RISK ASSESSMENT

Risk analysis deals with the identification and quantification of risks of the airport equipment/ facilities and personnel who may get exposed to accidents resulting from the hazards at the proposed airport.

In the sections below, the identification of various hazards, probable risks during the construction and operation of the airport, maximum credible accident analysis and consequence analysis are addressed either qualitatively or quantitatively. Based on the risk assessment of various hazards, Disaster Management Plan has been formulated and presented.

OBJECTIVE OF RISK ASSESSMENT

- To find out values of magnitude and severity of consequences for each hazard. These will be in general but an informed judgment as to order of magnitude
- To use the information as means of prioritizing actions. It means which hazard requires the most work and how it will be tackled?
- To specify mitigation features as appropriate to each hazard
- To find the effectiveness of mitigation features in reducing the risk

Purpose of Risk Assessment

Although the purpose of risk assessment includes the prevention of occupational risks, and this should always be goal, it will not always be achievable in practice. Where elimination of risks is not possible, the risks should be reduced and the residual risk controlled. At a later stage, as part of a review programme, such residual risk will be reassessed and the possibility of elimination of the risk, perhaps in the light of new knowledge, can be reconsidered.

The purpose of this risk assessment is to evaluate the adequacy of the airport and aircraft security. This risk assessment provides a structured qualitative assessment of the operational environment. It addresses sensitivity, threats, vulnerabilities, risks and safeguards. The assessment recommends cost-effective safeguards to mitigate threats and associated exploitable vulnerabilities.

However, it is important to know that there are other methods that work equally well, particularly for more complex risks and circumstances. The approach to assessment will depend upon:

- The nature of the workplace
- The type of process
- The task performed
- Technical complexity

In some cases a single exercise covering all risks in a workplace or activity may be appropriate. In other cases, different approaches may be appropriate to different parts of a workplace.

Risk Estimated/Analysis

Risk analysis is conducted in two ways i.e.

1. Qualitative Risk Analysis
2. Quantitative Risk Analysis

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** and **Table 2.**

Table 1: Risk Ranking

Level 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 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

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.

Risk can be evaluated and ranked according to the severity and frequency of occurrence. The risk rating and quantitative risk analysis for the project are given in **Table 3** and **Table 4**.

Table 3: Risk Rating

High Risk	15-25
Moderate Risk	8-12
Low risk	1-6

Table 4: Quantitative Risk Analysis for the Project

Operation	Persons Affected	Hazard Type	Risk Level	Severity
Aircraft Takeoff and Landing noise	Airport Staff/Residences below flight path	Physical	11	Moderate
Aircraft Takeoff and Landing(Fatalities)	Airport Crew and Passenger	Physical	25	High Risk (Serious)
Lifting/ Moving of luggage	Airport Staff	Physical	3	Minor
Movement of Staff near Aircraft	Airport Staff	Physical	2	Minor
Contamination/cap not fitted properly	Pilot, Crew and Passenger	Physical	10	Moderate
Door Detachment	Crew	Physical	10	Moderate
Turning Rotor	Crew	Physical	10	Moderate
Rotor Break Application	Pilot, Crew and Passenger	Physical	12	Moderate
Lack of Communication	Airport Staff	Physical	10	High Risk (Serious)
Lack of Communication	Pilot and Passenger	Physical	20	High Risk (Serious)
Engine design	Operator, Crew And Passenger	Physical	20	High Risk (Serious)
Ground Signals for landing	Pilot, Crew and Passenger	Physical	12	Moderate
Visibility	Pilot, Crew and Passenger	Physical	20	High Risk (Serious)
Altitude	Pilot, Crew and Passenger	Physical	20	High Risk (Serious)
Fuel Exhaustion/Starvation	Pilot, Crew and Passenger	Physical	15	Moderate
Engine Software Failure	Pilot, Crew and Passenger	Physical	15	High Risk (Serious)
Obstacles	Pilot, Crew and Passenger	Physical	20	High Risk (Serious)

Hazard Identification

Identification of causes and types of hazards is the primary task for planning for risk assessment. Hazard can happen because of the nature of fuels/ chemicals handled and also the nature of process involved.

An aviation accident is the worst nightmare of every pilot, crew or passenger that has ever ridden in an aircraft. Although air travel is one of the safest forms of transportation, accidents do happen with dramatic and terrifying results. The causes of these aviation accidents vary greatly depending on specific circumstances and problems that may develop during the flight process.

Human error, Runway, Descent and landing accidents, taxi and takeoff mishaps, mechanical failures, pilot errors, fuel mismanagement, and poor weather are only some of the many plights that can lead to injuries or

death in the sky. Although popular opinion may suggest that aviation accidents are caused by "bad luck", in many situations these incidents can be completely avoided through careful preparation and effective safety techniques. When flight crew and pilots do their jobs correctly, aviation accidents are much less likely to occur. Some hazards are listed below:

- Descent and Landing Hazard
- Human Error
- Weather Error
- Mechanical Failure and
- Other hazards

Hazard during Construction Phase

The main risks associated with the construction of the project are mainly electrical and mechanical failures or lack of safety precautions. During the construction phase, the responsibility of maintaining safety is jointly on the project developer and the deployed contractors. The risks and hazards associated with various construction activities are listed in **Table 5**. The mitigation measures/ safe working practices have also been mentioned in the **Table 5**.

Table 5: Risk & Hazard Associated and Control Measures

Risks & Hazards Associated with Construction	Control Measures
Manual Handling Strains and sprains Incorrect lifting Too heavy loads Twisting Bending Repetitive movement	Exercise/warm up Get help when needed Control loads Rest breaks/ no exhaustion No rapid movement/ twisting/ bending/ repetitive movement Good housekeeping
Falls - Slips - Trips Falls on same level Falls to surfaces below Poor house-keeping Slippery surfaces Uneven surfaces Poor access to work areas Unloading materials Wind Falling objects	 Good Housekeeping Tidy workplace Guardrails, handholds, harnesses, hole cover, hoarding, no slippery floors/ trip hazards Clear/ safe access to work areas & egress from work areas Dust/ water controlled environment as much as possible
Fire Flammable liquids/gases like LPG, diesel storage area and combustible building materials Poor housekeeping Grinding sparks Open flames, absence of fire hydrant network.	Combustible/ flammable materials properly stored/ used Good housekeeping Fire extinguishers made available & fire hydrant network with reserve Fire water (as per NFPA Code) Emergency preparedness plan in case of fire or collapse of structure. Regular mock drills
Absence of Personal Protective Equipment	Head/face - footwear - hearing/ eye - skin – respiratory

RISK ASSESSMENT DOCUMENT

FOR DEVELOPMENT OF GREEN FIELD AIRPORT AT ORAVAKALLU, DISTRICT-KURNOOL, ANDHRA PRADESH

DEVELOPED BY:- BHOGAPURAM INTERNATIONAL AIRPORT CORPORATION LTD (BIACL)

Risks & Hazards Associated with Construction	Control Measures
Lack of adequate footwear Head protection Hearing/eye protection Respiratory protection Gloves, goggles	protection provided Training for use of PPEs Proper maintenance of PPEs
Electricity Electrocution Overhead/underground services Any leads damaged or poorly insulated Temporary repairs No testing and tagging Circuits overloaded Nonuse of protective devices.	All electrical equipment in good condition and earthed No temporary repairs No exposed wires & good insulation No overloading Use of protective devices Testing and tagging No overhead/ underground services
Scaffolding Poor foundation Lack of ladder access Insufficient planking Lack of guardrails and toe boards Insufficient ties or other means All scaffolds incorrectly braced or stabilized to prevent overturning.	All scaffolds correctly braced and stabilized 3:1 height to base ratio Firm foundation, plumb and level Ladder access provided and used Proper platform Planks secured Guardrails and toe boards
Ladders Carrying loads Not secured against dislodgement Defective ladders Not sufficient length Wrong positions Incorrectly placed (angles, in access ways, vehicle movements	Secured against movement or footed Ladders in good condition and regularly inspected for faults Extend 1m above platform and placed at 4:1 angle Out of access ways, vehicle movements No carrying loads while climbing 3 points of contact Use for access only, not working platforms
Excavations Trench collapse Undetected underground services Falls Hazardous atmosphere	Knowledge of Soil stability No water accumulation and pumping facilities Material 600mm from edge Clear of suspended loads Hard hats/PPE Ladders Atmospheric testing Traffic controls Emergency Plan.
Noise Unknown noise levels Known noise levels over 85 decibels	Levels below 85 decibels Proper protections.
Falling Material Fall during carrying / lifting materials Dislodged tools and materials from overhead work areas.	Materials to be secured kept away from edge toe boards Use of hard hats
Cranes & Lifts	Periodic testing by competent authority

Risks & Hazards Associated with Construction	Control Measures
Display of carrying capacity i.e. loads (No. Of person), incorrectly slung, defective lifting equipment, unsecured loads, craning in close proximity to building Falls Falling materials.	Correctly slung/secured loads, lifting equipment good condition Use of proper hand signals Falls while unloading controlled
Visitors Presence at site Falls Struck by dropped materials Road accidents Insufficient hoarding or fencing - pedestrian access past site Mechanical plant movement on and off site	Sufficient hoarding Fencing and barricades Safe pedestrian access past site traffic management for loading and delivery Construction separated from occupied areas of projects.

Hazard during Operation Phase

Natural Disasters

Natural Disasters are often sudden and intense and results in considerable destruction, injuries and death disrupting normal life as well as the process of development. Disasters due to natural calamity could be as follows:

- Earthquake
- Flood
- Storms/ Cloud burst/lightning/extreme weather conditions

Aircraft Accident Related Disasters

Aircraft accident occurs near and within the airport during landing/take-off/taxing due to malfunctioning of some mechanism like undercarriage, failure of hydraulic power supply, non-functioning of one or more engines, malfunctioning of landing gear, sudden fire in aircraft while enrooting, unforeseen circumstances in which pilot loses control over aircraft and improper signaling by air traffic control tower (ATC). Disasters due to emergencies could be as follows:

- Aircraft accident at airport;
- Aircraft accident off airport; and
- Hazardous material emergency, hydrocarbon spills followed by fire

Terror Attack, Plane Hijack, Sabotage

The threat of bombing vital installations by enemy action or sabotage cannot be ruled out near and within the airport. Since airports are vital facilities prone to terror attack/ sabotage or plane hijacking, the threat to an airport could be from ground as well as from the air. Disasters due to external factors are on account of unlawful seizure, sabotage and bomb threat.

Fuel Storage at Airport

Fuel storage area has been one of the prime concerns as far as airport risk and hazards are concerned. There will be no fuel storages at the proposed airport site but drums of High Speed Diesel (HSD) for the DG sets will be available at the site. It is proposed that the oil company which will supply the fuel for the proposed airport will provide the necessary arrangements for filling.

Risk Assessment & Evaluation

Preliminary hazards analysis is based on the philosophy "*Prevention is better than cure*". This calls for identification of hazards, quantification of risk and further suggests hazard mitigating measures. An assessment of the conceptual design is conducted for the purpose of identifying and examining hazards related to operation of the proposed airport, utility and support systems, environmental factors and the safety measures.

Maximum Credible Accident Analysis (MCAA)

Hazardous substances may be released as a result of failures or catastrophes, causing possible damage to the surrounding area. This section deals with the question of how the consequences of the release of such substances and the damage to the surrounding area can be determined. Major hazards posed by flammable storage can be identified taking recourse to MCA analysis. MCA analysis encompasses certain techniques to identify the hazards and calculate the consequent effects in terms of damage distances of heat radiation, toxic releases, etc. A host of probable or potential accidents of the major units in the airport premises arising due to use, storage and handling of the hazardous materials are examined to establish their credibility. Depending upon the effective hazardous attributes and their impact on the event, the maximum effect on the surrounding environment and the respective damage caused can be assessed.

Damage Criteria

The fuel storage may lead to fire and explosion hazards. The damage criteria due to an accidental release of any hydrocarbon arise from fire and explosion. Contamination of soil or water is not expected as these fuels will vaporize slowly and would not leave any residue. The vapors of these fuels are not toxic and hence no effects of toxicity are expected.

Fire Damage

A flammable liquid in a pool will burn with a large turbulent diffusion flame. This releases heat based on the heat of combustion and the burning rate of the liquid. A part of the heat is radiated while the rest is convected away by rising hot air and combustion products. The radiation can heat the contents of a nearby storage or unit to above its ignition temperature and thus result in a spread of fire. The radiation can also cause severe burns or fatalities of workers or fire fighters located within a certain distance. Hence, it will be important to know before handling the damage potential of a flammable liquid pool likely to be created due to leakage or catastrophic failure of a storage tank. **Table 6** provides the damage effect on equipment and people due to thermal radiation intensity.

Table 6: Damage due to Incident Radiation Intensities

Sl. No.	Incident Radiation (kW/m^2)	Type of Damage Intensity	
		Damage to equipment	Damage to people
1	37.5	Damage to process equipment	100% lethality in 1 minute 1% lethality in 1 second.
2	25.0	Minimum energy required to ignite wood at indefinitely long exposure without a flame	50% Lethality in 1 minute Significant injury in 10 second
3	19.0	Maximum thermal radiation intensity allowed on thermally unprotected adjoining equipment	---
4	12.5	Minimum energy to ignite with a flame; melts plastic tubing	1% lethality in 1 min.
5	4.5	---	Causes pain if duration is longer than 20 sec, however blistering is un-likely (First degree burns)
6	1.6	---	Causes no discomfort on long exposures

Source: Techniques for Assessing Industrial Hazards by World Bank

Damage due to Explosion

Explosion is a sudden and violent release of energy accompanied by the generation of pressure wave and a loud noise. The rate of energy release is very large and has potential to cause injury to the people, damage the airport and nearby property etc. The effect of overpressure can directly result in deaths to those working in the direct vicinity of the explosion.