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Agenda Item 24: Aviation Safety and Air Navigation Priority Initiatives

EXTENDED MINIMUM CREW OPERATIONS

(Presented by the International Federation of Air Line Pilots' Associations (IFALPA), the International Transport Workers' Federation (ITF) and the International Federation of Air Traffic Controllers' Associations (IFATCA))

EXECUTIVE SUMMARY

Two concepts, Extended Minimum Crew Operations (eMCO) and Single Pilot Operations (SiPO), are currently being considered for implementation in the near and mid-term future. Both concepts would reduce the current number of required pilots present in the flight deck during operations to a single pilot and raise great concern due to significant new risks with unknown consequences resulting in a degradation of safety. It is imperative that any future evolution of this benchmark improves upon and does not degrade the safety and security level in any area. Where Extended Minimum Crew Operations (eMCO) are concerned, the concept lacks both maturity and proof of increased safety with the proposed enabling technology.

Proponents of eMCO have suggested this concept will address problems around pilot fatigue by providing more opportunities for pilots to rest during flight. Initial research being conducted under the supervision of the Royal Netherlands Aerospace Centre (NLR) for EASA indicates an increase in fatigue for the single pilot left alone in the flight deck during normal operations of the single pilot segment of the flight. The NLR has also published a report that indicates that there are significant issues around pilot physiological needs that may lead to extended absences of the pilot from the flight deck during the single pilot segment of an eMCO flight. The research suggests that there are no mitigations foreseeable for decades that would mitigate the issues around pilot physiological issues during the single pilot phase of the flight[1]. Of course, these physiological issues are just one of many that can lead to pilot incapacitation.

Pilot fatigue management is a much wider concept than providing pilots more opportunities to rest during the flight. Adequate pilot fatigue management starts with a scientific-based fatigue management approach established by the operator in collaboration with the pilot group.

Other proponents of eMCO have also suggested that because of the reduction of crew requirements, cost savings and efficiency can be achieved. We believe this to be a fundamentally incorrect assumption and would suggest that eMCO is confused with innovation and will increase operator costs and create new risks to safety and security in an already strained system.

Further development of automation must have the goal of enhancing flight safety, as has been done during more than one hundred years of aviation and must be focused on being a resource for flight crews, not a replacement. While progress continues to be made using algorithms that produce an automated response in lieu of pilot input, the safety of those conceptual designs has not been proven to be safer than two well trained, well rested, fully qualified pilots in the flight deck

[1] EMCO SIPO EASA. 2022.C17 D-7 Report on Solutions in Relation to Physiological Needs (May 2024).

Strategic Goals:	This working paper relates to *Every Flight is Safe and Secure.*
Financial implications:	No additional resources are needed to maintain the current multi-crew operations. Extensive ICAO, State and Operator resources will be needed to change the existing two-pilot minimum flight deck crew requirement
References:	All ICAO Annexes Doc 7300, *Convention on International Civil Aviation*

1. INTRODUCTION

1.1 Recent advances in automation and other technologies have led some in the aviation industry to inaccurately suggest that reduced-crew or single-pilot operations could improve capacity and efficiency without compromising safety. The European Union Aviation Safety Agency (EASA) is working with some European manufacturers on potential flight deck technology developments that could enable concepts of operations like the Extended Minimum Crew Operations (eMCO). Categorically the eMCO concept proposes the introduction of routine single-pilot flight deck operations for significant periods of time.

1.2 While technological advancements are designed to increase safety and security, there are numerous safety and security risks introduced with eMCO. Most prominently, these risks stem from the increased workload and subsequent fatigue for the remaining pilot, the lack of strategy to ensure safety and security when the lone pilot at the controls is incapacitated, and the elimination of a critical layer of monitoring, cross-checking and operating redundancy provided by a second pilot in the flight deck. This compromises safety and security beyond acceptable levels of risk given the many variable emergency and irregular operational situations that may occur during a flight. Automation technology can be effectively used to provide additional levels of safety for the two pilots operating the aircraft. However, automation cannot compensate for the only one remaining pilot in the flight deck without compromising safety.

1.3 There are significant concerns whether the new threats to safety that would be introduced by single-pilot operations, such as eMCO, could ever be effectively addressed and managed such that a tolerable risk level can be attained. Consistent with EASA's own assessment, known elevated risk areas in eMCO include single pilot workload, unmanaged threats developing into errors, pilot incapacitation, increased fatigue, and security. EASA's May 2025 final report on risk assessment for eMCO unambiguously concluded "that an equivalent level of safety between eMCO and normal crew operations can currently not be demonstrated." IFALPA concurs that the safety risks associated with eMCO are beyond tolerable levels.

2. DISCUSSION

2.1 Aviation operations occur in an environment of dynamically changing situations involving weather, passenger behavior, system operation and reliability and geopolitical considerations. Pilots mitigate safety, security and operational risks during every flight by adapting to changes in circumstances including direction from air traffic control, weather, equipment malfunctions and anomalies, airport congestion, flight diversions, as well as in-flight passenger and cargo issues. This ability of the two-pilot crew to share a common mental model and adapt to a dynamic environment is critical. Proposed automated solutions do not provide the same safety and security margin as having a

second rested, qualified, well-trained pilot physically present on the flight deck at all times. Removing this system of a crew, from the aviation system, has consequences on the safety and efficiency of the aviation system

2.2 There are many reported examples of incidents where two, or more, pilots on the flight deck were needed to recover from equipment malfunctions and other events that otherwise may likely have led to a negative outcome. Two pilots seated side by side in the flight deck can closely coordinate their actions via constant communications, including nonverbal cues. The pilot monitoring also plays a vital role in observing the performance of the pilot flying, watching out for errors or declines in cognitive ability. Should the pilot flying become incapacitated for health reasons during a flight, the pilot monitoring can quickly take control of the aircraft. Importantly, no data currently exists to properly understand the physiological and psychological effects on the remaining pilot who would be working alone on the flight deck for extended periods of time, and it is unclear how such data could effectively be collected much less validated.

2.3 Except in certain limited emergency conditions (e.g., one pilot incapacitated), there are no safety risk models and tools to be used for the case of only one pilot at the controls. Large, transport category aircraft are designed to operate with more than one pilot in the flight deck because safety and operations require it. Regulatory requirements mandate two or more pilots for safety. Automation is expected to play an important role in the future of air transport, while successful development of artificial intelligence in aviation continues to remain uncertain for even the most elementary of applications. A reduction in the minimum required flight deck crew, accompanied by increased reliance on automation, will introduce new categories of threats including potential errors in automation design, installation, reliability, and programming. Pilots are also all too frequently required to address in flight security concerns that may involve airspace issues, airport and ground-based events, and unruly passengers including those with possible malicious intent. In addition, the current aviation infrastructure, like all IT infrastructure, can be prone to cyber and inflight security threats, including insider threats.

2.4 Concepts such as eMCO are fundamentally rooted in economic arguments based on increasing pilot flight duty productivity and decreasing labor costs. eMCO is not solving an existing or potential safety problem. History has shown that putting economic gains, such as extending pilot duty time by attempting to allow them to rest during eMCO, as the primary goal tends to have a detrimental effect on safety. The safety and security risks, as well as the challenges associated with reducing flight deck crews, outweigh any potential benefits.

2.5 Adequate rostering and the impact of circadian rhythms are essential elements to consider when addressing pilot fatigue, and the total pilot fatigue profile of all pilots in the crew must be used when considering how the crew will respond to abnormal situations. Proper pilot fatigue management involves much more than providing pilots with an opportunity to rest during flight. Evidence from ultra-long-haul crews suggests that in-flight rest is often of inferior quality, particularly when taken outside of normal circadian rhythm sleep; and sleep inertia is present in crew members who return to the flight deck after rest. Many states struggle with science-based fatigue management, and not all operators are willing to commit the resources to implement FRMS. As a result, FRMS implementation worldwide is low. Without the appropriate data from a fatigue management program together with SMS or FRMS it is highly unlikely that pilot fatigue will be properly managed using eMCO. There is gathering evidence of a lack of positive safety culture and subsequently a lack of reporting (including fatigue) at operators in many Regions is a critical issue that must be addressed first before there is any serious consideration of any reduction in crew complement.

2.6 Experience has taught us that with increasing levels of automation more adapted pilot training, not less, is required to enhance the level of safety even with two pilots in flight deck let alone a reduced crew. There is much room for improvement in the quality and quantity of training for pilots that could enhance the level of safety. A significant part of training a professional pilot is mentorship and the transfer of skills, knowledge and experience out on the line. This has been done very effectively in the multi-crew environment. The industry is going to go through a significant demographic change over the next number of years with thousands of new pilots entering the profession and thousands of seasoned, experienced pilots retiring. The proven way to transfer the knowledge and experience from one generation of pilots to another is working together as a team, for the entire flight, not just part of it. The transfer of pilot knowledge and skills as well as the mentoring of young pilots is weakened with the reduced crew/single pilot operations model. Teamwork, adaptive leadership, and effective communication are essential elements that will continue to ensure the highest levels of safety and security in aviation.

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