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A Review of the Research on Aviation Risk Identification

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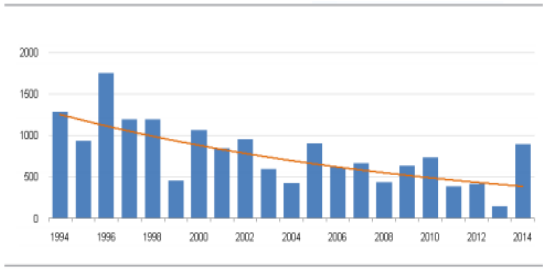
ABSTRACT: Flying involves risk. To stay safe, you need to know how to judge the level of risk, how to minimize it, and when to accept it. Before the risk to happen we need to identify the hazard. Hazard is anything with the potential to cause harm it's a present condition, event, and object, circumstance that could lead or contribute to a death to people, loss of property or equipment. It is a source of danger. Flying is one of the most secure methods for travel yet things turn out badly because of different reasons, for example, Human-errors, mechanical, climate, criminal activities. Records from the past mischance's has brought about the development of flight frameworks and innovation has lessened danger of past mischance's yet has made flight taking care of more entangled through years.

Keywords- Aviation, Risk, Safety, Identification, Air Traffic

I. INTRODUCTION:

Safety is a concern of everyone who flies or contemplates it. At the point when contemplating the scope of characteristics we search for in an aircraft, the capacity to convey us to our destination alive is at the highest priority**.** No other form of transportation is as scrutinized, investigated and monitored as commercial aviation. Safety is primary concern while choosing airlines we should select an airlines that are thorough in their safety inspections, navigation system and hold to fundamental best practices ensuring the plane is going in the right direction to its destination. Now a day due to the advancement technologies in Aviation industry the fatal deaths have reduced to 60% in the past two decades



Number of Fatal Accidents

Fig 01: fatal deaths per year

In the process of risk analysis in aviation risk identification is the crucial step as it deals with human life which is so precious.

Aviation Hazard Identification:

"Ref[1]" It's an act of recognising the failure conditions or threats which could lead to undesirable events defining the characteristics of these undesirable events in terms of their potential Safety Outcomes and of the magnitude of these safety outcomes Consequences. In aviation industry there are various reasons that have been identified, which include human error, weather-related problems, mechanical failures, and sabotage, among others.

Unfavourable Weather And Weather-related Pilot Errors Are the Top Factors That Pose a Major Challenge to Current Aircraft Safety Systems.

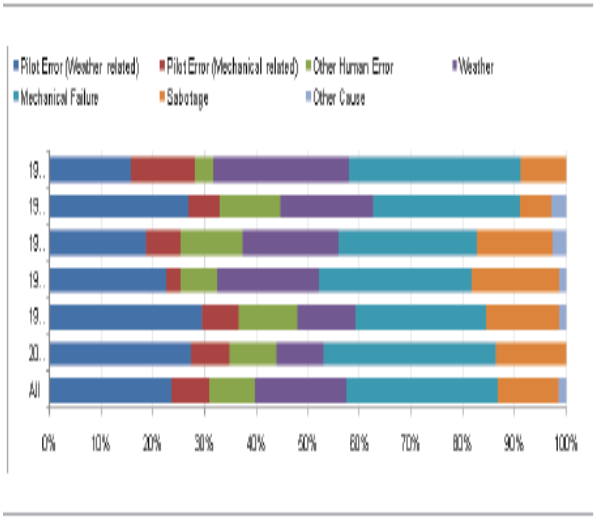


Fig 02: Error Distribution of Accidents

Over the years, pilot error has contributed to approximately 40% of aircraft fatalities. The errors committed by the pilot can be attributed to two main reasons:

- Lack of attention
- Lack of information to make accurate decision

Thus, there is a rise in need for technologies that minimize [5] human error. This need has led to a shift of research focus toward developing technologies that aid pilots in making informed decisions.

II. Technologies Involving human errors

Automatic Dependant Surveillance Broadcast ADS-B

"Ref[2]" It is a surveillance innovation in which aircraft decides its position by means of satellite route and intermittently telecasts it, empowering it to be followed. The data can be received by air traffic control ground station as a replacement for secondary radar. It can also be received by other aircraft [6] to provide situational awareness and allow self separation.

ADS-B provides many benefits to both pilots and air traffic control that improve both flight safety and efficiency.

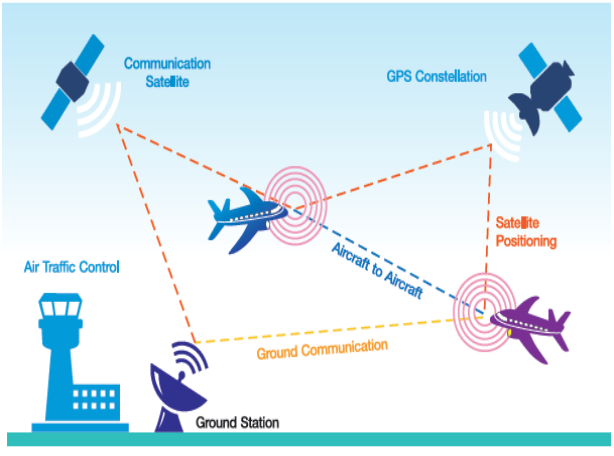


Fig 03: Automatic Dependent Surveillance-Broadcast (ADS-B)

1. Traffic: When using an ADS-B, a pilot [3] is able to view traffic information about surrounding aircraft. This information includes altitude, heading, speed, and distance to adjacent aircraft.

2. Terrain: ADS-B technology broadcasts a terrain overlay for pilots to view in the cockpit.

3. Efficiency: ADS-B updates about once per second while radar only updates every three to 13 seconds; it's thus less likely that aircraft[3,4] pilots will see a target of their own aircraft when manoeuvring.

4. Expense: ADS-B ground stations are significantly cheaper to install and operate compared to primary and secondary radar systems.

Without the above technology in the past we have faced a sad midair impact over the Grand Canyon, when a United Airlines Douglas DC-7 struck a Trans World Airlines Lockheed L-1049 Super Constellation. Each of the 128 on get onto both flights died.

III. Technologies Involving Weather Errors

Weather plays a crucial role in the safety of our Aircrafts. Some of the hazards are the Thunderstorms and the Icing.

***Thunderstorms*:** No other climate [7] experienced by a pilot can be as brutal or debilitating as a storm. Electrical storms produce numerous perils to the aircrafts, and, it's vital that pilots comprehend their temperament and how to manage them.

Icing:

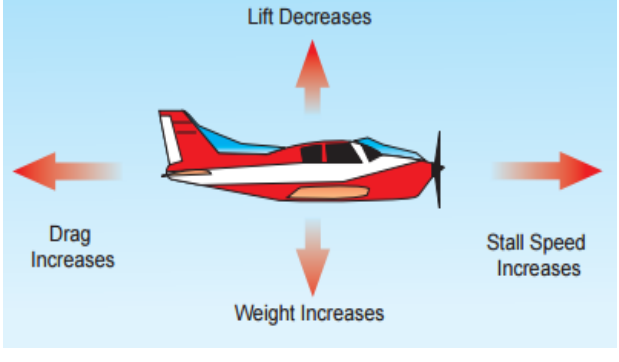


Fig 04: Icing of Aircraft

Aircraft icing occurs when super cooled water droplets strike an aircraft [5, 6] whose temperature is colder than 0°C. The effects icing can have on an aircraft can be quite serious and include:

- Disruption of the smooth laminar flow over the wings causing a decrease in lift and an increase in the stall speed. This last effect is particularly dangerous. An “iced” aircraft is effectively an “experimental”[8] aircraft with an unknown stall speed.

- Increase in weight and drag thus increasing fuel consumption
- Partial or complete blockage of pitot heads and static ports giving erroneous instrument readings
- Restriction of visibility as the windshield glazes over.

Aviation industry [10] plans to develop aircraft safety management technology for systems that can detect and keep track of the aircraft, runway and weather conditions, and enhance the safety of each aircraft to be managed.

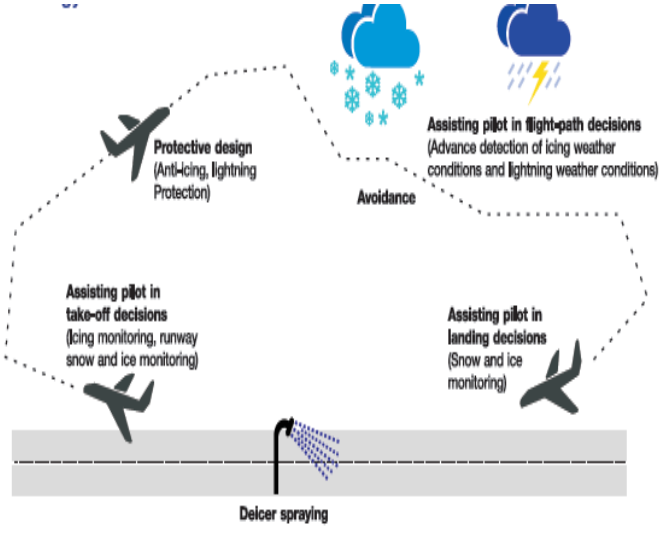


Fig 05: Aircraft Weather Management Technology

The technology includes icing and lightning monitoring systems along with passive safety systems such as anti-icing coating on the aircraft's outer body. The active system detects the weather conditions and checks for the possibility of icing, and accordingly decides the flight path that minimizes any icing incidents.

IV. Technologies Involving Mechanical Errors:

Automatic Ground Collision Avoidance System: The majority of collision [8] avoidance systems on fighter aircraft depend on the pilot taking action whenever a warning is issued by the manual system. Any future substantial reductions in mishap [9] rates will require extending the collision avoidance technology to systems that not only warn the pilot but also take control and fly the aircraft out of danger before returning control to the pilot. An Automatic Ground Collision Avoidance System (Auto GCAS) will provide this extension of collision avoidance technology.

Fig 06: Automatic Ground Collision Avoidance System

V. RISK ASSESSMENT:

"Ref:[3]"Assessment of risk is a vital segment of good hazard administration, however before a pilot can start to evaluate hazard, in advance, between a low risk flight and a high risk flight, and then establish a review process and develop risk mitigation strategies to address flights throughout that range.

A risk assessment tool should allow operators and pilots to see the risk profile of a flight in its planning stages. Each operator should determine an acceptable level of risk for its flights based on the type of operation, environment, aircraft used, crew training, and overall operating experience. When the risk for a flight exceeds the acceptable level, the hazards associated [11] with that risk should be further evaluated and the risk reduced. A higher risk flight should not be operated if the hazards cannot be mitigated to an acceptable level.

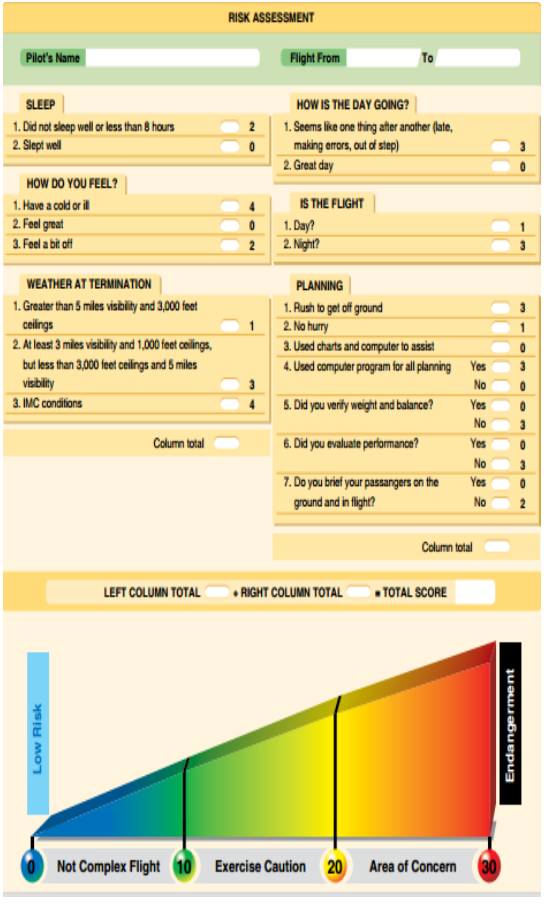


Fig 07: Risk Assessment tool for Pilot

RISK MANAGEMENT:

Once the risk is identified and assessed based on the level of risk it should be mitigated. The objective of Risk Management is to ensure that the risks associated with hazards to flight operations are systematically and formally identified, assessed [12] and managed within acceptable safety levels. The complete elimination of risk in aviation operations obviously is an unachievable and impractical goal

As not all risks can be removed, nor are all possible risk mitigation measures economically practical. In other words, it is accepted that there will be some residual risk of harm to people, property or environment, but this is considered to be acceptable or tolerable by the responsible authority.

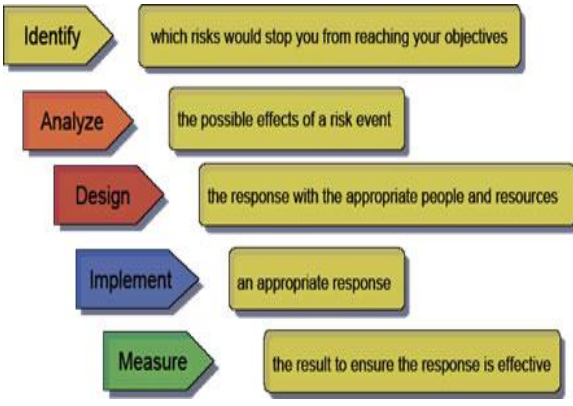


Fig 08: Risk Management steps

VI. RISK COMMUNICATION:

In addition with the risk management process, the communication of pertinent information necessary for reduction of the risk must be provided to the safety user. Depending on the type of risk involved, the user may either be a pilot, flight attendants, mechanics, and/or related support person. The primary recipient of risk identity is dependent upon the type of failure cause. Recurring material failure causes are generally the responsibility of the technical services or engineering organization, while human factor related cause factors are best communicated to employee groups (e.g., pilots, flight attendants, mechanics) as appropriate.

CONCLUSION:

Summing up all through the advancements technologies and standards in Aviation industry flight safety increases and in addition to the technology advancement human interference and pilot alertness can only help avoid flight accident

Reference:

1. *H. Blom, G. Bakker, P. Blanker, J. Daams, M. Everdij, M. Klompstra, "Accident risk assessment for advanced ATM",Proceedings of 2nd USA/Europe Air Traffic Management R&D Seminar, USA, 1998.*
2. *N. Bahr, System Safety Engineering and Risk Assessment: A Practical Approach, Taylor & Francis, United Kingdom, 1997.*
3. *J. Luxhoj, D. Coit, "Modeling Low Probability/High Consequence Events: An Aviation Safety Risk Model", Proceedings of the Reliability & Maintainability Symposium (RAMS), USA, pp. 215 – 220, 2006.*
4. *A. Roelen, R. Wever, A. Hale, L. Goossens, R. Cooke, R. Lapuhaa, M. Simons, P. Valk, "Causal Modelling for Integrated Safety at Airports", Proceedings of ESREL 2003 - European Safety and Reliability Conference, The Netherlands, pp. 1321 – 1327, 2003.*
5. *Z. Xiang, R. Wang and Q. Chen, Fault Tolerant Control of Switched Nonlinear Systems With Time Delay Under Asynchronous Switching, Int. J. Appl. Math. Comput. Sci., 2010, Vol. 20, No. 3, pp. 497-506.*
6. *] A. Roelen, R. Wever, R. Cooke, R. Lapuhaa, A. Hale, L. Goossens, "Aviation Causal Model Using Bayesian Belief Nets to Quantify Management Influence", Proceedings of ESREL 2003 - European Safety and Reliability Conference, The Netherlands, pp. 1315 – 1320, 2003.*
7. *] J. Shortle, Y .Xie, C. Chen, G. Donohue, "Simulating Collision Probabilities of Landing Airplanes at Non-towered Airports", Simulation, Vol. 80, Issue 1, pp. 21-31, 2004.*
8. *M. C. VanDyke, J. L. Schwartz and C. D. Hall, Unscented Kalman Filtering for Spacecraft Attitude State And Parameter Estimation, American Astronautical Society, 2004, No. AAS-04-115.*
9. *S. W. Sung, I. B. Lee and B. K. Lee, Sung, On-line process identification and automatic tuning method for PID controllers, Chemical Engineering Science 53, 1998, pp. 1847-1859. 112*
10. *] P. Reich, "Analysis of long range air traffic systems: Separation standards – I, II and III", Journal of the Institute of Navigation, No. 19, pp. 88-96, 169-176, 31-338, 1966.*
11. *A Concept Paper for Separation Safety Modelling, Federal Aviation Administration and EUROCONTROL, USA, 1998.*
12. *G. Bakker, H. Blom, "Air Traffic Collision Risk Modelling", Proceedings of 32nd IEEE Conference on Decision and Control, USA, pp.1464-1469,1993.*

