



ICAO

International Civil Aviation Organization

The Eighth Meeting of the Asia/Pacific
Aerodrome Assistance Working Group (AP-AA/WG/8)

(Bangkok, Thailand, 21 to 24 April 2026)

Agenda Item 3: Aerodrome Certification and Safety Management System

PAKISTAN'S EXPERIENCE WITH CONDUCT AND ACCEPTANCE OF TASK AND RESOURCE ANALYSIS (TRA) FOR CERTIFIED AERODROMES

(Presented by PAKISTAN)

SUMMARY

This paper presents and outlines the methodology adopted in Pakistan for conducting Task Resource Analysis (TRA) to determine the minimum RFFS staffing requirements based on operational tasks, workload, and aerodrome-specific conditions. It also describes how the PCAA evaluates and accepts TRA reports through a comprehensive, multidisciplinary process to ensure compliance and operational realism. Despite implementation challenges, the application of TRA significantly enhances safety, regulatory compliance, workforce planning, and emergency preparedness at aerodromes.

1. INTRODUCTION

1.1 The safe and efficient operation of aerodromes requires, among other factors, the availability of adequate operational resources, including suitably trained personnel to ensure the safety of aircraft operations.

1.2 In accordance with paragraphs 9.2.42 and 9.2.43 of ICAO Annex 14, Volume I, States are required to ensure the availability of sufficient trained personnel to operate all necessary RFF equipment at maximum capacity, meet the prescribed response times, and maintain continuous application of extinguishing agents at the appropriate rate. To comply with ICAO requirements, the Pakistan Civil Aviation Authority (PCAA) has implemented Task Resource Analysis (TRA) as a systematic approach to determine the minimum number of trained RFFS personnel required at certified aerodromes.

2. DISCUSSION

2.1 A sufficient and well-trained human resource is essential for maintaining safe operations at an aerodrome. Such personnel are particularly critical in safety-sensitive areas, such as Rescue and Fire Fighting Services (RFFS). While Annex 14, Volume I, specifies the number of fire vehicles and the quantity of extinguishing agents required, it does not prescribe the number of personnel, as aerodromes vary widely in size, layout, traffic density, aircraft types, and risk profiles. Therefore, a fixed number of personnel may be either insufficient for complex aerodromes or excessive for smaller ones. ICAO Annex 14, Volume I, particularly paragraph 9.2.43, emphasizes **two key requirements for RFF personnel**:

2.1.1 **Trained and competent** – Personnel must have the necessary training and skills to operate RFF vehicles and equipment effectively.

2.1.2 **Sufficient** – There must be enough personnel available to meet operational requirements, achieve minimum response times, and maintain continuous application of extinguishing agents.

2.2 Furthermore, Paragraph 9.2.44 of Annex 14, Volume I states, “In determining the minimum number of rescue and firefighting personnel required, a task resource analysis should be completed and the level of staffing documented in the Aerodrome Manual”.

2.3 To meet the requirements regarding the training of RFFS personnel, the Pakistan CAA established minimum qualification standards for RFFS personnel and ensured their implementation. In order to ensure that a “sufficient” number of trained personnel are deployed at certified aerodromes, the PCAA directed aerodrome operators to carry out a Task and Resource Analysis (TRA) and submit the report to PCAA for evaluation and acceptance. After the acceptance of the TRA, aerodrome operators were required to provide the number of trained personnel identified in the report.

2.4 The TRA was carried out for all certified aerodromes. It took the aerodrome operators more than a year to complete the task, as 18 of the 19 aerodromes are managed by the single operator i.e. Pakistan Airports Authority.

2.5 The teams constituted to conduct the TRA comprised subject matter experts and human resource specialists. An appropriate team composition was necessary to ensure that all operational, technical, human, and administrative factors were taken into account. The Pakistan CAA remained engaged with aerodrome operators throughout the process. The TRA framework conducted in Pakistan included:

2.5.1 **Identification of Tasks:** Assigned tasks were identified through:

- Regulatory requirements
- Aerodrome operations manuals/procedures
- Safety oversight findings
- Operational experience and best practices
- Job Descriptions

2.5.2 **Task Breakdown and Analysis:** Each operational task was further divided into sub-tasks in order to assess the sequence of activities required for its completion. This process enabled the identification of:

- Personnel roles and responsibilities
- Equipment and vehicle requirements
- Response time requirements
- Safety considerations

2.5.3 **Resource Determination:** Following task analysis the minimum resources required to perform each task were determined. This included

- ARFF personnel
- Fire fighting vehicles and rescue equipment
- Communication systems

2.5.4 **Workload Assessment:** Workload was evaluated based on several factors including:

- Aerodrome category
- Size and complexity of Airport Operations
- Aircraft movements (peak and off-peak periods)
- Aerodrome operating hours
- Emergency response requirements
- Human Factors
- Local conditions at the aerodrome (weather, terrain, etc.)

2.5.5 **Staffing Determination:** After thorough analysis of assigned tasks and workload factors, minimum number of RFFS personnel was identified.

2.6 TRA reports of certified aerodromes were submitted to the PCAA for acceptance and subsequent implementation by the aerodrome operators.

2.7 **Acceptance of TRA:**

2.7.1 TRA acceptance is a meticulous activity that focuses not only on whether a TRA has been completed, but also on verifying that the methodology, assumptions, scenarios, and staffing conclusions are reasonable, evidence-based, and capable of ensuring compliance with RFFS response requirements. Based on PCAA's experience, a multidisciplinary team should be established to evaluate and accept the Task and Resource Analysis (TRA), comprising aerodrome safety inspectors, RFFS, Aerodrome Operations and SMS. Additionally, human factors specialists and other stakeholders should also be involved where necessary. The acceptance process should begin with a completeness check of the TRA report, followed by a detailed review of the methodology, assumptions, and scenarios used. The evaluation must confirm that all critical RFFS tasks are identified, properly analyzed, and supported by adequate staffing calculations. Particular emphasis should be placed on validating credible worst-case scenarios, ensuring no task conflicts, and verifying that response time requirements and continuous application of extinguishing agents can be achieved.

2.7.2 PCAA also recommends that TRA evaluations take into account human factors such as fatigue, shift patterns, and the availability of reserve personnel, and include practical validation through drills or exercises to confirm the realism of the proposed staffing. Any identified gaps should be addressed through corrective actions before formal acceptance is granted. Upon satisfaction, the TRA should be formally accepted.

2.7.3 During the conduct of the TRA, PCAA maintained continuous liaison with aerodrome operators and provided necessary technical support and guidance. This proactive engagement significantly enhanced the correctness and completeness of the TRAs.

2.8 While the implementation of Task Resource Analysis may bring challenges in terms of budgetary allocations and integration with SMS, it can provide several operational and safety benefits to aerodrome industry including but not limited to:

- Implementing regulations and addressing Safety Oversight findings
- More efficient workforce planning and resource utilization
- Improved preparedness for emergency situations
- Improved alignment of operational resources with aerodrome requirements

3. ACTION BY THE MEETING

3.1 The meeting is invited to:

- a) note the information contained in this paper; and
- b) discuss any relevant matters as appropriate.
