

# Airport Aircraft Emergencies



**Norman Ashford,H.P.Martin Stanton.Clifton A.Moore,  
Airport Operation,pp356-386,1997**

# Outline

Introduction

Probability of an Aircraft Accident

Type of Emergencies

Level of Protection Required

Water Supply and Emergency Access Roads

Communication and Alarm Requirements

Rescue and Fire-fighting Vehicles

Personnel Requirements

The Airport Emergency Plan

Aircraft Fire-fighting and Rescue Procedures

Foaming of Runways

Removal of Disabled Aircraft

# Introduction

- Airport Aircraft Emergencies
- Probability of an Aircraft Accident
- Type of Emergencies
- Level of Protection Required

# Probability of an Aircraft Accident

Frequency	Probability	Examples
Frequent Likely to occur often during the life of the aircraft	$10^{-3}$	
Reasonably probable Unlikely to occur often but may occur several times in the life of the aircraft	$10^{-5}$	Engine failure
Remote Unlikely to occur to each aircraft in its life but may occur several times during the life of a number of aircraft of the type	$10^{-7}$	Low speed overrun Falling below the net takeoff flight path Minor damage Possible passenger injuries
Extremely remote Possible but unlikely to occur in the total life of a number of aircraft of the type	$10^{-9}$	High speed overrun Ditching Extensive damage Possible loss of life Hitting obstacle in net takeoff flight path Double engine failure on a twin
Will not happen		Aircraft destroyed Multiple deaths

# **Types of Emergencies**

- **Aircraft accident**
- **Full emergency**
- **Local standby**

# Level of Protection Required

## Airport categorization

Airport category		Airplane overall length		Maximum fuselage width
1	0	Up to but not including	9 m (29.53 ft)	2 m (6.56 ft)
2	9 m (29.53 ft)	Up to but not including	12 m (39.37 ft)	2 m (6.56 ft)
3	12 m (39.37 ft)	Up to but not including	18 m (59.06 ft)	3 m (9.84 ft)
4	18 m (59.06 ft)	Up to but not including	24 m (78.74 ft)	4 m (13.12 ft)
5	24 m (78.74 ft)	Up to but not including	28 m (91.86 ft)	4 m (13.12 ft)
6	28 m (91.86 ft)	Up to but not including	39 m (127.95 ft)	5 m (16.4 ft)
7	39 m (127.95 ft)	Up to but not including	49 m (160.76 ft)	5 m (16.4 ft)
8	49 m (160.76 ft)	Up to but not including	61 m (200.13 ft)	7 m (22.97 ft)
9	61 m (200.13 ft)	Up to but not including	76 m (249.34 ft)	7 m (22.97 ft)

# Minimum Usable Amounts of Extinguishing Agents

Airport category	Foam meeting performance Level A		Foam meeting performance Level B		Complementary agents		
	water (L)	discharge rate foam solution/minute (L/min)	water (L)	discharge rate foam solution/minute	dry chemical powders (kg)	Halon s (kg)	CO <sub>2</sub> (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

# Minimum Number of Vehicles

Airport category	No of vehicles
1	1
2	1
3	1
4	1
5	1
6	2
7	2
8	3
9	3



# Water Supply and Emergency Access Roads

- Water for aircraft rescue and fire-fighting purpose can come either from the airport water supply or from natural water supplies within the airport area.
- The ICAO recommends particular attention to providing ready access to approach area up to 3300feet(1000m) from the threshold.

# Communication and Alarm Requirements

- Direct communication between the emergency activation authority (usually air traffic control) and the airport fire station .
- Communication between rescue and fire-fighting vehicles and both air traffic control and the airport fire station.
- Other communication and alerting facilities.



# Rescue and Fire-fighting Vehicles

## Suggested Minimum Characteristics for Resource and Firefighting (RFF) Vehicles

Monitor	RFF vehicles up to 4500L	RFF vehicles up to 4500L
	Optimal 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 aeroplane	Appropriate to longest aeroplane
Hand lines	Required	Required
Under truck nozzles	Optimal	Required
Bumper turret	Optimal	Optimal
Acceleration	80km/h within 25s at the nominal operating temperature	80km/h within 40s at the nominal operating temperature
Top speed	At least 105km/h	At least 100km/h
All wheel drive capability	Yes	Required
Automatic or semi-automatic transmission	Yes	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°	30°
Minimum angle of tilt (static)	30°	28°

# Personnel Requirements

1. The rescue and fire-fighting vehicles can be staffed such that they can discharge both principal and complementary extinguishing agents at their maximum designed capability, and can be deployed immediately with sufficient personnel to bring them into operation.
2. Any control room or communications facility related to the rescue and fire-fighting service can continue operation until alternative arrangements are made under the airport emergency plan.

# Manual and Power Tools Needed at Accident Site

Adjustable wrench	1	1	1	1
Axe, rescue, large nonwedge type	—	1	1	1
Axe, rescue, small nonwedge or aircraft type	1	2	4	4
Cutter bolt, 61 cm	1	1	1	1
Crowbar, 95 cm	1	1	1	1
Crowbar, 1.65 m	—	—	1	1
Chisel, cold 2.5 cm	—	1	1	1
Flashlight	2	3	4	8
Hammer, 1.8 kg	—	1	1	1
Hook, grab or salving	1	1	1	1
Saw metal cutting or hacksaw, heavy duty, complete with spare blades	1	1	1	1
Blanket, fire resisting	1	1	1	1
Ladder, extending (of overall length appropriate to the aircraft types in use)	—	1	1	2 or 3
Rope line, 15 m length	1	1	—	—
Rope line, 30 m length	—	—	1	1
Pliers, 17.8 cm, side cutting, prs	1	1	1	1
Pliers, slip joint 25 cm	1	1	1	1
Screwdriver, assorted (set)	1	1	1	1
Snippers, tin	1	1	1	1
Chocks, 15 cm high	—	—	1	1
Chocks, 10 cm high	1	1	—	—
Powered rescue saw complete with two blades; or pneumatic chisel, plus spare cylinder chisel, and retaining spring	1	1	1	2
Harness cutting tools	1	2	3	4
Gloves, flame resisting pairs	2	3	4	8
Breathing apparatus and cylinders	—	2	3	4
Spare air cylinders	—	2	3	4
Hydraulic or pneumatic forcing tools	—	1	1	1
Medical first aid kit	1	1	1	1

SOURCE: ICAO 1993

# **The Airport Emergency Plan Should Consider**

- Perplanning before an emergency
- Operations during an emergency
- After an emergency

# The Purpose of Airport Emergency Plan

- Orderly and efficient transition from normal to emergency operations
- Delegation of airport emergency authority
- Assignment of emergency responsibilities
- Authorization of key personnel for actions contained in plan
- Coordination of effort to cope with the emergency
- Safe continuation of aircraft operation or return to operations as soon as possible

# Section 1 – Emergency Telephone Numbers for Emergency Plan Document

---

This section should be limited to essential telephone numbers according to site needs, including:

Air traffic services

Rescue and fire-fighting services (departments)

Police and security

Medical services

- Hospitals

- Ambulances

- Doctors — business/ residence

Aircraft operators

Government authorities

Civil defense

Others



# Section 2 – Aircraft Accident on the Airport for Emergency Plan Document

---

Action by air traffic services (airport control tower or airport flight information service)

Action by rescue and fire-fighting services

Action by airport authority

Vehicle escort

Maintenance

Action by medical services

Hospitals

Ambulances

Doctors

Action by aircraft operator involved

Action by emergency operations center and mobile command post

Action by government authorities

Communications network (emergency operations center and mobile command post)

Action by agencies involved in mutual aid emergency agreements

Action by transportation authorities (land, sea, air)

Action by public information officer(s)

Action by local fire departments when structures involved

Action by all other agencies

# Section 3 – Aircraft Accident off the Airport for Emergency Plan Document

---

Action by air traffic services (airport control tower or airport flight information service)

Action by rescue and fire-fighting services

Action by local fire departments

Action by police and security services

Action by airport authority

Action by medical services

Hospitals

Ambulances

Doctors

Action by agencies involved in mutual aid emergency agreements

Action by aircraft operator involved

Action by emergency operations center and mobile command post

Action by government authorities

Communication networks (emergency operations center and mobile command post)

Transportation authorities (land, sea, air)

Action by public information officer

Action by all other agencies

# **Section 4—Malfunction of Aircraft in Flight (Full Emergency or Local Standby) for Emergency Plan Document**

---

Action by traffic services (airport control tower or flight information service)

Action by airport rescue and fire-fighting services

Action by police and security services

Action by airport authority

Action by medical services

Hospitals

Ambulances

Doctors

Action by aircraft operator involved

Action by emergency operations center and mobile command post

Action by all other agencies

---

SOURCE: ICAO 1993

# Section 5 – Structural Fires for Emergency Plan Document

---

Action by air traffic services (airport control tower or flight information service)

Action by rescue and fire-fighting services (local fire departments)

Action by police and security services

Action by airport authority

Evacuation of structure

Action by medical services

- Hospitals

- Ambulances

- Doctors

Action by emergency operations center and mobile command post

Action by public information officer

Action by all other agencies

---

SOURCE: ICAO 1993

# Section 6— Sabotage Including Bomb Threat (Aircraft or Structure) for Emergency Plan Document

---

Action by air traffic services (airport control tower or airport flight information service)

Action by emergency operations center and mobile command post

Action by police and security services

Action by airport authority

Action by rescue and fire-fighting services

Action by medical services

Hospitals

Ambulances

Doctors

Action by aircraft operator involved

Action by government authorities

Isolated aircraft parking position

Evacuation

Searches

Handling and identification of luggage and cargo on board aircraft

Handling and disposal of suspected bomb

Action by public information officer

Action by all other agencies

# Section 7 – Unlawful Seizure of Aircraft for Emergency Plan Document

---

Action by traffic services (airport control tower or airport flight information services)

Action by rescue and fire-fighting services

Action by police and security services

Action by airport authority

Action by medical services

Hospitals

Ambulances

Doctors

Action by aircraft operator involved

Action by government authorities

Action by emergency operations center and mobile command post

Isolated aircraft parking position

Action by public information officer

Action by all other agencies

---

# Section 8— Incident on the Airport for Emergency Plan Document

---

An incident on the airport may require any or all of the action detailed in Section 2, “Aircraft accident on the airport”. Examples of incidents the airport authority should consider fuel spills at the ramp, passenger loading bridge, and fuel storage area; dangerous goods occurrences at freight handling areas; collapse of structures; and vehicle/ aircraft collisions.

---

SOURCE: ICAO 1993

# Section 9 – Persons of Authority – Site Roles for Emergency Plan Document

---

To include, but not limited to, the following according to local requirements:

Airport chief fire officer

Airport authority

Police and security – officer in charge

Medical coordinator

Off-airport

Local chief fire officer

Government authority

Police and security – officer in charge

The on-scene commander will be designated as required from within the prearranged mutual aid emergency agreement.

Experience indicates that confusion in identifying command personnel in accident situations is a serious problem. To alleviate this problem it is suggested that distinctive colored vests with reflective lettering and hard hats be issued to command personnel for easy identification. The following colors are recommended:

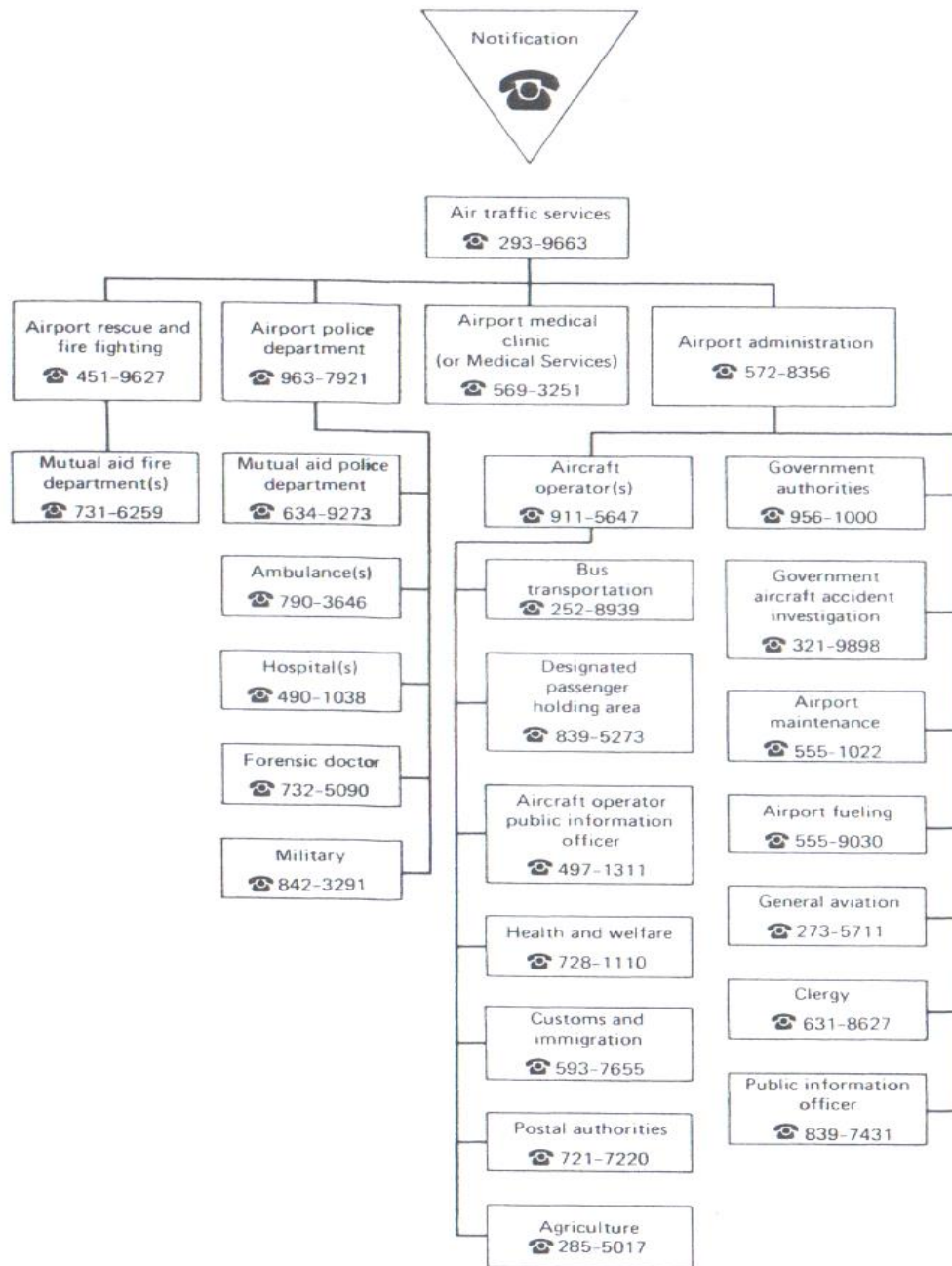
Red	Chief fire officer
Blue	Police chief
White (red lettering)	Medical coordinator
International orange	Airport administration
Lime green	Transportation officer
Dark brown	Forensic chief

An on-scene commander should be appointed as the person in command of the overall emergency operation. The on-scene commander should be easily identifiable and can be one of the persons indicated above or any other person from the responding agencies.

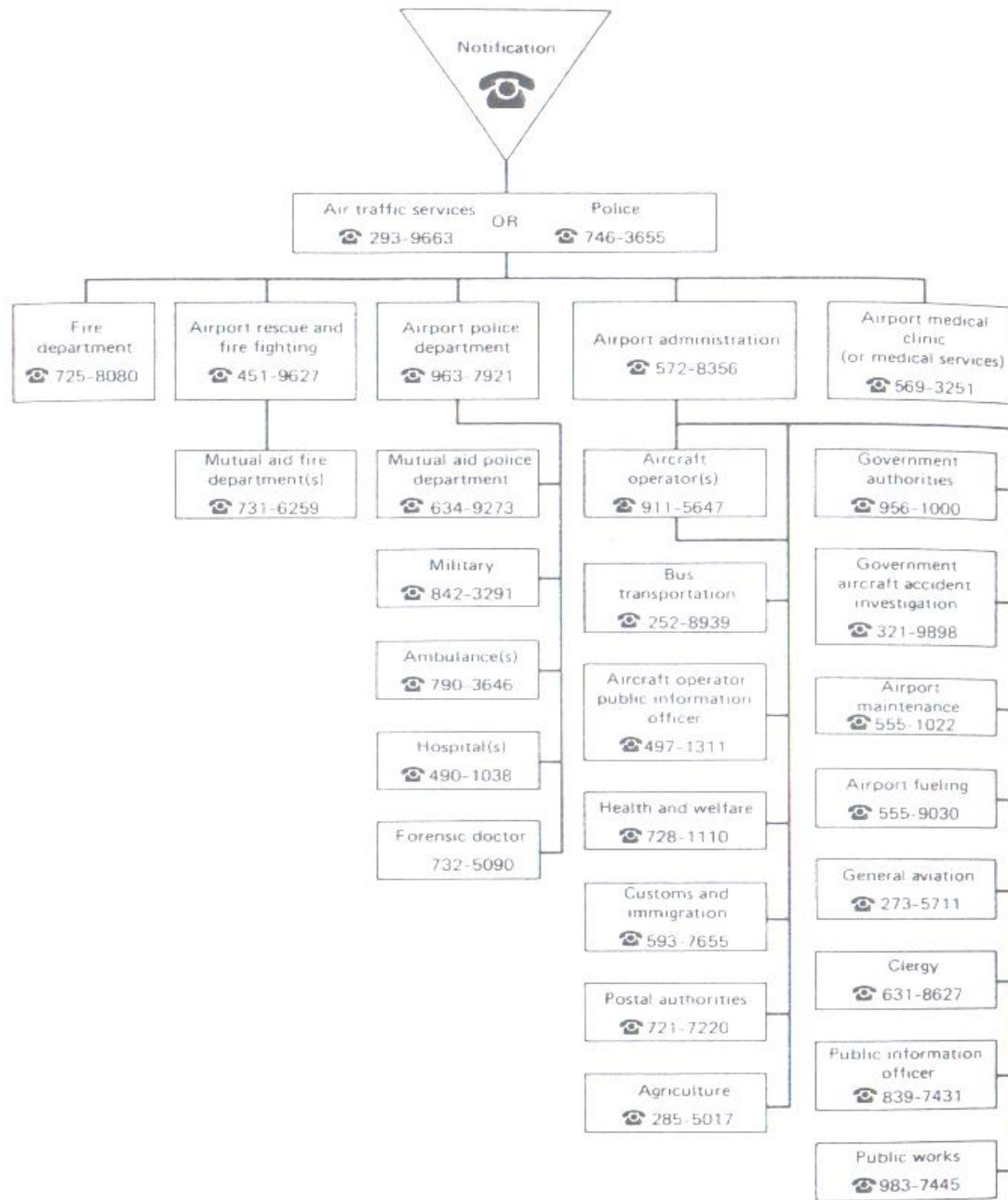


# Three C's of Disaster planning

- **Command**
- **Communications**
- **Coordination**



Flow control chart—aircraft accident on airport. (ICAO 1993)



Flow control chart— aircraft accident off airport. (ICAO 1993)

# Aircraft Fire-fighting and Rescue Procedures

- The effective rescue means:
  1. The fire-fighting and rescue team is well trained and is familiar with equipment and procedures.
  2. The equipment is effective for the purpose.
  3. The accident site is reached in time
- Perform functions:
  1. To form rescue teams to enter the aircraft to assist aircraft occupants who need help to evacuate
  2. To provide fire-fighting equipment within the aircraft for internal fires
  3. To provide lighting and ventilation within the fuselage

# Four Principal Benefits for Foaming of Runways

1. Reduction in aircraft damage.
2. Reduction in deceleration forces.
3. Reduction of spark hazard.
4. Reduction of fuel spill hazard.

# Other Factors for Foaming of Runways

- Whether there is sufficient time to lay a foam blanket (this usually takes about an hour)
- The reliability on the landing techniques to be used: wind, visibility, pilot skill, visual and radio aids, aircraft conditions
- Adequacy of foam-making equipment
- Problem of cleanup to reopen operations
- Ambient conditions such as rain, wind, or snow
- Runway condition and slope

# Criteria for Foaming of Runways

1. The pilot must be fully informed on how the operation is to be carried out and what protection is to be provided.
2. The vehicles providing the foam must not decrease the minimum level of airport protection required.
3. The Foam used should be additional to the minimum level of protection plus replenishment needs.
4. The positioning of the blanket should recognize that with a gear-up landing the aircraft contacts the runway much farther from the threshold than usual.
5. In reduced visibility, the pilot must be given a reference point to indicate where the foam starts.
6. Unnecessary personnel must be cleared from the area.
7. Prior to use, the foam should be aged about 10 minutes to permit drainage and surface wetting.
8. The foam blanket should be continuous.
9. The Blanket depth is about 2 inches (5 cm)
10. After laying the foam, all personnel and equipment are removed to emergency standby positions.

# Removal of Disabled Aircraft

- Itemization of equipment and personnel necessary together with location and time required to get to the airport
- Necessary access routes for heavy equipment
- Grid maps of the airport to locate accident site, access gate, and so on
- Security arrangements
- Arrangements for accepting specialized recovery equipment from airports in the technical pool
- Manufacturers' data on aircraft recovery for aircraft normally using airport
- Defueling arrangements with resident oil companies
- Logistics of supplying labor and special clothing
- Arrangements for expediting the arrival of the investigator in charge



# Typical Methods of Recovery of Heavy Aircraft for Various Conditions Damage

Conditions	Typical methods of aircraft recovery
Collapsed nose landing gear	Jacking and use of pneumatic lifting bags; hoisting with cranes and the use of specially designed slings; or by pulling down on tail tie-down fitting.
Collapsed or retracted main landing gear, but nose landing gear intact and extended	Jacks, pneumatic lifting bags, or cranes.
Collapsed main landing gear one side only	Jacks, pneumatic lifting bags, or cranes.
Collapse of all landing gears	Jacks, pneumatic lifting bags, or cranes.
One or more main landing gear off pavement, no aircraft damage	Assuming that the aircraft has the landing gear bogged down in soft soil or mud, extra towing or winching equipment or use of pneumatic lifting bags will usually suffice for this type of recovery. It may be necessary to construct a temporary ramp form timbers, matting, etc.
Nose landing gear failure and one side of main landing gear failure	Jacks, pneumatic lifting bags, or cranes.
Tire failure and/or damaged wheels	Jacks and parts replacement.

# General Checklist for Preparing an Emergency Plan

Functional area	General requirements/ actions	Responsibility/ designations for performance and governmental agency/ element participation	Established programs/ reference material	Airport emergency assignments
Aircraft incidents and accidents	Establish notification procedures; plan to respond to and to cope with occurrences; establish alert and standby procedures for airport fire-fighting, ambulance, and rescue services; provide care for any injured passengers; provide services for uninjured passengers; and activate mutual assistance plan if needed.	FAA ATC/FSS personnel monitor communications, relay messages, and establish points of contact; airport management to establish means and procedures for overall notification and receipt of messages and for response to emergencies. Units to be notified include airport operations, fire department, emergency medical service, the airport security office, the airline, and the NTSB.	FAA handbooks 7110.8B ( <i>Terminal Air Traffic Control</i> ), 7110.9B ( <i>En Route Air Traffic Control</i> ) 7110.10A ( <i>Flight Services</i> ), 7210.3 ( <i>Facility Management</i> ), and 8020.4A ( <i>Aircraft Accident Notification Procedures and Responsibilities</i> ). AC 1505200-15 ( <i>Availability of the International Fires Service Training Association's Aircraft Fire Protection and Rescue Procedures Manual</i> ) also procedures established for emergency alarm system	Entries in this column to be made by person in charge of emergency plan.

# General Checklist for Preparing an Emergency Plan

Functional area	General requirements/ actions	Responsibility/ designations for performance and governmental agency/ element participation	Established programs/ reference material	Airport emergency assignments
Bomb incident procedures including a designated parking area for aircraft suspected of having a bomb aboard	Carry out procedures to ensure that airport authorities, airport authorities, airport security offices, airline, etc., are notified; and park aircraft in isolated designated area. <i>Note: The plans for parking such aircraft are expected to be treated as privileged information</i>	ATC; airport security office; airport management; the airline; and public affairs.	The program administered by the Office of Air Transportation Security, Headquarters, FAA, SE-1	

SOURCE: Federal Aviation Administration

# General Checklist for Preparing an Emergency Plan

Functional area	General requirements/ actions	Responsibility/ designations for performance and governmental agency/ element participation	Established programs/ reference material	Airport emergency assignments
Structural fires	Establish procedures for notification of the fire department; evacuate structures in the vicinity of the fire; have employee designated to report to structure, facility, etc., to cut off power supply source as necessary for safety during fire-fighting operations. In addition, make sure that emergency crews can gain access to locked areas such as electrical vaults.	The fire department; airport security office; the emergency electrician; medical services; and airport management.		

# General Checklist for Preparing an Emergency Plan

Functional area	General requirements/ actions	Responsibility/ designations for performance and governmental agency/ element participation	Established programs/ reference material	Airport emergency assignments
Natural disasters	Set up plans for protecting the public during storms, such as hurricanes, floods or tidal waves; curbing operations as necessary during storms; and the utilization of fallout shelters, storm shelters, etc.	Combined efforts of airport disaster control organization	The Natural Disaster Warning System established by the National Oceanic and Atmospheric Administration	

SOURCE: Federal Aviation Administration

# General Checklist for Preparing an Emergency Plan

Functional area	General requirements/ actions	Responsibility/ designations for performance and governmental agency/ element participation	Established programs/ reference material	Airport emergency assignments
Crowd control and measures to prevent unlawful interference with operations	Make arrangements with law enforcement or other authorities to get intelligence reports; carry out procedures for crowd control, and take security measures to preclude sabotage; control of motor traffic, gates, access areas where pedestrians may enter the airport and block entry through underground service ducts, sewers, or tunnels.	Airport management; airport security office; local and state police forces.		

# General Checklist for Preparing an Emergency Plan

Functional area	General requirements/ actions	Responsibility/ designations for performance and governmental agency/ element participation	Established programs/ reference material	Airport emergency assignments
Radiological incidents or nuclear attack.	These requirements are in two categories of radiological incidents connected with the air transportation of radioactive material and nuclear attack; Under the first category, carry out notification procedures and establish security measures around the area by the use of guards, ropes, barricades, etc.	ATC; airport security office; various state organizations capable of coping with nondefense types of nuclear incidents; and the tripartite agreement between AEC-DOD-HEW to cover assistance following radiological emergencies.	FAA handbooks 7110.8B ( <i>Terminal Air Traffic Control</i> ), 7110.9B ( <i>En Route Air Traffic Control</i> ), 7110.10A ( <i>Flight Services</i> ), 7210.3 ( <i>Facility Management</i> ). AEC <i>Radiological Assistance Program Handbook</i> ; <i>Information summary on Interagency Radiological Assistance Plan</i> ; <i>Monograph on AEC Radiological Assistance Program</i> ; <i>Monograph on OS Interagency Radiological Assistance Plan</i> ; <i>Radiological Emergency Procedures</i> for the nonspecialist (available from AEC, Division of Operational Safety, Washington, DC 20545).	

# General Checklist for Preparing an Emergency Plan

Functional area	General requirements/ actions	Responsibility/ designations for performance and governmental agency/ element participation	Established programs/ reference material	Airport emergency assignments
	Under the second category, follow the procedures for operating under the Disaster Control Organization and establishing contact with DOD organization for military support of civil defense functions	The airport emergency organization and DOD military forces.	The training programs of the Office of Civil Defense (OCD) for radiological monitors and for fallout shelter management.	
Medical services	Provide for using facilities located on the airport and/or arrange to get ambulances, services, and other mutual assistance from hospitals, clinics, etc. that are located off the airport.	The designated airport medical officer.	The local and state health department's emergency medical service programs.	



# General Checklist for Preparing an Emergency Plan

Functional area	General requirements/ actions	Responsibility/ designations for performance and governmental agency/ element participation	Established programs/ reference material	Airport emergency assignments
Removal of disabled aircraft	Establish agreements between airport management and the airlines indicating for the quick removal of aircraft with tire, wheel, or gear failures. This involves removing the aircraft from surface maneuvering areas of the airport and performing the maintenance elsewhere.	The NTSB/FAA representatives for release of the aircraft to owner/operator for	AC 1505200-13 Removal of Disabled Aircraft; ATA Aircraft Recovery Committee;and	

SOURCE: Federal Aviation Administration

# Exercises for aircraft emergency at Makung Airport





Makung Airport



Makung Airport

# Airport aircraft emergency exercise at Makung airport (video)



# Key Terms

- Aircraft accident
- Type of emergencies
- Access roads
- Rescue and fire-fighting vehicles
- Foaming of runway
- Disabled aircraft
- Level of protection required
- Communication and alarm requirements

# Key Terms (cont.)

- Personnel requirement
- Accident site
- Emergency plan