Development of a Risk Management Model for Airplane Operation

Masterarbeit

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1 Introduction

The aviation sector is becoming a more and more relevant means of transportation. This is illustrated by the fact that the air traffic sector is growing by 4.9 percent every year (Statista, 2015). However, although the aviation sector is oftentimes stated as the most secure means of transportation, there are occasionally tragic events, which result in a crash of an aircraft. Several examples of them occurred in the recent past. The most significant example are the events of the September 11. Here, an American Airlines Boeing 767 loaded with 20,000 gallons of jet fuel crashed into the north tower of the World Trade Center in New York. Minutes later, a second Boeing 767 of United Airlines sliced into the south tower. The collision caused a massive explosion , which resulted in a collapse of the towers. Close to 3,000 people died in the World Trade Center. The attackers were Islamic terrorists from Arab nations (History, 2015). Another -more recent- example is the Germanwings flight 9525. In this event on 24 March 2015, the co-pilot locked the captain out of the cockpit when he went to the lavatory and crashed the aircraft -an Airbus A320- in the Alps. All 150 people on board were killed. The co-pilot suffered from psychological diseases and committed suicide (TheGuardian, 2015). These example have a background of terroristic or criminal intentions. However, accidents, which occur due to other reasons, are even more frequent. On June 1 1999 -for example- the American Airlines flight 1420 crashed after it overran the end of the runway and collided with a structure on the airport. The captain and ten passengers were killed. The probable cause for this event were the flight crew's failure to discontinue the approach when severe thunderstorms had moved into the airport area (National Transport Safety Board, 2001). These examples indicate that the process of flying is related to risks, which may result in a crash of the aircraft. This work will identify, which risks are the most critical ones for passenger aviation and evaluate systems and concepts, how the likelihood of these risks to occur can be reduced and how their critical consequences can be minimized in order to guarantee a high level of safety on flights in order to avoid further incidents. Therefore, a risk management model should be developed, which may enhance the safety of aviation further. Out of this, the following research questions of this work arise:

RQ1: What are critical risk factors for an aircraft and how can they be approached?

RQ2: How can a risk management model for aircrafts in operation be designed?

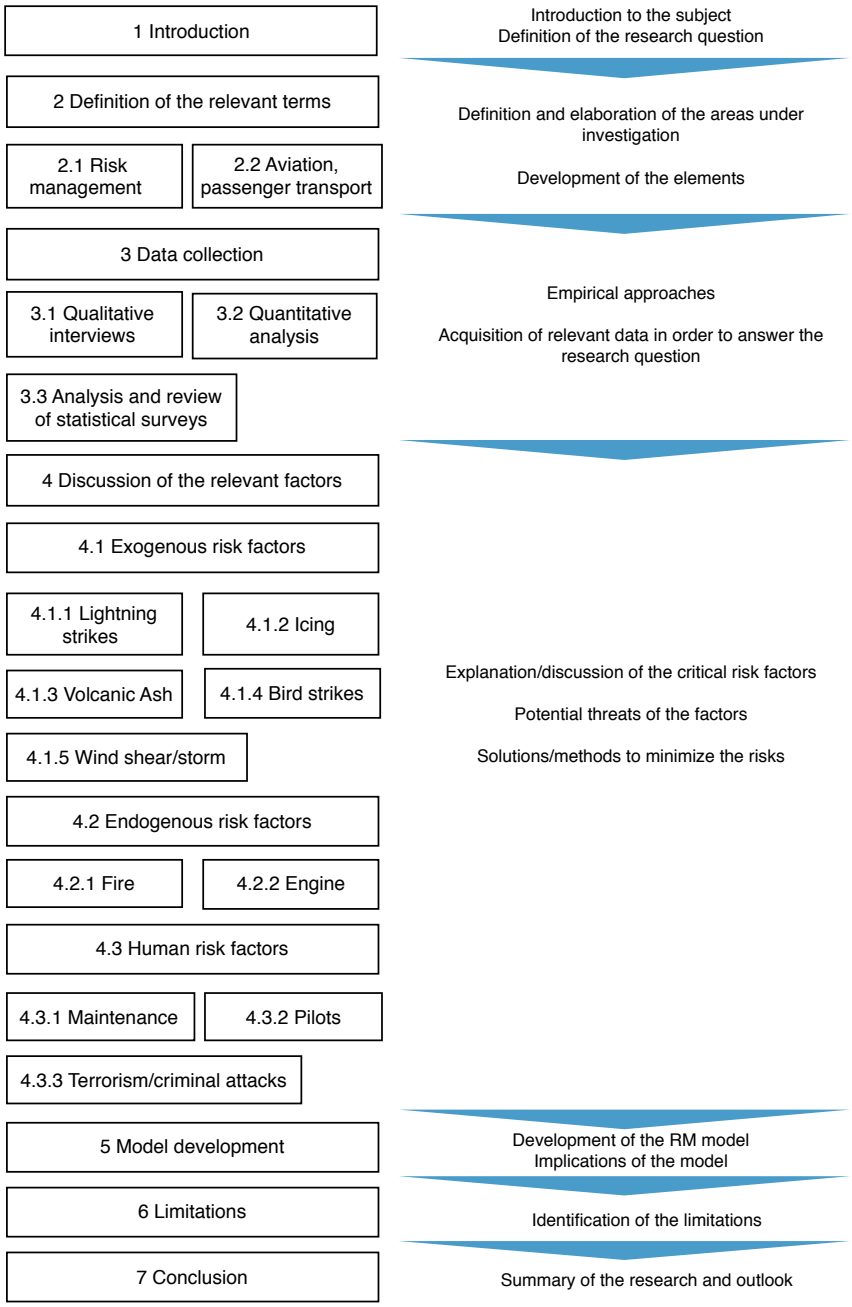

Fig. 1: Research Design

Source: Own illustration

In order to answer the research questions, the following structure of the work is selected: After this introduction, the relevant terms with regard to the research questions are defined. Then, the relevant data are collected. For this purpose, expert interviews and a quantitative survey are conducted. In addition to that, statistical surveys of the most important aviation institutions are reviewed and analyzed. After the data collection, the findings are discussed and the critical risk factors analyzed. Possible methods and concepts to counteract these risks are also given. Following that, the risk management model is developed and the research questions are answered. In the next chapter, the limitations of the work are identified. Ultimately, the conclusion of this work and an outlook of further research is given.

2 Definition of the relevant terms

2.1 Risk management

In order to answer the research question, it is important to define the relevant terms. The first aspect in this consideration is the risk management. Corbett (2004) describes risk management as „the identification, analysis, and treatment of an economic entities exposures to loss“ (Corbett, 2004: 51). The term risk is hereby defined as „the chance of something happening that will have an impact upon objectives. It is measured in terms of consequences and likelihood“ (Hodges, 2000: 7). Risk is an important factor in almost every economical consideration and has a big influence in the decision making process. However, risk management as a theory of science is a very young approach. For a long time in history, decisions were guided by instinct and superstition (Bernstein, 1996: 3). Not until the renaissance, the imagination of the humans began to challenge long existing beliefs and they started to sympathize for science. In 1654, the mathematicians Pascal and Fermat founded the theory of probability. With this knowledge, people were able to make forecasts

8 Conclusion

This research did develop a risk management model for aircrafts operating, which may serve as a framework for future risk management considerations of the aviation sector. For this development, three types of data collection were conducted: Expert interviews, a quantitative survey, and analyses of statistical surveys. These data were used to identify the most critical risk factors of the area under investigation. The risk factors can be divided into three categories: Exogenous risk factors (e.g. environmental conditions), endogenous risk factors (e.g. structural components like engines), and human risk factors (e.g. terrorism). These categories consist of different risk factors, which are discussed and evaluated. Additionally, counteractive measures and systems were elaborated, which -on the one hand- reduce the likelihood of occurrence of the factors and which-on the other hand- minimize the consequences and threats. It is shown that the risks are very small, but potential consequences severe. Hence, a model to further reduce the risks is developed. This model is cyclical and includes several steps, which range from the establishment of scenarios to critical limits of existing risks to adjustments of the safety measures. Furthermore, it may help to develop a risk-sensitive culture of organizations, since risk is a continuously confronted problem. However, the developed model is a more generic framework. Specific practical implications for all identified risk factors have to be elaborated in future researches in order to guarantee an adequate level of risk in the aviation sector.