GUIDANCE MATERIAL

REMOTE TOWER OPERATIONS

GM-RTO

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Preface

This Guidance Material (GM) is published by the Civil Aviation Authority of Fiji (CAAF) for the purpose of promulgating supplementary material to that published in the Authority's Standards Documents. It provides guidance to air navigation service providers, aerodrome operators and CAAF staff on the planning, safety assessment, certification and operation of remote aerodrome air traffic services (remote / aerodrome towers) in Fiji and the Nadi Flight Information Region (Nadi FIR).

This GM explains certain regulatory requirements by providing interpretive and explanatory material. It is issued under the authority of the Chief Executive of CAAF and should be read together with the Standards Document – Air Traffic Services (CAR Rule Part 172 / SD-ATS), the Standards Document – Aerodrome, the personnel-licensing provisions of CAR Part 65 / SD-PEL, and the applicable provisions of the Air Navigation Regulations 1981 and the Civil Aviation (Reform) Act 1999.

First implementation in Fiji

This is the first remote aerodrome tower guidance issued by CAAF and anticipates Fiji's first remote / aerodrome tower implementation. Because no remote aerodrome tower has previously operated in Fiji, there is no local operational or validation experience to rely upon. Every element of any proposed implementation must therefore be confirmed through a local safety assessment accepted by CAAF before it is introduced into service.

Chief Executive
Civil Aviation Authority of Fiji

Record of Amendments and Corrigenda

AMENDMENTS

CORRIGENDA

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1. Introduction

The concept of remote provision of aerodrome air traffic services (ATS) / aerodrome flight information service — commonly known as 'remote towers', 'remote tower operations' or 'aerodrome towers' — enables the provision of remote aerodrome tower from locations or facilities without direct visual observation of the aerodrome. Instead, the view of the aerodrome and its vicinity is obtained by technological means. Throughout this document the term used to describe this is 'remote aerodrome tower'.

1.1 Purpose and intended readership

This document provides guidance to support:

- Air Navigation Service Provider (ANSP) for the Nadi FIR and the aerodrome operator, in implementing or considering the implementation of remote aerodrome tower; and
- CAAF, as the competent authority responsible for the acceptance and oversight of any remote aerodrome tower implementation in Fiji.

It also describes the general concept of remote aerodrome tower to the Fiji aviation community, establishing a common baseline and understanding, and providing clarification of related terms and definitions. It lists areas and issues for consideration when implementing remote aerodrome tower, in particular those related to change management, safety and human factors. Every implementation is unique and is subject to a local safety assessment carried out in accordance with the applicable Fiji Standards Documents and the procedures accepted by CAAF.

1.2 Scope

The scope of this document is the overall concept of remote aerodrome tower — covering the single mode of operation, remote tower centre (RTC) operations and the use of technical enablers. The guidance is generic in nature and is then tailored to Fiji's first intended application, set out in the Fiji Applicability box below.

This document covers the technological, procedural and operational aspects of remote aerodrome tower, in order to facilitate its safe and harmonised implementation throughout Fiji in accordance with the objectives of ATS. It focuses primarily on the unique implementation aspects of remote aerodrome tower and does not restate all requirements applicable to aerodrome tower provision generally. ANSP, as ATS provider and aerodrome operator, remains responsible for ensuring compliance with all applicable ICAO Standards and Recommended Practices (SARPs) and Fiji Standards Documents, Civil Aviation Rules and Regulations.

Fiji Applicability — First Implementation

Mode of operation. Fiji's first implementation is limited to the single mode of operation — one Remote Tower Module (RTM) at a Remote Tower Centre (RTC) at Nadi providing service to one unattended aerodrome at a time. Multiple mode of operation (simultaneous service to two or more aerodromes from one RTM) is outside the scope of the first implementation and is not authorised until separately assessed and accepted by CAAF.

Type of service. The service in scope is Aerodrome Flight Information Service (AFIS) provided by an Aerodrome Flight Information Service Officer (AFISO), consistent with the service currently associated with the unattended aerodrome. Aerodrome control (ATC) content in this document is retained for completeness and future use but is not the basis of the first implementation.

Aerodrome characteristics. The unattended aerodrome is a low-density, day-only aerodrome (published hours 0800–1700 local), with a single instrument (RNP, non-precision) runway, PAPI on both runways, Category 5 rescue and firefighting, and no runway lighting. The 'basic features' (visual

presentation and binocular/PTZ functionality) form the baseline; advanced overlays are optional enhancements subject to safety assessment.
Regulatory posture. Introduction of remote aerodrome tower is a change to the functional system. No operation, including trials, may commence before CAAF acceptance of a joint FAL safety case, consistent with the safety-case-led approach CAAF applies to novel operations.

1.3 Document structure

- Chapter 1 – Introduction: purpose, scope, readership and Fiji applicability.
- Chapter 2 – Definitions.
- Chapter 3 – The remote aerodrome tower concept and modes of operation.
- Chapter 4 – Operational context, applications and related recommendations.
- Chapter 5 – Operational and system considerations (including minimum technical and performance specifications).
- Chapter 6 – Management of change (safety, human factors, security, contingency, transition, constituents).
- Chapter 7 – Aerodrome-related aspects.
- Chapter 8 – Possible impact on airspace users.
- Chapter 9 – Aeronautical information products and services.
- Chapter 10 – Qualification and training considerations.
- Appendices (implementation checklist, operational hazard lists, feature division, acronyms, references and technical compliance checklist).

1.4 Background and justification

The concept of remote aerodrome tower has been studied and progressively implemented internationally for over a decade. The first remote tower implementation providing aerodrome tower with situational awareness fully in accordance with ICAO Doc 4444 and Doc 9426 was approved and introduced into operation in Sweden in April 2015, and implementations have since followed in Norway, Germany, Hungary, the United States and elsewhere. The first industry technical standard on the optical aspects of remote towers has been published by EUROCAE as ED-240A.

The provision of ATS at an aerodrome is already governed by ICAO SARPs and by Fiji's national aviation law, including provisions relating to the assessment of changes to functional systems. This document provides support on how to meet those requirements where aerodrome tower is to be provided remotely. To provide a single source of information encompassing all aspects related to remote aerodrome tower, CAAF has developed this stand-alone Guidance Material.

Note on international research references *Findings drawn from international research and operational experience (for example the SESAR programme and implementations in Sweden, Norway, Germany and Hungary) are cited in this document as supporting evidence only. As this is the first remote aerodrome tower implementation in Fiji, no local validation data yet exists. Every such finding must be confirmed through a local safety assessment accepted by CAAF, taking into account Fiji's operational context, before it is relied upon in service.*

2. Definitions

For the purpose of this document, the following definitions apply. Related definitions are grouped rather than listed alphabetically. Terms not defined here have the meaning given in the SD-ATS and CAR Part 1 – Definitions and Abbreviations.

'aerodrome control service' means air traffic control service for aerodrome traffic.

'aerodrome flight information service (AFIS)' means flight information service and alerting service for aerodrome traffic at an aerodrome.

'aerodrome tower' means air traffic service for aerodrome traffic, in the form of aerodrome control service (ATC) or aerodrome flight information service (AFIS).

'remote aerodrome tower' means the provision of aerodrome tower from a remote tower / remote tower module.

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

'remote tower' means a geographically independent facility from which aerodrome tower is provided principally through indirect observation of the aerodrome and its vicinity by means of a visual surveillance system (equivalent in level to a conventional tower).

'remote tower centre (RTC)' means a facility housing one or more remote tower modules.

'remote tower module (RTM)' means a combination of systems and constituents from which remote aerodrome tower can be provided, including one or more ATCO/AFISO workstation(s) and the visual presentation.

'single mode of operation' means the provision of ATS from one remote tower / RTM for one aerodrome at a time.

'multiple mode of operation' means the provision of ATS from one remote tower / RTM for two or more aerodromes simultaneously (out of scope for Fiji's first implementation).

'out-of-the-window (OTW) view' means a view of the area of responsibility of the aerodrome tower unit from a conventional tower, obtained via direct visual observation.

'out-the-window (OTW) equivalence' means the principle that the visual and aural presentation provided to the controller/AFISO must be functionally equivalent to, or better than, direct visual observation from a conventional tower, for the purposes of providing ATS.

'visual presentation' means a view of the area(s) of responsibility of the aerodrome tower unit provided by a visual display.

'visual surveillance system' means a number of integrated elements — normally optical sensor(s), data transmission links, data processing systems and situation displays — providing an electronic visual presentation of traffic and other information necessary to maintain situational awareness at an aerodrome and its vicinity.

'sensor site' means the physical location at the aerodrome where the camera, microphone and associated sensor equipment is installed.

'data transmission network (DTN)' means the communications infrastructure, including transport links and network equipment, connecting the sensor site to the RTM.

'latency' means the end-to-end time delay between an event occurring in the physical environment at the sensor site and its presentation to the controller/AFISO at the RTM.

'detect / detection' means to visually be able to see that there is something.

'recognise / recognition' means to visually be able to determine the class / category / type of an object.

'identify / identification' means the ability to correlate a detected or recognised object with a specific individual aircraft / vehicle.

'operational context' means the operational characteristics — aerodrome size/layout, traffic volume/density and complexity, related airspace and flight procedures, etc. — to be considered when remote aerodrome tower is implemented.

3. The Remote Aerodrome Tower Concept and Modes of Operation

Remote aerodrome tower enables the provision of aerodrome tower from locations or facilities without direct visual observation. The primary change compared with conventional tower operations relates to the manner by which visual observation of the aerodrome and its vicinity is achieved: instead of direct out-of-the-window observation, it is achieved using a visual surveillance system that enables situational awareness in accordance with ICAO Doc 4444 and Doc 9426.

A remote aerodrome tower may be located away from the aerodrome it serves, or in a building on or close to the aerodrome without an adequate direct view of the area of responsibility. Visual surveillance system elements may also be introduced into a conventional tower to enhance or complement situational awareness.

3.1 Modes of operation

Remote aerodrome tower is categorised into two main modes of operation: single mode and multiple mode. For both, ATS may be provided as aerodrome control service (ATC) or aerodrome flight information service (AFIS). Remote aerodrome tower may be provided where a conventional tower already exists or where none exists, on a permanent basis, on a temporary basis (for example at night or for specific periods), or for contingency purposes.

3.2 Single mode of operation

The single mode of operation refers to the provision of ATS to one aerodrome at a time from a single RTM. Typical applications include the provision of ATS to one aerodrome from one RTM; provision during planned or unplanned contingency situations; and provision to distant or visually blocked areas of an aerodrome by installing visual surveillance system elements. This is the mode in scope for Fiji's first implementation (e.g. Nadi RTC serving the unattended aerodrome).

3.3 Multiple mode of operation (out of scope for the first implementation)

The multiple mode of operation refers to the simultaneous provision of ATS to more than one aerodrome from a single RTM. It is described in this document for completeness and future planning only. It is not part of Fiji's first implementation and must not be introduced until the additional operational, procedural, technical and human-factors considerations set out in Chapter 5 and Chapter 6 have been assessed and the change has been separately accepted by CAAF.

3.4 Remote tower centre (RTC)

The ATS provider may provide remote aerodrome tower from a centralised facility known as a remote tower centre (RTC), which may house one or several RTMs and, depending on size and requirements, one or more supervisor positions. For Fiji's first implementation the RTC at Nadi is envisaged initially with a single operational RTM serving the unattended aerodrome, designed to permit orderly future expansion. The required number of available RTMs depends on the number, complexity and size of connected aerodromes, and on contingency and service-availability requirements.

3.5 Technical enablers for remote aerodrome tower

The available solutions are not based on a unique system configuration but on a set of technical enablers, the appropriate configuration of which must be selected according to the operational needs of the implementation and supported by the safety, security and human-factors assessments. A non-exhaustive list of enablers (each described further in Chapter 5) includes:

- visual presentation replacing or complementing the OTW view (Section 5.2);
- binocular functionality, e.g. a pan-tilt-zoom (PTZ) camera emulating binoculars (Section 5.2);
- remotely controlled signalling lamp (Section 5.3);

- aerodrome sound reproduction (Section 5.4);
- communication means for aeronautical mobile, aeronautical fixed and surface movement control services (Section 5.5);
- management of navigation aids, aeronautical ground lights and other aerodrome assets (Section 5.7);
- meteorological information (Section 5.8);
- additional ‘hot spot / gap filler’ cameras and infrared / non-visible-spectrum sensors (Section 5.2.8);
- overlaid tracking, framing and information (‘visual tracking’, ‘radar tracking’, FOD detection support) (Section 5.2.8).

4. Operational Context, Applications and Related Recommendations

This chapter describes operational contexts and applications for remote aerodrome tower together with related recommendations. Regardless of context, implementation in Fiji depends upon a local safety assessment accepted by CAAF. Where the terms 'basic features' and 'advanced features' are used they carry the meaning set out in Appendix 4; 'low-density' and 'medium-density' describe aerodromes with, respectively, mostly single and frequently simultaneous aircraft movements.

4.1 Single mode of operation

4.1.1 Traffic volume/density and traffic complexity

Traffic volume/density and complexity — the characteristics and mix of aircraft (IFR/VFR, types, performance and equipage) and vehicle operations — are primary factors when implementing remote aerodrome tower, as they are when building or upgrading a conventional tower. They drive the requirements for the visual presentation, the need for binocular functionality and other enablers. International validation indicates that for low-density aerodromes the basic features are generally sufficient, particularly where the visual presentation is of high quality. The unattended aerodrome is a low-density aerodrome; accordingly, the basic features form the baseline for the first implementation, subject to confirmation by the local safety assessment.

4.1.2 Characteristics of the aerodrome layout

The aerodrome layout drives the requirements for the visual presentation and binocular functionality and affects the camera installation (single-camera tower with optional hot-spot cameras, or a distributed installation). The unattended aerodrome is a single-runway, non-complex layout that supports a single-camera / panoramic installation complemented by hot-spot cameras where the safety assessment identifies a need (for example at the runway thresholds and turn pads).

4.1.3 Aerodrome switching under single mode of operation

Single mode also covers scenarios in which the AFISO/ATCO switches service provision from one aerodrome to another without serving both simultaneously, typically in conjunction with the opening or closing of ATS. The ATS provider must establish the procedures and conditions for switching, which must be validated, accepted by CAAF as part of the change to the functional system, and documented in the operations manual.

4.1.4 Remote tower as a backup facility

The remote aerodrome tower concept may support ATS contingency arrangements, consistent with ICAO Annex 11 and the contingency provisions of the SD-ATS. Any contingency arrangement is temporary in nature and is not to be used as the principal means of providing the service unless properly demonstrated and accepted by CAAF. Where a backup facility is implemented, the required level of human-machine interface (HMI) commonality with the primary facility should be defined, and camera placement, infrastructure split (communications, uninterruptible power supply) and switchover time carefully considered.

4.2 Multiple mode of operation (future development)

The overarching recommendation for multiple mode is that it be used only where operational circumstances allow and where workload and complexity can be demonstrably managed. Multiple mode is not part of Fiji's first implementation. Should it be considered in future, the number and combination of aerodromes, the probability and impact of simultaneous movements, service-provision arrangements and staged transition steps must be assessed and separately accepted by CAAF.

4.3 Common aspects (single and multiple modes)

4.3.1 Airspace and traffic circuit characteristics

As for conventional operations, the airspace classification, traffic circuits, departure and arrival paths, and VFR entry/exit and holding points relevant to the particular aerodrome must be taken into account.

4.3.2 Aerodrome environment and wildlife

Each aerodrome's surrounding topography, natural phenomena and local wildlife characteristics must be considered. For the unattended aerodrome, this includes the occurrence of birds and animals on and in the vicinity of the aerodrome. The visual surveillance system design, and any detection/overlay enablers, should support the AFISO in maintaining awareness of wildlife, and must be integrated with the unattended aerodrome's Wildlife Hazard Management Plan (WHMP) and the daily wildlife-monitoring and culling-request procedures already in force at the aerodrome.

4.3.3 Local weather characteristics

Local weather and climate factors — proximity to sea, terrain, and the associated meteorological phenomena — may affect ATS provision. Fiji's tropical environment, heavy rain and reduced-visibility conditions are directly relevant: the unattended aerodrome has historically experienced weather-related diversions associated with low visibility. The safety assessment should therefore give particular attention to low-visibility performance of the visual surveillance system, the potential value of infrared / hot-spot cameras and clearly defined low-visibility procedures. Any dependence on such enablers for situational awareness must be matched by appropriate degraded-mode procedures.

4.3.4 AFISO's / ATCO's roles and responsibilities

The ATS provider must configure the RTM and related operating methods, taking into account the operational application and the particular needs of the unattended aerodrome, so that the AFISO is enabled to fulfil their responsibilities as if the service were provided from a conventional tower.

5. Operational and System Considerations

This chapter addresses procedural considerations, operational needs and requirements, and related system and equipment aspects for the implementation of remote aerodrome tower. AFISO/ATCO confidence and trust in the system is of vital importance; the human-factors assessment (Section 6.2) and an assessment of social aspects are fundamental to building that confidence. Sections 5.1 to 5.13 set out the operational and functional considerations; Section 5.14 consolidates the minimum quantitative technical and performance specifications applicable to the system.

5.1 Procedural considerations

All formal interfaces with stakeholders must be re-evaluated to include items unique to remote aerodrome tower, particularly communication between the remote ATS unit and the aerodrome operator and documented in local agreements (see Chapter 7). Where the ATS provider performs tasks that fall under the responsibility of the aerodrome operator, specific agreements must be in place.

Before assuming responsibility for service provision, the AFISO must be able to verify the status of the aerodrome (traffic, weather, systems), with coordination and transfer of control of operational systems where needed. Procedures and contingency plans must clearly define how to deal with unexpected or unusual events and require adequate and recurrent training.

5.2 Visual surveillance system

The visual surveillance system is the core element of remote provision of aerodrome tower and typically comprises the ‘visual presentation’ (replacing the OTW view) and the ‘binocular functionality’ (emulating binoculars), together with sensors, data transmission links, data processing systems and situation displays. Regardless of the technical solution, the system must fulfil the regulatory requirements and operational needs of the service. The ATS provider should use the process described in EUROCAE ED-240A, or an equivalent accepted by CAAF, to define the local operational visual performance requirements (the Detection and Recognition Range Performance requirements). It is recommended that the system be operationally validated against perceived total image quality rather than individual parameters alone.

5.2.1 Visual presentation

The visual presentation replaces the OTW view, providing a view of the aerodrome and its vicinity. A common design is a wide field-of-view ‘panorama’ derived from a central camera tower, optionally supported by hot-spot / gap-filler cameras. A ‘video wall’ design using distributed cameras may suit larger multiple-runway aerodromes; it is not required for the unattended aerodrome.

5.2.2 Binocular functionality

The binocular functionality (e.g. a PTZ camera as defined in ED-240A) emulates binoculars, allowing a close-up view of a specific location or object (for example landing gear, runway condition, or objects on the runway). It fulfils the part of ICAO Doc 9426 that lists binoculars as recommended equipment in an aerodrome control tower.

5.2.3 Primary / direct regulatory requirements

ICAO Doc 4444 (PANS-ATM) Chapter 7.1.1.2 requires aerodrome controllers to maintain a continuous watch on all flight operations on and in the vicinity of the aerodrome, as well as vehicles and personnel on the manoeuvring area, and provides that visual observation may be achieved through direct out-of-the-window observation or through indirect observation using a visual surveillance system specifically approved by the appropriate ATS authority. These provisions are incorporated into the SD-ATS. Accordingly, the surveillance system — subject to visibility and terrain — must enable the AFISO/ATCO to see flight operations in the vicinity of and on the aerodrome, and vehicles and personnel on the manoeuvring area, in both daylight and darkness (subject to the ATS hours of operation).

5.2.4 Indirect regulatory requirements

Certain ICAO Doc 4444 provisions apply indirectly to the visual surveillance system — for example the ability to observe abnormal aircraft configurations (such as landing gear not extended or unusual smoke), obstructions on the manoeuvring area, birds and animals, significant meteorological conditions in the take-off and climb-out area, and runway surface states. As part of the local implementation and safety assessment, ANSP must determine whether and to what extent the visual surveillance system needs to support the AFISO in observing these matters, defining local operational requirements for size, distance and meteorological/daylight conditions. This guidance extends the association of the relevant ICAO provisions to AFIS where appropriate.

5.2.5 Other operational needs

Where the ATS unit is also responsible for apron management services, cameras must provide an unobstructed view of the apron(s) concerned. Even where apron management is not provided there may be operational benefit in a view of the apron. The AFISO should be able to observe and follow changes in weather conditions and occurrences (for example precipitation, fog patches, build-up of cumulonimbus, or flooding) to the extent feasible from a conventional tower.

5.2.6 Camera siting

The number, location and height of cameras must be determined by a dedicated, coordinated assessment by ANSP, taking into account aerodrome dimensions and layout, the location of CNS equipment (to prevent interference), prevailing weather, existing buildings, obstacle limitation surfaces, sun glare, night-time lighting glare and external light sources. The assessment must demonstrate that the chosen configuration fulfils the objectives for the unattended aerodrome.

5.2.7 Functional considerations

Factors affecting system performance and usability — visual presentation setup and layout, seams/joints avoidance at hot spots, binocular functionality performance, video latency, video update rate, daylight/darkness perception, other image-quality factors, protection against natural external influences, and failure detection — must be assessed for the unattended aerodrome implementation. Maximum allowable video latency and update rate must be determined by the local safety assessment; ED-240A stipulates a maximum video latency of one second as a reasonable reference value (see the design parameters in Section 5.14.2). Given Fiji's climate, protection of cameras/sensors against heavy rain, humidity, condensation, sun glare and insect/bird interference, together with an appropriate cleaning and maintenance regime, must be specified.

5.2.8 Technical enablers for increased situational awareness

The visual presentation may include additional sensors (hot-spot / gap-filler cameras and infrared/thermal sensors) and overlaid information (symbols/labels for aircraft, vehicles, personnel, obstructions and wildlife; runway/taxiway framing; compass directions; meteorological, AIP and operational information; and FOD-detection support). Any such enabler must be evaluated (including validation and human-factors assessment) as part of the safety assessment. All overlaid information should be capable of being toggled on/off and adjusted in intensity by the AFISO to avoid blocking important visual information, information overload and distraction, and appropriate degraded-mode procedures must handle the loss of any function on which situational awareness depends.

5.3 Signalling lamp

Consistent with ICAO Annex 14 Volume I, ICAO Circular 211-AN/128 and the applicable provisions of the SD-ATS, the remote tower infrastructure must allow the AFISO/ATCO to communicate via a signalling lamp (for example in the event of radiotelephony or data-link failure). Remote command of the lamp must be

provided, its location published in the AIP, and any command latency assessed against the operational context.

5.4 Aerodrome sound

Where the AFISO cannot detect the naturally occurring sounds of the aerodrome, a function capturing and relaying aerodrome sound may be introduced. Such a function can be particularly valuable at smaller aerodromes, increasing situational awareness during low-visibility conditions and emergencies. If implemented, volume must be adjustable and a maximum allowable latency determined and synchronised with the video latency, consistent with the performance envelope described in EUROCAE ED-241 (see Section 5.14.3). Implementation must be assessed in the local safety assessment.

5.5 Communications

A remote tower facility must enable the AFISO/ATCO to perform voice/data-link communication for the aeronautical mobile service (air-ground), aeronautical fixed service (ground-ground) and, where applicable, surface movement control service, in accordance with ICAO Annex 11 and the communications requirements of the SD-ATS and SD-ATELCOM. The RTC/RTM may require a dedicated connection (e.g. via WAN) to the local radio equipment at the unattended aerodrome; the maximum allowable delay must be determined by the local safety assessment. A dedicated, independent backup/emergency radio connection is required, installed in a different location from the main radios. The emergency frequency 121.5 MHz must be provided as required by the SD-ATS.

5.6 Voice and data recording

The philosophy of recording and retaining all data used to support ATS provision applies. For remote aerodrome tower this extends to the visual presentation, binocular functionality and any aerodrome-sound reproduction. As a minimum, the image presented to the AFISO (the ‘screen recording’, including overlaid data) must be recorded and retained to support accident and incident investigation, time-synchronised with recorded ATC/AFIS communications, and consistent with ICAO Annex 11 and the record-retention requirements of the SD-ATS. Recording and retention of optical/video/sound data from public spaces must be handled in accordance with the Fiji Data Protection Act 2021 and other applicable Fiji legislation.

5.7 Management of aerodrome assets

The remote tower infrastructure must enable the AFISO to operate and monitor the assets necessary to fulfil the tasks assigned to the ATS unit, including aeronautical ground lights and the operational status of navigation services, consistent with ICAO Doc 4444, Annex 14 Volume I and Annex 11. Monitoring and manoeuvring of other aerodrome assets (for example crash/alarm systems and anti-bird systems) must be specified in local agreements between ANSP’s aerodrome and ATS functions.

5.8 Meteorological information

The remote tower infrastructure must support presentation of, and access to, relevant meteorological information in accordance with ICAO Annex 11, ICAO Doc 4444 and the SD-Aeronautical Meteorological Service Provider (SD-AMSP). Where the AFISO performs meteorological observations, arrangements consistent with the SD-AMSP and Fiji Meteorological Service requirements must be defined. Integration of AWOS/ATIS to reduce manual dissemination should be considered as part of the implementation (see Section 5.14.4).

5.9 Other ATS systems / functions

Systems needed for ATS provision but not necessarily affected by remote provision — for example any ATS surveillance display, handling of ATS messages, presentation and updating of flight-plan and control data, and presentation of correct UTC time — must be provided consistent with ICAO Doc 4444 and the SD-ATS. The AFISO must have access to all relevant operational data (AIP, NOTAM, manual of operations, etc.).

5.10 Technical architecture and redundancy

Service-continuity requirements must be considered when designing the complete system, including the data transmission links between the unattended aerodrome and the RTC, the number of cameras and screens, and power-supply needs. The data transmission links are a critical enabler. Based on current best practice it is recommended that the connection between the aerodrome and the remote facility be doubled and physically separated, with a third independent connection for backup/emergency radio purposes. Where ANSP relies on third-party network or telecommunications providers, the applicable requirements of the SD-ATS and SD-ATELCOM apply, and a service level agreement addressing availability, latency and restoration priority commensurate with the safety criticality of the service must be held.

5.11 Technical supervision

Remote aerodrome tower is based on a distributed infrastructure. The system and its constituents must include monitoring functions that continuously present technical status, detect failures, support analysis, propose actions and log technical data (see Section 5.14.6). The need for, and form of, a technical supervision role must be based on the local safety assessment and may be part of the maintenance organisation at the unattended aerodrome, a dedicated function at the RTC, or a combination.

5.12 Working environment

A dedicated analysis of the working environment and ergonomics of the RTC/RTM must be conducted by ANSP, as this is essential to a successful implementation and to AFISO trust. The physical working environment (noise, temperature, lighting) must comply with applicable Fiji workplace/occupational health and safety requirements, permit suitable daylight conditions, allow lighting to be adjusted to the daylight/darkness conditions at the unattended aerodrome, and provide state-of-the-art ergonomic workstations.

5.13 Additional considerations for multiple mode (future)

Where multiple mode is considered in future, additional procedural, communication, RTM-design, visual-presentation, aerodrome-sound and work-environment considerations apply (including frequency cross-coupling, aerodrome-name inclusion in transmissions, distinct vehicle call-sign series, and clear differentiation between aerodromes). These are retained for future planning and are not part of the first implementation.

5.14 Minimum technical and performance specifications

This section consolidates the minimum quantitative technical and performance specifications applicable to a remote aerodrome tower system. The values below represent the minimum acceptable performance recognised by CAAF for safety-approval purposes; an ANSP may propose an alternative means of compliance where the equivalence of the proposed means is substantiated in the system safety assessment. These specifications complement, and do not replace, the operational requirements in Sections 5.1 to 5.13, EUROCAE ED-240A/ED-241 and the local operational visual performance requirements.

5.14.1 System architecture

A remote aerodrome tower system comprises, at minimum, the following functional elements: (a) the sensor site, including visual and audio sensors and associated environmental protection; (b) the data transmission network (DTN) connecting the sensor site to the RTM; (c) the RTM, comprising the visual presentation, audio reproduction, communication, surveillance overlay and alerting subsystems; and (d) supporting infrastructure, including power supply, network monitoring and information-security controls. The architecture must be documented in a system description accompanying the safety assessment, including a network topology diagram and a functional block diagram.

5.14.2 Visual presentation performance parameters

The visual presentation must reconstruct the aerodrome environment and surrounding airspace to a standard that supports the safe and effective provision of ATS. The following minimum parameters, consistent with the performance envelope of EUROCAE ED-240A, apply and must be confirmed by the local safety assessment:

Parameter	Minimum requirement
Horizontal field of view	Continuous coverage of the aerodrome movement area and, where applicable to the ATS being provided, the surrounding visual circuit and approach/departure paths.
Effective visual range	Sufficient to detect, recognise and identify traffic, vehicles and relevant obstacles at distances and under conditions equivalent to those required for the applicable ATS, including within the aerodrome traffic zone.
End-to-end video latency	As determined by the local safety assessment. ED-240A stipulates a maximum of one second as the reference ceiling; a design target not exceeding 200 milliseconds under normal operating conditions is recommended, with a system-generated alert if the assessed threshold is exceeded.
Frame / update rate	Minimum 25 frames per second, free of perceptible stutter or tearing under normal network loading.
Image resolution	Sufficient across the full panoramic presentation to resolve aircraft markings and identify aircraft type at ranges consistent with the visibility minima under which the aerodrome is intended to operate.
Low-light / night performance	Where night operations are conducted, demonstrated equivalence to unaided human night vision using low-light-capable sensors, infrared overlay or equivalent technology (not applicable to the day-only first implementation).
Pan-tilt-zoom (PTZ) capability	Where fitted, PTZ response time and positional accuracy must not degrade continuous situational awareness of the panoramic presentation.
Display stitching	Panoramic image stitching must not introduce visible seams, parallax error, or object duplication/omission at stitch boundaries that could obscure traffic or obstacles.

The ANSP must complete a documented out-the-window (OTW) equivalence assessment demonstrating that the visual presentation enables the AFISO to perform all functions of the service to a standard not less than that achievable from a conventional tower at the same aerodrome, addressing detection and tracking of aircraft, vehicles and personnel; identification of runway incursions and foreign object debris; observation of ATS-relevant weather; and any sensor-suite limitations together with the mitigations applied.

5.14.3 Audio performance

Where aerodrome-sound reproduction is implemented under Section 5.4, the audio system must capture and reproduce ambient aerodrome sounds relevant to ATS (including aircraft engine noise, emergency-

vehicle sirens and radio communications) with sufficient fidelity and directional cueing to support situational awareness, consistent with EUROCAE ED-241. Audio latency must be synchronised with the visual presentation to within a tolerance that does not create a perceptible mismatch between sound and image.

5.14.4 Surveillance and meteorological data integration

Where surveillance data (for example ADS-B, multi-lateration or SSR-derived data) is available for the aerodrome or its associated airspace, the RTM must present this data overlaid on, or alongside, the visual presentation to augment — not replace — visual identification of traffic, complying with the applicable requirements of ICAO Annex 10 and the aeronautical data quality requirements referenced in SD-ATELCOM. Where the system replaces a conventional tower's direct observation of meteorological conditions, the RTM must be integrated with automated meteorological observation systems (e.g. AWOS/ATIS) providing, at minimum, wind, visibility, cloud base (where instrumented), QNH and significant weather, displayed in real time and cross-referenced against the visual presentation.

5.14.5 System availability and reliability

Metric	Minimum requirement
System availability	Not less than 99.9% during published hours of ATS operation, measured on a rolling 12-month basis.
Mean Time Between Failures (critical path)	As substantiated by the equipment manufacturer's reliability data and validated through in-service monitoring; subject to CAAF review where availability targets are not met.
Mean Time to Restore (contingency activation)	Consistent with the ANSP's approved contingency plan (Section 6.5) and no greater than the maximum permissible service interruption identified in the safety assessment.
Planned maintenance windows	Scheduled outside published hours of ATS operation wherever practicable and notified to airspace users via NOTAM where service impact is expected.

Performance data must be monitored continuously by the ANSP and made available to CAAF on request and as part of scheduled surveillance activities.

5.14.6 System alerting and failure indication

The RTM must provide a clear, unambiguous and, where appropriate, audible alert to the AFISO in the event of: loss or significant degradation of the visual or audio presentation; latency exceeding the assessed threshold; loss of a sensor or DTN path; loss of surveillance or meteorological data feeds; and any information-security event assessed as capable of affecting the integrity of the presented data. Alerting logic must be validated as part of the safety assessment (Section 6.1) and supported by the degraded-mode procedures of Section 6.5.

6. Management of Change

6.1 Safety assessment

Implementation of remote aerodrome tower is a change to the functional system. It does not require a special safety assessment methodology; the applicable requirements are those laid down in the SD-ATS (safety management and change) and in the ATS-provider certification framework (CAR Part 172 / AC 172-01), complemented by the safety-management provisions of the SD-Safety Management. ANSP must use its own safety assessment methodology as accepted by CAAF, including 5×5 risk-matrix classification of identified hazards.

Appendix 1 provides a non-exhaustive implementation checklist that ANSP and CAAF may use, adjusted to the unattended aerodrome operational context and the selected technical solution. Appendix 7 provides a technical compliance checklist for the equipment and performance requirements of Section 5.14. It is recommended that ANSP and CAAF agree a tailored checklist at the outset of the safety review.

6.1.1 Scope of the safety assessment

The safety assessment must cover the unattended aerodrome, the operational mode and every configuration/combination relevant to the implementation. For the first implementation this is the unattended aerodrome served in single mode from the Nadi RTC.

6.1.2 Dependencies and interfaces

The change may affect other entities — for example CNS providers, adjacent ATS units (including the Nadi Area Control Centre and Flight Information Centre), the aerodrome operator functions at the unattended aerodrome, and airspace users. ANSP must address dependencies, interfaces and interactions with these parties in the safety assessment, consistent with the SD-ATS.

6.1.3 Identification of hazards

ANSP must perform hazard identification for the change. The operational hazard lists derived from international safety work are provided as an initial input in Appendix 2 (ATC) and Appendix 3 (AFIS). Because they were developed for other operational contexts, they must be adapted to the unattended aerodrome's local conditions, and system-specific hazards added, before being used to develop safety requirements.

6.2 Human factors assessment

The introduction of remote aerodrome tower has direct human-factors implications. The human-factors assessment must be based on a state-of-the-art process, cover the relevant human-factors areas (HMI and system; working environment; procedures and working methods; organisation and human-human interaction; and transition factors), and involve the affected actors (AFISO and ATSEP).

It is recommended that the assessment be conducted independently and presented as part of the safety assessment. Assessment means may include simulations and passive, active and advanced shadow-mode validations using the final functional system.

The technical and human-factors elements listed in international guidance (screen layout; field of view; image quality; latency and synchronisation; blind areas; fatigue and workload; distance judgement; camera angles relative to the traffic circuit; and, for the unattended aerodrome specifically, deficiencies in image capture due to sea-water splash, heavy rain and glare) must be considered. Where AFISOs will switch service provision between aerodromes under the same shift (future multiple-mode scenario), consequences on fatigue and mental availability must be assessed and mitigated.

6.3 Transition / implementation plan

ANSP, in coordination with the unattended aerodrome function and other affected stakeholders, must establish a documented transition/implementation plan included in the safety assessment. Because the unattended aerodrome currently has no conventional control tower, the plan is for setting up a new remote ATS unit rather than migrating from a conventional tower; it must take into account the elements of this document and the specific conditions of the unattended aerodrome.

Where, in future, a service is migrated from a conventional tower to a remote tower, the phased 'conventional tower control → transferring control → remote tower control' approach, with fall-back provisions, applies. Airspace users, relevant ATS units and the aerodrome operator must be notified without undue delay through the aeronautical information products and services (see Chapter 9).

6.4 Information and cyber security

As an air navigation service provider, ANSP must establish and maintain a security management system to protect its facilities, personnel and operational data, consistent with the security provisions of the SD-ATS and the Civil Aviation Authority of Fiji Act 1979. Remote aerodrome tower relies on IT infrastructure for the visual surveillance system, communications and management of aerodrome equipment, which may introduce information- and cyber-security vulnerabilities that can affect safety. The distributed sensor sites, data transmission network and software-based RTM present a materially different cyber-security risk profile to a conventional tower; the system must therefore be treated as a critical aviation information system.

ANSP must conduct a dedicated security risk assessment and implement measures to protect its systems and constituents, taking into account the Fiji Data Protection Act 2021 and the Fiji Cybercrime Act 2021 and, as reference sources, the principles of ICAO Doc 10204 – Aviation Information Security (as reflected in CAAF's associated Guidance Material) and recognised international standards (for example the ISO/IEC 27000 family and EUROCAE ED-205). The results of the security risk assessment are an input to the safety assessment. At minimum, the ANSP must implement:

- network segmentation isolating the remote aerodrome tower system from general corporate IT networks;
- authenticated and, where practicable, encrypted transmission of visual, audio and control data across the data transmission network;
- access control and logging for all administrative access to sensor, network and RTM equipment;
- a vulnerability management and patching regime for all software and firmware components of the system; and
- incident detection and response procedures specific to the remote aerodrome tower system, integrated with the ANSP's broader aviation information security incident-response process.

Any cyber-security incident affecting, or with the potential to affect, the integrity, availability or confidentiality of the remote aerodrome tower system must be reported to CAAF in accordance with the reporting obligations established under the ANSP's SMS and CAAF's aviation information security guidance.

6.5 Contingency planning and degraded-mode procedures

ANSP must establish and implement contingency plans covering emergency and abnormal situations, and degraded-mode procedures for events not amounting to significant degradation, consistent with the contingency provisions of the SD-ATS and ICAO Annex 11. Given Fiji's status as a multi-hazard Small Island Developing State, particular attention must be given to the resilience of the system to natural-hazard events, including tropical cyclones, in addition to conventional equipment and cyber-related failure modes.

Any contingency arrangement is temporary. Contingency and degraded-mode procedures must be designed for the specific local conditions and technical architecture, addressing at least: unreliable, frozen

or delayed visual presentation; partial or full loss of visual presentation or binocular functionality; loss of the sensor site (e.g. due to cyclone damage, power loss or physical obstruction of camera housings); loss/degradation of the data transmission network, including diverse-path failure; loss of the RTM facility itself, including restoration from an alternative RTM where one is held; and loss/degradation of communications, signalling lamp, meteorological information, aeronautical ground lights, navigation aids, alarm management, aerodrome sound and other systems (surveillance information, flight-plan and control data). Each element must be considered in isolation and in combination with other failures. Sensor-site equipment must be installed and protected to a standard appropriate to the environmental exposure of the aerodrome (wind loading, water ingress and lightning protection), consistent with the manufacturer's specification and SD-ATELCOM. Contingency arrangements must be exercised at a frequency defined in the ANSP's local manual, and no less than annually, with records retained and made available to CAAF.

6.6 Remote tower system constituents

The split of the technical system into constituents is under the responsibility of ANSP, in agreement with CAAF, and must be assessed for the particular technical solution. Based on high-level functionalities the constituents may be grouped as: (a) visual surveillance system and aerodrome sound (ATS); (b) voice/data communication (CNS); and (c) manoeuvring and monitoring, including signal-light gun, aerodrome lights, alarms, navigation aids and technical supervision (ATS). EUROCAE ED-240A (MASPS for Remote Tower Optical Systems) is the accepted international technical standard for the optical system, complemented by ED-241 (audio) and, for any future multiple-remote-tower configuration, ED-262. ANSP may further split, merge or add constituents provided the interface specifications are based on accepted standards and are consistent with the ATM/ANS service concerned.

7. Aerodrome-Related Aspects

Under ICAO Annex 14 and Fiji's national law, certain aerodromes must be certified. In Fiji, aerodrome certification is granted under Section 10 of the Civil Aviation (Reform) Act 1999 and in accordance with the SD-Aerodrome. During aerodrome planning, design and certification, ATS aspects must be properly identified and addressed. Where the remote tower is located away from the aerodrome, close coordination between CAAF, ANSP's ATS function and ANSP's aerodrome function is particularly important throughout implementation and operation.

7.1 Certification

7.1.1 Documentation for aerodrome certification

The documentation for the certification (or continued certification) of the unattended aerodrome must identify the type of ATS provided (AFIS), the way it is provided (from a remote tower off-site at the Nadi RTC), and the associated CNS and MET arrangements. Where remote aerodrome tower is provided, the documentation must clearly identify: the location of the ATS unit; the communication means between the ATS unit and all relevant aerodrome units; the tasks to be carried out locally at the unattended aerodrome to enable and support the remote ATS; the organisation carrying out those tasks; and the communication procedures for special occurrences, emergency landings or diversions. Drawings must show the facilities, installations and equipment (cameras, sensors, etc.), their location and overall height.

7.1.2 Aerodrome manual

The unattended aerodrome Manual must additionally contain the relevant information for remote aerodrome tower, including: provision of information to the aeronautical information service for AIP publication; day-to-day coordination between the aerodrome and ATS functions (including wildlife management and airside works); participation of ATS personnel in the aerodrome's safety committees and the Local Runway Safety Team; site-familiarisation arrangements for AFISOs; low-visibility/extreme-weather procedures; the location and maintenance of facilities and equipment; safeguarding against unlawful interference; use of light and pyrotechnic signals; and procedures for initiating a NOTAM declaring the aerodrome closed in the event of failure of the supporting facilities.

7.1.3 Local agreement between aerodrome and ATS functions

A local agreement between the ANSP aerodrome function and the ANSP ATS function (and any other ATM/ANS providers) must define responsibilities and coordination needs and means, additionally covering the remote-ATS elements set out in Section 7.1.2.

7.2 Operational aspects

- Coordination in the event of system failure: timely coordination between the aerodrome and ATS functions to identify the cause and impact of any failure and to notify via NOTAM as necessary.
- Aerodrome safeguarding: assessment and mitigation of sources of interference, security procedures for the protection of facilities and equipment, cyber-security measures for the transmission of aeronautical data (including redundancy), and access control.
- Maintenance: a preventive and corrective maintenance programme for the remote tower system facilities at the unattended aerodrome, based on manufacturer instructions and taking account of Fiji's climate (cleaning of camera housings against rain, dust, salt and bird interference).
- Power supply: cameras and related facilities at the unattended aerodrome must have adequate primary and automatically switched secondary power supply, continuous/uninterrupted, consistent with the SD-Aerodrome electrical-supply requirements.

- Cameras where apron management is provided: cameras must give the ATS unit an unobstructed view of the apron(s) concerned.

8. Possible Impact on Airspace Users

In principle, and as confirmed by international operational experience, remote aerodrome tower should not negatively impact airspace users. Consistent with the open and transparent service-provision requirements of the SD-ATS, ANSP must publish the conditions of access to its services and changes thereto (see Chapter 9) and establish a consultation process with users. ANSP must analyse any possible impacts on airspace users in the safety assessment and propose appropriate mitigation measures in the operations manual. Airspace users are informed through the aeronautical information products and services.

9. Aeronautical Information Products and Services

ANSP, together with the unattended aerodrome function, must analyse the aeronautical information affected by the introduction of remote aerodrome tower and ensure that relevant information is included in the appropriate products and services, consistent with the SD-Aeronautical Information Services (SD-AIS) and AIP Fiji. In particular:

- AIP AD 2.23 (Additional information) for the unattended aerodrome should indicate that remote aerodrome tower is provided and the location of the signalling lamp (with a clear indication on the aerodrome chart);
- any specific communication methods (relevant to future multiple mode) should be published where applicable;
- implementation plans and milestones (for example the dates and scope of validation exercises and the planned date of operation) may be published by Aeronautical Information Circular (AIC).

10. Qualification and Training Considerations

A service provider shall ensure that it is able to provide its services in a safe, efficient, continuous and sustainable manner, consistent with any foreseen level of overall demand for a given airspace. Furthermore, all personnel involved in the operation and maintenance of the facilities, installations and equipment enabling and supporting remote aerodrome tower must be adequately trained, qualified and competent, consistent with the personnel requirements of the SD-ATS and the licensing provisions of SD-PEL Section 6 / CAR Part 65.

10.1 Qualification and training of AFISOs

For the first implementation, AFISOs providing remote aerodrome tower at the unattended aerodrome must hold the appropriate licence and rating/validation under CAR Part 65 / SD-PEL, and a current Class 4 medical certificate under CAR Part 67 as applicable. Training must enable AFISOs to acquire knowledge of the remote aerodrome tower concept and of the characteristics of the operating environment, to appreciate the specific human-factors influences, and to recognise and manage specific abnormal situations. Training must be delivered by an organisation approved/recognised by CAAF and must include unit endorsement and site familiarisation for the unattended aerodrome.

10.2 Qualification and training of ATCOs (future)

Should aerodrome control (ATC) be introduced in future, ATCOs must hold a valid licence, rating and validation under CAR Part 65 / SD-PEL, with training addressing the specificities of remote aerodrome tower.

10.3 Qualification and training of ATSEP

Air traffic safety electronics personnel involved in the operation and maintenance of the equipment, facilities and installations enabling and supporting remote aerodrome tower must be adequately trained, qualified and competent in accordance with the applicable provisions of the SD-ATS and SD-Aerodrome, and any ATSEP licensing framework adopted by CAAF.

Appendix 1
Checklist for the implementation of remote aerodrome tower

The following non-exhaustive checklist summarises key aspects to be considered by ANSP and CAAF when implementing remote aerodrome tower at the unattended aerodrome and for the related safety assessment. It should be adjusted to the operational context and the selected technical solution.

- Assessment of the configuration of technical enablers, based on operational context, needs and requirements, and supported by the safety, security and human-factors assessments.
- Development of operational visual performance requirements for the visual presentation and binocular functionality, based on primary/direct and indirect regulatory requirements and other operational needs.
- Development of functional requirements for the visual presentation and binocular functionality.
- Siting assessment of the location and number of cameras at the unattended aerodrome to meet view and visual-performance requirements.
- Implementation of data recording of new system elements to support accident and incident investigation, consistent with the Fiji Data Protection Act 2021.
- Identification of redundancy needs for the technical architecture, particularly the communication link between the RTC and the unattended aerodrome.
- Assessment of interfaces/interdependencies with external stakeholders and analysis of the necessary coordination processes.
- Assessment of the impact on existing and new tasks and the possible reassignment of tasks (ATS, aerodrome operator, MET, AIS and maintenance).
- Human-factors assessment, including working-environment and ergonomics analysis.
- Security risk assessment, taking into account the Fiji Data Protection Act 2021 and Cybercrime Act 2021.
- Splitting the remote aerodrome tower technical system into constituents, agreed with CAAF.
- Transition/implementation plan developed by ANSP (setting up a new remote ATS unit at the unattended aerodrome).
- Development of a contingency plan and related degraded-mode procedures.
- Review and update of the unattended aerodrome documentation and Aerodrome Manual.
- Review and documentation of roles and responsibilities of the ATS and aerodrome functions.
- Coordination between ANSP and CAAF on the safety-assessment process and methodology.
- Review and update of training requirements for AFISOs, ATSEP and aerodrome personnel.
- Analysis of possible impact on operational procedures and airspace users.
- Analysis of aeronautical information products and services and proposed modifications.
- Integration with the unattended aerodrome's Wildlife Hazard Management Plan and low-visibility procedures.

Appendix 2
Initial list of operational hazards: ATC service (future use)

The following operational hazards, derived from international safety work, may be used as an initial input should aerodrome control be introduced in future. They must be adapted to the unattended aerodrome's local conditions and supplemented with system-specific hazards. (Provided for completeness; the first implementation is AFIS — see Appendix 3.)

ID	Description	Operational effect
OH-05	Remote ATC fails to provide appropriate separation to traffic in the vicinity of the aerodrome.	Imminent infringement.
OH-08	Remote ATC does not detect in time conflicts / potential collision in the vicinity of the aerodrome.	Imminent collision.
OH-14	Remote ATC provides inadequate taxiing instruction to aircraft on the manoeuvring area.	Encounter with aircraft, vehicle or obstacle.
OH-19	Remote ATC incorrectly manages runway entry for a departing aircraft (occupied runway).	Runway conflict.
OH-26	Remote ATC fails to detect in time runway incursions (aircraft or vehicles).	Runway penetration.
OH-31	Remote ATC fails to properly support landing/take-off with respect to weather conditions.	Potential landing accident / runway excursion.
OH-32	Remote ATC fails to properly support landing/take-off with respect to runway conditions and FOD.	Potential landing accident / runway excursion.

Note: the full international list contains 37 hazards (OH-01 to OH-37). The above is a representative extract for planning; the complete adapted list must be developed in the safety assessment.

Appendix 3
Initial list of operational hazards: AFIS (primary for the first implementation)

The following AFIS operational hazards, derived from international safety work, are provided as an initial input for the unattended aerodrome implementation. They must be adapted to the unattended aerodrome's local conditions and supplemented with system-specific hazards.

ID	Description
OH-AFIS-01	Remote AFIS fails to properly select the runway-in-use.
OH-AFIS-02	Remote AFIS fails to identify potential 'conflicts' in the vicinity of the aerodrome.
OH-AFIS-03	Remote AFIS fails to provide appropriate traffic information (including local traffic) to relevant traffic.
OH-AFIS-04	Remote AFIS fails to provide appropriate information on runway availability for departing/arriving traffic.
OH-AFIS-05	Remote AFIS fails to provide appropriate traffic position information on the manoeuvring area.
OH-AFIS-07	Remote AFIS fails to provide appropriate essential information on aerodrome conditions (surface, obstacles, birds, lighting).
OH-AFIS-09	Remote AFIS fails to provide appropriate meteorological information to departing and arriving traffic.
OH-AFIS-10	Remote AFIS fails to manoeuvre the visual signals to indicate the aerodrome is not safe.
OH-AFIS-15	Remote AFIS fails to provide light signals to vehicles/personnel on the manoeuvring area (e.g. in radio failure).
OH-AFIS-18	Remote AFIS fails to detect a runway incursion or obstruction (including animals) on or near the take-off/landing area.
OH-AFIS-19	Remote AFIS fails to operate aeronautical ground lights (where applicable).
OH-AFIS-20	Remote AFIS fails to monitor visual aids status.

Note: the full international AFIS list contains 20 hazards (OH-AFIS-01 to OH-AFIS-20). The complete adapted list must be developed in the safety assessment, with particular attention to Fiji low-visibility and wildlife conditions at the unattended aerodrome.

Appendix 4
Division of basic and advanced features

For the purpose of this document, 'basic' and 'advanced' features are understood as follows. For the unattended aerodrome the basic features form the baseline; advanced features are optional enhancements subject to safety assessment.

Basic features

- Visual presentation, replacing the OTW view of a conventional tower.
- Binocular functionality (e.g. a PTZ camera/function as defined in ED-240A).

Advanced features

- Additional visual 'hot spot' cameras.
- Infrared or other optical sensors/cameras outside the visible spectrum.
- Binocular functionality automatically following moving objects ('PTZ tracking').
- Detection/identification and automatic following of aircraft or vehicles by labels based on surveillance data ('radar tracking').
- Detection and following of moving objects by image processing ('visual tracking').
- Other overlaid information (runway/taxiway framing and designation, compass directions, meteorological and aeronautical information).
- ATS surveillance (air and/or ground) presentation.

Appendix 5
List of acronyms

Acronym	Meaning
ADC	Aerodrome control service
ADS-B	Automatic dependent surveillance – broadcast
AFIS	Aerodrome flight information service
AFISO	Aerodrome flight information service officer
AIC	Aeronautical information circular
AIP	Aeronautical information publication
AIS	Aeronautical information service
ANSP	Air navigation service provider
ATC	Air traffic control (aerodrome control service)
ATCO	Air traffic controller
ATIS	Automatic terminal information service
ATS	Air traffic service
ATSEP	Air traffic safety electronics personnel
AWOS	Automated weather observing system
CAAF	Civil Aviation Authority of Fiji
CAR	Civil Aviation Rule
CNS	Communication, navigation, surveillance
DTN	Data transmission network
ED-240A	EUROCAE MASPS for Remote Tower Optical Systems
ED-241	EUROCAE MASPS for Remote Tower Audio Systems
ED-262	EUROCAE MASPS for Multiple Remote Tower Systems
FAL	Fiji Airports Limited
FIR	Flight information region
FOD	Foreign object debris
FOV	Field of view
HMI	Human-machine interface
ICAO	International Civil Aviation Organization
MASPS	Minimum Aviation System Performance Specification/Standard
MTBF	Mean time between failures
OTW	Out-of-the-window
PTZ	Pan-tilt-zoom

Acronym	Meaning
RTC	Remote tower centre
RTM	Remote tower module
SMS	Safety management system
SD-ATS	Standards Document – Air Traffic Services
WHMP	Wildlife Hazard Management Plan

Appendix 6
References

6.1 Fiji regulatory instruments

- Civil Aviation Authority of Fiji Act 1979 (CAP 174A).
- Civil Aviation (Reform) Act 1999 — Section 10 (certification or registration of aerodromes).
- Air Navigation Regulations 1981 (as amended), including Regulation 145A.
- CAAF Standards Document – Air Traffic Services (SD-ATS).
- CAAF Standards Document – Aerodrome (SD-Aerodrome, Volume I).
- CAAF Standards Document – Personnel Licensing / CAR Part 65 – Air Traffic Service Personnel Licences and Ratings (SD-PEL).
- CAAF Advisory Circular AC 172-01 – Air Traffic Service Organisations – Certification (and CAR Part 172).
- CAAF Standards Document – Aeronautical Telecommunications (SD-ATELCOM) / CAR Part 171.
- CAAF Standards Document – Aeronautical Meteorological Service Provider (SD-AMSP).
- CAAF Standards Document – Aeronautical Information Services (SD-AIS).
- CAAF Standards Document – Rules of the Air (SD-ROTA).
- CAAF Standards Document – Safety Management (SD-SM).
- CAAF Guidance Material on Aviation Information Security (based on ICAO Doc 10204).
- CAR Part 67 – Medical Standards and Certification.
- Aeronautical Information Publication (AIP) Fiji.
- Fiji Data Protection Act 2021.
- Fiji Cybercrime Act 2021.

6.2 ICAO provisions and publications

- ICAO Doc 4444 – Procedures for Air Navigation Services – Air Traffic Management (PANS-ATM).
- ICAO Doc 9426 – Air Traffic Services Planning Manual.
- ICAO Doc 9750 – Global Air Navigation Plan.
- ICAO Doc 9859 – Safety Management Manual (SMM).
- ICAO Doc 10066 – PANS – Aeronautical Information Management.
- ICAO Doc 10204 – Aviation Information Security (2025).
- ICAO Annex 10 – Aeronautical Telecommunications (Volumes I, III, IV and V).
- ICAO Annex 11 – Air Traffic Services.
- ICAO Annex 14 – Aerodromes, Volume I.
- ICAO Annex 19 – Safety Management.
- ICAO Circular 211-AN/128 – Aerodrome Flight Information Service.
- ICAO Doc 10056 – Manual on remote aerodrome tower (as developed) and related ICAO guidance.

6.3 Technical standards and other publications

- EUROCAE ED-240A – Minimum Aviation System Performance Standard (MASPS) for Remote Tower Optical Systems (accepted international technical standard).
- EUROCAE ED-241 – MASPS for Remote Tower Audio Systems.

- EUROCAE ED-262 – MASPS for Multiple Remote Tower Systems.
- EUROCAE ED-205 – Process standard for ATM/CNS ground-system security (reference).
- EASA CS-RTS – Certification Specifications for Remote Tower Services (reference basis only; recognised by CAAF as an acceptable means-of-compliance basis).
- ISO/IEC 27000 family – Information security management (reference).
- International research and operational experience, including the SESAR programme and implementations in Sweden, Norway, Germany, Hungary and the United States (supporting evidence only).

Appendix 7
Technical compliance checklist (summary)

This checklist summarises the principal technical compliance items associated with the equipment and performance requirements of Section 5.14. It does not replace the detailed requirements in the body of the document and is provided to assist ANSP in preparing an application and its supporting safety assessment. It is derived from the ANSI CNS technical requirements and adapted to remote aerodrome tower terminology.

Ref.	Compliance item	Evidence
5.14.2	Visual presentation meets field-of-view, latency, update-rate, resolution and (where applicable) low-light requirements.	Test / commissioning report
5.14.2	Out-the-window (OTW) equivalence assessment completed.	Assessment report
5.14.3	Audio system meets fidelity and audio/video synchronisation requirements (where implemented).	Test / commissioning report
5.14.4	Surveillance and meteorological data integrated and validated.	Integration test report
5.10 / 5.14.1	Data transmission network path diversity and continuous link-quality monitoring in place.	Network design / SLA documentation
5.6	Recording and retention arrangements for visual, audio and overlay data in place.	System configuration record
5.14.6	System alerting and failure-indication logic validated.	Safety assessment / test report
6.1	System-specific safety assessment completed and current (5×5 risk classification).	Safety assessment report
6.2	Human-factors assessment completed.	HF assessment report
6.4	Information- and cyber-security controls implemented (ICAO Doc 10204-based GM).	Security risk assessment
6.5	Contingency plan documented and exercised (natural-hazard and technical failure modes).	Contingency plan / exercise record
10	AFISO, ATSEP and aerodrome-personnel training completed.	Training records

— End of Guidance Material —