



**UPES** Centre for  
Continuing Education

**“Aviation Security Domestically or Internationally”**

By  
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Guide

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**A DISSERTATION REPORT SUBMITTED IN PARTIAL FULFILLMENT OF THE  
REQUIREMENT FOR**

**MBA (AVIATION MANAGEMENT)**

**CENTRE FOR CONTINUING EDUCATION**

**UNIVERSITY OF PETROLEUM & ENERGY STUDIES,  
DEHRADUN, INDIA**

**YEAR OF SUBMISSION – ‘May’ 2019**



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## APPENDIX-I

Subject:- Willingness for Guiding Dissertation of Vijendra Soni (SAP ID. 500056237).

Dear Sir,

Vijendra Soni is registered for MBA (Aviation Management), with the University of Petroleum & Energy Studies, Dehradun in the 2016-18 batch.

I hereby give my acceptance to guide the above student through the Dissertation work

'Titled: "Aviation Security Domestically or Internationally" which is a mandatory academic requirement for the award of the MBA degree.

Thanking You

Yours Sincerely

## Acknowledgement

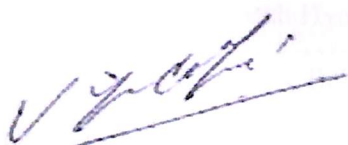
This is to acknowledge with thanks the help, guidance and support that I have received during the Dissertation.

I have no words to express a deep sense of gratitude to the management of University of Petroleum and Energy Studies for giving me an opportunity to pursue my Dissertation, and in particular Maj Ashwin Jena (Senior Technical Officer / Engineering Officer 3013 Maint Flight), for his able guidance and support.

I must also thank Capt Nabanita Chaudhary (Engineering Officer 3011 UH Flight), Sub MN Reddy (In charge Maintenance Control Section ), Miss Nimmi Banga (Dy. G.M.) and Mr. Navin Kumar (Chartered Accountant) for their valuable support.

I also place on record my appreciation of the support provided by FAE (Faculty of Aeronautical Engineering Secunderabad) and other library staff of Secunderabad faculty.

Finally, I also thanks to my Family, friends and specially my wife Mrs. Priyanka Soni for her great support.



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## **Executive Summary / Abstract:-**

As per the current development in the Air Transportation for cargo and passenger by the Air, the use of Very Large and Heavy Aircraft Carrier has increased in same civil and military sector. The reason behind the use of the bigger aircraft is the cost effectiveness and the operational cost reduction. But the Risk factor for the transportation of passenger has increased. We started dealing with huge quantities of cargo and passenger for long distance like Domestic and International. In view of safety of airlines, passenger and Crew is a challenges for the entire Airline Industry.

As per the data collected from various sources and self-having 16yrs experience in this Aviation Field. My analysis concludes the various measures can be taken to prevent the Aviation incidents, accident and other unlawful activity like Terrorism, Narcotics etc. Maximum No. of accidents has been taken place in the human involvement, lack of professional skill, staff morals, salaries, technology adaptation and execution.

Safety is at the core of ICAO's (International Civil Aviation Organization) fundamental objective. The organization is always determined, in close cooperation with the entire air transport community, to further improve aviation's successful safety performance while maintaining a high level of capacity and efficiency.

The Annual ICAO safety reports provides updates on safety indicators, including accidents and related risk factor. Refining the safety system of the global air transport system is ICAO's guiding and most fundamental strategic objective. The organization works constantly to address and boost global aviation safety through harmonized activities and targets outlined in its Global Aviation Safety Plan. ICAO strives to achieve a balance between assessed risks the requirements of practical, achievable and effective risk mitigation strategy.

The BCAS (Bureau of Civil Aviation Security) is an attached office of the Ministry of Civil Aviation (India). It is the controlling authority for civil aviation security/safety/operation in India. It is headed by an officer of the rank of Director General of police and is designed as commissioner of security (Civil Aviation). Commissioner of security (CA) is the appropriate authority for implementation of Annexure 17 (Security: Safeguarding International Civil Aviation against of Unlawful interference) to Chicago convention of international civil aviation organization.

Commissioner of security (CA) is responsible for the development, implementation and maintenance of the National Civil Aviation Security Programmed.

The BCAS was primarily set up as a cell in the Directorate General of Civil Aviation (DGCA) in January 1978 on the approval of the Pande Committee constituted in the line of the hijacking of the Indian Airlines flight on 10th Sep1976. The role of the cell was to coordinate, inspect, monitor and train personnel in Civil Aviation Security matters and hire staff in deputation mode with various Indian Organization.

The BCAS was modernized into an independent section in Apr 1987, under the Ministry of Civil Aviation. The main charge of BCAS is to lay down standards and measures in respect of security of civil flights at international and domestic airports in India.

Loss of life, Damage to aircraft structure, Reputation of airlines and National security is the main problem faced by the Air Transport today. The main reason behind for the study of this thesis is to gauge the risks, hazards, and accidents during transportation of passenger, cargo and crew by the air route.

Once we Identify and analyses the Risk and associated Threats for the transportation of passenger, Cargo and crew in air route, We can recommended the research outcome to the Airline Industry for the amendment to reduce the Hazard.

The study is carried out on risks associated with air transportation of passenger, cargo and crew. First with describing the general casual chain, causes, incidents, accidents and fatality, continuing with describing risk analysis techniques and risk control measures/options, and finally implementing above-mentioned investigations on real data.

**In this study, the results of examining data shown that the air accident/incident and aviation security all over is closely related with human factor which we many time ignore in aviation history,**

Though human error is the leading cause of aircraft accidents and security breaches, pilot error statistics tell only part of the story behind what causes In fact, pilot error is the primary cause of commercial airline accidents, with close to 80% of accidents caused by pilot error and his behavior on machine with Intelligence, according to Boeing. The other 20% are mainly due to faulty



aircraft equipment, maintenance and unsafe weather-related flying conditions and other behavior on the day.

Machine failures and maintenance error are among the other possible causes behind airline accidents/incident, which means that airplane machine are a sophisticated part, for ensuring that everyone on-board a flight arrives safely at their planned destination. Every airline has maintenance staff which are responsible for inspection of aircraft before flight routine.

When an aircraft has an accident/incident, investigators team look to the flight data recorder FDR/CVR, for collection of information about all factors happening before present condition, including fuel levels, brake operation, pilot actions throughout the flight, airspeed, auto mode and engine parameters. Crash investigators team use this information to decide whether the crash-accident-incident resulted from a mistake on the part of the pilot or a mechanical failure or a maintenance error.

“Aircraft usually work in the vibrant and dynamic environment, a majority of crews, technicians and ground staff, works on overload circumstances and overnight shift due to operational requirement and flight schedule on time, today aviation sector growing respect to Indian economy, aviation industry facing many downstream like as oil price hike, US against oil import from IRAN and sharp decline of respect/share like as Jet and kingfisher facing insolvency and bankruptcy etc. Huge aircraft accidents occur per year in country in which human element plays a major role in all operation and management. Identification and analysis of the components affect individuals as the staffs in aircraft, so that such component raises the conditions due to inattention which result in rise of severe and more severe aircraft accidents. Evaluation of each component has been taken into account in the present research. The present research seeks to examine and identify factors affecting human elements in aircraft accidents/incident and security risk.

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In this research, it also noted that the fatigue, human error, moral support and lack of training is also the great concern for the accident/incident in aviation industry.

To meet the high safety standard by various types of aircrafts and airport terminal, safety committee has made regulations for the Inspection of aircraft on calendar basis and Hrs. basis. Training of crew capabilities including the Safety Management system effectiveness ensure the smooth function of airport. They specially checks the Lifesaving equipment and Firefighting equipment's system and can give observance to comply as soon as possible. These data are circulated worldwide and Company has to get the recommendation improved, otherwise they will lose the life or machine.

I have collected the various data from the various organizations and Persons working in the aviation sectors like Technicians, AME Engineers, Pilots, Supervisor, Metrological/Navigating Officers, Airport operation team, Shipping Agents, working staff in training colleges and Officers working in airport and aircraft system. Finally conclusion of research shows the below factors are the main cause of aircraft incident and accident during.

On the basis of data collected, analysis and research done on the subject matter, which reveals the major concern for the accidents/incident/security in domestic and international airports are happened due to fatigue, human error, moral support and lack of training. Present day management team already board technical and risk management team, but above factor always excluded due to unavailability of staff and profit factor, which lead a fatal error for aircraft operation. My research has suggested some of the important points which will improve the safety of aircraft, passenger and operation of airport. It also mitigate the risk in this aviation sector.

# **‘Aviation Security Domestically or Internationally’**

## **Chapter-1 INTRODUCTION**

### **1.1 Overview**

**The objective:-**

- **To examine the composition of crews member for each flight.**
- **To estimate accident/incident possibilities during peak hour.**
- **To estimate damage in aircraft caused by an accident/incident, and the consequent.**
- **To evaluate measures to control accident/incident risks and produced a related decision support model and reaction team.**
- **To develop tools for estimating the loss after an accident/incident.**
- **To identify and assess security threats by intruder.**
- **To analyze the prevailing regulatory system related to aviation safety**
- **To analyze current training model and schedule.**
- **To understand work pressure, when aircraft on inspection or rectification.**
- **To understand management pressure for revenue generation and impact of work pressure.**
- **Reason behind airlines financial crisis, and impact on staff member life.**

The risk associated for the transportation of passenger and cargo thru the air route is a great concern, as it has various types of safety issues. World-wide attention has increased due to accidents/incident during the transportation by the various sizes of aircraft. It is the most important subject, which need to be addressed to avoid accidents/incident. Environmental and transportation literature, which requires close scrutiny with great emphasis on sound and proactive risk management, mostly due to increasing global demand of passenger as well as cargo delivery worldwide. With the analysis of past records and data we observed the aviation transport has good proportion with respect to other mode of transportation i.e. Road, Rail, and marine transport. The fatalities ratio in the case of aviation transport is lesser with respect to other modes of transport. But safety aspect is concern for future operation.

Airport structure is close to all city and congested area of the city like as Mumbai airport, the airport operation depend upon daily routine of employee shifting from outside to airport area. The safety scan for staff of airport depend upon only his/her face identification, I card check, duty passes and assurance. Many airport kept direct route for dispersal area only airport staff member and management team due to work load and change of shift on fast pace it creates loop hole for intruder and against safety of aircraft and passenger. Strategic planning at different levels are intended wishing to improve the safety of airport and passenger.

## 1.2 Background

“Numerous aircraft accidents due to human error cause the damage to property and life as well as reputation of the company with revenue. Year 2017 was declared the safest year in the history of commercial air travel, the number of people killed in air crashes increased sharply last year. In the year 2018, 15 airliner accidents with 556 people losing their lives. That is up from 44 deaths in 2017, according to the Aviation Safety Network. Despite the increase, 2018 is still the 3<sup>rd</sup> safest year on record for the number of fatal accidents and the ninth for the number of passenger losses. Currently, there are an estimated 37.8 million flights worldwide yearly and there is an accident rate of one fatal accident per 2.5 million flights. Massive progress has been made in making commercial air travel safer and Aviation Safety Network CEO Harro Ranter said that if the accident rate was the same as 10 years ago, 2018 would have seen 39 fatal accidents. Looking at 2000 rates, the fatal accident total would stand at 63. Over the past five years, Loss of Control accidents are a major safety alarm and were responsible for at least 10 of the worst 25 accidents during that timeframe.

The worst civilian accident in 2018 involved a Lion Air 737 Boeing Max and resulted in the deaths of 189 passengers and crew include. Indonesian air accident investigators later decided that the aircraft was not airworthy (not fit for fly condition) and should have been grounded. Other lethal accidents last year include the crash of one more 737 in Cuba with 112 deaths and the crash of a turboprop ATR 72 in Iran’s Zagros Mountains killed all 66 people onboard.

### 1.3 Purpose of the study or Problem Statement

Transportation of passengers and cargo by the air characterizes challenges from a safety viewpoint. In this type of transportation, different sizes of aircraft carrier used by airline for carrying passenger and cargo worldwide.

"The air transportation is involved with risks and hazards, which may lead to many losses; for instance, life threat, injuries of people, damaging airport amenities, properties, and damaging environment. The main purpose of this thesis is to evaluate the safety of airports/airlines domestic and internationally level during ground or flight. Hence, a better understanding of these risks and hazards can contribute to decrease the security threats and losses.

Rules and Regulations under the DGCA guidelines and various important publications to be used to control and prevent Maritime accidents:-

### 1.4 Research Hypothesis

Identify the Risk and Hazards related condition in aircraft and airport?

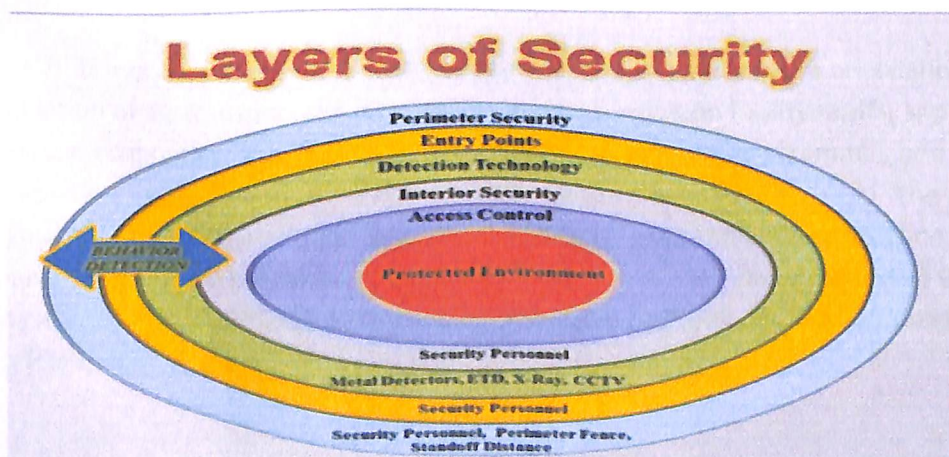
What is main cause of the Accidents/incidents?

What is the frequency of occurrence?

What is the severity of the occurrence and risk assessment to use to find the severity?

What method to be introduced to dull the Risk?

How the improvement can be done thru risk control and use of risk analysis techniques?



## Chapter- 2 LITERATURE RIVIEW

Before giving details regarding the research methodology used in the study, it is appropriate to present a brief overview of the research articles, case studies, and books written on this particular topic. Review of literature helps a researcher to get acquainted with his/her selected research problem and also may provide some guidelines in selecting a proper research methodology.

### 2.1 Review Area Broad

The **Air Transport Bureau** of the ICAO Secretariat is responsible for the air transport program of the Organization and aviation security and provides expertise and assistance on air transport matters to the various bodies and meetings of ICAO. More specifically, it is responsible for:

- the provision of expert assistance required by the Assembly, Council, Air Transport Committee, Joint Support Committee, Committee on Unlawful Interference and the specialized divisional, conference, panel, working and study group meetings that may be convened in the air transport field.
- The maintenance and amendment of the air transport and joint support work programmes, preparation of studies and documentation and the formulation of recommendations on these programmes for consideration, as appropriate, by the Air Transport Committee, Committee on Unlawful Interference or Joint Support Committee;
- The preparation of statistical digests and other statistical publications;
- The preparation and revision of manuals, policy and circulars on aviation security, regulation of air transport services, airport and air navigation facility tariffs, airport and air services economics, the ICAO statistical and data analysis programme, and air traffic forecasting; preparation of documentation and meeting reports in the economic regulatory, statistical, aviation security, facilitation, environmental protection, and joint financing fields; and preparation of annual publication of the **Annual Report of the Council** which provide a worldwide review of international civil aviation developments and the work of ICAO.

- the planning of periodic air transport meetings, conference and the preparation of the agenda point and supporting documentation, preparation for publication, approved amendments, Security point literature , and the compilation and promulgation is the work of ICAO.
- The coordination of environment-related activities, both within the Secretariat and with other international organizations.
- The coordination of the work of the regional civil aviation organizations with ICAO air transport programmes, and liaison and cooperation with international and regional organizations on air transport matters.

The Regional Aviation Bureau also provides technical support and assistance to other Bureaux of the Organization and contributes to the Organization's work in multi-disciplinary areas such as environmental matters and the implementation of communications, navigation and surveillance/air traffic management (CNS/ATM) systems, as well as the Aviation System Block Upgrade (ABUS) schemes. The Director of the Air Transport Bureau serves as the Secretary to the Air Transport Committee.

Outside of ICAO's , Air Transport Regional Officers are stationed at ICAO Regional Offices in Bangkok, Cairo, Dakar, Lima and Nairobi to provide assistance and expertise to the Contracting States to which each office is accredited and to the regional civil aviation bodies. They regularly attend meetings and conferences involving air transport as well as make periodic visits to Contracting States in their regions. They also provide liaison between ICAO Headquarters and those States on air transport matters. Transportation system or waterborne.

By which the aviation world has dramatically revolutionized, plays a vital role in international trade and world economic growth. "It has also enhanced the growing of population, fast industrialization, eliminating and removing the obstacles of trading, road congestion, and etc. So, it can be said that society is also affected by aviation transportation in four major features; namely economic, political, environmental, and social.

ICAO provides Contracting States with various published statements of its policy on international air transport regulatory matters, as developed or endorsed by the Assembly or the Council, as well as guidance materials and information developed by ICAO bodies or the Secretariat.

The ICAO publication entitled **Policy and Guidance Material on the Economic Regulation of International Air Transport** is a comprehensive reproduction of the conclusions, decisions and guidance material produced by ICAO on air transport which have received the endorsement of either the Assembly or the Council and are addressed to States or which directly impact on the conduct by States of their air transport activities, and of Assembly Resolutions which are directed to ICAO as well as to States.

In addition to the present manual, other relevant ICAO guidance material includes.

- **ICAO's Policies on Taxation in the Field of International Air Transport**, which contains the consolidated Council Resolution on taxation of international air transport, and an associated commentary;
- Statements by the Council, such as **ICAO's Policies on Charges for Airports and Air Navigation Services (Doc 9082)**, setting forth its recommendations and conclusions on these topics;
- Definitions, such as the **definition of a scheduled international air service** which, with notes on its application, provides guidance to Contracting States on the interpretation and application of the provisions of Articles 5 and 6 of the Convention;
- Model clauses, such as those on capacity and tariff regulation found in Doc 9587;
- digests of information, such as the **Digest of Bilateral Air Transport Agreements**, a reference guide to the main provisions of existing bilateral agreements which Contracting States concluded or amended and filed with ICAO. Doc 9511 has now been replaced by an online database renamed as the **World's Air Services Agreements (WASA)** with additional features including enabling subscribers to have access to the text of air services agreements contained in the WASA and search engine functions to find selected provisions of the agreements.;
- manuals, such as this manual and the **Manual on the ICAO Statistics Programme (Doc 9060)**, which is a guide for reporting and using ICAO civil aviation statistics, the **Manual on Air Traffic Forecasting (Doc 8991)**, which sets forth forecasting methods and case studies for civil aviation forecasters, the **Manual on Air Navigation Services Economics (Doc 9161)**, which provides guidance material to assist those responsible for the management of air navigation services and the **Airport Economics Manual (Doc 9562)**, which provides guidance to those responsible for airport management;



- studies, such as study on aircraft leasing and on the **Regulatory Implications of the Allocation of Flight Departure and Arrival Slots at International Airports (Cir 283)**; and
- State Letters, for the timely dissemination of information on particular topics, such as reports on developments in trade in services.

From time to time, articles on air transport regulatory topics are presented in the **ICAO Journal**, a monthly magazine which gives a concise account of ICAO activities and features additional information of interest to Contracting States and to the international aeronautical worldwide.

Each item of ICAO policy, guidance and information material is usually disseminated in one of three types of ICAO publications: document, circular or digest. An **ICAO document** is the publication type used for material considered to have a permanent character or special importance to all Contracting States, such as:

- Resolutions, decisions and recommendations formally adopted by the Assembly or the Council, texts approved by the Council, and the minutes of the end of the Council;
- Council Statements on policy relating to air transport questions;
- Reports of meetings such as worldwide conferences and divisional sessions convened by the Council or by the Air Transport Committee; and
- Guidance and information on international air transport.

An **ICAO circular** is the publication type used to disseminate specialized information of interest to Contracting States. An **ICAO digest of statistics** is the publication type used when considerable quantitative information is involved.

In addition, an **ICAO State Letter** (which is not published as a saleable ICAO document) is used to convey information on specific topics in a timely manner and often contains a request for a response or action by States.

Apart from the dissemination of printed materials and distinct from the policy development bodies identified earlier, **ICAO regional workshops** are used to inform persons in national administrations or related autonomous agencies about relevant ICAO policies, advice and information and to provide an opportunity to informally exchange information and views.

Various worldwide intergovernmental organizations, although not primarily responsible for civil aviation matters, may influence the regulation of international air transport, directly or indirectly, in the course of discharging their broader responsibilities. Most maintain relations with civil aviation bodies, in particular ICAO, on matters of mutual concern. The following sections of this chapter identify three types of such organizations: the organs of the United Nations, the specialized agencies within its system, and other worldwide intergovernmental organizations.

**ICAO Regional Workshops on Air Transport Regulatory Policy** focus on current air transport regulatory issues, including international air transport regulation at the national, bilateral and multilateral levels, both as regards regulatory process and structure and particular areas of regulatory content (e.g. market access, airline ownership and control, code sharing, and airline product distribution) and issues of economic regulation and liberalization.

An **ICAO Regulatory Policy Seminar** has a purpose similar to regional regulatory policy workshops but is shorter in duration and more focused on the issues and needs of a smaller group of States, typically in a sub region where the seminar is held.

Apart from the International Civil Aviation Organization, the specialized agency of the United Nations responsible for civil aviation, six other such agencies have certain limited international air transport-related activities.

The **International Labour Organization (ILO)**, headquartered in Geneva, Switzerland, was established in 1919 with the primary objective of raising working standards throughout the world and seeking to eliminate social injustice. The ILO is concerned, inter alia, with the social and labour consequences of economic, regulatory and technological changes in civil aviation ([www.ilo.org](http://www.ilo.org)).

The **International Organization for Standardization (ISO)**, headquartered in Geneva, Switzerland, was established in 1947 to promote the development of standardization and related activities in the world with a view to smoothing the international exchange of goods and services and to developing cooperation. In the international air transport area, the ISO is involved, inter alia, in uniform specifications for machine-readable travel documents (passports and visas) as developed by ICAO ([www.iso.ch](http://www.iso.ch)).

The **International Telecommunication Union (ITU)**, headquartered in Geneva, Switzerland, was established in 1865 with the primary objective of maintaining and extending international cooperation between all member States for the improvement and rational use of all types of telecommunications. The ITU's air transport-related tasks centre on its management of the radio frequency spectrum, particularly those parts allocated to aeronautical services ([www.itu.int](http://www.itu.int)).

The **United Nations Conference on Trade and Development (UNCTAD)**, headquartered in Geneva, Switzerland, was established in 1964 to promote international trade and more particularly, trade between and with developing countries. It serves, inter alia, as a forum for the discussion of air transport issues, particularly those facing the least developed, land-locked and island developing countries ([www.unctad.org](http://www.unctad.org)).

The **Universal Postal Union (UPU)**, headquartered in Berne, Switzerland, was established in 1874 to promote the development of communication between peoples by the efficient operation of postal services. The UPU is involved in airmail matters such as conveyance rates, the carriage of dangerous goods by mail and adaptation of postal services to the increasing competition from private couriers and express/small package operators ([www.upu.int](http://www.upu.int)).

## 2.2 Review Area Narrow

Risk and safety have always been important concerns in civil aviation. This is particularly so under current conditions of continuous growth in air transport demand, frequent scarcity of airport and infrastructure capacity, and thus permanent and increased pressure on the system components. There is also the growing public and operators' awareness of these and other system externalities such as air pollution, noise pollution, land use, water/soil pollution and waste management, and congestion. This paper suggest an assessment of risk and safety in civil aviation sector. It deals with general concept of risk and safety program, describes the main causes of aircraft accidents/incident and proposes a methodology for measuring risk and safety in aviation.

## 2.3 Factors critical to success of study

We have to minimize the risk associated with the transportation of cargo and passenger thru air route. Because today our everyday requirements are dependent upon this mode of transport worldwide. We have to keep the safety at utmost important and cost effective is the main objective of this subject. For this, the Airport would be selected as a case study area. The model would based on traffic growth scenarios in the Airport area, and respective estimations for aircraft accidents leading to losses of life and reputation of business. The Indian airport and airline sector is fighting with the accident/incident prevention methodology to improve and its effectiveness in this field. The expected damage will be huge if any airline crash takes places. We need to analysis and evaluate the full system of it in cost effective way. The cost- effectiveness of three risk control options aiming at preventing accident/incident. It require to take decision support tools for examining the recovery efficiency and optimal disposition for forecasting. Two approaches would be used in assessing the same factor.



Layer of Airport security

## 2.4 Summary

The **smallest aircraft** are like as children toys, and even smaller chopper nano aircraft.

The **largest aircraft by dimensions and volume** is the 302 foot. **British Airlander 10**, a airship, with helicopter and fixed wing features, and reportedly capable of speeds up to 90 mph, and an airborne durability of two weeks with a payload of up to 22050 pounds.

The **largest aircraft by weight and largest regular fixed-wing aircraft** ever built in 2016, is the **Antonov An-225**. That Ukrainian-built 6 engine Russian transport of the 1980s is 84 meters long, with an 88 meters wingspan. It holds the world payload record, after transporting 428,834 pounds of goods, and has recently flown 100 ton loads commercially. It can cruise speed up to 500 mph.

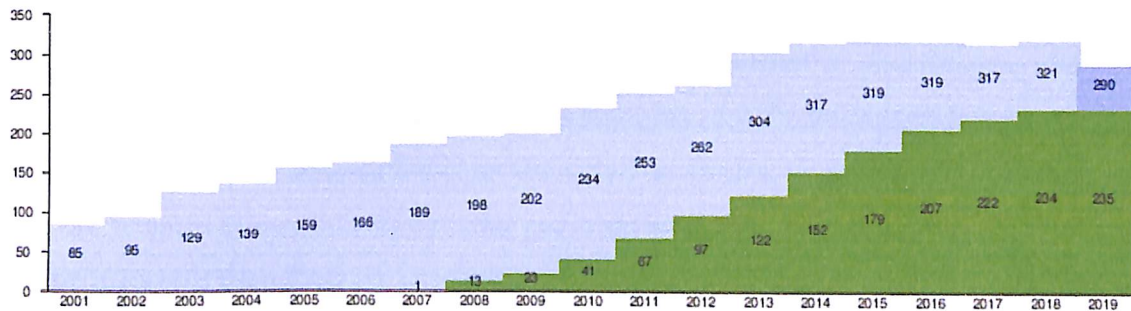
The **largest military airplanes** are the Ukrainian/Russian **Antonov An124** (world 2<sup>nd</sup> largest airplane, also used as a civilian), and American **Lockheed C5 Galaxy** transport, weighing, loaded over 765000 pounds .The 8engine, piston/propeller Hughes HK-1 "**Spruce Goose**," an American World War II wooden flying boat transport with a greater wingspan 94 meters than any current aircraft, and a tail-height equal to the tallest (Airbus A380-800 at 24.1 meters) flew only one short stage in the late 1940, and never flew out of ground effect.

The **largest civilian airplanes**, apart from the above-noted An225 and An124, are the Airbus Beluga cargo transport derivative of the Airbus A300 jet airliner, the Boeing Dream lifter cargo transport derivative of the Boeing 747 jet airliner/transport the 747-200B was, at its creation in the 1960s, the heaviest aircraft ever built, with a maximum weight of 836,000 pounds. The **double decker Airbus A380 super jumbo** jet airliner (the world **largest passenger airliner**).

The civil aviation in India has developed as one of the fastest growing industries in the country during the last 03 years. India is currently considered the 3<sup>rd</sup> largest domestic civil aviation market in the world. India has become the 3<sup>rd</sup> largest domestic aviation market in the world and is expected to overtake UK to become the 3<sup>rd</sup> largest air passenger market by 2024, India's passenger traffic grew at 16.52 % per year on year to reach 308.75 million in FY-18. It grew at 12.72 %, the research and development is the continuous process in the airline industries. All major airline maker company invest a more then 28% money on this.

As of July 2018, there were nearly 620 aircraft being operated by scheduled airline operators in India. Transportation of passenger and cargo, now a days we are using very large aircraft carrier an Airbus A380, the world largest passenger airliner, we see in reflecting orders and deliveries trend in current market.

### Cumulative orders and deliveries



Data from Airbus through the end of April 2019.



Fig. 1: Order and deliveries of Airbus

The International Civil Aviation Organization/Director General of Civil Aviation have different safety committee, and these safety committee keep making rules and regulations for the safety of airline and airport. Airline companies, Airport Authority, National and International Regional Aviation authority are responsible to verify the quality and standards of the airline and airport operations in all manner and situation.

The data has been collected from worldwide aircraft accident and the lessons learned is circulated through various publications. Regulations are also made and rules are passed to Comply. In this thesis we will evaluate the major cause of various types of accident/incidents taken place in the past during the passengers and cargos through air route. Also at the final stage we will evaluate the data and find the solution for the reduction of accident/incident in future.

### **Chapter 3: RESEARCH DESIGN, METHODOLOGY AND PLAN**

In this research three methods would be use; namely qualitative, quantitative, and positivistic. Qualitative method would be used in this study because the theoretical framework is constructed on the base of observation of previous studies, articles, reports and case studies related to the subject of this work. Quantitative approach would also be used in this research as the numeric records from ICAO are used for investigation and analysis in the empirical part. This thesis would also follow positivistic paradigm as both theoretical and empirical sides are created with description and explanation and also the analysis are based on real data and information, which are tangible and objective in the environment. Hence, the analysis is based on the fact and valid information, which occurred in the nature.

Below described, which is known as casual chain, demonstrates that how risks may happen in airline transportation and sometimes give rise to destructive consequences such as loss of goods, loss of life, injuries and environmental damaging such as life threat and pollution.

CAUSE ----INCIDENT----ACCIDENT----CAUSLITY

Accident/Incident is referred to an unintended event, which may result to the loss of life and asset and reputation. Reason behind any happening under mentioned factor impact on it. In aviation Very Serious accident/incident is lower than serious accident/incident and involve fire, explosion, collision, grounding, contact, heavy weather damage, serious defect. Very serious accident/incident loss of airline and life.

We know that the bigger accident/incident is less and the number of minor accident/incident is more. If we compare airline incidents/accident in a way that airline incidents/accident themselves also include hazardous. It is also to be noted that the effect of environment factor which affects the Airline Transport also. We have experienced thru myself during my ground time and flying time (Hrs.) as senior technician, the three main cause of errors comes in to the considerations

1. Human Error.
2. Company/organization problem.
3. Technical equipment failure.

**Human Error:-**

The following to be considered or noted in respect with the Human error:-

- a) Physical condition of the person operating the airliner and airport.
- b) Personal character of the operator and crews.
- c) Persons Morale.
- d) Persons Integrity.
- e) Knowledge of the person operating the equipment or system.
- f) Experience of the person using the equipment.
- g) Training imparted to operator by the organization.
- h) Other important aspects are:-Negligence, unawareness, jealousy, carelessness, boredom, alcohol, drugs, and lack of education, fatigue, arrogance, sluggishness, wrong assessment, and wrong intention. In the part of organization, bad management or bad organization resulted in many accidents.
- i) Operational Management also has significant effect on the operation of system, which includes lack of instructions, supervision, motivation, paucity of strategy for safety management, and lack of activity by airline administration.
- j) The attitude of a person operating the system also very important.
- k) Sometime system gives frequent false alarm and finally in the real situation it being ignored.
- l) It has been also observed that the system operations are hard or software issue creates problems.
- m) Visibility and accessibility takes a great role in the operation.
- n) Sometime person greedy



There are two main causes for any type of accidents:-

**Basic or root causes:** - Under this group mainly the reasons are operator's lack of knowledge. No evidence of knowledge for International Safety management standards. Operator does not have good skills, ability or correct knowledge.

**Immediate Causes:** - The use of unsafe manner protection equipment/avoid the basic policy or no use of protection equipment/avoid the basic policy is the best example of immediate cause. Sometime Technical failure or electrical failure or equipment failure or operation failure also initiate accident/incident. Operator physical and psychological causes also impact on the immediate cause. Fatigue/negligence is the major concern due to lots of commercial pressure in this area of study.

Passenger embarking and disembarking, Flying, Maintenance, Cargo Loading, Refueling and defueling, Parking and securing are also the great concern about the accidents/incident. If wrong loading or discharging is carried out then, the hull failure or structure failure can take place and big accident takes place. Oil leak and complete failure may take place. Aviation Safety is chain of good professional work.

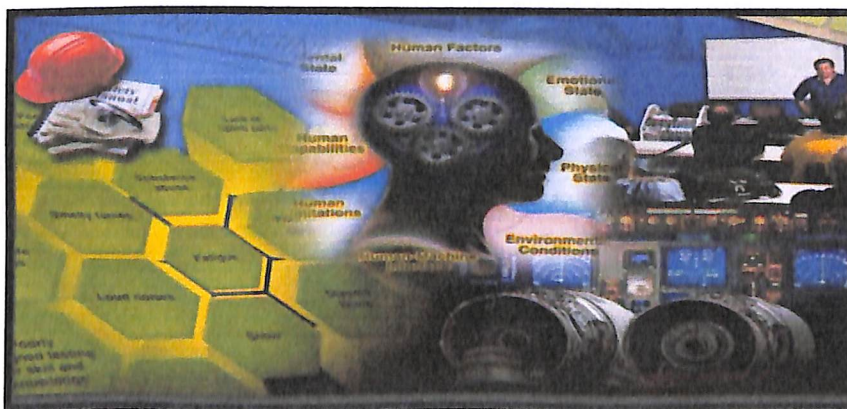


Fig. 2: Human factor and related factor

Different types of aircraft, different size of military aircraft are made as per their requirement by user unit, work for their tactical environment condition. Every aircraft have their weight and balance chart issue from original equipment manufacturer (OEM). It requires depth knowledge of loading / unloading of aircraft. Every manufacture OEM conduct classes before purchase a aircraft from them, for all crew's as per their job profile, after procurement of system from OEM , all the related snag rectification and major snag handled by manufacture and after end of the contract agreement technology transfer by the OEM to user country. The training of ground and aircraft crew time to time is a very costly job for any airline and airport. So many time airline conduct a classes in local manner instead of OEM instruction, which degraded a knowledge and experience of crew's.

Because company does not want to increase their cost in employee training, and flag of convenience is used to reduce cost, this increases the chance of inexperience employee and creates problem for operating aircraft carries. Due to compromised standard of training, employee, flag, risk in the field is increased

Above is not only the limitation, we have seen the terrorist incident, War fact, Labor problems, 30, bad weather, fogs which also increases the risk in the transportation of passengers and cargo. Terrorist attack and war crime can be considered as less common with less percentage but threat of accident and incident worldwide markets is more.

Accidents/Incidents takes place when precautionary measures fails and ignored by any of the concerned parties. Technical error, flying error, explosion, grounding, contact, collision, structural failure, hull failure, and external hazards are the main types of accidents which takes place in transportation of passenger and cargo. Other than above, we also face different types of accidents, which may occur more and less.

Air travel remains the safest form of transportation, but when accidents occur, they are often catastrophic due to the size of the aircraft and the height at which they fly. One of the common causes of aviation accidents—other than mechanical failure and unforeseen events (weather, sabotage, birds, etc.)—is human error.

Consequences can be divided to immediate or delayed impacts. Immediate consequences comprise loss of life, injuries, damaging property, and people in danger; on the other hand, delayed consequences cover damaging environment, financial costs, and further loss of life.

“In the case of aircraft crash or blast in air, the end result of the environmental damage due to the toxic smoke spill in entire environment. The **Human Factors Analysis and Classification System (HFACS)** identifies the human causes of an accident and offers tools for analysis as a way to plan preventative training.<sup>11</sup> It was developed by Dr Scott Shappell of the Civil Aviation Medical Institute and Dr Doug Wiegmann of the University of Illinois at Urbana-Campaign in response to a trend that showed some form of human error was a primary causal factor in 80% of all flight accidents in the Navy and Marine Corps.

HFACS is based in the "Swiss Cheese" model of human error which looks at four levels of human failure, including unsafe acts, preconditions for unsafe acts, unsafe supervision, and organizational influences. It is a comprehensive human error framework that folded Reason's ideas into the applied setting, defining four levels of human failure.

Moreover, loss of life and lives lost are other most important types of consequences in aviation transportation of passenger and cargo. Very serious casualties cover the entire loss of the aircraft and life or severe pollution. Severe pollution refers to making a pollution, which has the main deleterious effect on the environment or resulting this effect on the environment without precautionary action. Serious casualties is lower than very serious casualties and involve fire, explosion, collision, Grounding, contact, heavy weather damage, ice damage, hull cracking, or suspected hull defect.

Two Surya Kiran Aerobatic Team aircraft collided mid-air and crashed on May 2019 during a practice sortie for the 12th edition of Aero India, casting a shadow on the five-day biennial airshow that will kick off on Wednesday. One pilot, Wing Commander Sahil Gandhi died at the crash site. Wing Commander Vijay Shelke and Squadron Leader Tejeshwar Singh are under treatment at Command Hospital, the IAF confirmed. Shelke was the second-in-command of the Surya Kiran aerobatic team.

Indian Air Force's Mirage 2000 has crashed at HAL airport, Bengaluru. Reports are coming in that two pilots have perished in this unfortunate incident. The aircraft was being flown by two test pilots of the Indian Air Force. Squadron Leader Siddhartha Negi and Squadron Leader Samir Abrol were taking the plane for an acceptance test flight after it had been upgraded by the HAL there. Both pilots were from Aircraft and Systems Testing Establishment.

### 3.1 Data Sources

Accident data were collected from different sources such as the FAA (Federal Aviation Administration),(NTSB) National Transportation safety board and Directorate General of Civil Aviation (DGCA) website, daily newspapers, report of DGCA and BCAS, Various research papers. The accidents are analyzed according to different variables such as aircraft type, route pattern, Geographical areas, weather condition, nature of casualties, takeoff-landing and others factor mentioned.

The most common cause of aviation accidents is human error, usually by the pilot (53% of all accidents) or other person (8% of all accidents.) Although the error made by the pilot usually occurs during the flight or whilst taxiing on the runway, other errors occur outside the aircraft, for example during maintenance work, fuelling, or while loading the aircraft.

One in every five aviation accidents is as a result of some sort of mechanical failure, whether the problem arises from the aircraft, its equipment or one particular part. In other cases, the mechanical failure can be a contributory factor in the outcome of the accident, once there has been some kind of human error. Equipment can fail, there can be structural or design problems and if the aircraft is not maintained or repaired properly these can also contribute to an aviation accident.

While safety technology has made plane crashes less common in recent times, aviation accidents do still occur. Most often, airplane accidents are caused due to human error although some aviation accidents do occur due to malfunctioning equipment. Unfortunately, most of these accidents result in catastrophic injuries or death. Dramatically over the last decade and the number of fatalities has increased significantly.

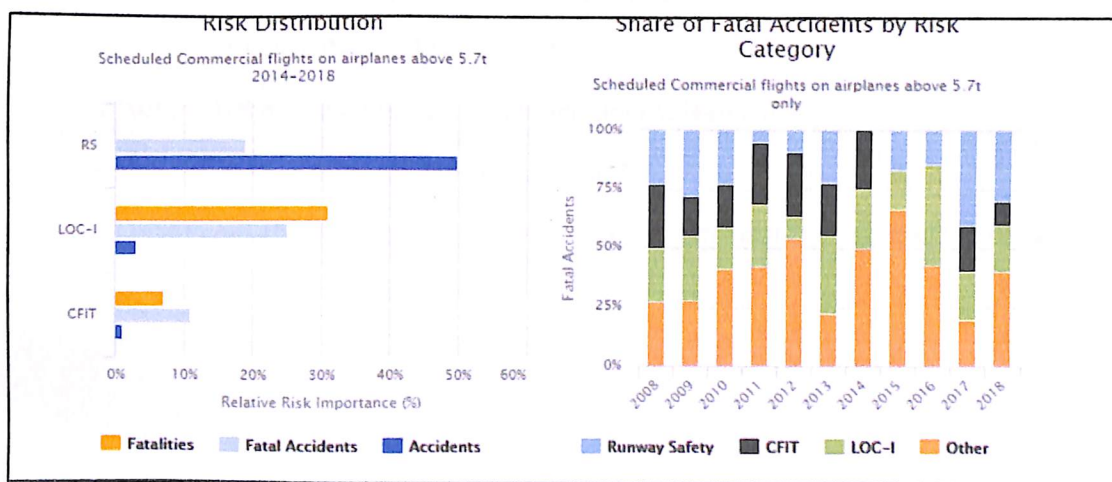


Fig. 3: Accident Graph and Present Situation on Graph  
<https://www.icao.int/safety/iStars/Pages/Accident-Statistics.aspx>

### 3.2 Research Design

"This thesis would be based on understanding and getting comprehensive information from library studies, reviewing several articles, reports, case studies, books, home pages, and empirical work on real records with relevant subjects to the purpose from reliable methods. ICAO safety manual and books are used; namely Emergency Response Guidance for Aircraft Incident Involving dangerous goods, homepages with their published reports; namely FAA, ICAO and DGCA detailed report of accident/incident analysis.

### 3.3 Survey Questions

From the problem statement and the objective of the study in the previous section, several research questions arise which will be elaborated in this MBA project. These research questions are:-

- What technical, environmental and human factors can cause aircraft accidents?
- What is the likelihood of accidents?
- What kind of consequences can the accidents lead to?
- Where are the most accident-risky areas?
- What could be the most cost-effective ways or measures to control the risks?

**Sample of the Questioner given below: -**

### **Questionnaire**

*Name: -*

*Rank or Designation: -*

*Organization: -*

*Experience in the field: -*

Please answer below questions as per your knowledge and experience related with "Aviation Security Domestically or internationally":-

1. What is the main cause of aircraft accident in passenger and cargo transportation? Please priorities in ascending order.

Options:- a) Human Error; b) Technical Problem; c) Environmental Issue; d) Design problem; e) others.

*Answer: - a*

2. Which circumstance is more risky during the flying of aircraft. Please priorities in ascending order.

Options:- a) Mountain valley; b) War zone area; c) Weather condition; d) Load and balance out; f) other

*Answer: - d,b,c,a,f*

3. Which types of accidents are most common in the aircraft accident history? Please priorities in the ascending order.

Options:- a) Collision; b) Grounding; c) Fire & Explosion; d) Over board; i) Others.

*Answer: - d,c,b,a,i*

4. What is the main reason of the Human error? Please priorities in the ascending order.

Options:- a) Fatigue; b) Lack of knowledge; c) Lack of training; d) Complexity of equipment; e) Competency ; f) others

*Answer:- c,b,a,d,f,e*

5. What are the Technical problems can arise during the flying? Please arrange in ascending order.

Options:- a) Main Engine failure; b) Technical Failure ; c) Jam or sudden stuck ; d) Design failure of equipment's ; e) others

*Answer: - c,d,a,e,b*

6. What are the major reasons under the flying affected by nature?

Options:- a) fog/vapor/poor visibility; b) storm/tides/current ; c) icing/deicing environment ; d) earth quake ; f) all.

*Answer: - all*

7. Which types of aircraft mostly having collision accidents in the world? Priorities in ascending orders.

Options:- a) Helicopter ; b) Piston type aircraft ; c) turboprop aircraft ; d) light jet aircraft ; e) narrow body jet ; f) wide body airline; g) Others.

*Answer: - f,e,d,c,b,a,g.*

8. How Human Error can be reduced to prevent accidents? Please Priorities.

Options:- a) Practical Training; b) Education; c) Stringent Regulations; d) Rest and work hours; e) Welfare; f) others

*Answer: - a,b,d,c,e,f*



9. How the design, material and construction failure can be reduced? Please priorities.

Options:- a) Control Inspection; b) Quality control department: c) regular check inspection; d) International Safety Management (ISM); e) all.

*Answer: - a,b,c,d,e.*

### 3.4 Interview Procedure

The interview process is a unique and unusual environment and whilst everyone understands that it can be a nervous and tense environment, preparation and practice can provide you with the confidence to overcome such problems.

With the advent of IT communication tools such as Skype and WebEx, first interviews remotely using the above tools. We have found that almost 90% of our clients will ask to speak to candidates over the telephone or via the web, at the first instance. After-which, formal face to face interviews are requested subject to a successful phone interview.

The initial phone and /or Skype calls are typically a relatively brief affair and can last from 30mins up to an hour. The general consensus is that if you can provide clear and precise answers and prepare / research the company and the role, then you should be in a good position to engage in good conversation. Make sure you have many relevant questions to ask? Remember you are there to investigate them and to find out more about target.

#### Face to face interviews

If having been successful at phone interview stage, then you will almost certainly be asked to meet for a formal interview, where a presentation is required.

For interview preparation, you need to have a good knowledge of the purpose. You must also understand why you would be the best person for the role and so when answering questions you can provide relevant skills to what they are looking for. You will often be asked about the company, their competitors and what you think the role requires.

Apart from experience and knowledge, a person's enthusiasm is perhaps the most important aspect that will increase your performance in the interview. Good preparation will give you the edge in terms of interview performance.

Prepare yourself for questions on your previous work experience, be ready to discuss what you did, what skills you learnt and improved while doing it and what you added to the role.

#### **Presentation**

- Engage the audience where possible, ask them for their opinion at relevant stages
- Use suitable graphics / charts to highlight your points
- Structure your presentation with a good flow from introduction, content through to final questions
  
- A good general presentation should have slides that include:
  - A little about you
  - Why you are doing the research about the Maritime Risk of Transportation
  - What skills you have that are suitable for them
  - A summary of your previous achievements

End the interview on the best positive note, ask interviewers about any reservations so that you get the chance to defend your answers. Feel free to ask when you might hear about the result of the interview, whether there is another stage and who you may or may not be in competition with. Reiterate your enthusiasm for the role and thank all for their time.

### 3.5 Data Analysis Procedure

Data collection for aircraft from FAA, ICAO, DGCA and from centralized organization to make correct report in this field is necessary. Data collected would cover related information to all types of aircraft. Analysis is focused on data concerning aircraft size, passenger capacity and cargo load. As general rule, we would collect data in step by step process. First we try find the cause of accident, type of accident and effect in the location of accident. Lack of information in terms of detailed causes of accidents did not support the second step of analysis (risk analysis techniques); consequently, this part of analysis is done on the base of information regarding detailed causes of accidents/incident in air or ground. The third part of analysis (risk control options/measures) is carried out on the base of findings from the second part. It should be noted that although the second part of analysis is done on the base of availability of information.

This report would summaries the work done graphical format, and provides recommendations for proactive management of aviation risk factor. It is targeted to authorities and decision makers at the international, regional, and state level, and to other stakeholder groups related to aviation team. The report can, however, be of interest to other researchers and to the general public as well. Since the report is a general, intended as easy-to-read description of the project and its results, scientific details are not in focus. Methods and other specific information of the individual analyses are described in more detail in the publications and presentations that are referred to in each section and would be listed at the end of the report.

#### *Risk analysis techniques*

Risk analysis technique, which is the main part of risk assessment and also used regularly in aviation follow three main goals: assessing safety level of technical systems, look into causes of casualties, and discovering most efficient prevention measures. Alleviation, recovery, and giving recommendations on preventions derive from the output of this part. Implementing different methods for risk analysis symbolize the importance of flexibility toward techniques, mainly because of not matching all problems to one specific technique and

also the limitation of availability of amount of information in some case. For transporting dangerous good, the techniques used are 1. Fault tree analysis and 2. Event tree analysis. Factor on which the aviation risk analyses are namely operation, man-machine interface, technique, and environment. Factor involve for operation includes information concerning owners-organization, number and competence of crew, trade and cargo. Man-machine interface contain information toward control centers and facilities. Cargo being loaded and the rush hour for loading is the most important part of techniques. Other factors are Weather condition, direction, Sea height and pressure impact according height and direction, Fog/visibility.

#### *Event tree analysis (ETA)*

“By this approach, the consequences of failure and accidents are logically analyzed with a diagram, which presents the likelihoods and frequencies of the accident/incident. This model is also connected to the precautionary measures, which can be taken after occurrence of accident or unintended events. In this technique, the starting point of accident/incident stem from initial event. Several branches are existed in this model to growing the initiating event to consequences. This technique can be used both qualitatively and quantitatively, which means that with considering frequency of initiating event and also estimating probabilities on the branches, this technique can be used quantitatively; on the other hand, it can be qualitatively provided that no probabilities or likelihoods are estimated for the branches (Ellis 2011).

#### *Fault tree analysis (FTA)*

“FTA is another risk analysis technique in bulk transportation. This analysis technique considers the reasons behind the accidents/incident deriving from the logical connection of human error, equipment failure and other external events. This technique has the possibility to investigate before factors considerably affect the probability and contributing to damage the system in a large-scale or resulting in the complexity of system.

As FTA commences from an effect hopping to figure out its causes, it can be viewed as a deductive technique. Its flexibility to use of both qualitative (recognizing the individual scenarios) and quantitative (estimate the frequency of event) analysis is another advantage of this approach.

<http://www.aviation-accidents.net/jet-airways-boeing-b737-800-vt-ibg-flight-9w2374/>

## Chapter- 4: FINDING AND ANALYSIS

### 4.1 Descriptive statistics

#### *Overview of accidents and casualties*

There were no fatal accidents related to aerodrome and ground handling operations in 2017. The number of nonfatal accidents was 35, which is less than the average of the preceding decade, which was 47.5.

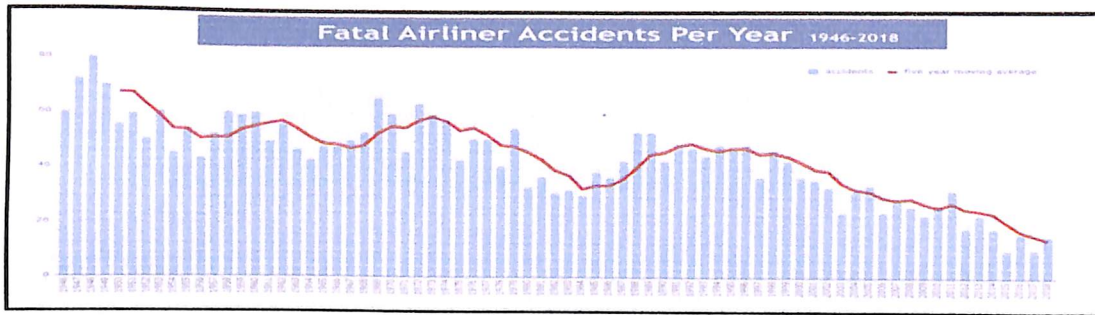
	Fatal Accidents	Non-Fatal Accidents	Serious Incidents
2007-2016 total	7	475	90
2017	0	35	8

	Fatalities	Serious Injuries
2007-2016 total	17	36
2017	0	4

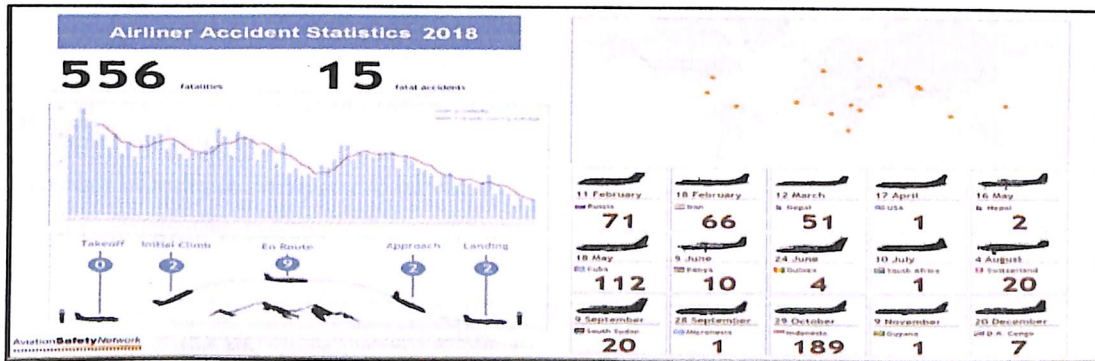
There were no fatal accidents related to aerodrome and ground handling operations in 2017. The number of non-fatal accidents were 35, which is less than the average of the preceding decade, which was 47.5.

**Fig 4. Accidents and fatalities graph A for year 1946 to 2018 and graph B year 2018 alone**  
[Data Source:-Aviation Safety Network]

In 2018, 556 fatalities were reported, and fatal accident reported 15 in. The under mentioned graph shown geographical location of the accident and other graph shown country wise data.



A



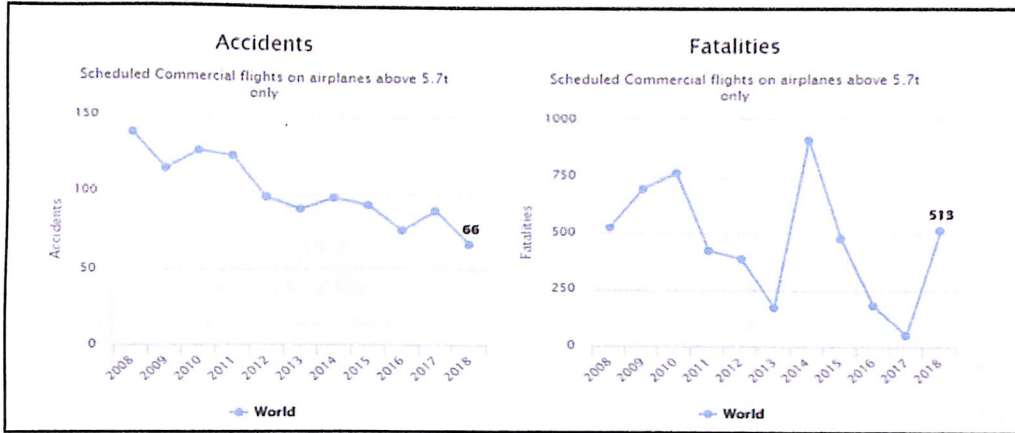
B

Fig 4. Accidents and fatalities graph A for year 1946 to 2018 and graph B year 2018 alone  
[Data Source:-Aviation Safety Network]

Graph A shown fatal airliner accident year from 1946 to 2018 data, shown data clearly indicate that the fatal accident decreasing compare to old day year, when technology is not a part of our system. Now a days in aviation culture we use delicate and sophisticated technology which empower men and machine to, do better work environment for accident/incident free job and provide safety to aviation network.

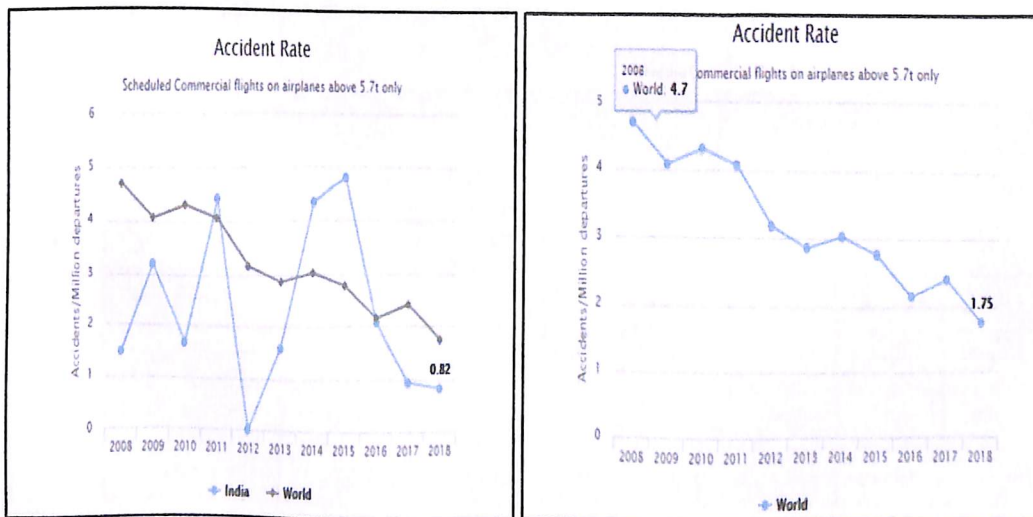


**Aircraft accidents and fatalities** shown in graph for world scenario in scheduled commercial flight only.



**Fig. 5: Accident/Fatalities in world**  
[Data Source:-Aviation Safety Network]

**Accident rate in India in compare to world**, graph shown India accident rate 0.82 and world accident rate 1.75 shown.



**Fig. 5: Accident Rate**  
[Data Source:-Aviation Safety Network]

**Worst geographical region:** having the highest number of fatal civil airliner accident from 1945 until now, Military accident, corporate jets, hijacking (and other criminal occurrences) are not included.

#	country	accidents	fatalities	ground fat.
1	USA	845	10791	133
2	Russia	525	8452	25
3	Brazil	188	2728	68
4	Canada	183	1773	2
5	Colombia	183	2932	28
6	U.K.	109	1296	11
7	France	105	2249	15
8	Indonesia	101	2233	52
9	Mexico	99	1266	53
10	India	94	2331	27

Fig. 7: Worst Geographical Region  
[Data Source:-Aviation Safety Network]

**Cause of fatal accident by decade:** Clearly indicate the accident rate percentage not just improve, its only just stop between them.

CAUSES OF FATAL ACCIDENTS BY DECADE								
DECADE	1950s	1960s	1970s	1980s	1990s	2000s	2010s	All
Pilot Error	50%	53%	49%	42%	49%	50%	57%	49%
Mechanical	26%	27%	19%	22%	22%	23%	21%	23%
Weather	15%	7%	10%	14%	7%	8%	10%	10%
Sabotage	4%	4%	9%	12%	8%	9%	8%	8%
Other	5%	9%	13%	10%	14%	10%	4%	10%

Fig. 8: Cause of fatal accident by decade  
[Data Source:-Aviation Safety Network]

**Error data :** Data shown the percentage of pilot error is high compare to other, but all other cause not refrain from responsibilities, pilot decision on aircraft is always depend upon the crew faith and his work, so if human error being placed so it danger for safety of men and machine.

RAW DATA								
Cause	1950s	1960s	1970s	1980s	1990s	2000s	2010s	All
Pilot Error	82	119	112	67	77	48	28	533
Mechanical	43	62	45	36	35	22	10	253
Weather	25	15	22	22	10	8	5	107
Sabotage	6	9	20	20	13	9	4	81
Other	9	21	31	16	22	10	2	111
	165	226	230	161	157	97	49	1,085

Fig. 8: Cause of fatal accident by decade  
[Data Source:-Aviation Safety Network]

The overall analysis of accidents revealed a picture of human error within aviation field that was not possible before the development (Figure). Specifically, the data indicate that skill-based errors were associated with the largest portion of aviation field accidents (79.2% of the 14,436 aviation field accidents), followed by decision errors (29.7%), violations (13.7%), and perceptual errors (5.7%). Note that many of the accidents were associated with multiple human factor categories. In other words, an accident could have been associated with a skill-based error, decision error, perceptual error, and violation, or any other combination. Therefore, percentages of accidents do not total 100%. Additionally, each accident may be associated with multiple instances of the same type of unsafe act. However, as stated previously, the findings presented here are for those accidents that involve at least one instance of a particular unsafe act category. The category of errors was expanded to include three basic error types (decision, skill-based, and perceptual errors).

In his model, Reason describes four levels of human failure, each one prompting the next. To hear Reason and others describe it, organizational misguidance often leads to instances of unsafe supervision which in turn lead to preconditions for unsafe acts and ultimately the unsafe acts of operators. It is at this latter level, the unsafe acts of operators.

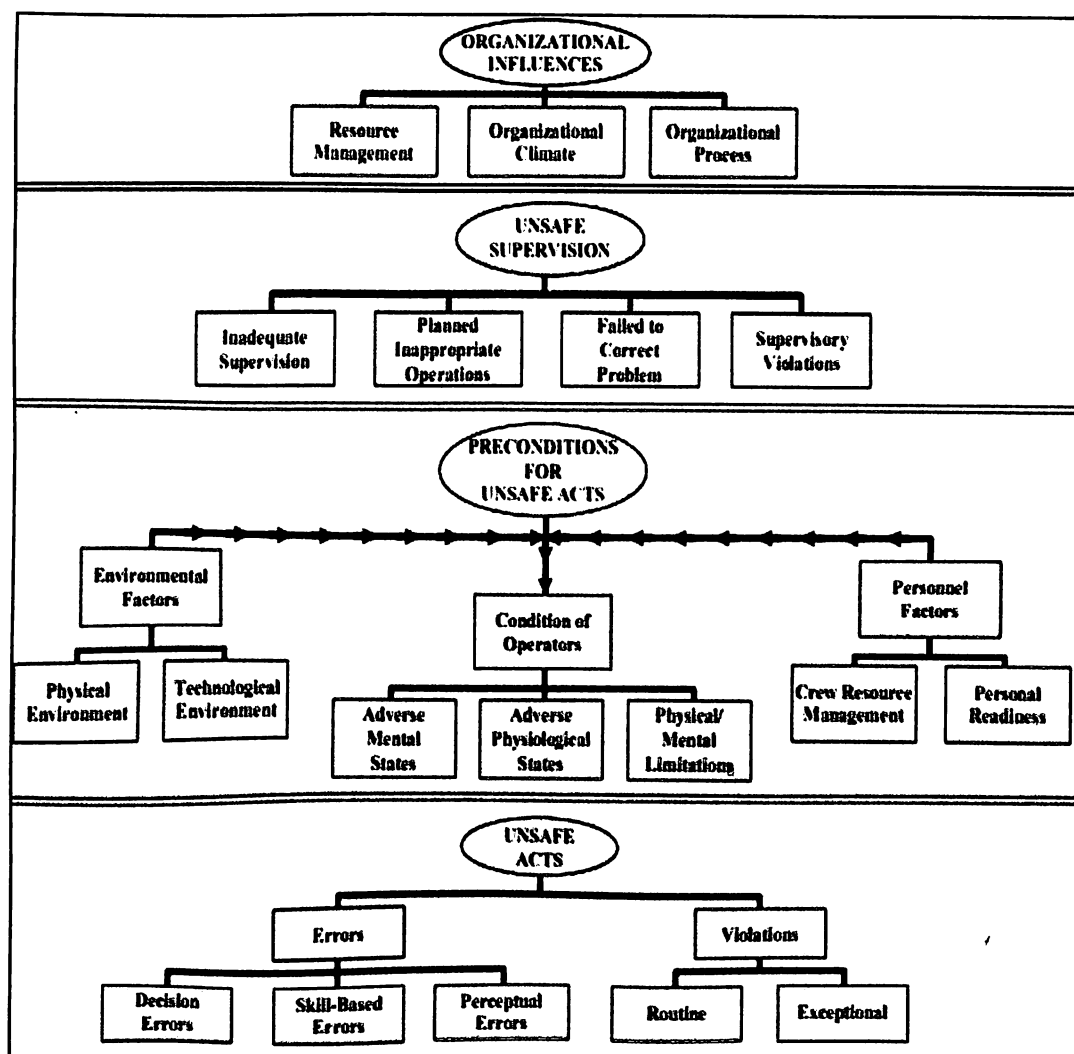


Fig 9. Human factor analysis graph,

[Data Source: - FAA]

**Human error in aviation:**

The data indicate that skill-based errors were associated with the largest portion of aviation field accidents (79.2% of the 14,436 GA accidents), followed by decision errors (29.7%), violations (13.7%), and perceptual errors (5.7%). Note that many of the accidents were associated with multiple human factor categories.

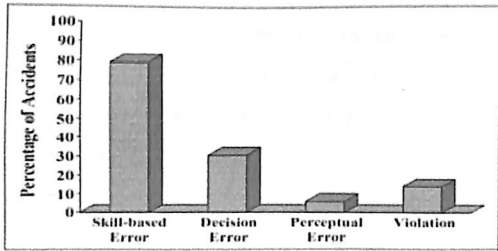


Figure 2. Percentage of aircrew-related accidents by unsafe act category.

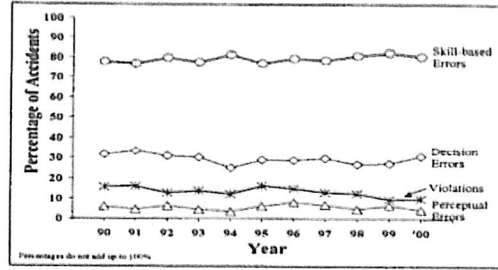


Figure 3. Percentage of accidents by error category by year.

**Fig. 10: Human error by categories**  
[Data Source: - FAA ]

Upon closer examination, it appears that the percentage of fatal and non-fatal accidents with skill-based, decision, and perceptual errors, was relatively equal the proportion of accidents associated with violations was considerably higher for fatal than non-fatal accidents. Fatal accidents were more than four times more likely to be associated with violations than non-fatal accidents.

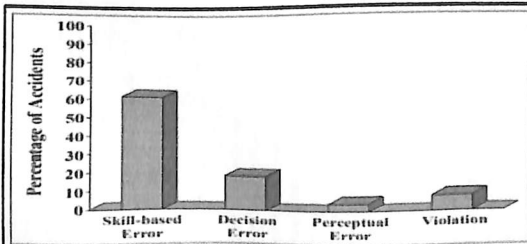


Figure 8. Percentage of accidents in which each unsafe act was the first (seminal) human error in the accident sequence.

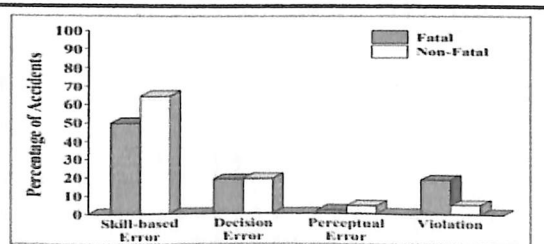


Figure 9. Percentage of fatal and non-fatal accidents associated with each seminal error category.

**Fig 11. Percentage of accident**  
[Data Source:-FAA]

Presents the number of fatalities and non-fatal injuries for each maintenance activity. Installation problems were not only the most frequently cited maintenance issue; they also resulted in the most severe consequences. Accident reports citing installation problems accounted for 100 fatalities and 210 injuries. Installation problems, maintenance, and maintenance inspection accounted for over 50% of the fatalities in this sample.

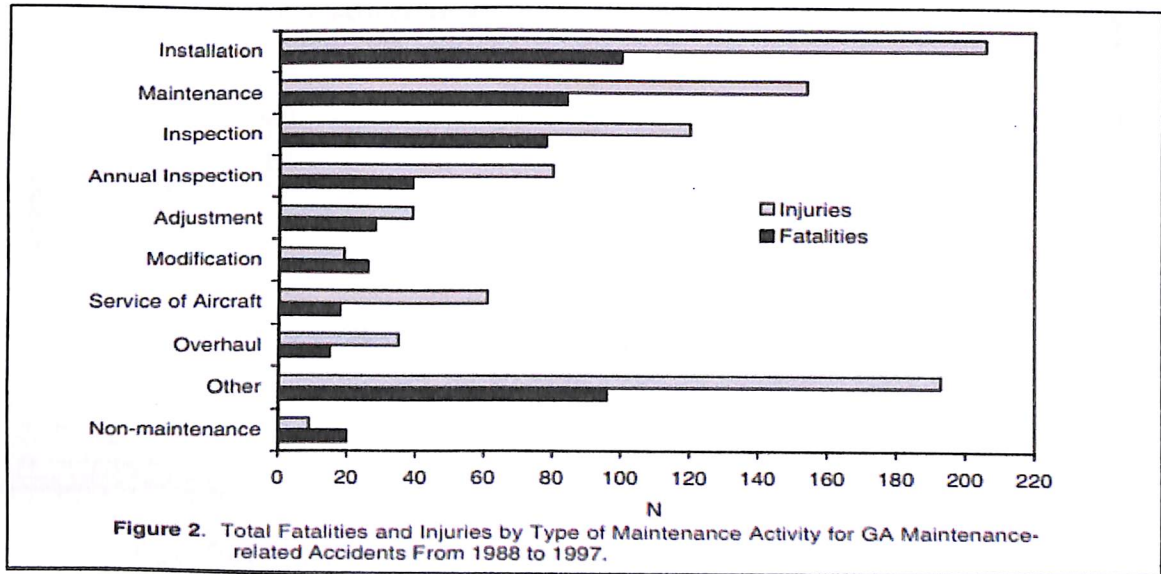


Fig 8. Total fatalities and injuries by type of Maintenance activity  
[Data Source:-FAA]

Number of Fatalities Involving Large Aero plane Passenger and Cargo Operations Worldwide, 1970-2017

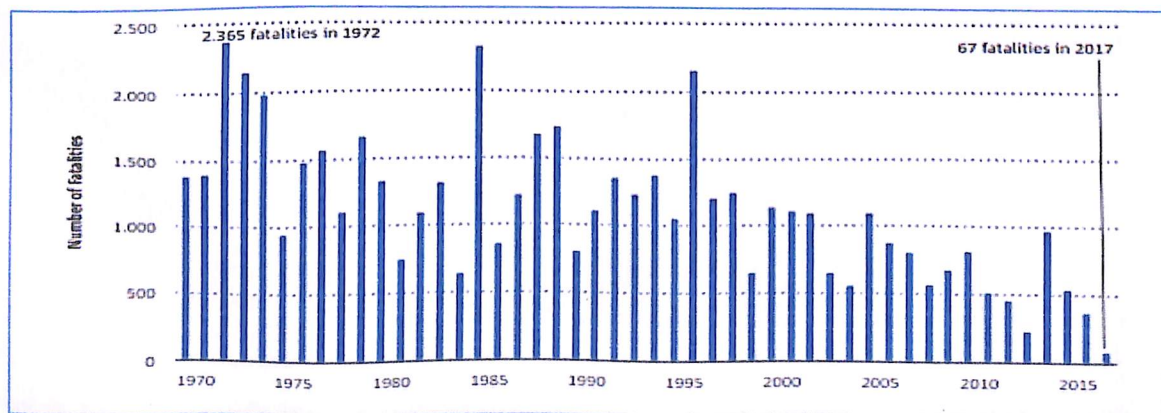


Fig 8. Fig 8. Total fatalities and injuries by type of Maintenance activity  
[Data Source:-EASA]

The rate of accidents has continued to decrease since 2014, although the number of serious incidents remains higher than usual following a peak in 2016. This peak is the result of the more stringent classification of separation minima infringements by the Members States Aviation and Safety Investigation Authorities, after the entry into force of the Regulation (EU) 376/2014.

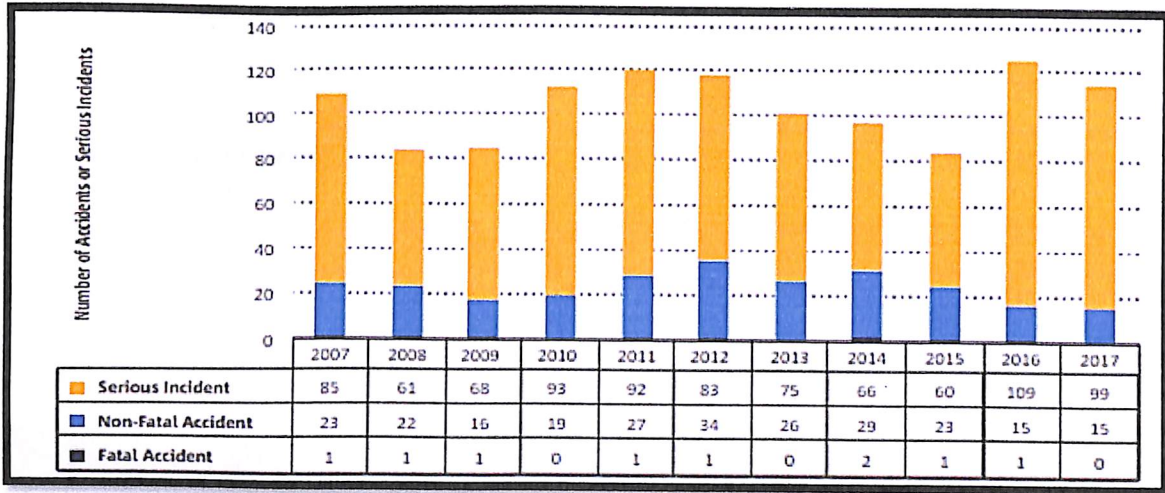


Fig 8. Total fatalities and injuries by type of Maintenance activity  
[Data Source:-EASA]

Distribution of key risk areas by fatalities, number of higher risk occurrences and ERCS risk score for commercial air transport airlines and non-commercial complex business, 2013-2017

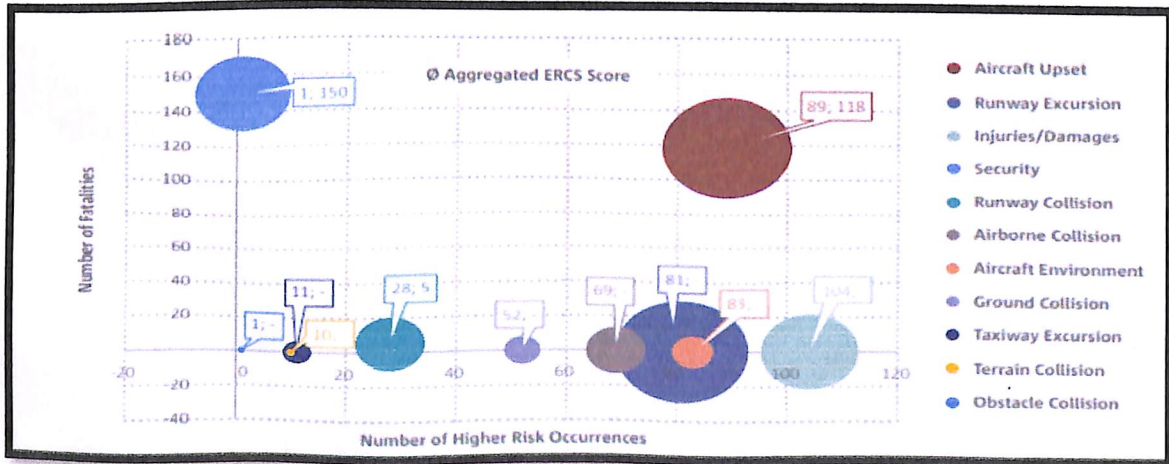


Fig 8. Total fatalities and injuries by type of Maintenance activity  
[Data Source:-EASA]

SHARE OF PASSENGER TRAFFIC							
DURING 2013-14 AT TOP 15 AIRPORTS							
Sr. No	Airport	Passengers (in Nos)					
		INTL	% Share	DOM	% Share	Total	% Share
1	DELHI (DIAL)	12681309	27.2	24195677	19.8	36876986	21.8
2	MUMBAI (MIAL)	10340709	22.2	21880686	17.9	32221395	19.1
3	CHENNAI	4537677	9.7	8358378	6.8	12896055	7.6
4	BANGALORE (BIAL)	2634726	5.7	10234104	8.4	12868830	7.6
5	KOLKATA	1765013	3.8	8335219	6.8	10100232	6.0
<b>TOTAL OF 05 AIRPORTS</b>		<b>31959434</b>	<b>68.6</b>	<b>73004064</b>	<b>59.7</b>	<b>104963498</b>	<b>62.1</b>
6	HYDERABAD (GHIAL)	2442980	5.2	6210804	5.1	8653784	5.1
7	COCHIN(CIAL)	3272350	7.0	2110766	1.7	5383116	3.2
8	AHMEDABAD	997771	2.1	3566454	2.9	4564225	2.7
9	GOA	736340	1.6	3149112	2.6	3885452	2.3
10	PUNE	101141	0.2	3495543	2.9	3596684	2.1
<b>TOTAL OF 10 AIRPORTS</b>		<b>39510016</b>	<b>84.8</b>	<b>91536743</b>	<b>74.8</b>	<b>131046759</b>	<b>77.6</b>



## Chapter - 5 INTERPRETATIONS OF RESULTS

### 5.1 Interpretation of Results

Recent studies that have assessed the frequency of maintenance-related commercial, naval, and aircraft accidents have found an accident rate close to 20% (see Murray, 1998; Schmidt, chmorrow, & Hardee, 1998). The current study found that 7.05% of all aircraft accidents occurring between 1998 and 1997 were attributed to a maintenance-related cause or factor. Due to the method used to obtain the sample in this study, the authors believe that 7.05% is a conservative estimate of aircraft maintenance-related accidents during this period. NTSB accident investigators report the probable cause of an accident with a subject code. NTSB accident reports that contain a subject code not classified as a maintenance code (e.g., "22000-Landing Gear") would not have been included in this sample but may have been involved in a "maintenance-related" accident. As a result, there are probably many more maintenance-related accident reports in the NTSB Database that were not included in this study because they were not designated with a maintenance code. The most frequently occurring maintenance activity in this sample was *installation*. Accident reports that identified *installation* as a cause or factor accounted for more fatalities than any other maintenance activity. *Maintenance* and *maintenance inspection* were the second and third (respectively) most frequent maintenance activities. In addition, *installation*, *maintenance*, and *maintenance inspection* accounted for more than 50% of the fatalities in this sample. Since *installation* is the most ubiquitous maintenance activity (most maintenance activities could be described as an "installation"), rigorous study of the underlying human behaviour is needed. The various categories associated with installation errors (incorrect attachment, omissions, wrong parts, etc.) suggest that the human factors of these events may span a broad range of concerns. For example, omissions may involve attentional lapses, distractions, complex installation instructions, or incomplete training. To better understand the importance of these other human factors, more extensive data are needed regarding the specific maintenance activities. Future studies could look at the behavioural and cognitive factors involved in the day-to-day successful execution of installation procedures.

Maintenance inspection is typically the last line of defence in an aircraft maintenance operation. Maintenance inspections and annual inspections together were cited in 22% of the fixed-wing accidents. Thus, it is surprising that so little information is included in the accident reports concerning the maintenance and inspection history of each aircraft. Indeed, most of the reports in this sample contained no maintenance or inspection history at all. The effectiveness of current inspection practices is difficult to assess without a prior maintenance history.

The maintenance activity categorized as "Maintenance" is difficult to interpret due to the ambiguous name. Fixed-wing aircraft were involved in the majority of accidents (85.7%) from 1988-1997. This is not surprising since fixed-wing aircraft are the most common type of aircraft (in 1996, 86% of aircraft were fixed-wing airplanes; FAA, 1996). However, helicopters, which in 1996 comprised only 3% of GA aircraft (FAA, 1996), were involved in 12.4% of the maintenance-related accidents. Helicopters, which are already well known for their high maintenance requirements, may be especially prone to maintenance-related accidents. However the type of maintenance activities reported as causal factors in this study were identical to those found for fixed-wing aircraft, installation and inspection.

This suggests that the maintenance errors being committed are aircraft-independent and efforts to manage human error in installation and inspection could greatly increase safety for all types of aircraft. The current study found that *incorrect attachment* and *incorrect connection* were the most frequent categories of installation errors in this sample. The distinction between a connection and an attachment may seem slightly ambiguous, but the underlying human behaviours may be quite different. For instance, an incorrect attachment could be the result of a lapse in concentration or incomplete documentation in the manual.

An incorrect connection may occur because of damaging one part of an aircraft (e.g., a fuel line) while attempting to service another part of the aircraft. Installation of components can be required in any of the numerous aircraft systems, and some systems are more critical to safety than others. In fact, the accident (fatality or injury) is dependent on the type of system upon which the installation error was committed. Power plant installation errors were the most prevalent in all accidents. This could be because of the central role played by the power plant, its complexity, or other factors such as limited access to engine components inherent in aircraft design, particularly small aircraft. Although occurring less frequently, the odds of a fatality or injury increased when the installation error involved flight controls or the electrical system. Maintenance technicians must perform many different maintenance tasks across a wide array of aircraft types to keep them airworthy. Understanding which maintenance activities pose the greatest risk is crucial to developing an effective error management and prevention program.

## 5.2 Comparison of Result with Assumptions

Many aviation maintenance technicians (AMTs) may hesitate to report their own errors for fear of reprisal from management or government. Therefore, any maintenance-error reporting system will likely require some level of immunity to disciplinary action to be successful. These essential issues will require consideration as a comprehensive maintenance human factors program and error reporting system are developed and implemented.

Causes of accidents are classified into four groups; namely human factor, technical factor, external factor, and other factor. In this category human factor was the chief culprit followed by technical and external factors. Fire/explosion occurred in terms of both fixed and rotary system and in both cases, material damage was the consequence. In this type of accident, two initial causes motivated this accident. One of the initial causes was electrical failure/fault, which can be categorized in the part of technical factors. Another initial cause was arson or carelessness, which is classified in the part of human factor.

Technical factors are the main reason behind the happening of fire/explosion/blast in air and ground check. Machinery failure/damage/blast happened many times in the air in the cases of machine failure happening in air. In these accidents, the causes were human and technical factors. In the part of technical factor system defect was the same initial cause for both fixed wing and rotary system. This type of accident in the air and ground was as just a result of technical factor. Hence, this type of accident also happened mostly due to technical factor but it should be noted that human factor also had contribution to this accident. In this case and regarding technical factors, it can be said that paucity of maintenance might be the main reason behind mechanical failure. Human factor, technical factor, and external factors contributed to the accident/incident. These factors were also the causes behind the presented accidents in the High altitude flight.

Importance of the role of human factor to accidents was noticeable in coastal waters where human factor recognized as the chief culprit and shared the largest proportion of causes of accidents with more percentage following by technical factor. Human and technical factors are also recognized as the main causes of accidents. Analysis of data on all parameter also displayed that although human factor was the main reason with the largest proportion of sharing accidents/incidents.

Some of the different types of planes and aircrafts involved in crashes include:

- **Commercial Aircraft**
- **Cargo planes**
- **Private Airplanes**
- **Private Helicopter Operations**
- **Offshore Helicopter Operations**
- **Sightseeing Helicopter Operations**
- **Air Ambulance / Emergency Medical Services (EMS)**
- **Military Attack Helicopters**
- **Military Cargo Helicopters**
- **Military cargo Aircraft**

**Aviation accidents may be caused by a number of factors including:**

**Pilot Error** – An aircraft pilot is responsible for safely transporting his/her passengers to their destination. Even though flying is one of the safest ways to travel, aircraft are piloted by humans who make mistakes. Unfortunately, an error made by a pilot can lead to catastrophic consequences wherein people are severely injured and killed. Pilot error is the cause for nearly half of all aviation accidents and for over two-thirds of all private aircraft accidents.

Pilot error is a decision, action, or inaction by a pilot of an aircraft that's determined to be a cause or contributing factor in an accident or incident. A few of the most common examples of pilot error include:

- Using aircraft equipment incorrectly
- Making navigational errors
- Incorrectly communicating with air traffic control
- Errors made in the monitoring of speed, altitude and other flight parameters
- Failing to manage fuel levels properly
- Failing to follow set procedures in regards to safety checklists

**Air Traffic Controller Negligence** – The role of air traffic controllers is to monitor and control the flow of air traffic in and around airports. When an air traffic controller makes an error while planes are taking off, in flight or landing, the results can be terrible, wherein innocent victims are severely injured or killed. Some of the most commonly made mistakes by air traffic controllers include:

- Working while fatigued or while under the influence of drugs or alcohol which can result in controllers falling asleep on the job
- Allowing two or more planes to fly too closely to each other
- Directing too many aircraft to a runway
- Misinterpretation of radar

**Defective Equipment** – It only takes one piece of defective equipment to bring down an airplane. Aviation accidents caused by defective equipment can be due to errors in aircraft design, manufacturing or maintenance. If a plane accident occurs and it is found that faulty equipment played a role, the aircraft designer or manufacturer could be found at fault for the accident. A product liability lawsuit may be filed against the designer or manufacturer of airplane equipment if it is found that defective equipment was to blame for an aviation accident.

It also could be found that those responsible for the maintenance of the aircraft are liable for what happened. For instance, a plane accident caused by a fault in the engine could be caused by negligence on the part of the maintenance personnel who were put in charge of inspecting and maintaining the aircraft's engine.

**FAA Regulation Violations** – Failure to adhere to FAA regulations and safety rules typically points to negligence on the part of the pilot, air traffic controller or other parties who were in violation of FAA rules and regulations. When an aviation accident takes place, investigators may and often do, find that someone was in violation of FAA rules and regulations. In this type of situation, the person or persons found in violation of FAA regulations can be held liable for any injuries, death or other damages suffered by the accident victims and their families.

**Airplane Turbulence** – The most common cause of injuries sustained while aircraft are flying is turbulence. An aircraft can encounter turbulence at any given time with the results being brief due to mild changes in altitude to extreme wherein the aircraft is tossed about violently. When turbulence is extreme, passengers can be thrust from their seats and tossed around the cabin wherein they suffer serious injuries.

When an airline accident victim is injured due to turbulence, he or she may be able to seek compensation from the airline or from its employees, depending upon what or who was found to be at fault. Even though commercial airlines do not guarantee the safety of their passengers, they are held responsible for negligence on the part of their employees. They also must do all they can within reason, to prevent their passengers from becoming injured while on their aircraft.

**Negligence of Airport and Airline Ground Crews** – Some aviation accidents are caused by negligence on the part of the ground crews in charge of directing planes in and out of airport terminal areas. For instance, an accident can happen on a runway if ground crews fail to clear the runway of obstructions, causing an aircraft to strike something like a stray baggage cart. This type of negligence can cause the aircraft to careen out of control which is an event that could end badly with passengers being injured.

**Human Factor:-**

Human error is the part of the operational part of the airport and aircraft. Fault tree analysis for the part of human error. In this analysis, inadequate passage planning could be also as a result of lack of training and experiences.

Careless /category of negligence because of maybe forgetting the policies or it might derive from other reasons such as alcohol or drugs.

Technical factor, which was the second biggest causes of accidents, involved with the parts of Design & construction, electrical part, and the part of problem in valve. Fault tree analysis for the part of technical factor in coastal waters.

External factor was another factor contributed to the accidents in handling of aircraft in airport and waste area for military operation.

Regarding fault tree analysis in aircraft accident/incident, it can be finding that design & construction part played a vital role for the failure in both human and technical factor. In this respect, human error was the chief culprit in the operation part of the aircraft to result in accidents and security breach. In air or ground, the consequences of accidents in terms classified to no damage, minor damage, and material damage. Among accidents in presented area, fire/explosion is selected for implementing event tree analysis (ETA) as it is the most significant reason behind the initial event for the accidents of aircraft. On the base of availability of information regarding the accident type of fire/explosion, an event tree analysis for this accident is implemented. This event tree analysis clearly demonstrates all possible consequences as a result of failures from human and technical factors. One of the main points, which can be finding from this accident, might be the



importance of specifying main areas and places of occurring fire or being vulnerable for happening fire like accommodation and recreational spaces.

In the next stage, general casual chains (comprising cause, incident, accident, and (consequences) need to be constructed and risk control measures to be identified at each node of the chain. Finally interventions must be implemented before each step of casual chain. Interventions should have the potential to remove the cause and put a stop to the situation resulting in lapses because a small lapse can motivate an. Interventions also should have the capability to reduce the severity of impacts of accidents. Table 5-1 shows some effective interventions before each step of casual chain. Although, most of these interventions are founded on the base of initial causes of accidents, but they work for the as well. Generally these interventions are useful in order to decrease the risks and enhance the safety security in national and international level.

In order to increase safety security in air transportation discussed areas, it is necessary to take into consideration some precautionary measures and airliner standard regulations such as successful risk and hazard communication in air transportation, FAA, ICAO, NSA, DGCA, BCAS /guideline/Policies/code, and safety management system (SMS) followed. Here, the addressed measure and standard regulations are described. Consequently, successful communication of risks and hazards is the best way to prevent accident, as well as injury. Visibility, legibility, and Intelligibility are three main factors, which affect the efficiency of risk and hazard communications.

Risk and hazard communication is intended to promote situation awareness (SA). Perception, comprehension, and projection of risks in the future are three main parts of situation awareness. Therefore, categorizing and describing hazards, how to avoid consequences and defining the consequences are the main purposes, which are followed by successful risk and hazard communication.

“Formal safety assessment (FSA) One way of taking precautionary measures before occurs a disaster is to use a process, which is known as formal safety assessment (FSA). One area where FSA is already being applied is bulk Cargo Airliner. Formal safety management is a structured and systematic methodology intended to improving safety, comprising protection of life, health, the marine environment and property by utilizing risk analysis and cost benefit assessment. FSA follows three main parts; namely recognizing hazards, evaluating risks and making a suitable decision action to handle the risks in a cost effective. FSA also helps the evaluation of new regulations for protection of the marine

Environment or in making a comparison between existing and possibly improved regulations with a view to achieving a balance between technical and operational issues, and between maritime safety and costs.

### **International safety management -**

The EPAS is developed through the European safety risk management (SRM) process, which is defined in 5 clear and specific steps as shown below:-

1. Identification of Safety Issues.
2. Assessment of Safety Issues.
3. Definition and Programming of Safety Actions.
4. Implementation and Follow Up.
5. Safety Performance Measurement.



### **Safety management systems (SMS)**

The Plan looks at aviation safety in a systemic manner by analysing data on accidents and incidents. It considers not only the direct reasons, but also the underlying or hidden causes behind an accident or incident. Moreover, the Plan takes a longer term view into the future, and it is constantly being reviewed and improved.

## **Chapter 6: CONCLUSIONS AND SCOPE FOR FUTURE WORK**

### **6.1 Conclusions**

We came to the conclusion that various methods, procedures can be adopted to reduce the accident/incident and security of aviation airport during the transportation and ground handling by men and machine.

Air transportation, through which loads of benefits for National and World economic can be found, is involved with many risks and hazards; accordingly, good understanding of these hazards give rise to enhance the safety.

In this study analysis in Human factor that affecting safety of national and international safety of aviation accidents/incident regarding collision, grounding, machinery failure, hull fire/explosion accident, terrorist attack including cyber-attack. Maximum number of accidents take places due to failure of maintenance work and pilot error in both areas ground and air. the results of finding revealed that safety breach in any area of aviation sharing 50% of all accidents followed by grounding staff . The analysis in safety of airport also displayed that human error is the main places of occurring initiating failures, which need to be more considered.

human and technical factors were the main reasons behind accidents/incident in these areas. Airport safety and security in national/international level also is in deep shade of security threats, terrorist's attacks, cyber-crime and Narcotics activity etc. Today airport security in term of outer peripheral and inner peripheral is very secure (figure ). The line of security personnel in airport terminal start from CISF (Central industrial security force) to Gate check and Baggage counter check terminal, scan and dispatch baggage to concern airliner , in international airport custom officer also available for cross check for any miss happening and block narcotic activity. In view of the above and analysis on data from various fact proved that human factor is behind security lapses, also provided that human factor and technical factor shared the biggest proportion of causes of accidents with 33% and 25% respectively. Analysis on the accident/incident data also displayed that although human factor was the main reason with largest proportion of sharing accidents, it was the reason behind three types of accidents; namely Collision, Grounding, and Security lapses. On the other hand, technical factor, which shared the second biggest proportions of accident, was the reason behind all types of aircraft accidents. Under the external cause of Human error different types of accidents can take place like collision, grounding, and security lapses.

In the part of risk analysis techniques, event tree analysis and fault tree analysis were implemented. Fault tree analysis applied to investigate the failures motivating to all accidents in coastal waters, equipment failure due to design and manufacturing problems also the significance role for the human error. We know the Human error is the main cause of accident during the operation of ships, but other factors also contribute the accidents. Human error is the major problem due to above reasons to be understood. In the case of technical factor, problem in valve and electrical failure were other factors resulting in accidents. External factor stem from environmental problems and other external causes. Event tree analysis is applied for one accident type of fire/explosion in air and ground. In this respect, event tree analysis looks into the rise potential of fire/explosion to establish all possible consequences, which were no damage, minor damage, and material damage.

Risk analysis and control measures have been taken to reduce or prevent or mitigate the accidents to avoid the known facts of Human error. Many regulations has been made by International Civil Aviation Organization (ICAO) and other agencies agreed by the contracting government of the airliner playing worldwide to reduce the accidents, which will impact the decrease in accidents/incident.

## 6.2 Scope for the future Work

- Issue of Navigational Warning for the VTIS Area.
- Recording the daily Movement of aircraft and analysis erroneous schedule at management level/supervisor level.
- Airport Management and information Service, Software for airport employee and employer.
- Issue of airport Clearance by security official through massaging system.
- Trained technical and security staff for new technology as per guidelines issue by BCAS and DGCA.
- Maintaining records of incident/accident cause and remedies for future analysis.
- OJT (On job training) in all manner and strictly adhere.
- Conduct ethics classes and morale lecture for all employees, for closing of security loop hole by, human.
- The security measures include "strict access control to regulate entry into terminal building, airside, all operational area and other aviation facilities".
- No vehicle should be parked in front of the terminal building and there should be "intensive checking of vehicles entering car parking area", according to the alert notification. Another measure is -- strict on ground monitoring of regulatory guidelines for operations of non-conventional aerial platform like micro light aircraft, aero models, par gliders, unmanned aerial systems (UAS), drones, power hang gliders and hot air balloons.
- Intensive checking of vehicles/persons at the approach to airport terminals/installations" has also been called for.
- The BCAS has suggested enhanced screening of passengers, staff, and hand baggage's and "strengthening of anti-terrorism/anti-sabotage measures and placement of quick response teams" at all airports.

## **EXPECTED OUTCOME**

This provides recommendations for proactive management of airport security risks. It is targeted to authorities and decision makers at the international, regional, and state level, and to other stakeholder groups related to aviation industry. The report can, however, be of interest to other researchers and to the general public as well. Since the report is a general, intended as easy-to-read description of the project and its results, scientific details are not in focus. Methods and other specific information of the individual examines are described in more detail in the publications and presentations that are referred to in each section and would be listed at the end of the report.

## **Bibliography**

1. MANUAL ON THE REGULATION OF INTERNATIONAL AIR TRANSPORT (Doc 9626)
2. ICAO Safety Report 2017 Edition.
3. ICAO Annex 14, 5th Edition Aerodrome Design and Operations.
4. Human Error and General Aviation Accidents: A Comprehensive, Fine-Grained Analysis Using HFACS.

## **References:-**

1. Aircraft Manual India Vol- II.
2. Aircraft Rule 1937.
3. CAR volume.
4. <http://dgca.nic.in/operator/ops-ind.htm>

## Appendix - I

Respondent - 1

*Name: - Sub Ratan Behra*

*Rank or Designation: - Technical Supervisor (Airframe)*

*Organization: - Army Aviation*

*Experience in the field:-25 yrs.*

Please answer below questions as per your knowledge and experience related with "Aviation Security Domestically or Internationally":-

1. What is the main cause of accident in Air Transportation? Please priorities in ascending order.

Options:- a) Human Error; b) Technical Problem; c) Environmental Issue; d) Design problem; e) others.

*Answer: - a, b, c, d, e*

2. Which types of accidents are most common in the Air Transportation? Please priorities in the ascending order.

Options:- a) Collision; b) Grounding; c) Fire & Explosion; d) Over board; e) Technical fault ; f) Human fault; g) Engine failure; h) Structure; i) Pilot error.

*Answer: - e, f, c, i, h, g, b, a, d*

3. What is the main reason of the Human error? Please priorities in the ascending order.

Options:- a) Fatigue; b) Lack of knowledge; c) Lack of training; d) Complexity of equipment; e) Competency ; f) others

*Answer: - b, c, a, d, e, f*

4. What are the major reasons under the environmental factor impact aviation wing?

Options:- a) fog ; b) Poor Visibility ; c) night; d) cloudy ; e) others

*Answer: - a, b, c, d, e*

5. How Human Error can be reduced to prevent accidents? Please Priorities.

Options:- a) Practical Training; b) Education; c) Stringent Regulations; d) Rest and work hours; e) Welfare; f) others

*Answer: - a, b, d, c, e, f*

6. How the design, material and construction failure can be reduced? Please priorities.

Options:- a) Control Inspection; b) Quality control department: c) regular inspection; d) International Safety Management ; e) Others.

*Answer: - a, b, c, d, e*



Respondent - 2

*Name: - Sub Maj Ajannyelu*

*Rank or Designation: - Maint Flight DSS I/C (Avionics Supervisor)*

*Organization: - 2016 maint flight*

*Experience in the field: - 23 yrs.*

Please answer below questions as per your knowledge and experience related with "Aviation Security Domestically or internationally":-

1. What is the main cause of accident in Airline Transportation? Please priorities in ascending order.

Options:- a) Human Error; b) Technical Problem; c) Environmental Issue; d) Design problem; e) others.

*Answer: - a, b, c, e, d*

2. Which types of accidents are most common in the Air Transportation? Please priorities in the ascending order.

Options:- a) Collision; b) Grounding; c) Fire & Explosion; d) Over board; e) Technical fault ; f) Human fault; g) Engine failure; h) Structure; i) Pilot error.

*Answer: - e, f, c, i, h, g, b, a, d*

3. What is the main reason of the Human error? Please priorities in the ascending order.

Options:- a) Fatigue; b) Lack of knowledge; c) Lack of training; d) Complexity of equipment; e) Competency ; f) others

*Answer: - c, b, a, e, f, d*

4. How do you feel the Air Traffic Service (VTS) is helpful for mitigating or preventing the Accident in Airline sector?

Options: - a) Very much helpful; b) Helpful; c) Moderately Helpful; d) Not helpful; e) Not known

*Answer: - a*

5. How Human Error can be reduced to prevent accidents? Please Priorities.

Options:- a) Practical Training; b) Education; c) Stringent Regulations; d) Rest and work hours; e) Welfare; f) others

*Answer: - a, d, b, c, f, e*

6. How the design, material and construction failure can be reduced? Please priorities.

Options:- a) Control Inspection; b) Quality control department; c) Regular inspection; d) International Safety Management ; e) Others.

*Answer: - b, a, d, e, c*

Respondent - 3

*Name: - Maj Nabanita chaudhary*

*Rank or Designation: - Engineering officer/ Helicopter Division (ALH)*

*Organization: - 3011 Technical officer and flight safety in charge*

*Experience in the field:-13 yrs.*

Please answer below questions as per your knowledge and experience related with "Aviation Security Domestically or internationally":-

1. What is the main cause of accident in Airline Transportation? Please priorities in ascending order.

Options:- a) Human Error; b) Technical Problem; c) Environmental Issue; d) Design problem; e) others.

*Answer: - a, c, b, d, e*

2. Which types of accidents are most common in the Air Transportation? Please priorities in the ascending order.

Options:- a) Collision; b) Grounding; c) Fire & Explosion; d) Over board; e) Technical fault ; f) Human fault; g) Engine failure; h) Structure; i) Pilot error.

1. *Answer: - e, f, c, i, h, g, b, a, d*

3. What is the main reason of the Human error? Please priorities in the ascending order.

Options:- a) Fatigue; b) Lack of knowledge; c) Lack of training; d) Complexity of equipment; e) Competency ; f) others

*Answer: - c, b, a, d, e, f*

4. How Human Error can be reduced to prevent accidents? Please Priorities.

Options:- a) Practical Training; b) Education; c) Stringent Regulations; d) Rest and work hours; e) Welfare; f) others

*Answer: - a, d, b, c, e, f*

5. How the design, material and construction failure can be reduced? Please priorities.

Options:- a) Control Inspection; b) Quality control department; c) regular inspection; d) International Safety Management ; e) Others.

*Answer: - b, a, c, d, e*

Respondent - 4

*Name: - Nb Sub P Kalai Selvan*

*Rank or Designation: - Master Technician / MCC I/C (Instrument supervisor)*

*Organization: - 2016 Maint Flight*

*Experience in the field: - More than 16 yrs.*

Please answer below questions as per your knowledge and experience related with "Aviation Security Domestically or internationally":-

1. What is the main cause of accident in Maritime Transportation? Please priorities in ascending order.

Options:- a) Human Error; b) Technical Problem; c) Environmental Issue; d) Design problem; e) others.

*Answer: - a, c, b, e, d*

2. What is the main reason of the Human error? Please priorities in the ascending order.

Options:- a) Fatigue; b) Lack of knowledge; c) Lack of training; d) Complexity of equipment; e) Competency ; f) others

*Answer: - c, b, a, d, e, f*

3. How Human Error can be reduced to prevent accidents? Please Priorities.

Options:- a) Practical Training; b) Education; c) Stringent Regulations; d) Rest and work hours; e) Welfare; f) others

*Answer: - a, d, b, c, f, e*

4. How the design, material and construction failure can be reduced? Please priorities.

Options:- a) Control Inspection; b) Quality control department; c) regular inspection; d) International Safety Management ; e) Others.

*Answer: - b, a, c, d, e*

Respondent - 5

*Name: - Maj Nakul*

*Rank or Designation: - Engineering officer/Master in (ALH Helicopter)*

*Organization: - 3013 Maint flight (301 Army Avn Sqn )*

*Experience in the field: - More than 15 yrs.*

Please answer below questions as per your knowledge and experience related with "Aviation Security Domestically or internationally":-

1. What is the main cause of accident in Airline Transportation? Please priorities in ascending order.

Options:- a) Human Error; b) Technical Problem; c) Environmental Issue; d) Design problem; e) others.

*Answer: - a, c, b, e, d*

2. What is the main reason of the Human error? Please priorities in the ascending order.

Options:- a) Fatigue; b) Lack of knowledge; c) Lack of training; d) Complexity of equipment; e) Competency ; f) others

*Answer: - c, b, a, d, f, e*

3. Which types of accidents are most common in the Air Transportation? Please priorities in the ascending order.

Options:- a) Collision; b) Grounding; c) Fire & Explosion; d) Over board; e) Technical fault ; f) Human fault; g) Engine failure; h) Structure; i) Pilot error.

*Answer: - e, f, c, i, h, g, b, a, d*

4. How the design, material and construction failure can be reduced? Please priorities.

Options:- a) Control Inspection; b) Quality control department; c) Regular inspection; d) International Safety e) Others.

*Answer: - b, a, c, e, d*



Respondent - 6

*Name: - Sub Raganath Kumar*

*Rank or Designation: - Tech Airframe Supervisor/safety instructor*

*Organization: - Army Aviation*

*Experience in the field: - More Than 21yrs.*

Please answer below questions as per your knowledge and experience related with "Aviation Security Domestically or internationally":-

1. What is the main cause of accident in Airline Transportation? Please priorities in ascending order.

Options:- a) Human Error; b) Technical Problem; c) Environmental Issue; d) Design problem; e) others.

*Answer: - a, c, b, e, d*

2. What is the main reason of the Human error? Please priorities in the ascending order.

Options:- a) Fatigue; b) Lack of knowledge; c) Lack of training; d) Complexity of equipment; e) Competency ; f) others

*Answer: - c, b, a, d, f, e*

3. Which types of accidents are most common in the Air Transportation? Please priorities in the ascending order.

Options:- a) Collision; b) Grounding; c) Fire & Explosion; d) Over board; e) Technical fault ; f) Human fault; g) Engine failure; h) Structure; i) Pilot error.

*Answer: - e, f, c, i, h, g, b, a, d*

4. How the design, material and construction failure can be reduced? Please priorities.

Options:- a) Control Inspection; b) Quality control department: c) Regular inspection; d) International Safety e) Others.

*Answer: - b, a, c, e, d*

## Questionnaire-7

*Name: - HMT PS RAO*

*Rank or Designation: - Master Tech /Engine (MCC Specialist)*

*Organization: - Army Aviation*

*Experience in the field: - 16 yrs.*

Please answer below questions as per your knowledge and experience related with "Aviation Security Domestically or internationally":-

1. What is the main cause of accident in Airline Transportation? Please priorities in ascending order.

Options:- a) Human Error; b) Technical Problem; c) Environmental Issue; d) Design problem; e) others.

*Answer: - a, c, b, e, d*

2. What is the main reason of the Human error? Please priorities in the ascending order.

Options:- a) Fatigue; b) Lack of knowledge; c) Lack of training; d) Complexity of equipment; e) Competency ; f) others

*Answer: - c, b, a, d, f, e*

3. Which types of accidents are most common in the Air Transportation? Please priorities in the ascending order.

Options:- a) Collision; b) Grounding; c) Fire & Explosion; d) Over board; e) Technical fault ; f) Human fault; g) Engine failure; h) Structure; i) Pilot error.

*Answer: - e, f, c, i, h, g, b, a, d*

4. How the design, material and construction failure can be reduced? Please priorities.

Options:- a) Control Inspection; b) Quality control department: c) Regular inspection; d) International Safety e) Others.

*Answer: - b, a, c, e, d*

Respondent - 8

*Name: - Nb Sub rajesh*

*Rank or Designation: - Master Tech (Instrument) / Faculty Instructor*

*Organization: - Instructor in Faculty of Aeronautical Engineering*

*Experience in the field: - More than 16 yrs experience*

Please answer below questions as per your knowledge and experience related with "Aviation Security Domestically or internationally":-

1. What is the main cause of accident in Airline Transportation? Please priorities in ascending order.

Options:- a) Human Error; b) Technical Problem; c) Environmental Issue; d) Design problem; e) others.

*Answer: - a, b, c, e, d*

2. Which types of accidents are most common in the Air Transportation? Please priorities in the ascending order.

Options:- a) Collision; b) Grounding; c) Fire & Explosion; d) Over board; e) Technical fault ; f) Human fault; g) Engine failure; h) Structure; i) Pilot error.

*Answer: - e, f, c, i, h, g, b, a, d*

3. What is the main reason of the Human error? Please priorities in the ascending order.

Options:- a) Fatigue; b) Lack of knowledge; c) Lack of training; d) Complexity of equipment; e) Competency ; f) others

*Answer: - c, b, a, e, f, d*

4. How do you feel the Air Traffic Service (VTS) is helpful for mitigating or preventing the Accident in Airline sector?

Options: - a) Very much helpful; b) Helpful; c) Moderately Helpful; d) Not helpful; e) Not known

*Answer: - a*

5. How Human Error can be reduced to prevent accidents? Please Priorities.

Options:- a) Practical Training; b) Education; c) Stringent Regulations; d) Rest and work hours; e) Welfare; f) others

*Answer: - a, d, b, c, f, e*

6. How the design, material and construction failure can be reduced? Please priorities.

Options:- a) Control Inspection; b) Quality control department; c) Regular inspection; d) International Safety Management ; e) Others.

*Answer: - b, a, d, e, c*

Respondent - 9

*Name: - Sub Balaraman*

*Rank or Designation: - Master Tech Airframe supervisor*

*Organization: - Fleet Management*

*Experience in the field: - 25 yrs.*

Please answer below questions as per your knowledge and experience related with "Aviation Security Domestically or internationally":-

1. What is the main cause of accident in Airline Transportation? Please priorities in ascending order.

Options:- a) Human Error; b) Technical Problem; c) Environmental Issue; d) Design problem; e) others.

*Answer: - a, b, c, e, d*

2. Which types of accidents are most common in the Air Transportation? Please priorities in the ascending order.

Options:- a) Collision; b) Grounding; c) Fire & Explosion; d) Over board; e) Technical fault ; f) Human fault; g) Engine failure; h) Structure; i) Pilot error.

*Answer: - e, f, c, i, h, g, b, a, d*

3. What is the main reason of the Human error? Please priorities in the ascending order.

Options:- a) Fatigue; b) Lack of knowledge; c) Lack of training; d) Complexity of equipment; e) Competency ; f) others

*Answer: - c, b, a, e, f, d*

4. How do you feel the Air Traffic Service (VTS) is helpful for mitigating or preventing the Accident in Airline sector?

Options: - a) Very much helpful; b) Helpful; c) Moderately Helpful; d) Not helpful; e) Not known

*Answer: - a*

5. How Human Error can be reduced to prevent accidents? Please Priorities.

Options:- a) Practical Training; b) Education; c) Stringent Regulations; d) Rest and work hours; e) Welfare; f) others

*Answer: - a, d, b, c, f, e*

6. How the design, material and construction failure can be reduced? Please priorities.

Options:- a) Control Inspection; b) Quality control department; c) Regular inspection; d) International Safety Management ; e) Others.

*Answer: - b, a, d, e, c*



Respondent - 10

*Name: - Sub Maj MK singh*

*Rank or Designation: - Master Tech Supervisor (Airframe)*

*Organization: - Army Aviation and HQ.*

*Experience in the field: - More than 30 yrs.*

Please answer below questions as per your knowledge and experience related with "Aviation Security Domestically or internationally":-

1. What is the main cause of accident in Air Transportation? Please priorities in ascending order.

Options:- a) Human Error; b) Technical Problem; c) Environmental Issue; d) Design problem; e) others.

*Answer: - a, b, c, d, e*

2. Which types of accidents are most common in the Air Transportation? Please priorities in the ascending order.

Options:- a) Collision; b) Grounding; c) Fire & Explosion; d) Over board; e) Technical fault ; f) Human fault; g) Engine failure; h) Structure; i) Pilot error.

*Answer: - e, f, c, i, h, g, b, a, d*

3. What is the main reason of the Human error? Please priorities in the ascending order.

Options:- a) Fatigue; b) Lack of knowledge; c) Lack of training; d) Complexity of equipment; e) Competency ; f) others

*Answer: - b, c, a, d, e, f*

4. What are the major reasons under the environmental factor impact aviation wing?

Options:- a) fog ; b) Poor Visibility ; c) night; d) cloudy ; e) others

*Answer: - a, b, c, d, e*

5. How Human Error can be reduced to prevent accidents? Please Priorities.

Options:- a) Practical Training; b) Education; c) Stringent Regulations; d) Rest and work hours; e) Welfare; f) others

*Answer: - a, b, d, c, e, f*

6. How the design, material and construction failure can be reduced? Please priorities.

Options:- a) Control Inspection; b) Quality control department: c) regular inspection; d) International Safety Management ; e) Others.

*Answer: - a, b, c, d, e*



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06 Feb 2018

### APPENDIX-I

Subject:- Willingness for Guiding Dissertation of Vijendra Soni (SAP ID. 500056237).

Dear Sir,

Vijendra Soni is registered for MBA (Aviation Management), with the University of Petroleum & Energy Studies, Dehradun in the 2016-18 batch.

I hereby give my acceptance to guide the above student through the Dissertation work

"Titled: "Aviation Security Domestically or Internationally" which is a mandatory academic requirement for the award of the MBA degree.

Thanking You

Yours Sincerely