

Advisory Circular

HALON REPLACEMENT FOR FIRE EXTINGUISHING AGENTS

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GENERAL

Advisory Circulars (ACs) are issued by the Director-General of Civil Aviation (DGCA) from time to time to provide practical guidance or certainty in respect of the statutory requirements for aviation safety. ACs contain information about standards, practices and procedures acceptable to CAAS. An AC may be used, in accordance with section 11 of the Air Navigation Act 1966 (ANA), to demonstrate compliance with a statutory requirement. The revision number of the AC is indicated in parenthesis in the suffix of the AC number.

PURPOSE

This AC provides guidance to demonstrate compliance with, and information related to, requirements on the replacement of halon as a fire extinguishing agent for use on aircraft. The AC also recommends the use of portable fire extinguishers with low global warming potential and zero or near-zero ozone depletion potential.

APPLICABILITY

This AC is applicable to a Singapore operator operating an aircraft in accordance with either ANR-91, ANR-125, ANR-121, ANR-135 or ANR-137.

RELATED REGULATIONS

This AC relates specifically to the requirement to carry a fire extinguisher on board an aircraft.

RELATED ADVISORY CIRCULARS

Nil.

CANCELLATION

This AC supersedes AC 91-6-2 (Rev 0). In this revision 1, amendments have been made to advise the operator to reduce the production and consumption of HFC gases, and to recommend the use of an alternative handheld extinguisher agent with low global warming potential and a near zero ozone depletion potential.

EFFECTIVE DATE

This AC is effective from 9 February 2023 .

OTHER REFERENCES

- Montreal Protocol on Substances That Deplete the Ozone Layer, 14th Edition, 2020
- Ratification of the Kigali Amendment Briefing Note, February 2017
- UNEP Halons Technical Options Committee Technical Note No. 1 – New Technology Halon Alternatives
- United States Environmental Protection Agency (EPA) Significant New Alternatives Policy (SNAP), approved listing 1 December 2016
- FAA Report No. DOT/FAA/AR-99/63
- FAA Advisory Circular AC20-42D
- FAA Report DOT/FAA/AR-01/37
- FAA Report DOT/FAA/AR-96/122

1 BACKGROUND

- 1.1 For over forty-five years, halogenated hydrocarbons (halon) have been the main fire extinguishing agents used in civil aircraft fire suppression systems. However, the halon-based extinguishing agents (halon 1211 and 1301) that are used today are ozone-depleting chemicals and contribute to climate change. With the signing of the *Montreal Protocol on Substances That Deplete the Ozone Layer (Montreal Protocol)*, the production of halon was banned on 1 January 1994 in developed States and on 1 January 2010 for all other States.
- 1.2 At its 28th meeting in Kigali, the parties to the Montreal Protocol had also reached an additional agreement to phase down the consumption and production of hydrofluorocarbons (HFCs) and adopted the Kigali Amendment in Decision XXVIII/1. The Kigali Amendment included HFC gases as controlled substances and parties are to reduce the production and consumption of HFC gases due to the concerns of global warming.
- 1.3 ICAO prohibits the use of halon as fire extinguishing agents at the lavatories and hand-held fire extinguishers on new aircraft by 31 December 2011 and 31 December 2018¹ respectively.
- 1.4 Singapore, a party to Montreal Protocol, will phase down the consumption of HFCs by 80 per cent over the next two decades to meet the obligations of the Kigali Amendment.
- 1.5 Regulation 84 of ANR-91 reflects these ICAO requirements. This AC provides guidance and recommendation for alternative fire extinguishing agents that may be acceptable by CAAS for use in Singapore-registered aircraft and aircraft operated by a Singapore operator.

2 MINIMUM PERFORMANCE STANDARDS

- 2.1 CAAS may consider an alternative fire extinguishing agent acceptable to be used in an aircraft if it meets the Minimum Performance Standards (MPS) as specified below:
 - (a) Portable Fire Extinguisher and Agents:
 - Appendix A to FAA Report DOT/FAA/AR-01/37 dated August 2002.
 - FAA Advisory Circular AC20-42D also contains information on the acceptable criteria in selecting fire extinguishers.
 - (b) Lavatory Extinguishing Systems and Agents:
 - Appendix D to FAA Report DOT/FAA/AR-96/122 dated February 1997
- 2.2 As specified in the MPS, the alternative agent must have the ability to extinguish a Class A fire and, in case of discharge, does not create an environment that exceeds the chemical agent's 'No Observable Adverse Effect Level' (NOAEL).
- 2.3 For the use of any other alternative agent that has not been specified in this AC, operators should carry out their assessment based on the MPS and make an application to CAAS for acceptance.

¹ At the 39th ICAO Assembly, the applicability date was extended as the identified halon alternatives were undergoing complex environmental approval processes.

3 OTHER ENVIRONMENTAL CONSIDERATION

- 3.1 CAAS encourages the use of environmentally friendly materials and practices. Fire extinguishing agents should preferably not lead to the depletion of ozone layer nor contribute to global warming.
- 3.2 The three alternatives to halon in FAA Advisory Circular AC20-42D are HFC-227ea, HFC-236fa and HCFC Blend B (blend of HCFC-123 and additives). Although these agents are acceptable to CAAS, they are heavier and would result in additional CO2 emissions:
 - (a) HFC-227ea and HFC-236fa have much higher global warming potential (GWP) values than halon 1211, and are also designated greenhouse gases under the Kyoto Protocol.
 - (b) HCFC Blend B is scheduled for a production and consumption phase out under the Montreal Protocol in 2030 in developing countries.
- 3.3 The International Aircraft System Fire Protection Working Group (IASFPWG) and fire extinguishing agent manufacturers have been actively developing the alternative portable fire extinguisher agent to meet the MPS. In December 2016, 2-bromo-3,3,3-trifluoro-1-propene, commonly referred to as 2-BTP, received the US EPA SNAP approval as it met the MPS. 2-BTP has low global warming potential and a near zero ozone depletion potential. Most of the recently manufactured large aeroplanes have installed portable fire extinguishers with 2-BTP agents. CAAS recommends Singapore operators to phase down the use of high GWP agents in portable fire extinguishers and switch to those using 2-BTP instead.
- 3.4 CAAS does not expect the current HFC-227ea and HFC-236fa agents for lavatory disposal receptable built-in extinguisher to phase down as there are no other alternatives at this moment. Investigation and research are undergoing to find an alternative with low global warming potential that meets the MPS.