International Civil Aviation Organization

**WORKING PAPER**

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# THIRTEENTH AIR NAVIGATION CONFERENCE

**Montréal, Canada, 9 to 19 October 2018**

**COMMITTEE A**

**Agenda Item 3: Enhancing the global air navigation system**
**3.5: Other ATM issues**

## NEED FOR STANDARDISATION AND GUIDANCE MATERIAL FOR DIGITAL TOWER AND REMOTE TOWER

(Presented by China)

**EXECUTIVE SUMMARY**

This paper describes the recent validation trials and implementation worldwide for remote tower (RT) (ASBU module B1-RATS) and digital tower (DT) to meet individual operational needs. In the light of technology for the digitisation of tower operations being ready for deployment with a view to enhancing air traffic services (ATS) safety, service levels and efficiencies, there is an increasing need to adopt a harmonised approach using common standards and guidance materials for the application of both DT and RT.

**Action:** The Conference is invited to note the information in this working paper and agree to the recommendation in paragraph 3.

## 1. INTRODUCTION

1.1 Remotely operated aerodrome control (ref. ASBU module B1-RATS) or remote tower (RT), which usually applies to low-traffic airports, provides safe and cost-effective air traffic services (ATS) from a remote location to one or more aerodromes where dedicated and/or local ATS are considered neither sustainable nor cost-effective. This setup can also enable its application as a contingency tower to maintain aerodrome control operation, in case the main tower has to be evacuated.

1.2 In recent years, there has been a growing trend for the deployment of similar technology for RT, with enhanced features and surveillance fusion technology, at conventional towers in medium-sized and even busy airports for enhancing air traffic control (ATC) safety and operational efficiency. Digital tower (DT) usually refers to the application of augmenting and enhancing visual capability for controllers at conventional towers. Both DT and RT make use of high resolution surveillance cameras to capture and digitise a panoramic view of the airfield environment. Through a

[1] Chinese and English versions provided by China.

high-speed and secured data network, the captured data are transmitted instantly to the ATC tower (for DT application) or an operational room (for RT application), where the real-time video data are displayed on wrap-around screens giving controllers an entire view of the airport. Aircraft and vehicles shown on the digitised video can be augmented with airfield maps and flight data, allowing a particular aircraft/vehicle to be identified and zoomed in based on its call-sign easily. Besides, artificial intelligence can be applied on the digitised video to provide additional safety alert functions for early detection of conflicting situation or intrusion to airfield restricted areas. These will greatly enhance ATC safety and operational efficiency in managing live aircraft and vehicle movements in medium-sized and even busy airports, especially during night time and low visibility conditions.

## 2. DISCUSSION

2.1 In ICAO State letter ref. AN 7/63.1.1-17/23 dated 6 March 2017, an amendment to the ICAO document *Procedures for Air Navigation Services - Air Traffic Management* (PANS-ATM, Doc 4444), is proposed by adding a new paragraph 7.1.1.2.1 "Visual observation shall be achieved through direct out-of-the-window observation, or through indirect observation utilizing a visual surveillance system[2] which is specifically approved for the purpose by the appropriate ATS authority". With the amendment to become applicable on 8 November 2018, the relevant technology is ready to serve as a provision of the visual surveillance system in the context of ATS. However, there remains a grey area on the required level of reliability, availability and integrity of the relevant system as a control tool for aerodrome operation, since no detailed requirements and guidelines are stipulated in Doc 4444. There is also a lack of global guidance material, such as relevant templates, on how to develop and benchmark safety case to ensure an objective assessment and approval by the appropriate ATS authority, as well as guidance for a systematic approach for planning, implementation and transition of the system into safe operation.

2.2 Apart from technological readiness, any implementation of DT and RT in providing ATS will have to go through the necessary robust consideration and assessments. Such processes include but are not limited to a sound business case with justifiable operational benefits, and more importantly the development of a safety case, the operational procedures and training requirements, as well as the subsequent regulatory approval. Many of such considerations and assessments will have to make reference to or be based on standardised requirements and guidelines. The *Global Air Navigation Plan* (Doc 9750, GANP) under its aviation system block upgrade (ASBU) framework, has promulgated RT under one of its Block 1 Modules, namely B1-RATS, in which States/administrations are encouraged to consider its implementation in timeframe of 2019-2025, where there is a positive business case with operational benefits and the corresponding matching provisions are available[3]. Despite its increasing application worldwide, DT has neither been specified in the GANP nor any ASBU modules.

2.3 Nowadays, the pace for technological development in DT and RT is well ahead of the available governing standards and guidance materials. This has led to the prevailing circumstances that diversified approaches are being adopted by different States/administrations and equipment suppliers. Despite the unavailability of such standards and guidance materials, trials/implementation of DT and RT have been intensively carried out worldwide to fit individual purpose. Examples are the civil aviation authorities(CAAs)/ (air navigation services providers (ANSPs) in various regions, including Australia, Austria, China (including Hong Kong China), Germany, Hungary, the Netherlands, New Zealand,

[2] A visual surveillance system is an electro-optical system providing an electronic visual presentation of traffic and any other information necessary to maintain situational awareness at an aerodrome and its vicinity. It will normally consist of a number of integrated elements, including sensor(s), data transmission links, data processing systems and situation displays.

[3] According to the ICAO ASBU Document published in July 2016, such matching provisions include, standards, avionics, infrastructure, ground automation, procedures and operational approval, which are estimated to be available in 2018.

Norway, Singapore, Sweden, the United Arab Emirates, the United Kingdom and the United States, etc. The Swedish ANSP has implemented the first remote tower in the world with operational approval from its CAA at a low-density airport for provision of ATS from a remote location.

2.4 There is a general observation worldwide that small airports located in remote areas with low air traffic movements are facing various challenges, including outmoded tower equipment, shortage of air traffic controllers and low operational efficiency. China has been considering to introduce RT to these small airports with a view to providing flexibility in deploying controllers and enhancing ATS safety and efficiency. In the early 2018, China has approved a trial project of the RT technology at Xinjiang Airport Group, which operates some nineteen small airports with lower traffic movements and limited opening hours. The initial technical solutions and implementation plan for this trial project have been endorsed and implementation has been in progress for planned commencement in 2019.

2.5 On the other hand, due to a rapid expansion of the large-scaled hub airports in China, there is an increasing demand for more sophisticated apron control operation. Currently, the tower and apron control at those airports is under responsibility of ATC. With challenges of high costs, complex operation and safety hazards under such operating mode, there is a need to segregate apron control from tower control and provide dedicated apron control service. With RT technology, dedicated apron control can be implemented in a quick and cost-effective manner. The Guangzhou Baiyun International Airport took lead in applying RT technology to provide dedicated apron control service. With various surveillance means and consolidated data providing centralised and improved situational awareness to the apron controllers, enhancement in safe and efficient apron operation can be achieved.

2.6 At the Hong Kong International Airport (HKIA), both DT and RT technologies involving high resolution surveillance cameras with pan-tilt-zoom features and thermal infrared capabilities will be deployed for trial. The trial system will be integrated with the advanced surface movement guidance and control systems (A-SMGCS), automatic dependent surveillance — broadcast (ADS-B), and flight plan data. Customised display screens showing essential flight information and panoramic view of the runways and apron areas will be installed at the aerodrome control tower and a remote site outside the airport. The objectives of the trial are to gather feedback from controllers and evaluate the technology to determine if it can: (i) enhance out-of-window view for performing day-to-day duties in managing aircraft and vehicle movements on the aerodrome, particularly under low visibility conditions; (ii) provide contingency operation from an off-tower location and (iii) improve visibility of distant areas of the airport under expansion.

2.7 Indeed, different ANSPs have provided different requirements to equipment suppliers with a view to performing trials/implementing DT and RT in accordance with their own operation needs. A harmonised approach with common standards and guidance materials for system interoperability has become increasingly important to ensure that system trials and implementation will not be fragmented with loopholes, where safety and service levels might be compromised.

2.8 With the ICAO ASBU B1-RATS module ready for deployment commencing 2019 according to the GANP, there is a need for stakeholders, including ICAO, regulators, ATS and communications, navigation, and surveillance (CNS) providers, aerodrome operators and equipment suppliers etc. to work together and expedite the development of corresponding standards and guidance materials. While the said State letter has made reference to European Aviation Safety Agency (EASA) guidance material published in 2015, standards and guidance materials are urgently required from ICAO to govern the rapid technological development and intensive activities of trials and implementation of DT and RT worldwide.

## 3. CONCLUSION

3.1 The Conference is invited to agree on the following recommendation:

**Recommendation 2.1/x – Standardisation and guidance material for digital tower and remote tower**

3.2 That the Conference :

a) note the diversified approaches currently adopted by various States/administrations in conducting trials on or implementing digital tower (DT) and remote tower (RT) to fit their own operational needs;

b) note that a harmonised approach with common standards and guidance materials is necessary to ensure the harmonised trials and implementation of DT and RT for upholding safety and service levels;

c) urge ICAO to consider including the application of DT into the *Global Air Navigation Plan* (GANP, Doc 9750) and relevant aviation system block upgrade (ASBU) module(s), in the light of a trend for global adoption by air navigation services providers (ANSPs) who found such application beneficial to their operational needs; and

d) urge ICAO to expedite the development of Standards and guidance materials in conjunction with stakeholders, which shall include a template for development of safety case, as well as a systematic approach for planning, implementation and transition of DT and RT into operation to ensure that a harmonised approach is adopted.

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