

**Robert Konieczka, Ph.D.**

*Court-appointed aviation expert at the District Court in Warsaw and Krakow*

bieglylot@wp.pl

*Department of Aviation Technology, Faculty of Transport, Silesian University of Technology*

robertkonieczka@polsl.pl

## Aviation as a specific field for issuing opinions by court experts

### Summary

This article attempts to provide a synthetic presentation of aviation as an area amenable to issuing opinions by court-appointed experts in the field. It presents basic issues concerning the participation of aviation experts in legal proceedings related to aviation, especially to air accidents. As indicated, aviation is an interdisciplinary industry employing highly diversified equipment. Subsequently, the article illustrates the role of an aviation expert in the proceedings conducted by law enforcement and judicial authorities, related to accident occurrence and other infringements of aviation law regulations. Basic issues that may be brought to the attention of the body conducting the proceedings are defined. The article emphasizes the uniqueness of the objectives of criminal proceedings and the activities aimed at determining the cause of an accident undertaken by the State Commission on Aircraft Accidents Investigation. The author's long-term practice as an aviation expert witness was exploited to familiarize the reader with aviation-related issues, which can be helpful in conducting a pre-trial procedure, in particular its initial phase.

**Keywords** aviation accident, aviation court expert, aviation law, causes of aviation accident, accident investigation

### Introduction

A judicial expert in the field of aviation is appointed subject to the general principles for appointing experts in preparatory and judicial proceedings. Typically, the field of expertise relates to a broad spectrum of aviation. Sometimes, however, experts in this field define clearly the scope of their specialties such as civil aviation, military aviation, hang gliding, parachuting, technical expertise, and aviation security.

A court expert in the field of broadly defined aviation is most typically appointed in connection to the following circumstances:

- aviation accident;
- aviation incident;
- personal injury or death in relation to the movement of aircraft in circumstances which do not entail any indication of an accident as hereinafter defined;
- damage to the aircraft equipment in circumstances not comprehending the above elements;
- repair of aircraft equipment;
- aviation law infringements;
- aircraft hardware functionality assessment;
- passenger rights infringements.

The above circumstances do not exhaust all the possibilities but they undoubtedly dominate the cases involving the appointment of an aviation expert. Most frequently, the expertises concern the first item on the list, e.g. an aviation accident. Within the meaning of legal regulations cited at the end of this paper, this type of event can be defined as follows:

Aviation accident means an occurrence 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. In the case of an unmanned aircraft, it takes place between the time the aircraft is ready to move with the purpose of flight until such time it comes to rest at the end of the flight and the propulsion system is shut down.

Apart from the above, the following conditions must be met to classify an occurrence as aviation accident:

- 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 persons hiding outside the areas normally available to the passengers and 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, wingtips, antennas, probes, vanes, tyres, brakes, wheels, fairings, panels, landing gear doors, windscreens, small dents or puncture holes in the aircraft skin, minor damage to main/tail rotor blades, minor hail or bird strike damage (including holes in the radome); or
- c. the aircraft is missing or is completely inaccessible.

Such definition enables distinguishing between aviation accidents and other events involving aircraft, and thus taking measures adequate to the specific group of events.

#### **Distinctness of proceedings related to aviation accident**

In Poland, the body entitled to conduct aviation accident investigations is the State Commission on Aircraft Accidents Investigation (hereinafter referred to as PKBWL (Państwowa Komisja Badania Wypadków Lotniczych)) attached to the Ministry of Transport (Infrastructure). Its primary purpose is to define the causes and circumstances of aviation incidents, whereas the overarching objective consists in formulating recommendations on preventive measures necessary to avoid similar events in the future. The Commission acts on the basis of Aviation Law and other provisions listed below.

1. The Convention on International Civil Aviation, signed on 7 December 1944 in Chicago and annexes thereto (in particular Annex 13);
2. Regulation of the European Parliament and of the Council (RE) No 996/2010 of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and repealing Directive 94/56/EC;
3. Regulation of the Minister for Transport of 18 January 2007 on accidents and incidents;
4. Regulation of the Minister of Infrastructure No 57 of 12 November 2008 on the State Commission on Aircraft Accidents Investigation;
5. Regulation of the Minister of National Defense and the Minister for Transport, Construction and Maritime Economy on cooperation between the Committee for Investigation of National Aviation

Accidents and the State Commission on Aircraft Accidents Investigation.

A distinct group (yet partially common) is made up by the provisions intended for the Committee for Investigation of National Aviation Accidents (military and law enforcement area), however, it should be noted that the rules in force in both these areas are very similar.

The Commission's findings are not decisive in terms of guilt and responsibility of those who participated in the event. They are independent and separate from any other proceedings, (e.g. preparatory, judicial or administrative actions aimed largely at passing judgment on guilt or liability) and are without prejudice thereto. What's more, the findings published in form of a report should not be used for legal purposes by people without specialist knowledge. The distinctness of the proceedings related to an aviation accident and common elements with other proceedings are shown in Figure 1. In this respect, it should be noted that pursuant to regulations cited herein, the materials of the State Commission on Aircraft Accidents Investigation are not available for the purposes of other ongoing proceedings. The provision of such materials is only possible with the authorization of the District Court in Warsaw or in Poznan in the case of civil and national aviation accidents, respectively. Subject to data protection are in particular:

- PKBWL expertises prepared in the course of the investigation;
- statements and testimonies obtained from persons in the course of accident investigation;
- correspondence between persons related to the operation of an aircraft;
- medical information about the participants of the aviation event;
- private information about the participants of the aviation event;
- recordings from on-board voice recorders;
- recordings of air traffic service providers, including copies;
- opinions expressed in the course of information analysis.

Such formulation of legal restrictions creates the need for independent gathering of similar materials by investigating authorities.

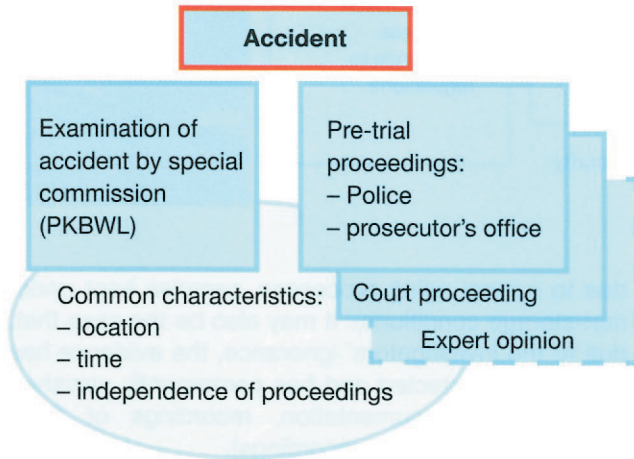
Independently of accident investigations carried out by the State Commission on Aircraft Accidents Investigation, certain preparatory proceedings may be conducted by the police and prosecution. Such cases are usually associated with the possibility of committing a criminal offense under article 177 of the Criminal Code, which states:

§1. Whoever, even inadvertently, violates the principles of land-bound, maritime or air traffic safety, thus unintentionally causing an accident in which another person sustains injuries referred to in Article 157 §1 (lasting longer than 7 days) shall be

subject to imprisonment of up to 3 years.

§2. If an accident resulted in another person's death or serious injury, the perpetrator is liable to the penalty of deprivation of liberty for a term from 6 months to 8 years.

However, the above actions may also be classified as other offenses against the security of communication as set forth in Chapter XXI of the Criminal Code.



**Fig. 1.** Illustration of distinctiveness and common features of proceedings related to aviation accidents. The expert opinion is marked with a dashed line as it is not always prepared.

Typically, an accident occurs due to the infringement of aviation regulations. These actions themselves may be penalized under the criminal section of Aviation Law, regardless of the effects of the infringements. The following are the most common infringements:

- lack of permission (e.g. licenses, certificates) to perform flight duties by the participants of the events – flight crew members, controllers, etc. (potential perpetrators);
- lack of psycho-physical abilities to perform flight duties (confirmed by aero-medical examination);
- lack of an aircraft certificate of airworthiness, meaning that an aircraft should be considered as not airworthy,
- flagrant violations of traffic distribution rules such as flights without notification outside the uncontrolled airspace (Class G airspace), unjustified lowering of flight altitude below the allowed limit, dropping objects from an aircraft, flying into the prohibited area, etc.
- lack of aircraft registration,
- lack of compulsory insurance against civil liability.

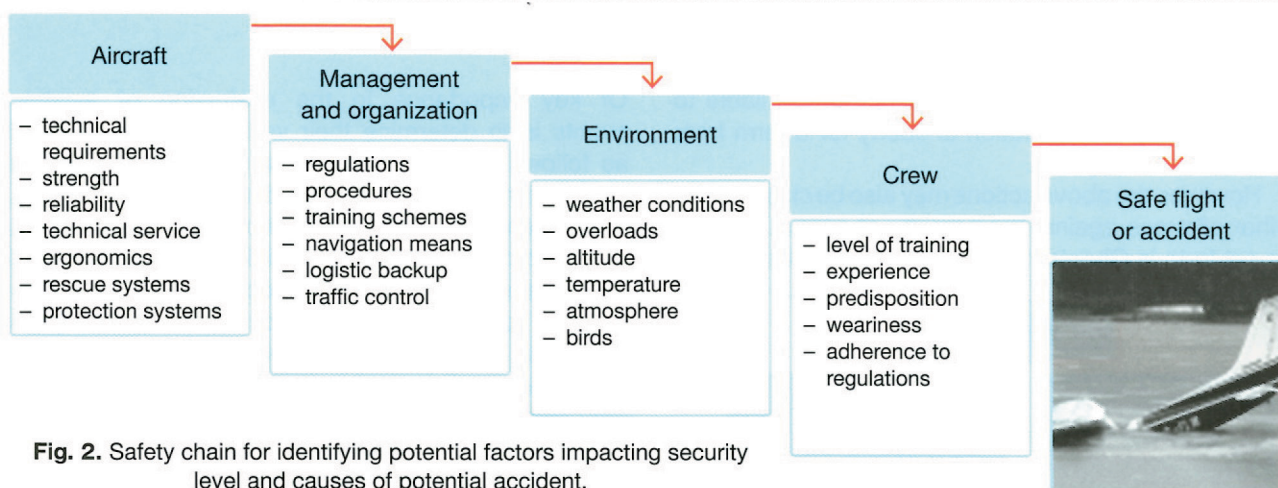
Certainly, the above merely represent the main and most common law infringements. The range of possibilities is much wider, all the more so given that the infringement cases may be isolated or they can accumulate during one flight (event).

## Causes of aviation events

Of key importance to the evaluation of aviation events is to determine their various causes, defined as follows: A direct cause is a fact, a phenomenon or a factor which directly contributed to the accident. A root cause is a factor, a phenomenon or an action, which contributed in an essential way to the accident and without which no emergency situation and thus a direct cause could have occurred. A favorable cause or most commonly favorable causes are an expression of the cause-and-effect (casual) chain and they constitute the real processing of capabilities into an actual risk of an aviation accident.

The most common root cause of aviation accidents (also events and incidents) is the broadly defined human factor, expressed through the phenomenon of committing errors. In a general sense, an error results from the fact that in the human-aircraft-aviation system environment, the first is the weakest and the most error-prone element. Each flight operation is affected by a combination of aviation-specific, external factors, harmful to man. They impact directly on the body, and indirectly on the ability to carry out tasks. Thus, the tasks have to be performed under abnormal conditions. Most often they are complex, thereby requiring continuous reception of large quantities of relevant incoming information, the assessment and analysis of current situation, swift and appropriate decision-making and the implementation of data. A man acting under conditions deviating strongly from those to which he has adapted throughout millions of years is by nature prone to committing errors, i.e. fails to act in accordance with previously established plan, and even his knowledge. Depending on the physiological and physical characteristics, skills, training, and established habits, the number of errors committed will vary. The errors can be eliminated at an early stage of their occurrence or they may go unnoticed (due to limitations in perception), thereby leading to a critical situation in terms of safety. Therefore, an error is an inherent attribute of human activities. In conclusion, a pilot (member of the aircraft crew) error as the most sensitive link in the aviation system, is the unintentional and unconscious activity (or its absence) caused by a failure to receive information necessary for the particular operation<sup>1</sup>. Pilot error may lead to deviations from the ordered flight conditions, which can endanger flight safety. Human imperfection is primarily based on the fact that a man is unable to accurately assess the hazards (to take into account all hazardous factors), given the complex nature of his actions and the impact of various external factors.

<sup>1</sup> On the basis of Klich E.: *Bezpieczeństwo lotów. Wypadki, przyczyny, profilaktyka*, Puławy 1998.



**Fig. 2.** Safety chain for identifying potential factors impacting security level and causes of potential accident.

The source of many events are also widely understood system errors which comprise minor but cumulative malfunctions of major system components (man, machine, environment). Due to its complexity, this subject is beyond the scope of this publication. However, various possible causes of errors leading to aviation accidents should be indicated at this point, including and their percentage distribution<sup>2</sup>:

- crew actions – 56%,
- technical causes – 27%,
- organization – 12%,
- logistics – 2%,
- other causes – 4%.

Therefore, as seen during the proceedings related to aviation accidents, it requires an extensive knowledge to identify the proper cause of the accident. The size of a spectrum of causes of aviation events is also illustrated in Figure 2. It can be stated with certainty that the investigating authorities have neither the knowledge nor practice necessary for such analysis. Therefore, it seems appropriate to appoint specialists (experts) on a case-to-case basis, whenever the proper identification of the phenomena associated with an aviation event is required.

### Expert participation in proceedings

Sadly, in the case of the proceedings related to aviation accidents an expert is usually appointed in the final phase, i.e. before case closure. This is an exceptionally unfavorable solution, typically used by the authorities carrying out an investigation (police, prosecution). The expert is appointed months or sometimes even years after the occurrence of the event. Meanwhile, it frequently occurs that the evidence collected is insufficient and requires supplementation, whereas it has already degraded (e.g. wreck of damaged aircraft

due to natural aging processes, samples kept under non-storage conditions). It may also be the case that, due to the investigators' ignorance, the evidence has been left unprotected and has permanently vanished (e.g. aircraft documentation, recordings of flight recorders, radar image recordings).

In the absence of the right questions, even the detailed witness testimonies may prove worthless in terms of accurate reconstruction of the flight and determining the possible causes and circumstances of the accident. This results in unjustified extension of the proceedings in order to be able to take complete evidence and close the case. In extreme cases, this may even prevent the proper handling of the proceeding and its termination as appropriate.

In this respect it should be noted that a number of authorities leading the investigation related to an aviation accident often forego the participation of an aviation expert. Their actions during the proceedings are based on generally available PKBWL report, in spite of clear and unambiguous indications contained in the provisions, which prohibit the use thereof without specialist knowledge. This leads to misleading conclusions, which do not withstand further testing and ultimately generate the following negative effects:

- unlawful use of evidentiary materials;
- lack of secured substantial evidence (e.g. wreck, documentation, fuel, etc.);
- lack or incomplete visual inspection (disregarding relevant elements);
- relying on invaluable and unverified witness testimonies, resulting in the necessity to supplement thereof, etc.

A growing legal consciousness of participants in the proceedings results in numerous appeals and complaints filed against the authorities conducting the proceedings.

<sup>2</sup> Ibidem, p. 103; Percentage distribution of serious injuries at WOSL WSOSP in the years 1986–1995.

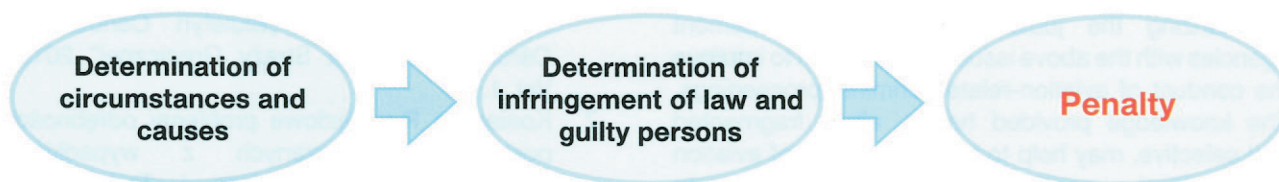


Fig. 3. Objectives of law enforcement and judicial authorities in the event of an aviation accident.

### Interdisciplinarity

Aviation is an area that comprises many different specialties representing various scientific disciplines. The most important specialties include:

- aerodynamics and flight mechanics
- general mechanics and strength of materials
- thermodynamics
- construction of aircrafts
- aircraft operation rules
- piloting technique
- electrical engineering
- electronics
- aeronautical telecommunication
- rescue
- aviation law and regulations
- air traffic
- navigation
- meteorology
- human factor
- aviation psychology
- aviation medicine.

As it can be seen, in general terms, aviation includes a number of separate specialties from different scientific disciplines. It is obvious that the expert in the field of aviation cannot be proficient and most importantly a practitioner in all these areas. Hence, for the purpose of preparing an opinion, an expert, apart from using his own knowledge, also draws on the knowledge related to other specialties, available

literature and various studies on the subject. This fact, however, should be clearly noticeable and identifiable to the authorities conducting the proceedings.

Currently, in Poland there are several dozen different types of aircrafts registered.. It is not possible for one person alone to be familiar with all these types. It is even less possible for one expert to acquire practical knowledge of all aircraft types, be it parachutes, hang gliders, paramotors, ultra-light aircrafts, gliders, helicopters or large communication services aircrafts. The various types of aircraft are shown on Fig. 4. Such an extensive range of equipment gives rise to a need to familiarize oneself very accurately with the specifics of a particular aircraft. Broad multidisciplinary expert knowledge, supported by a detailed analysis of case files and, most importantly, of the instructions concerning the aircraft and the aviation system, are the basis for issuing opinions consistent with the current state of facts.

### Summary

The present article mainly describes the circumstances and characteristics of the everyday work of court-appointed aviation experts, including interdisciplinary character of aviation, complexity of this issue, field of activity, autonomy from PKBWL's (Eng. State Commission on Aircraft Accidents Investigation) scope of operation, main causes of accidents, etc.

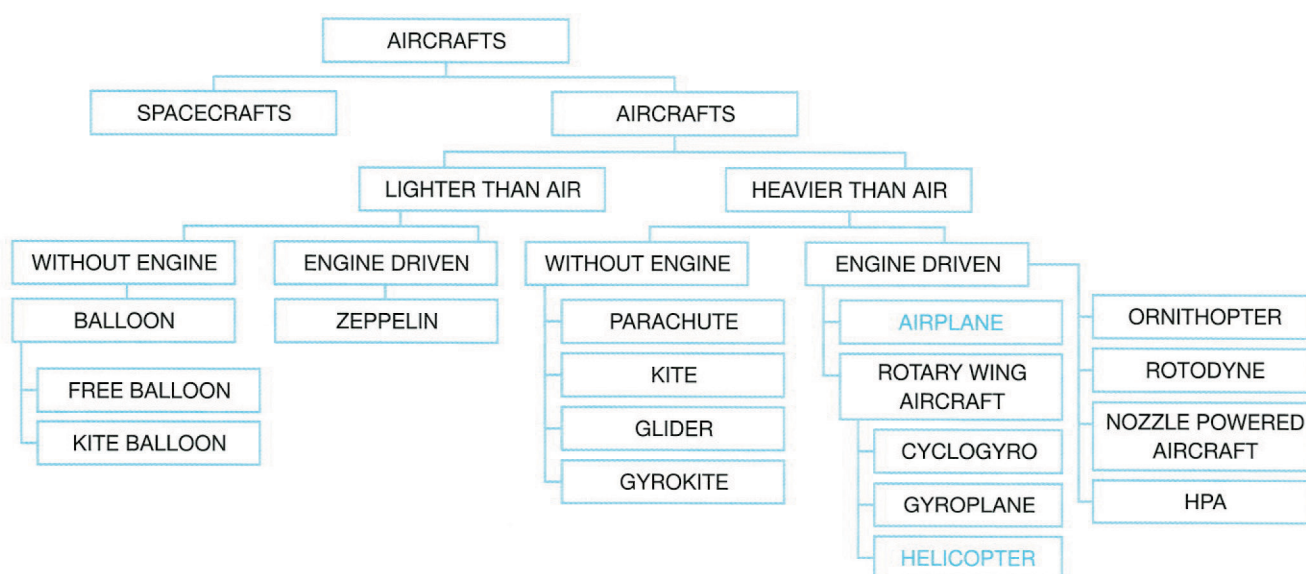


Fig. 4. General aircraft classification. The most common aircraft types (8) are indicated with light blue color.

Familiarizing the judiciary and law enforcement agencies with the above issues enable them to improve the conduct of aviation-related criminal proceedings. The knowledge provided herein, albeit fragmented and selective, may help to take advantage of aviation experts in the most effective manner, in order to conduct a proper pre-trial procedure, in particular its initial phase. Another objective of this article is to indicate the scope of possible law infringements, concerning not only criminal law, but most of all aviation law and implementing rules. Thus, the reader will be able to carry out preliminary identification of aviation law infringements and, subsequently, to take further action as appropriate. Apart from providing indispensable fundamentals, the above considerations should stimulate further broadening of knowledge of the issues discussed, which, in turn, may allow avoiding mistakes in legal proceedings.

### Sources of figures

Fig. 1, 3: author;

Fig. 2: author based on the article: „Metoda oceny bezpieczeństwa lotów z wykorzystaniem danych z procesu eksploatacji” by Zieja M., Mieja M., „Problemy Eksploatacji” 2011, Vol. 1.

Fig. 4: author based on the article: „Specyfika opiniowania przez biegłego z zakresu lotnictwa” by Konieczka R., 12th National Conference of Court-Appointed Experts. Częstochowa 2015.

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*Translation Rafał Wierzchośławski*