

"Independence does not mean isolation"

A practical Approach

(Presented by Johann Reuss, BFU Germany)

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Abstract

The work of Safety Investigation Authorities (SIA) has changed in the course of the last few years. Currently and in the future not only the causes in accordance with the definitions in ICAO Annex 13 will be the focal point of an investigation. More and more investigations are influenced by the media, family members of accident victims, the exchange of important information with other authorities and national and international politics. Due to the complexity of modern aviation a safety investigation requires a maximum involvement of manufacturers, airlines and pilots.

This presentation uses some examples to show how the German Federal Bureau of Aircraft Accident Investigation (BFU) already incorporates this in their work today. Experiences and indications of earlier investigations are presented.

Introduction

In the 70s and 80s of the last century, the determination of "technical" causes was widely practised. Nowadays an investigation goes beyond that and includes complex connections between machine and human beings and organisations. From the vantage point of the present, humans are one element in a complex socio-technical system. The international regulation ICAO Annex 13 has developed accordingly and is providing good foundation for the conduct of complex investigations. One important element is the organisation of teams according to Regulation ICAO Annex 13. It not only stipulates rights and duties of the states of design, manufacture, registry and operator involved in the investigation, it also establishes the basis for the organisation of teams. Advantage: The synergy effect of the concentrated know-how. The state conducting the investigation and therefore the safety investigation authority responsible for the investigation gain important advantages by establishing teams. The responsible safety investigation authority has to ensure the most important requirement - protecting the independence of the investigation.

In the past years, major transport aircraft accidents world-wide have shown that the implementation and use of Accredited Representatives (AccRep) and advisers in accordance with ICAO Annex 13 is one factor of effective safety investigation. Another one and also challenge is the contact and

interaction with the media and relatives, the cooperation with police, prosecution, other non-ICAO-13-authorities, politicians, and legal representatives.

In Germany, the standards of ICAO Annex 13 are applied in the Regulation (EU) No 996/2010 and the national Law Relating to the Investigation into Accidents and Incidents Associated with the Operation of Civil Aircraft (FIUUG).

Independence of the Safety Investigation Authority

The BFU is the responsible Safety Investigation Authority for the investigation into accidents and serious incidents in civil aviation and has to adhere to European and national requirements. The BFU is subordinated to the Federal Ministry of Transport and Digital Infrastructure (BMVI). The national flight accident investigation law stipulates the professional independence of the BFU. Based on this law the director of the BFU decides to initiate an investigation and appoints the responsible investigator in charge, who then determines the extent and depth of the investigation. The director of the BFU also decides whether or not safety recommendations are issued. The investigator in charge identifies and describes the safety deficits which are determined by the investigation. The BFU is of the opinion that this mode of operation practised since 1998 provides maximum independence. The BFU has the legal right to ignore any kind of professional instructions or interference.

However, the BFU has never interpreted this legal independence as isolation. A number of investigations of the past years - especially the investigation of the accident near Überlingen in 2002 - have shown that the improvement of flight safety is more than just determining the causes of an accident. It has also become clear that duties and requirements of other parties are justified and have to be supported.

Criteria of Effective Safety Investigation

The requirements for effective safety investigations have changed over time. During the 70s of the last century an investigation was considered "good" if the technical cause, e.g. the fractured pin, was found. During the 1980s operational aspects were added to the technical ones and during the 1990s human factors received more attention. Then other combinations became the focus: The interface humans - machines or the breakdown into indirect and direct causes were forms of describing the causes which had the quality criteria "state of the art". The Swiss Cheese Model by James Reason, Manchester University, illustrates the connection between latent and active human failure contributing to the collapse of a complex system. The chain of causes becomes evident. The model described by James Reason is accepted by safety investigation authorities the world over and defines the structure of the analysis in the investigation report, sometimes in modified forms. The BFU successfully applied this model during the investigation of the mid-air collision near Überlingen (Southern Germany) on 1 July 2002 involving a Boeing B757-200 and a Tupolev 150M. The differentiation between direct and indirect causes illustrated the backgrounds for the accident very well and the subsequently identified safety deficits were a good foundation for the safety recommendations the BFU later issued. But times do change here also. Nowadays the examination of human factors includes resilience engineering, i.e. determination and description of causes are continuously improved.

There is no doubt that the current models and presentations allow a very precise and detailed description of causes. Today the formal investigation report of an independent SIA in accordance with ICAO Annex 13 or Regulation (EU) No 996/2010 is no longer the sole quality characteristic of major investigation. Above and beyond the quality of the investigation report and the safety recommendations, the perception of the investigation process by the public, the relatives of accident victims, and politicians should not be underestimated.

We as safety investigators know that an investigation can only be effective if the investigation process is clear and investigation results and subsequent safety recommendations are comprehensible. The acceptance and perception of an independent and successful investigation by the parties either directly or indirectly involved is indispensable. In order to achieve this, the relatives, the media, and politicians must be provided with information.

A major investigation is effective if:

- Rights of safety investigation authorities of states involved are adhered to in accordance with ICAO Annex 13 and proper exchange of information occurs
- The investigation process is transparent
- The final investigation report lists the causes and the subsequent safety recommendations are comprehensible
- The media receives sound facts about the ongoing investigation
- Relatives receive sound facts about the ongoing investigation ahead of the media
- The ministry responsible for the safety investigation authority and other politicians receive sound facts about the ongoing investigation
- Police and the public prosecution department not only receive sound facts about the ongoing investigation, but exchange information in accordance with valid Regulations (in Europe: Regulation (EU) No 996/2010; in Germany: Law Relating to the Investigation into Accidents and Incidents Associated with the Operation of Civil Aircraft (FIUUG))
- Licensing and regulating authorities are involved in accordance with Regulations (in Europe: EASA; in Germany: Luftfahrt-Bundesamt (LBA), and ATM providers if appropriate)
- Appropriate and objective attention (in accordance with the regulations) to enquiries and demands of legal advisers (solicitors) of parties involved is given

If these aspects are viewed as task breakdown of a safety investigation authority it becomes clear that a major investigation can be a challenge. The safety investigation authority must focus on their independence which must not be compromised. However: The task breakdown also shows very clearly that independence should not be confused with isolation of the safety investigation authority. The organisation of the safety investigation authority and the individual investigators in charge have to take care of the independence of the investigation and the communication with parties involved.

I have almost 30 years' experience as investigator in different capacities during varied investigations. My experience and the development of the regulations show me, it is possible to put independence in the centre of attention and not isolate the safety investigation authority in the process. It is my opinion that this concept can be implemented in Germany, Europe, and many other places in the world.

As investigator in charge at the BFU I can say that the BFU has consequently implemented the theme of the ISASI 2015 meeting "Independence does not mean isolation" since the Überlingen accident.

The establishment of the European and national regulations (Regulation (EU) No 996/2010 and the Law Relating to the Investigation into Accidents and Incidents Associated with the Operation of Civil Aircraft) created the necessary framework.

Some tools and methods are necessary or at least helpful ensuring "we are not isolating".

One example is the communications model which we basically use during major investigations. This communications model defines three responsibilities:

1. The director of the BFU has the overall responsibility.
He decides if the investigation is a major investigation and appoints an investigator in charge.
2. The investigator in charge is responsible for the extent and depth of the investigation.
3. The spokesperson is responsible for public relations.

The communications model describes the process for the exchange of information during an ongoing investigation. The investigator in charge reports to the director and the spokesperson the determined facts of the ongoing investigation. Initially the intervals of such reports are rather frequent and become larger over time. The validity of the information is discussed and it is established which pieces of information will be passed on to which party at what time. The communications model also defines who provides outside parties with relevant information and present results of the ongoing investigation. The tasks are distributed as follows:

- The director of the BFU informs the Ministry of Transport and Digital Infrastructure and answers questions of politicians
- The investigator in charge pays attention to the interface prosecution authorities, such as police and public prosecution. He also informs persons involved and relatives of accident victims. The investigator in charge is also responsible for everyone involved in the accident and their legal advisers.
- The spokesperson is responsible for all media enquiries and also coordinates interview requests with the director and the investigator in charge.

Everyone involved in this communications process is aware that only coordinated and secured factual information is given to outside parties. In addition, information is given in general terms regarding the investigation and reporting process.

A similar communication model is appropriate for the team work with accredited representatives (AccRep) and advisers. At a very early stage of an investigation process the investigator in charge and the AccRep, respectively, should define responsibilities and rules for communication. We have to keep in mind that AccReps and advisers are not completely independent. AccReps have to keep their national SIAs informed and advisers are in constant contact with their respective companies.

Case Study Überlingen Accident¹

On 1 July 2002 a mid-air collision in cruise flight involving a Tupolev TU154M and a Boeing B757-200 occurred in Southern Germany. The TU 154M was on a flight from Moscow, Russia, to Barcelona, Spain. The cargo airplane B757-200 was on a flight from Bergamo, Italy, to Brussels, Belgium. Both aircraft flew according to IFR (Instrument Flight Rules) and were under control of ACC Zurich. After the collision both aircraft crashed into an area north of Überlingen. There were a total of 71 people on board of the two airplanes, none of which survived the crash.

The BFU investigated the accident in accordance with ICAO Annex 13 involving other states. The final report stated the causes as follows:

Immediate Causes:

- The imminent separation infringement was not noticed by ATC in time. The instruction for the TU154M to descend was given at a time when the prescribed separation to the B757-200 could not be ensured any more.
- The TU154M crew followed the ATC instruction to descend and continued to do so even after TCAS advised them to climb. This manoeuvre was performed contrary to the generated TCAS RA.

Systemic Causes:

- The integration of ACAS/TCAS II into the system aviation was insufficient and did not correspond in all points with the system philosophy. The Regulations concerning ACAS/TCAS II published by ICAO and as a result the regulations of national aeronautical authorities, operational and procedural instructions of the TCAS manufacturer and the operators were not standardised, incomplete and partially contradictory.
- Management and quality assurance of the air navigation service company did not ensure that during the night all open workstations were continuously staffed by controllers.
- Management and quality assurance of the air navigation service company tolerated for years that during times of low traffic flow at night only one controller worked and the other one retired to rest.

The description of the causes illustrates the complexity of the investigation. The international importance of the accident posed an additional challenge for the BFU. Both aircraft had foreign registrations and the passengers of the Tupolev were mainly children and young adults from Bashkortostan, Russian Federation. In addition to the investigation aspects in accordance with ICAO Annex 13 the political significance and the media attention played an important role.

The BFU gained substantial insights from this particular safety investigation. The following insights relate to this year's motto.

The accident near Überlingen explains very well the importance of an independent safety investigation, because safety deficits were identified in several places of the "system aviation". Five addresses received a total of nineteen safety recommendations.

¹ BFU File No.: AX001-2/02

With the benefit of hindsight, valuable experience can be derived from the public relations work, the assistance of family members of victims, the cooperation with the police and prosecution department.

Public Relations

The police at the accident site conducted most of the work with the media. BFU staff members in Braunschweig answered media enquiries addressed directly to the BFU. Active public relations work on site by the BFU was almost non-existent.

These experiences and others derived from investigations conducted in the last years have made clear that active public relations work after an accident and during the ongoing investigation is indispensable. It is also true that the changing media scene plays an important part. The modern media scene including the so-called social media scene, where users exchange information among themselves, make a structured and targeted approach necessary. The BFU now has a press office to meet these requirements. In regards to internal exchange of information the communications model described above is proved and tested.

Informing the relatives of accident victims

The day after the accident the relatives arrived at the site from Bashkortostan, Russian Federation, and local organisations and authorities took care of them in a very professional fashion.

In the first days after the accident the BFU did not have any direct contact with the family members of victims. In the course of the ongoing investigation relatives of victims or their representatives made direct enquiries. The investigator in charge answered these enquiries in regard to the investigation process and the results by giving factual information. After the first interim report had been published, an alleged spokesperson of the relatives asked the BFU for information concerning the investigation and said he would then inform the other relatives accordingly. At a later date it turned out that he was a legal representative working only for a small group of relatives.

Before the final report was published the BFU in Braunschweig set up a meeting where relatives could receive information ahead of the public. Only a few relatives took advantage of the meeting. It was especially tragic that one relative decided to kill the controller involved before the final report was published. He believed the controller was to be blamed for the accident.

Today Regulation (EU) No 996/2010 para 21 stipulates that all EU member states have to ensure the support of victims of accidents and their families and relatives. In Germany, the BFU supports the relatives of victims through the investigator in charge giving information to them during each phase of the investigation. The BFU also supports the responsible authorities caring for the relatives.

Similar to public relations work, the experience the BFU has made has shown how important it is to organise active and targeted information distribution for the relatives of accident victims. It is most important that the relatives receive first-hand information.

Cooperation with police and prosecution department

During the investigation into the accident near Überlingen, the cooperation with the prosecution authorities occurred in accordance with the national Law Relating to the Investigation into Accidents

and Incidents Associated with the Operation of Civil Aircraft (FIUUG). In Germany, two independent investigations take place after an accident: One conducted by the BFU and one by the prosecution department. The FIUUG describes the cooperation with "... in consultation with the local prosecuting authority...". This means that BFU and police have access to the wreckage and other evidence and have to make arrangements concerning the use of evidence. The prosecution department can decide to appoint their own experts. The investigation into the accident near Überlingen applied these principles. On site facts were determined and exchanged. After the field investigation was finished BFU and police, having different aims, conducted their investigation processes separately from each other. The police had access to the Flight Data Recorder (FDR) and the Cockpit Voice Recorder (CVR).

The BFU is of the opinion that the cooperation during the investigation was very constructive and decisions were made in mutual agreement.

After Regulation (EU) No 996/2010 para 14 was implemented information had to be assessed in regard to their sensitivity and protected accordingly. In general, data protection becomes important. Para 14 subpara 3 allows for consideration whether or not other authorities, e.g. prosecution authorities, should receive sensitive information. Germany implements this requirement together with the stipulations from the national Law Relating to the Investigation into Accidents and Incidents Associated with the Operation of Civil Aircraft. After commensurate consideration other authorities may receive information.

Case Study Fume Events²

Last year the BFU published a study on the issue of Fume Events. I am going to use this study as an example for the significance of communication in respect to this year's motto "Independence does not mean isolation".

Background and Content of the Study:

For the last few years the BFU has been receiving an increased number of reports of so-called fume events. These kinds of events include smell, smoke or vapour inside the airplane and/or health impairments of aircraft occupants. In addition, this topic was increasingly discussed among flight crew, occupational unions, the media and in political committees.

Of the accidents, serious incidents and incidents reported to the BFU between 2006 and 2013 a total of 845 cases were taken into consideration. A conjunction with cabin air could be determined in 663 reports. In 460 of these reported fume events, smell development and in 188 cases smoke development was reported. In 15 cases there was neither smell nor smoke but health impairments.

For this study, the BFU has divided the reported occurrences into the following categories:

- Fume events affecting flight safety
- Fume events possibly affecting the occupational safety of crew members
- Fume events affecting the comfort of aircraft occupants

² BFU File No.: 803.1-14

- Fume events and possible long-term effects on aircraft occupants

Relevance for Flight Safety, Flight Personnel and Passengers

The data analysis for this study showed that the criteria for a serious incident were met by some of the fume events, because the cockpit crew decided to don their oxygen masks, or one pilot was partially incapacitated. In a few of these events the safety margin was reduced such that the safe conduct of the flight was affected.

There were clear indications of health impairments in terms of occupational health for pilots and cabin crew.

The BFU came to the conclusion that compared to all reports a significant number affected the comfort of passengers only. These are reports which describe, for example, unpleasant but harmless smells.

In ten of all fume events reported to the BFU, the reporting person reported long-term health impairments at a later date. All these incidents were fume events where either oil smell or "old socks" were reported. In eight cases the BFU learned that the reporting person received medical treatment.

Analysis

The fume events taken into account in this study showed that no significant reduction of flight safety occurred. The study did show that fume events occur and can result in health impairments. With the methods of air accident investigation, the BFU cannot assess the possible long-term effects of fume events.

Safety Recommendations

The German Federal Bureau of Aircraft Accident Investigation issued four safety recommendations along with the study. Addressees were: The German Aerospace Industries Association (Bundesverband der Deutschen Luft- und Raumfahrtindustrie e.V. (BDLI)), German Aviation Association (Bundesverband der Deutschen Luftverkehrswirtschaft, BDL), and European Aviation Safety Agency (EASA). The safety recommendations aim at:

1. An improved identification and avoidance actions of cabin air contamination possibly hazardous to health.
2. Improvement of the reporting procedure
3. Improvement of the demonstration of compliance of cabin air quality during the certification process of transport aircraft
4. Assessment of a possible conjunction between long-term health impairments and fume events by a qualified institution.

Reasons for the Study and Intensive Communication

In Germany, cabin air quality and especially possible oil fumes contamination has been on the radar of the media and public for several years. The BFU received a number of reports from flight crew concerning smoke and smell developments in aircraft cabins which were associated with health impairments. Political committees and different media communicated and discussed these types of occurrences and possibly associated health impairments. The BFU had only individual cases which were classified as serious incidents.

Over time public and political pressure increased considerably. The BFU repeatedly had to appear before committees of the Deutscher Bundestag (German parliament) for hearings regarding this issue. Respective news coverage and the discussion in political committees criticised the reporting culture of airlines and the limited investigations by the BFU.

Due to this, the BFU decided to assess all reports of possible cabin air contaminations from 2006 until 2013 and publish a study in accordance with Regulation (EU) No 996/2010. In May 2014 the BFU published the study.

The study aimed at:

1. Clarify if a relevant flight safety problem exists.
2. Objectification of the issue and clear illustration of the duties and activities the BFU has in this regard.
3. Communicating the BFU point of view and the results of the study to the federal government and the political committees.

The study showed that concrete questions still needed clarification. The BFU determined no relevant flight safety issues but issued safety recommendations recommending scientific investigations to clarify open questions.

It became clear that the independence of the BFU was an important and vital factor. In addition, it was important to maintain communications with the responsible ministry and the political committees. By keeping the communications channels open political committees responded with great acceptance of the study and at the same time speculations prior to publication were prevented.

The BFU exchanged information with all addressees of safety recommendations prior to publication of the study. Due to these meetings the formulation of the safety recommendations was more precise and the addressees were prepared.

Case Study MD11³

On 27 July 2010 at King Khalid International Airport in Riyadh, Saudi Arabia, a Boeing MD11 registered in Germany and operated by a German operator suffered an accident during the landing. The Safety Department of the General Authority of Civil Aviation of the Kingdom of Saudi Arabia

³ BFU File No.: 2X003-10

conducted the investigation in accordance with ICAO Annex 13. The BFU representing the state of operator and registry and the US American National Transportation Safety Board (NTSB) representing the state of design and manufacturer participated in the investigation.

The MD-11F was on a flight from Frankfurt, Germany to Riyadh, Saudi Arabia. During the landing phase on runway 33Left in Riyadh, the MD-11F bounced during the initial firm landing, which was followed by two hard landings. The aft fuselage ruptured and the aircraft eventually stopped to the left of the runway following the collapse of the nose gear. A fire occurred in the area of the ruptured fuselage, which consumed a great portion of the fuselage and the cargo.

The proper landing technique and the bounce recovery technique were not applied. The aircraft was destroyed. The First Officer sustained serious injuries.

From the BFU point of view the investigation was effective and conducted in close cooperation with the safety investigation authorities and the advisers of the aircraft operator and aircraft manufacturer involved. The Safety Department of the General Authority of Civil Aviation of the Kingdom of Saudi Arabia issued the following safety recommendation along with the publication of the final report:

Lufthansa Cargo should consider installing Head-Up Displays (HUDs) on its MD-11F aircraft.

Despite the significant expense the aircraft operator accepted and supported the safety recommendation to equip the Lufthansa Cargo MD11 fleet with head-up displays. The safety investigation authority involved the aircraft operator early on in the decision making process regarding the safety recommendation.

The safety recommendation could not be realised because it was not possible to find a design organisation and a manufacturer for the head-up display. Several meetings between the aircraft operator, the BFU, and EASA took place as well as consultations with the Safety Department of the General Authority of Civil Aviation of the Kingdom of Saudi Arabia. These resulted in a mutual agreement that instead of a head-up display a simple indicator will be installed in the cockpit which indicates an additional lift-off after touchdown.

Subsequently, a discussion ensued lasting several months between the aircraft operator, the aircraft manufacturer, EASA, the US American Federal Aviation Administration (FAA), the NTSB, and the BFU whether or not a safety deficit even existed which could be fixed with the intended action. After the aircraft operator had conducted several demonstrations of compliance regarding the necessity and feasibility of the intended action, and discussed them with EASA the safety recommendation could finally be implemented.

This case showed quite clearly that without an independent safety investigation in accordance with ICAO Annex 13 this safety recommendation to install head-up displays would never have been made. And there we once more come full circle to this year's motto "Independence does not mean isolation". It also shows that the safety recommendation would not have been implemented if the different parties - aircraft operator, registration authority, and safety investigation authorities - had not worked together.

The BFU has learned in this process, that intended safety recommendations should not only be discussed pretty early on with the addressees, but there are cases where support in the implementation phase is absolutely necessary.

Conclusions

Effective flight safety work through the investigation of accidents and serious incidents requires independent safety investigation authorities. The requirements of international, European, and national regulations constitute a good basis for a comprehensive, verifiable, and clear investigation.

We should come to the important conclusion that a significant aspect of our work is the independence of the safety investigation authority but should not lead to isolation of the safety investigation and respective activities. On the Contrary: As important as it is for the safety investigation authorities to involve the accredited representatives and their advisers in the investigation process, as ICAO Annex 13 requires, it is equally vital to keep the communications channels with the respective ministry, the prosecution authorities, accident victims, and their relatives.

Finally, for implementation in practice “some “golden rules”. As anywhere in life, applying these “rules” might serve you well:

- Tell the truth
- Keep it simple
- Focus on factual information or (final) content of the report
- Explain the aim and process of the safety investigation.

The BFU is convinced and speaks from own experience that it is possible to implement these requirements in Germany, Europe and large parts of the world.