H.A.L.O. — Low-Cost Autonomous Landing System for Commercial Aircraft in Emergency Situations

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Aviation emergencies caused by pilot incapacitation remain a critical safety risk, particularly in regions with limited access to advanced automated systems. This project developed H.A.L.O., a low-cost autonomous landing system designed to detect pilot incapacity and guide an aircraft to a safe landing without human intervention. The system integrates sensor-based monitoring, real-time flight data processing, and an adaptive control algorithm connected to a flight simulation environment. Emergency conditions such as abnormal flight behavior or loss of pilot input trigger the system, which then identifies a suitable landing site and executes a controlled descent using predefined flight parameters. Testing was conducted using multiple simulated emergency scenarios to evaluate detection accuracy, response time, and landing stability. Results demonstrated reliable emergency detection and consistent landing execution under varied conditions, with improved stability compared to baseline uncontrolled scenarios. The findings suggest that low-cost autonomous safety systems can enhance aviation resilience and accessibility, particularly in developing regions. This approach has potential applications in both commercial and private aviation, contributing to global efforts to improve flight safety and reduce fatal incidents.

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