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REMOTE AERODROME AIR TRAFFIC SERVICES IN SAUDI ARABIA

(Presented by Saudi Arabia)

EXECUTIVE SUMMARY

This paper provides information on the Remote Digital Aerodrome Air Traffic Service and its technical enablers introduced by the Kingdom of Saudi Arabia. Al-Ula Virtual Tower System (VTS) is the first project that covers designing, installing, testing, and commissioning of facilities used for the provision of ATS at Al-Ula International airport (OEAO) remotely from a Remote-Control Centre located at the new Jeddah ATC TWR. It also provides an overview of Saudi Air Navigation Services (SANS)'s plan for the implementation of remote digital aerodrome ATS. This plan covers the new Red Sea aerodrome (OERD) and other aerodromes with no ATS facility.

<i>Strategic Goals:</i>	This working paper relates to <i>Every Flight is Safe and Secure</i> .
<i>Financial implications:</i>	Activities to be undertaken within existing budgetary allocations.
<i>References:</i>	Annex 10 — <i>Aeronautical Telecommunications</i> Annex 11 — <i>Air Traffic Services</i> Doc 9750, <i>Global Air Navigation Plan</i> Doc 9426, <i>Air Traffic Services Planning Manual</i> Doc 4444, <i>Procedures for Air Navigation Services — Air Traffic Management</i>

1. INTRODUCTION

1.1 The concept of remote provision of aerodrome air traffic services (ATS), commonly known as remote digital towers or remote virtual towers, 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 the aerodrome visual control room using a remote visual surveillance system, enabling situational awareness in accordance with the *Procedures for Air Navigation Services — Air Traffic Management* (PANS-ATM, Doc 4444) and the *Air Traffic Services Planning Manual* (Doc 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 movable high-definition digital video cameras deployed at the remotely controlled aerodrome. The remote streaming of data is used to replicate the view of the aerodrome and its vicinity, which is equivalent to the view that would exist from a tower visual control room on the aerodrome tower. The fixed cameras are covering the manoeuvring area of the aerodrome and used as the 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 fixed and mobile objects on the aerodrome. This usage replicates the way binoculars are used by air traffic controllers in a conventional tower. The movable 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 provision of an aerodrome ATS from a remote location using digital video or surveillance technologies is covered under Aviation system block upgrade (ASBU) element RATS-B1/1 - Remotely Operated Aerodrome Air Traffic Services of the ICAO Global Air Navigation Plan (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 ATS as defined under Annex 11 — *Air Traffic Services*, Annex 14 — *Aerodromes*, PANS-ATM and Doc 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, Chapter 6, 6.4.1. The standards related to 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-240B “Minimum Aviation System Performance Standard (MASPS) for Remote Tower Optical Systems”, July 2023;

- 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 remote tower centre (RTC). The ATS communications should be recorded and provided in accordance with Annex 11, Chapter 6, 6.1, 6.2 and 6.3 requirements;
- c) monitoring and management of navigation aids, and aeronautical ground lights, allowing the controller or flight information service officer 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 RTC using appropriate data transmission links;
- e) binocular functionality (e.g. a pan-tilt-zoom (PTZ) camera/function, as defined and described in ED-240B), emulates the function of a binocular in a conventional tower, by allowing the controller or flight information service officer to have a close-up view of a specific location or object as recommended under Doc 9426;
- f) light gun or signalling lamp, remotely controlled allowing the controller or flight information service officer to communicate via a signalling lamp in the case of radiotelephony or data link communication failure as required under 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.

3. OVERVIEW OF THE DEPLOYMENT OF REMOTE AERODROME ATS IN SAUDI ARABIA

3.1 Saudi Air Navigation Services (SANS) has developed a comprehensive plan for the implementation of remote aerodrome ATS. This plan covers the new Red Sea aerodrome (OERD) and other existing aerodromes with no ATS facility.

3.2 To set sustainable technical solutions for the introduction of remote aerodrome ATS, SANS signed a partnership agreement with one of leading ATM system provider and two agreements

with two national telecom service providers (STC and Mobily) to use their ground network for data transmission networks between the aerodrome and the remote tower/facility.

3.3 Al-Ula Virtual Tower System (VTS) is the first project that covers designing, installing, testing, and commissioning of facilities 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. The remote ATS started with the provision of AFIS in May 2025 with the installation of all technical enablers described in section 2 of this paper and automatic dependent surveillance — broadcast (ADS-B) stations to enhance the surveillance means and correlate the ADS-B data with the digital surveillance in the data block. The main activities of the implementation plan can be summarized as follows:

- a) development of concept of operation (ConOps) and operational requirements covering performance requirements of facilities to be used;
- b) development of a cost-benefit study with a 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;
- c) contracting one of the leading companies for the 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;
- d) 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 and aerodrome meteorological (MET) office;
- e) development of a transition plan to ensure smooth introduction of remote aerodrome ATS service at OEAO. This plan involves the aerodrome operator and the aerodrome MET Office;
- f) 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;
- g) publication of an AIP SUP and amendment of Saudi Arabia's AIP OEAO AD sections, including the 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.

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.

4.2 The implementation of remote aerodrome ATS service may be considered a significant improvement for aerodromes with no ATS or where ATS is available during limited operational working hours.

4.3 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.

4.4 The Assembly is invited to take note of the information provided in this paper and encourage States to share information, through ICAO, on the deployment of remote digital aerodrome Air Traffic Services.

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