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AERODROME RESCUE AND FIREFIGHTING

1. PURPOSE

1.1 This advisory circular provides guidance on aerodrome rescue and firefighting requirements, to assist aerodrome operators, to meet Myanmar Civil Aviation Requirements Part 139- Section 1_ Aerodrome Certification and Section 2_Aerodrome Standards.

1.2 This advisory circular also contains information, references, practices and procedure for aircraft rescue and firefighters to be an acceptable means of compliance with the Myanmar Civil Aviation Requirements Part 139.

2. REFERENCES

2.1. MCAR –Section 1 Aerodrome Certification
2.2. MCAR – Section 2 Aerodrome Standards
2.3. ICAO Annex 19 Safety Management System
2.4. ICAO Doc 9683 Human Factors Training Manual
2.5. ICAO Annex 14,Volume 1, Aerodromes Design and Operations
2.6. ICAO Doc 9137-AN/898 Airport Services Manual Part 1 Rescue and Fire Fighting

3. APPLICABILITY

3.1 Aerodromes serving international or domestic routes

This advisory circular contains guidance for compliance with Part 139 requirements for rescue and firefighting. For simplicity this advisory circular refers to Myanmar Civil Aviation Requirements Part 139, Section 2, 9.2 should be read in its entirety to determine the fire and rescue category required at an aerodrome.

4. The principal objective

4.1 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 RFS 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.

4.2 The rescue may require the use of equipment and personnel other than those assessed primarily for rescue and firefighting purposes. The most important factors bearing on effective rescue in a survivable aircraft accident are the:

(a) training received

(b) effectiveness of the equipment

(c) speed with which personnel and equipment designated for rescue and firefighting purposes can be deployed.

5. Physical and Medical Fitness Assessments for RFS

5.1 Personnel medical fitness

5.1.1 As the nature of RFF operations involves periods of intense physical activity, all RFF personnel have to possess a minimum level of physical fitness and medical fitness to be able to perform the tasks associated with these operations. Physical fitness and medical fitness is often described as the overall physical condition of the body, which can range from peak condition for performance at one end of the spectrum to extreme illness or injury at the other. The key fitness components for RFF are generally aerobic fitness, anaerobic fitness, flexibility and medical fitness. Optimum physical fitness and medical fitness for RFF personnel would mean that a firefighter is able to carry out RFF activities safely, successfully and without undue fatigue.

5.2 Physical fitness of personnel

5.2.1 The physical fitness assessments should be conducted for pre-employment entry as rescue and firefighting 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.

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

5.2.3 Aerobic endurance fitness is the ability to continue to exercise for prolonged periods of time at low to moderate or high intensity. This is typically what limits the ability to continue to run, cycle or swim for more than a few minutes and is dependent upon the body‘s heart, lungs and blood to get the oxygen to the muscles (VO2) providing the sustained energy needed to maintain prolonged exercise. Typical aerobic activities include walking, jogging, cycling, rope skipping, stair climbing, swimming, and or any other various endurance activities.

5.2.4 Anaerobic fitness works differently to aerobic fitness. It is an activity that requires high levels of energy and is done for only a few seconds or minutes at a high level of intensity. The term anaerobic means - without oxygen. Participation in anaerobic activities leads to anaerobic fitness, which may be defined as higher levels of muscular strength, speed and power. Examples of anaerobic activities include heavy weight lifting, running up several flights of stairs, sprinting, power swimming, or any other rapid burst of hard exercises. Muscular strength is the ability to lift, pull, push and carry heavy objects over.

5.2.5 Flexibility refers to the ability to move the limbs and joints into specific positions at the end of their normal range of movement. Flexibility is important as it will allow the body to work in cramped positions without unduly stressing the muscles, tendons and ligaments and may reduce the risk of injury. Flexibility is best developed using slow controlled stretching exercises.

5.3 Medical fitness of personnel

5.3.1 Medical fitness assessments specific to RFS should be developed. The medical fitness assessments should be conducted for pre-employment entry as rescue and firefighting personnel as well as ongoing medical fitness assessments for existing staff. The frequency of medical fitness assessments should be determined by local arrangement. The medical fitness framework assessments should be used to identify any underlying medical conditions, which may pose a risk to the individual rescue and firefighting personnel, during physically demanding activities.

5.3.2 The assessment should include a medical certificate:

(i) from a registered medical practitioner

(ii) with the periodicity of the checks set by the medical practitioner based on the rescue and firefighting personnel history, and results of examinations

(iii) with a maximum check periodicity of four years.

5.4 Entry training standards

5.4.1 A recruitment and retention policy should ensure that all rescue and fire personnel go through a detailed and comprehensive assessment process to ensure that the right candidate is selected for the position. If rescue and fire personnel are recruited with no previous RFS experience, they should undertake an initial fire fighters course and be deemed competent on acquisition of skills. Competency assessments in both practical and technical aspects should be conducted within this course.

5.5 Continued rescue and firefighting personnel development

5.5.1 An environment conducive to learning and development should be provided, enabling personnel to have the opportunity 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.

5.5.2 This training should include:

(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 (requirement to be determined at local level)
(c) drills to maintain operational performance with fire service equipment
(d) training to include human performance and team coordination
(e) breathing apparatus training in heat and or smoke.

5.6 RFS organizational structure

5.6.1 Aerodrome operators may use different titles in their organizational structure (such as firefighter, supervisor and manager) but they should equate to the following in terms of training, qualifications and accountability:

Rescue firefighter - carries out day-to-day firefighting and other duties.

Supervisor/Shift Leader–responsible for supervision of day to day work. Supervise to make daily training to RFF staffs (rescue firefighters) based on training requirements including breathing apparatus using, casual handling procedure, RFF vehicle inspection, how to approach crash site, etc. Conduct and supervise response time and live fire drill.

Chief fire officer - responsible for management of a fire station. Attend incident and accident as on sense commander. Develop all policies and procedures concerning firefighter in accordance with MCAR Part 139. Review RFF training plan and the RFF firefighter to have the adequate training. Inspect firefighting equipment in order to ensure adequate rescue equipment is available as required. Perform other duties as required.

5.6.2 Each RFS unit should establish a training syllabus, competencies and experience requirements for each supervisory and management level. Sole duty RFS personnel should be able to display the competency requirements, knowledge and understanding of a rescue fire officer .The RFS organizational structure should show clear lines of accountability so that it is apparent to all where safety responsibilities lie.

5.7 Protective clothing for personnel

5.7.1 It is essential that all personnel operating at an aircraft fire be provided with protective clothing designed to provide the firefighter with protection from radiated heat, occasional flame contact and injury from abrasive contact. Consideration should be given to the extent to which it is necessary to wear continuously all or some elements of, the protective clothing so as to ensure immediate response when a call for attendance at an aircraft accident is received. Some forms of protective clothing create dressing problems which cannot easily be solved within the crew compartment of a moving vehicle. On responding to a fire call, all RFS personnel should wear as a minimum, their firefighter boots and leggings prior to mounting the fire vehicle.

5.7.2 Each rescue firefighter should be provided with at least the following items of protective clothing:

(a) protective helmet complete with visor

(b) bunker coat and leggings

(c) firefighting gloves

(d) firefighting boots

(e) firefighter's flash hood.

(f) Protective suits.
  (i) proximity suits
  (ii) structural firefighting suits.

5.7.3 Self-contained respiratory equipment should be provided for those 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 those personnel who may be required to work in areas where breathing may be hazardous due to air borne particles (e.g. composite materials). Each aerodrome should also assess the need for other items such as entry protective suits or chemical suits.

5.8 Personnel levels

5.8.1 The objective of providing an adequate level of competent personnel is to have available sufficient 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

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

5.8.2 The RFS vehicles should be staffed so as to ensure their ability to discharge at their maximum capability, extinguishing agents, principal and complimentary, both effectively and safely, at an aircraft accident / 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 by the AEP. In determining the minimum number of rescue and firefighting personnel and supervisory levels required, a task and resource analysis (TRA) should be completed, and the level of staffing and supervisory control are documented or referenced in the aerodrome manual.

5.9 Task and resource analysis (TRA)

5.9.1.A TRA should be completed to establish justification as to the minimum number of competent personnel required to deliver an effective airport RFS. When carrying out a TRA, it is essential to fully understand the complexity of the various roles an individual is required to do in terms of actions, in order 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 of human performance due to workload, capabilities, functions, decision aids, environmental constraints, team versus individual performance and training effectiveness.

5.9.2. At aerodromes serving international routes, a fully trained chief 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.

5.9.3 ***General information.*** The airport operator should first establish the minimum requirements including: minimum number of RFS vehicles and equipment required for the delivery of the extinguishing agents at the required discharge rate for the specified RFF category of the airport.

5.9.4 ***Task analysis/risk assessment.*** A task analysis should primarily consist of a qualitative analysis of the RFFS response to a realistic, worst-case, aircraft accident scenario. The purpose should be to review the current and future staffing levels of the RFS deployed at the aerodrome. The qualitative analysis could be supported by a quantitative risk assessment to estimate the reduction in risk. This risk assessment could be related to the reduction in risk to passengers and aircrew from deploying additional personnel. One of the most important elements is to assess the impact of any critical tasks or pinch points identified by the qualitative analysis.

5.9.5 ***Qualitative approach***. The task analysis including a workload assessment aims to identify the effectiveness of the current staffing level and to identify the level of improvement resulting from additional staffing. A credible worst-case accident scenario should be analyzed to assess the relative effectiveness of at least two levels of RFS staffing.

5.9.6 ***Quantitative risk assessmen****t.* This assessment will generally be used to support the conclusions of the qualitative analysis by examining the risks to passengers and aircrew from aircraft accidents at the airport. This comparison of the risk allows the benefit of employing additional RFS staff to be evaluated in terms of the risk reduction in passengers and aircrew lives saved. This could be expressed in monetary terms and may be compared with additional costs incurred in employing the additional personnel. However, this is of little, if any, value in determining minimum levels of personnel.

5.9.7 ***Task analysis.*** The following items will assist in determining the basic contents of an analysis:

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

b) Promulgated RFS categories (Aeronautical Information Publication);

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 programmes 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;

n) First aid — role responsibility;

o) Medical facilities — role responsibility;

p) Pre-determined attendance: local authority services — police, fire and ambulance, etc.;

q) Incident task analysis — feasible worst-case scenarios) (workload assessment) (human Performance/ Factors. To include: mobilization, deployment to scene, scene management, firefighting, suppression and extinguishment, application of complementary agent(s), post fire security/control, personnel protective equipment, rescue team(s), aircraft evacuation and 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, etc.); and

u) Airport emergency plan and procedures.

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

5.9.7.1 **Phase 1**

The airport operator must be clear as to the aims and objectives for the RFF services, and the required tasks that personnel are expected to carry out.

5.9.7.2**Phase 2**

Identify a selection of representative realistic, feasible accidents that may occur at the airport. This can be achieved by a statistical analysis of previous accidents on airports and by analyzing data from international, national and local sources.

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

5.9.7.3 **Phase 3**

Identify the types of aircraft commonly in use at the airport; this is important as the type of aircraft and its configuration has a direct bearing on the resources required in meeting Phase 1. It may be necessary to group the aircraft types in relation to common aircraft configurations for ease of analysis or identify precise aircraft type that may have a unique configuration.

5.9.7.4 **Phase 4**

5.9.7.4.1 Every airport is unique in that the location, environment, runway and taxiway configuration, aircraft movements, airport infrastructure and boundary, etc., may present specific additional risks.

5.9.7.4.2 In order that the feasible accident scenario can be modeled/ simulated, a major factor is to consider the probable location for the most realistic accident type that may occur.

5.9.7.4.3 To confirm the location of the scenario, it is important that a facilitator using a team of experienced fire service personnel, who have knowledge of the airport and the locations in which an aircraft accident is likely to occur, evaluate the scenario.

5.9.7.4.4 The role of the facilitator is to seek agreement in identifying the credible worst-case locations and, by using a scoring system place, these locations in order of relevance and priority. The team must determine why the locations have been identified and provide a rationale for each location. One methodology would be to award a weighted number to each location, then total the numbers in relation to each identified location.

5.9.7.4.5 An additional time delay for any of the factors listed above should be estimated and recorded, then the location with the highest additional response time could be identified as the worst-case location.

5.9.7.4.6 It is important to note that the location of an accident could have an impact on the resources and tasks that will be required to be carried out by RFF personnel.

5.9.7.4.7 From the above analysis, a location or a number of locations could be identified, in agreement with the airport operator and the TRA facilitator.

5.9.7.5 **Phase 5**

5.9.7.5.1 Phase 5 combines the accident types to be examined as described in Phase 2, with the aircraft identified in Phase 3 and the locations as described in Phase 4; the accident types should be correlated with the possible location. In some cases this could be in more than one location on an airport, for which a task and resource analysis needs to be carried out.

5.9.7.5.2 The above information is to be built into a complete accident scenario that can be analyzed by experienced supervisors and firefighters for the task and resource analysis in Phase 6.

5.9.7.6 **Phase 6**

5.9.7.6.1 By using a TRA facilitator with teams of experienced airport supervisors and firefighters the accident scenario(s) developed in Phase 5 is subject to a task and resource analysis carried out in a series of tabletop exercises/simulations.

5.9.7.6.2 When carrying out a task and resource analysis, the principal 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:

a) receive the message and dispatch the RFF service (the dispatcher may have to respond as part of the minimum riding strength);

b) respond utilizing communications, taking appropriate route and achieving the defined response criteria;

c) position appliances/vehicles in optimum positions and operate RFF appliances effectively;

d) use extinguishing agents and equipment accordingly;

e) instigate incident command structure — supervisors;

f) assist in passenger and crew self-evacuation;

g) access aircraft to carry out specific tasks if required, e.g. firefighting, rescue;

h) support and sustain the deployment of firefighting and rescue equipment;

i) support and sustain the delivery of supplementary water supplies; and

j) need to replenish foam supplies as needed.

5.9.7.6.3 The task and resource analysis should identify the optimum time when additional resources will be available to support/augment and/or replace resources supplied by RFF services (aerodrome emergency plan). It can also provide vital evidence to support the level of RFF vehicles and equipment.

5.9.7.6.4 In order to start a task and resource analysis the required category of the airport must be identified as required by the regulatory authority. This should confirm the minimum number of vehicles, and the minimum extinguishing agent requirements and discharge rates, this should also determine the minimum number of personnel required to functionally operate the vehicles and equipment.

5.9.7.6.5 The results of the analysis should be recorded in a table or spreadsheet format and should be laid out in a method that ensures that the following is recorded:

a) receipt of message and dispatch of the RFF response;
b) time — this starts from the initial receipt of call and the timeline continues in minutes and seconds until additional external resources arrive or the facilitator decides an end-time;
c) list of assessed tasks, functions and priorities achieved;
d) the resources (personnel, vehicles and equipment) required for each task should be defined;
e) comments to enable team members to record their findings; and
f) identified pinch points.

5.9.7.7 A task analysis can be as detailed as necessary. The aim is to itemize the knowledge and practical skills (doing) involved in carrying out the task or function effectively and to the correct the standard of competence based on a qualitative analysis. Having gathered the appropriate data and agreed to 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 a task and resource analysis, ask the following questions:

a) What is done?
b) Why is it done?
c) When is it done?
d) Where is it done?
e) How is it done?
f) Who does it?

5.9.7.8 It is often difficult to assess the overall effectiveness of a complete unit by observation only. However, observation/demonstration does allow you to assess the effectiveness of individual units and any element(s) of the emergency arrangements. Documentary evidence relating to previous accidents or exercises may also assist in establishing if the current RFFS is staffed at an appropriate level. The overall objective is to be satisfied that the RFFS is organized, equipped, staffed, trained and operated to ensure the most rapid deployment of facilities to the maximum effect in the event of an accident. The above process can also be used to identify equipment shortages and training needs for personnel required to deal with identified tasks.

6. Training

6.1 General

6.1.1 Personnel whose duties consist primarily of the provision of RFS for aircraft operations are infrequently called upon to face a serious situation involving lifesaving at a major aircraft fire. They will experience a few incidents and a larger number of standbys to cover movements of aircraft in circumstances where the possibility of an accident may reasonably be anticipated, but will seldom be called upon to put their knowledge and experience to the supreme test. It follows, therefore, that only by means of a most carefully planned and rigorously followed programme of training can there be any assurance that both personnel and equipment will be fit to deal capably with a major aircraft fire should the necessity arise.

6.1.2 Training of rescue and firefighting 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)** 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 a SLP. The core content of the program can be organized into nine topics as follows:
   - (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 man oeuvres
   - (vi) emergency communication
   - (vii) leadership performance
   - (viii) physical fitness
   - (ix) auxiliary modules(e.g. rescue in difficult terrain, response to biological/chemical threats etc).

6.1.3 The training program, in its entirety, should be designed to ensure that both personnel and equipment are at all times fully efficient. This represents a very high standard of achievement but anything less than full efficiency is unacceptable and may be dangerous both to those in need of aid and also to those who are seeking to give such aid. In addition, the training program should also be designed to build cohesiveness between key functional units of a RFS team in order to deliver a consistent level of proficiency during emergencies. To ensure a high standard of operational readiness, RFS should develop a competency audit framework, to assess the effectiveness of RFS training at both individual and team levels. All initial training courses and all structured learning programs, 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.

6.2 Practical training

6.2.1 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. The area identified should be able to accommodate practical operational training 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 (requirement to be determined at local level)

(c) drills to maintain operational performance with fire service equipment

(d) training to include human performance and team coordination

(e) breathing apparatus training in heat and or smoke.

6.2.2 All RFS personnel at each RFS unit should be periodically assessed to determine their continued competencies in the practical activities identified above ((a) through (e)).

6.3 Theoretical training

6.3.1 Each RFS unit should have access to a training room or training area, on their aerodrome at a location that does not compromise their response time. The area identified should be conducive to learning and able to accommodate theoretical input and self-study. Each RFS unit should provide training aids to support the delivery of the nine topics that make up the content of the SLP (refer to paragraph 6.1.2(b)).

6.3.2 The training aids used for the study and instruction of the nine topics of the SLP can be from a variety of sources and in a variety of formats, such as:
(a) power point presentations
(b) visual aids
(c) fire service manuals
(d) interactive computer simulation
(e) locally agreed reference manuals.

6.3.3 All RFS personnel at each RFS unit should be periodically assessed to determine their continued competency in each of the nine topics that make up the content of the structured learning program.

6.4 Delivery of training

6.4.1 Each RFS unit should identify a person that is responsible for the coordination and supervision of rescue and firefighting training, and the maintenance of all training records. Personnel used for the delivery of training should be suitably trained and experienced in the rescue and firefighting role or specialists in a particular aspect of the training syllabus. The design of a course for a rescue and firefighting personnel at an aerodrome serving domestic routes only needs to address the fact that the rescue and firefighting personnel is not supported by a large organization and could be the sole duty rescue and firefighting personnel.

6.4.2 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, competencies and experience requirements for each supervisory and management level. Practical and theoretical forms of training are, understandably, a continuing commitment and should be resourced accordingly.

6.5 Live (hot) fire training

6.5.1 Each member of an airport RFS unit should participate in at least one live "hot" fire training exercise per 6 months period. The objective is for airport RFS personnel to observe fire behaviour and demonstrate the practicaltactics and techniques that are used to control and extinguish a live "hot" aircraft fire in a range of aircraft fire scenarios. These scenarios may include:

(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 under wing engine fire

(d) live fuel pond fire

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

6.5.2 The live hot fire training exercise should begin with all participants declaring themselves fit and well to take part. If deemed necessary, the fitness level of any participant may be ascertained by an on-site fitness test prior to taking part in the live hot fire training exercise. 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.

6.6 Fitness training

Fitness levels are to be maintained as an employment condition and may be reviewed during each operational shift.

7. Firefighting and Rescue Equipment

7.1 Firefighting equipment

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

firefighting equipment:

(a) fire delivery hose

(b) fire fighting branches

(c) stand pipe, key and bar.

7.2 Rescue equipment

7.2.1 Rescue equipment commensurate with the level of aircraft operations expected should be provided on the rescue and firefighting vehicle(s) in accordance with MCAR Part 139, Section 2, Appendix 7.

7.2.2 Aerodromes serving international routes should have at least the following equipment available for rescue at the scene of any aircraft accident:

(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 consisting of 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. Items (a) to (i) 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.Aerodromes serving domestic routes only should have at least the equipment listed in items (c), (f) and (h) except for stretchers, spine boards and blankets. The scale should be in relationship to the number of firefighting personnel being used. The equipment should be carried in the rescue and firefighting vehicles to be available at the accident site within the required response times under Part 139.Records of all tests and inspections should be maintained by the RFS for a minimum period of one year. The records should include details of consequential action where an inspection has revealed a defect or deficiency.

7.3 Mutual aid emergency agreements

7.3.1 In developing an AEP and the water rescue service at aerodromes, consideration should be given to public services (such as military search and rescue units, harbour police, or fire departments) and private rescue services (such as rescue squads, or shipping and waterway operators), that may be available and are capable of rendering assistance. A signal system for alerting private or public services in time of emergency should be prearranged.

7.3.2 The following should be considered:

(a) The close proximity of an airport to surrounding communities and the possibility of an off airport aircraft accident give rise to the need for mutual aid emergency agreements.

(b) A mutual aid emergency agreement should specify initial notification and response assignments. It should not specify the responsibilities of the agency concerned as this will be contained in the AEP.

(c) Mutual aid emergency agreements should be prearranged and duly authorized. The DCA may have to act as coordinating agency if more complicated jurisdictional or multi-agency agreements are necessary.

7.4 Operations in a difficult environment

7.4.1 For aerodromes serving international routes, the plan should include the ready availability of, and coordination with, appropriate specialist rescue services to be able to respond to emergencies, where an aerodrome is located close to water and/or swampy areas and where a significant portion of approach or departure operations takes place over these areas. 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. Guidance material on assessing approach and departure areas within 1,000m of runway thresholds (refers to Part 1, Chapter 13 of the ICAO Doc 9137 *Airport Services Manual)*.

7.4.2 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.

7.5 Communications

7.5.1 When rescue and firefighting vehicles leave the fire stations and enter the manoeuvring area, the RFS personnel come under the direction of the control tower. 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.

7.5.2 The radio equipment on rescue and firefighting vehicles should accommodate communication between vehicles, en route to, and in operation at, an aircraft accident. Within individual vehicles there should be an intercommunication system, particularly between drivers and monitor-operators, to optimize the deployment of the vehicles at an accident. The provision of a communication facility within an appliance must recognize the likelihood of high noise levels, and this may require the use of noise-cancelling microphones, headsets and loudspeakers, for effective intercommunication. The rescue and fire fighting vehicles should be provided with communication equipment capable of communicating directly with an aircraft in a situation of emergency using an aeronautical radio frequency.

7.5.3 The aeronautical radio frequency permits the rescue and firefighting service and the emergency aircraft, to communicate with each other directly, allowing the rescue and firefighting crew to issue critical information regarding the exact nature of, and the hazards associated with an emergency in progress, along with recommendations for actions.

8. Extinguishing Agents

8.1 Complementary extinguishing agents

The complementary agent(s) required is:

(a) carbon dioxide (CO2) or

(b) dry chemical powders (classes B and C powders)or

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

Compatibility must be ensured when selecting dry chemical powders for use with foam.

8.2 Foam concentrates

8.2.1. Any foam concentrate to be used in rescue and firefighting vehicles should meet the criteria of the ICAO specifications; so as to achieve performance level A,B and C. (refers to Part 1 Chapter8, Paragraph 8.1.3 of the ICAO Doc 9137, *Airport Services Manual*).

8.2.2. 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. The amount of foam concentrate should be sufficient to supply at least two full loads of such quantity of water where sufficient additional water supplies are immediately available to ensure a rapid replenishment of the water content carried.

8.2.3 The amounts of water specified for foam production are predicated on an application rate of 8.2 L/min/m2 for a foam meeting performance level A, 5.5 L/min/m2 for a foam meeting performance level B and 3.75L/min/m2 for a foam meeting performance level C. These application rates are considered to be the minimum rates at which control can be achieved within one minute.

8.3 Reserve supply

8.3.1 A 200 percent reserve supply of foam concentrate for the runway category should be maintained on the aerodrome for vehicle replenishment purposes. Where a major delay in the replenishment of this supply is anticipated, the amount of reserve supply should be increased.

8.3.2 If the 200 percent reserve supply of foam concentrate is temporarily not available on the aerodrome the runway rescue and firefighting category need only be reduced, when the quantity of foam concentrate available falls below 100 percent 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.

8.4 Water supplies

8.4.1 Supplementary water supplies, for the expeditious replenishment of rescue and firefighting vehicles, should be pre-arranged. The objective of providing additional water supplies at adequate pressure and flow is to ensure rapid replenishment of aerodrome RFS vehicles. This supports the principle of continuous application of extinguishing media to maintain survivable conditions at the scene of an aircraft accident. Additional water to replenish vehicles may be required in as little as five minutes after an accident; therefore an analysis should be conducted to determine the extent to which it, and its associated storage and delivery facilities, should be provided.

8.4.2 When conducting the analysis, the following factors are amongst those items which should be considered but not limited to:

(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) utilization of existing natural water supplies for firefighting purposes

(f) vehicle response times

(g) historical data of water used during aircraft accidents

(h) the need and 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

(n) overhead static water supplies.

9. Response Capability

9.1 Frequency of rescue and firefighting response verification

The holder of an aerodrome operating certificate should regularly complete a rescue and firefighting response time verification. Response time verifications should normally be held once a month.

9.2 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.

9.3 Response timing

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

9.3.2 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.

9.3.3 The operational objective of the RFF service should be to achieve response times not exceeding three minutes to the end of each runway, as well as to any other part of the movement area, in optimum conditions of visibility and surface conditions. Response time is considered to be the time between the initial call to the RFF service and the time when the first responding vehicle(s) is (are) in position to apply foam at a rate of at least 50 per cent of the discharge rate. Determination of realistic response times should be made by RFF vehicles operating from their normal locations and not from positions adopted solely for test purposes.

9.3.4 Any other vehicles required to deliver the amounts of extinguishing agents specified in should arrive in three minutes and no more than four minutes from the initial call so as to provide continuous agent application.

10. Aeroplane Classification by Aerodrome Category

10.1 Table 1 provides guidance to the types of aeroplanes with its respective category. The actual aerodrome RFF category will be determined after considering the nature, size and frequency of aeroplane movements .

Table 1 – Typical aeroplane types and the respective category

Airport Category 1	**Aeroplane**	**Over-all fuselage length (m)** $0 = L < 9$	**Maximum fuselage width (m)** $W \leq 2$
	Cessna 172 Skyhawk	8.2	1.0*
	Cessna 182 Skylane	8.84	1.07*
	Cessna 185 Skywagon	7.8	1.12*
Airport Category 2	**Aeroplane**	**Over-all fuselage length (m)** $9 \leq L < 12$	**Maximum fuselage width (m)** $W \leq 2$
	Cessna 206G Stationair	8.6	2.3
	Cessna 207A Skywagon	9.68	2.3
	Cessna 421 Golden Eagle	11.09	1.4
	Cessna Caravan 675 & 208	11.5	1.6
	Beech King Air C90B	10.8	1.37
Airport Category 3	**Aeroplane**	**Over-all fuselage length (m)** $12 \leq L < 18$	**Maximum fuselage width (m)** $W \leq 3$
	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

	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***
	ATR42 320 & 500	22.67	2.86
	Embraer Brasilia EM120	20.00	2.28
	Friendship F-27 100	23.56	2.70
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
	Embraer 145	27.93	2.28
	Frendship F-27 500	25.1	2.3*
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
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 757 200	47.32	3.7
	Boeing 767 200	48.5	4.7
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		
	Boeing 767 400	61.4	4.7
	Boeing 777 200	63.7	6.19

	Boeing 777 300	73.9	6.19
	Boeing 787 9 Preliminary Data	62.8	5.77
	Boeing 787 10 -Preliminary Data	68.3	5.77
Airport Category 10	**Aeroplane**	**Over-all fuselage length (m)** $76 \leq L < 90$	**Maximum fuselage width (m)** $W \leq 8$
	Airbus A380, A380F 841 & 861	72.8	7.14
	Antonov AN225	88.4	6.4*

*Approximate

Director General
Department of Civil Aviation