Chapter Two: The Risk and The Safety in Aviation Industry

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1 Introduction

Nowadays, the air transport system is recognized as one of the fastest growing areas within the transport sector as well as in overall regional and world economies. According to many forecasts this growth will continue at an average rate of 5% in passenger and 6% in freight transport demand over the next two decades. It will primarily be driven by overall economic growth, further globalization of the regional and world's economy, and even further decreasing of airfares thanks to among other factors the growth of the low-cost carrier's market share. The system infrastructure – airports and Air Traffic Control/Management (ATC/ATM) although in many cases acting as temporal "bottlenecks" are expected to be able to support such growth safely, efficiently and effectively.

Physically and operationally, the air transport system is a rather complex system with the main components; the airlines, the airports and the air traffic control services, interacting with each other on different hierarchical levels constituting a very complicated, highly distributed network of human operators, procedures and technical/technological systems. In particular, risk of accidents and related safety in such a complex system is crucially influenced by interactions between the various components and elements. This implies that providing a satisfactory level of safety (i.e., low risk of accident) is more than making sure that each of the components and elements functions safely. Due to such inherent complexity and severe consequences of accidents, risk and safety have always been considered as issues of the greatest importance for the contemporary air transport system. Consequently, they have been a matter of continuous research from different aspects and perspectives ranging from the purely technical/technological to the strictly institutional. In general, the former have dealt with design of safe aircraft and other system facilities and equipment. The later have implied setting up adequate regulations for system design and operations.

2 Aviation Risk and Safety

For a long time, risk and safety have been differently and ambiguously interpreted depending on the system and purpose. For technical systems, risk is related to the chance of failure of components or of the entire system causing exposure to hazard and related consequences. In economic business systems, risk is a chance of being exposed to the hazard of losing business opportunities

and/or money due to making decisions under uncertain circumstances. In social systems, risk is the chance of being exposed to the hazard of injuries and/or losing of life. Consequently, risk could be considered as combination of the probability (or frequency of occurrence) and the magnitude of consequences (or severity) of a hazardous event.

In the air transport system, risk and safety have always been related to air traffic accidents which resulted in the significant loss of life and property (aircraft and the property on the ground). Assuming that making an air trip is an individual choice and that the system deploys some resources to satisfy such choice, four types of risks can be identified in the air transport system:

1. real risk to an individual (determined onthe basis of future circumstances after their full development, frequently incorporated in decisions on introduction of new aerospace technologies in any system component);

2. statistical risk of occurrence of an accident (important for companies providing insurance, determined by the available statistical data on the incidents and accidents);

3. predicted risk (important for air transport authorities while introducing changes in technologies and air traffic patterns, determined from methodologies using some relevant historical research); and

4. perceived risk (important for users of the air transport system and determined by the individual's intuition, feeling and perception).

In addition, air traffic accidents may have some features distinguishing them from accidents in other transport modes as follows:

1. they may occur at any point in time and space mainly because flights may take place over large areas;

2. the primal target groups exposed to the risk exposure are passengers and crew; in addition, individuals on the ground may be exposed but generally have a lower probability of losing life or property;

3. they are relatively rare events but usually with severe consequences;

4. conditionally, each of them can be classified as an inherently risky although highly unlikely (but still possible) event; and

5. risk of an accident is inherently present during the flight.

Risk implies exposure of an individual to the hazard of an air traffic accidental event (collision between aircraft, and/or collision between the aircraft and terrain). This could result in losing life or getting severe injuries both onboard the aircraft and/or on the ground, damaging and/or destroying property (the aircraft and eventually buildings on the ground), and contamination of the environment (water and soil) by burning and/or leaking fuel and oil, and hazardous cargo.

In the above-mentioned context, assessing the risk of occurrence of an air traffic accident with the associated consequences can be used as a measure of the system safety for people, systems and environment.

3 Standards And Recommended Practices In Aviation Industry

Standards And Recommended Practices (SARPs) are technical specifications adopted by the International Civil Aviation Organization (ICAO) in accordance with Article 37 of the Convention on International Civil Aviation in order to achieve "the highest practicable degree of uniformity in regulations, standards, procedures and organization in relation to aircraft, personnel, airways and auxiliary services in all matters in which such uniformity will facilitate and improve air navigation".

SARPs are published by ICAO in the form of Annexes to Chicago Convention. SARPs do not have the same legal binding force as the Convention itself, because Annexes are not international treaties. Moreover States agreed to "undertake to collaborate in securing (...) uniformity", not to "comply with". Each Contracting State may notify the ICAO Council of differences between SARPs and its own regulations and practices. Those differences are published in the form of Supplements to Annexes.

A Standard is defined by ICAO as "any specification for physical characteristics, configuration, material, performance, personnel or procedure, the uniform application of which is recognized as necessary for the safety or regularity of international air navigation and to which Contracting States will conform in accordance with the Convention".

A Recommended Practice is defined by ICAO as "any specification for physical characteristics, configuration, material, performance, personnel or procedure, the uniform application of which is recognized as desirable in the interest of safety, regularity or efficiency of international air navigation and to which Contracting States will endeavour to conform in accordance with the Convention".

4 Aviation Safety Implementation and Investigatory Bodies

The aviation safety implementations exist in all countries worldwide. However the investigatory bodies exist in most of the countries in the world. These bodies address any accidents and incidents related to aviation and reports their findings.

In Australia, the Australian Transport Safety Bureau is the federal government body responsible for investigating transport-related accidents and incidents, covering air, sea, and rail travel. Formerly an agency of the Department of Infrastructure, Transport, Regional Development and Local Government, in 2010, in the interests of keeping its independence it became a stand-alone agency.

In Brazil, the Aeronautical Accidents Investigation and Prevention Center (CENIPA) was established under the auspices of the Aeronautical Accident Investigation and Prevention Center, a Military Organization of the Brazilian Air Force (FAB). The organization is responsible for the activities of aircraft accident prevention, and investigation of civil and military aviation occurrences. Formed in 1971, and in accordance with international standards, CENIPA represented a new philosophy: investigations are conducted with the sole purpose

of promoting the "prevention of aeronautical accidents".

In Canada, the Transportation Safety Board of Canada (TSB), is an independent agency responsible for the advancement of transportation safety through the investigation and reporting of accident and incident occurrences in all prevalent Canadian modes of transportation — marine, air, rail and pipeline.

In France, the agency responsible for investigation of civilian air crashes is the Bureau d'Enquêtes et d'Analyses pour la Sécurité de l'Aviation Civile (BEA). Its purpose is to establish the circumstances and causes of the accident and to make recommendations for their future avoidance.

In Germany, the agency for investigating air crashes is the Federal Bureau of Aircraft Accidents Investigation (BFU). It is an agency of the Federal Ministry of Transport and Digital Infrastructure. The focus of the BFU is to improve safety by determining the causes of accidents and serious incidents and making safety recommendations to prevent recurrence.

In Hong Kong, the Civil Aviation Department's Flight Standards & Airworthiness Division and Accident Investigation Division are charged with accident investigation involving aircraft within Hong Kong.

Until May 30, 2012, the Directorate General of Civil Aviation investigated incidents involving aircraft. Since then, the Aircraft Accident Investigation Bureau has taken over investigation responsibilities.

In Indonesia, The National Transportation Safety Committee (NTSC Or KNKT) is responsible for the investigation of incidents and accidents, including air accidents. Its aim is the improvement of safety in Indonesia.

In Italy, the Agenzia Nazionale per la Sicurezza del Volo (ANSV), has two main tasks: conducting technical investigations for civil aviation aircraft accidents and incidents, while issuing safety recommendations as appropriate; and conducting studies and surveys aimed at increasing flight safety. The organization is also responsible for establishing and maintaining the "voluntary reporting system." Although not under the supervision of the Ministry of Infrastructure and Transport, the ANSV is a public authority under the oversight of the Presidency of the Council of Ministers of Italy.

The Japan Transport Safety Board investigates aviation accidents and incidents. The Aircraft Accident Investigation Commission investigated aviation accidents and incidents in Japan until October 1, 2001, when the Aircraft and Railway Accidents Investigation Commission (ARAIC) replaced it, and the ARAIC did this function until October 1, 2008, when it merged into the JTSB.

In Mexico the Directorate General of Civil Aviation (DGAC) investigates aviation accidents.

In The Netherlands, the Dutch Safety Board (Onderzoeksraad voor Veiligheid) is responsible for the investigation of incidents and accidents, including air accidents. Its aim is the improvement of safety in The Netherlands. Its main focus is on those situations in which civilians are dependent on the government, companies or organizations for their safety. The Board solely investigates when incidents or accidents occur and aims to draw lessons from the results of these investigations. The Safety Board is objective, impartial and independent in its judgment. The Board will always be critical towards all parties concerned.

In New Zealand, the Transport Accident Investigation Commission (TAIC), is responsible for the investigation of air accidents. "The Commission's purpose, as set out in its Act, is to determine the circumstances and causes of aviation, rail and maritime accidents, and incidents, with a view to avoiding similar

occurrences in the future, rather than to ascribe blame to any person." The TAIC will investigate in accordance with annex 13 of the ICAO.

In Russia, the Interstate Aviation Committee (IAC, MAK according to the original Russian name) is an executive body overseeing the use and management of civil aviation in the Commonwealth of Independent States. This Organization investigates air accidents in the former USSR area under the umbrella of the Air Accident Investigation Commission of the Interstate Aviation Committee.

In Taiwan, the Aviation Safety Council (ASC) is the independent government agency that is responsible for aviation accident investigations. Established in 1998, ASC is under the administration of the Executive Yuan and independent from Civil Aeronautics Administration of Taiwan. The ASC consisted of five to seven board members, including a chairman and a vice chairman, appointed by the Premier. The managing director of ASC manages the day-to-day function of the organization, including accident investigations.

In the United Kingdom, the agency responsible for investigation of civilian air crashes is the Air Accidents Investigation Branch (AAIB) of the Department for Transport. Its purpose is to establish the circumstances and causes of the accident and to make recommendations for their future avoidance.

United States civil aviation incidents are investigated by the National Transportation Safety Board (NTSB). NTSB officials piece together evidence from the crash site to determine likely cause, or causes. The NTSB also investigates overseas incidents involving US-registered aircraft, in collaboration with local investigative authorities, especially when there is significant loss of American lives, or when the involved aircraft is American built.