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System-Based Licence Policy Review

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SUMMARY

System based Licence is a "next generation of air traffic controller licence concept" that focuses on emerging technological advancement which tries to adopt a non-geographical qualification scheme that leaves air traffic controller's local knowledge aside.

The purpose of this paper is to formalize the provisional policy established last year into a full policy.

1. INTRODUCTION.

1.1. During the 63rd IFATCA Annual Conference Singapore 2024, as a part of the combined Committee B & C agenda, Working Paper 97 "System-Based Air Traffic Controller Licence Concept" was presented as an information paper, according to the author's decision.

1.2. As part of the discussion on the paper, some Member Associations expressed interest in developing a policy based on its content. This policy would clarify IFATCA's position, alongside that of other organizations proposing a System-Based Air Traffic Controller Officer (ATCO) Licence Concept. The aim is to address the challenges of training the next generation of ATCOs and exploring non-geographical qualifications as a potential solution to staff shortages.

1.3. As outlined in WP 97, the system-based ATCO licensing concept certifies controllers based on their proficiency with a specific Air Traffic Management System (ATMS). This approach minimizes the need for controllers to acquire extensive operational and local knowledge, such as geography, procedures, and traffic patterns, as these would be system-provided.

1.4. The motion to table the paper for the creation of a drafting group was carried out, resulting in the development of a provisional policy, which was subsequently accepted. (IFATCA, 2024)

2. DISCUSSION

2.1. Holding an aviation personnel licence ensures that ATCOs have demonstrated an acceptable level of competence to perform a specific activity without compromising aviation safety.

2.2. According to ICAO, "competence itself is not derived from the licence but is the result of proper selection and training" (ICAO,2012)

2.3. Competence is the integrated set of knowledge, skills, and attitudes that enable a person to perform effectively in a given context (ICAO, 2012). Within this framework, knowledge can be classified into different types based on its level of formalization and accessibility. Explicit knowledge is that which can be documented, structured, and easily transmitted, such as rules, procedures, or theories. On the other hand, tacit knowledge is acquired through experience and practice, making it difficult to express in words or directly transfer to others. The latter plays a crucial role in the consolidation of competencies, as it complements formal skills with intuition and expertise developed in real work situations (Nonaka & Takeuchi, 1995), ensuring that controllers can not only understand concepts but also apply them effectively when providing air traffic control services.

2.4. IFATCA TPM (2024) provisional policy AAS 1.23 System-Based Air Traffic Control licence concept, establishes:

IFATCA does not support ATC licensing concepts under which ATCOs are authorised to provide an ATC service based solely on the automation, equipment and/or systems utilised, because the contribution of ATCO skills and knowledge to the safe provision of the ATC service in all possible situations is not sufficiently recognised.

2.5. Air Traffic Control as a part of aviation, is facing the increasing traffic density and new technology with more complex procedures and more sophisticated equipment, therefore it is required that ATCOs become more specialized and interact with more advanced equipment.

2.6. While automation and Artificial Intelligence (AI) are becoming more integrated into Air Traffic Management (ATM), particularly in Conflict Detection and Resolution applications, it is crucial to maintain a focus on the unique human strengths that technology cannot replicate. ATCOs tacit knowledge, which brings adaptability, intuition, and a holistic understanding of situations, which are vital for handling unexpected events or emergencies (Endsley, 2017; ICAO, 2016). A balanced approach to automation is essential, where technology complements rather than replaces human decision-making (Nonaka & Takeuchi, 1995).

2.7. ATCOs rely on a comprehensive knowledge base built through rigorous training, hands-on experience, and situational awareness. Situational awareness, as outlined by Endsley (1995), involves the perception of elements in the environment, comprehension of their meaning, and projection of their future status. AI systems, while proficient in processing large volumes of data and identifying patterns, lack the nuanced understanding that ATCOs develop through experience and real-time decision-making (Endsley, 2017). For example, AI can assist in tasks such as traffic flow optimization or conflict detection by analysing vast amounts of data in seconds. However, it is the ATCO who contextualizes this information within the broader operational framework, incorporating variables such as pilot intentions, weather conditions, airport constraints, equipment failures and emergencies (ICAO, 2016). This creates a dynamic where AI can complement, but not replace, human expertise. Hence a collaborative model is essential to maintaining high levels of situational awareness and safety (Ruitenberg & Isaac, 2017).

2.8. While the potential benefits of artificial intelligence, such as enhanced efficiency and safety, are promising, its intersection with air traffic controllers' knowledge introduces challenges that require thoughtful analysis and management, particularly the risk of proficiency decay.

2.9. As AI systems take on more operational tasks, there is a growing concern that ATCOs may experience proficiency decay. According to EASA proficiency decay refers to the deterioration of skills and knowledge due to a lack of recent practice or reduced operational activity. For ATCOs, this could lead to diminished proficiency in essential tasks such as manual conflict resolution and decision-making under pressure—skills that are crucial in scenarios where AI systems fail or are unavailable. Skill retention strategies as simulator training and manual exercises are essential to prevent proficiency decay. (EASA, 2021)

2.10. Regarding liability, a lot of questions are raised. In traditional ATC operations, ATCOs are ultimately responsible for their decisions and actions. However, when AI systems are integrated, determining accountability becomes more complex. Who is liable in the event of an incident caused by an AI error? Is it the ATCO who relied on the AI's recommendation, the developer of the AI system, or the organization that implemented the technology? These and other related concerns must be thoroughly examined as advancements and implementation progress.

2.11. A human-centric approach that leverages AI as a tool to support, rather than replace ATCO expertise, will ensure that the benefits of AI are realized without compromising the integrity of air traffic management (Endsley, 2017; ICAO, 2016). Robust training, legal clarity, and thoughtful system design will be key to achieving this balance.

2.12. ICAO Circular 241-AN/145, emphasizes that changes to ATC systems should, wherever possible, allow controllers to apply their existing skills and knowledge. Major changes, such as new automated tools, must be carefully accompanied by a redefinition of the required knowledge, skills, and procedures. Importantly, controllers should receive proper retraining before encountering these changes in live operations. Furthermore, regular refresher training is essential to ensure that controllers' skills and knowledge remain up to date and effective in all situations (ICAO,1993). This aligns with the provisional policy and reinforces IFATCA's stance against licensing concepts that authorize ATCOs solely based on automation or systems in use. Such an approach undervalues the critical role of ATCO competency in ensuring safety across all scenarios (IFATCA, 2024).

2.13. Modern technology plays a critical role in Air Traffic Control (ATC). However, when unexpected equipment failures occur, controllers often face significant challenges in maintaining seamless service, especially during periods of high traffic volume. Ensuring precise operations and continuous system functionality depends on the exceptional reliability of both hardware and software systems, highlighting the need for robust technological infrastructure. (Air Traffic Services Planning Manual).

2.14. The availability of an air traffic control automation system refers to the ability of the air traffic control automation system to complete the specified functions within a certain period of time under certain conditions of use. Technology introduces vulnerabilities to system failures or cyberattacks, ensuring reliable and efficient systems, and demands significant investment in both infrastructure and ongoing support. From developing robust hardware and software to establishing redundancies that minimize the impact of failures, these efforts require financial and technical resources. There is also a need for ATCOs to be able to recognise technical issues such as failure, degradation or otherwise dysfunctional equipment. ATCOs also require methodology to disable automation in these failure events. Additionally, maintaining high system availability and accuracy often involves substantial costs related to cybersecurity measures, system upgrades, and regular testing to ensure compliance with evolving operational demands. Such investments are necessary to balance the potential efficiency gains of automation with the imperative to maintain safety and operational continuity. (ICAO, 2008)

2.15. Nevertheless, there is always a likelihood that systems may still fail.

2.15.1. On December 15, 2024, Edinburgh Airport experienced a severe air traffic control system failure, grounding all flights and severely disrupting operations. The fault caused delays and cancellations for flights to key destinations, including Gatwick, Dublin, and Amsterdam. While engineers worked to resolve the issue, the disruption highlighted the operational risk of technical failures at critical aviation hubs, prompting calls for enhanced system reliability and support mechanisms. (Scottish Sun, 2024)

2.15.2. On August 17, 2024, in the evening, a failure occurred. Air operations were suspended at Brașov airport in Romania, due to technical issues leaving ROMATSA Centre without video feed from the control tower at the airport. Brașov airport is the only one whose air navigation services are provided remotely. Operations went back to normal the next morning. (SpotMedia, 2024)

2.15.3. In July 2024, a global IT outage caused by a faulty software update disrupted operations across various sectors, with aviation among the most affected. Major airlines, including Delta, United, and American Airlines, had to ground flights for hours, leading to approximately 4,000 flight cancellations and over 35,000 delays globally. The outage highlighted the critical dependence on automated systems for flight management and passenger processing. Airports and airlines were forced to revert to manual operations, significantly increasing delays and operational challenges. The incident underscored the need for robust contingency plans and resilient IT systems in aviation. (Wired, 2024).

2.15.4. In August 2023, the United Kingdom's NATS experienced a critical system failure caused by an anomaly in a flight plan that included two waypoints along its route that were geographically distinct, but which have the same designator. This unprecedented technical issue forced the system to shut down, leaving air traffic controllers to manage flight plans manually. The manual processing significantly reduced operational capacity, leading to the cancellation of around 2,000 flights and widespread disruptions for travellers. The incident highlighted vulnerabilities in system resilience, prompting an investigation by the Civil Aviation Authority to identify root causes and implement safeguards to prevent future occurrences. (Independent, 2023).

2.16. As previously stated, ATCOs need to be skilled in handling real-world scenarios, including technical failures. In emergency situations, it is also essential for controllers to be well-versed in regulations pertaining to emergency responses and the continuity of the service.

2.17. Preparedness for contingencies is integral to ATCO responsibilities. Controllers must be trained to manage unexpected events such as equipment failures, adverse weather, or aircraft emergencies. Standard Operating Procedures (SOPs) provide a framework for consistent responses, while simulation-based training reinforces practical application. The development of contingency plans, aligned with ICAO Annex 19 on Safety Management, underscores the importance of risk assessment and mitigation in preserving safety during disruptions. Additionally, ICAO Annex 11 explicitly mandates the development and promulgation of contingency plans to ensure continuity of air traffic services during unforeseen circumstances. This includes predefined measures for re-routing, alternative communication methods, and coordination between adjacent control units, highlighting the importance of preparedness in maintaining operational integrity. (ICAO, 2018).

2.18. During contingency scenarios, controllers must quickly assess evolving situations, anticipate cascading effects, and prioritize tasks. Effective communication with pilots, adjacent control units, and airport authorities are essential to maintain clarity and coordination during crises. Equally important is adaptability—ATCOs must shift between normal operations and contingency protocols seamlessly, often relying on training, knowledge (tacit and explicit) such as situational awareness, decision-making, communication skills, regulations, local conditions, conflict hotspots, frequencies, terrain, traffic flows, local aerodromes, airspace, creativity and sound judgment to resolve unforeseen challenges.

3. CONCLUSION

3.1. The evolving landscape of air traffic management necessitates a careful and balanced approach to integrating automation and artificial intelligence. While technological advancements offer significant potential to enhance efficiency and optimize operations, they must complement rather than replace the essential skills, knowledge, and judgment of air traffic controllers. The human element remains indispensable in handling complex, dynamic, and unexpected scenarios that technology alone cannot fully address.

3.2. The provisional policy presented by IFATCA provides a well-founded stance that safeguards the critical role of ATCOs in ensuring the highest levels of safety and operational continuity. It reinforces the necessity of maintaining robust training programs, competency standards, and situational awareness, which are vital for effective air traffic management. By emphasizing the importance of human oversight, the policy helps mitigate risks associated with over-reliance on automated systems and potential proficiency decay of controllers.

3.3. Ultimately, the adoption of a system-based ATCO licensing concept should be approached with caution, ensuring that safety remains the primary priority. Stakeholders must continue to prioritize comprehensive training, adaptability, and contingency preparedness while leveraging technology as an aid rather than a substitute.

4. DRAFT RECOMMENDATIONS

4.1. It is proposed the provisional policy IFATCA TPM 2024 AAS 1.23 System-Based Air Traffic Control licence concept becomes a full policy as it is published.

IFATCA TPM (2024) AAS 1.23 - System-Based Air Traffic Control Licence Concept
IFATCA does not support ATC licensing concepts under which ATCOs are authorised to provide an ATC service based solely on the automation, equipment and/or systems utilised, because the contribution of ATCO skills and knowledge to the safe provision of the ATC service in all possible situations is not sufficiently recognised.

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