



Civil Aviation Authority of Singapore

**Manual of Standards –
Aerodrome Rescue and Fire Fighting
Training**

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AMENDMENT RECORDS

The amendments listed below have been incorporated into this copy of the Document.

Amendment no.	Version no.	Subject	Source	Sections affected	Entered by (Date)	Approved by (Date)	Effective date
01	1.0	Original version	AAR	All	Bennard Yap (8 June 2012)	DGCA (13 June 2012)	13 June 2012
02	1.1	Table of Contents Foreword [Deleted] Replaced the term “Regulatory Authority” with “Authority”	AAR AAR ANO and Ministerial Directions No. 1/2016	pg i pg1, 2, 4, 5, 6, 7, 8, 9, 10 and A3-3	AAR Division (1 February 2017)	Authority (26 January 2017)	1 February 2017

DEFINITIONS and ABBREVIATIONS

Definitions

Advisory Circulars

Guidance material on the means of achieving the minimum compliance with the ANO and MOS-ARFFT

Aerodrome

A defined area on land (including any building, any installation, and equipment) used or intended to be used, either wholly or in part, for the arrival, departure and surface movement of aircraft

Aircraft

Any machine that can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface

Aircraft accident

An occurrence during the operation of an aircraft in which any person involved suffers death or serious injury or in which the aircraft receives substantial damage

Aircraft fire fighting

The control or extinguishment of fire adjacent to or involving an aircraft following ground accident/incidents

Aircraft incident

An occurrence, other than an accident, which affects or could affect the safe operation if not corrected and is associated with the operation of an aircraft

Approved training organisation

An organisation approved by a Contracting State in accordance with the requirements of Annex 1, 1.2.8.2

Facility

One or more items of equipment essential to provide a discrete technical function or amenity

Human performance

Human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations

Pressure-fed fuel fires

Fires associated with fuel discharged under very high pressure from a ruptured fuel tank

Abbreviations

AAR	Aerodrome and Air Navigation Services Regulation Division
ANO	Air Navigation Order
ARFF	Aerodrome Rescue and Fire Fighting
ARFFS	Aerodrome Rescue and Fire Fighting Services
ARFFT	Aerodrome Rescue and Fire Fighting Training
ASM	Airport Services Manual
BA	Breathing Apparatus
Doc	Document
FGC	Fire Ground Commander
ICAO	International Civil Aviation Organisation
LOA	Letter of Agreement
MOAS	Manual of Aerodrome Standards
MOS	Manual of Standards
MOU	Memorandum of Understanding
NFPA	National Fire Protection Association
QAS	Quality Assurance System

Chapter 1 Introduction

- 1.1 The Manual of Standards – Aerodrome Rescue and Fire Fighting Training (MOS-ARFFT), as referred to in the Singapore Air Navigation Order (ANO) contains the standards and requirements pertaining to the training of ARFF personnel in a certified aerodrome by an approved training organisation operating in Singapore. Readers should refer to the applicable provisions in the Singapore ANO, together with this Manual, to ascertain the requirements of, and the obligations imposed by or under, Singapore civil aviation legislation.
- 1.2 This Manual is based mainly on compliance with the following ICAO documents:
 - (a) ICAO Annex 1, Appendix 2 – Approved training organisation
 - (b) ICAO Annex 14 Volume I, Attachment A, Section 17 – Rescue and fire fighting services
 - (c) Airport Services Manual, Part 1 – Rescue and fire fighting
- 1.3 Where there is a difference between a standard in this Manual and that of the above-mentioned ICAO documents, the standard in this Manual shall prevail.
- 1.4 In this Manual, standards are preceded by the word “shall”, whereas recommended practices are preceded by the word “should”. An approved training organisation shall comply with all standards at all times and should endeavour to comply with all recommended practices.
- 1.5 From time to time, the Authority may wish to supplement the standards and recommended practices in this Manual in the form of Advisory Circulars. Where appropriate, such publications or circulars will be incorporated into this Manual by amendment.
- 1.6 The issuance of an approval for a training organisation and the continued validity of the approval shall depend upon the training organisation being in compliance with the requirements of this manual.

- 1.7 The approval document shall contain at least the following:
- (a) organisation's name and location;
 - (b) date of issue and period of validity (where appropriate); and
 - (c) terms of approval.
- 1.8 Should the approved training organisation be unable to meet any of the requirements spelt out in the MOS-ARFFT, a written notification has to be given to the Authority stating the reasons for not meeting the particular requirement along with its mitigating measures. The Authority will then decide if an exemption for that particular requirement should be granted for a period of time.
- 1.9 The following chapters contain requirements for a training organisation to be approved by the Authority.

Chapter 2 Application for the Approval of ARFF Training Organisation

- 2.1 An application for the grant of an ARFF training organisation approval shall include:
- (a) an application form (Attachment A) duly completed and signed by the person responsible for the organisation or a nominated accountable manager;
 - (b) a copy of the training and procedures manual; and
 - (c) a copy of relevant standard operating procedures in support of the training and procedures manual, if applicable.
- 2.2 The contents of the manuals and the course materials shall meet the requirements specified in the MOS-ARFFT.
- 2.3 To be approved as an ARFF training organisation, the applicant must provide details of:
- (a) a training course that achieves the requirements of this document;
 - (b) other relevant training courses/modules may be outsourced to a third party who is able to fulfil the requirements as specified by the training organisation;
 - (c) training facilities/training aids leased from a third party may be signed by MOU/LOA;
 - (d) qualified training staff;
 - (e) learning outcomes and testing processes;
 - (f) registration of certificates issued; and
 - (g) qualified assessors and validators.
- 2.4 Significant and continual non-compliance will result in the approval being suspended or revoked.

Chapter 3 Training and Procedures Manual

- 3.1 The training organisation shall provide a training and procedures manual for the use and guidance of personnel concerned. This manual may be issued in separate parts and shall contain at least the following information:
- (a) a general description of the scope of training authorised under the organisation's terms of approval;
 - (b) the content of the training programmes offered including the courseware and equipment to be used, for compliance with the requirements in Appendix 1 to 4;
 - (c) a description of the organisation's quality assurance system in accordance with Section 3.5;
 - (d) a description of the organisation's facilities, in particular training simulators for compliance with the requirements in Appendix 5;
 - (e) the name, duties and qualification of the person designated as responsible for compliance with the requirements of the approval in Section 6.1;
 - (f) a description of the duties and qualification of the personnel designated as responsible for planning, performing and supervising the training in Section 6.2;
 - (g) a description of the procedures used to establish and maintain the competence of instructional personnel as required by Section 6.3;
 - (h) a description of the method used for the completion and retention of the training records required by Chapter 7;
 - (i) a description, when applicable, of additional training needed to comply with an operator's procedures and requirements;
 - (j) a description of the standard operating procedure (SOP) for safety when training is conducted;
 - (k) a description of the selection, role and duties of the authorised personnel to conduct the testing requirements approved by the Authority; and
 - (l) an organisational structure chart of the training organisation

- 3.2 The training organisation shall ensure that the training and procedures manual is amended as necessary to keep the information contained therein up to date. Details of any course variation shall be provided to the Authority prior to implementation. All changes incorporated and the reasons for them shall be recorded and kept by the training organisation so that the history of its development could be traced.
- 3.3 Copies of all amendments to the training and procedures manual shall be furnished promptly to all organisations or persons to whom the manual has been issued.
- 3.4 The training organisation shall establish a quality assurance system, acceptable to the Authority granting the approval, which ensures that training and instructional practices comply with all relevant requirements.

Chapter 4 Training Courses

- 4.1 Three types of courses shall incorporate the course syllabus established by the Authority. They are namely:
- (a) Basic Firemanship Training
 - (b) Intermediate Firemanship Training
 - (c) Advanced Firemanship Training.
- 4.2 The Basic Firemanship Training course is designed to equip entry level of ARFF personnel with the necessary knowledge and skills to perform their tasks. Majority of the training will be devoted to practical exercises involving pressure-fed fuel fires to give ARFF personnel adequate exposure related to aircraft fire fighting.
- 4.3 The Intermediate Firemanship Training course is designed to equip experienced ARFF personnel with the theory, principles and practice of fire station management, tactical fire-fighting involving various emergencies and fireground command to prepare them for their roles as airport fire officers. Majority of the training will be devoted to practical exercises.
- 4.4 The Advanced Firemanship Training course is designed to equip senior fire officers with the theory, principles and practice of fire station management, facilities and fire safety planning, as well as command and control at aircraft crash site to prepare them for their roles as senior fire officers.
- 4.5 Particular attention is paid on these three courses as they cover the entry level training as well as leadership training for ARFF personnel. The operator of a certified aerodrome in Singapore is required to send all their new ARFF personnel to be trained in basic firemanship at a training organisation approved by the Authority. Personnel performing supervisory roles shall also be sent to a training organisation approved by the Authority for the appropriate leadership courses depending on their types of responsibilities.
- 4.6 The guidelines for the course syllabus are provided in Appendices 1 to 3.

Chapter 5 Facilities

- 5.1 The training organisation shall provide facilities and working environment appropriate for the task to be performed and be approved by the Authority.
- 5.2 The training organisation shall have, or have access to, the necessary information, equipment, training devices and materials to conduct the courses for which it is approved.
- 5.3 The training organisation shall have, or have an agreement with a third party to obtain access to the essential facilities specified in Appendix 5.

Chapter 6 Personnel

- 6.1 The training organisation shall nominate a person responsible for ensuring that it is in compliance with the requirements for an approved organisation. This person shall be sufficiently senior and should have authority to ensure that there are adequate resources to finance the operation of the training organisation.
- 6.2 The organisation shall employ the necessary personnel to plan, perform and supervise the training to be conducted.
- 6.3 The training organisation shall ensure that all instructional personnel have the necessary experience and qualifications appropriate for their job scope. They shall at least meet the minimum standards as specified in Appendix 6.
- 6.4 The training organisation shall ensure that all instructional personnel receive initial and continuation training appropriate to their assigned tasks and responsibilities. The instructors must complete the relevant training programme and shall be assessed as competent to conduct classroom lessons, practical simulator training and assessment of student competence. The training programme established by the training organisation shall also include training in knowledge and skills related to human performance including team coordination which can be found in the Human Factors Training Manual under ICAO Doc 9683.

Chapter 7 Records

- 7.1 The training organisation shall retain detailed student records to show that all requirements of the training course have been met as agreed by the Authority.
- 7.2 The training organisation shall maintain a system for recording the qualifications and training of instructional and examining staff, where appropriate.
- 7.3 Records from conducting the various ARFF training courses shall be documented and retained by the training organisation. Changes made to the training courses as a result of course reviews shall also be appropriately documented, together with the reasons for making them. These changes shall be recorded in the course records or course design documents. Such records shall be made available to the Authority upon request during an audit or inspection.
- 7.4 The records required by Section 7.1 shall be kept for a minimum period of two years after completion of the training. The records required by Section 7.2 shall be retained for a minimum period of two years after the instructor or examiner ceases to perform a function for the training organisation.

Chapter 8 Evaluation and Checking

- 8.1 When an approved training organisation conducts testing required for the issuance of a certificate, the testing shall be conducted by personnel designated by the training organisation in accordance with criteria approved by the Authority.

- 8.2 Assessment tests of theory and practical modules related to the courses specified in Appendix 1 to 3 shall be in accordance with procedures and to a standard acceptable to the Authority. Annual audits will be conducted by the Authority to ensure this.

APPENDIX 1

BASIC FIREMANSHIP TRAINING

1 GENERAL

- 1.1 Personnel whose duties consist solely of the provision of rescue and fire fighting services for aircraft operations are infrequently called upon to face a serious situation involving life saving at a major aircraft fire. Therefore, in order to assure that both personnel and equipment will be fit to deal with a major aircraft fire when the necessity arises, a most carefully planned and rigorously followed training programme is required. The entire training programme must 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 that is not only insufficient but may be dangerous to those who are in need of aid and also to the personnel who are providing such aid. The required course syllabus are listed in paragraph 2.

2 COURSE SYLLABUS

- 2.1 Basic Firemanship Training programme shall be designed to equip entry level of airport fire fighters with the necessary knowledge and skills to perform their tasks. Majority of the training must be devoted to practical exercises involving pressure-fed fuel fires to give fire fighters adequate exposure related to aircraft fire fighting. The Basic Firemanship Training programme of airport fire fighter course shall include at least the following areas:

2.1.1 Rescue and Fire Fighting Personnel Safety

- 2.1.1.1 Fire fighters should also possess basic knowledge of fire chemistry, smoke hazards and various safety precautions. The training course should also contain hazards of helicopters and military aircraft.

2.1.2 Emergency Communications Systems

- 2.1.2.1 Knowledge of operating radio communication equipment, proper procedures of radiotelephony communications and basic hand signals is essential to fire fighters in their operations.

2.1.3 Handling of Equipment

2.1.3.1 All fire fighters must be trained in the use of fire hoses, nozzles, turrets and other appliances required for compliance with Annex 14, Volume I, Chapter 9, 9.2. All fire fighters must also be trained in the operation and maintenance of the range of basic rescue equipment listed in Appendix 4. They must be capable of handling their equipment, not only under drill ground conditions, but also in rapidly changing conditions. The aim is to ensure that every individual is so well versed in the handling of all types of equipment that he can perform automatically under stress conditions.

2.1.4 Application of Extinguishing Agents

2.1.4.1 It is essential to acquire a thorough knowledge of the extinguishing agents employed in aircraft fire fighting. In particular, fire fighters shall be trained in the application of all the types of extinguishing agents required for compliance with Annex 14, Volume I, Chapter 9, 9.2.

2.1.5 Emergency Aircraft Evacuation

2.1.5.1 The training programme will need to provide instructions on aircraft evacuation procedures for different situations so that fire fighters can assist to evacuate occupants in the shortest time possible in the event of an aircraft accident or incident.

2.1.6 Fire Fighting Operations

2.1.6.1 All fire fighters must have a general knowledge of the causes of fire, factors contributing to its spread and the principles of fire extinction. They should also possess knowledge of fire prevention. All fire fighters are required to be trained in combating various types of fires:

- a) aircraft fires;
 - 1) engine fire
 - 2) internal fire
 - 3) fuel line fire
 - 4) helicopter fire
- b) building fire;
- c) liquefied petroleum gas fire; and

- d) bulk fuel fire.

2.1.7 Adaptation and Use of Structural Rescue and Fire Fighting Equipment for Aircraft Rescue and Fire Fighting

- 2.1.7.1 All fire fighters must be conversant with the proper usage and operation of various types of specialized rescue tools and fire fighting equipment for structural and aircraft rescue and fire fighting purposes.

2.1.8 Dangerous goods

- 2.1.8.1 All fire fighters may be called upon to respond to an incident or accident involving hazardous materials. As such, they will require basic knowledge on detection methods and containment measures.

2.1.9 Familiarisation with Fire Fighters' Duties under the Aerodrome Emergency Plan

- 2.1.9.1 Under the Aerodrome Emergency Plan, fire fighters are assigned to perform specific roles and responsibilities such as rescue operation, fire fighting, emergency medical care, casualty evacuation, ambulance service and logistics support in an aircraft accident or incident.

2.1.10 Protective Clothing and Respiratory Protection

- 2.1.10.1 All fire fighters may be called upon to effect a rescue from an aircraft cabin in conditions of great stress working in an atmosphere heavily laden with smoke and fumes. As such, they must be carefully trained to use self-contained breathing apparatus. Simulators to train fire fighters to operate in such environments will be necessary.

2.1.11 Medical First Aid and Casualty Handling

- 2.1.11.1 Every fire fighter of the rescue team shall be trained in first aid so that they can provide medical assistance when necessary and casualties are intelligently handled so as to avoid the infliction of additional suffering and/or injury in the removal of occupants in an aircraft accident or incident.

2.1.12 Search and Rescue

- 2.1.12.1 The training programme shall provide instruction in search procedures, not only in the enclosed spaces of an aircraft but also for procedures for systematic searching of the area in the immediate vicinity of an aircraft accident and also in the path of the aircraft.
- 2.1.12.2 Rescue operations should be accomplished through regular doors and hatches wherever possible but fire fighters must be trained in forcible entry procedures with the necessary tools.

2.1.13 Care of Equipment

- 2.1.13.1 A thorough knowledge of all equipment is essential in order to ensure its correct handling and to ensure thorough maintenance which is essential to guarantee operational efficiency under all circumstances. It is vitally important that every fire fighter be satisfied that any piece of equipment which may be used will work properly and in the case if ancillary equipment, that it is in its correct stowage position.

3 ON-JOB TRAINING

- 3.1 Personnel who have completed the Basic Firemanship Training shall receive the following on-job training in the fire station they are posted to:

3.1.1 Airport Familiarization

- 3.1.1.1 A thorough knowledge of the airport and its immediate vicinity is essential. The training shall encompass those areas of operation dealing with:
- a) thorough familiarisation of the movement area so that fire fighters can demonstrate their ability to:
 - 1) select the best routes to any point on the airport;
 - 2) select alternative routes to any point on the movement area when normal routes are blocked;
 - 3) recognize landmarks which may be indistinctly seen;
 - 4) use detailed grid maps as an aid to respond to an aircraft accident or incident; and
 - 5) recognize airport signs, marking and lighting.

- b) the use of guidance equipment when it is available. Air traffic control may be of assistance in providing information on the location of the accident site and position of other aircraft or vehicles on the airport which may obstruct or impair vehicular movement.

3.1.2 Aircraft Familiarization

3.1.2.1 It is essential that all fire fighters have an intimate knowledge of all types of aircraft using the airport. Information about the following design features is of special importance to fire fighters to ensure effective use of their equipment:

- a) location and operation of normal and emergency exits;
- b) seating configuration;
- c) type of fuel and location of fuel tanks;
- d) location of batteries; and
- e) position of break-in points on the aircraft.

APPENDIX 2

INTERMEDIATE FIREMANSHIP TRAINING

1 COURSE SYLLABUS

1.1 Intermediate Firemanship Training programme should be designed to equip experienced airport fire fighters with the theory, principles and practice of fire station management, tactical fire-fighting involving various emergencies and fire-ground command to prepare them for their roles as airport fire officers. Majority of the training should be devoted to practical exercises. The Intermediate Firemanship Training programme should include at least the following areas:

1.1.1 Proficiency Test and Rating System

1.1.1.1 This lesson provides general guidelines on the subjects to be covered in the operational rating system. It is also a reference for organizing and standardizing the proficiency rating and revalidation system to maintain the proficiency standards of all airport fire-fighters. The documentation and proficiency rating records to facilitate audit checks will be discussed.

1.1.2 Critical Area Concept and Response Time

1.1.2.1 The training programme shall enable participants to determine the theoretical and practical critical area for a given aircraft type and calculate the quantity of water to be provided at an aerodrome. They will also need to be able to calculate response time based on certain assumptions and recognize factors affecting response time.

1.1.3 Aircraft Internal Fire (Passenger and Freighter Aircraft)

1.1.3.1 Participants shall acquire a thorough knowledge on aircraft internal fire. They shall be able to explain differences between post crash fires and in-flight fires, know the types of cabin furnishings and toxic gases produced. The participants must also know the causes of internal fires, flashover and backdraft. The training programme shall also include rescue and fire-fighting procedures during an aircraft internal fire.

1.1.4 Breathing Apparatus Application

- 1.1.4.1 Fire fighters may be called upon to effect a rescue from an aircraft cabin in conditions of great stress working in an atmosphere heavily laden with smoke and fumes. As such, they must be carefully trained to use self-contained breathing apparatus. Simulators to train personnel to operate in such environments will be necessary.

1.1.5 Fireground Control at Crash Site

- 1.1.5.1 It is important that the fireground be managed by using all resources of men, equipment, water supply and associated agencies. Being capable of assimilating all available Information about the actual scene is paramount to safe action. The training programme shall equip participants with the necessary skills to undertake the position of Office-in-Charge during an emergency. They shall be taught on the various types of stand-by positions taken by the ARFFS for various declared aircraft emergencies and be able to explain the overall strategy of Fireground Leadership during aircraft fire fighting and rescue operations. The course shall also include Airport Emergency Planning.

1.1.6 Rescue and Fire Fighting Equipment

- 1.1.6.1 ICAO requires States to provide rescue and fire fighting equipment and services at an airport. Participants shall be able to determine the quantity and types of equipment to be carried on fire vehicle(s) and recommend suitable personal protective equipment for rescue and fire fighting operations.

1.1.7 Airport Water Supply

- 1.1.7.1 The training programme shall provide a basic guidance in master planning and overall water supply system for airport fire protection, taking into consideration domestic water usage where a combined fire protection and domestic water system is utilised.
- 1.1.7.2 It will also include basic selection criteria for water supply source and standards for a water distribution system designed to support aircraft and fire-fighting operations in airports.

1.1.8 Airport Categorization and Levels of Protection

- 1.1.8.1 Participants shall be able to determine the airport category of an aerodrome and understand the level of protection to be provided. They

shall also be able to state the minimum quantities of water, level A and B foams and other complementary extinguishing agents required for protection. The participants shall be taught the basic need and number of vehicles required at an airport to effectively deliver and deploy the agents specified for the airport category.

1.1.9 Leadership in the Fire Service

1.1.9.1 As the fire service evolves and becomes an increasingly diverse and dynamic industry, the need for competent leadership also grows. The training programme shall include the three theories of leadership and the relationship between leadership style and the decision making process.

1.1.10 Building Fire-Fighting and Rescue

1.1.10.1 The training programme shall include the significance and importance of the various basic divisions of fire-fighting strategy. The participants shall be able to demonstrate effective execution on fire fighting tactics and techniques in combating building fires.

1.1.11 Fireground Hydraulics

1.1.11.1 Hydraulics is a critical element in fire fighting. As soon as movement of water through a hose line is attempted, knowledge of hydraulics is required. The training programme shall include the principles, variables and calculations concerned with the practical application of water as utilised in the fire service. An overview of fire characteristics, properties of water, apparatus and appliances, fire streams and hydraulic calculations shall be addressed to establish a functional understanding of fireground hydraulics.

1.1.12 Fire Pumps and Primers

1.1.12.1 Water-based fire-suppression systems rely on an adequate water supply for proper operation, and fire pumps are often required to increase available water pressure. Training must be given to equip personnel with the necessary knowledge to understand and effectively operate the pumps.

1.1.13 Handling of Uncommon Emergencies

1.1.13.1 Fire fighters may be called upon to respond to an incident or accident involving hazardous materials. The training programme shall provide

instructions on operational procedures and tactical concepts of water rescue operations for aircraft accidents in the water. Participants shall also be informed about the types of radio-active materials, radio-active hazards and the strategic procedures of combating an aircraft fire involving radio-active materials.

1.1.14 Foaming Agents

- 1.1.14.1 A major aircraft accident typically involves a fuel-spill fire and the main extinguishing agent is foam. Existing regulations require that significant quantities of a foam/water agent be available to support aircraft fire fighting and rescue operations. Training shall be given to participants to enable them to understand the type of foams used in relation to aircraft fire fighting.

1.1.15 Communication Procedures and System

- 1.1.15.1 Knowledge of operating radio communication equipment, proper procedures of radiotelephony communications and basic hand signals is essential to fire fighters in their operations. Participants shall be trained to have a thorough knowledge in radiotelephony procedures.

1.1.16 Fire in Aircraft Hangars

- 1.1.16.1 The extremely high value of aircraft, hangars, and their ancillary facilities requires the thoughtful application of knowledge of the hazards involved. The training programme shall present to the participants the various hazards, restriction of movement, needs for evacuation, structural vulnerability and various other factors to be considered when dealing with such fires.

1.1.17 Post Crash Incident Report

- 1.1.17.1 Participants shall be taught on how to write reports based on the NFPA accident/incident format using standardized words to give relevant information to improve methods of saving lives.

1.1.18 Techniques of Instruction

- 1.1.18.1 An airport fire officer may be tasked to conduct lessons or give presentations to fellow fire fighting personnel. The training programme shall equip the officer with the necessary skills.

1.1.19 Principles of Supervision

- 1.1.19.1 An airport fire officer will need to exercise direct supervision over assigned staff. Training must be able to cover this aspect as well.

1.1.20 Fire Prevention Inspection

- 1.1.20.1 Participants shall be taught on the objectives of fire prevention and the fire protection system to prevent fire from spreading and further endangering life and property.

1.1.21 Aircraft Involved in Unlawful Act

- 1.1.21.1 The training programme shall examine the risks involved and the ways to deal with a situation where an aircraft is subjected to unlawful interference namely hijack bomb threat and chemical/biological sabotage.

1.1.22 Smoke Hazards

- 1.1.22.1 The training programme shall cover hazards of gases and smoke. It will also cover the 3 phases of fire, procedures when working in smoke-filled atmosphere and case studies of aircraft incidents with smoke impact.

APPENDIX 3

ADVANCED FIREMANSHIP TRAINING

1 COURSE SYLLABUS

1.1 Advanced Firemanship Training programme should be designed to equip senior fire officers with the theory, principles and practice of fire station management, facilities and fire safety planning, as well as command and control at aircraft crash site to prepare them for their roles as senior fire officers. The Advanced Firemanship Training programme should include at least the following areas:

1.1.1 Aerodrome Safety Management System

1.1.1.1 Related closely to safety policy (and safety culture) is how an organisation sets its objectives. Clearly stated objectives can lead to a commitment to action that will enhance the safety of the organisation. In some organisation no explicit safety objectives are stated. A few exceptional organisations set their objectives formally, clearly enunciating their vision, defining desired outcomes, spelling out the attainable steps for meeting the objectives, and documenting the process. They have agreed to relevant safety indicators and have adopted realistic safety targets.

1.1.2 Airport Fire Safety

1.1.2.1 The key to successful fire safety is not just airport fire and rescue services, but a holistic approach to the whole airport environment. Participants shall be taught on fire safety measures for airport terminal buildings and hangars. Fire prevention and fire safety practices in airports shall also need to be covered. The course shall equip participants with the knowledge to advise on the formation of emergency control organisations.

1.1.3 ARFF Vehicles' Standards

1.1.3.1 The ability to respond to airport emergencies with adequate and appropriate equipment is paramount to ARFF personnel. The course shall enable participants to:

- a) State ICAO requirements on ARFF vehicles;
- b) Stipulate requirements of ARFF vehicles for an airport;

- c) Select from options available for ARFF vehicles; and
- d) Specify the performance of ARFF vehicles for the purpose of procurement.

1.1.3.2 Participants should be informed on the latest technology and advanced ARFF vehicles that are used in major airports around the world.

1.1.4 Budgeting in Airport Fire Service

1.1.4.1 Estimates of expenditure are a projection of the fiscal records of a particular department to operate off efficiently. Participants shall at least appreciate the need for budgeting and be able to differentiate between the two estimates submissions.

1.1.4.2 The course should briefly cover the various headings for budgetary allocations of the Singapore Airport Emergency Services.

1.1.5 Design and Siting of Airport Fire Station

1.1.5.1 The primary focus of airport fire station design is to provide rapid response for fire fighters and vehicles responding to an alert. Station configuration should incorporate maximum views of the airfield and direct access from the apparatus bays to the road and runway system. The training programme shall provide standards and guidance for planning, siting, designing and construction of airport fire stations.

1.1.6 Emergency On-line Communication System

1.1.6.1 Each level of the fire ground organisation has a different need and capability to communicate. Those differences will necessarily affect the entire communications process as fire operations continue. The Fire Ground Commander (FGC) is on the command level and deals with decisions making, assignments, coordination, revision and control as he determines the overall strategy and manages the attack plan.

1.1.7 Fire Precaution in Buildings

1.1.7.1 Fire precautions are the measures taken and the fire protection provided in a building or other fire risk to minimize the risk to the occupants, contents and structure from an outbreak of fire. The advanced firemanship course shall include the aims for taking fire precautions in buildings and the concepts in building construction relevant to fire precaution.

1.1.8 Fire Service Administration

- 1.1.8.1 Participants shall be taught on the managerial role of a senior fire officer and the seven basic functions of management in the fire service. They shall be able to distinguish between management and leadership.

1.1.9 Fire Vehicle Performance Test

- 1.1.9.1 The training programme shall cover the standard for aircraft fire vehicle six-monthly performance test in accordance to FAA 150/5220-10B, Guide specification for water/foam aircraft rescue and fire fighting vehicles, 10/20/97.

1.1.10 Hangar Fire Protection

- 1.1.10.1 The extremely high value of aircraft, hangars, and their ancillary facilities requires the thoughtful application of knowledge of the hazards involved. Participants shall be taught on fire protection recommended for aircraft hangars.

1.1.11 Hazards of Aircraft Fuelling Operations

- 1.1.11.1 The airport authority, the aircraft operator and the fuel supplier each has responsibilities in respect of the safety measures to be taken during fuelling operations. Training must be able to cover this aspect.

1.1.12 Airport Services Manual

- 1.1.12.1 The training programme shall cover parts of Airport Services Manual that are related to aerodrome rescue and fire fighting.

1.1.13 Mass Casualty Evacuation

- 1.1.13.1 A mass casualty incident would significantly stress airport resources and would require fatality management capabilities and a surge in EMS and hospital response. The training programme shall equip participants with the skills and knowledge to manage this.

1.1.14 Planning and Development of ARFFS

- 1.1.14.1 Senior Fire Officers will likely be involved in master planning for their ARFFS. As such, the course shall be able to cover this.

1.1.15 Training and Proficiency Test

- 1.1.15.1 One of the objectives of the course is to ensure that Senior Fire Officers are conversant with the basic and specialist training required for ARFFS personnel to deal with aircraft emergencies.

1.1.16 Water Rescue Plan

- 1.1.16.1 The course shall include basic planning procedures, facilities and equipment to effectively perform rescue operations when an aircraft crashes into a body of water, swamp, or tidal area where normal ARFFS vehicles are unable to reach the accident scene.

1.1.17 Equipment Specification and Evaluation

- 1.1.17.1 Specifying and purchasing fire fighting equipment can be a difficult exercise for officers who are unfamiliar with the procedures involved. Many purchasers rely solely on the advice and guidance of the salesperson. This can add to the apprehension and anxiety of the officer who is tasked to obtain the required equipment at a reasonable price. The course shall impart adequate information and guidance materials to the participants on equipment specification.

APPENDIX 4

EQUIPMENT FOR RESCUE OPERATIONS

1. EQUIPMENT LIST

1.1 A general knowledge of all equipment is essential in order to ensure its correct handling and to ensure thorough maintenance which is essential to guarantee operational efficiency under all circumstances. All fire fighters must be trained in the operation and maintenance of the range of basic rescue equipment:

- 1) Lighting equipment
- 2) Power operated tools
- 3) Hand tools
- 4) Forcing equipment
- 5) Respiratory protection
- 6) Communications equipment
- 7) Equipment capable of delivering water spray with aircraft fuselages
- 8) Equipment capable of delivering a fresh air supply, probably by means of a powered-fan unit and incorporating trunking to suit aircraft delivery purposes
- 9) Medical first aid equipment

APPENDIX 5

TRAINING SIMULATORS

1. ESSENTIAL TRAINING SIMULATORS

- 1.1 A proper range of training simulators is critical to equip fire fighters with the necessary skills to perform their tasks. Improper training or lack of simulators may not only impede their performance but be dangerous to themselves and people involved in the accident or incident.
- 1.2 The training organisation shall have or an agreement with a third party who has the following essential simulators:
- a) Breathing apparatus simulator
 - b) Military aircraft fire simulator
 - c) Civil aircraft fire simulator
 - d) Fire pits/trays
 - e) Flashover simulator
 - f) Confined space simulator
- 1.3 A simulated aircraft fire must include a pit fire or a fire with an aircraft mock-up or similar device using enough fuel to provide a fire intensity which simulates realistic fire fighting conditions.
- 1.4 At times when a simulator or other fire fighting training facilities is unserviceable, the training organisation needs to ensure that it is rectified as soon as possible, and in the meantime, source for an alternative or replacement to ensure that training provided by the organisation will not be affected and thus standards will not be compromised.

APPENDIX 6

TRAINING INSTRUCTORS

1. CRITERIA FOR TRAINING INSTRUCTORS

- 1.1 It is imperative that the instructors are able to accommodate a broad range of training needs. Besides good knowledge of ICAO Standards and Recommended Practices, instructors must be able to meet a set of entry requirements.
- 1.2 The following set of requirements applies to instructors providing training for Basic Firemanship Training and Intermediate Firemanship Training:
- a) must have a minimum of 5 years' experience with an ARFF service provider;
 - b) leadership exposure in operations with an ARFF service provider;
 - c) pass the Intermediate Firemanship Training course;
 - d) pass the Breathing Apparatus Operations Training Course;
 - e) must possess relevant instructional techniques;
 - f) must possess effective communication skills;
 - g) must be able to conduct theoretical and practical assessments;
and
 - h) must possess a valid Medical First Aid certification.
- 1.3 As for instructors providing training for the Advanced Firemanship Training course, he shall, in addition to the set of requirements listed above, pass the Advanced Firemanship Training course.

ATTACHMENT A



APPLICATION FORM APPLICATION FOR APPROVAL AS AN ARFF TRAINING ORGANISATION

(Please tick ✓ as appropriate)

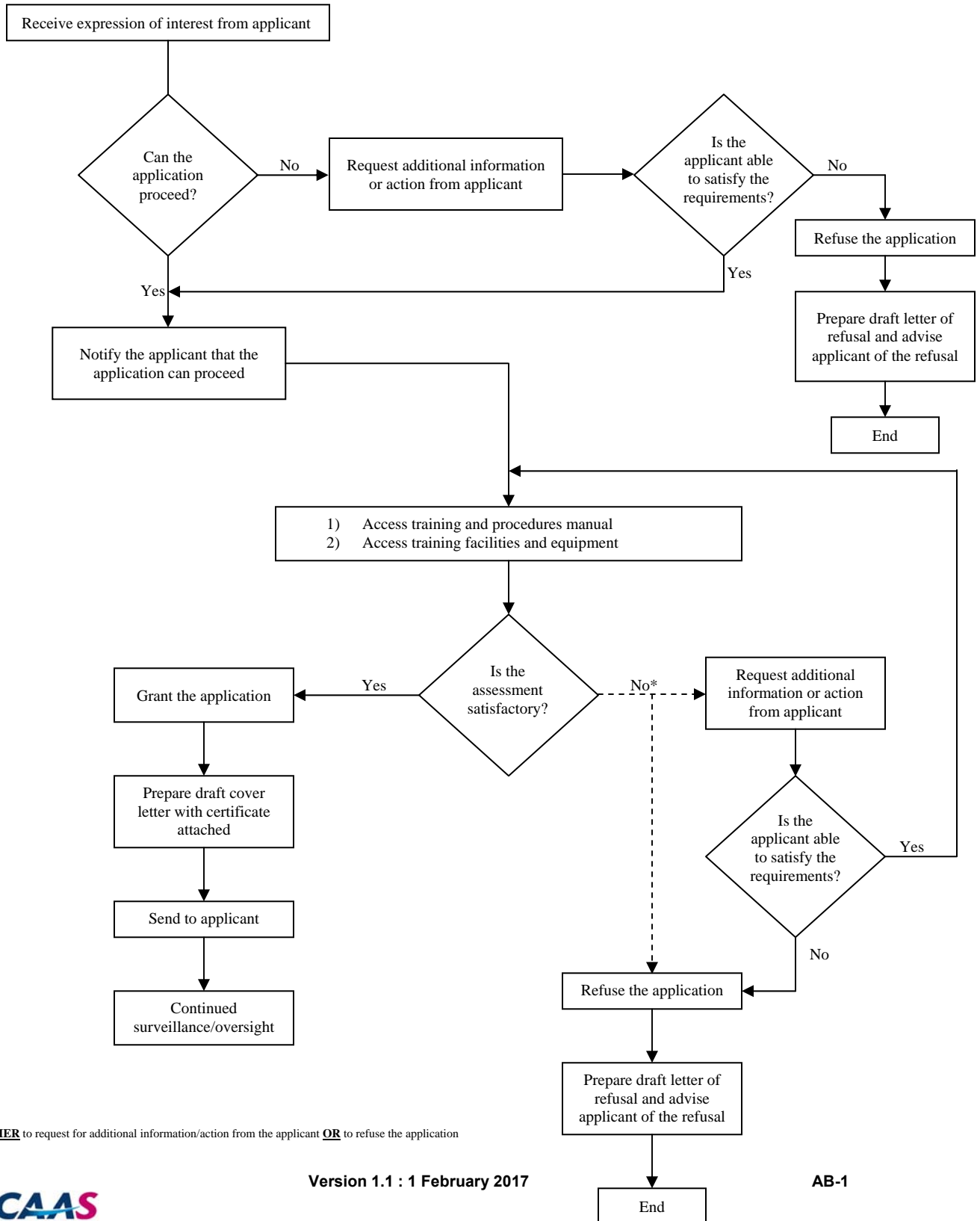
Initial Issue Renewal

This form will take about 5 minutes to complete


Basic Particulars			
Name of Organisation :			
Address of Organisation :			
Full Name of Accountable Manager :	Email	:	
	Tel No.	:	
	Fax No.	:	
Please indicate any documents, training courses, programmes, syllabi, instructional methods, simulators, facilities, etc. for seeking approval of ARFF Training Organisation. (If insufficient space, please attach a separate list).			
Submission Instructions			
This form is to be completed and submitted with the Training and Procedures Manual as required by the Manual of Standards – ARFF Training. The completed form and manual should be forwarded to the following address:			
Director (Aerodrome and ANS Regulation) Civil Aviation Authority of Singapore P. O. Box 1, Singapore Changi Airport 918141			
Any enquiry regarding approval of ARFF training organisation should be sent to the above address.			
Declaration			
I declare that the above particulars and all documents submitted in support of this application are true in every respect.			
_____ Name & Designation of Applicant		_____ Signature & Date	

ATTACHMENT B

FLOWCHART FOR APPROVAL PROCESS



***EITHER** to request for additional information/action from the applicant **OR** to refuse the application

Grant of an Aerodrome Rescue and Fire Fighting Training Organisation Certificate	 <small>Civil Aviation Authority of Singapore</small>
<p>AA/ADM/ARFF</p> <p>{dd/mm/yyyy}</p> <p>{Applicant's name} {Training Organisation's Name} {Training Organisation's Address}</p> <p>Dear Sir/Madam,</p> <p><u>Subject: Issue of certificate to operate {name of} ARFF training organisation</u></p> <p>I refer to your letter dated {dd/mm/yyyy} and your application for a certificate to operate {name of} ARFF Training Organisation. Your application has been approved and ARFF Training Organisation Certificate, number {FTxxx} is enclosed.</p> <p>Your training organisation will now/continue to* be subjected to regular routine surveillance by officers of the AAR under requirements expressed in Manual of Standards for ARFF Training.</p> <p>This safety oversight function and any day-to-day matter in relation to your training organisation will normally be performed by officers of the AAR.</p> <p>Please contact me if you have any queries regarding this certificate or any other ARFF training related matters.</p> <p>Yours Sincerely,</p> <p>{Signature}</p> <p>{Name} {Designation} Aerodrome and Air Navigation Services Regulation Division CIVIL AVIATION AUTHORITY OF SINGAPORE</p>	

*To be deleted accordingly