



International Civil Aviation Organization

MIDANPIRG Communication, Navigation and Surveillance Sub-Group

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(Muscat, Oman, 16-19 May 2022)

Agenda Item 4: CNS planning and implementation in the MID Region

REMOTE/VIRTUAL/DIGITAL AERODROME AIR TRAFFIC SERVICES

(Presented by Saudi Arabia)

SUMMARY

This paper describes the remote/Virtual/Digital aerodrome Air traffic service and its technical enablers. It also provides an overview on Saudi Air Navigation Services (SANS)'s plan for the implementation of remote aerodrome ATS. This plan covers the new Red sea aerodrome (OERD) and other existing aerodrome with no ATS facility. Al-Ula Virtual Tower System (VTS) is the first project which covers designing, installing, testing and commissioning of facilities to be used for provision of ATS at Al-Ula International airport (OEAO) remotely from a Remote-Control Centre located at the new Jeddah ATC TWR.

Action by the meeting is in paragraph 5.

REFERENCE(S)

ICAO Annex 10.
ICAO Annex 11;
Doc 4444, PANS-ATM
Doc 9426, Air Traffic Services Planning Manual
Doc 9750, Global Air Navigation Plan (GANP)
ICAO MID Surveillance Plan, Edition February 2021, Section §4.7
ICAO MID eANP. <https://www.icao.int/MID/MIDANPIRG/Pages/MID-eANP.aspx>.

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 remote streaming in data is used to replicate the view of the aerodrome and its vicinity, which is equivalent to the view which would exist from a tower visual control room on the aerodrome Tower. The fixed cameras are covering the maneuvering 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 by the European Union Aviation Safety Agency (EASA):

- **single mode of operation** refers to the provision of ATS to one aerodrome at a time, from a single remote ATS working position known also as remote tower module (RTM)^(*); and
- **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/RTM;

1.4 For both modes defined by EASA, 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 center (RTC), which could include one or several RTMs as shown in the illustration provided in **Appendix A**.

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.

1.6 The provision of remote aerodrome ATS 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:

- **Visual surveillance system**, replacing, or complementing, the OTW view of a conventional tower. It includes a number of 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

^(*) The European Union Aviation Safety Agency (EASA) defines remote tower module' (RTM) as a combination of systems and constituents from where remote aerodrome ATS can be provided, including one or more Air traffic Controller (ATCO) or Aerodrome Flight Information Service Officer (AFISO) workstation(s) and the visual presentation.

Systems', September 2021. A proposal for the minimum visual operational requirements are provided in **Appendix 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.
- **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;
- **Meteorological information**, the presentation of meteorological information at RTM using appropriate data transmission links.
- **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;
- **Light Gun or Signaling lamp**, remotely controlled allowing the ATCO/AFISO to communicate via a signaling lamp in the case of radiotelephony or data link communication failure as required under ICAO Annex 14 Volume I Chapter 5 §5.1.3.
- **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.
- **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.
- **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:

- data transmission links between the aerodrome and the RTM. A dual and independent connections should be provided with a third independent connection to be used for backup/emergency radio purposes;
- number of cameras at the aerodrome providing visual presentation of the aerodrome and its vicinity;
- number of screens for the visual presentation at an RTM;
- RTM mode of operation (single or multiple);
- weather conditions & operational hours; and
- power supply for all facilities.

3. OVERVIEW ON THE DEPLOYMENT OF REMOTE ATS TWR IN KSA.

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 aerodrome 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 national Telecom service provider (STC) 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) is 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. The activities of the implementation plan can be summarized as follows:

- development of cost-benefit study;
- 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;
- notification of change and request of an initial approval from General Authority of Civil Aviation (GACA);
- development of Concept of Operation (ConOps) and operational requirements covering performance requirements of facilities to be used;
- development of Request for proposal (RfP) 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;
- identification of required Staffing level and required qualifications;
- 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;
- 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;
- 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;
- coordination and agreement with Aerodrome meteorological Office for local weather reports;
- development of a contingency plan and related procedures covering the coordination with involved stakeholders;
- coordination with Al-Ula aerodrome operator to review and update of the aerodrome manual;
- development of a transition plan to ensure smooth introduction of remote aerodrome ATS service at OEAO. This plan is involving the aerodrome operator;
- training of technical and operational Staff;

- 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;
- 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
- 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 Q1-2023 and will be used as pilot-project for other deployment of remote aerodrome ATS.

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 as 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.

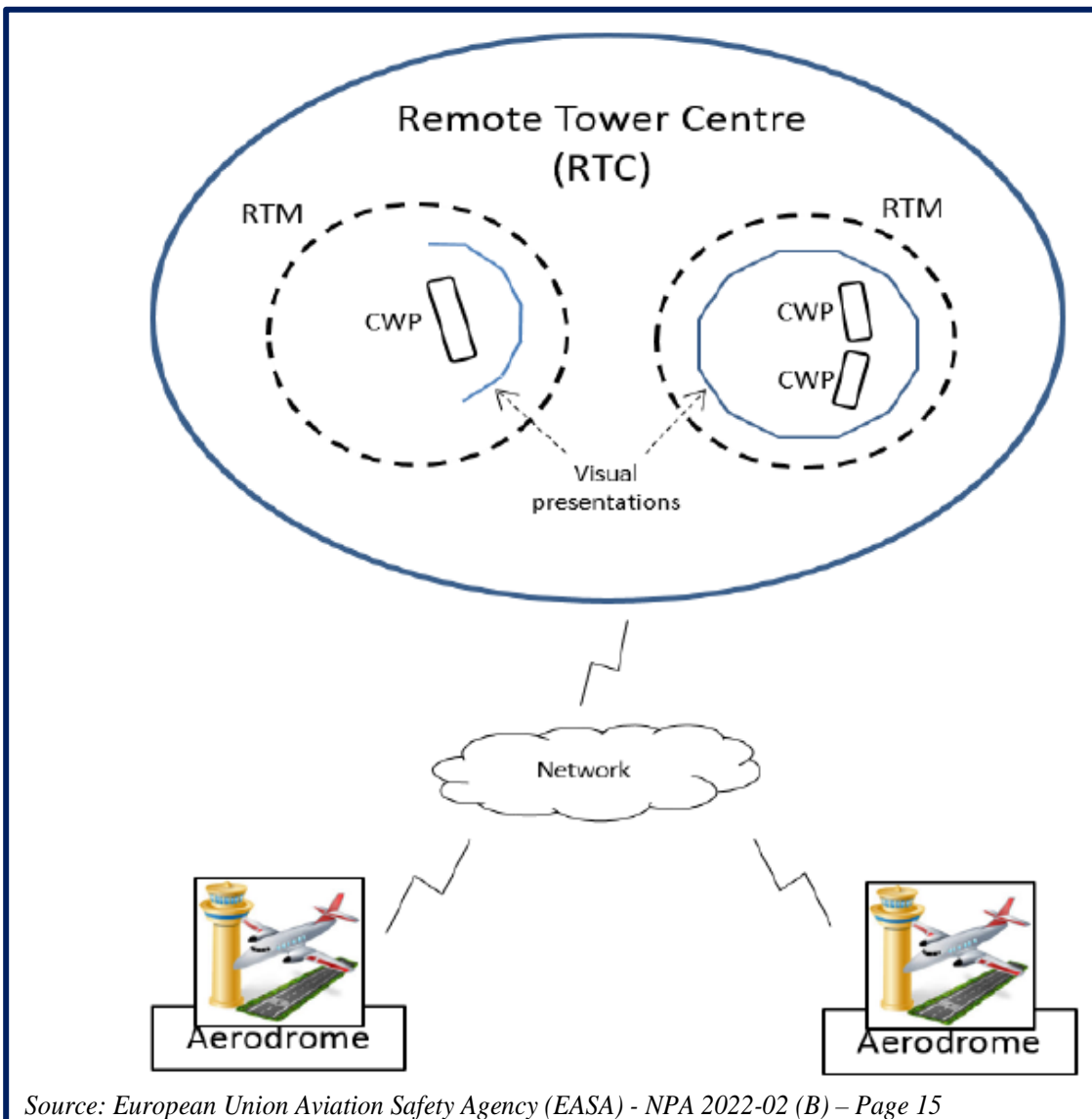
5. ACTION BY THE MEETING

5.1 The meeting is invited to:

- a) note the information provided in this paper.
- b) encourage MID States to share information on their experience related to introduction of remote aerodrome Air Traffic Services (ATS);
- c) invite ICAO MID Office to organize a webinar or workshop on remote aerodrome Air Traffic services (ATS) with consideration of CNS facilities; and
- d) discuss the proposal to establish an AG to amend MID Surveillance Plan to include details on visual surveillance system and to develop guidance on data transmission links to support the introduce of remote aerodrome air traffic services in the Middle East.

APPENDIX A

ILLUSTRATION ON REMOTE AERODROME ATS FROM AN RTC



Source: European Union Aviation Safety Agency (EASA) - NPA 2022-02 (B) – Page 15

APPENDIX B

MINIMUM OPERATIONAL VISUAL REQUIREMENTS (OVR)

I. TERMINOLOGY:

‘aerodrome conventional tower’ means a facility located at an aerodrome from which aerodrome ATS is provided principally through direct out-of-the-window observation of the aerodrome and its vicinity. ^

‘aerodrome remote tower’ means a geographically independent facility from which aerodrome ATS is provided principally through indirect observation of the aerodrome and its vicinity, by means of a visual surveillance system. (It is to be seen as a generic term, equivalent in level to a conventional tower. ^

‘Direct visual observation’ means observation through direct eyesight of objects situated within the line of sight of the observer, possibly enhanced by external elements (e.g. binoculars). ^

‘Operational context’ means the operational characteristics — such as aerodrome size/layout, traffic volume/density and complexity, related airspace and flight procedures, number of simultaneously served aerodromes, etc. — that should be considered when remote aerodrome ATS is to be implemented. ^

‘Remote tower center’ (RTC) means a facility housing one or more remote tower modules. ^

‘Remote tower module’(RTM) means a combination of systems and constituents from where remote aerodrome ATS can be provided, including one or more ATCO/AFISO workstation(s) and the visual presentation. (It can be compared with the tower cabin of an aerodrome conventional tower.). ^

‘Single mode of operation’ means the provision of ATS from a Remote Tower Module (RTM) for only one aerodrome at a time.

‘multiple mode of operation’ means the provision of ATS from one remote tower/remote tower module for two or more aerodromes at the same time (i.e. simultaneously); ^

‘Out-the-window view’ means a view of the areas of responsibility of the ATS unit from a conventional tower, obtained via direct visual observation; ^

Visual presentation’ means ^

a view equivalent, in terms of visual coverage, to the one available at the corresponding conventional tower; or

in the absence of a conventional tower, or when other locations are deemed more beneficial, it means an unobstructed view of all the areas of responsibility of the ATS unit.

Site-Specific Areas any area on the airport surface that may need additional and/or specific requirements for the controller to complete visual tasks (e.g., hotspots, blind spots). ^^

Physical Landmarks: A material object on the airport surface or vicinity nearby. Physical landmarks may not be substituted with virtual overlays within the remote Tower System (RTS). ^^

Relative Altitude: Altitude of one object in reference to another object. ^^

Relative Position: The location of one object in reference to another object. ^^

Relative Speed: Refers to slowing down, speeding up, and relative speed to other objects. ^^

‘detect/detection’ means to visually be able to see that there is something. ^

‘recognize/recognition’ means to visually be able to determine the class/category/type of an object, e.g.: class/category/type of aircraft based on e.g. size/fuselage, engine configuration, wing/stabilizer configuration, painting/color marking, etc. class/category/type of vehicle, e.g. ambulance/car/fuel truck/baggage trailer; class/category/type of personnel and obstructions, e.g. person/wildlife/FOD.

‘identify/identification’ means the ability to correlate a detected or recognized object with a specific individual aircraft/vehicle. ^

Observe: the user's ability to discern an object's state and any changes in an object's 12 state in the context of the environment. An object's state includes altitude, orientation, speed, 13 attitude, position, and/or condition. ^^

^= Definition is from EASA.

^^= Definition is from FAA.

II. PROPOSAL FOR OPERATIONAL VISUAL REQUIREMENTS (OVR)

#	Operational Visual Requirement
OR- 001	The remote tower system should permit the controller to visually recognize an aircraft on the runway.
OR- 002	The remote tower system should permit the controller to visually identify an aircraft on the runway.
OR- 003	The remote tower system should permit the controller to visually recognize an aircraft on the runway safety area.
OR- 004	The remote tower system should permit the controller to visually identify an aircraft on the runway safety area.
OR- 005	The remote tower system should permit the controller to visually recognize an aircraft on the movement area.
OR- 006	The remote tower system should permit the controller to visually identify an aircraft on the movement area.
OR- 007	The remote tower system should permit the controller to visually recognize an aircraft operating within any site-specific area.
OR- 008	The remote tower system should permit the controller to visually identify an aircraft operating within any site-specific area.
OR- 009	The remote tower system should permit the controller to visually observe an aircraft's direction of movement on the runway.
OR- 010	The remote tower system should permit the controller to visually observe an aircraft's direction of movement on the runway safety area.
OR- 011	The remote tower system should permit the controller to visually observe an aircraft's direction of movement on the movement area.
OR- 012	The remote tower system should permit the controller to visually observe an aircraft's direction of movement on any site-specific area.
OR- 013	The remote tower system should permit the controller to visually observe an aircraft's relative speed on the runway.
OR- 014	The remote tower system should permit the controller to visually observe an aircraft's relative speed on the runway safety area.
OR- 015	The remote tower system should permit the controller to visually observe an aircraft's relative speed on the movement area.
OR- 016	The remote tower system should permit the controller to visually observe an aircraft's relative speed on any site-specific area.
OR- 017	The remote tower system should permit the controller to visually observe the aircraft's spatial relationship with other aircraft on the runway.
OR- 018	The remote tower system should permit the controller to visually observe completed aircraft's landing roll.
OR- 019	The remote tower system should permit the controller to visually verify the aircraft's spatial relationship with the runway holding position markings.
OR- 020	The remote tower system should permit the controller to visually observe the aircraft's spatial relationship with the runway holding position markings.
OR- 021	The remote tower system should permit the controller to visually observe the aircraft's spatial relationship with the landing threshold.
OR- 022	The remote tower system should permit the controller to visually observe the aircraft's spatial relationship with the departure end of the runway.

OR- 023	The remote tower system should permit the controller to visually observe when a departure aircraft is airborne.
OR- 024	The remote tower system should permit the controller to visually verify the start of an aircraft's takeoff roll.
OR- 025	The remote tower system should permit the controller to visually observe the start of an aircraft's takeoff roll.
OR- 026	The remote tower system should permit the controller to visually observe an aircraft's initial departure turn over the runway.
OR- 027	The remote tower system should permit the controller to visually verify that the runway is free of all known objects the size of a deer or larger.
OR- 028	The remote tower system should permit the controller to visually observe the location of an aircraft on the runway in reference to intersections.
OR- 029	The remote tower system should permit the controller to visually observe the location of an aircraft on the runway in reference to suitable landmarks.
OR- 030	The Remote Tower System should permit the controller to visually verify if a known aircraft is Small single-engine propeller driven aircraft weighing 12,500 lbs. or less, and all helicopters at 1 nautical mile from the landing threshold.
OR- 031	The remote tower system should permit the controller to visually observe a Small single-engine propeller driven aircraft weighing 12,500 lbs. or less, and all helicopters direction of flight at 1 nautical mile from the landing threshold.
OR- 032	The remote tower system should permit the controller to visually observe relative speed of Small single-engine propeller driven aircraft weighing 12,500 lbs. or less, and all helicopters at 1 nautical mile from the landing threshold.
OR- 033	The remote tower system should permit the controller to visually observe relative altitude of a Small single-engine propeller driven aircraft weighing 12,500 lbs. or less, and all helicopters at 1 nautical mile from the landing threshold.
OR- 034	The remote tower system should permit the controller to visually verify if a known aircraft is a Small single-engine propeller driven aircraft weighing 12,500 lbs. or less, and all helicopters at 1.5 nautical miles from the landing threshold.
OR- 035	The remote tower system should permit the controller to visually observe direction of a Small single-engine propeller driven aircraft weighing 12,500 lbs. or less, and all helicopters at 1.5 nautical miles from the landing threshold.
OR- 036	The remote tower system should permit the controller to visually observe relative speed of a Small single-engine propeller driven aircraft weighing 12,500 lbs. or less, and all helicopters at 1.5 nautical miles from the landing threshold.
OR- 037	The remote tower system should permit the controller to visually observe relative altitude of a Small single-engine propeller driven aircraft weighing 12,500 lbs. or less, and all helicopters at 1.5 nautical miles from the landing threshold.
OR- 038	The remote tower system should permit the controller to visually verify if known aircraft is Medium/Large at 2 nautical miles from landing threshold.
OR- 039	The remote tower system should permit the controller to visually observe Medium/Large aircraft's direction of flight at 2 nautical miles from landing threshold.
OR- 040	The remote tower system should permit the controller to visually observe a Medium/Large aircraft's relative speed at 2 nautical miles from landing threshold.
OR- 041	The remote tower system should permit the controller to visually observe Medium/Large aircraft's relative altitude at 2 nautical miles from landing threshold.
OR- 042	The remote tower system should permit the controller to visually observe a departing aircraft passing through any intersecting flight path.

OR- 043	The remote tower system should permit the controller to visually observe a departing aircraft passing through any runway intersection.
OR- 044	The remote tower system should permit the controller to visually observe an arriving aircraft passing through the projected intersecting flight path of another aircraft.
OR- 045	The remote tower system should permit the controller to visually observe an arriving aircraft will hold short of any runway intersection.
OR- 046	The remote tower system should permit the controller to visually observe the spatial relationship between taxiing or hover-taxi helicopters and other aircraft.
OR- 047	The remote tower system should permit the controller to visually detect aircraft at a minimum of 3 nautical miles laterally and at a minimum of 1,500 feet above the top of the area of jurisdiction from active runway surface area.
OR- 048	The remote tower system should permit the controller to visually observe an aircraft in reference to suitable physical landmarks for 3,000 feet same runway separation.
OR- 049	The remote tower system should permit the controller to visually observe an aircraft in reference to suitable physical landmarks for 4,500 feet same runway separation.
OR- 050	The remote tower system should permit the controller to visually observe an aircraft in reference to suitable physical landmarks for 6,000 feet same runway separation.
OR- 051	The remote tower system should permit the controller to visually verify a aircraft abort takeoff.
OR- 052	The remote tower system should permit the controller to visually observe an aircraft abort takeoff.
OR- 053	The remote tower system should permit the controller to visually observe an aircraft execute a go-around.
OR- 054	The remote tower system should permit the controller to visually observe with reference to suitable surface markings a helicopter is a minimum of 200 feet from a simultaneous departing helicopter.
OR- 055	The remote tower system should permit the controller to visually observe with reference to suitable surface markings a helicopter is a minimum of 200 feet from a simultaneous landing helicopter.
OR- 056	The remote tower system should permit the controller to visually recognize a vehicle on the runway.
OR- 057	The remote tower system should permit the controller to visually recognize a vehicle on the runway safety area.
OR- 058	The remote tower system should permit the controller to visually recognize a vehicle on the movement area.
OR- 059	The remote tower system should permit the controller to visually recognize a vehicle on any site-specific areas.
OR- 060	The remote tower system should permit the controller to visually detect a pedestrian on the runway.
OR- 061	The remote tower system should permit the controller to visually detect a pedestrian on the runway safety area.
OR- 062	The remote tower system should permit the controller to visually detect a pedestrian on the movement area.
OR- 063	The remote tower system should permit the controller to visually observe a vehicle's direction of movement when operating on the movement area.

OR- 064	The remote tower system should permit the controller to visually observe a vehicle's relative speed on the movement area.
OR- 065	The remote tower system should permit the controller to visually observe an aircraft's spatial relationship with other aircraft on the movement area.
OR- 066	The remote tower system should permit the controller to visually observe an aircraft's spatial relationship with a known object on the airport surface.
OR- 067	The remote tower system should permit the controller to visually observe an aircraft on the upwind leg of a standard traffic pattern.
OR- 068	The remote tower system should permit the controller to visually observe an aircraft turning from upwind leg to crosswind leg of a standard traffic pattern.
OR- 069	The remote tower system should permit the controller to visually observe an aircraft on the crosswind leg of a standard traffic pattern.
OR- 070	The remote tower system should permit the controller to visually observe an aircraft turning from crosswind leg to downwind leg of a standard traffic pattern.
OR- 071	The remote tower system should permit the controller to visually observe an aircraft on the downwind leg of a standard traffic pattern.
OR- 072	The remote tower system should permit the controller to visually observe an aircraft turning from downwind leg to base leg of a standard traffic pattern.
OR- 073	The remote tower system should permit the controller to visually observe an aircraft on the base leg of a standard traffic pattern.
OR- 074	The remote tower system should permit the controller to visually observe an aircraft turning from base leg to final approach of a standard traffic pattern.
OR- 075	The remote tower system should permit the controller to visually observe an aircraft on final of a standard traffic pattern.
OR- 076	The remote tower system should permit the controller to visually verify an aircraft's relative position to landmarks at a minimum of 3 nautical miles from active runway surface area.
OR- 077	The remote tower system should permit the controller to visually observe an aircraft's spatial relationship with other aircraft at a minimum of 3 nautical miles laterally and at a minimum of 1,500 feet above the top of the area of jurisdiction from active runway surface area.
OR- 078	The remote tower system should permit the controller to visually verify the status of the runway edge lights.
OR- 079	The remote tower system should permit the controller to visually verify the status of the taxiway lights.
OR- 080	The remote tower system should permit the controller to visually detect construction work on the movement area.
OR- 081	The remote tower system should permit the controller to visually detect construction work immediately adjacent to the movement area.
OR- 082	The remote tower system should permit the controller to visually observe site-specific airport conditions impacting operations.
OR- 083	The remote tower system should permit the controller to visually observe spatial relationships between aircraft and site-specific obstructions.
OR- 084	The remote tower system should permit the controller to visually observe fixed-wing aircraft rock wings in response to a light gun signal between sunrise and sunset.

OR- 085	The remote tower system should permit the controller to visually observe fixed-wing aircraft move ailerons or rudders while on the ground in response to a light gun signal between sunrise and sunset.
OR- 086	The remote tower system should permit the controller to visually observe fixed-wing aircraft flash navigation or landing lights in response to a light gun signal between sunset and sunrise.
OR- 087	The remote tower system should permit the controller to visually observe a helicopter flash the landing light in response to a light gun signal between sunrise and sunset.
OR- 088	The remote tower system should permit the controller to visually observe a helicopter rock the tip path plane in response to a light gun signal between sunrise and sunset.
OR- 089	The remote tower system should permit the controller to visually observe a helicopter flash the landing light or search light in response to a light gun signal between sunset and sunrise.
OR- 090	The remote tower system should permit the controller to visually recognize visibility landmarks for tower visibility observations.
OR- 091	The remote tower system should provide Visual-Voice Safety NET Alarm.
OR-092	The Remote Tower System should provide 360 degrees CAM coverage
OR-093	The Remote Tower System should be supported by RADAR, ADS-B or Multilateration etc.
OR-094	The Remote Tower System should provide an adjustable aerodrome sound reproduction.
OR-095	The Remote Tower System should provide an adjustable light intensity of the display.
OR-096	The Remote Tower System should be able to limit the loss of visual information near sources of high variations in ambient light intensity such as the sun, reflection glare, or other lighting sources.
OR-097	The Remote Tower System should be synchronized to a certified external Coordinated Universal Time (UTC) reference which supports a resolution less than or equal to 0.01 seconds
OR-098	The Remote Tower System should provide a night visual presentation in case of a night operations are available at the aerodrome.
OR-099	The Remote Tower System should provide an acceptable means of safety performance during IMC conditions.
OR-100	The Remote Tower System should generate an Alert upon detecting a faulted condition not affecting the system's functional capabilities but is an advisory indication for potential maintenance needs.
OR-101	The Remote Tower System should provide acceptable coverage in all movement area that are served or monitored by ATCOs in accordance with the main objectives of ATS.

The Operational visual requirements should be not limited to the above requirements and should consider all potential hazards that might impact the provision of ATS service.