Towards Intelligent Control for Next Generation Aircraft

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NASA Aeronautics' Subsonic Fixed Wing Project is focused on mitigating the environmental and operation impacts expected as aviation operations triple by 2025. The approach is to extend technological capabilities and explore novel civil transport configurations that reduce noise, emissions, fuel consumption and field length. Two Next Generation (NextGen) aircraft have been identified to meet the Subsonic Fixed Wing Project goals—these are the Hybrid Wing-Body (HWB) and Cruise Efficient Short Take-Off and Landing (CESTOL) aircraft. The technologies and concepts developed for these aircraft complicate the vehicle's design and operation. In this paper, flight control challenges for NextGen aircraft are described. The objective of this paper is to examine the potential of state-of-the-art control architectures and algorithms to meet the challenges and needed performance metrics for NextGen flight control. A broad range of conventional and intelligent control approaches are considered, including dynamic inversion control, integrated flight-propulsion control, control allocation, adaptive dynamic inversion control, data-based predictive control and reinforcement learning control.