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Approach Safety

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***Abstract*—Safety and approach are two areas which are very important in aviation. Their mutual link is also one of contemporary very important challenges that aviation faces. This article deals with an overview of the current situation in this area.**

Keywords-Aviation safety, approach, safety indicators

I. INTRODUCTION

Aviation safety is an area, to which is given increasing attention, despite the negative attitude of various stakeholders from aircraft operators to the supervising authorities. Current solutions, examining and assessing of aviation safety is provided by means of safety studies that are being developed to all changes introduced in the aviation sector.

At present, there is an effort to optimize the growth of aviation as one important transport segment. This should be achieved by allowing the introduction of IFR operations at uncontrolled aerodromes in uncontrolled airspace. Although these procedures are normally used in the world, it is a novelty in the Czech Republic, which must be tested first. [11]

II. APPROACH

Approach to landing is the final phase of the flight, when the aircraft is guided from the arrival route to a landing on the runway. It consists of four flight phases. The most important one is the final approach, which, together with landing, is the most dangerous phase of flight. This is shown in Figure 1.

The consequences of the hazard of this phase of the flight will vary based on the used approach system, which indicates a great influence on the safety. It is dependence, which should not be so serious due to actual setting of regulations.

There are several types of approach. Their current nomenclature is changed thanks to ICAO PBN manual 4th edition. Comparison of old and new nomenclature is in Table 1.

TABLE I. PBN NOMENCLATURE

Approach	
Old name	New name
Precision approach	3D approach
Approach with vertical guidance	3D approach
Non-precision approach	2D approach

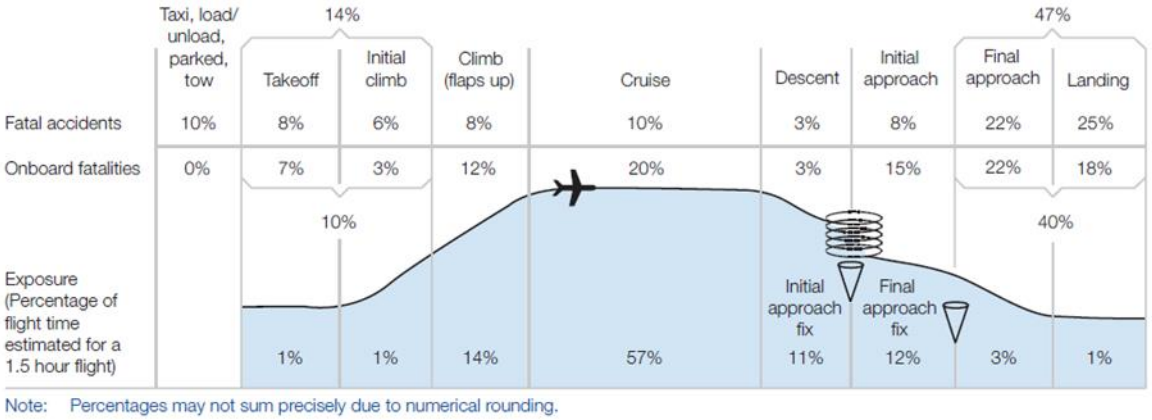

Figure 1. Percentage of fatal accidents and onboard fatalities [30]

Using a simple view on this problematic, it would thus be possible to identify that the 3D approach must be safer than the 2D approach, but this statement is not necessarily true. [16], [25], [27]

III. Aviation Safety

From the perspective of approach safety assessment has aviation safety adequate objectives to risk management - thus reducing the risk to ALARP (As Low As Reasonably Practicable). ALARP is defined in ICAO Doc. 9859 Safety Management Manual as the three areas of risk. It is shown in Figure 2.

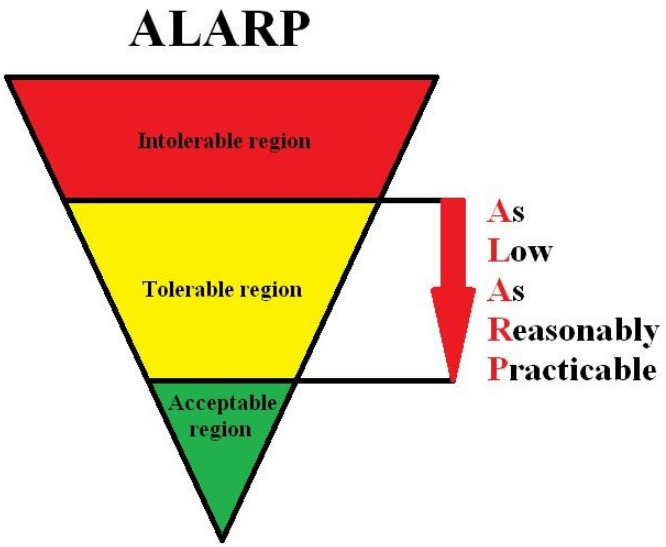

Figure 2. ALARP

More generally from the social perspective, this safety is dealt with acceptable level of safety (ALoS), which is required to define by the state in its State Safety Programme (SSP). The state should for all segments of aviation define measurable indicators and target levels that must be achieved. The main purpose of issuing SSP is reaching ALoS.

Achieving and maintaining ALoS can be problematic due to the system, which will ensure it. From the beginning, it is necessary to determine the reasonable values of ALoS, for which are mostly used safety indicators. When the safety indicators are nation widely determined, they must met two essential conditions. They must be look at from the availability point of view, respectively there must be enough data from the aviation stakeholders for their assessment, so that the indicator is conclusive. At the same time, the indicators should apply for various types of stakeholders.

In the case of an incorrect setting of an acceptable level of safety (ALoS), the aviation stakeholders could deviate from safety management to ALARP value and use the opposite system SAHARA (Set As High As Regulations Allow, Figure 3). Basically it is the same model of risk management, but the value of ALARP is moved to greater risks. This approach may not be detectable by anyone and neither the regulator may be able to detect it.

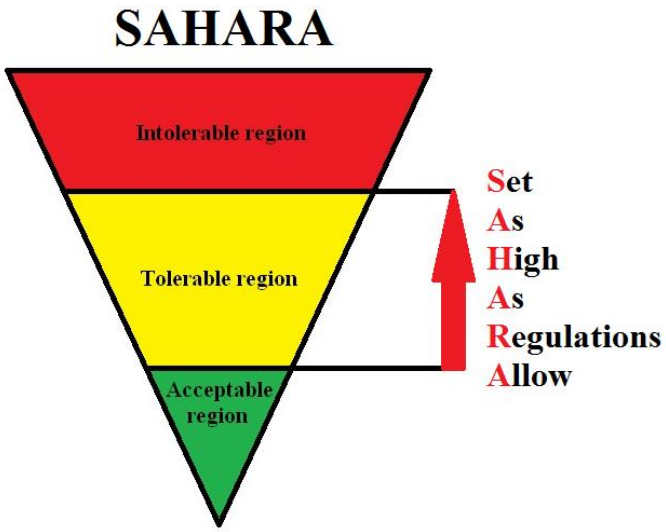

Figure 3. SAHARA

A. Safety Study

Given the need for maintaining safety it is required to create a safety study for every change that will value whether the future state will be acceptably safe. From the perspective of risk management, it appears to be most appropriate that the newly introduced change will maintain the level of safety, respectively it will increase it.

However, safety study is only a backing material for decision-making and it is in no way binding. This is defined by the fact that only in ideal condition there would be possible to create two safety studies by independent subjects with the same conclusion. In fact, the conclusions will undoubtedly vary and sometimes even quite dramatically.

Therefore, the essence of the safety study is not a final safety evaluation, but proposed safety requirements and safety recommendations. It is also possible to use the safety study as a basis for the creation of additional barriers that would increase safety. [15]

IV. IFR Approach to Uncontrolled Aerodrome

As already mentioned, IFR operations at uncontrolled aerodromes are a common phenomenon in the world. In the Czech Republic there are such procedures till now unused, so it is necessary to ensure the level of safety during the transition from the current state without IFR operations at uncontrolled aerodromes to the new one.

The introduction of IFR operations at uncontrolled aerodromes must resolve several key areas [10] such as:

1) Airspace class/type

From the airspace point of view, there must be addressed airspace class selection, minimums setting or other additional rules. [1], [6], [17], [19]

2) Approach type

For small uncontrolled aerodrome, transformation from VFR to IFR traffic is very substantial benefit, largely thanks to allowing scheduling of flights at the aerodrome with a high

probability of landing. Therefore, the operation will not be limited by the VMC. From this perspective, it is irrelevant for the aerodrome what type of approach will be implemented in this first implementation step, whether 2D or 3D. [7], [13], [21], [29]

3) Approach system type

The most appropriate approach system is the GNSS, because it means the lowest possible deployment costs. [2], [9], [14], [18], [24], [26]

4) Requirements for aerodrome equipment

Required aerodrome equipment is dependent on the approach system, regulations and on the requirements of the CAA. [21], [29], [11]

5) ATS requirements

At an uncontrolled aerodrome, where the IFR traffic will be introduced, it is necessary to provide ATS services as ATC or AFIS. [12], [16]

6) Maintaining an acceptable level of safety

The last major requirement is to maintain an acceptable level of safety in the implementation and after the introduction of a new type of operation. [3], [15], [22], [23], [25], [27], [28]

In the Czech Republic, all these areas are currently addressed by the working group led by the Ministry of Transport of the Czech Republic, which deals with pilot project of implementation of IFR operations at uncontrolled aerodromes at the airport in Hradec Kralove.

V. Conclusion

Safety assessment is crucial for aviation. Its use can be found in increasingly more changes that are approved mainly based on safety studies, since the regulations (standards and recommendations) cannot cover all the implementation cases.

Equally important is evaluating the current situation in order to have safety comparison for changes. For this evaluation is the best to use the safety indicators, which are structured queries into database (of classified events).

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