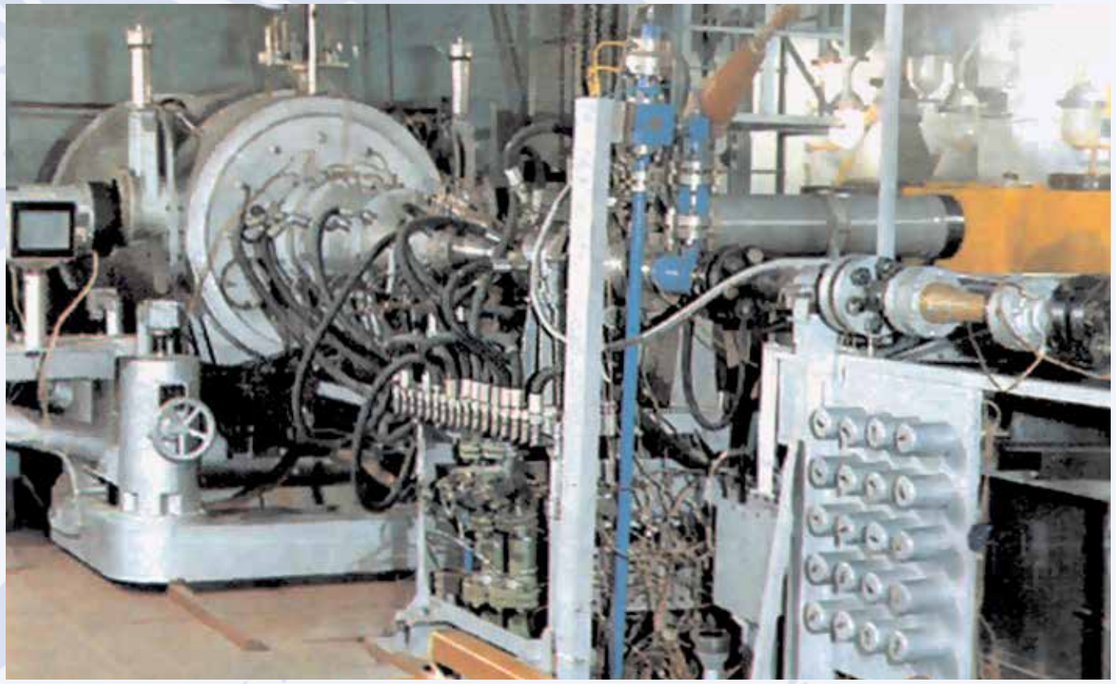
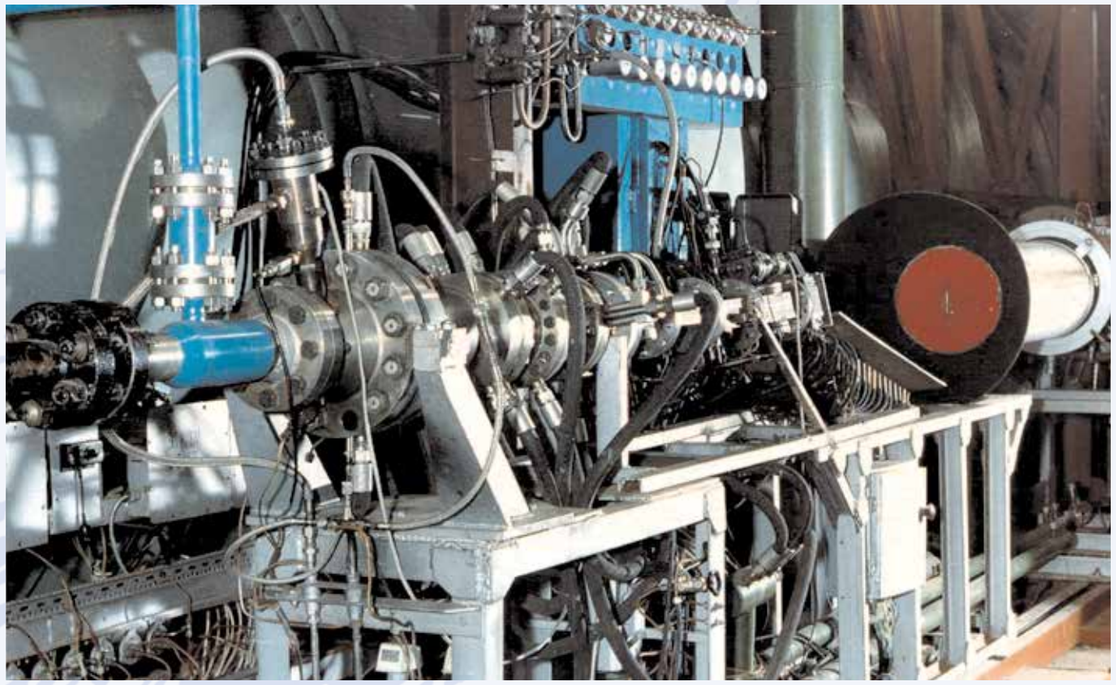
COMPLEX T-131

T-131B Wind Tunnel

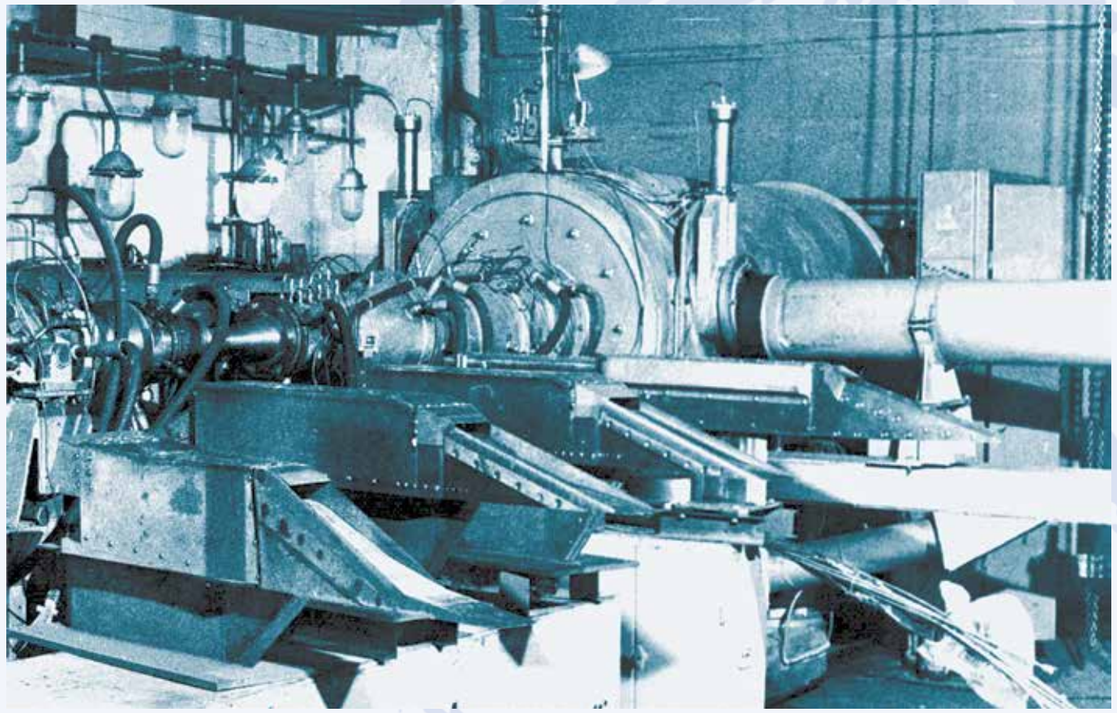


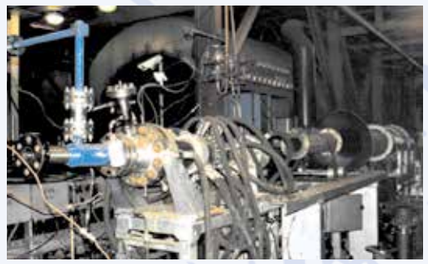
T-131V Aerodynamic Test Bench



T-131 complex is composed of two installations:

- T-131B WT for high speed ramjet engines units testing when free air blow-off;
- T-131V Test Bench for high speed ramjet combustor and its components models testing within the joined air duct.





Main Complex Performance

Investigating:

- High speed ramjet engines physics
- Supersonic and subsonic combustors physics
- Hypersonic air intake behavior
- High speed aircraft models
- Combustion action
- Structural materials

Simulating:

- Full-scale flight with M ..... up to 7
- Flight altitude ..... up to 35 km

Parameters:

- Flow Mach number ..... M = 2...10
- Total pressure ..... up to 11 MPa
- Stagnation temperature ..... up to 2350 K

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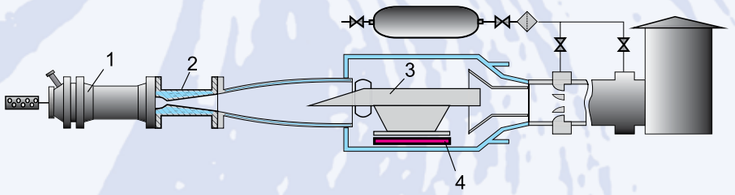
T-131B WIND TUNNEL

General Description

T-131B is a high-speed wind tunnel of a cyclic operation type with open loop and open-type test section. The T-131B is equipped with a four-stage ejector, a gas-flame air-heater and flow oxygen enrichment. Is also equipped with TV and photo cameras, the optical Toepler device for flow visualization, the gauging equipment for pressure, temperature, heat flow and flow rate; the six-component strain gauge balance, the high-efficiency computer system for the data acquisition and processing.



1. Air heater
2. Nozzle
3. Model
4. Balance

Main Technical Parameters

Flow Mach number ..... 5...10
Reynolds number per 1 m ..... up to $10 \cdot 10^6$
Total pressure ..... up to 11 MPa
Dynamic pressure ..... up to 100 kPa
Stagnation temperature ..... up to 2350 K
Run duration ..... 180 s

Test section dimensions:
Diameter ..... 1.2 m
Length ..... 2.3 m
Nozzle diameter ..... 0.4 m
Model length ..... up to 2.0 m

Capabilities

T-131B WT is intended to investigate:

- high speed ramjet models (inlet, combustion chamber, and nozzle) in free flow;
- thermo-chemical conversion of hydrocarbon fuels;
- various fuels mixing and combustion in supersonic and subsonic flows;
- external surfaces burning;
- jet engine inlets;
- materials and integral units strength.

Technological Advantages

- Flow parameters simulation in free jet corresponding to aircraft flight speed at M = 5...7.
- Investigating operation processes in jet engines components under joint action of inlet and combustion chamber when burning.
- Testing the ramjet engine models.

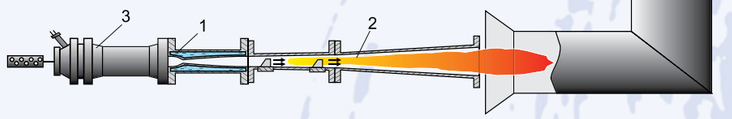
Application

The T-131B WT is being used to investigate the high speed ramjet models and engine units.

T-131V AERODYNAMIC TEST BENCH

General Description

T-131V Aerodynamic Test Bench is intended to investigate the operation processes in high speed jet engines combustion chambers. The tests are performed by the method of adjoined air ducting with gas-flame fore-heating and flow oxygen enrichment. The Test Bench is equipped with measuring system, instrumentation and gauging equipment for pressure, temperature and heat flow, gas and liquid consumption, optical Toepler device for flow visualization, TV and photo cameras and rapid videorecording system, thermal IR imager, thermal near-IR imager. The tests are performed when using the optical diagnosis techniques (emission spectroscopy, laser absorption spectroscopy, laser cutter and laser induced fluorescence).



1. Nozzle
2. Combustion chamber
3. Air heater

Main Technical Parameters

Flow Mach number ..... ≤ 4.0
Reynolds number per 1 m ..... up to $10 \cdot 10^6$
Total pressure ..... up to 11 MPa
Stagnation temperature ..... up to 2350 K

Test section dimensions (nozzle section):
Rectangular ..... 0.1×0.1, 0.04×0.1, 0.03×0.1 m
Round ..... 0.074 m, 0.148 m, 0.1 m
Model length ..... up to 3 m

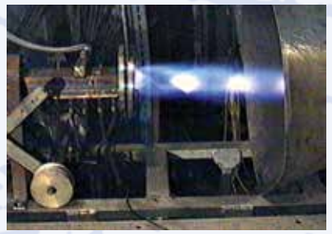
Capabilities

T-131V Aerodynamic Test Bench makes it possible to perform:

- investigating and debugging the operation processes for ramjet engine models;
- investigating different type fuel carburetion and burning in subsonic and supersonic flows;
- investigating the thermo-chemical conversion of hydrocarbon fuel;
- investigating the burning processes for the aircraft power plant bottom part;
- testing the heat-proofing materials and the structural materials;
- testing the heat-proofing systems for propulsion and aircraft structures.

Technological Advantages

- Procurement of high enthalpy air fluxes, which simulate the flow parameters (pressure, stagnation temperature, M-number) when at high speed jet engine combustion chamber input with keeping the free oxygen level within the flow, which corresponds to the oxygen level within the air;
- Testing when the gaseous hydrogen supply, when the liquid and gaseous hydrocarbon fuels, when the pyrolysis products and the hydrocarbon fuel conversion and when the solid fuels.



Application

T-131V Aerodynamic Test Bench is used to investigate the ramjet engine combustion chambers, rocket-ramjet engines, the detonating processes in combustion chambers, the heat-proofing materials.