Civil Aviation Authority of Nepal

Airport Rescue and Fire Fighting Services Manual

First Edition – 2012 (2069 B.S)

Approved by:

Director General
Civil Aviation Authority of Nepal

Airport Rescue and Fire Fighting Services Manual

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Record of Amendment

No. of Amendment	Details of Amendment	Date of Amendment	Entered by Name/Sig	Date entered	Remarks

Forewords

Nepal as a contracting state of International Civil Aviation Organization – ICAO since 1960, has made all possible efforts to protect safety of passengers, crew, aircraft, ground staff, buildings, airport and air navigation facilities and general public as well. Despite of these efforts, possibilities of emergency situation cannot be ignored. In such emergency situation particularly in situations where fire is involved either in aircraft or buildings, infrastructures or equipment, it has been felt the absence of a manual required for the effective implementation of Rescue and Fire Fighting Services (RFFS) which necessarily includes the command, control, communication procedures and the operation of services. Keeping under consideration of this ground reality, this manual has been adopted to assist airport operators in executing their duties in responding effectively the emergency situations as stipulated in airport emergency plan document of the respective airports.

This manual has been prepared by complying with ICAO Annex 14, Chapter 9standards and ICAO Document 9137- AN/898 - Airport Services Manual Part 1 (Rescue and Fire Fighting) to the extent possible and commensuration the provisions of Airport Emergency Plan of the respective airports.

Manual also contains the materials to assist the RFF managers, supervisors and fire fighters concerning the level of protection to be provided at an airport, critical area concept and the procedures by which the scale of extinguishing agents have been related to the critical area.

If any provisions of this manual contradicts with the respective provisions of AEP, in that case the provisions of latter shall prevail to the extent of contradiction.

Any suggestions from the stake holders shall be appreciated and considered as important elements for the amendment and updating the manual towards implementing it in more effective way.

Date: ……/……../2012

(Min Raj Upadhaya)
Off. Director General
Civil Aviation Authority of Nepal

……/……/ 2069

Chapter – One

General

1.1 Introduction

The principal objective of Rescue and Fire Fighting Service is to save lives in the event of aircraft accident or incident. This manual sets out the minimum requirements to be met in the provision of RFF Services at licensed airports as well as hub airports. The facilities required by this manual have assessed to being the minimum necessary for flights required by the Air Navigation Order to use a licensed airports. The RFFS shall be provided throughout the hours a licensed airport and hub airports is available for use by aircraft engaged in flights required to use an airport and for 15 minutes after the departure of the last aircraft.

Requirements to deal with building fires and fires involving fuel installations, or recommendations for the foaming of runway are not taken into account. The quantities of extinguishing agents and numbers of RFF personnel required for licensing of the airport are not designed to deal with building fires, runway foaming and fires involving fuel installations. However, where Civil Aviation Offices choose to deploy RFF resources to any such incidents, this shall not prejudice the response objective and minimum discharge rates specified in this manual.

The RFFS shall be established at a level commensurate with the size of aircraft using the airport and organized, equipped, staffed and trained to ensure rapid and effective deployment in the event of an accident. Policies and procedures relating to the provision and management of the RFFS shall be described in, or reference to the Aerodrome Manual.

The level and standards of RFFS to be provided at airports in the Nepal accords with the International Civil Aviation Organization Standards and Recommended Practices.

Informing concerning the scale/level of protection provided by airports shall be made available in the AIP of Nepal.

1.2 Objective of the Manual

Primary objective of this manual is to ensure the smooth operation of RFF service in accordance with the airport category to protect lives in the event of aircraft and airport emergencies specifically in case of fire. Guidance is also given on equipment, extinguishing agents,

personnel, training and emergency procedure to provide RFFS effectively, efficiently in a consistent manner.

The purpose and scope of this manual is to implement the ICAO standards and recommended practices as well as to assist all rescue and firefighting personnel in performing their role and responsibilities in systematically, efficiently and ultimately more effective manner to protect lives and properties.

1.3 Applicability

This manual is applicable to:

- All the airports of Nepal where Rescue and Fire Fighting Services are available at the airport.
- All the aircraft operators operating their services on airports of Nepal.
- All the stake holders at the airports of Nepal.
- All the emergency services and organizations (on and off airport) as mentioned in Airport Emergency Plan of the respective airports.

1.4 Review and Amendments of the Manual

Civil Aviation Authority of Nepal, Aviation Fire Division/Department shall review the manual once a year on regular basis and at any time if required.

In the course of reviewing the manual following items shall be kept under consideration:-

- Any amendment in ICAO Annex -14 and ICAO Airport Services Manual(DOC 9137-AN/898),
- Civil Aviation Authority requirements,
- Local requirements and
- Suggestions received from the stake holders.

On the basis of the elements as mentioned above, Civil Aviation Authority of Nepal, Head Office Aviation Fire Division/Department shall make the proposal for the amendment of the manual and submit to Director General for his approval.

1.5 Legal Enforcement

This manual has been given legal enforcement by virtue of;

i. International:
   - International Civil Aviation Organization – ICAO Annex -14, Chapter 9
   - International Civil Aviation Organization – ICAO Airport Services Manual Part – 1 (9137-AN/898)

ii. National:

- Civil Aviation Act 1959
- Civil Aviation Authority of Nepal Act 1996
- Civil Aviation Rules
- Airport Emergency Plan – AEP
- Aerodrome Manual

1.6 Need of Rescue and Fire Fighting Service

As per the objective of Rescue and Fire Fighting Services, all RFF personnel must assume at all times the possibility of and need for extinguishing fire which may exist at the time of landing, take off, taxiing and parking of aircraft, immediately after aircraft accident or incident and at any time during rescue operation.

1.7 Vulnerability Consideration

Consideration shall be given that;

- Possible spillage of highly volatile fuel and other flammable liquids during aircraft crash may result to high degree of ignition if these fuel and liquids come into contact with hot metal parts of aircraft or because of sparks caused by the movement of wreckage or disturbance of the electrical circuit.
- Fire may also occur through discharge of accumulated electrostatic charges at the time of ground contact or during fuelling operation.
- Aircraft fire tends to reach lethal intensity within a short time presenting a severe hazard to the lives to those involved in fire fighting and handicaps the rescue operation.
- Special tools shall be provided to the rescue team in order to gain access to the interior of fuselage only if their use is regarded as extreme measures to be taken whenever for special reasons normal means of access are unavailable or unsuitable for use.

1.8. RFF Administration and Management

1.8.1 Administration and Management.

Rescue and Fire Fighting Services at the airport are under the administrative control of Airport Civil Aviation offices under Civil Aviation Authority of Nepal which is responsible for the management, security, safety including the environment friendly effective operation of RFF service where this service is available.

Civil Aviation Office shall be responsible for ensuring that the service provided is organized, equipped, trained and operated in such a manner as to fulfill its proper functions.

Under the administrative control of respective Civil Aviation Office, chief of fire station shall be responsible to manage the service.

1.8.2 Daily Station Routine

To ensure the effectiveness of the service and performance of the RFF personnel, Chief of Fire Station shall be responsible to prepare and implement daily station routine as well as Standard Operating Procedures (SOP). Guidance of such routine is attached in Appendix – A

During checking the performance of fire vehicles guidance attached in Appendix – B shall be used.

1.8.3 Audit and Inspection.

The recommendation made by Audit inspection of concerned airport authority shall be responsible for the correction of findings along with the Corrective Action Plan (CAP) for the efficient fire fighting activities and operation

1.9 Coordination between Mutual Aid agencies

A prior agreement with airport civil aviation office and city fire fighting service and other agencies such as local police, armed police force, Nepal Army, local red cross, hospitals shall be made to gain their assistance in responding emergency situation.

1.10 Grid Map

A detailed grid map of the relevant airport and its surrounding areas shall be provided and attached to the local airport RFF service standard operating procedure – SOP. This map includes the information of topography, access roads and location of water supplies.

Grid map shall be made available at the control tower, fire watchtower, fire fighting vehicle, other supporting vehicles and mutual aid agencies.

Chapter – TWO

Definitions

Aerodrome - A defined area in land or water associated with buildings, installations and equipment which is either wholly or partly used for take-off, landing and surface movement of aircraft. See "airport".

Acts of Unlawful Interference– These are acts or attempted acts such as to jeopardise the safety of civil aviation and air transport, i.e.

- unlawful seizure of aircraft in flight,
- unlawful seizure of aircraft on the ground,
- hostage-taking on board aircraft or on aerodromes,
- forcible intrusion on board an aircraft, at an airport or on the premises of an aeronautical facility,
- introduction on board an aircraft or at an airport of a weapon or hazardous device or material intended for criminal purposes,
- communication of false information such as to jeopardize the safety of an aircraft in flight or on the ground, of passengers, crew, ground personnel or the general public, at an airport or on the premises of a civil aviation facility.

Aircraft – *A*ny machine that can derive support in the atmosphere from the reactions of the air against the earth's surface.

Aircraft Accident – An aircraft accident which has occurred on or in the vicinity of the airport

Aircraft In Flight – An aircraft shall be deemed to be in flight at any time from the movement with all its external doors closed following embarkation until the moment when any such door is opened for disembarkation. Provided that in case of a forced landing, the aircraft shall be deemed to be continued in flight until the competent authorities take over responsibility for the aircraft and for persons and property on board.

Aircraft In Service – An aircraft shall be deemed to be in service from the beginning of the pre-flight preparation of the aircraft by ground personnel or by the crew for a specific flight until twenty-four hours after landing. Such period of service shall, in any event, extend for the entire period during which the aircraft is in flight as defined above.

Aircraft Operator– A person, organization or enterprise engaged in or offering to engage in regular public transport or charter aircraft operations. Within the context of this Programme "aircraft operator" shall mean the operator of any aircraft engaged in commercial air transport operations and any entity conducting general aviation operations, including corporate aviation operations, using aircraft with a maximum take-off mass greater than 5.700 kg.

Aircraft Stand – a designated area on an apron intended to be used for parking an aircraft.

Air Navigation Installation - Any building, works, apparatus or equipment used wholly or mainly for the purpose of assisting air traffic control or as an aid to air navigation, together with any land contiguous or adjacent to such buildings, works, apparatus or equipment and used wholly or mainly for the purpose connected therewith.

Airport – Any area of land or water designed, equipped, set apart or commonly used for affording facilities for the landing and taking off of aircraft and includes any area of the space, whether on ground, on the roof of a building or elsewhere, which is designed, equipped or set apart for affording facilities for the landing and taking off of aircraft capable of descending or climbing vertically.

Airport Civil Aviation Office – Any office working at an airport under the Civil Aviation Authority of Nepal for the efficient operation of the airport including the provision of civil aviation security measures

Airport Operator – a person or organization whose name appears on the licensed document of an airport.

Airside – The movement area of an airport, adjacent terrain and buildings or portions of buildings thereof, access to which is controlled.

Apron – A defined area, on a land aerodrome, intended to accommodate aircraft for the purposes of loading or unloading passengers, mail or cargo, fuelling, parking or maintenance.

Bomb Threat – A communicated threat, anonymous or otherwise, which suggests, or implies, whether true or false, that the safety of an aircraft in flight or on the ground, or any airport or civil aviation facility or any person may be in danger from an explosive or other item or device

Dangerous Goods – Articles or substances which are capable of posing significant risk to health, safety, property of the environment and which are shown in the list of dangerous goods in the Technical Instructions or which are classified according to those instructions.

Command Post – The location at the scene of an emergency where the on-scene commander is located and where command, co-ordination, control, and communications are centralized.

Crew Member – A person assigned by an aircraft operator to duty on an aircraft during a flight duty period.

Explosive Device – Any device that can be triggered to explode. A list of such articles shall be attached to Airport Security Programmes.

Flight Crew – The operating crew of an aircraft including the flight deck and cabin crew.

Fire Pit – A pit where hot fire drill is carried out. The minimum size of pit shall be 30x20x1 Meter.

Full Emergency – When it is known that an aircraft approaching to an airport is or is suspected to be in such trouble that there is a danger of an accident.

Grid Map–Airport grid map showing airport and adjacent areas up to 4 km from airport perimeter boundary. It helps easily to find out exact location of aircraft accident or incident

Incendiary Device – Any device containing an inflammatory substance for causing a fire.

International Airport – any airport designated by the Contracting State in whose territory it is situated as an airport of entry and departure for international air traffic, where formalities incident to customs, immigration, public health, animal and plant quarantine and similar procedures are carried out.

Landside – that area of an airport and buildings to which both traveling passengers and the non-traveling public have unrestricted access.

Local Standby – when an aircraft approaching to an airport is known or is suspected to have developed some trouble but the trouble is not such as would normally involve any serious difficulty in effecting a safe landing.

Movement Area – that part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, consisting of the maneuvering area and the apron(s).

Ramp – see Apron.

Response Time – The operational objective of the rescue and fire-fighting service shall be to achieve a response time of two minutes not exceeding three minutes to the end of each runway as well as to any other part of the movement area, in optimum conditions of visibility and surface conditions. Response time is considered to be the time between initial call to the rescue and fire fighting service and the time when the first responding vehicle is in position to apply foam at a rate of at least 50% of discharge rate specified in table 1.1 and 1.2

Rendezvous Point – a rendezvous point is a pre-arranged reference point i.e. road junction, cross road or other specified place, to which personnel and vehicle responding to an emergency situation initially proceed to receive directions to staging areas and /or accident/ incident site.

Staging Area – A staging area is a pre-arranged strategically placed area where support response personnel, vehicles and other equipment can be held in readiness for use during an emergency. Normally one of the staging area is located in the vicinity of the fire station

S***tandby Point*** – It is pre-determined point/ place for the fire fighting vehicle to stay stand by to cope with any type of pre informed emergency.

Triage and Triage Area– Triage is the sorting and classification of casualties to determine the order of priority for treatment and transportation. Triage Area is the location where triage operations are performed.

Vulnerable Point – An installation or facility at an airport which, in the opinion of the Civil Aviation Authority, would impair civil aviation operations at the airport if damaged or destroyed.

Chapter – Three

Level of Protection

The scale/level of protection to be provided at an airport should be based on the airport category. Airports should be categorized for rescue and fire fighting purposes.

3.1 Airport category

The airport category for rescue and fire fighting should be based on the dimensions of the aeroplanes using the airport as adjusted for their frequency of operations.

The airports of Nepal have been categorized for the provision of rescue and fire fighting services on the basis of:-

- The biggest type of aircraft operating currently on those airports
- The airport category for rescue and fire fighting should be based on the overall length of the longest aeroplanes normally using the airport and their maximum fuselage width.
- The airport category should be determined from Table 3-1by categorizing the aeroplanes using the airport, first evaluating their overall length and second their fuselage width. If, after selecting the category appropriate to the largest aeroplane's overall length, that aeroplane's fuselage width is greater than the maximum width in Table 3-1 for that category, then the category for that aeroplane is actually one category higher.
- Airports should be categorized by counting the aeroplane movements in the busiest consecutive three months of the years as follows:
- When the number of movements of the aeroplanes in the highest category normally using the airports is 700 or greater in the busiest consecutive three months, then that category should be the airport category.
- When the number of movements of the aeroplanes in the higher category normally using the airport is less than 700 in the busiest consecutive three months, then the airport category may be one less than the highest aeroplane category.
- When there is a wide range of difference between the dimensions of the aeroplanes which are included in reaching 700 movements, the aeroplane category may be further reduced to be no lower than two categories below that of the highest aeroplane category.
- Either a take-off or a landing constitutes a movement. Movement of scheduled, non-scheduled and general aviation operations should be counted in determining the airport category. When past traffic levels are unavailable, the level of RFFS should be assessed from the best available information. The basis for this assessment should be recorded.

- Airports shall be categorized as per Table 3-1 for the purpose of providing rescue and fire fighting services:-

Table 3-1

Overall length of aircraft	Maximum Fuselage Width	Airport Category
0 -8.9 m	2m	1
9-11.9m	2m	2
12-17.9m	3m	3
18-23.9m	4m	4
24-27.9m	4m	5
28-38.9m	5m	6
39-48.9m	5m	7
49-60.9m	7m	8
61-75.9m	7m	9
76-89.9m	8m	10

The RFF category provided and promulgated by an airport shall be determined in a consistent manner with reference to above table.

On the basis of above parameters, airports of Nepal have been categorized as follows:-

S.N.	Name of the Airport	Largest Type of Aircraft operating	Airport Category	Remark
1	Tribhuvan International Airport, Kathmandu	B-777	IX	
2	Biratnagar Airport	ATR- 72	V	
3	Simara Airport	Jet Stream	V	
4	Gautam Buddha Airport	ATR-72	V	
5	Pokhara Airport	ATR-72	V	
6	Nepalgunj Airport	ATR- 72	V	

The provision of RFFS to the Category set out in paragraph 3.1 is a mandatory requirement. However, there may be circumstances when a part of the facility is temporarily unavailable due to an in-service mechanical failure of a vehicle or piece of equipment or sudden illness of a member of staff or any unforeseen event or during airport emergency exercises immediate action should be taken by the airport management to reinstate facilities. During the temporary depletion, the Category of RFFS shall not be less than the equivalent of two categories below that of the RFF category according to the size of aeroplanes expecting to use the aerodrome. If any depletion is significant enough to warrant a restriction of aeroplane movements then the temporary level of RFFS stated in terms of specific RFF Category, should be immediately promulgated by NOTAM and radio. Generally, temporary depletion should not last more than 24 hours at an aerodrome.

Licensed airports should consider developing contingency plans like a preventive maintenance plan, arrangements to cover unplanned leave to limit the need for temporary depletion of the promulgated level of RFFS. Licensed airports should consider the provision of reserve facilities to limit the need for temporary depletion.

3.2 Types of Extinguishing Agents

Principal Extinguishing Agents which is a foam mixed with water should be available at the airport for a permanent control of fire for a period of several minutes or longer and complementary extinguishing agents such as CO_2 or dry chemical powder or halogenated hydrocarbons or combination of both shall also be made available at the airport for rapid fire suppression.

3.3 Amount of Extinguishing Agents

The amounts of water for foam production and the complementary agents to be provided on the RFF vehicles should be in accordance with the airport category determined under Table 3-2. The amounts in Tables 3-2 are the minimum amounts of extinguishing agents to be provided. Whenever possible it is desirable to provide additional protection, bearing in mind the recurrent maintenance need of equipment, and/ or any unusual operational hazards particular to an airport.

Elements included in the following table shall be considered to determine the amount of extinguishing agents in respective category of airport:-

Table 3-2

Foam meeting performance level A			Foam meeting performance level B		Complementary Agents		
Airport category	Water (L)	Discharge rate foam solution/minute (L)	Water (L)	Discharge rate foam solution/minute (L)	Dry chemical powders (kg) or	Halons (kg) or	CO2 (kg)
1	350	350	230	230	45	45	90
2	1000	800	670	550	90	90	180
3	1800	1300	1200	900	135	135	270
4	3600	2600	2400	1800	135	135	270
5	8100	4500	5400	3000	180	180	360
6	11800	6000	7900	4000	225	225	450
7	18200	7900	12100	5300	225	225	450
8	27300	10800	18200	7200	450	450	900
9	36400	13500	24300	9000	450	450	900
10	48200	16600	32300	11200	450	450	900

The quality of foam concentrate separately provided on vehicle for foam production should be in proportion to the quantity of water provided and the foam concentrate selected. The amount of foam concentrate should be sufficient to supply at least two full loads of such quantity of water

where sufficient additional water supplies are immediately to ensure a rapid replenishment of the water content carried.

The amounts of water supplied for foam production are predicated on an application rate of 8.2 L/min/m^2 for performance level A foam and 5.5 L/min/m^2 for performance level B foam. These application rates are considered to be the optimum rates at which control can be achieved within one minute control time. Control time is the time required to reduce the initial intensity of the fire by 90 per cent. The amounts in Table 3-2 have been determined by adding the quantity of extinguishing agents which are required to obtain a control time and the quantity of extinguishing agents which are required for continued control of the fire thereafter and/or for possible complete of extinguishment.

3.4 Critical Area

The critical area is a concept for rescue of the occupants of an aircraft. As per this concept, priority is to be given to control the fire adjacent to the fuselage. Fire fighting should be concentrated to safeguard the integrity of fuselage and maintain tolerable conditions for its occupants.

The practical critical area represents the actual aircraft accident conditions and the theoretical critical area within which it may be necessary to control the fire.

3.5 Discharge Rates

Discharge rates should meet the requirement of obtaining one minute control time on the critical area and therefore it should be determined for each category by multiplying the critical area by application rate. The discharge rates of the foam solution should not be less than the rates shown in Table 3-2.

3.6 Supply and Storage of Extinguishing Agents.

To meet the requirement of airport category, chief of respective Airport Civil Aviation Office shall arrange to procure and store required amount of extinguishing agents including the amount required for the vehicle replenishment purpose. Where a runway foaming facilities is to be provided, additional supplies of protein foam concentrate for use in this operation should be made available.

The quantities of the various extinguishing agents to be provided in the rescue and fire fighting vehicles should be in accordance with the airport category. A reserve supply of foam concentrate and complementary agent equivalent to 200 per cent of the quantities of these agents to be provided in the rescue and fire fighting vehicles should be maintained on the airport for vehicle replenishment purposes. Vehicle foam tanks must be full at all times when the vehicle is in operational service.

3.7 Response Time

Response time shall be considered to be the time between the initial call to the rescue and fire fighting service and the time when the first responding vehicle is in position to apply foam at the rate of at least 50% of the discharge rate as shown in table 3.2 above.

Response time should be two minutes not exceeding three minutes to the end of each runway, as well as any other part of movement area in optimum condition of visibility and surface conditions.

Other supporting vehicle required to deliver the amounts of extinguishing agents should arrive to the site not later than one minute after the arrival of first responding vehicle.

3.8 Fire Station

Fire station shall be located at the airport in such an area to meet the response time. All the fire fighting and rescue vehicles shall be housed in fire a station all the time. Satellite fire stations should be provided whenever the response time cannot be achieved from a single fire station.

3.9 Communication and Alerting Service.

The provision of effective communications is a key consideration when preparing to deal with an aircraft incident or accident. A discrete communication system such as direct hot line, intercom, VHF Set etc. shall be provided to establish an immediate contact between followings units in case of an emergency to meet the response time as well as to respond the emergency in well systematized and effective manner.

Air Traffic Control Tower	–	Fire Station
Air Traffic Control Tower	–	RFF crew En - route
Fire Station	-	RFF crew En –route
RFF crew En–route	-	Another RFF crew En-route

RT communications equipment shall be provided to ensure the airport fire officer(s) to communicate with the flight deck. It is recommended that a recording facility for this specific frequency be provided. The use of this specific frequency is limited to direct communications between the fire officer and pilot when the aircraft is on the ground and only within the period of a declared emergency.

All RFF vehicles shall be provided with adequate communications equipment with effective range. Equipment to provide effective communication between vehicle driver and foam monitor operators shall be provided.

Where the deployment of personnel and vehicles for non-fire service duties includes entry to buildings, aircraft or aerodrome installations, portable communications equipment shall be provided to ensure that to respond to aircraft incidents capability is maintained.

3.10 Number of Vehicles

Following table shall be considered to determine the minimum number of fire fighting vehicle to be made available at the airport rescue and fire fighting service where this service is available.

Airport Category	**Number of fire fighting vehicle**
1	1
2	1
3	1
4	1
5	1
6	2
7	2
8	3
9	3
10	3

Chapter – Four

Airport Facilities required for Rescue and Fire Fighting Services

4.1 Water Supply

Availability of sufficient quantity of water from sources in proximity to apron as a support to aircraft rescue and fire fighting operation is most desirable.

Provision of auxiliary water tank vehicle for the production of foam to respond aircraft accident is recommended.

If the natural water sources are available in airport area, an access to such source shall be provided.

4.2 Emergency Access Roads

If the surface conditions (terrains) permits, emergency access roads within airport boundaries or at least 500 meters from the threshold, for the un-obstructed movement of fire fighting vehicle shall be made available to meet the minimum response time. Roads within 90 m of a runway should be constructed to prevent surface erosion and the transfer of debris to the runway.

Emergency access gates or frangible barrier shall be provided at the airport boundary fence for the access of fire fighting vehicle to the areas outside of airport.

The combined facility of emergency access road and gate should be subject to regular inspection and physical tests to ensure their availability in an emergency.

The Inspectors of Department of Aerodrome Safety and Standard will require be satisfied in the availability of water and access roads for emergency.

Chapter – Five

Specifications for Rescue and Fire Fighting Vehicles

RFF vehicles shall be specified so that the response objective is met in all circumstances of optimum visibility and surface conditions.

RFF vehicles shall be capable of carrying their full load with maximum traction and mobility on and off paved surface in optimum weather conditions. Vehicles may also be designed to carry required rescue equipment and complementary extinguishing agents. The amounts of foam concentrate carried should be sufficient to supply at least two full loads of water tank capacity. The vehicle shall be capable of being deployed in a way that ensures that response objective are achieved and that continuous agent application at the appropriate rate may be fully maintained.

5.1 Factors to be considered in determining the specifications

Following factors shall be considered to prepare the specification in procuring the new vehicle

Phase – 1 (Preliminary considerations)

- Role of new vehicle
- Capacity related to present or future airport RFF category
- Quantitative advantage of adopting improved extinguishing agents
- Compatibility of new vehicle with existing fleet
- Dimension or loading limitations imposed by local terrains or airport features

Phase – 2 (Preparation of Specification)

- Quantities and type of extinguishing agents – output requirements, discharge patterns and replenishment facilities
- Crew cab capacity, design and safety aspects – instrumentation, accessibility for operations, control system- ease of driving and operating simplicity
- Equipment – range and stowage- need for special equipment
- Automotive performance – minimum acceptance criteria
- Access for preventive maintenance and support – protective treatments and finishes

Phase – 3 (Additional contractual consideration)

- Provision of training for fire services personnel and supporting personnel
- Pre-delivery acceptance test –Factory acceptance test – FAT
- Provision of technical manual
- Initial commissioning at airport
- In – service support by suppliers technical staff

- Supply of spare parts with new vehicle

5.2 Characteristics and performance of rescue and fire fighting vehicles

In addition to the above factors as mentioned in 5.1, following characteristics and performance should be considered in selecting new fire fighting vehicle to be used also as rapid intervention purpose:-

Details	Vehicle up to 4500 L	Vehicle over 4500L
Monitor	Optional for categories 1 and 2 Required for categories 3 to 9	Required
Design feature	High discharge capacity	High and low discharge capacity
Range	Appropriate to longest aircraft	Appropriate to longest aircraft
Hand-lines	Required	Required
Under Truck Nozzles	Optional	Required
Bumper Turret	Optional	Optional
Acceleration	80km/hour within 25 sec. at the normal operating temperature	80km/hour within 40 sec. at the normal operating temperature.
Top Speed	At least 105 km/hour	At least 100km/hour
All wheel drive capability	Required	Required
Automatic or semi-automatic transmission	Required	Required
Single rear wheel configuration	Preferable for categories 1 and 2 Required for categories 3 to 9	Required
Minimum angle of approach and departure	30 Degree	30 Degree
Minimum angle of tilt(static)	30 Degree	28 Degree
Under chassis clearance	I4 inches(356mm)	I4 inches(356mm)

Foam tenders equipped with foam monitors should be able to produce foam whilst on the move at minimum speed of10 km/hr. Monitors and sideline branch pipes should have the capability to deliver foam in a jet or dispersed pattern and are to be capable of at least 50 percent of the discharge rate required for the RFF Category. Monitor platforms should be designed to provide a safe area for working. The crew compartment shall be capable of safely accommodating personnel and their equipment, including breathing apparatus. If appropriate, sufficient space shall be provided to facilitate the donning of personal protective equipment. All seats should be fitted with safely restrained to accepted road use standards and face towards.

Foam tenders shall be fitted with fixed or portable lighting equipment sufficient to illuminate the incident/accident site. Adequate communication facilities should be installed in the RFF vehicles.

5.3 Equipment to be carried on Rescue and Fire Fighting Vehicle

Equipment for Rescue Operation	Airport Cat 1-2	Airport Cat 3-5	Airport Cat 6-7	Airport Cat 8-10
Adjustable Wrench	1	1	1	1
Axe rescue large non –wedge type	-	1	1	1
Axe rescue small non –wedge or aircraft type	1	2	4	4
Cutler bolt 61cms	1	1	1	1
Crowbar 95cms	1	1	1	1
Crowbar 1.65m	-	-	1	1
Chisel cold2.5cms	-	1	1	1
Flash lights/hand lamps	2	3	4	8
Hammer 1.8 kg	-	1	1	1
Hook, grab or salving	1	1	2	3
Saw or Hacksaw	1	1	1	1
Blanket, Fire resisting	1	1	2	3
Ladder overall length appropriate to aircraft type in use	1	1	2	3
Rope line 15m length	1	1	2	3
Pliers 17.8cms side cutting	1	1	1	1
Pliers slip joint 2.5cms	1	1	1	1
Screw Drivers set	1	1	1	1
Snippers tin1	1	1	1	1
Chocks 15cms high	-	-	1	1
Chocks 10cms high	1	1	-	-
Powered rescue saw complete with two blades or pneumatic rescue chisel complete-plus spare cylinder, chisel and retaining springs	1	1	1	2
Seat Belt/harness cutting tool	1	2	3	4
Gloves ,flame resistant	2	3	4	6
Breathing apparatus and spare cylinder	One set/ person	One set/ person	One set/ person	One set/ person
Oxygen Inhaler	-	1	1	1
Hydraulic or pneumatic forcing tool	-	1	1	1
Medical first aid kit	1	1	2	3
Tarpaulin	1	1	2	3
Fan for ventilation and cooling	-	1	2	3
Protective Clothing	One set/person	One set/person	One set/person	One set/person
Stretcher	1	2	2	2
Rope line 30m length	-	-	2	3

Suitable and adequate lockers and stowage facilities should be provided to carry required rescue equipment and complementary extinguishing agents. All equipment shall be safely and securely stowed whilst allowing maximum accessibility.

Following additional factors may be found of benefit to the operation of RFF vehicles:

Forward and Rear facing cameras infra red etc., with video recording.

Mapping/Global Positioning System Systems.

Automatic Tyre Deflation/inflation.

Extending working platform.

Safety warning/interlocks for the safe operation of critical systems fitted to the vehicle.

Traction Control.

Anti-lock breaking systems.

Chapter - Six

Protective Clothing and Respiratory Equipment

Protective clothing and respiratory equipment are the personal protective equipment. All personnel shall be provided with protective clothing and respiratory protective equipment to the hazard and risk. Airport management should provide adequate training and facilities for the use, care and maintenance of personal protective equipment.

6.1 Use and type of protective clothing

Following factors shall be considered in determining the type of clothing for its use during hours of duty to meet the response time:-

- Wearing all or some elements of the clothing is necessary to ensure the immediate response when a call for attendance at an aircraft is received. Some forms of protective clothing are difficult to wear inside the fire vehicle crew compartment.

- Some of the elements of protective clothing must be worn at all times during a tour of duty, there may be significant effect on the wearer in locations with high temperature (Such as in airports located in Terai areas like Biratnagar, Simara, Bhairawa and Nepalgunj). In such locations there may be a compromise solution depending upon the degree of protection and some forms of clothing specifically designed for use in such areas. This compromise does not to expose operatives (RFF personnel responding aircraft fire) to unacceptable risk but to ensure that the immediate response is feasible.

- If the protective clothing has to be shared on an impersonal basis, it is essential to recognize the problem which may arise for aesthetic and hygienic reasons. Costs of protective clothing may be a reasonable ground for requiring elements for protective clothing.

6.2 Types and Qualities of Protective Clothes

- Protective Clothing should be distinct from ordinary fire service uniforms and is worn during rescue and fire fighting activities including training.
- It should be designed to protect fire fighters from radiated heat and injuries that may arise from impact of operational activities.

6.3 Components of Protective Clothing

Typical protective clothing consists following components;-

i. Helmet:- It should provide adequate protection to the RFF personnel. It should be used during fire fighting activities for the protection of head, neck and chest as well from heat

and electrical conductivity. Helmet should not give the wearer impression of being isolated and must permit both speech and the reception and audible signals or words of command. It should have movable visor and wide angle vision.

ii. Protective suits:- Protective suits are classified into two categories, entry suits and proximity suits.

- Entry Suits: - Entry Suits shall be provided to fire fighters to enter into active fire areas usually to rescue the occupants of military aircrafts. Entry suits are necessarily complex to provide the required degree of protection and often necessitated the accommodated with breathing apparatus.
- Proximity Suits:- Proximity Suits are designed to permit fire fighters to approach and suppress a fire situation. These suits are not intended to provide the level of protection necessary for entering active fire areas, are provided in one piece overall design and in two – piece jacket and trousers combinations. Materials of suits should match the climatic and other considerations in the location of intended use.

  Qualities of Proximity suits:-

  - Proximity suits should provide thermal insulation, resistant to direct heat, direct flame contact and water.
  - Material should be lightweight, provide freedom for movement, comfortable and easy to wear without assistance.
  - Fabrics should not be bulky.
  - Should be resistant to tearing and abrasion.
  - May be coated in a reflective medium or lined to minimize the effects of radiated heat on the water.
  - Fastening should be easily secured by the wearer to ensure their security under stress and resistant to damage by heat or flame contact. Seam should be waterproof and pockets should drainage holes in the lower corner.
  - It should be capable of being cleaned without reducing its protective qualities.

iii. Boots:- Uppers should be of tough, flexible, heat resistant material, extended up to the mid-calf or knee level. Should be of a non-slip material. Rubber boots shall not be used.

iv. Gloves:- Gloves should be of type to protect wrist. Construction should permit the wearer to operate switches, fastenings and hand tools. Back of the gloves should have a reflective surface to minimize radiated heat effects and that the pal and fingers should be provided in a material resistant to abrasion and penetration by sharp objects. All seams should be liquid penetration proof.

6.4 Respiratory Equipment

Fire fighters shall be provided with respiratory equipment to protect themselves against dangerous toxic gases such as carbon monoxide, hydrogen chloride, chlorine, hydrogen cyanide those may be produced by burning aircraft cabin interior materials.

It is essential to ensure that the respiratory equipment selected is adequate in terms of its basic function and its operational duration for the rescue and fire fighting.

Wherever respiratory equipment is operated, adequate arrangements must be made for the recharging of breathing apparatus with pure air and a quantity of spare parts should be held to ensure the continuous availability of the service.

Chapter – Seven

Ambulance and Medical Service

Ambulance service shall be provided in the airport. Civil Aviation Office shall arrange to have sufficient medical supplies, available on or in the vicinity of the airport to treat the passenger and crew capacity of the largest aircraft normally using the airport. The availability of ambulance and medical services should form part of the over-all emergency plan established to deal with aircraft accident/incident. As the city ambulance and medical service takes time to reach airport/crash site, airport rescue and fire service station shall be provided with ambulance and medical service/first aid for the establishment of initial triage and provide first aid till arrival of city medical service (to work as airport medical service as mentioned in airport emergency plan of respective airport). Ambulance team should be qualified in first aid.

The extent of these facilities shall be determined on the basis of type and density of traffic.

Ambulance should be able to move even in the terrain in the vicinity of airport.

Depending upon the frequency and volume of traffic movement, as a measure of economy the vehicle used for other purposes may be used as ambulance (in domestic airports) provided such use will not interfere with its availability in the event of need. But such vehicle must be suitably modified to permit the carriage of stretchers and other necessary equipment.

The provision of portable lighting should be considered for illuminating an accident scene particularly triage and casualty handling areas.

Chapter – Eight

Extinguishing Agents Characteristics

Principal extinguishing agent shall be a Foam which meets either performance level A or B. The principal extinguishing agent should be aqueous film forming foam or film forming fluoroprotein foam or fluoroprotein foam or protein foam or a combination of these agents. The complementary extinguishing agents shall be any combination of Dry Chemical powder and gaseous agents with proven low environmental impacts like Clean Agent – Heltron, or CO_2 or any other agent which demonstrates equivalent performance. The minimum quantities and types of extinguishing agents required for each RFF Category are set out in Table 3-2. It is a mandatory requirement.

8.1 Principal Extinguishing Agents

i. Foam:-

It shall always be reminded that foam is used to provide an air excluding blanket which prevents volatile flammable vapors from mixing with air or oxygen. To achieve this objective fire fighters shall follow the following guidance:-

- Foam must flow over the fuel surface
- Must resist disruption due to wind or exposure to heat or flame
- Should be capable of resealing any ruptures caused by disturbances of an established blanket.

a. Method of foam production:- Foam solution is produced either in pre-mixed forms or by the use of a proportioning system, which are delivered at a pre-determined pressure to nozzle which induce air to aspirate the solution. The pressure may be created by a pump or, with vehicles of smaller capacity, by a compressed gas source usually either dry nitrogen or dry air. In all cases the system will produce an acceptable foam only if the solution is delivered in the appropriate volume and in the correct pressure range to the aspirating nozzle or nozzles.

b. Quality of Foam:- The quality of foam produced by a rescue fire fighting vehicle using any of the concentrated type will significantly affect the control and extinguishment times of an aircraft fire. Any foam concentrate to be used in aircraft rescue and fire fighting vehicle should meet or exceed the criteria in given below specifications, so as to achieve the performance level A and B, as appropriate.
   Specification:
   The pH value of foam concentrate should be as neutral as possible and should register between the values of 6 and 8.5.

The viscosity measurement of a foam concentrate when at its lowest temperature should not exceed 200 mm/s.

When a foam concentrate is tested by the centrifuge method, foams should contain no greater than 0.5 per cent of sediment.

Functional fire tests shall be carried out to determine the suitability of foam concentrate in the airport environment. Test shall be conducted to evaluate the ability of a foam concentrate to:

i. Extinguish a fire 2.8m. sq. or 4.5 m. sq. as appropriate
ii. Resist burn back due to exposure to fuel and heat.

Equipment:

a. A circular fire steel tray of 2.8m. sq. or 4.5 m. sq. The vertical wall shall be 200mm;
b. Equipment or access to facilities to enable accurate recordings of air temperature, water temperature and wind velocity;
c. Fuel: 100 L of Avtur (Jet A) for performance level B tests; 60 L of Avtur (Jet A) for performance level A tests;
d. Branch pipe, straight stream, air aspirating nozzle;
e. Suitable stop watch; and
f. Circular, burn back pot, measuring 300 mm (Internal diameter), 200 mm high, 2 L of gasoline or kerosene.

Preferable conditions:

a. Air temperature (degree Centigrade)	15
b. Foam solution temperature (degree Centigrade)	15
c. Wind velocity (m/s)	3

8.2 Complementary agents

Complementary agents have the capability of rapid fire suppression but offer a transient control and are particularly used on concealed fire such as engine fire, fire in aircraft freight holds and beneath the wings where foams may not penetrate and on running fuel fire situation on which foams are ineffective.

It is also necessary to apply a principal agent simultaneously or at least before flashback can occur in order to achieve permanent control.

It should be reminded that when a large amount of complementary agents are discharged a dense cloud of the agent may affect aircraft evacuation or rescue operation by limiting the visibility and affecting the respiration to those exposed to the effects.

i. Dry Chemical Powder

Dry chemical powder is finely divided powder of sodium bicarbonate or potassium bicarbonate or mono-ammonium phosphate etc. which are combined with additives to improve their performance and normally used against fire involving flammable liquids and those of an electrical origin.

It can provide rapid knockdown of flammable liquid fire and some protection to operatives from radiated heat when used with foam in dual agent attack and delivered at suitable rate.

The successful use of dry chemical powder is strongly dependent on the technique of its application. The application of dry chemical powder is also significantly affected by wind speed but use may be made of wind to augment the range of a powder stream and to influence its pattern of distribution. When selecting dry chemical powder for use with a foam as a dual agent attack, care must be exercised to ensure its compatibility with that foam.

ii. Carbon Dioxide (CO_2)

Used as a means of rapid knockdown for small fire or a flooding agent in reaching concealed fires in areas inaccessible to foam.

It should not be used on fires involving flammable metal. It may be used as complementary agent in a dual – agent attack with a foam.CO_2 is most effective at high rates of delivery, achieved through low pressure system.

Carbon dioxide installation types:

High Pressure System:- Consists a series of cylinders manifold together, containing CO_2 gas at 5900kpa pressure at an ambient temperature of 21 Degree Celsius.

Low Pressure System:- Where carbon dioxide is contained in an insulated pressure vessel at a controlled low temperature usually -18 Degree Celsius. At this temperature the storage pressure is 2100 kpa and the delivery system can provide discharge rates up to 1100kg/min giving a long throw to a great volume of gas.

8.3. Conditions of Storage of Extinguishing Agents

The reserve of extinguishing agents shall be stored in the fire station and the conditions of storage should be:

- Foam:- Avoid extreme temperature and direct exposure to sunlight. Replace and seal the caps of any partly-used containers;
- Dry chemical powder:- Maintain stock, replace and seal the caps of any partly-used containers;
- Halogenated hydrocarbon agents:- Avoid direct exposure to sunlight and high temperature. Use pressure release valve to reduce overpressure.

The stocks of fire extinguishing agents should be stored and used in a consistent manner in accordance with manufacturers' guidance. Consideration should be given to avoid prolonged or extreme storage conditions. It should be inspect and test in regular basis. This may require the keeping of log books and records of test to be assured of continual fitness for purpose. Inspector from the Department of Safety and Standards of Civil Aviation Authority of Nepal, may require to examine any evidence of this assurance from time to time.

Foam generating system shall be regularly checked for induction accuracy. Foam system designed to induce at 6%, induction should be in the range of 5% to 7% at the optimum working conditions. For system designed to induce at 3%, the range is 3% to 5%, and for 1% systems, the range is 1% to 1.1%.

When different types of extinguishing agents are used on the aerodrome, care must be taken to ensure that incompatible types are kept apart and care is exercised when these have to be used simultaneously against fires.

Chapter – Nine

Fire Station

9.1 Design, Construction and Location of Fire Station

Properly constructed and located Fire Station may contribute the morale and efficiency of the rescue and fire fighting services. In selection the location of the fire station prime concern is to meet the minimum response time and easy access to both the runways ends and the movement areas of the airport.

Following factors shall be considered in selecting and designing the fire station:-

- The location of the fire station shall be based on minimizing response time to areas where aircraft accidents and incidents might occur. At large complex aerodromes it may be necessary to consider the provision of more than one fire station to meet the response time in optimum conditions of visibility and surface conditions
- Need to deal with structural fire
- Location strategically in relation to the runway pattern
- Possibilities of accidents and incidents occur on or close to the runways.
- Emergency fire vehicles should have direct access to the movement area within the recommended response time.
- Access to the runways is direct with minimum number of turns.
- Vehicle running distance should be as minimum as possible in relation to runways.
- Ability of vehicles to reach the stand by point without delay.
- Widest possible view of airport areas from fire watch tower.
- Adequate accommodation for the housing of vehicles, and their maintenance.
- Domestic and personnel administrative facilities.
- Communication and alarm system.
- Appropriate storage and technical support facilities.
- Fire station apron or maneuvering area shall be strong enough to bear the weight of fully laden vehicles and should not be damaged when vehicles are driven away rapidly.
- The station apron should be adequately illuminated. Lights should be mounted so as not to adversely affect driver's vision or airport operation.
- There should be an exterior water connection or hydrant assembly for the refilling of vehicle water tanks.
- The provision of means to rapidly replenish foam concentrate tanks is desirable.

9.2 Fire Fighting Vehicle Housing

Following facilities and infrastructure shall be made available for the housing of fire vehicles:-

- Series of bays with sufficient space for each of the vehicle and surrounding areas for fire personnel to work around the vehicle. (at least 1.2 meters around each of the vehicle)
- Strength of bays floor should capable to hold the maximum weight of the vehicle. Surface should be resistant to oil, grease and foam and should be easily cleaned to avoid slippery.
- If doors are provided to the bays, they should be easily opened without delaying the movement of vehicles. Doorways shall be wide enough to enable a quick and safe exit by vehicles giving adequate clearance to ladders obstruction lights and aerials etc. which may fitted to vehicle roofs.
- Ceiling of the bays should be of sufficient height to the tops of vehicles so that inspection of foam tanks etc. may be conducted.
- Vehicle bay shall be provided with adequate lighting facilities. Electrical systems of appropriate design, shall be provided for engine heating, battery charging or other equipment.

9.3 Domestic and Administrative Requirements

Following facilities should be available at the fire station:-

- Office room for the chief of station, second in command and other RFF personnel.
- Locker room for the staff for changing their clothing.
- Mess room fitted with chairs, tables and mounted white board which could also be used as class room.
- Kitchen facilities.

9.4 Supporting Facilities

Following facilities shall be made available to the extent possible which are necessary to maintain the efficiency of the personnel, equipment and ultimately the service:-

- Well-equipped workshop for the repair and maintenance of the vehicle and the equipment.
- Hydrant and water source (may be well) for the test purpose.
- Electric or manual pump for the transfer of foam from containers to vehicle.
- The specific area for training purposes. The area is not required to be a separate enclosed room, although this may be desirable.
- The provision for proper exercise facilities.
- Secondary electrical power supply to ensure the continuous availability of essential equipment and facilities.
- Hose storage space should be provided including suitable racking and ventilation.

9.5 Fire Watch Tower

Fire watch tower shall be the central point for the reception of emergency calls. The watch tower should be sited in a position which enables surveillance of as much of the movement areas as possible. The importance of prompt and clear communications is paramount. Therefore, each fire station should be provision of direct communication facilities with air traffic control, RFF vehicles, crew en route to, or in attendance at, an aircraft accident or incident. A direct telephone line to the local city fire brigade should be provided.

Double glazing and other sound proofing measures may be necessary to exclude excessive noise from aircraft. Facilities should be required to minimize the effect of direct exposure to the sun. Facilities should be provided for varying lighting intensity in the watch tower room to permit maximum external vision at night. The fire watch tower should be provided with a public address so that details of the emergency can be conveyed to crew members.

Chapter – Ten

Rescue and Fire Fighting Personnel

10.1 Number of Personnel

The determination of rescue and fire fighting personnel depends upon many factors such as:-

- Traffic density, types of aircraft and the fire fighting category.
- In any case fire station and fire vehicle should be staffed to ensure the discharge the maximum capability of principal or auxiliary extinguishing agents.
- Continuous operation of watch tower
- Personnel for rescue operation and providing first aid.

10.2 Selection of fire fighting personnel

Fire fighting personnel should be:-

- Resolute
- Possess initiative
- Competent to carryout intelligent assessment of fire situation
- Well trained and fully qualified.
- Capable of sizing up the changing circumstances at an aircraft accident and taking necessary action without detailed supervision
- Must be free from any physical disability.
- Free from any trouble for wearing and using respiratory equipment.

10.3 Required number of fire fighting personnel in different airports

i. Tribhuvan International Airport, Kathmandu

Chief of station(Commander)	-	01
Second in command	-	01
Shift in-charge -1x3 shifts-3, including Training Manager 1	-	04
Team Leader1x3Teamx3shifts	-	09
Driver1, Monitor Operator1, Sideline Operator3=5x3vihiclex3shifts`	-	45
Rescue Vehicle 5x3 shifts	-	15

Ambulance driver1, Assistant 2=3x3shifts	-	09
Fire Watch Tower 2x3shifts	-	06
For Non Operational Duty(Skeleton Shift) duty:		
Shift in-charge	-	01
Vehicle Driver1, Monitor Operator1, Sideline Operator3	-	06
Ambulance driver1, Assistant 2	-	03
Watch Tower 1	-	01
Total		101
Contingency 10%		10
Grand Total		111

ii. Domestic Airports

Chief of Station (Commander)	-	01
Second in command	-	01
Vehicle driver1, monitor oerator1, side line operator3=5x2 shifts	-	10
Ambulance driver1, rescuer2,=3x2shifts	-	06
Fire Watch Tower 2x2 shifts	-	04
For Non Operational hour(Skeleton Shift) duty:		
In-charge	-	01
Vehicle Driver1, Monitor Operator1, Side line Operator2	-	04
Ambulance Driver1, Rescuer2=3	-	03
Total	-	30
Contingency10%	-	03
Grand Total	-	33

Chapter – Eleven

Emergency Organization

11.1 Airport Emergency Plan

In responding aircraft and airport emergencies including fire emergencies, Airport Rescue and Fire Fighting Services shall follow Airport Emergency Plan- AEP of concerned Airport.

For Tribhuvan International airport Kathmandu, AEP is in force since 1995 domestic airport emergency plan are in force since 2007.

In compliance to the provisions of relevant AEP, Rescue and Fire Fighting personnel shall be always aware with following elements of AEP:-

11.1.1 Types of Emergency Situation

ALERT – 1, Aircraft Accident (On Airport)

ALERT – 2, Aircraft Accident (Off Airport)

ALERT – 3, Full Emergency (Airborne Aircraft)

ALERT – 4, Unlawful Interference

ALERT – 5, Bomb Threat – to Aircraft

ALERT – 6, Bomb Threat – to Building

ALERT – 7, Ground Incident

ALERT – 8, Structural Fire

ALERT – 9, Local Stand by

ALERT – 10, Weather Stand by

ALERT – 11, Medical Emergency

11.1.2 On and off airport organizations involved in emergency situation

On Airport Organizations:-

- Airport Civil Aviation Office
- Airport Security Police
- Airport Rescue and Fire fighting Service
- Concerned Airlines(In case of aircraft accident/incident)
- Nepal Army/Armed Police Force(whichever is available at the airport)
- Airport Vigilance (if available)

Off – Airport Organization

- Nepal Police
- Nepal Army/Armed Police Force(whichever is available)
- City Fire service
- Hospitals/Ambulances
- RFFS shall be activated as per the decision of ECC.

11.1.3 Role and Responsibilities of Agencies involved(in brief)

Civil Aviation Office

- Emergency Notification
- Coordination
- Activation of Emergency Operations Centre – EOC
- Closure of airport either wholly or partly if needed
- Issuance of emergency access permits

Airport Security Police

- Security Cordon of accident site
- Access control to the site
- Crowd control
- Re-route the normal traffic away from the route to provide congestion free road for the emergency vehicles.
- Crime prevention

Airport Rescue and Fire Fighting Service

- Attack with wind and knock down the fire.
- Control the fire with establishing and maintaining rescue path
- Prevent the spread of fire

- Secure the area to prevent re-ignition
- Arrange backup water and foam supplies
- Rescue operation begin on arrival, transport occupants into a bearable atmosphere
- Establishing collection area and medical triage area
- Conduct a complete overhaul i.e. a thorough inspection of the entire aircraft and crash areas to ensure that the aircraft is fire safe.

Concerned airlines

- Collect all the details of aircraft including type of aircraft, number of persons on board, fuel on board, details of cargo, dangerous goods if any. Provide these information to ATS Tower and EOC.
- Provide facilities and logistics to the personnel involved in emergency
- Arrange transportation, accommodation and further journey of passengers.
- Clergy service.

Nepal Army/Armed Police Force

- Search and Rescue Operation
- Assist in rescue and fire fighting operation
- Armed intervention if needed and required by EOC.

Hospitals

- Provide first aid and stabilization.
- Establish Medical Triage and prioritize the injuries according to their seriousness.
- Dispatch injuries to the hospitals.

11.1.4 Command, Control and coordination

A command post shall be established at EOC. At Tribhuvan International Airport Kathmandu, EOC is located at the second floor of Airlines Operation complex. Whereas at domestic airports, chief of airport civil aviation office shall be responsible to establish EOC in proper location (that may be the office room of chief of civil aviation office)

Command post is represented by all of those agencies involved in responding any emergency situation as mentioned above. Command post is resided by person as described in concerned AEP.

A forward command post shall be established in the close proximity of accident/incident site. In the case of fire situation, chief of RFF service shall be the on-scene commander till the fire is suppressed. After fire is suppressed, chief of fire fighting service shall handover the command to the chief of concerned civil aviation office.

At Tribhuvan International Airport, Terminal Duty officer shall be responsible for emergency notification and coordination of emergency situation whereas chief of concerned civil aviation office or his designee shall be responsible for such notification and coordination.

11.1.5 Rendezvous Point(RVP)

At Tribhuvan International Airport there are three RVPs- 1,2 and 3, the location of these points are described in TIAAEP.

In domestic airports, chief of civil aviation office in prior coordination with RFF chief and chief of airport security police shall establish RVPs.

11.1.6 Collection Area and Triage Area

Location of collection area and medical triage area depend upon the site of accident/incident. Collection area will be established by RFFS. Casualties from accident site will be transferred by RFF personnel in the collection area. This area should be safe for casualties. The triage area should be located at least 90 m upwind of the accident site to avoid possible exposure to fire and smoke. If necessary, more than one triage area may be established.

There will be a care area according to the priority base. A transportation area will be established for the recording, dispatching and evacuation of survivors. This area should be located between the care area and the egress road.

Chief of rescue and fire fighting service in coordination with medical team and security agencies shall establish medical triage area and care area as required.

11.2 Aircraft Emergencies

To determine the level of services to be provided, aircraft emergencies are classified as follows:-

i. Aircraft accident
ii. Full emergency
iii. Local Standby

11.2.1 Aircraft Accident

An aircraft accident which occurs on or in the vicinity of the airport (within 4kms from the airport perimeter fence) is known as aircraft accident.

In case of aircraft accident, air traffic services (ATS) Tower shall immediately call Fire Watch Tower. The notification shall include following information according following priority order:-

- Type of aircraft

- Time of accident
- Number of occupants
- Fuel on board
- Aircraft Operator
- Dangerous goods on board if any including its quantity and location

11.2.2 Full emergency

If it is known that an aircraft approaching the airport is, or is suspected to be, in such a trouble that there is danger of accident is known as full emergency.

In case of Full Emergency, air traffic services (ATS) Tower shall immediately call Rescue and Fire Fighting Service Watch Tower (RFF Tower). The notification shall include following information according following priority order:-

- Type of aircraft
- Estimated time of landing
- Number of occupants including special occupants that is handicapped, immobilized, blind and deaf.
- Nature of trouble
- Fuel on board
- Runways to be used
- Dangerous goods on board if any including its quantity and location

11.2.3 Local Standby

When an aircraft approaching an airport is known or is suspected to have developed some trouble but the trouble is not such as would normally involve any serious difficulty in effecting a safe landing.

In case of Local Standby situation, air traffic services (ATS) Tower shall immediately call Fire Watch Tower. The notification shall include following information according following priority order:-

- Type of aircraft
- Estimated time of landing
- Number of occupants including special occupants that is handicapped, immobilized, blind and deaf.
- Nature of trouble
- Fuel on board
- Runways to be used
- Dangerous goods on board if any including its quantity and location

Chapter – Twelve

Aircraft Fire Fighting and Rescue Procedures.

12.1 Operational Procedures

The rescue and fire fighting services at an airport are under the administrative control of the concerned airport civil aviation offices. Airport Civil Aviation Offices and Airport Rescue and Fire Fighting Services shall be responsible for ensuring that the service provided is organized, equipped, staffed, trained and operated in such a manner as to achieve its objective that is rescuing affected persons by extinguishing fire effectively. In this context, Civil Aviation Authority of Nepal -CAAN Head Office Aviation Fir Division/Department shall play a positive role in making policy to fulfill its objective.

There are three shifts(morning, day, and night) at Rescue and Fire Fighting Service(Division) at TIA. Each shift has 6 hours operational duty. If the flight movement is continued after the end of third shift, the same third shift will continue till last movement of aircraft. Besides three shifts, there is another non-operational shift (night standby duty) i. e. Skeleton Shift for mid night to the beginning of morning shift.

At the domestic airports, there are two shift, second shift shall continue its duty till the completion of last flight. A skeleton manpower shall be deployed on duty in non-operational shift(night standby duty)

All the operational activities shall be carried out under the command, control and supervision of shift in-charge, whereas overall command remains in chief of fire station.

12.2 Responsibilities in particular

12.2.1 Chief of fire Station

- Establishing command and control over all the RFF staff and over all operational aspect both in normal operating conditions and in case of emergency.

- Ensuring that the shift in-charges are maintaining the command and control over the staff and operation during period of their duty shifts.

- Ensuring that shift in-charges is fully accomplishing their duties and responsibilities as mentioned in this SOP in effective manner Airport Emergency Plan and other relevant rules, directives and their job specific description.

- The coordination with respective Airport Civil Aviation office management in all matters required for the smooth functioning of Rescue and Fire Fighting Services.

12.2.2Duties and responsibilities of Shift-In-Charge

- Establishing command and control over the staff and the operation of the shift
- Taking briefing about the serviceability of the fire vehicles, equipment, other facilities and personnel
- Maintain up to date status of fire vehicles, services and report to Fire chief
- Assign duty to the respective positions
- Implement the station routine duties including routine testing of vehicle and equipment and performance of the drivers and other staff
- Arrange to provide fire vehicle on standby position in accordance to VVIP Handling procedure (Appendix - C)
- Follow AEP and the provisions of this manual
- Other jobs as required by chief of station.

12.2.3 Team Leader

- Check Ancillaries according to the inventory check list and fulfill missing items with the help of subordinates
- Communicate and coordinate with shift in-charge and other staff as necessary
- Ensure the functioning of vehicle, other equipment, availability of adequate quantity of extinguishing agents and availability of staff.
- Carryout drill in accordance to station routine.

12.2.4 Fire Vehicle Operator(Driver)/Rescuer/sideline Operator

- Check and ensure the performance of the vehicle and ancillaries
- Check water, foam , fuel other agents
- Ensure all the staff assigned in particular vehicle are on duty
- Keep and maintain rescue and fire fighting equipment, personal protective equipment in good order
- Carryout action as instructed by shift in-charge and team leader.

12.3 Emergency Response Procedures

12.3.1 Common features to all emergencies;-

Following factors and conditions are some common elements applicable to all types of emergency situation:-

- Constant observation of all flights and apron activities by airport fire station watch tower.
- Observation of taxiing of aircraft, ground observation of engines

- Availability of access routes
- Effect of weather conditions as a possible restrictions on movement of emergency vehicle
- On receipt of information from control tower announcing an aircraft emergency the required equipment shall be dispatched to the scene of the accident or incident to the determined sand-by positions applicable to the runway.
- If the information is received other than ATS Tower, in that case ATS tower must be informed and verification of information is necessary.
- Rescue and fire fighting vehicles shall be positioned to provide the best possible coverage of the potential crash area.
- For emergencies involving gear malfunctioning and tire difficulty, there is possibility of aircraft veering off the runway and possibility of hitting the emergency equipment. In that case as precaution emergency equipment are to be located in touch down point.
- Broken fuel, hydraulic fluid, alcohol and oil lines should be plugged or crimped when possible to reduce the amount of spill and extent of fire.
- Use of aircraft windows for rescuing and ventilation

12.3.2 Aircraft Fire Classification

For the effectively responding and extinguishing the aircraft fire, some aircraft fire has been classified as follows:-

i. Class A Fire:-

Fires involving cargo, upholstery and similar solid combustibles are Class A fire which requires cooling and quenching for extinguishing. If no flammable liquids are involved, water preferably water fog can be used.

ii. Hot breaks and wheel fires

Heating of aircraft wheels and tires presents a potential explosion hazard greatly increased when fire is present. Extra precaution should be taken to be protected from these dangers. Normally hot breaks will be cooled down themselves without using extinguishing agents. Fire fighters should approach the wheels with extreme precaution, never from the side in line with the axle.

If extinguishing agents is required to be applied, then apply it in area to the break from wheel

iii. Rocket Engine Fire

I fire surrounds around the engine of an aircraft equipped with rocket engine, precaution should be taken I approaching the area. No attempt should be made to extinguish the engine if they should ignite. Water or foam may be used effectively to control the fire around the rocket motors, but they cannot be extinguished because of the self-contained oxidizer in the propellant. They burn very intensely for a short

duration, however they will normally not contribute significantly to the damage, since their chambers are so well insulated that it takes several minutes of very intense heat to ignite them. This heat will normally have done irreparable damage or caused fatalities before ignition of the rocket engines occurs.

I fire does not occur, igniters and ignition cables should be removed from unexpended rocket engines on the crashed aircraft as soon as possible to reduce the possibility of inadvertent ignition from stray voltage entering the ignition wiring

iv. Confined Engine Fire (Piston):-

If engine fire confined within the nacelle cannot be controlled by the aircraft extinguishing system, dry chemical powder or halon should be applied first as these agents are more effective than water or foam inside the nacelle. Foam or water should be used externally to keep adjacent aircraft structure cool. The propellers should never be touched even when at rest.

v. Confined Turbine Engine Fire (Jet)

From the viewpoint of aircraft evacuation and other safety consideration the best way of controlling the fire confined to the combustion chambers of turbine engines, if the flight crew is in a position to keep the engine turning over. Fire fighters shall stand clear of the exhaust but may have to protect combustibles from exhaust flames.

Fire outside the combustion chambers of turbine engines and confined within the nacelle is best controlled with the aircraft built-in extinguishing system. If the fire persists after the built-in system has been expended and the turbine is shut down, halon or dry chemical may be used to extinguish the fire.

Foam should not be used in the intake or exhaust of turbine engines unless fire is not extinguished by using other agents and appears to be danger of spreading. Foam or water spray should be used externally to keep adjacent aircraft structure cool.

RFF Personnel should stay at least 7.5 meters away from the intake of an operating turbine engine to avoid being sucked in, and 45 meters away from the rear to avoid being burned from the blast.

vi. Titanium Fire Control

If titanium parts of aircraft are ignited, fire cannot be extinguished with the use of conventional agents available to aircraft rescue and fire fighting crews. If these fires are contained within the nacelle, it should be possible to allow to burn out without seriously threatening the aircraft itself as long as there are no external flammable vapor air mixtures which could be ignited by the flames or hot engine surface; and foam or water spray is available to maintain the integrity of the nacelle and surrounding exposed aircraft structures.

vii. Fire situation involving rear mounted aircraft engines.

Problem may arise in extinguishing the fire of aircraft engine which is mounted on the rear fuselage associated with vertical stabilizer, because of the height of the engine above ground level. In this case provision of ladders, elevated working platforms and extensible applicators for delivering suitable extinguishing agents may be required.

viii. Magnesium Fire

- Use extinguishing agents specifically designed for flammable metal fires.
- Apply large volume of coarse water stream if large mass of magnesium is involved
- Attack of water stream is undesirable where the primary fire control technique is with foam as the water stream would damage the foam blanket.

12.4 Rescue Tactics and Associated Equipment Requirements

i. Rescue Tactics.

First Phase:

- Identify the task to be performed
- Take the term “Rescue” to include the protection of the route to be followed by aircraft occupants who are able to escape from the aircraft.
- Activities outside the aircraft may include:- Fire fighting, blanketing of fuel of wetted areas adjacent to the aircraft, assistance in the effective use of emergency escape equipment deployed from the aircraft and the provision of lighting to expedite the evacuation.
- Entry to the aircraft should not be made by any route used by escaping occupants during evacuation.
- Rescue of all aircraft occupants may be considered as the primary objective, the overall requirements is to create conditions in which survival is possible and in which rescue operations may be conducted. For this reason, it may be essential to commence fire fighting before attempting rescue any one of the occupants.
- It should also be considered that evacuation from the aircraft and any operation within fuselage may not be conducted effectively if fire situation exists in fuselage.

Second Phase

- Arrangements shall be made to provide personnel and the equipment to rescue those occupants who are unable to make their escape without assistance.
- Maintain fire security inside and outside the aircraft which may entail the periodic restoration of the foam blanket on any fuel wetted areas.

- Delivery of air within the fuselage may be required to provide a repairable atmosphere and for the provision of localized fire protection to rescue operations involving the use of hand or powered tools.

Third Phase (Fire Protection and Maintenance of Fire Safety)

Rescue and Fire fighting must be taken together even if there is no initial fire, possibility of a sudden and disastrous outbreak cannot be ignored. Following precautions should be taken:-

- Blanketing of fuel wetted areas.
- Protection must be available when opening doors and windows of aircraft for entry or evacuation purpose to guard against the ingress of fire and to maintain escape paths if there is a sudden outbreak.

ii. Ensuring the extinguishing Agents

- Primary requirement is to ensure the availability of adequate quantity of highly efficient fire fighting agent and from the current range of foams, dry chemical powder and halogenated hydrocarbons, foam is most suitable.
- Number of crew in first vehicle should be sufficient to ensure the operation of the fire fighting or fire suppression equipment and to provide some assistance at escape slides or other exit routes if evacuation is in progress.
- After arrival of other vehicle the crew of the first vehicle will become available to assist in other duties as demanded by the existing situation.
- After the major fire situation has been controlled or critical area around the occupied portion of the aircraft has been secured, it is essential fire rescue team, each team consisting of two person to assist occupants from the aircraft, to provide firefighting equipment within the aircraft capable of extinguishing or cooling cabin trim and furnishing materials which nay have become involved as well as to provide lighting and ventilation equipment within the aircraft.

iii. Post Accident Ventilation

After the fire inside aircraft cabin has been controlled, aircraft cabin may be filled up with smoke, it is necessary to create serviceable environment within the cabin. For this, effective ventilation is essential to create serviceable environment.

iv. Rescue Equipment Requirements

- Adequate quantity of highly efficient fire fighting agents preferably a foam
- Lighting equipment – operated by portable generator, flood lights, smaller lighting equipment which may be torches etc.
- Power Operated tools –Rotary saw, other cutting devices,
- Hand tools- wire and bolt cutters, screw drivers, crowbars, hammers, axes
- Forcing Equipment- hydraulic operated for bending and lifting operations which may be tubular shaft.
- Respiratory equipment- breathing apparatus
- Communications equipment- radiotelephone units, loudspeakers,
- Miscellaneous items- wedges, plugs for fuel lines, shovels, grab-hook or pike pole, ladders, etc.
- Equipment capable of delivering water spray within aircraft fuselage.
- Equipment capable of delivering a fresh air supply probably by means of powered fan unit.
- Medical first kits, Stretchers etc.

v. Coordination with flight crew

An effective coordination and understanding between flight crew and RFF personnel is necessary to reduce confusion on the part of all personnel concerned and their role in the handling of aircraft accidents or incidents on or near an airport.

It is important that both flight crew members and RFF personnel must be aware with each other's duties and responsibilities in case of emergencies.

Role and responsibilities of flight crew members in emergencies:-

- Pilot in command is responsible to declare an emergency, its type or alert number in accordance to AEP(for the purpose determining the necessity of fire fighting service, PIC also to indicate the nature of emergency such as power plant fire, bomb threat, cabin fire, and plan of coping with incident
- Each of the pilots is familiar with the regulations and procedures of the airports to be used.
- Flight crew should be trained and be aware with their duties in to perform in cases of an aircraft accident or incident including emergency evacuation of aircraft occupants and directing them to a safe distance from the scene of the accident or incident. (Flight crew are responsible to make the final determination to evacuate from the aircraft and the manner in which the evacuation shall be carried out)
- Maintain personnel contact with RFF personnel.
- Be aware in case of fire following an accident or incident is of the dangers associated with the indiscriminate opening of doors or emergency exits which

might permit entry into the fuselage of flames or noxious fumes or which might promote the progress of the fire to other parts of the aircraft,

- Ensure the availability of emergency equipment such as emergency evacuation slides and ropes and be aware to use these equipment. Also make sure the availability of lightweight steps or stairs as these are often required where the aircraft equipment has failed to operate or evacuation from the leading edge of the wing is necessary

Role of RFF Personnel;-

- RFF personnel should not disturb aircraft evacuation slides in use unless they have been damaged by use or fire exposure.
- RFF personnel should stand by at the foot of the slides to aid exiting persons to their feet and direct them to a safe distance from the scene.
- Provide assistance to evacuees using over viewing exits for evacuation will normally slide off the rear edge of the wing or down the wing flaps to prevent leg injuries and direct them to a safe distance from the scene.
- Establish direct contact with flight crew members for the coordination of better evacuation procedures. Two way radio equipment is preferred to use for contact.
- Assist crew members in anyway possible
- Since crew member visibility is restricted, RFF personnel should make immediate appraisal of the external portion of the aircraft and report unusual condition to crew members.

vi. Communication

To establish an effective coordination between fight crew members and RFF personnel, following communication equipment such as radios and intercoms should be made available.

12.5 Accident involving Dangerous Goods.

Both the passengers and the cargo flights may carry dangerous goods, which are marked and packed in accordance to the requirements of ICAO AAnnex-18(Safe Transportation of Dangerous Goods by Air) and ICAO Technical Instruction for the transportation of dangerous goods by air(DOC 9284).These dangerous good s are classified in following nine classes according to their severity:-

Class 1	Explosives
Class2	Gases:- compressed, liquefied, dissolved under pressure or deeply refrigerated
Class3	Flammable liquids

Class4	Flammable solids: - Substances liable to spontaneous combustion, substances which in contact with water, emit flammable gases.
Class5	Oxidizing substances; organic peroxides
Class6	Poisons(Toxics) and infectious substances
Class7	Radioactive materials
Class8	Corrosives
Class9	Miscellaneous dangerous goods; that is articles or substances which during air transport present a danger not covered by other classes. Examples: magnetized materials; acetaldehyde ammonia; expandable polystyrene beads.

In case if emergency occurs in flight, Pilot –in- command should inform the appropriate air traffic services unit for the information to RFF services of any dangerous goods on board. If situation permits PIC shall also include in the information the class, type and quantity of dangerous goods. If situation does not permit PIC to furnish all the details, these details shall be obtained concerned airlines ground personnel.

Fire fighting personnel shall determine the extinguishing agent to be used in responding respective nature of dangerous goods.

Fire fighting personnel shall wear protective clothing including breathing apparatus. As far as possible RFF personnel should stay upwards, out of smoke, fumes and dust.

RFF personnel shall take following precautions to respond fire associated with following classes of dangerous goods:-

Explosives:- If situation permits , effort should be made to obtain the information about the class of explosives.(Normally only the type of explosives are carried in aircraft to board the blast and explosion effects are limited to the extent that they do not significantly hinder fire fighting or other emergency actions.

Gases:- The risk of failure of gas cylinders carried as cargo would be no greater than that typically installed in the aircraft.

Radioactive Materials:- Foam, water or chemicals used to suppress fire , air current and fire itself can spread radioactive materials around the site. Protective clothing and respiratory equipment shall be worn.

Spills and Leaks:- Dangerous goods if damaged by aircraft fire or leaking on accident site may pose a risk or injury or adverse health effects to aircraft occupants and RFF personnel.

If possible pre- identified trained personnel (Possible source may be NAST, Ministry of Health, Quarantine, etc.) should mad available and their expertise advice should be taken.

Poisonous or infectious substances:- In the event of occurrences, food or drinking water which may have come into contact with poisons or other infectious substances should not be used. Public Health and veterinary authorities should be notified. Any person exposed to these dangerous should be removed from the scene of the occurrence and transported for decontamination as soon as possible to the appropriate medical facilities.

12.6 Post Accident Procedures;

RFF personnel should be aware with local airport emergency plan procedures and at least following actions to be taken after the completion of emergency response procedures:-

- Removal of bodies of fatally injured occupants remaining in wreckage after fire has been extinguished or controlled under the direction of medical team.
- Area should be photographed for future reference prior to body removal activity.
- Wreckage should not be disturbed until released for removal by investigation authorities.
- If aircraft parts are to be moved in the course of rescue, record of their original position should be kept.
- Care should be taken to preserve all physical evidences.
- As far as possible mail should be protected and information should be given to local postal authority.
- As aviation fuels and hydraulic may cause harm to skin,it should be washed thoroughly with soap and water if spilled to skin. Change wet cloths.

Chapter – Thirteen

Rescue Operation in Difficult Environment

13.1 Rescue Operation

There are difficult terrains such as mountainous areas in the immediate vicinity of Tribhuvan International Airport Kathmandu.

Out of other airports where RFF Facilities are available, such difficult terrains are also located in the immediate vicinity of Pokhara Airport.

In Biratnagar, Simara, Bhairahawa and Nepalgunj Airports, where RFF Facility are available, difficult terrain of mountainous area are located approximately 10 km from the airport boundary.

In the rest of the domestic airports, where RFF facilities are not available and difficult terrains such as mountains and locations which are subject to heavy seasonal snowfall are present in the immediate vicinity of such airports.

With the consideration of above constraints, National Civil Aviation Security Programme (NCASP) of Nepal and Airport Emergency Plan of respective Airports require Nepal Army to carry out Search and Rescue operation in such areas. (Nepal Army owns helicopters and trained personnel for the rescue operation)

13.2 Inter Agency Exercise

Respective airport authority shall conduct a joint exercise with all the agencies involved in emergency in accordance to the provisions of respective AEP.

13.3 Memorandum of Understanding (MOU)

A written MOU shall be signed between respective airport authorities (or Civil Aviation Authority of Nepal whichever is applicable) and the off airport agencies such as Nepal Army, Nepal Police, Armed Police Force, City Fire, City Hospitals, Red Cross and other agencies which may involve in emerge

Chapter – Fourteen

Training

14.1 RFF Training Programme

Aviation Fire Division at Civil Aviation Authority of Nepal (CAAN) shall prepare Rescue and Fire Fighting Service Training Programme (RFFTP) and shall submit to Director General of CAAN for approval.

14.2 Types of Training

Following types of trainings shall be included in RFFTP:-

- Basic Training – For all RFF personnel
- Operational Tactics/Advanced Training – For all RFF personnel who are directly involved in RFF operation and for all lower level to upper level of managerial RFF Personnel
- Refresher Training – For all RFF personnel
- RFF Management Training – For middle and upper level of staff.

14.3 Major Areas of the Training

Types of Training	Subjects to be included
Basic	Fire and Fire extinction Types of extinguishing agents to used Handling of equipment Care of Equipment Local topography Aircraft Familiarization Medical First aid Rescue Operation Practical Exercises
Operational Tactics/Advanced Training	A brief introduction of all the subjects contained in Basic Training The approach Positioning of Equipment
RFF Management	Subjects included in basic and operational tactics RFF Station Management- Managing Personnel, Managing equipment, logistics, preparing budget.
Refresher	Refresher of short duration on basic, advanced and management training.

14.4 Curriculum

Following areas shall be included in curriculum at minimum:-

- Airport Familiarization
- Aircraft Familiarization
- RFF Personnel safety
- Emergency communication system including aircraft fire alarm.
- Use of appliances – hoses, nozzles, turrets, monitor, ladder
- Application of the types of extinguishing agents.
- Emergency aircraft evacuation assistance
- Fire fighting operation
- Use of structural rescue and fire fighting equipment for aircraft rescue and fire fighting
- Knowledge and extinguishing dangerous goods fire.
- Role and responsibility as stipulated in respective AEP
- Use of protective clothing and respiratory equipment.

Chapter – Fifteen

Foaming of Runways for Emergency Landing

15.1Benefits from Runway foaming

Following may be the benefits from foaming of runway in case of emergency landing:-

- Preventing aircraft damage – Foam will likely reduce the extent of aircraft damage which may be forced to make an emergency landing with wheels –up or where the nose gear is defective.
- Reduction in declaration forces – Foam will reduce the coefficient of friction of the runways resulted by emergency landing and helps to decrease the declaration force.
- Prevention of friction spark hazard
- Reduction in fuel spill fire hazard

15.2Operational Problem

Following aspects shall be evaluated to determine the feasibility of runway foaming for emergency landing:-

- Actual nature of emergency – aircraft can lower its main gear or not, whether only one gear is down and cannot be retracted, number of tires and wheels damaged, nose gear is cocked or not, other related conditions.
- Time available for the preparation and distribution of foam for the purpose of covering, which may take time. Number and nature of available foam making appliances
- Reliability of information on aircraft landing techniques under existing emergency condition.
- The foam making capability and adequacy of the equipment available on the airport for runway foaming. (Airport having inadequate equipment should not attempt for runway foaming)
- Foaming may affect other aircraft movement. Consider time to be taken for cleaning foam from runway. (In all airports of Nepal, only one runway is available for operations)
- Feasibility of foaming under existing weather condition (In very cold weather condition freezing of water element draining from foam blanket could create serious breaking problem during emergency landing.
- As runway slope and runway surface temperature may affect the protein foam water drainage time, the length and surface condition at the time of emergency landing shall be considered.

15.3Techniques of Runway Foaming

After the evaluation of factors as stipulated in 15.1 and 15.2 above, if decision is taken for foaming the runway, following techniques shall be used to accomplish the runway foaming:-

- Radio contact shall be established between Pilot –in Command and ground personnel coordinating the runway foaming
- Primary RFF vehicles shall not be used for runway foaming as far as possible.
- Time shall be calculated to work out the scheduling of the foam laying operation and the vehicle reload requirements. Pre-planning and pre-arrangements shall be made to ensure the adequate quantity of foam compound for rapid vehicle re-servicing.

15.4 Water and Protein Foam Liquid Requirements for Runway Foaming

Distance to Threshold	Malfunctioning Nose Wheel	2-Engine Propeller	Wheel –Up Landing 2-3 engine - Jet	Wheel –Up Landing , 4- engine - Propeller	4-engine –Jet
Width of Pattern	8m	12m	12m	23m	23m
Length of Pattern	450m	600m	750m	750m	900m
Runway area covered	3600msq	7200msq	9000msq	17250msq	20200msq
Water required	14400L	28800L	36000L	69000L	82800L
Protein Foam required 3% type 6%type	 432L 864L	 864L 1728L	 1080L 2160L	 2070L 4140L	 2484L 4968L

Lists of Appendices

Appendix - A

Rescue and Fire Fighting Service Division

Fire Station

Daily Station Routine

Following elements shall be included in daily station duty routine

Attendance and Duty deploy, Equipment Checking

Reporting/debriefing

Physical Exercise

Break Time

Station Drills and other activities:

Breathing Apparatus Drill, Refilling of B. A.

Pump Drill + Fire Fighting Practices

Ladder Drill + Rescue Drill

Knots & Lines Drill + Rescue Drill

Hose Drill (Dry and Wet), Rescue equipment Drill

Foam Drill, Equipment and Station Cleaning

Games and other activities

Handover and Takeover after each shift

Appendix -B

Rescue and Fire Fighting Service Division
Fire Station
Fire Vehicle Performance Form

Type of Vehicle: ……..

Acceleration: 80 km./hr. within ……..seconds.

Top speed: …….. km./hr.

Pump performance Test :

1. Monitor :

a) Throwing Range - ……..meters at 14 bar

b) Discharge Rate - …… L/min. at 14 bar

2. Side Lines :

a) Throwing Range - ……..meters at 14 bar

b) Discharge rate - ……..L/min. at 14 bar.

Remarks : ……..

Signature and Name of the operator ……

Signature and name of Shift-In-Charge :…….

Note: The performance test shall be conducted once in a month

Appendix - C

Rescue and Fire Fighting Service Division

Fire Station

VVIP/VIP Movement Record Form

(to be used only if RFF service is required and provided to designated VVIP)

Date: ……

Name of VVIP/VIP : …….

Flight No. : ……

Arrival Time : ETA :…….ATA……..

Departure Time : ETD :…….ATD……..

Initial Call Time : ……. Turn Out Time:…….

No. of vehicle used : ……..

Time Returned back to the station: …….

Name and Signature of commander…….

Name and signature of the shift in-charge : ……..

Appendix - D

Rescue and Fire Fighting Service Division

Fire Station

Daily Maintenance Report Form

Shift : …… Date : ……

S. No.	Name of the equipment	Details of problem	Reporting Time	Remarks
Clearance action details: Clearing Section Name: Clearing Tech. Name:				
Facility outage:				

Reported by:

Signature……..

Name……

Designation…….

Division/Section…….

Report Received by:

Signature……..

Name……

Designation……..

Division/Section……..

Name and Signature of shift in-charge…….

Appendix – E

Rescue and Fire Fighting Service Division

Fire Station

Drill Activity Report Form

Date : ……

The Chief,

RFFS Division

S. No.	Drill Name	Time	Name of Crew member	Name of non-participator	Causes	Remarks

Drill Commander :

Name and Signature :

Name and signature of shift in-charge

Appendix - F

Rescue and Fire Fighting Service Division
Fire Station
Daily Operational Report Form

Date :……

The Chief

RFFS Division

1. Details of Crew member of :

S. No.	Name and Designation	Remarks	S. No.	Name and Designation	Remarks
1			14		
2			15		
3			16		
4			17		
5			18		
6			19		
7			20		
8			21		
9			22		
10			23		
11			24		
12			25		
13			26		

2. Name of Drill Commander : ……
3. Total No. of Crew (Including Shift In-charge):……..
4. No. of staff present :……..
5. No. of staff absent : ……..
6. No. of staff on leave :……
7. No. of staff weekly R/Off : ……..
8. Water level on overhead tank : ……Liters.
9. Water level on ground tank : ……Liters.
10. Details of WatchTower Equipments:

a) V.H.F. 118.10 :…….. *b) V.H.F. 121.90 : ……*

Appendix - G

Rescue and Fire Fighting Service Division

Fire Station

Emergency Report Form

Date …….

Information Received from :……..

From :……..

Time :……..

Type of Emergency : ……

ETA of Aircraft : ……..(GMT) ……(LT)

Runway to be used : ……

Aircraft Call Sign : ……

Type of Aircraft : ……

Accident site (In the case of ALERT 1): ……

Amount of Fuel On board : ……..

No. of Passenger and crew : ……

Any cargo of critical significance : ……

Location : ……

Quantity : ……

Turn-out Time :……..

No of used Vehicle :…….

Types of Vehicle:…….

Return back time to station. ……

Details of accident/incident

……

Remarks

……

Signature : ……..

Shift-In-Charge Name :……

CHAPTER: ONE
GENERAL

1.8.3 AUDIT AND INSPECTION

The recommendation made by Audit inspection of concerned airport authority shall be responsible for the correction of findings along with the ` Corrective Action Plan (CAP) for the efficient fire fighting activities and operation

CHAPTER: THREE
LEVEL OF PROTECTION

3.1 AIRPORT CATEGORY

The provision of RFFS to the Category set out in paragraph 3.1 is a mandatory requirement. However, there may be circumstances when a part of the facility is temporarily unavailable due to an in-service mechanical failure of a vehicle or piece of equipment or sudden illness of a member of staff or any unforeseen event **or during airport emergency exercises** immediate action should be taken by airport management to reinstate facilities. During the temporary depletion the category of RFFS shall not be less than the equivalent of two categories below that of the RFF Category according to the size of aeroplanes expecting to use aerodrome. If any depletion is significant enough to warrant a restriction of aeroplane movements then the temporary level of RFFS stated in terms of specific RFF Category, should be immediately promulgated by NOTAM and radio. Generally, temporary depletion should not last more than 24 hours at an aerodrome. Licensed airports should consider developing contingency plans like a preventive maintenance plan, arrangement to cover unplanned leave to limit the need for temporary depletion of the promulgated level of RFFS. Licensed airports should consider the provision of reserve facilities to limit the need for temporary depletion.