

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 3C of the Air Navigation Act (Cap. 6) (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.

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 SAR-1.

EFFECTIVE DATE

This AC is effective from 1 October 2018.

OTHER REFERENCES

- Montreal Protocol on Substances That Deplete the Ozone Layer, 8th Edition, 2009
- UNEP Halons Technical Options Committee Technical Note No. 1 – New Technology Halon Alternatives
- FAA Report No. DOT/FAA/AR-99-6
- 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*, the production of halon was banned on 1 January 1994 in developed States and on 1 January 2010 for all other States.
- 1.2 After considering the inputs from all stakeholders including regulators, aircraft manufacturers, the International Aircraft System Fire Protection Working Group (IASFPWG) and fire extinguishing agent manufacturers, the proposal for halon replacement was adopted at the 37th ICAO Assembly. ICAO therefore mandates the prohibition of 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 2016 respectively.
- 1.3 Regulation 84 of ANR-91 reflects these ICAO requirements. This AC provides guidance 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 HFC-227ea and HFC-236fa are considered acceptable alternative fire extinguishing agents by CAAS in meeting the MPS. These are currently widely in use with large aeroplanes.
- 2.4 For the use of any alternative agent other than HFC-227ea and HFC-236fa, operators should carry out their assessment based on the MPS and make applications to CAAS for acceptance.

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 Presently all three alternatives to halon: HFC-227ea, HFC-236fa and HCFC-123 are heavier and as such would result in additional CO₂ emissions. Two of the alternatives (HFC-227ea & HFC-236fa) have much higher global warming potential (GWP) values than halon 1211, and are also designated greenhouse gases under the Kyoto Protocol. The third alternative (HCFC-123) is not permitted for use as a fire extinguishing agent under EU regulation.
- 3.3 A possible alternative agent under development is bromotrifluoropropene, or BTP. BTP is not an ozone depleting substance (under Montreal Protocol) nor a greenhouse gas (under Kyoto Protocol). Investigation and research are currently undergoing to establish BTP as a drop in replacement for halon 1211. Further testing is expected to determine whether BTP meet the MPS.

4 CONTACT PERSON AND INFORMATION

- 4.1 Should you have any queries relating to the above, please contact Head of Airworthiness Engineering Section at CAAS_AFO_Infocenter@caas.gov.sg.