

# New European Union Approach to Civil Aviation Accident Investigation and Prevention

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**Civil aviation has a long-standing tradition of investigating accidents, which contributes to making aviation one of the safest forms of transport. The obligation to investigate accidents is enshrined in the Chicago Convention of 1944. Recognizing the importance of accident investigation, the European Union adopted the principles governing the investigation of civil aviation accidents. But the European Union rules on investigating air accidents need to be updated to reflect the current realities of Europe's aviation market and the complexity of the global aviation industry. Accordingly, the European Commission has been working on a regulation on the investigation and prevention of accidents and incidents in civil aviation. Reasons behind this new regulation are presented in this paper, together with a detailed explanation of its main contents, an assessment of their impact, and their expected benefits.**

## I. Introduction

SINCE the early 20th century, safety has been a constant byword in aviation development [1]. Data published by the ICAO (International Civil Aviation Organization) show that the safety of aviation has substantially improved from 1945 onward [2]. In 2009, according to the International Association of Transport Airlines, the western-built hull-loss accident rate was one accident per 1.4 million flights. This means that if you were to take a flight everyday, the odds are that you could go 3859 years without an accident.

However, with air traffic steadily increasing, accidents do happen, despite the best efforts of regulators and industry. The investigation of accidents and the determination of the causes and contributing factors, as well as producing recommendations for preventing similar situations in the future, are essential elements in the process of continuous safety improvement. For this reason among others, this transport mode retains a globally low accident rate [3–8].

To make flying safer, independent investigation into accidents is essential, as it is the surest way of identifying the causes of an accident and answering the fundamental questions of what really happened and what can be done to prevent similar incidents in the future [9–11].

## II. Old Regulatory Framework for Investigation and Reporting of Accidents in the EU

The investigation of civil aviation accidents was regulated internationally in the first instance by ICAO, through the existing Convention on International Civil Aviation signed in Chicago in 1944 and its Annex 13 [12]. Since then, ICAO has produced manuals and guidance material to advise states on the conduct of aviation accident investigations: for example, ICAO documents 6920 [13] and 9756 [14], Circular 298 [15], and many others [16].

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The EU, recognizing the importance of aviation accident investigation, has also established common basic obligations through various council directives. In 1980 the European Union adopted Directive 80/1266/EEC [17] on cooperation and mutual assistance between member states in the field of air accident investigation. This directive was the first piece of air safety legislation adopted by the EU. It was later replaced by Council Directive 94/56/EC [18] of 21 November 1994, laying down the fundamental principles governing the investigation of accidents and incidents in civil aviation in the European Union. This work was later completed with Directive 2003/42/EC [19] on incident reporting [20].

## III. Need for Change: Why Reform is Necessary

The European regulatory framework dealing with civil aviation accident investigation and prevention, Directive 94/56/EC [18], which is now already 15 years old, no longer meets the requirements of the EU and the member states. Since its publication in 1994 there have been significant changes in aviation, most notably, the following:

- 1) There was substantial growth of the EU common aviation market in both size and complexity in the last decade (emergence of multibased operators, increased reliance on the outsourcing of maintenance, etc.).
- 2) Aircraft and their systems are becoming increasingly complex; consequently, the investigation of aviation accidents requires substantially more diversified expertise, equipment, and resources.
- 3) There are varying capabilities of accident investigation boards, compared with 1994.
- 4) Safety standards are now almost exclusively defined at the EU level, and the role of European Aviation Safety Agency needs to be clarified.
- 5) There are a wealth of practical experiences in the application of Directive 94/56/EC [18] by the community and the member states.

Because of the above issues, the EU system for civil aviation accident investigation and incident reporting operates below optimum efficiency. There is both a need and an opportunity for improving and optimizing the processes and results of the investigation of civil aviation accidents.

## IV. Specific Problems Addressed by the New Regulation

The new regulation recognizes that there should be a high general level of safety in civil aviation in Europe and all efforts should be

made to reduce the number of accidents and incidents to ensure public confidence in air transport. In short, the new regulation aims to improve aviation safety by ensuring a high level of efficiency, expediency, and quality of European civil aviation safety investigations, including through the establishment of a European network of civil aviation safety investigation authorities. The regulation also aims to reinforce the rules and conditions applicable to safety investigations. Where voluntary cooperation<sup>‡</sup> cannot resolve issues, the proposed regulation provides a number of obligations that would be contained within a legally binding framework that would accomplish the following:

- 1) Update and replace key elements of Directive 94/56/EC [18].
- 2) Ensure common obligations for member states in relation to the organization and independence of national safety investigation authorities.
- 3) Enshrine international standards asserted in the Chicago Convention into community law, particularly in regard to the protection of information.
- 4) Elucidate the roles and requirements of the national safety investigation authorities and of the European Aviation Safety Agency (EASA).
- 5) Ensure the preservation and protection of sensitive information and evidence.

The regulation also provides for rules concerning the timely availability of information relating to all persons and dangerous goods onboard an aircraft involved in an accident. It also aims to improve the assistance to victims of air accidents and their relatives. The major items covered by the new regulation are explained in detail hereafter.

Specific problems resulting from the above considerations, and that are addressed by the new regulation, include the following:

- 1) There is a lack of uniform investigating capacity. The capacity of aircraft accident investigation authorities and the quality of the investigations is important not only to ensure high standards at the state level, but also to ensure consistency in the way investigations are conducted across the EU.<sup>§</sup> This is due to the fact that, with the adoption of the common safety standards and the establishment of EASA, any deficiencies in EU regulations, certification procedures, or oversight practices may have EU-wide consequences [21–23].
- 2) There are tensions between investigations. Normally after an accident, separate investigations are carried out to determine causes of the accident, legal or criminal responsibilities, and, where applicable, to apportion civil liability. These separate investigations have differing objectives and, as such, should be carried out by separate authorities. However, in practice, there is a certain overlap [24–28].
- 3) The role of the community in safety investigations is ill-defined. The relationship between EASA and the aircraft investigation boards (AIBs) is not defined, either in regard to the representation of EASA in accident investigations or with respect to the interchange of important safety information between the agency and aircraft investigation boards.<sup>¶</sup>

<sup>‡</sup>Voluntary cooperation between aircraft accident investigation authorities was envisaged in the Directive 94/56/EC [18] and has been recently strengthened with the establishment of the Council of European Aviation Safety Investigation Authorities and other initiatives, such as a code of conduct for civil aviation accident investigation [29] and the “checklist on assistance” developed by the group of experts on accident investigation of the European Civil Aviation Conference.

<sup>§</sup>Neither Directive 94/56/EC [18] nor Annex 13 [12] are directly applicable and need to be incorporated into the national legal orders of the member states, who are entitled to not implement certain standards of Annex 13 (not covered by Directive 94/56/EC [18]) and to notify ICAO of any differences.

<sup>¶</sup>A common set of directly applicable safety legislation was established by the EU, covering initial and continuous airworthiness, pilot licensing, flight operations (of both community and third-country operators), and has been recently extended to air traffic management/air navigation services and safety aspects of aerodrome operations. In addition, on behalf of the member states, EASA (established in 2002) carries out the functions and tasks of the state of design, manufacture, and registry when related to design approval, as specified in the Chicago Convention and its annexes.

4) There are weaknesses in the implementation of safety recommendations. It is important that an efficient and transparent process be in place to ensure that every safety recommendation is always assessed, with corrective measures implemented where required. However, the implementation of safety recommendations is not currently mandatory.

5) Measures are expected regarding the management of passenger manifests and the rights of the air accident victims and their families to receive assistance and to have access to factual information about the circumstances of the accident and the progress of the investigation.

The following sections describe in detail how major problems are addressed in the new regulation.

## V. Lack of Uniform Investigating Capacity in the EU

The problem of the lack of uniform investigating capacity in the EU is addressed by a set of measures that includes the following:

- 1) Ensure common obligations for the civil aviation safety investigation.
- 2) Ensure the status of the safety investigators.
- 3) Reinforce cooperation by the establishment of a network of European safety authorities.
- 4) Reinforce EU accident, incident, and casualty databases.

Figure 1 summarizes the main problems and main solutions promoted in this area.

### A. Civil Aviation Safety Investigation

A member state shall investigate accidents and serious incidents that have occurred in its territory or that have involved aircraft registered in a member state or operated by an undertaking established in a member state when the accident or incident occurred outside its territories and such investigations are not conducted by a third country or when the accident location cannot be definitely established. Additionally, states shall appoint an accredited representative to participate as a state of registry, state of the operator, state of design, state of manufacture, state providing information, or state having a special interest by virtue of fatalities or serious injuries to its citizens. States shall also facilitate experts at the request of the third country conducting the investigation.

The scope of safety investigations should be chosen taking into consideration the lessons that can be drawn from them for improving aviation safety and bearing in mind the need for the cost-efficient utilization of investigation resources within the EU. However, at the same time, the new regulation requires that the same methodology be applied to all types of accidents being investigated. For example, the regulation provides for a period of 60 days of public comment, with all comments to be included in draft reports, regardless of the seriousness or importance of the accident or incident. As such, incidents involving small aircraft will inevitably slow down the process and increase the administrative burden of committees. This requirement goes beyond the ICAO standards and is inconsistent with the magnitude of the incident. The aircraft investigation boards perceive this requirement to be an additional burden without a clear or equivalent benefit, as the obligation to investigate all serious incidents, of any type, can notably increase the workload [30].

Each member state shall ensure that safety investigations are conducted or supervised, without external interference, by a permanent functionally independent national civil aviation safety investigation authority (safety investigation authority) that is capable of independently carrying out a full safety investigation, either on its own or through agreements with other safety investigation authorities [31–33]. The regulation lays down the minimum requirements in terms of human and material resources, facilities, and budget of these authorities in order to ensure a uniform minimum level in accordance with the EU level.

### B. Status of the Investigators

As it is essential to ensure clearly defined rights for safety investigations, member states should, in compliance with the national

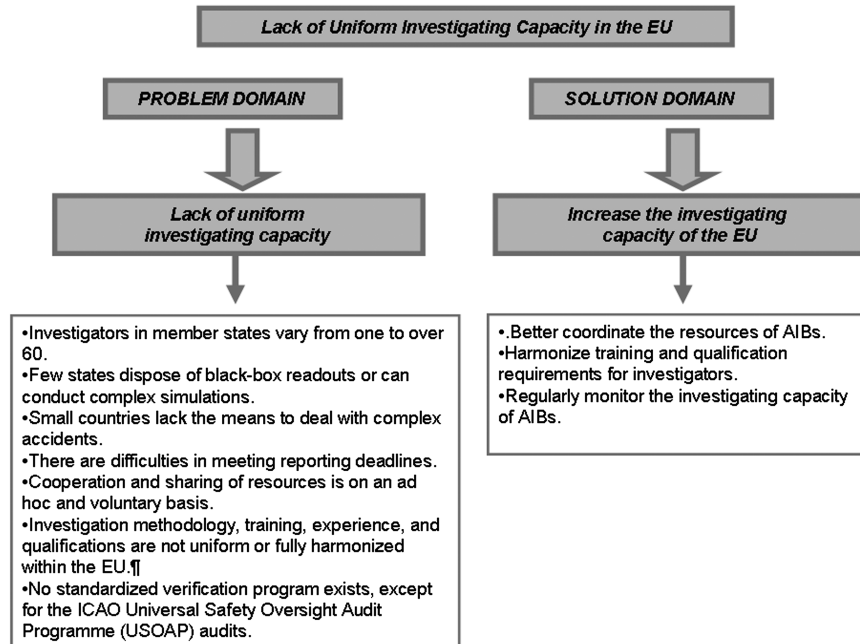


Fig. 1 Lack of uniform investigating capacity.

legislation in force regarding the powers of the authorities responsible for judicial investigation and, where appropriate, in close collaboration with those authorities, ensure that safety investigation authorities are allowed to carry out their tasks in the best possible conditions in the interests of aviation safety.

The safety investigation authorities should therefore be granted immediate and unrestricted access to the site of the accident and to all the elements necessary to satisfy the requirements of a safety investigation, without compromising the objectives of a judicial investigation. The regulations reinforce the status of the safety investigators by establishing the actions that the investigator in charge shall, in particular, be entitled to perform, notwithstanding any confidentiality obligations under EU or national legislation.

To achieve these objectives the investigator in charge shall, in particular, be entitled to perform the activities summarized in Fig. 2.

### C. European Network of Safety Authorities

Coordination of investigation activity is to be achieved through a new European network of civil aviation safety investigation authorities comprising the heads of the Accident Investigation Authorities of each member state or their representatives. This would transform the existing informal cooperation between national safety investigation authorities into a formal European network of civil aviation safety investigation authorities.

The network shall have no legal personality, and its mandate shall be limited to an advisory and coordination role on all aspects of the development and implementation of EU policies and rules relating to safety investigations and the prevention of accidents and incidents. Nevertheless, the carrying out and implementation of these tasks is not established in the proposal, which is something that should have been established by the legislation. For example, among other issues,

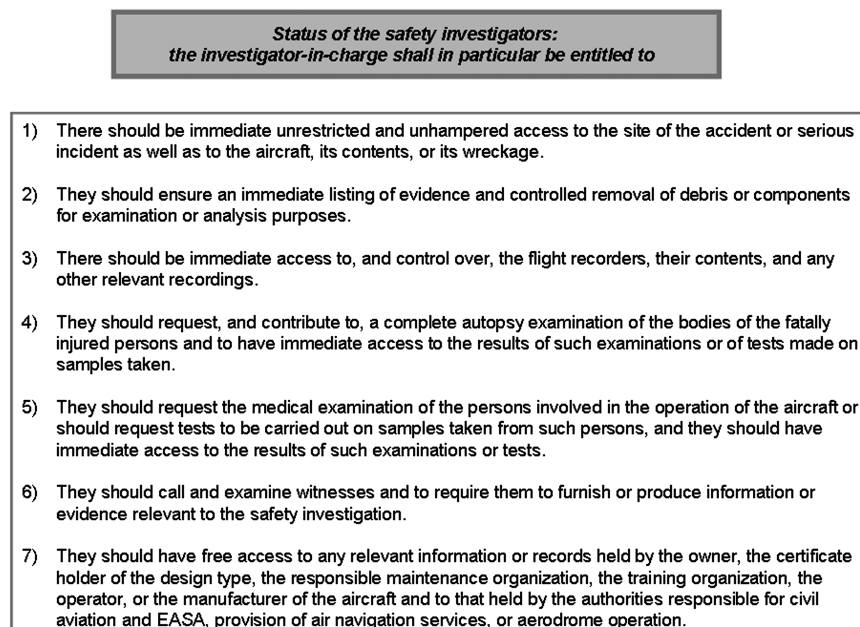


Fig. 2 Status of the safety investigators.

### Network responsibilities

- 1) Prepare suggestions and advise the European Union institutions on all aspects of the development and implementation of European Union policies and rules relating to safety investigations and the prevention of accidents and incidents.
- 2) Promote the sharing of information useful for improving aviation safety and actively promote structured cooperation between the authorities responsible for safety investigations, the Commission, EASA, and the national civil aviation authorities.
- 3) Coordinate and organize, where appropriate, peer reviews, relevant training activities, and skill-development programs for the investigators.
- 4) Promote the best safety investigation practices with a view to developing a common European Union safety investigation methodology and draw up an inventory of such best practices.
- 5) Strengthen the investigating capacities of the safety investigation authorities, in particular, by developing and managing a framework for sharing resources.
- 6) At the request of the safety investigation authorities, provide appropriate assistance, including, but not limited to, a list of investigators, equipment, and capabilities available in the other member states for potential use by the authority conducting an investigation.
- 7) They should have access to information contained in the database, and they should analyze the safety recommendations therein with a view to identifying important safety recommendations of EU-wide relevance.

Fig. 3 Network responsibilities.

it should have detailed the tasks and missions on issues related to improving safety and the exchange of information and materials.

The network shall seek to further improve the quality of the investigations conducted by safety investigation authorities and to strengthen their independence. To achieve these objectives, the network shall perform the activities indicated in Fig. 3.

The network shall draw up the annual work program covering the previously identified activities, but it is not clear how this work program is going to be financed, and the economic viability of the network is still an open issue that could prevent the network for achieving its objectives and fulfilling the expectations with regard to cooperation.

Another point that could limit the performance of the network is related to the reporting mechanism at the EU level. The network shall report to the Commission, who shall inform the European Parliament and the Council of the network's activities on a regular basis. In particular, the network must submit an annual report to the Commission, which shall in turn send it to the Parliament and Council. Some countries consider that it would have been preferable for the network to submit the annual report to the Parliament and Council directly.

#### D. EU Accidents, Incident, and Casualty Databases

Accident and casualty databases are an indispensable tool for the calculation of accident rates. Such databases are needed to describe the current state of transport safety across the world, to help define target levels of safety and to facilitate a data-led systems approach in defining strategies.

Chicago Convention contracting states are obliged to report information to the ICAO on all aircraft accidents that involve aircraft of a maximum certificated takeoff mass of over 2250 kg. To process this information ICAO has operated the Accident/Incident Data Reporting (ADREP) system since 1976. In 1997, in its opinion of the Commission's air safety strategy, the European Parliament called for the urgent establishment of a European data bank on air accidents, incidents, and safety recommendations.

Directive 2003/42/EC [19] on occurrence reporting in civil aviation obliges member states to collect, evaluate, process, store in a database, and exchange the information about safety occurrences since July 2005. Mandatory incident reporting within a European framework is supported by a central database called ECC-AIRS (European Coordination Centre for Aviation Incident Reporting Systems) operated by the Commission's joint research. As of January 2009, some 45 states and seven international organizations

have installed the ECC-AIRS software and have reported occurrences in the ECC-AIRS format to ICAO. Additionally, the EASA Accident Investigation Section is developing a European standard for exchanging safety recommendations built upon the already operating ECC-AIRS application. But despite significant efforts in this respect, there is still no consistent approach in the community concerning gathering, processing and implementation of safety recommendations resulting from accident investigations.

To allow that accident databases can be effectively used to derive accidents rates, operational information must also be gathered appropriately. To calculate an accident rate, not only the number of accidents must be known, but also the total number of flights that were conducted during the same period of time (accident and non-accident flights). Therefore, exposure data are needed. At this point it is crucial to mention the lack of common denominator data for aircraft accidents rates (e.g., operation, flying hour, approaches, departures, etc.). Additionally, while for scheduled flights it is relatively easy to calculate the number of flights using timetable information, for nonscheduled flights this is not possible. There are no databases available that directly contain nonscheduled flight information.

Finally, despite the obligation to report aviation accidents to ICAO, full reports are only provided for a minority of accidents and more than half the accidents are not officially reported at all. Moreover, as the obligation affects only accidents that involve aircraft of a maximum certificated takeoff mass of over 2250 kg there is a lack of information about light aircraft mainly used in general and recreational aviation. Aviation accident rates are generally calculated from ICAO ADREP database, therefore, most statistics concern only aircraft above 2250 kg. To avoid this limitation additional request has to be made to states to obtain light aircraft accident data.

## VI. Tensions Between Investigations

Investigations are made subject to judicial or administrative procedures for determining guilt and responsibility. To this end, the regulation provides significant measures to respect the independence of the safety investigation authority and allow the technical investigation to be conducted diligently and efficiently. For example, the investigator in charge shall be notified when a judicial investigation is also instituted in relation to an accident or serious incident, and in such a case, the investigator in charge shall ensure traceability and retain custody of flight recorders and any material evidence. Where the judicial authority is entitled to seize any evidence, the investigator

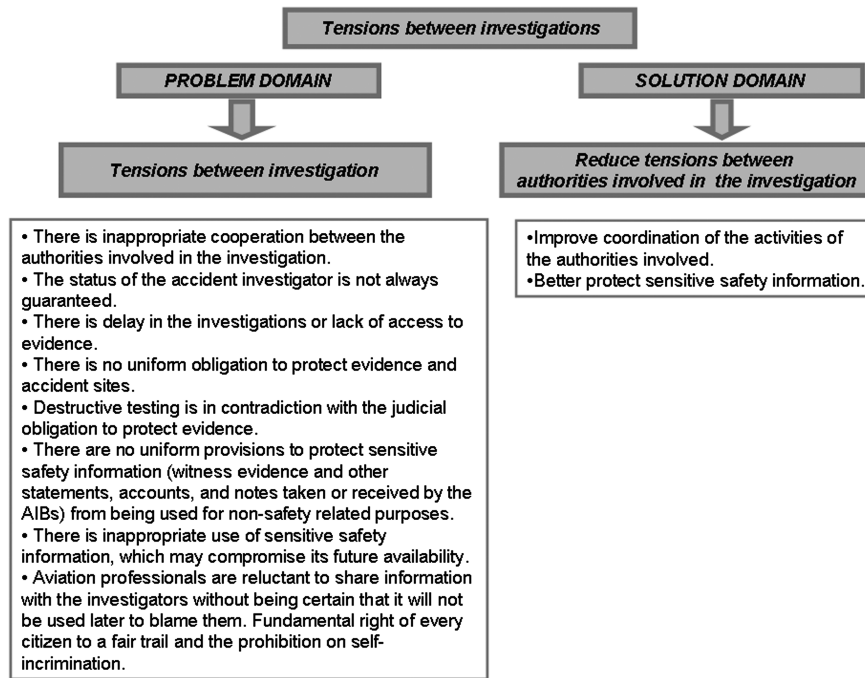


Fig. 4 Tensions between investigations.

in charge shall have immediate and unlimited access to and use of such evidence.

To reinforce the independence of the investigation the regulation establishes that safety investigation authorities and other authorities likely to be involved in the activities related to the safety investigation, such as the judicial, civil aviation, search and rescue authorities, cooperate with each other through advance arrangements. Nevertheless, there is no experience in many countries with regard to previous agreements with judicial authorities and the new requirement of the regulation in this respect introduces certain uncertainty about the success of this new tool.\*\* Those advance arrangements shall be communicated to the Commission and shall cover among others the following subjects: 1) access to the site of the accident, 2) preservation of and access to evidence,†† 3) initial and ongoing debriefings of the status of each process, 4) exchange of information, 5) appropriate use of safety information, and 6) resolution of conflicts.

The regulation states that the civil aviation system should equally promote a nonpunitive environment facilitating the spontaneous reporting of occurrences and thereby advancing the principle of just culture [34,35].

To create the necessary confidence, the regulation clearly identify information that shall not be made available or used for purposes

other than those of the safety investigation. In particular, flight recorder data shall not be made available or used for purposes other than those of the safety investigation, airworthiness, or maintenance purposes, except when such data are identified or disclosed under secure procedures [36]. It also provides that the administration of justice or the authority competent to decide on the disclosure of records according to national law may decide that the benefits of the disclosure of the records referred for any other purposes permitted by law outweigh the adverse domestic and international impact that such action may have on that or any future safety investigation. Member states should have the option to limit the cases in which a decision of disclosure regarding information obtained during a safety investigation could be taken, without affecting the smooth functioning of the judicial system [37,38].

Figure 4 summarizes the main problems and solution proposed in this area.

## VII. Role of EASA and Civil Aviation Authorities in Safety Investigations

The regulation takes into account the latest changes in the institutional and regulatory framework (in particular, the establishment of EASA and the European-wide dimension of safety recommendations), given that aviation safety is increasingly regulated at the EU level.\*\*

The regulation sets out the role of EASA in accident and incident investigations. EASA carries out, on behalf of the member states, the functions and tasks of the state of design, manufacture, and registry when related to design approval, as specified in the Chicago Convention and its annexes. Therefore EASA, in accordance with Annex 13 [12] to the Chicago Convention, should be invited to participate in a safety investigation as well as national civil aviation authorities. EASA representatives participating in an investigation, provided that the requirement of no conflict of interest is satisfied, shall be entitled to visit the site of the accident and examine the wreckage, receive copies of all pertinent documents and obtain relevant factual information, suggest areas of questioning and obtain witness information,

\*\*In the United Kingdom, for example, a Memorandum of Understanding between the Crown Prosecution Service and the Air Accidents Investigation Branch, the Marine Accident Investigation Branch, and the Rail Accident Investigation Branch sets out the principles for liaison between the Crown Prosecution Service and the AIBs. The aim is to ensure effective investigation and decision-making processes while maintaining the independence of all parties and reinforcing the role of the AIBs as the guardians of public safety when investigating transport accidents and incidents ([http://www.aib.gov.uk/cms\\_resources/MOU%20AIB-CPS.pdf](http://www.aib.gov.uk/cms_resources/MOU%20AIB-CPS.pdf) [retrieved 2011]).

††In the investigation of the Air France Concorde F-BTSC crash at Gonesse on 25 July 2000, three inquiry teams were competing for access to physical evidence, resulting in delays and restrictions in the access to the crash site and material evidence by the safety experts. During the investigation of a Boeing MD-87 runway collision with a Cessna 525-A at Milano Linate Airport on 8 October 2001, the investigation could not receive testimonies from the ground and tower controllers as well as tower supervisor, as they made themselves unavailable pending the judicial procedure and the original radio and telephone communications was not made available, so the AIBs could not test the efficiency of the equipment the transmission, as it has been seized by the Magistrate for the purpose of the criminal inquiry and not made available.

\*\*The restrictions envisaged in Directive 2003/42/EC [19] and its implementing rules do not permit such access on a continuous basis. At the same time, such information, due to its sensitive and confidential nature, should be used by the agency only for purposes related to improvement of safety and protected from unauthorized disclosure.

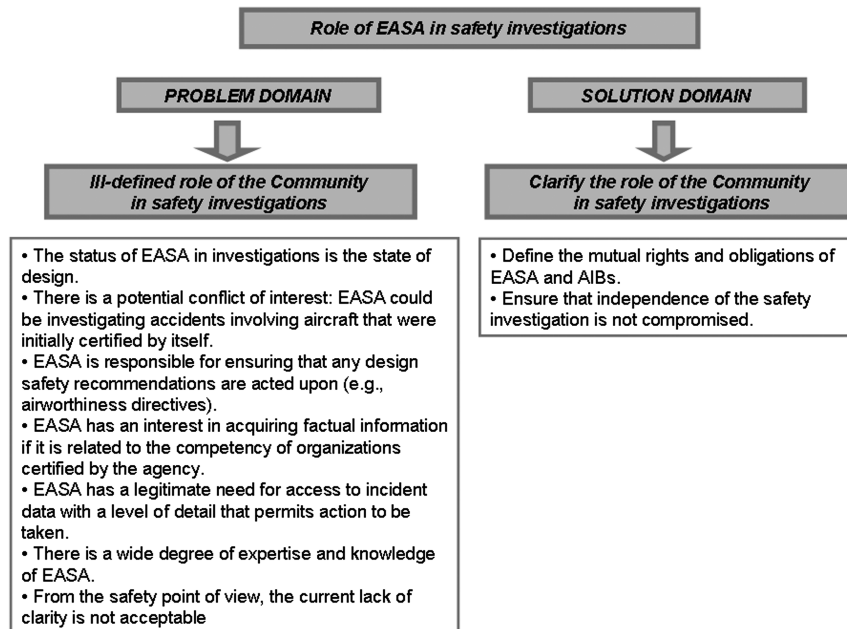


Fig. 5 Role of community in safety investigations.

participate in the readouts of recorded media except cockpit voice or image recorders, and participate in offsite investigative activities such as component examinations, tests, and simulations; technical briefings; and investigation progress meetings, except when related to the determination of the causes of the accident or serious incident or formulation of safety recommendations. Needless to say, although it is not explicitly stated in the proposal, EASA's participation shall not influence the course or the result of the safety investigation, so its actions must be limited to that of an advisor as defined in Annex 13 [12] of ICAO.

To ensure better prevention of aviation accidents and incidents, EASA, in cooperation with the competent authorities of the member states, should also participate in the exchange and analysis of information in the framework of the occurrence reporting systems in accordance with Directive 2003/42/EC [19], while avoiding any conflicts of interest. This information should be adequately protected from unauthorized use or disclosure.<sup>§§</sup> As indicated in Fig. 5, the role of EASA in safety investigation is ill-defined and needs to be clarified.

### VIII. Implementation of Safety Recommendations

Each safety investigation shall be concluded with an investigation report in a form appropriate to the type and seriousness of the accident or serious incident. The report shall state that the sole objective of the safety investigation is the prevention of future accidents and incidents without apportioning blame or liability [39,40]. The report shall contain, where appropriate, safety recommendations. The report shall be forwarded to safety investigation authorities and civil aviation authorities of the states concerned, to ICAO, to the addressees of safety recommendations contained in the report and also to the Commission and EASA.

The final report shall be made public the in the shortest possible time and where possible within 12 months of the date of the accident or serious incident. Where this is not possible an interim statement shall be released at each anniversary of the accident or serious incident, detailing the progress of the investigation and any safety issues rose.

<sup>§§</sup>The current situation was identified as being not acceptable in a recent audit of EASA conducted by ICAO within the framework of the USOAP audit. The report makes a finding on this particular issue and concludes that, "EASA has not reached a formal agreement with the EU member status regarding the modalities and status of participation of EASA and representatives of member states bodies in accident and serious incident investigations involving aircraft whose type certificate is delivered by EASA.

The report shall protect the anonymity of any person involved in the accident or serious incident and before its publication comments shall be solicited from the entities that have participated in the investigation. The consulted entities shall be bound by applicable rules of professional secrecy with regard to the contents of the consultation.

The addressee of a safety recommendation shall acknowledge receipt of the transmittal letter and inform within 90 days, of the actions taken or under consideration, and where appropriate, of the time necessary for their completion and where no action is taken, the reasons therefore. Within 60 days of the receipt of the reply, the safety investigation authority shall inform the addressee whether or not it considers the reply adequate and give justification when they disagree with the decision to take no action.

Safety investigation authority shall implement procedures to record the responses to the safety recommendations it issued and the addressee of a safety recommendation shall implement procedures to monitor the progress of the action taken in response to the safety recommendations received. All safety recommendations and their follow-up shall be recorded in the central European repository.<sup>¶¶</sup> Figure 6 summarizes the main weaknesses in the implementations of safety recommendations and the main strategies to improve their implementation.

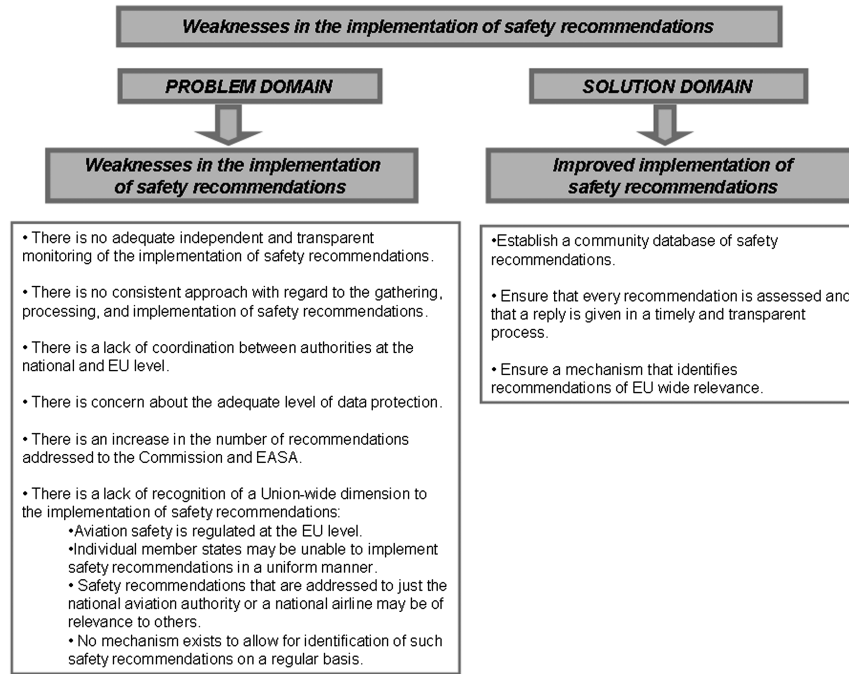
### IX. Rights of Victims and Their Families

In accordance with the policy of the protection of passenger rights adopted by the European Union in recent years, the regulation of the rights of victims of a civil aviation aircraft accident and their families is addressed.

First, the regulation establishes the obligation, for arriving/ departing flights operated by EU airlines and departing flights operated by non-EU airlines, to produce a validated list, based on the best available information, of all the persons onboard at the latest within 2 h of the notification of the occurrence of an accident and a list of the dangerous goods onboard immediately after notification of the occurrence of an aircraft accident.<sup>\*\*\*</sup> The lists of passengers shall be

<sup>¶¶</sup>Established under Commission Regulation (EC) No. 1321/2007 [41] of 12 November 2007, laying down implementation rules for integration into a central repository of information exchanged on civil aviation occurrences in accordance with Directive 2003/42/EC [19].

<sup>\*\*\*</sup>In practice, the most advanced protocols in this respect are developed by the community airlines operating to the United States, due to federal requirements of the U.S. Aviation Disaster Family Assistance Act of 1996 and U.S. Foreign Air Carrier Family Assistance Act of 1997.



**Fig. 6 Weaknesses in the implementation of safety recommendations.**

made available principally for the purposes of safety investigations, provision of information to relatives of victims, and medical response to an accident, and the name of a person onboard shall not be made publicly available before the relatives of that person have been informed by the relevant authorities.

Experience has shown that reliable lists of persons onboard an aircraft are sometimes difficult to obtain in a rapid manner but also that it is important to establish a deadline within which an airline is required to produce such a list. Confining the obligation to a period of 2 h may be helpful in streamlining the communication process to the families of the victims, but what if the list is not correct? In long-haul flights and flights with several companies, this period may not be enough.

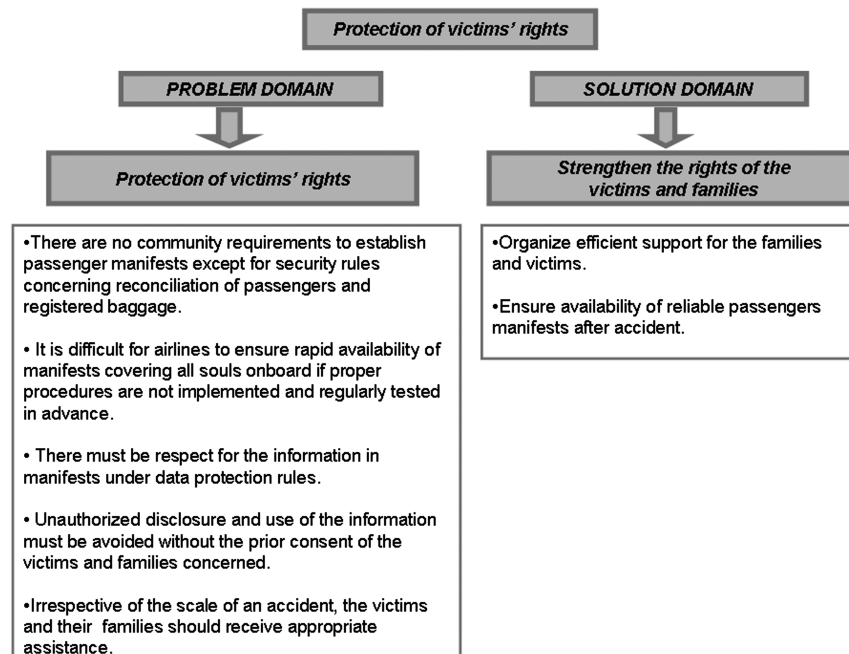
Second, member states should have an emergency plan providing for, in particular, airport emergency services and assistance to victims of civil aviation accidents and their relatives [40]. Airlines should

also have a plan for assistance to victims of civil aviation accidents and their relatives. Member states shall audit the assistance plans of the airlines established in their territory. A crucial aspect is that the state shall provide for the appointment of a reference person as a point of contact and information for the victims and their relatives so that he or she can coordinate the information coming from the agencies involved and transmit it to the family, which undoubtedly will be a support for families who are enduring the pain of the disappearance of a relative.

The main problems regarding the protection of the victims' rights and their possible solutions are highlighted in Fig. 7.

## X. Conclusions

Air transport in the EU can be considered as one of the safest forms of travel. Since the early 20th century, safety has been a constant and



**Fig. 7 Protection of victims' rights.**

a byword in aviation development. Despite its relatively short life, when compared with other modes of transport, civil aviation is characterized by its deeply rooted culture of safety.

However, with air traffic steadily increasing, accidents do happen, despite the best efforts of regulators and industry. Although significant progress has been made we must continue working to improve civil aviation safety levels.

Our challenge is to develop and implement new approaches to investigating accidents and incidents in civil aviation, as this is a key mechanism for preventing future accidents. Being well aware of this fact, the European Commission has been working over the last two years on a regulation on the investigation and prevention of accidents and incidents in civil aviation that promotes more efficient and independent inquiries into the causes of air accidents and also aims to strengthen the rights of the victims of air accidents.

The regulation address organizational changes, improvements in the coordination between the authorities responsible for the technical investigation and judicial measures to protect the information obtained in the course of the investigation, improvements in the monitoring of safety recommendations, and the establishment of a European network of cooperation between the organizations responsible for each stage of the investigation of civil aviation accidents.

Statements taken from individuals by a safety investigator, as well as voice and image recordings inside cockpits and air traffic control units, will only be used for safety investigations, unless there is an overriding reason for judicial disclosure. The European Union expects that this will ensure that people can testify to the safety investigators without fear.

The passing of the legislation will reconfirm the principle that investigations have the sole objective of preventing future accidents, and the regulation will not affect the prerogatives of the national courts and competent judicial authorities of member states. It will ensure that accident investigators have immediate access to evidence material and information that may be relevant to improving aviation safety. It will require that member states to guarantee coordination between accident investigations and judicial proceedings. Separation of these interests is one of several changes enshrined in the new law.

The regulation also requires airlines to produce a list of those onboard an aircraft within 2 h of an accident. Passengers will be entitled to name an individual to be informed in such an event. A list of any dangerous goods onboard the aircraft will also have to be released by the airline immediately after the accident. Additionally, each member state will be required to have a civil aviation accident emergency plan and to ensure that all airlines based in its territory have a plan to assist victims and relatives.

European representatives are also to set up a network of civil aviation safety investigation agencies to advise European Union institutions and make safety recommendations, while the Commission will need to draft an update to air safety occurrence reporting directives by the end of next year.

In general, member states have overwhelmingly approved the new legislation on air accident investigation. The new law, approved in the European Parliament by 604 votes in favor to 11 against, will ensure that the safety investigation be carried out free of pressure from regulatory and other authorities, as noted by the Parliament. The European Transport Commissioner Siim Kallas said that, "The new rules will allow us to improve investigations, but most importantly, to better prevent accidents from happening."

## References

- [1] "ICAO Annual Report of the Council," International Civil Aviation Organization, Rept. 9921, Montréal, 2009.
- [2] "Annual Safety Review 2008," European Aviation Safety Agency, Rept. 978-92-9210-032-2, Cologne, Germany, 2009.
- [3] Stoop, J. A., and Kahan, J. P., "Flying is the Safest Way to Travel: How Aviation Was a Pioneer in Independent Accident Investigation," *European Journal of Transport and Infrastructure Research*, Vol. 5, No. 2, 2005, pp. 115–128.
- [4] Marinho de Bastos, S., "The Need for a European Union Approach to Accident Investigations," *Journal of Hazardous Materials*, Vol. 111, No. 1, July 2004, pp. 1–5.
- doi:10.1016/j.jhazmat.2004.02.011
- [5] Cormier, P. E., "Accident Investigation Board: Where It Came from, How It Came to Be What It Is, and Where It Is Going," *The Reporter*, Vol. 26, No. 2, 1999, pp. 3–10.
- [6] Allen, B. R., "International Cooperation on Accident Investigations," *AIAA, Royal Aeronautical Society, and Japan Society for Aeronautical and Space Sciences, Aircraft Design and Technology Meeting*, CP 65-768, Los Angeles, Nov. 1965, pp. 1–6.
- [7] Spooner, A., "The Causes of Aircraft Accidents," *Canadian Aeronautics and Space Institute, AIAA, and Cornell–Guggenheim Aviation Safety Center Aviation Safety Meeting*, CP 66-804, Toronto, pp. 1–7.
- [8] Noonan, J. W., "Contributions to Flight Safety by Application of Aircraft Systems Accident Investigation Data," *Canadian Aeronautics and Space Institute, AIAA, and Cornell–Guggenheim Aviation Safety Center Aviation Safety Meeting*, CP 66-809, Toronto, 1966, pp. 1–17.
- [9] Stoop, J., and Roed-Larsen, S., "Public Safety Investigations—A New Evolutionary Step in Safety Enhancement?," *Reliability Engineering & System Safety*, Vol. 94, No. 9, Sept. 2009, pp. 1471–1479. doi:10.1016/j.res.2009.02.016
- [10] Klett, T. A., "Accident Investigation: Keep Asking 'Why?'," *Journal of Hazardous Materials*, Vol. 130, No. 1, March 2006, pp. 69–75. doi:10.1016/j.jhazmat.2005.07.047
- [11] Dien, Y., Llory, M., and Montmayeul, R., "Organisational Accidents Investigation Methodology and Lessons Learned," *Journal of Hazardous Materials*, Vol. 111, No. 1, July 2004, pp. 147–153. doi:10.1016/j.jhazmat.2004.02.021
- [12] "Aircraft Accident and Incident Investigation," *Convention on International Civil Aviation*, International Civil Aviation Organization, Annex 13, Montreal, 1951.
- [13] "Manual of Aircraft Accident Investigations," International Civil Aviation Organization, Doc. 6920, Montreal, 1970.
- [14] "Manual of Aircraft Accident and Incident Investigation," International Civil Aviation Organization, Doc. 9756, Montreal, 2000.
- [15] "Training Guidelines for Aircraft Accident Investigators," International Civil Aviation Organization, Circ. 298, Montreal.
- [16] Frostell, C., "Current and Future Activities in Accident Investigation and Prevention in ICAO," *Advances in Aviation Safety Conference & Exposition*, CP981226, SAE International, Warrendale, PA, April 1998, Paper 981226. doi:10.4271/981226.
- [17] "Air Accident Investigations Cooperation Directive," 80/1266/EEC, European Economic Area Joint Comm., 1980.
- [18] "Council Directive 94/56/EC of 21 November 1994 Establishing the Fundamental Principles Governing the Investigation of Civil Aviation Accidents and Incidents," 94/56/EC, European Council, Brussels, 1994.
- [19] "Occurrence Reporting in Civil Aviation," 2003/42/EC, European Parliament and of the Council, Brussels, 2003.
- [20] Perez, J. D., "An Analysis of the European Union's Legislation on the Mandatory Reporting of Aviation Occurrences," *Journal of Knowledge Advancement & Integration*, Vol. 2007, No. 1, 2007, pp. 81–91.
- [21] Littleton, T., "The National Transportation Safety Board: How Should They Conduct Witness Investigations—The Need for a Privilege," *Transportation Law Journal*, Vol. 27, No. 2, 2000, pp. 255–270.
- [22] Sklet, S., "Comparison of Some Selected Methods for Accident Investigation," *Journal of Hazardous Materials*, Vol. 111, No. 1, July 2004, pp. 29–37. doi:10.1016/j.jhazmat.2004.02.005
- [23] Harms-Ringdahl, L., "Relationships Between Accident Investigations, Risk Analysis, and Safety Management," *Journal of Hazardous Materials*, Vol. 111, No. 1, July 2004, pp. 13–19. doi:10.1016/j.jhazmat.2004.02.003
- [24] Janicki, W. D., "Aircraft Accident Reports and Other Government Documents: Evidentiary Use in International Air Crash Litigation in the United States," *Journal of Air Law and Commerce*, Vol. 74, No. 4, 2009, pp. 801–844.
- [25] Sweeney, E., "Safety Regulations and Accident Investigation: Jurisdictional Conflicts of C.A.B. and C.A.A.," *Journal of Air Law and Commerce*, Vol. 17, No. 4, 1950, pp. 141–180.
- [26] Atwood, R. T., "Admissibility of National Transportation Safety Board Reports in Civil Air Crash Litigation," *Journal of Air Law and Commerce*, Vol. 53, 1987, pp. 469–500.
- [27] Faulk, J. E. and Welch, W. A., Jr., "The Use of Aviation Accident Reports by Civil Litigants: The Historical Development of 49 U.S.C. Section 1441(e)," *Pepperdine Law Review*, Vol. 10, No. 991, 1983, p. 582.
- [28] Smart, K., "Credible Investigation of Air Accidents," *Journal of Hazardous Materials*, Vol. 111, No. 1, July 2004, pp. 111–114.



- doi:10.1016/j.jhazmat.2004.02.018
- [29] "ECAC Code of Conduct on Co-Operation in the Field of Civil Aviation Accident/Incident Investigation," Council of European Aviation Safety Investigation Authorities, Brussels, 2007.
- [30] Dempsey, P. S., "Independence of Aviation Safety Investigation Authorities: Keeping the Foxes from the Henhouse," *Journal of Air Law and Commerce*, Vol. 75, 2010, pp. 223–284.
- [31] Stop, J. A., "Independent Accident Investigation: A Modern Safety Tool," *Journal of Hazardous Materials*, Vol. 111, No. 1, July 2004, pp. 39–44.  
doi:10.1016/j.jhazmat.2004.02.006
- [32] van Vollenhoven, P., "Independent Accident Investigation: Every Citizen's Right, Society's Duty," European Transport Safety Council, Brussels, Jan. 2001.
- [33] Bennun, M. E., and McKellar, G., "Flying Safely, the Prosecution of Pilots, and the ICAO Chicago Convention. Some Comparative Perspectives," *Journal of Air Law and Commerce*, Vol. 74, 2009, pp. 737–760.
- [34] Learmount, D., "Criminalisation of Air Accidents: The Solutions May Be Forged in Europe," *Air & Space Law*, Vol. 35, Nos. 4–5, 2010, pp. 325–330.
- [35] Lane, L. L., "The Discoverability of Sensitive Security Information in Aviation," *Journal of Air Law and Commerce*, Vol. 71, No. 3, 2006, pp. 427–448.
- [36] Allen, B. R., "The Potential Role of Flight Recorders in Aircraft Accident Investigation," *Canadian Aeronautics and Space Institute, AIAA, and Cornell—Guggenheim Aviation Safety Center Aviation Safety Meeting*, CP 66-810, Toronto, 1966, pp. 1–13.
- [37] Meyer Hinckley, C., Hettinger, H., and Juenger, J. E., "The Argument for Federal Legislation Protecting the Confidentiality of Aviation Safety Action Program Information," *Journal of Air Law and Commerce*, Vol. 75, No. 1, 2010, pp. 161–180.
- [38] Hoard, E. D., and Feehan, J. D., "Proper Use of Safety Mishap and Accident Reports," *The Reporter*, Vol. 14, No. 2, 1987, pp. 2–21.
- [39] Adams, K. E., "Accident Investigation Reports What Are Your Lawyers Afraid Of?," *Development Conference and Exhibition*, CP 99-001, Baltimore, MD, June 1999.
- [40] Naylor, L., "Aircraft Accident Emergency Planning and Emergency Management," *Australian Journal of Emergency Management*, Vol. 16, No. 2, 2001, pp. 19–25.
- [41] "Commission Regulation (EC) No 1321/2007 of 12 November 2007 Laying Down Implementing Rules for the Integration into a Central Repository of Information on Civil Aviation Occurrences Exchanged in Accordance with Directive 2003/42/EC of the European Parliament and of the Council," 1321/2007, European Parliament and of the Council, Brussels, Nov. 2007.