CIVIL AVIATION AUTHORITY
OF NEW ZEALAND
Te Mana Rererangi Tūmatanui o Aotearoa

Advisory Circular
AC139-4

Revision 7

Aerodrome Rescue and Firefighting

16 September 2024

General

Civil Aviation Authority (CAA) Advisory Circulars (ACs) contain information about standards, practices, and procedures that the Director has found to be an **acceptable means of compliance** with the associated rule.

Consideration will be given to other methods of compliance that may be presented to the Director. When new standards, practices, or procedures are found to be acceptable they will be added to the appropriate AC.

Purpose

This AC describes an acceptable means of compliance with aerodrome rescue and firefighting requirements under Civil Aviation Rule Part 139 *Aerodromes—Certification, Operation and Use*.

Related Rules

This AC relates specifically to rules 139.57*, Aerodrome emergency plan,* 139.59, *Rescue and firefighting – category determination*, 139.61, *Rescue and firefighting extinguishing agents*, 139.63, *Rescue and firefighting vehicles*, 139.65, *Rescue and firefighting personnel requirements*, 139.67, *Rescue and firefighting response capacity*, and 139.67A, *Rescue and firefighting communication and alerting system*.

Change Notice

Revision 7:

- Adds new sections *4.7, Simulated and synthetic training,* and *7.4, Rescue and firefighting – operational requirements*
- Updates some medical requirements
- Updates some entry training standards
- Adds Tables 1 and 2 to section 6.5 *Reserve supply*
- Deletes the *Definitions* section

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- Updates old Table 1, now Table 3, *Typical aeroplane types and the respective category*
- Updates style and format to align with current AC standards, and
- Adds a Version History.

Version History

History log:

Revision no	Effective date	Summary of changes
AC139-04, Rev 0	21 Dec 1992	Initial issue
AC139-04, Rev 1	13 Sept 1999	Superseded AC139-04, Rev 0, that was published in hard copy on grey paper. No technical change to this AC.
AC139-04, Rev 2	16 Dec 2003	Encompassed the recommendations of the Rescue and Firefighting CIRAG TSG, the addition of information on aeroplane classification by aerodrome category, and editorial and formatting updates.
AC139-4, Rev 3	27 Apr 2007	Re-numbered from AC 139-04 to AC 139-4 as part of a project to standardise the numbering of all ACs
AC139-4, Rev 4	26 Sept 2014	Made significant changes as follows: • re-numbered headings and subheadings as part of a systematic update to standardise the formatting of all ACs • incorporated amendments to reflect industry best practice, and • amended headings and sub-headings as necessary.
AC139-4, Rev 5	7 Feb 2016	Made significant changes as follows: • updated to align with Amendment 12 to Part 139 • introduced an annual live hot fire training exercise • incorporated fitness and competency checks of participants prior to commencement of the annual live hot fire training exercise, and • added option to review fitness levels during each operational shift.
AC139-4, Rev 6	19 Aug 2016	Added an example of a rescue and firefighting service (RFS) 'response model'. Clarified required actions when 'initiating the rescue'.

AC139-4, Rev 7	16 Sept 2024	Adds new sections *4.7, Simulated and synthetic training*, and *7.4, Rescue and firefighting – operational requirements.* Updates some medical requirements. Updates some entry training standards. Adds Tables 1 and 2 to section 6.5 *Reserve supply.* Deletes the *Definitions* section. Updates old Table 1, now Table 3, *Typical aeroplane types and the respective category.* Updates style and format to align with current AC standards. Adds a Version History. ***Note:*** *Because of the new material, the numbering of some sections has changed.*

Table of Contents

1. Introduction

1.1 The principal objective

The principal objective of a rescue and firefighting service (RFS) is to save lives in the event of an aircraft accident or incident occurring at, or in the immediate vicinity of, an aerodrome. The role of the RFS is to:

- create and maintain survivable conditions
- provide egress routes for occupants, and
- 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 intended primarily for rescue and firefighting purposes.

The most important factors in effective rescue in an aircraft accident are the:

- training received
- effectiveness of the equipment, and
- speed with which RFS personnel and equipment can be deployed.

1.2 Initiating the rescue

This subsection contains an example of an RFS response model which splits the actions into three main parts (phases)[1]:

- **Phase 1** – Aerodrome RFS create and maintain survivable conditions, and facilitate rescue (aircraft occupants self-evacuate or receive limited assistance with evacuation).
- **Phase 2** – Local fire authority(s) and support services respond to and assemble at the aerodrome.
- **Phase 3** – Rescue of occupants who are unable to make their escape without direct aid.

[1] This example is relevant to an aerodrome which has determined that on-board rescue efforts will not be undertaken until external fire services are present. Some aerodromes may have the capability to start Phase 3 prior to, or in parallel with, Phase 2.

When initiating the rescue, an RFS team should have a reasonable understanding of the:

a) rescue capabilities of aerodrome RFS

b) rescue capability with back-up, and

c) reliance on external provision.

These capabilities should be set out in the aerodrome emergency plan (AEP) as per rule 139.57, *Aerodrome emergency plan*, and remain acceptable to the Director.

In addition, planned actions as part of initiating the rescue should be considered in the context of the particular aerodrome's:

- operation
- types of aircraft
- location and terrain
- pre-determined attendance of local emergency services, and
- time of response by local emergency services, etc.

Initiating the rescue should at least involve ensuring that the local emergency services have been alerted.

In some situations initiating the rescue could be opening aircraft doors/exits and positioning ladders/steps in readiness for support services to begin the rescue phase.

In other situations the RFS may need to make plans to carry out rescues themselves with limited aid from support services, as may be the case in remote locations. A task and resource analysis (TRA) can help clarify the aerodrome rescue capability and the role of external services.

Aerodrome operators should collaborate with their local fire and rescue authority(s) and support services to identify the steps required to meet Phase 3 of the response model. Once agreed, this should be reflected in the responsibilities of each agency concerned in the AEP. Mutual aid emergency agreements between all emergency and support services may be involved.

2. Application

2.1 Aerodromes serving international or domestic routes

This AC contains guidance on Part 139 requirements for RFS. For simplicity this AC refers to:

- aerodromes to which rule 139.5(aa)(1) applies as 'aerodromes serving international routes', and
- aerodromes to which rule 139.5(aa)(2) applies as 'aerodromes serving domestic routes'.

Rule 139.59 should be read in its entirety to determine what type of RFS is appropriate for different types of certificated aerodromes.

2.2 Rescue and firefighting service (RFS) guidance material

This AC contains guidance for compliance with Part 139 requirements for an RFS and addresses elements that need further expansion and guidance.

There are several publications available which address the elements of RFS in detail, including:

- ICAO Annex 19 *Safety Management*
- ICAO Doc 9683 *Human Factors Training Manual* *Human Factors Training Manual (Doc 9683) | ICAO Store*
- CAP 1150 *Rescue and Fire Fighting Service Task and Resource Analysis*
- ICAO Annex 14 *Aerodromes*
- ICAO Doc 9137-AN/898 *Airport Services Manual Part 1 Rescue and Fire Fighting*
- National Fire Protection Association (NFPA) Codes – e.g. 402, 403, 1003 & 1500
- Guidance on delivering an effective Airport Rescue and Fire Fighting Service (RFFS) (caa.co.uk)
- CAP 699: *Framework for the competence of rescue and fire fighting service (RFFS) personnel* | Civil Aviation Authority (caa.co.uk)

Information on the ICAO Documentation is obtainable from the ICAO website at https://store.icao.int/

Information on the NFPA Codes is available from the NFPA website at http://catalog.nfpa.org/

3. Personnel

3.1 Entry training standards

A recruitment policy should ensure that all RFS go through a detailed and comprehensive assessment process to ensure that the right candidate/s is/are selected for the position.

If rescue and fire personnel are recruited with no previous RFS experience, they should take an initial fire fighter's course and be deemed competent on acquisition of skills. Competency assessments in both practical and technical aspects should be conducted within this course.

3.2 Personnel medical fitness

Personnel selected for rescue and firefighting duties should be free from any physical or mental condition or disability which might limit their performance or which might be aggravated by a sudden level of exertion. Medical fitness should be assessed before employment and regularly throughout their career to ensure health conditions are identified and managed, enabling firefighters to remain capable of conducting prescribed duties when on watch.

If satisfactory visual function for the rescue and firefighting duties is achieved only with the use of correction, the spectacles, inserts or contact lenses must provide optimal visual function, be well-tolerated, and suitable for rescue and firefighting duties, including the wearing of breathing apparatus. Spectacles should have some form of retaining mechanism to ensure they remain in place.

***Note**: In earlier revisions of this AC, the advice on medical and fitness standards was more directive, to provide specific guidance for developing RFS units. Now that many RFS units have*

matured enough to have their own medical and fitness standards, it is more appropriate for detailed fitness standards to be part of RFS employees' conditions of employment and for any medical conditions to be managed by RFS units. Since many medical conditions that once would have disqualified potential RFS staff are now common and can be managed, CAA's advice is that medical and fitness standards of existing RFS staff and RFS applicants should be tailored by the employer to enable the RFS demands to be effectively managed based on the level of equipment and response provided specific to each aerodrome's TRA.

Continued physical fitness of personnel

A condition of employment for RFS crew members is maintaining the required fitness levels.

The physical fitness assessments should be conducted for pre-employment entry as RFS personnel as well as ongoing physical fitness assessments for existing staff to ensure that rescue and firefighting personnel are maintaining their level of physical fitness.

RFS managers should develop various types of tests to ensure that the aerobic endurance fitness, anaerobic fitness and flexibility is tested to determine if RFS personnel have the required physical fitness level for the job. The physical fitness assessment should also be conducted at least once a year.

3.3 Continued rescue and firefighting service (RFS) personnel development

An environment conducive to learning and development should be provided, enabling personnel to fulfil their potential.

All personnel in the aerodrome RFS, regardless of RFS experience on or off aerodromes, should participate in an ongoing structured learning program (SLP). Competency assessments in both practical and technical aspects should be conducted within this program.

All RFS watches, shifts or crews should participate in comprehensive recurrent training appropriate to their roles and tasks to maintain skills necessary to ensure all RFS operations are carried out safely and effectively. In addition to the activities in section 4.2, *Practical training*, RFS personnel wanting to widen their skill base could focus on training centred on:

a) participation in the coordinated incident management system in emergency response activities

b) leading the entry team in an aircraft incident (when resources allow)

c) the initial command and control at hazardous substance emergencies, and

d) practicing of casualty care during rescue and extrication activities.

3.4 RFS organisational structure

The RFS organisational structure should show clear lines of accountability so that it is apparent to all where safety responsibilities lie when responding to an incident or carrying out routine duties.

Each RFS unit should establish a training syllabus, with competencies and experience requirements for each rank from recruit fire fighter to supervisory and management level.

RFS personnel arriving first at the scene should be able to display the required competencies to create and maintain survivable conditions and act as the first on scene point of contact.

3.5 Personal protective equipment (PPE)

In accordance with rule 139.65(1), all personnel operating at an aircraft fire need to be provided with protective clothing (personal protective equipment or PPE) designed to provide protection from radiated heat and occasional flame contact, and injury from abrasive contact.

On responding to a fire call the emphasis is on response time to the scene. Each aerodrome operator should assess the need to don PPE before climbing aboard the fire appliance or enroute to the scene. The donning of full PPE should be completed before entering the hazard zone.

Each rescue firefighter should be provided with at least:

a) protective helmet complete with visor

b) structural firefighting garments

c) firefighting gloves

d) firefighting boots, and

e) firefighter's protective hood.

Self-contained breathing apparatus equipment should be provided for personnel who are required to enter a smoke-filled cabin or operate in the presence of smoke or toxic gases.

Respiratory protection should be provided for personnel who may be required to work in areas where breathing may be hazardous due to airborne particles (e.g. composite materials).

Each aerodrome should also assess the need for other items such as entry protective suits or chemical suits.

3.6 Personnel levels

RFS managers should ensure timetables are well-planned to make sure that the aerodrome's RFS has available sufficient trained staff at all responsibility levels to ensure that:

a) the RFS is capable of achieving the principal objective

b) all vehicles and equipment can be operated effectively and safely

c) continuous agent application at the appropriate rate(s) can be fully maintained (as determined in Part 139 for the applicable category)

d) sufficient supervisory grades can implement a coordinated incident management system, and

e) the RFS elements of the AEP can be effectively achieved.

The RFS vehicles should be staffed to ensure discharged rates of principal and complementary extinguishing agents applicable to the aerodrome category in Table 2 in Part 139 are met. Extinguishing agents should be applied effectively and safely at an aircraft accident or incident.

Any control room or communications facility operated by, and serving, the RFS can continue to provide this service until alternative arrangements to undertake this function are initiated following the procedures in the AEP.

In determining the minimum number of RFS personnel and supervisory levels required, a task and resource analysis (TRA) should be completed, and the level of staffing and supervisory control needed documented or referenced in the aerodrome exposition.

3.7 Task and resource analysis (TRA)

A TRA should be completed to determine the minimum number of competent personnel required to deliver an effective airport RFS, at different times of the day and night.

When carrying out a TRA, RFS managers need to understand the complexity of the various roles an individual is required to do to achieve the principal objective of the RFS.

The task analysis should observe human factor principles to obtain optimum response by all existing agencies participating in emergency operations. The principles should include the effect on human performance of workload, capabilities, functions, decision aids, environmental constraints, team versus individual performance and training effectiveness.

When assigning operational duties to RFS personnel on the way to the incident, RFS managers need to stress the need to:

- approach the scene with extreme caution and watch for evacuating occupants, wreckage debris, fuel ponding, and other hazards, and
- avoid driving through any smoke which obscures vision and view of potential evacuees, and
- avoid driving over any aircraft wreckage, and
- ensure the monitor-operator is able to:
    - assume the operating position while the vehicle is in motion, and
    - operate the monitor through at least 60 degrees either side of the central axis of the vehicle.

The following items will assist in determining the basic contents of a TRA:

a) Description of the aerodrome(s) including the number of runways.

b) Promulgated RFS categories (Aeronautical Information Publication (AIP)).

c) Response time criteria (area, times and number of fire stations).

d) Current and future types of aircraft movements.

e) Operational hours.

f) Current RFS structure and establishment.

g) Current level of personnel.

h) Level of supervision for each operational crew.

i) RFS qualifications/competence (training programme and facilities).

j) Extraneous duties (to include domestic and first aid response).

k) Communications and RFS alerting system including extraneous duties.

l) Appliances and extinguishing agents available.

m) Specialist equipment: fast rescue craft, hovercraft, water carrier, hose layer, extending boom technology and high reach extendable turret technology.

n) Initial emergency medical aid: roles and responsibilities.

o) Medical facilities: roles and responsibilities.

p) Pre-determined attendance- local council authority services, police, fire and ambulances, etc.

q) Incident task analysis- feasible worst-case scenarios, workload assessment, human performance/factors including:

i. mobilisation

ii. deployment to scene

iii. scene management

iv. firefighting

v. suppression and extinguishment

vi. application of complementary agents

vii. post fire security/control

viii. personnel protective equipment

ix. rescue teams

x. aircraft evacuation, and

xi. extinguishing agent replenishment.

Note: *the aim is to identify any pinch points within the current workload and proposed workload.*

r) Appraisal of existing RFS provision.

s) Future requirements - aerodrome development and expansion.

t) Enclosures could include airport maps, event trees to explain tasks and functions conducted by the RFS.

u) AEP and procedures.

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

At aerodromes serving international routes, a fully trained senior rescue fire officer should arrive at the scene of the incident no later than the first responding RFS vehicle. This will allow an early appraisal of conditions to assess and direct firefighting operations.

At aerodromes serving domestic routes only, a fully trained senior fire officer or a suitably trained fire officer should arrive at the scene of the incident no later than the first responding

RFS vehicle. This will allow an early appraisal of conditions to assess and direct firefighting operations.

4 Training

4.1 General

Training of RFS personnel falls into two broad categories:

a) **Initial training** in the use and maintenance of equipment, and operational tactics training, which covers the development of personnel and equipment to accomplish control of fire to permit rescue operations to proceed.

b) **Structured learning program (SLP)** which should be commenced on completion of the initial training course. All RFS personnel, regardless of previous applicable experience, on or off the aerodrome should participate in an SLP. The core content of the program can be organised into nine topics:

   i. fire dynamics, toxicity and basic first aid

   ii. extinguishing agents and firefighting techniques

   iii. handling of vehicles, vessels and equipment

   iv. airfield layout and aircraft construction

   v. operational tactics and manoeuvres

   vi. emergency communication

   vii. leadership performance

   viii. physical fitness, and

   ix. auxiliary modules (e.g. rescue in difficult terrain, response to biological/chemical threats etc).

Training also needs to address the key paradox of an RFS role: trained fire fighters who spend most of their professional life not fighting fires, but who need to be fully prepared to do so at very short notice.

RFS personnel at aerodromes are not often going to be called on to face a serious situation involving lifesaving at a major aircraft fire. They are likely to experience a few incidents and a larger number of standbys to cover movements of aircraft in circumstances where an accident may reasonably be anticipated, but will seldom be called upon to put their knowledge and experience to the supreme test.

This makes it harder for RFS personnel to maintain their operational readiness for major fires, and increases the risk that the RFS unit will not be prepared. To mitigate this risk of unpreparedness, maintaining fitness and readiness, e.g. by running drills and desktop exercises, needs to be central to RFS training.

The training programme should be designed to ensure that personnel are at all times prepared and their equipment is effective. Anything less than full preparedness increases the risk to both RFS personnel and those they may need to assist.

In addition, the training program should also be designed to build cohesiveness between key functional units of an RFS team to deliver a consistent level of proficiency during emergencies. To ensure a high standard of operational readiness, RFS managers should develop a competency audit framework, to assess the effectiveness of RFS training at both individual and team levels.

All initial training courses and SLPs should include an assessment of competence with oral technical, practical and written technical tests. The minimum competence standard for students should be established for each course.

Each RFS unit should have access to a training ground or training area on their aerodrome at a location that does not compromise their response time.

4.2 Practical training

Practical training for live fire exercises and for the use of breathing apparatus in heat and or smoke can be delivered on station or at off site facility.

The area identified for practical training should be able to accommodate activities such as:

a) realistic fire drills commensurate with the types of aircraft in use at the aerodrome

b) live fires associated with fuel discharge under very high pressure

c) drills to maintain operational performance with fire service equipment

d) training to include human performance and team coordination, and

e) breathing apparatus training in heat and or smoke.

f) All RFS personnel at each RFS unit should be periodically assessed to determine their continued competencies in the practical activities identified above.

4.3 Theoretical training

The area identified for theoretical training should be conducive to learning and able to accommodate lectures, seminars and self-study.

Each RFS unit should provide training aids to support the delivery of the nine topics in section 4.1(b) above.

The training aids used for the study and instruction of the nine topics of the SLP can be in a variety of formats, such as:

a) power point presentations

b) visual aids

c) fire service manuals adopted or purchased by the aerodrome operator

d) interactive computer simulation and ‘synthetic’ training, discussed in more detail below, and

e) site-specific information manuals detailing situations unique to each operational environment.

All RFS personnel at each RFS unit should be periodically assessed to determine their continued competency in each of the topics that make up the SLP.

4.4 Delivery of training

Each RFS unit should identify a person that is responsible for the coordination and supervision of RFS training, and the maintenance of all training records.

Personnel used for the delivery of training should be suitably trained and experienced in the RFS role or specialists in a particular aspect of the training syllabus.

The design of a course for RFS personnel at an aerodrome serving domestic routes should address the fact that the RFS personnel are not supported by a large organisation. Because of this, personnel on the first arriving fire appliance should be trained accordingly. The training of such a person should consider this self-sufficiency with emphasis on proficiency at the aerodrome and on the equipment provided.

Each RFS unit should establish a training syllabus, and competency and experience requirements for each supervisory and management level.

Practical and theoretical forms of training are a continuing commitment and should be resourced accordingly.

4.5 Annual live (hot) fire training

Each member of an airport RFS unit should participate in at least one live 'hot' fire training exercise per 12-month period.

The objective is for airport RFS personnel to observe fire behaviour and demonstrate the practical tactics and techniques that are used to control and extinguish a live 'hot' aircraft fire in a range of aircraft fire scenarios including:

a) live external fire on a static training rig simulating an aircraft fuselage

b) live internal fire on a static training rig simulating an aircraft fuselage

c) live fire of an underwing engine on a static training rig simulating an underwing engine fire

d) live undercarriage fire or overheating

e) live fuel pond fire, and/ or

f) live fire training to include human performance and team coordination.

Exercises should begin with all participants having ensured that they are fit and well enough to take part. If deemed necessary, the fitness level of any participant may be ascertained by an on-site fitness test before taking part. If a fitness test is required, suitable recovery time should be allowed before the participant takes part in the live hot fire training exercise.

The operational competence of each firefighter is key to the safe conclusion of the live hot fire training exercise and as such, individual operational competence should be ascertained prior to participation.

4.6 Simulated and synthetic training

Simulated and synthetic training should not replace the need for live hot fire training as well as classroom training, formal study, learning from more experienced colleagues or practical on-the-job training.

In addition to simulated training, and other types of virtual reality experiences, 'synthetic' training, that is, a mixture of virtual reality (VR), augmented reality (AR), Mixed Reality (MR) and Artificial Intelligence (AI) interacting with a live environment, can significantly enhance training of RFS staff.

Despite the potential of these training tools and methods, however, they do not provide a full training experience alone: they are an enhancement to more traditional methods, and should be treated as such. They do not replace the need for classroom training, formal study, learning from more experienced colleagues or practical on-the-job training.

5 Firefighting and Rescue Equipment

5.1 Firefighting equipment

Each RFS vehicle required under Part 139 should be equipped with at least the following firefighting equipment:

a) fire delivery hose

b) firefighting branches

c) standpipe, key and bar, and

d) vehicle primary monitor.

5.2 Rescue equipment

Aerodrome operators should provide rescue equipment on vehicles in line with the level of aircraft operations expected:

a) portable lighting equipment providing flood and spot lighting

b) power operated cutting tools that can be operated from a portable power source

c) hand tools including wire and bolt cutters, screwdrivers of appropriate sizes and designs, crowbars, hammers, axes, metal and wood saws

d) forcing equipment, usually hydraulically operated, for bending or lifting operations

e) sufficient breathing apparatus sets

f) medical first aid equipment, ideally pre-packed wound dressings in protective containers, scissors, adhesive dressings and burn dressings, stretchers or spine boards and blankets

g) communications equipment in the form of radiotelephone units and a portable loud hailer

h) miscellaneous items including shovels, grab hooks, lines (cordage), harness cutting knives, and ladders of appropriate type and length, related to the likely aircraft types involved

i) a powered fan unit capable of extracting contaminated air from aircraft, and

j) battery-operated equipment.

The quantity and type of rescue equipment held on site by the aerodrome operator should be specific to aircraft types regularly using the aerodrome and be readily available to arrive at the scene of the incident without delay.

Items (a) to (j) inclusive should be carried in the rescue and firefighting vehicles to be available at the accident site within the required response times under Part 139.

5.3 Mutual aid emergency agreements

When developing an AEP and the water rescue service at aerodromes, a range of public and private rescue services may be available to help in an emergency. Public services include military search and rescue units, harbour police, or fire departments. Private rescue services include: rescue squads, power and communication companies, offshore oil field operators, or shipping and waterway operators. A signal system for alerting private or public services when there is an emergency should be prearranged.

All on-airport and off-airport services should consider the necessary level of aid from nearby public and private services. Therefore, it is recommended that aerodromes and nearby public and private service develop mutual aid emergency agreements which:

a) specify initial notification and response assignments

b) set out the responsibilities of each party concerned, and

c) are prearranged and duly authorised.

The airport authority may have to act as coordinating agency if more complicated jurisdictional or multi-agency agreements are necessary.

5.4 Operations in a difficult environment

For aerodromes serving international routes, the plan should include the activation of the Emergency Operations Centre (EOC) for coordination with appropriate specialist rescue services agreed in the pre-determined response plan.

At those aerodromes located close to water and/or swampy areas, or difficult terrain, the AEP should include the establishment, testing and assessment at regular intervals of a predetermined response for the specialist rescue services.

An assessment of the approach and departure areas within 1,000m of the runway threshold should be carried out to determine the options available for intervention. Part 1, Chapter 13 of the ICAO Doc 9137, *Airport Services Manual,* contains guidance on assessing approach and departure areas within 1,000m of runway thresholds.

For aerodromes serving domestic routes only, the AEP should have specific procedures and specialist agencies involved when the aerodrome is located near large bodies of water, swamps or where the approach/departure areas are over water. This could include the use of coast guard, divers, boats/hovercraft and the local harbourmaster. The appropriate rescue services should be involved in testing of the emergency exercises on a regular basis.

It is important that RFS are aware of the operating environment, notably whether the aerodrome has a control tower or not. At controlled aerodromes, i.e., those with ATC on watch, RFS come under the direction of ATC. At aerodromes without ATC on watch, RFS should broadcast their intentions on the promulgated radio frequency.

When RFS vehicles leave fire stations and enter the manoeuvring area, RFS personnel come under the direction of the control tower when moving across manoeuvring areas. These vehicles should be equipped with two-way radio communications equipment, through which their movements can, at all times, be subject to direction by the control tower. The choice of:

- a direct air traffic control/fire service frequency, monitored in the master watch room, or
- a discrete airport fire service frequency, relaying airfield / air traffic control instructions and fresh information,

will be a matter for the airport authority to determine, based on local operational and technical considerations.

5.5 Communications

The radio equipment on RFS vehicles should accommodate communication between vehicles, on the way to, and in operation at, an aircraft accident. Within individual vehicles there should be a communication system, particularly between drivers and monitor-operators, to optimise the deployment of the vehicles at an accident. The communication facility should be chosen or designed to cope with high noise levels, and this may require the use of noise-cancelling microphones, headsets and loudspeakers, for effective intercommunication.

The RFS vehicles should be provided with communication equipment capable of communicating directly with an aircraft in an emergency using an aeronautical radio frequency. The aeronautical radio frequency permits the RFS and the emergency aircraft, to communicate with each other directly, allowing the RFS crew to issue critical information regarding the exact nature of, and the hazards associated with an emergency, along with recommendations for actions.

6 Extinguishing Agents

6.1 Complementary extinguishing agents

The complementary agent(s) required is/are:

a) carbon dioxide (CO2), or

b) dry chemical powders, or

c) a combination of the agents stated in items (a) and (b).

It is important to ensure compatibility when selecting dry chemical powders for use with foam.

6.2 Halogenated hydrocarbons

In line with the 1987 *Montreal Protocol on Substances that Deplete the Ozone Layer*, the production of halon 1301, 1211 and 2402 has been banned since 1994.

Halons are therefore no longer discussed in this document but may still be found in some aircraft fixed installations.

6.3 Foam concentrates

Any foam concentrate used in RFS vehicles should meet or exceed the ICAO specifications, so as to achieve performance level B or C foam solution when using 3% or 6% foam concentrate (as outlined in Part 1, Chapter 8, Paragraph 8.1.3 of ICAO Doc 9137, *Airport Services Manual*).

There is no direct relationship between this specification and specifications of other organisations such as the International Standards Organisation (ISO) or US defence force military specifications (Mil Spec). If such foam concentrates are used, users need to be able to show that they will produce foam meeting the ICAO performance level B or level C requirements. It is the responsibility of the Part 139 certificate holder to ensure all firefighting foam used meets the latest standards as published by Environmental Protection Authority (EPA) which are available at: https://www.epa.govt.nz/assets/RecordsAPI/Fire-Fighting-Chemicals-Group-Standard-2021-HSR002573.pdf

6.4 Foam characteristics

The amounts of water specified for foam production are calculated on an application rate of 5.5 L/min/m² for foam meeting performance level B or C.

For agent substitution, the following equivalent should be used:

- 1 kg dry chemical powder or 2 kg CO2 = 0.66 L water for production of a foam meeting performance level B.

6.5 Reserve supply

A 200% reserve supply of foam concentrate for the runway category should be maintained on the aerodrome for vehicle replenishment. Where a major delay in getting the reserve resupplied is anticipated, the amount kept in reserve should be increased. The quantity of foam concentrate separately provided on vehicles for foam production should be in proportion to the quantity of water provided and the foam concentrate selected.

If the 200% reserve supply of foam concentrate is temporarily not available on the aerodrome, the runway rescue and firefighting category should only be reduced when the quantity of foam concentrate available falls below 100% of that for the normal category.

The quantity of foam concentrate provided on a vehicle should be sufficient to produce at least two loads of foam solution.

Table 1 - Foam requirements when using ICAO Performance Level B Foam

	(1) Minimum foam carried on Fire Appliance(s) Ltr		(2) 200% Reserve Foam requirement Ltr	
Category	3%	6%	3%	6%
3	72	144	144	288
4	144	288	288	576
5	324	648	648	1296
6	474	948	948	1896
7	726	1452	1452	2904
8	1092	2184	2184	4368
9	1458	2916	2916	5832
10	1938	3876	3876	7752
(1) Minimum foam carried on Fire Appliance(s) + (2)200% Reserve Foam requirement = (3) Total foam required by the rule.				

Table 2 - Foam requirements when using ICAO Performance Level C Foam

	(1) Minimum foam carried on Fire Appliance(s) Ltr		(2) 200% Reserve Foam requirement Ltr	
Category	3%	6%	3%	6%
3	50	100	100	200
4	102	204	204	408
5	234	468	468	936
6	348	696	696	1392
7	528	1056	1056	2112
8	768	1536	1536	3072
9	1026	2052	2052	4104
10	1368	2736	2736	5472
(1) Minimum foam carried on Fire Appliance(s) + (2)200% Reserve Foam requirement = (3) Total foam required by the rule.				

6.6 Water supplies

Supplementary water supplies, for quickly supplying RFS vehicles, should be pre-arranged to ensure additional water supplies with adequate pressure and flow for aerodrome RFS vehicles. This ensures there is enough continuous water being supplied to be most effective in an aircraft accident.

Additional water may be required in as little as five minutes after an accident so RFS teams should fully assess, ahead of any emergency, how well their storage and delivery facilities can achieve this

When assessing this, the following factors should be considered:

a) sizes and types of aircraft using the aerodrome

b) the capacities and discharge rates of aerodrome fire vehicles

c) the provision of strategically located hydrants

d) the provision of strategically located static water supplies

e) availability existing natural water supplies for firefighting purposes

f) vehicle response times

g) historical data on amounts of water used during aircraft accidents

h) the availability of supplementary pumping capacity

i) the provision of additional vehicle-borne supplies

j) the level of support provided by local authority emergency services

k) the pre-determined response of local authority emergency services

l) fixed pumps where these may provide a rapid and less resource-intensive method of replenishment

m) additional water supplies adjacent to airport fire service training areas, and

n) overhead static water supplies.

There are likely to be other factors, depending on the type of operation, staffing levels and terrain.

7 Response Capability

7.1 Frequency of RFS response verification

Aerodrome operators should regularly complete an RFS response time verification exercise. Response time verifications should be held from between every month and every three months.

7.2 Response location

The verification should require a fire vehicle to produce water through the vehicle's monitor at the correct operating pressure, immediately upon arrival at a nominated location.

7.3 Response timing

The response time verification should be initiated using the normal emergency response activation procedures detailed in the AEP. The time required from the activation to the production of water at the nominated location should be recorded.

The response timing verification should be carried out during periods of minimal or no traffic so that the fire vehicles are not disrupted during the verification and the vehicles can be serviced before the next scheduled aircraft movement. The timing verification should be carried out during daylight hours and with dry surface conditions.

7.4 Rescue and firefighting – operational requirements

One required fire appliance:

Aerodromes with a category of 3, 4, and 5 are required to provide:

- a minimum of one operational primary fire appliance, and
- access to a minimum of one operational reserve appliance, in case the primary appliance is unavailable

during the RFS promulgated hours in the AIP.

When a reserve appliance replaces a primary appliance, the aerodrome category should be immediately recalculated. This information should be promulgated, in accordance with rule 139.123, *Aerodrome condition notification*, to notify of any change to the aerodrome category.

If an aerodrome operates two appliances to meet the capability requirements of rule 139.61, *Rescue and firefighting extinguishing agents,* and one becomes unavailable (e.g. during maintenance), the aerodrome category should be immediately recalculated. This information should be promulgated, in accordance with rule 139.123, to accurately reflect any change to the aerodrome category.

If the primary and reserve fire appliances are inoperative at the same time, regular passenger transport operations (RPT) by aircraft with 30+ seats should cease until an aerodrome category of 3, 4 or 5 is achieved. This information should be promulgated in accordance with rule 139.123.

Two required fire appliances:

Aerodromes with a category of 6 and 7 are required to provide:

- a minimum of two operational primary fire appliances, and
- access to a minimum of one operational reserve appliance, in case the primary appliances are unavailable

during the RFS promulgated hours in the AIP.

When a reserve appliance replaces a primary appliance, the aerodrome category should be immediately recalculated (using Part 139's Table 2, *Minimum usable amounts of extinguishing agents.* Any change to the aerodrome category should be promulgated in accordance with rule 139.123.

If the aerodrome operator is only able to provide one operational fire appliance, the category should be reduced to reflect the capability of the remaining fire appliance as per Part 139's Table 2 and Table 3, *Minimum rescue and firefighting vehicles*.

If the reserve appliance allows the aerodrome operator to operate with the same aerodrome category as per rule 139.61, *Rescue and firefighting – extinguishing agents,* and rule 139.63, *Rescue and firefighting – vehicles*, but cannot meet the requirements of rule 139.67, *Rescue and firefighting – response capability*, the aerodrome may continue to operate for a period of

72 hours before restricting aircraft operations to the aerodrome category that meets the performance requirements of all three rule parts.

An example would be an aerodrome with a published aerodrome category of 7 which has two primary fire appliances and an older reserve appliance. In the event that one of the primary fire appliances was not operational (e.g. for maintenance), the reserve appliance could be used. The use of the reserve appliance could ensure the aerodrome operator continued to meet:

- the minimum usable amounts of extinguishing agents (as per Table 2), and
- the minimum rescue and firefighting vehicles (as per Table 3)

to meet requirements for the promulgated aerodrome category.

In practice, however, the reserve appliance might not be able to arrive within three or four minutes as required by rule 139.67. If this was the situation, the aerodrome operator would be able to continue to operate for 72 hours before changing the aerodrome category to reflect the requirements of rules 139.61, 139.63 and 139.67.

In the event that a primary appliance was not available, the aerodrome operator should consider the expected timeframe for the return to service of the appliance before considering whether to amend the aerodrome category immediately.

Three required fire appliances:

Aerodromes with a category of 8, 9, and 10 are required to provide:

- a minimum of three operational primary fire appliances, and
- access to a minimum of one operational reserve appliance, in case the primary appliances are unavailable

during the RFS promulgated hours in the AIP.

When a reserve appliance replaces a primary appliance, the aerodrome category should be immediately recalculated (using Table 2). This information should be promulgated in accordance with rule 139.123, to notify of any change to the published aerodrome category.

If the aerodrome operator is only able to provide two operational fire appliances, the category should be reduced to reflect the capability of the remaining appliances as per Part 139 Tables 2 and 3.

If the reserve appliance enables the aerodrome operator to operate with the same aerodrome category as per rules 139.61 and 139.63, but not to meet the requirements of rule 139.67, the aerodrome may continue to operate for a period of 72 hours before restricting aircraft operations to the aerodrome category to a level that meets the performance requirements of all three rule parts.

In the event that a primary appliance was not available, the aerodrome operator should consider the expected timeframe for the return to service of the appliance before considering whether to amend the aerodrome category immediately.

8 Aeroplane Classification by Aerodrome Category

8.1 Aircraft categories

Table 1 provides guidance on the types of aeroplanes with its respective category. However the actual aerodrome category specified under rule 139.59(a) may differ from the guidance provided in Table 1.

The actual aerodrome category will be determined after considering the nature, size and frequency of aeroplane movements (rule 139.59(b) and (c)).

Typical aeroplane types and the respective category

Airport Category 3	**Aeroplane**	**Over-all fuselage length (m)** ***12 ≤ L < 18***	**Maximum fuselage width (m)** ***W ≤ 3***
	Beech 99 Airliner	13.58	1.40
	Beech 1900 D Airliner	17.63	1.40*
	Beech Premier I	14.02	1.68*
	Beech King Air 200	13.4	1.37
	Beech King Air 350	14.2	1.37
	British Aerospace Jetstream 31 & 32	14.37	1.98*
	Cessna Citation CJ1	12.98	1.47*
	Cessna Citation CJ3	15.61	1.43*
	Cessna Citation Encore	14.9	1.49*
	Cessna Grand Caravan	12.7	1.6
	Dassault Falcon 10	13.85	1.46*
	Dassault Fan Jet Falcon D, E & F	17.15	1.87*
	Hawker 400 XP	14.76	1.5*
	Hawker 800 XP	15.6	1.83*
	Hawker 125	14.45	1.80*
	Learjet 31, 45 & 60	14.83, 17.6, 17.8	1.62, 1.8, 1.95
	Nomad GAF 22, & 24A	12.57, 14.36	1.44
	Piper Cheyenne PA42	13.2	1.3

	Twin Otter DH-6 & Srs 300	15.77	1.61
Airport Category 4	**Aeroplane**	**Over-all fuselage length (m)** ***18 ≤ L < 24***	**Maximum fuselage width (m)** ***W ≤ 4***
	Airtech CN235	21.40	2.90
	ATR42 320 & 500	22.67	2.86
	BAe Jetstream 41	19.25	1.85*
	Bombardier Challenger 300	20.91	2.34
	Bombardier Challenger 604	20.85	2.69
	Cessna Citation Sovereign	19.37	1.7*
	Cessna Citation X	22	1.7*
	Dassault Falcon 900	20.21	2.34*
	De Havilland Dash 8 DHC-8 100 & 200	22.25	2.69
	Dornier 328	21.22	2.41
	Douglas DC3 Dakota	19.63	2.03
	Embraer Brasilia EM120	20.00	2.28
	Friendship F-27 100	23.56	2.70
	Hawker Horizon	21.08	1.97*
	Hawker Siddeley HS-748	20.42	2.46*
	Metroliner 23 & III	18.1	1.68
	Saab 340	19.65	2.3*
Airport Category 5	**Aeroplane**	**Over-all fuselage length (m)** ***24 ≤ L < 28***	**Maximum fuselage width (m)** ***W ≤ 4***
	ATR72 200, 210 , 500 & 600	27.17	2.86*
	BAe 146 100	26.16	3.56*

	Bombardier Challenger 800	26.77	2.69
	Canadair RJ	24.38	2.69
	Convair 440 & 580	24.67, 24.84	2.39*
	De Havilland Dash 8 DHC-8 300	25.68	2.69
	Embraer 145	27.93	2.28
	Friendship F-27 500	25.1	2.3*
	Grumman Gulfstream II	24.36	2.39
Airport Category 6	**Aeroplane**	**Over-all fuselage length (m)** ***28 ≤ L < 39***	**Maximum fuselage width (m)** ***W ≤ 5***
	Airbus A318	31.44	3.96
	Airbus A319	33.84	3.96
	Airbus A320	37.57	3.96
	Boeing 737 300	33.4	3.76
	Boeing 737 700	33.6	3.76
	Bombardier Global Express	30.3	2.69
	De Havilland Dash 8 DHC-8 400	30.48	2.69
	Embraer 170	29.9	3.0
	Embraer 175	31.7	3.0
	Embraer 190 / Lineage 1000	36.2	3.0
	Embraer 195	38.7	3.0
	Grumman Gulfstream G500 & G550	29.4	2.4
	Lockheed Martin C130J Hercules	29.7	4.3

Airport Category 7	**Aeroplane**	**Over-all fuselage length (m)** ***39 ≤ L < 49***	**Maximum fuselage width (m)** ***W ≤ 5***
	Airbus A321	44.51	3.96
	Boeing 737 800	39.5	3.76
	Boeing 737-900ER	42.1	3.8
	Boeing 757 200	47.32	3.7
	Boeing 767 200	48.5	4.7
	Bombardier CRJ 1000	39.1	2.7
Airport Category 8	**Aeroplane**	**Over-all fuselage length (m)** ***49 ≤ L < 61***	**Maximum fuselage width (m)** ***W ≤ 7***
	Airbus A300 600	54.1	5.64
	Airbus A310 300	46.66	5.64
	Airbus A330 200	59.0	5.64
	Airbus A340 200	46.06	5.64
	Boeing 757 300	54.5	3.7
	Boeing 767 300	54.9	4.7
	Boeing 787 800	56.7	5.77
Airport Category 9	**Aeroplane**	**Over-all fuselage length (m)** ***61 ≤ L < 76***	**Maximum fuselage width (m)** ***W ≤ 7***
	Airbus A330 300	63.6	5.64
	Airbus A340 300	63.6	5.64
	Airbus A340 500	67.9	5.64
	Airbus A340 600	75.3	5.64
	Antonov AN124	69.1	6.4*

	Boeing 747 100, 200 & 300	70.6	6.1*
	Boeing 747 400	70.7	6.1*
	Boeing 767 300	54.9	5.0
	Boeing 767 400	61.4	4.7
	Boeing 777 200	63.7	6.19
	Boeing 777 300	73.9	6.19
	Boeing 787 9	62.8	5.77
	Boeing 787 10 - Preliminary Data	68.3	5.77
Airport Category 10	**Aeroplane**	**Over-all fuselage length (m)** ***76 ≤ L < 90***	**Maximum fuselage width (m)** ***W ≤ 8***
	Airbus A380, A380F 841 & 861	72.8	7.14
	Antonov AN225	88.4	6.4*

*Approximate