

IAF SPACE PROPULSION SYMPOSIUM (C4)
Hypersonic Air-breathing and Combined Cycle Propulsion (9)

Author: Dr. Yuyang Shi

Sichuan Institute of Aerospace System Engineering, China, yuyang.shii@gmail.com

Dr. Wei Wang

China Aerospace Science & Industry Corporation (CASIC), China, w_wang@yeah.net

Dr. Jianke Sha

Sichuan Institute of Aerospace System Engineering, China, jianke.sha@gmail.com

Dr. Yi Zuo

Sichuan Institute of Aerospace System Engineering, China, nkzuoyi@foxmail.com

Mr. Li Bo

Sichuan Institute of Aerospace System Engineering, China, li.chengbo@foxmail.com

RESEARCH ON RAMJET AIRCRAFT OVERALL AND SCRAMJET PARAMETERS
COORDINATION DESIGN

Abstract

The ramjet design parameters can significantly affect the aircraft overall performance, so the optimal overall scheme of ramjet aircraft could be obtained only these parameters are designed reasonably and coordinated. In this paper a novel design method is proposed in order to clearly demonstrate the coupling characteristics between the overall parameters of ramjet aircraft and the ramjet design parameters, meanwhile to give the feasible domain and the optimal solution of ramjet design parameters while the overall parameters of ramjet aircraft have been given. Firstly, ramjet engine performance prediction model, aircraft mass analysis model and trajectory model are established. Then the solution flow and algorithm of the feasible domain and optimal solution of ramjet design parameters in all design dimensions are given. Finally, the algorithm is verified by a typical example aiming to minimize the fuel consumption of cruise flight section. The simulation results show that: 1) The proposed method can obtain the feasible domain and optimal solution of ramjet design parameters while the overall parameter of aircraft has been given, meanwhile this method can provide important theoretical and data support for the design and optimization of the overall parameters of ramjet aircraft and ramjet design parameters, 2) The fuel consumption which aircraft consume at different cruise altitude and different flight Mach number based on constant Mach flight strategy has obvious nonlinear characteristics, so it is very difficult to obtain the optimal overall scheme of ramjet aircraft if not adopt the coordination design method in all design dimension.