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THE STUDIES OF CONSTRUCTION ELEMENTS OF SCRAMJET ENGINE CONDUCTED BY ON UNIVERSAL MODEL AERODYNAMIC FACILITY

Eremkin I.V., Kiktev S.I., Shirokov I.N.
Moscow Aviation Institute (National Research University)
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ABSTRACT

Aerodynamic tunnels is widely used for study the physical and mathematical models of behavior of construction elements in a supersonic flow. This article provide a brief review about tests, which conducted in Moscow Aviation Institute.

1 AERODYNAMIC TUNNEL

In the Moscow Aviation Institute (MAI), tests are carried out on universal model aerodynamic facility (UMAF). The main advantage of UMAF – simple design and low power consumption. This allows use the plant both for scientific research in the aerodynamic laboratories and for training students.

Installation (Fig. 1) provides the opportunity to conduct tests in the range of gas flow speed M = 2...7, with the ability to heat flow up to 800 K. Time operation of the plant is 1...2 s. Formation of the flow performed through the use of accumulated gas in the working balloons.

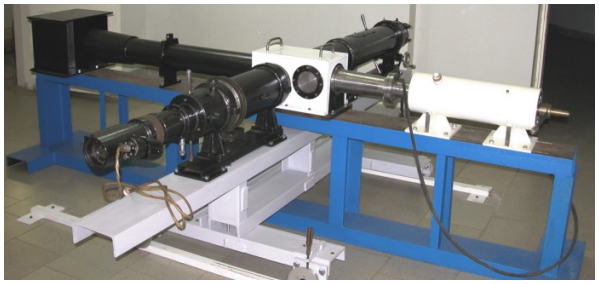

Fig. 1 Universal model aerodynamic facility

Students conduct in the laboratory works an optical observation of the formation and behavior of shock waves at supersonic speeds of the airflow, are measured total and static pressure, speed and temperature of the flow. Work is underway on the development and application of plasmatron to improve air-heating system, instead of the heater with nichrome filament yarns.

2 ONGOING RESEARCH

Postgraduate students and staff of the Institute carries out research at the facility.

An experimental mixing chamber for the study of the various interactions of supersonic gas flows with subsonic combustion flows of natural gas or solid fuel.

It is conducted the studying of mixing transverse and longitudinal gas-dynamic jets in the nozzle with new geometric shape. Measurement of main parameters carried out with help surface pressure sensors and pitot tubes arranged in the gas stream. Evaluation of propagation of jets in the area of their intersection and at the nozzle exit with the help of optical detecting methods is performed.

Studies are under new design of two position nozzle block, in the supercritical region which the air is injected. This approach allows optimizing the operating modes of the nozzle unit and reduce its overall dimensions.

Is created methods of an express analysis of the data obtained during the registration of the results of experiments in the form of color pictures. This approach can significantly reduce the time to interpret the results of experiments and to study further the structure of the gas flow.

3 CONTACT AUTHOR EMAIL ADDRESS

mailto: Igor_Shirokov@hotmail.com;
horizont62@ya.ru

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