INTERNATIONAL FEDERATION OF AIR TRAFFIC CONTROLLERS' ASSOCIATIONS

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Simulator and Operational Duties

Presented by PLC

SUMMARY

This working paper aims to research and understand the impact of workload, fatigue and interaction when working in a simulator session and live-operational environment within the same shift. It also reviews the current IFATCA policy in TRNG 9.3.1 "No operational duty should be carried out after simulator duty during the same shift".

1. INTRODUCTION

1.1. Given the global air traffic controller (ATCO) staffing situation and operational demand, some Air Navigation Service Providers (ANSPs) may roster ATCOs for both air traffic control (ATC) simulator sessions and live operational duty within the same shift.

1.2. There is concern from some Member Associations (MAs) about ATCOs returning to operational duty following simulator duty impacting the ATCOs performance, rest and working conditions.

1.3. This working paper aims to research and understand the impact of workload and fatigue when working in a live operational environment following a simulator session, and to review the current IFATCA policy TRNG 9.3.1 "no operational duty should be carried out after simulator duty during the same shift".

2. DISCUSSION

2.1. In March 2001, WP161: On the Job Training (OJT) & Simulator Duty was presented at the 40th IFATCA Annual Conference in Geneva. Concerns about the interaction between simulator and operational duties both before and after one another during the same shift were raised during the meeting. Some concerns that were raised at that time were, quote:

> "It is possible that the use of a simulator in ATC training may well introduce a mind set into either trainee or OJTI of a "this is not for real" situation that could be carried forward should live training then be undertaken immediately after a simulator session."

> and

> "This could equally apply to a valid ATCO who has been carrying out such tasks as Emergency Continuation Training, or development work on a new sector where he/she may take the new procedures inappropriately into the current operations room."

> and

> "So called "harrowing" scenarios can be created that may have an adverse impact on mental wellness and increase stress upon some individuals. For most experienced ATCO's, however, this is readily distinguishable from reality although in some cases (especially with ab-initio trainees) this may constitute a problem. And, even where this does not occur, it could be that fatigue is induced by the very nature of high levels of traffic possible on the simulator."

2.2. These concerns are relevant to the interaction of simulator and operational duties when performed before or after one another within the same shift.

2.3. There was a need to protect both the On-The-Job-Training Instructor (OJTI) and the trainee with policies that are robust enough to cover those concerns but flexible enough to permit practices that are acceptable.

2.4. One of the policies that was recommended was 'no operational duty should be carried out after simulator duty during the same shift' and was thereafter accepted.

2.5. ATC Simulator Sessions

2.5.1. ATC simulator sessions play a crucial role in training ATCOs. It helps practise technical skills (phraseology, application of separation standards, and clearances), focus on non-technical skills (interactions with pilots and coordination with colleagues) and builds confidence.

2.5.2. ATC simulator sessions are used for:

- ab-initio training;

- refresher and other training for licenced ATCOs;

- conversion training for tower, en-route, and approach environments;

- training of new tools, equipment as well as airspace and procedure changes, and

- training of abnormal and emergency situations.

2.5.3. Compared to live-operational duty, where some variables like weather cannot be influenced, a simulator session is an environment where all variables can be controlled and changed specifically for the purpose of the session.

2.5.4. In the following table, some factors such as workload and fatigue of live-operational duty and simulator duty are compared.

Live operational environment	Simulated environment
Workload	
Real-Time Pressure	
ATCOs deal with real-time traffic, which includes unpredictable elements like weather changes, emergencies, and pilot errors which adds a level of stress and urgency.	Simulators can replicate traffic scenarios without real-world consequences for air traffic. However, pressure may be experienced by instructors for being accountable for the trainees' success or by trainees that need to improve their skills.
Complexity and Volume	
Dynamic: can have high traffic volumes and complex airspace configurations, but also less busy or complex periods.	Simulators can mimic maximum complexity and highest traffic patterns (which is sometimes why they are used - e.g. during seasons of low traffic in the live environment). While simulators can mimic complex scenarios, they are often used for training specific skills or handling particular situations, which can be more controlled and predictable.
Human Interaction	
ATCOs interact with real pilots and other controllers, which can introduce variability in communication and coordination.	Scripted scenarios or automated responses are used, which may be more predictable and less demanding in terms of communication. There is still the human element of unpredictability of responses.
Fatigue	
Stress and Pressure	
The stress and emotional burden of real-world consequences can amplify the effects of fatigue, possibly leading to quicker cognitive decline and increased error rates.	Although realistic, simulators do not carry the same emotional weight and consequences as working with real life traffic, possibly making fatigue less impactful. For trainees, however, simulator exercises can be highly stressful because their performance directly affects their training progression. Additionally, learning new skills and handling unfamiliar situations can be mentally exhausting, amplifying the emotional and cognitive demands of the session.
Workload and Complexity	
The unpredictable and complex nature of live operations can increase cognitive load, making it	A controlled environment allows for more manageable workload and recovery, reducing the impact of fatigue with the

harder for fatigued controllers to maintain performance.	option of pausing or stopping the simulator exercise anytime. Simulators are, depending on the objective of the session, used to train in high complexity and busy scenarios, increasing fatigue.
Recovery and Breaks	
Operational demands can limit opportunities for breaks and recovery, making it harder to mitigate fatigue.	Structured schedules often allow for regular breaks, helping to manage fatigue more effectively.

2.5.5. As shown in the table, there are different variables that influence the workload and fatigue in both live operational and in a simulated environment. Also, some of these variables can be controlled and some cannot, resulting in a difference in impact on fatigue. Although these differences are present, in the end, either working in a live operational environment or a simulated environment will induce fatigue. Therefore, one should consider the impact of working in a simulated environment to working in a live operational environment and vice versa, especially if this will happen within a short time, for example, within the same shift.

2.5.6. IFATCA's current policy TRNG 9.3.1: "no operational duty should be carried out after simulator duty during the same shift" may restrict the need to perform operational duty after simulator duty during the same shift should the need arise but some ANSPs may continue to do so without taking any appropriate safety measures. However, since working on a simulator and in an operational environment both induce fatigue, there are considerations and pros and cons in case operational duty is carried out after a simulator session or vice versa that should be kept in mind, written below:

2.6. Advantages

2.6.1. There are some advantages of having simulator sessions and operational duty during the same shift. These advantages apply on both operational duty after simulator sessions and vice versa.

2.6.2. Continuity of training and immediate feedback

2.6.2.1. Air traffic controllers and trainees can immediately apply what they have learned in the simulator to real-world scenarios, which may reinforce their training and improve retention. Immediate feedback on their performance can be received in both simulated and real environments, allowing for quicker adjustments and improvements.

2.6.3. Roster efficiency

2.6.3.1. Combining simulator and operational duties in the same shift can optimise scheduling and reduce the need for additional shifts. This could potentially allow for extra days off in a roster and more rest time. Roster efficiency should not result in an increased workload, but rather help create more opportunities for breaks or rest, allowing consolidating training and starting the next exercise in a more recovered state.

2.6.4. Better use of simulator and resources

2.6.4.1. The availability of simulators as well as other training resources could possibly restrict when simulator training can be conducted. With the possibility to combine

simulator and live-operational sessions during a shift, these resources could be used more efficiently.

2.6.5. Hybrid simulator / live-environment OJT session

2.6.5.1. During periods of low traffic, training teams can opt to have a skill enhancement training session in the simulator and then later apply these techniques in the live-environment during the same shift.

2.6.6. Staffing Contingency

2.6.6.1. As an example, if there was a situation where an ATCO in the operational unit has to be relieved of their duties, the ATCO in the simulator may cover the first (short) period before a stand-by shift arrives on duty. ATCOs in the simulator can be used as a contingency in case someone unexpectedly gets ill or when an incident happens and the standby shift is not yet present at the operational unit. Simulator duties shall not be used as a stand-by duty for a live operational shift or to replace live operational staffing. The use shall only be considered as short, temporary, exceptional support in exceptional circumstances.

2.7. Disadvantages and considerations

2.7.1. Switching between live and simulated environments has some disadvantages. These disadvantages are especially applicable in cases where you move from a simulator session to an operational duty, but some of the considerations are also applicable in vice versa scenarios.

2.7.2. Mental Transition

2.7.2.1. After a simulator session, transitioning back to the live-operational environment requires mental adjustment. Participants may need time to shift from simulated scenarios to actual operational tasks. Sometimes there is also a need for a physical transition as the simulator is not necessarily placed in the same building as the operational room or tower.

2.7.3. Context Shift

2.7.3.1. Live-operational environment factors (such as weather conditions, aircraft performance, equipment and unexpected events) can differ greatly from those experienced during the simulator session. Variables such as rate of climb and descent or timing and effectiveness of vectoring, often differ between a simulation and reality. These discrepancies can create inaccurate expectations in a live-operational environment. Also, procedures and policies in a simulator and live-operation may differ, leading to possible mistakes or confusion.

2.7.4. Complacency

2.7.4.1. If participants have spent too much time in the simulator, they may become too accustomed to simulator scenarios. They might underestimate risks or become complacent when faced with actual operational challenges when working in the live-operational environment within the same shift.

2.7.5. Fatigue and reduced performance in efficiency

2.7.5.1. Fatigue can have an influence on the performance of efficiency. This is not only applicable to operational duty after simulator sessions, but also vice versa. Fatigue may result in a sub-optimal performance in terms of efficiency, for example because one may feel tired and decide to create some extra spacing between aircraft to reduce consequences of reduced alertness.

2.7.5.2. This kind of performance reduction may diminish the effectiveness of a simulator session, where you might want to push yourself a bit more to train yourself or a trainee. Therefore, best practice would be to schedule simulator duty and operational duty in separate shifts, to reduce the consequences of fatigue on efficiency performance.

2.7.6. Fatigue and safety concerns

2.7.6.1. Although the International Civil Aviation Organisation (ICAO) Standards and Recommended Practices (SARPs) currently contain no provisions that prevent or restrict performance of operational duties following a simulator session in the same shift, ICAO addresses fatigue as a safety concern.

2.7.6.2. ICAO Doc 9966, Manual for the Oversight of Fatigue Management Approaches, prescribes duty limitation parameters for the air traffic controller and flight time and duty limitations for pilot and flight crew. In Appendix C, paragraph C4.2 Maximum Duty Hours, the following is written, quote:

> "Duty includes all tasks carried out at the behest of the operator. These include, but are not limited to: [...] training given or received (classroom, flight simulator or aeroplane); rostered office/management time; [...]."

2.7.6.3. There might be some differences between air traffic control simulators and flight simulators in terms of realism and possibilities. However, they are often used for the same purpose. Although there is nothing equivalent written about air traffic controllers in this documentation, one can therefore deduce that simulator sessions or training can also be a part of the duty of an air traffic controller (trainee), similar to what flight simulator training is for pilots and flightcrew. In addition, Appendix D discusses prescriptive limitations parameters for air traffic controllers. In paragraph D1, ICAO notes service providers responsibilities, quote:

> "The Service Provider should not require an ATCO to undertake any safety related task if it is known or suspected that the ATCO is fatigued to the extent that safety may be adversely affected."

2.7.6.4. Although simulator duty itself can be seen as non-safety-critical work, as there are no real-world consequences, simulator sessions can lead to increased fatigue, which can impair cognitive performance and decision-making abilities, especially after mentally challenging and exhausting exercises. This fatigue can carry over to operational duty, potentially increasing the risks of errors and mistakes as the air traffic controller may be tired and not fully focused.

2.7.6.5. The Eurocontrol guidelines on fatigue management in ATC Rostering systems address (non) safety critical duties, quote:

> "ATCOs are often tasked for other duties (e.g., safety management, training and operational project development). Some ANSPs are not counting these tasks in the ATCOs rosters, or do not include those duties in the protection and limits for fatigue, claiming they are not safety critical. Although this is true in terms of fatigue risks while performing such non-OPS duties, they anyhow limit the ATCOs' opportunities for resting possibilities, thus becoming fatigue factors when ATCOs switch back to operational duties."

And, quote:

> "Although not every shift-work fatigue limit applies to non-OPS duties, it is recommended, that non-OPS duties are included as an intrinsic part of rosters, considering their potential impact with reference to the fatigue principles."

2.7.6.6.   These Eurocontrol guidelines emphasise the fact that non-operational duties could potentially have an impact on fatigue and therefore should be an intrinsic part of rosters.

2.7.6.7.   The increased fatigue caused by simulator sessions and other non-operational duties creates a higher chance that an air traffic controller will be too fatigued and that safety may be adversely affected. Therefore, simulator duty and training should be recognised as (part of) a duty or shift, and be counted towards maximum permitted duty hours, to prevent cumulative excess (off-duty) hours that might contribute to fatigue.

2.7.6.8.   Air traffic controllers have a duty of care and a safety accountability to refrain from operating in a live environment when in a fatigued state. Requiring an ATCO to choose between following the duty roster without proper management of duty hours and meeting their safety responsibilities creates an unacceptable safety risk. For this reason, proper management of rostering and duty hours is essential.

3.   CONCLUSION

3.1.   Although simulator duty itself can be seen as non-safety-critical work since there are no real-world consequences, it shall be included as an intrinsic part of a roster and recognised as (part of) a duty or shift, considering its potential impact on fatigue, and must therefore also be counted towards maximum permitted duty hours.

3.2.   While there are some advantages of combining operational duty and simulator duty within the same shift, best practice is to schedule simulator duty and operational duty in separate shifts, to prevent reduced performance caused by fatigue. When it is necessary to combine them within the same shift, operational duty shall not be carried out after a simulator session.

3.3.   Because of safety and performance concerns caused by fatigue, context shift, mode-switching errors and complacency, operational duty shall not be carried out after simulator duty within the same shift, to eliminate real-life safety issues.

3.4.   Since the considerations regarding operational duty following after simulator duty are not only applicable to OJT scenarios but also to other scenarios, such as recurrency training or development and testing of procedures, it is recommended that the current IFATCA policy as mentioned below in 9.3.1 ON-THE-JOB-TRAINING (OJT) is moved to a new section in the TPM TRNG 9.2.11 SIMULATOR TRAINING.

4.   RECOMMENDATIONS

4.1.   It is recommended that the following portion of IFATCA policy in TRNG 9.3.1 ON-THE-JOB-TRAINING (OJT) is moved and amended into a new section in the TPM TRNG 9.2.xx SIMULATOR TRAINING, and that a new paragraph is added into the new section, as follows.

> **IFATCA TPM (2025), ~~TRNG 9.3.1 ON-THE-JOB-TRAINING (OJT)~~ TRNG 9.2.xx SIMULATOR TRAINING**
>
> **Proposal:**
>
> ~~No operational duty should~~ Operational duty shall not be carried out after simulator duty during the same shift.
>
> Simulator duty and training shall be recognised as (part of) a duty or shift, considering its potential impact on fatigue, and shall therefore be counted towards maximum permitted duty hours.

> **IFATCA TPM (2025), TRNG 9.3.1 ON-THE-JOB-TRAINING (OJT)**
>
> **Proposal:**
>
> A period of consolidation should follow a validation. The previous experience of the student shall be taken into account.
>
> Apart from being validated on the sector concerned, controllers should not be engaged in training student controllers unless they have at least two years' operational experience and have been validated on that sector for at least six months.
>
> When conducting ATC OJT on adjacent positions, the following items shall be considered to reduce the likelihood and consequences of communication errors:
>
> 1. System quality and functionalities;
> 2. Communication methods;
> 3. Operational briefing and OJTI training;
> 4. Trainees' schedule;
> 5. Trainee level of experience; and
> 6. Airspace complexity.
>
> ~~No operational duty should be carried out after simulator duty during the same shift.~~
>
> To ensure ATC OJTIs have sufficient time working on their own and are able to retain competence on each sector for which they hold validations, ATC OJTI time should be limited to no more than 50% of duty time. This can be organised on a daily, weekly, monthly or shift pattern basis, but shall limit the time gap between solo operations and take into account leave and other periods when the controller is not at work.
>
> It shall be made clear that the ATC OJTI is responsible for maintaining the safety of air traffic on the position where OJT is provided.
>
> In case of investigation following an incident/accident involving an ATC OJTI and a trainee the principles of Just Culture shall be applied.

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