

Remote Tower Provisional Policy: An Analysis of Simultaneous Operations

Presented by TOC

SUMMARY

This paper outlines the changes to the provisional policy statement that provides positive guidance to the possible implementation in the provision of Multiple Aerodrome Control service from a single Digital Air Traffic Service (DATS) platform.

1. INTRODUCTION

- 1.1. Digital Aerodrome Traffic Service (DATS), also known as Remote Tower Operation, is a concept where aerodrome control services are provided remotely rather than by the conventional method of looking Out of The Window (OTW) from an aerodrome control tower sited at the aerodrome. OTW control services are now provided from camera feeds mounted at strategic locations around the aerodrome, providing a panoramic view of the airfield on digital screens at a remote location with pan-tilt-zoom (PTZ) functions. This concept of DATS has been adopted by some Air Navigation Service Providers (ANSPs), while many others are carrying out a feasibility study.
- 1.2. There are guidance materials established for remote tower concepts for Single Mode Operations (SMO)¹. (ICAO Doc 4444, Chapter 7 para 7.1.1.2.1 “**Note 2: Guidance material on the implementation of the remote tower concept for single mode of operation can be found in the Annex to European Aviation Safety Agency (EASA) Executive Director Decision 2023/005/R (30 March 2023) (EASA – Issue3)**”). This note gives a global recognition to SMO.
- 1.3. From the initial DATS concept of operations for a SMO, ANSPs are now considering providing Air Traffic Services to multiple aerodromes, simultaneously. The consolidated workforce by this concept in one Remote Tower Centre, provides the flexibility to redeploy officers to Remote Tower Modules where additional manpower is needed.
- 1.4. Since the 53rd Annual Conference, Gran Canaria in Spain (5th to 9th May 2014), IFATCA has been opposed to the provision of aerodrome control services to multiple

¹ SMO - The provision of air traffic service from a Remote Tower Module (RTM) for only one aerodrome at a time.

aerodromes simultaneously (IFATCA, 2014). More recently, EASA in their Notice of Proposed Amendment 2017-21, claims that

“there is already sufficient information and data available to provide regulatory support and guidance to facilitate its safe implementation and to provide a basis for its further development and industrialisation” (EASA - Notice of Proposed Amendment 2017-21)

to support Multiple Mode Operations (MMO). However, the Technical and Operations Committee (TOC) has not been able to find supporting documents for this claim.

- 1.5. As ANSPs are gaining interest in the provision of ATS to multiple aerodromes simultaneously, it may be prudent for IFATCA, in the interest of ATCO’s provision of these services, to stay inclusive rather than excluding itself from the conversations with stakeholders. It is sensible for IFATCA to stay involved at the onset in all conversations that would eventually lead to the implementation of providing ATS to multiple aerodromes simultaneously, remotely. Hence a review was conducted to expand IFATCA’s policy on this front, outlining the issues by listing all possible considerations working in a multiple remote environment that might be essential in the provision of DATS.
- 1.6. At the 63rd IFATCA conference in Singapore (15th - 19th April 2024), a draft recommendation to IFATCA policy ADME 2.14 was presented. During the discussion it was clear that most, if not all Member Associations (MAs), do not support providing DATS to multiple aerodromes simultaneously. Nevertheless, it was generally agreed that maintaining IFATCA's current and strongly worded policy risks excluding the organization from relevant discussions. Furthermore, MAs expressed concern that some ANSPs are prematurely introducing MMO without proper study of the concept of operations or sufficient guidance materials to support safe implementation.
- 1.7. SMOs have already been deployed in many ANSPs. Economic reasons were the main driver for the introduction of remote tower ATS. In the Copenhagen Economics report –

“The remote tower centres must be connected to more than one airport for the remote tower concept to be cost saving, and to reach its full cost saving potential the multiple remote towers must be simultaneous”.

(Nystrom, S., Nielsen, C. K., Nordstrom, D., March 2019).

Equally in the CEAS Aeronautical Journal (2022) –

“these cost-effective systems cause procurement, implementation, and maintenance costs, which make them unaffordable for non-ATC aerodromes with low revenues”

(Reuschling, F., Jakobi, J., 2022)

This is mainly due to the cost of initial setup, continued maintenance and future technology developments. For these reasons, ANSPs may strongly consider combining aerodromes for simultaneous control service.

- 1.8. For significant cost savings, ANSPs are exploring other cost-effective measures. In a press release on successful first SESAR 2020 Multiple Remote Tower validation for three airports (Frequentis, 2018), it was mentioned that “**most significant impacts in cost-effectiveness are to be expected with multiple and/or centre settings**”. These concepts are seen as the “Golden Bullet” in the cost-conscious ATM industry.
- 1.9. Though MAs were agreeable on the need to amend IFATCA’s strong and negative policy, there were mixed thoughts to the draft recommendations of a policy change to ADME 2.14 that was presented at the conference in Singapore. After many discussions, it was suggested to maintain a strict policy until a study is completed and to provide an overarching policy change. The draft recommendations were carried out as provisional policy.

2. DISCUSSION

- 2.1. IFATCA’s Technical and Professional Manual (TPM), ADME 2.14 - Remote and Virtual Tower currently reads as:

ADME 2.14 – Remote and Virtual Tower

ATCOs shall not be required to provide Digital Air Traffic Services (DATS) to more than one aerodrome simultaneously.

When implementing DATS, standards, procedures, guidance, and clear requirements shall be developed.

Requirements at a minimum should include, but are not limited to:

- **Surveillance equipment capable of providing the desired service level;**
- **A robust contingency plan in case of system failure.**

DATS shall provide an equivalent or greater level of safety, compared to the previous configuration.

When replacing a conventional tower, DATS should be capable of providing an equivalent or greater level of service as the aerodrome control tower.

Standardized training requirements shall be developed for all ATCOs that work directly or indirectly with DATS.

A specific endorsement is required to operate at an aerodrome where DATS are provided.

For reasons of safety and human factors issues the minimum frame rate in a digital air traffic services unit shall be 25 FPS.

- 2.2. The draft recommendations accepted as Provisional Policy at the 63rd IFATCA Conference in Singapore is appended below:

ADME 2.14 – Remote and Virtual Tower (*Provisional Policy*)

When implementing DATS, standards, procedures, guidance and clear requirements shall be developed.

Requirements at a minimum should include, but are not limited to:

- ***surveillance equipment capable of providing the desired service level; and***
- ***a robust contingency plan in case of system failure.***

DATS shall provide an equivalent or greater level of safety, compared to the previous configuration.

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Standardised training requirements shall be developed for all ATCOs that work directly or indirectly with DATS.

A specific endorsement is required to operate at an aerodrome where DATS are provided.

For reasons of safety and human factors issues the minimum frame rate in a digital air traffic services unit shall be 25 FPS.

When an ATCO is endorsed to provide ATS at more than one aerodrome, special consideration shall be given to the associated human factors issues.

Simultaneous DATS provision is currently not supported because there is a lack of credible solutions concerning, but not limited to:

- ***the situational awareness of ATCOs when services are provided to multiple aerodromes***
- ***safety related issues and operational risks***
- ***the possible confusion in radio communication/phraseology***
- ***the combination of aerodromes considering the airfield layouts, similar sounding taxiways, runway orientations, differences in time zone, surrounding terrain and geographical location***
- ***the human machine interface (HMI) and system integration***
- ***achieving runway safety***
- ***on the type of flights (IFR/VFR) permissible***
- ***contingencies in the event of system failures***
- ***ATCOs workload management and complexity***
- ***human factors research***
- ***the concerns in the pilot communities***

- **the definition of low/medium/high density airport**

IFATCA does not currently support the provision of DATS for aerodromes to multiple aerodromes simultaneously by ATCOs.

Runway Safety

- 2.3. The Global Runway Safety Action Plan (GRSAP) emphasizes the critical role of air traffic controllers' situational awareness in preventing runway incidents. Maintaining a clear mental picture of the airfield environment, including aircraft positions, movements, and ground operations, is paramount. This involves anticipating potential conflicts, recognizing deviations from expected patterns, and proactively addressing emerging safety concerns. The Tenerife runway accident serves as a stark reminder of the consequences of breakdowns in situational awareness. The Human Factors Report on the Tenerife Accident states, “**some confusion caused by the operation of three different frequencies by two controllers** (ALPA – Aircraft Accident Report)”. This may have caused some loss of situational awareness. Miscommunication and confusion regarding the presence of a KLM Boeing 747 on the runway led to a catastrophic collision with a Pan Am Boeing 747, resulting in 583 fatalities. Similarly, the Haneda runway accident, while less severe in terms of casualties, underscores the importance of maintaining accurate situational awareness during periods of high traffic density and complex operations. In this incident, “**several errors on the part of the air traffic controller who failed to notice the JCG plane had entered the runway due to a series of distractions** (AVweb, 2024)”, highlights the potential for errors even in well-controlled environments when situational awareness is not maintained.
- 2.4. When controllers provide aerodrome service to more than one aerodrome simultaneously, the challenges to maintaining situational awareness are amplified. The increased workload associated with managing multiple locations, coordinating operations between them, and ensuring the safe and efficient flow of traffic across all sites can strain cognitive resources. This can lead to increased mental workload, potential for information overload, and a heightened risk of errors. The complexity of coordinating operations between multiple aerodromes, especially during peak hours or in adverse weather conditions, further exacerbates the situation. Controllers must consider factors such as airspace congestion, runway capacity, and potential conflicts between aircraft operating at different locations, thus adding another layer of complexity to their task.
- 2.5. To mitigate these challenges, vendors are implementing various strategies. These include advanced technologies such as automation and artificial intelligence to assist controllers in managing the increased workload and complexity. Comprehensive training programs and standardized procedures are essential to equip controllers with the necessary skills and knowledge to handle multiple aerodromes effectively. Fostering collaboration and communication between controllers (e.g. Aerodrome and Approach controllers) at different locations is crucial to ensure a shared understanding of the operational situation and facilitate coordinated decision-making. Additionally,

creating a comfortable and ergonomic working environment can help controllers maintain focus and reduce fatigue, further enhancing their situational awareness and overall performance.

Situational Awareness

- 2.6. ATCOs' situational awareness is crucial for aerodrome control. According to ICAO Doc 4444 Chapter 6 para 7.1.1.2:

Aerodrome controllers must continuously monitor all flight operations near an aerodrome, as well as vehicles and personnel in the manoeuvring area, using visual observation and ATS surveillance systems when available.

- 2.7. In an MMO environment, this can be challenging with simultaneous movements at multiple aerodromes, especially with a mix of IFR and VFR traffic.

- 2.8. While advanced technology offers a range of tools, such as overlays on the screens, Pan-Tilt-Zoom features, overlay labels and frame highlights to which the transmissions is coming from to enhance situational awareness in remote tower environments, the lack of standardized guidance on their effective use can be counterproductive. An overabundance of tools, without clear operational procedures, may inadvertently complicate the controller's workload, potentially leading to information overload and decreased situational awareness. A balanced approach, combining essential tools with well-defined guidance, is crucial to optimize remote tower operations and ensure safety.

- 2.9. ICAO Doc 4444 Chapter 7.4.1.7 states:

Whenever an abnormal configuration or condition of an aircraft, including conditions such as landing gear not extended or only partly extended, or unusual smoke emissions from any part of the aircraft, is observed by or reported to the aerodrome controller, the aircraft concerned shall be advised without delay.

- 2.10. ATCO's continuous watch over an arriving or departing aircraft, requires cognitive attention for a reasonable amount of time. Providing simultaneous ATS in MMO can increase the risk of delayed or missed attention to aircraft in abnormal situations, due to divided ATCO focus. Para 2.13 below states "**people can track up to four moving targets attentively**". In an MMO, these numbers can be higher, possibly losing attention at the most critical time. ATCOs must rapidly switch attention between different aerodrome environments, each with unique runway configurations, procedures, and conditions. This rapid switching creates significant cognitive demands, increasing the potential for errors in phraseology or instructions caused by inadequate attentional resources or inappropriate use of attention.

- 2.11. MMO operations **will largely depend on the ability of the controller to provide airport Air Traffic Service while maintain acceptable levels of situational awareness and workload** (CANSO – Guidance Material for Remote and Digital Towers, Edition 2). Ignoring the critical impacts of traffic density, complexity,

schedules, and airfield layout on ATCO workload during simultaneous DATS operations poses significant risks and demands thorough analysis.

- 2.12. In the Air Traffic Management (Principles, Performance, Markets) book published by Routledge, Chapter 12 on “Multiple remote tower operations” stated that:

“Effective visual scanning by the air traffic controller is the main safety concern for human-computer interaction, as the aim of Multiple Remote Tower Operations (MRTO) is a single controller performing air traffic management tasks originally carried out by up to four ATCOs”.

(Kearney, P., Li, WC., Braithwaite, G., 2023)

It also indicated that an ATCO’s attention distribution among the display systems is the key Human-Machine Interface (HMI) issue, in single ATCO performing multiple monitoring tasks.

- 2.13. An abstract from the National Library of Medicine:

A hallmark of both visual attention and working memory is their severe capacity limit: People can attentively track only about four objects in a multiple object tracking (MOT) task and can hold only up to four objects in visual working memory (VWM). It has been proposed that attention underlies the capacity limit of VWM. We tested this hypothesis by determining the effect of varying the load of a MOT task performed during the retention interval of a VWM task and comparing the resulting dual-task costs with those observed when a VWM task was performed concurrently with another VWM task or with a verbal working memory task. Instead of supporting the view that the capacity limit of VWM is solely attention based, the results indicate that VWM capacity is set by the interaction of visuospatial attentional, central amodal, and local task-specific sources of processing.

Presentation of information, complexity of that information and the characteristics of the operating environment requires further study. (Fougnie, D., Marois, R., n.d.)

VFR vs IFR flights

- 2.14. Instrument Flight Rules (IFR) must operate in accordance with a clearance issued by an ATCO. They navigate through the published SIDS and STARS. Altitude restrictions, speed instructions, missed approach profile through its flight path is predictable. ATCOs are able to anticipate the lookout point to sight the aircraft. The cameras that feed the image could be limited to the viewpoint for IFR arrivals, as the arrival and departure path is predictive.
- 2.15. Aircraft operating under Visual Flight Rules (VFR), particularly when performing complex or unpredictable manoeuvres, can significantly increase ATCO workload and **“need additional visual attention”** (CANSO – Edition 2). Because VFR aircraft often lack published joining procedures, their entry points into the aerodrome circuit can vary, requiring ATCOs to issue ad hoc joining instructions. Furthermore, the typically smaller size of VFR aircraft makes them more difficult to visually acquire and track.

- 2.16. In a conventional tower, ATCOs have the freedom to move around the control cabin to adjust their viewpoint to detect the VFR flights. In a digital environment, viewpoint adjustments are limited by the camera's pivoting angle. VFR aircraft beyond the camera's coverage within the aerodrome can be a challenge to control. These challenges multiply in an MMO.
- 2.17. In MMO, the mixture of VFR and IFR traffic may increase the workload of an ATCO. An increased amount of time would be spent in sighting the VFR traffic with the limited PTZ functions of the camera, rather than managing the traffic. Radio transmissions can be high directing the VFR traffic for an approach. Compounded challenges can be experienced by the ATCO if VFR and IFR traffic are operating at two aerodromes continuously, where services are provided simultaneously.
- 2.18. Enhanced technologies might mitigate these challenges. Additional cameras to provide a comprehensive coverage, virtually including the aircraft sound to assist in locating the aircraft and radar tracking with overlaid display are some of the available technologies that can be considered. While harnessing these technologies, importance should be placed in the HMI and Human Factors studies. It would be imperative to include the end users at the onset during the development stage.
- 2.19. HungaroControl, one of the leading service providers in Europe driving the improvement of safety, efficiency, cost effectiveness and environment sustainability, issued a press release in Feb 2018, on the **Successful first SESAR 2020 Multiple Remote Tower validation for three airports (DLR, LEONARDO, HungaroControl)**. At the DLR Air Traffic Validation in Braunschweig, a single remote tower controller controlled three airports simultaneously. Although the overall traffic volume is reported as 30 movements per hour, this figure is heavily weighted towards Budapest Airport. Debrecen handles a significantly lower volume of traffic, while Papa is a military airfield. Following the evaluation test, two ATCO comments require further attention.

ATCO 1: "There's a lot to develop and research further to answer the uprising questions and make the multi-remote concept really safe, useful and efficient in the near future."

ATCO 2: "I have really enjoyed controlling in the simulator, but it is clear that intensive technical development will be needed until this project determining the future of the aviation industry becomes successful, and a lot of effort awaits those working on the procedures and the legal environment."

Combination of Aerodrome for MMO considering airport characteristics

- 2.20. **"Camera placement needs to be considered in terms of proximity to key features such as, among others, runways, runway thresholds, aiming points, final approach, runway intersections, runway protection surfaces, and taxiway intersections"** (CANSO – Edition 2). It is crucial for the ATCOs to have impartial views of the approach and runway critical areas for the provision of safe DATS.
- 2.21. To assist the ATCO in the provision of DATS, there are many technical enablers, among others, Foreign Object Debris (FOD) detection support, visual overlays, use of

optical sensors, lock and follow targets, gap filler cameras, airport sound reproduction and more (CANSO – Edition 2). These technologies may bring some improvements to the provision of Aerodrome DATS through automation and reducing ATCOs workload. Yet, one must be mindful of information overload for an ATCO to decipher while on MMO. Though technologies are available, the interface between humans and machines must be carefully studied.

Radio communication

2.22. Providing multiple aerodrome control services simultaneously poses significant challenges in radio communication and phraseology. Based on validation results, SESAR JU has identified some preferences for air-ground communications. Two options were preferred: i) handling respective aerodrome frequencies separately or ii) coupling the aerodrome frequencies (EASA 30th March 2023, Issue 3).

2.22.1. Separate frequencies – ATCOs monitor all relevant aerodrome frequencies but transmit to individual aerodromes selectively or simultaneously. Pilots only hear transmissions intended for their designated aerodrome. While this approach minimizes pilot confusion, the frequent frequency changes can lead to ATCOs missing transmissions if their attention is focused elsewhere or if they inadvertently transmit on the incorrect frequency.

2.22.2. Coupled frequency – All aerodrome frequencies are linked, enabling ATCOs and pilots to hear all transmissions within the ATCO's area of responsibility. This enhances situational awareness and reduces incorrect frequency selection but can confuse pilots with transmissions intended for other aerodromes. SESAR JU favours frequency coupling and recommends including aerodrome names in all clearances and transmissions to mitigate this confusion. They also suggest ATS providers consider including aerodrome names/ATS unit call signs in all transmissions, not just initial contact. An increase in RT chatter can be noted here.

2.23. Separate or Coupled frequencies, they both has their own challenges in MMO. These challenges stem from the complexity of managing multiple traffic environments concurrently, each with its unique set of aircraft, procedures, and potential conflicts.

2.23.1. Call Sign and Aerodrome Confusion - MMO increases the risk of call sign confusion when multiple aerodromes use similar call signs. For instance, imagine two aerodromes within the same MMO, one named "City Tower" and the other "Metro Tower," both using call signs that sound similar, especially under less-than-ideal radio conditions. The risk multiplies when the combined aerodrome in MMO has a similar runway configuration. If both City and Metro Airport have two parallel runways numbered 27L and 27R, the potential for confusion between aircraft landing or departing on these runways increases significantly. An aircraft cleared to land on 27L at "City Airport" could mistakenly begin its approach to land on 27L at "Metro Airport." It increases even

further if the ATCO were to provide ground control service simultaneously. Now, the controller is managing multiple aircraft with similar call signs and runway designations across different aerodromes, all while handling ground movements. This complex scenario creates a high-risk environment for misidentification and potentially hazardous situations, such as an aircraft taxiing onto the wrong runway or a ground vehicle crossing an active runway without clearance.

- 2.23.2. Frequency Congestion - Increased radio traffic in MMO can lead to frequency congestion, causing blocked transmissions, incomplete messages, or missed calls, jeopardizing safety and efficiency. For example, during peak hours, multiple aircraft from different aerodromes within the MMO might try to contact the same controller simultaneously. This could result in a pilot's critical request for a runway change due to a sudden weather shift being blocked by other routine communications. Alternatively, a controller attempting to relay urgent information about a runway incursion might have their message cut short due to frequency congestion, leading to a potentially dangerous situation. Similarly, a pilot calling for emergency assistance might experience a missed call due to the heavy radio traffic, delaying critical aid. This congestion can also force pilots to repeat messages multiple times, further exacerbating the problem and wasting valuable time.
- 2.23.3. Emergency Management - Handling emergencies across multiple aerodromes requires effective prioritization and clear communication, potentially diverting attention from routine operations. For example, a fire at one aerodrome could require the diversion of aircraft to another, potentially overwhelming the receiving aerodrome's resources and delaying critical emergency response. Similarly, a medical emergency at one aerodrome could necessitate the mobilization of emergency medical services, potentially impacting the availability of these services for other aerodromes within the MMO.
- 2.23.4. Phraseology Consistency - Maintaining consistent standard phraseology across multiple, rapidly changing aerodrome scenarios becomes challenging. This involves recalling specific runway configurations, local procedures, and current operational conditions for each aerodrome, increasing the potential for errors in phraseology or instruction. For example, a controller working within an MMO might need to switch rapidly between handling traffic at Aerodrome A, which uses a "follow-the-green" taxi system, and Aerodrome B, which relies on explicit taxi clearances for each movement. The controller could inadvertently issue a "follow-the-green" instruction to an aircraft at Aerodrome B, leading to confusion and potential runway incursions. Similarly, if Aerodrome A is experiencing a temporary runway closure due to construction, the controller must remember to include this information in their clearances and instructions. A lapse in memory could result in an aircraft being directed towards the closed runway.

Furthermore, variations in local procedures, such as noise abatement procedures or specific arrival/departure routes, adds another layer of complexity. The controller must be able to recall and apply the correct phraseology for each situation, increasing the cognitive load and the likelihood of errors, especially during peak traffic periods or in emergency situations. For instance, forgetting to specify a noise abatement procedure during a departure clearance at one aerodrome within the MMO could lead to a noise complaint, while the same omission at another aerodrome might have no such consequence due to different local regulations.

- 2.24. These challenges underscore the need for rigorous training, robust procedures, and technological aids for ATCOs in MMO. Regular assessment and refinement of communication protocols are essential. While SESAR JU has noted preferences for both separate and coupled frequency handling, further research is needed to determine the optimal approach and address the associated challenges.

ATCOs workload management and complexity

- 2.25. SESAR JU posted a video on the concept of MMO by a single ATCO (SESAR, Feb 2022a). The conops indicated that the supervisor who is monitoring the workload of an ATCO in MMO, calls the ATCO concerned to check if he needs assistance. The supervisor then, with the help of a planning tool, identifies a suitable ATCO for support and transfers the control of the aerodrome to the available ATCO. Interestingly, in a webinar session following the validation test, a Human Factors Specialist noted the ATCOs workload increased for a few minutes as the ATCO took time to build up situational awareness (SESAR, 2022b webinar). It takes time for the ATCO receiving the aerodrome to build the mental picture of the traffic situation and coordinate with the transferring ATCO. The Aerodrome Switch (splitting or merging aerodrome display) led to confusion and temporary loss of situational awareness due to the change in Human Machine Interface (HMI). There may not be ample time for a proper Handover brief.
- 2.26. The handover process during the splitting and merging of aerodromes significantly increased workload due to the necessary coordination, requiring the supervisor's intervention. The supervisor noted difficulties in timely sector splits and identifying peak periods. In surveillance environments, sector splitting and merging involve minimal coordination with adjacent sectors. However, in an MMO, managing multiple aerodromes requires significant coordination across various air traffic control units, increasing cognitive load. Further studies and guidance are needed as this heavily depends on the supervisor.
- 2.27. In the guidance material (EASA, 2023) quoted in para 1.2 above, it was mentioned that “no operational implementation of this concept (MMO) exists” and “operational experience is limited to validation and trial activities”. EASA considers that there is sufficient information and data available to provide support and guidance to facilitate its safe implementation. This is still in the development stage.

Provisional Policy

2.28. While the majority of IFATCA policy ADME 2.14 concerning Remote and Virtual Towers remains valid, the first note, stating "**ATCOs shall not be required to provide Digital Air Traffic Services (DATS) to more than one aerodrome simultaneously,**" requires review to ensure its continued relevance. The proposal to remove this note from ADME 2.14 was provisionally accepted. The TOC continues to recommend deleting this provision.

2.29. ICAO Doc 444, PANS ATM Chapter 2, para 2.1.1 states;

States shall ensure that the level of air traffic services (ATS) and communications, navigation and surveillance, as well as the ATS procedures applicable to the airspace or aerodrome concerned, are appropriate and adequate for maintaining an acceptable level of safety in the provision of ATS.

A portion of ADME 2.14 indicates that;

Requirements at a minimum should include, but are not limited to:

- **surveillance equipment capable of providing the desired service level; and**
- **a robust contingency plan in case of system failure.**

2.30. In MMO environments where surveillance is essential for ATCOs to operate safely, the term "desired" does not imply a mandatory minimum standard of equipment. Instead, it indicates that ideal standards are sufficient for providing DATS in MMO. The desired level of service reflects the aspirations of the ANSP, or vendors involved in the MMO system. In contrast, the required level of service denotes the absolute minimum necessary for ATCOs to perform their duties safely. It is recommended to amend the text from "desired" to "required", to establish a mandatory minimum standard for surveillance equipment.

2.31. As operations evolve, IFATCA must establish a clear policy regarding the provision of simultaneous DATS services to multiple aerodromes (MMO). At the 63rd IFATCA conference in Singapore, the provisional policy stated: "**When an ATCO is endorsed to provide ATS at more than one aerodrome, special consideration must be given to the associated human factors issues.**" This policy acknowledges the significant cognitive challenges (para 2.11 above) ATCOs face when managing multiple aerodromes. These challenges include rapid mental switching between different operational environments and the need to recall and apply distinct procedures for each location, potentially leading to increased stress and fatigue. Addressing these human factors is crucial for ensuring safe and efficient MMO operations. The inherent complexity (para 2.24.1 above) of managing multiple aerodromes amplifies the potential for stress and fatigue, which can negatively impact performance. Therefore, to prioritize safety and efficiency in MMO scenarios, a thorough consideration of the human factor's involvement is essential.

2.32. Additionally, in the provisional policy, a list of issues that requires further studies were presented for discussion.

Simultaneous DATS provision is currently not supported because there is a lack of studies:

- the situational awareness of ATCOs when services are provided to multiple aerodromes
- safety related issues and operational risks
- the possible confusion in radio communication/phraseology
- the combination of aerodromes considering the airfield layouts, similar sounding taxiways, runway orientations, differences in time zone, surrounding terrain and geographical location
- the human machine interface (HMI) and system integration
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- the definition of low/medium/high density airport

2.33. While this paper has explored several key challenges associated with MMO operations, it is important to acknowledge that the list provided above is not exhaustive. As the aviation industry continues to delve deeper into MMO, additional concerns and issues are likely to emerge and evidently it was raised and discussed at the 63rd IFATCA conference.

2.34. To ensure the safe and efficient implementation of MMO, it is crucial that these concerns be addressed by the task force responsible for developing MMO guidance material. The list in para 2.32 above will be forwarded to RTTF to include in the guidance material along with other research by the task force. By providing an overarching policy to these concerns, we can advocate for comprehensive and practical guidance that will mitigate risks and optimize operational efficiency.

2.35. While IFATCA maintains a strong policy against MMO, it is important to remain open to alternative policies to remain inclusive in the implementation. The current provisional policy **"IFATCA does not support the provision of DATS for aerodromes to multiple aerodromes simultaneously by ATCOs"** seems to contradict the proposed deletion in para 2.14. It does not pave the way for an open discussion. To stay involved in future discussion while still maintaining our stand (as IFATCA does not fully support DATS to multiple aerodromes simultaneously due outstanding issues), the policy should be amended as **"IFATCA currently does not support the provision of DATS to multiple aerodromes simultaneously, due to the number of outstanding issues"**.

2.36. To improve the logical flow of ADME 2.14, some paragraphs have been rearranged as proposed in the draft recommendation. For example, the statement **"For reasons of safety and human factors issues, the minimum frame rate in a digital air traffic services unit shall be 25 FPS"** has been moved to a more appropriate position within the document. This reorganization enhances readability and ensures a more coherent presentation of the information, while maintaining the original factual content.

Remote Tower Task Force

- 2.37. The IFATCA Remote Tower Task Force Team (RTTF) was consulted in reviewing this policy. It was noted that there are no specific guidance materials or credible studies conducted thus far for MMO. The existing guidance material by EASA could be further enriched by incorporating specific operational procedures and safety standards based on empirical data and real-time world experience.
- 2.38. The proposal for IFATCA to have guidance material for the implementation of MMO suggests a more nuanced approach, potentially allowing for a wider range of discussions and future possibilities.
- 2.39. The RTTF has embarked on MMO research. Until the research is complete, IFATCA may not have the clarity to amend the policy. On the other hand, if we stand by our hard negative policy, we might be excluded from future discussions on this concept of operations.
- 2.40. The guidance material that is currently being prepared by RTTF may not be ready at the time of this paper. TOC understands that the first draft of the guidance material would be made available at the time of the 64th IFATCA conference in circulation for MAs comments.

3. CONCLUSION

- 3.1. The provision of simultaneous aerodrome control service in a remote environment is not far from realisation. Major industry players are working on MMO and have validated the CONOPs in a simulated environment and are working on the next phase to introduce the concept in a live environment. Through the successful validation test in 2017, stakeholders have stated the following: **“it is planned to endorse this concept on a real-life validation platform based on Frequentis smartVISION Solution together with HungaroControl and Selex at HungaroControl’s premises in Budapest”** (Frequentis, 2018).
- 3.2. Given the numerous outstanding issues and the potential safety implications, IFATCA currently does not support the provision of aerodrome DATS to multiple aerodromes simultaneously. Therefore, IFATCA should maintain this position and not support such operations by a single ATCO, until a comprehensive study is completed. A draft recommendation to the change in provisional policy is provided below.

4. DRAFT RECOMMENDATIONS

- 4.1. The draft recommendations to ADME 2.14 accepted as provisional policy at the 63rd IFATCA conference in Singapore read as:

ADME 2.14 – Provisional Policy

When implementing DATS, standards, procedures, guidance and clear requirements shall be developed.

Requirements at a minimum should include, but are not limited to:

- surveillance equipment capable of providing the desired service level; and
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DATS shall provide an equivalent or greater level of safety, compared to the previous configuration.

When replacing a conventional tower, DATS should be capable of providing an equivalent or greater level of service as the aerodrome control tower.

Standardised training requirements shall be developed for all ATCOs that work directly or indirectly with DATS.

A specific endorsement is required to operate at an aerodrome where DATS are provided.

For reasons of safety and human factors issues the minimum frame rate in a digital air traffic services unit shall be 25 FPS.

When an ATCO is endorsed to provide ATS at more than one aerodrome, special consideration must be given to the associated human factors issues.

Simultaneous DATS provision is currently not supported because there is a lack of studies:

- the situational awareness of ATCOs when services are provided to multiple aerodromes
- safety related issues and operational risks
- the possible confusion in radio communication/phraseology
- the combination of aerodromes considering the airfield layouts, similar sounding taxiways, runway orientations, differences in time zone, surrounding terrain and geographical location
- the human machine interface (HMI) and system integration
- achieving runway safety
- on the type of flights (IFR/VFR) permissible
- contingencies in the event of system failures
- ATCOs workload management and complexity
- human factors research
- the concerns in the pilot communities
- the definition of low/medium/high density airport

IFATCA does not support the provision of DATS for aerodromes to multiple aerodromes simultaneously by ATCOs.

Is amended to read as follows

ADME 2.14 – Proposed Draft Recommendations

When implementing DATS, standards, procedures, guidance and clear requirements shall be developed.

Requirements at a minimum should include, but are not limited to:

- surveillance equipment capable of providing the required level of service; and
- a robust contingency plan in case of system failure.

For reasons of safety and human factors issues the minimum frame rate in a digital air traffic services unit shall be 25 FPS.

DATS shall provide an equivalent or greater level of safety, compared to the previous configuration.

When replacing a conventional tower, DATS should be capable of providing an equivalent or greater level of service as the aerodrome control tower.

Standardised training requirements shall be developed for all ATCOs that work directly or indirectly with DATS.

A specific endorsement is required to operate at an aerodrome where DATS are provided.

When an ATCO is endorsed to provide ATS at more than one aerodrome, special consideration shall be given to the associated human factors issues

IFATCA currently does not support the provision of DATS to multiple aerodromes simultaneously due to the lack of knowledge about the operational hazards, the effects of the operational mode and the associated risks.

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6. List of acronyms

ANSP	Air Navigation Service Provider
ATCO	Air Traffic Control Officer
DATS	Digital Aerodrome Traffic Service
EASA	European Union Aviation Safety Agency
HMI	Human Machine Interface
IFR	Instrument Flight Rules
MA	Member Association
MMO	Multiple Mode Operations
PTZ	Pan Tilt Zoom
RTTF	Remote Tower Task Force
SESAR JU	SESAR JU – Single European Sky ATM Research Joint Undertaking
SMO	Single Mode Operations
VFR	Visual Flight Rules

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