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HYBRID AIRCRAFT FOR EARTH-TO-SPACE TRAVEL: ADVANCING SEAMLESS TRANSPORT BETWEEN ATMOSPHERE AND ORBIT

Abstract

The development of hybrid vehicles capable of transitioning between atmospheric flight and space missions represents a groundbreaking innovation in aerospace engineering. These hybrid vehicles are designed to operate within Earth's atmosphere for conventional flight and seamlessly transition to space for interplanetary travel or transport to space stations. The ability to combine both air and space travel in a single vehicle addresses key challenges in current space transportation, offering an efficient and cost-effective solution for cargo and passenger transport between Earth and orbiting platforms. This research investigates the engineering principles, design considerations, and potential applications of hybrid vehicles, focusing on propulsion systems, aerodynamics, and structural integrity required for dual-environment functionality. The integration of rocket-based propulsion systems with advanced aerodynamics ensures the vehicle's capability to withstand the extreme conditions of space while maintaining optimal performance in Earth's atmosphere. Key challenges such as re-entry, thermal protection, and fuel efficiency are explored, alongside potential solutions and technological advancements that can make such vehicles a reality. This paper also highlights the potential impact of these hybrid vehicles on future space exploration, including the facilitation of space tourism, research missions, and the transport of goods to and from space stations. The development of hybrid vehicles could revolutionize space transportation, significantly reducing the cost of access to space while increasing the frequency of space travel. This research paves the way for a new era in aerospace, where the boundaries between atmospheric flight and space exploration become increasingly blurred.