WIND TUNNELS
OF THE EASTERN HEMISPHERE

A Report Prepared by the Federal Research Division,
Library of Congress for the
Aeronautics Research Mission Directorate, National Aeronautics and Space Administration

August 2008

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PREFACE

This catalog is a compilation of data on subsonic, supersonic, and hypersonic wind tunnels in the Eastern Hemisphere used for aeronautical testing. The countries represented in this catalog include those in Africa (South Africa), Asia (Australia, China, Indonesia, Japan, Malaysia, Singapore, and South Korea), Europe (Belgium, France, Germany, Italy, the Netherlands, Romania, Russia, Sweden, Ukraine, the United Kingdom), and the Middle East and Central and South Asia (India, Iran, Israel, Pakistan, Turkey). The catalog profiles 279 wind tunnels. A table, distribution chart, and bar charts following this preface depict the number and types of wind tunnels operating in each country. The bulk of the catalog is made up of data sheets for each facility, indicating the facility's name; the name of the installation where it is located; its technical parameters, such as size, speed range, temperature range, pressure, operational status, and Reynolds number; its replacement and/or operating cost; its testing capabilities; current programs; planned improvements; contact information; and schematics, if available. The report has four sections, one section for each speed (subsonic, supersonic, and hypersonic), and one section for tunnels of undetermined speed. In addition, cross-reference indexes with page numbers, at the end of the report, provide quick look-up tools. A bibliography is also included. Sources consulted include wind tunnel installation Web sites (in English and/or foreign languages), technical reports on wind tunnels, published by Sverdrup Technology, RAND, and NASA; articles and reports from various technical journals; and information provided by installation managers in response to direct inquiries.

Table of Contents

INTRODUCTION

The wind tunnels in this catalog, classified according to speed regime, are presented in the following order:

- Subsonic
- Supersonic
- Hypersonic

The specific criteria used for each category are as follows:

Wind Tunnel Category	Speed Range (Mach No.)
Subsonic	>0.1
Supersonic	1.2–5.0
Hypersonic	>5.0

EXPLANATION OF WIND TUNNEL DATA SHEETS

The boxes at the top of each data sheet are designed to provide a summary of the facility's most pertinent characteristics, such as name, size, speed, etc. The paragraphs under the boxes provide more details as to the facility's technical parameters, usage, and contact information. The following descriptions correspond to the numbered boxes on the following page:

1. Wind Tunnel Speed Category: subsonic, supersonic, or hypersonic.
2. Country in which the tunnel is located.
3. Name of the installation where the facility is located.
4. Test Section Size: dimensions of the test section (height x width x length) or cross-section diameter.
5. Temperature Range: tunnel's stagnation temperature(s) in ^{o}R or K.
6. Speed Range: in Mach number with feet per second (ft/sec) or meter per second (m/sec) for subsonic tunnels; different speed ranges may be listed for different test sections.
7. Reynolds Number: shown in millions (10^6) per feet or meters.
8. Name of the facility.
9. Cost: either construction cost or replacement cost.
10. Dynamic Pressure: a range given in psf or kilo-Newtons per square meter (kN/m^2).
11. Operational Status: backlog, inactive, standby, or on-demand basis.
12. Stagnation Pressure: given in atmospheres or bars.
13. Testing Capabilities: provides details about the facility, discussing unique features, special instrumentation, and performance capabilities.
14. Data Acquisition: describes the types of systems used for data gathering, the number of channels available, and the form of output.
15. Current Programs: provides details about the kinds of tests the facility has performed, discussing unique features, special instrumentation, and performance capabilities.
16. Date Constructed/Planned Improvements: describes major improvements, rehabilitations, and planned modifications.
17. User Fees: fees charged to use the facility.
18. Contact Information.

1. WIND TUNNEL SPEED CATEGORY **2. COUNTRY**

3. INSTALLATION NAME	**4. TEST SECTION SIZE**	**5. TEMPERATURE RANGE**
	6. SPEED RANGE	**7. REYNOLDS NUMBER**
8. FACILITY NAME	**9. COST**	**10. DYNAMIC PRESSURE**
	11. OPERATIONAL STATUS	**12. STAGNATION PRESSURE**

13. TESTING CAPABILITIES

14. DATA ACQUISITION

15. CURRENT PROGRAMS

16. DATE CONSTRUCTED/PLANNED IMPROVEMENTS

17. USER FEES

18. CONTACT INFORMATION

TABLE: MAJOR WIND TUNNELS DISTRIBUTION—EASTERN HEMISPHERE

Location	Subsonic	Supersonic	Hypersonic	Unknown	Total
Asia	**48**	**28**	**16**	**5**	**97**
Australia	8	4	7	1	20
China	14	16	5	4	39
Indonesia	1	0	0	0	1
Japan	3	7	4	0	14
Malaysia	1	0	0	0	1
Singapore	0	1	0	0	1
South Korea	21	0	0	0	21
Europe	**56**	**46**	**32**	**1**	**135**
Belgium	4	2	2	0	8
France	5	4	5	0	14
Germany	9	3	2	0	14
Italy	2	1	1	0	4
Netherlands	4	5	1	0	10
Romania	1	2	0	0	3
Russia	14	23	21	0	58
Sweden	1	1	0	0	2
Ukraine	0	0	0	1	1
United Kingdom	16	5	0	0	21
Africa, Near, and Middle East	**26**	**13**	**4**	**4**	**47**
India	11	5	3	1	20
Iran	4	2	0	1	7
Israel	2	4	1	0	7
Pakistan	1	0	0	2	3
South Africa	7	2	0	0	9
Turkey	1	0	0	0	1
TOTAL	**130**	**87**	**52**	**10**	**279**

CHARTS: DISTRIBUTION OF EASTERN HEMISPHERE WIND TUNNELS

FIGURE 1: NUMBER OF WIND TUNNELS IN AFRICA, ASIA, EUROPE, AND THE NEAR AND MIDDLE EAST BY SPEED REGIME

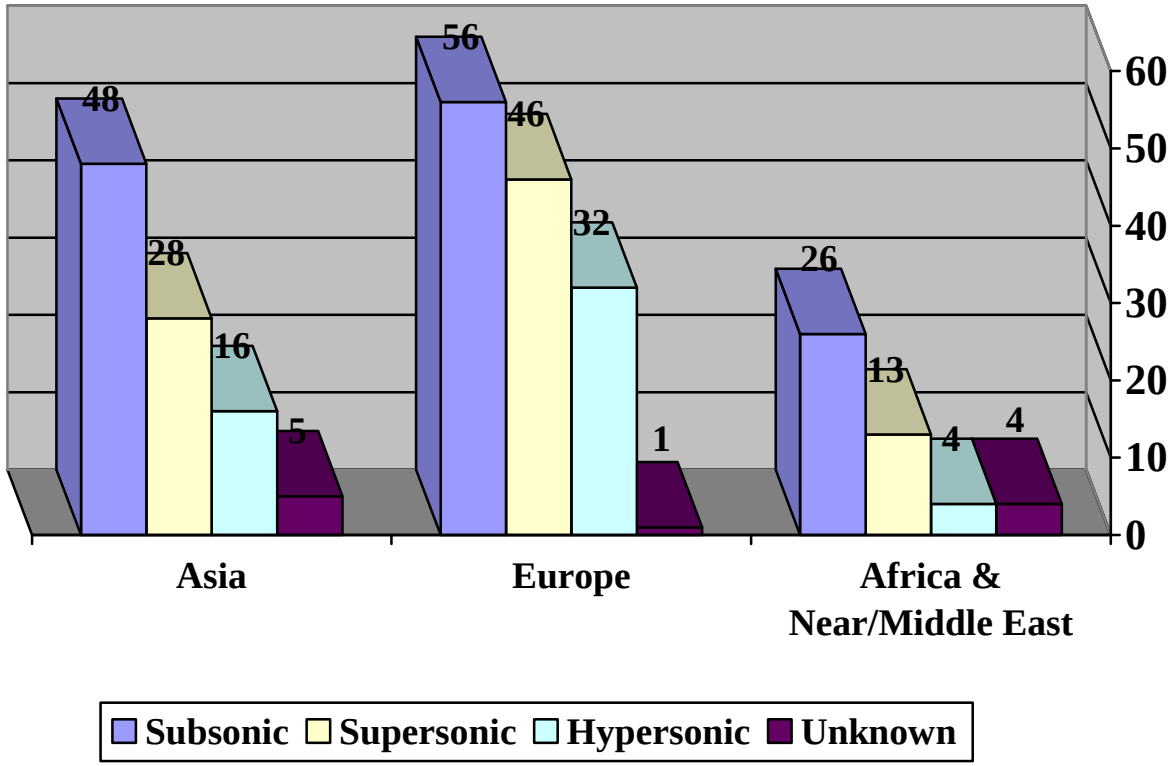


Figure 2: Wind Tunnel Distribution: Asia

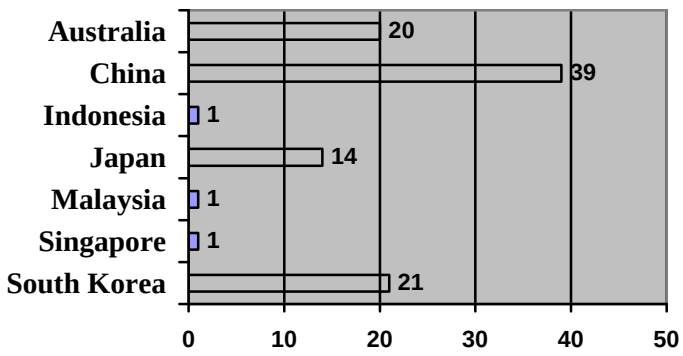


Figure 3: Wind Tunnel Distribution: Europe

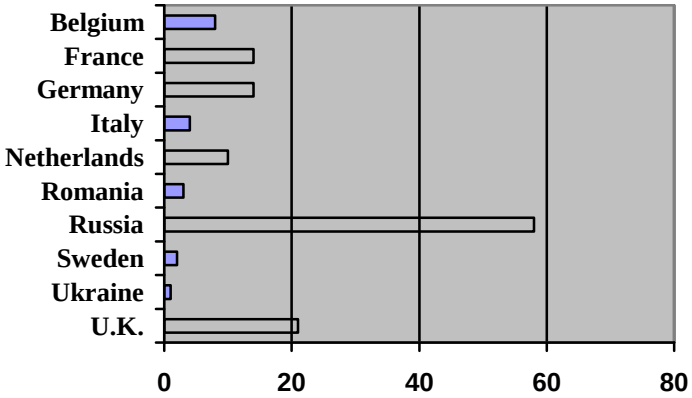
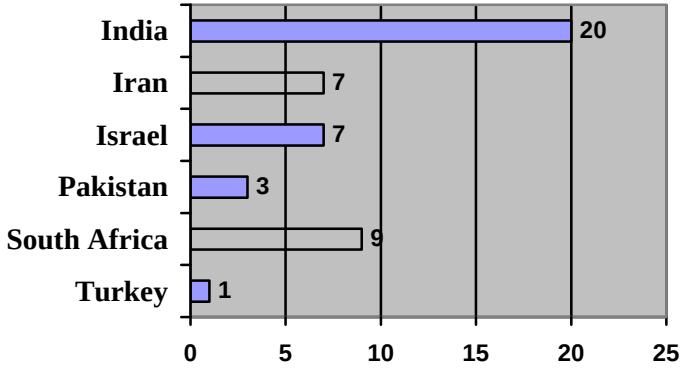


Figure 4: Wind Tunnel Distribution: Africa, Near and Middle East



Wind Tunnels of the Eastern Hemisphere

Subsonic **Australia**

Installation Name	Test Section Size	Temperature Range
Defence Science and Technology Organisation (DSTO), Air Vehicles Division, Fisherman's Bend, Victoria, Australia	2.7 x 2.1 x 6.6 m³	Atmospheric
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	90 m/sec	1.7
Low Speed Wind Tunnel (LSWT)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	Atmospheric

Testing Capabilities

Closed-jet, single-return circuit, atmospheric pressure; column-mounted, pitch-roll mechanism for pitch-angle range -150° to +30°, roll-angle range +/- 180°; co-axially mounted turntables in floor and ceiling of test section with rotation of +/- 360° in 1° increments; underfloor load-cell balance with an angle of side slip range of +/- 360°.

Data Acquisition

Digital AlphaServer 400, UNIX, ethernet, COMFRC software.

Current Programs

Flight behavior of military aircraft and missiles; ground-effect tests on aircraft, ships, automotive vehicles.

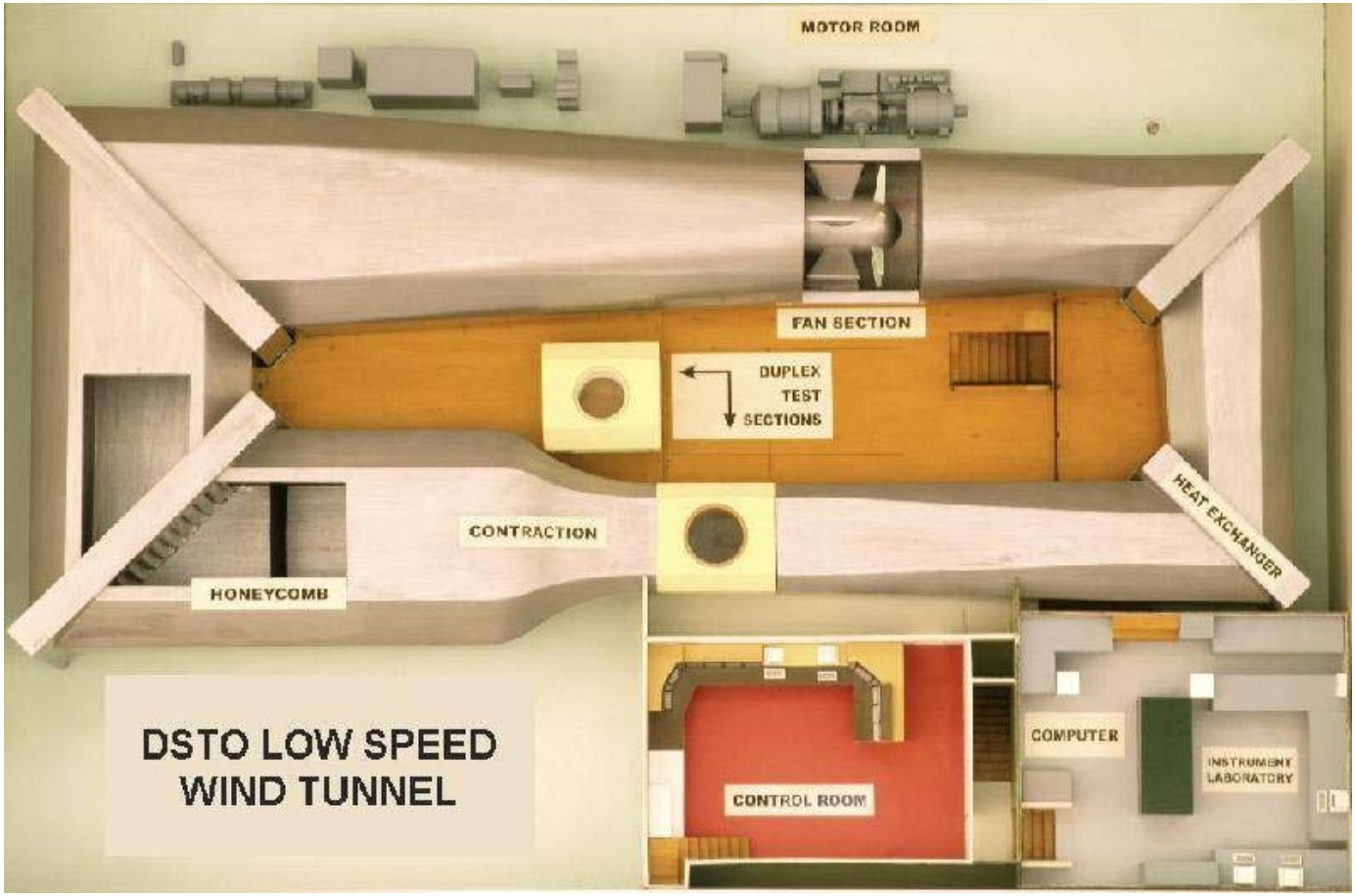
Date of Construction/Planned Improvements

1941 (constructed); progressively upgraded; 1996 (test section length increased); planned improvements: replace honeycomb or install screens to improve quality of flow in test section.

User Fees

Contact Information

Stephen Lam, Air Vehicles Division, Defence Science and Technology Organisation, 506 Lorimer Street, Fishermans Bend, Victoria 3207, Australia; Tel (Lam): (61) 3 9626 7283; Fax (Lam): (61) 3 9626 7188; Email (Lam): Stephen.Lam@dsto.defence.gov.au; Web site: http://www.dsto.defence.gov.au.



Low Speed Wind Tunnel,
Defence Science and Technology Organisation (DSTO),
Air Vehicles Division,
Fisherman's Bend, Victoria, Australia.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Australia**

Installation Name	Test Section Size	Temperature Range
Monash University, Faculty of Engineering, Department of Mechanical Engineering, Clayton, Victoria, Australia	#1: 4 x 5.2 x 9 m³ (closed jet); #2: 4 x 2.6 x 11 m³ (open jet); #3: 4 x 12 x 50 (wind engineering)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0 to 50 m/sec	
1 MW Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Confirmed active.	

Testing Capabilities

Return-circuit, multipurpose tunnel; 3 test sections - #1. closed-jet high-Reynolds-number section; #2: open-jet for vehicle testing; #3: large wind engineering section; powered by 4 400 kW electric motors; 2 5 m fans; 4 3-component force pads; automated turntable providing 360° yaw; noise and vibration dynamometer; in-house built robotic traverse; largest wind tunnel in Australia.

Data Acquisition

Current Programs

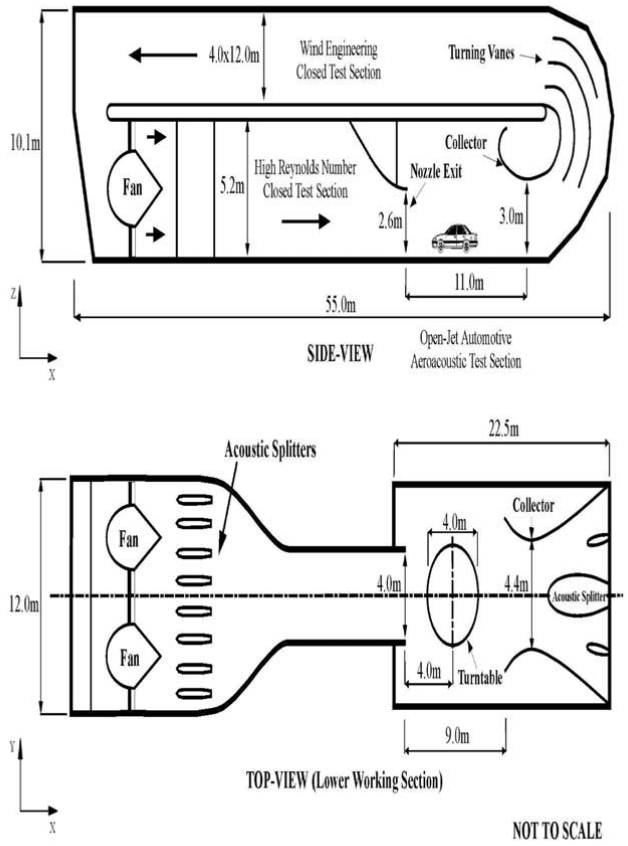
Used for vehicle design; development and verification in aerodynamics, aeroacoustics, and cooling analysis in both road and racing car design; testing of airplanes, UAVs, scale testing, microlights, trucks, trains, building, cycles, boats, etc.; available for industrial, research, and student use.

Date of Construction/Planned Improvements

User Fees

Contact Information

David Burton (Wind Tunnel Manager), Building 37, Monash University, Clayton Campus, Wellington Road, Clayton Victoria 3168 Australia; Tel: (61) 3 9905 3707; Fax: (61) 3 9905 1825; Email: david.burton@eng.monash.edu.au.



1 MW Wind Tunnel,
Monash University, Faculty of Engineering,
Department of Mechanical Engineering,
Clayton, Victoria, Australia.

Installation Name	Test Section Size	Temperature Range
Royal Melbourne Institute of Technology (RMIT) University, School of Science, Engineering, and Technology, Department of Aerospace and Aviation Engineering, Wackett Centre, Bundoora, Victoria, Australia	4.5 x 3.5 ft²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name		
Low Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Octagonal, closed-return test section; sophisticated, custom-built, 6-axis, robotic traverse; 6-component force balance.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Dr Arvind Sinha (Contact), Wackett Aerospace Centre, RMIT, GPO Box 2476V, Melbourne, Victoria 3001 Australia; Tel (Sinha): (61) 3 9645 4541; Email (Sinha): arvind.sinha@rmit.edu.au; Web site: http://www.rmit.edu.au/browse;ID=eby2kw0ry2zw.

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Installation Name	Test Section Size	Temperature Range
Royal Melbourne Institute of Technology (RMIT) University, School of Science, Engineering, and Technology, Department of Aerospace and Aviation Engineering, Wackett Centre, Bundoora, Victoria, Australia		
	Speed Range	Reynolds Number (x 10^6)
Facility Name		
Three Low Speed Wind Tunnels		Dynamic Pressure
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Open-return test section.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Dr Arvind Sinha (Contact), Wackett Aerospace Centre, RMIT, GPO Box 2476V, Melbourne, Victoria 3001 Australia; Tel (Sinha): (61) 3 9645 4541; Email (Sinha): arvind.sinha@rmit.edu.au; Web site: http://www.rmit.edu.au/browse;ID=eby2kw0ry2zw.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Australia**

Installation Name	Test Section Size	Temperature Range
Royal Melbourne Institute of Technology (RMIT) University, School of Science, Engineering, and Technology, Department of Mechanical and Manufacturing Engineering, Bundoora, Victoria, Australia	3 x 2 x 9 m³	Ambient
Facility Name	**Speed Range**	**Reynolds Number (x 10^6)**
Industrial Wind Tunnel	0 to 145 km/hr	
	Cost	**Dynamic Pressure**
	US$500,000	
	Operational Status	**Stagnation Pressure**
	Confirmed active as of March 2007.	

Testing Capabilities

Data Acquisition

Current Programs

Low-speed surface vehicles and aircraft; low-noise car and component testing; USAF micro-plane research; surface-vehicle aerodynamics; wind generators, etc.

Date of Construction/Planned Improvements

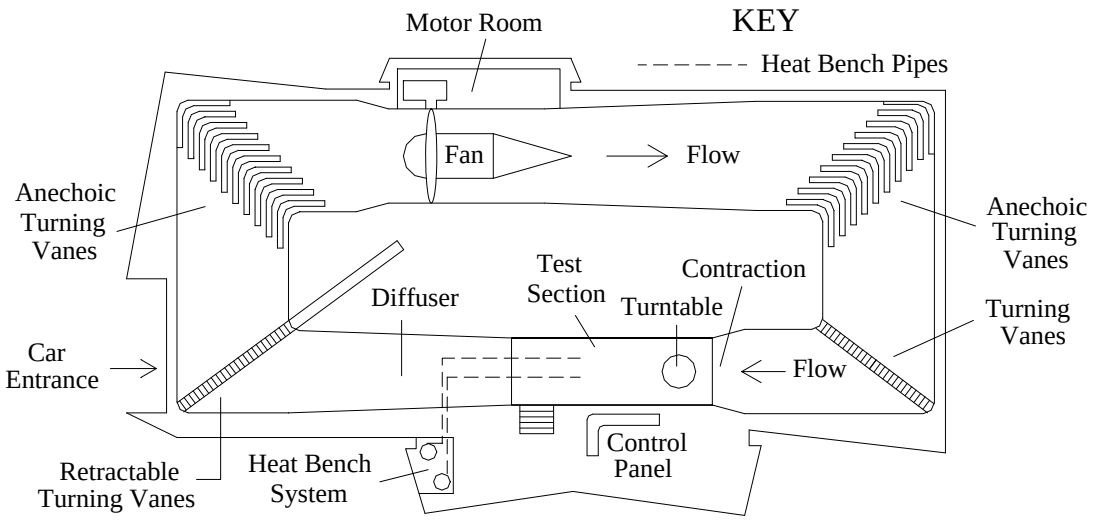
2000 (constructed).

User Fees

US$5,000/8 hr shift.

Contact Information

S. Watkins (Professor), RMIT University, Department of Mechanical and Manufacturing Engineering, Level 3, Building 251, Bundoora East Campus, 264 Plenty Road, Mill Park 3083 Australia; Tel (Watkins): (61) 3 9925 6084; Email: simon@rmit.edu.au; Web site: http://www.rmit.edu.au/browse;ID=425u0vzwuq0y#wind2.



Industrial Wind Tunnel,
Royal Melbourne Institute of Technology (RMIT) University,
School of Science, Engineering, and Technology,
Department of Mechanical and Manufacturing Engineering,
Bundoora, Victoria, Australia

Wind Tunnels of the Eastern Hemisphere

Subsonic **Australia**

Installation Name	***Test Section Size***	***Temperature Range***
University of New South Wales, Australian Defence Force Academy, School of Aerospace, Civil and Mechanical Engineering, Canberra, Australia	460 x 460 mm²	
	Speed Range	***Reynolds Number (x 10^6)***
Facility Name	45 m/sec	
Subsonic Wind Tunnel		***Dynamic Pressure***
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

School of Aerospace, Civil and Mechanical Engineering, University of New South Wales, Australian Defence Force Academy, Northcott Drive, Canberra ACT 2600 Australia; Tel: (61) 2 6268 8348; Fax: (61) 2 6268 8337; Email: c.konrad@adfa.edu.au; Web site: http://www.unsw.adfa.edu.au/acme/facilities/laboratories.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Australia**

Installation Name	Test Section Size	Temperature Range
University of Sydney, School of Aerospace, Mechanical and Mechatronic Engineering, Sydney, Australia	1.219 x 0.914 m² (4 x 3 ft²)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	2 to 60 m/sec	0.3 to 1
4 x 3 ft Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Confirmed active as of March 2007.	Atmospheric

Testing Capabilities

Low-speed, very low-turbulence, shear-layer-profile, 8 x 10 ft² return-leg test section; 20 m/sec max speed; fixed or portable 6-component balance; 152 x 152 mm fillets; upper test section: 2.438 x 1.829 m (8 x 6 ft); 229 x 229 mm fillets; 15 m/sec max speed.

Data Acquisition

Six-component transducer balance; integrated DAC system.

Current Programs

Industrial research and development; student research projects; university teaching facility.

Date of Construction/Planned Improvements

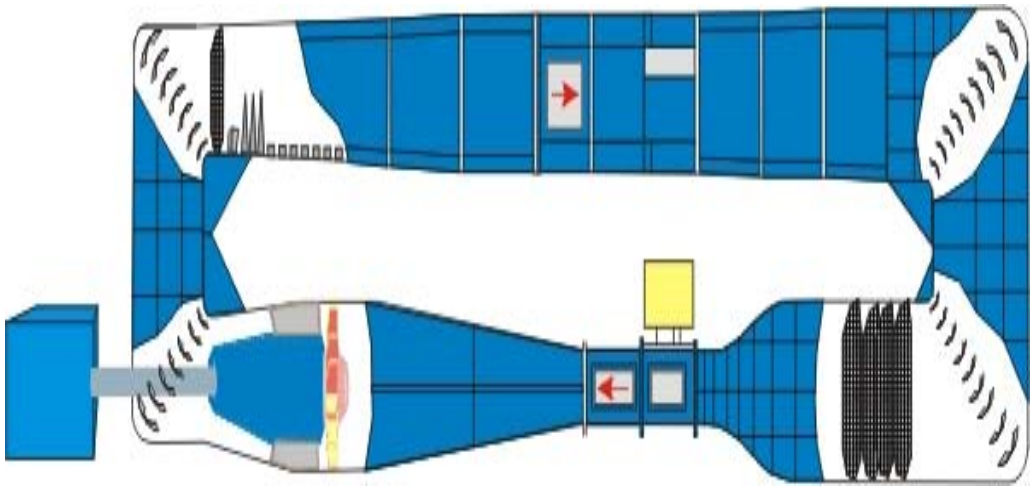
1975 (constructed); 2002 (updated DAC system).

User Fees

US$150 to $250/hr (government); US$250 to $350/hr (commercial); 8 hr minimum.

Contact Information

Doug Auld (Senior Lecturer), School of Aerospace, Mechanical and Mechatronic Engineering, University of Sydney, NSW 2006, Australia; Tel (General): (61) 2 9351 2341; Fax (General): (61) 2 9351 7060; Email (General): enquiry@aeromech.usyd.edu.au; Email (Auld): d.auld@usyd.edu.au; Web site: http://www.aeromech.usyd.edu.au/industry/testing/tunnel/lowspeed43.html.



4 x 3 ft Subsonic Wind Tunnel,
University of Sydney,
School of Aerospace, Mechanical and Mechatronic Engineering,
Sydney, Australia.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Australia**

Installation Name	Test Section Size	Temperature Range
University of Sydney, School of Aerospace, Mechanical and Mechatronic Engineering, Sydney, Australia	7 x 5 ft²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	2 to 40 m/sec (0 to 0.12 Mach)	0.3 to 1
7 x 5 ft Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Confirmed active as of March 2007.	Atmospheric

Testing Capabilities

Low speed; low turbulence; fixed or portable, 3-component load balance.

Data Acquisition

Current Programs

Industrial research and development; student research projects; university teaching facility; research on unmanned aerial vehicles (Brumby Mk II UAV).

Date of Construction/Planned Improvements

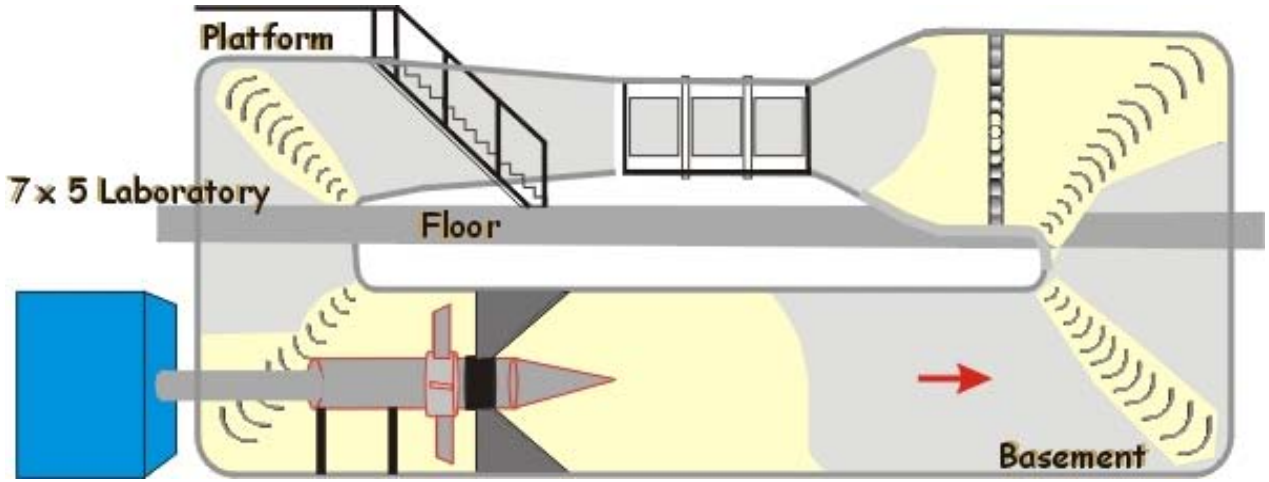
1940s (commissioned); 1958 (constructed); 1980s (new drive motor, improvements to balance); 1998 (turntable added).

User Fees

US$150 to $250/hr (government); US$250 to $350/hr (commercial); 8 hr minimum.

Contact Information

Doug Auld (Senior Lecturer), School of Aerospace, Mechanical and Mechatronic Engineering, University of Sydney, NSW 2006, Australia; Tel (General): (61) 2 9351 2341; Fax (General): (61) 2 9351 7060; Email (General): enquiry@aeromech.usyd.edu.au; Email (Auld): d.auld@usyd.edu.au; Web site: http://www.aeromech.usyd.edu.au/industry/testing/tunnel/lowspeed75.html.



7 x 5 ft Low Speed Wind Tunnel,
University of Sydney,
School of Aerospace, Mechanical and Mechatronic Engineering,
Sydney, Australia.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Belgium**

Installation Name	Test Section Size	Temperature Range
Von Karman Institute for Fluid Dynamics (VKI), Saint Genese, Belgium	100 x 117 x 800 mm³	120 K
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	80 m/sec	0.2 to 1
Adaptive Wall Low Speed Wind Tunnel T-3		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	4 bar

Testing Capabilities

5 mm stainless steel walls; 11,400 rpm fan speed; injection; under ambient conditions with 7.5 kW motor yields Mach 0.23 (80 m/sec) in test section; originally built by Onera for transonic operation.

Data Acquisition

Current Programs

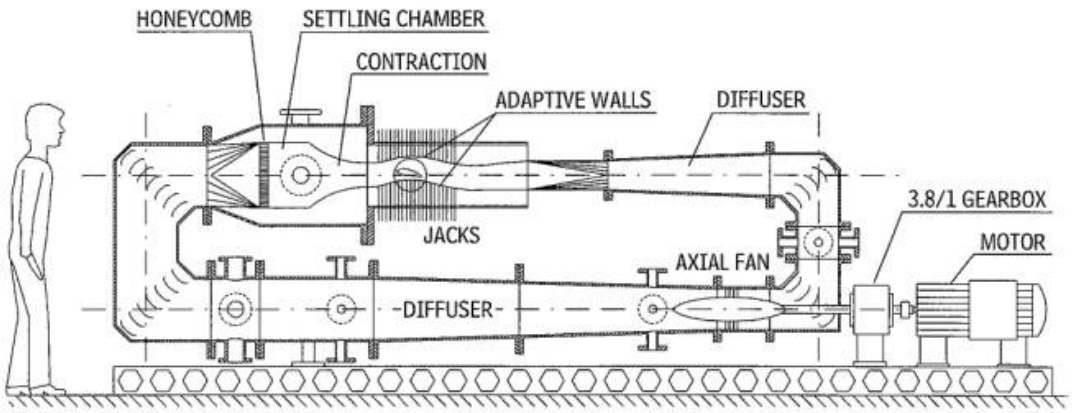
Pilot facility for cryogenic T-2 transonic pressurized tunnel.

Date of Construction/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.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Belgium**

Installation Name	Test Section Size	Temperature Range
Von Karman Institute for Fluid Dynamics (VKI), Saint Genese, Belgium	0.1 x 0.3 x 1.6 m³	As low as –40°C
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	70 m/sec (max)	
CWT-1 Cold Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	

Testing Capabilities

Low-speed, closed-circuit; operates at sub-freezing temperatures; wood and epoxy-fiberglass composite; insulated with polystyrene foam with 5 cm polystyrene foam, covered by smooth epoxy lining; settling chamber fitted with honeycomb; 12.4:1 contraction ratio; centrifugal fan driven by PC-controlled variable-speed 8 kW dc motor.

Data Acquisition

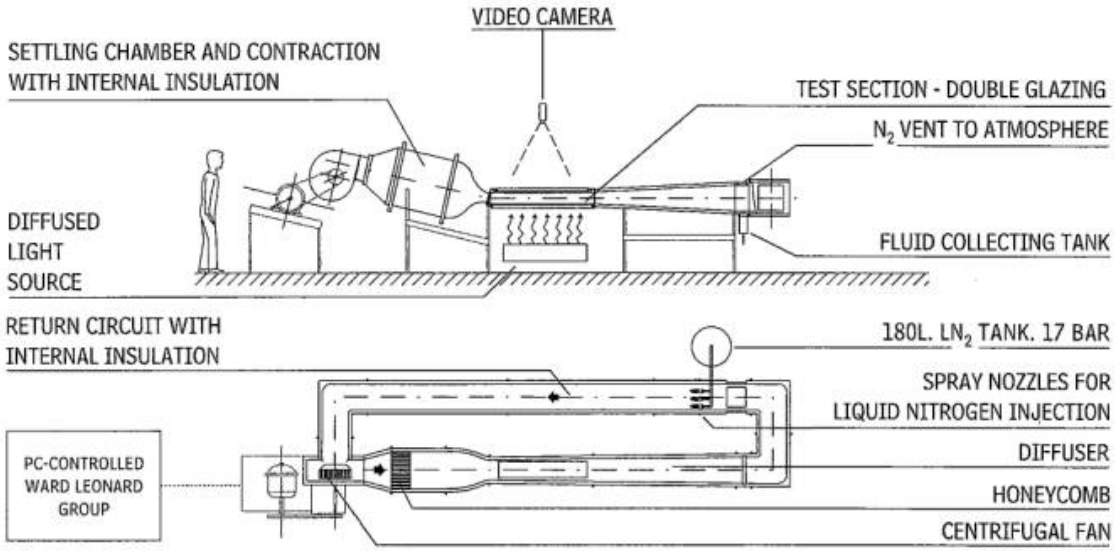
Current Programs

Date of Construction/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.



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

Wind Tunnels of the Eastern Hemisphere

Subsonic **Belgium**

Installation Name	Test Section Size	Temperature Range
Von Karman Institute for Fluid Dynamics (VKI), Saint Genese, Belgium	3 x 4.5 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	2 to 60 m/sec	
L-1A Low Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	

Testing Capabilities

Free, open-jet test section; variable speed, 580 kW dc motor; contraction ratio of 4:1; typical turbulence level of 0.3 percent.

Data Acquisition

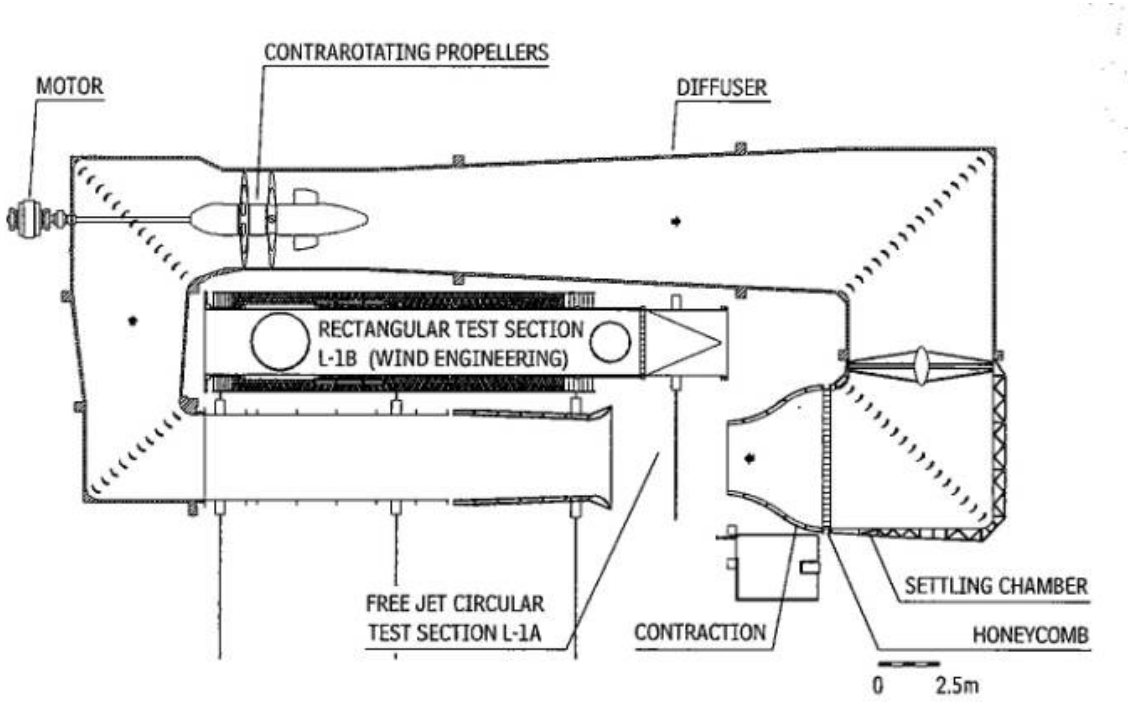
Current Programs

Date of Construction/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.



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

Wind Tunnels of the Eastern Hemisphere

Subsonic **Belgium**

Installation Name	Test Section Size	Temperature Range
Von Karman Institute for Fluid Dynamics (VKI), Saint Genese, Belgium	1.3 x 0.28 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	45 m/sec (max)	
L-2A Low Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	

Testing Capabilities

Low-speed, open-circuit wind tunnel with air inlet, settling chamber, circular cross-section with honeycomb and meshes; asymmetric 8:1 contraction ratio; 2-directional traversing mechanism located in test section; axial fan end of 1:4 diffuser, driven by a 9.9 kW variable speed dc motor; turbulence level of 0.2 %.

Data Acquisition

Current Programs

Research projects and laboratory training in turbulent boundary layers, aircraft wakes, vortex-strake interactions, 3D velocity measurements and, with the addition of a smoke generator and of an air exhaust to outside, laser sheet flow visualizations.

Date of Construction/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.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **China**

Installation Name	Test Section Size	Temperature Range
China Academy of Aerospace Aerodynamics (CAAA), Beijing, China AKA: Beijing Institute of Aerodynamics (BIA) or 701st Institute of the China Aerospace Science and Technology Corporation (CASC)	3 x 3 x 12 m³	
Facility Name	**Speed Range**	**Reynolds Number (x 10^6)**
Low Speed Wind Tunnel	10 to 100 m/sec	6
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005.	

Testing Capabilities

Stepless regulation of airflow speed.

Data Acquisition

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.

Date of Construction/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 IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **China**

Installation Name	Test Section Size	Temperature Range
China Aerodynamics Research and Development Center (CARDC), Mianyang City, Sichuan Province, China	#1: 12 x 16 m²; #2: 8 x 6 m²	Atmospheric
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	#1: up to 0.07 Mach; #2: up to 0.30 Mach	#1: 1.7, #2: 6.9
Large Low Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	Atmospheric

Testing Capabilities

Larger test section has 2D contraction ratio of 2.5:1; 3D contraction ratio of 4:1 between the test sections give total CR+10 for smaller test section; powered by 3 fans, 7,800 kW total.

Data Acquisition

Current Programs

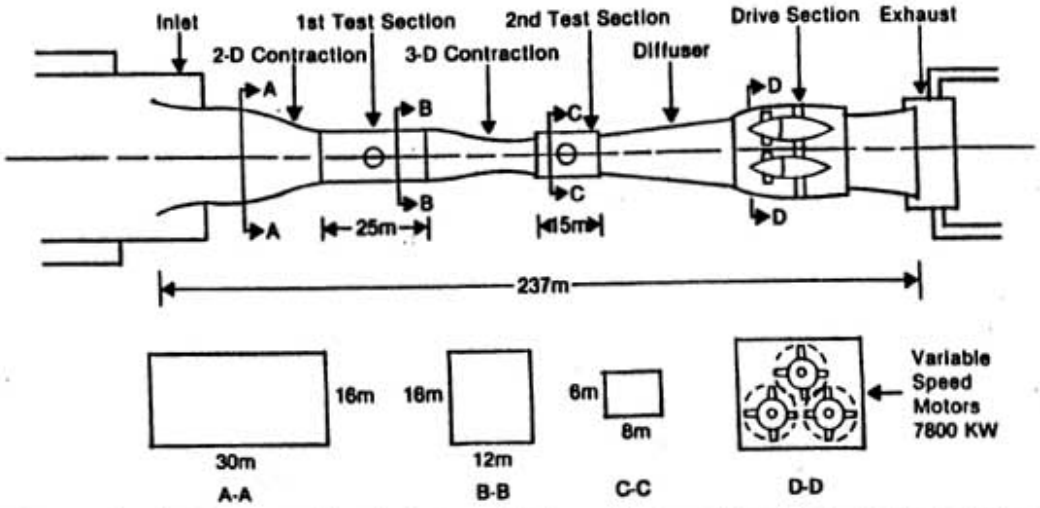
Date of Construction/Planned Improvements

1979 (constructed).

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 or http://www.cardcgs.com/default2.asp.



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.

Installation Name	Test Section Size	Temperature Range
China Aerodynamics Research and Development Center (CARDC), Mianyang City, Sichuan Province, China	55 m (height), 5 m (diameter)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	Up to 50 m/sec	
Large-Scale Vertical Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

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

Data Acquisition

Current Programs

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

Date of Construction/Planned Improvements

2005 (constructed).

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 or http://www.cardcgs.com/default2.asp.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
China Aerodynamics Research and Development Center (CARDC), Mianyang City, Sichuan Province, China	4 x 3 m²	Atmospheric
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	100 m/sec	6
Low Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	Atmospheric

Testing Capabilities

Closed circuit, continuous flow, atmospheric.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

Mid to late 1970s (constructed).

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 or http://www.cardcgs.com/default2.asp.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Chinese Aerodynamics Research Institute of Aeronautics (CARIA), Harbin, Heilongjiang Province, China	1.5 m (diameter)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	50 m/sec (max)	
FL-5 Low Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Circular aperture, single return.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1995 (constructed).

User Fees

Contact Information

Professor Yu Tao (Director), Chinese Aerodynamic Research Institute of Aeronautics (CARIA), PO Box 88, 2 Yiman Street, Harbin, Heilongjiang Province, 15000 China; Tel: (86) 451 82539364; Fax: (86) 451 82838327; Email: cph@caria.com.cn; Web site: http://www.caria.com.cn.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Chinese Aerodynamics Research Institute of Aeronautics (CARIA), Harbin, Heilongjiang Province, China	3.5 x 2.5 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	Up to 73 m/sec	
FL-8 Low Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Closed-circuit, flat, octagonal-shaped test section.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1963 (constructed).

User Fees

Contact Information

Professor Yu Tao (Director), Chinese Aerodynamic Research Institute of Aeronautics (CARIA), PO Box 88, 2 Yiman Street, Harbin, Heilongjiang Province, 15000 China; Tel: (86) 451 82539364; Fax: (86) 451 82838327; Email: cph@caria.com.cn; Web site: http://www.caria.com.cn.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **China**

Installation Name	Test Section Size	Temperature Range
Chinese Aerodynamics Research Institute of Aeronautics (CARIA), Harbin, Heilongjiang Province, China	4.5 x 3.5 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name		Up to 8.5 (per meter)
FL-9 Low Speed Continuous Pressurized Wind Tunnel		**Dynamic Pressure**
	Cost	0.4 Mpa
		Stagnation Pressure
	Operational Status	
	Under construction in 2006.	

Testing Capabilities

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

2006 (constructed).

User Fees

Contact Information

Professor Yu Tao (Director), Chinese Aerodynamic Research Institute of Aeronautics (CARIA), PO Box 88, 2 Yiman Street, Harbin, Heilongjiang Province, 15000 China; Tel: (86) 451 82539364; Fax: (86) 451 82838327; Email: cph@caria.com.cn; Web site: http://www.caria.com.cn.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **China**

Installation Name	Test Section Size	Temperature Range
Chung Cheng Institute of Technology, Rotating Fluids and Vortex Dynamics Lab, Taiwan, China	400 x 400 mm²	
	Speed Range	Reynolds Number (x 10^6)
Facility Name		
Open Loop Low Speed Wind Tunnel		Dynamic Pressure
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of August 2002.	

Testing Capabilities

Data Acquisition

Current Programs

Date of Construction/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 IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **China**

Installation Name	Test Section Size	Temperature Range
Nanjing University of Aeronautics and Astronautics (NUAA), Nanjing, Tiangsu Province, China	#1: 5.1 x 4.25 m²; #2: 3.0 x 2.5 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	#1: 30 m/sec; #2: 90 m/sec	#1: 1.8, #2: 5.4
Large-Scale Dual-Test Section Low Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Data Acquisition

Current Programs

Can be used as a low-turbulence wind tunnel, 3D smoke wind tunnel, water tunnel, and jet flow test device; used as 6-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.

Date of Construction/Planned Improvements

User Fees

Contact Information

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

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **China**

Installation Name	Test Section Size	Temperature Range
Northwestern Polytechnical University (NWPU, NPU), Xi'an, Shaanxi Province, China	#1: 3 x 1.6 m² (2D); #2: 3.5 x 2.5 m² (3D); #3: 2.2 m diameter (propeller test section)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	#1: 130 m/sec (max); #2: 90 m/sec; #3: 145 m/sec (max)	#1: 7; #2: 5; #3: N/A
NF-3 Low Speed Airfoil Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	Atmospheric

Testing Capabilities

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

Data Acquisition

Distributed control system: PSI8400 pressure measurement system, 3D laser velocimeter, hotwire anemometer, infrared imager to measure flow transition, and automatic calibration of pressure and balance.

Current Programs

Date of Construction/Planned Improvements

2002 or 2005 (constructed).

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 IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
State Key Laboratory of Turbulence and Complex Systems (LTCS), Beijing University, Beijing, China	0.6 x 0.6 x 5 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.5 to 20 m/sec	
Boundary Layer Wind Tunnel No. 1		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Direct-action type with temperature and velocity profilers.

Data Acquisition

Current Programs

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

Date of Construction/Planned Improvements

Late 1980s (constructed).

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.edu.cn/cn.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **China**

Installation Name	Test Section Size	Temperature Range
State Key Laboratory of Turbulence and Complex Systems (LTCS), Beijing University, Beijing, China	#1: 3.88 x 1.8 x 12 m³; #2: 1.2 x 1 x 8 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	30 m/sec (both test sections)	
Boundary Layer Wind Tunnel No. 2		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Data Acquisition

Current Programs

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

Date of Construction/Planned Improvements

Late 1980s (constructed).

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.edu.cn/cn.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **China**

Installation Name	Test Section Size	Temperature Range
State Key Laboratory of Turbulence and Complex Systems (LTCS), Beijing University, Beijing, China	2.25 m (diameter), 3.65 m (long)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	55 m/sec (max)	
Large-Scale Low Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Open circuit, circular test section.

Data Acquisition

Current Programs

When built, was China's largest low speed wind tunnel; was used for research and development of aircraft; in the 1970s was used for simulating atmospheric boundary layers; recently used to conduct basic experiments to develop a theory of scale laws for turbulent layer gradations.

Date of Construction/Planned Improvements

1958 (constructed).

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.edu.cn/cn.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **China**

Installation Name	Test Section Size	Temperature Range
State Key Laboratory of Turbulence and Complex Systems (LTCS), Beijing University, Beijing, China	0.3 x 0.8 x 3.2 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.3 to 23 m/sec	
Low Turbulence Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Suckdown-type wooden structure, contraction ratio of 18.25:1, motor power of 7.5 kW; 2D closed-end test section with large contraction ratio, honeycombs, and fine-meshed, 4-wall screens can reduce turbulence degree to 0.085.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1983 (constructed).

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.edu.cn/cn.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **France**

Installation Name	Test Section Size	Temperature Range
Concurrent Engineering in Practice (CEPRA) and ONERA, Center for Engine Testing, Saclay, France	#1: 2 m (open jet); #2: 3 m (open jet)	#1: 877°C; #2: 227°C
	Speed Range	**Reynolds Number (x 10^6)**
	#1: 120 m/sec; #2: 60 m/sec	#1: 1.3; #2: 0.8
Facility Name		**Dynamic Pressure**
CEPRA 19 Anechoic Wind Tunnel	**Cost**	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	

Testing Capabilities

Open-circuit, continuous atmospheric, aero-acoustic wind tunnel; 7 MWA 12 x 9 m inlet featuring dust filter, acoustic baffles, anti-turbulence screens and 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

Current Programs

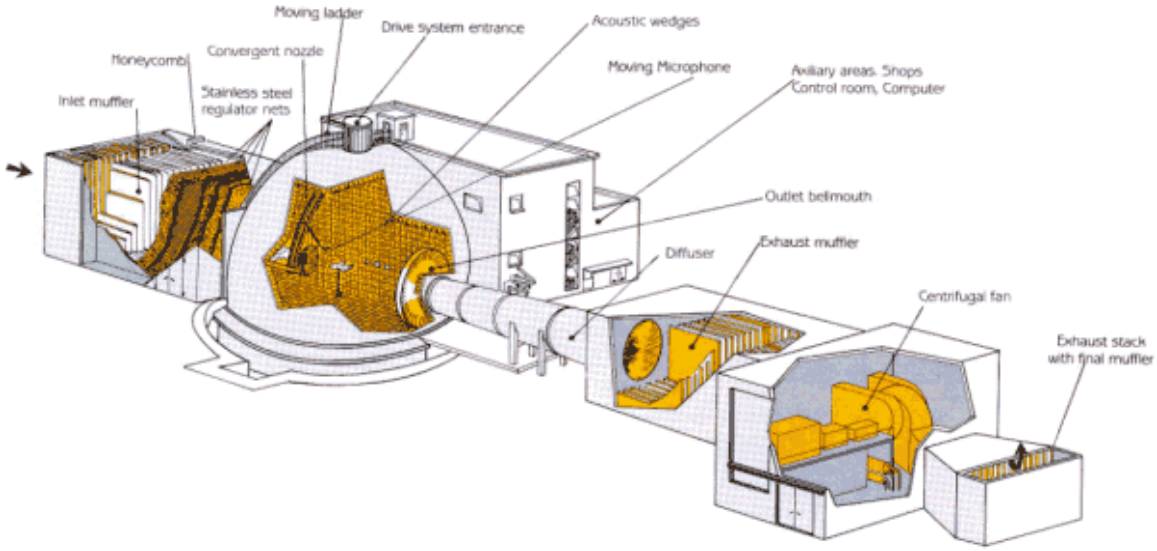
Date of Construction/Planned Improvements

1976 (constructed); 1999 (upgrade).

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.

Wind Tunnels of the Eastern Hemisphere

Subsonic **France**

Installation Name	Test Section Size	Temperature Range
French-German Research Institute of Saint Louis (ISL), Saint Louis, France	90 x 70 x 80 cm³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.126 Mach	
S20 Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	

Testing Capabilities

Data Acquisition

Current Programs

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; visualization by means of holographic filters.

Date of Construction/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,
Saint Louis, France.

Installation Name	Test Section Size	Temperature Range
ONERA French Aeronautics and Space Research Center, Le Fauga Mauzac Center, Le Fauga Mauzac, France	Four 4.5 x 3.5 m² model carts	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	123 m/sec (0.36 Mach)	8
F1 Continuous Pressurized Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	1 to 3.85 bar

Testing Capabilities

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/sec, 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; model deformation measurements.

Data Acquisition

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

Current Programs

Propellar calibration tests.

Date of Construction/Planned Improvements

1974 (constructed).

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 IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **France**

Installation Name	Test Section Size	Temperature Range
ONERA French Aeronautics and Space Research Center, Le Fauga Mauzac Center, Le Fauga Mauzac, France	1.4 x 1.8 m²	± 1°C
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	Up to 100 m/sec	1.1
F2 Continuous Atmospheric Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	

Testing Capabilities

Data Acquisition

Current Programs

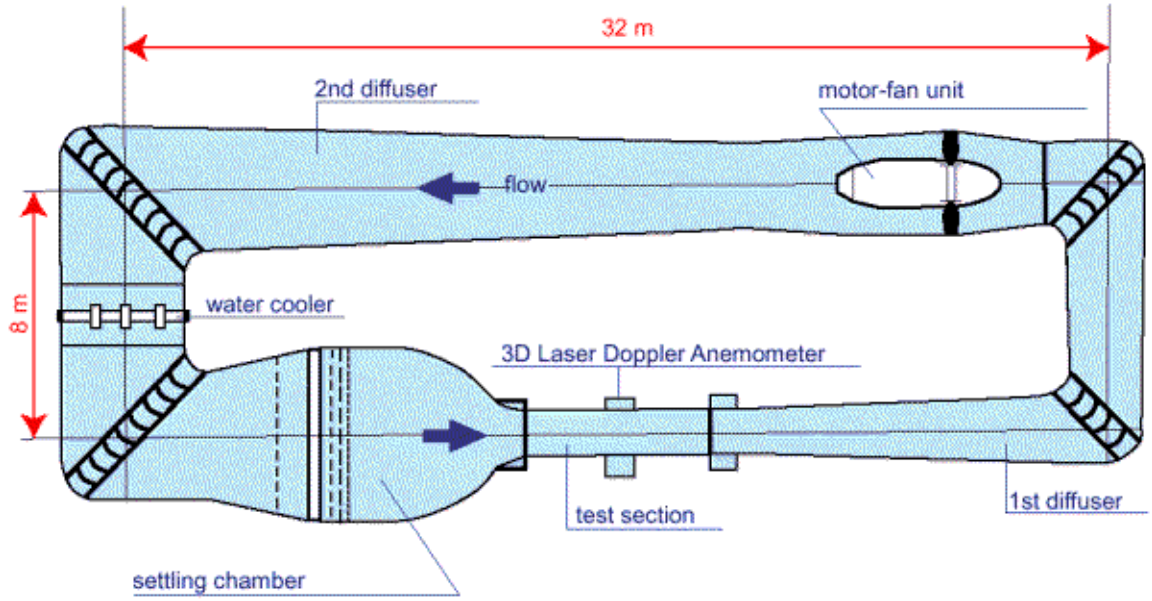
Date of Construction/Planned Improvements

1974 (constructed).

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.

Installation Name	Test Section Size	Temperature Range
ONERA French Aeronautics and Space Research Center, Modane-Avrieux, France	#1: 40 x 42.6 m² (slotted walls); #2: 45 x 45 m² (solid walls); # 3: 45.4 x 47 m² (solid walls); #3: 38.5 x 38.5 m² (anechoic walls)	Ambient (-4 to 140°F)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	#1: up to 1; #2: up to 1; #3 (solid): up to 1; #3 (anechoic walls): up to 0.85 Mach	#1: 7.3 to 7.5; #2: 7.7; #3 (solid): 7.7 to 7.9; #3 (anechoic): 6.7
S1Ma Sub/Transonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	Atmospheric

Testing Capabilities

Rectangular, continuous, high-speed, slotted wall, closed-circuit, atmospheric, return-type circuit; 155 m long x 40 m wides; maximum diamter 24 m; test section diameter 8 m; 3 interchangeable test sections; 2 counter rotating fans; 88 MW Pelton turbines; external and internal balances.

Data Acquisition

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

Current Programs

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

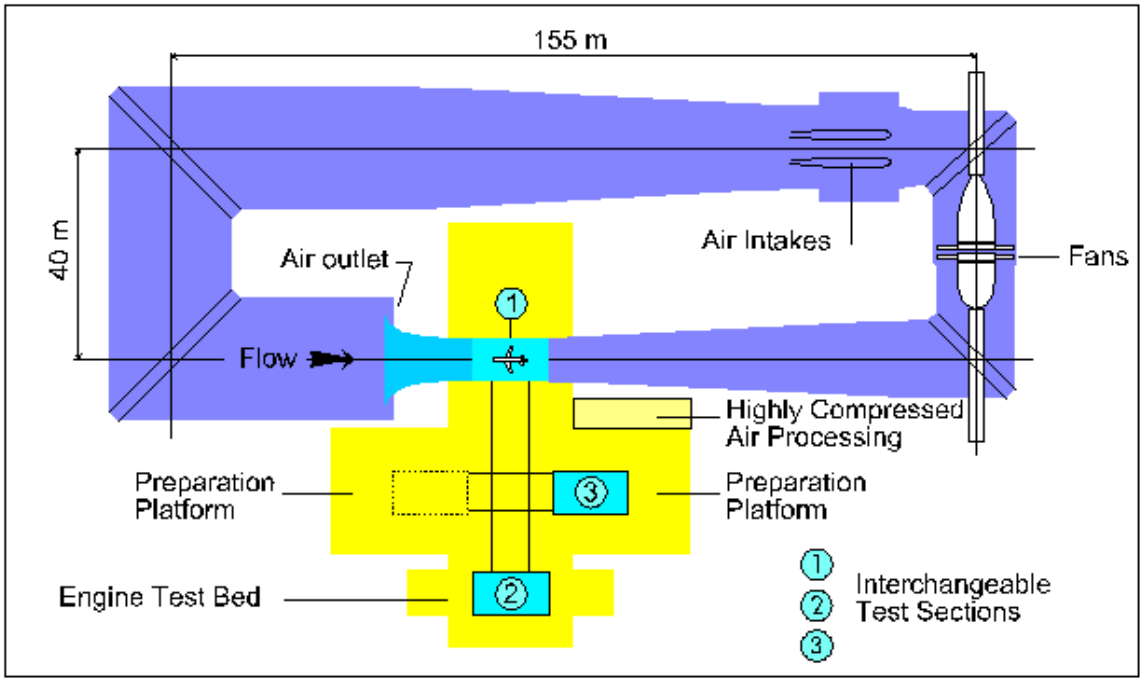
Date of Construction/Planned Improvements

1951 (constructed).

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 Sub/Transonic Wind Tunnel,
ONERA French Aeronautics and Space Research Center,
Modane-Avrieux, France.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Germany**

Installation Name	Test Section Size	Temperature Range
Carolo-Wilhelmina Technical University at Braunschweig, Institute for Fluid Mechanics (ISM), Braunschweig, Germany	600 x 400 x 1500 mm³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	19 m/sec	Low
Low Noise, Low Speed Wind Tunnel (LNB)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Continuous, atmospheric, Eiffel-type wind tunnel with closed test section; driven by 3 kW motor in suction mode; has rectangular cross section with burger-type axial area; contraction ratio is 16; air passes through 30 mm thick fleece mat followed by honeycomb 133 mm long.

Data Acquisition

Stereoscopic-PIV, multiplane-PIV, and time-resolved PIV techniques.

Current Programs

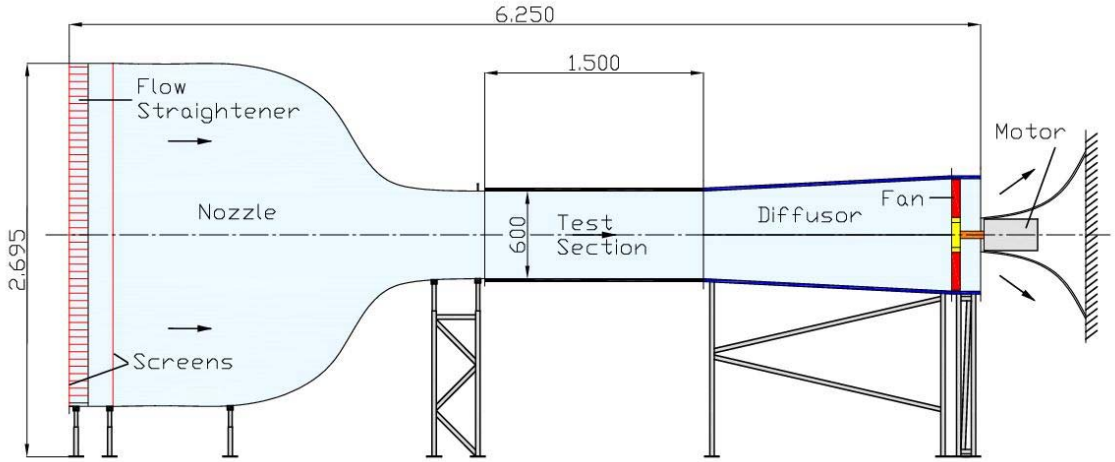
Research in low Reynolds number and unsteady aerodynamics; detailed flow investigations of laminar separation bubbles and interaction of coherent flow structures in turbulent boundary layers; experiments on flapping wings at low Reynolds numbers also planned.

Date of Construction/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,
Institute for Fluid Mechanics (ISM),
Braunschweig, Germany.

Installation Name	Test Section Size	Temperature Range
Carolo-Wilhelmina Technical University at Braunschweig, Institute for Fluid Mechanics (ISM), Braunschweig, Germany	#1: 1300 x 1300 x 3000 mm³; #2: 800 x 800 x 3000 mm³	10°C (max)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	60 m/sec (max)	0.69
Low Speed Wind Tunnel (MUB)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Göettinger-design, closed-circuit, atmospheric; 3 exchangeable measuring sections; new heat exchanger in calming chamber permits stable flow temperatures; flexible and optical measuring sections.

Data Acquisition

8,400 DTC pressure measuring system; 3-component PIV system; 340 Hz of indigo infrared camera system research underway to develop infrared heat transfer measurements; two 6-component balances; KME 4 external balance.

Current Programs

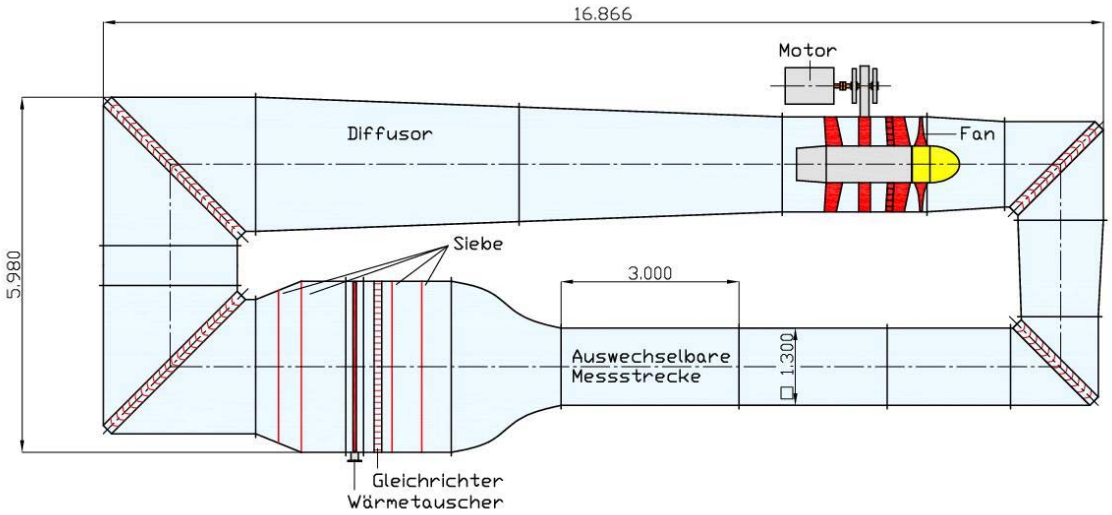
Research on airfoils, aircraft componets, and ground vehicles.

Date of Construction/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 at Braunschweig,
Institute for Fluid Mechanics (ISM),
Braunschweig, Germany.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Germany**

Installation Name	Test Section Size	Temperature Range
Carolo-Wilhelmina Technical University at Braunschweig, Institute for Fluid Mechanics (ISM), Braunschweig, Germany	4,997 x 2,450 x 940 mm³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	65 m/sec (max)	
Small Continuous Atmospheric Wind Tunnel Braunschweig (KWB)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Continous, open test section; driven by a 22 kW motor; nozzle can be replaced with burger-nozzle of bi-superelliptic shape; 505 mm open-jet diameter.

Data Acquisition

Current Programs

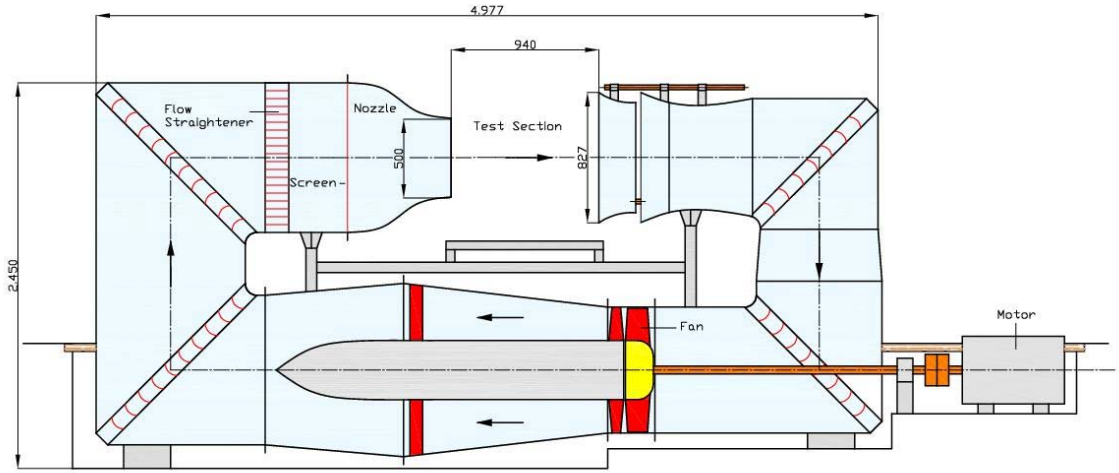
Educational; investigates new measurement techniques; studies feasibility of new research concepts such as flow control.

Date of Construction/Planned Improvements

User Fees

Contact Information

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



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

Wind Tunnels of the Eastern Hemisphere

Subsonic **Germany**

Installation Name	Test Section Size	Temperature Range
German-Dutch Wind Tunnels (DNW), Braunschweig, Germany	#1: 3.25 x 2.8 m² (closed or slotted wall); #2: 3.25 x 2.8 m² (open jet)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	#1: 90 m/sec; #2: 75 m/sec	#1: 1.8; #2: 1.5
Low Speed Continuous Atmospheric Wind Tunnel (NWB)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	

Testing Capabilities

Atmospheric, low-speed, closed-circuit tunnel; settling chamber equipped with honeycomb-type flow straightener and 3 fine mesh screens; 1.4 MV power supply maximum.

Data Acquisition

Up to 240 measurement channels; PSI system 8,400 DTC for pressure; measurement up to 1,024 pressure points.

Current Programs

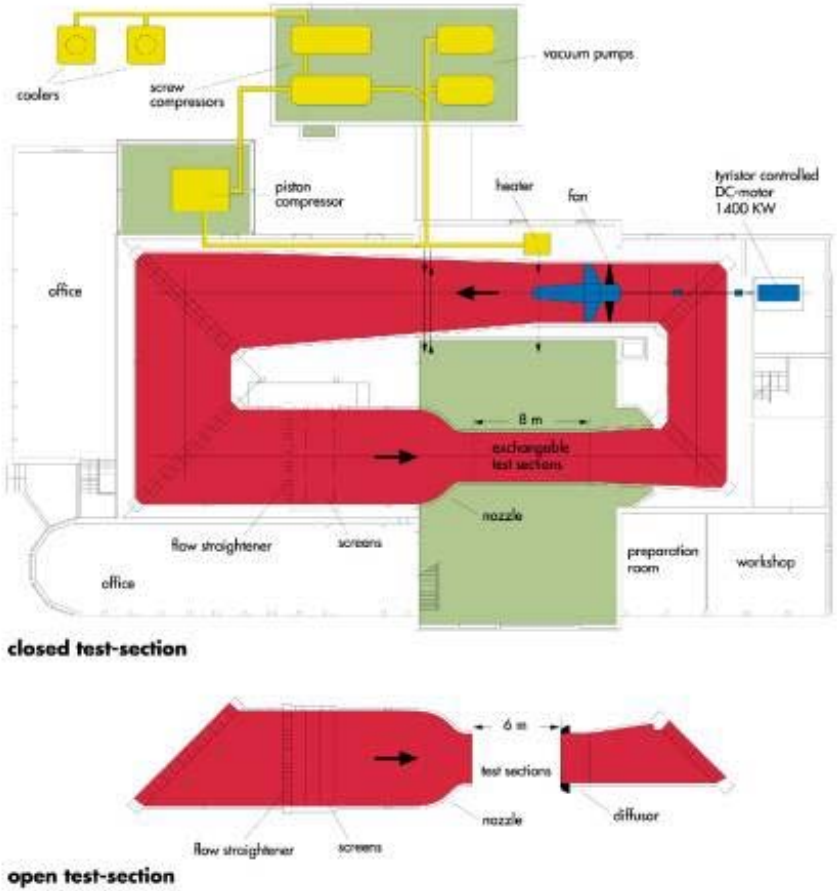
Date of Construction/Planned Improvements

1960 (constructed); 1980 (upgrade).

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.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Germany**

Installation Name	Test Section Size	Temperature Range
German-Dutch Wind Tunnels (DNW), Göttingen, Germany	0.6 x 0.6 m²	Ambient
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	35 m/sec (max)	12
High-Pressure Continuous Subsonic Wind Tunnel (HDG)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	

Testing Capabilities

Pressurizing the air in the wind tunnel up to 100 bar obtains very high Reynolds numbers in incompressible flow with velocities up to 35 m/sec; models can be installed in different test sections; test section exchange 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.

Current Programs

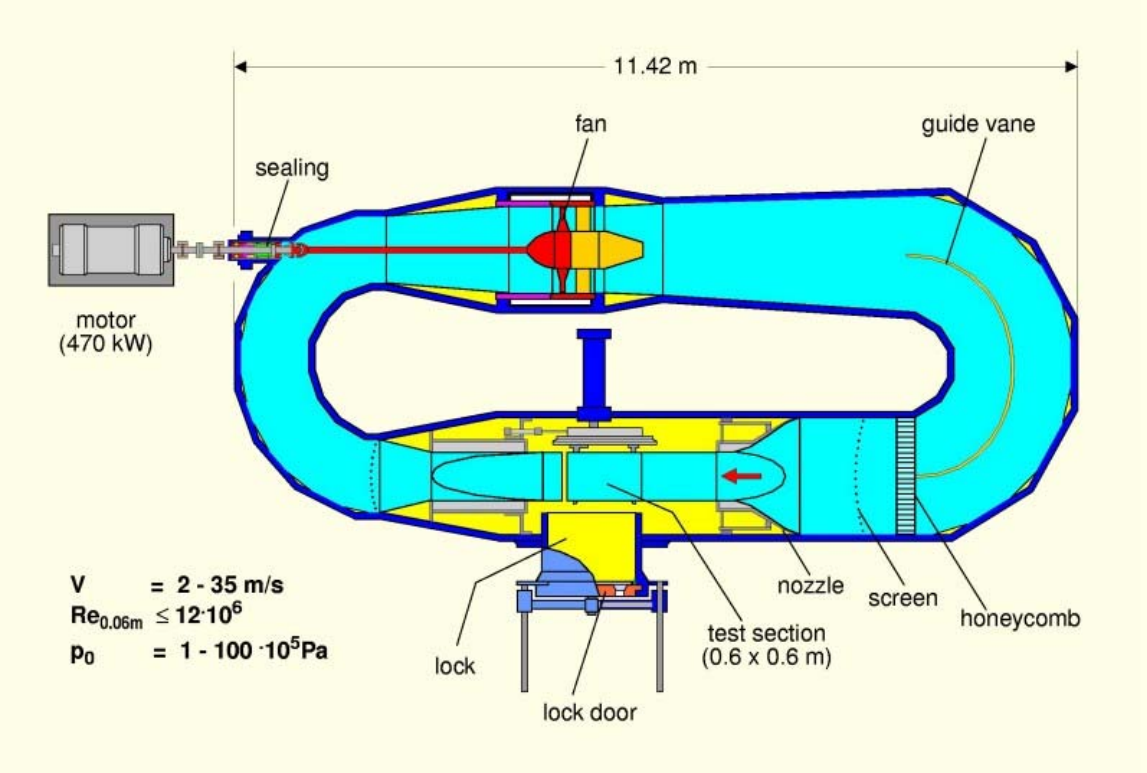
Investigations requiring simulation of correct Reynolds number; systematic steady and unsteady fluid-dynamic research into Reynolds effect on solid generic models such as spheres, cylinders, airfoils, etc. models, as well as on high-speed trains, buildings, bridges, and other engineering structures.

Date of Construction/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/.



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

Wind Tunnels of the Eastern Hemisphere

Subsonic **Germany**

Installation Name	Test Section Size	Temperature Range
German-Dutch Wind Tunnels (DNW), Köln, Germany	2.4 x 2.4 m²	116 to 300 K
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0 to 0.38 Mach	9.5
Continuous Cryogenic Wind Tunnel (KKK)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	Ambient

Testing Capabilities

Continuously working, closed tunnel circuit; gas temperature varied between 100 and 300 K with liquid nitrogen to increase Reynolds number by factor of 5.5.

Data Acquisition

Current Programs

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

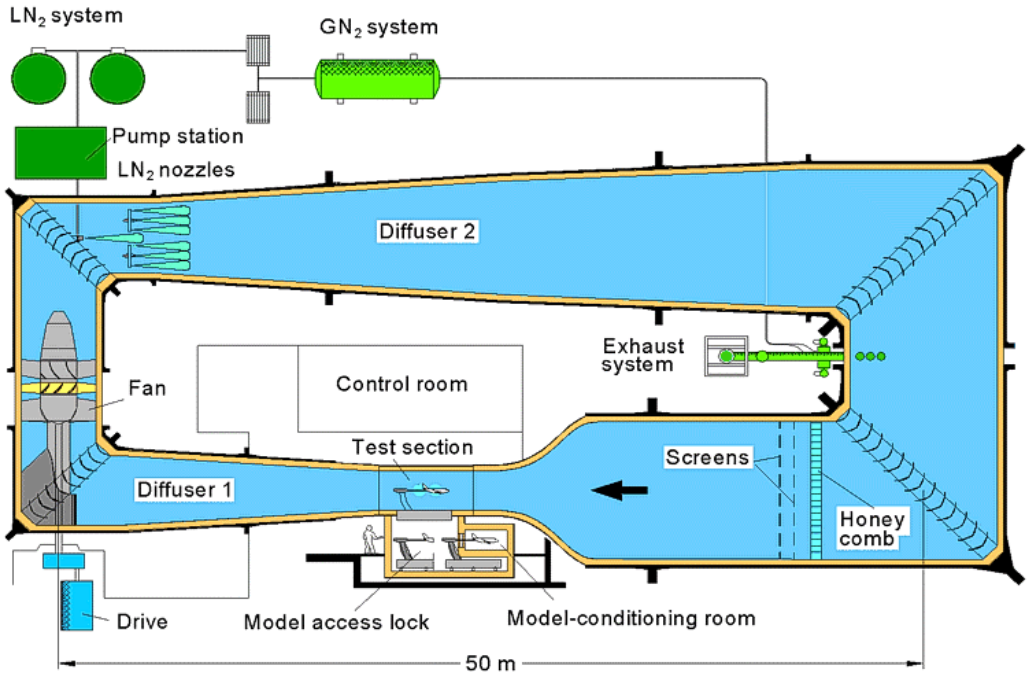
Date of Construction/Planned Improvements

1980 to 1985 (upgrade to high Reynolds-number cryogenic wind tunnel); July 1987 (entered service).

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; Email: dnw-kkk@dnw.aero; Web site: http://www.dnw.aero/.



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

Wind Tunnels of the Eastern Hemisphere

Subsonic **Germany**

Installation Name	Test Section Size	Temperature Range
Institute for Aerodynamics and Gas Dynamics (IAG), University of Stuttgart, Stuttgart, Germany	0.73 x 2.73 x 3.15 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	90 m/sec	5 (max)
Laminar Wind Tunnel (LWK)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	

Testing Capabilities

Closed aerodynamic circuit; long blowdown; closed measuring section; Eiffel-type open air feedback; 220 kW motor speed; 100:1 contraction ratio; integrated filter mats u < 0.2%.

Data Acquisition

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

Current Programs

Measurement of 2D models.

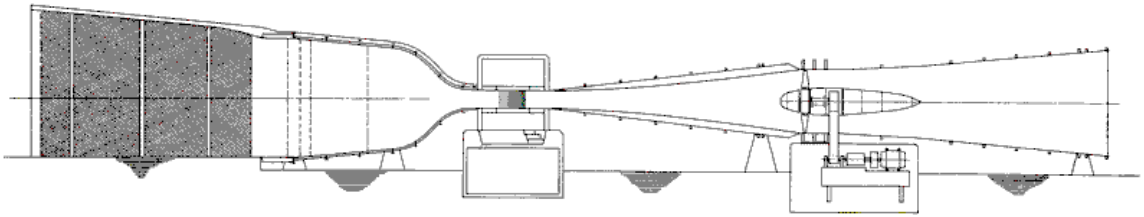
Date of Construction/Planned Improvements

1962 (constructed)

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/.



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

Wind Tunnels of the Eastern Hemisphere

Subsonic **Germany**

Installation Name	Test Section Size	Temperature Range
Institute for Aerodynamics and Gas Dynamics (IAG), University of Stuttgart, Stuttgart, Germany	0.373 x 0.6 x 0.8 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	30 m/sec	0.03 to 0.4
Model Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	75 mm WC (max)

Testing Capabilities

Long-blowdown, closed measuring section, open-air feedback (Eiffel type); 6-blade blower with 4 kW 3-phase motor; turbulence/flow rate of 20,000 to 750,000.

Data Acquisition

PC-supported system with 12-bit AD Wandler.

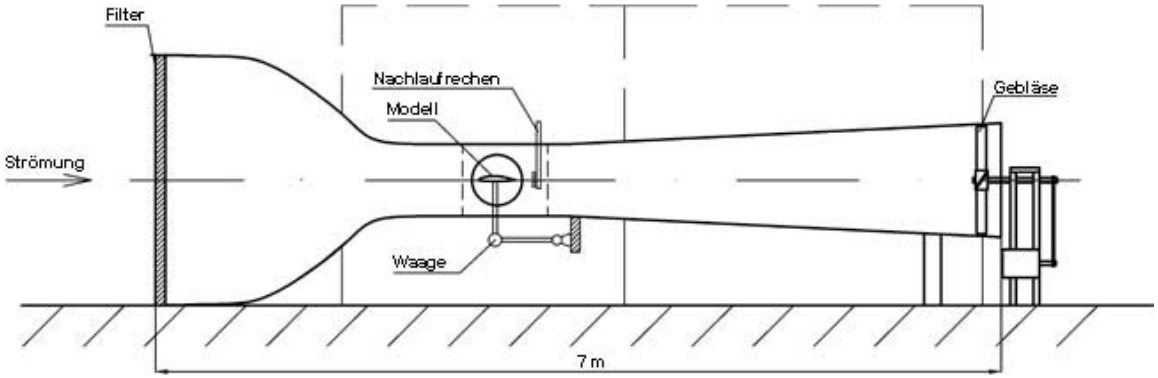
Current Programs

Date of Construction/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.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Germany**

Installation Name	Test Section Size	Temperature Range
Technical University of Darmstadt, Darmstadt, Germany	2.2 x 2.9 x 4.3 m³	Ambient
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	68 m/sec	1.14
2.2 x 2.9 m Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	Ambient

Testing Capabilities

Closed, single-return; 300 kW single-stage axial fan; PSI system; no ground effects; 50-bar air supply system, 500 kg air-mass flow.

Data Acquisition

Micro Vax.

Current Programs

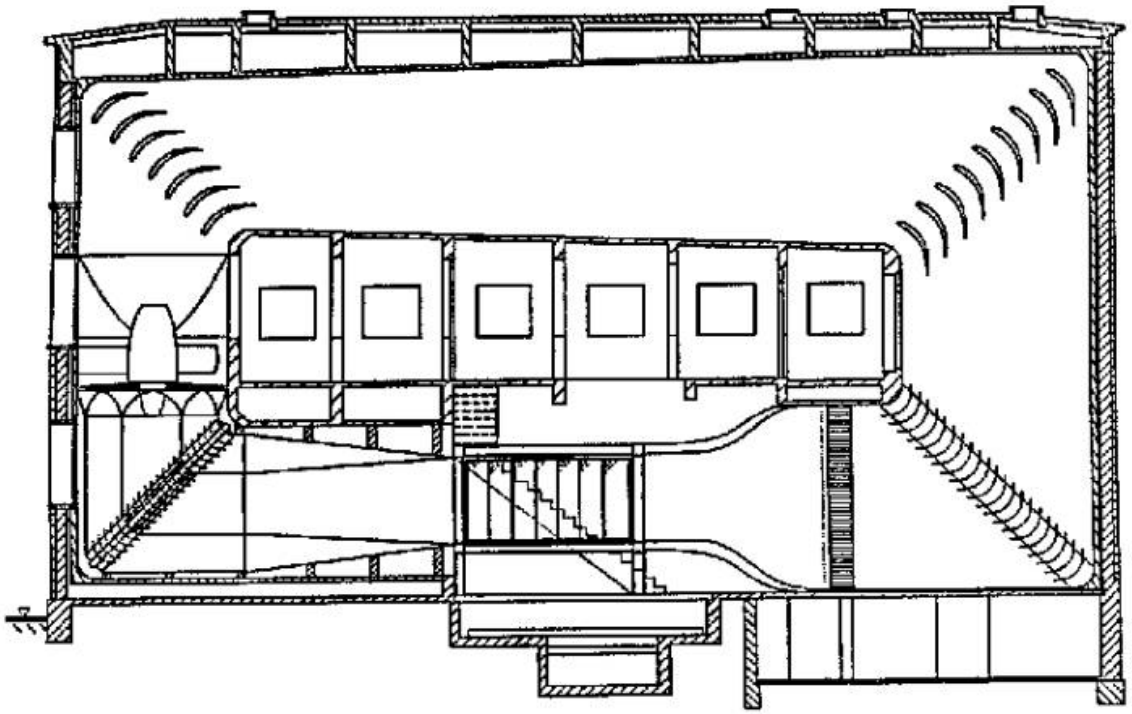
Date of Construction/Planned Improvements

1937 (constructed).

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.

Wind Tunnels of the Eastern Hemisphere

Subsonic **India**

Installation Name	Test Section Size	Temperature Range
Council of Scientific and Industrial Research (CSIR), National Aerospace Laboratories (NAL), Nilakantan Wind Tunnel Centre, Bangalore, India	1.2 x 1.2 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.2 to 4.0 Mach	8 to 60
1.2 x 1.2 m Trisonic Wind Tunnel (H1)		**Dynamic Pressure**
	Cost	
	US$4.2 million (in 1964).	**Stagnation Pressure**
	Operational Status	
	Presumed active as of June 2006.	1.5 to 8.0 bar

Testing Capabilities

Blowdown; typical testing duration 30 sec; model incidence -15° to 27°; continuous and step mode; model roll angle 0° to 360°.

Data Acquisition

Data acquisition through front-end MicroVAX computer systems.

Current Programs

Tests for launch vehicle multi-booster separation; dynamic stability; flutter and heat transfer; supports all Indian aerospace programs (aircraft, missiles, and launch vehicles); development of novel test techniques for blowdown tunnels; design and fabrication of sophisticated models and balances; trajectory of a store separating from a MiG-21 aircraft; air intake on the Light Combat Aircraft (LCA).

Date of Construction/Planned Improvements

1967 (commissioned).

User Fees

Contact Information

Dr. A.R. Upadhya (Director), Natioal Aerospace Laboratories, Post Bag No. 1779, Kodihalli, Bangalore-560 037 India; Tel: (91) 80 252 70584 or 65579; Fax: (91) 80 252 60862 or 70670; Email: director@css.nal.res.in; Web site: http://www.nal.res.in.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **India**

Installation Name	Test Section Size	Temperature Range
Indian Institute of Science, Department of Aerospace Engineering, Bangalore, India	30 cm x 30 cm x 4 m	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name		
30 x 30 cm Open Circuit Low Speed Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of March 2007.	

Testing Capabilities

Data Acquisition

Current Programs

Boundary layer work; in addition to this tunnel, several small tunnels of test section size 30 cm x 30 cm have been built in the past to suit specific studies; these include wall jets, reverse transition in accelerating flows, and curved wall boundary layers.

Date of Construction/Planned Improvements

User Fees

Contact Information

Professor B.N. Raghunandan (Chairman), Department of Aerospace Engineering, Indian Institute of Science, Bangalore 560012 India; Tel: (91) 80 229 32878 or 33023; Email: raghubn@aero.iisc.ernet.in; Web site: http://www.aero.iisc.ernet.in/facilities/aerodyn_facilities.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **India**

Installation Name	*Test Section Size*	*Temperature Range*
Indian Institute of Science, Department of Aerospace Engineering, Bangalore, India	50 cm x 50 cm x 3 m	
	Speed Range	*Reynolds Number (x 10^6)*
Facility Name		
50 x 50 cm Open Circuit Low Turbulence Tunnel		*Dynamic Pressure*
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of March 2007.	

Testing Capabilities

Turbulence level < 0.05 %.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Professor B.N. Raghunandan (Chairman), Department of Aerospace Engineering, Indian Institute of Science, Bangalore 560012 India; Tel: (91) 80 229 32878 or 33023; Email: raghubn@aero.iisc.ernet.in; Web site: http://www.aero.iisc.ernet.in/facilities/aerodyn_facilities.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **India**

Installation Name	Test Section Size	Temperature Range
Indian Institute of Science, Department of Aerospace Engineering, Bangalore, India	50 mm x 540 mm x 8 m	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name		
50 x 540 mm Closed Channel Facility		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of March 2007.	

Testing Capabilities

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Professor B.N. Raghunandan (Chairman), Department of Aerospace Engineering, Indian Institute of Science, Bangalore 560012 India; Tel: (91) 80 229 32878 or 33023; Email: raghubn@aero.iisc.ernet.in; Web site: http://www.aero.iisc.ernet.in/facilities/aerodyn_facilities.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **India**

Installation Name	*Test Section Size*	*Temperature Range*
Indian Institute of Science, Department of Aerospace Engineering, Bangalore, India	600 x 600 mm²	
	Speed Range	*Reynolds Number (x 10^6)*
Facility Name		
600 x 600 mm Open Circuit Type Low Speed Wind Tunnel		*Dynamic Pressure*
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of March 2007.	

Testing Capabilities

Data Acquisition

Current Programs

Suitable for R&D work; supplied to 30 academic and research institutions in India; slightly larger wind tunnel supplied to World Meterological Organization (WMO) in the Phillippines.

Date of Construction/Planned Improvements

User Fees

Contact Information

Professor B.N. Raghunandan (Chairman), Department of Aerospace Engineering, Indian Institute of Science, Bangalore 560012 India; Tel: (91) 80 229 32878 or 33023; Email: raghubn@aero.iisc.ernet.in; Web site: http://www.aero.iisc.ernet.in/facilities/aerodyn_facilities.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **India**

Installation Name	Test Section Size	Temperature Range
Indian Institute of Science, Department of Aerospace Engineering, Bangalore, India	2.2 x 1.5 m² (7 x 5 ft²)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	Up to 180 mph (80 m/sec)	
Elliptical Low Speed Closed Circuit Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of March 2007.	

Testing Capabilities

Originally fan driven by aeroengine with mechanical balance for measuring forces and moments; aeroengine later replaced by electric motor, mechanical balance replaced by model support system using internal strain gauge balances.

Data Acquisition

Some instrumentation (e.g., balances and pressure-measuring system) shared with the larger 4.25 m x 2.75 m open-circuit wind tunnel (OCWT) commissioned later.

Current Programs

Early development studies for Hindustan Aeronautics Limited (HAL).

Date of Construction/Planned Improvements

1944 (commissioned).

User Fees

Contact Information

Professor B.N. Raghunandan (Chairman), Department of Aerospace Engineering, Indian Institute of Science, Bangalore 560012 India; Tel: (91) 80 229 32878 or 33023; Email: raghubn@aero.iisc.ernet.in; Web site: http://www.aero.iisc.ernet.in/facilities/aerodyn_facilities.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **India**

Installation Name	Test Section Size	Temperature Range
Indian Institute of Science, Department of Aerospace Engineering, Bangalore, India	4.25 x 2.75 m² (14 x 9 ft²)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	70 m/sec	
Open Circuit Low Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of March 2007.	

Testing Capabilities

Data Acquisition

Current Programs

Aerospace and non-aerospace programs.

Date of Construction/Planned Improvements

1959 (commissioned); recent upgrades: 6-component internal strain gauge balance/calibration rig (from KTH Sweden); new set of honeycombs in inlet section; sector-type model support system permits both pitch and yaw control.

User Fees

Contact Information

Professor B.N. Raghunandan (Chairman), Department of Aerospace Engineering, Indian Institute of Science, Bangalore 560012 India; Tel: (91) 80 229 32878 or 33023; Email: raghubn@aero.iisc.ernet.in; Web site: http://www.aero.iisc.ernet.in/facilities/aerodyn_facilities.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **India**

Installation Name	Test Section Size	Temperature Range
Indian Institute of Technology, Department of Aerospace Engineering, Low Speed Aerodynamic Laboratory, Kanpur, India	24 x 24 x 120 in³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	20 m/sec (variable)	
Boundary Layer Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Open-return, suction-type tunnel; powered by 20 hp fan; 9:1 contraction ratio.

Data Acquisition

DISA hotwire anemometry; pressure scanners; flow visualization system; strain gauge and mechanical balances; digital storage oscilloscope; spectrum analyzer; transducers and probes of different types to measure both steady and unsteady flow quantities.

Current Programs

Unsteady aerodynamics; flow control on airfoils, wings, and other bodies; bluff body flows; wind engineering; decelerator aerodynamics.

Date of Construction/Planned Improvements

User Fees

Contact Information

Dr. K. Poddar, Low Speed Aerodynamics Laboratory, Department of Aerospace Engineering, Indian Institute of Technology, Kanpur 208 016 India; Tel (office): (91) 512 259 7293; Tel (lab): (91) 512 259 7812; Fax: (91) 512 259 7561; Email: kamal@iitk.ac.in; Web site: http://www.iitk.ac.in/aero/lsalab/lshome.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **India**

Installation Name	Test Section Size	Temperature Range
Indian Institute of Technology, Department of Aerospace Engineering, Low Speed Aerodynamic Laboratory, Kanpur, India	12 x 16 in²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	25 m/sec	
Low Turbulence Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Open-return, suction-type tunnel; powered by 2.5 hp dc fan; outlet from 8:1 contraction has exit velocities up to 25 m/sec; 48 in long working section can be extended if needed; fan equipped with variable speed control.

Data Acquisition

DISA hotwire anemometry; pressure scanners; flow visualization system; strain gauge and mechanical balances; digital storage oscilloscope; spectrum analyzer; transducers and probes of different types, to measure both steady and unsteady flow quantities.

Current Programs

Unsteady aerodynamics; flow control on airfoils, wings, and other bodies; bluff body flows; wind engineering; decelerator aerodynamics.

Date of Construction/Planned Improvements

User Fees

Contact Information

Dr. K. Poddar, Low Speed Aerodynamics Laboratory, Department of Aerospace Engineering, Indian Institute of Technology, Kanpur 208 016 India; Tel (office): (91) 512 259 7293; Tel (lab): (91) 512 259 7812; Fax: (91) 512 259 7561; Email: kamal@iitk.ac.in; Web site: http://www.iitk.ac.in/aero/lsalab/lshome.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **India**

Installation Name	Test Section Size	Temperature Range
Indian Institute of Technology, Department of Aerospace Engineering, Low Speed Aerodynamic Laboratory, Kanpur, India	12 x 48 x 60 in³ (2D section); 24 x 36 in² (3D section)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	40 m/sec (2D section), 30 m/sec (3D section)	
Twin Air or 5D Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Closed circuit with 2 test sections: one 2D and one 3D; powered by two 15 hp fans; variable speed control; contraction ratios: 12:1 (2D), 11:1 (3D).

Data Acquisition

DISA hotwire anemometry; pressure scanners; flow-visualization system; strain gauge and mechanical balances; digital storage oscilloscope; spectrum analyzer; transducers and probes of different types, to measure both steady and unsteady flow quantities.

Current Programs

Unsteady aerodynamics; flow control on airfoils, wings, and other bodies; bluff body flows; wind engineering; decelerator aerodynamics.

Date of Construction/Planned Improvements

User Fees

Contact Information

Dr. K. Poddar, Low Speed Aerodynamics Laboratory, Department of Aerospace Engineering, Indian Institute of Technology, Kanpur 208 016 India; Tel (office): (91) 512 259 7293; Tel (lab): (91) 512 259 7812; Fax: (91) 512 259 7561; Email: kamal@iitk.ac.in; Web site: http://www.iitk.ac.in/aero/lsalab/lshome.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **India**

Installation Name	Test Section Size	Temperature Range
Indian Institute of Technology, Kanpur, India	3 x 2.25 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	90 m/sec (320 mph)	6
National Wind Tunnel Facility (NWTF)		**Dynamic Pressure**
	Cost	
	US$70 million (phase 1)	
	Operational Status	**Stagnation Pressure**
	Presumed active as of April 2007.	

Testing Capabilities

Closed jet; return circuit; continuous flow; 6-component, strain-gauge balance and load cells; 3-axis, automated probe traverse mechanism; 2 synchronous turntables; sting-type model support system; moving-belt ground plane (phase II).

Data Acquisition

CCTV observation and monitoring system; Virtual Instrument (VI)-based data acquisition and control system; 6 W argon-ion laser; laser sheet optics and soke generator; hotwire anemometer; electronic pressure scanners.

Current Programs

Takeoff and landing of aircrafts including ground effects; cruise performance at moderate speeds; development of high lift devices; laminar flow testing for transport aircraft; aerodynamics of helicopters; parachute testing; non-aeronautical testing includes: buildings, urban complexes, bridges, vehicles, and ships.

Date of Construction/Planned Improvements

1999 (constructed).

User Fees

Contact Information

Professor Kamal Poddar (Head), National Wind Tunnel Facility, Department of Aerospace Engineering, Indian Istitute of Technology Kanpur, 2080016 Uttar Pradesh India; Tel: (91) 512 2597843 or 7293 or 7226; Fax: (91) 512 2597843; Email: kamal@iitk.ac.in; Web site: http://www.iitk.ac.in/nwtf/.

National Wind Tunnel Facility (NWFT),
Indian Institute of Technology,
Kanpur, India.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Indonesia**

Installation Name	Test Section Size	Temperature 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 m³	
Facility Name	**Speed Range**	**Reynolds Number (x 10^6)**
Indonesia Low Speed Wind Tunnel (ILST)	110 m/sec	6.5
	Cost	**Dynamic Pressure**
	US$18 million (estimated construction cost)	
	Operational Status	**Stagnation Pressure**
	Confirmed active as of 2004.	

Testing Capabilities

Test section operates in 2 parts: 5.75 m front part for aeronautical testing, 4.25 m aft part for non-aeronautical testing; aeronautical and industrial aerodynamics closed-return circuit; atmospheric and closed-wall test sections; 1:9 contraction ratio; ground plane enables aircraft landing and takeoff simulation; 200 m³ pressurized dry air of 60 bars allows testing on air-turbine-powered engine simulators.

Data Acquisition

256 channels

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 takeoff testing; air turbine powered engine simulators.

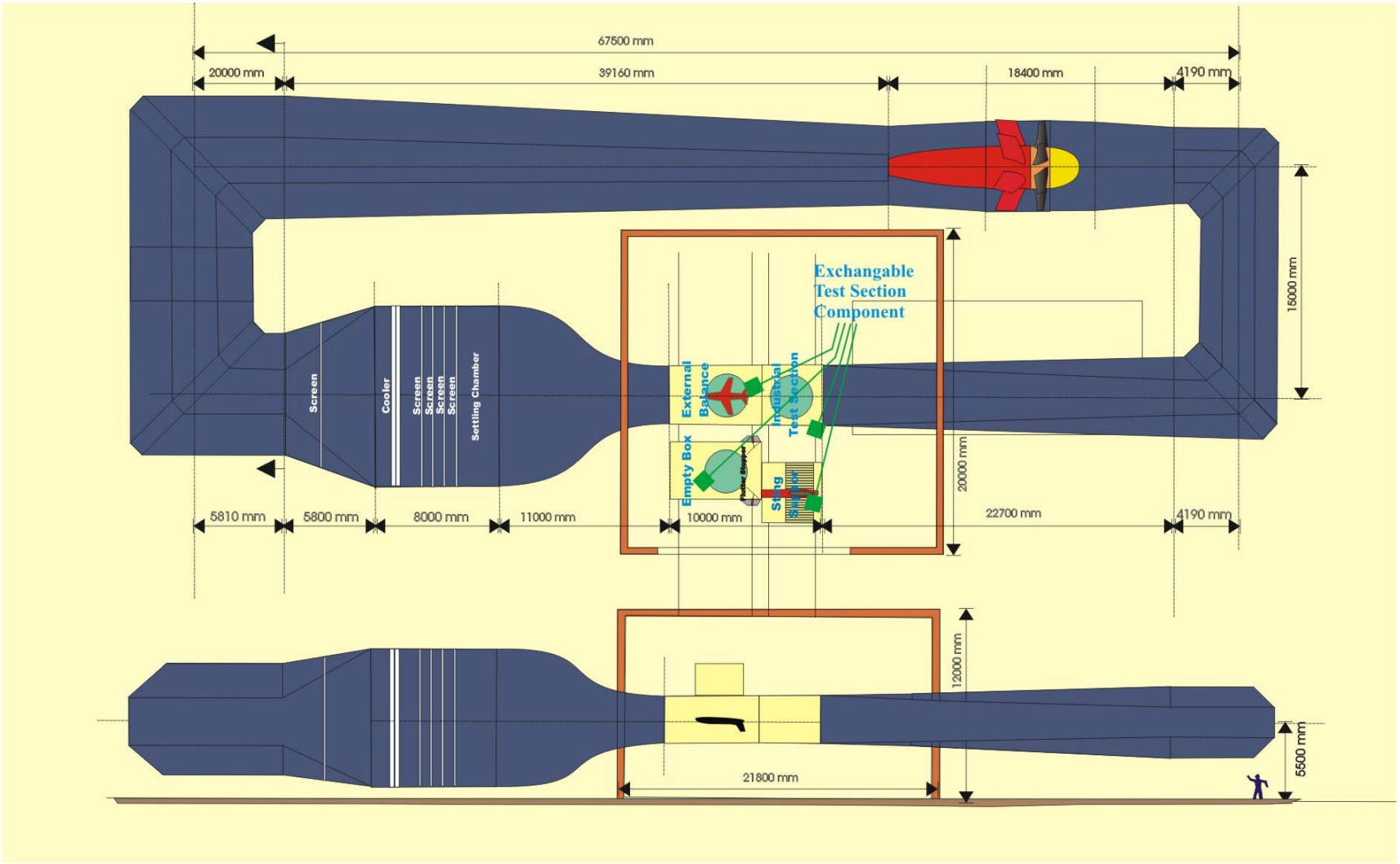
Date of Construction/Planned Improvements

1987 to 1988 (constructed; developed under bilateral technological cooperation between Republic of Indonesia and Netherlands National Aerospace Laboratory).

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),

Wind Tunnels of the Eastern Hemisphere

Subsonic **Iran**

Installation Name	*Test Section Size*	*Temperature Range*
Iran Research Organization for Science and Technology (IROST), Tehran, Iran		
	Speed Range	*Reynolds Number (x 10^6)*
Facility Name		
Subsonic Wind Tunnel		*Dynamic Pressure*
	Cost	
		Stagnation Pressure
	Operational Status	

Testing Capabilities

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Dr. Mohammad Ali Ardekani, Forsat St., No. 71, Ferdowsi Square, Tehran, Islamic Republic of Iran; Tel: (98) 21 88 38 323; Fax:(98) 21 64 38 357; Email (Ardekani): ardekani@irost.com; Web site: http://www.irost.org/, http://www.irost.com/.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Iran**

Installation Name	Test Section Size	Temperature Range
Iran University of Science and Technology (IUS), Mechanical Engineering Department, Aerodynamics Research Laboratory, Tehran, Iran		
	Speed Range	Reynolds Number (x 10^6)
Facility Name		
Closed Circuit Subsonic Wind Tunnel		Dynamic Pressure
	Cost	
		Stagnation Pressure
	Operational Status	

Testing Capabilities

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Dr. Reza Taghavi Zenouz (Director), Iran University of Science and Technology, Mechanical Engineering Department, Aerodynamics Research Laboratory, Tehran, Iran; Tel: (98) 21 77491228-29; Fax: (98) 21 77240488; Email (Director): taghavi@iust.ac.ir; Web site: http://mech.iust.ac.ir/files/3/document/dr.taghavi.pdf.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Iran**

Installation Name	Test Section Size	Temperature Range
Iran University of Science and Technology (IUS), Mechanical Engineering Department, Aerodynamics Research Laboratory, Tehran, Iran		
	Speed Range	Reynolds Number (x 10^6)
Facility Name		
Three Open Circuit Subsonic Wind Tunnels		Dynamic Pressure
	Cost	
		Stagnation Pressure
	Operational Status	

Testing Capabilities

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Dr. Reza Taghavi Zenouz (Director), Iran University of Science and Technology, Mechanical Engineering Department, Aerodynamics Research Laboratory, Tehran, Iran; Tel: (98) 21 77491228-29; Fax: (98) 21 77240488; Email (Director): taghavi@iust.ac.ir; Web site: http://mech.iust.ac.ir/files/3/document/dr.taghavi.pdf.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Iran**

Installation Name	***Test Section Size***	***Temperature Range***
Sharif University of Technology, School of Mechanical Engineering, Fluid Mechanics Laboratory, Tehran, Iran		
	Speed Range	***Reynolds Number (x 10^6)***
Facility Name		
Low Speed Wind Tunnel		***Dynamic Pressure***
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of March 2007.	

Testing Capabilities

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Bijan Farhanieh (Director), Sharif University of Technology, School of Mechanical Engineering, P.O. Box 11365-9567, Azadi Avenue, Tehran, Iran; Tel: (21) 66165557; Fax: (21) 66000021; Email: bifa@sharif.edu; Web site: http://www.sina.sharif.edu.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Israel**

Installation Name	Test Section Size	Temperature Range
Israel Aerospace Industries Ltd., Ben Gurion International Airport, Israel	3.66 x 2.59 x 6 m³	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	100 m/sec	6
Low Speed Wind Tunnel (LSWT)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	Ambient

Testing Capabilities

Closed construction; single return; power from 1,750 hp fan; internal balances; fixed-plane ground effects; air supply system; 45 psi air mass flow; 3 kg/sec.

Data Acquisition

VAX 4200; PDP 11/73; PC DX4; B&B 12-bit channels, 32 analog, 16 digital.

Current Programs

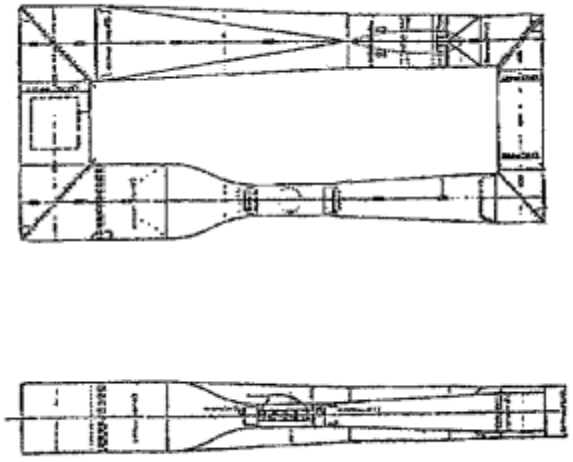
Date of Construction/Planned Improvements

1973 (constructed).

User Fees

Contact Information

Israel Aerospace Industries Ltd., Ben Gurion International Airport, 70100 Israel; Tel: (972) 3 9353 111; Fax: (972) 3 9353 278; Email: corpmkg@iai.co.il; Web site: http://www.iai.co.il/Templates/Homepage/Homepage.aspx?lang=en.



Low Speed Wind Tunnel (LSWT),
Israel Aerospace Industries Ltd.,
Israel

Wind Tunnels of the Eastern Hemisphere

Subsonic **Israel**

Installation Name	Test Section Size	Temperature Range
Technion-Israel Institute of Technology, Faculty of Aerospace Engineering, Aerodynamics Laboratory, Haifa, Israel	1 x 1 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	35 m/sec (max)	
Open Circuit Continuous Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

200 hp; variable-speed.

Data Acquisition

Instruments for measuring force, pressure, velocity, and temperature; DEC 3400-controlled NEFF system for data acquisition reduction; integral 5- to 30-mm, 6-component, sting-type, strain-gauge balances for up to 250 kg forces; laser-Doppler anemometry velocity-measuring technique; optical diagnostics.

Current Programs

Date of Construction/Planned Improvements

2007 (upgrades to 100 mph with new 390 hp centrifugal fan).

User Fees

Contact Information

Dean, Faculty of Aerospace Engineering, Technion-Israel Institute of Technology, Technion City, Haifa 32000 Israel; Tel: (972) 4 829-2308 or 2260; Fax: (972) 4 829-2030; Email: aerdean@aerodyne.technion.ac.il; Web site: http://ae-www.technion.ac.il/research/aerodynamic.php.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Italy**

Installation Name	Test Section Size	Temperature Range
Galleria del Vento, Milan Polytechnic University (GVPM), Milan, Italy	#1: 4 x 3.84 m² (aeronautics test section); #2: 3.84 x 13.84 x 36 m³ (civil test section)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	#1: 55 m/sec; #2: 14 m/sec	0.1 to 1.1
GVPM Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	Ambient

Testing Capabilities

Closed-circuit, single vertical return; 12-blade fan; 14 motors; overall power 1.4 MW.

Data Acquisition

National instruments cards.

Current Programs

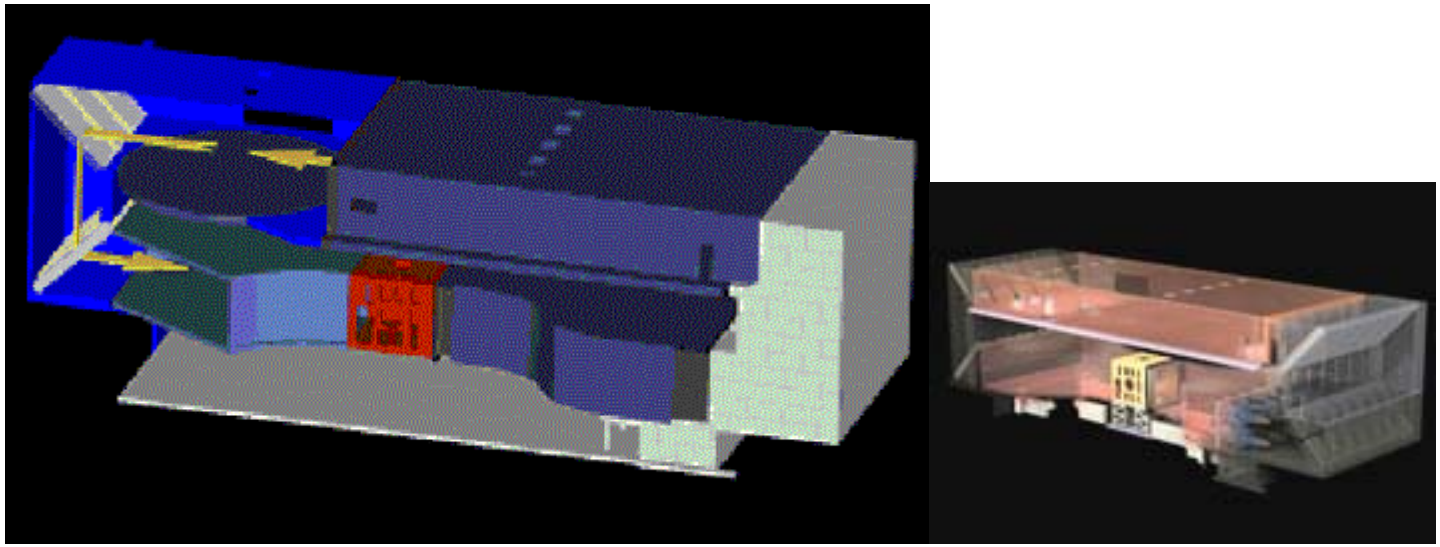
Date of Construction/Planned Improvements

2001 (constructed).

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.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Italy**

Installation Name	Test Section Size	Temperature Range
Italian Aerospace Research Center (CIRA), Capua, Italy		-40°C to -35°C
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.25 to 0.7 Mach	
Icing Wind Tunnel (IWT)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	Up to 1.45 bar

Testing Capabilities

Closed-circuit; 3 different test sections; 4 different open-jet configurations.

Data Acquisition

Current Programs

Date of Construction/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.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Japan**

Installation Name	Test Section Size	Temperature 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 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	3 to 60 m/sec (continuous use), 67 m/sec (max)	
2 x 2 m Low Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of December 2005.	

Testing Capabilities

Continuous circulation type; air blower: 250 kW; gust wind tunnel: uniform air flow 3 to 30 m/sec; gust generator: movable cascade pitch angle 0 ~ ± 0.15 radians; oscillations 0 to 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 1,470 N; position accuracy ± 0.5 mm.

Data Acquisition

Current Programs

Studies of wind loads on aircraft and spacecraft.

Date of Construction/Planned Improvements

1971 (constructed); 1994 (upgrade).

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.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Japan**

Installation Name	Test Section Size	Temperature 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 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	1 to 70 m/sec	
6.5 x 5.5 m Low Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of December 2005.	

Testing Capabilities

Continuous circulation type; octagonal test section with four 1 m corners; air blower: 3,000 kW; fan blade variable-angle type and rotation speed-control type at the same time; strut-mounted pyramid; 6-component balance, sting-mounted internal balance, operating at 4 free angles; ground effect test device: moving belt type, 50 m/sec.

Data Acquisition

Current Programs

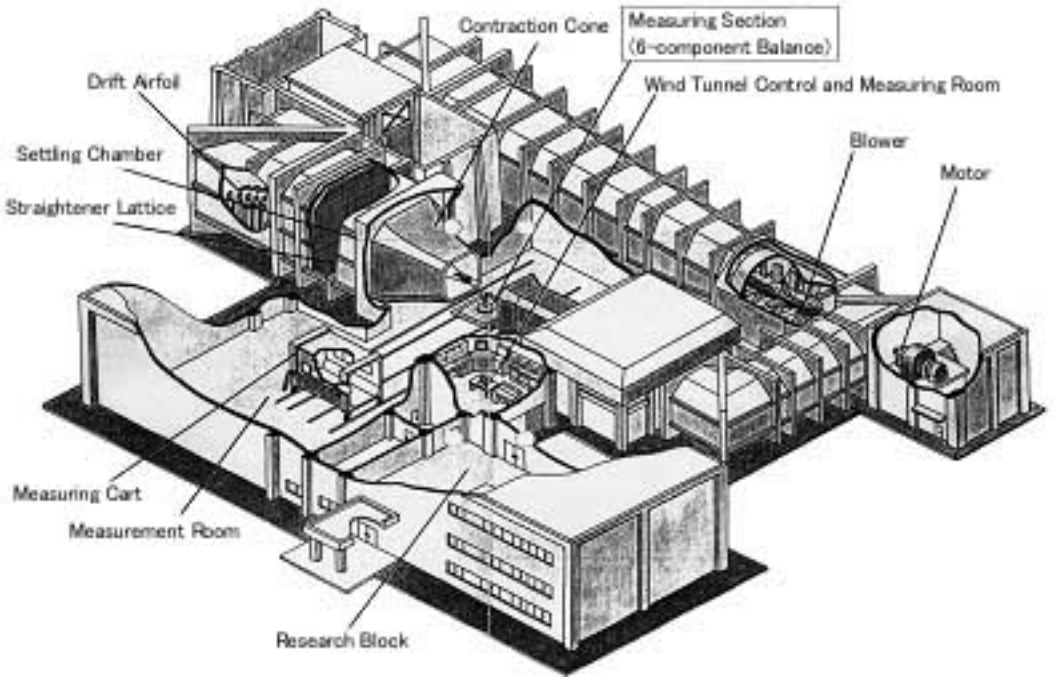
Date of Construction/Planned Improvements

1965 (constructed).

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@chofu.jaxa.jp; Web site: http://www.iat.jaxa.jp/res/wttc/b04.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.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Japan**

Installation Name	Test Section Size	Temperature Range
Kawada Wind Tunnel Research Center, Kawada Industries Inc., Tochigi, Japan	#1: 2.0 x 2.5 x 15.0 m³; #2: 2.5 x 2.5 x 5.0 m³	Ambient
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	#1: 50 m/sec; #2: 45 m/sec	#1: 3.4; #2: 3.1
Kawada Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of December 2005.	#1: 156.25 kg/m² ; #2: 126.56 kg/m²

Testing Capabilities

Single-return, open-circuit; powered by 220 kW fan; 2 external balances, one 3-component and one 6-component; no air supply system; no air mass flow; no ground effects.

Data Acquisition

HP 3852A, spring balance vibration data.

Current Programs

Date of Construction/Planned Improvements

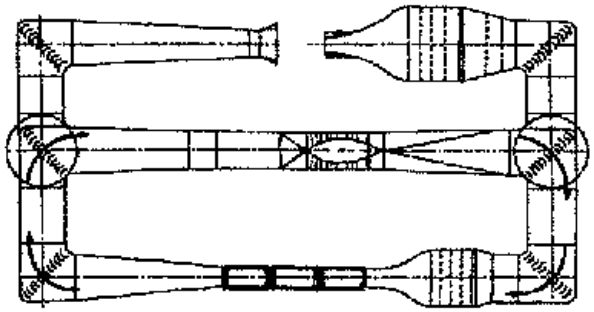
1992 (constructed).

User Fees

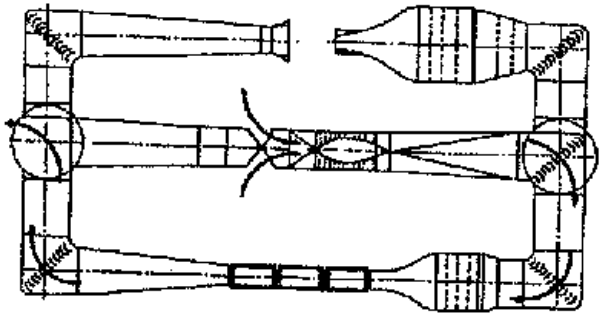
Contact Information

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.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Agency for Defense and Development (ADD), Wind Tunnel Testing Laboratory, Taejo, Daejeon, Republic of Korea	3 x 2.25 x 8.75 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	10 to 120 m/sec	8
Low Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
	US$12 million (estimated)	
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005.	Atmospheric

Testing Capabilities

Three interchangeable test sections; open-jet; slotted or solid wall; probe traverse system; external balance; upper turntable; model handling system; closed-circuit; continuous-flow; atmospheric; powered by 2,400 kW, 11-blade fan.

Data Acquisition

NEFF 471, 128 channels.

Current Programs

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

Date of Construction/Planned Improvements

1998 (constructed).

User Fees

Contact Information

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

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Chosun University, Department of Aerospace Engineering, Gwangju, Republic of Korea	1x 1 x 3 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	60 m/sec (max)	
Closed Circuit Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
	US$253,900 (construction cost, 1999)	**Stagnation Pressure**
	Operational Status	
	Presumed active as of January 2006.	

Testing Capabilities

Solid wall, square test section; 6 contraction ratio; 1.5 m diameter, 132 kW fan.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1999 (constructed).

User Fees

Contact Information

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

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Chunbuk National University, Department of Aerospace Engineering, Jeonju, Republic of Korea	0.6 x 0.45 x 1 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	35 m/sec (max)	
0.6 m Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of January 2006.	

Testing Capabilities

Open, rectangular test section; closed circuit; contraction ratio: 6.25; fan: 0.9 m diameter, 22 kW.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1988 (constructed).

User Fees

Contact Information

Dr. Bongzoo Sung (Manager), Department of Aerospace Engineering, Chunbuk National University, Duckjin-Gu, Jeonju, 561-756, Republic of Korea; 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 IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Chunbuk National University, Jeonju, Republic of Korea	0.6 x 0.6 x 1.3 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	60 m/sec (max)	
Closed Circuit Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
	US$88,648 (construction cost, 1991)	**Stagnation Pressure**
	Operational Status	
	Presumed active as of January 2006.	

Testing Capabilities

Solid wall, square test section; closed circuit; 7.1 contraction ratio; 1.5 m diameter, 30 kW fan.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1991 (constructed).

User Fees

Contact Information

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

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Chungnam National University, Department of Aerospace Engineering, Daejeon, Republic of Korea	1.25 x 1.25 x 4 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	70 m/sec (max)	
Aero-Acoustic Wind Tunnel		**Dynamic Pressure**
	Cost	
	US$305,811 (construction cost, 2000)	**Stagnation Pressure**
	Operational Status	
	Presumed active as of January 2006.	

Testing Capabilities

Solid wall, open, square test section; 5.76 contraction ratio; 2.35 m diameter, 260 kW fan.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

2000 (constructed).

User Fees

Contact Information

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

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Hanyang University, Department of Mechanical Engineering, Seoul, Republic of Korea	0.8 x 0.8 x 1.6 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	65 m/sec (max)	
Small Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
	US$91,723 (construction cost, 2001)	**Stagnation Pressure**
	Operational Status	
	Presumed active as of January 2006.	

Testing Capabilities

Solid wall, square test section; suction circuit; 6.25 contraction ratio; 1.8 m diameter, 55 kW fan.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

2001 (constructed).

User Fees

Contact Information

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

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Inha University, Department of Aerospace Engineering, Incheon, Republic of Korea	1 x 1 x 2 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	70 m/sec (max)	
Aerospace Engineering Wind Tunnel		**Dynamic Pressure**
	Cost	
	US$36,479 (construction cost, 1978)	**Stagnation Pressure**
	Operational Status	
	Presumed active as of January 2006.	

Testing Capabilities

Solid wall, octagonal test section; 4 contraction ratio; 1.6 m diameter, 75 kW fan.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1978 (constructed).

User Fees

Contact Information

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

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Konkuk University, Department of Aerospace, Seoul, Republic of Korea	1 x 1 x 3.5 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	45.1 m/sec (max)	
Multipurpose Wind Tunnel		**Dynamic Pressure**
	Cost	
	US$3,368 (construction cost, 2000)	**Stagnation Pressure**
	Operational Status	
	Presumed active as of January 2006.	

Testing Capabilities

Solid wall, square test section; 7.2 contraction ratio; 2.25 m diameter, 90 kW fan.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

2000 (constructed).

User Fees

Contact Information

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

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Korea Advanced Institute of Science and Technology, Aeronautics Department, Daejeon, Republic of Korea	1.016 x 0.712 x 1.52 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	62 m/sec (max)	
Low Turbulence Open Circuit Wind Tunnel		**Dynamic Pressure**
	Cost	
	US$71,460 (construction cost, 1981)	**Stagnation Pressure**
	Operational Status	
	Presumed active as of January 2006.	

Testing Capabilities

Solid wall, rectangular test section; suction circuit; 7.2 contraction ratio; 1.575 m diameter, 112 kW fan.

Data Acquisition

Current Programs

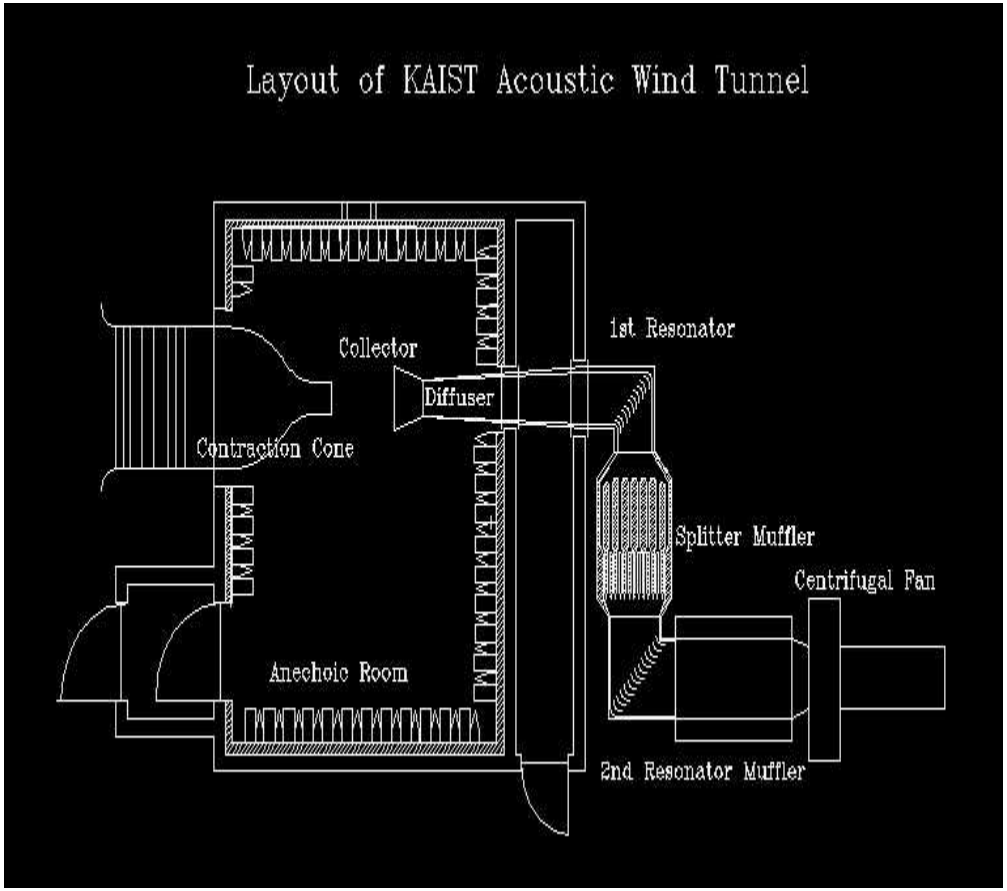
Date of Construction/Planned Improvements

1981 (constructed).

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, Republic of Korea; Tel: (82) 42 869 3753 or 3785; Email: 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).

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Korea Aerospace Research Institute (KARI), Daejeon, Republic of Korea	#1: 4 x 3 x 10 m³ (closed); #2: 6 x 4.5 x 13.5 m³ (slotted); #3: 4 x 3 x 8 m³ (open jet)	
Facility Name	**Speed Range**	**Reynolds Number (x 10^6)**
4 m Low Speed Wind Tunnel	#1: 0.32 Mach; #2: 0.15 Mach; #3: 0.27 Mach	#1: 7.4; #2: 3.5; #3: 6.2
	Cost	**Dynamic Pressure**
	US$20 million (estimated)	
	Operational Status	**Stagnation Pressure**
	Presumed active as of January 2006.	Atmospheric

Testing Capabilities

Closed-circuit, continuous-flow, atmospheric; powered by 3,740 kW fan; external balances; zero ground effects; 7.8 bar air supply; 270 l/sec air mass flow.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1999 (constructed).

User Fees

Contact Information

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

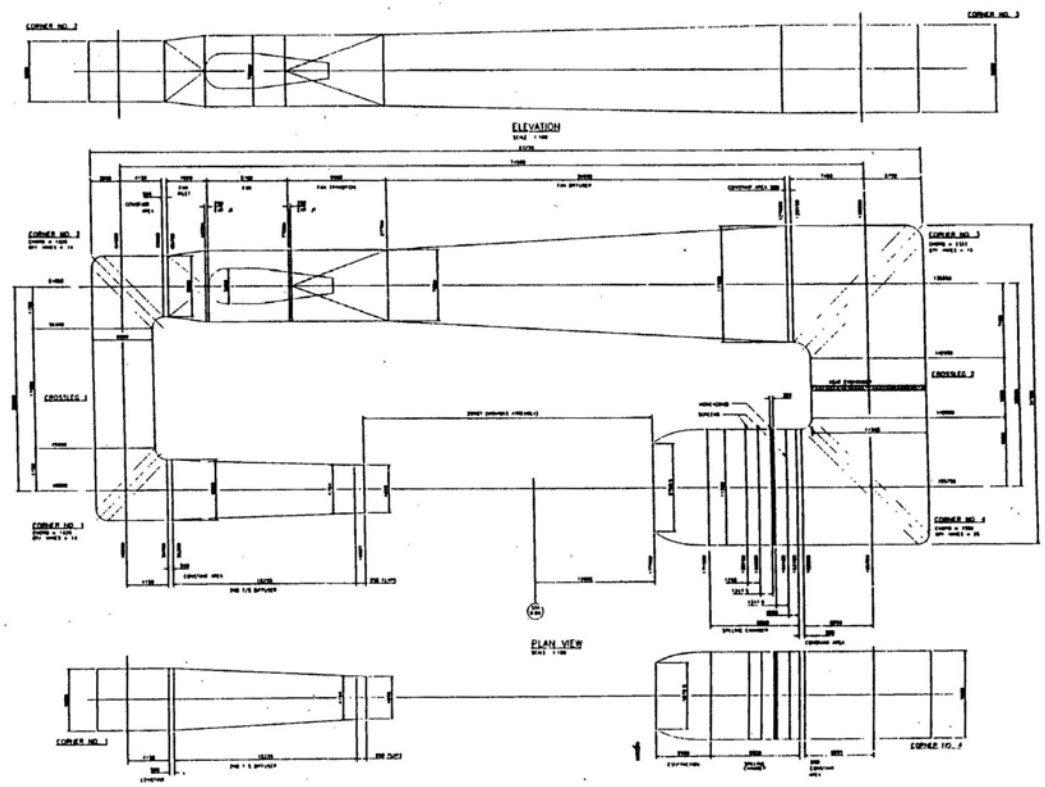


Figure 7.1-1 KARI – LSWT Schematic

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

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Korea Aerospace Research Institute (KARI), Daejeon, Republic of Korea	1 x 0.75 x 2 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	110 m/sec (max)	
KARI 1 m Wind Tunnel		**Dynamic Pressure**
	Cost	
	USD $427,965 (construction cost, 1993)	**Stagnation Pressure**
	Operational Status	
	Presumed active as of January 2006.	

Testing Capabilities

Solid wall, rectangular test section; 11.5 contraction ratio; 2 m diameter, 250 kW fan.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1993 (constructed).

User Fees

Contact Information

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

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Korea Aerospace Research Institute (KARI), Dae-Jeon, Republic of Korea	4 x 3 x 10 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	110 m/sec (max)	
KARI Low Speed Wind Tunnel (LSWT)		**Dynamic Pressure**
	Cost	
	USD $17,612,356 (construction cost, 1998)	**Stagnation Pressure**
	Operational Status	
	Presumed active as of January 2006.	

Testing Capabilities

Solid wall, rectangular test section; 8.24 contraction ratio; 7 m diameter, 4100 kW fan.

Data Acquisition

Current Programs

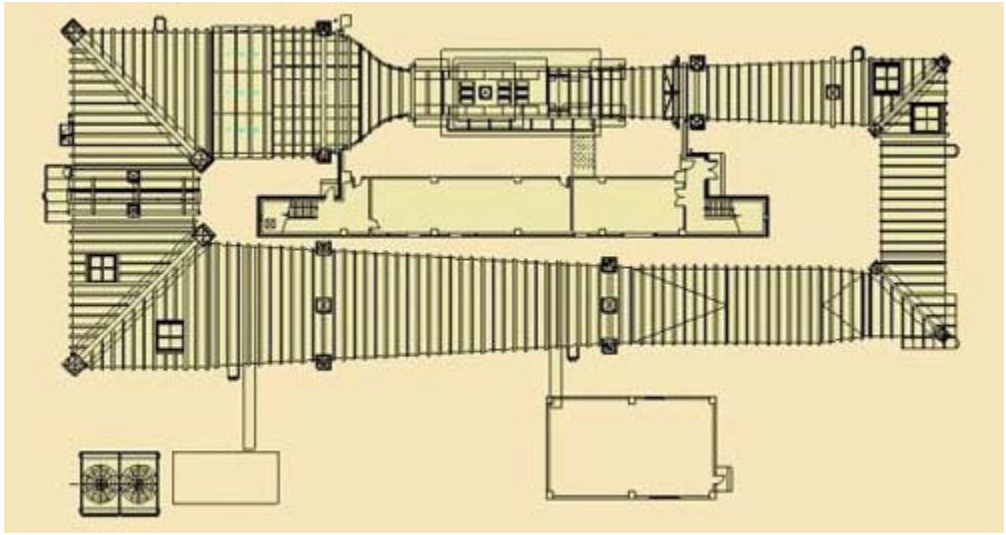
Date of Construction/Planned Improvements

1998 (constructed).

User Fees

Contact Information

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



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

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Korea Air Force Academy (KAFA), KAFA Subsonic Wind Tunnel Laboratory, Choongbuk, Republic of Korea	3.5 x 2.45 x 8.7 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	92 m/sec (max)	
KAFA Low Speed Wind Tunnel (LSWT)		**Dynamic Pressure**
	Cost	
	USD $12,768,179 (construction cost, 1999)	**Stagnation Pressure**
	Operational Status	
	Presumed active as of January 2006.	

Testing Capabilities

Solid wall, rectangular test section; closed circuit; 7.26 contraction ratio; 5.25 m diameter, 2100 kW fan.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1999 (constructed).

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, Republic of Korea; Tel: (82) 043 290 6462 or 6176; Email: hschung@afa.ac.kr; Web site: http://www.afa.ac.kr/index_new.htm.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Korea Air Force Academy (KAFA), KAFA Subsonic Wind Tunnel Laboratory, Choongbuk, Republic of Korea	#1: 3.5 x 2.45 x 8.7 m³; #2: 5.25 x 3.67 x 13.0 m³	
	Speed Range	**Reynolds Number (x 10^6)**
	#1: 0.27 Mach; #2: 0.11 Mach	#1: 6.2; #2: 2.7
Facility Name		**Dynamic Pressure**
KAFA Subsonic Wind Tunnel	**Cost**	
	US$15 million (estimated)	
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005	Atmospheric

Testing Capabilities

Closed wall, closed circuit, interchangeable test sections; slotted wall; open-jet; honeycomb flow straightener; 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.

Current Programs

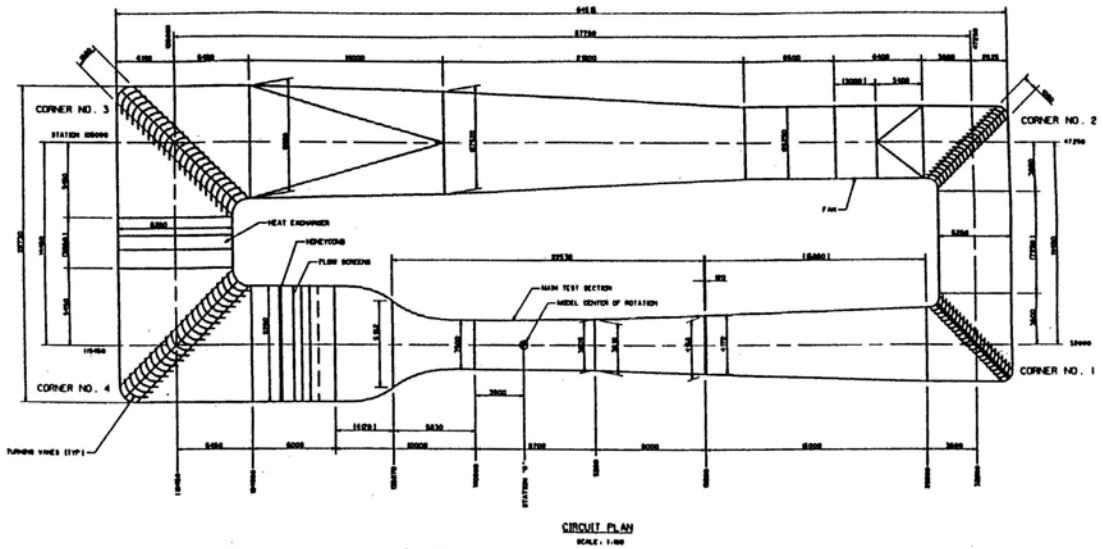
Date of Construction/Planned Improvements

August 5, 1999 (constructed).

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, Republic of Korea; Tel: (82) 43 290 6160 or 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

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

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Kyeongsang National University, School of Mechanical and Aerospace Engineering, Jinjoo, Republic of Korea	1 x 1 x 3 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	60 m/sec (max)	
Multipurpose Small Wind Tunnel		**Dynamic Pressure**
	Cost	
	US$3,564 (construction cost, 2002)	**Stagnation Pressure**
	Operational Status	
	Presumed active as of January 2006.	

Testing Capabilities

Solid wall, square test section; 7.2 contraction ratio; 2 m diameter, 130 kW fan.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

2002 (constructed).

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, Republic of Korea; Tel: (82) 055 751 6106; Email: aero@gsnu.ac.kr; Email (Cho): sycho@nongae.gsnu.ac.kr; Web site: http://engine.gsnu.ac.kr.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Pohang University of Science and Technology, Pohang, Republic of Korea	1.8 x 1.5 x 4.3 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	75 m/sec (max)	
Medium-Sized Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
	US$1,018,792 (construction cost, 1995)	**Stagnation Pressure**
	Operational Status	
	Presumed active as of January 2006.	

Testing Capabilities

Solid wall, rectangular test section; 9:1 contraction ratio; 3.4 m diameter, 260 kW fan.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1995 (constructed).

User Fees

Contact Information

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

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Pohang University of Science and Technology, Pohang, Republic of Korea	0.72 x 0.6 x 2.5 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	40 m/sec (max)	
Small Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of January 2006.	

Testing Capabilities

Solid wall, rectangular test section; 9 contraction ratio; 1.5 m diameter, 100 kW fan.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1990 (constructed).

User Fees

Contact Information

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

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Pusan National University, Department of Aerospace Engineering, Pusan, Republic of Korea	0.7 x 0.7 x 2 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	60 m/sec (max)	
Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
	US$72,929 (construction cost, 1992)	**Stagnation Pressure**
	Operational Status	
	Presumed active as of January 2006.	

Testing Capabilities

Solid wall, square test section; 6.6 contraction ratio; 0.68 m diameter, 75 kW fan.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1992 (constructed).

User Fees

Contact Information

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

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Sejong University, Seoul, Republic of Korea	0.3 x 0.3 x 1 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	35 m/sec (max)	
Small Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
	US$30,552 (construction cost, 2000)	**Stagnation Pressure**
	Operational Status	
	Presumed active as of January 2006.	

Testing Capabilities

Open, square test section; blowdown circuit; 9 contraction ratio; 0.3 m diameter, 3.7 kW fan.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

2000 (constructed).

User Fees

Contact Information

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

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Seoul National University, Department of Mechanical Engineering, Seoul, Republic of Korea	1.35 x 0.95 x 2.44 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	70 m/sec (max)	
Aerospace Engineering Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of January 2006.	

Testing Capabilities

Solid wall, rectangular test section; closed circuit; 6.16 contraction ratio; 1.8 m diameter, 56 kW fan.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1961 (constructed).

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, Republic of Korea; Tel: (82) 2 880 1915; Fax: 82 2 880 1910; Email: chongnam@plaza.snu.ac.kr; Web site: http://mae.snu.ac.kr/eng/default.asp.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Korea (South)**

Installation Name	Test Section Size	Temperature Range
Ulsan University, Ulsan, Republic of Korea	2 x 1.8 x 10 m³	
	Speed Range	**Reynolds Number (x 10^6)**
	35 m/sec (max)	
Facility Name		
Multipurpose Wind/Water Tunnel		**Dynamic Pressure**
	Cost	
	US$407,550 (construction cost, 1999)	
	Operational Status	**Stagnation Pressure**
	Presumed active as of January 2006.	

Testing Capabilities

Solid wall, rectangular test section; suction circuit; 4 contraction ratio; 2.6 m diameter, 117 kW fan.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1999 (constructed).

User Fees

Contact Information

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

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Malaysia**

Installation Name	Test Section Size	Temperature Range
Technological University of Malaysia, Faculty of Mechanical Engineering, Aeronautical Laboratory, Johor, Malaysia	1.5 x 2 x 5.8 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	3 to 80 m/sec (max)	1
UTM Low Speed Wind Tunnel (UTM-LST)		**Dynamic Pressure**
	Cost	
	US$7 million (estimated construction cost)	
	Operational Status	**Stagnation Pressure**
	Presumed active as of December 2005.	Atmospheric

Testing Capabilities

Solid wall, interchangeable test section; closed-return type, continuous, atmospheric, horizontal-arrangement; 9 contraction ratio.

Data Acquisition

Pacific Instrument PI 6000 Series Data Acquisition System; pre-test, test, post-test analysis/calibration; Windows 2000/NT OS.

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 aerodynamics (3D model aircraft testing); automotive/ground vehicle aerodynamics wind engineering; half-model testing; airfoil testing; aerodynamic derivative testing.

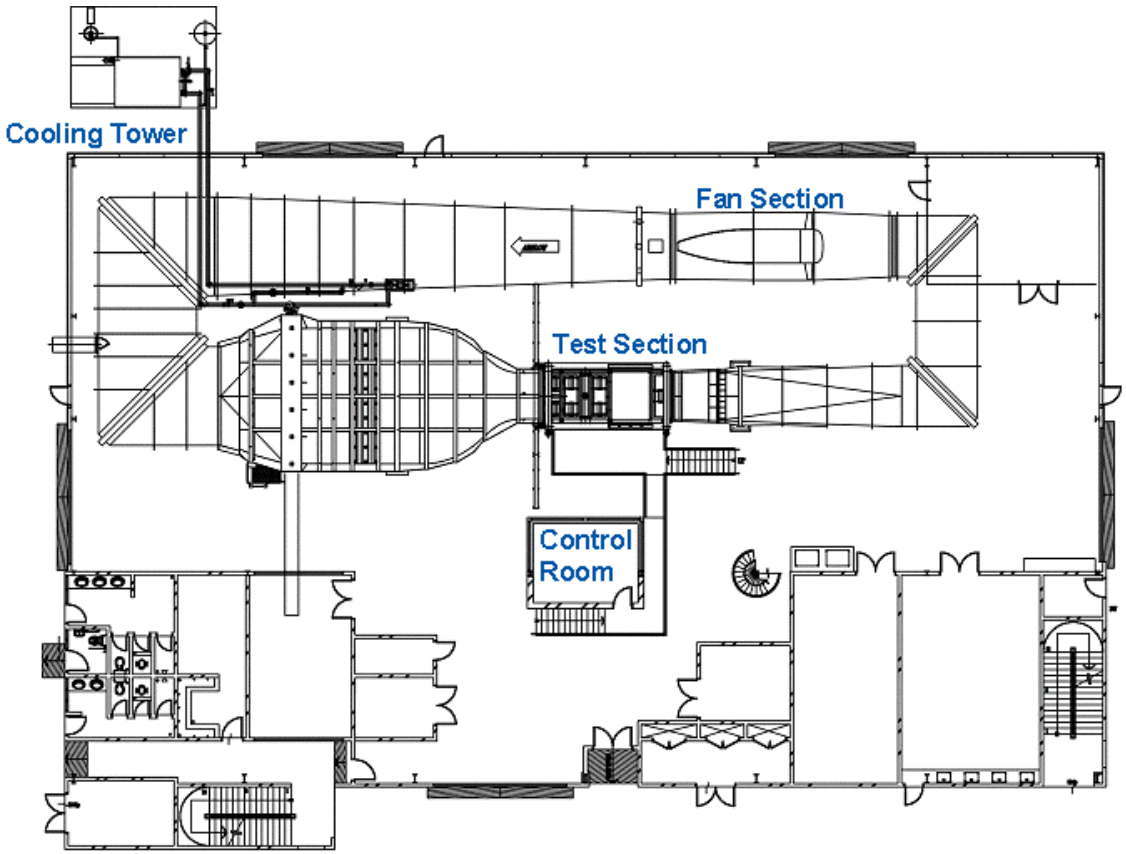
Date of Construction/Planned Improvements

May 2001 (constructed).

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 or 4857; Fax: (60) 7 556 6159; Email: aerolab@fkm.utm.my; Web site: http://www.fkm.utm.my/aerolab/.



GROUND FLOOR PLAN

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

Wind Tunnels of the Eastern Hemisphere

Subsonic **Netherlands**

Installation Name	Test Section Size	Temperature Range
Delft University of Technology (TUDELFT), Delft, The Netherlands	1.25 x 0.25 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.15 Mach	
Boundary Layer Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	Gradient

Testing Capabilities

Closed-circuit, low-speed; flexible wall with suction slits for pressure gradient control.

Data Acquisition

Current Programs

Date of Construction/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 IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Netherlands**

Installation Name	Test Section Size	Temperature Range
Delft University of Technology (TUDELFT), Low Speed Laboratory, Delft, The Netherlands	1.25 x 1.80 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.35 Mach	
Subsonic Low Turbulence Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	

Testing Capabilities

Closed circuit; < 0.1% turbulence level; 6-component balance; automatic multi-manometer.

Data Acquisition

Current Programs

Date of Construction/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 IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
German-Dutch Wind Tunnels (DNW), NOP Business Unit, Emmeloord, The Netherlands	#1: 6.0 x 6.0 m² (closed or slotted walls); #2: 8.0 x 6.0 m² (closed or slotted walls); #3: 8.0 x 6.0 m (open jet); #4: 9.5 x 9.5 m (closed walls)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	#1: 152 m/sec (max); #2: 116 m/sec (max); #3: 85 m/sec (max) ; #4: 62 m/sec (max)	#1: 6.0; #2: 5.3; #3: 3.9; #4: 3.9
Large Low Speed Wind Tunnel (LLF)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	

Testing Capabilities

Continuous, closed-return, atmospheric; Europe's largest low-speed atmospheric wind tunnel; 1 open-jet configuration in large anechoic testing hall; single-stage fan with 8 12.35 m non-adjustable blades; direct-drive; variable-speed, 12.65 MW synchronous electric motor; 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.

Current Programs

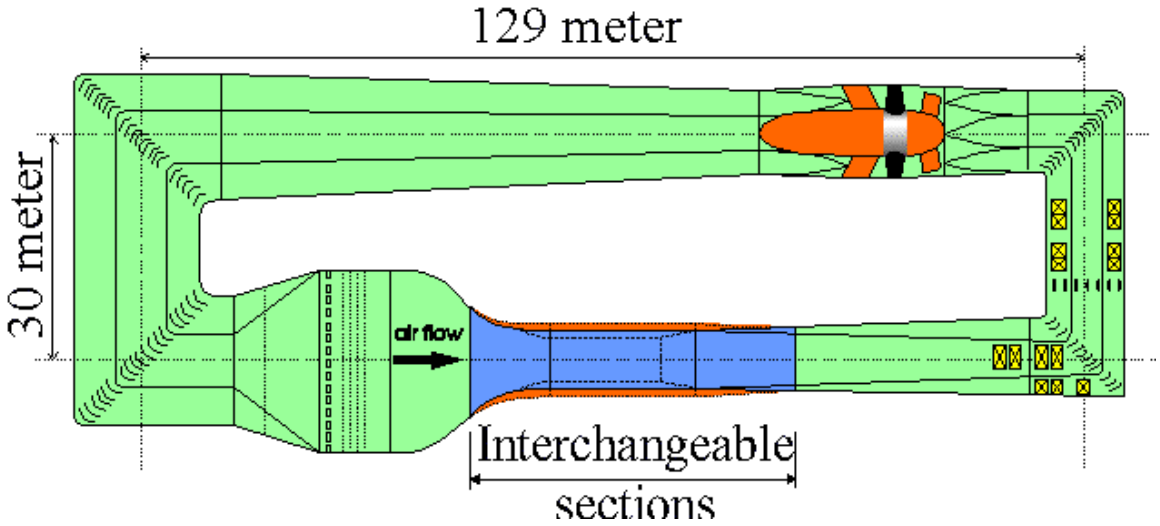
Date of Construction/Planned Improvements

1980 (constructed).

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.**

Wind Tunnels of the Eastern Hemisphere

Subsonic **Netherlands**

Installation Name	Test Section Size	Temperature Range
German-Dutch Wind Tunnels (DNW), NOP Business Unit, Emmeloord,The Netherlands	3.0 x 2.25 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	80 m/sec (max)	1.4
Low Speed Wind Tunnel (LST)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	

Testing Capabilities

Continuous, atmospheric; closed-return circuit; 2 interchangeable test sections; single-stage fan with 8 non-adjustable blades; direct-drive, variable-speed, 700 kW electric motor; 1:9 contraction ratio.

Data Acquisition

64 measuring channels.

Current Programs

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

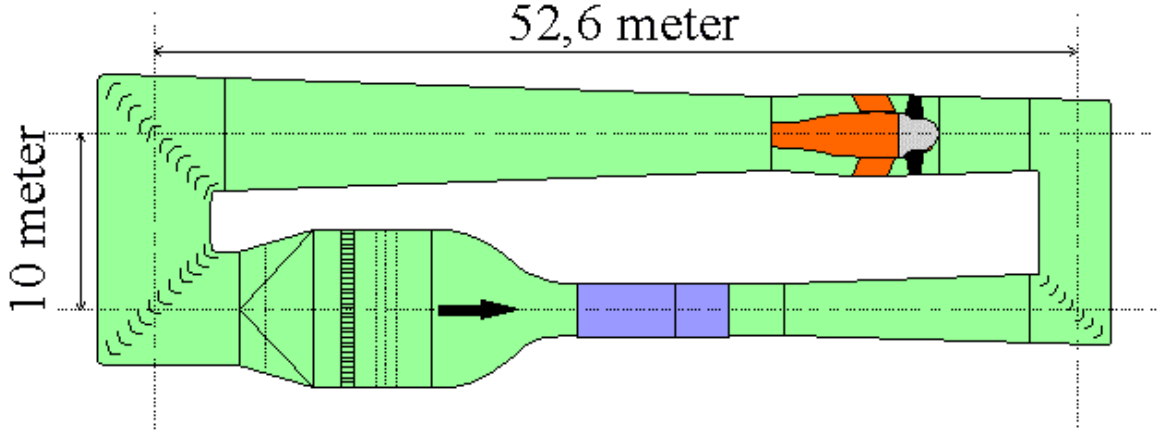
Date of Construction/Planned Improvements

1983 (constructed).

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/.



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

Wind Tunnels of the Eastern Hemisphere

Subsonic **Pakistan**

Installation Name	*Test Section Size*	*Temperature Range*
National University of Science and Technology, College of Aeronautical Engineering, Aerodynamics Laboratory, Risalpur, Pakistan		
	Speed Range	*Reynolds Number (x 10^6)*
Facility Name		
Subsonic Wind Tunnel		*Dynamic Pressure*
	Cost	
		Stagnation Pressure
	Operational Status	

Testing Capabilities

Data Acquisition

Current Programs

Measurement of lift, drag, and pitching moments on a 1:45 scaled-down model of F-15 aircraft.

Date of Construction/Planned Improvements

User Fees

Contact Information

College of Aeronautical Engineering, PAF Academy, Risalpur, Pakistan 24090; Tel: (92) 51 9280513 or (92) 923 631391, Ext 7600; Fax: (92) 937 873294; Web site: http://202.83.173.142:81/nustwebportal/usr/showContents.aspx?mdl=570.

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Wind Tunnels of the Eastern Hemisphere

Subsonic **Romania**

Installation Name	Test Section Size	Temperature Range
Elie Carafoli National Institute for Aerospace Research (INCAS), Bucharest, Romania	2.5 x 2.0 x 5 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	10 to 110 m/sec	1.5 to 2.5 x 10-³
Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Closed circuit; model mounted directly on the balance or by using 1, 2, or 3 pods; model position automatically set by rotating balance around vertical axis; maximum load: 10,000 N; accuracy 0.01%; powered by 1,200 kW, variable-speed dc motor, driving 12-blade, 3.5 m-diameter fan; test dynamic pressure automatically controlled

Data Acquisition

6-component, pyramidal-type, external mechanical balance; automatically controlled measuring process; data displayed on control panel and handled by built-in data acquisition system, which can handle 2 scanivalves for pressure measurements on specially equipped models; more scanivalves can be handled by external drives controlled by data acquisition system.

Current Programs

Aerodynamic tests on aircraft models, cars, buildings, antennae, towers, or other civil structure models; studies aerodynamic characteristics of aircraft; aerodynamic loads on aircraft; aerodynamic design and analysis of propellers; theoretical pressure distribution on complex configurations; nonsteady aerodynamic forces on lifting systems; aeroelastic behavior of lifting-surface structures and aerodynamic characteristics; development of computer programs for graphical display of aerodynamic characteristics.

Date of Construction/Planned Improvements

User Fees

Contact Information

Dr. eng. Catalin Nae (Lab Head), Elie Carafoli National Institute for Aerospace Research (INCAS), B-dul Iuliu Maniu 220, sector 6, Bucharest 061126 Romania; Tel: (40) 21 434 00 83; Fax: (40) 21 434 0082; Email: incas@aero.incas.ro; Email (Nae): cnae@aero.incas.ro; Web site: http://www.incas.ro/english/index_eng.html.

Subsonic Wind Tunnel,
Elie Carafoli National Institute for Aerospace Research (INCAS),
Bucharest, Romania.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Laboratory for Takeoff and Landing Investigations, Zhukovsky, Moscow Region, Russia	2.33 x 4 x 4 m³	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	15 to 55 m/sec	3.3
T-102 for Takeoff and Landing Investigations		**Dynamic Pressure**
	Cost	Up to 1.8 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Elliptical, continuous run; provides data to aircraft designers about total and local loads acting on a model, aerophysical aspects of the flow over a model, and behavior of elastically and dynamically similar models in the flow; tests carried out in free flow near screen simulating ground effect; accommodates models with wing area up to 0.8 m² , span up to 2.5 m, length up to 2.5 m.

Data Acquisition

Data processed by computerized measurement complex; results available immediately after tests in the form of express reports in Russian and in English.

Current Programs

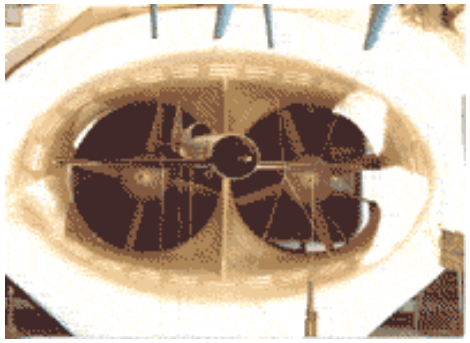
Experimental laboratory includes wind tunnels T-102 and T-103; designed to investigate aerodynamic characteristics of aircraft models during takeoff, landing, and low-speed flight; for more than 50 years, test results have been used for design and development of practically all types of Soviet and Russian airplanes; one of the most cost-effective and efficient wind tunnels in the world.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.



**T-102 for Takeoff and Landing Investigations,
Central Aerohydrodynamic Institute (TsAGI),
Laboratory for Takeoff and Landing Investigations,
Zhukovsky, Moscow Region, Russia.**

Wind Tunnels of the Eastern Hemisphere

Subsonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Laboratory for Takeoff and Landing Investigations, Zhukovsky, Moscow Region, Russia	2.33 x 4 x 3.8 m³	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	10 to 110 m/sec	Up to 7
T-103 for Takeoff and Landing Investigations		**Dynamic Pressure**
	Cost	Up to 7kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Elliptical test section; continuous run; provides data to aircraft designers about total and local loads acting on a model, aerophysical aspects of the flow over a model, and behavior of elastically and dynamically similar models in the flow; tests carried out in free flow near screen simulating ground effect; accommodates models with wing area up to 0.8 m², span up to 2.5 m, length up to 2.5 m.

Data Acquisition

Data processed by computerized measurement complex; results available immediately after tests in the form of express reports in Russian and in English.

Current Programs

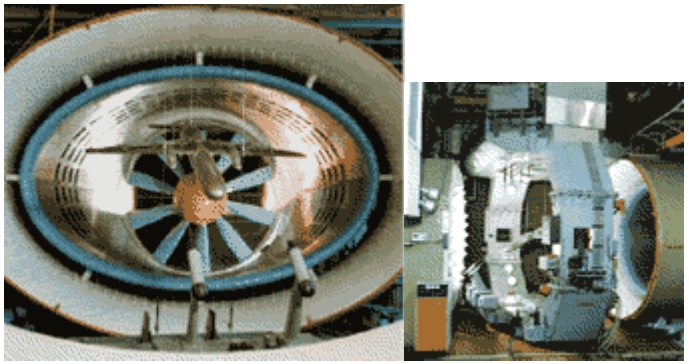
Experimental laboratory includes wind tunnels T-102 and T-103; designed to investigate aerodynamic characteristics of aircraft models during take-off, landing, and low-speed flight; for more than 50 years, test results have been used for design and development of practically all types of Soviet and Russian airplanes; one of the most cost-effective and efficient wind tunnels in the world.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.



**T-103 for Takeoff and Landing Investigations,
Central Aerohydrodynamic Institute (TsAGI),
Laboratory for Takeoff and Landing Investigations,
Zhukovsky, Moscow Region, Russia.**

Wind Tunnels of the Eastern Hemisphere

Subsonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	6.5 m (long), 3 m (diameter)	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	5 to 60 m/sec	Up to 3.8
T-1 Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 2.14 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Circular, closed, continuous run test section; automated, 3-component balance; dynamic stability device; mirror method used for measuring model aerodynamics; translational vibrations device; 2 screens for ground-effects tests; flow generated by 6-blade fan powered by 1,000 kW motor; T-2 tunnel operates independently when movable diffuser components removed.

Data Acquisition

Data processing capacity accommodates experiment data rates.

Current Programs

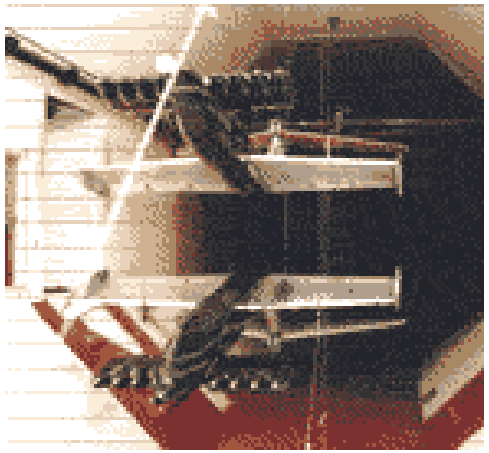
Models of airships, aerostats, airplanes, ground-effects vehicles, ships, and various industrial objects; instrumentation determines principal aerodynamic characteristics of aircraft models; rotational derivatives determined by free and forced vibration methods; surface pressure distributions.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.



T-1 Subsonic Wind Tunnel,
Central Aerohydrodynamic Institute (TsAGI),
Zhukovsky, Moscow Region, Russia.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	24 m (long), 14 x 24 m²	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	5 to 55 m/sec	Up to 3.3
T-101 Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 1.8 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Open, continuous run test section; elliptical nozzle; 6-component balance; air flow generated by two 30 mW fans; cold and hot air supplied to article under test.

Data Acquisition

Computer complex for test data processing; measuring equipment determines main aerodynamic characteristics of aircraft models (flutter, baffling, static pressure distributions) and total aerodynamic characteristics of industrial objects.

Current Programs

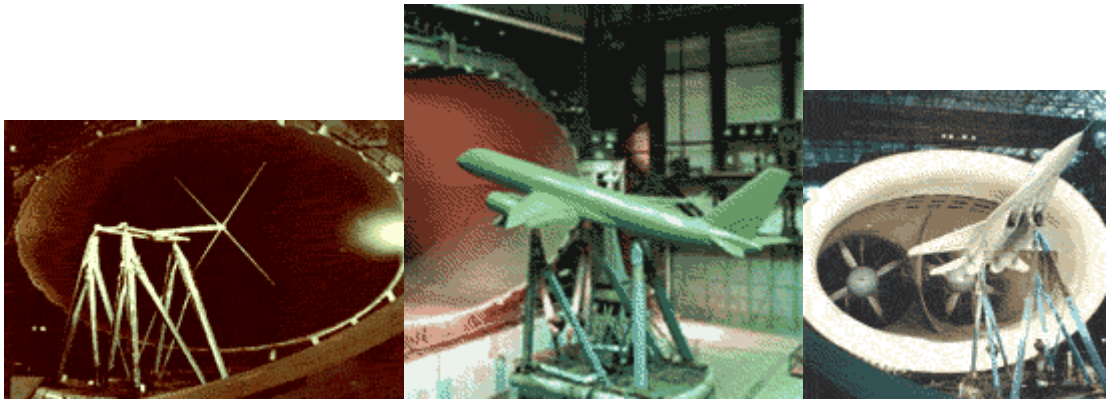
Tests full-scale and large-scale airplane and helicopter models, parachutes, paragliders, deltaplanes, and industrial objects; tests have included civil and military airplanes; 1/3-scale models; models of aerospace vehicles and transportation systems; reentry space vehicle models; and others.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.



T-101 Subsonic Wind Tunnel,
Central Aerohydrodynamic Institute (TsAGI),
Zhukovsky, Moscow Region, Russia.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	13 m (long), 7 m (nozzle diameter)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	15 to 125 m/sec	Up to 8
T-104 Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 8.5 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Continuous, return-flow, open test section; designed for testing full-scale power plants, large elastically similar models and propellers at low subsonic flow velocity in a wide range of angles of attack and side-slip angles.

Data Acquisition

Current Programs

Provides more than 20 types of tests on characteristics of power plants, propellers, and rotors; aerodynamic characteristics of aircrafts and components; dynamic phenomena on aeronautic models, inlets, parachutes, and rescue means; wind loads on industrial objects; physical phenomena investigation, etc.; power plants of passenger aircrafts and the aeroelastic model of the aircraft equipped by Pratt & Whitney engines tested in 1991 to 1992.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.

T-104 Subsonic Wind Tunnel,
Central Aerohydrodynamic Institute (TsAGI),
Zhukovsky, Moscow Region, Russia.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	7 m (long), 4.5 m (diameter)	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	2 to 35 m/sec	Up to 2.2
T-105 Vertical Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 0.74 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Circular nozzle; open, continuous run; equipped with devices for testing airplane models over wide ranges of angles of attack and side-slip angles; helicopters of various configurations; control surface positions; pressure distribution over airplane, helicopters, and rotor-blade models; flow parameters near models; rotors, steering rotors, airships, parachute systems, and industrial objects.

Data Acquisition

Information-measurement control system; computer provides for remote control of models, data acquisition, and processing.

Current Programs

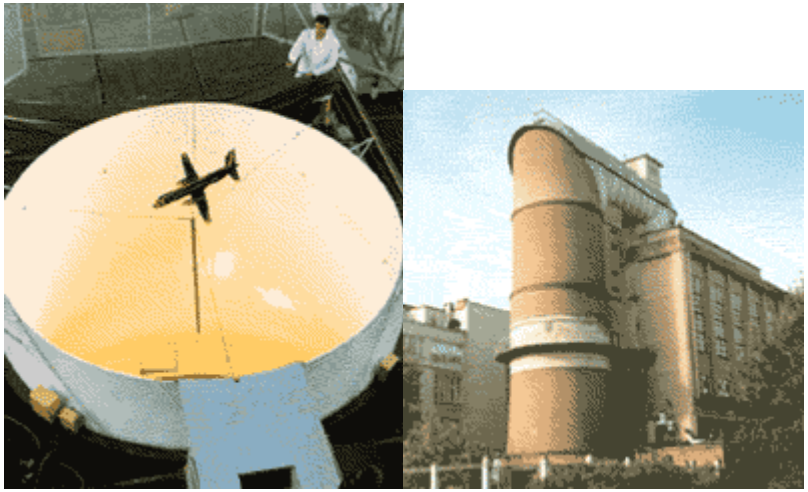
Spin tests of military and civil airplane models; aerodynamic characteristics of fighters at high angles of attack; aerodynamic configuration; and interference of rotors and helicopter bodies.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.



T-105 Vertical Subsonic Wind Tunnel,
Central Aerohydrodynamic Institute (TsAGI),
Zhukovsky, Moscow Region, Russia.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	3.5 m (long), 2.7 m (diameter)	280 to 323 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.15 to 0.9 Mach	Up to 14.5
T-107 Constant Density Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 35 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Closed, continuous run; mechanical and strain gauge balances; main supporting device is strip suspension; accomodates models: L = 2.2 m, S = up to 0.5 m², W = up to 200 kg.

Data Acquisition

Computerized measurement complex performs data monitoring, acquisition, and processing in real time during an experiment.

Current Programs

Investigates aerodynamic characteristics of aircraft models and their components; tests aerodynamic characteristics of single and counter-rotating propeller models on VP-107 propeller device; total aerodynamic coefficients of models on mechanical and strain-gauge balances; pressure distribution by pressure orifices method; model characteristics on VP-107; laminarization by boundary-layer suction; and physical testing (holography, kaolin coating method, etc.); testing on angles of attack from -8 to 14.5° (on mechanical balance) and from -3 to 60° (on strain gauge balance).

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	1 x 1 x 4 m³	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	2 to 100 m/sec	Up to 6.4
T-124 Low Turbulence Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 5.6 kPa
		Stagnation Pressure
	Operational Status	
	Active as of February 2007.	

Testing Capabilities

Fan-type, continuous run test section; unique low-turbulence level <= 0.04%; second test section has magnetic model suspension; 6-component balance for investigating aircraft model behavior at large angles of attack (up to 90°); 5-component, lateral, strain-gauge balance for investigating high-lift wings.

Data Acquisition

Current Programs

Balance measurements; experimental measurements of pressure distribution over models using point-to-point gauges; set of pressure transducers (up to 150 pc), velocity-vector measurement inside a given space; flow visualization using shadow-method surface visualization and various paints; continuous-flow pattern recording by photographic, motion picture, and television cameras; condition of boundary layer on models; flow laminarization; turbulence fraction reduction; separated flow and separation control.

Date of Construction/Planned Improvements

1984 (new system for electronic tracking of shaft revolutions).

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.

T-124 Low Turbulence Subsonic Wind Tunnel, Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	1.75 m (long), 1.2 m (nozzle exit diameter)	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	6 to 80 m/sec	Up to 4.8
T-129 Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 3.8 kPa
		Stagnation Pressure
	Operational Status	
	Active as of February 2007.	

Testing Capabilities

Closed layout, open, continuous run test section; turntable and remote-control, 2-stage, calibrating machine; compressed air supply system with resistance heater; ejector used in gas suction system; 3-component balance; flow visualization system has laser knife and smoke; flow generated by 200 kW fan.

Data Acquisition

Measuring equipment determines integrated aerodynamic characteristics of aircraft models; static-pressures distribution; local-flow parameters at interaction of jets with structure components; study of physical phenomena.

Current Programs

Designed to investigate the laws of flow over aircraft, jet streams, and industrial objects; simulation of engine jet exhaust flow over aircraft; T-129 has tested jet systems and structural components of advanced airplanes; helicopters; and wing-in-ground-effect machine.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	6.5 m (long), 3 m (diameter)	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	5 to 60 m/sec	Up to 3.8
T-2 Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 2.14 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Circular, closed, continuous run test section; 5-component, strain-gauge device for determining aerodynamic characteristics of rotating turbomachinery models; 5-component, propeller strain-gauge device with asynchronously controlled drive apparatus for testing propeller and fan models; flow generated by 6-blade fan powered by 1,000 kW motor.

Data Acquisition

Data processing capacity accommodates the experiment data rates.

Current Programs

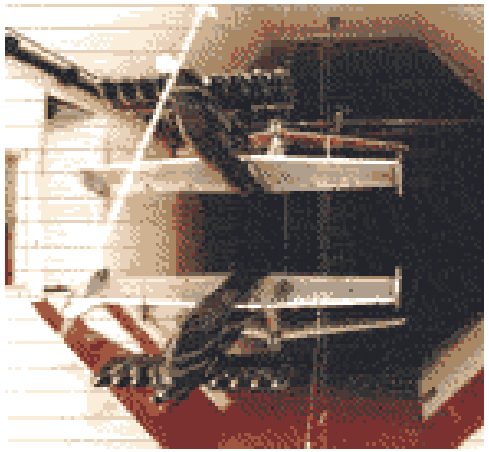
Models of airships, aerostats, airplanes, ground effects, vehicles, ships, and various industrial objects; instrumentation determines principal aerodynamic characteristics of aircraft models; rotational derivatives determined by free and forced vibration methods; surface pressure distributions.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.



T-2 Subsonic Wind Tunnel,
Central Aerohydrodynamic Institute (TsAGI),
Zhukovsky, Moscow Region, Russia.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	3.15 m (long), 2.2 m (diameter)	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	5 to 55 m/sec	Up to 3.4
T-5 Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 1.8 kPa
		Stagnation Pressure
	Operational Status	
	Active as of February 2007.	

Testing Capabilities

Open, continuous run test section; automatic 6-component balance with remote-control screen; propeller facility; calibration device moves pressure probes to given locations of test section.

Data Acquisition

Measurement equipment allows determination of main aerodynamic characteristics of aircraft models; thrust and moment of single and counter-rotating propellers; downwash and flow-velocity components in the wake behind a model; pressure distribution and total aerodynamic characteristics of industrial objects.

Current Programs

Testing of models of all types of civil and military vehicles and objects: airships and aerostats; airplanes; submarines; aircraft carriers; wing-in-ground-effect flying machines; buildings; and industrial constructions.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	0.78 x 0.78 x 2 m³	5,000 to 8,000 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	4,000 to 4,200 m/sec	0.001 to 0.004
VTS High Temperature Wind Tunnel		**Dynamic Pressure**
	Cost	0.1 to 8 kPa
		Stagnation Pressure
	Operational Status	100 to 500 Pa
	Presumed active as of February 2007.	

Testing Capabilities

Up to 3,600 second run; working fluids: air, argon, N2; tests conducted at M=4 to 6 in underexpanded jet effluxing out of a conical nozzle; flow core up to 4 cm; enthalpy 10 to 40 MJ/kg; induction gas heater to obtain stable, non-contaminated gas flow with a pure spectrum.

Data Acquisition

Computerized measurement complex and means to determine model temperature by optical methods.

Current Programs

High temperature wind tunnel VTS designed to investigate non-equilibrium heat exchange and to test materials' properties; during the past three years primarily used for determining catalytic properties, radiation characteristics, and thermomechanical stability of high-temperature materials and coatings.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **Russia**

Installation Name	Test Section Size	Temperature Range
Institute of Theoretical and Applied Mechanics (ITAM), Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia	1 x 1 x 4 m³	300 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.03 to 3 Mach (2 to 80 m/sec)	3
T-324 Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of 2003.	~1 atm

Testing Capabilities

Closed, rectangular test section; low turbulence; 60 min run time; made of aviation plywood; automatic speed change from analog control; 640 kW dc compressor; axial, 1-staged, 20-wooden-blade engine; turbulence-level control from 0.01% to several percent; testing of models to 4 m size in the tunnel-settling chamber.

Data Acquisition

Measures forces and moments; pressure distribution; smoke-wire visualization; oil-soot visualization; noise distribution; thermo-anemometry using 1-component balances +-25 N and single-X- and V-hotwires of different sizes; computers: Macintosh Classic II, Macintosh LC II with mathematical coprocessors; high-speed cameras.

Current Programs

Tests physics of laminar/turbulent transition and separation; measures high, free-stream turbulence level, in the Klebanoff regime, using a grid; measures influence of riblets for laminar/turbulent transition and other laminar/turbulent transitions for engines. Partners: DLR, Stuttgart University, Berlin Technical University (Germany), Royal Technological Institute (Sweden).

Date of Construction/Planned Improvements

User Fees

Staff: US$200/wk; tunnel: US$300; actively soliciting commercial customers.

Contact Information

Khristianovich Institute of Theoretical and Applied Mechanics SB RAS, Institutskaya str., 4/3, Novosibirsk 630090, Russia; Tel: (7) 383 2 35 07 78; Fax: (7) 383 2 35 22 68; Email: admin@itam.nsc.ru; Web site: http://www.itam.nsc.ru/ENG/Truba/T-324.html.

T-324 Subsonic Wind Tunnel,
Russian Academy of Sciences—Siberia Branch,
Institute of Theoretical and Applied Mechanics (ITAM),
Novosibirsk, Russia.

Wind Tunnels of the Eastern Hemisphere

Subsonic **Russia**

Installation Name	Test Section Size	Temperature Range
Moscow State University, Institute of Mechanics, Experimental Aerodynamic Complex, Moscow, Russia	4 x 2.33 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.01 to 0.25 Mach	0.8 to 1.2
A-6 Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Open, elliptical test section; 6-component aeromechanical weights.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Yu. M. Okunev, Institute Director, Institute of Mechanics, Moscow State University, Michurinskii prospekt, d. 1, Moscow, Russia 119192; Tel: (7) 095 939-3121; Fax: (7) 095 939-0165; Email: common@imec.msu.ru; Web site: http://www.imec.msu.ru/pages/02-10-10-1374853.html (in Russian).

A-6 Subsonic Wind Tunnel,
Moscow State University,
Institute of Mechanics,
Experimental Aerodynamic Complex,
Moscow, Russia.

Wind Tunnels of the Eastern Hemisphere

Subsonic **South Africa**

Installation Name	Test Section Size	Temperature Range
Council for Scientific and Industrial Research (CSIR), Defence Aeronautics Programme, Pretoria, South Africa	2 m (diameter)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0 to 30 m/sec	
2 m Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of January 2006.	

Testing Capabilities

Continuous, open-circuit.

Data Acquisition

Current Programs

Useful for studies where ready access to the model is required.

Date of Construction/Planned Improvements

User Fees

Contact Information

Peter Skinner (Facility Manager), Defence Aeronautics Programme, Council for Scientific and Industrial Research (CSIR), PO Box 395, Meiring Naudé Road, Brummeria, Pretoria 0001, South Africa; Tel (Skinner): (27) 12841 4839; Email (Skinner): pskinner@csir.co.za; Web site: http://www.csir.co.za/plsql/ptl0002/PTL0002_PGE057_RESEARCH?DIVISION_NO=1000024&PROGRAM_NO=3410004.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **South Africa**

Installation Name	Test Section Size	Temperature Range
Council for Scientific and Industrial Research (CSIR), Defence Aeronautics Programme, Pretoria, South Africa	7.5 x 6.5 x 10.5 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	2 to 33 m/sec	
7 m Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of January 2006.	Atmospheric

Testing Capabilities

Continuous, open-circuit tunnel powered by 28-axial flow fans at the exit of the diffuser; each fan is 30 kW with fixed pitch blades, giving uniform flow distribution even at low speeds; speed in the working section adjusted by switching on one of 13 different fan patterns.

Data Acquisition

Force measurement (internal balance, platform balance and rotor balance); pressure measurement (scanivalve system); flow visualisation (tufts, oil flow, smoke); flow field measurement (multi-hole probes).

Current Programs

Typical Tests: aircraft, RPVs, and helicopters (full-scale or models); scale models of helicopter rotors using dedicated rotor test facility; subsonic aircraft and helicopter inlets; engine-cooling tests; automobile tests: force, ventilation, external flow, and cooling systems; wind generators; wind effects on man-made structures and geographical features; helicopter-intake characterisation.

Date of Construction/Planned Improvements

User Fees

Contact Information

Peter Skinner (Facility Manager), Defence Aeronautics Programme, Council for Scientific and Industrial Research (CSIR), PO Box 395, Meiring Naudé Road, Brummeria, Pretoria 0001, South Africa; Tel (Skinner): (27) 12841 4839; Email (Skinner): pskinner@csir.co.za; Web site: http://www.csir.co.za/plsql/ptl0002/PTL0002_PGE057_RESEARCH?DIVISION_NO=1000024&PROGRAM_NO=3410004.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **South Africa**

Installation Name	Test Section Size	Temperature Range
Council for Scientific and Industrial Research (CSIR), Defence Aeronautics Programme, Pretoria, South Africa	610 x 740 mm²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.1 to 0.5 m/sec (2 gauzes plus plate 3); 0.5 to 2 m/sec (2 gauzes plus plate 2); 2 to 6 m/sec (2 gauzes plus plate 1); 6 to 35 m/sec (open tunnel)	
Calibration Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of January 2006.	

Testing Capabilities

Octagonal test section; can be configured for 4 speed ranges; calibrated against a laser.

Data Acquisition

Current Programs

Regularly tests hotwire anemometers; vane anemometers; timed-vane anemometers; pitot tubes; vortex instruments.

Date of Construction/Planned Improvements

User Fees

Contact Information

Gavin Ratner (Facility Manager), Defence Aeronautics Programme, Council for Scientific and Industrial Research (CSIR), PO Box 395, Meiring Naudé Road, Brummeria, Pretoria 0001, South Africa; Tel (Ratner): (27) 128412321; Email (Ratner): gratner@csir.co.za; Web site: http://www.csir.co.za/plsql/ptl0002/PTL0002_PGE057_RESEARCH?DIVISION_NO=1000024&PROGRAM_NO=3410004.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **South Africa**

Installation Name	Test Section Size	Temperature Range
Council for Scientific and Industrial Research (CSIR), Defence Aeronautics Programme, Pretoria, South Africa	2.1 x 1.5 m² (7 x 5 ft²)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	5 to 120 m/sec	6 at 120 m/sec
Low Speed Wind Tunnel (LSWT)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of January 2006.	Atmospheric

Testing Capabilities

Continuous, single return with closed, rectangular test section with corner fillets; strut-mounted models suspended from overhead 6-component virtual-center balance; auxiliary pitch sector allows sting-supported models to be mounted on variety of internal strain gauge balances; alternate test section equipped with moving belt used for ground-effect testing of aircraft and racing vehicles.

Data Acquisition

Systems available for data acquisition: NEFF System 470 with PC interface; 6-component virtual center balance; scanivalve system for pressure measurements.

Current Programs

Has performed: scaled aircraft loads and static stability; pressure distribution; air data probe calibration; flutter; 2D oscillating aerofoil; scaled racing vehicle tests; flow visualization (oil flow, tufts, liquid crystals); helicopter-intake characterization; propeller tests.

Date of Construction/Planned Improvements

User Fees

Contact Information

Peter Skinner (Facility Manager), Defence Aeronautics Programme, Council for Scientific and Industrial Research (CSIR), PO Box 395, Meiring Naudé Road, Brummeria, Pretoria 0001, South Africa; Tel (Skinner): (27) 12841 4839; Email (Skinner): pskinner@csir.co.za; Web site: http://www.csir.co.za/plsql/ptl0002/PTL0002_PGE082_PROJ?DIVISION_NO=1000024&PROJECT_NO=3610576.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **South Africa**

Installation Name	Test Section Size	Temperature Range
University of Pretoria, Department of Mechanical and Aeronautical Engineering, Pretoria, South Africa	0.94 x 1.145 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0 to 15 m/sec	
Atmospheric Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Open loop (turbulent boundary layer).

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Wind Tunnel Manager, Department of Mechanical and Aeronautical Engineering, University of Pretoria, Pretoria, 0002 South Africa; Tel: (27) 12 420 3104; Fax: (27) 12 362 5124; Email: mecheng@up.ac.za; Web site: http://www.me.up.ac.za/about/fac.htm#lswt

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **South Africa**

Installation Name	Test Section Size	Temperature Range
University of Pretoria, Department of Mechanical and Aeronautical Engineering, Pretoria, South Africa	1.2 x 0.8 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	10 to 60 m/sec	
Low Speed Aerodynamic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Closed loop.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Wind Tunnel Manager, Department of Mechanical and Aeronautical Engineering, University of Pretoria, Pretoria, 0002 South Africa; Tel: (27) 12 420 3104; Fax: (27) 12 362 5124; Email: mecheng@up.ac.za; Web site: http://www.me.up.ac.za/about/fac.htm#lswt.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **South Africa**

Installation Name	Test Section Size	Temperature Range
University of Pretoria, Department of Mechanical and Aeronautical Engineering, Pretoria, South Africa	800 x 800 mm²	5 to 40°C
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0 to 45 m/sec	
Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
	US$700,000	
	Operational Status	**Stagnation Pressure**
	Confirmed active as of March 2007.	

Testing Capabilities

Closed circuit with heat exchanger.

Data Acquisition

Scanivalve; Validyne; National Instuments SCXI cards; LabView 7

Current Programs

Force measurement (internal balance); pressure measurement (scanivalve system); flow visualization (tufts, oil, flow, smoke).

Date of Construction/Planned Improvements

1975 (constructed); 1999 (unidentified improvements); new stings to be procured in 2008/2009.

User Fees

US$150/hr

Contact Information

Leon Liebenberg (Professor), University of Pretoria, Department of Mechanical and Aeronautical Engineering, Pretoria 0002, South Africa; Email (Liebenberg): leb@up.ac.za; Web site: http://www.me.up.ac.za.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Swedish Defense Research Agency, FOI, Stockholm, Sweden	8 m (long), 3.6 m (diameter)	Ambient
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.23 Mach	1.8
LT1 Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	Ambient

Testing Capabilities

Data Acquisition

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

Current Programs

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

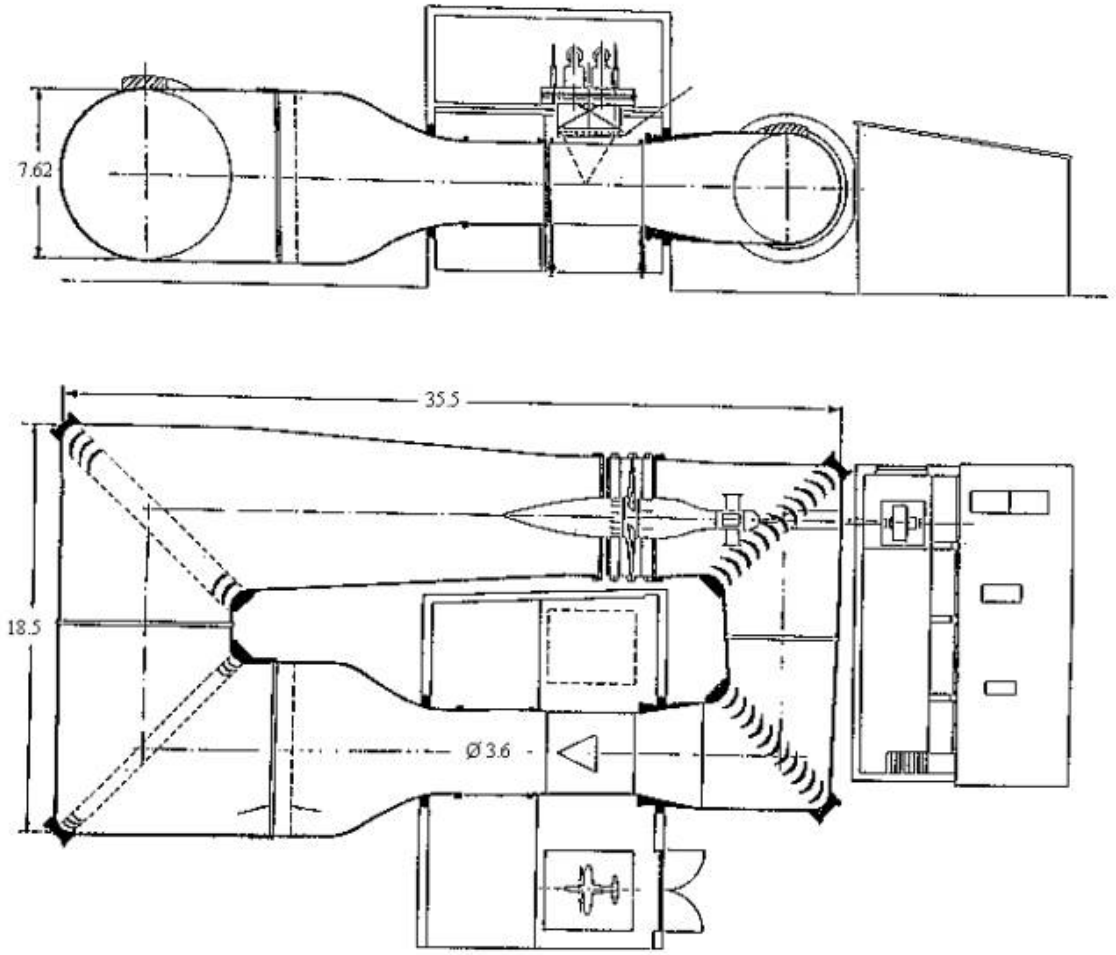
Date of Construction/Planned Improvements

1940 (constructed).

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/.



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

Wind Tunnels of the Eastern Hemisphere

Subsonic **Turkey**

Installation Name	Test Section Size	Temperature Range
Defense Industries Research and Development Institute - SAGE, TUBITAK-SAGE-AWT, Ankara, Turkey	2.4 x 3.0 x 3.0 m³	Atmospheric
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	55.9 mph	5.6
Ankara Subsonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of July 2006.	Atmospheric

Testing Capabilities

Data Acquisition

DAQ card: DAS 1802 HC; signal conditioning unit: OI-Tech Company Product DBK43 A; 7 1D load cells.

Current Programs

3D force and moment measurement; aero; ground transportation; flow visualization.

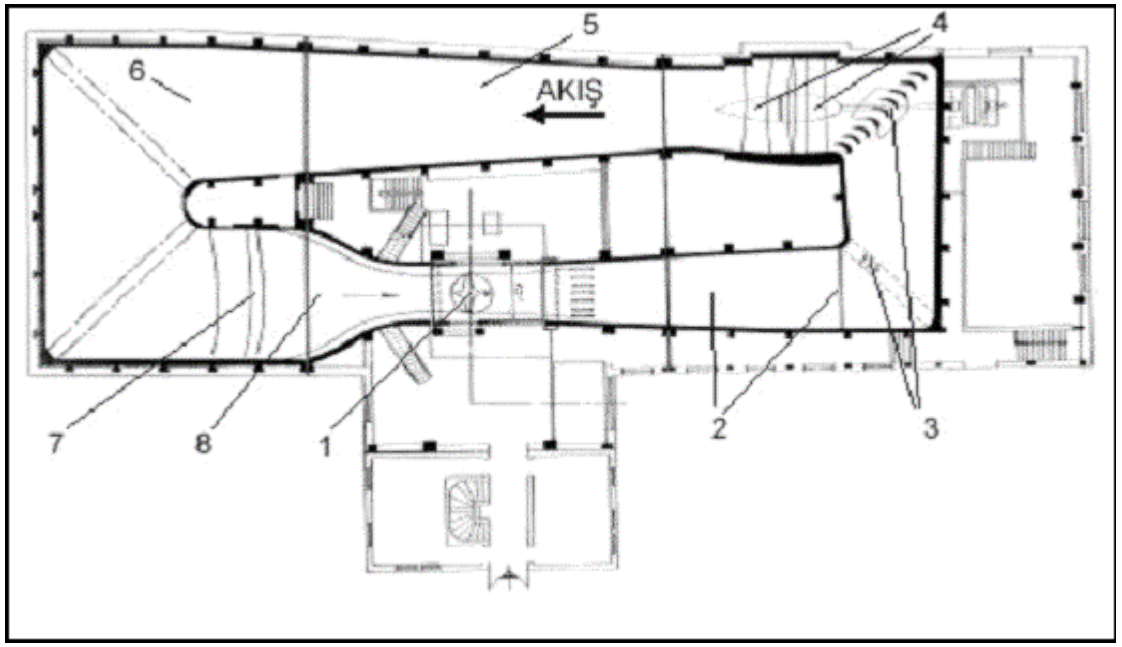
Date of Construction/Planned Improvements

1950 (constructed); 1993 (last upgrade).

User Fees

Contact Information

Ankara Subsonic Wind Tunnel, TUBITAK-SAGE-AWT, Samsun Yolu, Lalahan, PK 16 Mamak 06261 Ankara, Turkey; Tel: (90) 312 590 90 00; Fax: (90) 312 590 9148 or 9147; Email sage@sage.tubitak.gov.tr; Web site: http://www.sage.tubitak.gov.tr/en/index.asp.



Ankara Subsonic Wind Tunnel,
Defense Industries Research and Development Institute – SAGE,
Ankara, Turkey.

Wind Tunnels of the Eastern Hemisphere

Subsonic **United Kingdom**

Installation Name	Test Section Size	Temperature Range
Airbus, New Filton House, Bristol, England, United Kingdom	12 x 10 ft²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	217.0 mph (max)	
Airbus Filton Low Speed Wind Tunnel Facility		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2006.	

Testing Capabilities

Closed, single-return circuit; 1.6 MW power, 6-component load cell balance.

Data Acquisition

SLA 7000 stereolithography system from 3D Systems Technology.

Current Programs

Aircraft, ground vehicles.

Date of Construction/Planned Improvements

1957 (constructed); 2004 (replacement of control and data acquisition system; improvements to control room, tunnel, associated buildings).

User Fees

Contact Information

Alison Kearin, Filton-Airbus, Airbus, New Filton House, Filton, Bristol, BS99 7AR, England, UK; Tel: (44) 1179 69 3831; Email: alison.kearin@airbus.com; Web site: http://www.airbus.com/en/worldwide/airbus_in_uk.html.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
BAE Systems Air Systems, Warton Aerodrome, Lancashire, England, United Kingdom	12 x 10 x 25 ft³	Ambient to 45°C
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.25 Mach	1.4
Filton 12 x 10 ft Low Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2006.	Ambient

Testing Capabilities

Solid construction, return circuit, fan-powered; corner fillets; scanivalve or ZOCs for steady pressures; floor and rood balances; belt/suction/blowing ground effects; 280 psi and 3,500 psi air-supply systems; 4 pps air mass flow.

Data Acquisition

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

Current Programs

Aeronautics, ground transportation, buildings.

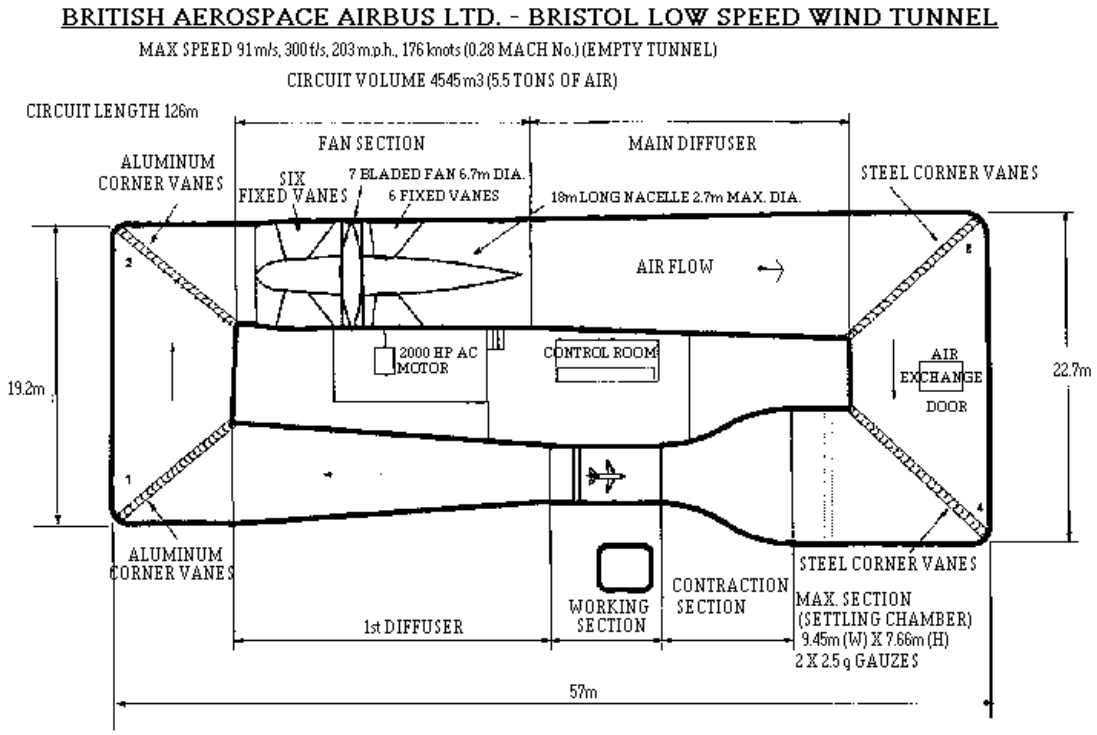
Date of Construction/Planned Improvements

1955 (constructed).

User Fees

Contact Information

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



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

Wind Tunnels of the Eastern Hemisphere

Subsonic **United Kingdom**

Installation Name	Test Section Size	Temperature Range
Department of Aerospace Engineering, University of Bristol, Bristol, England, United Kingdom	2.1 x 1.5 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	60 m/sec (max)	
Large Low Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as February 2006.	

Testing Capabilities

Octagonal test section; 5.5 x 2.6 m² return section at max speed of 12 m/sec.

Data Acquisition

Current Programs

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

Date of Construction/Planned Improvements

User Fees

Contact Information

Department of Aerospace Engineering, University of Bristol, Bristol, University Walk, Bristol BS 8 1 TR, England, UK; 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 IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **United Kingdom**

Installation Name	Test Section Size	Temperature Range
Department of Aerospace Engineering, University of Bristol, Bristol, England, United Kingdom	0.8 x 0.6 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	100 m/sec (max)	
Low Turbulence Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as February 2006.	

Testing Capabilities

Octagonal test section; turbulence level 0.05%.

Data Acquisition

Current Programs

Fundamental fluid mechanics and aerodynamics.

Date of Construction/Planned Improvements

User Fees

Contact Information

Department of Aerospace Engineering, University of Bristol, Bristol, University Walk, Bristol BS 8 1 TR, England, UK; 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 IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **United Kingdom**

Installation Name	Test Section Size	Temperature Range
Department of Aerospace Engineering, University of Bristol, Bristol, England, United Kingdom	1.1 m (diameter)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	40 m/sec (max)	
Open Jet Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as February 2006.	

Testing Capabilities

Data Acquisition

Current Programs

Aerofoil characteristics; vibration and oscillation studies.

Date of Construction/Planned Improvements

User Fees

Contact Information

Department of Aerospace Engineering, University of Bristol, Bristol, University Walk, Bristol BS 8 1 TR, England, UK; 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 IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **United Kingdom**

Installation Name	Test Section Size	Temperature Range
Department of Aerospace Engineering, University of Bristol, Bristol, England, United Kingdom	0.6 x 0.6 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	35 m/sec (max)	
Two Open Return Low Speed Wind Tunnels		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as February 2006.	

Testing Capabilities

Data Acquisition

Current Programs

Teaching and student projects.

Date of Construction/Planned Improvements

User Fees

Contact Information

Department of Aerospace Engineering, University of Bristol, Bristol, University Walk, Bristol BS 8 1 TR, England, UK; 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 IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Farnborough Air Sciences Trust (FAST), Berkshire, England, United Kingdom	24 ft (7.3 m) (diameter)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	Up to 165 ft/sec (50 m/sec)	
No. 1 24 ft Low Speed Wind Tunnel (LST)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Closed in 1996, may be re-opened for use; soliciting operators as of January 2006.	

Testing Capabilities

Open-jet, single-return circuit, continuous flow; 2000 hp, 750 V dc motor powers mahogany 6-bladed fan; at full speed runs at 1.5 MVA.

Data Acquisition

Current Programs

Full-size aircraft testing in 1930s; pitch behavior beyond stall for rear-engined aircraft (BAC111, VC10, Trident) testing in 1960s; current research: 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 tests conifers behavior, motorway barriers, full-size radar scanners, and full-size cars.

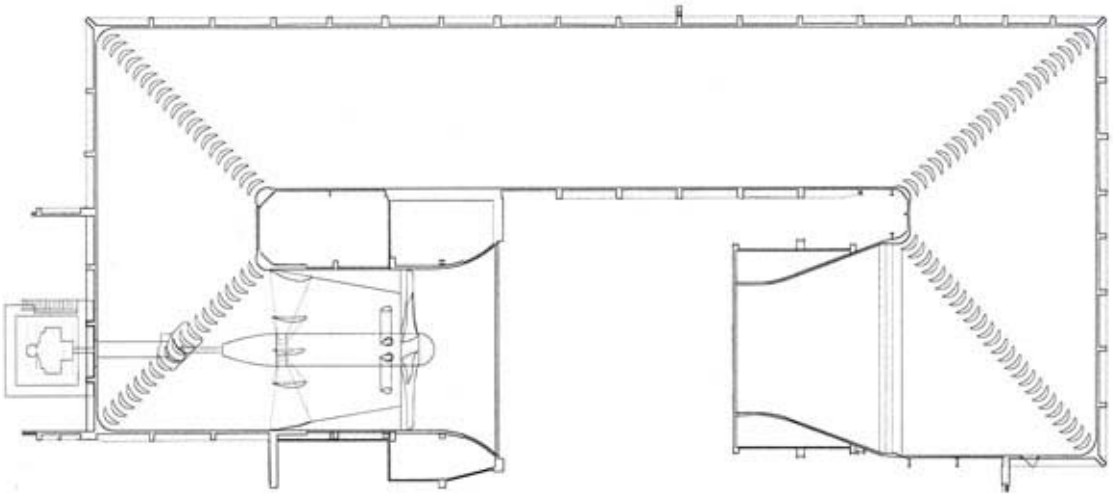
Date of Construction/Planned Improvements

1935 (constructed); 1992 (upgrade); 1996 (closed); 2006 (soliciting operators).

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 (LST),
Farnborough Air Sciences Trust (FAST),
Berkshire, England, UK.

Installation Name	Test Section Size	Temperature Range
Farnborough Air Sciences Trust (FAST), Berkshire, England, United Kingdom	3.4 x 2.6 x 6.1 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	200 ft/sec (60 m/sec) (max w/o cooling); 300 ft/sec (90 m/sec) (max @ 1.25MVA)	
No. 2 Low Speed Wind Tunnel (LST)		**Dynamic Pressure**
	Cost	
	Refurbishment estimate available upon request.	**Stagnation Pressure**
	Operational Status	
	Inactive since 1998; soliciting operators as of January 2006.	

Testing Capabilities

3-component roof balance; 6-component floor balance; sting support –10 +30° of incidence.

Data Acquisition

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 behavior research; weapon systems research; oil cooler research for piston engines; testing of F1 racing cars, post office telegraph wires, and bobsleds; high-incidence canard delta tests; drag tests on Olympic skiers.

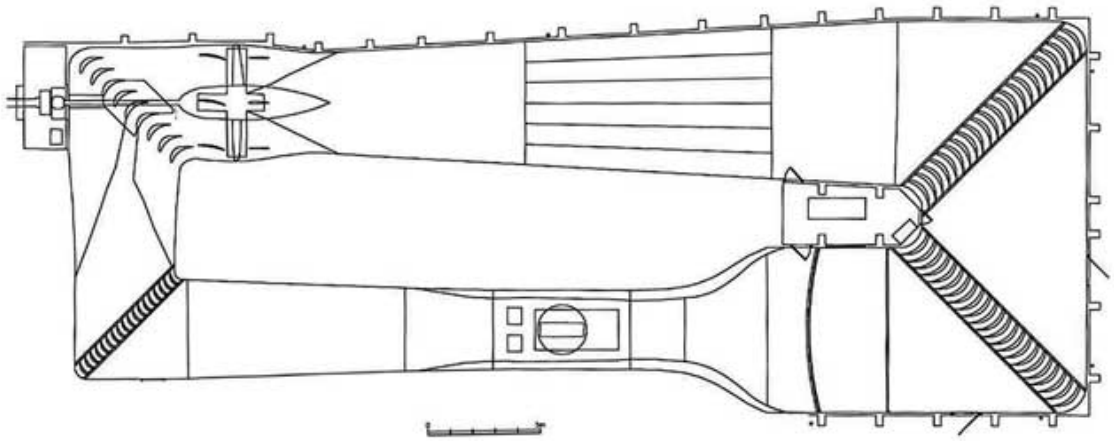
Date of Construction/Planned Improvements

1942 (constructed); 1970 (upgrade); 1998 (deactivated); 2006 (soliciting operators).

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, UK.

Installation Name	Test Section Size	Temperature Range
Farnborough Air Sciences Trust (FAST), Berkshire, England, United Kingdom	1.2 x 0.9 x 3.4 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	Up to 280 ft/sec (85 m/sec)	
No. 3 Low Speed Wind Tunnel (LST)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Inactive since mid-1990s; soliciting operators as of January 2006.	

Testing Capabilities

Continuous flow, closed circuit, octagonal cross section; 200 hp dc motor powers mahogany 6-bladed fan; 3-component roof balance; traverse sting support; 32:1 contraction ratio.

Data Acquisition

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; simplicity, safety, and low operating costs make this tunnel ideal for educational use.

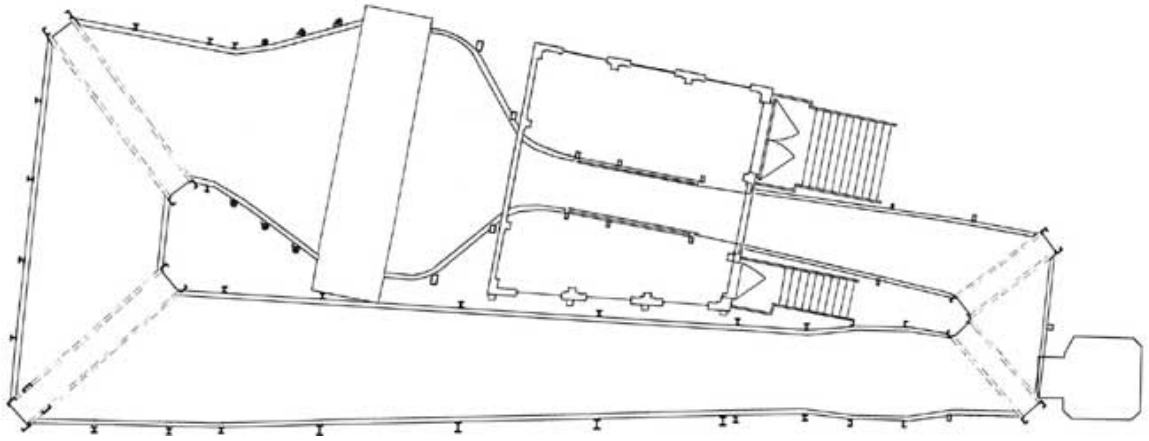
Date of Construction/Planned Improvements

1946 (constructed); 1990 (upgrade); mid-1990s (deactivated); 2006 (soliciting operators).

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. 3 Low Speed Wind Tunnel (LST),
Farnborough Air Sciences Trust (FAST),
Berkshire, England. UK.

Wind Tunnels of the Eastern Hemisphere

Subsonic **United Kingdom**

Installation Name	Test Section Size	Temperature Range
Flow Science Limited, Goldstein Research Laboratory, Manchester, England, United Kingdom	0.5 x 0.5 x 3.0 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	Up to 42 m/sec	
0.5 x 0.5 m Low Turbulence Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	

Testing Capabilities

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

Data Acquisition

Current Programs

Ideally suited for detailed flow investigations in such areas as laminar flow studies on aircraft wings.

Date of Construction/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 IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Subsonic **United Kingdom**

Installation Name	Test Section Size	Temperature Range
Flow Science Limited, Goldstein Research Laboratory, Manchester, England, United Kingdom	1.35 x 0.95 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	40 m/sec (open jet), 50 m/sec (closed)	
1.35 x 0.95 m Blowdown Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	

Testing Capabilities

Blowdown to open jet or closed working section with diffuser; turbulence level < 0.6%; flow velocity variation <0.2%; double inlet centrifugal fan, 1.3 m diameter with 50 kW drive via magnetic clutch; two 1.0-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; hotwire probes; digital oscilloscopes; digital spectrum analyser for recording transient, unsteady, or fluctuating flows or responses.

Current Programs

Date of Construction/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 IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Flow Science Limited, Goldstein Research Laboratory, Manchester, England, United Kingdom	2.75 x 2.23 x 5.5 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	Up to 70 m/sec (max)	
AVRO 9 x 7 ft Low Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	

Testing Capabilities

Closed-return test section; occupies 39 x 15 m floor space; turbulence level < 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; hotwire probes; digital oscilloscopes; digital spectrum analyser for recording transient, unsteady, or fluctuating flows or responses; flow visualisation using tufts, fluorescent mini-tufts, smoke, and oil film.

Current Programs

Used extensively by industry, government agencies, and research establishments for obtaining aerodynamic performance data of scale-model flight and surface vehicles.

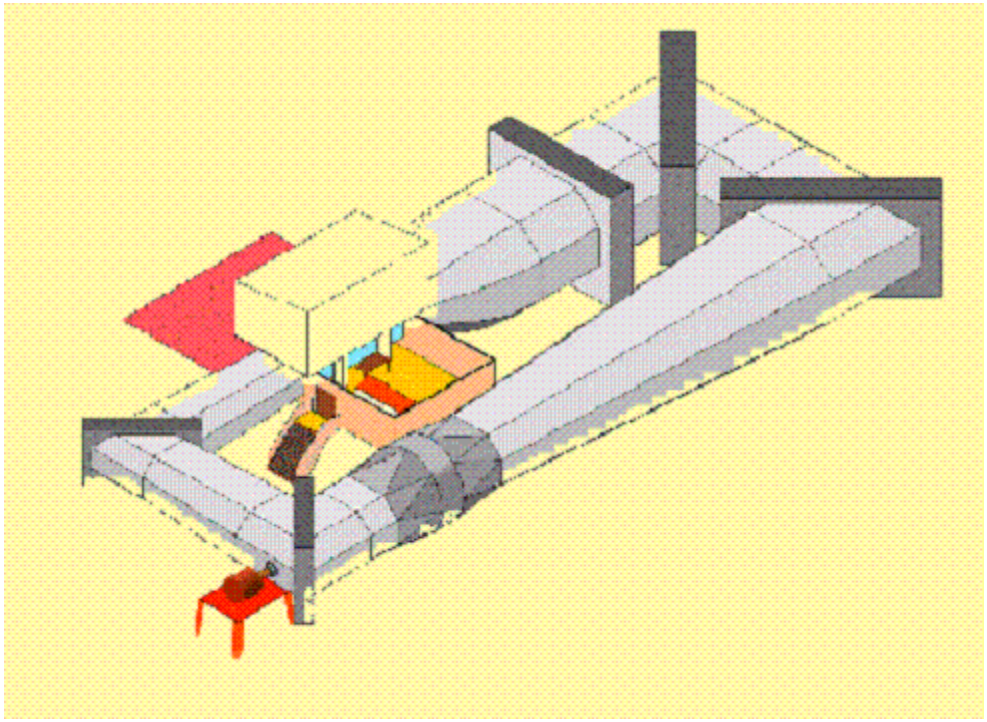
Date of Construction/Planned Improvements

1950s (constructed); 1989 (acquired from British Aerospace, moved, refurbished).

User Fees

Contact Information

David Smith (Operations Director), Flow Science Limited, Goldstein Research Laboratory, Barton Airport Eccles, Manchester M 30 7RU, England, United Kingdom; 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, UK.

Installation Name	Test Section Size	Temperature Range
QinetiQ, Farnborough, England, United Kingdom	4.2 x 5.0 x 8 m³	Ambient
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.05 to 0.34 Mach	7.6
5 m Low Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of January 2006.	3.0 bar

Testing Capabilities

Closed, single-return; solid constuction with tapered fillets; 13.6 MW max power (ac and dc); PSI (8400 and ESP) pressure system; 2 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-minute air mass flow.

Data Acquisition

DEC-Alpha/Vax.

Current Programs

Models landing and take-off performance for civil and military aircraft; other tests range from applications on high-speed trains to rotor blades, radar to a range of aerofoil structures.

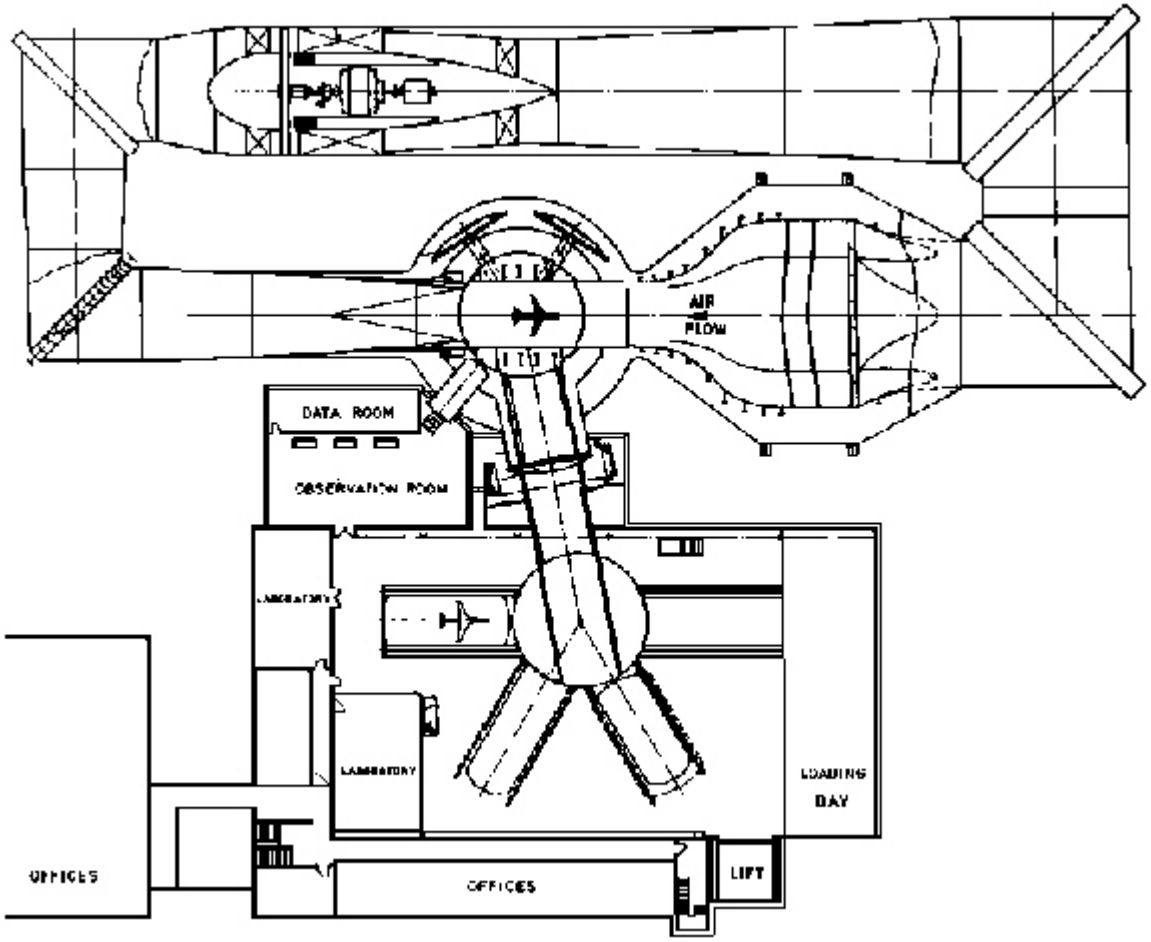
Date of Construction/Planned Improvements

1977 (constructed); continuous rolling refurbishment program.

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 m Low Speed Wind Tunnel, QinetiQ, Farnborough, England, UK.

Wind Tunnels of the Eastern Hemisphere

Subsonic **United Kingdom**

Installation Name	Test Section Size	Temperature Range
University of Glasgow, Department of Aerospace Engineering, Glasgow, Scotland, United Kingdom	1.15 x 0.95 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	30 m/sec (max)	
1.15 x 0.95 m Low Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	

Testing Capabilities

Closed-return facility; 3-component mechanical balance; rotary vortex generator for helicopter rotor wake simulation.

Data Acquisition

200-channel parallel data acquisition system; 50 kHz per channel; automatic gain setting and offset removal for maximum sensitivity; digital PIV sytem based on 2 Nd-Yag lasers and 2 Kodak Megaplus digital cameras; 3-channel TSI IFA 300, constant-temperature anemoneter system with DISA probes and supports; computer-controlled (LABView); high-resolution video image capturing system; silicon graphics; O2 workstations.

Current Programs

Date of Construction/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 IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
University of Glasgow, Department of Aerospace Engineering, Glasgow, Scotland, United Kingdom	2.65 x 2.04 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	76 m/sec (max)	
Argyll Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	

Testing Capabilities

Closed-return; 2 interchangeable working sections; yawing capability up to 10°; rotary vortex generator; mechanical 6-component balance.

Data Acquisition

200-channel parallel data acquisition system; 50 kHz per channel; automatic gain setting and offset removal for maximum sensitivity; digital PIV sytem based on 2 Nd-Yag lasers and 2 Kodak Megaplus digital cameras; 3-channel TSI IFA 300, constant-temperature anemoneter system with DISA probes and supports; computer-controlled (LABView); high-resolution video image capturing system; silicon graphics; O2 workstations.

Current Programs

Date of Construction/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, UK.

Wind Tunnels of the Eastern Hemisphere

Subsonic **United Kingdom**

Installation Name	Test Section Size	Temperature Range
University of Glasgow, Department of Aerospace Engineering, Glasgow, Scotland, United Kingdom	2.13 x 1.61 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	60 m/sec (max)	
Handley-Page Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	

Testing Capabilities

Closed return; 3-strut hydraulic system.

Data Acquisition

200-channel parallel data acquisition system; 50 kHz per channel; automatic gain setting and offset removal for maximum sensitivity; digital PIV sytem based on 2 Nd-Yag lasers and 2 Kodak Megaplus digital cameras; 3-channel TSI IFA 300, constant-temperature anemoneter system with DISA probes and supports; computer-controlled (LABView); high-resolution video image capturing system; silicon graphics; O2 workstations.

Current Programs

Date of Construction/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 IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **Australia**

Installation Name	Test Section Size	Temperature Range
Defence Science and Technology Organisation (DSTO), Air Vehicles Division, Fisherman's Bend, Victoria, Australia	0.806 x 0.806 x 3.12 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.3 to 1.2 Mach; 1.4 Mach (fixed nozzle)	2 to 3
Transonic Wind Tunnel		**Dynamic Pressure**
	Cost	200 kPa absolute
		Stagnation Pressure
	Operational Status	
	Confirmed active as of February 2007.	

Testing Capabilities

Cylindrical pressure chamber test chamber; slotted walls; interchangeable solid sidewalls; 2-stage axial flow compressor powered by 5.3 MW variable-speed motor.

Data Acquisition

420 mm diameter, Schlieren-quality window in plenum shell and test section side walls provide for flow visualization.

Current Programs

Aerodynamic grid testing; research applicable to the F/A18 and F-111 fighter aircraft.

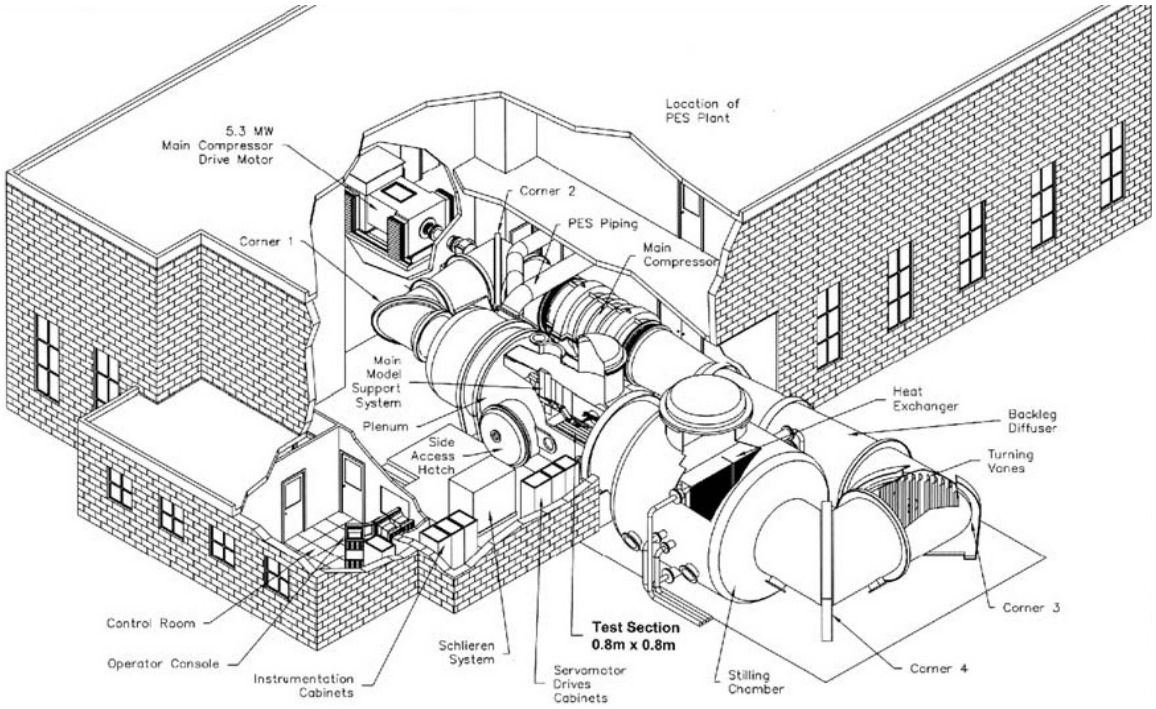
Date of Construction/Planned Improvements

March 2000 (completed); plans to implement trajectory prediction algorithm into control system.

User Fees

Contact Information

Stephen Lam, Air Vehicles Division, Defence Science and Technology Organisation, 506 Lorimer Street, Fishermans Bend, Victoria 3207, Australia; Tel (Lam): (61) 3 9626 7283; Fax (Lam): (61) 3 9626 7188; Email (Lam): Stephen.Lam@dsto.defence.gov.au; Web site: http://www.dsto.defence.gov.au.



The AMRL Transonic Wind Tunnel, 1999

Transonic Wind Tunnel,
Defence Science and Technology Organisation (DSTO),
Air Vehicles Division,
Fisherman's Bend, Victoria, Australia.

Wind Tunnels of the Eastern Hemisphere

Supersonic **Australia**

Installation Name	Test Section Size	Temperature Range
University of New South Wales, Australian Defence Force Academy, School of Aerospace, Civil and Mechanical Engineering, Canberra, Australia	155 x 90 mm²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	2 Mach	
Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

School of Aerospace, Civil & Mechanical Engineering, University of New South Wales, Australian Defence Force Academy, Northcott Drive, Canberra ACT 2600 Australia; Tel: (61) 2 6268 8348; Fax: (61) 2 6268 8337; Email: c.konrad@adfa.edu.au; Web site: http://www.unsw.adfa.edu.au/acme/facilities/laboratories.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **Australia**

Installation Name	Test Section Size	Temperature Range
University of Queensland, Department of Mechanical Engineering, Centre for Hypersonics, Brisbaine, Australia	100 x 140 mm²	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	1.5 to 3.5 Mach	
Supersonic Blowdown Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	250 kPa to 2,000 kPa

Testing Capabilities

Intermittent facility; set of asymmetric sliding nozzle blocks for 1.5 to 3.5 Mach; upper limit set by liquifaction of air in test section; sliding nozzle design leads to long nozzles and thick (up to 20 mm) boundary layers on walls; single-axis, probe-traversing mechanism used for boundary-layer traversing.

Data Acquisition

Pressure Systems Incorporated ESP-32 pressure-sensor module, with 32 individual piezoresitive sensors (-45 psi to 45 psi differential), accessed sequentially; data acquisition controlled by old PC.

Current Programs

Intersecting, swept-shock-wave, boundary-layer interactions; heat-transfer measurements in a blowdown tunnel; fixed Mach number nozzles.

Date of Construction/Planned Improvements

User Fees

Contact Information

Professor Richard Morgan (Director), The University of Queensland, Centre for Hypersonics, Room 305, Level 3, Mansergh Shaw Building (St Lucia), Brisbane QLD 4072 Australia; Tel (Morgan): (61) 7 3365 3592; Fax (Morgan): (61) 7 3365 4799; Email (Morgan): morgan@mech.uq.edu.au; Web site: http://www.uq.edu.au/hypersonics/index.html?page=32358&pid=19498.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **Australia**

Installation Name	Test Section Size	Temperature Range
University of Sydney, School of Aerospace, Mechanical and Mechatronic Engineering, Sydney, Australia	0.200 x 0.203 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	544 to 1,191 m/sec (1.6 to 3.5 Mach)	
Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of March 2007.	1,500 psi

Testing Capabilities

Blowdown; air exhausted through silencing system; compressed air storage with 2 pressure vessels; max pressure 1,500 psi; run time >2 min; throat area varied by adjusting lower tunnel thus varying Mach number during operation; designed by Aerolab Supply Company of Hyattsville, MD (US).

Data Acquisition

Optical grade viewing windows extend to the full tunnel height and are mounted on both walls of the test section.

Current Programs

Design of models for light aircraft; design of wing platforms for light aircraft; construction of 1/6th scale models.

Date of Construction/Planned Improvements

1970s (constructed).

User Fees

US$215 to $315/hr (government); US$315 to $415/hr (commercial); 8 hr min; additional fees for model construction, data analysis, calibration, etc.

Contact Information

Wind Tunnel Manager, School of Aerospace, Mechanical and Mechatronic Engineering, University of Sydney, NSW 2006, Australia; Tel: (61) 2 9351 2341; Email: enquiry@aeromech.usyd.edu.au; Web site: www.aeromech.usyd.edu.au.

Supersonic Wind Tunnel,
University of Sydney,
School of Aerospace, Mechanical and Mechatronic Engineering,
Sydney, Australia.

Wind Tunnels of the Eastern Hemisphere

Supersonic **Belgium**

Installation Name	Test Section Size	Temperature Range
Von Karman Institute for Fluid Dynamics (VKI), Saint Genese, Belgium	Three 40 x 36 cm² test sections	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	15 to 20 Mach	4
S-1 Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Continuous, closed-circuit, Ackeret-type; driven by 615 kW axial flow compressor; solid half nozzle M=1.43 for shock-wave and boundary-layer studies; 3° traverse mechanism; variable incidence mechanism up to +/- 35°.

Data Acquisition

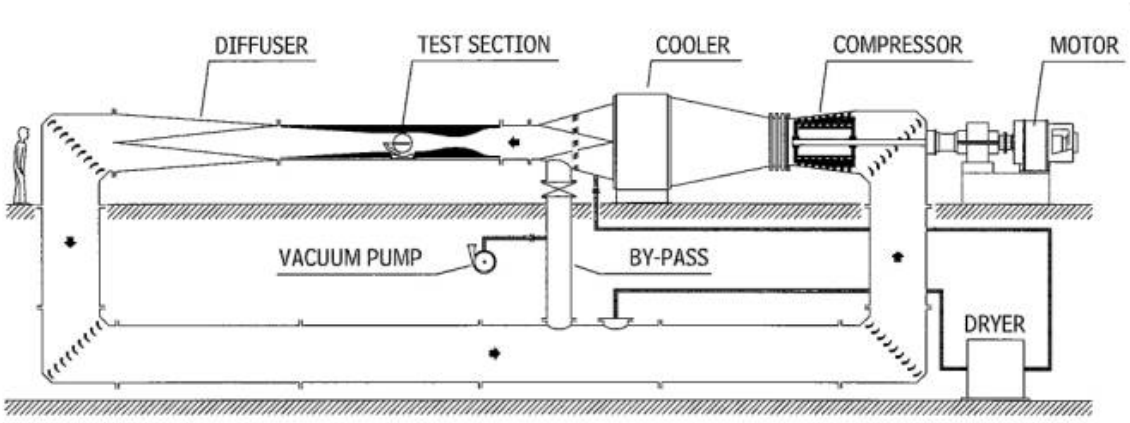
Current Programs

Date of Construction/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.



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

Installation Name	Test Section Size	Temperature Range
Von Karman Institute for Fluid Dynamics (VKI), Saint Genese, Belgium	8 x 10 cm²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	3.5 Mach	50
S-4 Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	3 to 18 bar

Testing Capabilities

Blowdown; test times achieved in 8 to 25 mins, depending on stagnation pressure; model incidence range from –10 to +10°.

Data Acquisition

Shadow and schlieren systems.

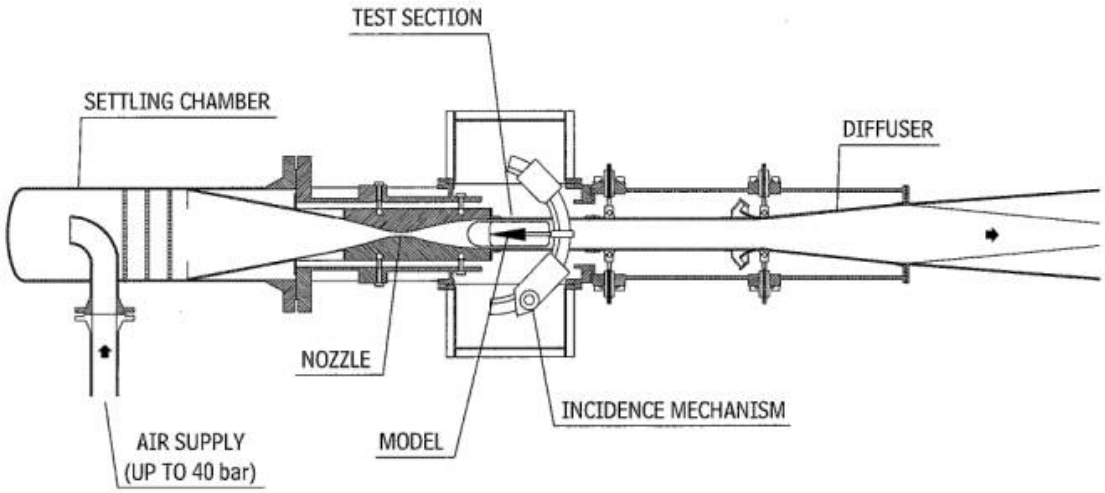
Current Programs

Date of Construction/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.



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

Wind Tunnels of the Eastern Hemisphere

Supersonic **China**

Installation Name	Test Section Size	Temperature Range
Aerospace Science and Technology Research Center, National Cheng Kung University, Taiwan, China		
	Speed Range	Reynolds Number (x 10^6)
Facility Name		
Transonic Wind Tunnel		Dynamic Pressure
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Data Acquisition

Current Programs

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

Date of Construction/Planned Improvements

User Fees

Contact Information

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

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **China**

Installation Name	Test Section Size	Temperature Range
China Academy of Aerospace Aerodynamics (CAAA), Beijing, China AKA: Beijing Institute of Aerodynamics (BIA) or 701st Institute of the China Aerospace Science and Technology Corp (CASC)	0.6 x 0.6 x 1.575 m³	
Facility Name	**Speed Range**	**Reynolds Number (x 10^6)**
Supersonic Wind Tunnel	0.4 to 4.5 Mach	
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005.	

Testing Capabilities

Intermittent semi-return.

Data Acquisition

Central integrated measurement, control, and processing by computers.

Current Programs

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

Date of Construction/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 IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
China Academy of Aerospace Aerodynamics (CAAA), Beijing, China AKA: Beijing Institute of Aerodynamics (BIA) or 701st Institute of the China Aerospace Science and Technology Corporation (CASC)	0.76 x 0.53 m²	
Facility Name	**Speed Range**	**Reynolds Number (x 10^6)**
Transonic Wind Tunnel	0.3 to 1.15 Mach	
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005.	

Testing Capabilities

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

Data Acquisition

Current Programs

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

Date of Construction/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.

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

Wind Tunnels of the Eastern Hemisphere

Supersonic **China**

Installation Name	Test Section Size	Temperature Range
China Academy of Aerospace Aerodynamics (CAAA), Beijing, China AKA: Beijing Institute of Aerodynamics (BIA) or 701st Institute of the China Aerospace Science and Technology Corp (CASC)	0.6 x 0.6 m²	
Facility Name	**Speed Range**	**Reynolds Number (x 10^6)**
BIA Trisonic Wind Tunnel FD-06	0.4 to 4.5 Mach (using 10 fixed nozzle blocks)	12 to 30
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005.	Up to ~15 atmospheric

Testing Capabilities

Perforated wall in test section; semi-blowdown (ejector augmented).

Data Acquisition

AGARD B models used to compare data with western tunnels.

Current Programs

Date of Construction/Planned Improvements

1962 (constructed).

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.

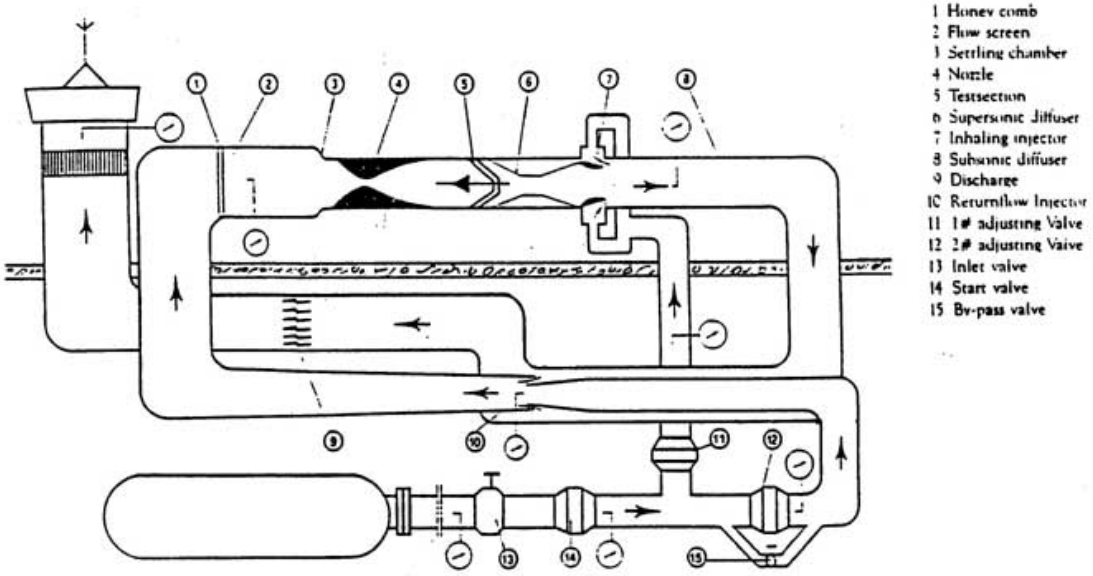


Figure 4.1-2 BIA Trisonic Wind Tunnel FD-06

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

Wind Tunnels of the Eastern Hemisphere

Supersonic **China**

Installation Name	Test Section Size	Temperature Range
China Aerodynamics Research and Development Center (CARDC), Mianyang City, Sichuan Province, China	1.2 x 1.2 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.6 to 3.5 Mach	35
1.2 x 1.2 m Trisonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	up to 4.5 atmospheric

Testing Capabilities

45 to 60 sec run time; 3,000 runs/year.

Data Acquisition

Current Programs

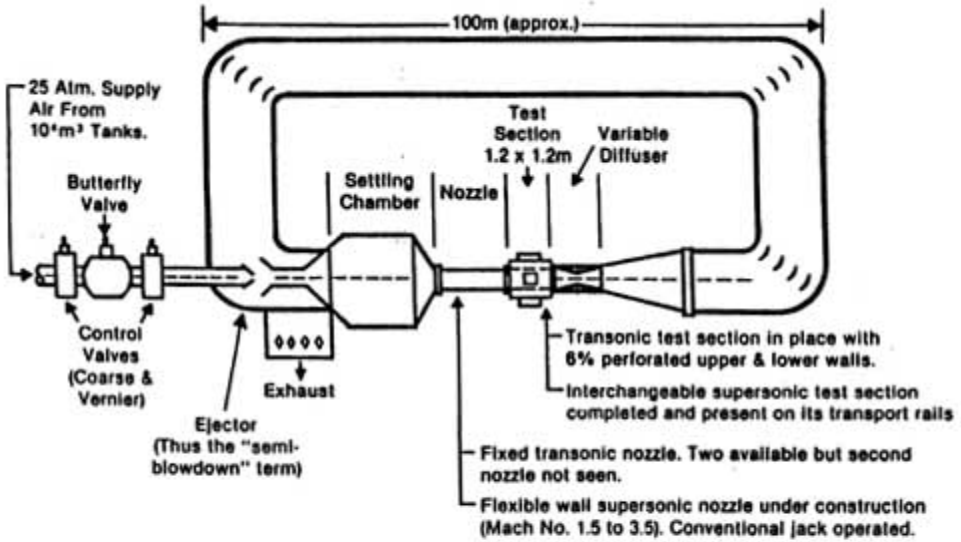
Date of Construction/Planned Improvements

1979 (constructed); improvements to flow quality planned.

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 or http://www.cardcgs.com/default2.asp.



Semi-blowdown "trisonic" wind tunnel at the High-Speed Aerodynamic Research Institute near Mianyang

Figure 4.1-6 CARDC 1.2 x 1.2m Trisonic Wind Tunnel

1.2 x 1.2 m Trisonic Wind Tunnel,
China Aerodynamics Research and Development Center (CARDC),
Mianyang, China

Wind Tunnels of the Eastern Hemisphere

Supersonic **China**

Installation Name	Test Section Size	Temperature Range
China Aerodynamics Research and Development Center (CARDC), Mianyang City, Sichuan Province, China	2.4 x 2.4 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.3 to 1.2 Mach	40 to 70
2.4 m Transonic Wind Tunnel		**Dynamic Pressure**
	Cost	4.5 atmospheric (max)
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

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

Data Acquisition

Current Programs

Research and development of aerospace flight vehicles.

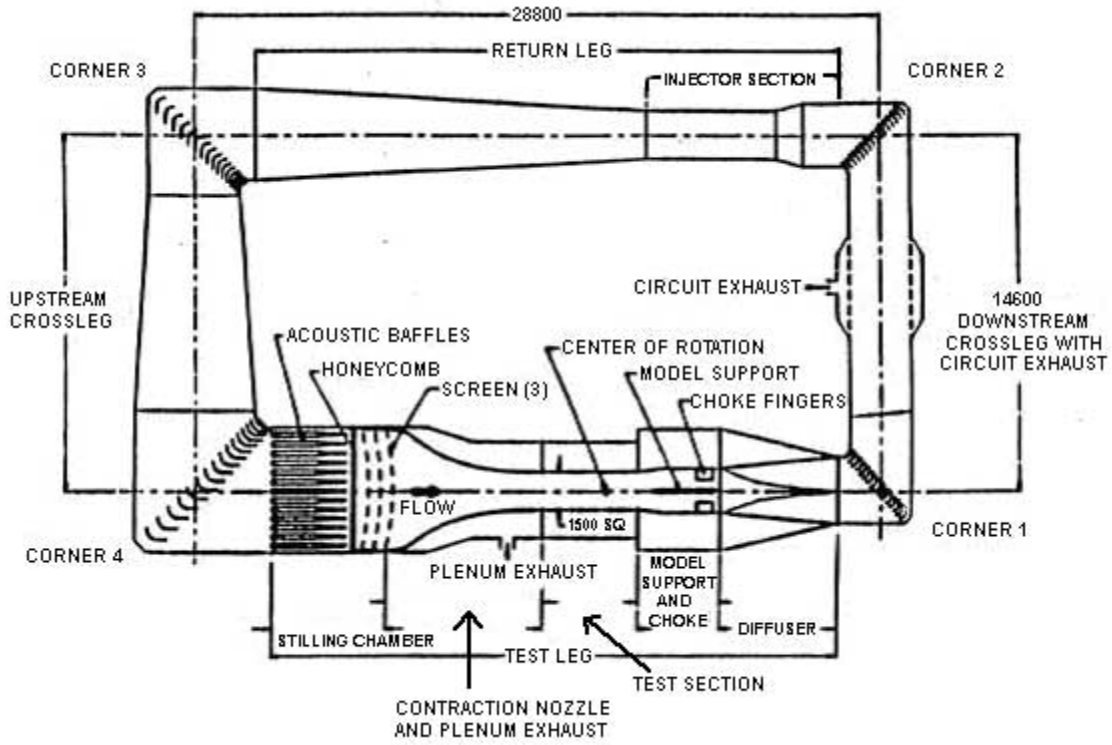
Date of Construction/Planned Improvements

1997 (constructed); 1998 (upgrade).

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 or 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.

Installation Name	Test Section Size	Temperature Range
China Aerodynamics Research and Development Center (CARDC), Mianyang City, Sichuan Province, China		100 to 148 K
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name		
Low Temperature Compressed Air Transonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Prototype, not yet operational.	10.6 bar

Testing Capabilities

Refrigeration system uses liquid nitrogen.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1998 (constructed).

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 or http://www.cardcgs.com/default2.asp.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Chinese Aerodynamics Research Institute of Aeronautics (CARIA), Harbin, Heilongjiang Province, China	0.6 x 0.6 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.35 to 4.0 Mach	
FL-1 Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

When testing at transonic speeds, upper and lower walls perforated with open-area ratio of 15 %, pore diameters of 10 mm pore diameters, solid side walls; when testing at supersonic speeds, all 4 walls are solid.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1960 (constructed).

User Fees

Contact Information

Professor Yu Tao (Director), Chinese Aerodynamic Research Institute of Aeronautics (CARIA), PO Box 88, 2 Yiman Street, Harbin, Heilongjiang Province, 15000 China; Tel: (86) 451 82539364; Fax: (86) 451 82838327; Email: cph@caria.com.cn; Web site: http://www.caria.com.cn.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Chinese Aerodynamics Research Institute of Aeronautics (CARIA), Harbin, Heilongjiang Province, China	1.2 x 1.2 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.4 to 2.0 Mach	Variable
FL-2 Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

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

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1993 (constructed); 1995 (upgrade).

User Fees

Contact Information

Professor Yu Tao (Director), Chinese Aerodynamic Research Institute of Aeronautics (CARIA), PO Box 88, 2 Yiman Street, Harbin, Heilongjiang Province, 15000 China; Tel: (86) 451 82539364; Fax: (86) 451 82838327; Email: cph@caria.com.cn; Web site: http://www.caria.com.cn.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **China**

Installation Name	Test Section Size	Temperature Range
Chinese Aerodynamics Research Institute of Aeronautics (CARIA), Harbin, Heilongjiang Province, China		
	Speed Range	Reynolds Number (x 10^6)
Facility Name		
FL-3 High Speed Air Inlet Test Platform		Dynamic Pressure
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Special-use experimental wind tunnel with subsonic and transonic air inlets.

Data Acquisition

Current Programs

Date of Construction/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, 15000 China; Tel: (86) 451 82539364; Fax: (86) 451 82838327; Email: cph@caria.com.cn; Web site: http://www.caria.com.cn.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Chinese Aerodynamics Research Institute of Aeronautics (CARIA), Harbin, Heilongjiang Province, China	0.64 x 0.52 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.2 to 1.5 Mach	
FL-7 Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Continuously adjustable speed; 4 perforated walls; variable open area ratio.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1963 (constructed).

User Fees

Contact Information

Professor Yu Tao (Director), Chinese Aerodynamic Research Institute of Aeronautics (CARIA), PO Box 88, 2 Yiman Street, Harbin, Heilongjiang Province, 15000 China; Tel: (86) 451 82539364; Fax: (86) 451 82838327; Email: cph@caria.com.cn; Web site: http://www.caria.com.cn.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **China**

Installation Name	Test Section Size	Temperature Range
Key Laboratory of High-Temperature Gas Dynamics (LHD), Beijing, China		2,100 K
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	2.5 Mach	
Directly Coupled Supersonic Combustion Test Platform		**Dynamic Pressure**
	Cost	1.5 Mpa
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Kerosene combustion uses atomized pilot hydrogen and wall cavities;combustion efficiency 90%; pressure recovery over 50%.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1994 (lab founded).

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 IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Key Laboratory of High-Temperature Gas Dynamics (LHD), Beijing, China	0.8 m (jet tube diameter)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	3.5 to 6 Mach	
Tube/Shock Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

30 to 50 millisec run time.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1994 (constructed).

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 IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Nanjing University of Aeronautics and Astronautics (NUAA), Nanjing, Tiangsu Province, China	0.6 x 0.6 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.3 to 3.0 Mach	
High Speed Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

-30° to +30° angle of attack; -10° to +10° sideslip angle.

Data Acquisition

Current Programs

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

Date of Construction/Planned Improvements

1970 (constructed).

User Fees

Force measurements, US$100/hr; pressure measurement, US$100 to 125/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, Tiangsu Province, 210016, China; Tel: (86) 25 84891585; Email: xwxu@nuaa.edu.cn; Web site: http://www.nuaa.edu.cn.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **China**

Installation Name	Test Section Size	Temperature Range
Nanjing University of Aeronautics and Astronautics (NUAA), Nanjing, Tiangsu Province, China	0.6 x 0.6 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.5 to 3.5 Mach	
Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Data Acquisition

Current Programs

Tests on aircraft and missiles: 6-component force measurements; pressure measurements; hinge moment measurements; flutter and buffeting tests; acoustic environment tests.

Date of Construction/Planned Improvements

User Fees

Contact Information

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

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **China**

Installation Name	Test Section Size	Temperature Range
Northwestern Polytechnical University (NWPU, NPU), Xi'an, Shaanxi Province, China	0.3 x 0.3 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.3 to 4.5 Mach	
Small Scale, High Speed Research Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

2002 or 2005 (constructed).

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 IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
French-German Research Institute of Saint Louis (ISL), Saint Louis, France	30 x 30 cm²	320 K
	Speed Range	**Reynolds Number (x 10^6)**
	1.5 to 4.4 Mach	1.4
Facility Name		**Dynamic Pressure**
S30 Supersonic Wind Tunnel	**Cost**	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	0.2 to 1 Mpa

Testing Capabilities

Continuous 4-stage, 7 MW radial compressor.

Data Acquisition

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

Current Programs

Date of Construction/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.

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

Installation Name	Test Section Size	Temperature Range
ONERA French Aeronautics and Space Research Center, Fluid Mechanics and Energetics Branch, Meudon Center, Meudon, France	0.06 m	Up to 400 K (variable stagnation temperature)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	3 or 5 Mach	10 to 30
R1Ch Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	Variable up to 15 bar

Testing Capabilities

Long blowdowns from 10 to 60 seconds; free test section; can be equipped with Mach 3 or Mach 5 nozzles with 0.326 m exit diameter; maximum mass flow rate of 80 kg/sec.

Data Acquisition

Current Programs

Date of Construction/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/dafe-en/r1r2ch/index.html.

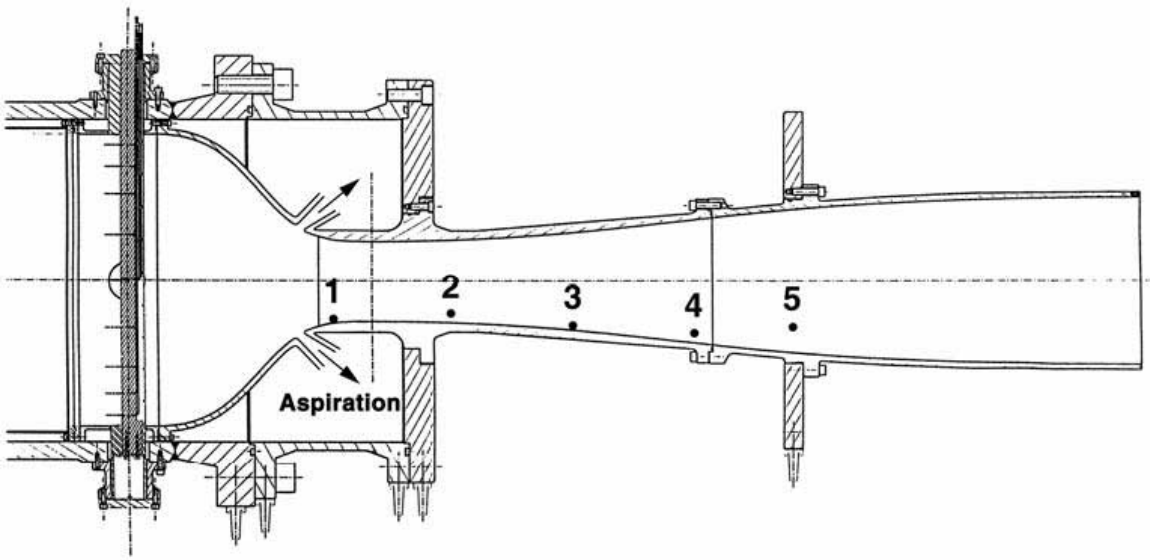


Figure 5 : Sketch of the R1Ch wind tunnel. 1,2,3,4,5 denote the hot film locations. Diameter of the nozzle exit: 30 cm.

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

Installation Name	Test Section Size	Temperature Range
ONERA French Aeronautics and Space Research Center, Modane-Avrieux, France	1.75 x 1.77 m² (transonic); 1.75 x 1.93 m² (supersonic)	313 K
Facility Name	**Speed Range**	**Reynolds Number (x 10^6)**
S2Ma Continuous Pressurized Sub/Trans/Supersonic Wind Tunnel	Up to 1.3 Mach (transonic); 1.5 to 3.1 Mach (supersonic)	4.0 (supersonic); 5.4 (transonic)
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of September 2005.	2.5 bar

Testing Capabilities

Variable pressure; closed -circuit; continuous-flow; captive trajectory system.

Data Acquisition

160 analogous channels; 64 channels at 20 KHz/channel by SAR system; 56 channels at 17.7 KHz; PCM systems; real-time data processing; model supports and tunnel wall interferences corrections; graphics on colored screens by ALPHA Station 200 4/100.

Current Programs

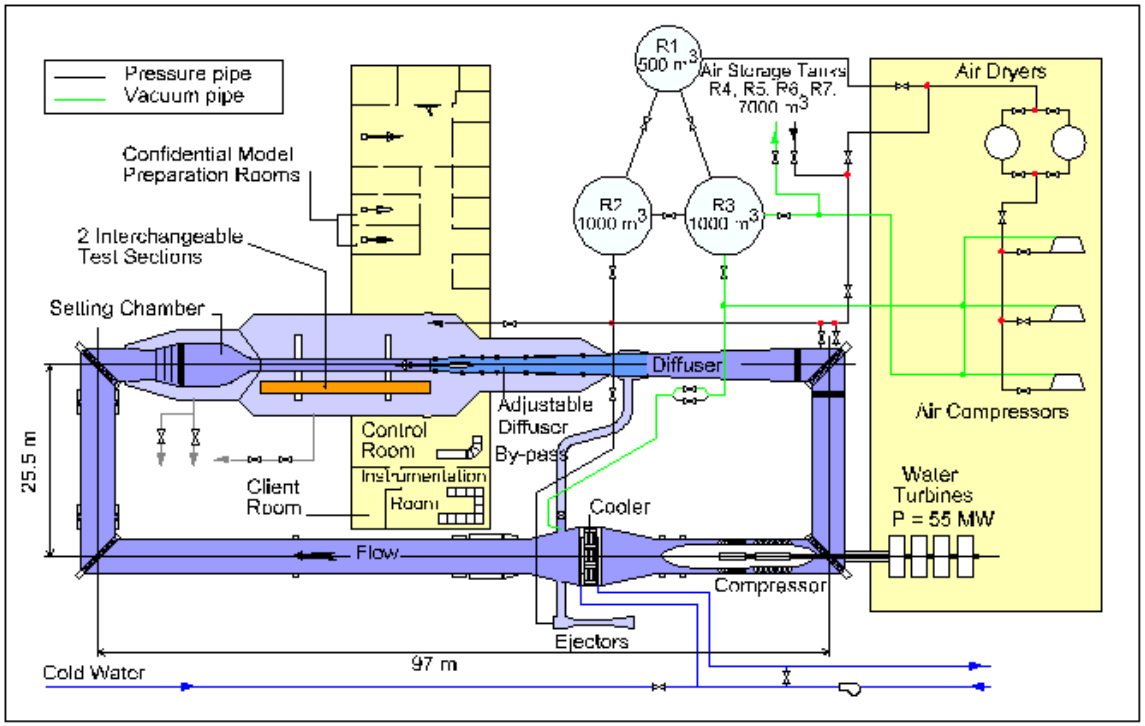
Sting holder: angle of attack range=25°, roll range=360°; variable knuckle from - 10° to + 25°; 3° of freedom bent sting: angle of attack range=46°, yaw range=22° (with zero roll angle); wall turret: angle of attack range = 360°.

Date of Construction/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 Continuous Pressurized Sub/Trans/Supersonic Wind Tunnel,
ONERA French Aeronautics and Space Research Center,
Modane-Avrieux, France.

Wind Tunnels of the Eastern Hemisphere

Supersonic **France**

Installation Name	Test Section Size	Temperature Range
ONERA French Aeronautics and Space Research Center, Modane-Avrieux, France	0.56 x 0.78 m² (transonic); 0.76 x 0.80 m² (supersonic)	530 K (max)
Facility Name	**Speed Range**	**Reynolds Number (x 10^6)**
S3Ma Blowdown Pressurized Sub/Trans/Supersonic Wind Tunnel	0.1 to 1.3 Mach (transonic); 1.65 to 5.5 Mach (supersonic)	3.5 (transonic); 3.2 (supersonic)
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Confirmed active.	.02 to 7.5 bar

Testing Capabilities

Blowdown; rectangular; 3 to 20 runs/day.

Data Acquisition

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

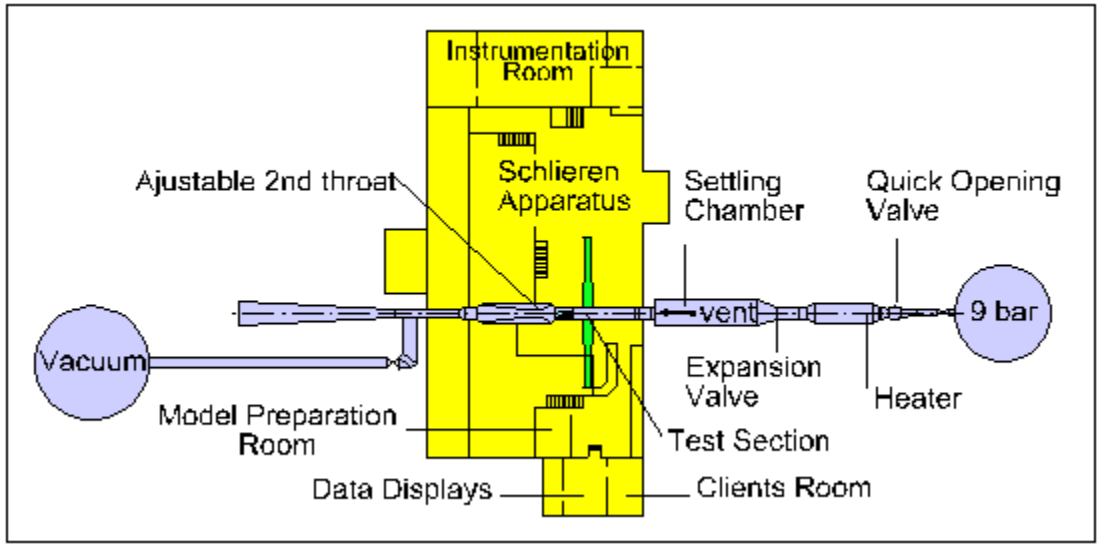
Current Programs

Date of Construction/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 Blowdown Pressurized Sub/Trans/Supersonic Wind Tunnel,
ONERA French Aeronautics and Space Research Center,
Modane-Avrieux, France.

Wind Tunnels of the Eastern Hemisphere

Supersonic **Germany**

Installation Name	Test Section Size	Temperature Range
European Transonic Wind Tunnel (ETW), Cologne, Germany	2.0 x 2.4 x 9.0 m³	110 to 313 K
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.15 to 1.35 Mach	Up to 50 (full models); up to 85 (half models)
2 x 2.4 m Cryogenic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	1.25 to 4.5 bar

Testing Capabilities

Closed, aerodynamic circuit; insulated stainless steel pressure shell; up to 50 MW drive power; –160°C nitrogen flow driven through 2 filling screens into stilling chamber and through honeycomb flow straightener and 2 anti-turbulence screens; 12:1 contraction ratio.

Data Acquisition

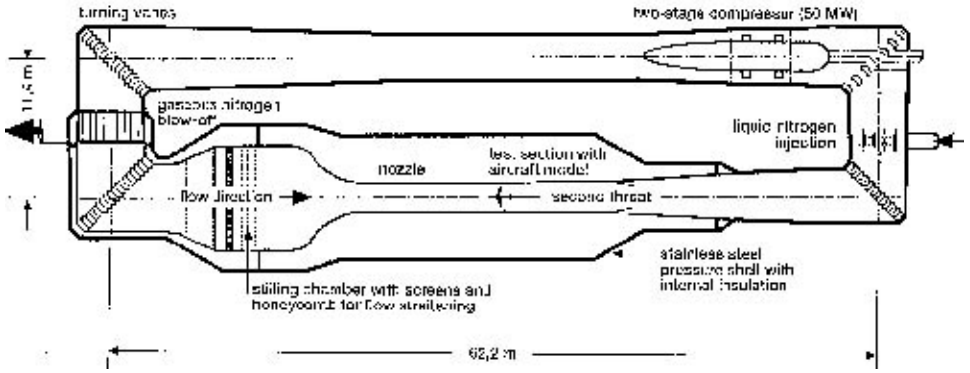
Current Programs

Date of Construction/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.

Wind Tunnels of the Eastern Hemisphere

Supersonic **Germany**

Installation Name	Test Section Size	Temperature Range
German-Dutch Wind Tunnels (DNW), Göttingen, Germany	0.4 x 0.35 m²	100 to 300 K
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	102 to 323 m/sec	
Transonic Wind Tunnel (KRG)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	

Testing Capabilities

Intermittent Ludwieg tube (t = 0.6 sec to 1.0 sec).

Data Acquisition

Current Programs

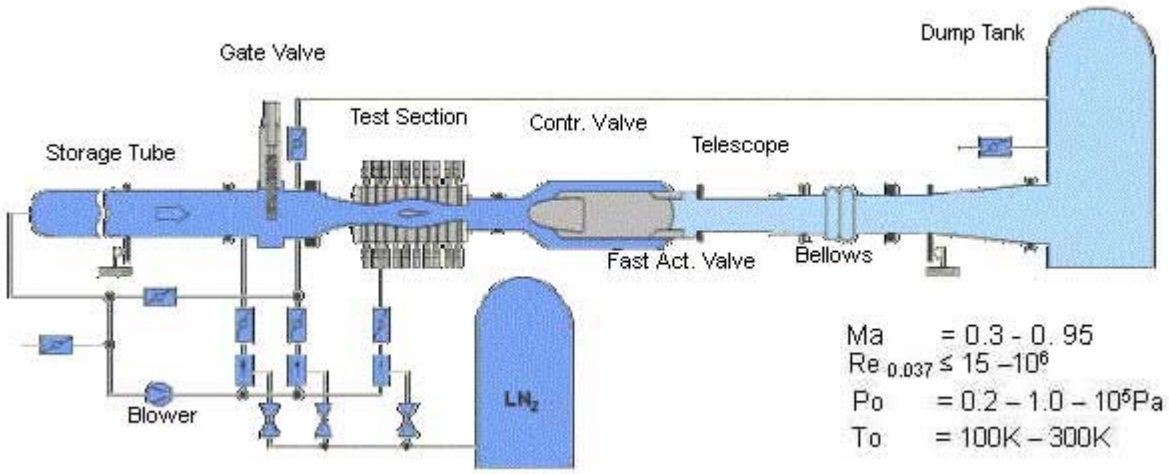
Date of Construction/Planned Improvements

1982 (constructed); 1994 (upgrade).

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.

Wind Tunnels of the Eastern Hemisphere

Supersonic **Germany**

Installation Name	Test Section Size	Temperature Range
German-Dutch Wind Tunnels (DNW), Göttingen, Germany	1.0 x 1.0 m²	293 to 315 K
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.3 to 0.9 Mach (adaptive walls); 0.3 to 1.2 Mach (perforated walls); 1.3 to 2.2 Mach (flexible Laval nozzle)	1.8
Transonic Wind Tunnel (TWG)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	

Testing Capabilities

Continuous pressurized wind tunnel; 3 exchangeable test sections for subsonic, transonic, and supersonic speed ranges; 12 MW power supply to 4- or 8-stage axial compressor; auxiliary suction plant with radial compressors for transonic test section (perforated walls) available.

Data Acquisition

150,000 lines of code, Unix operating system.

Current Programs

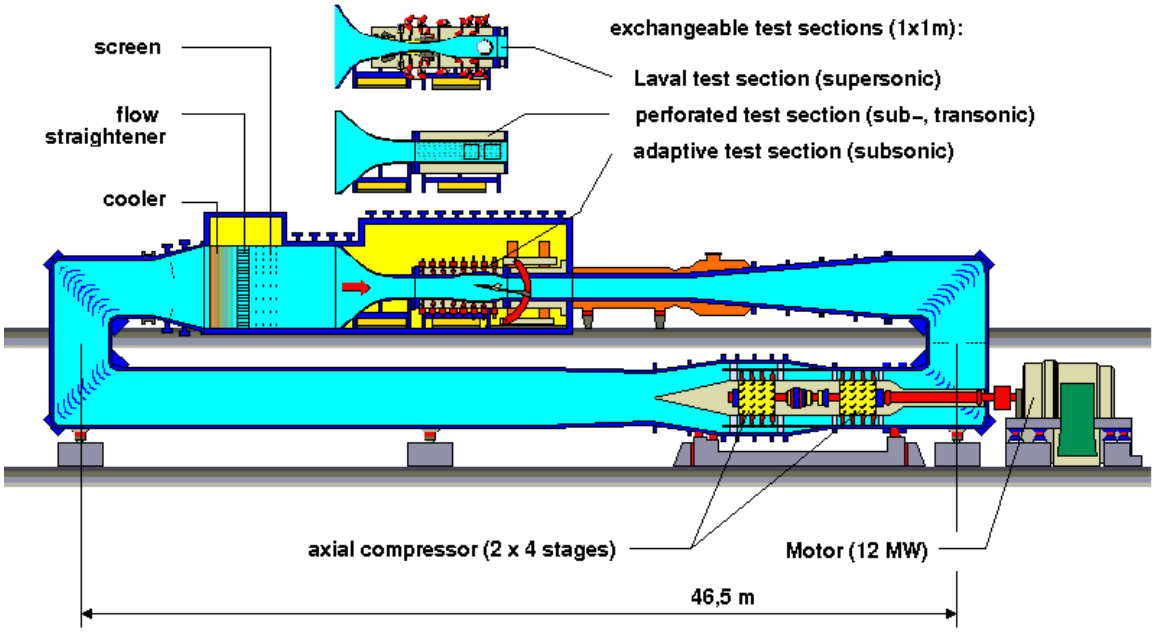
Date of Construction/Planned Improvements

1991 to 1993 (constructed).

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.

Wind Tunnels of the Eastern Hemisphere

Supersonic **India**

Installation Name	Test Section Size	Temperature Range
Council of Scientific and Industrial Research (CSIR), National Aerospace Laboratories (NAL), Nilakantan Wind Tunnel Centre, Bangalore, India	0.6 x 0.6 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.2 to 1.2 Mach	8 to 60
0.6 x 0.6 m Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of June 2006.	1.5 to 4.0 bar

Testing Capabilities

Test duration: 3 to 40 secs, 180 sec max; model incidence -150 to 300, continuous and step mode.

Data Acquisition

Front-end MicroVAX computer systems.

Current Programs

Date of Construction/Planned Improvements

1989 (commissioned).

User Fees

Contact Information

Dr. A.R. Upadhya (Director), National Aerospace Laboratories, Post Bag No. 1779, Kodihalli, Bangalore 560 037 India; Tel: (80) 25270584 or (80) 25265579; Fax: (80) 25260862 or 25270670; Email: director@css.nal.res.in; Web site: http://www.nal.res.in.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **India**

Installation Name	Test Section Size	Temperature Range
Indian Institute of Science, Department of Aerospace Engineering, Bangalore, India	1 x 3 in²	
	Speed Range	Reynolds Number (x 10^6)
Facility Name		
1 x 3 in Blowdown Supersonic Wind Tunnel		Dynamic Pressure
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of March 2007.	

Testing Capabilities

Fixed-block; replaceable nozzles for achieving different Mach numbers.

Data Acquisition

Schlieren systems for flow visualization.

Current Programs

Date of Construction/Planned Improvements

1950s (constructed); recently (electronic pressure-scanning system replaced mercury manometers).

User Fees

Contact Information

Professor B.N. Raghunandan (Chairman), Department of Aerospace Engineering, Indian Institute of Science, Bangalore 560012 India; Tel: (91) 80 229 32878 or 33023; Email: raghubn@aero.iisc.ernet.in; Web site: http://www.aero.iisc.ernet.in/facilities/aerodyn_facilities.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **India**

Installation Name	Test Section Size	Temperature Range
Indian Institute of Science, Department of Aerospace Engineering, Bangalore, India	5 x 7 in²	
	Speed Range	Reynolds Number (x 10^6)
Facility Name		
5 x 7 in Blowdown Supersonic Wind Tunnel		Dynamic Pressure
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of March 2007.	

Testing Capabilities

Fixed block; replaceable nozzles for achieving different Mach numbers.

Data Acquisition

Current Programs

Schlieren systems for flow visualization; electronic pressure scanning system (ESP) for pressure measurements.

Date of Construction/Planned Improvements

1950s (constructed); recently (electronic pressure-scanning system replaced mercury manometers).

User Fees

Contact Information

Professor B.N. Raghunandan (Chairman), Department of Aerospace Engineering, Indian Institute of Science, Bangalore 560012 India; Tel: (91) 80 229 32878 or 33023; Email: raghubn@aero.iisc.ernet.in; Web site: http://www.aero.iisc.ernet.in/facilities/aerodyn_facilities.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **India**

Installation Name	Test Section Size	Temperature Range
Indian Institute of Technology, Department of Aerospace Engineering, High Speed Aerodynamics Laboratory, Kanpur, India	225 x 175 mm²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name		
Supersonic Blowdown Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Intermittent; blowdown.

Data Acquisition

Dedicated computer system.

Current Programs

New testing techniques and basic research on transonic/supersonic flows.

Date of Construction/Planned Improvements

User Fees

Contact Information

Dr. A. Kushari, High Speed Aerodynamics Laboratory, Department of Aerospace Engineering, Indian Institute of Technology, Kanpur 208 016 India; Tel (office): (91) 512 259 7126; Tel (lab): (91) 512 259 7992; Fax: (91) 512 259 7561; Email: akushari@iitk.ac.in; Web site: http://www.iitk.ac.in/aero/hsalab/hsahome.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **India**

Installation Name	Test Section Size	Temperature Range
National Aerospace Laboratories (NAL), Nilakantan National Trisonic Aerodynamic Facilities (NTAF), Bangalore, India	0.6 x 0.6 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.2 to 1.2 Mach	8 to 60
0.6 m Transonic Tunnel (H2)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	1.5 to 4.0 bar

Testing Capabilities

Square, slotted walls; intermittent blowdown; test duration: 30 to 40 seconds, max 180 sec.

Data Acquisition

Front-end MicroVAX computer systems in H1,H2 and H3 tunnels; host VAX 11/785 networked with MicroVAX system for data processing and archiving; special controls: PC-based tunnel control system, transonic Mach number sweep, pressure sweep Data System

Current Programs

Studies related to delta-wing model with flaps, generic axisymmetric body progression; performance enhancement of typical combat aircraft with various leading-edge devices; air-intake model of aircraft to assess performance of intake; assessment of stability characteristics of typical air-to-air aerospace model at subsonic to transonic Mach numbers; force measurements on the model; roll characteristics.

Date of Construction/Planned Improvements

1989 (constructed).

User Fees

Contact Information

Dr. A.R. Upadhya (Director), National Aerospace Laboratories, Post Bag No.1779, Kodihalli, Bangalore-560 017, India; Tel: (80) 25270584 or 25265579; Fax: (80) 25260862 or 25270670; Email: director@css.nal.res.in; Web site: www.nal.res.in.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **Iran**

Installation Name	Test Section Size	Temperature Range
Imam Hossein University, Tehran, Iran		
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.4, 0.6, 1.5 Mach	0.84, 1.26, 3.15
Trisonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of August 2005.	

Testing Capabilities

Data Acquisition

Static and dynamic force and moment; dynamic derivatives.

Current Programs

Model of Standard Dynamics Model (SDM) fighter aircraft; aerodynamic behavior during oscillatory maneuvers.

Date of Construction/Planned Improvements

User Fees

Contact Information

Imam Hossein University, Tehran, Iran; Web site: http://www.ihu.ac.ir.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **Iran**

Installation Name	Test Section Size	Temperature Range
Iran University of Science and Technology (IUS), Mechanical Engineering Department, Aerodynamics Research Laboratory, Tehran, Iran		
	Speed Range	Reynolds Number (x 10^6)
Facility Name		
Supersonic Wind Tunnel		Dynamic Pressure
	Cost	
		Stagnation Pressure
	Operational Status	

Testing Capabilities

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Dr. Reza Taghavi Zenouz (Director), Iran University of Science and Technology, Mechanical Engineering Department, Aerodynamics Research Laboratory, Tehran, Iran; Tel: (98) 21 77491228-29; Fax: (98) 21 77240488; Email (Director): taghavi@iust.ac.ir; Web site: http://mech.iust.ac.ir/files/3/document/dr.taghavi.pdf.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **Israel**

Installation Name	Test Section Size	Temperature Range
Technion-Israel Institute of Technology, Faculty of Aerospace Engineering, Aerodynamics Laboratory, Haifa, Israel	10 x 10 cm²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name		
10 x 10 cm Supersonic Blowdown Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Flexible nozzle.

Data Acquisition

Instruments for measuring force, pressure, velocity, and temperature; DEC 3400-controlled NEFF system for data acquisition reduction; integral 5- to 30-mm, 6-component, sting-type, strain-gauge balances; laser-Doppler anemometry-velocity measuring technique; optical diagnostics.

Current Programs

Also used as open sonic jets.

Date of Construction/Planned Improvements

User Fees

Contact Information

Dean, Faculty of Aerospace Engineering, Technion-Israel Institute of Technology, Technion City, Haifa 32000 Israel; Tel: (972) 4 829-2308 or 2260; Fax: (972) 4 829-2030; Email: aerdean@aerodyne.technion.ac.il; Web site: http://ae-www.technion.ac.il/research/aerodynamic.php.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **Israel**

Installation Name	Test Section Size	Temperature Range
Technion-Israel Institute of Technology, Faculty of Aerospace Engineering, Aerodynamics Laboratory, Haifa, Israel	30 x 30 cm²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name		
30 x 30 cm Supersonic Blowdown Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Data Acquisition

Instruments for measuring force, pressure, velocity, and temperature; DEC 3400-controlled NEFF system for data acquisition reduction; integral 5- to 30-mm, 6-component, sting-type, strain-gauge balances; laser-Doppler anemometry-velocity measuring technique; optical diagnostics.

Current Programs

Designed for fixed Mach numbers; also used as open sonic jets.

Date of Construction/Planned Improvements

User Fees

Contact Information

Dean, Faculty of Aerospace Engineering, Technion-Israel Institute of Technology, Technion City, Haifa 32000 Israel; Tel: (972) 4 829-2308 or 2260; Fax: (972) 4 829-2030; Email: aerdean@aerodyne.technion.ac.il; Web site: http://ae-www.technion.ac.il/research/aerodynamic.php.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **Israel**

Installation Name	Test Section Size	Temperature Range
Technion-Israel Institute of Technology, Faculty of Aerospace Engineering, Aerodynamics Laboratory, Haifa, Israel	60 x 80 cm²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.4 to 1.2 Mach	0.08 to 0.15
Low Turbulence Transonic Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	Atmospheric

Testing Capabilities

Induction-driven; floor-and-ceiling-perforated; 1 atm total pressure.

Data Acquisition

Instruments for measuring force, pressure, velocity, and temperature; DEC 3400-controlled NEFF system for data acquisition reduction; integral 5- to 30-mm, 6-component, sting-type, strain-gauge balances; laser-Doppler anemometry-velocity measuring technique; optical diagnostics.

Current Programs

Testing of missiles with elliptical cross sections.

Date of Construction/Planned Improvements

User Fees

Contact Information

Dean, Faculty of Aerospace Engineering, Technion-Israel Institute of Technology, Technion City, Haifa 32000 Israel; Tel: (972) 4 829-2308 or 2260; Fax: (972) 4 829-2030; Email: aerdean@aerodyne.technion.ac.il; Web site: http://ae-www.technion.ac.il/research/aerodynamic.php.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **Israel**

Installation Name	Test Section Size	Temperature Range
Technion-Israel Institute of Technology, Faculty of Aerospace Engineering, Aerodynamics Laboratory, Haifa, Israel	40 x 50 cm²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	1.5 to 3.6 Mach	0.45 to 0.9
Supersonic Blowdown Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	10 atm (total pressure)

Testing Capabilities

Up to 1 min test duration; flexible nozzle for continuously variable Mach number.

Data Acquisition

Instruments for measuring force, pressure, velocity, and temperature; DEC 3400-controlled NEFF system for data acquisition reduction; integral 5- to 30-mm, 6-component, sting-type, strain-gauge balances; laser-Doppler anemometry-velocity measuring technique; optical diagnostics.

Current Programs

Testing of missiles with elliptical cross sections.

Date of Construction/Planned Improvements

User Fees

Contact Information

Dean, Faculty of Aerospace Engineering, Technion-Israel Institute of Technology, Technion City, Haifa 32000 Israel; Tel: (972) 4 829-2308 or 2260; Fax: (972) 4 829-2030; Email: aerdean@aerodyne.technion.ac.il; Web site: http://ae-www.technion.ac.il/research/aerodynamic.php.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **Italy**

Installation Name	Test Section Size	Temperature Range
Italian Aerospace Research Center (CIRA), Capua, Italy	0.35 x 0.45 x 0.6 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	Up to 0.35 Mach (continuous, subsonic); up to 1.1 Mach (intermittent at subsonic and transonic); up to 1.4 Mach (supersonic)	
PT-1 Transonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005	1.85 bar (max)

Testing Capabilities

Pressurized, continuous and intermittent flow; subsonic, transonic, and supersonic regimes; 145 kW fan; powered by high-pressure air-injection system; runtime 150 sec.

Data Acquisition

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.

Date of Construction/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.

Wind Tunnels of the Eastern Hemisphere

Supersonic **Japan**

Installation Name	Test Section Size	Temperature 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 m²	330 K
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	1.5 to 2.5 Mach	
0.2 x 0.2 m Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	50 to 120 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of December 2005.	

Testing Capabilities

Continuous circulation type.

Data Acquisition

Current Programs

Research on aerodynamics in a supersonic low-turbulence environment.

Date of Construction/Planned Improvements

1994 (constructed; 1999 (settling chamber repaired to improve quality of air flow in test section).

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.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **Japan**

Installation Name	Test Section Size	Temperature 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 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.2 to 1.4 Mach	5 to 40
0.8 x 0.45 m High Reynolds Number Transonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of December 2005.	196 to 1176 kPa

Testing Capabilities

Intermittent blowdown; test duration: 9 to 100 seconds.

Data Acquisition

Current Programs

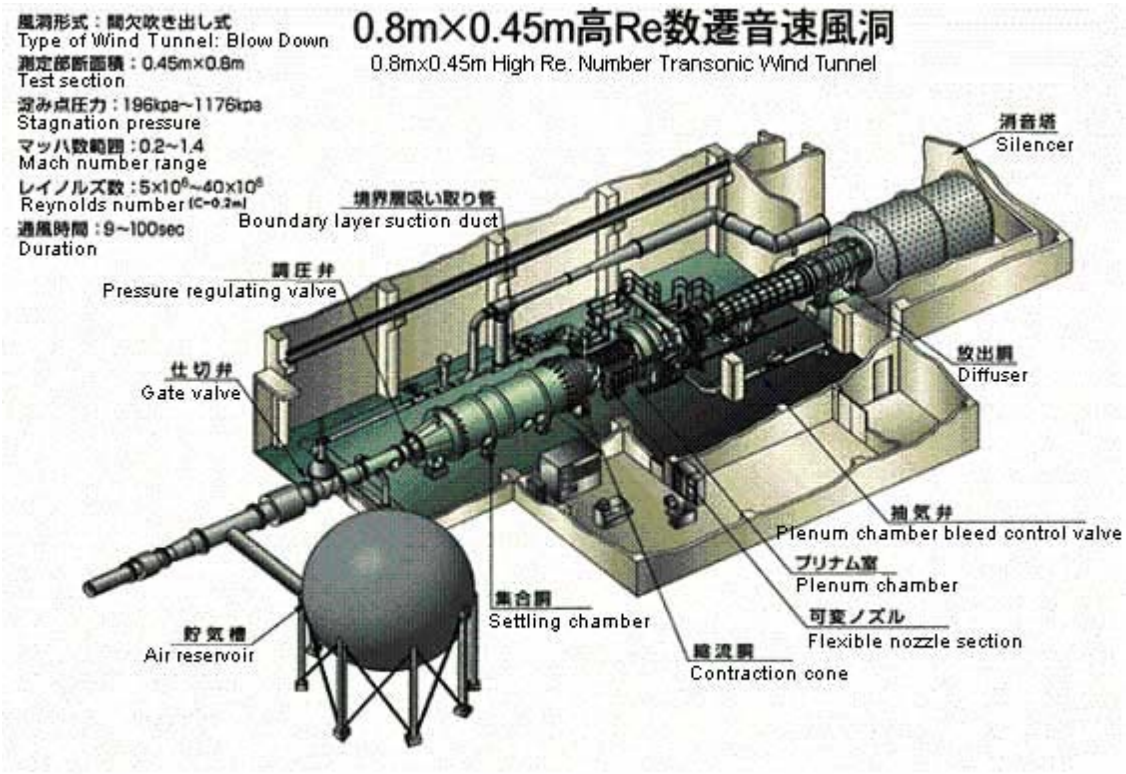
Date of Construction/Planned Improvements

1979 (constructed); 1997 (upgrade).

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

Installation Name	Test Section Size	Temperature 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 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	1.4 to 4.0 Mach	20 (Mach 1.4); up to 60 (Mach 4)
1 x 1 m Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of December 2005.	150 kPa (Mach 1.4) to 1,400 kPa (Mach 4.0)

Testing Capabilities

Intermittent blowdown-type; 40 sec run time; electric-powered multi-jack; 2D flexible nozzle; 280 kg/sec flow rate.

Data Acquisition

Current Programs

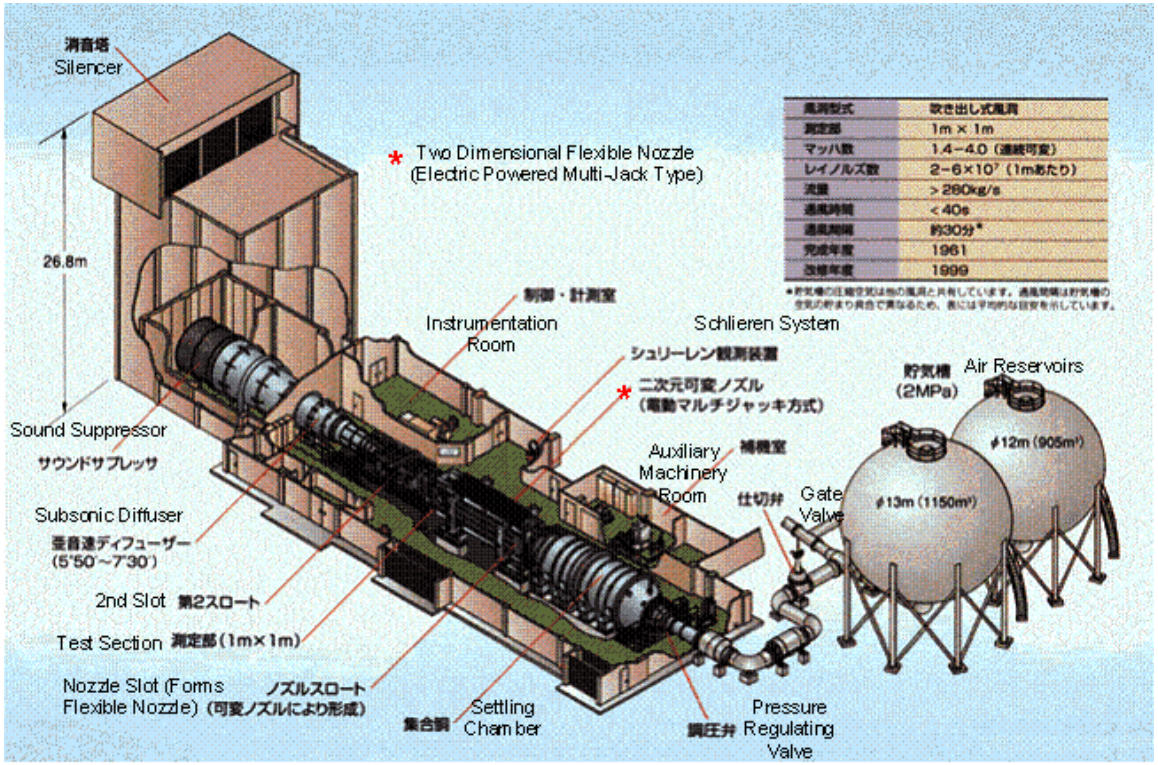
Date of Construction/Planned Improvements

1961 (constructed); 1999 (upgrade).

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.



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.

Wind Tunnels of the Eastern Hemisphere

Supersonic **Japan**

Installation Name	Test Section Size	Temperature Range
Japan Defense Agency (JDA), Technical Research and Development Institute (TRDI), Tachikawa, Japan	12 m (long), 4.3 m (diameter)	-72°C to +270°C
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0 to 2.5	
High Altitude Engine Test Facility (ATF)		**Dynamic Pressure**
	Cost	3.5 to 101.3 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of December 2005.	

Testing Capabilities

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; test section mounts engines up to 1.5 tons.

Data Acquisition

Current Programs

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

Date of Construction/Planned Improvements

2002 (constructed).

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; Fax: (81) 425 24 2411; Email: info@jda-trdi.go.jp; Web site: http://www.jda-trdi.go.jp/happyou.htm.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Japan Defense Agency (JDA), Technical Research and Development Institute (TRDI), Tachikawa, Japan	2 x 2 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.3 to 4.0 Mach	100 and up
Trisonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of December 2005.	

Testing Capabilities

Intermittent; blowdown; 10+ sec run time within 45 minutes; noise level: up to 65 Db.

Data Acquisition

Current Programs

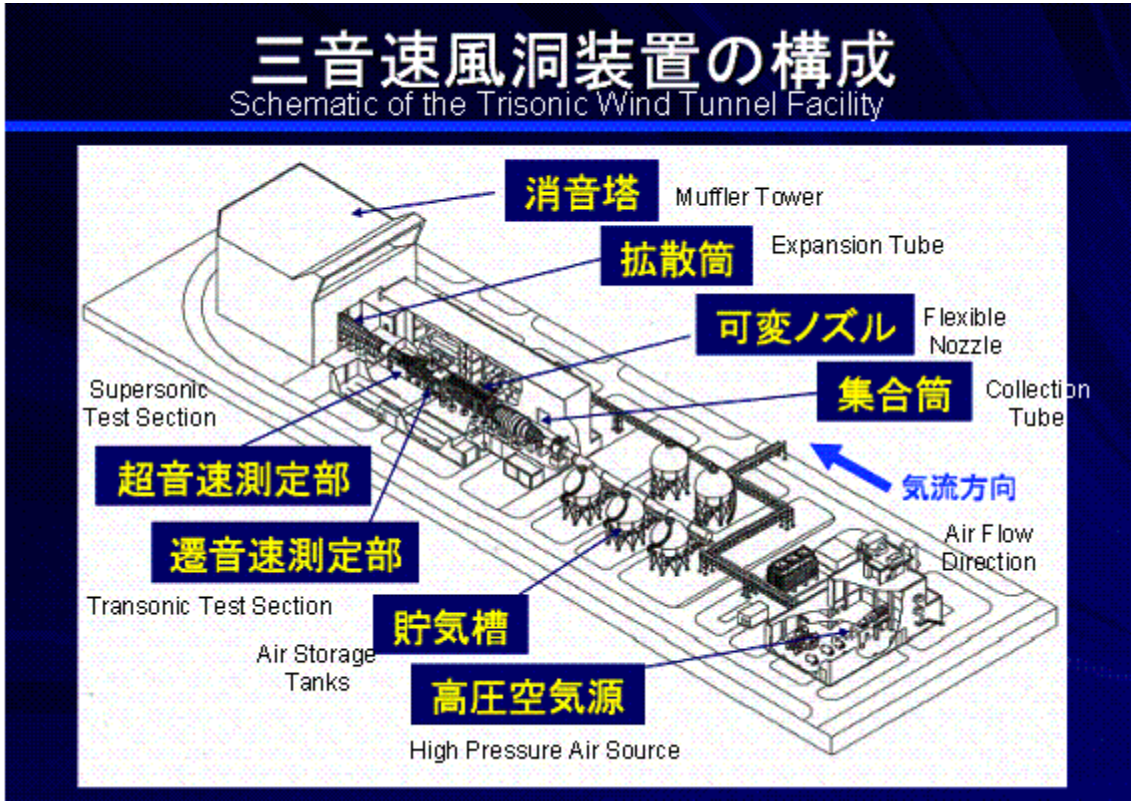
Date of Construction/Planned Improvements

1995 (constructed).

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; Fax: (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.

Installation Name	Test Section Size	Temperature Range
Mitsubishi Heavy Industries Kobe Shipyard and Machinery Works (MHI Kobe), Kobe, Japan	600 mm (nozzle exit diameter)	Ambient
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.4 to 4.0 Mach	2
60 cm Trisonic Wind Tunnel		**Dynamic Pressure**
	Cost	1.18 MPa (max)
		Stagnation Pressure
	Operational Status	
	Presumed active as of December 2005.	

Testing Capabilities

Subsonic, transonic, and supersonic regimes; intermittent blowdown; Nozzle outlet: 0.6 x 0.6 m; blowing time: 20 sec at Mach 1.0; 35 sec at Mach 2.5; air source: 8 m spherical air tank.

Data Acquisition

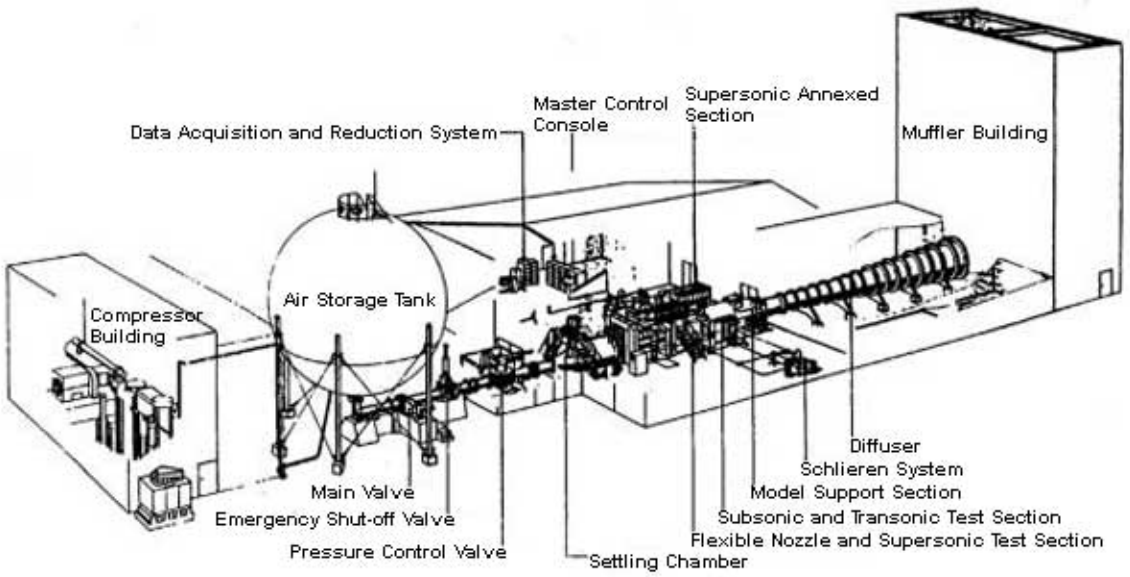
Current Programs

Date of Construction/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 or 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.

Wind Tunnels of the Eastern Hemisphere

Supersonic **Japan**

Installation Name	Test Section Size	Temperature Range
Mitsubishi Heavy Industries Kobe Shipyard and Machinery Works (MHI Kobe), Kobe, Japan		90 to 300 K
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.2 to 2.5 Mach	up to 240
Continuous Circulation Cryogenic Wind Tunnel		**Dynamic Pressure**
	Cost	110 to 500 kPa
		Stagnation Pressure
	Operational Status	
	Currently in the planning stage.	

Testing Capabilities

Max blowdown time: 30 min; liquid nitrogen injected upstream; gaseous nitrogen exhausted downstream.

Data Acquisition

Current Programs

Prediction of turbulence transition and flow separation points.

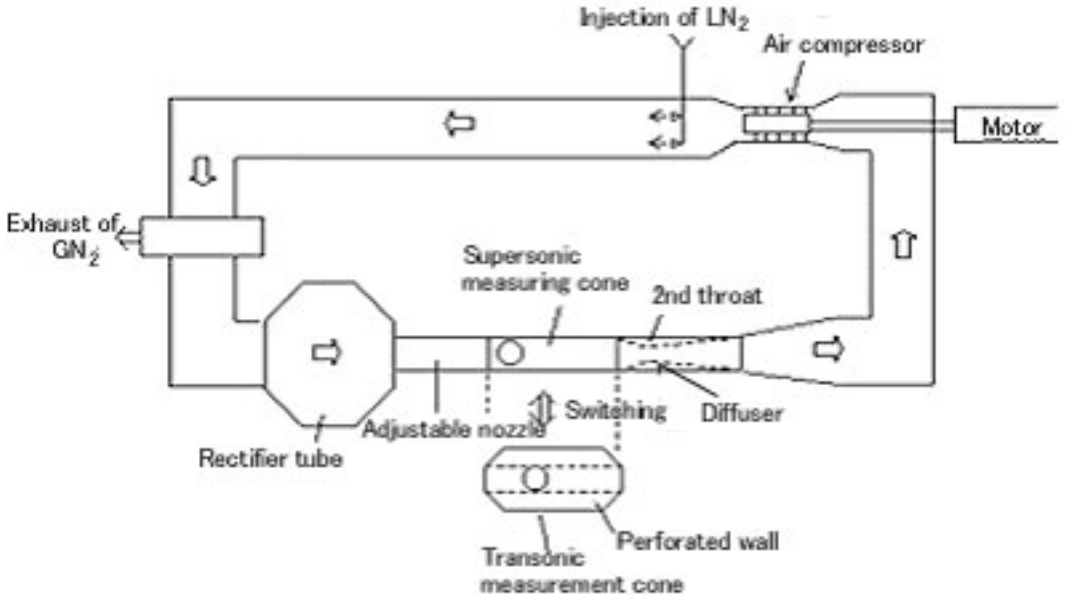
Date of Construction/Planned Improvements

Currently in the planning stage; quiet supersonic nozzle planned.

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 or 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.

Wind Tunnels of the Eastern Hemisphere

Supersonic **Netherlands**

Installation Name	Test Section Size	Temperature Range
Delft University of Technology (TUDELFT), High-Speed Laboratory, Delft, The Netherlands	150 x 150 mm²	
	Speed Range	Reynolds Number (x 10^6)
Facility Name	0.7 to 3.0 Mach	
ST-15 Wind Tunnel		Dynamic Pressure
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	

Testing Capabilities

Blowdown; 800 sec runtime; interchangeable nozzle blocks.

Data Acquisition

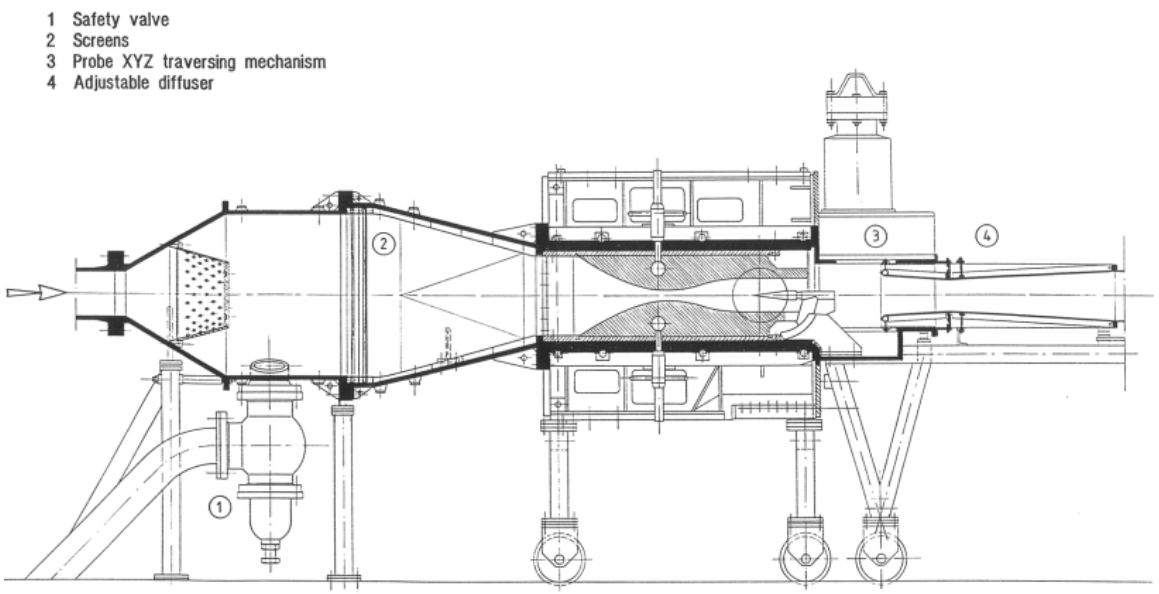
Current Programs

Date of Construction/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.

Installation Name	Test Section Size	Temperature Range
Delft University of Technology (TUDELFT), High-Speed Laboratory, Delft, The Netherlands	30 x 30 mm²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	1.5 to 3.5 Mach	
ST-3 Vacuum Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	

Testing Capabilities

Small vacuum wind tunnel; 2 hr runtime; semiflexible symmetrical or fixed asymmetrical test section available; 50 kW vacuum pump; silica gel dryer.

Data Acquisition

Current Programs

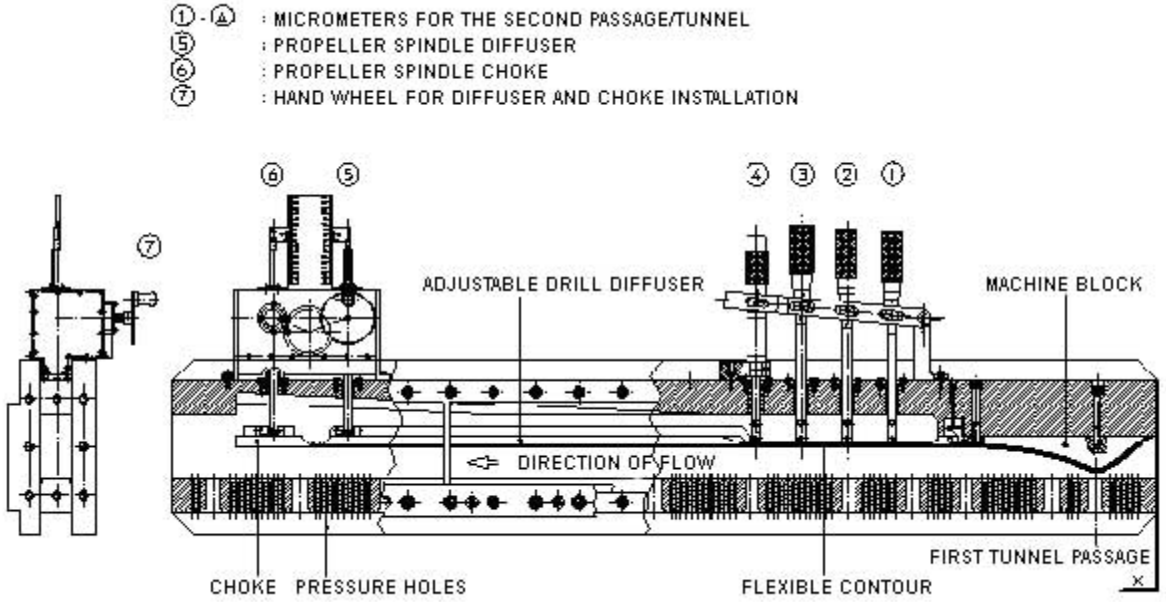
Date of Construction/Planned Improvements

1969 (constructed).

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.

Installation Name	Test Section Size	Temperature Range
Delft University of Technology (TUDELFT), High-Speed Laboratory, Delft, The Netherlands	280 x (250-270) mm²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	#1: 0.5 to 0.85 Mach (subsonic); #2: 1.15 to 4.2 Mach (supersonic)	38 (transonic) to 130 (Mach 4.0)
TST-27 Transonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	High

Testing Capabilities

Closed or slotted-wall test section; blowdown; 350 sec runtime; single jack semi-flexible nozzle; 220 kW electric motor.

Data Acquisition

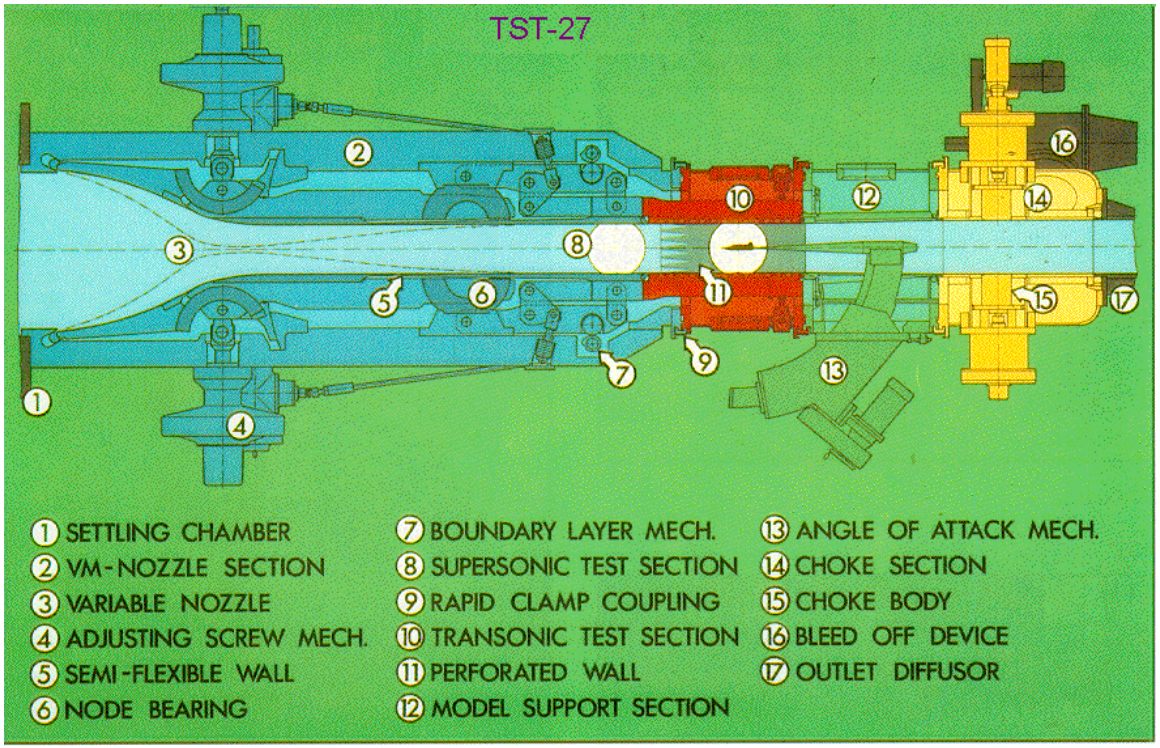
Current Programs

Date of Construction/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.

Wind Tunnels of the Eastern Hemisphere

Supersonic **Netherlands**

Installation Name	Test Section Size	Temperature Range
German-Dutch Wind Tunnels (DNW), Amsterdam, The Netherlands	2.0 x 1.8 m²	300 to 310 K
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	.01 to 1.35 Mach	9
2.0 x 1.8 m Continuous Pressurized Wind Tunnel (HST)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	0.2 to 4.0 bar

Testing Capabilities

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1960 (constructed); 1997 (new fan drive completed).

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 IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
German-Dutch Wind Tunnels (DNW), Amsterdam, The Netherlands	1.2 x 1.2 m²	290 K
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	1.2 to 4.0 Mach	15
Supersonic Blowdown Wind Tunnel (SST)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	1,470 kPa

Testing Capabilities

Blowdown; fed by air storage vessel containing 600 m³ dry air at maximum pressure of 4,000 kPa.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

1964 (constructed); 1973 (flexible top and bottom walls added); 1999 (major overhaul).

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 IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Elie Carafoli National Institute for Aerospace Research (INCAS), Bucharest, Romania	800 x 300 mm² (subsonic, transonic Ludwieg tube); 800 x 800 mm² (large shock tube)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.6 to 1.35 Mach (subsonic/transonic); 50 to 100 m/sec (large shock tube)	
Combined Ludwieg Shock Tube		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Multiple configuration; subsonic/transonic Ludwieg Tube/large shock tube combination; max shock wave intensity Ms=3.0; max runtime (Ludweig): 0.7 to 0.8 sec.

Data Acquisition

Current Programs

Aerodynamic characteristics of aircraft; aerodynamic loads on aircraft; aerodynamic design and analysis of propellers; theoretical pressure distribution on complex configurations; non-steady aerodynamic forces on lifting systems; aeroelastic behavior of lifting-surface structures and aerodynamic characteristics; interaction between shock wave and pre-established flow; development of computer programs for graphical display of aerodynamic characteristics.

Date of Construction/Planned Improvements

User Fees

Contact Information

Dr. eng. Florin Munteanu (Lab Head), Elie Carafoli National Institute for Aerospace Research (INCAS), B-dul Iuliu Maniu 220, sector 6, Bucharest 061126 Romania; Tel: (40) 21 434 00 83; Fax: (40) 21 434 0082; Email (Muneanu): munteanu@aero.incas.ro; Web site: http://www.incas.ro/english/index_eng.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **Romania**

Installation Name	Test Section Size	Temperature Range
Elie Carafoli National Institute for Aerospace Research (INCAS), Bucharest, Romania	1.2 x 1.2 m² (subsonic, transonic 3D, supersonic); 0.48 x 1.2 m² (transonic 2D)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.1 to 0.8 Mach (subsonic); 0.6 to 1.1 Mach (transonic 2D); 0.6 to 1.4 Mach (transonic 3D); 1.4 to 3.5 Mach (supersonic)	40 to 80 (subsonic); 105 to 130 (transonic 2D); 75 to 95 (transonic 3D); 95 to 70 (supersonic)
Trisonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Blowdown; pressurized; 10 sec runtime; operates in 3 regimes: subsonic (solid walls), transonic (perforated walls), supersonic (solid walls); internal strain-gauge, aerodynamic, 6-component balances; built in cooperation with DSMA-Canada.

Data Acquisition

Scanivalves equipped with miniature transducers; fast data acquisition system (80 analog input channels, max 500,000 samples/sec); schlieren visualization system.

Current Programs

Aerodynamic characteristics of aircraft; aerodynamic loads on aircraft; aerodynamic design and analysis of propellers; theoretical pressure distribution on complex configurations; non-steady aerodynamic forces on lifting systems; aeroelastic behavior of lifting-surface structures and aerodynamic characteristics; development of computer programs for the graphical display of aerodynamic characteristics.

Date of Construction/Planned Improvements

User Fees

Contact Information

Dr. eng. Florin Munteanu (Lab Head), Elie Carafoli National Institute for Aerospace Research (INCAS), B-dul Iuliu Maniu 220, sector 6, Bucharest 061126 Romania; Tel: (40) 21 434 00 83; Fax: (40) 21 434 0082; Email (Muneanu): munteanu@aero.incas.ro; Web site: http://www.incas.ro/english/index_eng.html.

Trisonic Wind Tunnel,
Elie Carafoli National Institute for Aerospace Research (INCAS),
Bucharest, Romania

Wind Tunnels of the Eastern Hemisphere

Supersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	3.0 m (long), 1.5 m (diameter)	1,000 to 3,000 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	1.0 to 4.0 Mach	1 to 5
GGU-M Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	100 to 1,600 kPa
		Stagnation Pressure
	Operational Status	
	Active as of February 2007.	

Testing Capabilities

Blowdown; 2.5 to 5 sec runtime; gas-generating facility allows for investigation of thermal and force effects on jets; stagnation temperature and other aerodynamic parameters close to real ones in wide range of ambient pressures.

Data Acquisition

Equipped with data acquisition and processing system.

Current Programs

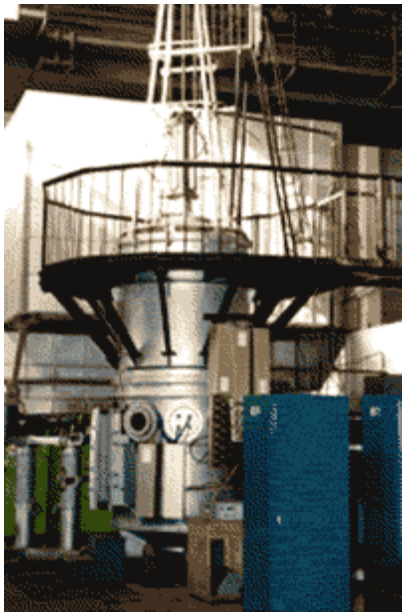
Simulation of thermal and force effects of jets on structural components during take off and separation in atmosphere; investigates effect of jets on launchers and staging units of several rocket types; effect of power-plant jets on airplane tail section; effect of orbiter-vehicle jets on airplane carrier tail.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.



GGU-M Supersonic Wind Tunnel,
Central Aerohydrodynamic Institute (TsAGI),
Zhukovsky, Moscow Region, Russia

Wind Tunnels of the Eastern Hemisphere

Supersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	0.50 x 0.516 m² (nozzle diameter at M<5), (0.56 m nozzle diameter at M=5.5, 6)	290 to 500 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.3 to 6.0 Mach	Up to 110
SVS-2 Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 300 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Blowdown, variable density, open; 3,600 sec runtime; 2.6 x 6 m² cylindrical Eiffel chamber with optical windows in sidewalls; set of model stings with throttle flowmeter; built-in strain-gauge balance; flow visualization by shadow and light plane methods; surface pressure measurement by luminescent transducers.

Data Acquisition

Computerized measurement complex provides for static pressure, temperature, pressure fluctuations, aerodynamic forces, and moments measurements.

Current Programs

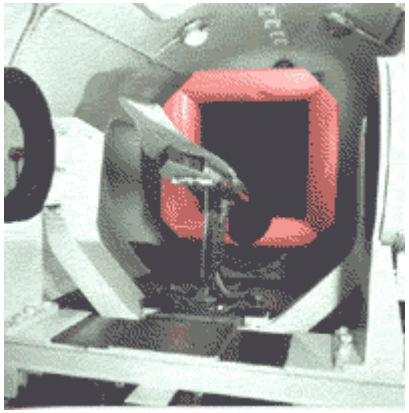
Tests inlet models and aircraft aerodynamic models; investigations of inlets and channels of various types, pressure distribution over aircraft model surface; has tested inlets of modern supersonic airplanes and winged rockets.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.



SVS-2 Supersonic Wind Tunnel,
Central Aerohydrodynamic Institute (TsAGI),
Zhukovsky, Moscow Region, Russia

Wind Tunnels of the Eastern Hemisphere

Supersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	4.85 m (long), 2.48 m (diameter)	290 to 330 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.15 to 1.1 Mach	Up to 35
T-106 Transonic Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 58 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Continuous run; determines angles of attack from -10 to 40° (mechanical balance), from 0 to 90° (internal strain-gauge balance); strip suspension; model dimensions: l = 1.7 m, L = 2.2 m, S up to 0.5 m², P <= 200 kg.

Data Acquisition

Computerized measurement complex performs data monitoring, acquisition, and processing in real time during an experiment; thermal vision device for transition-line detection; pneumatic and electronic scanivalves; pressure-measurement system using paints, aerial, motion picture, and television cameras.

Current Programs

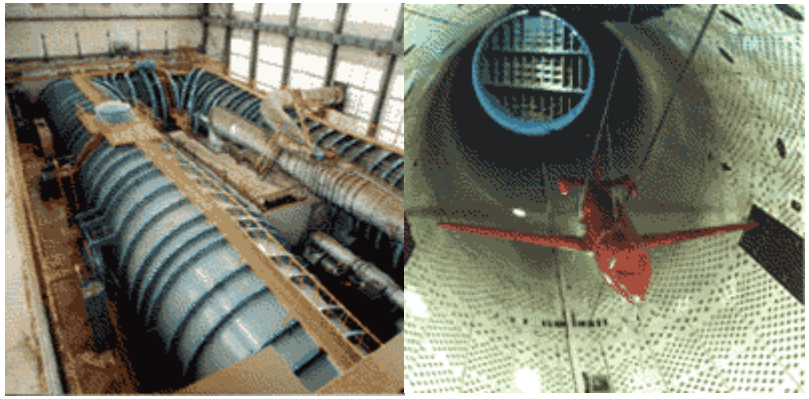
Aerodynamic characteristics of aircraft models and their components; total aerodynamic coefficients of models on mechanical, strain-gauge balances; pressure-distribution investigation using pressure orifices and pressure-indicating paints; investigation of inlets characteristics; simulation of jet streams (jet flap, etc.); physical and optical research.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.



T-106 Transonic Wind Tunnel,
Central Aerohydrodynamic Institute (TsAGI),
Zhukovsky, Moscow Region, Russia.

Wind Tunnels of the Eastern Hemisphere

Supersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	1 x 1 x 2.1 m³	290 to 330 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.5 to 1.7 Mach	11 to 20
T-108 Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 60 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Continuous run; perforated walls at M < 1.3; 4-stage compressor with 13,500-kW main drive; 4-component electromechanical balance; set of strain-gauge balances for models of various types and sizes.

Capabilities:

Data Acquisition

Current Programs

Aerodynamic characteristics of aircraft models and their components; pressure distribution over a model surface; characteristics of inlet models and aircraft models with air flow through internal channels; characteristics of models with blowing-out of jets; interference of separating cargos and cargo-carriers; characteristics of models in proximity of the ground with a fixed screen; angle-of-attack ranges up to 83°; side-slip angle ranges - 8 to + 8°.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	2.25 x 2.25 x 5.5 m³	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.4 to 4.0 Mach	12 to 60
T-109 Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 140 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Variable density; blowdown; half-closed; square; up to 900 sec run; reverse channel; 2 ejectors; supersonic variable-area diffuser; flow-generation by bottled compressed air with compressors; 0 to 18% porosity horizontal walls; partially perforated vertical walls; tail sting; strip suspension with 3-point model attachment; side-sting suspension devices; fixed-area nozzles; one variable-area nozzle (M=0.4 to 4.0); 5 to 20° angles of attack; -10 to +10° side-slip angles; model dimensions: L <= 3.0 m, S <= 1.5 m.

Data Acquisition

Computerized measurement complex: strain-gauge balances, pressure transducers, pneumatic scanivalves, measuring devices; data available in real time.

Current Programs

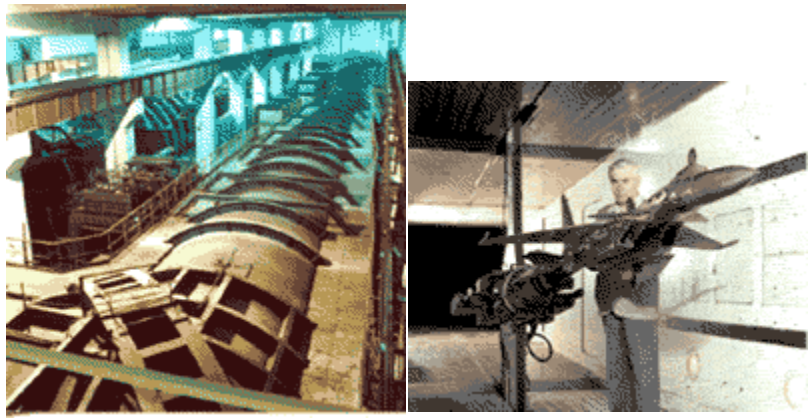
Simulation of all structural features of aircraft and their components; aircraft-model tests in a wide range of Re and M numbers (0.4 to 4.0); has facility within tunnel for engine jet simulation.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.



T-109 Supersonic Wind Tunnel,
Central Aerohydrodynamic Institute (TsAGI),
Zhukovsky, Moscow Region, Russia.

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	0.6 x 0.6 x 2.59 m³	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.6 to 1.8 Mach	Up to 15
T-112 Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 45 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Blowdown; up to 300 sec run; half-closed layout test facility with suction ejector; horizontal or all 4 walls perforated at M <= 1.5; 4-component, mechanical aerodynamic balance; set of strain-gauge balances for models of various types and sizes; special contouring of vertical walls available; pressure-distribution measurement using pressure-indicating paints; 0° to 360°angle-of-attack.

Data Acquisition

Current Programs

Aerodynamic characteristics of aircraft models and their components; pressure distribution over model surface; characteristics of inlets models and aircraft models with flow through the internal channels; shadow pattern of flow over a model; boundary-layer transition;
physical nature of separated flow.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	0.6 x 0.6 x 1.5 m³	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.3 to 4.0 Mach	4 to 20
T-114 Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 72 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Blowdown; up to 3,600 sec run; half-closed layout test facility with reverse channel; 2 ejectors; supersonic variable-area diffuser; horizontal walls perforated at M <= 1.2; 6-component electromechanical balance with magneto-electric transducers; set of strain-gauge balances for models of various types and sizes; angle-of-attack: - 8 to 43° (rigid strut N° 1), - 8 to 90° (strut N° 2).

Data Acquisition

Current Programs

Aerodynamic characteristics of aircraft models and their components; characteristics of inlets models and aircraft models with flows through the internal channels; cargo and carrier interference during separation; calibration characteristics of Pitot tubes; angle-of-attack and side-slip angle transducers; shadow patterns of flows over models.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	160 x 220 mm² (transonic); 200 x 200 mm² (supersonic)	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.3 to 1.2 Mach (transonic); 1.5 to 4.0 (supersonic)	Up to 100 (can vary over a wide range)
T-125 Low Turbulence Wind Tunnel		**Dynamic Pressure**
	Cost	340 kPa
		Stagnation Pressure
	Operational Status	
	Active as of February 2007.	

Testing Capabilities

Two test sections: transonic with continuous Mach=0.3 to 1.2; supersonic with discrete Mach=1.5 to 4.0; average air-flow rate > 20 kg/sec; flow-rate fluctuations level <= 0.7%; temperature fluctuations <= 0.3%; model size: L <= 0.06 m; straight-through, blowdown; up to 360 sec runtime.

Data Acquisition

Current Programs

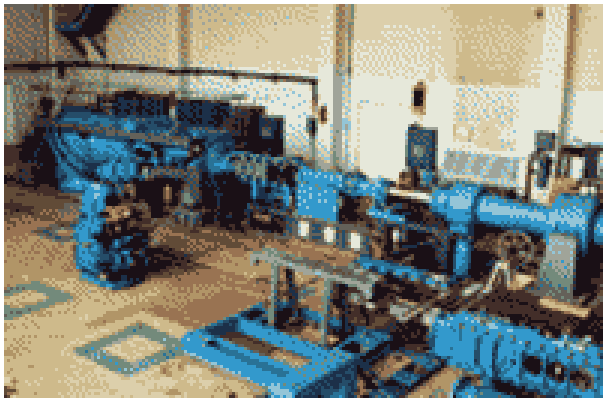
Balance measurements; experimental measurements of pressure distribution over models using point-to-point gauges; physical investigations; acoustic investigations; flow visualization using shadow methods; spatial flow visualization using holographic interferometer (unique to TsAGI); surface visualization using various coatings; continuous recording of flow pattern using photographic, motion-picture, and television cameras.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.



**T-125 Low Turbulence Wind Tunnel,
Central Aerohydrodynamic Institute (TsAGI),
Zhukovsky, Moscow Region, Russia.**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	2.75 x 2.75 x 7.2 m³	293 to 323 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.15 to 1.7 Mach	Up to 41
T-128 Transonic Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 80 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Variable density; continuous run; square test section; 100,000 kW compressor; interchangeable test sections; basic suspension devices; device for mounting infinite span wings; 3 test sections with multi-section, varying perforation; 2 test sections with section-controlled slots.

Data Acquisition

Current Programs

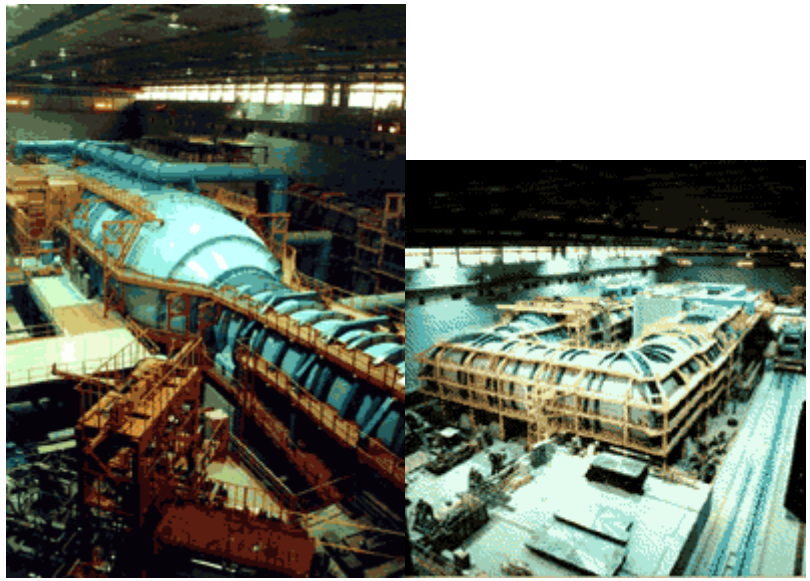
Aerodynamic characteristics of aircraft models and their components; investigates inlets, physical processes, aeroelasticity; has investigated aerodynamic characteristics of many types of civil and military airplanes.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.



T-128 Transonic Wind Tunnel,
Central Aerohydrodynamic Institute (TsAGI),
Zhukovsky, Moscow Region, Russia.

Wind Tunnels of the Eastern Hemisphere

Supersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	0.38 m (long), 0.4 m (diameter)	288 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.5 to 3.0 Mach	32
T-58 Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	75 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Closed; up to 20 min runtime; ejectors provide altitude conditions; flow generated by discrete fixed-area nozzles; set of stings (with balances or without); engine jet simulations using low-pressure and high-pressure compressed air and solid-propellant combustion.

Data Acquisition

Current Programs

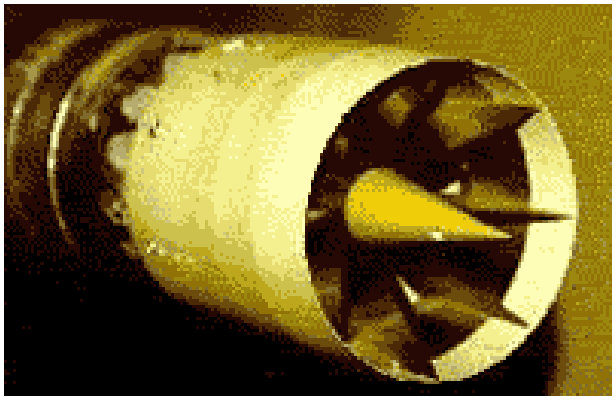
Internal and external aerodynamic characteristics of nozzles and aircraft tail sections; pressure distribution over aircraft surfaces; physical phenomena; jet streams; propulsive nozzle models of aircraft; engine jet simulations; investigation of nozzle models in range of aircraft engine-operation regimes.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.



T-58 Supersonic Wind Tunnel,
Central Aerohydrodynamic Institute (TsAGI),
Zhukovsky, Moscow Region, Russia.

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	3.0 m (long), 4.0 m (diameter)	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.3 to 4.0 Mach	Up to 60
TPD Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 230 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Eiffel chamber; 1.06 and 0.8 m nozzle diameters; up to 0.5 hr runtime; flow generated by discrete, fixed-area nozzles using compressed air; ejector used for altitude conditions; angle-of-attack and side-slip angle mechanisms; model stings.

Data Acquisition

Current Programs

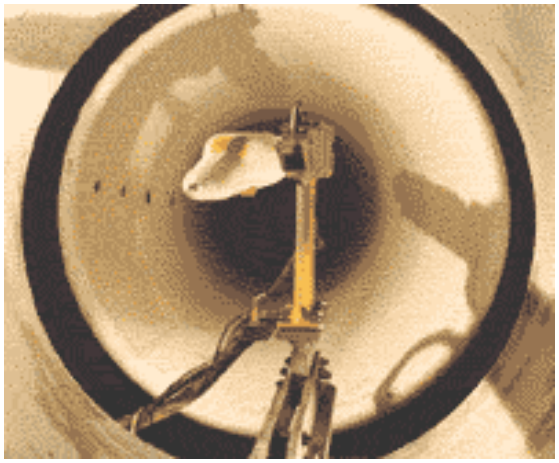
Internal and external aerodynamic characteristics of inlets (M=0.3 - 4.0) and nozzles (M=0.3 - 1.1); pressure distribution over model surfaces; physical phenomena and dynamic characteristics (flutter); loss of effective nozzle thrust in transonic flows; internal and external characteristics of inlets models integrated with aircraft range of speeds; aircraft models with engine jets simulation at 800 to 2,500 K; full-scale models with operating engines.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.



TPD Supersonic Wind Tunnel,
Central Aerohydrodynamic Institute (TsAGI),
Zhukovsky, Moscow Region, Russia

Installation Name	Test Section Size	Temperature Range
Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, Korolev, Moscow Region, Russia	0.4 x 0.4 x 2.85 m³	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	2 to 4.5 Mach	32 to 84
U-1 Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Active as of February 2007.	

Testing Capabilities

Orientation mechanism for setting models at ±10° angles of attack; air supply system for model with pressures < 31.3 MPa; optical-physical investigation system; 30 to 60 sec runtime.

Data Acquisition

Information measurement complex for data acquisition and processing.

Current Programs

Aerodynamic forces and moments of test models, while simulating space vehicle stage/element separation and engine jets; balance, kinematic, drainage, jet, optical, and thermal tests.

Date of Construction/Planned Improvements

1949 (commenced operation).

User Fees

Contact Information

Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, 4 Pionerskaya Street, Korolev, Moscow Region, 141070, Russia; Tel: (7) 095 513 5000; Fax: (7) 095 187 0322; Email: corp@tsniimash.ru; Web site: http://www.tsniimash.ru/Centers/AeroGasDynam.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, Korolev, Moscow Region, Russia	1.4. x 1.4 x 5.6 m³; 1.4 x 1.4 m² (nozzle exit)	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.2 to 1.2 and 1.8 Mach	0.04 to 100
U-21 Variable-Density Subsonic and Transonic Wind Tunnel	**Cost**	**Dynamic Pressure**
		0.004 to 0.37 Mpa
	Operational Status	**Stagnation Pressure**
	Active as of February 2007.	

Testing Capabilities

Orientation mechanism for setting models at +/ 15°, sideslip angles at +/- 10°; Mach number, Reynolds number, and mass-flow rate regulator/controller; air supply system for model at < 29.2 MPa; optical-physical investigation system.

Data Acquisition

Automated data acquisition and processing system.

Current Programs

Aerodynamic forces and moments while simulating engine jets; space vehicle model stage/element separation; nonstationary characteristics; dynamic stability characteristics; pressure distributions and fluctuations; balance, kinematic, jet, thermal, and optical tests; optical-physical investigation system; simulation of wide range of flight conditions and engine jets.

Date of Construction/Planned Improvements

1987 (commenced operation).

User Fees

Contact Information

Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, 4 Pionerskaya Street, Korolev, Moscow Region, 141070, Russia; Tel: (7) 095 513 5000; Fax: (7) 095 187 0322; Email: corp@tsniimash.ru; Web site: http://www.tsniimash.ru/Centers/AeroGasDynam.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, Korolev, Moscow Region, Russia	0.6 x 0.6 x 2.45 m³, 0.6 x 0.6 m² (nozzle exit)	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.25 to 1.2 Mach; 1.5 to 1.75 Mach	6.3 to 20
U-3 Transonic Wind Tunnel		**Dynamic Pressure**
	Cost	0.005 to 0.054 Mpa
		Stagnation Pressure
	Operational Status	
	Active as of February 2007.	

Testing Capabilities

Semi-closed circuit; ejector-type; subsonic, transonic, and low-supersonic flows; orientation mechanism for setting models at -19 to +10°angles-of-attack, ±180° rotation angles; optical-physical investigation system; Mach number regulator/controller in the 0.25 to 1.2 range; cold-air supply system for model; 30 to 60 sec runtime.

Data Acquisition

Information measurement complex for data acquisition and processing.

Current Programs

Balance, kinematic, drainage, free-flight, jet, and optical tests; aerodynamic forces and moments at incidence angles while simulating engine jets.

Date of Construction/Planned Improvements

1951 (commenced operation).

User Fees

Contact Information

Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, 4 Pionerskaya Street, Korolev, Moscow Region, 141070, Russia; Tel: (7) 095 513 5000; Fax: (7) 095 187 0322; Email: corp@tsniimash.ru; Web site: http://www.tsniimash.ru/Centers/AeroGasDynam.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, Korolev, Moscow Region, Russia	0.6 x 0.6 x 2.85 m³; 0.6 x 0.6 m² (nozzle exit)	Ambient (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.2 to 1.2, 1.6, 2.0, 2.5, 3.0 Mach	0.9 to 90
U-3M Variable Density Trisonic Wind Tunnel		**Dynamic Pressure**
	Cost	0.001 to 0.2 Mpa
		Stagnation Pressure
	Operational Status	
	Active as of February 2007.	

Testing Capabilities

Up to 60 sec runtime (lowdown mode); continuous run (continuous mode); subsonic, transonic, and supersonic flows.

Data Acquisition

Current Programs

Aerodynamic forces and moments while simulating engine jets and model element separation; pressure distributions on the model's surface; pressure fluctuation characteristics; dynamic stability and trim angle characteristics; optical characteristics; heat-flux and temperature distributions on model's surface; interaction between jet gas exhaust and flying vehicle.

Date of Construction/Planned Improvements

1975 (commenced operation).

User Fees

Contact Information

Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, 4 Pionerskaya Street, Korolev, Moscow Region, 141070, Russia; Tel: (7) 095 513 5000; Fax: (7) 095 187 0322; Email: corp@tsniimash.ru; Web site: http://www.tsniimash.ru/Centers/AeroGasDynam.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, Korolev, Moscow Region, Russia	0.6 x 0.6 x 2.85 m³; 0.6 x 0.6 m² (nozzle exit)	250 to 500 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	1.8 and 2.0 to 6.0 Mach	0.8 to 200
U-4M Variable Density Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	0.002 to 0.5 Mpa
		Stagnation Pressure
	Operational Status	
	Active as of February 2007.	

Testing Capabilities

Up to 60 sec run (blowdown mode) or continuous (continuous mode).

Data Acquisition

Current Programs

Balance, kinematic, drainage, free flight, fluctuation, jet, thermal, acoustic, and optical tests; aerodynamic forces and moments while simulating engine jets and model element separation static pressure distributions on the model's surface; pressure-fluctuation characteristics; dynamic stability characteristics; optical characteristics; heat-flux and temperature distributions on the model's surface; interaction between jet-gas exhaust and flying vehicle.

Date of Construction/Planned Improvements

1975 (commenced operation).

User Fees

Contact Information

Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, 4 Pionerskaya Street, Korolev, Moscow Region, 141070, Russia; Tel: (7) 095 513 5000; Fax: (7) 095 187 0322; Email: corp@tsniimash.ru; Web site: http://www.tsniimash.ru/Centers/AeroGasDynam.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Institute of Theoretical and Applied Mechanics (ITAM), Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia	200 x 200 x 600 mm³	300 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.5 to 4.0 Mach	20
T-325 Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of 2005.	12 atm

Testing Capabilities

Low level disturbances; changeable nozzles for M=0.6 to 1.2, 1.5, 2.2, 2.5, 3, 3.5, 4; stabilization of flow temperature within +/- 0.5°C; cooling of models; input and investigation of controlled-flow disturbances; changing-flow temperature not more than 1°; closed, square, blowdown, 60 min runtime; made of steel.

Data Acquisition

10-bit A/D converter; 8-bit A/D converter; optical shadow device; computer: DVK 3.2 (analog PDP 11/34), connected with CAMAC for automatic control of parameters flow, co-ordinates of probes, measurement of pulsations, and mean flow; IBM PC/AT 486DX33.

Current Programs

Laminar/turbulent flow measurements for Mach 2 to 4; artificial disturbances of the boundary layer; testing of non-linear stability theory; research on cone shapes, supersonic wakes, and the stability of the 3D boundary layer; testing plate, cone, and wing profile; simulation of aerothermal destruction of models in hypersonic high-temp flow. Customers: NPO "Molniya" (BURAN-Shuttle), TsAGI,ISF (Soros). Potential partners: Aerospatiale, ONERA, CNES (France), DLR (Germany).

Date of Construction/Planned Improvements

User Fees

Staff: US$250/wk; tunnel: US$5,000/wk; actively soliciting customers.

Contact Information

A. Kosinov, Khristianovich Institute of Theoretical and Applied Mechanics SB RAS, Institutskaya str., 4/3, Novosibirsk 630090, Russia; Tel: (7) 383 2 35 07 78; Tel: (Kosinov): (7) 383 2 35 69 28; Fax: (7) 383 2 35 22 68; Email: admin@itam.nsc.ru; Web site: http://www.itam.nsc.ru/ENG/Truba/T-325.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Institute of Theoretical and Applied Mechanics (ITAM), Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia	0.2 m, 200 mm (nozzle diameter)	Up to 1,500 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	5 to 14 Mach	4
T-326 Hypersonic Wind Tunnel	**Cost**	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Presumed active as of 2003.	120 atm

Testing Capabilities

Plasma heating; ohm air heater for M<=10; plasma for M=12; removable contoured nozzles for M=6, 8, 10, 12, 14; conical nozzle for M-14; blowdown, Eiffel chamber, 1 min runtime; made of stainless steel.

Data Acquisition

IBM/PC-386; external cooled 3-component balance based on alpha-mechanism (N, T and Mz components); 200-mm field diameter Toepler device.

Current Programs

Heat-flux distribution on the model surface; pressure distribution with external gages; weighting measurements; has tested multiple models of Cosmos reentry vehicles descending by ballistic trajectories.

Date of Construction/Planned Improvements

User Fees

US$1,500/wk; US$300/run.

Contact Information

Khristianovich Institute of Theoretical and Applied Mechanics SB RAS, Institutskaya str., 4/1, Novosibirsk 630090, Russia; Tel: (7) 383 2 35 07 78; Fax: (7) 383 2 35 22-68; Email: admin@itam.nsc.ru; Web site: http://www.itam.nsc.ru/ENG/Truba/T-326.html.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Institute of Theoretical and Applied Mechanics (ITAM), Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia	0.8 x 0.8 m²	800 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	2 to 5 Mach	5 to 10
T-333 Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of 2003.	50 atm

Testing Capabilities

Cylindrical test section; blowdown; ohmic air heater; conical nozzle in an open-jet configuration; speed changed by 5 nozzles @ M = 2.0, 2.5, 3.0, 4.0, 5.0; 8 MW heat power; 2 gasholder pressure values: 1.9 MPa and 20 MPa; diameter of homogeneous flow core=0.3 m; 10 min runtime; made of stainless steel.

Data Acquisition

IBM PC/XT; CAMAC-system; 2-component strain-gauge balance; +- 20 N for X,Y; shadowgraph optical system IAB-451; 50-canal strain-gauge pressure sensor; 50-canal thermocouple; 3-dimensional probe-driver with accuracy +- 1 mm.

Current Programs

Forces; heat transfer; Pitot pressure; surface pressure distribution; pressure pulsations; shadow and laser-sheet visualization; model tests with jet blow out; solid-rocket engine elements. Customers: NPO "Iskra," NPO "Altay," KB "Yugnoye."

Date of Construction/Planned Improvements

User Fees

Staff: US$1,500/wk; tunnel: US$7,500/wk.

Contact Information

Boris Melamed, Khristianovich Institute of Theoretical and Applied Mechanics SB RAS, Institutskaya str., 4/1, Novosibirsk 630090, Russia; Tel (General): (7) 383 2 35-07-78; Tel (Melamed): (7) 383 2 35 75 64; Fax (General): (7) 383 2 35 22 68; Email: admin@itam.nsc.ru; Web site: http://www.itam.nsc.ru/ENG/Truba/T-333.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Moscow State University, Institute of Mechanics, Experimental Aerodynamic Complex, Moscow, Russia	0.2 x 0.2 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	1.5 to 4.0 Mach	12.0 to 300.0
A-3 Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Eiffel chamber.

Data Acquisition

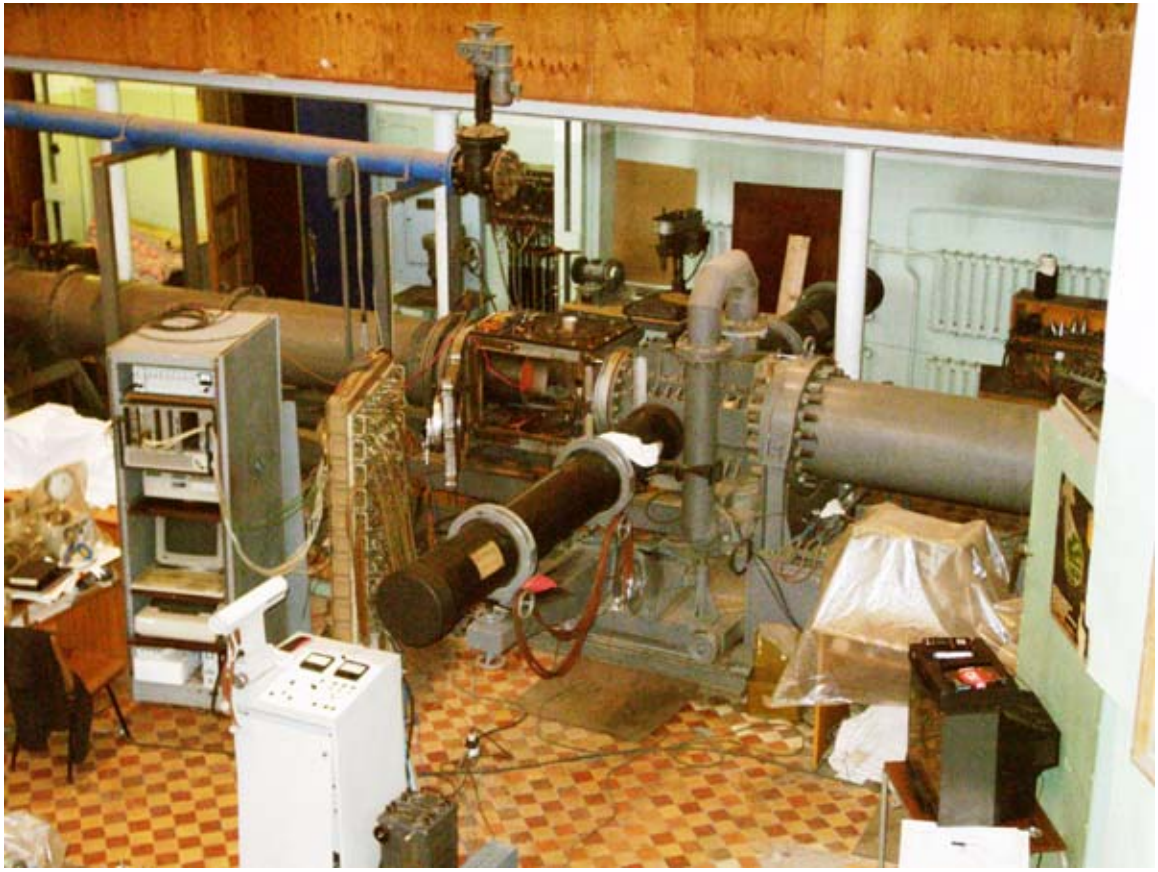
Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Yu. M. Okunev, Institute Director, Institute of Mechanics, Moscow State University, Michurinskii prospekt, d. 1, Moscow, Russia 119192; Tel: (7) 095 939-3121; Fax: (7) 095 939-0165; Email: common@imec.msu.ru; Web site: http://www.imec.msu.ru/pages/02-10-10-1374853.html (in Russian).



A-3 Supersonic Wind Tunnel,
Moscow State University,
Institute of Mechanics,
Experimental Aerodynamic Complex,
Moscow, Russia

Wind Tunnels of the Eastern Hemisphere

Supersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Moscow State University, Institute of Mechanics, Experimental Aerodynamic Complex, Moscow, Russia	0.6 x 0.6 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.7 to 4.0 Mach	4.0 to 16.0
A-7 Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Perforated walls.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Yu. M. Okunev, Institute Director, Institute of Mechanics, Moscow State University, Michurinskii prospekt, d. 1, Moscow, Russia 119192; Tel: (7) 095 939-3121; Fax: (7) 095 939-0165; Email: common@imec.msu.ru; Web site: http://www.imec.msu.ru/pages/02-10-10-1374853.html (in Russian).

A-7 Supersonic Wind Tunnel,
Moscow State University,
Institute of Mechanics,
Experimental Aerodynamic Complex,
Moscow, Russia

Wind Tunnels of the Eastern Hemisphere

Supersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Moscow State University, Institute of Mechanics, Experimental Aerodynamic Complex, Moscow, Russia	0.6 x 0.6 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.2 to 0.8 and 1.5 to 3.0 Mach	2.8 to 17.0
A-8 Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

4-component aeromechanical weights.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Yu. M. Okunev, Institute Director, Institute of Mechanics, Moscow State University, Michurinskii prospekt, d. 1, Moscow, Russia 119192; Tel: (7) 095 939-3121; Fax: (7) 095 939-0165; Email: common@imec.msu.ru; Web site: http://www.imec.msu.ru/pages/02-10-10-1374853.html (in Russian).

A-8 Supersonic Wind Tunnel,
Moscow State University,
Institute of Mechanics,
Experimental Aerodynamic Complex,
Moscow, Russia

Wind Tunnels of the Eastern Hemisphere

Supersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Moscow State University, Institute of Mechanics, Experimental Aerodynamic Complex, Moscow, Russia	0.09 x 0.07 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	1.7 to 3.5 Mach	22.0 to 17.0
AR-2 Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Regulating nozzle, continuous run.

Data Acquisition

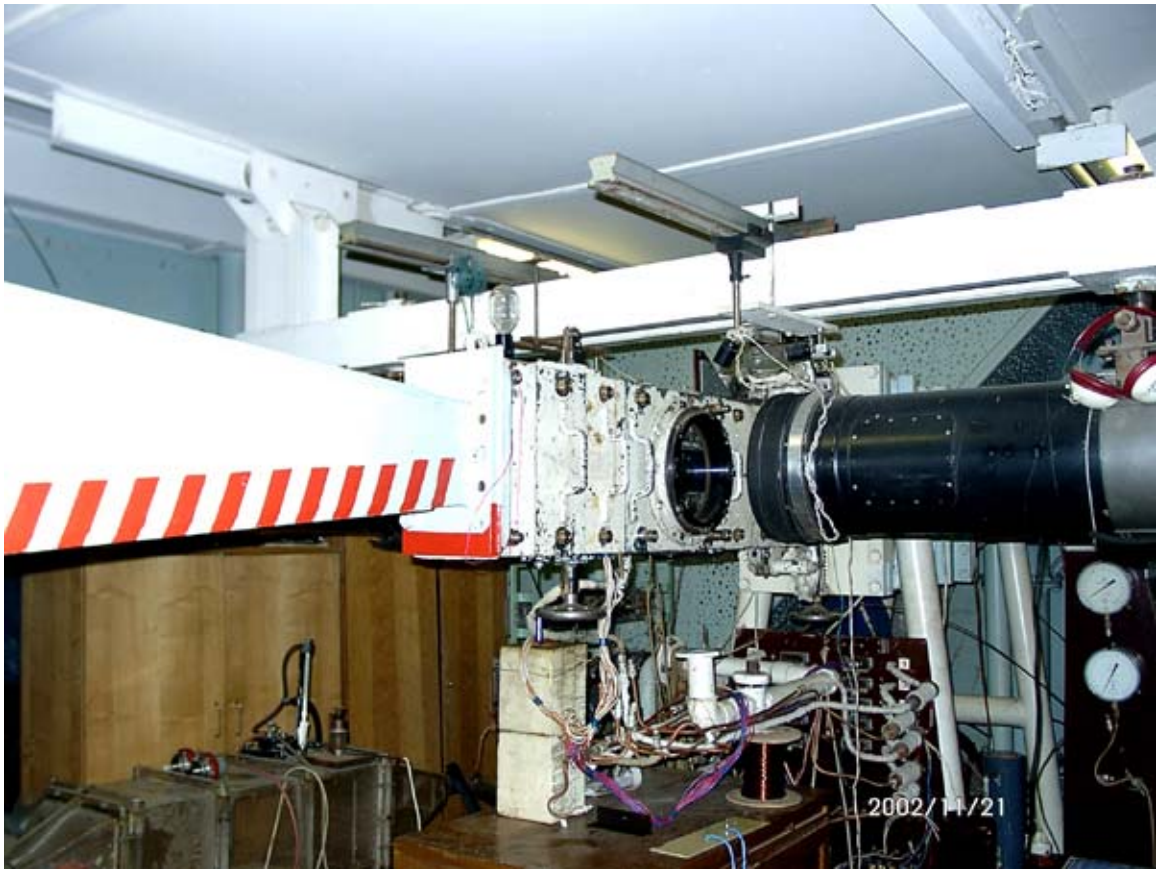
Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Yu. M. Okunev, Institute Director, Institute of Mechanics, Moscow State University, Michurinskii prospekt, d. 1, Moscow, Russia 119192; Tel: (7) 095 939-3121; Fax: (7) 095 939-0165; Email: common@imec.msu.ru; Web site: http://www.imec.msu.ru/pages/02-10-10-1374853.html (in Russian).



AR-2 Supersonic Wind Tunnel,
Moscow State University,
Institute of Mechanics,
Experimental Aerodynamic Complex,
Moscow, Russia

Wind Tunnels of the Eastern Hemisphere

Supersonic **Singapore**

Installation Name	Test Section Size	Temperature Range
National University of Singapore, Department of Mechanical Engineering, Singapore	1.2 x 1.2 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.25 to 4 Mach	
DSO Trisonic Wind Tunnel		**Dynamic Pressure**
	Cost	
	US$30 million (construction cost)	**Stagnation Pressure**
	Operational Status	
	Presumed active as of December 2005.	

Testing Capabilities

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

Data Acquisition

ASE 2000 control and data system.

Current Programs

Supports Singapore Ministry of Defense in the area of aeronautics; R&D activities in aerodynamics and aeronautics technology; used by staff members of Department of Mechanical Engineering at the National University of Singapore for aerodynamics research and teaching activities.

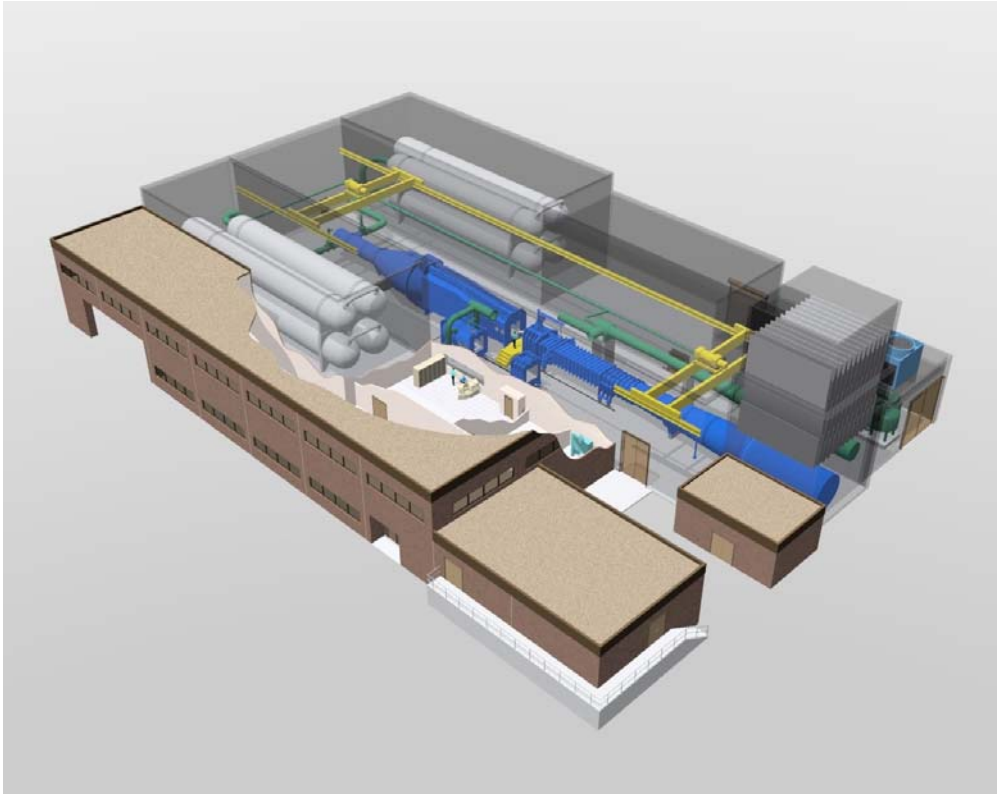
Date of Construction/Planned Improvements

Early 2004 (constructed).

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 or 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.

Wind Tunnels of the Eastern Hemisphere

Supersonic **South Africa**

Installation Name	Test Section Size	Temperature Range
Council for Scientific and Industrial Research (CSIR), Defence Aeronautics Programme, Pretoria, South Africa	0.45 x 0.45 m² (1.5 x 1.5 ft²)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.6 to 4.3 Mach	6 to 50
High Speed Wind Tunnel (HSWT)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of January 2006.	120 to 1,200 kPa (total pressure)

Testing Capabilities

Trisonic, blowdown; subsonic and supersonic Mach numbers tested using standard setup; transonic tests use extra cart fitted with plenum evacuation system, porous walls; can perform a Mach scan during blow; Mach number can be changed within minutes, thus allowing significant flexibility in test matrix; 10 to 30 sec runtime.

Data Acquisition

NEFF 490; high-speed data acquisition; Scanivalve system: pressure and analogue signals; color Schlieren system for flow visualization.

Current Programs

Force and moment measurements on scale models; inlet flow measurements; pressure distribution; flow visualization (color Schlieren recorded on video); supersonic Mach scans; specialized tests: life-jackets; effect of rain on test specimen; effect of tracer plume.

Date of Construction/Planned Improvements

User Fees

Contact Information

Gavin Ratner (Facility Manager), Defence Aeronautics Programme, Council for Scientific and Industrial Research (CSIR), PO Box 395, Meiring Naudé Road, Brummeria, Pretoria 0001, South Africa; Tel (Gratner): (27) 128412321; Email (Gratner): gratner@csir.co.za; Web site: http://www.csir.co.za/plsql/ptl0002/PTL0002_PGE057_RESEARCH?DIVISION_NO=1000024&PROGRAM_NO=3410004.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Council for Scientific and Industrial Research (CSIR), Defence Aeronautics Programme, Pretoria, South Africa	1.5 x 1.5 m² (5 x 5 ft²)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.2 to 1.4 Mach	31 at 0.8 Mach
Medium Speed Wind Tunnel (MSWT)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of January 2006.	20 to 250 kPa (total pressure)

Testing Capabilities

Transonic, continuous, variable density; Defencetek's major testing facility; 20 MW (26,800 hp) electric motor drives; 3-stage axial compressor with variable guide vanes and stator blade angles; operates continuously for optimum productivity and accuracy; square test section slotted, with porosity of 5%; has 6-DOF, two-sting captive trajectory system (CTS) for store release tests.

Data Acquisition

Primary data from 2 NEFF 620 systems; multi-channel, electronically scanned Scanivalve system; multi-channel, miniature ESP Scanivalve pressure modules.

Current Programs

Force measurement (including hinge moment); pressure measurement (unsteady and pressure distribution); captive trajectory (store release); dynamic stability; flutter tests; flow visualization (liquid crystals, micro tufts, oil flow); 2D aerofoil tests; high-angle-of-attack (HAOA) tests; flow-field measurement tests.

Date of Construction/Planned Improvements

User Fees

Contact Information

Mauro Morelli (Facility Manager), Defence Aeronautics Programme, Council for Scientific and Industrial Research (CSIR), PO Box 395, Meiring Naudé Road, Brummeria, Pretoria 0001, South Africa; Tel (Morelli): (27) 12841 4892; Email (Morelli): mmorelli@csir.co.za; Web site: http://www.csir.co.za/plsql/ptl0002/PTL0002_PGE057_RESEARCH?DIVISION_NO=1000024&PROGRAM_NO=3410004.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **Sweden**

Installation Name	Test Section Size	Temperature Range
Swedish Defense Research Agency, FOI, Stockholm, Sweden	1.5 x 1.5 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.2 to 1.25 (slotted walls); 0.2 to 2.0 (solid walls)	Up to 80
T1500 Transonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	

Testing Capabilities

Closed-circuit, pressurized; up to 4 runs/hr; test results available in 10 minutes.

Data Acquisition

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

Current Programs

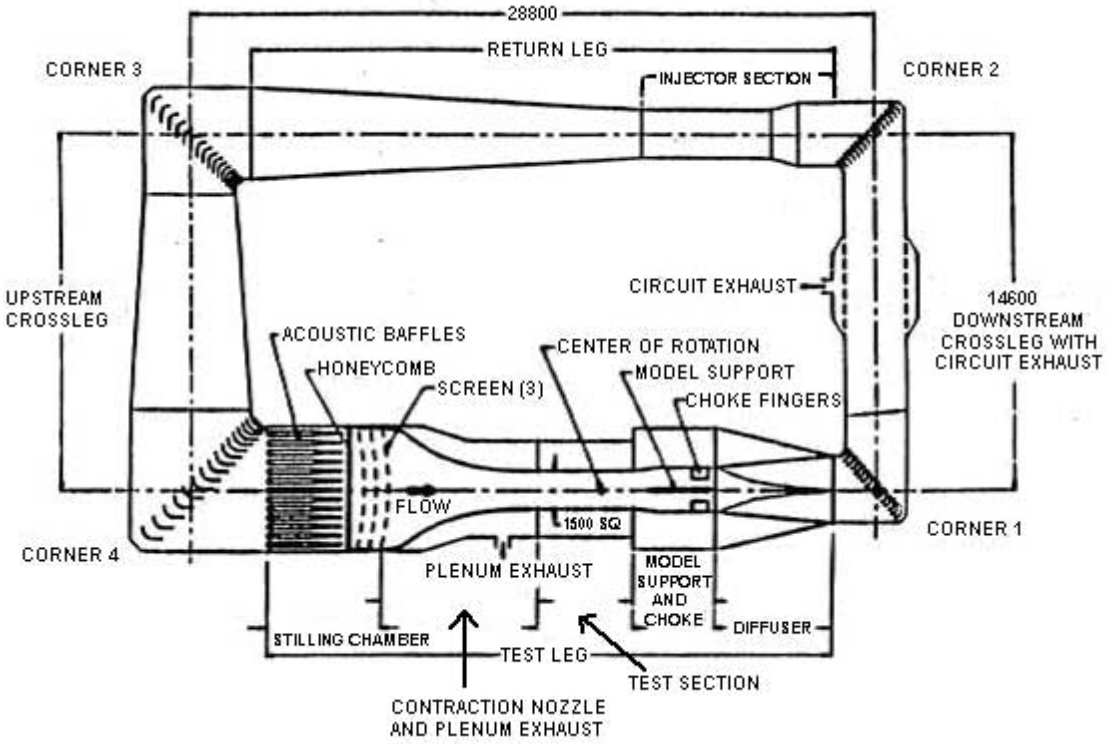
Date of Construction/Planned Improvements

1989 (constructed).

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.

Wind Tunnels of the Eastern Hemisphere

Supersonic **United Kingdom**

Installation Name	Test Section Size	Temperature Range
Aircraft Research Association Limited (ARA), Bedford, England, United Kingdom	0.23 x 0.20 m²	Ambient
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.3 to 1.3 Mach	11
Pilot Wind Tunnel Z4T		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Pilot	Atmospheric

Testing Capabilities

Small transonic induction; 1/12 size of transonic wind tunnel (TWT); normal runtime up to 120 sec; -10° to +18° incidence range; fixed angle of roll range; maximum model length 0.20 m.

Data Acquisition

Schlieren and on-line computing facilities.

Current Programs

Date of Construction/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 IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **United Kingdom**

Installation Name	Test Section Size	Temperature Range
Aircraft Research Association Limited (ARA), Bedford, England, United Kingdom	0.69 x 0.76 m²	Ambient
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	1.4 to 3.0 Mach	8 (Mach 3.0); 20 (Mach 1.4)
Supersonic Wind Tunnel (SWT)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	0.4 to 1.4 bar

Testing Capabilities

Continuous runtime; -10° to +40° incidence range; maximum model length 3.50 m (11.48 ft).

Data Acquisition

Current Programs

Date of Construction/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 IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Supersonic **United Kingdom**

Installation Name	Test Section Size	Temperature Range
Aircraft Research Association Limited (ARA), Bedford, England, United Kingdom	2.74 x 2.44 m²	Ambient
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.2 to 1.4 Mach	13, 17
Transonic Wind Tunnel (TWT)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	0.8 to 1.2 bar

Testing Capabilities

Continuous-flow, closed-circuit; driven by main fan; additional speed provided by compressor; incidence range of –10° to +40°; roll range 0° to 360°; maximum model length 1.83 m (6 ft); 24-hour operation.

Data Acquisition

Schlieren and on-line computing facilities.

Current Programs

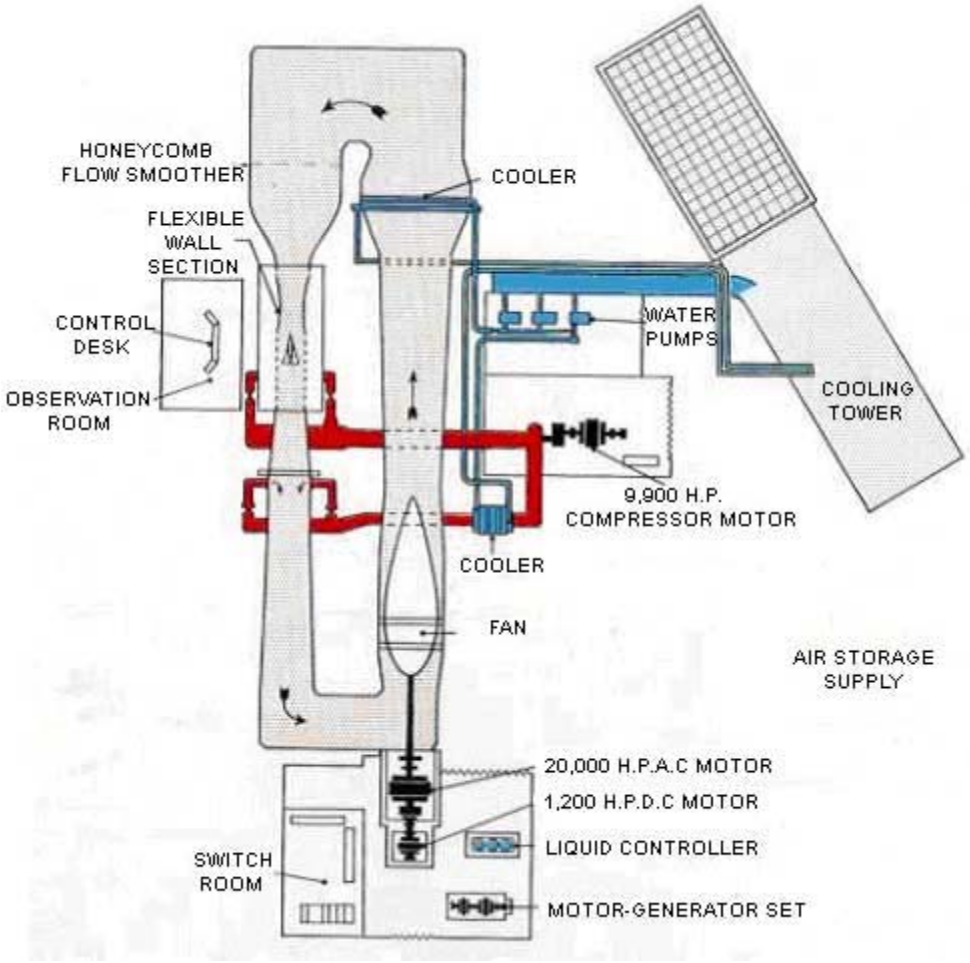
Involved in test programs around the world; has played a part in every major aircraft and weapons development program involving UK industry; has made significant contributions in transonic aerodynamic research, notably in the scale effects.

Date of Construction/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.



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

Installation Name	Test Section Size	Temperature Range
Aircraft Research Association Limited (ARA), Bedford, England, United Kingdom	0.20 x 0.46 m²	Ambient
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	102 to 296 m/sec	19
Two Dimensional Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	1.5 to 4.0 bar

Testing Capabilities

2D; blowdown; run time of 20 sec; -11 to +20° incidence range; maximum model length of 0.13 m.

Data Acquisition

Current Programs

Date of Construction/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 IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Flow Science Limited, Goldstein Research Laboratory, Manchester, England, United Kingdom	0.21 x 0.15 x 0.6 m³ (transonic); 0.21 x 0.15. 0.8 m³	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.3 to 2.0 Mach	
0.21 x 0.15 m Transonic/Supersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of December 2005.	

Testing Capabilities

Rectangular test section; slotted walls; blowdown into reservoir of 130 m³; pressurised, intermittent flow; approximate runtime 45 sec; reservoir evacuation < 5 min; 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.

Current Programs

Date of Construction/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 IMAGE AVAILABLE

Installation Name	*Test Section Size*	*Temperature Range*
Royal Melbourne Institute of Technology (RMIT) University, School of Science, Engineering, and Technology, Department of Aerospace and Aviation Engineering, Wackett Centre, Bundoora, Victoria, Australia		
	Speed Range	*Reynolds Number (x 10^6)*
Facility Name		
Amrad High Speed Teaching Wind Tunnel		*Dynamic Pressure*
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Dr Arvind Sinha (Contact), Wackett Aerospace Centre, RMIT, GPO Box 2476V, Melbourne, Victoria 3001 Australia; Tel (Sinha): (61) 3 9645 4541; Email (Sinha): arvind.sinha@rmit.edu.au; Web site: http://www.rmit.edu.au/browse;ID=eby2kw0ry2zw.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Australia**

Installation Name	Test Section Size	Temperature Range
University of New South Wales, Australian Defence Force Academy, School of Aerospace, Civil and Mechanical Engineering, Canberra, Australia	650 mm (diameter cross section), 200 mm (diameter uniform test core)	100 K to 1,500 K (static in freestream); 2,500 K to 6,000 K (total)
Facility Name	**Speed Range**	**Reynolds Number (x 10^6)**
T-ADFA Shock Tunnel	8 to 11 Mach (2 to 5.5 km/sec)	0.15 to 2
	Cost	**Dynamic Pressure**
	Operational Status	**Stagnation Pressure**
	Confirmed active as of April 2007.	5 to 15 Mpa

Testing Capabilities

Data Acquisition

PCB/Kulite high-speed pressure transducers; thermocouple and thin-film heat-flux gauges; Schlieren coupled with Shimadzu 1-MHz, full-frame rate, video camera; Planar Laser-Induced Flourescence (PLIF); tunable laser diode absorption spectroscopy; transient stress-wave force measurements.

Current Programs

Date of Construction/Planned Improvements

1960 (constructed as shock tube); 2003 (converted to shock tunnel, upgraded test section and nozzle); planned improvements: lengthening driver section to achieve higher stagnation pressures and run times.

User Fees

Contact Information

Dr. R. Boyce (Senior Lecturer), School of Aerospace, Civil and Mechanical Engineering, University College, University of New South Wales, Australian Defence Force Academy, Northcott Drive, Canberra ACT 2600, Australia; Tel (Boyce): (61) 2 62688279; Fax (Boyce): (61) 2 62688276; Email: r.boyce@adfa.edu.au; Web site: http://www.unsw.adfa.edu.au/acme/facilities/laboratories.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Australia**

Installation Name	Test Section Size	Temperature Range
University of Queensland, Department of Mechanical Engineering, Centre for Hypersonics, Brisbaine, Australia	3 m (long), 62 mm (diameter)	#1: 2,270 K; #2: 3,000 K; #3: 495 K; #4: 1,820 K
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	#1: 1.8 Mach; #2: 0.54 Mach; #3: 4.0 Mach; #4: 0.42 Mach	
Drummond Tube/Tunnel		**Dynamic Pressure**
	Cost	#1: 79kPa; #2: 310kPa; #3: 16.8 kPa; #4: 320 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Impulse facility; nozzles: Mach 4, 7 (conical), 7 (contoured); #1: freestream/tube; #2: normal shock/tube; #3: freestream/tunnel; #4: normal shock/tunne; high-pressure and low-pressure chambers separated by aluminium diaphragm; test time: several hundred microsecs; #1 freestream/tube; #2 normal shock/tube; #3 freestream/tunnel; #4 normal shock/tunnel.

Data Acquisition

When operated as shock tube, optical access obtained through 4 windows near end of tube with model mounted within; good optical access with 4 100 mm diameter quartz windows.

Current Programs

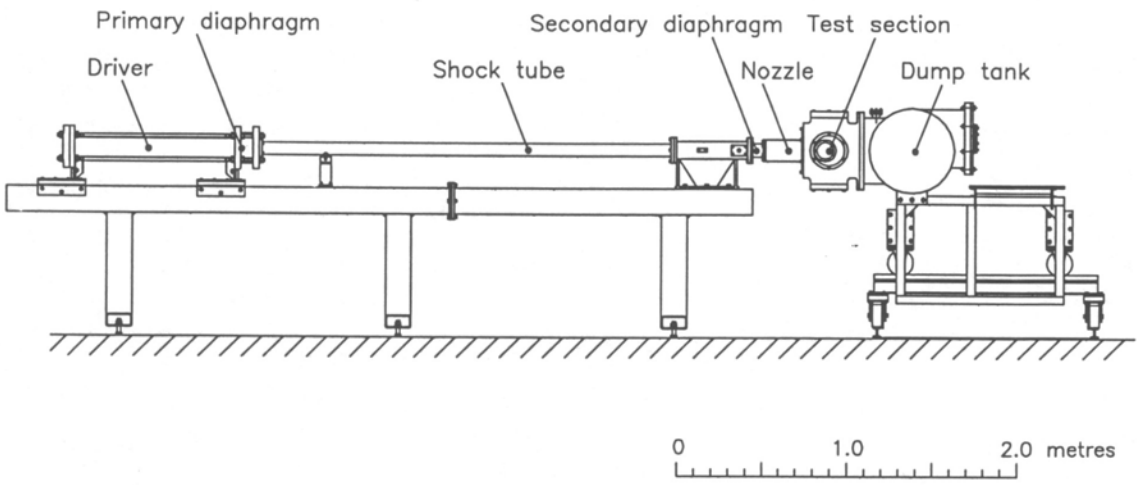
Used for testing at velocities of 2 km/sec.

Date of Construction/Planned Improvements

User Fees

Contact Information

Dr. Mee (Head), Division of Mechanical Engineering, School of Engineering, University of Queensland, Centre for Hypersonics, Room 305, Level 3, Mansergh Shaw Building (St Lucia), Brisbane QLD 4072 Australia; Tel (Mee): (61) 7 3365 4058; Fax (Mee): (61) 7 3365 4799; Email (Mee): d.mee@uq.edu.au; Web site: http://www.uq.edu.au/hypersonics/index.html?page=32356&pid=19498.



Drummond Tube/Tunnel,
University of Queensland,
Department of Mechanical Engineering,
Centre for Hypersonics,
Brisbaine, Australia

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Australia**

Installation Name	Test Section Size	Temperature Range
University of Queensland, Department of Mechanical Engineering, Centre for Hypersonics, Brisbaine, Australia	100 mm (M=4) to 250 mm (M=10) (core flow diameter)	2,500 to 7,500 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	2,000 to 5,000 m/sec	
T4 Free Piston Driven Shock Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	10 to 80 Mpa

Testing Capabilities

Impulse facility; nozzles: 4, 6, 8, and 10 Mach; capable of producing flows with total enthalpies 2.5 to 15 MJ/kg.

Data Acquisition

21 channels at sampling rate of 4 MHz/channel; with multiplexing, 84 channels at 250 kHz/channel.

Current Programs

High-speed craft such as reentry vehicles, including models of the US Space Shuttle and Japan's HYFLEX vehicle; scramjet testing; and fundamental flow phenomena in hypervelocity flows.

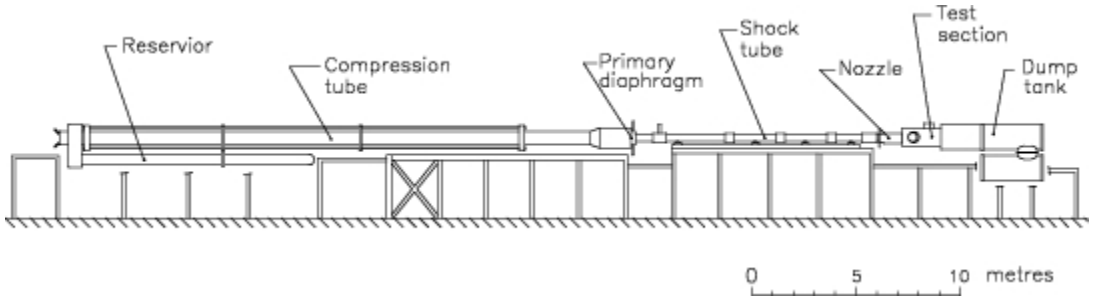
Date of Construction/Planned Improvements

1987 (commenced operation); 2000 (driver upgrade to increase stagnation pressure capability); planned upgrade of data acquisition to 48 channels at 4 MHz/channel.

User Fees

Contact Information

Dr. Mee (Head), Division of Mechanical Engineering, School of Engineering, University of Queensland, Centre for Hypersonics, Room 305, Level 3, Mansergh Shaw Building (St Lucia), Brisbane QLD 4072 Australia; Tel (Mee): (61) 7 3365 4058; Fax (Mee): (61) 7 3365 4799; Email (Mee): d.mee@uq.edu.au; Web site: http://www.uq.edu.au/hypersonics/index.html?page=32356&pid=19498.



T4 Free Piston Driven Shock Tunnel,
University of Queensland,
Department of Mechanical Engineering,
Centre for Hypersonics,
Brisbaine, Australia

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Australia**

Installation Name	Test Section Size	Temperature Range
University of Queensland, Department of Mechanical Engineering, Centre for Hypersonics, Brisbaine, Australia	37 mm x 2.08 m (shock tube); 37 mm x 2.94 m (acceleration tube)	#1: 3,270 K; #2: 6,400 K; #3: 7,160 K; #4: 15,900 K
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	#1: 3.7 Mach; #2: 0.3 Mach; #3: 4.7 Mach; #4: 0.29 Mach	
X1 Free Piston Driven Expansion Tube		**Dynamic Pressure**
	Cost	#1: 35 kPa; #2: 580 kPa; #3: 29 kPa; #4: 850 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Impulse facility; test time, 50 microsec; #1: freestream/moderate enthalpy; #2: normal shock/moderate enthalpy; #3: freestream/high enthalpy; #4: normal shock/high enthalpy.

Data Acquisition

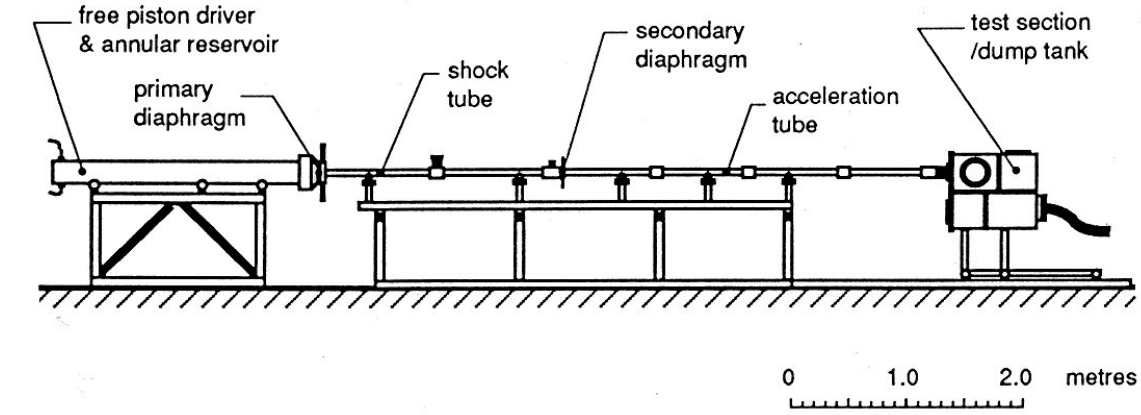
Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Dr. Mee (Head), Division of Mechanical Engineering, School of Engineering, University of Queensland, Centre for Hypersonics, Room 305, Level 3, Mansergh Shaw Building (St Lucia), Brisbane QLD 4072 Australia; Tel (Mee): (61) 7 3365 4058; Fax (Mee): (61) 7 3365 4799; Email (Mee): d.mee@uq.edu.au; Web site: http://www.uq.edu.au/hypersonics/index.html?page=32356&pid=19498.



X1 Free Piston Driven Expansion Tube,
University of Queensland,
Department of Mechanical Engineering,
Centre for Hypersonics,
Brisbaine, Australia

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Australia**

Installation Name	Test Section Size	Temperature Range
University of Queensland, Department of Mechanical Engineering, Centre for Hypersonics, Brisbaine, Australia	85 mm (diameter)	#1: 4,900 K; #2: 8,500 K; #3: 4,800 K; #4: 11,500 K
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	#1: 4.8 Mach; #2: 0.3 Mach; #3: 7.3 Mach; #4: 0.2 Mach	
X2 Super Orbital Expansion Tube		**Dynamic Pressure**
	Cost	#1: 67 kPa; #2: 1,890 kPa; #3: 3.3 kPa; #4: 220 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Impulse facility; next generation after X1; uses larger models than X1; compound piston; #1: freestream/moderate enthalpy; #2: normal shock/moderate enthalpy; #3: freestream/high enthalpy; #4: normal shock/high enthalpy.

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Dr. Mee (Head), Division of Mechanical Engineering, School of Engineering, University of Queensland, Centre for Hypersonics, Room 305, Level 3, Mansergh Shaw Building (St Lucia), Brisbane QLD 4072 Australia; Tel (Mee): (61) 7 3365 4058; Fax (Mee): (61) 7 3365 4799; Email (Mee): d.mee@uq.edu.au; Web site: http://www.uq.edu.au/hypersonics/index.html?page=32356&pid=19498.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Australia**

Installation Name	Test Section Size	Temperature Range
University of Queensland, Department of Mechanical Engineering, Centre for Hypersonics, Brisbaine, Australia	180 mm (test exit diameter)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	10 km/sec	
X3 Free Piston Driven Expansion Tube		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Impulse facility; flow durations up to 1 m/sec; large super-orbital expansion tube; over 300 shots have been fired; produces stagnation enthalpies above 100 MJ/kg.

Data Acquisition

Current Programs

Gas dynamics occuring around interplanetary atmospheric entry; manoeuvers at superorbital velocities.

Date of Construction/Planned Improvements

2007 (upgrade with improved driver).

User Fees

Contact Information

Dr. Mee (Head), Division of Mechanical Engineering, School of Engineering, University of Queensland, Centre for Hypersonics, Room 305, Level 3, Mansergh Shaw Building (St Lucia), Brisbane QLD 4072 Australia; Tel (Mee): (61) 7 3365 4058; Fax (Mee): (61) 7 3365 4799; Email (Mee): d.mee@uq.edu.au; Web site: http://www.uq.edu.au/hypersonics/index.html?page=32356&pid=19498.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Belgium**

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

Testing Capabilities

Blowdown; air supplied from pebble bed; flow speed 1,000 m/sec; flow temperature –210ºC; flow pressure 0.007 to 0.025 bar.

Data Acquisition

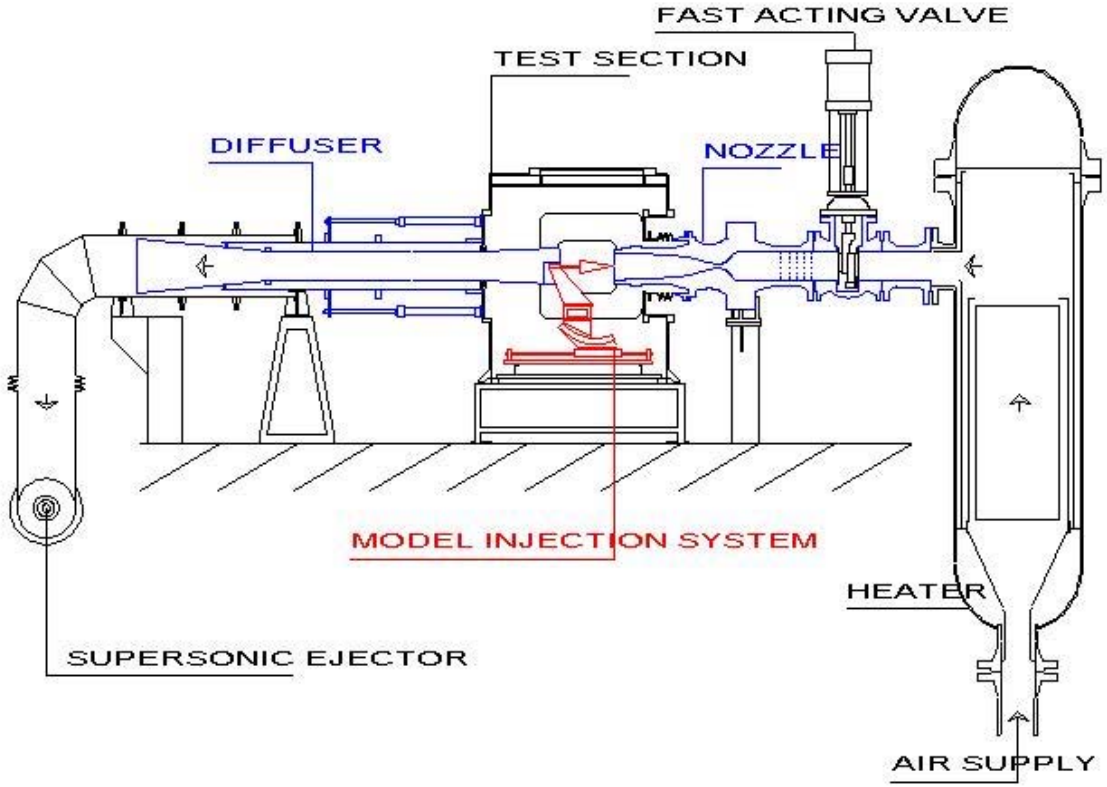
Current Programs

Date of Construction/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.



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

Installation Name	Test Section Size	Temperature Range
Von Karman Institute for Fluid Dynamics (VKI), Saint Genese, Belgium	0.43 m (Mach-14 contoured nozzle exit diameter); 0.60 m (6° conical nozzle exit diameter)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	15 to 20 Mach	5 to 15
Longshot Free-Piston Gun Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	

Testing Capabilities

Free piston tunnel.

Data Acquisition

64 channels, 50 kHz.

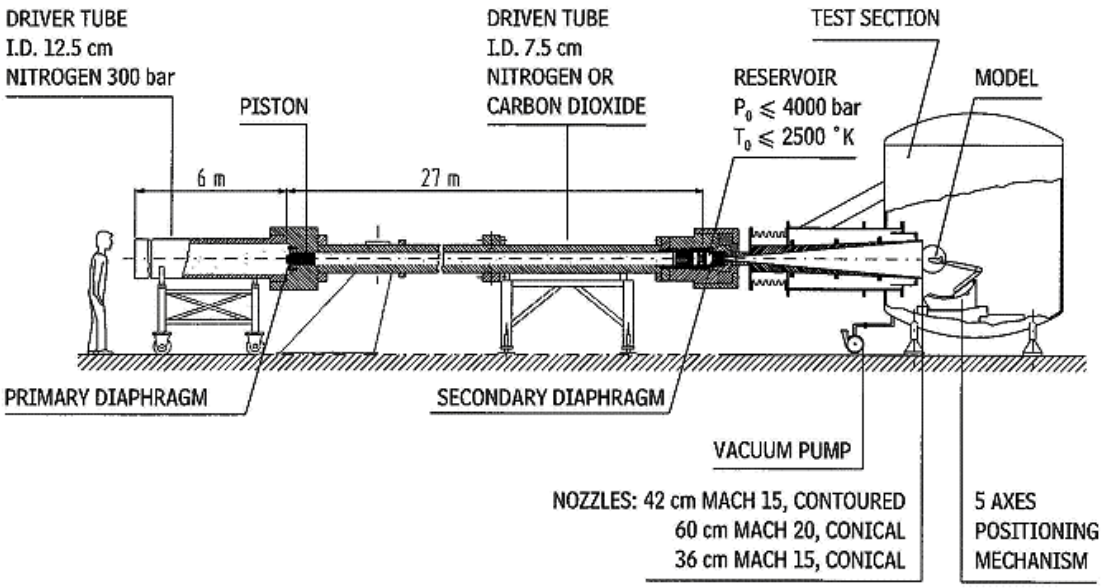
Current Programs

Date of Construction/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.



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

Installation Name	Test Section Size	Temperature 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 m³ (two lines); 0.5 m (nozzle exit diameter)	
Facility Name	**Speed Range**	**Reynolds Number (x 10^6)**
Hypersonic Wind Tunnel	#1: 5 to 8 Mach; #2: 10 to 12 Mach	**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Free jet, intermittent type; two lines: plate heater in 1st, pebble-bed heater in 2nd; performs unconventional tests continuously for over 10 minutes; part of a 3-tunnel hypersonic wind tunnel complex; other 2 are research tunnels: one is Mach=3.5 to 8.0, the other is Mach=5.0 to 10.

Data Acquisition

Current Programs

Aircraft model aerodynamics; aircraft aero-dynamic heat transfer and coating scouring; engine jet flow; aero-optics; 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, particle erosion; research on boundary layer transitions and shockwave-boundary layer interference.

Date of Construction/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 IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
China Academy of Aerospace Aerodynamics (CAAA), Beijing, China AKA: Beijing Institute of Aerodynamics (BIA) or 701st Institute of the China Aerospace Science and Technology Corp (CASC)	0.4 to 0.5 m (nozzle exit diameter)	900 to 1,500 K
Facility Name	**Speed Range**	**Reynolds Number (x 10^6)**
FD-20 Hypervelocity Conventional Piston-Gun Wind Tunnel	8, 12, 15 Mach	30
	Cost	**Dynamic Pressure**
		6 to 100 Mpa
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005.	30 to 750 bar

Testing Capabilities

Air and nitrogen used for driver and test gas; 15 to 30 m/sec runtime.

Data Acquisition

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; flow visualization.

Date of Construction/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 IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
China Academy of Aerospace Aerodynamics (CAAA), Beijing, China AKA: Beijing Institute of Aerodynamics (BIA) or 701st Institute of the China Aerospace Science and Technology Corp (CASC)	0.42 to 0.5 m (nozzle exit diameter)	1,500 to 3,000 K
Facility Name	**Speed Range**	**Reynolds Number (x 10^6)**
FD-22 Hypervelocity, Longshot Free Piston-Gun Wind Tunnel	15, 20, 25 Mach	30 (max)
	Cost	**Dynamic Pressure**
		100 Mpa
	Operational Status	**Stagnation Pressure**
	Presumed active as of November 2005.	4000 bar

Testing Capabilities

Driver gas and test gas are nitrogen; 20 to 40 m/sec runtime; this institute also has several arc-heated wind tunnels ranging from subsonic to hypersonic, but details are not provided.

Data Acquisition

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; flow visualization.

Date of Construction/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 IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Key Laboratory of High-Temperature Gas Dynamics (LHD), Beijing, China		Up to 9,000 K
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	7 to 20 Mach	
JF-10 Oxygen-Hydrogen Detonation-Driven High-Enthalpy Shock Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	800 bar

Testing Capabilities

Data Acquisition

Current Programs

Experimental research on real gas effects of high-temperature flows.

Date of Construction/Planned Improvements

1994 (lab constructed).

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 IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Hypersonic **China**

Installation Name	Test Section Size	Temperature Range
Key Laboratory of High-Temperature Gas Dynamics (LHD), Beijing, China	0.8 m (nozzle exit diameter)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	6.5 to 15 Mach	
JF-8 Hypersonic Shock Gun Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

20 to 30 m/sec runtime.

Data Acquisition

Current Programs

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

Date of Construction/Planned Improvements

1994 (constructed).

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 IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
ONERA French Aeronautics and Space Research Center, Chalais-Meudon, France	#1: 0.190 m; #2: 0.325 m (nozzle exit diameters)	Up to 700 K (variable, stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	#1: 3, 4 Mach; #2: 5, 6, 7 Mach	
R2Ch Hypersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	Variable up to 80 bar, 700 K

Testing Capabilities

Free test section; long blowdowns (10 to 60 sec); Qmax = 60 kg/sec.

Data Acquisition

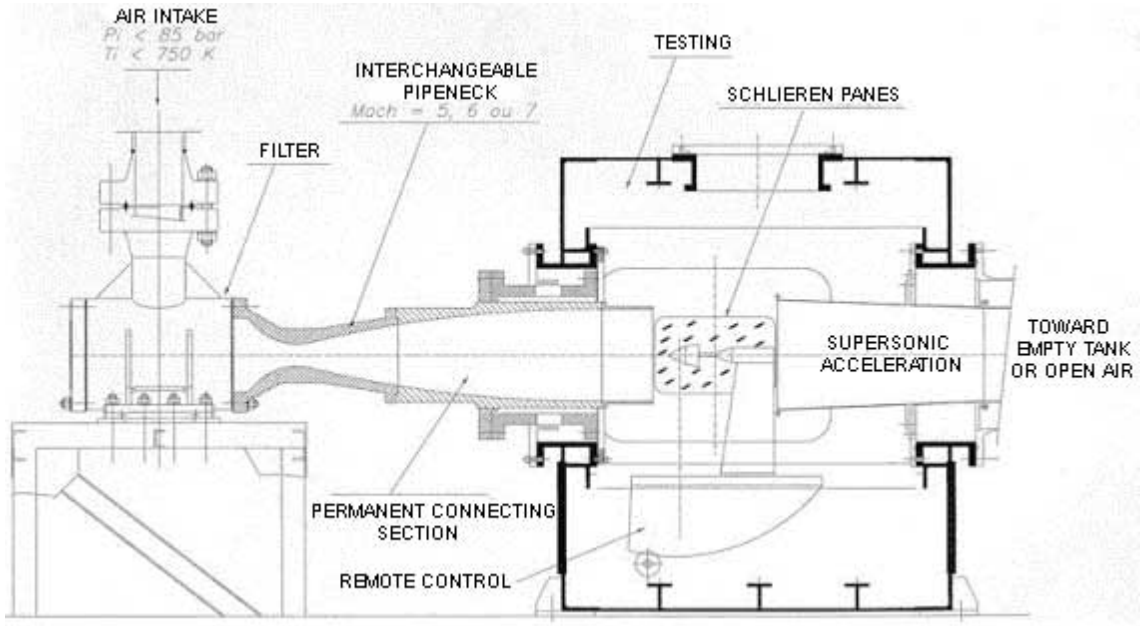
Current Programs

Date of Construction/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.

Wind Tunnels of the Eastern Hemisphere

Hypersonic **France**

Installation Name	Test Section Size	Temperature Range
ONERA French Aeronautics and Space Research Center, Chalais-Meudon, France	0.350 m (nozzle exit diameter)	1,100 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	10 Mach	
R3Ch Hypersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	Variable, 12 to 120 bar

Testing Capabilities

Long blowdowns (10 sec); free test section; Qmax = 2 kg/sec; rapid initiation by 3-way valve.

Data Acquisition

Current Programs

Date of Construction/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.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Hypersonic **France**

Installation Name	Test Section Size	Temperature Range
ONERA French Aeronautics and Space Research Center, Chalais-Meudon, France	0.350 m (nozzle exit diameter)	1,100 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	10 Mach	Unit Reynolds number in free flow: 167,000 m-1
R5Ch Hypersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	2.5 bar (variable)

Testing Capabilities

Continuous molecular regime; free test section; up to 90 sec blowdown duration; maximum flow rate: .030 kg/sec; rapid initiation by 3-way valve.

Data Acquisition

Current Programs

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

Date of Construction/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.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature 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)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	#1: 8 to 17 Mach; #2: 7 to 13 Mach; #3: 6 to 11 Mach; #4: 9 to 21 Mach	#1: 2; #2: 3; #3: 5; #4: 1
F4 Arc-Heated, High-Enthalpy, Hypersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	500 bar

Testing Capabilities

200 m/sec blowdown; can reach 500 bar total pressure with enthalpy of 16.5 mJ/kg (reduced H/RTo = 200).

Data Acquisition

Data acquisition system with 72 channels; each one has analog conditioner, amplifier filter, 16-bit 50 kHz analog-to-digital converter and buffer memory of 64,000 samples.

Current Programs

Hypersonic spacecraft reentry.

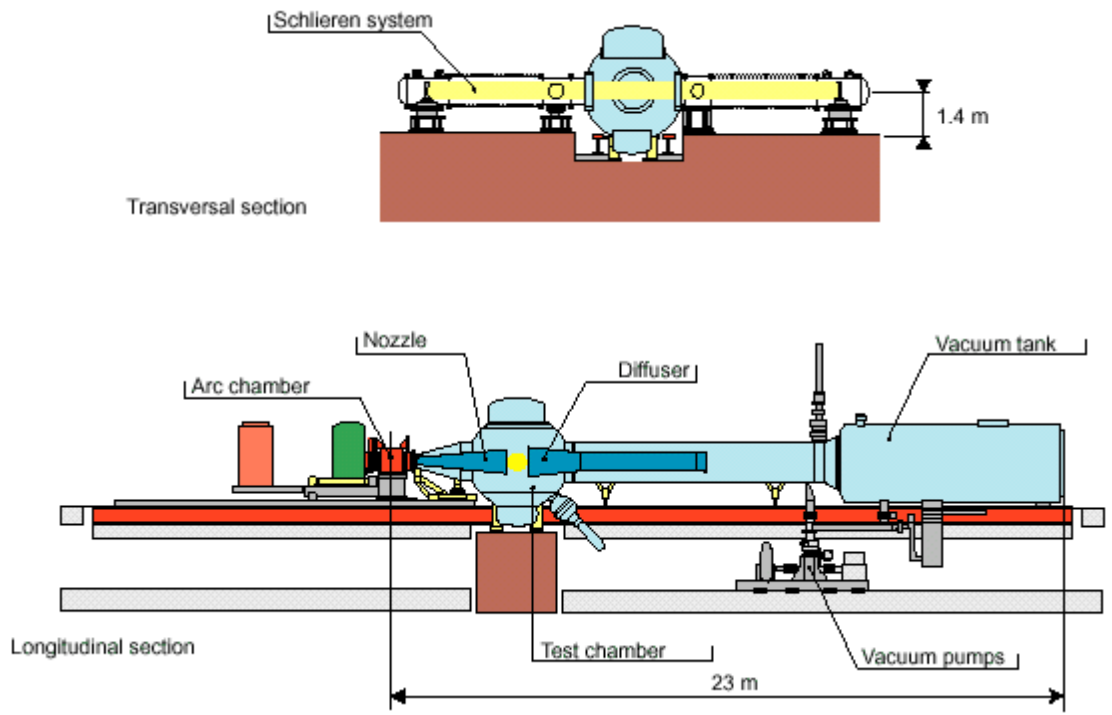
Date of Construction/Planned Improvements

1988 to 1991 (constructed).

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; Email: 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.

Installation Name	Test Section Size	Temperature Range
ONERA French Aeronautics and Space Research Center, Modane-Avrieux, France	#1: 0.68 m; #2: 1 m; #3: 1 m (nozzle exit diameters)	1,800 K
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	#1: 6.4 Mach, #2: 10 Mach, #3: M = 12 Mach	#1: 1.7; #2: 0.9; #3: 0.35
S4Ma Blowdown Hypersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	Up to 150 bar

Testing Capabilities

3 interchangeable nozzles.

Data Acquisition

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

Current Programs

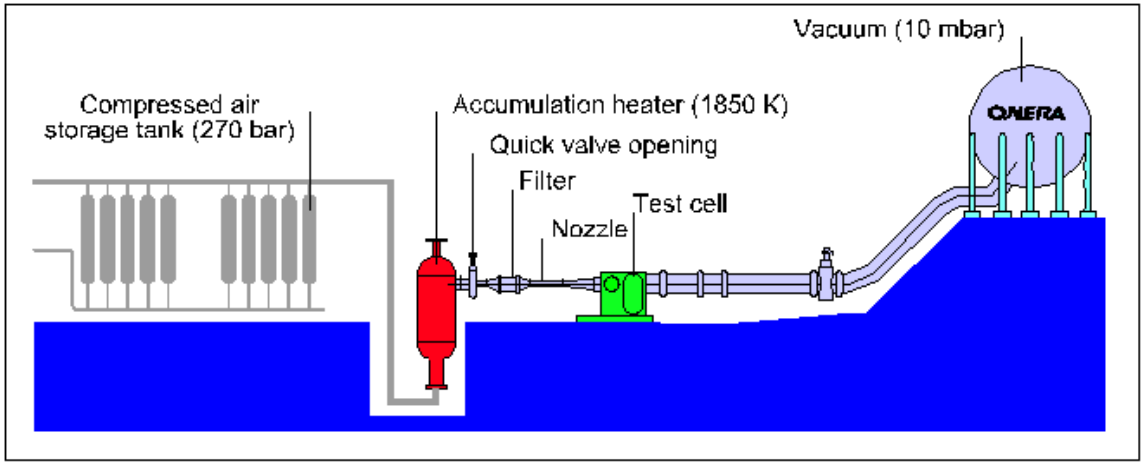
Date of Construction/Planned Improvements

1970 (constructed).

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.



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

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Germany**

Installation Name	Test Section Size	Temperature Range
Carolo-Wilhelmina Technical University at Braunschweig, Institute for Fluid Mechanics (ISM), Braunschweig, Germany	0.5 m (diameter)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	6.0 Mach	3 to 20
Hypersonic Ludwieg Wind Tunnel (HLB)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	3 to 30 bar

Testing Capabilities

Intermittent Ma=6 air flow for unit Reynolds numbers up to 20 million; tests models up to 0.2 m long; 10 runs/hr.

Data Acquisition

Schlieren; infrared thermography; pressure gauges.

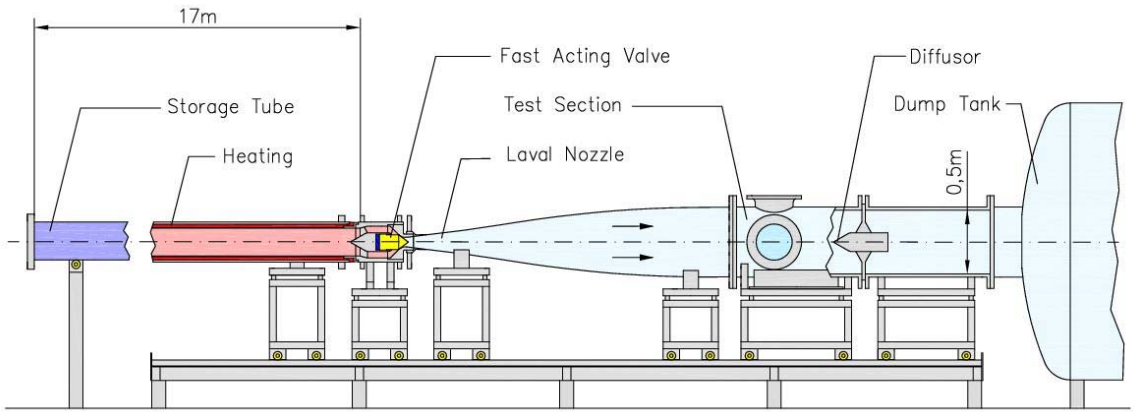
Current Programs

Date of Construction/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 Ludwieg Wind Tunnel (HLB),
Carolo-Wilhelmina Technical University,
Institute for Fluid Mechanics (ISM),
Braunschweig, Germany.

Installation Name	Test Section Size	Temperature Range
German-Dutch Wind Tunnels (DNW), Göttingen, Germany	#1: 0.5 x 0.5 m², #2: 0.5 m (diameter)	#1: 300 K (max); #2: 700 K (max)
	Speed Range	**Reynolds Number (x 10^6)**
	#1: 2.9 to 4.65 Mach; #2: 5.0 to 6.9 Mach	#1: 3.5; #2: 2.2
Facility Name		**Dynamic Pressure**
Intermittent Ludwieg Tube Wind Tunnel with two legs (RWG)	**Cost**	
		Stagnation Pressure
	Operational Status	
	Presumed active as of September 2005.	

Testing Capabilities

Intermittent Ludwieg tube with two legs (t = 0.4 sec); Reynolds numbers for flight altitudes 10 to 50 km; 2 80 m long storage tubes connected by fast-action valve and exchangeable supersonic nozzles to test section.

Data Acquisition

Current Programs

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

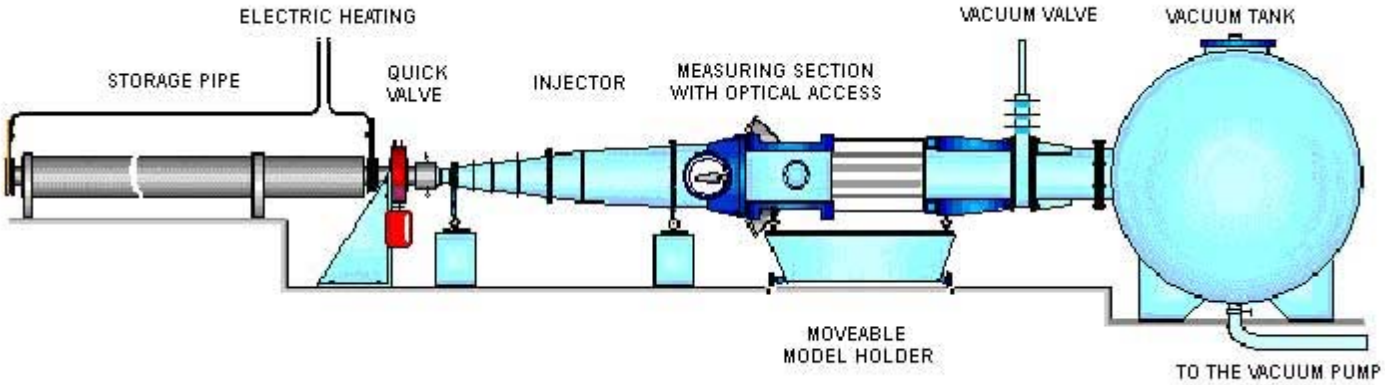
Date of Construction/Planned Improvements

1968 (constructed).

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.

Wind Tunnels of the Eastern Hemisphere

Hypersonic **India**

Installation Name	Test Section Size	Temperature Range
Indian Institute of Science, Department of Aerospace Engineering, Bangalore, India	200 mm (open jet)	800 K
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	6 to 10 Mach	0.1 to 100
200 mm Hypersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of March 2007.	67 atm (2,000 psi)

Testing Capabilities

Pressure-vacuum-type tunnel; max storage pressure: 134 atm; 1 Torr vacuum; allumina pebble bed heater.

Data Acquisition

Current Programs

In-house research and national programs.

Date of Construction/Planned Improvements

1986 (commissioned).

User Fees

Contact Information

Professor B.N. Raghunandan (Chairman), Department of Aerospace Engineering, Indian Institute of Science, Bangalore 560012 India; Tel: (91) 80 229 32878 or 33023; Email: raghubn@aero.iisc.ernet.in; Web site: http://www.aero.iisc.ernet.in/facilities/aerodyn_facilities.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Hypersonic **India**

Installation Name	Test Section Size	Temperature Range
Indian Institute of Science, Department of Aerospace Engineering, Bangalore, India	300 x 300 mm²	800 to 5,000 K
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name		
300 x 300 mm Hypersonic Shock Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of March 2007.	

Testing Capabilities

Driven by 50 mm diameter shock tube and 165 mm diameter, 17 m long performance shock tube; special balance accelerometers to measure forces.

Data Acquisition

Current Programs

High enthalpy studies; has been used to generate force, pressure, and heat transfer data on configurations of interest to Indian Space Research Organisation (ISRO) and Defence Research and Development Organisation (DRDO).

Date of Construction/Planned Improvements

User Fees

Contact Information

Professor B.N. Raghunandan (Chairman), Department of Aerospace Engineering, Indian Institute of Science, Bangalore 560012 India; Tel: (91) 80 229 32878 or 33023; Email: raghubn@aero.iisc.ernet.in; Web site: http://www.aero.iisc.ernet.in/facilities/aerodyn_facilities.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Hypersonic **India**

Installation Name	Test Section Size	Temperature Range
Vikram Sarabhai Space Centre (VSSC), Thiruvandrum, Kerala, India		
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	5 to 15 Mach	
Hypersonic Wind Tunnel (HWT)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Under construction.	

Testing Capabilities

Data Acquisition

Current Programs

Aerodynamic characteristics of aircraft models; aircraft components; engine jets simulation pressure distribution over models' surfaces; models of inlets and aircraft with flow-through in the internal channels; aircraft components interference during separation and heat-exchange parameters.

Date of Construction/Planned Improvements

Construction began in June 2005; not yet completed.

User Fees

Contact Information

Wind Tunnel Manager, Vikram Sarabhai Space Centre (VSSC), Thiruvandrum, Kerala, India 695022; Tel: (91) 471 562 444 or 562 55; Fax: (91) 471 7979.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Israel**

Installation Name	Test Section Size	Temperature Range
Technion-Israel Institute of Technology, Faculty of Aerospace Engineering, Aerodynamics Laboratory, Haifa, Israel	1 in (diameter 30, APG), 30 in (diameter, tunnel)	Up to 6,000 K (APG).
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	8 Mach (tunnel)	
Arc Plasma Generator (APG)/Hypersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	Up to 50 atm (APG).

Testing Capabilities

5 mW arc plasma generator; plasma flows up to 0.5 kg/sec at pressures </= 50 atm, temps </= 6,000 K; evacuated test chamber for aerodynamic testing with air; atmospheric leg for simulation of aerodynamic heating and ablation studies; nozzle for M=8 operation constructed with APG as air heater.

Data Acquisition

Instrumented for measuring force, pressure, velocity, and temperature; DEC 3400-controlled NEFF system for data acquisition reduction; integral 5- to 30-mm, 6-component, sting-type, strain-gauge balances; laser-Doppler anemometry velocity-measuring technique; optical diagnostics.

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Prof. Rimon Arieli, Faculty of Aerospace Engineering, Technion-Israel Institute of Technology, Technion city, Haifa 32000 Israel; Tel (Faculty Dean): (972) 4 829-2308 or 2260; Tel (Arieli): (972) 4 829-2714; Fax: (972) 4 829-2030; Email (Dean): aerdean@aerodyne.technion.ac.il; Email (Arieli): rimon.arieli@gmail.com; Web site: http://ae-www.technion.ac.il/research/aerodynamic.php.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Italy**

Installation Name	Test Section Size	Temperature Range
Italian Aerospace Research Center (CIRA), Capua, Italy	2 m (diameter)	10,000 K
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	12 Mach	
Scirocco Plasma Hypersonic Wind Tunnel (PWT)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	

Testing Capabilities

Hypersonic, thermo-structural; electric arc heater with maximum power of 70 MW.

Data Acquisition

Current Programs

Date of Construction/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.**

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Japan**

Installation Name	Test Section Size	Temperature 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)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	5, 7, 9, 11 Mach	
0.5 m Hypersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of December 2005.	1 to 1.85 Mpa

Testing Capabilities

Intermittent blowdown, vacuum suction; free jet test section; 2 runs at 60 sec duration each; 2 interchangeable 18 m^3 air sources at 19.7 MPa each; two 1,150 m^3 vacuum tanks; 2 6,500 m^3/hr air blowers; built by Mitsubishi Heavy Industries.

Data Acquisition

Current Programs

Research on aerodynamics in a supersonic low-turbulence environment.

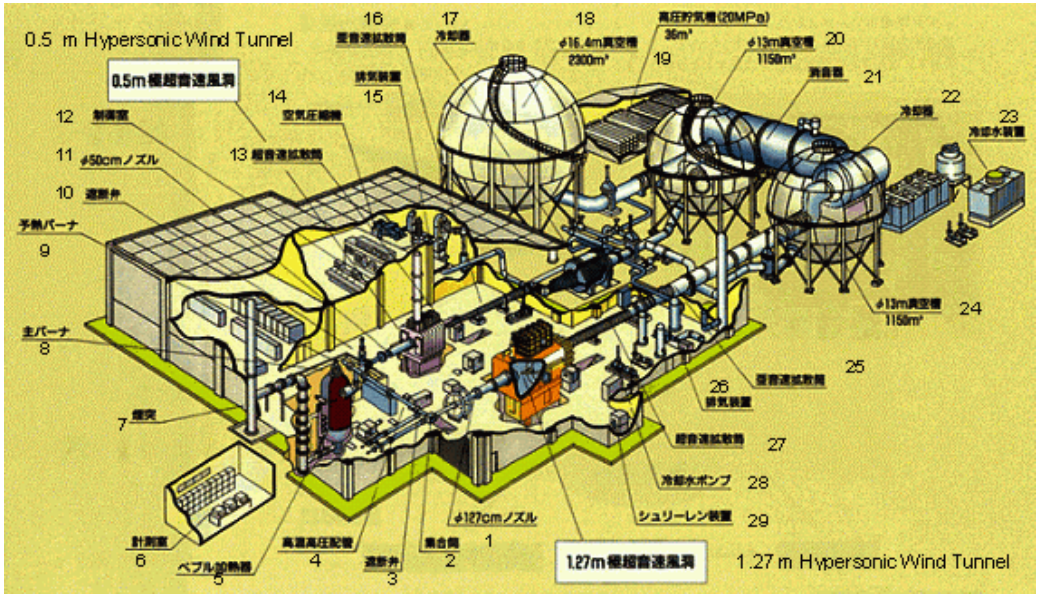
Date of Construction/Planned Improvements

1965 (constructed).

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@chofu.jaxa.jp; Web site: http://www.iat.jaxa.jp/res/wttc/b04.html.



(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

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Japan**

Installation Name	Test Section Size	Temperature 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)	10,000 K (max)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	12 to 20 Mach (4 to 7 km/sec)	
High Enthalpy Shock Wind Tunnel (HIEST)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of December 2005.	150 MPa (max)

Testing Capabilities

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 to 720 kg; slot diameter: 0.024 to 0.05 m; test time > 2 microsec; driver gas: helium, helium/argon; driver gas temperature: max 4,000 K; world's largest free-piston shock wind tunnel; max stagnation enthalpy: 25 MJ/kg.

Data Acquisition

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

Current Programs

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

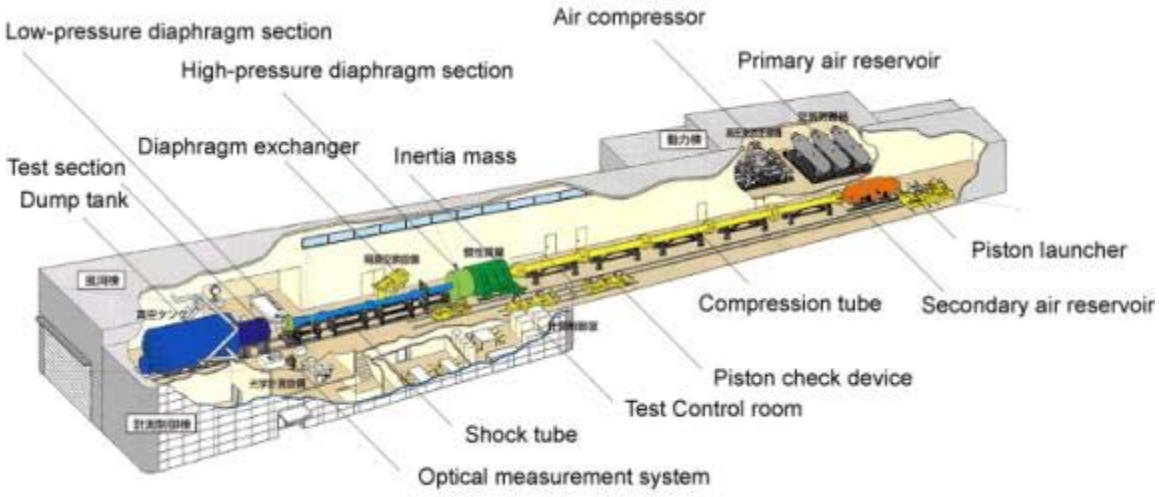
Date of Construction/Planned Improvements

1999 (constructed).

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.

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Japan**

Installation Name	Test Section Size	Temperature 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)	1,400 K (continuous operation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	10, 12 Mach	
0.44 m Hypersonic Shock Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of December 2005.	0.5 to 4 Mpa

Testing Capabilities

Diaphragm-less shock wind tunnel when under continuous operation; 2-stage compression shock wind tunnel when operating at high enthalpy; free-jet-type test section; 40 millisec air flow duration when under continuous operation; 2 millisecs at high enthalpy 8 MJ/kg.

Data Acquisition

Current Programs

Research on aerodynamics in a supersonic low-turbulence environment.

Date of Construction/Planned Improvements

1967 (constructed); 1994 (upgrade).

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.

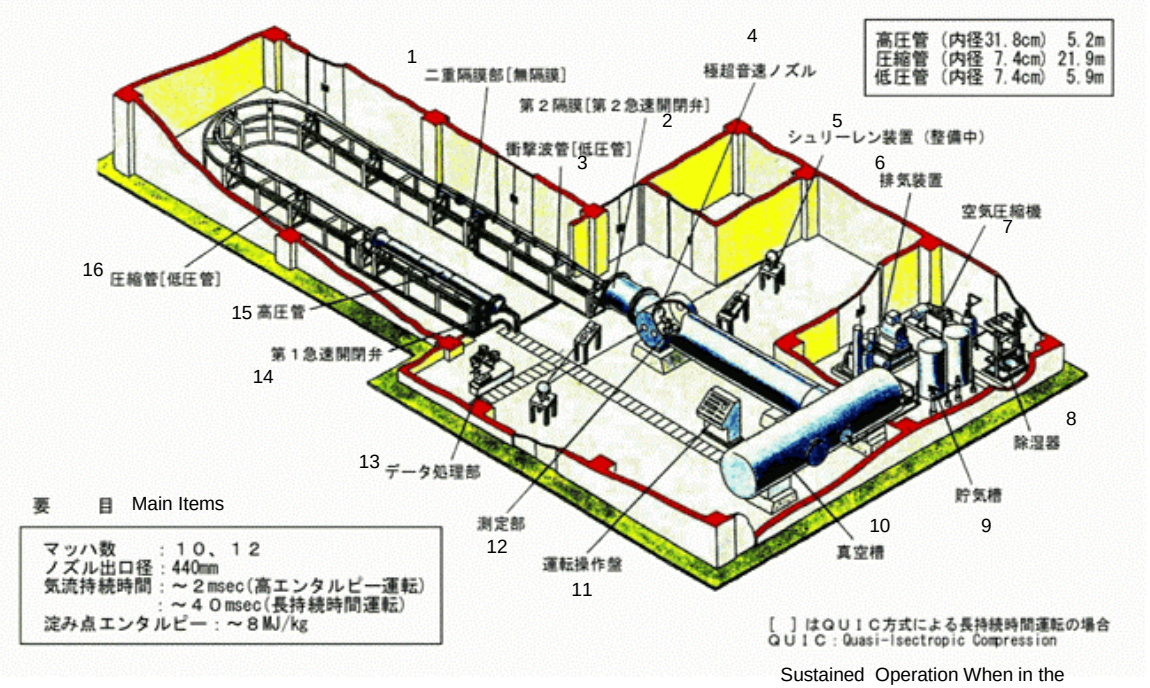
1. Double Diaphragm Section (Diaphragmless)
2. 2nd Diaphragm (2nd Rapid Open-Shut Valve)
3. Shock Tube (Low Pressure Tube)
4. Hypersonic Nozzle
5. Schlieren Device (Built-in)
6. Air Exhaust
7. Air Compressor
8. Dehumidifier
9. Air Storage Tanks
10. Vacuum Tank
11. Operating Panel
12. Test Section
13.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

0.44 m 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.

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Japan**

Installation Name	Test Section Size	Temperature 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)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	10 Mach	
1.27 m Hypersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of December 2005.	1 to 8.5 Mpa

Testing Capabilities

Intermittent blowdown, vacuum-suction-type, free-jet-type test section; built by Mitsubishi Heavy Industries.

Data Acquisition

Current Programs

Research on aerodynamics in a supersonic low-turbulence environment.

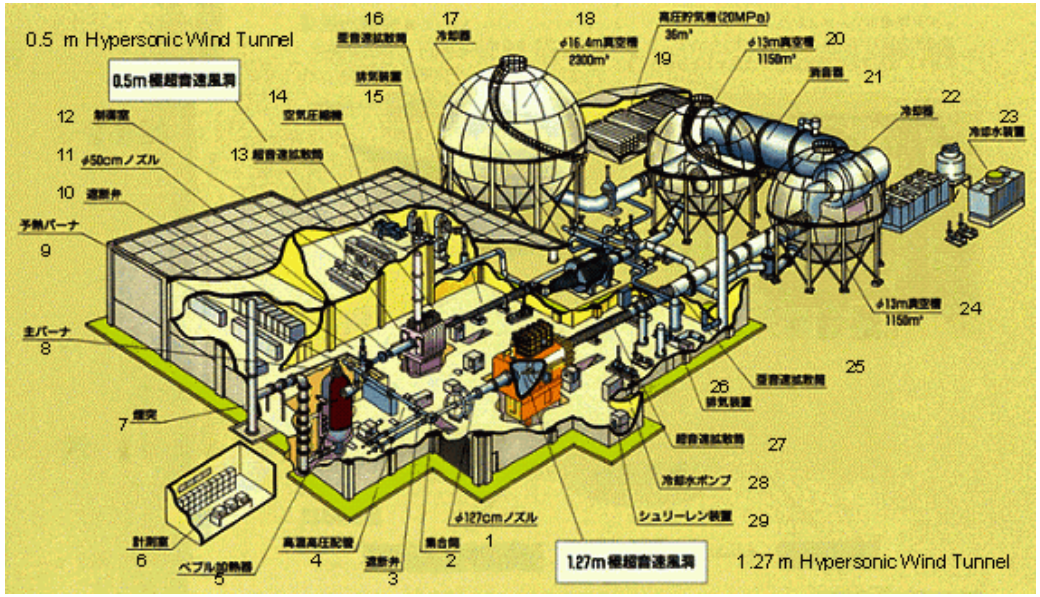
Date of Construction/Planned Improvements

1994 (constructed).

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 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

Installation Name	Test Section Size	Temperature Range
Delft University of Technology (TUDELFT), High-Speed Laboratory, Delft, The Netherlands	350 mm (diameter)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	6 to 11 Mach	
Hypersonic Wind Tunnel (HTFD)		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of October 2005.	

Testing Capabilities

Run time: 0.07 to 0.13 sec.

Data Acquisition

Current Programs

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

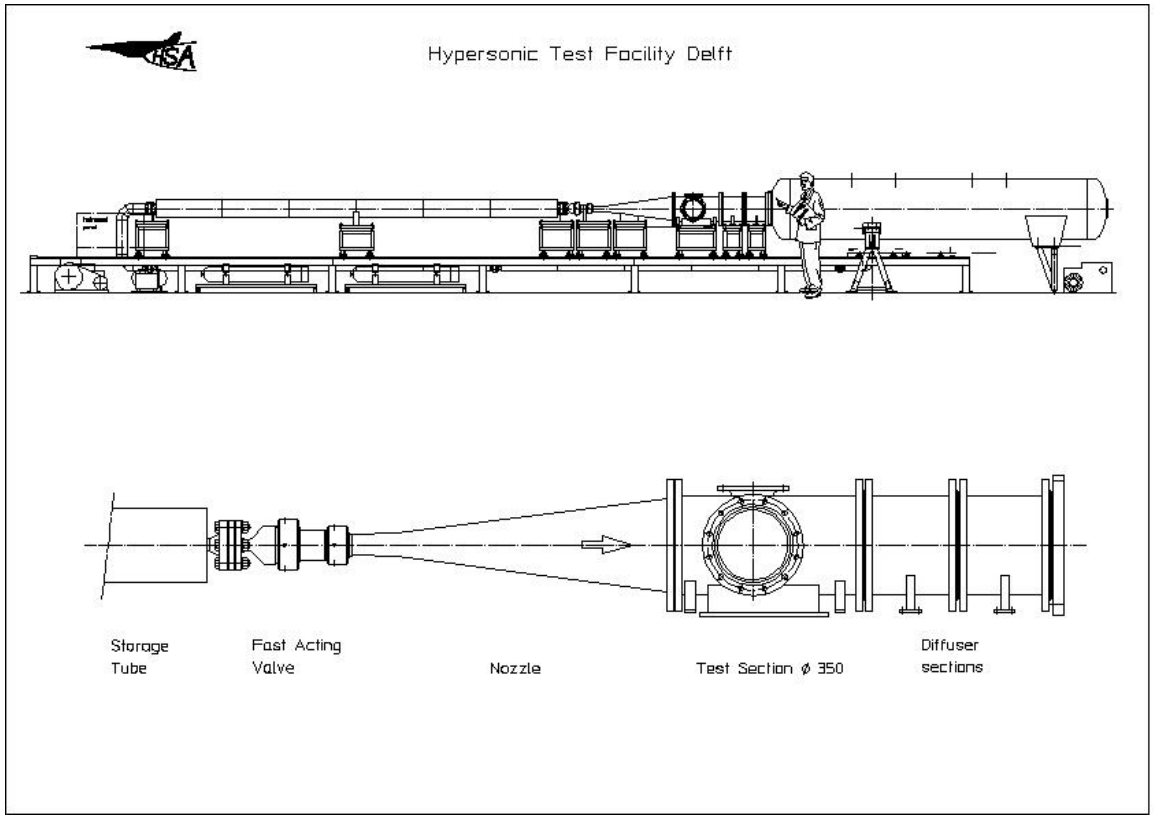
Date of Construction/Planned Improvements

1995 (constructed).

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.



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

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	0.44 m (contoured nozzle); 0.2, 0.53, and 0.9 m (conical nozzle)	1,500 to 5,000 K (stagnation)
Facility Name	**Speed Range**	**Reynolds Number (x 10^6)**
IT-2 Impulse Wind Tunnel	16.3 to 17.9 Mach (contoured nozzle); 10.4 to 21.6 Mach (conical nozzle)	0.2 to 40
	Cost	**Dynamic Pressure**
		1 to 100 kPa
	Operational Status	**Stagnation Pressure**
	Presumed active as of February 2007.	

Testing Capabilities

Intermittent facility; exhaust into vacuum reservoir; achieves high-flow stagnation parameters due to electric discharge of a powerful bank of capacitors in closed space filled with gas.

Data Acquisition

Computerized measuring complex including a set of 3-component, strain-gauge balances; pressure and heat-flux transducers; data acquisition and processing systems (30 channels).

Current Programs

Investigates aerodynamic characteristics of hypersonic aircraft models in a range of Mach and Reynolds numbers; heat-fluxes distribution measurement; flow visualization (Stiller method); measurement of electron concentration distribution in shock layer over model; internal flows, jet streams, and some problems of atmospheric physics.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.

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Wind Tunnels of the Eastern Hemisphere

Hypersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	0.025 x 0.025 m² to 0.18 x 0.18 m² (electric arc heater); 0.025 x 0.025 m² to 0.25 x 0.25 m² (electric arc heater, MHD accelerator)	Up to 3,800 K (stagnation; electric arc heater); up to 15,000 K (stagnation; electric arc heater and MHD accelerator)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	Up to 2.5 km/sec (10 Mach; electric arc heater); up to 7.5 km/sec (15 to 18 Mach, electric arc heater and MHD accelerator)	
SMGDU Hypersonic Wind Tunnel with Magneto-Hydrodynamic Acceleration Flow		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Active as of February 2007.	

Testing Capabilities

4,000 kVA power; operates with 2.5 T magnetic induction intensity; exit section diameter 0.015 to 0.025 m; acceleration section 0.8 m long.

Data Acquisition

Current Programs

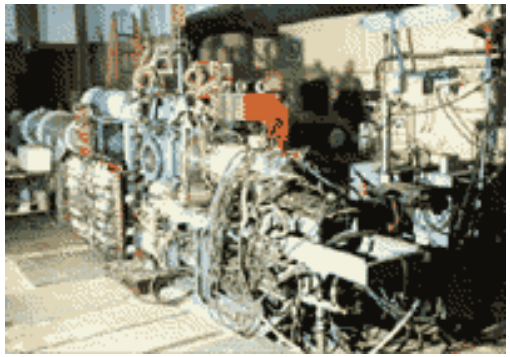
Simulates hypersonic flight conditions at speeds of 2.5 to 8 km/sec in rarefied and dense gases; gas dynamics of scramjet combustion chambers and aerospace reentry vehicles modelsl analytic model validation at 3D; real gas hypersonic flows.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.



**SMGDU Hypersonic Wind Tunnel with Magneto-Hydrodynamic Acceleration Flow,
Central Aerohydrodynamic Institute (TsAGI),
Zhukovsky, Moscow Region, Russia**

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	0.6 x 0.6 x 1.9 m³	300 to 750 K (stagnation)
Facility Name	**Speed Range**	**Reynolds Number (x 10^6)**
T-113 Hypersonic Wind Tunnel	1.8 to 6.0 Mach	Up to 43
	Cost	**Dynamic Pressure**
		Up to 78 kPa
	Operational Status	**Stagnation Pressure**
	Presumed active as of February 2007.	

Testing Capabilities

2 supersonic, fixed-area ejectors; 800 mm nozzle for M <= 4; 300 mm nozzle for M = 4.5 to 6.0; 5,000 kW resistance air heater; vortex structures investigations with high-voltage discharge; blowdown; closed; square; up to 300 sec runtime.

Data Acquisition

Current Programs

Total aerodynamic characteristics of aircraft models and their components; pressure distribution over a model surface; characteristics of inlet models and aircraft models with flow-through internal channel; shadow pattern of flow over the model; boundary layer transition; vortex structures and separation phenomena near models

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	1 x 1 x 2.35 m³	290 to 1,075 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	1.8 to 10 Mach	2.5 to 42
T-116 Hypersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Exhausts to atmosphere; variable area supersonic diffuser; 3 suction ejectors; 3 independent, 2D nozzles for supersonic velocities (M = 1.8 to 4.0); 2 assymetrical hypersonic ranges for M = 5 to 7 and 7 to 10; easy access to models; 6-component, mechanical aerodynamic balance; set of strain-gauge balances for models of various types and sizes; high-angle-of-attack mechanism; blowdown, closed, up to 300 sec runtime.

Data Acquisition

Current Programs

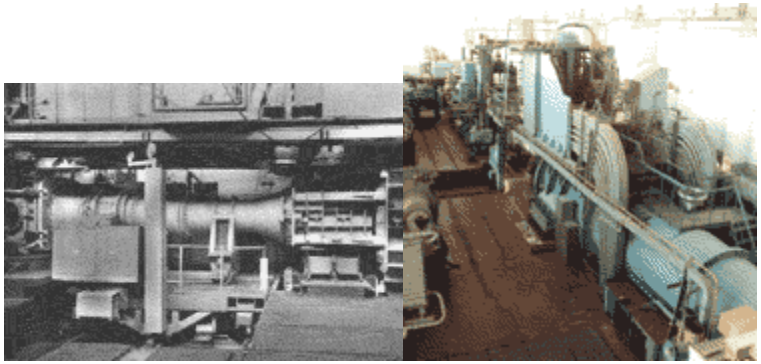
Total aerodynamic characteristics of aircraft models and their components; tests with engine jets simulation; pressure distribution over models' surfaces; models of inlets and aircrafts with flow-through in the internal channels; aircraft components interference during separation; heat-exchange parameters; characteristics of elastically similar models; shadow-pattern of flow over model.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.



T-116 Hypersonic Wind Tunnel,
Central Aerohydrodynamic Institute (TsAGI),
Zhukovsky, Moscow Region, Russia.

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	2.5 x 2.4 x 1.9 m³, 1 m (nozzle diameter)	1,100 to 3,000 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	8 to 18 Mach	Up to 4
T-117 Hypersonic Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 12 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Eiffel chamber; arc heated; 2 interchangeable heaters (25 and 2.5 MW); 2 systems create pressure difference in ejector and vacuum systems; flow from bottled compressed air and compressors; tail sting; blowdown; cooled walls; 60 to 180 sec runtime.

Data Acquisition

Current Programs

Aerodynamic and thermal characteristics of aircraft models in wide range of Mach and Reynolds numbers; aerodynamic characteristics of aircraft components; heat-flux distribution; visualization of flow over model with help of shift interferometer; angles of attack from 6 to 51°; side-slip angles from -30 to 30°; has tested hypersonic aircraft models and Buran space shuttle.

Date of Construction/Planned Improvements

1979 (commenced operation).

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.

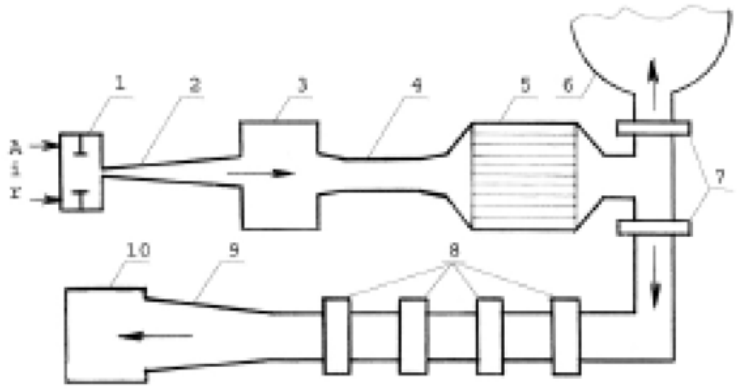


Fig. 1. Sketch of T-117 TsAGI wind tunnel. 1 – arc heater; 2 – nozzle; 3 – test section; 4 – diffuser; 5 – heat exchanger; 6 – vacuum tank; 7 – vacuum isolation valves; 8 – ejectors; 9 – subsonic diffuser; 10 – exhaust stack.

T-117 Hypersonic Wind Tunnel,
Central Aerohydrodynamic Institute (TsAGI),
Zhukovsky, Moscow Region, Russia.

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	0.55 m (long), 0.8 m (Eiffel chamber diameter), 0.28 to 0.305 m (nozzle diameter)	Up to 770 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	3 to 5 Mach	Up to 70
T-33 Hypersonic Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 135 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Intermittent supersonic, low-hypersonic test facility, with replaceable heaters and 2-stage gas ejector in the exhaust section; blowdown; up to 30 min runtime.

Data Acquisition

Current Programs

Testing of aircraft models and parachutes; heating due to shock-wave interference under aerodynamic heating conditions; heat transfer; pressure distributions; flow visualization.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.

T-33 Hypersonic Wind Tunnel,
Central Aerohydrodynamic Institute (TsAGI),
Zhukovsky, Moscow Region, Russia

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	0.15, 0.3 m (nozzle exit diameters)	2,000 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	5 to 12 Mach; 13 to 20 Mach	10
UGSD Hypersonic Wind Tunnel with Adiabatic Gas Compression	**Cost**	**Dynamic Pressure**
		Up to 2 Mpa
	Operational Status	**Stagnation Pressure**
	Active as of February 2007.	

Testing Capabilities

Newly developed source of high-pressure, high-temperature gas produces test gas cleaner than atmosphere typically generated in hot-shot and classical adiabatic-compression wind tunnels; working fluids: air, N^2, etc; suspension system allows both model and shock-wave generator to be installed in any position within test section; blowdown; 0.05 to 0.1 sec runtime.

Data Acquisition

Shadow graphs of flow patterns and shock-wave interaction; temperatures evaluated using a temperature indicator coating.

Current Programs

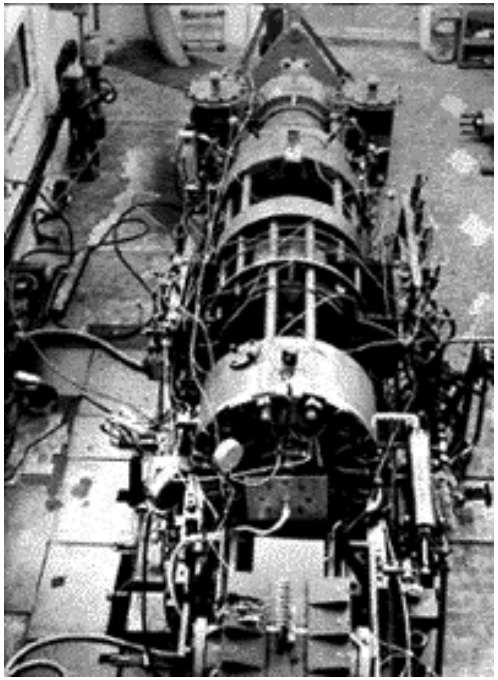
Outperforms other hypersonic wind tunnels in flow purity, test run duration, and stability of both pressure and stagnation temperature.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.



UGSD Hypersonic Wind Tunnel with Adiabatic Gas Compression.
Central Aerohydrodynamic Institute (TsAGI),
Zhukovsky, Moscow Region, Russia

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	2.0 m (long), 1.2 m (diameter)	3,000 to 6,000 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	4,000 to 8,000 m/sec	Up to 0.2
VAT-103 Vacuum Wind Tunnel		**Dynamic Pressure**
	Cost	0.2 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Vacuum wind tunnel; molecular beam; 2 chambers with independent gas evacuation; 30 to 400 eV ion-plasma generators; 100-mm, flow-core diameter 0.5 m from nozzle exit; 3-component balance; flux-level sensors; pressure- and heat-flux transducers; mass-spectrometer; working fluids: air, N^2, Ar, He, mixtures of O^2 with He or Ar; continuous run.

Data Acquisition

Equipped with an automated computerized measuring complex.

Current Programs

Aerodynamic and thermal characteristics of space vehicles and their components in upper atmosphere; aerodynamic coefficients Cx, Cy, Mz; momentum and energy-transfer coefficients in materials testing; testing materials resistance to atomic oxygen.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	4 m (long), 1.6 m (diameter), 0.05 m (nozzle exit diameter)	5,000 to 7,000 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	4 to 8 Mach	0.002 to 0.01
VAT-104 High Temperature Wind Tunnel		**Dynamic Pressure**
	Cost	0.1 to 4 kPa
		Stagnation Pressure
	Operational Status	1 to 102 Pa
	Presumed active as of February 2007.	

Testing Capabilities

Continuously operating; working fluids: air, N^2, Ar; enthalpy of 10 to 40 MJ/kg; equipped with heat exchanger; 3-stage calibration device; fast-response model insertion mechanism; induced-type gas heater; steady additive-free, high-enthalpy flows; up to 3,600 sec runtime.

The regime is maintained with the accuracy not worse than 1% .

Data Acquisition

Computerized measuring complex; data printed out in tables and plots.

Current Programs

Non-equilibrium heat exchange and materials; determination of catalytic properties, radiation characteristics, and thermomechanical stability of high temperature materials and coatings; material characteristics and their variation with time; thermal insulation system components and temperature transducers.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	2.5, 1.5, 0.5 m (long); 1.6, 1.0, 0.5 m (diameter)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.1 to 100 m/sec	0.1 to 10, 0.01 to 0.1
VAT-105 Hypersonic Wind Tunnel		**Dynamic Pressure**
	Cost	Up to 0.002 Pa
		Stagnation Pressure
	Operational Status	
	Active as of February 2007.	

Testing Capabilities

Vacuum-type; continuous operation; 3 working chambers: 1 for hypersonic ion flow, 2 provide dissociated gas flow from HF and UHF plasmatrons; deep vacuum produced by high-throughput, ion-magnetic, and arc-evaporating pumps; probe-positioning mechanisms; deep oil-free vacuum.

Data Acquisition

Current Programs

Tests of materials and spacecraft components; determines atom recombination coefficients on model surfaces; studies resistance of polymeric materials in discharge after-glow zones; ion beam determines coefficients of momentum/energy transfer of ions and neutral molecules on the surface; evaluates sample mass variations.

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	1.7 m (long), 1.0 m (diameter); 0.15 m, 0.3 m (nozzle diameters)	290 to 2,000 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	12, 18 Mach (contoured nozzle); 20 Mach (conical nozzle)	0.5 to 1.5 at Mach 12; 0.03 to 0.1 at Mach 18, 20
VAT-3 Impulse Wind Tunnel		**Dynamic Pressure**
	Cost	5 kPa
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

1.5 m³ volume test section; cryogenic panels cooled by gaseous helium; small value of temperature up to 0.02 is simulated; high vacuum maintained in test section; cryopumping of test gas; blowdown; cryogenic; 0.1 to 5 sec runtime.

Data Acquisition

Measuring equipment determines: Cx, Cy, Cz, Mx, My, Mz; force and thermal effect of strongly underexpanded jets; gas dynamics of jets blown out into a hypersonic rarefied flow; detecting and measuring loads induced by jets.

Current Programs

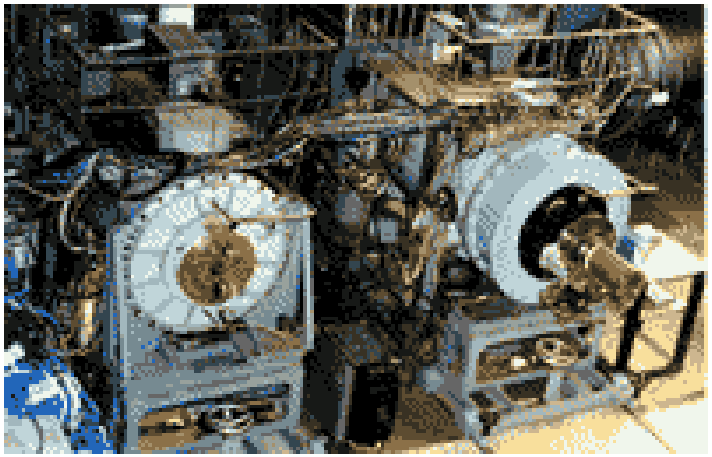
Aero-gasdynamics of aerospace vehicles docking; aerospace plane descent with the use of jet control system; development of jet control system components for extra-vehicular space activity; determines local aerogasdynamic and thermal characteristics of aircraft in transitional flow; simulation of aerospace vehicle descent at altitudes H=100 to 75 km;

Date of Construction/Planned Improvements

User Fees

Contact Information

TsAGI, International Business Department, 1 Zhukovsky Street, Moscow 140180, Russian Federation; Tel: (7) 095 556-41-01; Fax: (7) 095 777-63-32; Email: ibd@tsagi.ru; Web site: http://www.tsagi.ru/eng/areas/test_facilities/.



VAT-3 Impulse Wind Tunnel,
Central Aerohydrodynamic Institute (TsAGI),
Zhukovsky, Moscow Region, Russia

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, Korolev, Moscow Region, Russia	5 x 1.4 m²; 0.4, 0.8 m (nozzle diameters)	120 to 3,500 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	0.1 to 0.7 and 6 to 20 Mach	0.1 to 500
U-11 Multi-Purpose Piston Gasdynamic Unit		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Active as of February 2007.	

Testing Capabilities

Engine-jet simulation system; can quickly change over subsystems; working fluids: air, N², He, Ar, Xe, CO2, hydrocarbon-mixture combustion products; can operate as a plasmatron.

Data Acquisition

Current Programs

Balance, kinematic, drainage, jet, thermal, acoustic, optical, high-density plasma generation tests; aerodynamic and heat-exchange problems associated with launch-vehicle afterbody models; ejection effect of engine jets using jet generators; effects of high-energy ultraviolet radiation on objects and materials; aerogasdynamic and heat-exchange problems of launch vehicles during stage separation.

Date of Construction/Planned Improvements

1959 (commenced operation); 1984 (upgrade).

User Fees

Contact Information

Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, 4 Pionerskaya Street, Korolev, Moscow Region, 141070, Russia; Tel: (7) 095 513 5000; Fax: (7) 095 187 0322; Email: corp@tsniimash.ru; Web site: http://www.tsniimash.ru/Centers/AeroGasDynam.

U-11 Multi-Purpose Piston Gasdynamic Unit,
Central Research Institute for Machine Building (TsNIIMASH),
AeroGasdynamics Center,
Korolev, Moscow Region, Russia

Installation Name	Test Section Size	Temperature Range
Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, Korolev, Moscow Region, Russia	U-22: 20 m (high), 8 m (diameter); U-22M: 13.5 m (high); 3 m, 5 m (diameters)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	10 to 20 Mach	
U-22 and U-22M Gas-Dynamic Vacuum Chamber		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Active as of February 2007.	

Testing Capabilities

2 test zones; balance, drainage, jet, thermal, optical tests; simulates effects closely resembling actual flight conditions using mechanical vacuum/vapor-jet pumps; jet-simulation system; model spatial relocation mechanism; sluice chamber; pressure, temperature/heat flux, aerodynamic force/moment measurement system; optical-physical measurements using holographic interferometers/high-speed filming.

Data Acquisition

Automated system for data acquisition and processing (200 channels).

Current Programs

Forces, moments, pressure, and temperature distributions on structural elements during stage-separation process simulations, orbital docking and undocking, and takeoff and landing on planets; vehicle operations at high altitudes; gasdynamic and thermal processes of jets and separated flows; develops experimental technologies using cryogenic, vacuum, and jet technologies.

Date of Construction/Planned Improvements

1975 (commenced operation).

User Fees

Contact Information

Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, 4 Pionerskaya Street, Korolev, Moscow Region, 141070, Russia; Tel: (7) 095 513 5000; Fax: (7) 095 187 0322; Email: corp@tsniimash.ru; Web site: http://www.tsniimash.ru/Centers/AeroGasDynam.

U-22 and U-22M Gasdynamic Vacuum Chamber,
Central Research Institute for Machine Building (TsNIIMASH),
AeroGasdynamics Center,
Korolev, Moscow Region, Russia

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, Korolev, Moscow Region, Russia	6 m (long), 2.5 m (diameter), 1.2 m (nozzle exit diameter)	250 to 1,000 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	2, 3, 4, 6, 8, 10 Mach	0.5 to 200
U-306-3 Hypersonic Wind Tunnel		**Dynamic Pressure**
	Cost	0.009 to 0.3 Mpa
		Stagnation Pressure
	Operational Status	
	Active as of February 2007.	

Testing Capabilities

Blowdown; 0.5 sec to 10 min runtime.

Data Acquisition

Current Programs

Aerodynamic forces/moments while simulating engine jets and model-element separation; local loads/pressure distributions; surface heat-flux/temperature distributions; optical flow characteristics; operational characteristics of vehicle elements and large-scale models and different design intakes; gasdynamic parameters within scramjet combustion chambers; balance, kinematic, drainage-thermal, free-flight, jet, thermal, and optical tests.

Date of Construction/Planned Improvements

1991 (commenced operation).

User Fees

Contact Information

Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, 4 Pionerskaya Street, Korolev, Moscow Region, 141070, Russia; Tel: (7) 095 513 5000; Fax: (7) 095 187 0322; Email: corp@tsniimash.ru; Web site: http://www.tsniimash.ru/Centers/AeroGasDynam.

U-306-3 Hypersonic Wind Tunnel,
Central Research Institute for Machine Building (TsNIIMASH),
AeroGasdynamics Center,
Korolev, Moscow Region, Russia

Installation Name	Test Section Size	Temperature Range
Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, Korolev, Moscow Region, Russia	0.445 x 0.575 x 0.730 m³; 0.35 m, 0.276 m (nozzle exit diameters)	493 to 923 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	6, 7, 8, 9.5 Mach	7.0 to 70
U-6 Variable Density Hypersonic Wind Tunnel		**Dynamic Pressure**
	Cost	0.01 to 0.13 Mpa
		Stagnation Pressure
	Operational Status	
	Active as of February 2007.	

Testing Capabilities

Orientation mechanism for setting models at angles of attack between -18° and +10°; sideslip angles between ±20°; mechanism for simulating stage separation; mechanism for model injection into and out of flow field; air and gas supply system; optical-physical investigation system; 30 to 60 sec runtime.

Data Acquisition

Information-measurement complex for data acquisition and processing.

Current Programs

Aerodynamic forces and moments; static and dynamic stability characteristics; pressure distributions; heat-exchange characteristics; aerogasdynamic characteristics; stage/element separation processes with engine and control-jet simulations; flexible-joint, configuration-element parameters (e.g., parachute descent of vehicles); balance, kinematic, drainage, free-flight, fluctuation, jet, acoustic, thermal, and optical tests.

Date of Construction/Planned Improvements

1953 (commenced operation).

User Fees

Contact Information

Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, 4 Pionerskaya Street, Korolev, Moscow Region, 141070, Russia; Tel: (7) 095 513 5000; Fax: (7) 095 187 0322; Email: corp@tsniimash.ru; Web site: http://www.tsniimash.ru/Centers/AeroGasDynam.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, Korolev, Moscow Region, Russia	5 m (length), 1.4 m (diameter)	1,000 to 3,500 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	10 to 20 Mach	0.5 to 50
U-7 Hypersonic Piston Gasdynamic Unit		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Active as of February 2007.	

Testing Capabilities

High-driving gas parameters (i.e., P = 2 x 108 Pa and T0 = 2,000 - 4,000 K and 10,000 K, with monatomic and 2-phase gases); working fluids: air, N2, He, Ar, Xe, CO2, hydrocarbon mixture; combustion automated; angle-of-attack range ±15°; angle-of-rotation range ± 85°.

Data Acquisition

Balance, kinematic, drainage, thermal-acoustic, and optical tests on following equipment: Mach number and Reynolds number regulator/controller; spatial-orientation mechanism for setting model; placement mechanism to position model elements during separation simulations; electro- and optical-physical measurement systems.

Current Programs

Aerodynamic and heat-exchange problems associated with large-scale models while simulating engine operations and planetary atmospheric environments; vehicle-dynamic characteristics; kinetic parameters associated with oxidation of natural gas and other hydrocarbons at pressures < 108 Pa; aerogasdynamic acoustic and thermal loads during separation.

Date of Construction/Planned Improvements

1959 (commenced operation); 1984 (upgrade).

User Fees

Contact Information

Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, 4 Pionerskaya Street, Korolev, Moscow Region, 141070, Russia; Tel: (7) 095 513 5000; Fax: (7) 095 187 0322; Email: corp@tsniimash.ru; Web site: http://www.tsniimash.ru/Centers/AeroGasDynam.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Institute of Theoretical and Applied Mechanics (ITAM), Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia	0.3 x 0.3 m² and 0.6 x 0.6 m²; 300 mm, 600 mm (nozzle diameters)	2,500 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	8 to 14 M (300 mm nozzle); 14 to 20 (600 mm nozzle)	15 to 60 (300-mm nozzle); 20 to 25 (600-mm nozzle)
AT-303 Hypersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of December 2006.	3,000 atm

Testing Capabilities

Adiabatic compression with pressure multipliers; full-scale simulation of Reynolds numbers in hypersonic range; high-pressure test gas in the settling chamber; very pure flow, free of working gas dissociation; chemical and mechanical admixtures; test gases: air, nitrogen, CO, etc.; Eiffel chamber, up to 500 m/sec runtime.

Data Acquisition

Forces and moments; pressure; heat fluxes; high-speed filming; infrared imaging using single-component strain-gauge balance +/- 500 N; 20 fast-response pressure gauges simultaneously; 20 heat-flux gauges simultaneously; shadowgraph with 230 mm test-field diameter.

Current Programs

Fundamental and applied problems related to provision of long-time flight of scramjet-powered hypersonic flying vehicles in Earth's atmosphere; complicated gas/thermal-dynamic processes; aerodynamic test programs when Mach= 8 to 20 at high Reynolds values; simulation of scramjet under conditions of pure air flow; potential partners: Aerospatiale, ONERA, Dassault Aviation (France), DLR (Germany), ESTEC/ESA (Netherlands).

Date of Construction/Planned Improvements

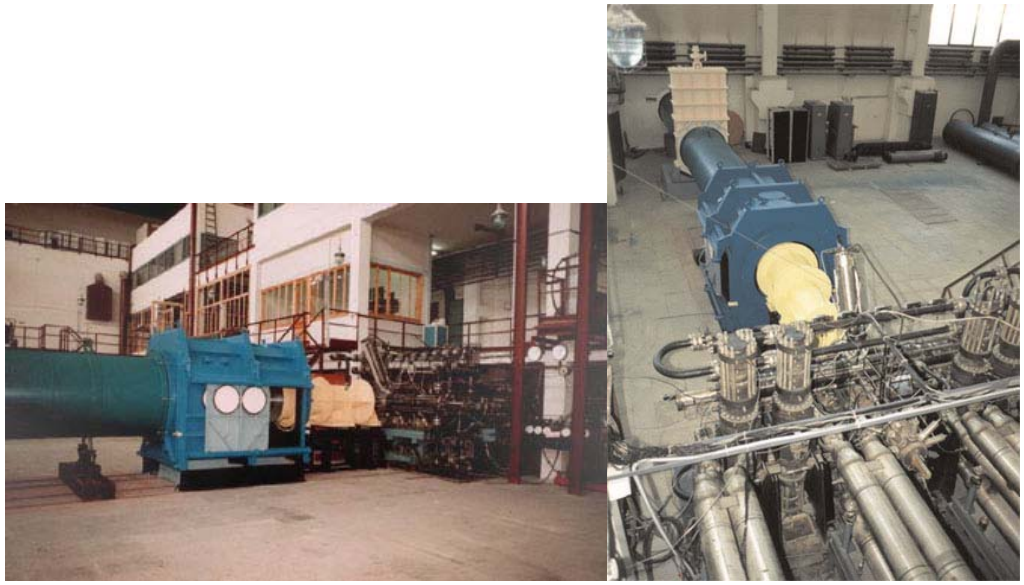
2000 (commissioned).

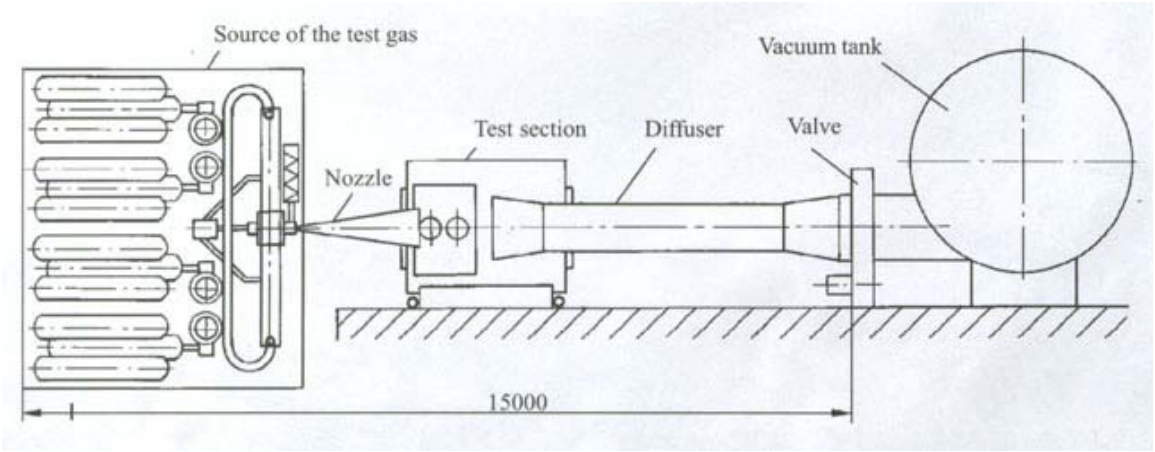
User Fees

US$3,000 to 6,000/wk.

Contact Information

V.I. Zvegintzev, Khristianovich Institute of Theoretical and Applied Mechanics SB RAS, Institutskaya str., 4/1, Novosibirsk 630090, Russia; Tel (General): (7) 383 330-34-30; Tel (Zvegintzev): (7) 383 330-18-95; Fax (General): (7) 383 330-72-68; Email: patent@itam.nsc.ru; Email (Zvegintsev): zvegin@itam.nsc.ru; Web site: http://www.itam.nsc.ru/eng/applications/at-303.htm.





AT-303 Hypersonic Wind Tunnel,
Institute of Theoretical and Applied Mechanics (ITAM), Russian Academy of Sciences—Siberia Branch
Novosibirsk, Russia

Installation Name	Test Section Size	Temperature Range
Institute of Theoretical and Applied Mechanics (ITAM), Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia	600 mm x 600 mm x 2.5 m	Up to 700 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	1.8 to 6.0 Mach; up to Mach 4 (cold air), Mach 5 and 6 (heated air)	6
T-313 Hypersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of 2003.	12 atm

Testing Capabilities

Automated control system for drag pressure in settling chamber; gas chamber has total vol 5,000 m³ and pressure P0=20 atm; simultaneous tests of 2 models available.

Data Acquisition

Weighting, pressure, oil-film visualization, shadowgraphy, Schlieren method, laser-knife method, interferometry, hot-wire anemometry; uses 4-component mechanical balance; set of strain-gauge balances for various loads; IBV-451 optical device; automated real-time data acquisition and processing system; CAMAC, IBM/PC-386, and 486; video available.

Current Programs

Complex turbulent flow and shock interaction and bonding; transition from regular reflection to Mach reflection. Customers: Tupolev design bureau, NPO "Energy", TsIAM, NPO "Krasnaya Zvezda", DLR, Aerospatiale, Parachute Research Institute. Potential partners: Aerospatiale, ONERA, Dassault Aviation (France), DLR (Germany), ESTEC/ESA (Netherlands), CIRA (Italy).

Date of Construction/Planned Improvements

User Fees

US$850/run; US$17,000 to 20,000/wk; actively soliciting commercial customers.

Contact Information

Khristianovich Institute of Theoretical and Applied Mechanics SB RAS, Institutskaya str., 4/1, Novosibirsk 630090, Russia; Tel: (383) 330-34-30; Fax: (383) 330-72-68; Email: patent@itam.nsc.ru; Zvegintzev Valery Ivanovich, Tel: (383) 330-18-95; Email: zvegin@itam.nsc.ru.

T-313 Hypersonic Wind Tunnel,
Russian Academy of Sciences—Siberia Branch,
Institute of Theoretical and Applied Mechanics (ITAM),
Novosibirsk, Russia

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Institute of Theoretical and Applied Mechanics (ITAM), Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia	0.45 x 0.4 x 0.5 m³	2,500 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	1,450 to 2,200 m/sec	Up to 1
T-327 Hypersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of 2003.	200 atm

Testing Capabilities

Fitted with graphite heater; conical nozzle in open-jet configuration; exhaust to vacuum tank; rectangular vacuum chamber; 40 sec runtime.

Data Acquisition

IBM PC/AT 386; 3-component strain-gauge balance; infrared camera system; optical system for average and pulsation density measurements based on nitrogen electron-beam florescence.

Current Programs

Forces and moments; heat transfer; Pitot pressure; density distribution; density pulsations; electron-optic visualization; tests with blow-out gas from model's surface; test models with surface cooling; previous customers: NPO Molniya, Energiya; tested Buran space shuttle.

Date of Construction/Planned Improvements

User Fees

Staff: US$250/wk; tunnel: US$400/wk.

Contact Information

Boris Sapogov, Khristianovich Institute of Theoretical and Applied Mechanics SB RAS, Institutskaya str., 4/3, Novosibirsk 630090, Russia; Tel (General): (7) 383 2 35-07-78; Tel (Sapogov): (7) 383 2 35 35 28; Fax (General): (7) 383 2 35 22 68; Email: admin@itam.nsc.ru; Web site: http://www.itam.nsc.ru/ENG/Truba/T-327.html.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Institute of Theoretical and Applied Mechanics (ITAM), Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia	500 mm (diameter)	290 K (stagnation)
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	4 to 8 Mach	2.4 (Mach 3); 1.5 (Mach 4)
Tranzit-M Short Duration Wind Tunnel		**Dynamic Pressure**
	Cost	20,000 (Mach 3); 8,000 Pa (Mach 4)
		Stagnation Pressure
	Operational Status	10^5 Pa

Testing Capabilities

Assymetric contoured nozzle; removable inserts provide different Mach values; facility based on set of high-pressure chambers; includes main settling chamber, additional settling chamber, and 2 high-pressure vessels connected to the main settling chamber; air gathered in settling chamber at 200 bar; before run main settling chamber and 2 high-pressure vessels filled by cold-working gas and 4 electric heaters inside vessels switched on; 0.1 to 0.2 sec runtime.

Data Acquisition

Current Programs

Aerodynamic testing at high-level Reynolds numbers.

Date of Construction/Planned Improvements

2000 (upgrade with new settling chamber).

User Fees

Contact Information

Khristianovich Institute of Theoretical and Applied Mechanics SB RAS, Institutskaya str., 4/1, Novosibirsk 630090, Russia; Tel: (7) 383 330-34-30; Fax: (7) 383 330-72-68; Email: patent@itam.nsc.ru; Web site: http://www.itam.nsc.ru/eng/applications/.

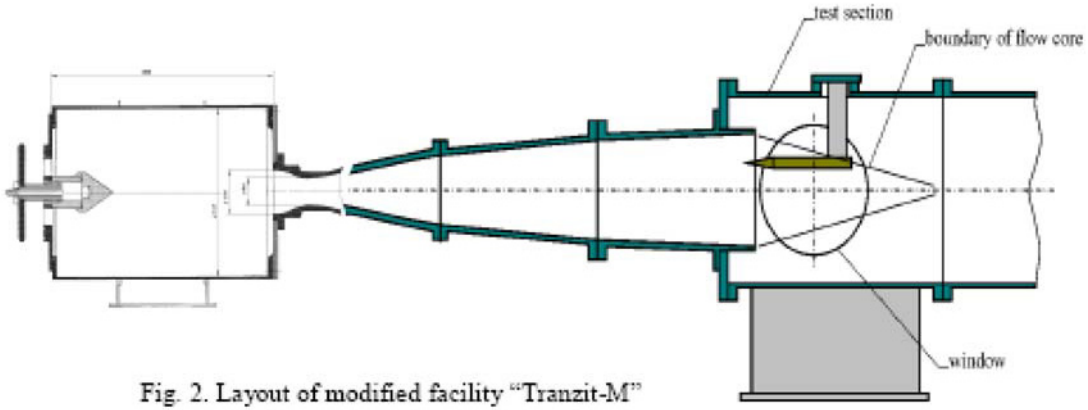


Fig. 2. Layout of modified facility "Tranzit-M"

Tranzit-M Short Duration Wind Tunnel,
Institute of Theoretical and Applied Mechanics (ITAM),
Siberian Branch of the Russian Academy of Sciences,
Novosibirsk, Russia

Wind Tunnels of the Eastern Hemisphere

Hypersonic **Russia**

Installation Name	Test Section Size	Temperature Range
Moscow State University, Institute of Mechanics, Experimental Aerodynamic Complex, Moscow, Russia	0.2 m (diameter)	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name	5 to 10 Mach	0.02 to 12.0
GAU Hypersonic Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of February 2007.	

Testing Capabilities

Eiffel chamber.

Data Acquisition

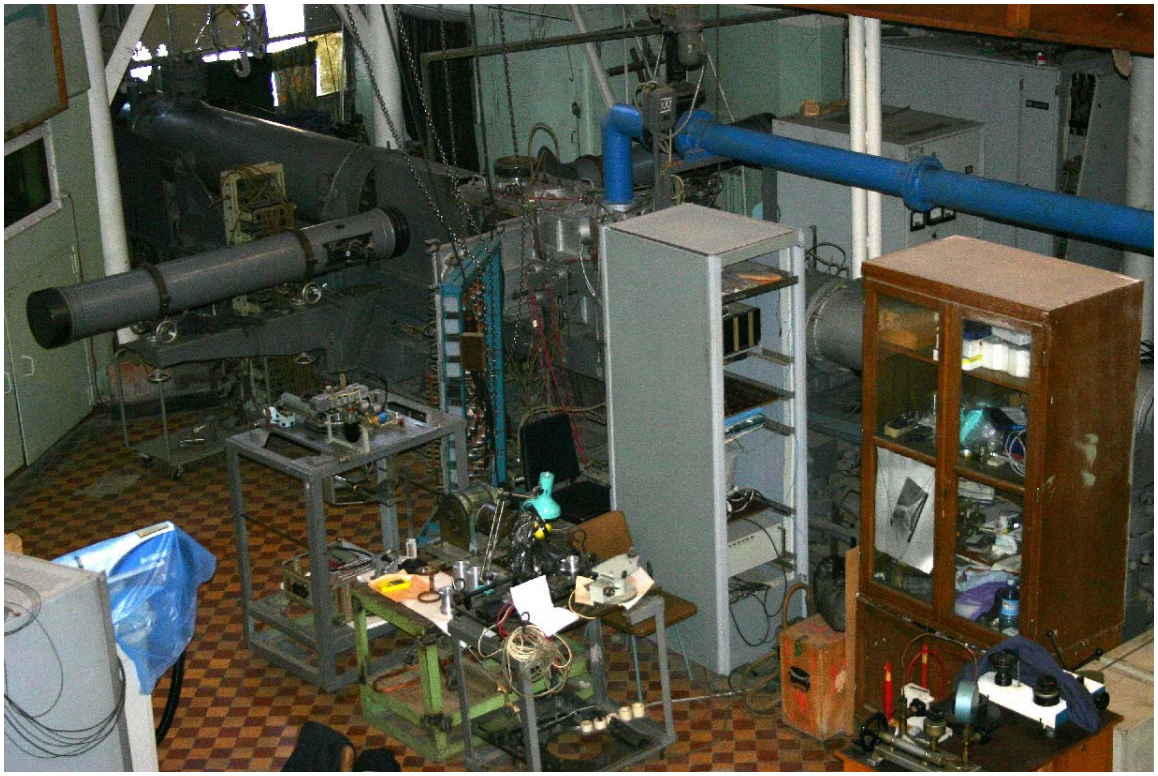
Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

Yu. M. Okunev, Institute Director, Institute of Mechanics, Moscow State University, Michurinskii prospekt, d. 1, Moscow, Russia 119192; Tel: (7) 095 939-3121; Fax: (7) 095 939-0165; Email: common@imec.msu.ru; Web site: http://www.imec.msu.ru/pages/02-10-10-1374853.html (in Russian).



GAU Hypersonic Wind Tunnel,
Moscow State University,
Institute of Mechanics,
Experimental Aerodynamic Complex,
Moscow, Russia

Wind Tunnels of the Eastern Hemisphere

Unknown **Australia**

Installation Name	***Test Section Size***	***Temperature Range***
Royal Melbourne Institute of Technology (RMIT) University, School of Science, Engineering, and Technology, Department of Aerospace and Aviation Engineering, Wackett Centre, Bundoora, Victoria, Australia		
	Speed Range	***Reynolds Number (x 10^6)***
Facility Name		
Small Flow Visualisation Wind Tunnel		***Dynamic Pressure***
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of April 2007.	

Testing Capabilities

Data Acquisition

Current Programs

Flow visualization.

Date of Construction/Planned Improvements

User Fees

Contact Information

Dr Arvind Sinha (Contact), Wackett Aerospace Centre, RMIT, GPO Box 2476V, Melbourne, Victoria 3001 Australia; Tel (Sinha): (61) 3 9645 4541; Email (Sinha): arvind.sinha@rmit.edu.au; Web site: http://www.rmit.edu.au/browse;ID=eby2kw0ry2zw.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Unknown **China**

Installation Name	Test Section Size	Temperature Range
Beijing (Beihang) University of Aeronautics and Astronautics (BUAA), Fluid Mechanics Laboratory, Beijing, China		
	Speed Range	Reynolds Number (x 10^6)
Facility Name		
Wind Tunnel		Dynamic Pressure
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Laboratory area = 2,300 m² with 4 low-speed, 2 high-speed, 3 1.5 m, low-turbulence wind tunnels; Asia's largest demonstration circulating multipurpose water tunnel.

Data Acquisition

Current Programs

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

Date of Construction/Planned Improvements

2000 (constructed)

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 or 82317114; Web site: http://www.buaa.edu.cn.

NO IMAGE AVAILABLE

Installation Name	Test Section Size	Temperature Range
Northwestern Polytechnical University (NWPU, NPU), Xi'an, Shaanxi Province, China		
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name		15
NF-6 High Speed Continuous Pressurized Wind Tunnel		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

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

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

2002 or 2005 (constructed); construction underway of lower-temperature facility with Reynolds numbers that will reach 23, fully covering range of 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, Shaanxi Province, 710072, China; Tel: (86) 29 8492222; Fax: (86) 29 8491000; Web site: http://www.nwpu.edu.cn.

NO IMAGE AVAILABLE

Installation Name	*Test Section Size*	*Temperature Range*
Northwestern Polytechnical University (NWPU, NPU), Xi'an, Shaanxi Province, China		
	Speed Range	*Reynolds Number (x 10^6)*
Facility Name		
Small Scale Adaptive Wall Research Wind Tunnel		*Dynamic Pressure*
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

2002 or 2005 (constructed).

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 IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Unknown **China**

Installation Name	*Test Section Size*	*Temperature Range*
Northwestern Polytechnical University (NWPU, NPU), Xi'an, Shaanxi Province, China		
	Speed Range	*Reynolds Number (x 10^6)*
Facility Name		
Small Scale Low Vortex Research Wind Tunnel		*Dynamic Pressure*
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of November 2005.	

Testing Capabilities

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

2002 or 2005 (constructed).

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 IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Unknown **India**

Installation Name	Test Section Size	Temperature Range
National Aerospace Laboratories (NAL), Nilakantan National Trisonic Aerodynamic Facilities (NTAF), Bangalore, India	0.3 x 0.3 m²	
	Speed Range	**Reynolds Number (x 10^6)**
Facility Name		
H3		**Dynamic Pressure**
	Cost	
		Stagnation Pressure
	Operational Status	

Testing Capabilities

Square test section.

Data Acquisition

Current Programs

Tests for Vikram Sarabhai Space Centre (VSSC).

Date of Construction/Planned Improvements

User Fees

Contact Information

Dr. A.R. Upadhya (Director), National Aerospace Laboratories, Post Bag No.1779, Kodihalli, Bangalore-560 017, India; Tel: (80) 25270584 or 25265579; Fax: (80) 25260862 or 25270670; Email: director@css.nal.res.in; Web site: www.nal.res.in.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Unknown **Iran**

Installation Name	*Test Section Size*	*Temperature Range*
K.N. Toosi University of Technology, Faculty of Aerospace Engineering, Tehran, Iran		
	Speed Range	*Reynolds Number (x 10^6)*
Facility Name		
Wind Tunnel		*Dynamic Pressure*
	Cost	
	Operational Status	*Stagnation Pressure*

Testing Capabilities

Data Acquisition

Current Programs

Date of Construction/Planned Improvements

User Fees

Contact Information

J. Roshanian (Associate Professor), K.N. Toosi University of Technology, Faculty of Aerospace Engineering, 322 Mirdamad Ave. West, 19697, P.O. Box: 15875-4416, Tehran, Islamic Republic of Iran 19697-64499; Tel: (98) 21 8888 2991-3; Fax: (98) 21 8879 7469; Email (Roshanian): roshanian@kntu.ac.ir; Web site: http://www.kntu.ac.ir.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Unknown **Pakistan**

Installation Name	Test Section Size	Temperature Range
Defence Science and Technology Organization (DESTO), Rawalpindi, Pakistan		
	Speed Range	Reynolds Number (x 10^6)
Facility Name		
Wind Tunnel Facility		Dynamic Pressure
	Cost	
		Stagnation Pressure
	Operational Status	
	Presumed active as of 2005.	

Testing Capabilities

Data Acquisition

Current Programs

Aerodynamic studies of various projectiles.

Date of Construction/Planned Improvements

User Fees

Contact Information

Wind Tunnel Facility, Defence Science and Technology Organization, Defence Production Division, Ministry of Defense, Chaklala Cantonment, Rawalpindi 46200 Pakistan; Tel: (92) 51 9280507; Fax: (92) 51 9280502; Email: hq@desto.sdnpk.undp.org.

Wind Tunnel Facility,
Defence Science and Technology Organization (DESTO),
Rawalpindi, Pakistan

Wind Tunnels of the Eastern Hemisphere

Unknown **Pakistan**

Installation Name	*Test Section Size*	*Temperature Range*
National Defense Complex (NDC), Aerodynamics and Structural Analysis Center (ASAC), Islamabad, Pakistan		
	Speed Range	*Reynolds Number (x 10^6)*
Facility Name		
Wind Tunnel Complex		*Dynamic Pressure*
	Cost	
		Stagnation Pressure
	Operational Status	

Testing Capabilities

Data Acquisition

Current Programs

Missile development.

Date of Construction/Planned Improvements

User Fees

Contact Information

National Defence Complex (NDC), P.O. Box 2216, Islamabad, Pakistan; Tel: (92) 51 9266018 or 9266142; Fax: (92) 51 282696; Web site: http://www.depo.org.pk/products/ndc/index.htm.

NO IMAGE AVAILABLE

Wind Tunnels of the Eastern Hemisphere

Unknown **Ukraine**

Installation Name	*Test Section Size*	*Temperature Range*
Antonov Aeronautical Scientific and Technical Complex, Kiev, Ukraine		
	Speed Range	*Reynolds Number (x 10^6)*
Facility Name		
AT-1 Wind Tunnel		*Dynamic Pressure*
	Cost	
	Operational Status	*Stagnation Pressure*

Testing Capabilities

Data Acquisition

Current Programs

Testing of Antonov aircraft; evidence, but not specific information, of other wind tunnels at Antonov.

Date of Construction/Planned Improvements

User Fees

Contact Information

Antonov Aeronautical Scientific and Technical Complex, 1,Tupolev Str., Kiev, 03062,Ukraine; Tel.: (380 44) 454 31 49 and 442 60 75; Fax: (380 44) 442 41 44 and 442 70 98; Email: info@antonov.com; Web site: http://www.antonov.com.

AT-1 Wind Tunnel,
Antonov Aeronautical Scientific and Technical Complex,
Kiev, Ukraine

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Index by Country—Eastern Hemisphere

Index by Speed—Eastern Hemisphere

Speed	Country	Installation Name	Facility Name	Page No.
Subsonic (cont)	**Germany (cont)**	Institute for Aerodynamics and Gas Dynamics (IAG), University of Stuttgart, Stuttgart, Germany	Laminar Wind Tunnel (LWK)	75
			Model Wind Tunnel	77
		Technical University of Darmstadt, Darmstadt, Germany	2.2 x 2.9 m Subsonic Wind Tunnel	79
	India	Council of Scientific and Industrial Research (CSIR), National Aerospace Laboratories (NAL), Nilakantan Wind Tunnel Centre, Bangalore, India	1.2 x 1.2 m Trisonic Wind Tunnel (H1)	81
		Indian Institute of Science, Department of Aerospace Engineering, Bangalore, India	30 x 30 cm Open Circuit Low Speed Tunnel	83
			50 x 50 cm Open Circuit Low Turbulence Tunnel	85
			50 x 540 mm Closed Channel Facility	87
			600 x 600 mm Open Circuit Type Low Speed Wind Tunnel	89
			Elliptical Low Speed Closed Circuit Wind Tunnel	91
			Open Circuit Low Speed Wind Tunnel	93
		Indian Institute of Technology, Department of Aerospace Engineering, Low Speed Aerodynamic Laboratory, Kanpur, India	Boundary Layer Tunnel	95
			Low Turbulence Tunnel	97
			Twin Air or 5D Tunnel	99
		Indian Institute of Technology, Kanpur, India	National Wind Tunnel Facility (NWTF)	101
	Indonesia	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	Indonesia Low Speed Wind Tunnel (ILST)	103
	Iran	Iran Research Organization for Science and Technology (IROST), Tehran, Iran	Subsonic Wind Tunnel	105
		Iran University of Science and Technology (IUS), Mechanical Engineering Department, Aerodynamics Research Laboratory, Tehran, Iran	Closed Circuit Subsonic Wind Tunnel	107
			Three Open Circuit Subsonic Wind Tunnels	109
		Sharif University of Technology, School of Mechanical Engineering, Fluid Mechanics Laboratory, Tehran, Iran	Low Speed Wind Tunnel	111

Speed	Country	Installation Name	Facility Name	Page No.
Subsonic (cont)	**Israel**	Israel Aerospace Industries Ltd., Ben Gurion International Airport, Israel	Low Speed Wind Tunnel (LSWT)	113
		Technion-Israel Institute of Technology, Faculty of Aerospace Engineering, Aerodynamics Laboratory, Haifa, Israel	Open Circuit Continuous Wind Tunnel	115
	Italy	Galleria del Vento, Milan Polytechnic University (GVPM), Milan, Italy	GVPM Subsonic Wind Tunnel	117
		Italian Aerospace Research Center (CIRA), Capua, Italy	Icing Wind Tunnel (IWT)	119
	Japan	Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), Tokyo, Japan	2 x 2 m Low Speed Wind Tunnel	121
			6.5 x 5.5 m Low Speed Wind Tunnel	123
		Kawada Wind Tunnel Research Center, Kawada Industries Inc., Tochigi, Japan	Kawada Wind Tunnel	125
	Korea (South)	Agency for Defense and Development (ADD), Wind Tunnel Testing Laboratory, Taejo, Daejeon, Republic of Korea	Low Speed Wind Tunnel	127
		Chosun University, Department of Aerospace Engineering, Gwangju, Republic of Korea	Closed Circuit Subsonic Wind Tunnel	129
		Chunbuk National University, Department of Aerospace Engineering, Jeonju, Republic of Korea	0.6 m Wind Tunnel	131
		Chunbuk National University, Jeonju, Republic of Korea	Closed Circuit Subsonic Wind Tunnel	133
		Chungnam National University, Department of Aerospace Engineering, Daejeon, Republic of Korea	Aero-Acoustic Wind Tunnel	135
		Hanyang University, Department of Mechanical Engineering, Seoul, Republic of Korea	Small Subsonic Wind Tunnel	137
		Inha University, Department of Aerospace Engineering, Incheon, Republic of Korea	Aerospace Engineering Wind Tunnel	139
		Konkuk University, Department of Aerospace, Seoul, Republic of Korea	Multipurpose Wind Tunnel	141
		Korea Advanced Institute of Science and Technology, Aeronautics Department, Daejeon, Republic of Korea	Low Turbulence Open Circuit Wind Tunnel	143

Speed	Country	Installation Name	Facility Name	Page No.
Subsonic (cont)	**Korea (South) (cont)**	Korea Aerospace Research Institute (KARI), Daejeon, Republic of Korea	4 m Low Speed Wind Tunnel	145
			KARI 1 m Wind Tunnel	147
			KARI Low Speed Wind Tunnel (LSWT)	149
		Korea Air Force Academy (KAFA), KAFA Subsonic Wind Tunnel Laboratory, Choongbuk, Republic of Korea	KAFA Low Speed Wind Tunnel (LSWT)	151
			KAFA Subsonic Wind Tunnel	153
		Kyeongsang National University, School of Mechanical and Aerospace Engineering, Jinjoo, Republic of Korea	Multipurpose Small Wind Tunnel	155
		Pohang University of Science and Technology, Pohang, Republic of Korea	Medium-Sized Subsonic Wind Tunnel	157
			Small Subsonic Wind Tunnel	159
		Pusan National University, Department of Aerospace Engineering, Pusan, Republic of Korea	Subsonic Wind Tunnel	161
		Sejong University, Seoul, Republic of Korea	Small Subsonic Wind Tunnel	163
		Seoul National University, Department of Mechanical Engineering, Seoul, Republic of Korea	Aerospace Engineering Wind Tunnel	165
		Ulsan University, Ulsan, Republic of Korea	Multipurpose Wind/Water Tunnel	167
	Malaysia	Technological University of Malaysia, Faculty of Mechanical Engineering, Aeronautical Laboratory, Johor, Malaysia	UTM Low Speed Wind Tunnel (UTM-LST)	169
	Netherlands	Delft University of Technology (TUDELFT), Delft, The Netherlands	Boundary Layer Wind Tunnel	171
		Delft University of Technology (TUDELFT), Low Speed Laboratory, Delft, The Netherlands	Subsonic Low Turbulence Wind Tunnel	173
		German-Dutch Wind Tunnels (DNW), NOP Business Unit, Emmeloord, The Netherlands	Large Low Speed Wind Tunnel (LLF)	175
			Low Speed Wind Tunnel (LST)	177
	Pakistan	National University of Science and Technology, College of Aeronautical Engineering, Aerodynamics Laboratory, Risalpur, Pakistan	Subsonic Wind Tunnel	179
	Romania	Elie Carafoli National Institute for Aerospace Research (INCAS), Bucharest, Romania	Subsonic Wind Tunnel	181

Speed	Country	Installation Name	Facility Name	Page No.
Supersonic (cont)	**China**	Aerospace Science and Technology Research Center, National Cheng Kung University, Taiwan, China	Transonic Wind Tunnel	273
		China Academy of Aerospace Aerodynamics (CAAA), Beijing, China AKA: Beijing Institute of Aerodynamics (BIA) or 701st Institute of the China Aerospace Science and Technology Corp (CASC)	BIA Trisonic Wind Tunnel FD-06	279
			Supersonic Wind Tunnel	275
			Transonic Wind Tunnel	277
		China Aerodynamics Research and Development Center (CARDC), Mianyang City, Sichuan Province, China	1.2 x 1.2 m Trisonic Wind Tunnel	281
			2.4 m Transonic Wind Tunnel	283
			Low Temperature Compressed Air Transonic Wind Tunnel	285
		Chinese Aerodynamics Research Institute of Aeronautics (CARIA), Harbin, Heilongjiang Province, China	FL-1 Supersonic Wind Tunnel	287
			FL-2 Supersonic Wind Tunnel	289
		Chinese Aerodynamics Research Institute of Aeronautics (CARIA), Harbin, Heilongjiang Province, China (cont)	FL-3 High Speed Air Inlet Test Platform	291
			FL-7 Supersonic Wind Tunnel	293
		Key Laboratory of High-Temperature Gas Dynamics (LHD), Beijing, China	Directly Coupled Supersonic Combustion Test Platform	295
			Tube/Shock Supersonic Wind Tunnel	297
		Nanjing University of Aeronautics and Astronautics (NUAA), Nanjing, Tiangsu Province, China	High Speed Wind Tunnel	299
			Supersonic Wind Tunnel	301
		Northwestern Polytechnical University (NWPU, NPU), Xi'an, Shaanxi Province, China	Small Scale, High Speed Research Wind Tunnel	303
	France	French-German Research Institute of Saint Louis (ISL), Saint Louis, France	S30 Supersonic Wind Tunnel	305
		ONERA French Aeronautics and Space Research Center, Fluid Mechanics and Energetics Branch, Meudon Center, Meudon, France	R1Ch Supersonic Wind Tunnel	307
		ONERA French Aeronautics and Space Research Center, Modane-Avrieux, France	S2Ma Continuous Pressurized Sub/Trans/Supersonic Wind Tunnel	309
			S3Ma Blowdown Pressurized Sub/Trans/Supersonic Wind Tunnel	311

Speed	Country	Installation Name	Facility Name	Page No.
Supersonic (cont)	**Germany**	European Transonic Wind Tunnel (ETW), Cologne, Germany	2 x 2.4 m Cryogenic Wind Tunnel	313
		German-Dutch Wind Tunnels (DNW), Göttingen, Germany	Transonic Wind Tunnel (KRG)	315
			Transonic Wind Tunnel (TWG)	317
	India	Council of Scientific and Industrial Research (CSIR), National Aerospace Laboratories (NAL), Nilakantan Wind Tunnel Centre, Bangalore, India	0.6 x 0.6 m Supersonic Wind Tunnel	319
		Indian Institute of Science, Department of Aerospace Engineering, Bangalore, India	1 x 3 in Blowdown Supersonic Wind Tunnel	321
			5 x 7 in Blowdown Supersonic Wind Tunnel	323
		Indian Institute of Technology, Department of Aerospace Engineering, High Speed Aerodynamics Laboratory, Kanpur, India	Supersonic Blowdown Wind Tunnel	325
		National Aerospace Laboratories (NAL), Nilakantan National Trisonic Aerodynamic Facilities (NTAF), Bangalore, India	0.6 m Transonic Tunnel (H2)	327
	Iran	Imam Hossein University, Tehran, Iran	Trisonic Wind Tunnel	329
		Iran University of Science and Technology (IUS), Mechanical Engineering Department, Aerodynamics Research Laboratory, Tehran, Iran	Supersonic Wind Tunnel	331
	Israel	Technion-Israel Institute of Technology, Faculty of Aerospace Engineering, Aerodynamics Laboratory, Haifa, Israel	10 x 10 cm Supersonic Blowdown Tunnel	333
			30 x 30 cm Supersonic Blowdown Tunnel	335
			Low Turbulence Transonic Tunnel	337
			Supersonic Blowdown Tunnel	339
	Italy	Italian Aerospace Research Center (CIRA), Capua, Italy	PT-1 Transonic Wind Tunnel	341
	Japan	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 Supersonic Wind Tunnel	343
			0.8 x 0.45 m High Reynolds Number Transonic Wind Tunnel	345
			1 x 1 m Supersonic Wind Tunnel	347
		Japan Defense Agency (JDA), Technical Research and Development Institute (TRDI), Tachikawa, Japan	High Altitude Engine Test Facility (ATF)	349
			Trisonic Wind Tunnel	351
		Mitsubishi Heavy Industries Kobe Shipyard and Machinery Works (MHI Kobe), Kobe, Japan	60 cm Trisonic Wind Tunnel	353

Speed	Country	Installation Name	Facility Name	Page No.
Hypersonic (cont)	**Australia (cont)**	University of Queensland, Department of Mechanical Engineering, Centre for Hypersonics, Brisbaine, Australia (cont)	X2 Super Orbital Expansion Tube	445
			X3 Free Piston Driven Expansion Tube	447
	Belgium	Von Karman Institute for Fluid Dynamics (VKI), Saint Genese, Belgium	H-3 Hypersonic Wind Tunnel	449
			Longshot Free-Piston Gun Wind Tunnel	451
	China	China Academy of Aerospace Aerodynamics (CAAA), Beijing, China AKA: Beijing Institute of Aerodynamics (BIA) or 701st Institute of the China Aerospace Science and Technology Corp (CASC)	FD-20 Hypervelocity Conventional Piston-Gun Wind Tunnel	455
			FD-22 Hypervelocity, Longshot Free Piston-Gun Wind Tunnel	457
			Hypersonic Wind Tunnel	453
		Key Laboratory of High-Temperature Gas Dynamics (LHD), Beijing, China	JF-8 Hypersonic Shock Gun Wind Tunnel	461
			JF-10 Oxygen-Hydrogen Detonation-Driven High-Enthalpy Shock Wind Tunnel	459
	France	ONERA French Aeronautics and Space Research Center, Chalais-Meudon, France	R2Ch Hypersonic Wind Tunnel	463
			R3Ch Hypersonic Wind Tunnel	465
			R5Ch Hypersonic Wind Tunnel	467
		ONERA French Aeronautics and Space Research Center, Le Fauga Mauzac Center, Le Fauga Mauzac, France	F4 Arc-Heated, High-Enthalpy, Hypersonic Wind Tunnel	469
		ONERA French Aeronautics and Space Research Center, Modane-Avrieux, France	S4Ma Blowdown Hypersonic Wind Tunnel	471
	Germany	Carolo-Wilhelmina Technical University at Braunschweig, Institute for Fluid Mechanics (ISM), Braunschweig, Germany	Hypersonic Ludwieg Wind Tunnel (HLB)	473
		German-Dutch Wind Tunnels (DNW), Göttingen, Germany	Intermittent Ludwieg Tube Wind Tunnel with two legs (RWG)	475
	India	Indian Institute of Science, Department of Aerospace Engineering, Bangalore, India	200 mm Hypersonic Wind Tunnel	477
			300 x 300 mm Hypersonic Shock Tunnel	479
		Vikram Sarabhai Space Centre (VSSC), Thiruvandrum, Kerala, India	Hypersonic Wind Tunnel (HWT)	481
	Israel	Technion-Israel Institute of Technology, Faculty of Aerospace Engineering, Aerodynamics Laboratory, Haifa, Israel	Arc Plasma Generator (APG)/Hypersonic Wind Tunnel	483

Speed	Country	Installation Name	Facility Name	Page No.
Hypersonic (cont)	**Italy**	Italian Aerospace Research Center (CIRA), Capua, Italy	Scirocco Plasma Hypersonic Wind Tunnel (PWT)	485
	Japan	Japan Aerospace Exploration Agency (JAXA), Institute of Aerospace Technology (IAT), Aerospace Research Center (ARC), Wind Tunnel Technology Center (WINTEC), Tokyo, Japan	0.44 m Hypersonic Shock Wind Tunnel	491
			0.5 m Hypersonic Wind Tunnel	487
			1.27 m Hypersonic Wind Tunnel	493
			High Enthalpy Shock Wind Tunnel (HIEST)	489
	Netherlands	Delft University of Technology (TUDELFT), High-Speed Laboratory, Delft, The Netherlands	Hypersonic Wind Tunnel (HTFD)	495
	Russia	Central Aerohydrodynamic Institute (TsAGI), Zhukovsky, Moscow Region, Russia	IT-2 Impulse Wind Tunnel	497
			SMGDU Hypersonic Wind Tunnel with Magneto-Hydrodynamic Acceleration Flow	499
			T-33 Hypersonic Wind Tunnel	507
			T-113 Hypersonic Wind Tunnel	501
			T-116 Hypersonic Wind Tunnel	503
			T-117 Hypersonic Wind Tunnel	505
			UGSD Hypersonic Wind Tunnel with Adiabatic Gas Compression	509
			VAT-3 Impulse Wind Tunnel	517
			VAT-103 Vacuum Wind Tunnel	511
			VAT-104 High Temperature Wind Tunnel	513
			VAT-105 Hypersonic Wind Tunnel	515
		Central Research Institute for Machine Building (TsNIIMASH), AeroGasdynamics Center, Korolev, Moscow Region, Russia	U-6 Variable Density Hypersonic Wind Tunnel	525
			U-7 Hypersonic Piston Gasdynamic Unit	527
			U-11 Multi-Purpose Piston Gasdynamic Unit	519
			U-22 and U-22M Gas-Dynamic Vacuum Chamber	521
			U-306-3 Hypersonic Wind Tunnel	523
		Institute of Theoretical and Applied Mechanics (ITAM), Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia	AT-303 Hypersonic Wind Tunnel	529

Index of Companies—Eastern Hemisphere

Index of Facilities—Eastern Hemisphere

Index of Schematics—Eastern Hemisphere