

Rescue and Fire-Fighting Services Resourcing

**Issue 1
20 January 2014**

Effective on issue

GENERAL

Overseas Territories Aviation Circulars are issued to provide advice, guidance and information on standards, practices and procedures necessary to support Overseas Territory Aviation Requirements. They are not in themselves law but may amplify a provision of the Air Navigation (Overseas Territories) Order or provide practical guidance on meeting a requirement contained in the Overseas Territories Aviation Requirements.

PURPOSE

This Circular provides guidance on the requirements for RFFS staffing.

RELATED REQUIREMENTS

This OTAC relates to OTAR Part 140.

CHANGE INFORMATION

First issue

ENQUIRIES

Enquiries regarding the content of this Circular should be addressed to Air Safety Support International or to the appropriate Overseas Territory Aviation Authority

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1. Principal Objective

The principal objective of a rescue and fire fighting service is to save lives in the event of an aircraft accident or incident occurring at, or in the immediate vicinity of, an aerodrome. The rescue and fire fighting service is provided to create and maintain survivable conditions, to provide egress routes for occupants and to initiate the rescue of those occupants unable to make their escape without direct aid. The rescue may require the use of equipment and personnel other than those assessed primarily for rescue and fire fighting purposes.

The most important factors bearing on effective rescue in a survivable aircraft accident are: the training received, the effectiveness of the equipment and the speed with which personnel and equipment designated for rescue and fire fighting purposes can be put into use (*ref. Annex 14 Volume 1, Chapter 9*).

This OTAC examines/provides guidance on the processes relating to:

1. tasks,
2. resourcing (staffing), and
3. time

that RFFS providers may consider in the provision of the service.

2. Aerodrome Category

The level of protection to be provided at an aerodrome should be based on the dimensions of the aeroplanes using the aerodrome, as determined in Annex 14, Chapter 9, Table 9-1. Further Guidance is also available in ICAO Doc9137 Part 1, Chapter 2. (*ref. OTAR 140.27*).

3. Personnel

Annex 14 requires that all rescue and fire fighting personnel shall be properly trained and competent to perform their duties in an efficient manner (*ref. Annex 14 Volume 1, Chapter 9*).

Note: Guidance to assist the appropriate authority in providing proper training is given in Attachment A, Section 17, and the Airport Services Manual (Doc 9137), Part 1.

4. Resourcing (Staffing)

OTAR Part 140 requires that during flight operations, sufficient trained personnel shall be detailed and be readily available to ride the rescue and fire fighting vehicles and to operate the equipment at maximum capacity. (*ref. ICAO Annex 14 Volume 1, 9.2.42*).

The determination of the minimum staffing required for the category of operation (see section 2) is a fundamental requirement to ensure the RFFS is capable of meeting and discharging its responsibilities both within the initial response and as determined in the emergency plan.

Experience has shown that there is a real risk of an RFFS being over committed above the capacity of its resources within emergency plans. Over commitment imposes a risk that valuable resources may be diverted from the vital initial response to secondary or subsidiary tasks.

Depending on organisation and resourcing, examples of over commitment could include (examples only):

- Accident site traffic management;
- Setting up triage centres;
- Marking out hazard zone boundaries

These tasks do not form part of the critical initial response.

This OTAC, provides advice that helps RFFS providers define their manning requirements and consequent training needs (OTAC 140-7 provides guidance regarding training).

5. Task and Resource Analysis

A task and resource analysis (TRA) will assist aerodrome managers and RFFS providers determine the tasks required of the RFFS personnel according to role(s). A TRA should primarily consist of an analysis of the RFFS response to realistic worst-case aircraft accident scenarios.

A TRA seeks to identify the minimum number of personnel required to undertake identified tasks in real-time before supporting external services are able to effectively assist the airport RFFS.

The objective of a TRA is to have available sufficient staff at all responsibility levels to ensure that:

- (1) The RFFS is capable of achieving the Principal Objectives.
- (2) All vehicles and equipment can be operated effectively and safely.
- (3) Continuous agent application at the appropriate rate(s) can be fully maintained.
- (4) Sufficient supervisory grades can focus on the 'hot zone'; provide survivable conditions for occupants and to initiate the rescue phase of the response.
- (5) The RFFS elements of the aerodrome emergency plan can be effectively achieved.
- (6) Any limitations of the response can be identified.

Following completion of a TRA an RFFS provider will be able to utilise the results to identify training needs. The analysis should remain live and be reviewed appropriately.

In all cases personnel conducting a TRA must take account of health and safety, and fatigue issues as well as the regulatory requirements.

Appendix A provides guidance on a TRA framework that may be helpful.

Appendix A – Task and Resource Analysis Guidance

1. General Information

(a) A Task and Resource Analysis consists of the following:

- (1) A scenario for analysis.
- (2) Identification of the tasks that need to be carried out for that scenario.
- (3) A time line, identifying when individual tasks are to be carried out.
- (4) The number of persons required to carry out individual tasks (due account should be taken of fatigue, health and safety issues etc.).
- (5) All the tasks identified within the scenario.

This process should be undertaken for a number of different scenarios.

It may be useful to run the process as a tabletop exercise, involving a number of disciplines.

(b) The scenarios and analysis should take into consideration the following elements including, for example:

- Aircraft types using the aerodrome;
- The RFFS vehicle(s); and
- The use of self contained breathing apparatus (SCBA);
- Hand lines;
- ladders; and
- Other rescue and fire-fighting equipment¹ provided at the aerodrome associated with aircraft RFFS operations.

(c) The minimum requirements should be established including: minimum number of RFFS vehicles and equipment required for the delivery of the extinguishing agents at the required discharge rate for the specified ICAO RFFS category of the aerodrome. (*ref. OTAC 140-5. ICAO Annex 14 Volume 1, Table 9-2 and 9.2.41*).

(d) One of the most important elements of a TRA is to identify and assess the impact of any critical tasks or pinch points identified by the analysis. The nature of the analysis will differ depending on whether it is an assessment of the existing RFFS deployment at the aerodrome or planning for future requirements.

(e) The assessment should examine the workload and identify the effectiveness of the staffing level. Where shortfall(s) or pinch point(s) are found the analysis should identify the additional staffing or equipment required to eliminate them.

¹ This should extend to specialist equipment such as, fast rescue craft, hovercraft, water carrier, hose layer, extending boom technology

- (f) The following items will assist in determining the basic contents of an analysis:
- Human factors;
 - Description of aerodrome(s) including the number of runways;
 - Promulgated RFFS Categories (Aeronautical Information Publication);
 - Response Time Criteria (Area, times and number of Fire Stations);
 - Current and future types of aircraft movements;
 - Operational hours;
 - Current RFFS structure and establishment;
 - Current level of personnel;
 - Level of supervision for each operational crew;
 - RFFS qualifications/competence (training programme and facilities);
 - Extraneous duties (to include domestic and first aid response);
 - Communications and RFFS alerting system including extraneous duties;
 - Appliances and extinguishing agents available;
 - Aerodrome terrain (in the response area);
 - Specialist equipment – fast rescue craft, hovercraft, water carrier, hose layer, extending boom technology;
 - First aid – role responsibility;
 - Medical facilities – role responsibility;
 - Pre-determined attendance: local authority services – Police, Fire and Ambulance etc.;
 - Appraisal of existing RFFS provision
 - Future requirements. Aerodrome development and expansion
 - Enclosures could include: Aerodrome maps, event trees to explain tasks and functions conducted by the RFFS etc.
 - Aerodrome emergency plan and procedures

Note: The above list is not exhaustive and should only act as a guide.

2. Task and Resource Analysis Team

- (a) It is important to identify a facilitator who will manage the TRA exercise. In the planning stage, the role of the facilitator is to seek agreement that the worst-case scenario is credible and an adequate test of the RFFS response.
- (b) To carry out the TRA a team of experienced fire service personnel to evaluate the scenario needs to be established. They need to have knowledge of the aerodrome and the locations in which an aircraft accident is likely to occur. The team should include all levels of the RFFS organisation.
- (c) For some scenarios, it may be useful to include one or two non-RFFS personnel in the exercise (possibly experienced operational or ATC staff) to check and challenge the validity of any assumptions that may arise during the TRA.

3. Task and Resource Analysis

- (a) A Task and Resource Analysis may be structured in three phases:
- **Phase 1** – Aims and Objectives
 - **Phase 2** – Scenario development
 - **Phase 3** – Task and Resource Analysis

(b) Guidance on the content of each Phase, including examples, is provided below. Clearly, each aerodrome will need to establish and design its TRA to suit its particular environment and operation. The following bullets are not exhaustive, nor are they a rigid framework. However, they provide an outline of the type of content that may be expected in a TRA.

(c) **Phase 1 – Aims and Objectives**

The aims and objectives of the RFFS must clearly identify the required tasks that personnel are expected to carry out.

(1) **Aims**

To maintain a dedicated RFFS of qualified and competent fire and rescue personnel equipped with vehicles and specialist equipment to make an immediate response to an aircraft incident/accident on or in the immediate vicinity of the aerodrome within the specified response time criteria.

To identify any pinch points within the current workload and proposed workload. For small RFFS units, identified pinch points may have to be covered by alternative resources.

(2) **Tasks Objectives**

- Meet the required response time
- Extinguish an external fire
- Protect escape slides/ exit routes
- Assist in the self-evacuation of the aircraft
- Create a survivable environment
- Rescue trapped personnel
- Maintain post-fire security/control
- Preserve evidence

Notes: The above list is not exhaustive and all relevant tasks must be identified before moving to Phase 2.

Each task/mission may include numerous activities/actions.

(d) **Phase 2 – Scenario(s) development**

(1) Identify a selection of representative realistic and feasible aircraft accidents/incidents that may occur at the aerodrome. It is also important to consider aircraft at the high end of the RFFS category to enable analysis of the upper limits of the RFFS response. This can be achieved by:

- analysis of accidents around the world;
- consideration of the accident/incident history at the aerodrome;
- brainstorming ideas using a representative team from the aerodrome;
- statistical analysis of previous accidents at aerodromes.

Note: All accidents should involve fire to represent a feasible worst-case scenario that would require an RFFS response.

Example scenarios could include:

- Aircraft engine failure on take-off with a fire (aborted take-off);
- Aircraft aborts and overruns into the Runway End Safety Area (RESA) with fire on take-off (including aircraft beyond aerodrome boundary (within response area) into water or difficult terrain);
- Aircraft into aircraft with fire (collision);
- Aircraft into structure (terminal buildings) with a fire;

- Aircraft leaves the runway on landing into the runway strip (full emergency evacuation);
 - Internal aircraft fire (e.g. cabin fire, baggage hold, cargo hold, avionics bay(s)).
- (2) In order that the feasible accident scenario can be modelled/simulated, a major factor is to consider the probable location for the most realistic accident type that may occur, taking into account the aerodrome's particular location, environment, runway and taxiway configuration, etc., which may present specific risks.
- (3) The team may have identified that the following elements contribute to a worst-case location:
- Response time;
 - Route to the accident site (on or off paved surfaces);
 - Terrain;
 - Crossing procedures for active runway(s);
 - Communications;
 - Supplementary water supplies;
 - Adverse weather conditions – e.g. Low Visibility Procedures, snow/ice;
 - Daylight and darkness;
- (4) From the above analysis a location or a number of locations may be identified, in agreement with the aerodrome operator, the TRA facilitator and, if necessary, the regulator.

(e) Phase 3 – Task and Resource Analysis

- (a) Led by the TRA facilitator, the TRA team evaluates the accident scenario(s) developed in **Phase 2** in a series of tabletop exercises/simulations.
- (b) The TRA objective should be to identify in real-time, and in sequential order the minimum number of RFF personnel required at any one time to achieve the following:
- | | |
|---|--|
| • Receive the message and dispatch the RFFS (the dispatcher may have to respond as part of the minimum riding strength) | • Deploy equipment accordingly |
| • Respond utilising communications; taking appropriate route and achieving the defined response time | • Instigate Incident Command Structure |
| • Position appliances/vehicles in optimum positions and operate RFF appliances effectively | • Assist in passenger and crew self-evacuation |
| • Use extinguishing agents and equipment accordingly | • Access aircraft to carry out specific tasks if required, e.g. fire fighting, rescue etc. |
| | • Support and sustain the deployment of fire-fighting and rescue equipment |
| | • Support and sustain the delivery of supplementary water supplies |
| | • Need to replenish foam supplies |
- (c) The results of the analysis should be recorded in a table, spreadsheet or other suitable format. An example is given below.

(d) Stated objectives for the RFFS

- Initiate aerodrome emergency plan
- Deploy within the required response time
- Select appropriate route and communications
- Position appliances in optimum positions and operate effectively
- Initiate incident command system
- Suppress/extinguish any fire
- Assist with self-evacuation of the aircraft
- If appropriate, extinguish any internal fire
- If required, ventilate aircraft to create survivable conditions
- Maintain post-fire control of the critical area
- Preserve evidence

(e) The TRA may be set out in a table that times each task and identified the resource required for each step of the response. Table 1 is an abbreviated example to demonstrate the principles.

Table 1 Task and Resource Analysis

TIME	TASKS	RESOURCES	COMMENTS
00:00	Call received from ATC as aircraft accident runway 06 RESA. Gulfstream 5. RFF personnel mobilised by dispatcher	Sup	Achieved
00:15	Call made to operate the aerodrome emergency plan	ATC/Dispatcher/Operations Unit	Achieved. ATC
00:30	Personnel donning in appropriate respiratory protective equipment (RPE)	Major Fire Tenders A, B Supervisor A1 Supervisor B1 Fire-fighter A3 Fire-fighter B3	Achieved All staff, except drivers A2, B2 donning RPE
00:40	...ed and appliances mobile enroute to 06 R...	MFTs A, B	Achieved. Supervisors and Drivers
00:50	Supervisor(s) utilise communications (RTF); discreet frequency, ATC, Local Authority, etc.	Supervisor(s) MFTs A, B	Achieved. Note: Aircraft may have already initiated evacuation (air crew)
04:15	Following self-evacuation provide assistance mustering passengers/crew to place of safety	A1, A2, B3	Achieved. Assistance provided by aircraft crew

TIME	TASKS	RESOURCES	COMMENTS
05:05	External emergency services are brought forward to the accident site with additional equipment to support removal of the remaining survivors and to transport the survivors to the appropriate safety zone.	A1 and external commanders: <ul style="list-style-type: none"> • Police • Fire • Ambulance • Medical • Others 	Achieved
Additional Points			
<p>Note 1: At this point the aerodrome emergency plan is fully instigated and the supporting services can relieve B3, provide supplementary water if required from the nearest hydrant or emergency water supply, assist in the deployment of specialist fire ground equipment and if required support the teams that are engaged in removing the survivors to a place of safety.</p>			
<p>Note 2: The facilitator may decide to terminate the analysis at this point or continue with the exercise to evaluate specific elements of the emergency plan, e.g. preservation of evidence.</p>			

Notes: It can be seen that four fire-fighters and two supervisors including the officer in charge are required to achieve the above, supported by two Major Foam Tenders.

The timings can be further verified by the use of practical exercises and individual analysis to establish if they are realistic and achievable for each task and function.

Each of the above tasks can be sub-divided into individual functions associated with the specific task performed at a particular time.

Questions that may be asked as part of the TRA:

- How long does it take to don protective clothing?
- How long does it take to don self-contained breathing apparatus?
- How long does it take to slip and pitch a ladder?
- How long does it take to open an aircraft door from the head of a ladder (if required)?
- How long does it take to deploy one, two, three, etc., lengths of delivery hose?
- How long does it take to carry any item of rescue equipment over a specified distance and get to work?

4. Conclusion

(a) A Task Resource Analysis can be as detailed as necessary. The aim is to itemise the knowledge and practical skills (doing) involved in carrying out the task effectively and to the correct standard. Having gathered the appropriate data and agreed the outcome, the TRA should enable an RFFS to confirm and subsequently provide the correct level of vehicles, equipment and personnel. It would also enable the RFFS to develop a training specification and a learning programme can then be designed around role and task. When planning and carrying out a TRA ask the following questions:

- | | |
|--------------------|---------------------|
| • What is done? | • Where is it done? |
| • Why is it done? | • How is it done? |
| • When is it done? | • Who does it? |

- (b) The overall objective is to be satisfied that the RFFS is organised, equipped, staffed, trained and operated to ensure the most rapid deployment of facilities to maximum effect in the event of an accident.
- (c) The above process can also be used to identify equipment shortages and training needs for personnel required to deal with identified tasks.