 10° to + 25°. Three degree of freedom bent sting: angle of attack range = 46°, yaw range = 22° (with zero roll angle, with continuous variation of incidence (or yaw), yaw (or incidence) being constant. Wall turret: angle of attack range = 360°. Captive trajectory system.

Data Acquisition

160 analogous channels, 14 bits sign A/D convert; 64 channels, at 20 KHz per channel by SAR system and 56 channels, at 17.7 KHz by PCM systems. Real-time data processing, model supports and tunnel wall interferences

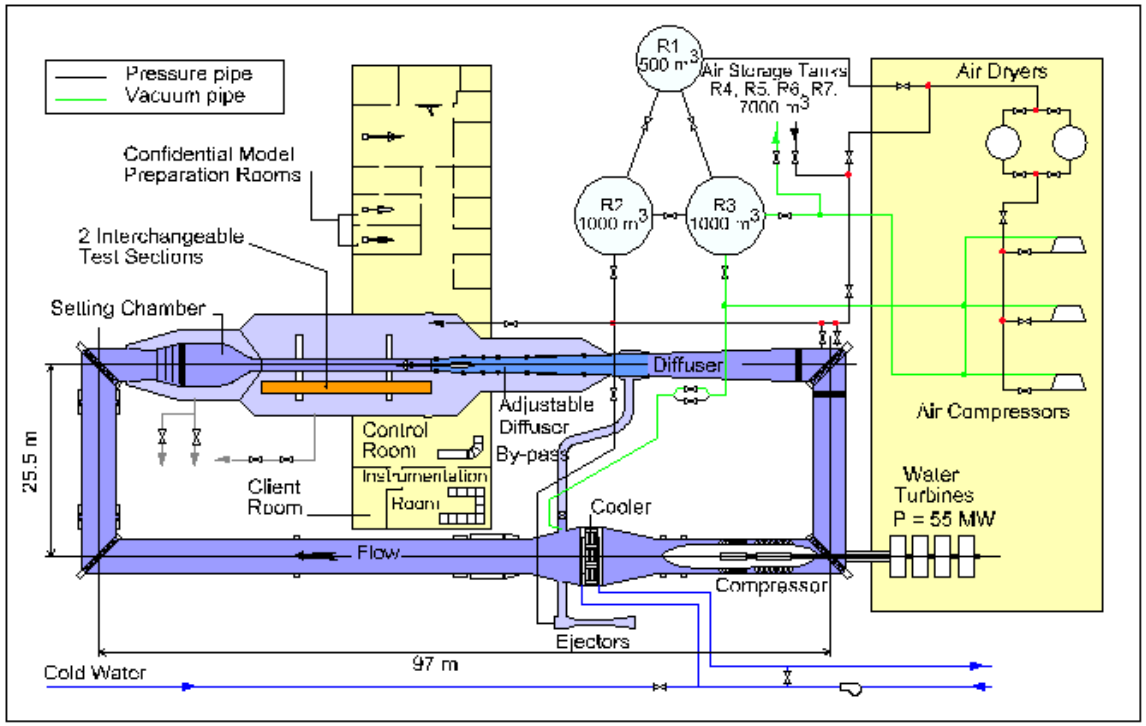
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Jean-Paul Bècle (Director), Modane-Avrieux Wind Tunnel Department, PO Box 25, F-73500 Modane, France.
Tel: (33) 4 79 20 20 91, Fax: (33) 4 79 20 21 68, Email: becle@onera.fr, Web site: http://www.onera.fr/gmt-en/wind-tunnels/s2ma-bis.html.



S2Ma Wind Tunnel, ONERA French Aeronautics and Space Research Center, Modane-Avrieux, France.

European and Asian Wind Tunnels

Supersonic | France

Installation Name	Test Section Size	Speed Range
ONERA French Aeronautics and Space Research Center, Modane-Avrieux, France	0.56 x 0.78 m (transonic), 0.76 x 0.80 m (supersonic)	0.1 to 1.3 Mach (transonic), 1.65 to 5.5 Mach (supersonic)
		Temperature Range
	Date Built/Upgrade	530°K (max)
Facility Name		**Reynolds Number (million)**
S3Ma Blow-down Pressurized Sub/Trans/Supersonic Wind Tunnel		3.5 (transonic); 3.2 (supersonic)
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Active (3 to 20 runs per/day)	.02 to 7.5 bar

Supplementary Technical Parameters

Blow down wind tunnel. Rectangular test section.

Data Acquisition

48 analog channels: steady measurements rate up to 25 Hz per channel with a 14 bits + sign A/D converter

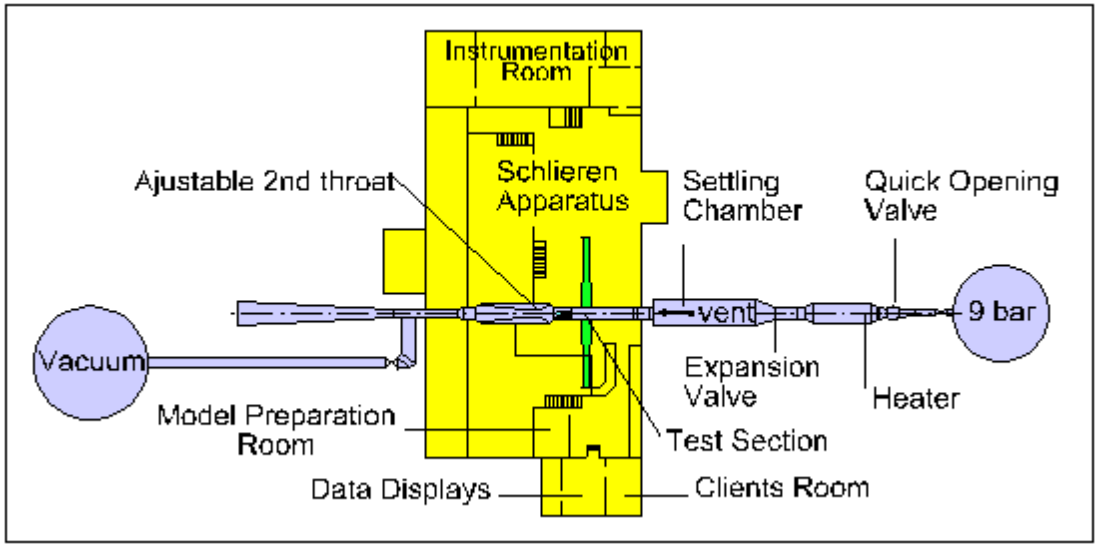
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Jean-Paul Bècle (Director), Modane-Avrieux Wind Tunnel Department, PO Box 25, F-73500 Modane, France.
Tel: (33) 4 79 20 20 91, Fax: (33) 4 79 20 21 68, Email: becle@onera.fr, Web site: http://www.onera.fr/gmt-en/wind-tunnels/s2ma-bis.html.



S3Ma Wind Tunnel, ONERA French Aeronautics and Space Research Center, Modane-Avrieux, France.

European and Asian Wind Tunnels

Supersonic | Japan

Installation Name	Test Section Size	Speed Range
Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), Tokyo, Japan	0.2 x 0.2 m	1.5 to 2.5 Mach
		Temperature Range
	Date Built/Upgrade	330°K
Facility Name	1994/1999 (upgrade)	**Reynolds Number (million)**
0.2 x 0.2 m Supersonic Wind Tunnel		
	Cost	
		Dynamic Pressure
		50 to 120 kPa
	Operational Status	**Stagnation Pressure**
	Presumed active as of December 2005	

Supplementary Technical Parameters

Continuous circulation type. The settling chamber was repaired in 1999 to improve the quality of the air flow in the test section.

Data Acquisition

Testing Capabilities/Current Programs

Research on aerodynamics in a supersonic low-turbulence environment.

Planned Improvements

User Fees

Contact Information

Dr. Masashi Shigemi (WINTEC Director), Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), 7-44-1 Jindaiji Higashi-machi, Chofu-shi, Tokyo182-8522, Japan.
Tel: (81) 3 422 40 3000, Fax: (81) 3 422 40 3281, Email (Director): shigemi.masashi@jaxa.jp, Email (WINTEC): wintec@chofu.jaxa.jp, Web site: http://www.iat.jaxa.jp/res/wttc/b04.html.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Supersonic | Japan

Installation Name	**Test Section Size**	**Speed Range**
Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), Tokyo, Japan	0.8 x 0.45 m	0.2 to 1.4 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	1979/1997 (upgrade)	**Reynolds Number (million)**
0.8 x 0.45 m High Reynolds Number Transonic Wind Tunnel	**Cost**	5 to 40
		Dynamic Pressure
	Operational Status	
	Presumed active as of December 2005	**Stagnation Pressure**
		196 to 1176 kPa

Supplementary Technical Parameters

Intermittent blowdown type. Test duration: 9 – 100 seconds

Data Acquisition

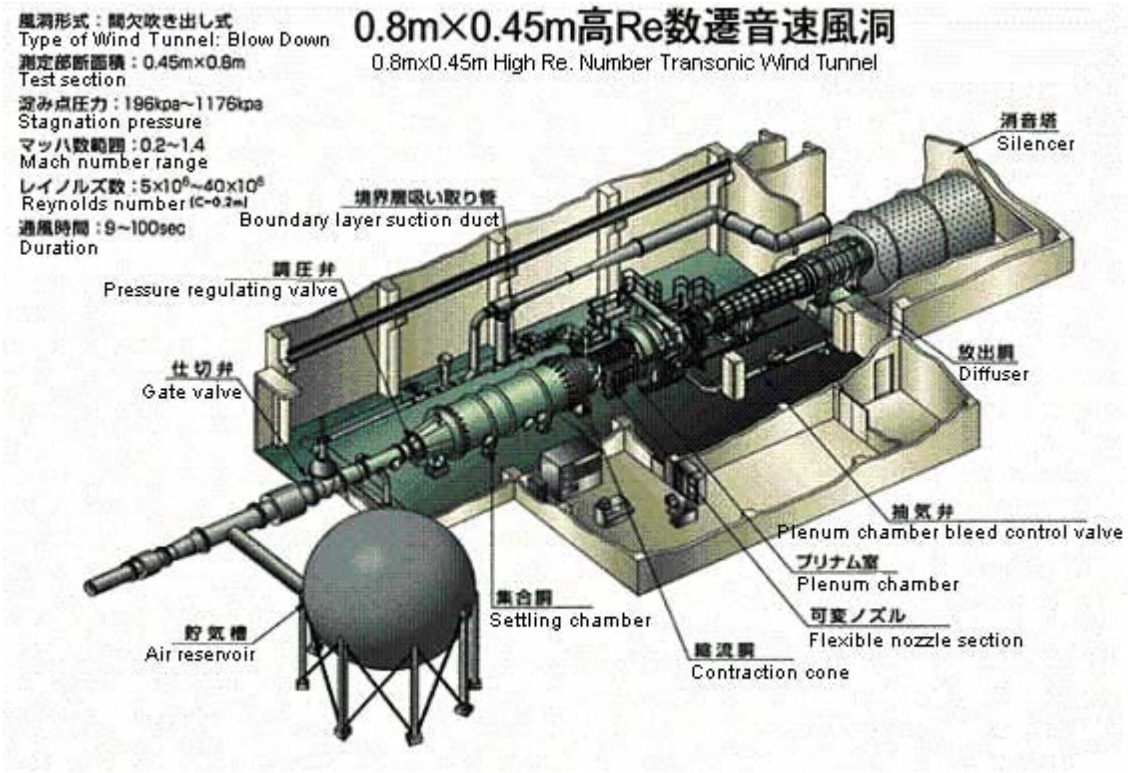
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Masashi Shigemi (WINTEC Director), Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), 7-44-1 Jindaiji Higashi-machi, Chofu-shi, Tokyo 182-8522, Japan.
Tel: (81) 3 422 40 3000, Fax: (81) 3 422 40 3281, Email (Director): shigemi.masashi@jaxa.jp, Email (WINTEC): wintec@chofu.jaxa.jp, Web site: http://www.iat.jaxa.jp/res/wttc/b04.html.



0.8m×0.45m 高レイノルズ数遷音速風洞全体図

0.8 x 0.45 m High Reynolds Number Transonic Wind Tunnel, Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), Tokyo, Japan.

European and Asian Wind Tunnels

Supersonic | Japan

Installation Name	**Test Section Size**	**Speed Range**
Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), Tokyo, Japan	1 x 1 m	1.4 to 4.0 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	1961/1999 (upgrade)	**Reynolds Number (million)**
1 x 1 m Supersonic Wind Tunnel		20 (Mach 1.4); up to 60 (Mach 4)
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of December 2005	**Stagnation Pressure**
		150 kPa (Mach 1.4) to 1,400 kPa (Mach 4.0)

Supplementary Technical Parameters

Intermittent blowdown type wind tunnel. Run time 40 seconds. Electric powered multi-jack type, two dimensional flexible nozzle. Flow rate 280 kg/sec.

Data Acquisition

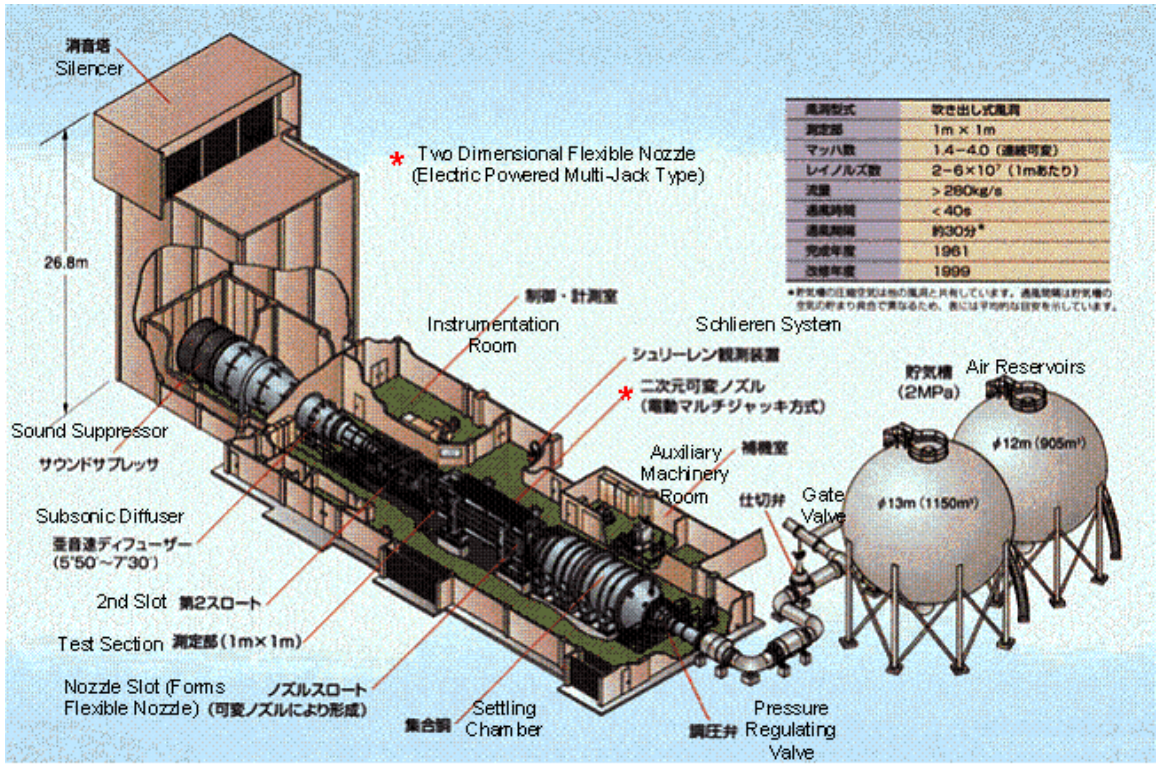
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Dr. Masashi Shigemi (WINTEC Director), Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), 7-44-1 Jindaiji Higashi-machi, Chofu-shi, Tokyo 182-8522, Japan.
Tel: (81) 3 422 40 3000, Fax: (81) 3 422 40 3281, Email (Director): shigemi.masashi@jaxa.jp, Email (WINTEC): wintec@chofu.jaxa.jp, Web site: http://www.iat.jaxa.jp/res/wttc/b04.html.



1m×1m 超音速風洞全体図

1 x 1 m Supersonic Wind Tunnel, Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), Tokyo, Japan.

European and Asian Wind Tunnels

Supersonic | Japan

Installation Name	Test Section Size	Speed Range
Japan Defense Agency (JDA), Technical Research and Development Institute (TRDI), Tachikawa, Japan		0 to 4 Mach
		Temperature Range
	Date Built/Upgrade	248 to 928°K
Facility Name	1992	**Reynolds Number (million)**
Combustion Wind Tunnel		
	Cost	
		Dynamic Pressure
		0.01 to 3.8 Mpa
	Operational Status	**Stagnation Pressure**
	Presumed active as of December 2005	

Supplementary Technical Parameters

Air flow rate: 150 kg/sec. Pitch angle and yaw angle in the semi-free jet configuration: 0° ~ +15°, -5° ~ +5°, respectively. Simulation of flight conditions at 0 – 80,000 ft.; testing of ramjet engines in direct-connect (DC) or semi-free jet (SFJ) configurations; testing of solid fuel propellants consecutively in the booster phase, the transient separation phase, and the subsequent ramjet phase.

Data Acquisition

Testing Capabilities/Current Programs

Ramjet engine flight conditions and engine performance.

Planned Improvements

User Fees

Contact Information

Japan Defense Agency (JDA), Technical Research and Development Institute (TRDI), 3rd Research Center, 1st Division, 1-2-10, Sakae-cho, Tachikawa-shi, Tokyo, 190-8533, Japan. Wind tunnel located at: Aerodynamic and Propulsion Test Facility of the Sapporo Test Center, 1032, Komasato, Chitose-shi, Hokkaido, 066-0011, Japan. Tel: (81) 123 42 3501.
Tel.: (81) 425 24 2411, Email: info@jda-trdi.go.jp, Web site: http://www.jda-trdi.go.jp/happyou.htm.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Supersonic | Japan

Installation Name	**Test Section Size**	**Speed Range**
Japan Defense Agency (JDA), Technical Research and Development Institute (TRDI), Tachikawa, Japan	4.3 m (diameter), 12 m (long)	0 to 2.5
		Temperature Range
	Date Built/Upgrade	-72 to +270°C
Facility Name	2002	**Reynolds Number (million)**
High Altitude Engine Test Facility (ATF)		
	Cost	
		Dynamic Pressure
		3.5 to 101.3 kPa
	Operational Status	**Stagnation Pressure**
	Presumed active as of December 2005	

Supplementary Technical Parameters

Largest facility of its kind in Japan. Air flow: 0 – 70 kg/sec. Engine intake pressure: 7.5 – 244 kPa. Intermediate pressure air source: two IHI LM 1600 centrifugal air compressor gas turbines with a pressure of 686 kPa and a flow rate of 35 kg/sec. Test section can mount engines up to 1.5 tons.

Data Acquisition

Testing Capabilities/Current Programs

Jet engine high altitude performance up to 75,000 ft.

Planned Improvements

User Fees

Contact Information

Japan Defense Agency (JDA), Technical Research and Development Institute (TRDI), 3rd Research Center, 1st Division, 1-2-10, Sakae-cho, Tachikawa-shi, Tokyo, 190-8533, Japan. Wind tunnel located at: Aerodynamic and Propulsion Test Facility of the Sapporo Test Center, 1032, Komasato, Chitose-shi, Hokkaido, 066-0011, Japan. Tel: (81) 123 42 3501.
Tel.: (81) 425 24 2411, Email: info@jda-trdi.go.jp, Web site: http://www.jda-trdi.go.jp/happyou.htm.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Supersonic | Japan

Installation Name	**Test Section Size**	**Speed Range**
Japan Defense Agency (JDA), Technical Research and Development Institute (TRDI), Tachikawa, Japan	2 x 2 m	0.3 to 4.0 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	1995	**Reynolds Number (million)**
Trisonic Wind Tunnel		100 and up
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of December 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Type: intermittent blow-down. Measuring time: 10 seconds or more. Interval between tests: within 45 minutes. Noise level: 65 Db and below.

Data Acquisition

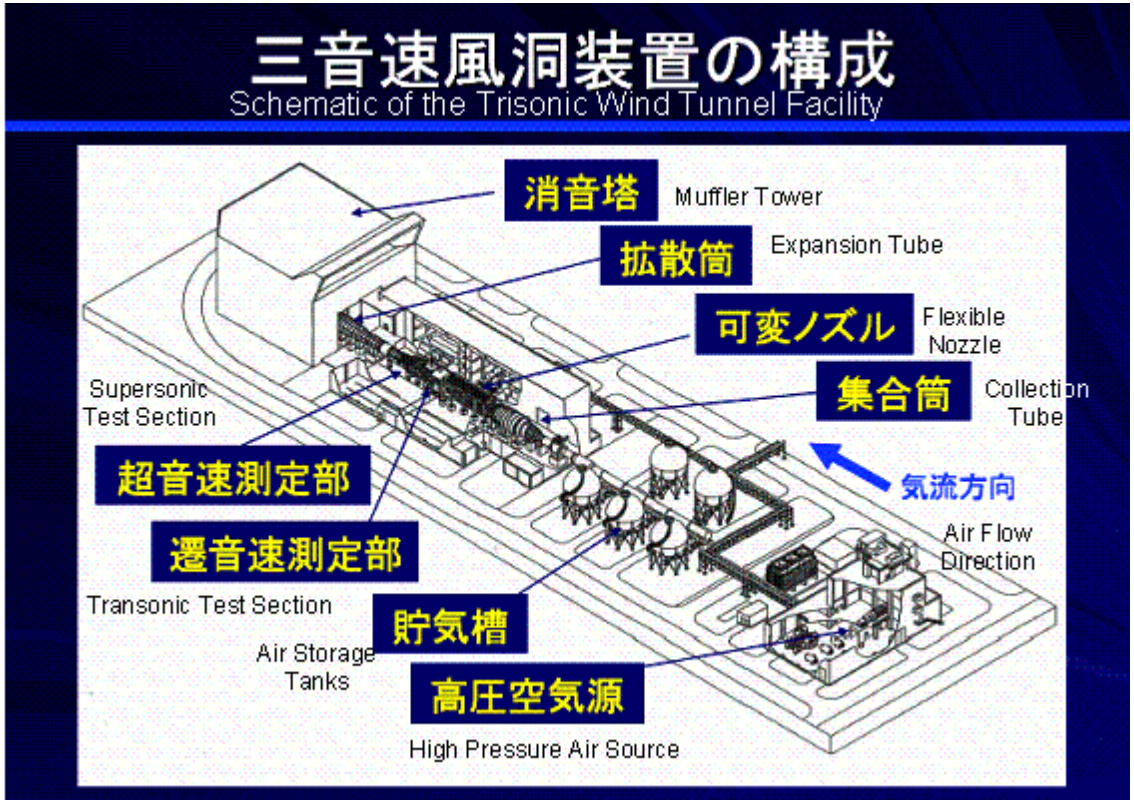
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Japan Defense Agency (JDA), Technical Research and Development Institute (TRDI), 3rd Research Center, 1st Division, 1-2-10, Sakae-cho, Tachikawa-shi, Tokyo, 190-8533, Japan. Wind tunnel located at: Aerodynamic and Propulsion Test Facility of the Sapporo Test Center, 1032, Komasato, Chitose-shi, Hokkaido, 066-0011, Japan. Tel: (81) 123 42 3501.
Tel.: (81) 425 24 2411, Email: info@jda-trdi.go.jp, Web site: http://www.jda-trdi.go.jp/happyou.htm.



Trisonic Wind Tunnel, Japan Defense Agency (JDA), Technical Research and Development Institute (TRDI), Tachikawa, Japan. Located at the Aerodynamic and Propulsion Test Facility, Sapporo Test Center Hokkaido, Japan.

European and Asian Wind Tunnels

Supersonic | Japan

Installation Name	**Test Section Size**	**Speed Range**
Mitsubishi Heavy Industries Kobe Shipyard and Machinery Works (MHI Kobe), Kobe, Japan	600 mm (nozzle exit diameter)	0.4 to 4.0 Mach
		Temperature Range
	Date Built/Upgrade	Room temperature
Facility Name		**Reynolds Number (million)**
60 cm Trisonic Wind Tunnel		2
	Cost	
		Dynamic Pressure
		1.18 Mpa (max)
	Operational Status	**Stagnation Pressure**
	Presumed active as of December 2005	

Supplementary Technical Parameters

This wind tunnel covers subsonic, transonic, and supersonic regimes; it has been named trisonic by the manufacturer. Intermittent blow out. Nozzle outlet: 0.6 x 0.6 m. Blowing time: 20 seconds at Mach 1.0, 35 seconds at Mach 2.5. Air source: spherical air tank with an inside diameter of 8 meters.

Data Acquisition

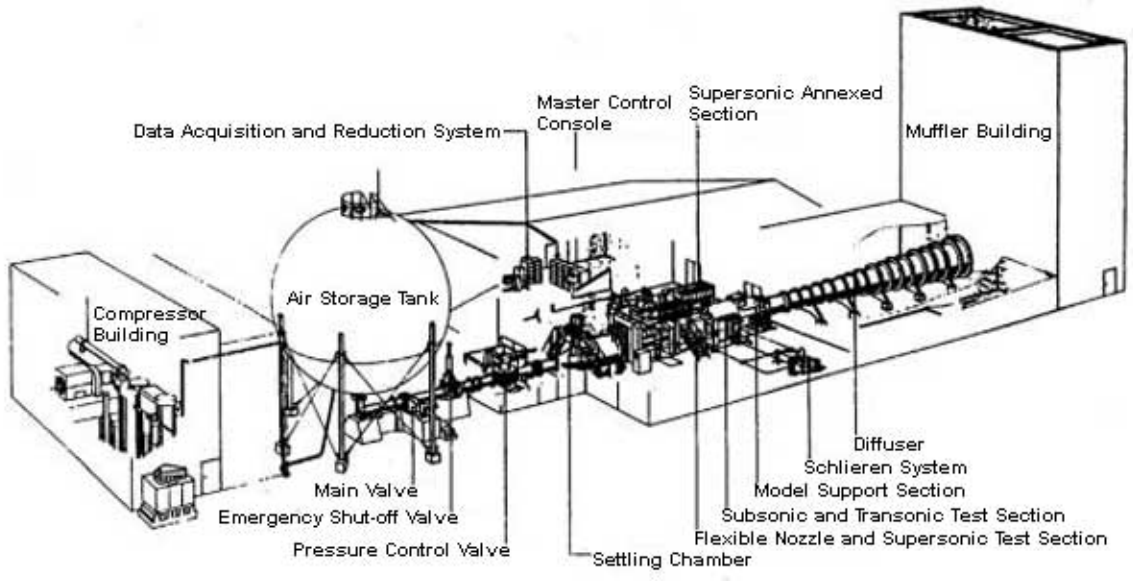
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Mitsubishi Heavy Industries Kobe Shipyard and Machinery Works (MHI Kobe), Main Plant, 1-1, Wadasaki-cho 1-chome, Hyogo-ku, Kobe, 652-8585 Japan.
Tel: (81) 78 672 2221 2224, Fax: (81) 78 672 2245, Web site: http://www.mhi.co.jp/kobe/mhikobe-e/products/etc/siken/high_index.html.



60 cm Trisonic Wind Tunnel, Mitsubishi Heavy Industries Kobe Shipyard and Machinery Works (MHI Kobe), Kobe, Japan.

European and Asian Wind Tunnels

Supersonic | Japan

Installation Name	**Test Section Size**	**Speed Range**
Mitsubishi Heavy Industries Kobe Shipyard and Machinery Works (MHI Kobe), Kobe, Japan		0.2 to 2.5 Mach
		Temperature Range
	Date Built/Upgrade	90 to 300° K
Facility Name	Currently in the planning stage	**Reynolds Number (million)**
Continuous Circulation Cryogenic Wind Tunnel		up to 240
	Cost	**Dynamic Pressure**
		110 to 500 kPa
	Operational Status	**Stagnation Pressure**
	Currently in the planning stage.	

Supplementary Technical Parameters

Liquid nitrogen injected upstream; gaseous nitrogen exhausted downstream. Blowing time maximum 30 minutes.

Data Acquisition

Testing Capabilities/Current Programs

To be used for prediction of turbulence transition and flow separation points.

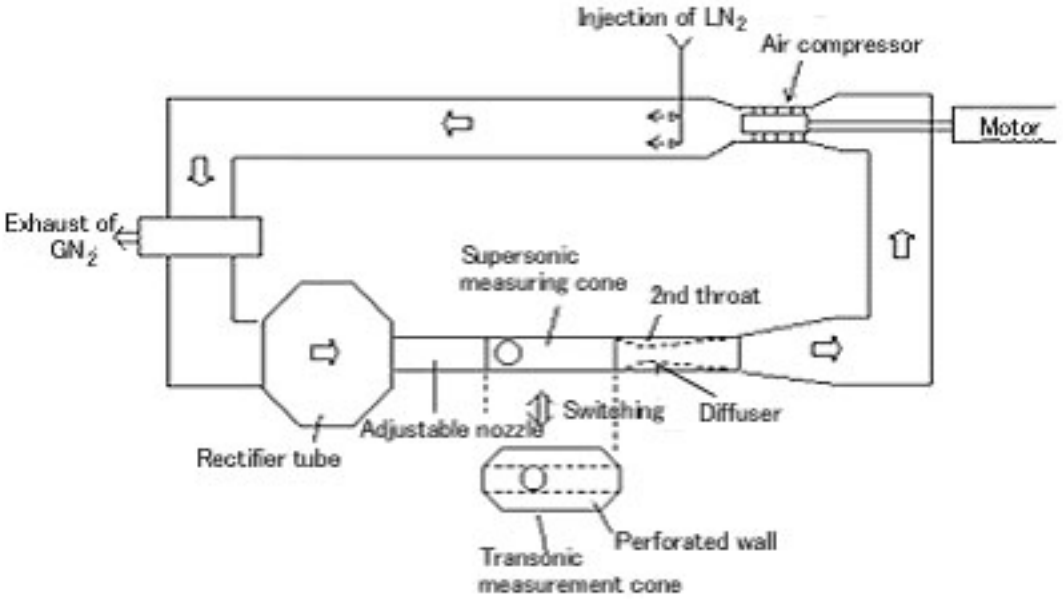
Planned Improvements

Quiet supersonic nozzle.

User Fees

Contact Information

Mitsubishi Heavy Industries Kobe Shipyard and Machinery Works (MHI Kobe), Main Plant, 1-1, Wadasaki-cho 1-chome, Hyogo-ku, Kobe, 652-8585 Japan.
Tel: (81) 78 672 2221-2224, Fax: (81) 78 672 2245, Web site: http://www.mhi.co.jp/kobe/mhikobe-e/products/etc/siken/high_index.html.



Continuous Circulation Cryogenic Wind Tunnel,
Mitsubishi Heavy Industries Kobe Shipyard and Machinery Works (MHI Kobe),
Kobe, Japan.

European and Asian Wind Tunnels

Supersonic | Netherlands

Installation Name	**Test Section Size**	**Speed Range**
Delft University of Technology (TUDELFT), High-Speed Laboratory, Delft, The Netherlands	150 x 150 mm	0.7 to 3.0 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
ST-15 Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of October 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Blow-down wind tunnel. Runtime 800 seconds. Interchangeable nozzle blocks.

Data Acquisition

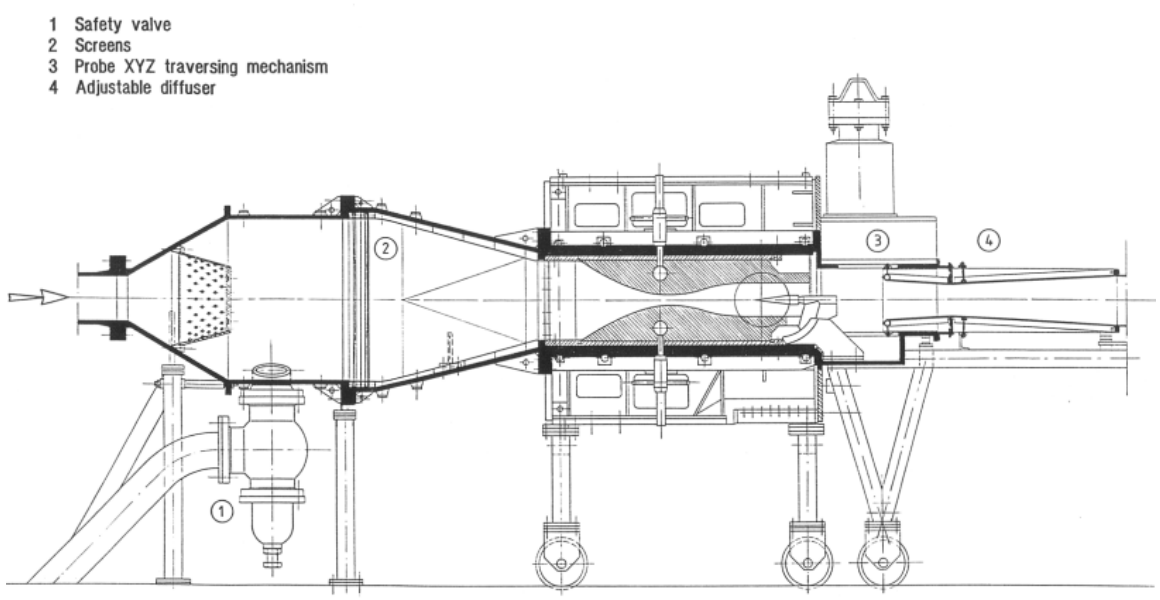
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

High-Speed Laboratory, Delft University of Technology (TUDELFT), Kluyverweg 1, 2629 HS Delft, The Netherlands.
Tel: (31) 15 2784501, Fax: (31) 15 2787077, Web site: http://www.aero.lr.tudelft.nl/ae_facilities_fr.html.



ST-15 Wind Tunnel

ST-15 Wind Tunnel, Delft University of Technology (TUDELFT), Delft, The Netherlands.

European and Asian Wind Tunnels

Supersonic | Netherlands

Installation Name	Test Section Size	Speed Range
Delft University of Technology (TUDELFT), High-Speed Laboratory, Delft, The Netherlands	30 x 30 mm	1.5 to 3.5 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	1969	**Reynolds Number (million)**
ST-3 Vacuum Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of October 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Supersonic, small vacuum wind tunnel. Runtime 2 hours. Semiflexible symmetrical or fixed asymmetrical test section selectable, 50 kW vacuum pump, silica gel dryer.

Data Acquisition

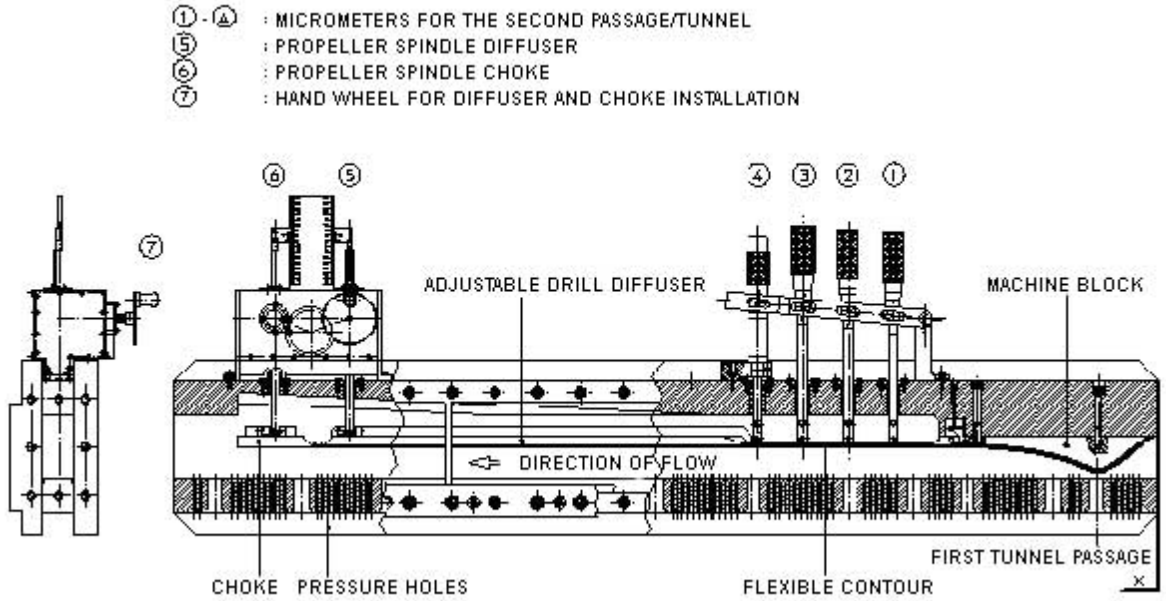
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

High-Speed Laboratory, Delft University of Technology (TUDELFT), Kluyverweg 1, 2629 HS Delft, The Netherlands.
Tel: (31) 15 2784501, Fax : (31) 15 2787077, Web site: http://www.aero.lr.tudelft.nl/ae_facilities_fr.html.



ST-3 Vacuum Wind Tunnel, Delft University of Technology (TUDELFT), Delft, The Netherlands.

European and Asian Wind Tunnels

Supersonic | Netherlands

Installation Name	**Test Section Size**	**Speed Range**
Delft University of Technology (TUDELFT), High-Speed Laboratory, Delft, The Netherlands	280 x (250-270) mm (closed or slotted)	#1: 0.5 to 0.85 Mach (subsonic), #2: 1.15 to 4.2 Mach (supersonic)
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
TST-27 Transonic/Supersonic Wind Tunnel		38 (transonic) to 130 (Mach 4.0)
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of October 2005	**Stagnation Pressure**
		High

Supplementary Technical Parameters

Blow-down wind tunnel. Runtime 350 seconds. Single jack semi-flexible nozzle. 220-kW electric motor.

Data Acquisition

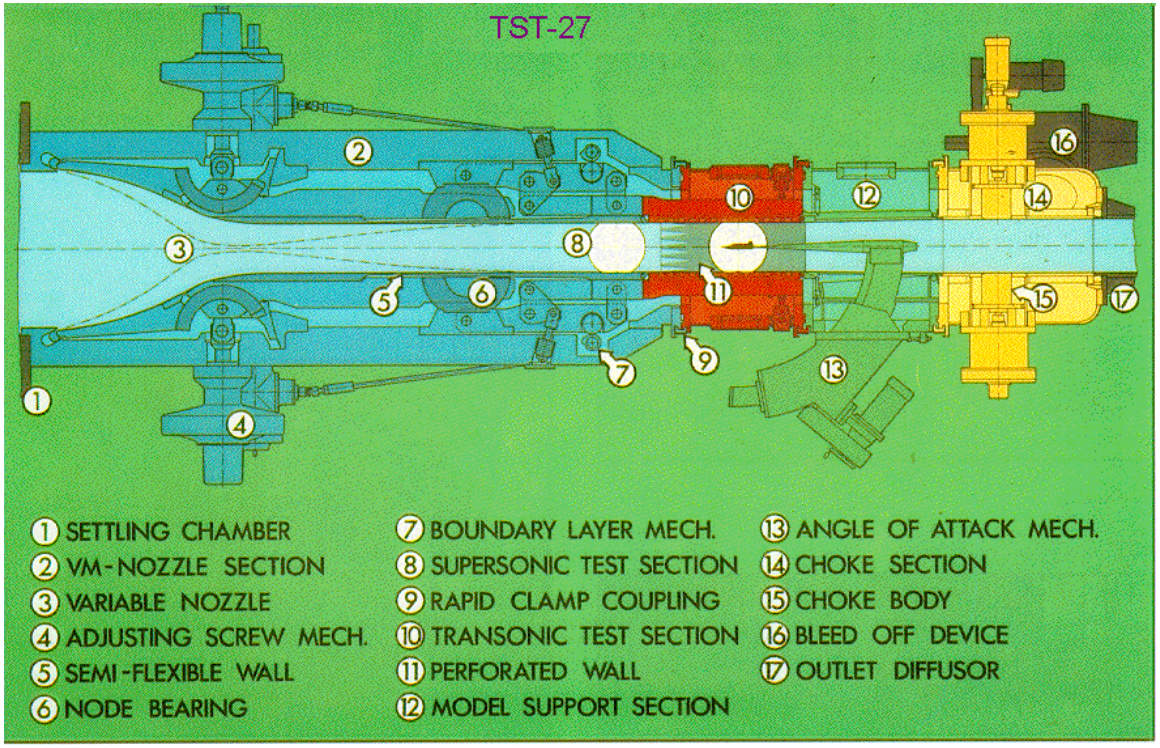
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

High-Speed Laboratory, Delft University of Technology (TUDELFT), Kluyverweg 1, 2629 HS Delft, The Netherlands.
Tel: (31) 15 2784501, Fax : (31) 15 2787077, Web site: http://www.aero.lr.tudelft.nl/ae_facilities_fr.html.



TST-27 Transonic Wind Tunnel, Delft University of Technology (TUDELFT), Delft, The Netherlands.

European and Asian Wind Tunnels

Supersonic | Netherlands

Installation Name	**Test Section Size**	**Speed Range**
German-Dutch Wind Tunnels (DNW), Amsterdam, The Netherlands	2.0 x 1.8 m	.01 to 1.35 Mach
		Temperature Range
	Date Built/Upgrade	300 to 310°K
Facility Name	1960/1997(new fan drive completed)	**Reynolds Number (million)**
2.0 x 1.8 m Continuous Pressurized Wind Tunnel (HST)	**Cost**	9
		Dynamic Pressure
	Operational Status	
	Presumed active as of September 2005	**Stagnation Pressure**
		0.2 to 4.0 bar

Supplementary Technical Parameters

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Ir. G.H. Hegen, German-Dutch Wind Tunnels (DNW), Anthony Fokkerweg 2, 1059 CM Amsterdam, The Netherlands.
Tel: (31) 527 24 8519, Fax: (31) 527 24 8582, Email: info@dnw.aero, Web site: http://www.dnw.aero/.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Supersonic | Netherlands

Installation Name	**Test Section Size**	**Speed Range**
German-Dutch Wind Tunnels (DNW), Amsterdam, The Netherlands	1.2 x 1.2 m	1.2 to 4.0 Mach
		Temperature Range
	Date Built/Upgrade	290°K
Facility Name	1964/1973/1999	**Reynolds Number (million)**
Supersonic Blow-Down Wind Tunnel (SST)		15
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of September 2005	1470 kPa

Supplementary Technical Parameters

The supersonic wind tunnel DNW-SST is a blow-down facility fed by an air storage vessel containing 600 m^3 of dry air at a maximum pressure of about 4,000 kPa.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

A flexible top and bottom walls were provided in 1973. In 1999, a major overhaul was carried out.

User Fees

Contact Information

Ir. G.H. Hegen, German-Dutch Wind Tunnels (DNW), Anthony Fokkerweg 2, 1059 CM Amsterdam, The Netherlands.
Tel: (31) 527 24 8519, Fax: (31) 527 24 8582, Email: info@dnw.aero, Web site: http://www.dnw.aero/.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Supersonic | Singapore

Installation Name	**Test Section Size**	**Speed Range**
National University of Singapore, Department of Mechanical Engineering, Singapore	1.2 x 1.2 m	0.25 to 4 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	early 2004	**Reynolds Number (million)**
DSO Trisonic Wind Tunnel		
	Cost	
	US$30 million (construction cost)	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed operational as of December 2005.	

Supplementary Technical Parameters

Tunnel relocated from the United States. Refurbished and installed by Aero Systems Engineering (ASE) of St. Paul, Minnesota. A joint project of the Ministry of Defense and the National University of Singapore. Can operate at subsonic, transonic, and supersonic speeds.

Data Acquisition

ASE 2000 control and data system

Testing Capabilities/Current Programs

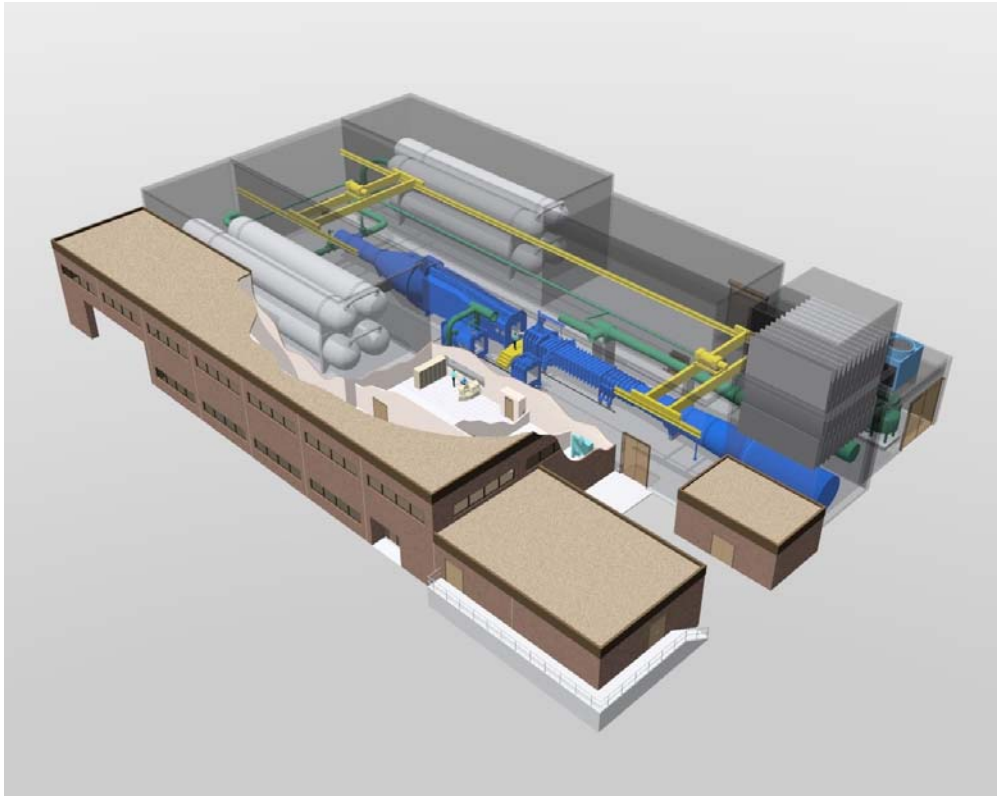
Supports the needs of Singapore Ministry of Defense in the area of aeronautics and to promote R&D activities in aerodynamics and aeronautics technology. The facility is also used by staff members of the Department of Mechanical Engineering at the National University of Singapore to carry out research and teaching activities related to aerodynamics.

Planned Improvements

User Fees

Contact Information

Chye-Lee Soo Leng, Department of Mechanical Engineering, Block EA #07-08, 9 Engineering Drive 1, Singapore 117576.
Tel: (65) 6874 2212/6874 4498, Fax: (65) 6779 1459, Email: mpesec@nus.edu.sg, Web site: http://www.me.nus.edu.sg/mehighlights/windtunnel.html.



DSO Trisonic Wind Tunnel, National University in Singapore, Department of Mechanical Engineering, Singapore.

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Hypersonic Wind Tunnels

European and Asian Wind Tunnels

Hypersonic | Belgium

Installation Name	Test Section Size	Speed Range
Von Karman Institute for Fluid Dynamics (VKI), Saint Genese, Belgium	12 cm (diameter)	6 Mach
		Temperature Range
	Date Built/Upgrade	550 to 575°K
Facility Name		**Reynolds Number (million)**
H-3 Hypersonic Wind Tunnel		3 to 30
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of September 2005	**Stagnation Pressure**
		10 to 35 bar

Supplementary Technical Parameters

Blow-down wind tunnel. The H-3 wind tunnel air is supplied from a pebble-bed, flow speed 1000 m/s, flow temperature –210 degrees C, flow pressure 0.007-0.025 bar.

Data Acquisition

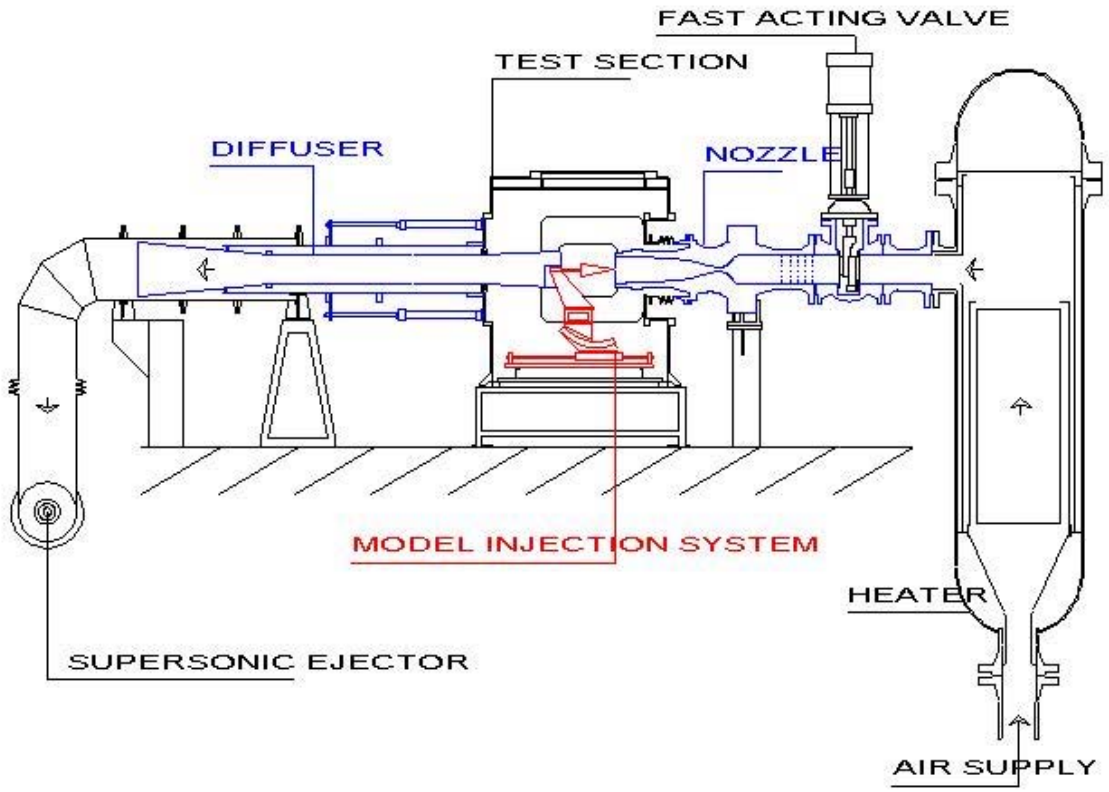
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Olivier Chazot, Von Karman Institute for Fluid Dynamics, B-1640 Rhode, Genese, Belgium.
Tel: (32) 02 359 11, Fax: (32) 02 359 96 00, Email: chazot@vki.ac.be, Web site: http://www.vki.ac.be/ar-dept/virtual/facility/h3/h3.html.



H-3 Hypersonic Wind Tunnel, Von Karman Institute (VKI), St. Genese, Belgium.

European and Asian Wind Tunnels

Hypersonic | Belgium

Installation Name	**Test Section Size**	**Speed Range**
Von Karman Institute for Fluid Dynamics (VKI), Saint Genese, Belgium	0.43 (nozzle exit diameter)	15 to 20 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Longshot Free-Piston Gun Wind Tunnel		5 to 15
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of September 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Free piston tunnel. A Mach-14 contoured nozzle of 0.43 m exit diameter and a 6° conical nozzle of 0.60 m exit diameter.

Data Acquisition

64 Channels, 50 KHz.

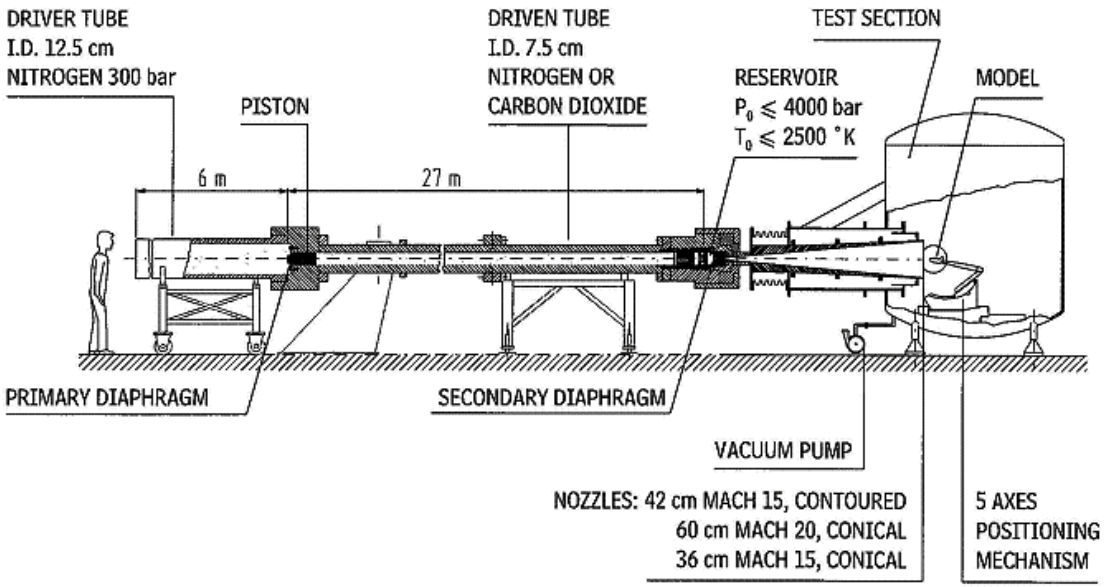
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Olivier Chazot, Von Karman Institute for Fluid Dynamics, B-1640 Rhode, Genese, Belgium.
Tel: (32) 02 359 11, Fax: (32) 02 359 96 00, Email: chazot@vki.ac.be, Web site: http://www.vki.ac.be/ar-dept/virtual/facility/longshot/longshot.html.



Longshot Free-Piston Gun Wind Tunnel,
Von Karman Institute for Fluid Dynamics (VKI),
St. Genese, Belgium.

European and Asian Wind Tunnels

Hypersonic | China

Installation Name	Test Section Size	Speed Range
China Academy of Aerospace Aerodynamics (CAAA), Beijing, China AKA: Beijing Institute of Aerodynamics (BIA) or 701st Institute of the China Aerospace Science & Technology Corp (CASC)	0.4 to 0.5 (nozzle exit diameter)	8, 12, 15 Mach
		Temperature Range
	Date Built/Upgrade	900 to 1500°K
Facility Name		**Reynolds Number (million)**
FD-20 Hypervelocity Conventional Piston-Gun Wind Tunnel		30 (max)
	Cost	**Dynamic Pressure**
		6 to 100 Mpa
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005	30 to 750 bar

Supplementary Technical Parameters

Nozzle exit diameter 0.4 – 0.5 m. Both driver gas and test gas are air and nitrogen. Run time 15 – 30 m/sec.

Data Acquisition

Testing Capabilities/Current Programs

Pressure and force measurements of hypervelocity vehicle models, aerodynamic heat transfer tests, model free flight dynamic stability, stage separation, hot and cold jet simulation, rocket firing, shock interaction, and flow visualization.

Planned Improvements

User Fees

Contact Information

Li Feng (Director), China Academy of Aerospace Aerodynamics (CAAA), 17 Yungang West Road, Fengtai District, Beijing 100074, China.
Tel: (86) 10 68740603, Fax: (86) 10 68374758, Email: caaa@bia701.com, Web site: http://www.bia701.com/html/e_19_fd22_10.htm.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Hypersonic | China

Installation Name	**Test Section Size**	**Speed Range**
China Academy of Aerospace Aerodynamics (CAAA), Beijing, China AKA: Beijing Institute of Aerodynamics (BIA) or 701st Institute of the China Aerospace Science & Technology Corp (CASC)	0.42 to 0.5 (nozzle exit diameter)	15, 20, 25 Mach
		Temperature Range
	Date Built/Upgrade	1,500 to 3,000°K
Facility Name		**Reynolds Number (million)**
FD-22 Hypervelocity, Longshot Free Piston-Gun Wind Tunnel		30 (max)
	Cost	
		Dynamic Pressure
		100 Mpa
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005	4000 bar

Supplementary Technical Parameters

Nozzle exit diameter 0.42 – 0.50 m. Both driver gas and test gas are nitrogen. Run time 20 – 40 m/sec. This institute also has several arc-heated wind tunnels ranging from subsonic to hypersonic, but details are not provided.

Data Acquisition

Testing Capabilities/Current Programs

Pressure and force measurements of hypervelocity vehicle models, aerodynamic heat transfer tests, model free flight dynamic stability, stage separation, hot and cold jet simulation, rocket firing, shock interaction, and flow visualization.

Planned Improvements

User Fees

Contact Information

Li Feng (Director), China Academy of Aerospace Aerodynamics (CAAA), 17 Yungang West Road, Fengtai District, Beijing 100074, China.
Tel: (86) 10 68740603, Fax: (86) 10 68374758, Email: caaa@bia701.com, Web site: http://www.bia701.com/html/e_19_fd22_10.htm.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Hypersonic | China

Installation Name	**Test Section Size**	**Speed Range**
China Academy of Aerospace Aerodynamics (CAAA), Beijing, China AKA: Beijing Institute of Aerodynamics (BIA) or 701st Institute of the China Aerospace Science & Technology Corp (CASC)	1.2 x 1.4 x 1.8 m (two lines)	Line #1: 5 to 8 Mach; Line #2: 10 to 12 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Hypersonic Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Free jet, intermittent type. Nozzle exit 0.5 m diameter. Body of the tunnel is divided into two lines: plate heater in the 1st, pebble bed heater in the 2nd. Can perform unconventional tests continuously for over 10 minutes. This wind tunnel is part of a three-tunnel hypersonic wind tunnel complex. The other two are research tunnels, one of which has a Mach number range of 3.5 – 8.0, and the other of which has a Mach number range of 5.0 – 10.

Data Acquisition

Testing Capabilities/Current Programs

Tests on: aircraft model aerodynamics, aircraft aero-dynamic heat transfer and coating scouring, engine jet flow, aero-optics. Measurement of: dynamic and stagnation pressure on aircraft models, reentry body aerodynamic characteristics, control surface hinge moment characteristics. Simulations of: interstage separation, thrust vector control, low-temperature ablation and particle erosion. Research on boundary layer transitions and shockwave-boundary layer interference.

Planned Improvements

User Fees

Contact Information

Li Feng (Director), China Academy of Aerospace Aerodynamics (CAAA), 17 Yungang West Road, Fengtai District, Beijing 100074, China.
Tel: (86) 10 68740603, Fax: (86) 10 68374758, Email: caaa@bia701.com, Web site: http://www.bia701.com/html/e_18_f500_04.htm.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Hypersonic | China

Installation Name	**Test Section Size**	**Speed Range**
Key Laboratory of High-Temperature Gas Dynamics (LHD), Beijing, China		5.6 Mach
		Temperature Range
	Date Built/Upgrade	2,000°K
Facility Name		**Reynolds Number (million)**
Hypersonic Propulsion Test Facility (HPTF)		
	Cost	
		Dynamic Pressure
		5 Mpa
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005	

Supplementary Technical Parameters

Flow rate: 4 kg/sec for 10 seconds.

Data Acquisition

Testing Capabilities/Current Programs

Model tests of scramjets.

Planned Improvements

User Fees

Contact Information

Professor Jiang Zonglin (Director), Key Laboratory of High Temperature Gas Dynamics (LHD), No.15 Beisihuanxi Road, Beijing 100080, China.
Tel (Lab): (86) 10 62548132, Tel (Director): (86) 10 62545947, Fax (Director): (86) 10 62657081, Email (Director): zljiang@imech.ac.cn, Web site: http://www.lhd.cn.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Hypersonic | China

Installation Name	**Test Section Size**	**Speed Range**
Key Laboratory of High-Temperature Gas Dynamics (LHD), Beijing, China		7 to 20 Mach
		Temperature Range
	Date Built/Upgrade	ip to 9,000°K
Facility Name	Lab - 1994, wind tunnel - unknown.	**Reynolds Number (million)**
JF-10 Oxygen-Hydrogen Detonation-Driven High Enthalpy Shock Wind Tunnel	**Cost**	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**
		800 bar

Supplementary Technical Parameters

Data Acquisition

Testing Capabilities/Current Programs

Experimental research on real gas effects of high temperature flows.

Planned Improvements

User Fees

Contact Information

Professor Jiang Zonglin (Director), Key Laboratory of High Temperature Gas Dynamics (LHD), No.15 Beisihuanxi Road, Beijing 100080, China.
Tel (Lab): (86) 10 62548132, Tel (Director): (86) 10 62545947, Fax (Director): (86) 10 62657081, Email (Director): zljiang@imech.ac.cn, Web site: http://www.lhd.cn.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Hypersonic | China

Installation Name	**Test Section Size**	**Speed Range**
Key Laboratory of High-Temperature Gas Dynamics (LHD), Beijing, China	0.8 m (nozzle exit diameter)	6.5 to 15 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	1994	**Reynolds Number (million)**
JF-8 Hypersonic Shock Wind Tunnel Gun Wind Tunnel	**Cost**	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Run time: 20 – 30 m/sec.

Data Acquisition

Testing Capabilities/Current Programs

Experimental research on vehicle aerodynamic force and heat transfer of hypersonic flight.

Planned Improvements

User Fees

Contact Information

Professor Jiang Zonglin (Director), Key Laboratory of High Temperature Gas Dynamics (LHD), No.15 Beisihuanxi Road, Beijing 100080, China.
Tel (Lab): (86) 10 62548132, Tel (Director): (86) 10 62545947, Fax (Director): (86) 10 62657081, Email (Director): zljiang@imech.ac.cn, Web site: http://www.lhd.cn.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Hypersonic | France

Installation Name	**Test Section Size**	**Speed Range**
ONERA French Aeronautics and Space Research Center, Chalais-Meudon, France	#1: 0.190 m; #2: 0.325 m (nozzle exit diameters)	#1: 3, 4 Mach; #2: 5, 6, 7 Mach
		Temperature Range
	Date Built/Upgrade	up to 700°K
Facility Name		**Reynolds Number (million)**
R2Ch Hypersonic Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of September 2005	variable up to 80 bar

Supplementary Technical Parameters

Long blow-downs from 10 to 60 seconds. Free test section. Variable stagnation temperature up to 700°K, Maximum flow rate: Qmax = 60 kg/s.

Data Acquisition

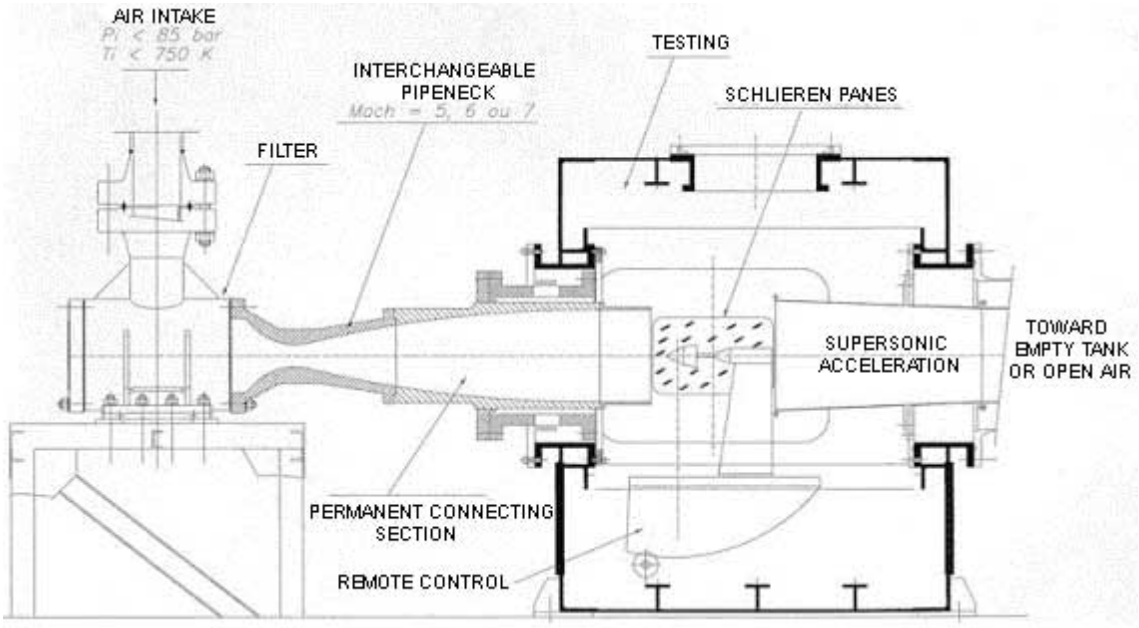
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Bruno Chanetz, Lucien Morzenski, Meudon Center, ONERA – DAFE 8, rue des Vertugadins 92190 Meudon, France.
Tel (Chanetz): (33) 1 46 23 51 76, Tel (Morzenski): (33) 1 46 23 51 46, Fax: (33) 1 46 23 51 58, Email (Chanetz): chanetz@onera.fr, Email (Morzenski): morzenski@onera.fr, Web site: http://www.onera.fr/dafe-en/r1r2ch/index.html.



R2Ch Hypersonic Wind Tunnel, ONERA French Aeronautics and Space Research Center, Chalais-Meudon, France.

European and Asian Wind Tunnels

Hypersonic | France

Installation Name	Test Section Size	Speed Range
ONERA French Aeronautics and Space Research Center, Chalais-Meudon, France	0.350 m (nozzle exit diameter, free test section)	10 Mach
		Temperature Range
	Date Built/Upgrade	1,100° K
Facility Name		**Reynolds Number (million)**
R3Ch Hypersonic Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of September 2005	variable 12 to 120 bar

Supplementary Technical Parameters

Long blow-downs: 10 seconds. Stagnation temperature: 1,100° K. Maximum flow rate: Qmax = 2 kg/s. Rapid initiation by three-way valve.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Bruno Chanetz, Lucien Morzenski, Meudon Center, ONERA – DAFE 8, rue des Vertugadins 92190 Meudon, France.
Tel (Chanetz): (33) 1 46 23 51 76, Tel (Morzenski): (33) 1 46 23 51 46, Fax: (33) 1 46 23 51 58, Email (Chanetz): chanetz@onera.fr, Email (Morzenski): morzenski@onera.fr, Web site: http://www.onera.fr/dafe-en/r1r2ch/contacts.html.

NO SCHEMATIC AVAILABLE

Hypersonic | France

Installation Name	Test Section Size	Speed Range
ONERA French Aeronautics and Space Research Center, Chalais-Meudon, France	0.350 m (nozzle exit diameter, free test section)	10 Mach
		Temperature Range
	Date Built/Upgrade	1,100°K
Facility Name		**Reynolds Number (million)**
R5Ch Hypersonic Wind Tunnel		Unit Reynolds number in free flow: 167,000 m-1
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of September 2005	**Stagnation Pressure**
		2.5 bar (variable)

Supplementary Technical Parameters

Hypersonic flows, continuous molecular regime. Blow-down duration: up to 90 seconds. Stagnation temperature: 1,100°K. Maximum flow rate .030 kg/s. Rapid initiation by three-way valve.

Data Acquisition

Testing Capabilities/Current Programs

Investigation of hypersonic flows in continuous molecular regime at very low Reynolds numbers (simulating fully laminar flows).

Planned Improvements

User Fees

Contact Information

Bruno Chanetz, Lucien Morzenski, Meudon Center, ONERA – DAFE 8, rue des Vertugadins 92190 MEUDON, France.
Tel (Chanetz): (33) 1 46 23 51 76, Tel (Morzenski): (33) 1 46 23 51 46, Fax: (33) 1 46 23 51 58, Email (Chanetz): chanetz@onera.fr, Email (Morzenski): morzenski@onera.fr, Web site: http://www.onera.fr/dafe-en/r1r2ch/contacts.html.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Hypersonic | France

Installation Name	Test Section Size	Speed Range
ONERA French Aeronautics and Space Research Center, Le Fauga Mauzac Center, Le Fauga Mauzac, France	#1: 670 mm; #2: 670 mm; #3: 430 mm; #4: 930 mm (nozzle exit diameters)	#1: 8 to 17 Mach; #2: 7 to 13 Mach; #3: 6 to 11 Mach; #4: 9 to 21 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	1988-1991	**Reynolds Number (million)**
F4 Arc-Heated High-Enthalpy Hypersonic Wind Tunnel	**Cost**	#1: 2; #2: 3; #3: 5; #4: 1
		Dynamic Pressure
	Operational Status	
	Presumed active as of September 2005	**Stagnation Pressure**
		500 bar

Supplementary Technical Parameters

The usual blowdown duration obtained is 200 m/s. The test conditions can reach a total pressure of 500 bar together with an enthalpy of 16,5 mJ/kg (reduced H/RTo = 200).

Data Acquisition

Data acquisition system with 72 channels. Each one has an analog conditioner, an amplifier filter, a 16 bit 50 kHz analog to digital converter and a buffer memory of 64000 samples.

Testing Capabilities/Current Programs

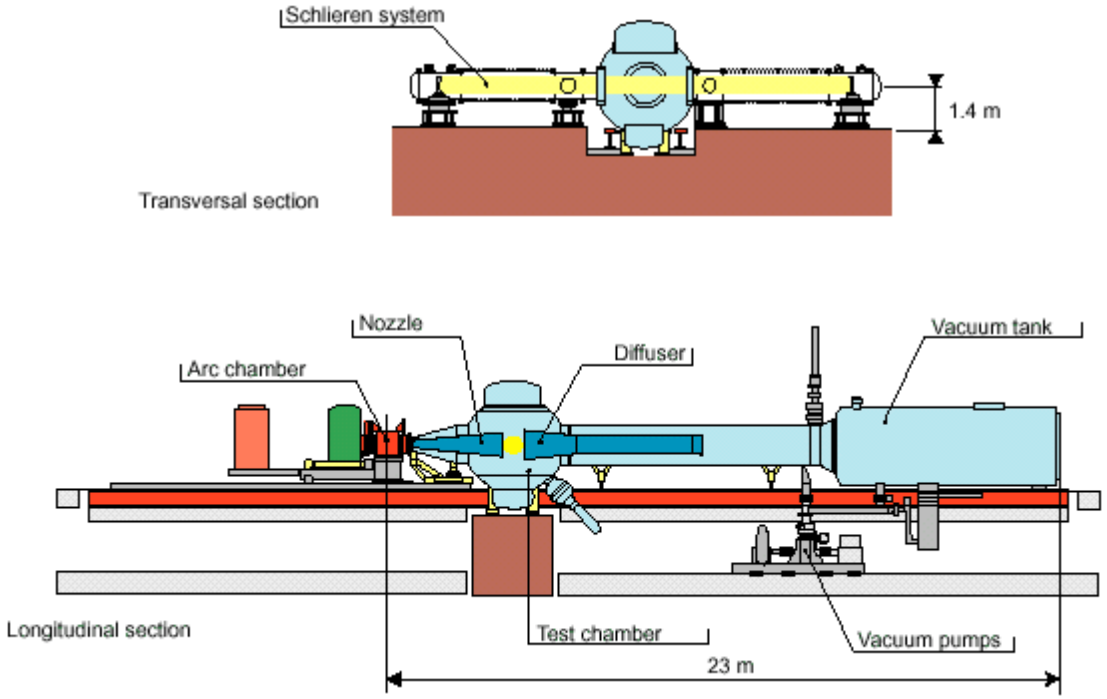
Hypersonic spacecraft reentry.

Planned Improvements

User Fees

Contact Information

Jean-Claude Traineau (Director), Le Fauga-Mauzac Wind Tunnel Department (DSFM), ONERA - GMT, F-31410 NOE, Le Fauga-Mauzac, France.
Tel: (33) 5 61 56 63 01, Fax: (33) 5 61 56 63 63, E-mail: Jean-Claude.Traineau@onera.fr, Email: cfm@onera.fr, Web site: http://www.onera.fr/gmt-en/table.html, http://www.onera.fr/geographie-en/fauga-mauzac.html.



F4 Arc-Heated, High-Enthalpy Hypersonic Wind Tunnel, ONERA French Aeronautics and Space Research Center, Le Fauga-Mauzac Center, Le Fauga-Mauzac, France.

European and Asian Wind Tunnels

Hypersonic | France

Installation Name	Test Section Size	Speed Range
ONERA French Aeronautics and Space Research Center, Modane-Avrieux, France	#1: 0.68 m; #2: 1 m; #3: 1 m (nozzle exit diameters, three interchangeable nozzles)	#1: 6.4 Mach, #2: 10 Mach, #3: M = 12 Mach
		Temperature Range
	Date Built/Upgrade	1,800°K
Facility Name	1970	**Reynolds Number (million)**
S4Ma Blow-Down Hypersonic Wind Tunnel		#1: 1.7; #2: 0.9; #3: 0.35
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of September 2005	up to 150 bar

Supplementary Technical Parameters

Data Acquisition

48 to 72 analog channels, extension up to 120 channels.

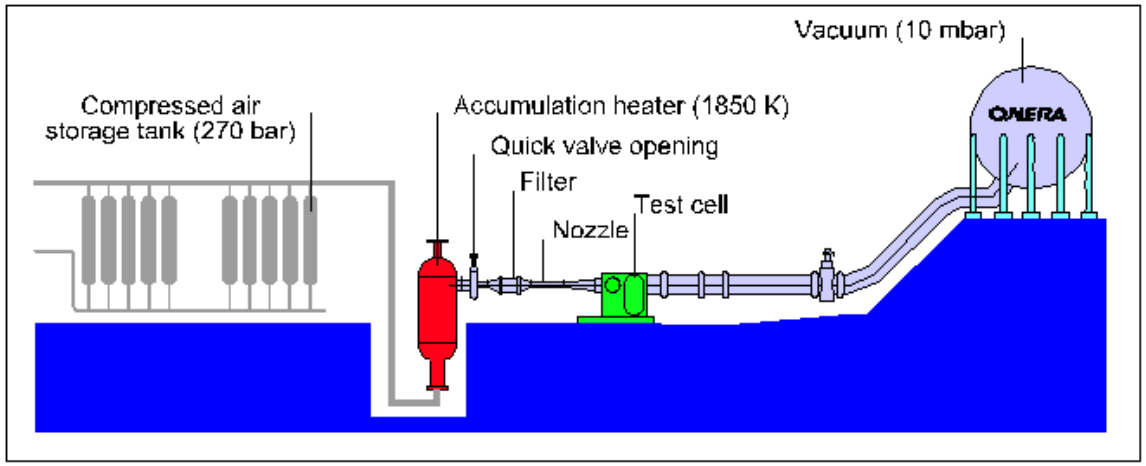
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Jean-Paul Bècle (Director), Modane-Avrieux Wind Tunnel Department, Onera, PO Box 215, F-73500 Modane, France.
Tel: (33) 4 79 20 20 91, Fax: (33) 4 79 20 21 68, Email: becle @ onera.fr, Web site: http://www.onera.fr/gmt-en/wind-tunnels/s1ma-bis.html.



S4Ma Hypersonic Wind Tunnel, ONERA French Aeronautics and Space Research Center, Modane-Avrieux, France.

European and Asian Wind Tunnels

Hypersonic | Germany

Installation Name	**Test Section Size**	**Speed Range**
Carolo-Wilhelmina Technical University at Braunschweig, Institute for Fluid Mechanics (ISM), Braunschweig, Germany	0.5 m (diameter)	6.0 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name		**Reynolds Number (million)**
Hypersonic Ludweig Wind Tunnel (HLB)		3 to 20
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005. 10 runs every hour	**Stagnation Pressure**
		3 to 30 bar

Supplementary Technical Parameters

Generates an intermittent Ma=6 air flow for unit Reynolds numbers up to 20 million. The test section size allows to test models of about 0.2 m length.

Data Acquisition

Instrumentation includes schlieren, infrared thermography, and pressure gauges.

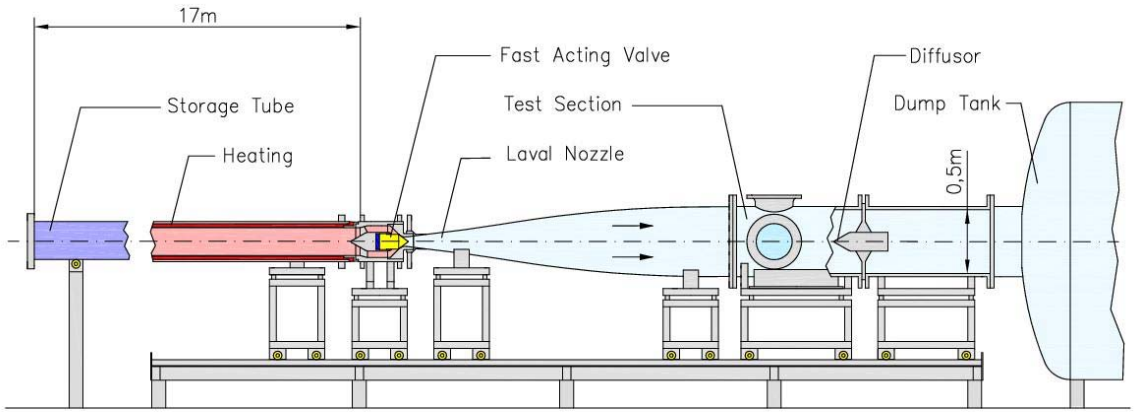
Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Prof. Dr.-Ing R. Radespiel, Department of Mechanical Engineering, Institut für Strömungsmechanik (ISM), Bienroder Weg, 338106 Braunschweig, Germany.
Tel: (49) 531 391 2971, Fax: (49) 531 391 5952, Email: ism@tu-braunschweig.de, Web site: http://www.tu-braunschweig.de/ism/institut/wkanlagen/hlb.



Hypersonic Ludweig Wind Tunnel (HLB), Carolo-Wilhelmina Technical University, Institute for Fluid Mechanics (ISM), Braunschweig, Germany.

Hypersonic | Germany

Installation Name	Test Section Size	Speed Range
German-Dutch Wind Tunnels (DNW), Göttingen, Germany	#1: 0.5 x 0.5 m, #2: 0.5 m (diameter)	#1: 2.9 to 4.65 Mach; #2: 5.0 to 6.9 Mach
		Temperature Range
	Date Built/Upgrade	#1: 300°K (max); #2: 700 °K (max)
Facility Name	1968	**Reynolds Number (million)**
Intermittent Ludwig Tube Wind Tunnel with Two Legs (RWG)	**Cost**	#1: 3.5; #2: 2.2
		Dynamic Pressure
	Operational Status	
	Presumed active as of September 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Intermittent Ludwieg tube with two legs (t = 0.4 sec). Reynolds numbers represent flight altitudes from 10 to 50 km. The RWG has two 80 m long storage tubes (A and B), which are connected by a fast-action valve and exchangeable supersonic nozzles to the test section.

Data Acquisition

Testing Capabilities/Current Programs

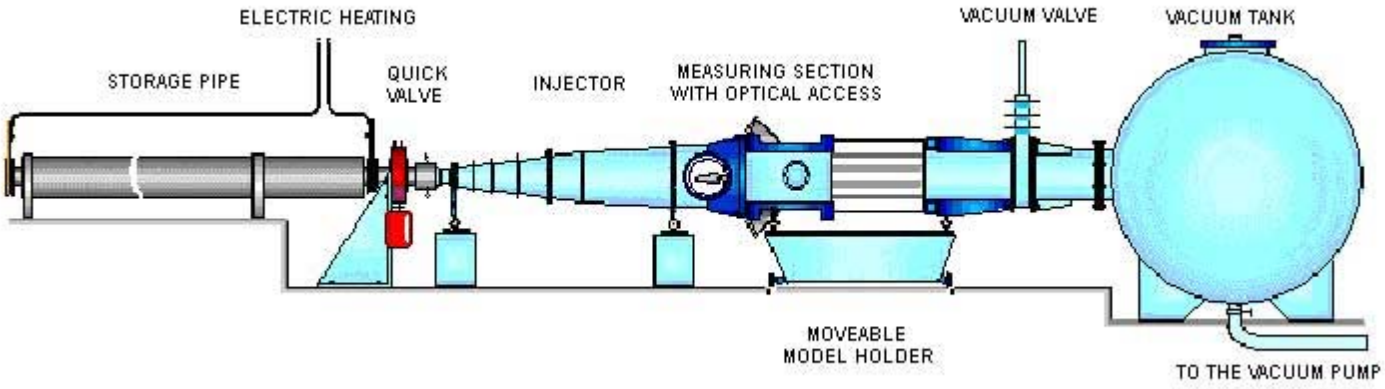
Space vehicle and missile research and development (for example, HERMES, Sänger, ARD, CRV, and X-38).

Planned Improvements

User Fees

Contact Information

Dr.-Ing. K.-W. Bock, German-Dutch Wind Tunnels (DNW), Bunsenstrasse, 10, 37073 Göttingen, Germany.
Tel: (49) 551 709 2820, Fax (49) 551 709 2888, Email: dnw-guk@dnw.aero, Web site: http://www.dnw.aero/.



Intermittent Ludwieg Tube with two legs (RWG),German-Dutch Tunnels (DNW), Göttingen, Germany.

European and Asian Wind Tunnels

Hypersonic | Italy

Installation Name	Test Section Size	Speed Range
Italian Aerospace Research Center (CIRA), Capua, Italy	2 m (diameter)	12 Mach
		Temperature Range
	Date Built/Upgrade	10,000°K
Facility Name		**Reynolds Number (million)**
Scirocco Plasma Hypersonic Wind Tunnel (PWT)		
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of October 2005	

Supplementary Technical Parameters

Hypersonic, thermo-structural. The Scirocco facility is a plasma hypersonic wind tunnel, based on the electric arc heater, with a maximum power of 70 MW .

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Italian Aerospace Research Center (Centro Italiano Ricerche Aerospaziali: CIRA), Via Maiorise, 81043 Capua, Italy.
Tel: (39) 0823 623001, Email: info@cira.it, Web site: http://www.cira.it/.

Scirocco Plasma Hypersonic Wind Tunnel (PWT), Italian Aerospace Research Center (CIRA), Capua, Italy.

European and Asian Wind Tunnels

Hypersonic | Japan

Installation Name	Test Section Size	Speed Range
Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), Tokyo, Japan	0.5 m (nozzle exit diameter)	5, 7, 9, 11 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	1965	**Reynolds Number (million)**
0.5 m Hypersonic Wind Tunnel		
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of December 2005	1 to 1.85 Mpa

Supplementary Technical Parameters

Built by Mitsubishi Heavy Industries. Intermittent blowdown, vacuum suction type wind tunnel. Free jet type test section. Two runs at 60 second duration each. Two interchangeable 18 m^3 air sources at 19.7 MPa each. Two 1150 m^3 vacuum tanks. Two 6500 m^3/hour air blowers.

Data Acquisition

Testing Capabilities/Current Programs

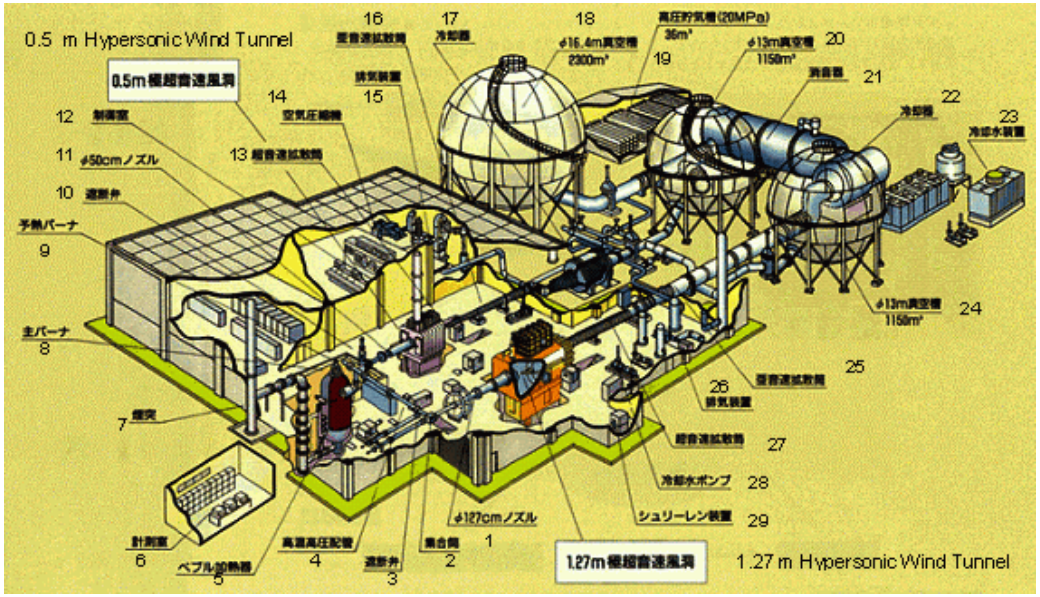
Research on aerodynamics in a supersonic low-turbulence environment.

Planned Improvements

User Fees

Contact Information

Dr. Masashi Shigemi (WINTEC Director), Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), 7-44-1 Jindaiji Higashi-machi, Chofu-shi, Tokyo182-8522, Japan.
Tel: (81) 3 422 40 3000, Fax: (81) 3 422 40 3281, Email (Director): shigemi.masashi@jaxa.jp, Email: wintec@chofu.jaxa.jp, Web site: http://www.iat.jaxa.jp/res/wttc/b04.html.



1.27m極超音速風洞 および 0.5m極超音速風洞全体図

(Schematic of the 1.27 m Hypersonic Wind Tunnel and the 0.5 m Hypersonic Wind Tunnel)

Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), Tokyo, Japan.

1. ø 127 cm Nozzle
2. Settling Chamber
3. Shut-Off Valve
4. High Temperature High Pressure Pipe
5. Vapor Heater
6. Measurement Room
7. Smokestack
8. Main Burner
9. Preheating Burner
10. Shut-Off Valve
11. ø 50 cm Nozzle
12. Control Room
13. Supersonic Diffuser
14. Air Compressor
15. Air Exhaust
16. Subsonic Diffuser
17. Cooler
18. ø 16.4 m Vacuum Tank 2300 m
19. High Pressure Air Storage Tank (20 MPa) 36 m
20. ø 13 m Vacuum Tank 1150 m
21. Muffler
22. Cooler
23. Cooling Water System
24. ø 13 m Vacuum Tank 1150 m
25. Subsonic Diffuser
26. Air Exhaust
27. Supersonic Diffuser
28. Cooling Water Pump
29. Schlieren Device

European and Asian Wind Tunnels

Hypersonic | Japan

Installation Name	**Test Section Size**	**Speed Range**
Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), Tokyo, Japan	1.2 m (nozzle exit diameter)	12 to 20 Mach (4 to 7 km/s)
		Temperature Range
	Date Built/Upgrade	10,000°K (max)
Facility Name	1999	**Reynolds Number (million)**
High Enthalpy Shock Tunnel (HIEST)		
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of December 2005	150 Mpa (max)

Supplementary Technical Parameters

Compression tube: length 42 m, diameter 0.6 m. Shock tube: length 17 m, diameter 0.18 m. Secondary air reservoir capacity: 7.7 m³. Piston weight: 300 – 720 kg. Slot diameter: 0.024 – 0.05 m. Test time: over 2 microseconds. Driver gas: helium, helium/argon. Driver gas temperature: maximum 4,000°K. World's largest free-piston shock wind tunnel. Maximum stagnation enthalpy: 25 MJ/kg.

Data Acquisition

250 channels. Optical measurement system: schlieren device and double exposure hologram interferometer.

Testing Capabilities/Current Programs

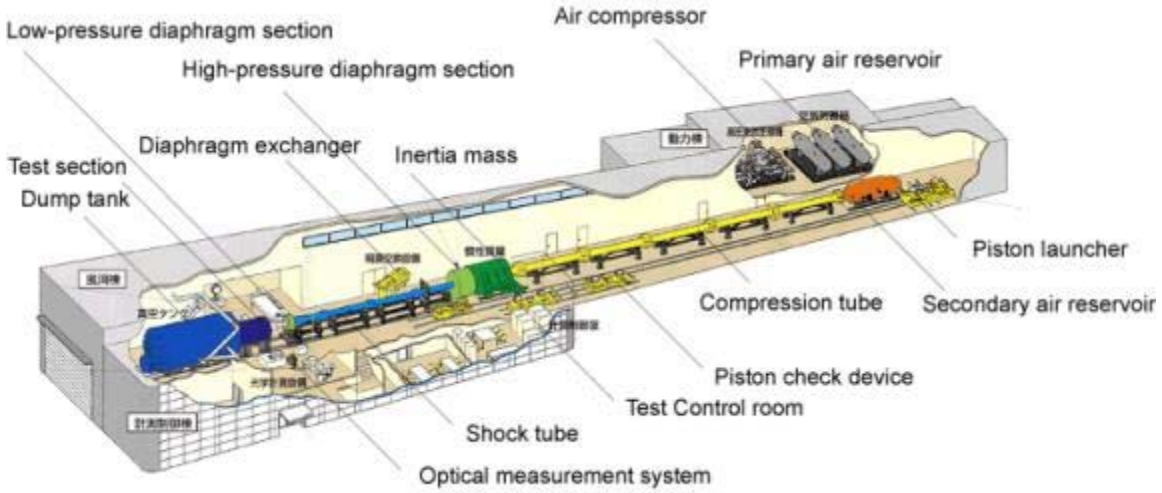
Simulation of the aerothermodynamic flow around reentry space vehicles and combustion characteristics of scramjet engines.

Planned Improvements

User Fees

Contact Information

Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Kakuda Space Center, 1 Koganezawa, Kimigaya, Kakuda-shi, Miyagi 981-1525, Japan.
Tel: (81) 224 68 3111, Fax: (81) 224 68 2860, Web site: http://www.jaxa.jp/about/centers/kspc/index_e.html.



High-Enthalpy Shock Wind Tunnel (HIEST), Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Kakuda Space Center, Miyagi, Japan.

European and Asian Wind Tunnels

Hypersonic | Japan

Installation Name	Test Section Size	Speed Range
Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), Tokyo, Japan	0.44 m (nozzle exit diameter)	10, 12 Mach
		Temperature Range
	Date Built/Upgrade	1,400°K (continuous operation)
Facility Name	1967/1994 (upgrade)	**Reynolds Number (million)**
0.44 m Hypersonic Shock Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	**Stagnation Pressure**
	Presumed active as of December 2005	0.5 to 4 Mpa

Supplementary Technical Parameters

Diaphragm-less shock wind tunnel when under continuous operation. Two-stage compression shock wind tunnel when operating at high enthalpy. Test section: free jet type. Air flow duration 40 milliseconds when under continuous operation, 2 milliseconds at high enthalpy 8 MJ/kg.

Data Acquisition

Testing Capabilities/Current Programs

Research on aerodynamics in a supersonic low-turbulence environment.

Planned Improvements

User Fees

Contact Information

Dr. Masashi Shigemi (WINTEC Director), Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), 7-44-1 Jindaiji Higashi-machi, Chofu-shi, Tokyo182-8522, Japan.
Tel: (81) 3 422 40 3000, Fax: (81) 3 422 40 3281, Email (Director): shigemi.masashi@jaxa.jp, Email: wintec@chofu.jaxa.jp, Web site: http://www.iat.jaxa.jp/res/wttc/b04.html.

Schematic of the 0.44 m Hypersonic Shock Wind Tunnel

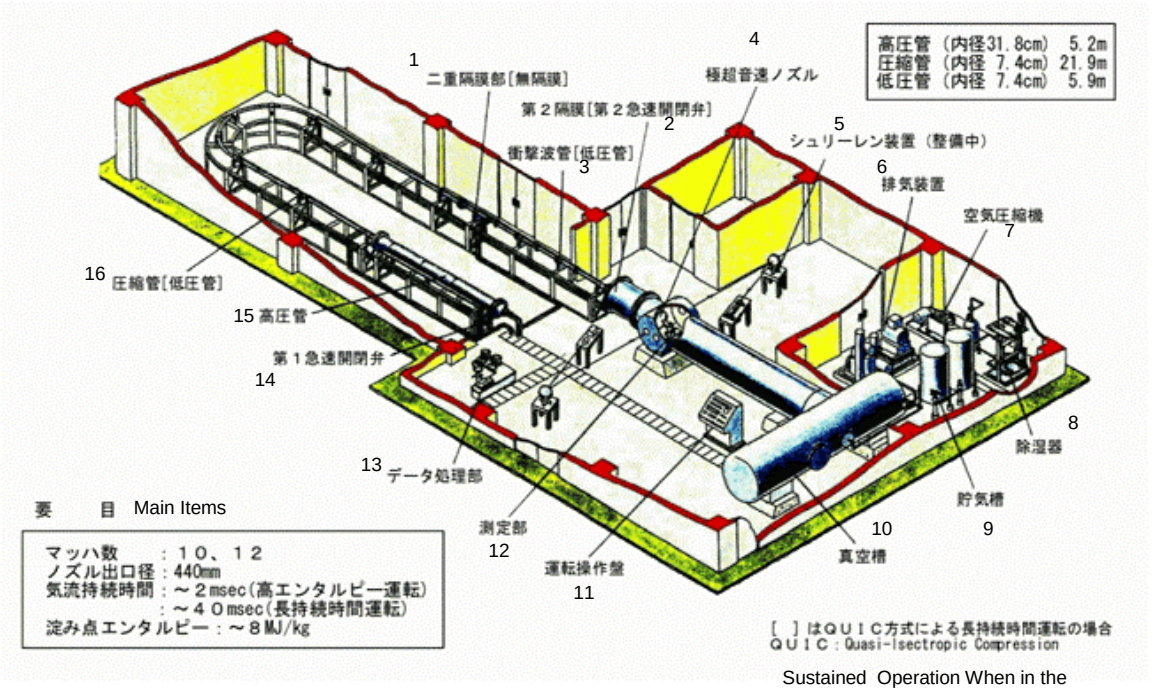
1. Double Diaphragm Section (Diaphragmless)
2. 2nd Diaphragm (2nd Rapid Open-Shut Valve)
3. Shock Tube (Low Pressure Tube)
4. Hypersonic Nozzle
5. Schlieren Device (Built-in)
6. Air Exhaust
7. Air Compressor
8. Dehumidifier
9. Air Storage Tanks
10. Vacuum Tank
11. Operating Panel
12. Test Section
13. Data Processing Section
14. 1st Rapid Open-Shut Valve
15. High Pressure Tube
16. Compression Tube (Low Pressure Tube)

Upper Right Box

High Pressure Tube (Interior Diameter 31.8 cm)
Compressor Tube (Interior Diameter 7.4 cm)
Low Pressure Tube (Interior Diameter 7.4 cm)

Main Items

Mach Number: 10,12
Nozzle Exit Diameter: 440 mm
Air Flow Duration:
~ 2 milliseconds (High Enthalpy Operation)
~ 40 milliseconds (Sustained Operation)
Stagnation Point Enthalpy: ~ 8 MJ/kg



Sustained Operation When in the QUIC Mode

0.44m 極超音速衝撃風洞全体図

0.44m Hypersonic Shock Wind Tunnel, Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), Tokyo, Japan.

European and Asian Wind Tunnels

Hypersonic | Japan

Installation Name	Test Section Size	Speed Range
Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), Tokyo, Japan	1.27 m (nozzle exit diameter)	10 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	1994	**Reynolds Number (million)**
1.27 m Hypersonic Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of December 2005	**Stagnation Pressure**
		1 to 8.5 Mpa

Supplementary Technical Parameters

Built by Mitsubishi Heavy Industries. Intermittent blowdown, vacuum suction type wind tunnel. Free jet type test section.

Data Acquisition

Testing Capabilities/Current Programs

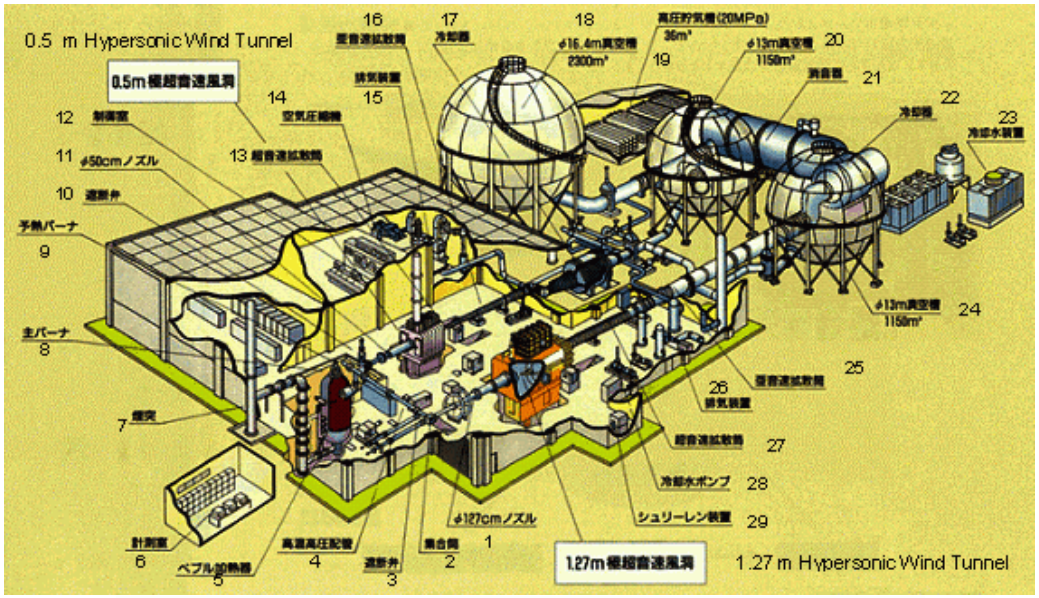
Research on aerodynamics in a supersonic low-turbulence environment.

Planned Improvements

User Fees

Contact Information

Dr. Masashi Shigemi (WINTEC Director), Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), 7-44-1 Jindaiji Higashi-machi, Chofu-shi, Tokyo 182-8522, Japan.
Tel: (81) 3 422 40 3000, Fax: (81) 3 422 40 3281, Email (Director): shigemi.masashi@jaxa.jp, Email (WINTEC): wintec@chofu.jaxa.jp, Web site: http://www.iat.jaxa.jp/res/wttc/b04.html.



1.27m極超音速風洞 および 0.5m極超音速風洞全体図

(Schematic of the 1.27 m Hypersonic Wind Tunnel and the 0.5 m Hypersonic Wind Tunnel)

Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), Tokyo, Japan.

1. ø 127 cm Nozzle
2. Settling Chamber
3. Shut-Off Valve
4. High Temperature High Pressure Pipe
5. Vapor Heater
6. Measurement Room
7. Smokestack
8. Main Burner
9. Preheating Burner
10. Shut-Off Valve
11. ø 50 cm Nozzle
12. Control Room
13. Supersonic Diffuser
14. Air Compressor
15. Air Exhaust
16. Subsonic Diffuser
17. Cooler
18. ø 16.4 m Vacuum Tank 2300 m
19. High Pressure Air Storage Tank (20 MPa) 36 m
20. ø 13 m Vacuum Tank 1150 m
21. Muffler
22. Cooler
23. Cooling Water System
24. ø 13 m Vacuum Tank 1150 m
25. Subsonic Diffuser
26. Air Exhaust
27. Supersonic Diffuser
28. Cooling Water Pump
29. Schlieren Device

European and Asian Wind Tunnels

Hypersonic | Japan

Installation Name	**Test Section Size**	**Speed Range**
Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Kakuda Space Center, Miyagi, Japan.	Nozzle size: 0.51 x 0.51 m free jet.	4, 6, 8 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	1993	**Reynolds Number (million)**
Ramjet Engine Test Facility		5
	Cost	
		Dynamic Pressure
		10.3 Mpa (Mach 8); 5 Mpa (Mach 6); 0.87 Mpa (Mach 4)
	Operational Status	**Stagnation Pressure**
	Presumed active as of December 2005	575 kPa (Mach 8); 2.6 kPa (Mach 6); 5.5 kPa (Mach 4)

Supplementary Technical Parameters

Maximum test duration: 30 seconds (Mach 8), 60 seconds (Mach 6), 60 seconds (Mach 4). Air flow rate: 7.92 kg/sec (Mach 8), 29 kg/sec (Mach 6), 42 kg/sec (Mach 4).

Data Acquisition

Testing Capabilities/Current Programs

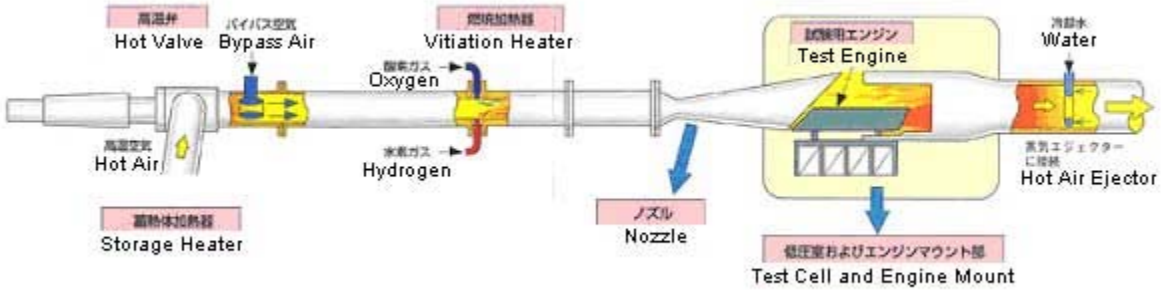
Simulation of flight conditions for ramjet and scramjet engines at Mach 4, 6, and 8, at altitudes of 20, 25, and 35 km, respectively.

Planned Improvements

User Fees

Contact Information

Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Kakuda Space Center, 1 Koganezawa, Kimigaya, Kakuda-shi, Miyagi 981-1525, Japan.
Tel: (81) 224 68 3111, Fax: (81) 224 68 2860, Email: koho@chofu.jaxa.jp, Web site: http://www.iat.jaxa.jp/kspc/eng/tf/rjtf.htm.



Ramjet Engine Test Facility, Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Kakuda Space Center, Japan.

European and Asian Wind Tunnels

Hypersonic | Netherlands

Installation Name	**Test Section Size**	**Speed Range**
Delft University of Technology (TUDELFT), High-Speed Laboratory, Delft, The Netherlands	350 mm (diameter)	6 to 11 Mach
		Temperature Range
	Date Built/Upgrade	
Facility Name	1995	**Reynolds Number (million)**
Hypersonic Wind Tunnel (HTFD)		
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of October 2005	**Stagnation Pressure**

Supplementary Technical Parameters

Run time 0.07-0.13 seconds.

Data Acquisition

Testing Capabilities/Current Programs

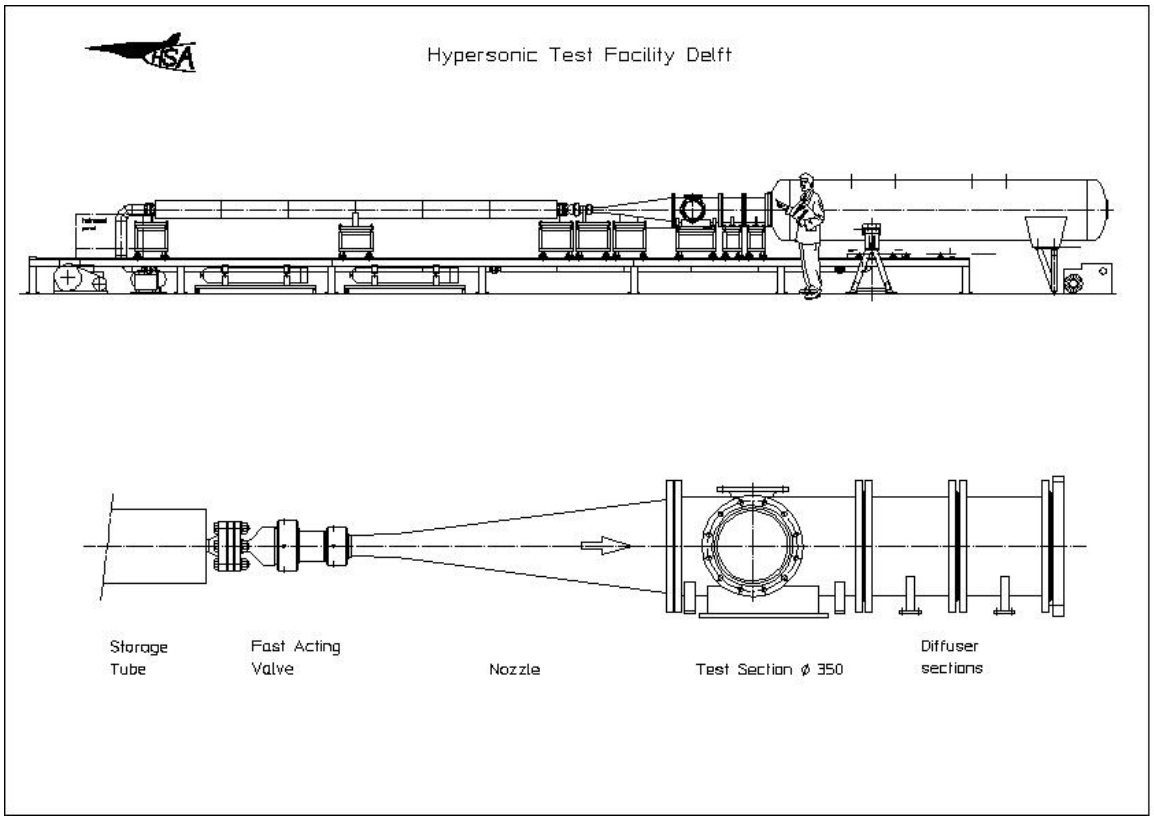
Problems in hypersonic flight: the investigation of the external flow field around an ESA test model of a hyperboloid-flare, using Digital Electro-Optical Interferometry (currently under development as STW project) and flow research on the influence of the entropy-layer on boundary layer transition.

Planned Improvements

User Fees

Contact Information

Delft University of Technology (TUDELFT), High-Speed Laboratory, Kluyverweg 1, 2629 HS Delft, The Netherlands.
Tel: (31) 15 2784501, Fax: (31) 15 2787077, Web site: http://www.aero.lr.tudelft.nl/ae_facilities_fr.html.



Hypersonic Wind Tunnel (HTFD), Delft University of Technology (TUDELFT), High-Speed Laboratory, Delft, The Netherlands.

TABLE OF CONTENTS
Unknown Speed

European and Asian Wind Tunnels

Unknown	China

Installation Name	Test Section Size	Speed Range
Beijing (Beihang) University of Aeronautics and Astronautics (BUAA), Fluid Mechanics Laboratory, Beijing, China		
		Temperature Range
	Date Built/Upgrade	
Facility Name	2000	**Reynolds Number (million)**
	Cost	
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

The Fluid Mechanics Laboratory has a total area of 2300 square meters. It consists of four low-speed wind tunnels, two high-speed wind tunnels, three 1.5-m low-turbulence wind tunnels, and Asia's largest demonstration circulating multi-purpose water tunnel.

Data Acquisition

Testing Capabilities/Current Programs

Nonsteady flow and vortex motion, turbulence and transition, hypersonic flow and advanced aerodynamic configuration, computational fluid dynamics (CFD).

Planned Improvements

User Fees

Contact Information

Professor Sun Mao (Director), Key Laboratory of Fluid Mechanics of the the Ministry of Education, Beijing University of Aeronautics and Astronautics, 37 Xueyuan Road, Haidian District, Beijing 100083, China.
Tel: (86) 10 82317685/82317114, Web site: http://www.buaa.edu.cn.

NO SCHEMATIC AVAILABLE

European and Asian Wind Tunnels

Unknown	China

Installation Name	Test Section Size	Speed Range
Northwestern Polytechnical University (NWPU, NPU), Xi'an, Shaanxi Province, China		
		Temperature Range
	Date Built/Upgrade	
Facility Name	2002 or 2005	**Reynolds Number (million)**
NF-6 High Speed Continuous Pressurized Wind Tunnel	**Cost**	15
		Dynamic Pressure
	Operational Status	
	Presumed active as of November 2005	**Stagnation Pressure**

Supplementary Technical Parameters

China's first high-speed continuous pressurized wind tunnel.

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

Construction is underway of a lower temperature facility with Reynolds numbers that will reach 23, fully covering the range of the Reynolds numbers for rotary wings in actual flight.

User Fees

Contact Information

Northwestern Polytechnical University, School of Aeronautics, State Key Laboratory for Airfoil and Cascade Aerodynamics, No.127 West Youyi Road, Xi'an City 710072, Shaanxi Province, China.
Tel: 011-86-29-8492222, Fax: 011-29-8491000, Web site: http://www.nwpu.edu.cn.

NO SCHEMATIC AVAILABLE

Unknown	China

Installation Name	Test Section Size	Speed Range
Northwestern Polytechnical University (NWPU, NPU), Xi'an, Shaanxi Province, China		
		Temperature Range
	Date Built/Upgrade	
Facility Name	2002 or 2005	Reynolds Number (million)
Small-Scale Adaptive-Wall Research Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	Stagnation Pressure
	Presumed active as of November 2005	

Supplementary Technical Parameters

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Northwestern Polytechnical University, School of Aeronautics, State Key Laboratory for Airfoil and Cascade Aerodynamics, No.127 West Youyi Road, Xi'an City, Shaanxi Province, 710072, China.
Tel: (86) 29 8492222, Fax: (86) 29 8491000, Web site: http://www.nwpu.edu.cn.

NO SCHEMATIC AVAILABLE

Unknown	China

Installation Name	Test Section Size	Speed Range
Northwestern Polytechnical University (NWPU, NPU), Xi'an, Shaanxi Province, China		
		Temperature Range
	Date Built/Upgrade	
Facility Name	2002 or 2005	Reynolds Number (million)
Small-Scale Low-Vortex Research Wind Tunnel		
	Cost	
		Dynamic Pressure
	Operational Status	Stagnation Pressure
	Presumed active as of November 2005	

Supplementary Technical Parameters

Data Acquisition

Testing Capabilities/Current Programs

Planned Improvements

User Fees

Contact Information

Northwestern Polytechnical University, School of Aeronautics, State Key Laboratory for Airfoil and Cascade Aerodynamics, No.127 West Youyi Road, Xi'an City, Shaanxi Province,710072, China.
Tel: (86) 29 8492222, Fax: (86) 29 8491000, Web site: http://www.nwpu.edu.cn.

NO SCHEMATIC AVAILABLE

Unknown | Japan

Installation Name	Test Section Size	Speed Range
Japan Defense Agency (JDA), Technical Research and Development Institute (TRDI), Tachikawa, Japan	3.5 m (diameter), 12 m (long)	
		Temperature Range
	Date Built/Upgrade	248 to 928°K
Facility Name	1997	**Reynolds Number (million)**
Combustion Wind Tunnel		
	Cost	
		Dynamic Pressure
		0.01 to 3.8 kPa
	Operational Status	**Stagnation Pressure**
	Presumed active as of December 2005	

Supplementary Technical Parameters

Air flow rate: 150 kg/sec. Pitch angle and yaw angle in the semi-free jet configuration: 0° ~ +15°, -5° ~ +5°, respectively. Simulation of flight conditions at 0 – 80,000 ft.; testing of ramjet engines in direct-connect (DC) or semi-free jet (SFJ) configurations; testing of solid fuel propellants consecutively in the booster phase, the transient separation phase, and the subsequent ramjet phase.

Data Acquisition

Testing Capabilities/Current Programs

Ramjet engine flight conditions and engine performance.

Planned Improvements

User Fees

Contact Information

Japan Defense Agency (JDA), Technical Research and Development Institute (TRDI), 3rd Research Center, 1st Division, 1-2-10, Sakae-cho, Tachikawa-shi, Tokyo, 190-8533, Japan. Wind tunnel located at: Aerodynamic and Propulsion Test Facility of the Sapporo Test Center, 1032, Komasato, Chitose-shi, Hokkaido, 066-0011, Japan. Tel: (81) 123 42 3501.
Tel.: (81) 425 24 2411, Email: info@jda-trdi.go.jp, Web site: http://www.jda-trdi.go.jp/happyou.htm.

NO SCHEMATIC AVAILABLE

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