

# Safety Hazard and Risk in Slovak Aviation Regulations

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## Summary

Slovak Republic as a member state of EASA is bound to adopt aviation regulations. There are some terminology discrepancies when translating EASA regulations and general text from English to Slovak language. Safety hazard and safety risk in Slovak language have different meaning than in English language. The subject of the paper is therefore to explain some peculiarities in definitions according to ICAO Safety Management System, USA FAA and Slovak legislation. Terms "risk" and "hazard" according to the International Civil Aviation Organization (ICAO), the USA Federal Aviation Authority (FAA) are compared to Slovak equivalents. In Slovak administrative law the term 'hazard' is missing. Instead of the term hazard terms 'danger', 'threat' or 'danger' are used.

## KEY WORDS

safety  
hazard  
risk  
danger  
threat  
aviation legislation  
administrative law

## INTRODUCTION

Rules and regulations are important for a number of reasons. Without them there would be a total collapse of organized societies today.

Government agencies are responsible for implementing and regulating policies. Such regulations are in place to ensure that the markets run effectively. In aviation they also aim to protect consumers through safety regulations.

The implementation of the Basic Regulation and its implementing regulations by Member States is subject to the European Union oversight.

According to Article 54 of the Basic Regulation - Inspections of Member States - the Agency shall assist the Commission in monitoring such implementation by conducting standardization inspections. Upon the standardization inspection the Agency establishes an inspection report where it addresses findings identified during the inspection and which will be sent to the Member State concerned and to the Commission. In cases of non-compliance, the Commission may initiate an infringement procedure.

Aviation policy must be implemented in ways that require legislation.

Given the many ways that aviation can result in injury or harm, those involved with aviation have been pre-

occupied with preventing accidents since the earliest days of flying. Through the discipline of "flight safety," the frequency and severity of aviation occurrences have declined significantly.

Since Slovak Republic is member of the European Union by European legislation it is obliged to execute liabilities according to its membership in other aviation organizations (ICAO, EASA, EUROCONTROL). This reality is crucial point in Slovak aviation legislation. Each organization engaged in aircraft operating and engineering has to adopt safety programs for a number of reasons. Some form of accident-prevention program is usually a regulatory requirement. These requirements may take the form of laws, regulations, and directives that govern the design, construction, maintenance, and operation of aircraft. Analogous to Quality Management System (QMS), the Safety Management System (SMS) plays important role in aviation operation.

## RISK AND HAZARD CONFUSION

In many areas of life we are exposed to hazards in the form of a substance or a process which may harm us.

The terms Hazard and Risk are often used interchangeably but this simple example explains the difference between

the two. If there was snow on runway then the snow would present a slipping hazard to aircraft passing through it. If the runway was cleaned then the hazard would remain though the risk would be minimized.

When we refer to risk in relation to occupational safety and health the most commonly used definition is 'risk is the likelihood that a person may be harmed or suffers adverse health effects if exposed to a hazard.'

Generally term safety according to ICAO is defined as "the state in which the risk of harm to persons or property damage is reduced to, and maintained at or below, an acceptable level through a continuing process of hazard identification and risk management".

Risk is an assessment, expressed in terms of predicted probability and severity, of the consequence(s) of a hazard taking as reference the worst foreseeable situation [1]. The differentiation between hazards and safety risks is oftentimes a source of difficulty and confusion. In order to develop safety management practices that are relevant and effective, a clear understanding of what is a hazard and what is a safety risk is essential.

The concise Oxford Dictionary defines

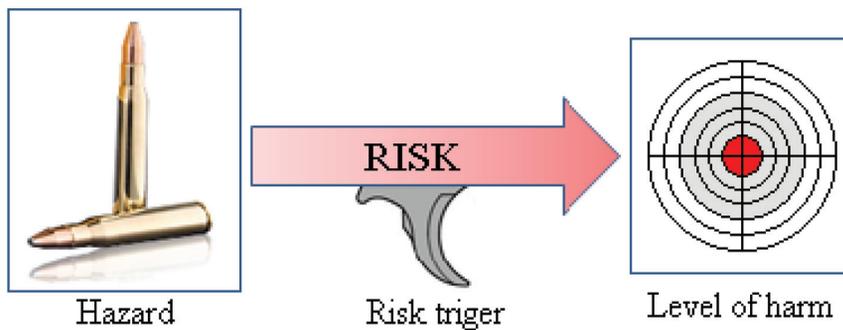


Fig.1. Risk and hazard relation

risk (noun) in terms of a hazard, chance, bad consequences, loss, etc., exposure to mischance. It defines risk (verb) in terms of: to expose to chance of injury or loss, venture on, accept the chance of. The dictionary definitions do not correspond entirely with what epidemiologists or professionals in the field of aviation would understand these terms to mean.

The meaning of the word hazard can be confusing. Often dictionaries do not give specific definitions or combine it with the term "risk". For example, one dictionary defines hazard as "a danger or risk" which helps explain why many people use the terms interchangeably.

Hazard is not deemed to be synonymous with risk although it can be an important determinant of risk. Although risk may be related to a chance event and expressed as a probability, there is much more to it than that. Probability is not an entirely haphazard one of course but relates to a number of factors which will be discussed further. A hazard is any source of potential damage, harm or adverse health effects on something or someone under certain conditions at work. Basically, a hazard can cause harm or adverse effects (to individuals as health effects or to organizations as property or equipment losses). Sometimes a hazard is referred to as being the actual harm or the health effect it caused rather than the hazard.

The characterization of risk has both quantitative and qualitative components to it. These can be described separately. One must not forget that often statements about causation are made which depend on certain assumptions. Therefore statements about risk must also be guided by indication of the uncertainty that may be associated with them. You may wish to find out more about critical appraisal of published literature, for example.

If risk is defined as the probability

of death, past risk in traveling can be empirically determined from fatality rates. Commercial aviation accidents involving large jets can result in the deaths of hundreds of people; thus, a single accident can significantly influence fatality rates. Consequently, trend analyses of fatality rates require data from time periods of roughly five years or more. These rates give poor indication of short-term changes in risk. [2]

The relationship between hazard and risk must be treated very cautiously. If all other factors are equal - especially the exposures and the people subject to them, then the risk is proportional to the hazard. However all other factors are very rarely equal.

### ICAO AND FAA RISK AND HAZARD DEFINITIONS

International air commerce is almost completely controlled by various multilateral and bilateral treaties. One of the more famous treaties, the Chicago Convention, spawned the International Civil Aviation Organization (ICAO). The ICAO is an international organization which is dedicated to aviation safety and uniformity in international aviation. International aviation safety and uniformity are self-regulating in the sense that member states agree to abide by international principles. To the extent that the member states of the ICAO have agreed upon uniform standards for navigation, engineer, design, communication and safety, etc., the rules and standards promulgated by the ICAO are binding on the member states and the aviation industry within those member states.

The Federal Aviation Administration (FAA) is tasked by the Federal Aviation Act to maintain aviation safety and to promote air commerce. Thus, the FAA wears two hats. Under one hat, the FAA promotes business growth in the aviation

industry. Additionally, the FAA regulates and enforces as necessary to maintain aviation safety.

Both organizations have their own definitions regarding aviation safety.

Hazard is defined as "condition or object with the potential of causing injuries to personnel, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function" [3].

Consequence is potential outcome(s) of the hazard. A wind of  $8\text{m}\cdot\text{s}^{-1}$  blowing directly across the runway is a hazard. A pilot may not be able to control the aircraft during takeoff or landing is one of the consequences of the hazard.

There are five types of hazards:

- natural (hurricanes, major winter storms, drought, tornadoes, thunderstorms lightning, wind shear)
- technical (aircraft and aircraft components, systems, subsystems, related equipment)
- economic (growth, recession, cost of material or equipment),
- organizational (complex organizational structures resulting in unclear responsibilities, re-organization).
- ergonomic (deficiencies in the environment the front line employees have to operate 24-hour operation with impact on individual's performance)

### HAZARD FAA DEFINITION

A hazard is defined as a "condition, event, or circumstance that could lead to or contribute to an unplanned or undesirable event". Seldom does a single hazard cause an accident. More often, an accident occurs as the result of a sequence of causes. A hazard analysis will consider system state, for example operating environment, as well as failures or malfunctions.

### HAZARD AND ITS EQUIVALENT IN THE SLOVAK WORKPLACE HEALTH AND SAFETY LEGISLATION

The term of hazard in Slovak workplace health and safety legislation doesn't exist. Instead of hazard the term of "bezpečnosť" in Slovak language (i.e. danger, dangerousness, and threat) is used (Fig. 2). Hazard in Slovak meaning is joined with gambling activities that could have different meaning to danger or threat.



Fig. 2. Natural hazard - aircraft bird strike

Danger is the state or property of working process and work environment factor that can make harm of man health. Threat is situation in which is not possible to eliminate harm of the man health. Harm – physical or mental damage. Loss - the damage, trouble, disadvantage, deprivation, etc. caused by losing something.

Since the Slovak Republic is member of JAA (Joint Aviation Authorities) and EASA (European Aviation Safety Agency) we retire all documents and are required to keep common European regulations and rules in aviation legislation. Different languages may sometimes cause different terms meaning. Danger and threat in Slovak language is known as something that causes harm or adverse effects to individuals as health effects or to organizations as property or equipment losses.

Danger: if any single object or single operation, e.g. machinery, engineering systems, materials, technology and other operating activities are characterized by sudden negative occurrence, e.g. harm to persons or property damage – it is concerned to be danger or dangerous activities. Danger can be seen as the hidden property of the object, potential to make harm [4].

Threat: when engineering object

starts its operation and its dangerous property is not accepted, when activities start with emerging danger, when materials with potential danger are actively used, then the danger is generated in space and time dimension. Threat is manifestation of danger and a way to injury or harm making [4].

### THREAT AS A POTENTIAL OF RISK

Mathematically risk can be expressed as:

$$R = P \times S \quad (1)$$

where: R – risk, P – probability (likelihood that an unsafe event or condition might occur), S – severity (the possible effects of an unsafe event or condition, taking as reference the worst foreseeable situation)

$$R = f(P, S) \quad (2)$$

$$R = \sum_i P_i \times \sum_j S_j \quad (3)$$

$$R = P \times S^C \quad (4)$$

where i, j - indexes relating to potential i – threat and j – consequence, C – express different types of consequences (based on the scale, C≥1)

Term “threat” is not used in ICAO SMS. In aviation threats are defined as “events or errors that occur beyond the influence

of the air traffic controller, increase operational complexity, and which must be managed to maintain the margins of safety” [5]. During typical ATC operations, air traffic controllers have to take into account various contextual complexities in order to manage traffic. Such complexities would include, for example, dealing with adverse meteorological conditions, airports surrounded by high mountains, congested airspace, aircraft malfunctions, and/or errors committed by other people outside of the air traffic control room (i.e. flight crews, ground staff or maintenance workers). In Slovak common use the terms danger and threat are expressed by one word only, usually as a danger that in English language means a hazard.

### ICAO RISK DEFINITION

Safety risk is defined as “the assessment, expressed in terms of predicted probability and severity, of the consequence(s) of a hazard taking as reference the worst foreseeable situation”(Fig. 3).

Risk probability is defined as the likelihood that an unsafe event or condition might occur. Risk severity is the possible effects of an unsafe event or condition, taking as reference the worst foreseeable situation. Risk management is the identification, analysis and elimination, and/or mitigation to an acceptable level of risks that threaten the capabilities of an organization.

### FAA RISK DEFINITION

Risk is the future impact of a hazard that is not controlled or eliminated. It can be viewed as future uncertainty created by the hazard. If it involves skill sets, the same situation may yield different risk [2].

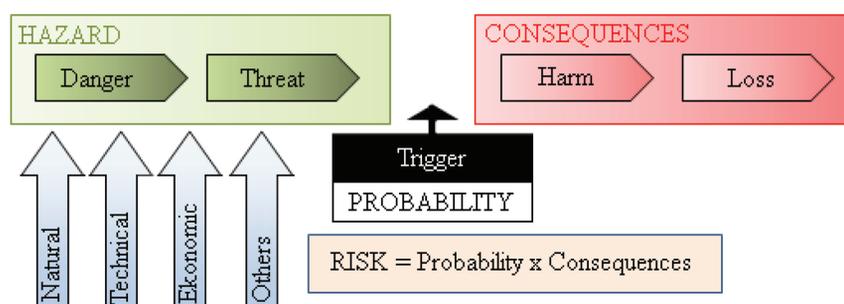


Fig. 3. Causal relation of accident generation

Assessment of risk is made by combining the severity of consequence with the likelihood of occurrence in a matrix.

## CONCLUSION

The differing use of the terms "risk" and "hazard" could be one explanation for the misunderstandings that arise in risk communication between public authorities, industry, non-governmental organizations and the general public. The results of the studies show that the terms "risk" and "hazard" are used differently by various scientific disciplines like natural sciences, social sciences and humanities and each has its own clear definition.

Risk and hazard are two words that you may hear used interchangeably, but there is a very important difference in the meaning of these two little words. Hazard is the harm that something can cause. The harm may be physical injury, damage to health, property and/or the environment. Risk is the likelihood that a hazardous material will cause harm to

people, property or the environment. In Slovak language instead of hazard we say danger or threat which has the same meaning as hazard.

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