SOUTH AFRICAN CIVIL AVIATION AUTHORITY

Technical Guidance Material
for Aerodromes Rescue & Fire Fighting Services
Advisory Circular

SUBJECT: TECHNICAL GUIDANCE MATERIAL FOR RESCUE & FIRE FIGHTING SERVICES

EFFECTIVE DATE: 08 JANUARY 2019

APPLICABILITY:

The following introductory chapters, serves to enlighten the aerodrome inspector and the aerodrome operator, with regards to the minimum requirements expected to be met by the aerodrome operators of South Africa.

PURPOSE:

The International Civil Aviation Organisation (ICAO) issues International Standards and recommended practices for Civil Aviation. As a member of the Chicago convention South Africa agreed to comply within its boundaries to the set out recommendations.

This document is provided for information and guidance purposes. It may describe an example of an acceptable means, but not the only means, of demonstrating compliance with regulations and standards.

REQUIREMENTS:

The principal objective of an Aerodrome Rescue and Fire Fighting Service (AR&FFS) is to save lives. The secondary objective is to protect property from damage or total destruction caused by fire. For this reason, the primary task of an AR&FFS is creating a safe environment for rescue operations to commence. Provision should be made for an AR&FFS, on the appropriate level, for dealing with the largest aircraft operating to and from an aerodrome that can be involved in an accident or incident occurring at, or in the immediate vicinity of an aerodrome assumes primary importance. It is within this area that there is the greatest opportunity of saving lives. The primary objective must never be subjected to, or be subservient to the secondary objective of an AR&FFS.

TERMS OF REFERENCE:

The intent of these documents is to serve as a guideline only and as such may not be used, as a standard.

i. Civil Aviation Regulations – Part 139 Aerodromes and Heliports: Licensing and Operation of Aerodromes.
ii. Aerodromes – Annex 14 – Chapter 9-Aerodrome operational Services, Equipment and Installations
iii. International Standards and Recommended Practices. Aerodrome Design Manual - ICAO Doc 9137-AN898 Part 1, Part 7 and Doc 7192-AN/857 Part E2.
iv. Occupational Health and Safety Act. No 85 of 1993.

v. National Building Regulations and Building Standards Act, 1977 (Act no.103 of 1997) as amended, or any other law and applicable standards.

AERODROME RESCUE AND FIRE FIGHTING SERVICES (AR&FFS)

1. INTRODUCTION: AND BASIC GUIDELINES FOR AIRPORT FIRE SERVICE INSPECTORS.

1.1. The International Civil Aviation Organisation (ICAO) issues International Standards and recommended practices for Civil Aviation. As a member of the Chicago convention South Africa agreed to comply within its boundaries to the set out recommendations.

1.2. The following introductory chapters, serves to enlighten the aerodrome inspector and the aerodrome operator, with regards to the minimum requirements expected to be met by the aerodrome operators of South Africa. The legislative requirements are in accordance with the Civil Aviation Regulations as contained in Part 139 as well as with the technical standards in Part 139 of the SA-CATS-AH. The aforementioned regulations and technical standards makes the ICAO documents Annex 14, Doc 9137-AN/898 Parts 1 & 7, as well as ICAO document Doc 7192-An 857 Part E2 applicable.

1.3. As South Africa is regarded as the gateway to Africa, it is expected that the general initiative should come from the South African Civil Aviation Authority (SACAA) to implement the ICAO standards in establishing a safety culture within the Civil Aviation Industry.

1.4. It is therefore imperative that the SACAA applies standards, as set by ICAO to be the minimum standards and to regulate these standards within the boundaries of South Africa as far as practicable. These standards are applicable to all licensed aerodromes. This however does not imply that unlicensed aerodromes can operate commercially without complying with the prescribed standards. The level of service provided at unlicensed aerodromes is not regulated. However, commercial activities can take place at an unlicensed aerodrome under AIC50.4, provided that an exemption is obtained from the Director of Civil Aviation (DCA).

1.5. CAA inspectors, appointed by the DCA as authorised officers in terms of Section 88(1)(a) of the Civil Aviation Act, Act 13 of 2009, will for the purpose of licensing and license renewal visit aerodromes to verify that the laid down standards are being met and maintained. Contravention of, or non-compliance with the laid down standards will have, as a result, that an aerodrome licence either not be issued, or suspended or revoked, until such time that an aerodrome can comply with the prescribed standards.

1.6. This document is compiled in order to guide the aerodrome inspector of the acceptable minimum requirements with regards to Aerodrome Rescue and Fire-fighting Services as enacted in the Civil Aviation Regulations Part 139.02.15(1) (2). The categories referred to are those contained in paragraph 9.2 of Annex 14, Volume 1. (Airports), as well as in chapter two (2) of the Airports Service Manual, Doc 9137-AN/898, Part 1 on Rescue and Fire Fighting Services.

1.7. The principal objective of an Aerodrome Rescue & Fire Fighting Service (AR&FFS) is to save lives. The secondary objective is to protect property from damage or total destruction caused by fire. For this reason, the primary task of an AR&FFS is creating a safe environment for rescue operations to commence. Provision for an AR&FFS, on the appropriate level, for dealing with the largest aircraft operating to and from an aerodrome that can be involved in an accident or incident occurring at, or in the immediate vicinity of an aerodrome assumes primary importance. It is within this area that there is the greatest opportunity of saving lives. The primary objective must never be subjected to, or be subservient to the secondary objective of an AR&FFS.

1.8. The most important factors contributing to effective rescue attempt in a survivable aircraft crash is as follows and will be verified in accordance with the relevant chapters of the ICAO Document Doc 9137-AN/898 Part 1 & 7 as well as Doc 7192-AN/857. Part E2.

2. THE CHAPTERS REFERRED TO FOR INSPECTION PURPOSES, ARE DEPICTED BELOW AND ARE THOSE CONTAINED IN ICAO DOC 9137-AN/898 PARTS 1 (ENACTED IN CAR'S 139.02.15) TECHNICAL STANDARDS CONTAINED IN SA-CATS-AH WITH THE SAME REFERENCE NUMBERS.

2.1. Chapter 1 General considerations.

2.2. Chapter 2. Level of Protection to be provided.
2.3. Chapter 3. Aerodrome Facilities Affecting Rescue and Fire-fighting Services.
2.4. Chapter 4. Communications and alarm requirements.
2.5. Chapter 5. Factors in the specifications process for Rescue and Fire-fighting vehicles.
2.6. Chapter 6. Protective Clothing and Respiratory Equipment.
2.7. Chapter 7. Ambulance and Medical Services.
2.8. Chapter 8. Extinguishing agent characteristics.
2.9. Chapter 9. Fire stations.
2.10. Chapter 10. Personnel.
2.11. Chapter 11. Emergency organisations.
2.12. Chapter 12. Aerodrome Fire-Fighting and Rescue Procedures.
2.13. Chapter 13. Rescue operations in difficult environments.
2.14. Chapter 14. Training.
2.15. Chapter 15. Aircraft fuelling practices
2.16. Chapter 16. Availability of RFF Information.
2.17. Chapter 17. Preventative maintenance of vehicles and rescue equipment
2.18. Chapter 18. Human Factors.

3. BASIC INFORMATION:

3.1. To determine the level of protection that must be provided at an aerodrome, the aerodromes are categorised, this is done on a structured way by taking in consideration the dimensions (over all length and fuselage width) as well as, the total number of aircraft making use of such an aerodrome.
3.2. Level of extinguishing agent required is determined using the Critical Area Concept contained in Chapter 2 of ICAO Doc 9137-AN/898 Part 1. The number of passengers should also play a large part in finalising the decision. It is also pointed out, that at remote aerodromes, the risk of an aircraft accident is much greater than at some of the larger aerodromes. This is due to the fact that the level of sophisticated navigation equipment, radar and air traffic services does not exist or is not at the same level as that on larger aerodromes.
3.3. Whilst determining the category of an aerodrome, all aircraft movements must be taken in consideration, landing and take-off of all aircraft scheduled and non-scheduled constitutes a movement and should therefore be brought in contention.
3.4. It is noted that on some of the smaller aerodromes, financial constraints can be a factor. This however does not give any aerodrome operator the authority to lower the category of that aerodrome without proper consultation and/or obtaining an exemption under Part 11 of the Civil Aviation Regulations from CAA.

4. AERODROME CATEGORISATION

4.1. The level of protection provided at an aerodrome for AR&FFS shall be appropriate to the aerodrome category determined using the principles in paragraph 2.3.8 Table 2-3 except that, where the number of movements of the aeroplanes in the highest category normally using the aerodrome is less than 700 in the busiest consecutive three months, the level of protection shall be:
   a) From January 2005, the level of protection provided for rescue and fire fighting should be equal to the aerodrome category determined using these principles. (Annex 14, Chapter 9.2.3)
4.2. Principles:
   a) The aerodrome category shall be determined using the following table, (Table “A”) below and shall be based on the longest aeroplanes normally using the aerodrome and their fuselage width.

Note: To categorise the aeroplanes using the aerodrome, first evaluate their overall length and then their fuselage width.

b) If, after selecting the category appropriate to the longest aircraft over-all length, it is determined that the aircraft fuselage width is greater than the maximum width in the following table, column 3, for that category, then the category for that aeroplane shall actually be one category higher.

Note:

Guidance on categorising aerodromes for AR&FFS is given in, paragraph 9.2 of Annex 14, as well as ICAO Doc9137-AN/898 Part 1, Chapter 2 and in the following table:

CATEGORISING TABLE: TABLE "A"

1	2	3
Aerodrome category	Aeroplane over-all width	Maximum fuselage width
1	0 m up to but not including 9 m	2 m
2	9 m up to but not including 12 m	2 m
3	12 m up to but not including 18 m	3 m
4	18 m up to but not including 24 m	4 m
5	24 m up to but not including 28 m	4 m
6	28 m up to but not including 39 m	5 m
7	39 m up to but not including 49 m	5 m
8	49 m up to but not including 61 m	7 m
9	61 m up to but not including 76 m	7 m
10	76 m up to but not including 90 m	8 m

Table 1 Aerodrome category for rescue and fire fighting

5. EXTINGUISHING AGENTS

5.1. Both principal and complimentary extinguishing agents shall be provided at a licensed aerodrome.

Note: Description of the extinguishing agents can be found in the Airports Services Manual, Doc 9137 AN/898. Part 1. Chapter 2

5.2. The principal extinguishing agent should be:

a) Foam meeting the minimum performance level A; or
b) Foam meeting the minimum performance level B; or
c) Foam meeting the minimum performance level C; or
d) A combination of these extinguishing agents. If a combination is used, it should be of a compatible nature.

5.3. It is also recommended that aerodromes up to category 3 should preferably meet the minimum performance level B or C.

5.4. The complimentary extinguishing agent should be:

Dry chemical powders; (compatibility must be determined and ensured)

5.5. The amounts of water for foam production and the complimentary agents to be provided on the rescue and fire fighting vehicles shall be in accordance with the determined aerodrome category; except that these amounts may be modified as follows:

a) For aerodrome categories 1 and 2, up to 100% of the water requirement may be replaced by complimentary agent.
b) For aerodrome categories 3 to 10 when a foam meeting performance level A is used, up to 30% of the water used, may be replaced by complimentary agent

Note: For the purpose of agent substitution, the following equivalents shall/can be used:-

- 1 kg dry chemical powder or 2kg CO2 = 1.0 L water for production of a foam meeting performance level A.
- 1 kg dry chemical powder or 2kg C02 = 0.66 L water for production of a foam meeting performance level B.

- The amounts of water specified for foam production are predicated on an application rate of 8.2 L/min/m² for foam meeting level A, and 5.5 L/min/m² for foam meeting performance level B.

c) Discharge rate of extinguishing media shall not be less than that specified in the table above, but may exceed the minimum requirements.

Note: The quantity of foam concentrates separately provided on vehicles shall be in proportion with the water provided and the foam concentrate selected must be sufficient to produce at least two loads of foam solution.

5.6. Minimum useable amounts of extinguishing agents.

	Foam meeting performance level A		*Foam meeting performance level B*		*Foam meeting performance level C*		*Complementary agents*	
Aerodrome Category	*Water (L)*	*Discharge rate foam solution/ minute (L)*	*Water (L)*	*Discharge rate foam solution/ minute (L)*	*Water (L)*	*Discharge rate foam solution/ minute (L)*	*Dry chemical powders (kg)*	*Discharge rate (kg/sec)*
1	350	350	230	230	160	160	45	2.25
2	1 000	800	670	550	460	360	90	2.25
3	1 800	1 300	1 200	900	820	630	135	2.25
4	3 600	2 600	2 400	1 800	1 700	1 100	135	2.25
5	8 100	4 500	5 400	3 000	3 900	2 200	180	2.25
6	11 800	6 000	7 900	4 000	5 800	2 900	225	2.25
7	18 200	7 900	12 100	5 300	8 800	3 800	225	2.25
8	27 300	10 800	18 200	7 200	12 800	5 100	450	4.5
9	36 400	13 500	24 300	9 000	17 100	6 300	450	4.5
10	48 200	16 600	32 300	11 200	22 900	7 900	450	4.5

Note: Take into consideration the amount of water to fill the pump, pipes and hoses needed for fire extinguishing, this can diminish the available resources.

6. RESPONSE TIME

6.1. The operational objective of the AR&FFS should be to achieve response times of two minutes but not to exceed three minutes to the end of any runway on the aerodrome as well as any other part of the movement area, in optimum conditions of visibility and surface conditions.

Note: Response time is regarded as the time from initial call is received until the first responding vehicle arrives at the scene and is in position to discharge at least 50% of the required rate of foam production specified in the table above, onto the fire. Any other vehicles required to deliver the full compliment of required foam production must reach the scene within three minutes not more than four minutes after the initial call was received.

7. EMERGENCY ACCESS ROADS

7.1. Emergency access roads should be provided on an aerodrome where terrain conditions permit their construction, so as to facilitate achieving minimum response times. Service roads may be used for this purpose.

7.2. All emergency roads should be so surfaced as to prevent debris to be transferred onto runways and taxiways (Roads and emergency roads are being dealt within the aerodrome Construction-manual).

8. PERSONNEL

8.1. All AR&FFS personnel shall be properly trained to perform their duties in an efficient manner and shall

participate in live fire drills commensurate with the types of rescue and fire fighting equipment in use at the aerodrome, including pressure fed fuel fires.

9. PREVENTATIVE MAINTENANCE OF VEHICLES AND RESCUE EQUIPMENT

9.1. The most important aspects bearing on effective rescue in a survivable aircraft accident or incident is the training received and the effectiveness of the fire vehicles and associated rescue equipment and the speed in which personnel and equipment can be deployed, maintenance programme including preventative maintenance where appropriate, shall be established to maintain facilities in a condition which does not impair the safety, regularity or efficiency of air navigation.

9.2. A robust maintenance programme would also maximize the lifecycle of both fire vehicles and equipment, all ARFFS vehicles and rescue equipment must have regular preventive maintenance conducted on them.

10. HUMAN FACTOR PRINCIPLES

10.1. The subject Human Factors it's about people in their working and living environment, it is also about their relationship with equipment, procedures, environment and other people.

10.2. Human factors involve the overall performance of human beings with the aviation system; it seeks to optimize people's performance through the systematic application of human science.

10.3. It is essentially a multidisciplinary field including but not limited to: psychology, engineering, physiology and sociology.

10.4. Operational effectiveness and standards of ARFFS operations relies very much on teamwork, the importance of building mutual trust and team coordination among staff during training cannot be overstressed.

10.5. The design of fire stations is another important factor that could affect the human performance of ARFF personnel, ARFF services needs to be kept up-to-date with constant development and innovation of more sophisticated rescue equipment and fire vehicles.

10.6. To ensure that AFRRS personnel are able to perform their roles effectively thought needs to be put into designing an appropriate physical fitness programme and consideration must be given to individual's limitations, noisy environment and fatigue are an important factor that directly affect human performance and is greatly influenced by the shift system of fire services.

11. REQUIREMENT

11.1. During flight operations sufficient trained personnel should be detailed and be readily available to man the rescue and fire fighting vehicles and to operate the equipment at maximum capacity.

11.2. These trained personnel should be deployed in a way that ensures that minimum response times can be achieved and that continuous agent application, at the appropriate rate, can be fully maintained.

11.3. Consideration should also be given for personnel to use hand-lines, ladders and other rescue and fire fighting equipment normally associated with aircraft rescue and fire fighting operations.

11.4. To determine the number of personnel required to provide rescue and fire fighting services, the types of aircraft, most likely to make use of the aerodrome, should be taken into consideration.

11.5. All available personnel should also be equipped with proper protective clothing and respiratory equipment to enable them to perform their allocated duties in an effective way.

12. PROPOSALS FOR IMPROVEMENT OF AR&FFS TGM

NOTE: If any incorrect information is found in the AR&FFS Technical Guidance Material, or if any user is of the opinion that it could be improved at the next revision, input in that regard is welcome. Kindly complete such proposals on Form CA 139-67 Feedback Sheet for AR&FFS TGM and return it to the E: IA at the SACAA.

12.1. The following checklists have been compiled in accordance with ICAO Doc 9137-AN/898, Part 1 and Part 7

will be used during the airport inspection/ audit and can be found on the CAA website and the CAA's internal ISO Folder.

The applicable Civil Aviation Regulations are: CARS 139.02.6, 139.02 7, 139.02.21, 139.02.22, 139.02.28 and the relevant corresponding technical specifications as contained in SA-CATS-AH, Part 139.			
Form number	ICAO Chapter	Description	CAR Part
CA 139-10	Chapter 2	Checklist - ARFFS Inspection Checklist	CAR Part 139.02.14,15,16,17,18,23,25 and 26

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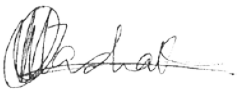	VICTRESS MASHAVA	08 JANUARY 2019
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