SELECTION OF COMPOSITION AND OPERATION MODE OF PROPULSION SYSTEM FOR THE SUPERSONIC AIRCRAFT

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Development of passenger aircraft that allow supersonic transocean flights is one of the promising directions in aviation again [1, 2]. Supersonic flight can be provided by various composition of the propulsion system (PS). The method of choosing composition and operation mode of propulsion, operation mode of aircraft with the supersonic cruising speed is presented in the work [3].

On the basis of the proposed method for the specified aircraft and flight profile, the sums of the relative masses of fuel and propulsion system were calculated for various PS compositions $\left(\bar{m}_f + \bar{m}_{PS}\right)$. Seven of the candidate PS for the supersonic aircraft were considered:

- turbojet engine;
- turbofan engine;
- afterburning turbojet engine;
- afterburning turbofan engine;
- duct-burning turbojet engine which can operate at ramjet mode with the blocked gas turbine duct at supersonic flight conditions;
- duct-burning turbofan engine which can operate at ramjet mode with the blocked gas turbine duct at supersonic flight conditions;
- afterburning turbofan engine which can operate at ramjet mode with the blocked gas turbine duct at supersonic flight conditions.

The analysis of the results from the point of view $\left(\bar{m}_f + \bar{m}_{PS}\right)$ showed that PS with the forced engines (afterburning turbojet and turbofan engines) lose out to non-forced engines at the turbine inlet gas temperature $T_g^* \approx 1900\,K$. The each composition of PS have a Mach number at which $\left(\bar{m}_f + \bar{m}_{PS}\right)_{min}$.The Mach number which corresponds to $\left(\bar{m}_f + \bar{m}_{PS}\right)_{min}$, increases in the transition from PS with turbofan engine to PS with turbojet engine and from PS with turbojet engine to PS with engines which can operate at ramjet mode with the blocked gas turbine duct at supersonic flight conditions.

References:

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3. Kislov, O. V., Shevchenko, M. A. Metod vybora sostava i rezhima raboty silovoi ustanovki, rezhima raboty dlya letatel'nogo apparata so sverkhzvukovoi kreiserskoi skorost'yu [Method of Choosing Composition and Operation Mode of Propulsion, Operation Mode of Aircraft at Supersonic Cruising Speed]. *Otkrytye informatsionnye i komp'yuternye integrirovannye tekhnologii [Open Information and Computer Integrated Technologies]*, 2020, no. 88, pp. 51-61. DOI: 10.32620/oikit.2020.88.04.