HEXAFLY-INT FACILITY MODULE TESTING IN HIGH-ENTALPY FLOW

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In the project HEXAFLY a large-scale model of a high-speed civil aircraft on hydrogen fuel was proposed [1-2]. The concept of this model formed the basis of the HEXAFLY-INT project [3]. The view of the investigated aircraft is shown in Fig. 1. This project involves the Central Institute of Aviation Motors (CIAM), Moscow, Russia, in the part of preparing, conducting and analyzing the ground tests of the facility module. The geometry of the facility module (Fig. 2) differs from the original one in that the facility module has the intake of a simplified configuration. The facility module has two fuel supply zones, one at the entrance to the inner flow path, the other in the middle of the expanding combustion chamber.

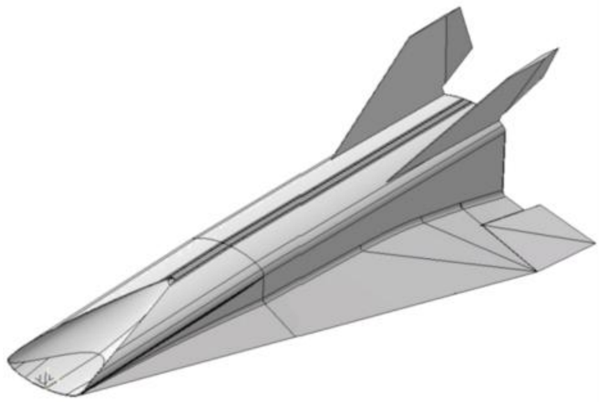

Fig. 1. External view of HEXAFLY-INT model

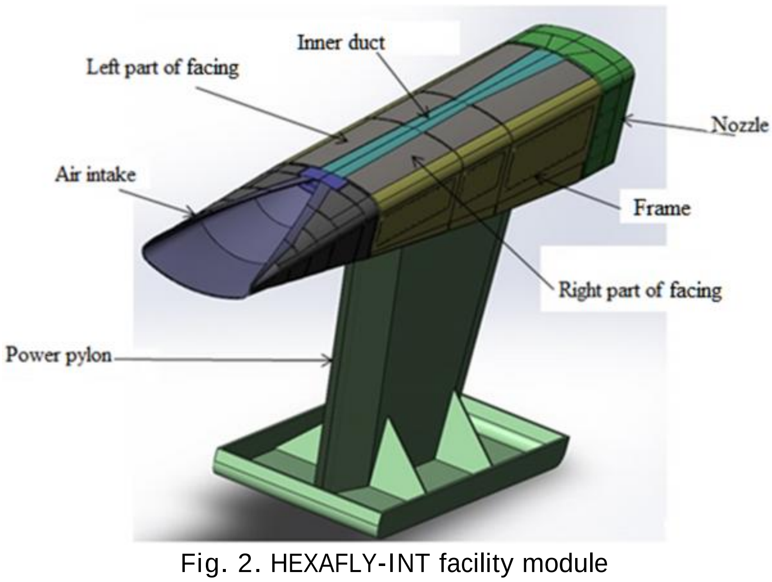

Fig. 2. HEXAFLY-INT facility module

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The tests were conducted to demonstrate the positive aeropropulsive balance of the facility module and to evaluate the efficiency of the working process in the combustion chamber. Also, the tests made it possible to evaluate the aerodynamic forces acting on the apparatus. The facility module was installed on the load-testing device of the facility which allows to determine the thrust and drag characteristics of the facility module. The module was equipped with static pressure sensors for analyzing the working process inside the module's flow path.

During the tests, the operating mode of the vitiation heater was p0 = 62-65 bar and T0= 2300 K, which simulates the flight at a speed corresponding to the Mach number M = 7,5. During the test, the equivalence ratio ER and the percentage of fuel supply to the first and second fuel supply zones were varied. A positive aeropropulsive balance was demonstrated at ER = 1.58 - 1.82. At the same time, it is shown that the limiting fuel mass-flow rate through the first fuel supply zone was 18 g/s. When this value is increased, the intake was unstarted. In Fig. 3 shows the dependence of the force acting on the facility module integrated with the power pylon versus time for the variant ER = 1,82.

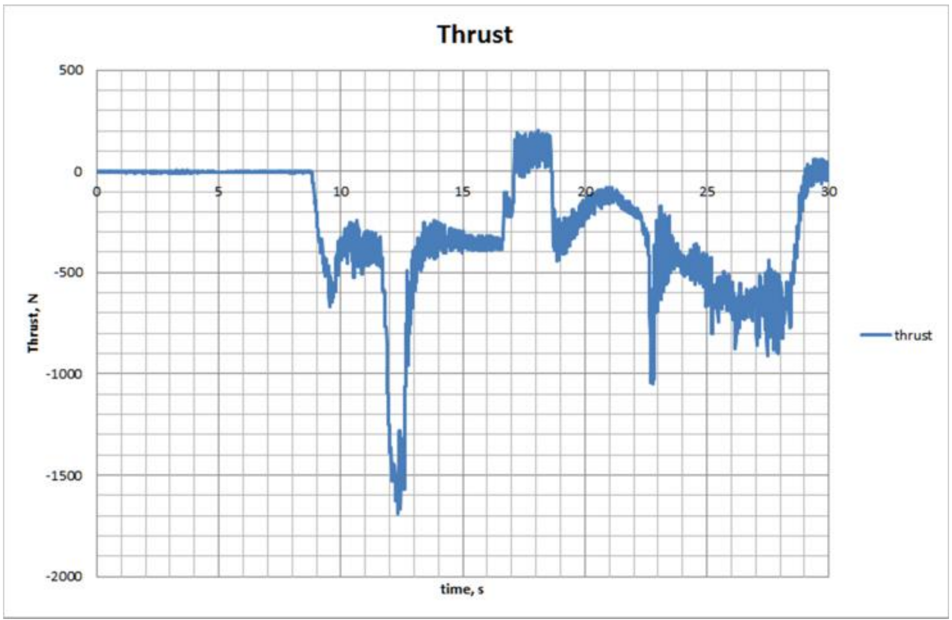

Fig. 3. The dependence of the force acting on the facility module integrated with the power pylon versus time

Thus, the principle possibility of providing the aeropropulsive balance of the proposed engine concept was demonstrated. The limits of the combustion chamber operability depending on ER and the fuel supply strategy in high-enthalpy flow conditions were determined.

Acknowledgments

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References

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