

**Remote Tower Policy: An Analysis of Simultaneous Operations**

Presented by TOC

**SUMMARY**

This paper outlines the draft change in 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. Remote Tower Operation as a part of the nomenclature now adopted as Digital Aerodrome Traffic Service (DATS), is a concept where Aerodrome control services are provided remotely rather than the conventional method of looking Out of The Window (OTW) from an aerodrome control tower sited at the aerodrome. Cameras mounted at strategic locations around the aerodrome, provide a panoramic view of the airfield on digital screens at a remote location. These screens replace the OTW view and conventional binoculars, with pan-tilt-zoom camera functions. Additional picture in picture or other similar superimposed image functions provide zoom settings for additional viewpoints over hotspots, runways, taxiways, and aprons. 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. The initial DATS concept of operations for a single remote tower mode where an ATCO manages one aerodrome at a time is typically targeted towards low<sup>1</sup> density airports. However, the current understanding of the concept, heavily driven by the high flexibility use of technologies, is applicable to airports of all sizes [5.2].
- 1.3. In today's extremely challenging environment for the management of air traffic, the provision of digital aerodrome control service, has emerged as one of the explorative concepts which ANSPs are considering. The consolidated workforce in a single location while providing Air Traffic Services to multiple aerodromes, provides the flexibility to redeploy officers.

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<sup>1</sup> ICAO Annex 14 – Aerodromes Para 1.1 Definitions, Aerodrome traffic density, a) Light – Where the number of movements in the mean busy hour is not greater than 15 per runway or typically less than 20 total aerodrome movements.

1.4. IFATCA policy ADME 2.14 regarding Remote and Virtual Tower has been:

**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.**

As ANSPs are gaining interest in the provision of ATS to multiple aerodromes simultaneously, IFATCA should not exclude itself from conversations with all relevant stakeholders considering the interest of ATCOs in the way these services are provided.

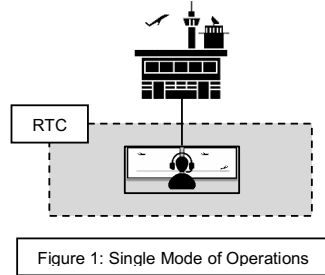
1.5. It would be prudent to stay involved at the onset in all conversations that would eventually lead to the implementation in providing ATS to multiple aerodromes simultaneously, remotely. We may have to review and expand IFATCA's policy on this front, outlining the issues by listing all considerations working in a multiple remote environment that might be essential in the provision of DATS. IFATCA has opposed to the provision of aerodrome control services to multiple aerodromes simultaneously since 2014. However, most recently, EASA has come forth claiming there is sufficient information and data to support and guidance to facilitate MMO's safe implementation and a basis for further development, though currently they are less mature facing present technical and human factor challenges [5.3].

#### Single Mode of Operations

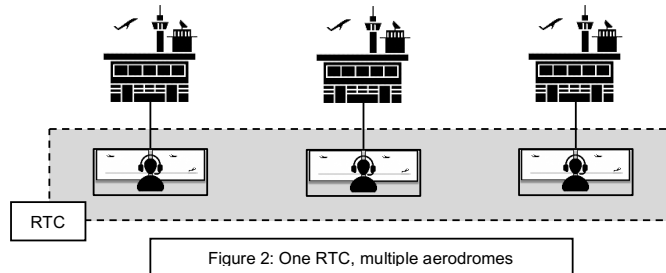
1.6. Initial concept of DATS was developed for low density airports to achieve a more cost-effective way in providing Aerodrome control service [5.2]. However, SESAR's research concludes that SMO is not interesting from a cost effectiveness perspective. Nevertheless, SMO centralises the resources and provides flexibility in providing air

traffic service. This is defined as “Single Mode of Operations” (SMO) – The provision of ATC from one remote tower module for one aerodrome at a time (Fig 1) [5.2]. The figure below depicts a single ATCO providing aerodrome control service remotely from a Remote Tower Centre (RTC).

- 1.7. Further expanding on this concept, multiple remote towers can be housed under one Remote Tower Centre (RTC) while still operating under SMO. In this configuration, one RTC provides DATS for multiple aerodromes, each assigned with an independent



ATCO. Figure 2 below describes this concept.



### Multiple Mode of Operations

As defined by EASA - “Multiple operating mode” refers to the provision of ATS to two or more airports simultaneously from a digital tower centre [5.2].

- 1.8. With the main driving factor to further save cost and human capital, aviation industries and ANSPs are exploring the provision of DATS to multiple aerodromes simultaneously by a single ATCO from a single Remote Tower Centre (RTC). This is defined as “Multiple Mode of Operations” (MMO)<sup>2</sup> - The provision of ATS from one

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<sup>2</sup> As defined by EASA - “Multiple operating mode” refers to the provision of ATS to two or more airports simultaneously from a digital tower centre [5.2].

remote tower module for two or more aerodromes at the same time (i.e., simultaneously – Figure 3 below).

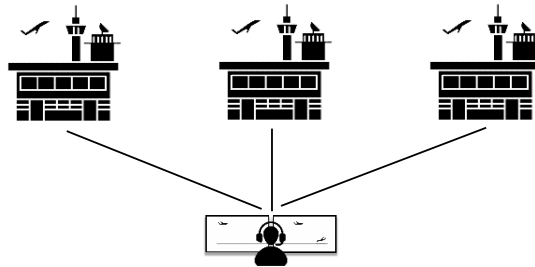


Figure 3: Multiple Mode of Operations

- 1.9. This mode of operations shows a significant change to current, normal operating methods. Several changes to the available technical aspects have to be duplicated or integrated and combined to assist the ATCOs. It would largely depend on the ability and capacity of the ATCOs to maintain acceptable levels of situational awareness. Simultaneous modes of operations or aerodrome combinations may not be limited to traffic density, complexity, traffic schedules and airfield layouts. There should be many other unrealised factors to be considered.
- 1.10. The Controller Working Position (CWP) in an RTC providing multiple aerodrome control services and the combined digital screens providing a panoramic view of a particular airfield, are typically arranged by stacking a panoramic view of multiple airfields on top of each other or side by side. This layout of display (Figure 4: Dual Aerodrome Layout and Figure 5: Triple Aerodrome Layout) is managed by a single ATCO under the MMO with the support of an assistance on demand.

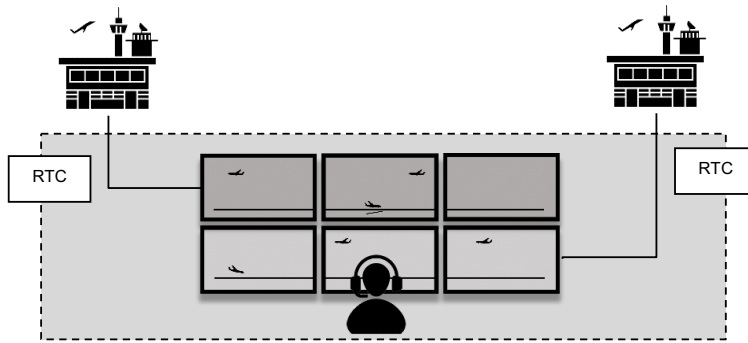


Figure 4: Dual Aerodrome Layout

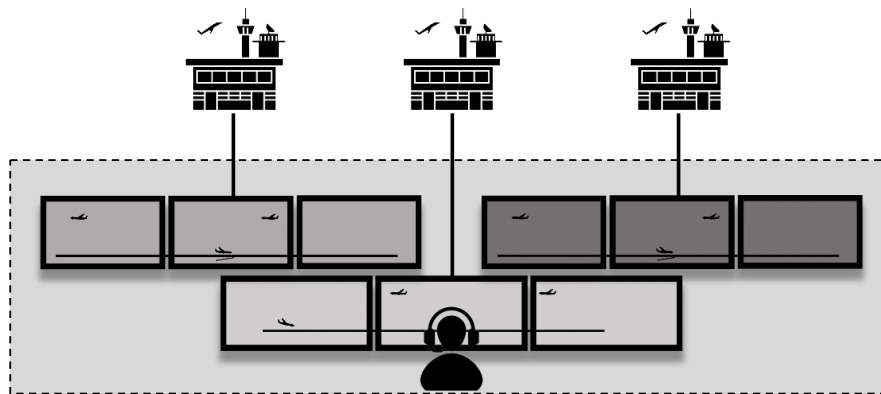


Figure 5: Triple Aerodrome Layout

## 2. DISCUSSION

### Main Drivers for Multiple Mode of Operations

- 2.1. There are several driving factors for stakeholders to embark on DATS. By switching operations from SMO to MMO, the benefits gained are much greater and receive more attention. Of these, the main drivers are i) Cost Efficiency, ii) Flexibility iii) Human capital and Centralization of services. These factors are all intertwined where overall available resources are better used [5.4].
- 2.2. Cost Efficiency: The introduction of RTS is mainly driven by ANSPs desire to reduce ATS operational cost. Some regional airports with less than one million passengers' movements are currently making a loss [5.4]. These operation costs can be shared by relocating the ATC function in one location, the RTC. Albeit high operating costs, ANSPs continues to keep small rural airports open for local business sectors and communities out of necessity.
- 2.3. The provision of ATS remotely for a new small/medium capacity airport is an alternate solution to cost efficiency. The building and operational costs of remote tower facilities is much lower compared with constructing a traditional physical tower. Building infrastructure and maintenance of the traditional control tower, cost of supporting staff and ATCOs, land cost and other associated expenses in maintaining a physical tower, could far outweigh the cost in providing similar services from a remote tower facility [5.4].
- 2.4. However, there is a trend of growing concern by safety regulators as to how human performance is managed using these new technologies. There is a requirement to develop a safety case and address concerns that multiple remote tower operations may increase operational risk for ATCOs [5.4].
- 2.5. Flexibility: The provision of Aerodrome ATS from a RTC provides the opportunity to be flexible and traffic oriented, which is not achievable in the same way from a conventional tower. ATCOs are required to be stationed at the conventional tower,

manning the CWP, even if there's no traffic movement. The possibility to provide a capacity-on-demand service and to provide an efficient service is possible, by adapting the operational resources to suit demands.

- 2.6. By providing Aerodrome ATS in a centralised location, ATS services can be provided to airfields for a finite period. Flexible ATS can be provided as required, by pooling resources. ATS services can also be extended to extreme or hostile environments, where controllers may not be conveniently or safely placed.
- 2.7. On the contrary, the provision of DATS in a single location is a risk. If for any reason the RTC becomes inoperable due, e.g. system failures, monsoon or weather, aerodromes that were managed within the RTC will be greatly impacted. Aircrafts losing ATC services may have to proceed to their alternate aerodromes which could be capacity limited. Impact to be further when operating under MMO. ANSPs should study and plan proper contingencies for such eventualities.
- 2.8. Human Capital and Centralised Service: Looking at the bright side, being in a central facility makes sharing of a human resource pool convenient. Additionally, costs are reduced and flexible ATS can be provided. Staffing can be matched to traffic demands, without generating additional costs for low or no traffic. SESAR 2020 partners carried out four real-time simulations in MMO testing human performance, visual information displays, advanced voice services, technical support systems and safety performance. The results showed that in MMO, same volume of traffic could be handled with up to 25% fewer ATCOs<sup>3</sup>.
- 2.9. On a positive note, working in an RTC, ATCOs need not work alone in a low-density airport for which they may be under-stimulated and experience reduced opportunities to learn and gain skills. Conversely, in times of emergencies necessary assistance will be readily available. However, at this moment, the provision of MMO by a single ATCO in a live setting is not established. A "Safety Case" to address different details associated with MMO is still in discussion.

#### Multiple Mode Operational Challenges

- 2.10. As of now, there are established guidance materials for remote tower concepts for SMO. (ICAO Doc 4444, Chapter 7 para 7.1.1.2.1 states: 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).*") For MMO, the concept of operations and guidance materials is still in the trial phase. It is imperative for IFATCA to be involved in this phase to voice our concerns, while the guidance materials are outlined.
- 2.11. As described in this paper above, para 1.4, IFATCA's stand has been "NO" to the provision of simultaneous operations in an RTC. As many ANSPs are moving towards MMO, IFATCA TOC is reviewing the long-standing policy. By continuing to stand by

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<sup>3</sup>SESAR JU: <https://www.sesarju.eu/sesar-solutions/multiple-remote-tower-module>

our hard policy and with ANSPs noting the benefits, we need to highlight the safety issues, workload, and complexity challenges of MMO.

- 2.12. The overarching consideration with regards to MMO is that it is to be used only when the operational circumstances facilitate the operations, and it is assessed that the ATCO workload and complexity can be managed. Operational circumstances should be suitably defined with careful considerations and adequate safety assessments are conducted.
- 2.13. The number of aerodromes and size should be carefully assessed. When combining multiple aerodromes to a single working position, not only the number of aerodromes should be considered. The selection of aerodromes for an appropriate combination based on the operational aspects has to be carefully assessed. Geographical locations, traffic levels (peaks and troughs) and traffic mix (IFR/VFR), complexity (training flights, military traffic, general aviation), meteorological conditions, runway orientations, surrounding terrains, etc. are some of the aspects that should be considered when deciding on the combination. Generally, ATCO's workload and situational awareness should not be compromised by a combination that's poorly selected, creating an unsafe situation.

#### SESAR Research

- 2.14. There's continued research ongoing within SESAR and the validation exercises performed so far indicates that MMO can be applied for the simultaneous provision of ATS to selected aerodromes, by a single ATCO. Part of their research includes the provision of ATS, simultaneously to three aerodromes. SESAR's continued research in MMO concept expands to managing higher traffic volumes and increasing the number of simultaneous aerodromes. The number of aerodromes ultimately depends on various factors like traffic volume, schedule, meteorological conditions, technical configuration, and other supporting functions. SESAR has also indicated that such evolution will be dependent on operational experience gained and trust.
- 2.15. In the research by SESAR, it is described that the basic Human Machine Interfaces (HMI) are deemed to be adequate for the provision of ATC service in a low-density airport. According to SESAR's validation result, it was also noted as the total traffic level and complexity generally have greater impact on the ATCO's workload rather than the number of aerodromes to which the services are provided. Notably, aside from the ICAO Annex 14 – Aerodromes on the definition of low-density traffic volume, there is no clear indication to define low/medium/high density airports, relative to the number of aircraft movements. A global standard is not established.

#### Situational Awareness

- 2.16. ICAO Doc 4444 Chapter 6 para 7.1.1.2 states: "*Aerodrome controllers shall maintain a continuous watch on all flight operations on and in the vicinity of an aerodrome as well as vehicles and personnel on the manoeuvring area. Watch shall be maintained by visual observation, augmented when available by an ATS surveillance system.*" At the 62nd Annual Conference in Montego Bay, it was accepted that in the interest of safety and human factors issues, the minimum frame rate in a remote tower

operational unit shall be 25 FR for single remote towers. When in MMO, the frame rate received from the respective aerodromes, should not be any lesser than the single remote tower.

- 2.17. Aircraft on final to landing and vacating the runway or, departing aircraft till it is airborne, are the critical phase of any flight. ATCO's continuous watch over this aircraft while scanning the runway to ensure it is clear for aircraft movements, requires cognitive attention for a reasonable amount of time. This attention span will be divided while providing simultaneous ATS in MMO. 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."* Timely information of aircraft's abnormal configuration or conditions required by the ATCOs to inform the pilot might be delayed or missed due to the ATCO's divided attention. It was very evident in the Überlingen incident where the ATCO's attention was divided juggling between working positions.
- 2.18. In another incident where there was a momentary lapse in situational awareness happened in Tulsa, Oklahoma (USA) where a FedEx Federal Express Boeing 757-200 freighter, cleared for a visual approach and landing runway 18L, lined up with runway 18R and continued for a landing on runway 18R. After the aircraft vacated the runway at the end, the crew informed tower they had landed on the wrong runway. To this incident, NTSB's final report concluded "The tower controller's failure to monitor the flight throughout the duration of its progress resulted in a missed opportunity to notify the crew and correct the misalignment before landing" as one of the probable causes of the incident. These are just a couple of incidents that are quoted here in this paper, and there are many more similar instances.
- 2.19. The likelihood of simultaneous aircraft movements into different aerodromes, based on the expected traffic, should be carefully assessed, and considered in the local safety assessment before implementing MMO. A completely different aerodrome or similar aerodrome with changing weather patterns, can lead to temporary loss of SA causing misunderstandings, mix-ups, and other working errors. This raises a huge safety concern.
- 2.20. In the effort to maintain the situational awareness, while in MMO, management of traffic distribution between aerodromes must be carefully regulated. If simultaneous Aerodrome ATS are provided, simultaneous arrivals between aerodromes should be avoided. EASA's **Guidance Material on remote aerodrome air traffic services** [5.6] indicates that this can be achieved as follows:
  - 2.20.1. Strategical: By forecasting and pre-planning of traffic flows, planning of staffing and the grouping of RCT.
  - 2.20.2. Pre-tactical: With the available flight plans, plan the traffic sequence and take necessary action, if necessary, e.g. by delaying traffic from departure aerodrome.



- 2.20.3. Tactical: The usual tactical working practices by ATCO, to sequence arriving aircraft (e.g., by either delaying start-ups, imposing speed control, holding, taking vectors for delay, etc) while there's another runway movement on another aerodrome.
- 2.21. In the conventional OTW provision of ATS, ATCOs would be accustomed to the size of the aircraft from the tower point of view, relative to the runway, surrounding buildings and structures. While in a remote environment looking at the digital screens, sometimes there can be a misconception concerning depth perception and the ability to judge distances. Human depth perception based on eye distance is effective only at near distances (typically up to 6 metres which is equivalent to a 6/6 vision). Faraway objects that typically appear smaller than in real life, may appear different from a remote tower (zoom functions). For example, a B777 in one screen where the camera is closer to the aircraft, may appear bigger while the same type of aircraft in another screen where the camera is placed further away may appear smaller. The constant adjustment to this perception may cause fatigue and confusion if not managed correctly. The placement of the camera's distance from the area of concern, height of the camera and zooming of image must be carefully considered.
- 2.22. For certain decision-making processes, the subconscious mind will take reference from the surroundings and will build a perception in our mind on the scale. This subconscious mind can be calibrated when providing similar service remotely in SMO. However, in MMO, this could be an added work to the ATCO to constantly adjust the mind image scale as they may not be the same across the different aerodromes. Potential confusion and spatial disorientation from the different views of the different aerodromes may occur. ATS providers should consider the effects of these differences in scale, when implementing MMO.
- 2.23. It is essential that the ATCO is able to distinguish between the aerodromes at which ATS are simultaneously provided remotely. When selecting aerodromes for the purpose of MMO, runway alignments should be contemplated. If the grouping of aerodromes with similar runway alignment is required (e.g. Runway 03/21 with Runway 05/23 or Runway 15/33 with Runway 12/30), runway directions and relative to cardinal/compass directions on all aerodromes may be screened on the displays for the ATCO's situational awareness when providing ATS to several aerodromes simultaneously. To allay the possible confusion in such combinations, and if frequencies are not separated (see para 2.29.1), the inclusion of aerodrome names in clearances/radio transmissions should be considered as a standard procedure [5.6]. Conversely, this may contribute to frequency congestion and workload issues, which could become a critical safety issue.
- 2.24. The number of Human Machine Interface (HMI) devices to control the same functions for different aerodromes should be kept to a minimum and similar. This would support the efficient provision of ATS when operating in MMO. Situational awareness can be enhanced by strategically placing microphones, capturing and relaying the aerodrome sound to RCT, providing a sense of presence and direction of aircraft movements [5.6]. Additionally, in an MMO environment, the possibility of different daylight/darkness conditions to be felt by the ATCO should be mitigated to minimise any disarray.

## System/Communication

- 2.25. It is near impossible to replicate the OTW view for a human eye performance in an RTC. However, it is essential to provide an image that sufficiently supports the provision of ATS and its operational needs. The camera's frame rate (minimally 25 FPS), latency and resolution should be validated to support the service provided. With the available technology, technical integration, systems and components in RTC, it is possible to design and segregate different types of alarm, alerts and messages. In MMO, it is to be ensured only operationally relevant information is directed to the ATCO in control position. All other non-operational information should be directed to another officer who is not providing ATC service to filter. ATCOs concentration should be in managing the traffic and not to be distracted by non-operational information.
- 2.26. The technical system should support and reduce ATCO workload by system integration to the level where the ATCO can focus on task performance in MMO. Furthermore, the system design should support the ATCO to clearly distinguish to which aerodrome any single set of displays and functionalities are linked. A lesson that we draw from the pilot community is the risk of mode-switching error. On 6<sup>th</sup> Sep 2011, the pilot in command of B737-700 who stepped out of the cockpit monetarily, was returning. The First Officer (FO) at the controls who was new to the B737-700 at that time, instead of turning the doorknob, erroneously turned the aircraft rudder trim increasing the angle of bank of the aircraft and losing about 6300ft. Investigation revealed that the FO who was initially trained on a B737-500 was confused with the position of the rudder trim and doorknob. The rudder trim position in a B737-700 is the doorknob location in a B737-500 [5.5]. Such mode-switch errors should be mitigated when designing the HMI for a MMO.
- 2.27. In a multiple mode of operation, to help reduce the ATCO's overall workload, it is recommended that coordination and transfer of control is supported by system means, enabling automated coordination of a flight to/from other ATS units.
- 2.28. As part of the local safety assessment, in-depth evaluation of the communication characteristics between air and ground communications in MMO has to be conducted by the ATS provider. Related operational procedures should be designed and reestablished with the necessary system support. In the framework of the SESAR JU programme, various ways of handling communication in a MMO context were examined. As part of the framework validation activity, simultaneous management of various aerodrome radio frequencies and the increased number of telephone lines were assessed.
- 2.29. To this regard, based on the validation results, SESAR JU has noted some preferences. Two possibilities for air ground communications were preferred i) respective aerodrome frequencies are handled separately or ii) the aerodrome frequencies are coupled.
- 2.29.1. Separate frequencies – In this configuration, the ATCO would be able to hear the transmissions from all the aerodromes under their control. As for the pilots, they will hear the transmission meant for the respective aerodrome as selected by the ATCO. The ATCO has the choice to either transmit separately (individual aerodrome

frequency selected) or all at once on all the aerodrome frequency (all aerodrome frequencies selected). This method of separate frequencies would reduce the risk of pilot confusion as well as lowering the risk of misinterpreted transmission meant for other aerodromes. The trade-off would be pilot's transmission on the frequency may not be heard by the ATCO as the ATCO might be occupied with another aerodrome frequency. They would not be able to hear the transmissions of the other aerodrome where the same ATCO is providing ATS. It should also be noted that the ATCO should select the correct frequency otherwise there could be mix-up of instructions (transmitting on the wrong aerodrome frequency).

- 2.29.2. Coupled frequency – When the aerodrome frequencies are cross-coupled, ATCOs and pilots would hear all the transmissions related to all aerodromes under the ATCO's responsibility. It would be similar to single frequency operation. The various aerodrome's frequencies are cross-linked at the back end. Pilots would then be aware of the frequency occupancy and the risk of simultaneous transmissions can be reduced. ATCO's wrong aerodrome frequency selection can be also mitigated. The trade-off would be the possibility of confusion for pilots hearing transmission for other aerodromes.
- 2.30. Based on SESAR JU validation results, the preferred method seems to be frequency cross-coupling across the aerodromes. To reduce the possibility of pilots' confusion hearing transmission for other aerodromes in cross-coupled method, it is recommended to include the aerodrome names in clearances as a standard procedure. Additionally, ATS providers should also consider the inclusion of aerodrome names/ATS unit call signs for all transmissions as part of local safety assessment. Aerodrome names/ATS call signs should not be limited to only the first contact [5.6].

#### Operational Procedures

- 2.31. In some ANSPs, ATCOs may have more than one aerodrome endorsements. This is supported by IFATCA policy ADME-2.14 **A specific endorsement is required to operate at an aerodrome where DATS are provided**. These ATCOs may be rostered for duty at those aerodromes at various schedules. In the conventional tower operations, operating methods and procedures may differ between aerodromes due to local variations and practices. There's often a lack of standardisation of systems and equipment between different aerodromes. ATCOs would have to remember the different procedures applicable to the specific aerodrome. In the conventional tower, the CWP layouts, surroundings and the OTW visual cues would assist ATCOs to perform effectively. In an MMO setting, ATCOs may not have these aids to work and would have to adapt to the same CWP layouts for different aerodromes. It would be a challenge for ATCOs to apply the different procedures specific to the aerodrome and here lies the risk of mix-ups in a Remote CWPs. The absence of the conventional tower's physical environment, OTW visual cues in RTC would be an added challenge. ATCOs must remember the various aerodrome procedures to which they are required to provide ATS. When providing simultaneous ATS, they might be exposed to the risk of applying the wrong procedure to an aerodrome not meant for.

- 2.32. To support the flexibility of providing ATS in a MMO, and to reduce the ATCO training needs as well as to improve the uniformity of ATS, it is recommended to unify the RTM within the RTC in terms of HMI and equipment to which the services are provided. Operating methods and procedures for the various RTM connected in the RTC are recommended to be unified and streamlined. At the onset, before ATCOs can be deployed to function in MMO, they must be minimally endorsed in the aerodrome where ATS is to be provided. A comprehensive training program should be established.
- 2.33. Implementation of MMO would be part of an extension to an existing SMO. ATCOs providing ATS in SMO should gain sufficient operational experience specific to the aerodrome before being deployed to provide ATS to multiple aerodromes simultaneously where experience was gained. IFATCA Policy ATS 3.12 says **Introductions of new Mixed Mode Operations should be avoided by creating intrinsically safe solutions and When safety of a Mixed Mode Operation cannot be completely managed at an intrinsic level, assessment shall take place to ensure that the change in the ATM system does not increase controller workload to an unacceptable level.**
- 2.34. With standardised operational procedures (one combined operations manual for the complete RTC), similar CWP and HMI, provision of safe ATS simultaneously in MMO can be enhanced. LFV, the world's first provision of remote airport control service has shared in their lessons learnt as *"ATCOs can more easily work at more airports thanks to the same CWP/HMI and thanks to standardised operational procedures (one combined operations manual for the complete RTC) [5.2]."*
- 2.35. ATCOs workload would increase significantly if there were unexpected or unusual events, such as emergencies at one aerodrome with simultaneous aircraft movements. One such example of an emergency - When an aircraft reports that he could not extend the undercarriage, the ATCO's coordination process with the relevant agencies would increase tremendously [5.6]. Amid handling the emergency, the ATCO may be distracted and safe provision of service to the other aerodrome may be compromised. ATS providers should put in place appropriate procedures and contingency plans to manage such events. Such procedures should include adequate training. The operational procedures placed should assist the supervisory figure in the RTC to split, remerge and prioritise the RTM. Contingency and degraded mode procedures should include the effects of any event on all aerodromes connected to one RTM, as to how these failures may interfere between the aerodromes.
- 2.36. Missed approach is part of a flight profile for safety reasons in the event the aircraft cannot continue with the approach for a landing. IFR approach charts should describe the missed approach profiles i.e. the route and altitude to climb and the pilot follows the published profiles. In the MMO, there should be nil or limited alterations to those published missed approach profiles. If a verbal instruction by the ATCO is required for these missed approaches, actions of the pilots must be followed through by the ATCO to ensure that the pilot carries out the correct instructions. ATCOs attention would be diverted away from the subsequent arrival approaching another aerodrome. This would consequently increase ATCOs workload. ATS should also consider publishing

a missed approach profile/procedure for VFR flights eliminating the need to receive instruction from ATCO.

#### WORKLOAD

- 2.37. ANSP should establish procedures to manage capacity peaks or ATCOs high workload. This would address the need to when and how to split the aerodrome from MMO to SMO. It is essential for the RTC supervisor to have a clear picture of upcoming traffic movements using available data and meteorological information to act and organise the combination of aerodromes for MMO. The supervisor, assessing the traffic volume, complexity due to abnormal or emergency situations, should plan and act to change service provision between aerodromes on a flexible basis. The supervisor should split aerodromes in order to isolate the aerodrome with the abnormal/emergency situations on an RTM dealing with only this issue.
- 2.38. The possibility of changing from a SMO to a MMO environment, or vice versa, by adding or closing/transferring aerodromes in the RTM possible change of service may include [5.6]:
  - 2.38.1. Switching provision of aerodrome service from one combination to another - e.g. service from aerodrome A & B to aerodrome A & C.
  - 2.38.2. Merging aerodrome to be provided service with – e.g. provision of service from aerodromes A & B, adding another aerodrome C to provide combine service to aerodromes A & B & C; and
  - 2.38.3. Closing or transferring service provision for one or several aerodromes - e.g. if providing service to aerodromes A, B & C, change service to aerodromes A & B).
- 2.39. Switching/merging/transferring/closing of aerodromes should be carried out according to the traffic volume and complexity. The ATS provider should establish the procedures and conditions to adequately manage the operational circumstances detailing when and how it should be carried out. On this note, having a supervisor to decide on the mode of operations, considering all factors (e.g. future traffic movement, weather, complexity, abnormal/emergency events) is critical. This supervisor should be ensuring the necessary assistance is provided for the ATCO operating in MMO. This can be achieved by those tactical methods described in para 2.20.1, 2.20.2 and 2.20.3 above.
- 2.40. It is essential to bring in the end user, the operational ATCOs, early in the process of implementing MMO as they can provide the necessary inputs in the design of systems, procedures and HMIs from the operational perspective. This is also supported by IFATCA's policy AAS 1.13 – Determining operations readiness of new ATM systems “**Operational controllers shall be involved in the design, development and implementation of new ATM systems**”. It will also assist to build trust in the system. Workload can be reduced by system integration, and it is recommended for the interaction to be handled by one system for all system parts. In a case study report from DFS remote tower centre (CANSO Guidance material), as part of lesson learnt, they have indicated “*The early involvement of ATCO and ATSEP was very important*”

*and contributed to the success of the first commissioning (Saarbrücken airport from RTC Leipzig)” [5.2]. Prior to making the decision in implementing MMO, an impact assessment on performance management considering four areas i) safety (including human performance), ii) environment, iii) economic (including cost benefits analysis) and iv) social impacts, and the interdependencies should be studied. These interdependencies should consider all factors affecting safety, both in short term and long-term operations [5.3].*

### **3. CONCLUSION**

- 3.1. Majority of IFATCA's policy ADME 2.14 regarding Remote and Virtual Tower remains valid. However, the first note of the policy requires a review to stay involved.

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

- 3.2. Simultaneous Aerodrome control service in a remote environment, is not far from realisation. ANSPs, vendors and stakeholders alike are studying the possibilities in implementing such services.
- 3.3. While the concept of operations is in the trial phase, it is imperative for IFATCA to have a well-grounded and debated position, if aerodrome air traffic control services were to be provided simultaneously.
- 3.4. Maintaining situational awareness is assessed to be of the utmost importance and it must be addressed. Losing situational awareness may contribute to increased workload and confusion. Situational awareness could be minimally maintained by Strategic, Pre-Tactical or Tactical traffic management. Coupling of frequencies may enhance the situational awareness for both the pilots and ATCOs.
- 3.5. Aside from situational awareness, ATCOs workload needs to be managed. Monitoring traffic movements in more than one aerodrome simultaneously would increase the workload. The presence of a supervisor is needed to moderate the traffic flow and when the needs arise, to split the combined aerodromes. A well-established procedure with minimum difference between the aerodromes needs further guidance.
- 3.6. Also, it is essential to include the ATCOs and ATSEP personnel, early in the discussion and implementation in the provision of simultaneous RTS in an RTC. ANSPs may then get the “buy in” from the operational officers and any challenges or issues can be identified and mitigated. It is also advised to evaluate the experience gained over a long period in SMO before embarking MMO.
- 3.7. There are many aspects of the MMO that still lacks clarity. ATCOs workload management, Study of Human Factors (HF) in relation MMO, Human Machine Interface (HMI) considerations, System Integration, Safety assessment, etc are some of the main aspects that need more research and studies. The Remote Tower Task Force (RTTF) has embarked on MMO research. Till the research is completed, 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.

- 3.8. Similar runway configuration and taxiway naming convention must be carefully reviewed and assessed for potential risk of confusion. Communication procedures must be also established.

#### **4. RECOMMENDATIONS**

- 4.1. Existing IFATCA policy ADME 2.14 regarding Remote and Virtual Tower is amended to read:

~~**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;**
- 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.**

**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.**

Is amended to read as follows:

## ADME 2.14

~~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; 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.

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.



And included in the Technical and Professional Manual.

## 5. REFERENCES

- 5.1. ICAO Doc – PAN-ATM 4444 and 9426
- 5.2. CANSO - Guidance Material for Remote and Digital Towers - <https://canso.org/publication/guidance-material-for-remote-and-digital-towers-edition-2/>
- 5.3. EASA: <https://www.easa.europa.eu/en/downloads/137788/en>
- 5.4. [Multiple Remote Tower for Single European Sky – Research article](#)
- 5.5. Aircraft Serious Incident Investigation Report - [JA16AN.pdf \(mlit.go.jp\)](#)
- 5.6. [Guidance Material on Remote Aerodrome Air Traffic Services - EASA](#)

## 6. List of acronyms

DATS	Digital Aerodrome Traffic Service
OTW	Out of The Window
RTC	A facility established to provide Digital Aerodrome Traffic Service to multiple aerodromes.
RTM	Remote tower module
RCT	Remote Control Tower
CWP	Controllers Working Position
RTS	Remote Tower Services
SMO	Single Mode Operations
MMO	Multiple Mode Operations
MRTM	Multiple Remote Tower Module
SESAR JU	SESAR JU – Single European Sky ATM Research Joint Undertaking

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