United Kingdom Overseas Territories Aviation Circular

OTAC 140-5

Rescue and Fire-Fighting Management of Extinguishing Agents

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GENERAL

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

PURPOSE

This OTAC provides guidance on the requirements for extinguishing agent performance and testing.

RELATED REQUIREMENTS

This Circular relates to OTAR Part 140.

CHANGE INFORMATION

General review and update of OTAR 140 references

ENQUIRIES

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

CONTENTS

1. Aerodrome Category

The level of protection to be provided at an aerodrome should be based on the dimensions of the aeroplanes using the aerodrome. The aerodrome category for RFFS should be based on the overall length of the longest aeroplanes using the aerodrome and their maximum fuselage width. The airport category should be determined from ICAO Annex 14 Tables 9-1 by:

1. evaluating their overall length and,
2. their fuselage width.

Annex 14, Chapter 9, Table 9-1 refers. Further Guidance is also available in ICAO Doc9137 Part 1, Chapter 2 (***ref OTAR 140.61***).

2. Principal Extinguishing Agent

Foam for aircraft rescue and fire-fighting is primarily intended to provide an air-excluding blanket which prevents volatile flammable vapours from mixing with air or oxygen. To perform this function foam must flow freely over the fuel surface, must resist disruption due to wind or exposure to heat of flame and should be capable of resealing any ruptures caused by the disturbance of an established blanket. Its water retention properties will determine its resistance to thermal exposure and will provide limited cooling to any elements of the aircraft structure to which it adheres.

The principal extinguishing agent is a foam meeting performance level B or C (***ref OTAR 140.151***).

It is essential when selecting a concentrate to ensure that it is suitable for use in the total system incorporated in a rescue and fire-fighting vehicle. It is also important to discuss with the manufacturer or supplier the use of a concentrate in extreme temperatures or where salt or brackish water may be used in the solution, with particular regard to the possibility of interaction between the tank structure, any surface treatment or the associated plumbing of the system (***ref ICAO Doc 9137 Part 1 Chapter 8 8.1.1(b)***).

Note: Descriptions of agents and information on the required physical properties and fire extinguishing performance criteria needed for a foam to achieve an acceptable performance level B or C rating is given in the Airport Services Manual (Doc 9137), Part 1.

3. Foam Quality

The quality of foam produced by a rescue and fire-fighting vehicle will significantly affect the control and extinguishment times of an aircraft fire. Functional fire tests are required to determine the suitability of a foam concentrate in an airport environment. Any foam concentrates to be used in aircraft rescue and fire-fighting vehicles should meet or exceed the criteria in these specifications, so as to achieve performance level B or C (***ref OTAR 140.151. ICAO Doc 9137 Part 1 Chapter 8 8.1.3***).

Where an RFFS does not have the facilities for conducting the tests which will establish the specified properties and performances, certification of the concentrate should be obtained from the manufacturer or supplier, based on local operating conditions (***ref OTAR 140-151. ICAO Doc 9137 Part 1 Chapter 8 8.1.4***).

The quality of foam produced by a vehicle system may be affected by the characteristic of the local water supply. Adjustments to the solution strength may be necessary in certain situations to achieve optimum foam quality. No corrosion inhibitors, freezing point depressants or other additives should be used in the water supply without prior consultation with, and the approval of, the foam concentrate manufacturer (***ref ICAO Doc 9137 Part 1 Chapter 8 8.1.6***).

4. Testing

The Rescue and Fire-Fighting Service should determine an appropriate period for carrying out foam tests. OTAR 140.161 sets out the requirement. However, RFFS Units should determine their own periodicity to ensure performance of both the extinguishing agent and vehicle(s) are maintained.

The following simple method provides a means by which the volumes of water and foam discharged by the foam equipment may be estimated.

The results give an indication of the RFFS category that the equipment can achieve.

Volume = Amount of water (litres) used in test
Seconds = time (seconds) to discharge amount of water (Volume) used in test

$$\frac{\text{Volume}}{\text{Seconds}} \times 60 = \text{discharge rate per minute (litres/minute)}$$

The result of this calculation can be checked against ICAO Annex 14 Volume 1 Table 9-2, against the appropriate level of foam performance [Level B column (5), Level C column (7)].

Note: OTAR 140 (140.151 (b)) mandates the use of foam of performance level B or C. This assumes the performance level of the foam has been confirmed/certificated. The second part of the calculation uses the foam proportioning percentage set in the system to estimate the volume of foam produced.

$$\text{Volume per minute} \times \%\ \text{proportion} = \text{Volume of foam (litres)}$$

By multiplying the volume per minute by the percentage proportion set for foam induction, the result estimates the volume of foam required for that percentage. This gives a guide to the minimum amount of foam concentrate required by the machine.

Again, this should be checked against the fire-fighting vehicle or vehicles' capacities to confirm adequate amounts of water and foam available for the category.

If the results are less than Table 9-2 the category must be adjust down until the capacities and flows are equal to or more than the minimums in the table.

The results should also be checked to ensure the 200% reserve requirements are achieved and maintained.

5. Complimentary agents

The discharge rate of complementary agents should be selected for optimum effectiveness of the agent.

The complementary extinguishing agent should be a dry chemical powder suitable for extinguishing hydrocarbon fires (***ref OTAR 140.151. ICAO Annex 14 Volume 1, 9.2.10***).

Note 1: When selecting dry chemical powders for use with foam, care must be exercised to ensure compatibility.

Note 2: Additional information on extinguishing agents is given in the Airport Services Manual (Doc 9137), Part 1.

The amounts of water for foam production and the complementary agents to be provided on the rescue and fire-fighting vehicles shall be in accordance with the aerodrome category, except that for aerodrome categories 1 and 2, up to 100 per cent of the water may be replaced by complementary agent, refer to Annex 14 Chapter 9 for details (***ref ICAO Annex 14 Volume 1, 9.2.11***).

6. Storage

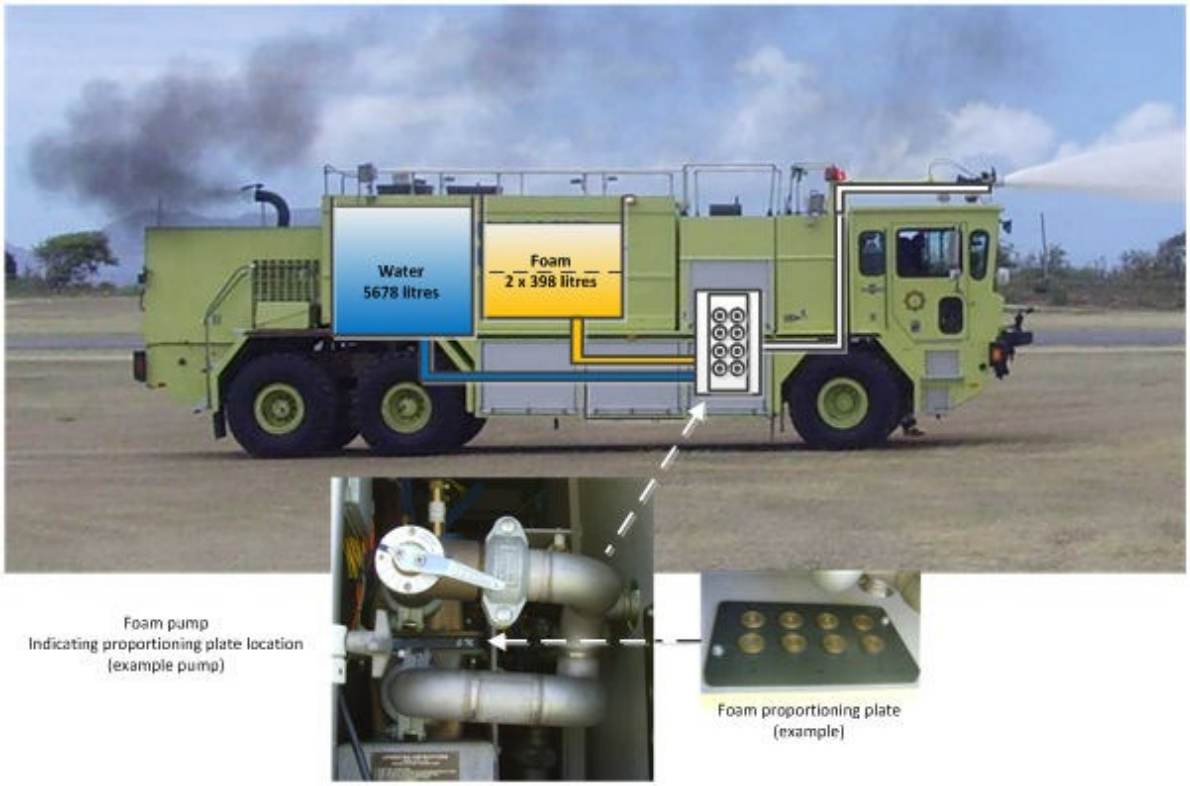
ICAO proposes that a reserve supply of foam concentrate and complementary agents must be maintained on the aerodrome, equivalent to 200% of the quantities in the vehicles. ICAO Doc 9137 suggests that this reserve shall be stored in the fire station(s). The conditions of storage are frequently specified by manufacturers or suppliers but in general terms the aim should be:

a) *Foam concentrate:*
Avoid extremes of temperature.
Use stocks in order of receipt.
Keep concentrate in manufacturer's containers until required for use. Replace and seal the caps of any partly used containers.

b) *Dry chemical powders:*
Use stocks in order of receipt.
Replace and seal the caps of any pertly used containers.

Plus any additional requirements specified by the manufacturer or supplier (***ref ICAO Doc 9137 Part 1 Chapter 8 8.3***).

7. Simple foam performance test



The following is a simple example to provide guidance for the assessment of RFFS foam delivery performance testing (refer to OTAR 140).
It must be noted that the procedure assumes foam performance Level B and 6% proportioning. Therefore, capacities and results should approximate to Annex 14, table 9-2, columns 4 and 5.
The results are approximate as this procedure uses water only and does not use foam. However, as a minimum, they should equal or exceed the figures in table 9-2 depending on the equipment capacities tested.

EXAMPLE

1. Water tank capacity **5678** litres
2. Record the time it takes to empty the water tank via the main monitor.
3. Time to discharge water tank **113.00** seconds
4. Flow rate **5678** ÷ **113.00** = **50.25** × 60
5. = **3014.9** litres/ minute
6. In this example the result is greater than 900 litres/ minute for Category 5 (table 9-2, column 5). Therefore declared Category is 5. = **CAT 5**

8. Simple foam performance test template

The following is a simple template that may help with the assessment of RFFS foam delivery performance testing (refer to OTAR 140).
It must be noted that the procedure assumes foam performance Level B proportioning. Therefore, capacities and results should approximate to Annex 14, table 9-2, columns 4 and 5.
The results are approximate as this procedure uses water only and does not use foam. However, as a minimum, they should equal or exceed the figures in table 9-2 depending on the equipment capacities tested.

1. Water tank capacity [Box 1] litres

2. Record the time it takes to empty the water tank via the main monitor.

3. Time to discharge water tank [Box 2] seconds

4. Flow rate [Box 1. number] ÷ [Box 2. number] = [ ] × 60

   = [Box 3] litres/minute

5. Compare the result of box 3 with Annex 14, Table 9-2, column 5. The result should be equal to or greater than the number in the table for the capacity of your equipment. If it is lower, the water system is non-compliant. The RFFS Category must be reduced to a table 9-2 Category below the flow rate calculated and the revised Category promulgated. **Remedial action is required**.

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a. Foam tank capacity [ ] litres — This is at least 200% (see table 1-1 column 4 below) of the requirement. Therefore, for the next calculation ½ of the total capacity is required (the result in box b).

b. Foam tank capacity [ ] ÷ 2 = [Box b] litres

c. Flow rate Record the flow rate from box 3 above. = [Box 3 number] litres/minute

d. Proportion [Box b. number] ÷ [Box 3 number] = [ ] %

e. The result in line e. should confirm the Level B proportion percentage. If the percentage figure is not as expected, the foam proportioning may be incorrect, or the foam is not Level B, or there is another problem with the foam system. **Remedial action is required.** Withdraw appliance and promulgate RFFS status/Category reduction.

Table 1-1 (Reference ICAO Annex 14, Table 9-2)

RFFS aerodrome category		Foam meeting performance level B [1]			Foam meeting performance level C [1]			Complementary Agent (kg) [3]	
Aerodrome Category	Aircraft Overall Length (m)	Water (litres)	Foam Concentrate for 2 Loads (200%) (litres)	Discharge Rate Foam Solution (litres/minute)	Water (litres)	Foam Concentrate for 2 Loads (200%) (litres)	Discharge Rate Foam Solution (litres/minute)	Dry Chemical Powder (kg)	Discharge Rate (kg/minute)
(1)	(2)	(3)	(4) [2]	(5)	(6)	(7) [2]	(8)	(9)	(10)
1	0m up to but not including 9m	230	28 [2]	230	160	19 [2]	160	45	2.25
2	9m up to but not including 12m	670	80 [2]	550	460	55 [2]	360	90	2.25
3	12m up to but not including 18m	1,200	144 [2]	900	820	98 [2]	630	135	2.25
4	18m up to but not including 24m	2,400	288 [2]	1,800	1,700	204 [2]	1,100	135	2.25
5	24m up to but not including 28m	5,400	648 [2]	3,000	3,900	468 [2]	2,200	180	2.25
6	28m up to but not including 39m	7,900	948 [2]	4,000	5,800	696 [2]	2,900	225	2.25
7	39m up to but not including 49m	12,100	1,452 [2]	5,300	8,800	1,056 [2]	3,800	225	2.25
8	49m up to but not including 61m	18,200	2,184 [2]	7,200	12,800	1,536 [2]	5,100	450	4.50

RFFS aerodrome category		Foam meeting performance level B [1]			Foam meeting performance level C [1]			Complementary Agent (kg) [3]	
Aerodrome Category	Aircraft Overall Length (m)	Water (litres)	Foam Concentrate for 2 Loads (200%) (litres)	Discharge Rate Foam Solution (litres/minute)	Water (litres)	Foam Concentrate for 2 Loads (200%) (litres)	Discharge Rate Foam Solution (litres/minute)	Dry Chemical Powder (kg)	Discharge Rate (kg/minute)
(1)	(2)	(3)	(4) [2]	(5)	(6)	(7) [2]	(8)	(9)	(10)
9	61m up to but not including 76m	24,300	2,916 [2]	9,000	17,100	2,052 [2]	6,300	450	4.50
10	76m up to but not including 90m	32,300	3,876 [2]	11,200	22,800	2,736 [2]	7,900	450	4.50

Note 1: 200% reserve of foam concentrate shall be available at the aerodrome.

Note 2: The quantities of foam concentrate in columns 4 and 7 are based on concentrates used at 6% solution strength and may be adjusted where concentrates are used that are designed for use at different strengths, eg 3%.

Note 3: 100% of complementary agents shall be available at the aerodrome. For aerodromes Category 1 and 2 up to 100% of water may be substituted with complementary agent.

[**Source: Annex 14 9.2 and CAP 168**]