Delhi Mumbai Industrial Corridor Development Corporation

Development of Greenfield International Airport at Bhiwadi, Rajasthan

RISK ASSESSMENT STUDIES
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1 RISK ASSESSMENT STUDIES

1.1 RISK ASSESSMENT

Risk assessment is the use of the factual base to define health effects of exposure of individual or population to hazard material and situations. It is the identification of main hazard and unsafe practices in Airport operations.

Risk assessment encompasses the systematic use of available information to determine the likelihood of certain events occurring and the magnitude of their possible consequences. As a process, it is generally agreed that it includes:

- Identifying the nature, location, intensity and probability of a threat;
- Determining the existence and degree of vulnerabilities and exposure to those threats
- Identifying the capacities and resources available to address or manage threats; and
- Determining acceptable levels of risk.

1.1.1 Risk Assessment Methodology

Following step by step method is used for Conducting a Risk Assessment

1. Identifying construction and operations jobs for airport project.
2. Identifying the critical tasks of each job or flight operations that have a potential of injury or ill health.
3. Determine the hazards associated with the job task, including severity and probability, if controls are not available.
4. Determine the existing controls implemented and the resulting risk level associated with the identified hazards.
5. If the risk is High, the risk is not acceptable, and additional controls must be introduced to reduce the risk to Medium or Low.
6. If the risk is Medium, the risk is acceptable, and additional controls should be considered if practical.

1.1.2 Hazard Identification

Aircraft service may involve one or more of the following:

- Mechanical Hazards; Accidental activation of aircraft safety systems
- Occupational Hazards; Accidents Manual handling

- Unsafe condition which may affect the use of aircraft (including landing)
- Threats from Birds aerials
- Chemical Hazards; engine exhaust during landing and takeoff to surrounding Area.
- Disruption to/interference with DMP Team communication systems from ATR /IG International airport authority during emergency
- Fire Hazard; Fire /Explosion of aviation fuel storage tanks
- Noise Hazards ; High Noise level during landing and Takeoff

A. ATF Hazards

Jet A-1 (ATF) is a highly flammable liquid. The fuel has a low vapour pressure at ambient temperature, which makes the liquid less volatile. Hence, it evaporates slowly in case of fuel leakage and remains in the atmosphere posing threat of fire. Also, the fuel has a flash point lower than the ambient temperature of Mundra in summers. This means that the fuel will give off flammable vapour at a concentration sufficient to cause ignition. However, significant heat source is, required to ignite the fuel and therefore proper safety management has to be implemented.

Jet A-1 is classified for supply purpose as harmful as a result of the aspiration hazard and irritation to the skin. Toxicity following a single exposure to high levels (orally, dermally or by inhalation) of Jet A-1 is of low order; however exposure to high vapour concentration can lead to nausea, headache and dizziness. Accidental ingestion can lead to chemical burning of the mouth. Ingestion can lead to vomiting and aspiration into the lungs which can result in chemical pneumonitis which can be fatal. Prolonged and repeated skin contact can lead to defatting of the skin, drying, cracking and dermatitis.

B. Storage Hazards

Typical storage hazards are applicable for this type of tank farm systems. Sources of ignition can include lightning, open flame, electrical spark, static discharge, chemical reaction, or any heat source that can raise or ignite the fuel-air vapor mixture. The release of ATF could occur from transfer stations (gantry areas), storage to refueller systems, valve glands or pipelines due to several reasons. The most typical emergency relating to fuel handling is a fuel overflow or spill. Such events can be very minor in nature involving just a few liters of product, or they can be a catastrophic event involving hundreds of litres of fuel.

C. Combustion Hazards

The combustion products of aviation fuel include carbon dioxide, nitrogen oxides and sulphur oxides. Incomplete combustion will generate thick black smoke and potentially hazardous gases including carbon monoxide. However smoke from such fires is buoyant and does not tend to seriously impact people on the ground in the open air.

D. Electrostatic hazards of ATF (Jet A-1)

Jet A-1 has a low electrical conductivity. This provides for static electricity to be generated and charges to be accumulated. According to HSE, UK, the degree to which a static charge may be acquired by aviation fuels depends upon many factors such as

- Amount and type of residual impurities
- Dissolved water
- Linear velocity through piping systems
- Presence of static generating mechanisms e.g. filters and
- Opportunity for the fuel to relax for a period of time to allow any charge generated to dissipate safely to earth.

In order to reduce the accumulated amount of static electricity, antistatic additives are added to the fuel. This works by enhancing the conductivity of the fuel in order to shorten the time required for dissipating the static charge safely to earth.

E. Health Hazard

Jet A-1 is classified, for supply purposes as harmful, as a result of the aspiration hazard and irritation to the skin.

Acute Health Hazards: Toxicity following a single exposure to high levels (orally, dermally or by inhalation) of Jet A-1 is of a low order. However, exposure to higher vapour concentrations can lead to nausea, headache and dizziness. If it is accidentally ingested, irritation to the gastric mucous membranes can lead to vomiting and aspiration into the lungs can result in chemical pneumonitis which can be fatal.

Inhalation: Under normal conditions of use Jet A-1 is not expected to present an inhalation hazard.

Skin: Jet A-1 is slightly irritating to the skin, and has a defatting action on the skin.

Eyes: Jet A-1 may cause discomfort to the eye.

Chronic Health Hazards: Prolonged and repeated contact with Jet A-1 can be detrimental to health. The main hazards arise from skin contact and in the inhalation of mists. Skin contact over long periods can lead to defatting of the skin, drying, cracking and possibly dermatitis. Excessive and prolonged inhalation of mists may cause chronic inflammatory reaction of the lungs and a form of pulmonary fibrosis.

Exposure Limit Values : Jet A-1 does not contain any components to which exposure limits apply, however it is chemically very similar to white spirit, for which the following UK occupational exposure standards apply (HSE, 2000):

- Occupational Exposure Limit (OEL) = 575 mg/m3 (100 ppm) 8-hour TWA value
- Occupational Exposure Limit (OEL) = 720 mg/m3 (125 ppm) 10-min TWA value (TWA - Time Weighted Average)

F. Environmental Hazard

Hazard Environmental Conditions: High wind and/or inclement weather conditions may create additional hazards, especially during landings and take-offs, therefore greater safety distances may be necessary. Hazards may be compounded due to poor visibility or darkness.

Air: Jet A-1 is a mixture of non-volatile components, which when released into the air will react rapidly with hydroxyl radicals and ozone.

Noise: The noise created by the engines creates additional hazards to personnel working with aircraft. Hazards posed by noise may be twofold:

- If the noise is of such intensity that normal speech cannot be heard, personnel may mishear (or not hear) critical safety information and may expose themselves and/or others to additional hazards.
- Prolonged intense noise may result in damage to hearing. It is understood that the noise levels during the project operation exceeds the noise in nearby area for residential zone limit of 55 dB(A) and silence zone limit of 50 dB(A) for day time.

Water: If released into water, the majority of Jet A-1 will evaporate at a moderate rate but a small proportion will dissolve. Dissolved components will be either absorbed in sediments or evaporate into the air. In aerobic water and sediments they will biodegrade, but in anaerobic conditions they will persist. Jet A-1 is slightly toxic to aquatic organisms and contains components which have a high potential to bio-accumulate, but is unlikely to persist in the aquatic environment for sufficient time to pose significant hazards.

Soil: Small volumes released on land will evaporate at a moderate rate, with a proportion being absorbed in the upper layers of the soil and be subject to biodegradation. Larger volumes may penetrate into anaerobic soil layers in which it will persist. A spill of Jet A-1 may reach the water table on which it will form a floating layer, and move along with the groundwater flow. In this case, the more soluble components, such as aromatics, will cause groundwater contamination. Mammalian toxicity is expected to be of a low order.

G. Descent and Landing Hazard

Descent and Landing accident are most common in aviation industry. They account almost for 36% of aviation mishaps. The various stages of descent and landing are as under:

Aborted Landing: At the time of unavoidable circumstance pilot takes control or abandon his landing plan for safer alternative is termed as Aborted landing. It is created by runway obstruction. Sometimes aborted landing may go wrong and accident may occur.

Climb Out/Takeoff Accidents: The weather condition or wind speed dramatically influence the flight plan during takeoff. Due to gusty winds plane may pitch from side to side which can further result in crash.

H. Human Error

Human error is cited as being causal or contributing factor in majority of aviation accidents. Error may occur at planning stage or during execution of the plan. In reality, human error is the primary contributor to more than 70 percent of all commercial airplane accidents. Pilot

error is a far more likely cause of an airplane crash than mechanical failure or bad weather conditions.

"Pilot error (weather related)" represents accidents in which pilot error was the cause but brought about by weather related phenomena. "Pilot error (mechanical related)" represents accidents in which pilot error was the cause but brought about by some type of mechanical failure. "Other human error" includes air traffic controller errors, improper loading of aircraft, fuel contamination and improper maintenance procedures. Sabotage includes explosive devices, shoot downs and hijackings. "Total pilot error" is the total of all three types of pilot error. Where there were multiple causes, the most prominent cause was used. Some of the aircraft accidents due to human error are taxi and take off errors, pre-flight accidents, faulty flight manoeuvres, terrain and visual illusions.

I. Weather

The poor weather condition is beyond the control of pilot, air line and flight crew. Some accidents attributed to other causes involved weather as a contributing factor, as in case of improper IFR approach. Wind shear and cross wind also caused weather related accidents in VFR condition.

Lighting: The accidents due to lighting are:

- Struck by lightning during thunderstorm
- Ignition of gasoline vapours emanating from the tank vent pipes by static discharge
- Electric power was lost following lightening strike

Wind and Wind Shear: These accidents are caused by off side or end of the runway on takeoff. The turbulence is stream of irregular wind which influences steadiness of plane. 48% of light air craft accidents occur due to wind.

Visibility/Snow: During the winter season visibility is low. Reduction in temperature may cause certain parts to freeze or jam leading to unwanted problems or complications. This if not noted in time lead to accident.

Rain: Rain and thunderstorm are very dangerous to plane. Turbulence, cumulus clouds, high winds, ice, hail, lightning, loss of visibility, electrostatic discharge, tornadoes, altimetry errors, and wet runways often accompany rain and must be managed by pilots and flight crews. The heavy rain fall makes the runway slick or slippery causing to lose control and break apart.

J. Hazards due to incorrect approach/boarding/disembarking

There may be occasions when Fire crew and safety personnel are required to approach, board or disembark from stationary aircraft. The hazards arising from incorrect approach/boarding/disembarking to or from aircraft may be due to any personnel approaching from the rear or side of the aircraft, where they cannot be observed by the pilot.

K. Overhead HT Power Lines, Trees and Other Hazards

No tress found in project area except few outside flying zone. Aerials, particularly high frequency aerials which are cables slung down near the airport, pose a significant hazard during high frequency transmissions and can cause burns.

L. Mechanical Failure

No machine is completely fool proof. In case something goes wrong everything will be wrong. The aircraft are complicated instruments needs meticulous and sophisticated technology and software. The mechanical errors account for 13 % of accidents. Some of the Mechanical Failures are Engine failure, Defective Landing gear, Lack of Maintenance, propeller blade, improper fuelling, malfunction of fuel pump, improper hardware, obstacles in and around, mechanical error, electrical malfunctions, defective rudder, and defective gauges.

M. Birds strike

Birds are not always but it is threat to plane safety. During the take off there are chances of engine failure due to high altitude birds and plane may be crashed. Bird strike occurs when there is collision between bird and an aircraft. The speed of the impact is such that even light bird may cause destructive damage to fast moving plane.

1.1.3 RISK ESTIMATION/ANALYSIS

A risk estimates is the estimation of the likelihood or statistical probability that risk/harm may occur. Risk analysis is conducted in two ways 1) Qualitative risk analysis and 2) Quantitative risk analysis. These two type of risk analysis can be conducted simultaneously or in a chosen order, and even within a defined period gap.

1.1.3.1 Qualitative Risk Analysis

The objective of conducting a qualitative risk analysis is to acquire safety against recognized risks and to increase the alertness of management, team members, and all personnel who are vulnerable to them. The risk ranking and severity of consequences are given in Table 1.1 and Table 1.2.

TABLE 1.1: RISK RANKING

Risk Assessment			
Likelihood of Harm	**Severity of harm**		
	Slight harm	**Moderate Harm**	**Extreme Harm**
Very unlikely	Very low risk	Very low risk	High risk
Unlikely	Very low risk	Medium risk	Very high risk
Likely	Low risk	High risk	Very high risk
Very Likely	Low risk	Very high risk	Very high risk

TABLE 1.2: SEVERITY OF CONSEQUENCES

Minor injury 1	Minor damage to Aircraft/ building/people A person can go home with first aid treatment or bandage to wounds
Injury (no time lost) 2	Damage but repair cost is low Person needs treatment till 2 days
Injury (time lost) 3	High damage repair cost more Person needs treatment for more than 2 days
Major Reportable injury 4	Very high damage Repair cost Person admitted to hospital for needed treatment
Fatality 5	Major damage major cost Death of a person on the spot or in hospital during treatment

1.1.3.2 Quantitative Risk Analysis

Quantitative risk analysis is more focused on the implementation of safety measures that have been established, in order to protect against every defined risk. By using a quantitative approach, an organization is able to create a very precise analytical interpretation that can clearly represent which risk-resolving measures have been most well-suited to various project needs. This makes the quantitative approach favored by many management teams since risk assessments can be clearly represented in the empirical forms like percentages or probability charts, since it emphasizes using tools such as metrics.

Risk can be evaluated and rank according to the severity and frequency of occurrence. Probability of occurrence and frequency can be calculated after ranking the level of risk at various levels of operation.

1.1.3.3 Frequency of Risk Occurrence at Airport

The chances of risk occurrence at the proposed airport are described briefly as under:

- Descent and Initial Climb: The aircraft descends to get closer to its destination airport. Air traffic control may request the aircraft to loiter and wait its turn for the next phase. Over half of all accidents occur during the final approach and landing stages. These aren't the most devastating accidents; however a runway overrun may result in only a few injuries. Frequency of occurrence of this type of risk is very rare.

- The length of runway is sufficient as per the ICAO norms. The speed of the aircraft is not controlled by the pilot it will skid further and stop after landing. There will be minor injury to passenger and casualty is not fatal. Frequency of occurrence of this type of risk is very rare.

- There are chances of tyre burst due to sharp object on the runway. This will lead skidding of aeroplane causing minor injury to pilot, crew and passengers. Frequency of occurrence of this type of risk is once in 10,000 landings.

1.1.4 MITIGATION MEASURES /CONTROL MEASURES

The mitigation/ control measures for the above risks are given below:

- Safely signs/ warnings/Do's & Don't will be displayed at Passenger Terminal, reception desk, check-in area, security check, departure hold area, cafeteria, main gate, and office areas.
- Provision of a paved apron for parking aeroplanes.
- Provision of first aid facilities at the Terminal building
- The surface of the safety area abutting the FATO shall be continuous with the FATO and the whole of the safety shall be treated to prevent loose stones and any other flying debris caused by rotor downwash.

Safe practices of Fuel Tank Farm: All safety provisions will be as directed by PESO norm like safe storage of fuel barrels in a re-fuelling bay, and Provision of Safe "hot-fuelling" which allows the fuelling of helicopters without turning off power to the main rotor.

The organization will procure a fuel bouzer from Indian Oil Corporation to refuel its Aircraft. The fuel bouzer will be operated and maintained by IOC as per DGCA Civil Air requirements Section-2 Series H Pt I, II, III and their own guide lines on the subject. Periodical checks and monitoring shall be carried out as stipulated in above guide lines. Subsequently, qualified staff will be trained by IOC and uproot by DGCA to handle the same functions.

Noise Hazard Mitigation: Proposed helicopter approach paths follow unpopulated routes or areas with high ambient noise levels such as highways. The flight operator should follow the measures given below to reduce the noise at sensitive and residential areas:

- maintaining a hover/circling at higher altitudes,
- Optimal aircraft route planning to avoid noise sensitive areas
- reduce speed,
- observe low noise speed/descent settings,
- avoid sharp maneuvers, and
- use high take-off/descent profiles

Safe approach funnels: It was seen that Proposed airport at Bhiwadi is not falling on approach or take off funnels of the runways at IGI Airport. The aircraft approach paths of proposed airport are also clear of aircraft paths of IGI Airport. The airport is not located on any Restricted, Prohibited or Danger areas.

Safe Practice of Operations: Permission & positive control of ATC, IGI Airport for operations is considered essential. Prior clearance from statutory authorities will be obtained.

Safe handling Facilities: Provision of helicopter parking, terminal building with facilities, repairs & maintenance, weather and communication, crew handling facilities, passenger facilitation, medical facilities like ambulance, hangar-ray machines, food court, ATM

machines, operators counters, offices for operators, rest rooms/wash rooms, vehicle parking facilities, recreational facilities etc in order to provide dedicated services under one roof.

Structural stability provided Final approach and take-off (FATO) area: The surface of FATO should be

- Free from irregularities that would adversely affect the landing and take-off.
- Capable of sustaining the effect of rotor down wash.
- Have sufficient bearing strength to sustain rejected take off

Safe distance from Highway: Threat from accidental fire /explosion cloud threat from High way/ LPG tanker incident are limited. Project is at a distance of 23 km laterally from NH 8.

Provision of Safety Area and fencing: A safety area surrounding Final Approach and Take-off (FATO) area intended to be used in visual meteorological conditions (VMC) shall extend outwards from the periphery of the FATO, for a distance of at least 3.00 m or 0.25 times the overall length or width (whichever is greater), of the largest helicopter intended to be used at the airport.

No Mobile Zone: No fixed objects shall be permitted in the safety area. No mobile object shall be permitted during aircraft operations.

Provision of supporting facilities:

- Provision of ATC building, Technical block, Met office for safe operations
- Fire station having space for Fire tender, Ambulance and a Jeep for airport staff.
- Fuel storage yard,
- Electric packaged sub-station, U.G. Tank
- Navigational aids

Provision of Crash Fire Rescue Facilities: As per ICAO classification the levels of protection to be provided at the proposed airport fall under “Category 9 Annexure 14”. An area of 17,000 m2 is earmarked for the ARFF facility. The area proposed for the ARFF building is 2000 sqm. Minimum usable amounts of extinguishing agents would correspond to 36,400 litres of water at a discharge rate foam solution of 16,600 litres per minute, and 450 kg of dry chemical powders. Rescue equipment will be adequate to meet DGCA CAR requirements. The minimum number of ARFF vehicles present would be three. A paved emergency access road of 5 m wide will be provided from the locations of the ARFF facilities to both runways. A communication and alerting system will be provided linking the ARFF station with the control tower and ARFF vehicles.

Provision of safety system & Documentation: Emergency Evacuation plan /Disaster management plan, Mutual aid from allied agencies, Medical facilities, Relevant Training to cope with emergency shall be provided for airport operations.

Mechanical Failure: The good maintenance and replacement of worn part regularly will reduce mechanical failure.

- **Improper Fuelling:** The quality of fuel should be checking before refuelling. It should adhere to the standards issued by ICAO.
- **Improper Hardware:** The hardware used in the air craft should be ICAO approved. There should not be any compromise on the quality of hardware.
- **Design Flaw:** All the parts of engine and air craft should be flawless from design and construction angle.

Weather: Weather is a major environmental consideration. As pilots set their own personal minimums, they should evaluate the weather for a particular flight by considering the following:

- What are the current ceiling and visibility? In mountainous terrain, consider having higher minimums for ceiling and visibility, particularly if the terrain is unfamiliar.
- Consider the possibility that the weather may be different from forecast. Have alternative plans and be ready and willing to divert should an unexpected change occur.
- Consider the winds at the airports being used and the strength of the crosswind component
- Are there any thunderstorms present or forecast?
- If there are clouds, is there any icing, current or forecast? What is the temperature-dew point spread and the current temperature at altitude? Can descent be made safely all along the route?

Human Error Control - PAVE: Using PAVE helps to identify risk before departure and assists the pilot's decision-making process. With the PAVE checklist, pilots have a simple way to remember each category to examine for risk prior to each flight. Once a pilot identifies the risks of a flight, he or she needs to decide whether the risk or combination of risks can be managed safely and successfully. If not, make the decision to cancel the flight. If the pilot decides to continue with the flight, he or she should develop strategies to mitigate the risks. One way a pilot can control the risks is to set personal minimums for items in each risk category.

A) Pilot: A pilot must continually make decisions about competency, condition of health, mental and emotional state, level of fatigue, and many other variables. When most people make mistakes at their jobs, their employment can be terminated. When pilots are negligent or make errors while on the job, there is a potential risk for hundreds of lives. Pilots receive extensive training designed to prepare them to handle a wide variety of situations, but there are times when fatal mistakes are made.

One of the best ways pilots can mitigate risk is a self evaluation to ensure they are in good health. A standardized method used in evaluating health employ is the I M SAFE checklist. It can easily and effectively be used to determine physical and mental readiness for flying and provides a good overall assessment of the pilot's well being.

B) Environment: The environment encompasses many elements that are not "pilot or airplane" related, including such factors as weather, air traffic control (ATC), navigational aids (NAVAIDS), terrain, takeoff and landing areas, and surrounding obstacles. Weather is one element that can change drastically over time and distance.

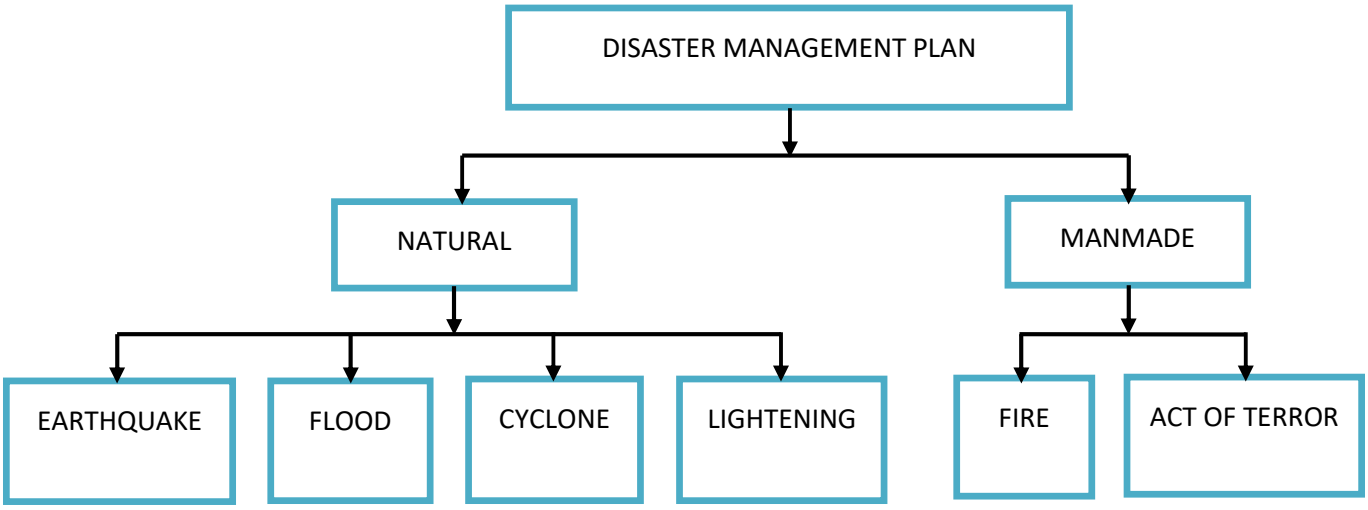
C) External Pressures: The interaction between the pilot, airplane, and the environment is greatly influenced by the purpose of each light operation. The pilot must evaluate the three previous areas to decide on the desirability of undertaking or continuing the flight as planned. It is worth asking why the flight is being made, how critical it is to maintain the schedule, and if the trip is worth the risks. External pressures are influences external to the flight that create a sense of pressure to complete a flight - often at the expense of safety.

Management of external pressure is the single most important key to risk management because it is the one risk factor category that can cause a pilot to ignore all other risk factors. External pressures place time-related pressure on the pilot and figure into a majority of accidents. The use of personal standard operating procedures (SOPs) is one way to manage external pressures. The goal is to supply a release for the external pressures of a flight.

1.2 DISASTER MANAGEMENT PLAN

Disaster management plan for proposed airport is to discuss about standard operating procedures that should be implemented during emergencies. The whole process involves a preparation plan for the impending disaster, action in response to a disaster, and support and strength to rebuild a community after the occurrence of a disaster during aircraft communication services. Basic elements of Disaster Management Plan are shown in Figure 1.1. Dedicated Disaster management plan is advisable for airport operations being located from far away from New Delhi. It makes the operator staff, passenger aware of the various disasters possible in a building, prevention and procedures, training in disaster management, and after-disaster procedures for building objects.

FIGURE 1.1: ELEMENTS OF DISASTER MANAGEMENT PLAN



In general, disaster management is a continuous process that aims to manage and minimize hazards. Under disaster response, there are a variety of actions to take like evacuation quarantine and mass decontamination. Disaster management has its own advantages. Some of these are:

- Reduces the effects of a disaster
- Gives the chance to survive, no matter what kind of a disaster occurs irrespective of when it occurs
- Gives you peace of mind from the uncertainties of close encounters to unexpected and dangerous natural events
- Minimize the effects of the accident on people and property
- Initiate the rescue and medical treatment of casualties;
- Bring the incident under control
- Preserve relevant records and equipment for the subsequent enquiry into the cause and circumstances of the emergency
- Investigate and take steps to prevent recurrence of similar incidents
- Inform and collaborate with statutory local and state authorities

1.2.1 Standard operating procedure for Take-off and landing at Bhiwadi Airport

When planning the takeoff, consider the direction of the wind, obstructions, and forced landing areas. To help fly up and over an obstacle, form an imaginary line from a point on the leading edge of the helicopter to the highest obstacle to be cleared.

Before takeoff, make a reconnaissance from the ground or cockpit to determine the type of takeoff to be performed, or to determine the point from which the takeoff should be initiated to ensure the maximum amount of available area, and finally how to maneuver the helicopter best from the landing point to the proposed takeoff position.

1) If wind conditions and available area permit, the helicopter should be brought to a hover, turned around, and hovered forward from the landing position to the takeoff position.

2) When planning the takeoff, consider the direction of the wind, obstructions, and forced landing areas.

4) To help fly up and over an obstacle, form an imaginary line from a point on the leading edge of the aircraft to the highest obstacle to be cleared.

5) Fly this line of ascent with enough power to clear the obstacle by a safe distance. After clearing the obstacle, maintain the power setting and accelerate to the normal climb speed. Then, reduce power to the normal climb power setting.

1.2.2 SOP for Avoiding Common Errors

1) Failure to perform, or improper performance of, a high or low reconnaissance.
2) Approach angle that is too steep or too shallow for the existing conditions.
3) Failing to maintain proper rpm.
4) Failure to consider emergency landing areas
5) Failure to select a specific landing spot.
6) Failure to consider how wind and turbulence could affect the approach.
7) Improper takeoff and climb technique for existing conditions.
8) Failure to maintain safe clearance distance from obstructions.
9) Fly this line of ascent with enough power to clear the obstacle by a safe distance. After clearing the obstacle, maintain the power setting and accelerate to the normal climb speed. Then, reduce power to the normal climb power setting.

1.2.3 List of Common Errors/Failures during Landing to be avoided

1) Failure to perform, or improper performance of, a high or low reconnaissance.
2) Approach angle that is too steep or too shallow for the existing conditions.
3) Failing to maintain proper rpm.
4) Failure to consider emergency landing areas.
5) Failure to select a specific landing spot.
6) Failure to consider how wind and turbulence could affect the approach.
7) Improper takeoff and climb technique for existing conditions.
8) Failure to maintain safe clearance distance from obstructions.

1.2.4 Standard Operating Procedure of controlling Fire incidents in Airport

Engine Fire in flight

This is one of the more serious emergencies a pilot has to deal with. Usually the solution is to get on the ground. Autorotation is normally the fastest way to get down.

Ventilating the cabin

If fumes are present in the cabin, it can usually be ventilated by opening windows or doors or both. If a cabin heater is in use, it would normally be turned off to eliminate the chance of bringing in smoke from the engine compartment.

Turning off the Electrical System

A possibility is that the electrical system is providing the ignition source for the engine fire. If this is suspected, the pilot might elect to turn off the battery and generator.

1.2.5 Emergency Procedure Events

Bhiwadi International Airport (BIA) should competently operate all installed emergency equipment and to correctly apply the procedures specified in the operating manual.

A. Power Plant Failures

Aviation Engineer may introduce malfunctions requiring an engine shutdown during the flight test. This provision is not intended as authority to require an unrealistic number of failures, but to permit such failures at times when they are most appropriate.

Power plant failures should be limited to those necessary for determining pilot's proficiency. If a multiengine helicopter is not capable of maintaining altitude with an engine inoperative, pilots are expected to maintain the best engine-out climb speed while descending. The pilot must promptly identify the inoperative engine and initiate corrective action while maneuvering the helicopter safely. Smooth application of flight controls and proper trim is required.

B. Other Emergency Procedures.

Inspectors and examiners should sample as many of the following events as necessary for determining whether a pilot is proficient in identifying and responding to emergency situations:

- Fire in flight;
- Smoke control;
- Hydraulic and electrical system failure or malfunctions (if safe and appropriate);
- Navigation or communications equipment failure; and
- Any other emergency procedures outlined in the operator's aircraft operating manual or training program

C. Response Plan

Identify site disaster manager for handling disasters with clearly enumerated functions:

- General Manager Operations will handle disaster with his safety team with clearly enumerated functions during construction phase
- Project Proponent will allot an General Manager BIA-Airport (Chairman Airport Site safety committee) for handling disaster by keeping in view of his knowledge & Aviation accidents handling experience, fire safety exposure, communication skill and his contact with public and local NGO's

D. Control Room/Location ATC room

1. Earmark a specific area to function as control room for disaster management

   - Security Control Room during operation phase is at the main entry gate:
   - The traffic in the area comprises
     - ❖ Regular workers & staff
     - ❖ Passenger
     - ❖ Visitors to the Working staff & external agencies in Commercial buildings
     - ❖ Representatives of local public bodies, couriers companies food supply etc
     - ❖ The traffic could be mobile or pedestrian

2. Prepare Inventory of Resources (Rescue equipment, medical equipment for emergencies, ambulances, hospitals, NGOs and disaster management related material and personnel

   Only Aviation safety Trained & Certified employees /staff will undertake work having

   - ❖ Safety policy
   - ❖ Standard operation procedures SOP
   - ❖ Emergency rescue equipment and resources such as Rescue cage (Basket),
   - ❖ Provision of stretcher at appropriate location ,
   - ❖ Implementation of Work Permit system during fuelling, hot work near fuel storage
   - ❖ All emergency contact details will be maintained in register.

3. Maintenance of systems/equipments necessary for tackling disasters

   Maintenance of systems/ equipments necessary for tackling disaster will be done periodically by a competent person after getting checked during mock drill

4. Warning System

   - Security will do the announcement by fan horn or reflex horn speaker in the guidance of Safety In-Charge (Secretary Site safety Committee).
   - Provision of fire alarm switch at security room.

5. Organize extensive training for disaster managers and assistants

   Quarterly Training will be arranged by project proponent for disaster managers and assistants during construction stage

E. Response Plan

- Project Manager (Chairman Site safety committee) will handle disaster with his safety team with clearly enumerated functions during construction phase
- Project Proponent will allot an Project Manager (Chairman Site safety committee) for handling disaster by keeping in view of his English knowledge, fire safety exposure, communication skill and his contact with public and local NGO's

F. Control Room

- Security Control Room during Construction phase is at the main entry gate:
- The traffic in the area comprises
  - Regular workers
  - Vendors
  - Visitors to the Working staff
  - Representatives of public bodies, couriers companies etc.
  - The traffic could be mobile or pedestrian

1.2.6 Organizational Chart of Emergency Management Team

BIA Safety team should be formed to control and reduce the possible hazards and risk which may occur. Organizational Chart of Emergency Management Team for the proposed Airport is given in Figure 1.2.

1.2.7 Roles and Responsibilities

Position: Chief General Manager BIA

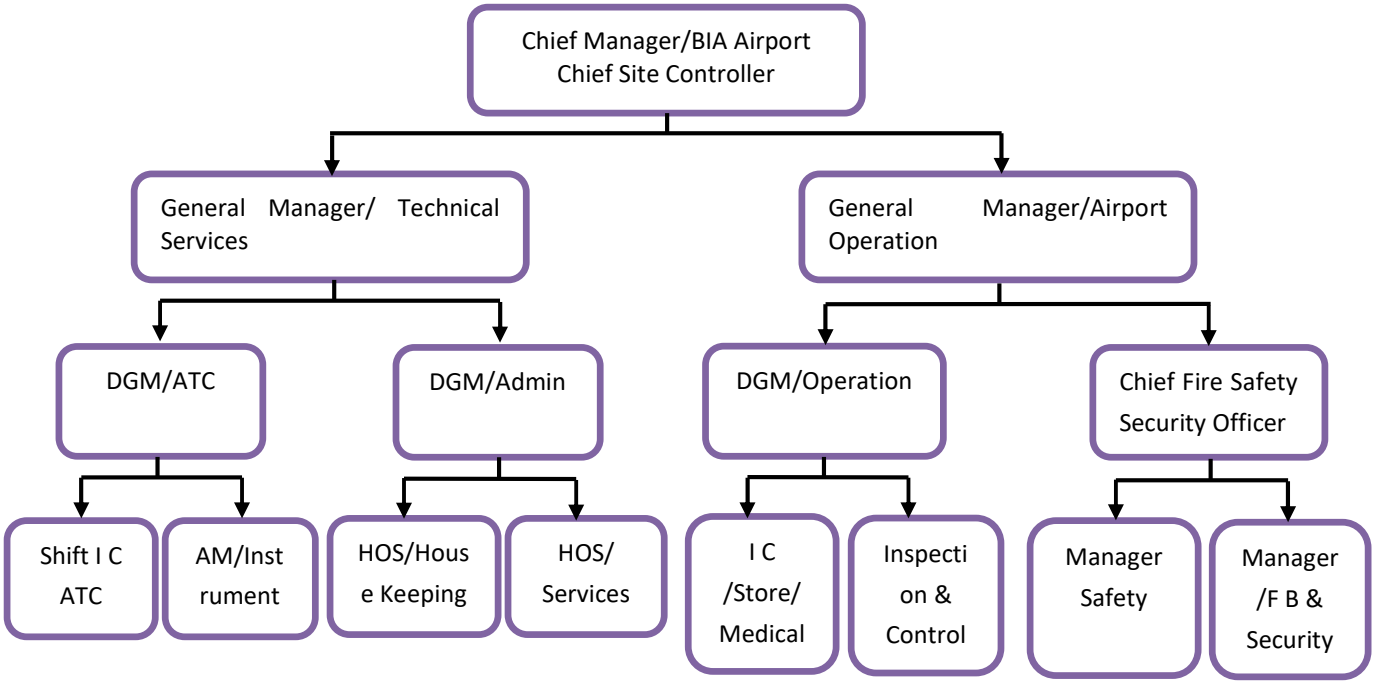
- Ensure that airport management teams are adequately staffed by suitably trained and experienced personnel
- Advising the site management of their specific responsibilities and duties for health and safety
- Promoting an interest and enthusiasm for health and safety
- Conducting regular aircraft aviation Fire safety, Evacuation mock drills & periodic assessment effective response by team members.

Position: Aviation Safety Manager

- Monitoring the implementation and operation of the safety plan
- Responsible to the head safety on day to day basis
- Verifying the correct reporting procedures for accidents, dangerous occurrences

- Day-to- Day scrutiny of operations on site with regard to safe aviation system of work
- Investigation of accident and dangerous occurrences, reporting and recommending corrective actions
- Ensure that all accident and dangerous occurrences are reported and any necessary remedial actions are taken
- Manage the site safety condition and relation with client in proper comportment

FIGURE 1.2 ORGANISATION CHART FOR DISASTER MANAGEMENT TEAM



Position: Flight Safety Officer

- Ensure company safety procedures are followed on site
- Ensure that all statutory posters and notices are displayed together with the policy document
- Carry out formal weekly site inspection and inform in writing to the senior safety executive of any necessary improvement to ensure the activities are undertaken in a safe manner
- Daily inspection will be carried out and any dangerous condition reported
- Ensure that an adequate supply of protective clothing and equipment is available and issued to operatives
- Ensure that operatives are aware of their responsibilities regarding the wearing of such equipment

- Ensure that fire extinguishers are located in correct place and are fully charged. Provide weekly reports and monthly status

Position: Safety Supervisor

- Regular safety inspection for slings, chain ropes, fire extinguishers, housekeeping, scaffolds, ladders etc.
- Correcting unsafe work practices on site
- Enforcing use of personal protective equipments
- Conducting safety inductions and safety tool box talks
- Training of banks men / signalmen
- Ensure that the location of medical facilities is made known to all employees
- Daily site safety inspection and report to the SO/SSE
- Ensure that an adequate supply of protective clothing and equipment is available and issued to operatives
- Ensure that operatives are aware of their responsibilities regarding the wearing of such equipment

Position: Site Workers

- To take reasonable care to safeguard their own health and safety and of other workers who may be affected by their work
- Never misuse anything provided in the interest of health and safety
- To use correct tools and equipment for the job
- Use personal protective equipment as required
- To warn new man to know hazard at work

1.2.8 On Site Emergency Action Plan

If accident / incident takes places in airport, its effects are to be confined to the airport premises, involving only the persons working in the airport and the property inside the airport, it is called as On-site Emergency. The emergency action plan includes:

- Designated Emergency Control Centre/Room
- Assembly Points
- The Key Personnel for Onsite Emergency
- Communication System
- Escape Route

- Evacuation Plan
- Emergency Facilities

A. Emergency Control Centre

The operations to handle the emergency are directed and co-ordinated by emergency control centre. The facilities will be made available in the emergency control are:

i. Internal and external communication.

ii. Computer and other essential records.

iii. Daily attendance of workmen employed in Airport.

iv. Pollution records.

v. Walky-talky.

vi. Plan of the Airport showing-

   a. Storage area of hazardous materials.

   b. Storage of safety equipments.

   c. Fire fighting system and additional source of water.

   d. Site entrance, roadway and emergency exist.

   e. Assembly points.

   f. Truck parking area.

   g. Surrounding location.

   h. Emergency Alarm

vii. Note Book, Pad and Pencil.

viii. List of Key Personnel with addresses, telephone number etc.

B. Assembly Points

A safe place far away from the Airport has been pre-determined as assembly point where in case of emergency personnel evacuated from the affected areas are to be assembled. The Airport workers, contract workers and visitors will assemble in assembly point in case of emergency and office clerk should take their attendance so as to assess the missing person during emergency.

C. The Key Personnel for Onsite Emergency

The key personnel for the onsite emergency are given below and action by these officials is given above.

- Chief General Manager

- Aviation Safety Manager
- Flight Safety Officer
- Safety Supervisor
- Site Workers

D. Communication System

Communication is a key component to control an emergency. The following communication system will be provided at the Airport

- Walky Talky
- Telephone (internal & external)
- Cell phone
- Intercom
- Runners (verbal or written messages)

Alarm System: As an Alarm system like Simple fire bell, hand operated siren – break open type, fire alarm etc. will be used.

Siren for Emergency: Siren for emergency should be different from the normal siren. The emergency siren will be audible to a distance of 5 Km radius. The emergency siren should be used only in case of emergency.

E. Escape Route

The escape route from Airport should be clearly marked. The escape route is the shortest route to reach out of the affected area to open area, which leads to assembly point. This route should be indicated on the layout plan attached to the On-site Emergency Plan.

F. Evacuation Plan

All non-essential staff should be evacuated from the emergency site. As soon as the emergency siren rings the staffs have to move to the assembly point. The closing procedure in case of emergency should be prepared and kept ready and responsible person should be nominated for the purpose.

Counting of Personnel: One officer from the Airport will collect the details of personnel arriving at the assembly point. These numbers should be checked with the attendances of regular workers, contract workers present in the site on the day of emergency. The accident control should be informed and arrangement should be made for searching missing person in the emergency affected area. The employees' address, contact number of next to kin should be maintained in the time office so that during emergency relatives of those affected due to emergency may be informed accordingly. Information in respect of emergency will be given to the media and other agency.

All Clear Signal: After control of emergency the Aviation Safety Manager will communicate to the Chief General Manager about the cessation of emergency. The Chief General Manager can declare all clear by instructing the time office to sound "All Clear Sirens".

Mock drills on emergency planning will be conducted once in 6 months and sequence of events will be recorded for improvement of the exercise. Exercises on On-site Emergency Planning will be monitored by the higher official of the organization and the plan is reviewed every year.

G. Emergency Facilities

The following facilities will be provided at Airport to tackle any emergency at any time.

1. Fire Protection and Fire fighting facilities
2. Emergency Lighting and standby Power
3. Emergency Equipment and Rescue Equipment
    - Breathing apparatus
    - Fire Proximity suit
    - First Aid Kit
    - Stretchers
    - Torches and
    - Ladders
4. Safety Equipment
    - Respirators
    - Gum Boots
    - Safety Helmets
    - Rubber Hand Gloves
    - Goggles and face shield
    - Wind Direction Indicator

On-site Emergency Plan contains:

- Site plan and topographic plan.
- Plan showing the fire fighting facilities.
- Plan showing hazardous material storage area.
- Material safety data sheets for hazardous chemicals.

- Facilities available in main control centre.
- List of emergency equipment.
- List of Safety Equipment.
- List of important telephone numbers and addresses.
- Nearest hospitals and ambulance service center.
- Nearest fire station.
- Govt. Officials.
- Transport provider.
- Names and address & contact telephone number of Key Personnel.

The onsite emergency plan so prepared shall be documented in a printed form in sufficient copies to give all concerned for knowledge, study and easy follow up. The emergency plan shall be rehearsed and practiced at regular intervals to test efficiency of personnel, equipments co-ordinate efforts and to increase confidence and experience to operate such plan.

1.2.9 Off Site Emergency Plan

The main objectives of the plan are:

- To save lives and injuries.
- To prevent or reduce property losses and
- To provide quick resumption of normal situation or operation.

A. Central Control Committee

As the offsite plan is to be prepared by the Government, a Central Control Committee shall be formed under the Chairmanship of the District Collector. Other officers from Police, Fire Service, Site Engineer, and Medical Department shall be incorporated as members of the Central Control Committee. Under the Central Control Committee the following committees shall be constituted under the control of the District Collector.

- Incident and Environment Control Committee.
- Fire Control Committee.
- Traffic control, Law and order, Evacuation and Rehabilitation Committee.
- Medical help, Ambulance and Hospital Committee.
- Welfare, Restoration and Resumption Committee.
- Utility and Engineering Services Committee.

- Press, Publicity and Public Relations Committee.

The Off-site Emergency Plan shall be prepared by the District Collector in consultation with the management and Govt. agencies. The plan contains up to date details of outside emergency services and resources such as Fire Services, Hospitals, Police etc. with telephone number. The district authorities are to be included in the plan area.

- Police Department.
- Revenue Department.
- Fire Brigade.
- Medical Department.
- Municipality.
- Railway Department.
- Telephone Department.
- Electricity Department.
- Pollution Control Department.
- Explosive Department.
- Press and Media.

Mock exercises on Off-site plan will be carried out at least once in a year to train the employees, up to date the plan, observe and rectify deficiencies.