

A Study on Aircraft Accidents in India Reasons and Basic Lessons Learnt

Karthikeyan. L. M

Department of Aeronautical Engineering
Techno Global University
Megalaya, India

Sathiyavani. K

Department of Electrical & Electronics Engineering
Jayam College of Engineering & Technology
Tamilnadu, India

Abstract— Aircraft accidents are the unexpected and unplanned events, which can collapse the complete mission schedule of an airplane. The study of various accidents happened in the past years will give some ideas and suggestions to prevent the unsafe flying environments as well as the accident causes. Safety is the condition of being safe. Safety Management System (SMS) is the system to be created for managing the safety elements at work place. In an Indian aircraft industry, Safety Management System has been implemented by Director General of Civil Aviation (DGCA) with Civil Aviation Requirements (CAR) and the Aviation Advisory Circulars (AAC) to reduce the Aircraft accidents. This study deals with aircraft accidents and lessons learnt from the past 10 year's history in Indian aviation sector. The major causes of accidents and techniques for eliminating the causes were studied in this paper.

Keywords—aircraft; accidents; safety; security

I. INTRODUCTION

If any aircraft accident happens throughout the world, it should be thoroughly studied and analyzed. The report must be issued openly for the aircraft industrial people to avoid the similar incidents in future. For this purpose Federal Aviation Administration (FAA) released a web service and in India various aircraft accident reports will be issued in the DGCA website. If it is necessary, new department or cell will form under the Ministry of Civil Aviation to coordinate the safety or security concern. For example, after the hijacking of the Indian Airlines flight during September 1976, the Bureau of Civil Aviation Security has been formed by DGCA to coordinate all the airport security issues in India. So, aircraft accident study is an effective tool for increasing the safety and security awareness in air transportation. India always maintains safety precautions for controlling the aircraft accidents. On 22nd May 2010 Mangalore international airport met an air crash. A Boeing 737-800 has overshooted the runway, 158 people were killed. Unstabilised approach, prolonged sleep of the captain due to crew fatigue during flight and failure to maintain the proper planning of descending profile were found to be the major causes of that accident. After this major accident, the safety awareness increased in addition of the regular activities in Indian aircraft industries. Even then some accidents occurred in various industries, and this indicated the importance of the safety awareness in Aircraft industries.

II. ACCIDENTS DETAILS

The Fig.1 shows that most of the accidents happened during the non schedule operations. Wang and Yonggang [9] indicated the six kinds major failures are, air-conditioning system failure, Fireproofing system failure, Aircraft flight control systems failure, landing gear system failure, Bleed air system failure and engine system failure. Air safety circulars are issued by the Director General of Civil Aviation for avoiding the mistakes and minimizing the accidents. It will help to find the reasons of the past accidents to the operators, pilots and other personal involved in the aviation activity. By reading the circulars, it is clear that major accidents happen by the human error and bad weather conditions.

A. Accidents as per the Operation Category

The Table.1 shows the details of accidents happened in India during the past 10 years. The past accident reports shows that, the non scheduling operation aircrafts met various accidents because of the inadequate skill of the pilots and some other safety issues. Zhang [11] analyzes the various factors affecting the flight control on plateau airports, and the safety for flying at plateau airports. Zhou and Hu [12] have studied the various reasons for aircraft accidents in tallest places like southwest region of China. The major reasons found for the accidents are, bird strike, poor weather, machinery and crew failure, poor maintenance, controller mistakes and ground support failure. Everywhere, poor maintenance reasons playing major role for the non scheduled aircraft accidents. When compared to the other operators, airline operators have more responsibility because more number of human lives are involved in the flight operation.

Fig.2 shows that more human lives will be affected in small number of airliner accidents. Critical phases causing aircraft accidents. Indian Civil Aviation Authority found out the following points and circulated it to the Aviation people to realize the critical phases of aircraft operation.

- More concentration needed for the approach and landing phases, because approximately 60 % of accidents happens in this mission phases only.
- Crew members are the reasonable persons for more or less 60 % of accidents.
- 90 % of Controlled Flight into Terrain (CFIT) accidents happens because of the bad weather, mostly in hill areas.
- Many of the accidents are happening due to the poor weather conditions and disobedience for the proper laid down procedure.

Alessandro Cardi, Paola Di Mascio, Michele Di Vito and Costantino Pandolfi [4] have studied the accident data from various information sources for the period of 1996-2011. It has found that, most of the aircraft accidents happened during the in-flight and landing phases. Very few incidents happened during take-off period. It is clear that 80% of flight operations have failed due to the lack of safety awareness in the bad weather conditions.

III. ACCIDENT PREVENTION METHODS BEFORE FLYING

Some Accident prevention methods to be followed during aircraft operation are given below

- Distribution of pay load weights in the aircraft is the important duty for ground personals for safe flying by maintaining the proper centre of gravity position. The weight distribution as per the aircraft manual should be followed during the aircraft operation, especially by the seasonable operators.
- The standard operating procedures are given in the flight manual clearly to the pilots. The pilots must be strictly following the Flight Manual for the safety operation.
- During emergency operations, passenger may be seated in the co pilot seat in the single pilot operating aircraft, and at that time, there the duplicate controls must be deactivated. It is the duty of operators to ensure the deactivation of duplicate controls.
- The landing space must be sufficient for landing the aircraft safely. The non schedule operators and the seasonable operators must ensure available space for safe landing comfortably.
- The airworthy condition of any aircraft must be ensured before flying. The quality control is the major aspect for airworthiness. The non scheduled operators and seasonal operators must get the permission of Government authorities and they must be ensured the weather conditions in the assigned flight path. They must assure that the passengers are wearing the seat belt or not. Smoking is strictly prohibited inside the aircraft.
- The Landing gear working condition must be inspected periodically. Lubrication systems and the force given system for the landing gears must be thoroughly checked during the maintenance time. Always proper

grade and quality of fuel should be used for the aircrafts.

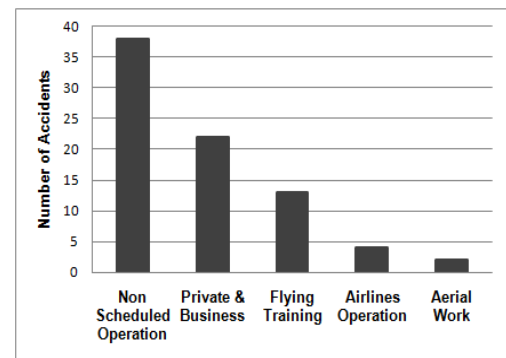


Fig. 1. Accident analysis by operation category

IV. SUGGESTIONS FOR REDUCING ACCIDENTS DURING FLIGHT

Air Safety Circular No.2 [1] explained the guidelines for helicopter pilots to minimize the accidents. The important guidelines for the all pilots and operators to reduce the accidents during flight are given below.

A. Handling Bad Weather Situations

Pilots may fly in the bad weather situations with proper approval from their senior pilots, Air Traffic Controllers and Instructor/ Examiner with the approved navigational aids. But the routes also must be checked randomly with the Director of operations / Director of flight safety. Rajendra and Ashok [7] has explained the reasons for the aircraft accidents due to the bad weather condition in Indian and other global regions.

The pilot should be aware of the invisible hazards during the shallow fog in the landing phase, and the ground proximity warning system must be carried as per the aircraft rule issued by Director General of Civil Aviation. Air Safety Circular No.2 [3] indicated the guidelines to minimize the weather related helicopter accidents. Anna Sulej, Zaneta Polkowska and Jacek Namiesnil [5] studied the influence of rain water contaminants in environment of two international airports in Poland. The installed weather radar system, wind shield wiper system and rain repellent systems should be checked for serviceability and satisfied operation.

B. Eliminating Bird or Animal Strike

In case of Bird or animal strike, Pilot in command should immediately inform the incident to the local air traffic control unit. It is important to know the inhabiting species of birds in the air fields and according to that the bird hit incidents can be minimized. Guan Yupu, Zhao Zhenhua, Chen Wei, Gao Deping [6] studied the effects and problems of foreign object damage to fan rotor blades of aero engines. The assortment of the bird or animal must be sent to the Natural history society after the bird or animal strike on an aircraft. The reporting has to be made with the specified DGCA format.

TABLE I. NUMBER OF ACCIDENTS HAPPENS FROM 2000 - 2009

Year	Non Scheduled Operation	Private & Business	Flying Training	Airlines Operation	Aerial Work
2000	Nil	5	Nil	2	Nil
2001	7	2	1	Nil	Nil
2002	5	1	Nil	Nil	Nil
2003	9	2	Nil	Nil	Nil
2004	3	4	3	Nil	Nil
2005	4	Nil	Nil	Nil	Nil
2006	1	2	1	Nil	Nil
2007	2	4	2	1	Nil
2008	3	2	4	Nil	Nil
2009	4	Nil	2	1	2

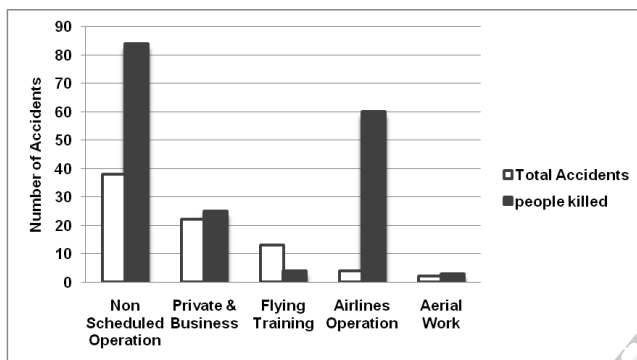


Fig. 2. People killed in the accidents

C. Handling Critical Situations

During the emergency time the cockpit crew members must work intelligently within the available minimum time period, especially during the smoke, fire or forced landing periods, a little dangerous activity can become fatal to the life of the passengers. All the operators must be monitoring the proper working condition of their flight data recorder to avoid the instrument error. The pilots must follow the approved navigational systems like GPS and must obey the approved signals. For light weight aircrafts, minimum service ceiling has been mentioned in the CAR series. Pilots and operators should be maintaining the safe limit of height for the aircrafts to prevent the flight from the low flying hazards. During the take off period, take off speeds must be compute correctly and the correct rotation techniques must be followed as per the Flight crew operating manual for safe operation. No walkie talkie equipments should be used for the two-way communication between Aircraft and ground operating people. In the cockpit area, the radio apparatus with the special equipments for communication must be fitted and maintain in the airworthy condition.

D. Managing Heavy Work Loads

Major accidents happen because of the pilots no response situation for the air traffic control stations during landing phase. Shan Kunlun, Li Yan and Xu Ming [8] explained a safety approach to predict human error in critical flight tasks. From the previous incidents, it has been found that pilot and crew members may be affected by the micro sleep phenomenon and sleeping because of the crew fatigue. So the pilots must necessarily learn the fatigue management techniques and specific training to control the sleepiness by the fatigue especially during the night landing. The log note and the data entry must be ensuring that the pilots or copilots are not affected by continuous flying duties, and the time interval should manage in the flying schedule. For the safe flight operation, pilot and pilot in command should maintain proper understanding, because incorrect crew combination may cause the major problem in aircraft operation. Generally with the high experienced pilots, the pilot in command may feel the uncomfortable working environment during flight time. So maintaining the good relationship within the pilot and the pilot in command is very important to eliminate the human errors. More than that the pilot and the pilot in command must occupy their seats properly (may be left or right) without interchange. In any flight operation, the periodic training will help to the pilots to handle the emergency situations.

E. Preventing Hijacking

Hijacking of airline transport aircrafts may be done by some anti social people to demand their requirement against the Government or any Management. To prevent the hijackers to enter inside the aircraft, screening process must be carried out in the initial and departure gates for airport employees, passengers, baggage, computers and laptops. The most important explosive and trace detection devices for screening in aerodrome are x ray inspection devices and metal detectors. For the safe Cargo operation, Tags and other identifications must be maintained in proper manner in baggage. Security tips for airline passengers are given below.

- The passengers must bring only the allowed goods in the airport.
 - All baggage and laptop computers should be carried with the identification labels.
 - Valuable goods should not be allowed with the carry on packages.
 - All metal items including jewels and keys must be carried with the carry-on bags only.
- Be aware of strangers.

V. SAFETY AND SECURITY MANAGEMENT SYSTEM

From the study, it is clear that, the lake of awareness will be the major cause for the aircraft accidents. Air Safety Circular No.6 [2] explained the action required of police authorities in case of aircraft accidents. All operators must follow the Safety Management System (SMS) implemented by Civil Aviation Authorities. Yu Jingyu, Liu Ling [10] describes the history and features of airworthiness directive from civil aviation administration of China. In India the operator of a licensed aerodrome shall

implement a Safety Management System acceptable to DGCA. Proper security system is also another important concern for safe flying of any Airport. For safety purpose, the hangers, working areas, flight kitchens, cargo areas, Passenger terminal areas and all other operational areas should be kept in clean condition. No photography should be taken in the government Aerodrome. If it is necessary, then proper permission should be obtained from the DGCA as per the procedure. During operation, the airline operators must follow the proper seating arrangement and correct number of seats for passengers and seat belt wearing is important for all passengers.

No outside personal should be entering inside the aircraft operational area. It may be dangerous for the safe flight operations. So that safety rules must be followed in these aspects. All the working persons including security staffs must wear safe jackets and should maintain the proper dress code. The two wheelers are not allowed in the airside operational area. During the mission, all aircrafts should carry cockpit check list for emergency handling. In case of emergency during the landing time like forced landing, the pilot must inform to the crew members regarding the emergency operation before landing. It is important to alert the passengers by crew members to prevent them from the impact effect. If they have to move from their proper place from the cockpit during the mission, the pilots must give the information to the crew members to observe their work. The unnecessary arguments must be avoided with the ATC officers; it may create accident environment due to the human error.

VI. CONCLUSION

Safety is the main concern during air travel, because small careless mistakes also can create very critical situations for Aircraft operators. Safe aircraft operation is possible by proper understanding between pilots, crew members and operators. Also to achieve this, the excess of human workloads must be minimized in any work environments by following the implemented systems of the Airworthiness authorities. This study presented the details about the accident causes and safety techniques to reduce the causes. In this paper the past accident history of Indian

aircraft industries has been considered. When compared to the other countries, the numbers of accidents in India are very less only. But human lives are directly involved in the accidents. So, accident prevention methods must be strictly followed by aircraft operators and the safety management system will be implemented in all aircraft industries for safe aircraft operations.

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