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MITIGATION OF REENTRY BLACKOUT: CURRENT TECHNIQUES AND FUTURE DIRECTIONS

Abstract

Reentry blackout is a critical challenge in aerospace engineering, particularly for manned missions returning to Earth from space. This phenomenon, caused by the ionization of atmospheric gases around a spacecraft during reentry, results in a temporary loss of communication between the spacecraft and ground control. This review explores the various techniques developed to mitigate reentry blackout, including advanced materials for heat shielding, active plasma control, and gas injection. Furthermore, we examine the performance of these techniques in both past and current space missions, highlighting their successes and limitations. The review also discusses emerging technologies that may offer novel solutions to this issue in future deep space missions. The mitigation of reentry blackout is essential for improving mission safety, communication reliability, and overall mission success.