



**ASSEMBLY — 41ST SESSION**

**TECHNICAL COMMISSION**

**Agenda Item 33: Other issues to be considered by the Technical Commission**

**REMOTE DIGITAL AERODROME AIR TRAFFIC SERVICES**

(Presented by Saudi Arabia)

**EXECUTIVE SUMMARY**

This paper describes the remote digital aerodrome air traffic service (ATS) and its technical enablers and provides an overview on the implementation plan of remote aerodrome ATS adopted by the air navigation service provider in the kingdom of Saudi Arabia (Saudi Air Navigation Services (SANS)). This plan covers Al-Ula International airport (OEAO), and the new Red Sea aerodrome (OERD). Al-Ula Virtual Tower System (VTS) will be the first project which covers designing, installing, testing, and commissioning of facilities to be used for provision of ATS at (OEAO) remotely from a Remote-Control Centre located at the new Jeddah ATC TWR (OEJN) – Ground floor.

<i>Strategic Objectives:</i>	This paper relates to the Safety and Air Navigation Capacity and Efficiency Strategic Objectives.
<i>Financial implications:</i>	Without any financial implications
<i>References:</i>	Annex 10 — <i>Aeronautical Telecommunications</i> Annex 11 — <i>Air Traffic Services</i> Annex 14 — <i>Aerodromes</i> Doc 4444, <i>Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM)</i> Doc 9426, <i>Air Traffic Services Planning Manual</i> Doc 9750, <i>Global Air Navigation Plan (GANP)</i> ICAO MID Surveillance Plan, Edition February 2021, Section §4.7.

**1. INTRODUCTION**

1.1 The concept of remote provision of aerodrome air traffic services (ATS) commonly known as remote digital towers or remote virtual tower enables the provision of aerodrome ATS from a location or facility where direct visual observation of the traffic is not available. Under this concept, the provision of aerodrome ATS is based on a replication of the traditional 'out of the window (OTW)' view of the aerodrome and its vicinity from aerodrome visual control room using remote visual surveillance system, enabling situational awareness in accordance with ICAO Documents 4444 and 9426.

1.2 The Aerodrome ATS from a remote location is enabled by the streaming in real time of the view from an assembly and integration of fixed and moveable high-definition digital video cameras deployed at the remotely controlled aerodrome. The fixed cameras are covering the manoeuvring area of the aerodrome and used as main source of inputs for displays. These may be supplemented by other visual surveillance system such as CCTV for unsighted areas. Moveable cameras having Pan-Tilt Zoom (PTZ) capability, which can be directed as required to zoom on fix and mobile objects on the aerodrome. This usage replicates the way binoculars is used by air traffic controller in a conventional tower. The Moveable cameras can be temporarily configured to compensate for a faulty fixed camera. Thus, visual situational awareness for the air traffic controller is well enhanced and complemented by a range of environmental sensors and microphones capturing sound and meteorological or other operational data.

1.3 The concept of remote aerodrome ATS is evolving and currently two main modes of operation are defined:

- a) single mode of operation refers to the provision of ATS to one aerodrome at a time, from a single remote ATS working position; and
- b) multiple mode of operation refers to the provision of ATS to more than one aerodrome at a time, i.e., simultaneous service provision from a single remote ATS working position.

1.4 For both modes, ATS may be provided either as aerodrome control service (ATC) or Aerodrome Flight Information Service (AFIS). The remote aerodrome ATS may be provided from a centralized facility known as a remote tower centre, which could include one or several ATS working position.

1.5 The provision of an aerodrome ATS from a remote location using digital video or surveillance technologies is covered under ASBU element RATS-B1/1 - Remotely Operated Aerodrome Air Traffic Services of ICAO GANP. It should be subject of comprehensive assessment considering four areas: safety (including human performance), environment, economic (including a cost-benefit analysis) and social impacts, and the interdependencies between those areas.

## 2. TECHNICAL ENABLERS FOR REMOTE AERODROME ATS

2.1 Considering the requirements of aerodrome Air traffic Services as defined under Annexes 11, 14, ICAO Documents 4444, and 9426, the implementation of aerodrome ATS from a remote location should be supported, at least by the following technical enablers:

- a) **Visual surveillance system**, replacing, or complementing, the OTW view of a conventional tower. It includes several integrated elements, including sensors, data transmission links, data processing systems and situation displays. The visual surveillance system must be operationally validated in various visual conditions and weather phenomena (e.g. dawn, daylight, dusk, darkness and different visibility conditions). The situation display is the combined visual presentation providing a view of the aerodrome and its vicinity (Area of Responsibility). The visual surveillance system data should be recorded as required under Annex 11 §6.4.1. The standards related visual tracking, video rate updates, control latency and camera movement speed performances, interoperability, integrity and system availability regarding a visual surveillance system are covered under EUROCAE ED-240A

Change 1, 'Minimum Aviation System Performance Standard (MASPS) for Remote Tower Optical Systems', September 2021;

- b) **ATS Communication means** to provide air-ground, ground-ground communications (main and backup/emergency) in the area of responsibility through dedicated ground connections between the local radio equipment at the aerodrome and RTM. The ATS communications should be recorded and provided in accordance with Annex 11, Chap. 6 §6.1 & §6.2 & 6.3 requirements;
- c) **Monitoring and management of navigation aids, and aeronautical ground lights**, allowing ATCO/AFISO to operate and monitor NAVAIDS and AGL which are necessary for the provision of aerodrome ATS;
- d) **Meteorological information**, the presentation of meteorological information at RTM using appropriate data transmission links;
- e) **Binocular functionality** (e.g., a pan-tilt-zoom (PTZ) camera/function, as defined and described in ED-240A Change 1), emulates the function of a binocular in a conventional tower, by allowing the ATCO/AFISO to have a close-up view of a specific location or object as recommended under ICAO Doc 9426 ATS Planning Manual;
- f) **Light Gun or Signalling lamp**, remotely controlled allowing the ATCO/AFISO to communicate via a signalling lamp in the case of radiotelephony or data link communication failure as required under ICAO Annex 14 Volume I Chapter 5 §5.1.3;
- g) **Aerodrome ambient airfield/airside audio**, functionality would be an enabler for increased situational awareness on aircraft and vehicles ground movements. Working environment and ergonomics of the facilities used for remote aerodromes ATS;
- h) **Local and remote Monitoring functions** that continuously monitor the technical status of equipment and systems used, generate alarms and warnings when failures have been detected; and
- i) **Maintenance and operating working instructions** covering preventive and corrective maintenance activities with technical and operational contingency arrangements.

2.2 The service continuity requirements related to the provision of remote aerodrome ATS as well as interdependency aspects should be considered, when designing the overall technical solution of the complete system, i.e., all the facilities, installations and equipment enabling and supporting the remote aerodrome ATS, including the identification of redundancy needs which should cover:

- a) data transmission links between the aerodrome and the ATS working positions. A dual and independent connections should be provided with a third independent connection to be used for backup/emergency radio purposes;
- b) number of cameras at the aerodrome providing visual presentation of the aerodrome and its vicinity;

- c) number of screens for the visual presentation at an ATS working position;
- d) mode of operation (single or multiple);
- e) Weather conditions & operational hours; and
- f) Power supply for all facilities.

### **3. OVERVIEW ON THE DEPLOYMENT OF REMOTE ATS TWR IN SAUDI ARABIA**

3.1 The General Authority of Civil Aviation (GACA) in the kingdom of Saudi Arabia has approved an initial implementation plan and safety impact assessment, submitted by the air navigation service provider (Saudi Air Navigation Services (SANS)), for the deployment of remote aerodrome ATS at Al-Ula aerodrome (OEAO), at the new Red Sea aerodrome (OERD), and other existing aerodrome with no ATS facility.

3.2 To set sustainable technical solutions for the introduction of remote aerodrome ATS, the air navigation service provider in the kingdom of Saudi Arabia (SANS) signed a partnership agreement with one of leading ATM system provider and two agreements with national telecom service providers i.e., Saudi Telecommunication Company (STC) and Mobily Telecommunication Company to use their ground network for data transmission links between the aerodrome and the remote tower/facility.

3.3 Al-Ula Virtual Tower System (VTS) will be the first project which covers designing, installing, testing, and commissioning of facilities to be used for the provision of ATS at Al-Ula aerodrome (OEAO) remotely from a Remote-Control Centre located at the new Jeddah ATC TWR facility (OEJN) – Ground floor. The implementation plan can be summarized as follows:

- a) development of cost-benefit study;
- b) development of Concept of Operation (ConOps) and operational requirements covering performance requirements of facilities to be used;
- c) development of comprehensive assessment considering four areas: safety (including human performance), environment, economic (including a cost-benefit analysis) and social impacts, and the interdependencies between those areas.
- d) notification of change and request of an initial approval from General Authority of Civil Aviation (GACA);
- e) development of request for proposal covering the operational and technical requirements for the provision of remote aerodrome ATS. The EUROCAE ED-240A Change 1, ‘Minimum Aviation System Performance Standard (MASPS) for Remote Tower Optical Systems’, September 2021 is considered the main reference for the requirements related to visual surveillance system;
- f) identification of required Staffing level and required qualifications;

- g) deployment of state-of-the-art modular, advanced, and integrated Remote-Control Centre with redundant TCP/IP connections to Al-Ula aerodrome (OEAO) including recording & replay facilities;
- h) installation of state-of-the-art technical facilities at Al-Ula aerodrome (OEAO) to be used for the provision of ATS including backup/emergency facilities. This includes Camera masts with proper hazard warning lights, and provision of auto cleaning of camera screens and safeguards against birds.
- i) development of technical and operational working arrangements supporting the provision of remote aerodrome ATS (ATS procedures and maintenance instructions). The working arrangements covering coordination with the aerodrome operator to conduct preventive and corrective maintenance;
- j) coordination and agreement with Aerodrome meteorological Office for local weather reports;
- k) development of a contingency plan and related procedures covering the coordination with involved stakeholders;
- l) coordination with Al-Ula aerodrome operator to review and update the aerodrome manual;
- m) development of a transition plan to ensure smooth introduction of remote aerodrome ATS service at OEAO. This plan is involving the aerodrome operator;
  - 1) training of technical and operational Staff;
  - 2) conduct of comprehensive operational testing and trials to validate the performance of deployed facilities and ensure that operational Staff and technicians are familiar with the working conditions and environment. The operational trials involve the aerodrome operator and airlines operating from/to OEAO;
  - 3) publication of an AIC and drafting of proposal for amendment of KSA AIP OEAO AD sections including AD chart to insert the location of the main tower, where the rotating beacon light is installed. This activity is coordinated with the aerodrome operator; and
  - 4) submission of request to GACA supported by a safety risk assessment to approve the provision of remote aerodrome service.

3.4 The provision of remote aerodrome ATS at Al-Ula (OEAO) is planned to be effective during the Q2-2023 and will be used as pilot-project for other deployment of remote aerodrome ATS. The results and lessons learned of this deployment will be shared with ICAO MID ATM SG and CNS SG during the upcoming meetings.

#### 4. CONCLUSION

4.1 The provision of remote aerodrome ATS is supported by new digital technologies and evolving procedural and operational aspects, which ensure a level of operational safety equivalent to what can be achieved using a manned tower at the aerodrome to oversee both air and ground movements. It may be considered as significant improvement for aerodromes with no ATS or where ATS is available during limited operational working hours.

4.2 The visual surveillance system and the data transmission links constitute the most critical enabler as aeronautical mobile service (air-ground communication) and surface movement control service voice communication (ground-ground communications), as well as monitoring and operating of systems/equipment on the aerodrome (e.g. camera management, aerodrome lights and navigation aids systems) would rely on the visual presentation and the communication links for the provision of safe aerodrome ATS service.

4.3 The Assembly is invited to take note of the information provided in this paper and encourage States and Regions to exchange information on the implementation of remote aerodrome air traffic services as a cost-effective solution for aerodromes with no ATS or where ATS is available during limited operational working hours.

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