

eMCO – SiPO

Extended Minimum Crew Operations and Single Pilot Operations Safety Risk Assessment Framework



Contractor

NLR

Consortium Members

DLR, ADSE, Ries Simons and Deep Blue

Contract period

30/08/2022 – 29/08/2024

Budget

930 000€

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Main objectives:

The main objective of the project is to develop a reference risk-assessment framework and a knowledge base to characterize the impact on flight safety of the introduction of the **Extended Minimum Crew Operations (eMCO)** and the **Single Pilot Operations (SiPO)** concepts. The analysis will focus on the human factors in both normal and abnormal operations during single pilot segments and on specific issues, such as sleep inertia, fatigue risk management, or pilot incapacitation. The specific objectives of the project are to:

- assess the feasibility and relevant issues of the implementation of eMCOs in the EU regulatory framework by developing a reference risk-assessment framework and investigating a series of key safety hazards and mitigations;
- assess the feasibility and relevant issues of the implementation of SiPOs in the EU regulatory framework through a preliminary analysis of the related main safety hazards.

Impacts & benefits

The impacts on the safety of flight of single-pilot operations in the cruise phase in normal and abnormal conditions and the identification of mitigating measures to be introduced to maintain a level of safety at least equivalent to current multi-crew operations.



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Further reading



Continued technological developments as well as the development of autonomous unmanned aircraft, bearing the potential for safety and efficiency gains, and the consequent aviation industry needs are the reasons to explore the technical and regulatory feasibility of further reducing the number of pilots on board of commercial air transport (CAT) aircraft, either limited to specific portions of the flight or, at a later stage, end-to-end. In this context,

Extended Minimum-Crew Operations (eMCO) are defined as operations in which there are extended periods of the cruise phase with a minimum flight crew of one pilot at the controls while the other pilot(s) is (are) resting. For CAT operations where the Air Operations regulation requires today two pilots at the controls, eMCO must ensure a level of safety as that granted by these operations.

Single-Pilot Operations (SiPO) are defined as end-to-end single-pilot operations. PART-ORO already foresees conditions and limitations under which these types of operations are allowed. In the future, it is foreseen that these conditions and limitations will need to evolve in order to extend to large aeroplanes the possibility to be operated by a single-pilot, provided that compensation means (e.g. ground assistance, advanced cockpit with workload alleviation means, capability to cope with an incapacitation, ATM, etc.) are in place in order to offer an overall equivalent level of safety.

Over the past few years, the main **European Union original equipment manufacturers (OEMs)** have been working independently on the feasibility of such concepts, and are confident that the objective in terms of safety is achievable. They are working, under the auspices of EASA, on developing their individual safety cases. However, the reduction of the flight crew below the current two-pilot requirement for certain type of operations requires a robust assessment of the safety impact at all levels to support and develop both the safety case and the appropriate amendments to the existing regulations.

The scope of the project encompasses the generic risk assessment of the main changes induced by the eMCO and SiPO operations while considering a series of changes to

aircraft cockpit configuration identified for large CAT aircraft and including new flight management applications.

The safety risk assessment covers the analysis of potential failure cases, the characterisation of their potential impact on flight operations while evaluating the main mitigations at the level of flight crew working methods, operational procedures, and training.

The project should provide the relevant quantitative and qualitative input for the future impact assessment exercise(s) launched for the development of the eMCO initially and, later, SiPO rulemaking actions. More precisely, it should provide input to estimate the operational benefits and cost elements associated to the introduction of eMCO and SiPO considering different types of aircraft operators and air operations.

As the eMCO concept is meant to be implemented in a shorter time frame, this project focuses on this specific topic while performing an initial hazard analysis for SiPO. Bearing in mind that some of the the results of the eMCO risk assessment may be reused for the assessment of the SiPO concept, it is foreseen that the project will contribute to support additional research for the end-to-end risk assessment for single-pilot operation concepts.

EASA is currently working with its stakeholders to explore the feasibility of such operational concepts, while maintaining the current safety level in passenger air transport.

