

IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
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DESIGN OF INTELLIGENT AIRCRAFT SYSTEM FOR THE FREE TRAVEL IN THE
EARTH-MOON SPACE

Abstract

As China Chang'e series of detectors have successfully completed multiple Earth-moon space round-trip missions, sending humans back to the Moon, establishing lunar surface scientific research stations, and even long-term resident bases, have become a hot topic for future lunar exploration. Comfortable and rapid round-trip transportation between the Earth and the Moon will definitely be the development direction of the future Earth-Moon express. Comfort requires the aircraft to have highly autonomous operation and management capabilities, minimizing human intervention by astronauts, while also providing valuable flight strategies for astronauts. Rapidity requires minimizing task processing time and flight time in the Earth-Moon space. Focusing on the need to support future transportation of astronauts and materials between the Earth and the Moon, with the core goal of intelligent aircraft design, we propose an intelligent Earth-Moon space round-trip transport aircraft design plan, using near Earth orbit (such as the near Earth space station) and lunar surface (such as the lunar base) as stochastic boundary conditions, possessing autonomous navigation and task planning, autonomous decision-making and emergency response, autonomous learning and environmental adaptation capabilities. The plan will meet various mission requirements such as rapid transfer and free flight in the Earth-Moon space, fixed-point landing on the lunar surface, and instant lunar surface ascent. While the aircraft system design to implement this plan is provided, including the attitude and orbit control function design, information management function design, etc. Elaborating from the aspects of plan design layer, system design layer and technical implementation layer using the technology of integration of state perception and flight decision-making, integration of human-computer interaction and information management to improve the performance of aircraft systems with autonomous task management and fault handling capabilities.