Chapter 2
Aviation Safety

2.1 Origin of and Difference Between Aviation Safety and Aviation Security

In the early twentieth century civil aviation underwent an unprecedented development. Technological evolution of the time was driven by the incredible enterprising spirit of flight pioneers such as the Wright brothers, Charles Lindbergh, Amelia Earhart, Louis Bleriot, Umberto Nobile and many others and the events of two world wars which, despite being tragic, led to discoveries that then became part of aviation know-how. All this made the twentieth century a completely different landscape for air transport. The use of new technologies allowed transport of both goods and passengers to be swifter, safer and to cover increasingly longer distances. Civil aviation went from a mostly individual to a collective dimension. This collective dimension was reinforced by the massive diffusion of routes and carriers due to the period of deregulation and liberalisation of the sector in the USA in the 70s and in Europe between the 80s and 90s.

One has to wonder, however, if this globalisation of the sector may not have been somewhat at the cost of passenger safety.

All in all, air transport is generally perceived as being safe and reliable, despite dramatic events such as the terrorist attacks of September 2001 or the Italian Linate Airport accident, which caused 118 victims and, furthermore, the accidents such

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1 The ICAO (International Civil Aviation Organisation) defines ‘[a]ccident’ in its Annex 13: ‘An occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, in which (a) a person is fatally or seriously injured as a result of: being in the aircraft; or direct contact with any part of the aircraft, including parts which have become detached from the aircraft; or direct exposure to jet blast (except when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are to stowaways hiding outside the areas normally available to the passengers or crew); or (b) the aircraft sustains damage or structural failure which: adversely affects the structural strength, performance or flight characteristics of the aircraft and would normally require major repair or replacement of the affected component (except for engine failure or damage, when the damage is limited to the engine, its cowlings or accessories; or for damage limited to propellers, wing tips, antennas, tires, brakes, fairings, small dents or puncture holes in the aircraft skin); or (c) the aircraft is missing or is completely inaccessible’. 
as those of August 2005, when in the space of a mere 10 days, in three different aeroplane accidents, 297 people lost their lives, or of June 2009, when an Air France flight fell into the Atlantic Ocean, killing 228 people or, again, the accidents such as those of March and July 2014, when two different jet airliners of Malaysia Airlines were involved in two shocking accidents. This perception of safety is particularly deeply entrenched in Europe, since many of the most serious accidents of the last years have occurred in non-European countries.

This concept is to be kept distinct from that of ‘Serious Incident’, indicating ‘[a]n incident involving circumstances indicating that there was a high probability of an accident and associated with the operation of an aircraft which, in the case of a manned aircraft, takes place between the time any person boards the aircraft with the intention of flight until such time as all such persons have disembarked, or in the case of an unmanned aircraft, takes place between the time the aircraft is ready to move with the purpose of flight until such time as it comes to rest at the end of the flight and the primary propulsion system is shut down’, and that of ‘Incident’ which, instead, describes ‘[a]n occurrence, other than an accident, associated with the operation of an aircraft which affects or could affect the safety of operation’. The distinction between Accident and Serious Incident only concerns the results and consequences of the event. All definitions are in Annex 13 (‘Aircraft Accident Inquiry’) to the Convention on International Civil Aviation, signed at Chicago on 7 December 1944 (better known as the ‘Chicago Convention’) and in Doc. 9756 ‘Manual of Aircraft Accident and Incident Investigation’. For a short analysis of Annex 13, see Sect. 2.4.

2 On 17 July 2014, Malaysia Airlines Flight MH17, heading from Amsterdam to Kuala Lumpur, was shot down by a missile while it was flying over the Ukrainian war zone, not far from the Ukraine-Russia border; 298 people lost their lives. On 8 March 2014, Malaysia Flight MH370, heading from Kuala Lumpur (Malaysia) to Beijing (China) disappeared over the Gulf of Thailand. Although the wreckage of the aircraft has not been located yet, the international community is concerned that such disappearance could have caused the death of the 227 passengers and 12 crew. In the latter case, it must be recalled that the disappearance of an aircraft is considered as an accident, according to the definition of “Accident” set out in ICAO Annex 13.

3 In the last 15 years the most serious fatal accidents occurred in: Mali, 24 July 2014 (116 victims); Ukraine, 17 July 2014 (298 victims); Nigeria, 3 June 2012 (159 victims); Pakistan, 28 July 2012 (127 victims); India, 22 May 2010 (158 victims); Libya, 12 May 2010 (102 victims); Brazil, 17 July 2007 (in the above-mentioned accident that killed 187 people) and on 29 September 2006 (in two different accidents in which a total of 308 people died); Ukraine, 22 August 2006 (170 victims); Venezuela, 16 August 2005 (160 victims); Egypt, 3 January 2004 (148 victims); Benin, 25 December 2003 (141 victims); Iran, 19 February 2003 (275 victims); over the Pacific Ocean, 25 May 2002 (225 victims); South Korea, 15 April 2002 (129 victims); the United States, 12 November 2001 (260 victims); Russia, 4 July 2001 (145 victims); Bahrain, 23 August 2000 (143 victims); the Philippines, 19 April 2000 (131 victims); Cote d'Ivoire, 30 January 2000 (169 victims); over the Atlantic Ocean, 31 October 1999 (217 victims); Canada, 2 September 1998 (229 victims); Taiwan, 16 February 1998 (196 victims). So far as concerns EU-certified carriers, or accidents which happened within the territory of the EU, there have been four ‘fatal accidents’ with the highest number of victims in the last few years. The latest of these was the previously mentioned accident of 1 June 2009, involving Air France Flight 447 which ditched in the Atlantic Ocean off the Brazilian coast, causing the death of 228 people. Then there was the accident of 20 August 2008, in Spain, when 154 people died in the crash of an MD 82 (Spanair Flight 5022). On 14 August 2005, in Greece, 121 people lost their lives in the Helios Airways Flight 522 accident. Finally, on 8 October 2001, in Italy, a runway collision between two planes at Milano Linate Airport caused the death of 118 people. Before these fatal accidents, the most serious accident in EU airspace involving a European carrier dated back to 1985 when, on the Madrid–Bilbao route, Iberia Boeing 727-256 crashed, causing the death of its 141 passengers and 7 crew. The complete statistics may be found at http://aviation-safety.net/index.php. Regulation (EC) No 1008/2008 of the European Parliament
2.1 Origin of and Difference Between Aviation Safety and Aviation Security

This perception of safe civil aviation is, furthermore, supported by the statistical data. According to the latest ICAO safety report, 2012 was the safest year in the history of scheduled international aviation, with an accident rate of 3.2 per million departures. Out of a total of approximately 2.9 billion passengers carried by air transport, only 99 accidents (as defined in ICAO Annex 13) were recorded worldwide. Victims totalled 372, a decrease of 10% compared to the 414 fatalities of the previous year.

The continuous improvement of the aviation safety level, year by year, is showed and confirmed by the fact that last year, 2013, according to the ICAO safety report, has been the second consecutive safest year, after 2012, ever recorded in terms of fatalities for scheduled air transport operations. Fatalities themselves were down a significant 53.5% from 2012, dropping to only 173. 2013 represents the third consecutive year in which fatalities have continued to decrease.

Achieving these remarkable results was possible thanks to the international community’s increased awareness of and attention to the matter of safeguarding the safety of air transport.

It is undeniable that in air transport the life of crews, passengers or, generally speaking, users may be endangered by the risks and dangers present in a complex system such as that required for aircraft traffic.

Consequently, it befalls the States to arrange all and any means, both from a technical and a statutory standpoint, to reduce as much as possible the probability of risks resulting in accidents, bearing in mind that achieving a total absence of accidents and of the Council of 24 September 2008 on common rules for the operation of air services in the Community (Recast), OJEU L 293, 31.10.2008, p. 3, defines ‘air carrier’ as ‘an undertaking with a valid operating licence or equivalent’. The Regulation defines a ‘Community air carrier’ as an ‘air carrier with a valid operating licence granted by a competent licensing authority’.


5 With regard to the definition of “Accident” given by ICAO Annex 13, the latest two accidents reported in 2014 happened, one after the other, in July. On 23 July 2014, Transasia Airways Flight GE222, heading from Kaohsiung International Airport (Taiwan) to Magong Airport (Taiwan), crashed during a second an attempt at a landing, probably due to extremely bad weather conditions. More than 50 people died. Just one day later, 24 July 2014, Air Algérie Flight AH5017, departed from Ouagadougou Airport (Burkina Faso) to Algiers–Houari Boumediene Airport (Algeria), operated by a MD-83 leased from Spanish airline Swiftair for the summer season, crashed in the area of Gossi, Mali. There were no survivors among the 116 occupants of the plane. 80 of them were European Union citizens. At present the cause of the accident is unknown. The aircraft was flying through an area of turbulence hit by regular thunderstorms at this time of the year.

6 See ICAO Newsroom, ‘ICAO Annual Safety Report Confirms Excellent Results for 2013’ at http://www.icao.int/Newsroom/Pages/ICAO-annual-Safety-Report-confirms-excellent-results-for-2013.aspx and ICAO 2014 Safety Report viewable at http://www.icao.int/safety/Documents/ICAO_2014%20Safety%20Report_final_02042014_web.pdf. The four above-mentioned air accidents involving two different Malaysia Airline jets, the Transasia Airways Flight GE222, and the Air Algérie Flight AH5017, which happened in the first seven months of 2014 (three of them in just one week from 17 July to 24 July), seem to have interrupted this positive trend. The statistics provided by the Aviation Safety Network show how the number of fatalities up to July 2014 (761) is already double the average number per year recorded in the last 10 years (376).
risks or danger in aircraft navigation is practically impossible and that seeking such a result would fundamentally make the very existence of air transport impossible; this is because expecting zero risks would render a flight safe only on the condition that it did not actually take off.

A fundamental role must be played by the legislature’s regulatory activity, both at national and international levels. In fact, the very first law on the matter was on flight safety, to safeguard the people and property on the ground. On 28 April 1784, a lieutenant in the Parisian police force suggested that hot air balloons, using as they did extremely flammable gases and being practically at the mercy of winds, since they were barely steerable, could be extremely dangerous when flying over or landing in densely populated areas with wooden buildings, which were also extremely flammable. Therefore, a directive expressively prohibiting these balloons operating above such urban locations without previous authorisation from public authorities was issued.\(^7\) From the very beginning, then, the central role of safety was immediately recognised, to be achieved by adequate and dynamic interlinked regulations which, evolving at the same rate as the development of the air transport sector, would help achieve the highest possible level of flight safety at any stage.

Before undertaking a detailed analysis of this system of laws, a point in its terminology must be clarified.

In approaching the subject of safety, it is necessary to distinguish between two separate concepts: Aviation Safety and Aviation Security. These two branches find their main differentiation in the types of danger that may threaten flights.

In 2006 ICAO, the world organisation for the setting of standards and regulations for the civil aviation sector, published a modern definition of safety, identifying it as ‘the state in which the possibility of harm to person or of property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and safety risk management\(^8\).\(^8\) Such risks (hazards) are of a technical nature, consequently mainly accidental and not the outcome of malicious (intentional) behaviour. The ICAO rules, in particular Annex 17 to the Chicago Convention of 7 December 1944\(^9\), define Security (AVSEC), however, as ‘a combination of measures and human and material resources intended to safeguard civil aviation against acts of unlawful interference’\(^10\).\(^10\) These measures consist in activities for the safeguarding and protecting of the community from ‘unlawful acts’ intentionally carried out by individuals, or groups of individuals, against or by means of civil aviation.

This twofold aspect of the concept of safety is also acknowledged in European Union law.

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\(^8\) ICAO, Safety management manual, 1st ed. 2006 (Doc. 9859), paragraph 1.2.

\(^9\) Chicago Convention, December 7, 1944, cit.

In October 2011, the Commission, presenting measures for the establishment of common rules for civil aviation ‘Security’, remarked on the difference between the two concepts, defining ‘Safety’ as relating to the prevention of accidental accidents capable of ‘affect[ing] material or people’ and ‘Security’ as the prevention of unlawful acts aiming ‘to affect planes or people’.

### 2.2 Aviation Safety in International Law

At international level, concern with aviation safety is the role required of ICAO—the International Civil Aviation Organisation. In 1944, with the aim of implementing safety in air transport, the United States Government organized a conference in Chicago, which saw the participation of the allied powers who had won the Second World War. On December 7, 1944, at its conclusion, the ‘Convention on International Civil Aviation’, better known as the ‘Chicago Convention’, was adopted.

The Convention highlighted the central role played by air safety in the development of air traffic. Already in its preamble, great emphasis was laid on ‘[h]aving agreed on certain principles and arrangements in order that international civil aviation may be developed in a safe and orderly manner’. Moreover, Article 44 of the Convention provides that ‘[t]he aim and the objectives of the Organisation are to develop the principles and techniques of international air navigation and to foster the planning and development of international air transport’. The Article then mentions safety three times: in paragraph (a) ‘Insure the safe and orderly growth of international civil aviation throughout the world’; in paragraph (d) ‘Meet the needs of the peoples of the world for safe, regular, efficient and economical air transport’ and, finally, in paragraph (h) ‘Promote safety of flight in international air navigation’. In pursuing these goals, ICAO acted both on a judicial and a technical level. Indeed, the Organisation issued many documents containing rules on the disciplining of air transport and its safety.

They are primarily the Chicago Convention and its 19 Annexes (the latter are binding on the signatory States, if ratified in their domestic legal systems, covering

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11 For a full analysis of the discipline of Aviation Security, see Chap. 3.


13 Preamble to the Chicago Convention of 7 December 1944.

the various aspects of air navigation and assistance, safety, efficiency in the provision of services, the regularity of operations and so on). The Annexes contain SARPS (Standard and Recommended Practices), the former being actual binding rules for the users of International Civil Aviation, while the latter are no more than rules of behaviour to which it is desirable every States should conform. In addition PANS (Procedures for Air Navigation Services) contain procedures that flesh out the Annexes, clarifying their interpretation and application. Finally technical handbooks illustrate the application of SARPS and PANS.

The production of rules, however, is not the only activity of ICAO. In recent years there have been many actions aiming, for example, at ‘Global Safety Monitoring’, including the launching of ‘ICAO’s Universal Safety Oversight Audit Programme—USOAP’ in 1998, which lays the foundations for interfacing between the various national safety programs, in order to assess the State of implementation of ICAO rules within the various States.

The USOAP, considered a milestone in the creation of a new ‘safety’ regime, is being constantly developed and is oriented towards a new concept/methodology of investigation known as the ‘Continuous Monitoring Approach’. By gathering and analysing the ‘safety information’ issuing from signatory States and the system operators, USOAP—CMA makes it possible continuously to assess the efficiency of their internal aviation safety system, as well as monitor any corrective actions undertaken and their progress towards ICAO’s own ‘Global Aviation Safety Plan’.

Moreover, ICAO is involved in additional projects, such as the ‘Integrated Safety Trend Analysis and Reporting System (ISTARS)’ and the ‘Online Aircraft Safety Information System—OASIS’, which are IT systems designed to gather and access data, analyses and risk evaluation.

ICAO has also undertaken effective initiatives to tackle significant safety problems. For example, in Europe, in 2010, during the volcanic ash crisis, it acted via

On 20 March 2010 Eyjafjallajökull, an Icelandic Volcano, started to erupt violently. On 14 April 2010 this entered an explosive phase that generated a huge cloud of volcanic ash, which then dispersed across the skies of Europe. Due to the high danger this circumstance would have posed for the safety of aircraft, on 15 April 2010 the authorities of several European States responsible for air traffic, decided to close air space. The air space of countries interested by the cloud underwent intermittent shutting down until 9 May 2010, thus provoking the cancellation of tens of thousands of flights. This event will be addressed in Chap. 6, Sect. 6.4.3 on the protection of passenger rights. See the Information Note to the Commission of 27 April 2010, The Impact of the Volcanic Ash, Cloud Crisis on the Air Transport Industry, SEC(2010) 533 and the Eurocontrol documents Ash-cloud of April and May 2010: Impact on Air Traffic, at http://www.eurocontrol.int/sites/default/files/attachments/201004-ash-impact-on-traffic.pdf. ICAO, thanks to the research and studies carried out by this task force, issued, in 2012, Doc. 9974, ‘Flight Safety and Volcanic Ash’ a manual
the creation of a specific task force; another task force is still active today in identifying effective measures to prevent what is one of the most dangerous phenomena in aviation: ‘Runway Incursions’ (the presence on the active runway of an aircraft or other vehicle without ATC clearance). The next ICAO High Level Safety Conference is going to be held in February 2015 in Montreal at ICAO Headquarters. At this event several safety issues of great importance, such as aircraft tracking methods, will be addressed.

2.3 The History of Aviation Safety in the European Union

The astonishing development of air transport in the early twentieth century naturally also involved Europe. This means that European States must also consider whether it was worth creating, at a supranational European level, bodies capable of making it possible for the various countries of the continent to cooperate among themselves as a condition for ensuring an orderly and safe development of air traffic.

As far back as 1951, after a series of proposals for the creation of a European authority for air navigation, the Consultative Assembly of the Council of Europe recommended that the Committee of Ministers call a conference whose aim should be to create an association for European airlines. Such an association would also be charged with communication between European Union Member States and elaborating new technologies to facilitate a closer collaboration, aimed at reaching the target of better efficiency and economy of European air transport.

During the ‘The European Civil Aviation Conference’ held in Strasbourg in 1954, prompted by the Committee of Ministers and with the essential support of ICAO, the ‘European Civil Aviation Conference—ECAC’ was established as a permanent European organisation that, in collaboration with the various Governmental and non-Governmental civil aviation agencies, has the task of developing the recommendations adopted during the conference, in close collaboration to ICAO.

providing the main guidelines on the measures to adopt on the part of States and operators in air transport in case similar circumstances were to reoccur. See ICAO Press Release of 5 March 2012, at http://www.icao.int/Newsroom/Pages/ICAO-publishes-first-ever-manual-on-volcanic-ash.aspx. Doc. 9974, may be perused at http://www.icao.int/publications/Documents/9974_en.pdf. In this regard, in 1951, many proposals were made by several European States. In particular, Italy proposed (‘Piano Sforza’) the creation of a supranational authority for air navigation; the institution of a European association for air space; and an additional European agency to manage and oversee operations in all of the European air space. France, with its ‘Bonnefous Plan’ promoted the creation of a ‘European High Authority for Transport’. For the complete text of the original proposal, see Annex, ‘Le projet d’organisation européenne des transports’.

With Resolution (53) 2 of 19 March 1953. This Resolution was then wholly reproduced in Doc. ICAO 7447-C/868 titled ‘Resolutions of the Council of ICAO and the Council of Europe Relative to the Convening of a Conference on the Co-ordination of Air Transport in Europe.

ECAC is a permanent inter-Governmental organisation, with 44 European Member States (almost all the States of Europe). Its mission is the promotion of the continued development of a safe, efficient and sustainable European air transport system. Its actions mainly aim at harmonising civil
Article 1 of the Statute of the Conference expressly provided that: ‘[t]he objectives of the European Civil Aviation Conference shall be to promote the continued development of a safe, efficient, and sustainable European air transport system’. The emphasis was thus on the predominant role of air safety and on how it could not be legislated for or restricted to individual Member States’ legal systems.

Thus, in 1978, the Council of Ministers (now the Council of the European Union) declared safety to be one of the various priorities to be pursued in civil aviation, at programming level. This was followed by the Commission’s ‘Memorandum’, calling for the implementation of safety in air transport to be effected also at a European level.19

It must also be noted that in the 70s some of the most important of European aeronautical authorities entered into a sort of mutual cooperation aiming at developing common technical industrial standards: the ‘Airbus Industrie consortium’.20

The first concrete piece of legislation in the sector was Council Directive 80/1266/EEC21 of 16 December 1980 on air accident investigation.

Subsequently, in 1987, the ‘Air Safety Symposium’ made clear the need to raise air accident prevention to the level of the Community. In particular, guidelines were laid down for actions to be undertaken for the reinforcement of collaboration between Member States and for the harmonisation of their institutions and Regulations.

### 2.3.1 Aviation Safety Regulation in the European Union

In the early 1990s the need to harmonise safety rules and Regulations was encouraged by drawing up common standards and procedures including at a regional level, by means of an *ad hoc* body.

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20 The ‘Airbus Industrie Consortium’ was created in December 1970 on the initiative of French and German undertakings with the aim of creating an aerospace manufacturing corporation capable of competing with American giants: Boeing, McDonnell Douglas and Lockheed Aircraft Corporation. Over the years, the Consortium also included the presence of Spanish and British undertakings. Incredibly, Italy never decided to take part in this industrial model. Airbus became a single corporate entity in 2001.

The first step in this direction was the signing of ‘the Cyprus Arrangement’ by the ECAC Directors General on 11 September 1990. This agreement established the creation of the ‘Joint Aviation Authorities—JAA’, an associated body of 34 national aviation authorities of the various signatory States, with the task of developing and improving the procedures, as well as the safety rules and standards, in Europe.

In the document, moreover, the various signatory States bound themselves to adopt, in their legal systems, the rules to be issued by the new organisation, as well as to contributing to their development. With this agreement, Europe for the first time moved from a system of voluntary collaboration between the various national authorities to accepting a single supranational body.

Over the years and in close collaboration with the ‘Federal Aviation Administration—FAA’ of the United States the authority managed to draw up a large number of standards, in particular with regard to aircraft certification, their spare parts, their maintenance, flight operation and the relative licensing.

In particular, this authority had the task within ECAC—European Civil Aviation Conference of listing a series of technical requirements, the JAR-OPS codes, incorporated into the European Union via Council Regulation (EEC) No 3922/91, that guarantee mutual recognition within the EU of certification for the construction and maintenance of EU aircraft.

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22 ‘Arrangement Concerning the Development, the Acceptance and the Implementation of Joint Aviation Requirements’ signed in Cyprus on 11 September 1990.

23 The Federal Aviation Administration, established in 1958 by the ‘Federal Aviation Act’, is the agency of the United States Department of Transportation responsible for the regulation and oversight of civil aviation.

Such requirements thus apply to all aircraft used by Community operators (now Union operators), regardless of whether they are registered in a Member State or in a third country.

JAR-OPS Regulations, which define the minimum level of safety required, were changed on 1 January 2005, which thus necessitated an amendment of Regulation (EC) No 3922/91/EEC, operated by way of Regulation (EC) No 1899/2006/EC.\(^\text{25}\) The latter was also necessary in order to bring Regulation (EEC) No 3922/91/EEC into line with the responsibilities and powers of the European Aviation Safety Agency. Formerly, the differences between national Regulations would make producers plan different versions of the same aircraft model and its equipment, according to the country for which it was intended.

Common requirements regarding safety and environmental protection were laid down in Regulation (EC) No 1592/2002\(^\text{26}\) (which also established the EASA—European Aviation Safety Agency).\(^\text{27}\) The creation of this agency became necessary because of the significant problems that the JAAs encountered in carrying out their tasks. The immense restrictions under which the JAA had to work, including because it lacked the power to have its Regulations immediately implemented and had no autonomous certifying power (which was still the preserve of the individual national authorities), demonstrated the need for a new authority, at Community level, endowed with wide regulating and certifying powers.


\(^{27}\) In particular, the Regulation lays down the requirements for airworthiness of aircraft which are (a) designed or manufactured by an organisation for which the Agency or a Member State ensures safety oversight; (b) registered in a Member State; (c) registered in a third country and used by an operator for which any Member State ensures oversight of operations.
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