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STUDY OF A NEW AEROSPACE VEHICLE PROJECT BASED ON TURBINE-BASED COMBINED CYCLE ENGINE

Abstract

A new two-stage-to-orbit (TSTO) launch conceptual aerospace vehicle with horizontal take-off is presented in this paper. The first stage employs turbine-based combined cycle (TBCC) engine, while the second one makes use of Liquid Hydrogen and Liquid Oxygen (LH/LO) rocket engine. Normally the parallel configuration of the TSTO aerospace vehicle yields high drag. Thus the good acceleration performance of TBCC is needed to arrive predetermined separate point. Consequently the capture area of inlet will be too huge to achieve satisfied vehicle systemic performance. In this study a rocket engine assistant approach is proposed and an optimization technique for capture area is adopted. The numerical simulations on the combined power, the vehicle shape and the trajectory character are carried out. A feasible framework of the whole conceptual aerospace vehicle project is obtained. It is shown that the percentage of fuel at the whole take-off mass is lower than 47.7 percent and the fuel consumption decreases 25 percent, compared to the scheme without rocket engine to arrive the same separate point.