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WORKING PAPER

ASSEMBLY — 41ST SESSION

TECHNICAL COMMISSION

Agenda Item 31: Aviation Safety and Air Navigation Standardization

EXTENDED MINIMUM CREW OPERATIONS

(Presented by Costa Rica and the International Federation of Air Line Pilots' Associations (IFALPA))

EXECUTIVE SUMMARY

Two specific 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. 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 eMCO are concerned, the concept lacks both maturity and statistical 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. 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 risk management system (FRMS) established by the operator in collaboration with the pilot group. With a fully functional and properly established FRMS, the operator will have the data to better understand how fatigue is impacting the crews and take the necessary measures to address it.

Lack of crew interaction and coordination would create new hazards in pilot training that need to be carefully evaluated before any kind of reduction in crew composition is seriously considered. Additionally, further development and increased reliance on automation should have the goal of enhancing flight safety, as has been done during more than one hundred years of aviation. 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.

It is essential to fully address these risks and safety shortfalls before the industry accepts changes to the Standards, which have built the safest transportation system in history.

Action: The Assembly is invited to:

a) carefully examine whether it is appropriate for ICAO to commit any work or resources towards development of a concept of operations (CONOPS) for eMCO. Current eMCO proposals lack support from independent publicly available data and scientific research, and independent risk assessment results, methods and tools, that are necessary precursors to any ICAO decision to commit work or resources in the area;

b) ensure that current ICAO Standards regarding fatigue management are implemented in an effective and efficient way worldwide to obtain the necessary data about crew fatigue in air operations before any reduction in the number of pilots in the flight deck is considered;

c) promote a positive safety culture worldwide considering cultural differences, with a special emphasis on sound reporting cultures before any change in current ICAO Standards in aircraft certification and aircraft operations are modified to accommodate reduced crew/single pilot operations; and

d) evaluate the potential impact on pilot training and oversight that reduced crew/single pilot operations will pose to current and future operations.

Strategic Objectives:	This working paper relates to the Safety Strategic Objectives.
Financial implications:	No additional resources are needed to maintain the current multi-crew operations. Extensive ICAO resources will be needed to change the existing two-pilot minimum flight deck crew requirement.
References:	Convention on International Civil Aviation and its Annexes.

1. INTRODUCTION

1.1 Recent advances in automation and other technologies have led some in the aviation industry to suggest that reduced-crew or single-pilot operations could improve capacity and efficiency without compromising safety. A new concept of operation referred as “extended minimum crew operations” (eMCO) is currently under evaluation by the European Union Aviation Safety Agency (EASA). Categorically the eMCO concept proposes the introduction of routine single-pilot flight deck operations for significant periods of time.

1.2 There are numerous risks associated with eMCO. Most prominently, these risks stem from the increased workload for the remaining pilot and the elimination of a critical layer of monitoring, cross-checking and operating redundancy provided by a second pilot in the flight deck. This could compromise the safety and security beyond acceptable levels of risk given the many variable emergency situations that may occur during a flight. It has not been demonstrated that automation has matured to the point of enabling eMCO operations with only one pilot in the flight deck without compromising safety.

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 on a frequent basis 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 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.

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, extensive study would be necessary 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.

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 continues to remain uncertain. 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 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. History has shown that putting economic gains, even if innovative, 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, may well 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 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 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 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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