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ROLE OF AIR TRAFFIC CONTROLLER IN PROTECTION OF AVIATION SAFETY

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ABSTRACT:

Nowadays, usage of flights has been increased as well as demands of get increased and the most importantly the traffic in the airspace get increases. From the ancient time itself the major cause for aviation accidents is the human error thought the traffic is less those times. Now traffic is more, so this paper is about the relationship of Air Traffic Controller (ATC) with regards to the civil aviation safety. At first the paper says about how a small negligent work of ATC causes a fatal aviation accident by literature reviewing the report of NTSB. Then the paper concentrates on the accidents and incidents occurred in India. Then paper shows up the surveys, statistics, and operational difficulties of ATC. At last the paper analysis the regulations for the aviation safety. I hope that this paper contributes something to the aviation safety by providing suggestion to increase manpower facilities regarding the increase of air traffic and stringent regulation for defaulters.

KEYWORDS: Aviation safety, Human error, USAIR ON SKYWEST, Increasing traffic and less space of separation.

INTRODUCTION:

As compared to early time, nowadays the number of flights and usage of flights increased. From ancient to modern, human error is the major factor for air accidents. It's the job of air traffic controller to guide the airplanes in order to prevent any collision. Air traffic controller plays the role of guardians in controlling them for their safety in mid-air, while entering and exiting the airports, thus they have responsible role in handling the life of people. ATC has to develop to deal with interactions with humans to humans and use of technology while they were busy in directing the pilots for the separation of aircraft in both vertical and horizontal directions. ATC has to do multiple works like thinking, listening, speaking and decision making. Since their job is heavier one make think of probability of mistakes that to when the traffic is heavier these days. In simple terms ATC error is directly proportional to the aviation traffic.

At first, how a negligent work of ATC caused a fatal accident by reviewing the reports of NTSB[1].

And then paper goes on with operational difficulties of ATC by reviewing the existing literature, surveys, notable incidents and expert opinions. At last paper overviews the regulations in aviation safety and by giving suggestions to the development of aviation safety. The aim of the paper is to find how difficult is the job of ATC and how a negligent act would be catostropic.

DISTURBING FACTS OF INDIAN AVIATION SAFETY

INCIDENTS IN INDIA:

Indian Airlines Flight 491[2] was a domestic flight carrying 112 passengers connecting Delhi to Bombay at stops. The heavy aircraft started its take-off on 26 April 1993 from Aurangabad Airport's runway 09. Almost at the end of the runway it impacted heavily with a truck on the highway at the end of the runway. The accident caused 55 fatalities and 63 injured survivors. The major cause of the crash was the failure of the NAA to regulate the mobile traffic on the highway during the flight hours.(Singh et al. 2012)

On 22 August 2016, an ATC saw Indigo flight IGO258 and Air India flight AIC995[3] was approaching on the same altitude over New Delhi. The Air India flight was asked to turn left to avoid a collision but that put the plane on the path of another Indigo flight IGO528. Fortunately all the planes landed safely. This is the near miss case. This could also be a fatal accident. Thus

nowadays the traffic increased thus there is minimum separation of flights, there no room for breathe when a flaw occurs. It is the duty of ATC to check for the altitude of the flight. This incident is similar to the incident occurred in 1996 charkhi dadri mid-air collision were two aircrafts collided in mid-air at same altitude were the ATC didn't verify the altitude of the flights but in this it was a pilot error to cause a crash. In this also if the ATC verified the altitude he might have saved the crash

A recent incident in Delhi Airport which occurred on 28th December 2016 that Indigo flight and Spice jet flight came face to face in the runway, both pilots after realising the situation applied brakes and save the aircrafts. In this it was the ATC error to give the proper navigation and direction to the pilots in the way of landing and taxing[4].

PRECEDENT ON NEGLIGENT ACT OF ATC

USAIR LANSDED ON SKY WEST

Facts

As per the report of NTSB, on February 1st 1991 at 1807 Pacific Standard Time an aircraft from US named USAIR 1493 while landing at the runway 24L of Los Angeles International Airport collided with a metroliner named SKYWEST 5569. The SKYWEST 5569 was waiting for the clearance to take off on the same runway 24L. The incident was a catastrophic accident on the aviation history. As a result of collision both the flights was destroyed, all 10 passengers and 2 crew members of SKYWEST 5569 and 20 passengers and 2 crew members of USAIR 1493 were fatally injured.

Major reasons for Accident:

Communication by the both aircrafts USAIR 1493 and SKYWEST 5569 was made to Local Controller2 (LC2). At 1804:44 LC2 told SKYWEST 5569 to proceed to runway 24L and wait for the further information for departure. At 1805:29 USAIR 1493 requested to land at 24L and then at 1805:53 LC2 cleared the USAIR 1493 to land on runway 24L. Then LC2 conducted transmissions to other aircrafts which are waiting for departure which includes one metroliner and two boeing 747 aircrafts. But she didn't conduct any transmission to SKYWEST 5569 which on runway 24L. The controller forgets about the occupied runway 24L by a metroliner SKYWEST 5569 since because LC2 had no flight progress strip in front of her for airplane to

depart. Then at 1806:30, she verified with the flight crew that they had a departure squawk indicating that the departure had been issued. A search for strip was conducted and the strip was located at the clearance delivery (CD) position, misfiled as yet to be delivered in departure. The negligence on the part of LC2 that before clearing a aircraft to land she didn't check the airport surface. The reason also includes the failure of airport surface detection equipment at that time and also mishandling of strips caused the USAIR1493 to land on the SKYWEST 5569.

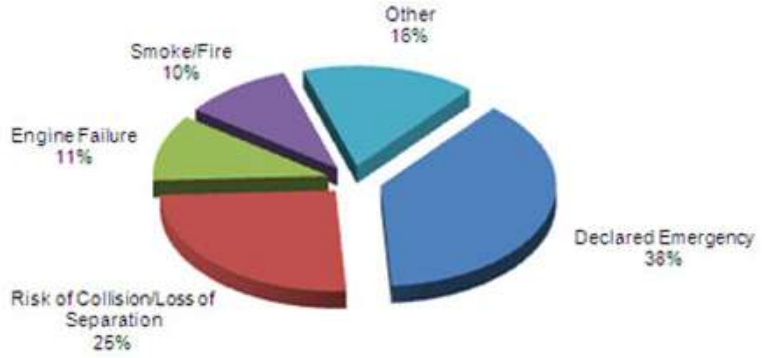
STATISTICS:

ACCIDENTS BY CAUSE[5]						
Cause	**1960s**	**1970s**	**1980s**	**1990s**	**2000s**	**All**
Pilot Error	**60%**	**55%**	**54%**	**60%**	**60%**	**58%**
Mechanical	**21%**	**16%**	**18%**	**15%**	**18%**	**17%**
Weather	**6%**	**5%**	**6%**	**6%**	**7%**	**6%**
Sabotage	**5%**	**11%**	**11%**	**8%**	**9%**	**9%**
Other	**8%**	**13%**	**11%**	**11%**	**6%**	**10%**

RAW DATA						
Cause	**1960s**	**1970s**	**1980s**	**1990s**	**2000s**	**All**
Pilot Error	**150**	**132**	**111**	**140**	**107**	**640**
Mechanical	**52**	**38**	**37**	**36**	**32**	**195**
Weather	**14**	**13**	**11**	**13**	**12**	**63**
Sabotage	**12**	**25**	**23**	**19**	**16**	**95**
Other	**20**	**30**	**23**	**27**	**11**	**111**

Cause of Fatal Airplane Crashes[6]	**Percentage of Crashes**
Pilot Error	32 %
Pilot Error (weather related)	16 %
Pilot Error (mechanical related)	5 %
Total Pilot Error	53 %
Other Human Error	6 %
Weather	12 %
Mechanical Failure	20 %
Sabotage	8 %
Other Cause	1 %

PIECHART ON ACCIDENTS BY CATEGORY[7]



" *THERE WERE 35 near-miss incidents from March 2015 to March 2016, involving aircraft belonging to major airlines and the IAF, according to statistics submitted by Union Minister of State for Civil Aviation Mahesh Sharma in Lok Sabha last month.*
According to the official figures examined by The Indian Express, of the 35 incidents, at least 11 were reported in Delhi airspace, eight in Chennai, seven in Mumbai and four in Varanasi.
*The statistics handbook of the Directorate General of Civil Aviation (DGCA) for 2014-15 recorded 11 "serious incidents" in the previous cycle, although a senior official told The Indian Express that "not all near-miss incidents could be classified as serious"**[8]**.*

Flight risk: 2016 most unsafe year for Indian aviation, 40% spike in near-miss cases

On August 22 last year, an air traffic controller saw Indigo flight IGO258 and Air India's AIC995 approaching the same altitude over New Delhi. Flight AIC995 was asked to turn left to avoid a collision, but that put the plane on the path of another Indigo aircraft, IGO528.

It was a close shave, and in the end the three flights landed safely after the AI plane again made changes to its altitude, a source at the civil aviation ministry told HT.

*The incident was among 32 cases of 'near miss' in 2016, highest for any year in the history of the country's civil aviation, according to government data obtained by HT through the Right to Information law. The year beat the previous maximum seen in 2013 by 40%**[9]**.*

HINDUSTANTIMES had, on the basis of figures for the 2016 January-May period, reported in August that the year was shaping up to be the worst in terms of air safety.
Indiscipline and attitude issues were found as major reasons for pilots violating protocol.

But a bulk of last year's mid-air scares, 22 of 32, were due to errors by the air traffic control (ATC).

ATCs in India, sources there and in the directorate general of civil aviation (DGCA) said, are overwhelmed by widespread issues of bad infrastructure and few staff.

"Under pressure from the International civil aviation organisation (a United Nations specialised agency set up to recommend air safety standards to its member countries), the airport authority of India recruited 1,000 air traffic controllers in 2016 but its three training colleges in Allahabad, Hyderabad and Gondia don't have the capacity to train all of them at one go," an official working in the ATC told HT on the condition of anonymity,

"Delhi's 65% airspace is with the air force. We have 1,300 daily take-offs and landings of aircraft only in 35% of airspace," one of the sources said."

EXPERT OPINIONS

- *"Lowering such incidents lies on balance of investment in technology and training of the crew and the ATC officers. Currently, we need traffic flow management systems throughout Indian airspace and advanced radar surveillance," said Martin.*
- *Experts say that recent initiatives to boost the aviation sector will only weaken air safety standards, beset at present by a shortage of manpower, training and airspace for civilian traffic.(Singh et al. 2012; Fowler 2012)*
- *"While safety requires maximum separation, increasing traffic has brought aircraft closer to each other's boundaries, so the chances of transgression are high," said SS Singh, a retired executive director of air traffic monitoring.*

- *"Unattractive salary structure is one of them. To control high attrition, AAI introduced new job conditions that include a 5-year bond. If candidates leave within five years, they will have to pay Rs 5 lakh to AAI. This further discourages the best minds to take the ATC job," he said.*

- *PH Singh, former general secretary of the ATC Guild, said developed nations "have a system of need-based optimisation of airspace, but that's not here in India."*

- *"Before any enhancement in traffic, there must be a matching enhancement in infrastructure like airspace, technology, number of trained controllers and ground infrastructure. Surveillance and advanced warning and communication systems should be adequate. There should be honest, continued safety assessment," said Singh.*

- *"Increasing traffic is no justification for increase in near-miss as human error can be minimised with well-structured training and upgradation of technology," said SS Panesar, a veteran pilot.*

NOTABLE ACCIDENT IN HISTORY

Air Traffic Control Error			
04/14/1958	Castel de Fels, Spain	Aviaco	Another aircraft was permitted to takeoff without knowing the exact position of the plane.
07/21/1961	Shemya, Alaska	Alaska AL	Lack of guidance from air traffic controller during last stages of flight.
02/08/1965	New York, New York	Eastern AL	Placement of the two aircraft on a near head on course causing one to crash.
03/05/1969	San Juan, Puerto Rico	Prinair	A trained vectored the aircraft into mountainous terrain under IFR conditions.

02/06/1970	Samarkand, USSR	Aeroflot	Misidentification of aircraft by the ATC causing the plane to impact a mountain.
12/20/1972	Chicago, Illinois	Delta/North Central	The ATC gave ambiguous instructions to the crew.
09/09/1976	Adler, Russia	Aeroflot / Aeroflot	Violation of separation rules.
08/11/1979	Dneprodzerzhinsk, USSR	Aeroflot	Separation error by the ATC causing a midair collision.
04/19/1983	Keninakan, Russia	Aeroflot	ATC procedural error in not identifying the planes position.
02/01/1991	Los Angeles, California	USAir/Skywest	ATC cleared a plane to land while the runway was occupied by another aircraft.
11/07/1996	Lagos, Nigeria	Aviation Dev. Corp.	The controller thought he had cleared to aircraft to the correct altitude but didn't.
09/26/1997	Buah Nabar, Indonesia	Garuda Indonesian AL	ATC error in directing the plane in the wrong direction into mountainous terrain.
07/01/2002	Uberlinger, Germany	Bashkirian AL / DHL	Conflicting information give to pilot by ATC and what he was receiving on his TCAS.

ERROR ELEMENTS DONE BY AIR TRAFFIC CONTROLLER:

Basically the errors committed by the ATC or elements on which the ATC can commit a error can be categorise into three:

Communication error- are those which would occur the radio transmission between ATC and pilots and also between air traffic controllers. The major error elements that are considered as communication error are as follows

- Incorrect read back not challenged
- Wrong call signal used
- Non – standard phraseology
- Call sign omission
- Clipped call

Procedure error- When Air Traffic Controllers who didn't follow the standard ATC procedure prescribed. Errors such as difficulties in following checklist. The major error elements that are considered as procedure error are as follows

- Failure to respond to unanswered call
- No/Late response alarm
- No level or altitude verification
- No identification of aircraft
- Radar service not terminated
- No/Late issuance of landing clearance
- Reasons for vectoring not given

Instruction error occurs while conducting control procedures and communication. Error such as giving incorrect instructions. The following are considered as the major elements:

- Incorrect information passed to aircraft
- Late descent
- Late change
- Altitude instruction error
- Heading instruction error
- Clearance instruction error

Thus above are the major elements of error which may end up in a fatal accident in aviation. When these elements are being minimised to the lowest possibility, then the civil aviation is in the safe hands controllers of guardians.

LAW RELATING TO AVIATION SAFETY

There are many international conventions on aviation but Chicago Convention on International Civil Aviation 1944 was the one which is signed by most of the states which includes the all the member of United Nations have signed. India also signed this convention.

Under the chapter VI of the Chicago Convention on International Civil Aviation, 1944 gives the International Standards and Recommended Practices. The several other chapters also says about the establishment International Civil Aviation Organisation and also give the solution for the disputes

Article 37 says that *"each contracting state undertakes to collaborate in securing the highest practicable degree of uniformity in regulations, standards, procedure and organisation in relation to aircraft, personnel, airways and auxiliary services in all matters in which such uniformity will facilitate and improve air navigation".(Fischer 2015)*

"To this end the International Civil Aviation Organisation shall adopt and amend from time to time, as may be necessary international standards and recommended practices and procedure dealing with:-

a) Communication systems and air navigation aids, including ground markings.
b) Characteristics of airports and landing areas.
c) Rules of air and air traffic control practices.
d) Licensing of operating and mechanical personnel.
e) Airworthiness of aircraft.
f) Registration and identification of aircraft.
g) Collection and exchange of metrological information.
h) Log books.
i) Aeronautical maps and charts
j) Customs and immigration procedure
k) Aircraft in distress and investigation of accidents

And such other matters concerned with the safety, regularity and efficiency of air navigation as may from time to time appear appropriate".

Chapter VII says about the composition, objectives, powers and functions of the International Civil Aviation organisation

Article 43 says that *"an organisation to be named the International Civil Aviation Organisation is formed by the Convention. It is made up of an Assembly, a council and such other bodies as may be necessary".*

Article 44 of the Chicago Convention speaks about the objective of the organisation:

"The aims and objectives of the Organization are to develop the principles and techniques of international air navigation and to foster the planning and development of international air transport so as to:

(a) Insure the safe and orderly growth of international civil aviation throughout the world;

(b) Encourage the arts of aircraft design and operation for peaceful purposes;

(c) Encourage the development of airways, airports, and air navigation facilities for international civil aviation;

(d) Meet the needs of the peoples of the world for safe, regular, efficient and economical air transport;

(e) Prevent economic waste caused by unreasonable competition;

(f) Insure that the rights of contracting States are fully respected and that every contracting State has a fair opportunity to operate international airlines;

(g) Avoid discrimination between contracting States;

(h) Promote safety of flight in international air navigation;

(i) Promote generally the development of all aspects of international civil aeronautics."

Chapter XV of the Convention says about the Airports and Other navigation facilities, in that Article 69 says about the improvement of air navigation facilities. It says *"if the Council is of the opinion that the airports or other air navigation facilities, including radio and meteorological services, of a contracting State are not reasonably adequate for the safe, regular, efficient, and economical operation of international air services, present or contemplated, the Council shall consult with the State directly concerned, and other States affected, with a view to finding means by which the situation may be remedied, and may make recommendations for that purpose. No contracting State shall be guilty of an infraction of this Convention if it fails to carry out these recommendations."*

SUGGESTIONS:

After analysis the incidents, reviewing literatures, statistical data, experts opinion and by going through the regulation of aviation safety, we would like to give some suggestions for the improvement of aviation safety in future since the air transport has been utilised more and so the traffic in airspace has been increased.

- More continuous and regular training of Air Traffic Controller with the technology and in the absence of technology in case of emergency.
- Regular inspection over the work of ATC and the administration of Airport by the International Aviation Authority with regard to the following of procedure and the provisions
- The establishment of Airport standards shall be fixed internationally. Like place were airports should be located, no single runway airports, the runway length in common, facilities of navigation in common and etc. these standard must be strictly followed by the contracting states.
- Stringent regulations have to be made for the defaulters in following the procedures and provisions. Like increasing imprisonment periods, increase in fine etc.
- In developing countries like India, more labour force in Airports and more Air traffic Controllers have to be employed since the traffic has increased much more and the ATC are less in number to control them.
- Education and Awareness have to be made about the responsibilities of ATC and about the aviation safety and handling the emergency situations at the time heavy traffic.

CONCLUSION:

In this modern Era, technology plays an important role in the human life that to in the aviation sector technology is the heart of it. But aviation sector is still depending on the decisions of the Air traffic Controller, that's why they are called as guardians of the sky. They play an important role in protecting life of people at the time of civil aviation. There is always been a probability error occurs when the human factor comes into effect. In the ATC training they are trained with

the technology but they are not trained how to manage without technology. In the work place once the equipment fails, ATC gets stressed up and forgets their basics. These types of negligence are always avoidable, they should the regularly trained and immense tests have to be conducted. Though the history shows up the ATC error is not much higher than the other categories, they incidents occurred are based on the negligence part of ATC which are avoidable.

Nowadays, Air Traffic volume has been increased and the work of ATC has been increased by separating the aircrafts from preventing them from collision. At this stage the Air Traffic Controller must work more caution and carefully since because if any error occurs there is no room for rectifying it, it would be a fatal one. Thus in order to manage heavy traffic more and regular training have to be given to ATC and more ground staffs and ATC have to be employed. In developing countries like India there are shortage of Air traffic controllers and the present ATC do overtimes; this may lead to a catastrophe in future thus employment of Air Traffic Controller must be increased. India like countries has to develop a uniform aviation law with more stringent regulations and provisions for the defaulters.

It would be effective to assess the determined traffic rate in regular basis and according to that take corrective measures by supplementing manpower, enhancing the controlling seats and controlling traffic systems thus minimising the traffic circulation and safer aviation. I hope that this paper contributes something to the aviation safety by providing suggestion to increase manpower facilities regarding the increase of air traffic and stringent regulation for defaulters.

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