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Report of the Remote Tower Taskforce (RTTF)

Presented by
RTTF

SUMMARY

The RRTF held 21 meetings and an exchange with TOC on the proposed working paper. With the help of members of the Joint Cognitive Human Machine System Group a novel approach was developed which has the potential to set new grounds for

1. Introduction

1.1. The ROSC (Remote Operations Standing Committee) was set up during the Conference of Toronto 2017 under the name Remotely Operated Tower Working Group as a specialized team tasked with the drafting of a position paper on Remote Towers Operations. The group had more than 40 people from all regions and was coordinated through email and Basecamp.

For one year the group developed its task and presented the position paper to committee B+C during the Conference of Accra 2018. The directors decided to change the status of the group to a standing committee.

To give a boost to the activities of the ROSC in 2022 and since then a group of volunteers have gathered. The coordination of the group is led by SESAR/EASA coordinator. After presenting working paper 97 to conference in Jamaica the RTTF continued its work.

1.2. The RTTF is composed of Katariina Syväys (Finland), Miriam Kelm (Germany), Antonio Anzellotti (Italy), Mikel Goyarzu Cano (Spain), Thomas Harrison (UK), Thomas Kolbeisen (Norway), Adam Rhodes (USA), Péter Szalóky (Hungary), Mathias Wiegland (Germany) and Marc Baumgartner (SESAR/EASA Coordinator. Benjamin van der Sanden (EVP Tech), Jaymi Steinberg (TOC Chair), Danahe Lopez (TOC), Jeyapa Bala Machap (TOC) have been association to the work.

1.3. Members of the RTTF participated online to the TOC meeting.

1.4. Regulatory material is constantly evolving. ICAO DATS, EASA, Eurocae, FAA and SESAR are continuously updating their respective material and IFATCA must stay on top of it.

1.5. Following the 2023 conference the RTTF discussed how best to cope with the fact that IFATCA is in principle opposed to Multiple Remote Tower working environment and at the same time does not close the door for consultation, interactions and exchanges with the organisations mentioned in para.

1.6. A paper has been proposed to the group by Dr. Stathis Malakis from Greece who is a

member of the JCHMS. Labelled Safety Concerns of Multiple Mode of Remote Tower Operations.

1.7. It is proposed to use the STAP process to identify possible hazards from a future Multiple Remote Tower environment. The RTTF members will have to complete the Hazards, to use the developed algorithms to outline the possible hazards which must be tackled by the regulator, service providers and ATCOs.

1.8. This Information Paper updates on the progress so far and offers the first insight into the safety hazards of the Multiple Remote Tower Environment.

2. Discussion

2.1. Changes in the Air Traffic Management (ATM) domain is of a continuous nature and challenges of research, development and transition to introduce these changes are daily life for Air Navigation Service Providers (ANSPs) and their staff, air traffic controllers, technicians, engineers, managers, and decision makers. Automation is nothing new in the ATM system. The so-called 'new technologies' leading digitalization, including Artificial Intelligence (AI) and Machine learning (ML) are finding their ways into the ATM working environment. Whereas a lot of expectation is linked to technology hype, the introduction of new technology will have to follow the path of introducing new technological components into a running ATM system.

A Digital Tower environment offers possibilities to use technologies in a novel way and comes with new challenges for the Air Traffic Controllers working in such an environment. Licensing, where current EASA licensing regulation prevails, opens a new challenge for Air Traffic Control.

2.1.1. The provision of aerodrome air traffic services (ATS) from remote locations is receiving increased attention. Remote operational services are provided at airports open for commercial aircraft operations since April 2015 and several new services are being deployed. The concept of 'remote provision of aerodrome air traffic services' (commonly known as remote tower operations) enables the provision of aerodrome ATS from locations where direct visual observation is not available. Instead, provision of aerodrome ATS is based on a view of the aerodrome and its vicinity through means of technology.

2.2. The interactive global map

Remotely Operated Airports – Google My Maps was created by Katariina from Finland to provide an easy overview at the global level of the various initiatives. This map was published, and updates are provided. To improve the intelligence on the ongoing initiative, the RTTF would like to invite Directors at conference to indicate if they are aware of certain plans to set up and/or implement remote/digital towers.

2.3. Safety concerns for Multiple Mode of Remote Tower Operations

The concept of Remote Towers enables provision of aerodrome ATS from locations/facilities without direct visual observation. Instead, provision of aerodrome ATS is based on a view of the aerodrome and its vicinity through means of technology. The primary change introduced by remote tower operations relates to the manner by which visual observation of the aerodrome and its vicinity is achieved. When operating from a remote tower facility, this is no longer carried out by direct out-of-the-window observation from a conventional tower. Instead, visual observation

is achieved utilizing a visual surveillance system, enabling situational awareness in accordance with Regulation (EU) 2017/373 and ICAO Documents 4444 and 9426.

A remote tower can be located away from the aerodrome it is providing a service to, or it can be in a building on or close to the aerodrome but without an adequate direct view of the area of responsibility. System elements of a visual surveillance system could also be introduced in a conventional tower, to enhance/complement situational awareness or to provide a visual presentation of parts of the aerodrome or its vicinity which is otherwise either inadequate or non-existent.

In the European Continent the concept was initially introduced and developed within some European States in the early 2000s, and it has been further developed and refined within the SESAR JU program. At the time of publication of this document, four so-called SESAR Solutions related to remote tower operations have been published by SESAR JU. (With reference to the European Operational Concept Validation Methodology (E-OCVM), a SESAR Solution indicates that an operational concept has completed phase V3 of the Concept Lifecycle Model, thus being ready and mature for industrialisation (V4) and deployment (V5)).

When it comes to remote aerodrome ATS, Japan has been providing AFIS from remote locations since 1974, although in the beginning only with a limited visual presentation of the aerodrome and its vicinity. The first remote tower implementation providing aerodrome ATS based on situational awareness fully in accordance with ICAO Documents 4444 and 9426 was approved and introduced into operations in Sweden in 2015. Since then, several initiatives to provide remote aerodrome ATS have been introduced into operation, with an increasing number of initiatives being undertaken throughout Europe as well as worldwide.

2.3.1. Making sense of Multiple Remote Towers Concept

SESAR JU has to date published one SESAR Solution related to the multiple mode of operation, with further research to expand the concept ongoing. Yet, at the time of publication of this document, no operational implementation of this concept exists, and subsequently operational experience is so far limited to validation and trial activities (performed within the SESAR JU framework as well as individually by ATS providers). Nevertheless, implementation plans including the multiple mode of operation exist among providers within the EASA Members States; EASA considers that there is already sufficient information and data available to provide support and guidance to facilitate its safe implementation, as well as to provide a basis for further development.

The overarching recommendation about multiple mode of operation is that it is to be used only when the operational circumstances so allow and when certainty exists that workload and complexity can be managed. It is the responsibility of the ATS provider to define the suitable operational circumstances, which require careful considerations, as well as to provide sufficient evidence for an acceptable level of safety (as is always the case).

Some further aspects - as elaborated by SESAR and EASA Guidance material - to consider for the implementation of multiple mode of operation are provided in the sections below:

- Number and size of aerodromes

- Simultaneous aircraft movements
- Aerodrome switching/merging/transferring/closing
- Service provision in multiple mode of operation
- Recommended implementation and transition steps
- Possible developments of multiple mode of operation
- Airspace and traffic circuit characteristics
- Aerodrome environment
- Local weather characteristics
- ATCO's roles and responsibilities
- Handling of abnormal and emergency situations
- Communication aspects in multiple mode of operation
- RTM design considerations in multiple mode of operation
- Visual presentation in multiple mode of operation
- Aerodrome sound
- Other ATS systems/functions in multiple mode of operation

This list will be enhanced by the RTTF in the coming month.

2.3.2. The Method

With the help of members of the Joint cognitive human machine system group (JCHMS) a method is being proposed to better analyze the possible hazards in a possible future Multiple Remote Tower environment. For this a 2-day workshop will be organized with the members of the RTTF before autumn. The method is briefly introduced below.

STPA (System-Theoretic Process Analysis) is a relatively new hazard analysis technique based on an extended model of accident causation. In addition to component failures, STPA assumes that accidents can also be caused by unsafe interactions of system components, none of which may have failed.

Some of the advantages of STPA over traditional hazard/risk analysis techniques are that:

- Very complex systems can be analyzed. "Unknown unknowns" that were previously only found in operations can be identified early in the development process and either eliminated or mitigated. Both intended and unintended functionality are handled.
- Unlike the traditional hazard analysis methods, STPA can be started in early concept analysis to assist in identifying safety requirements and constraints. These can then be used to design safety (and security) into the system architecture and design, eliminating the costly rework involved when design flaws are identified late in development or during operations. As the design is refined and more detailed design decisions are made, the STPA analysis is also refined to help make more and more detailed design decisions. Complete traceability from requirements to all system artifacts can be easily maintained, enhancing system maintainability and evolution.
- STPA includes software and human operators in the analysis, ensuring that the hazard analysis includes all potential causal factors in losses.
- STPA provides documentation of system functionality that is often missing or difficult to find in large, complex systems.
- STPA can be easily integrated into system engineering process and into model-based system engineering.

Many evaluations and comparisons of STPA to more traditional hazard analysis methods, such as fault tree analysis (FTA), failure modes and effects criticality analysis (FMECA), event tree analysis (ETA), and hazard and operability analysis (HAZOP) have been done. In all these evaluations, STPA found all the causal scenarios found by the more traditional analyses, but it also identified many more, often software-related and non-failure, scenarios that the traditional methods did not find. In some cases, where there had been an accident that the analysts had not been told about, only STPA found the cause of the accident. In addition, STPA turned out to be much less costly in terms of time and resources than the traditional methods.

3. Conclusions

Digital technology makes it possible to provide tower ATC from a remote location. This poses new challenges about different elements of a tower ATC system.

IFATCA has created a RTTF to address some of the new challenges related to remote/digital towers.

This paper describes the work of the RTTF since conference in Jamaica and introduces for the future work of the RTTF a new approach to the topic by assessing the safety concerns and providing a method which in the future will assist to identify the hazards linked to Multiple.