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Comparative analysis of risk exposure and insurance premiums in the aviation industry

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Abstrakt

Der Hauptzweck dieser Arbeit ist, festzustellen, ob die Preise für Versicherungsprodukte, die auf dem Luftfahrtversicherungsmarkt angeboten werden, angemessen sind oder ob Fluggesellschaften und Passagiere bereit sind, für ihre Sicherheit mehr zu bezahlen. Die Hypothese, dass Versicherungen möglicherweise überteuert sind, wurde ausgewählt, da die Risikobewertung oft mit der Behavioral Finance Theorie assoziiert wird.

Die Luftfahrtindustrie ist ein hochentwickelter Markt, der aus verschiedenen Elementen besteht, die in den Kapiteln zwei und drei beschrieben werden. Ein weiterer herausforderndер Aspekt dieser Arbeit bestand darin, zu ermitteln, inwieweit eine tatsächliche Risikoexposition in der Luftfahrtindustrie am Markt dargestellt wird. Die Ermittlung der Risikoexposition wird in Kapitel vier beschrieben. Die rasante Entwicklung des technischen Fortschritts in der Luftfahrtindustrie ist ziemlich transparent, aber wie der Luftverkehrsversicherungsmarkt auf solche Entwicklungen reagiert, ist für Menschen, die sich beruflich nicht an diesem spezifischen Markt beteiligen, nicht völlig klar. Ziel dieser Arbeit war, die Luftverkehrsrisiken und die sich ändernden Tendenzen der Versicherungsprämien in der Luftfahrtindustrie zu analysieren, um zu untersuchen, ob der Luftfahrtversicherungsmarkt den technologischen Fortschritt und die Sicherheitsentwicklung in der Luftfahrt oder im Versicherungsbereich angemessen widerspiegelt. Die Produktversorgung wird von psychologischen und sozialen Faktoren beeinflusst.

Abstract

The main purpose of this thesis was to determine whether the prices for insurance products supplied on the aviation insurance market are reasonable or if airline companies and passengers are overpaying for securing their safety. The hypothesis that insurance policies could be potentially overpriced was chosen considering the opinion that understanding risk exposure is often associated with the behavioral finance theory.

The aviation industry is a sophisticated field, which consists of various elements, described in the chapters two and three. Another challenging aspect of this thesis was to determine to what extent an actual risk exposure in the aviation industry is presented on the market. The identification of risk exposure is described in chapter four. The rapid development of technological progress in the aviation industry is quite transparent, but how the airline insurance market reacts to such developments might not be completely clear to people who are not professionally involved in this specific market. In this context, the aim of this thesis was to analyze the aviation risks and changing tendencies in insurance premiums in the aviation industry, in order to investigate whether the airline insurance market reflects the technological progress and safety developments in aviation, or if the insurance product supply is influenced by psychological and social factors.

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1. Introduction

Once you have tasted flight, you will forever walk the earth with your eyes turned skyward, for there you have been, and there you will always long to return. – Leonardo da Vinci[1]

The aviation industry is a sophisticated field which consists of various elements, such as (a) production of an aircraft (such as helicopters, airplanes, or private jets), (b) the service industry (for example, an aircraft's operating function, performed by cargo airlines) (c) functionality of airports and (d) an independent industry sector - military aviation (cf. Milton 2008: xv). This thesis focuses on the commercial aviation industry, which aims to provide passengers with transportation services (Cambridge Dictionary 2014). From a regular passenger's perspective, it is interesting to explore which factors might influence people's perception of possible risk exposure while flying (cf. Baker 2014: 59). Another challenging aspect of this thesis is to determine to what extent (in comparison with other transportation industries) an actual risk exposure in the aviation industry is present on the market. The rapid development of technological progress in the aviation industry is quite transparent, but how the airline insurance market reacts to such developments might not be completely clear to people who are not professionally involved in this specific market (AON Risk Solutions 2016: 4). In this context, the aim of this thesis is to analyze the aviation risks and changing tendencies in insurance premiums in the aviation industry, in order to investigate whether the airline insurance market adequately reflects the technological progress and safety developments in aviation, or if the insurance product supply is influenced by psychological and social factors (cf. Fischhoff et al. 1978: 128).

[1]Although this quote is widely attributed to da Vinci, its origins cannot be verified (cf. English n.d.).

Given the complexity of this subject, this thesis introduces general definitions of risk and insurance in chapter two.[2] It concentrates on the types of regular insurance products which currently exist in the aviation industry, how the insurance market has been shaped by the events of 9/11, and the aviation industry's vulnerability to terrorism (cf. Hartwig 2006: 1).

Chapter three focuses on the factors that potentially influence the pricing of insurance premiums in the aviation industry, which may result in overpricing insurance policies. My analysis takes the following aspects into account: psychological aspects, political and economic factors, information asymmetries and the possible impact of mass media on the insurance market. In particular, psychological aspects are important, as it is possible that insurers use them to their advantage to set higher prices for their products (Forbes 2009: 135).

The goal of the fourth chapter is to perform a comparative analysis of passengers' current risk exposure when using different types of transportation. The analysis is based on statistical data of fatality rates in the United States in four transportation industries: highway, railway, maritime and aviation. In this section, each transportation mode is analyzed separately using a time scale of 35 years, followed by a comparison of fatality risk exposure using all of the aforementioned transportation industries. Another goal of this chapter is to identify the causes of incidents that occur in aviation and have resulted in major losses to the industry. For a further understanding of the complexity of each fatal accident in aviation, this chapter concludes the analysis with a detailed overview of the most disastrous aviation accidents in history (cf. Savage 2013: 10-20).

The fifth chapter focuses on the airline insurance market. This section of my thesis covers the analysis of insurance premiums in the aviation industry and how they have developed over time (AON Risk Solutions 2016: 4). Additionally, it includes an analysis of the importance and development of the reinsurance market for the aviation industry (cf. Carter 1983: 457). Another important aspect is personal air-travel insurance purchased by passengers directly. This type of insurance is not obligatory. Therefore, it may be associated with overpricing,

[2]See Reavis (2012: 3f) for more specific definitions.

psychological factors and behavioral finance. The latter is described in the third chapter of this thesis. In this regard, the aim of this analysis is to find out whether the insurance market is overpriced for airline companies and/or passengers, or if the aviation insurance market has achieved equilibrium (cf. McDonald and Korcok 2009).

I will conclude my research by investigating whether there is a logical connection between technological developments in the field of aviation in general and the airline insurance market in particular (AON Risk Solutions 2016: 4). Also, the purpose of this thesis is to conclude whether the insurance market reflects risk exposure accordingly, or if external factors, such as mass media or society, play a significant role in shaping the industry (Lo 2013: 1255).

2. Risk and insurance

Insurance products play an important role in modern society, and the insurance industry generates considerable revenue. People tend to decrease risks in their everyday lives by signing policy contracts and by paying premiums to be able to submit claims in case something happens (Reavis 2012: 1). During the past few decades, the variety of types of insurance and the extent of insurance coverage have grown noticeably in terms of products supplied on the market, which gave rise to significant developments in this sector as a whole (Baker and Simon 2002: 3).

This chapter introduces general definitions of insurance and risk, which should be sufficient for a further understanding of the specificity and the characteristics of airline insurance.

2.1 Risk and insurance in general terms

Insurance can be described as a pool in which a group of individuals contributes their capital independently. Therefore, in the event of misfortune and materialization of affiliated damages, each of these individuals could receive financial compensation which covers their losses (Reavis 2012: 2). Insurance can also be defined as a market transaction where individuals purchase products to be secured against accidental future losses (Straw 2003: 205).

Based on the definitions above, it becomes clear that the purpose of insurance is to relocate risks from a person or a legal entity to an insurance provider. Said provider measures volumes of probable future losses, estimates probabilities of risk exposures and calculates losses in monetary amounts (Williams 2006: 2).

The goal of insurance products is to assess risks as precisely as possible. In this regard, it is important to note what constitutes a risk according to the insurance market. The insurance business commonly portrays risk as a form of uncertainty. This uncertainty concerns both the extent to which a person or a legal entity might expect harm, damages, or associated costs, and when they could arise (Reavis 2012: 3).

The problem associated with risk assessment lies in an inability to express a loss in pecuniary terms. For example, it is not difficult to estimate the value of a home on the one hand, but on the other hand, it is impossible to calculate what amount of money could compensate claimants for the loss of memories and feelings they experienced in this home (Williams 2006: 3).

Nevertheless, in accordance with the rules of the insurance market, it is necessary to identify risk as a variable which is assessable, quantitative and weighable. To be able to estimate any hazard, an insurance company must consolidate various uncertainties under identical categories, in order to be able to implement "the law of large numbers" and make a statistical approach for risk assessment visible (Reavis 2012: 3).

In this regard, the insurance market presents risk as a loss exposure, which can be seen as "a thing or a subject to the possibility of a loss" (Skipper and Kwon 2007: 20). Two other elements of insurance are loss and claim. Loss is a devaluation of an item, which appears due to an unexpected accident (such accidents usually cause harm, impairments, traumas and other damages), whereas a claim is an appeal made by a contractual party for compensation of a loss they experienced as a result of another party. Said party can be either a corporate counterparty, legal entity, single person or a group of individuals (Reavis 2012: 5).

Additionally, insurance can be seen as an indeterminate and highly diversified tool which depends on risks in different business sectors, specific regulations and on customers (both companies and individuals) that pay premiums to cover their risks (Ewald 1991: 197).

Considering the specificity of my research in the aviation industry, the following subsection will briefly present the complexity of the aviation industry and focus mainly on the types of products available on the airline insurance market.

2.2 Aspects of aviation insurance

The aviation industry is crucial for promoting research and development in the field of aviation insurance. Mass media and scientific articles provide us with a constant overview of technological progress in the aircraft industry worldwide (Vértesy 2016: 1-3). Even during the financial crisis, the aviation industry continued to develop and expand (Vespermann and Holztrattner 2010: 10). The aviation insurance industry has been expanding drastically as well, taking into account the premiums in the amount of USD 6,950 in 2002 versus USD 2,830 in 2000 (Harding et al. 2002: 3).

Nowadays, the aviation industry can be defined by using the following key criteria:

- Airlines – passenger airlines or cargo airlines;
- Aircraft industry – the aircraft manufacturing industry dominated by Airbus and Boeing;
- Airports – "providers of ground infrastructure";
- Institutions – "private, national and supranational institutions" such as the Federal Aviation Administration, the International Air Transport Association, or the International Civil Aviation Organization (Vespermann and Holztrattner 2010: 13-20).

Each part of the industry experiences growth and develops its functionality, production, monitoring system and therefore its revenue (Vespermann and Holztrattner 2010: 21). The first aforementioned criterion of the aviation industry (in particular, passenger airlines) is the key scope of this thesis in terms of risk exposure analysis and its focus on the insurance market. The aviation insurance market is a very clearly defined and specified branch in terms of its approach to calculating premiums and its clientele. Insurance companies in this industry offer coverage for each of the four aspects of the aviation industry described above (Gasson 2012: 1).

2.2.1 Hull aircraft insurance

Hull insurance covers any physical damage to the aircraft itself (Gasson 2012: 1). Aircraft risks are associated with different types of perils or with being completely destroyed or lost. Exceptions include the illegal use of an aircraft (Rubin 2002: 22). The extent of the damage depends on whether an aircraft is flying or located on the ground; therefore, the premium rates for ground risks are usually less than those for flight risks. The value of an aircraft is estimated when signing the insurance policy contract. However, in the event of aircraft damage, the basis for the claim would be an aircraft's impaired value, i.e. the fair value of an aircraft at the moment of an accident. It is also possible to update the terms of an insurance contract, where both parties can agree on a specific basis value for a claim in the event of total damage to an aircraft. For minor perils, there are usually issues of corresponding deductibles. The aim of airlines is to obtain the lowest possible deductibles from an insurance company. Insurance companies mostly offer varieties of premiums frames with different approaches for deductible possibilities; therefore, it is realistic to agree on minimum deductibles (cf. Whipp 2011).

2.2.2 Aircraft liability insurance

Aircraft liability insurance refers to the obligatory liability toward passengers and third-party individuals (Rubin 2002: 22). Both types of insurance are mandatory, which means that a government establishes regulatory requirements for national insurance law. On the one hand, a range of insuring parties are required to pay fixed premiums and, on the other hand, insurers are obliged to provide compensation for material damage. This also applies to damage which affects the public interest (Kulakova 2011: 119-120).

2.2.3 Passenger liability insurance

An airline is obliged to provide compensation to a passenger in the event of an accident which could be fatal or have caused bodily injury. The responsibilities of airlines are listed in the International Convention for the Unification of Certain Rules Relating to International Carriage by Air, which was originally approved by the Warsaw Convention in 1929 (Hjalsted 1982: 91-92). Nowadays, legal liability toward passengers is mandatory on an international level. The Montreal Convention regulates the requirements for compensations in case of death or injury of a passenger. The minimum compensation is usually covered by a state legislation (cf. Montreal Convention 1999: 64, Chapter III Article 17). In the United States, the Code of Federal Regulations dictates that the minimum limit per passenger is USD 300, 000 (Legal Information Institute n.d.-a). In Russia, the minimum compensation is RUB 2,000,000 per passenger (*Federal Law* 2012. Article 8 §2 (2)), and in India the limit is 1,250,000 francs (Directorate General of Civil Aviation[3] 2009).

Insurance companies' policies take these legal requirements into account, whereas airlines usually aim to obtain the best coverage, which defrays the legally indicated limits. Some airlines might consider insurance products which cover both liability toward passengers and third parties. As Whipp (2011) notes:

> It would not be uncommon for insurers to impose 'passenger caps' on certain areas of operation to limit their liability on a 'per passenger' basis, so this should be considered and negotiated should the need arise, with particular reference to their lease/finance agreements, to ensure there are no coverage shortfalls. A 'passenger cap', for example, might be included if operators were regularly flying to the USA, given the litigious nature of this country, i.e. 'passenger liability in respect of operations within the USA would be limited to US$500,000 each and every passenger'.

2.2.4 Third-party liability insurance

Third-party liability is a mandatory compensation for the damage caused by an airline to any third party. Such insurance compensation is regulated by state legislation in different countries (cf. Rome Convention 1952). The situation is regulated in the European Union as follows:

> Regulation 785/2004 imposes minimum insurance requirements that correspond to the maximum take-off mass (MTOM) of aircraft specified in the certificate of airworthiness. This approach reflects the relationship between the weight and the potential third party damage that can be caused by each type of aircraft (European Commission 2008).

Insurance companies offer policies that cover the damages toward persons (excluding employees of an airline, the operating crew, and passengers) caused

[3]Referred to hereinafter as "DGCA."

by airlines due to aircraft accidents. In some cases, insurance coverage for the operating crew can be included in third-party liability insurance (Whipp 2011).

2.2.5 The war and terrorism risk

Airlines have been vulnerable to terrorist attacks long before September 11, 2001 (Liedtke and Courbage 2002: 1). However, the amount of claims which arose from the events of 9/11 and discussions about whether insurance companies would have to cover these losses inevitably changed the approach toward such disasters (Liedtke and Courbage 2002: 150). As a result, the Aviation Insurance Clauses Group[4] introduced the exclusion clause AVN48C to the industry; this clause prevents companies from having claims for risks such as war, revolution, sabotage, the use of nuclear weapon, hi-jacking, among other things (AICG 2006). Airlines face problems concerning what is included in war risk insurance. It is possible to obtain extra insurance coverage for the risks which are excluded in the clause or to take out hull war insurance which also covers some of the risks listed under AVN48C (Whipp 2011). Section 2.3 provides an in-depth analysis of how this type of insurance has changed following the events of 9/11.

2.2.6 Personal accident insurance

According to Barclays, personal accident insurance entails coverage for severe injuries or death. This insurance is suitable for any possible accidents in life; it does not specify whether flight accident insurance is included or not (cf. Barclay's Bank PLC n.d.). Zurich Insurance Group's personal accident insurance policy includes accident insurance for passengers, but not for the operating crew (cf. Zurich Australian Insurance Limited 2015: 11). The Allianz Group provides mandatory types of aviation insurance, as well as additional personal accident insurance, which insure individuals against risks they may face during the flight. This insurance product is suitable for passengers and the operating crew (cf. Allianz Insurance 2017). In some cases, this type of insurance compensates the

[4]Referred to hereinafter as "AICG."

losses which affect staff in the aviation industry. Examples include the operating crew, pilots, or baggage handlers (cf. Aviation Underwriters.com 2017).

2.3 The events surrounding 9/11 and reshaping the insurance market

The terrorist attacks that took place on September 11, 2001 caused the death of almost 3,000 people and incurred costs of approximately USD 200 billion. The insurance market changed drastically. Overall insurance claims totaled almost USD 36 billion: approximately USD 4 billion accounted for aviation liability and USD 1 billion for aviation hull (Hartwig 2006: 1).

These events are considered to be among those which have had the most negative impact on the insurance market in the United States: 9/11 caused twice as many losses as Hurricane Andrew in 1992, which were approximately USD 20 billion (Towers Watson 2001: 4).

Before the events of 9/11, the war risk insurance provided by the Federal Aviation Administration (FAA) would cover losses and airlines did not have to pay any insurance premiums. The United States Department of Defense (DOD) would have to compensate the FAA in these cases. Premiums were determined only for particular destinations with tense political situations. In 1991, some airlines cancelled flights to Israel due to political instability and the growing probability of terrorism. This resulted in increased insurance premium costs, which rose from USD 6,000 to USD 125,000 per flight. The FAA did not provide insurance for flights to Israel, except for the flights from Tel Aviv to New York for military staff only and, as an exception, coverage for American passengers who had return flights (Elias et al. 2014: 5).

After the 9/11 attacks, insurance companies immediately excluded war risk coverage from third-party liability insurance products. The newly introduced war risk insurance product was expensive, while the coverage it offered decreased significantly. As a result, the costs of insurance increased to USD 1.4 billion compared to pre-9/11 insurance premiums of USD 850 million (9/11 Memorial Website n.d.: 5). The FAA introduced the Aviation War Risk Insurance program, while according to the statue 49 U.S.C. § 44301 et seq., war risk insurance coverage had to be provided to airlines registered in the United States (Elias et al. 2014: 2). The limits for compensation were determined in the policies: airline insurance would only cover hull, passengers and members of the crew. A war risk insurance policy for third parties had to be purchased separately at a price that corresponded to commercial rates. Moreover, the aforementioned statute stipulates the maximum amount of policies as follows:

> [...] in no event shall the total premium paid by the air carrier for the policy, as amended, be more than twice the premium that the air carrier was paying to the Department of Transportation for its third party policy as of June 19, 2002 (Legal Information Institute n.d.-b).

The events of 9/11 changed the insurance market dramatically, making insurance products for the risk of terrorism too costly and almost impossible to purchase. Consequently, the United States Congress introduced the Terrorism Risk Insurance Act of 2002, which established the reinsurance program for terrorism losses (Elias et al. 2014: 6).

Elias et al. (2014: 15-16) provide details of the Terrorism Risk Insurance Act and its accompanying Travel Insurance Act and Aviation War Risk Insurance as follows:

> The TRIA program does not provide coverage directly to businesses at risk of terrorism losses, but rather provides government reinsurance for private insurers offering particular lines of commercial property/casualty coverage. These insurers are required to offer terrorism coverage and would thus cover any losses due to terrorism. Assuming certain conditions are met, the TRIA program would then reimburse the private insurers for some amount of their losses.
>
> TRIA has no provision for premiums to be paid for the government coverage. There is no "TRIA Fund" in the Treasury equivalent to FAA's Aviation War Risk Insurance Fund. Any losses covered under TRIA would be paid from the government's general fund. There are no upfront premiums, but the act provides for a post-event recoupment fee on commercial insurance policies to recover the government's costs. Depending on the size of the losses, this recoupment is either mandatory or may be applied at the discretion of the Secretary of the Treasury.
>
> TRIA coverage is considerably more limited than federal aviation war risk insurance. Because it operates through private insurers, whatever limits or deductibles applying to

> an insured under the private insurance policy would also apply for TRIA coverage, and each insurer must meet a substantial general deductible. In addition, the circumstances under which TRIA coverage applies are much more limited than for aviation war risk insurance. Before any federal funds would flow under TRIA, a minimum total of $100 million in insured losses must have occurred due a terrorist act. The acts which could be certified to count against this $100 million threshold are much narrower than the acts that would trigger federal aviation war risk insurance.
>
> There are no federal limits on the cost of terrorism coverage under TRIA. The statute requires private insurers to offer coverage under the same terms as insurance against losses from causes other than terrorism, but these insurers may charge a separate premium for this coverage and the law does not specifically limit this premium. Terrorism premiums, however, may be limited under state laws regulating insurance.

Initially, the Terrorism Risk Insurance Act was considered to be a short-term measure (Elias et al. 2014: 11). However, considering the rise in terrorist attacks as a global issue, the law was amended a number of times and extended until the end of 2020 (National Association of Insurance Commissioners n.d.).

Another insurance alternative was introduced to the aviation insurance market: “captive insurance” (Captive.com 2014). The largest airlines in the world began to discuss the possibility of establishing a single insurance company which would cover the costs associated with terrorism. However, this meant that ticket prices for flights would increase significantly (9/11 Memorial Website n.d.: 5). This project was unsuccessful, and most airlines continued to rely on government support (OECD 2005: 124).

The main goal of all the measures undertaken thus far has been to ensure people’s safety. Unfortunately, even nowadays the risk of terrorism and the cost of coverage associated with it remain questionable (Hartwig 2006: 1), and the extent of damage may be enormous. Hence, the prices suggested by insurance companies are considered to be high and might impose a major burden on the aviation industry (9/11 Memorial Website n.d.: 5).

3. Factors influencing passengers' perception of risk exposure in the aviation industry

People experience a number of psychological issues during flights for various reasons. There are theories that they stem from the biological inability of human beings to fly and to handle the stress that the human body endures on an airplane (Bor and Hubbard 2006: 13). The fear of air travelling can be influenced by media coverage, provoking insecurities in people's minds (Baker 2014: 59). A country's political situation and social environment may also have an impact on people's perception of travelling, considering that most individuals would like to have sufficient funds to reach their desired destination without the risk of strikes or other military problems (O'Connor 2001: 12). Assuming the existence of an indirect correlation between a destination's perceived risk and a decision to purchase an insurance product (Lo 2013: 1255), this chapter introduces the factors that might have an impact on how passengers perceive risk.

3.1 Psychology

The psychological factor in the context of this thesis means, in particular, the fear of boarding an airplane. One of the most crucial concerns among passengers is that an aircraft and a flight itself must be reliable and secure; even if the technological progress of the aviation industry is perceived positively by most people, the extent of feeling safe remains questionable. The research based on a scientific analysis of Chauncey Starr discusses the problematic issues and attitudes toward risks associated with safety matters (Fischhoff et al. 1978: 128).

For the purpose of a statistical analysis, Starr used scales such as knowledge about risk, control over risk, chronic-catastrophic risk, and common-dread. Knowledge about risk means both being able to understand the nature of possible risks by passengers and by experts, while control over risk refers to the ability of individuals to use their knowledge to prevent an accident. Chronic-catastrophic risk measures how many victims were in a deadly accident, i.e. the magnitude of fatality, and common-dread is used to determine whether an accident is perceived to be ordinary or shocking. One of the goals of Starr's analysis was to find out if the understanding and acceptance of a fatality was affiliated with people's willingness to accept the risk (Fischhoff et al. 1978: 133). For the purpose of this thesis, it is assumed that passengers make the decision to board a flight themselves. Nevertheless, the aforementioned scales used in Starr's studies reflect the significant psychological issues addressed in this thesis.

One aspect of having a sense and knowledge of risks can be seen in multiple studies that confirm that passengers' education and their awareness of how an aircraft behaves during a flight, as well as how to proceed in the event of an accident may raise the survival rate (Chang and Liao 2009: 1337). Additionally, it is important to note that not having enough information about the nature of the flight may result in insufficient comprehension of situations; therefore, passengers will ultimately question the safety of the flight (Bor and Hubbard 2006: 21). The nature of panic issues is a sophisticated topic in psychology, and in their study, Iljon Foreman and Borril (1994: 31) cited the feeling of losing control. The complexity of this factor reflects both being afraid of losing inner control and experiencing a humiliating situation while being surrounded by a group of people travelling on the same aircraft, as well as not having the opportunity to prevent an accident and be dependent on an operating crew and an aircraft itself (Bor and Hubbard 2006: 55-59). With regard to the catastrophic perception of risks, psychologists maintain that it relates to posttraumatic stress disorder. People invariably experience fear of events that cause the deaths of many people at a single point of time. An example of this reaction includes the 9/11 terrorist attacks, covered by mass media all over the world and inevitably changing people's perception of risk exposure during a flight. The magnitude of those attacks could not be perceived as something common in people's minds, and it might therefore exaggerate the anticipation of flight accidents (Bor and Hubbard 2006: 49). Psychological factors have an enormous impact on individual's perception of risk. A fear of flying fears leads to an irrational perception of risk exposure (Slovic and Weber 2002: 7-10).

3.2 Mass media

Media coverage and the way messages are delivered to an international audience could create a subjective reality in people's minds (Scheufele 1999: 106). By concentrating on some specific occasions, journalists may "amplify" the actual risk exposure, and therefore influence people's perception of risks. However, some accidents receive less media coverage, and, as a result, some risks can be attenuated (Kasperson et al. 2003: 13). The particular extent of news coverage of accidents or disasters might have a significant impact on social comprehension of actual risk; these types of events are part of the risk amplification category. One of the problems with media coverage is that the public is usually more informed about material damages, injuries and fatalities rather than about the actual risk factors. Another issue could be that many headlines and news stories are controlled by governments or are influenced by specific traditions and cultural backgrounds (Kasperson et al. 2003: 22). Also, the reliability of sources used by different magazines and broadcasters is one of the major concerns (Singer and Endreny 1993: 14).

Journalism is often based on shock tactics, feeding off terrifying stories and the public's astonishment:

> A death from an aeroplane accident is 6000 times more likely to make front-page news than a death from cancer. Assaults on children by strangers are more likely to receive coverage than abuse within the home […]. Chemical factory or nuclear accidents receive far greater attention than the death toll caused by smoking […]. (Kitzinger 1999: 55).

Real news is not the only source of these ideas in our minds: films, television series or fiction novels deliver an even stronger exaggerated message about potential hazards (Singer and Endreny 1993: 5). For example, Leiserowitz's analytical study about the influence of the film *The Day After Tomorrow* on people's understanding of global climate change shows that the film had a significant influence on public risk perception and "conceptual models of climate change (Leiserowitz 2010: 24-28).

3.3 Countries' political and economic situations

As the world has become more interconnected, and globalization has been seen as a constant driver for development the past several decades, the aviation industry has become a crucial part of the global political and economic environment (Button 2008: 5). Many countries' economies depend on the tourism industry. Factors such as an unstable political situation and a growing possibility of terrorism influence the number of tourists drastically (Basu and Marg 2010: 12). The impact of terrorist attacks on travelling is both inevitable and understandable, as acts of terror are covered by international media, which then disseminate information quickly. Nevertheless, people may also be concerned about an unstable political environment in different destinations, while their risk perception of political crises and chaos possibly continues to remain in their minds for an even longer period of time than a sudden act of terror (Sönmez 1998: 421). Hence, the way tourists perceive risk is influenced by both of these political factors and also can be seen in the "substitution effect" phenomenon. This occurs when people change their decisions to travel to more politically stable destinations. Consequently, some airports and airlines might lose passengers while others might experience a growing numbers of tourists (Sönmez 1998: 429).

Sönmez (1998: 422-423) cites Fiji, Spain and Slovenia as examples of destinations which were influenced by an unstable political situation and acts of terrorism: in the case of Fiji, two military coups resulted in media coverage which prompted the governments of Australia and New Zealand to issue travel warnings. In Spain, the ETA Basque separatist group attacked tourist infrastructure in the 1980s, which led to a decrease in the number of tourists visiting the country. After being invaded by the Yugoslav army in 1991, the number of tourists who visited Slovenia two years later was lower than it had been prior to the war (Sönmez 1998: 422-423).

Airline passengers also react to an airline's economic situation. Airlines are often managed and/or controlled by governments and must fulfill different regulatory requirements, including, for example, safety and navigation standards. Additionally, airlines may be subject to ordinary financial constraints, as is the case with any other enterprise (O'Connor 2001: 4-5). O'Connor's (2001: 4-5) examples include the following:

> controlling costs, negotiating with labor unions, seeking rates that accurately reflect various elasticities of demand, obtaining financing, and making the kind of profit that will keep stockholders happy and will attract capital.

One of the risks any airline might anticipate is the risk of a strike by employees. As a part of the transportation business, aviation is vulnerable to strikes; in critical cases, the costs associated with a strike could possibly lead to an airline becoming bankrupt and defunct (O'Connor 2001: 83). Another issue is that a strike can damage a company's reputation and provoke a negative image among people; therefore, an airline may be seen as more risky according to public opinion (Cowden and Sellnow 2002: 195).

3.4 Social factors

Society as such represents a group of individuals that share similar views and ideas and that might influence each other's impressions of various causalities (Panopio and Santico-Rolda 2007: 53). The factors described above (psychological issues, media coverage, political and economic factors) have an impact on how society perceives risks. However, considering that each person has their own attitude toward hazardous situations, it might not be completely accurate to generalize the level of risk aversion. Individuals can only estimate risks associated with technology industries based on their own personal knowledge (Wildavsky and Dake 1990: 42-43). For example, pilots and members of the cabin crew are obliged to undergo psychometric testing and professional training. As a result thereof, they gain the knowledge needed to understand a flight procedure and the workings of an airplane. Therefore, the operating crew perceives risks in a different way than an ordinary passenger who does not have this knowledge (Bor 2007: 213). However, if pilots are classified as one social group, the presence of "encouraged risky behavior" is a social factor that might often be the cause of human error. An accident might happen due to "unwillingness to admit that one does not know something and to continue in the face of uncertainties" (Orasanu, Martin and Davison 2001: 219). This phenomenon is demonstrated clearly in the following example:

> […] a runway collision in near zero visibility (due to fog) resulted when one aircraft stopped on an active runway because the crew did not realize where they were […]. The captain was unfamiliar with the airport and was making his first unsupervised flight after a long period of inactivity. The first officer boasted of his knowledge of the airport but, in fact, gave the captain incorrect information about taxiways. Rather than questioning where they were, the captain went along (Orasanu, Martin and Davison 2001: 219).

3.5 Behavioral finance in aviation

Taking into account that the factors described in this section can change people's risk perception, these factors may also influence people's decision to purchase insurance (Byrne and Utkus 2013: 1). If an individual estimates risks rationally, he or she will assess the possible outcome considering the actual probability of risks. However, humans are believed to be affected emotionally when making decisions. Therefore, when risks are amplified, people are driven by emotions and are ready to purchase a more expensive insurance product. Airline passengers are willing to spend more money on death insurance not because of the actual risk exposure, but because of the news headlines about a terrorist attack killing a large number of people (Forbes 2009: 134). A study conducted by the U.S. Travel Insurance Association[5] shows that approximately 30 percent of Americans purchase travel insurance. Before 9/11, it was only 10 percent. The most popular reasons for purchasing travel insurance were as follows: peace of mind, protection against the unexpected and concerns about losing the financial investment associated with a trip. Furthermore, approximately 70 percent of cruisers purchase travel insurance (cf. UStiA 2015). As Kundell (2011: 1) notes:

> Americans spent nearly $1.8 billion on all types of travel insurance and assistance services in 2010, up from $1.6 billion in 2008, and $1.3 billion in 2006. The 2010 figure reflects a steady growth in sales of nearly 14% from2008, and more than 15% from 2009 […].

[5]Referred to hereinafter as "UStiA."

Society instantly reacts to such events in a way that is comparable to a stock-market crash: accidents, damages and losses are associated with such events and, as a result, we observe the reaction of financial markets. There may be a thin line between real price fixing and speculative commercial activity and gambling (Forbes 2009: 135).

Researchers nowadays can prove that humans' brains naturally react to certain events, and therefore emotional behavior influences our rationale when we make decisions (Byrne and Utkus 2013: 27).

> Events such as the 2010 ash cloud from the Eyjafjallajokull Volcano in Iceland, the 2011 Japan tsunami, earthquakes and floods in New Zealand and Australia, combined with higher-than-average snowfalls in many parts of the world underscore the importance of protecting a hard-earned vacation investment. […] [I]n an uncertain economy, people want to be sure their vacation dollars and their health will be protected in case of emergency and unforeseen circumstances (Kundell 2011: 2).

In order to further identify the airline insurance market's reaction toward the aviation industry's innovations in safety, this thesis will continue to analyze the relative risk exposure in the aviation industry using the available statistical data.

4. Identifying relative risk exposure in the aviation industry

Technological development in aviation can be seen in different statistical reports which attest to the declining tendency for incidents and fatality rates over the past 30 years (Rose 1991: 1-2). On the one hand, air travel is considered to be one of the safest forms of transportation; on the other hand, the consequences of any possible incident are frightening and far-reaching. Therefore, many people avoid flights and prefer different types of travelling (Hudson 2003: 7). The following chapter addresses the statistical analysis of the actual risk exposure in the aviation industry, including the comparison of fatality rates over the years in different transportation modes and identifying the causes of incidents.

4.1 Statistical data on accidents in different transportation modes

The fatality rate is a defining factor for risk exposure. When people find themselves in a dangerous environment, they consider it risky only when it is associated with a high probability of death (Steward and Mueller 2008: 145). The comparative analysis between the transportation modes listed below is based on statistical data from the United States. The United States has one of the most developed air traffic systems, which has been constantly developing since 1936. Also, it has made inroads into improving technology and safety in a way that is second to none (LaPorte 1988: 2-5). Finally, another reason why statistical data from the United States was chosen for this analysis is the reliability, availability and the scale of the data collected by government sources, such as the Bureau of Transportation Statistics[6] and the United States Department of Transportation (cf. BTS n.d.-a).

4.1.1 Highways

Over the last 35 years, the mortality rates in connection with vehicles on highways have decreased significantly. The statistical data confirms that the situation

[6]Referred to hereinafter as “BTS.”

continues to improve: from 1975-1980, the death rate had been increasing mostly due to incidents involving large trucks. It has steadily decreased since then. The sharpest decline in fatal incidents was noted between 1980 and 1995; from 1995 until 2010, the data reflects the flatter, yet still decreasing trend. It is important to point out that the number of fatalities does not completely correspond to the trend in mortality rates. According to Savage, the overall decrease in the number of fatal incidents is obvious; however, between 1975 and 1990, the declining trend was not constant. In fact, the analyzed data reveals some fluctuations, whereas the number of accidents with large trucks has not changed significantly over the years. The reason for this is that the number of motor vehicles on highways and the number of miles travelled has been increasing ever since 1975. When comparing 1975 and 2012, there was a 123% increase in total vehicle miles travelled (Savage 2013: 15).

The development of regulatory standards and health care systems plays a significant role in the reduction of mortality rates on highways (Savage 2013: 16). However, this mode of transport's death rate remains one of the highest and is considered to be one of the riskiest in terms of fatalities. According to the statistical data collected between 2000 and 2009, nearly all of the total fatality risk occurs in this sector. Deaths on the highway were 94.4% of the national total (Savage 2013: 10). More than 70% of fatalities are attributed to automobiles and light trucks. 55% of the aforementioned 70% of fatalities are categorized as single-vehicle crashes. It is also important to mention that the fatality rate for passengers in automobiles and light trucks amounted to 30%, while 70% of fatalities involved drivers. Buses with more than 10 passengers represent only 0.1% of total death rates on highways. Age, gender and alcohol consumption are considered to have a direct influence on fatality rates. Therefore, it is possible to conclude that human error is one of the key issues in this transportation mode (Savage 2013: 15-16).

4.1.2 Railroads

Savage (2013) uses four types of individuals for the purpose of the analysis of the railroad fatalities. The most significant decrease could be seen in the category "crossing users per vehicle registered." This category includes incidents on highways. From 1975 to 2010, the fatality risk of crossing users per vehicle registered fell from 100% to 15%, mostly due to the improvement of crossings standards. Collisions between vehicles and trains were seen as one of the key problems for both transportation modes. However, over the years the risk of fatal collisions and highway crossings decreased by more than 70%. For this thesis, a particularly significant category is "passengers per passenger mile." Between 1975 and 2005 the overall decrease in death rates for train passengers was noted. It represents the average rates for the period of 11 years, meaning that the data for 1975 also accounts for the data from 1970 to 1981. These figures include major fatal accidents, such as an accident in Chicago in 1972, which killed 45 people, and an accident in Alabama in 1993, which claimed the lives of 42 individuals. The reduction in fatality rates in the other two categories is also noted; however, the decreasing trend is not as sharp (Savage 2013: 16-17).

4.1.3 Maritime transportation

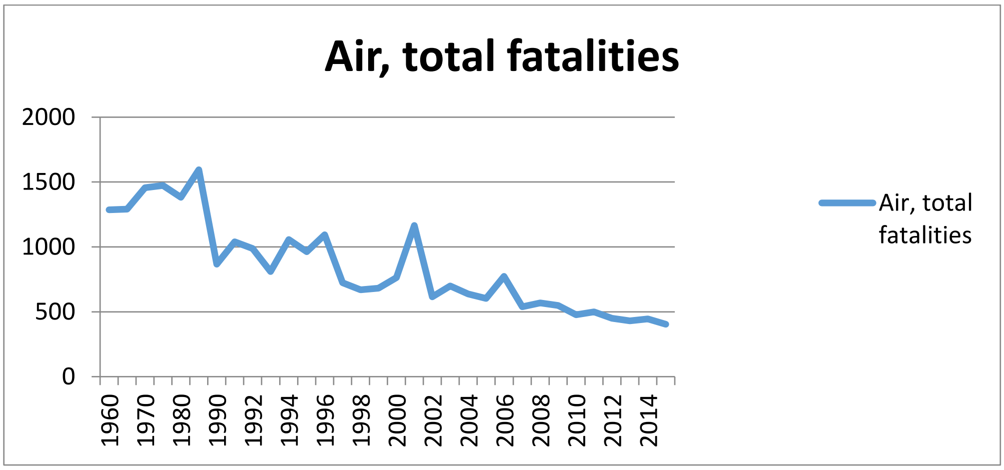
Maritime transportation has clearly become safer over the past 35 years. There was a 70% decrease in fatality rates involving recreational ships and a 50% decrease in total amounts, from 1500 victims in 1975 to 700 in 2010. In the commercial sector, a sixfold decrease over the same period was noted. Major improvements can be seen between 1975 and 1990 in both subsectors. During that period, safety measures were developed and life jackets became obligatory for passengers and staff. Furthermore, the recreational subsector has become more popular over the years (Savage 2013: 17). Accidents on private luxury boats and using popular water sports equipment caused the majority of deaths, accounting for 85% of fatalities (Savage 2013: 12).

4.1.4 Aviation

A fatal incident in the aviation industry is a rather uncommon event. However, when this type of accident occurs, it claims the lives of many people at once. In this regard, risk exposure depends on the number of passengers, which has continued to increase over the past few decades (Savage 2013: 18).

The BTS provides data for fatalities in different transportation industries in the United States. The graph below shows that, in general, the total number of fatalities decreased radically from 1960 to 2014 (n.d.-b). The spikes on the graph below appear almost every decade, which confirms that even though accidents rarely happen, every single accident causes the deaths of hundreds of individuals (Dorfman 1998: 301). On the other hand, given the rising volumes of air travelers (cf. BTS 2016) and the decrease in the number of mortalities, it is clear that aviation safety has developed significantly, and the fatality risk continues to decrease (Rose 1991: 29).

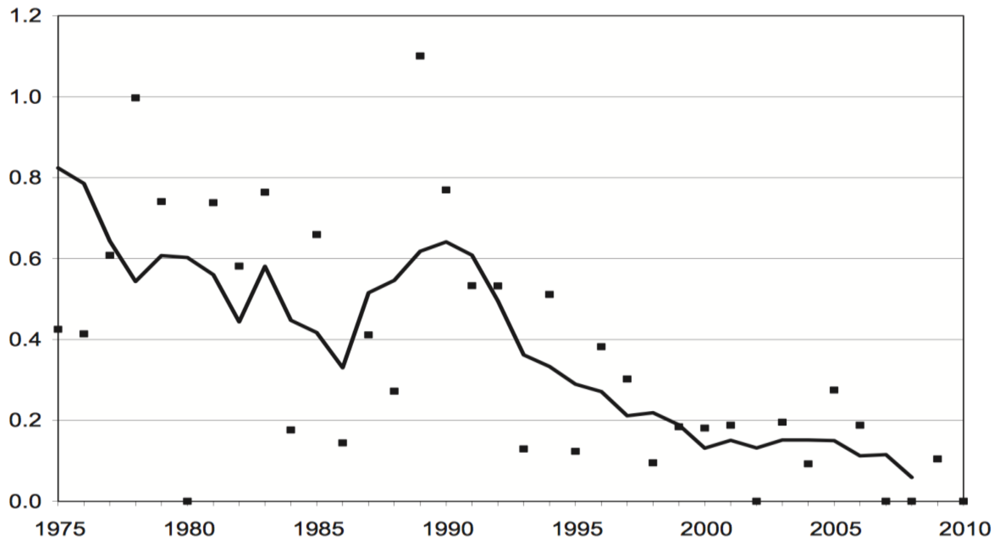
Figure 1 – Aviation fatalities 1960-2014



Source: BTS (n.d.-b).

The most dangerous phases of a flight are takeoff and landing. As Savage (2013: 18) points out, the graph below presents the rate of fatal accidents per million departures for Part 121 scheduled service, with squares representing the fatal accident rate in any given year. The solid line shows the five-year moving average, plotted at the mid-point year. This statistical data shows the significance of a decrease in fatality rates between 1975 and 2010. The year 1990 shows a jump in the graph; otherwise, the overall declining trend in fatality rates is obvious (Savage 2013: 18).

Figure 2 – Fatal aviation accidents per million departures 1975-2010



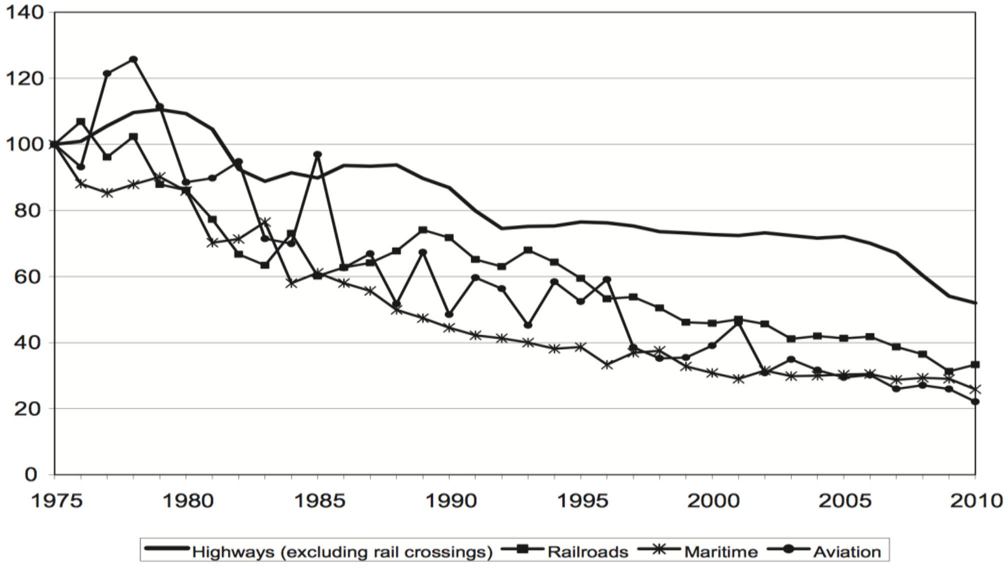
Source: Savage I. (2013: 18).

Another approach to estimate the trend for fatality rates is based on the rate of passenger fatalities per million passenger enplanements (Savage 2013: 18). Also, this data confirms the radical improvement in the industry's safety standards over the past several decades. Between 1975 and the 2000s, the death rate decreased by 96%, which attests to impressive progress in the aviation industry (Savage 2013: 19).

The declining rates were significantly affected by the Tenerife accident in 1977, the most fatal accident in aviation history (Savage 2013: 19). Although this thesis focuses exclusively on analyzing risk exposure in commercial aviation, it is still important to note, however, that private aviation accounts for 85% of all fatalities (Savage 2013: 13).

4.1.5 Comparison of risk exposure in different transportation modes

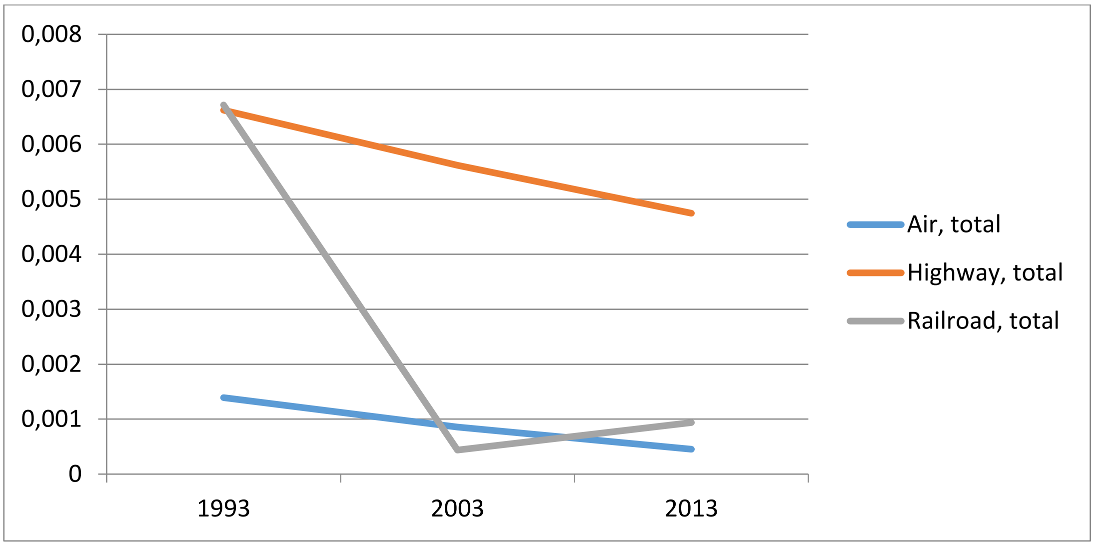
Figure 3 – Indices of time trends in per capita fatality rates 1975-2010



Source: Savage (2013: 20).

In order to compare these four different transportation industries, an estimate of the probability of individual fatalities per year is recommended. The graph above shows that the risk exposure in all forms of transportation has been declining for the past 35 years: risk exposure for highways, railroads, and maritime travel have decreased by 50%,67%, and 75% respectively; the best results are seen in the aviation industry, with an improvement of 80% (Savage 2013: 20).

Figure 4 - Fatality per passenger-kilometer (M)



Source:BTS (n.d.-b).

In order to estimate which transportation mode has the lowest risk exposure, fatality rates have been calculated per million passenger-kilometers (Graham 2017: Appendix N). The calculation was made based on statistical data of the BTS; unfortunately, there was no data available for maritime travel (cf. BTS n.d.-b). The graph clearly shows that highways are the riskiest transportation mode, even though a declining trend in fatality rates can be noted. Air travel has a stable downward slope and has been shown to be the safest form of transportation by far, as reflected in the statistical data cited in this thesis. Railroad transportation displays the best improvement in terms of fatality rate reduction. In 1993, the risk for railroads was almost as high as for highways, while as of 2013, it had a slightly higher fatality rate than air travel cf. BTS n.d.-b).

4.2 Identifying incident causes in aviation

Even though aviation is reported to be the safest transportation mode, and technological development has a positive dynamic, human error has remained the number one cause of accidents. Even though human error decreased significantly over the past 10 years, this factor is still the main cause of overall losses (AON Risk Solutions 2016: 4).

Statistics show that the human factor accounts for approximately 80% of all incidents (Bent and Chan 2010: 302). According to the analysis in section 4.1, fatality rates have continued to decrease drastically. However, this reduction is mostly related to ongoing improvements in aircraft manufacturing and the fact that machines have become safer. The correlation between mechanical and human factors is undisputed: there is an inverse relationship between human error and safer aircraft with more reliable flight technology (Wiegmann and Shappell 2003: 10-11). The progress of safety measures depends on the investigations of accidents. Human error is usually listed as the cause of an accident, even if other factors also play a significant role. Training the operating crew, including pilots and cabin crew, is crucial for improving safety. However, the financial and economic situation that airlines are currently facing causes issues such as "a shortage of experienced personnel, fatigue/work practice and airline management experience/attitude/culture" (Bent and Chan 2010: 2010: 307). In this regard, the industry is confronted with many perils associated with pilots' backgrounds and skills. Airlines do not invest enough in skill development programs for the operating crew due to high costs, which puts pilots and pilot instructors at a serious disadvantage. The quality of training decreases, and younger generations lose interest in pursuing a career as a pilot or improving their existing skills. Technological progress and aircraft automation influences the scope of pilots' knowledge. The regulatory requirements for pilot licensing have developed significantly over the years. Furthermore, airlines are exposed to new financial threats, such as stiff competition, an unstable oil market and terrorism (Bent and Chan 2010: 305-308).

Terrorism has become one of the most problematic security issues in aviation. Over the past decade, terrorism has incurred losses of more than USD 10 million on at least five different occasions, and it will most probably remain the most problematic hazard in the future (AON Risk Solutions 2016: 4). It is believed that it will be the most fatal factor in the industry, as the goal of terrorist attacks is to kill a large number of people. The problem associated with calculating statistics for terrorist attacks is that, initially, almost every fatal accident is suspected to have been caused by an act of terror. Terrorist groups often take responsibility for the attacks; however, further investigations show that, on average, about 50%

of all incidents can be classified as terrorism, while 25% remain the subject of additional inquiry, and the actual cause cannot be determined (Jenkins 1999: 51).

The major factors that cause the fatalities and the scale and complexity of the accidents make it problematic to estimate risks in the aviation industry using the law of large numbers (El-Kasaby, Tarry and Vlasek 2003: 304).

The major fatal events in aviation history listed below demonstrate how disastrous accidents can be, even if the probability of such an event is far less than 1% (Dorfman 1998: 301).

4.2.1 Tenerife Airport Disaster

On March 27, 1977, the Las Palmas airport was closed due to a terror attack, causing various flights to be diverted to Los Rodeos Airport. Because of Los Rodeos airport's limited capacity, many airplanes were forced to wait for further instructions prior to takeoff and landing. Both Pan Am Flight 1736 and KLM Flight 4805 were ordered to stop at Los Rodeos airport. As soon as Las Palmas Airport resumed normal operations, the pilot of the KLM Boeing 747 requested to fuel up the aircraft. The KLM pilot followed the air traffic controller instructions to make a turn of 180 degrees and stop at a Runway C3 until further notice. Weather conditions were quite poor; visibility was approximately 100-300m. Meanwhile, the Pan Am flight was ordered to follow the KLM flight's route to C3, which meant that the Pan Am Boeing 747 would need to make a turn of 135 degrees. This was a technically difficult maneuver which caused Pan Am's operating crew to misunderstand ATC's instructions, and the aircraft turned onto runway C4. Further miscommunication between the air traffic controllers and both of the airlines caused two airplanes to prepare for takeoff simultaneously and move toward each other (Fitzgerald 2010: 7-14).

Due to poor visibility, both pilots were unable to see one another early enough to prevent the collision; the outcome was as follows:

KLM 4805: All 234 passengers and 14 members of the operating crew died.

Pan AM 1736: 317 passengers and 9 members of the operating crew died, 61 people survived (Fitzgerald 2010: 15).

4.2.2 Japan Airlines Flight 123 (1985)

JA 8119, a Boeing 747 SR-100 of Japan Air Lines Co., Ltd, operating as Flight 123, experienced an emergency at approximately 1825 hours during a flight from Tokyo to Osaka on August 12, 1985. While approaching the east coast of the Southern Izu Peninsula, it ultimately crashed into the mountains in Ueno Village, Tano Gun, Gunma Prefecture at approximately 1856 hours (Griffioen 2011: 17).

The report on this accident noted that weather conditions were quite extreme, including thunderclouds and heavy rainfall (Griffioen 2011: 45-47). Further investigations declared that the Boeing aircraft was damaged abaft during one of the previous landings, which led to the failure in a bulkhead when the aircraft was taking off and in the climb-out phase. A lack of necessary technical service caused these defects and failures during the flight (Griffioen 2011: 59-67).

Consequences of the accident: 505 passengers and 15 members of the operating crew died. 4 passengers suffered severe injuries (Griffioen 2011: 29).

4.2.3 Charkhi Dadri Mid-Air Collision (1996)

According to the investigation report, the mid-air collision happened due to communication problems with the cockpit of Kazakhstan Airlines Flight 1907, which either disregarded or misunderstood the ATC instructions from Delhi. As a result, the aircraft did not reach the altitude specified by ATC, and the latter was unable to successfully communicate with the Kazakhstan Airlines pilots of the Ilyushin Il-76. The Saudi Arabian Airlines Boeing 747-100B had no time to change its altitude. Consequences of the accident: no survivors, with a total of 349 fatalities (Cooper 1996).

5. Analysis of premium changes in aviation insurance

This chapter discusses how hull and liability insurance premiums have changed over the years. In terms of technology, the aviation industry has continued to develop over the course of several decades. Aviation is one of the safest forms of transportation nowadays; however, the industry is undoubtedly exposed to the biggest safety concern in the world: terrorism. Airlines, insurance companies and governments continuously endeavor to mitigate threats associated with it (AON Risk Solutions 2016: 4).

Underwriters perform the forecast for insurance premiums and analyze insurance market developments. The key factors for underwriters are physical hazards and moral hazards. Physical hazards are the tangible damages to an aircraft. They can be estimated by insurance companies and, therefore, they are clearly defined in companies' policies. Moral hazards are more problematic, as underwriters cannot estimate how an aircraft's operating and service crews will act. As the further analysis is based on data that combines the values of both hull and liability insurance, it is important to mention how underwriters rate and differentiate between these types of insurance (Lyons et al. 1996: 392):

> For hull insurance and other material damage risks, the rate is given as a percentage of the insured value. For Third Party Liability it is given usually as an in full amount though for bigger risks such as airlines it could well be an adjustable rate basal [sic!] on revenue miles flown. Passenger Liability is an amount per seat calculated on the number of seats or alternatively, again as an adjustable rate on revenue passenger miles flown.

5.1 Hull and liability insurance

The positive forecasts made by underwriters over the years can be seen in the analysis performed by AON's risk department. Hull and liability insurance premiums have been decreasing consistently for decades. AON Risk Solutions reported that almost every year was the year with the lowest number of fatalities in industry history since 1995 (AON Risk Solutions 2012: 5).

The report shows that there was a slight decrease in hull and insurance premiums in 2011. The average premium value went down by 3% and totaled USD 1.82 billion in 2011 against USD 1.88 billion in 2010. The decrease in claims was sharper, whereas 2011 was considered to be one of the safest years for the airline industry. Total claims in 2011 equaled USD 1.13 billion, which was almost a billion dollars less than the year before (AON Risk Solutions 2012: 7).

The further reduction of premiums can be seen in 2012, while 2012 was associated with even lower costs for insurance companies than 2011 (AON Risk Solutions 2012: 1). Insurance premiums fell to approximately USD 20 million by the end of 2012 as compared to 2011, totaling USD 1.61 billion. Also, a 20% reduction in claims was reported and in total amounted to USD 924 million (AON Risk Solutions 2013: 6).

Given the decreasing loss ratio over the years, underwriters had a positive forecast for 2013, which can be seen in the significant 10% reduction in insurance premiums. 2013 was recorded as the year of low accident and fatality rates, although the claims for hull insurance increased (AON Risk Solutions 2013: 1). In total, claims equaled USD 1.5 billion and premiums were approximately USD 1.4 billion. Even though the insurance market showed profits during previous years, many insurance companies suffered due to negative results in 2013, also because of the fact that premiums have been decreasing consistently for the past ten years (AON Risk Solutions 2014: 5). Given the industry's continued technological progress and the overall tendency for decreasing fatality rates, underwriters expected 2014 to remain safe and continued to suggest not increasing premium prices (AON Risk Solutions 2014: 7).

Figure 5 – Quarterly analysis of net hull and liability trends

2014 NET HULL & LIABILITY MARKET PREMIUM & EXPOSURE MOVEMENTS

	No. of Renewals	AFV % Change	PAX % Change	2013 Net Premium US$ m	2014 Net Premium US$ m	US$ m Premium Change	Premium % Change
January	5	16%	17%	$ 12.09	$ 14.29	$ 2.20	18.2%
February	3	15%	5%	$ 6.33	$ 5.01	$ -1.32	-20.9%
March	12	18%	11%	$ 38.34	$ 33.83	$ -4.51	-11.8%
Q1	**20**	**17%**	**12%**	**$ 56.76**	**$ 53.13**	**$ -3.63**	**-6.4%**
April	12	9%	9%	$ 92.90	$ 88.17	$ -4.73	-5.1%
May	11	0%	3%	$ 43.87	$ 36.26	$ -7.61	-17.3%
June	22	9%	3%	$ 68.38	$ 62.81	$ -5.57	-8.2%
Q2	**45**	**7%**	**6%**	**$ 205.16**	**$ 187.24**	**$ -17.91**	**-8.7%**
July	36	11%	12%	$ 126.60	$ 113.73	$ -12.88	-10.2%
August	7	15%	10%	$ 22.39	$ 21.77	$ -0.63	-2.8%
September	9	8%	3%	$ 16.84	$ 20.53	$ 3.68	21.9%
Q3	**52**	**11%**	**11%**	**$ 165.84**	**$ 156.02**	**$ -9.82**	**-5.9%**
October	9	-4%	7%	$ 58.22	$ 69.66	$ 11.44	19.7%
November	36	6%	9%	$ 285.40	$ 280.51	$ -4.89	-1.7%
December	70	7%	4%	$ 655.16	$ 701.77	$ 46.61	7.1%
Q4	**115**	**6%**	**5%**	**$ 998.77**	**$ 1,051.93**	**$ 53.16**	**5.3%**
2014 Total	**232**	**7%**	**6%**	**$ 1,426.53**	**$ 1,448.32**	**$ 21.79**	**1.5%**

Source: Doyle et al. (2015: 2).

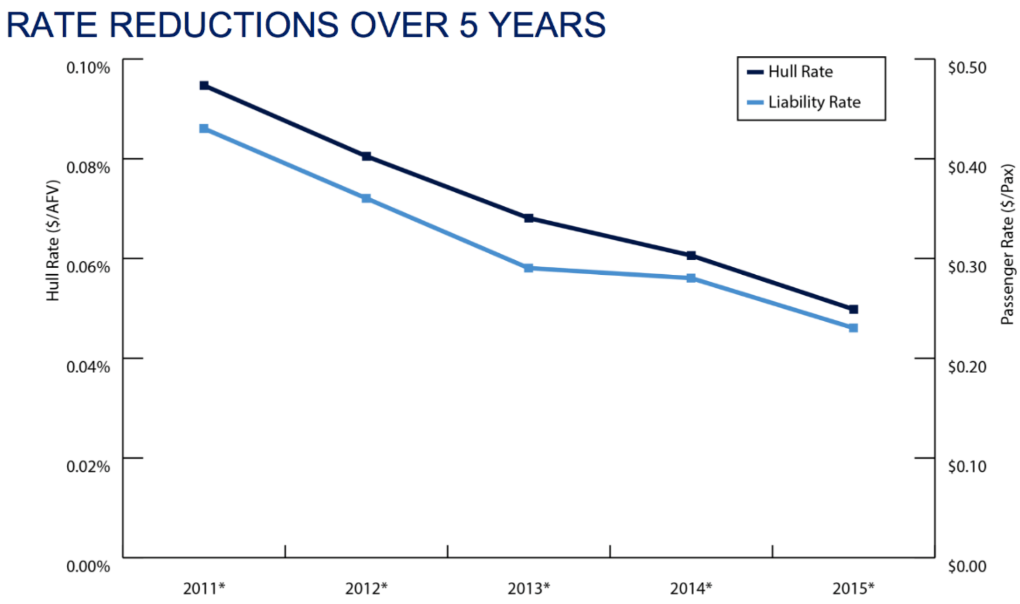
The table above shows that, in terms of total premium amounts, there was almost no change in 2014 compared to 2013. In the first three quarters of 2014, premium changes were negative. The insurance market reacted to the number of incidents that took place in July 2014 (AON Risk Solutions 2016: 9).

This reaction can be seen in the last quarter of 2014, when the premium increased by more than 5%. The fourth quarter was also associated with the drastic increase of renewal amounts, which also negatively influenced the insurance market (Doyle et al. 2015: 1). In 2014, the total amount of claims exceeded the total amount of premiums by USD 0.45 billion. The overall loss was higher than in 2013. However, the inclination toward lowering premium prices applied to 2015 (AON Risk Solutions 2016: 7).

In 2015, the amount of hull and liability premiums equaled almost USD 1.26 billion, which is approximately USD 100 million less than in 2014. This corresponds to a 10% decrease annually. In 2015, there was a slight increase in the amount of renewals compared to 2014, and total claims equaled USD 1.6 billion (AON Risk Solutions 2016: 6).

The comparative analysis performed here reflects the premiums, which included both hull and liability premium amounts. Nevertheless, it is important to note that the rates of these two types of insurance premiums decreased in a similar way over the last 5 years, which is seen in the graph below (JLT 2016: 7).

Figure 6 – Rate reductions in hull and liability rates 2011-2015



Source: JLT (2016: 7).

5.2 Reaction of insurance prices toward the value of claims and capacity growth

There is a certain correlation between changes in premiums and claims, because insurance companies use the premiums they have collected to cover the costs which arise as a result of claims. In this context, the analysis below presents the reaction of the insurance market toward incidents and the claims associated with them (Harding et al. 2002: 4).

The insurance market reacts to changes in claims. In 2001, the volume of claims for hull and liability were much higher than the average over the years; the pick of volumes increase took place volumes between 2001 and 2004 (AON Risk Solutions 2016: 16). The rise in average premiums during that period might be explained by the shock that the insurance market experienced following 9/11 (Towers Watson 2001: 4).

Beginning in 2002, the aviation insurance market started to adjust its prices and work on modernizing and regulating the insurance market. This excludes insurance coverage for war and terrorism from the basic package for third-party liability insurance (Elias et al. 2014: 6). From 2008- 2010, underwriters started to incline toward the break-even point in premiums. During this period, the graph shows a slight increase in average premium changes, continuing to decline in 2011. On average, the number of incidents continues to decrease, with the lowest occurrence of incidents taking place between 2010 and 2014 (AON Risk Solutions 2012: 9-10).

Along with low incident rates, the volume of claims was at its lowest between 2010-2014. Minor changes in average premiums can be seen during that period of time. Whereas in 2014 and 2015 both the number of incidents and the amount of claims increased, the changes in premiums remained unchanged, with a negative outlook for premium prices. The tendency toward lower premium prices remains, as the average rate for claims continues to decline over the years (AON Risk Solutions 2016: 8-9).

The aviation market reflects the industry's development and constant optimization of flight safety standards, which can be seen in the decreasing level of accidents and fatalities over the years. However, the costs for insurance companies might not have decreased proportionally, as airplanes are manufactured at a much higher price nowadays; airlines tend to renew their fleets, and the number of passengers has been constantly increasing. In this regard, the claims for hulls which exceed USD 100 million doubled during the past 5 years (Marsh 2015: 2). For example, when comparing the period 2006 to 2015 the number of passengers grew from 2.3 billion to 3.6 billion, fleet value increased by USD 368 billion, total premiums decreased from USD 1.72 billion to USD 1.25 billion (AON Risk Solutions 2016: 11). Overall, the insurance premiums for hull and liability decreased by approximately 65%, as compared to 15 years ago. Even though every single accident may be deemed to have a larger risk exposure, the aviation insurance industry takes into account the number of accidents over the years (AON Risk Solutions 2016: 8) and relies on the law of large numbers (Dorfman 1998: 301). It is still quite a conflicting approach, as even one accident per year may have a huge impact on the industry, and can be too costly for any insurance company (Dorfman 1998: 301). On the other hand, the industry's capacity is constantly growing, which results in more competition and gives underwriters a reason to lower insurance premium prices (AON Risk Solutions 2016: 3).

According to the data provided and considering the USD 1.5 billion total hull and liability limit of insurance companies presented on the market, it is possible to conclude that insurance companies with an A rating from S&P could cover the risk exposure outside the US by 224% and within the US by 191%. Despite the high level of competition that already exists, insurance companies still enter the market; for example, Apollo, Fidelis, Endurance, and HDFC Ergo entered the market in 2015 (JLT 2016: 11-12). The aviation insurance industry's capacity is a tricky aspect, as it directly influences market prices. To weaken its capacity would allow underwriters to strengthen insurance premiums and forecast the industry's profit. On the other hand, normal capacity levels should be maintained in order to curb the presence of overpriced products. This would also facilitate prices adjustments within a short period of time (AON Risk Solutions 2016: 12). If capacity continues to grow, this could divide the insurance market into two tiers, where the companies would be able to apply for different levels of liability limits (AON Risk Solutions 2016: 13).

5.3 The reinsurance market

The increased capacity of the aviation insurance market reshaped many insurance companies' approaches. As a result, they established and continued to develop special departments for the aviation industry. In this regard, the insurance market began to adapt reinsurance products globally, as different companies all over the world began to create provisions to be able to pay out all possible claims (Carter 1983: 457).

Reinsurance is seen as an independent type of insurance market. A reinsurance agreement is signed by two companies, where one insurance company partially transfers risks to another company which is obliged to pay the losses in the event damage occurs (Carter 1983: 4). One of the main purposes of reinsurance is to provide financial support to the insurance company resulting from “the random occurrence of one or more very large individual losses, or an accumulation of losses arising from one event, relative to premium income and reserves” (Carter 1983: 7). In the aviation industry, reinsurance products generally cover costs according to the principle of excess-of-loss. This means that the reinsurance company is obliged to cover the losses which exceed the amount stated in the reinsurance policy. At the same time, reinsurance does not cover the total exceeding amount; the maximum amount to be paid must also be stated in the contract. In this regard, every reinsurance company approves a certain limit for certain risks (Lane 2005: 198). Also, given the market’s capacity and the problem of applying the law of large numbers to every possible single risk exposure (Dorfman 1998: 301), underwriters and reinsurance companies agree to distribute risks among many different companies (Carter 1983: 458).

The aviation reinsurance market remained stable in 2011 and 2012. The fact that these years were associated with low values of claims influenced the market and resulted in fewer expenses for reinsurance companies (AON Risk Solutions 2012: 16). On the other hand, profits in 2011 and 2012 were reduced significantly as a result of existing costs, including costs for reinsurance products, and underwriters continued to lower costs for reinsurance in their accounts (AON Risk Solutions 2016: 9-10). In 2013 and 2014, when the market experienced a decrease in premium volumes and an increase in claim values (AON Risk Solutions 2014: 5), insurance companies had to consider lowering the costs for reinsurance products. Therefore, reductions in reinsurance pricing were noted overall (AON Risk Solutions 2014: 11).

As the expenses for reinsurance products are in fixed accounts, reinsurance companies’ income has not been falling as sharply as direct insurance companies’ income over the past few years. However, the negative tendency for the prices of reinsurance products can be noted, and one of the reasons is due to the growth in the insurance market’s capacity. Nevertheless, reinsurance companies continue to function as an irreplaceable tool in the aviation insurance industry, providing financial support for both hull and liability risks and hull war risks (AON Risk Solutions 2016: 13).

5.4 Air-travel insurance for passengers

Travel insurance has been experiencing changes over the past 10 years (McDonald and Korcok 2009). Global travel is a core component of the commercial aviation industry. The opportunity and willingness to travel has an influence on the number of passengers carried (Becken 2010: 114). Approximately 1.5 billion people were reported to have travelled with an airplane in 1999 (Gönenç and Nicoletti 2001: 184). 10 years later, the number of passengers per annum accounted had already reached 2.6 billion (World Bank 2017). In 2015, approximately 3.5 billion air travelers were registered (ICAO 2015).

The US Travel Insurance Association reports that the number of Americans who purchase travel insurance policies continues to grow. In 2006, US citizens spent approximately USD 1.3 billion in total on travel insurance and approximately USD 1.8 billion in 2010. One of the reasons why they chose travel insurance coverage was that people were more concerned about “emergency and unforeseen circumstances” (Kundell 2011: 2). From 2008-2009, people were still very affected by the events of 9/11. More than 70% of American travelers pointed out that they had concerns about their safety; the main anticipated risk was terrorism. At the same time, about 50% of those surveyed noted that they preferred to have travel insurance, whereas approximately 20% refused to pay for this type of insurance product (Kundell 2009: 2).

By 2012, almost 30 million Americans were reported to have some form of travel insurance coverage. Insurance providers (from travel agencies to airlines) experienced growth in their product sales (Kundell 2013: 1). By 2014, the number of Americans with travel insurance rose to 33.4 million. Furthermore, expenses for insurance policies amounted to USD 2.2 billion in total. During this period, travelers were mostly concerned about their trips being cancelled or interrupted for any given reason (Walsh 2014: 1). This, however, does not determine whether they are concerned about the cancellation or interruption of their flights, as the reasons for cancelled or interrupted flights may vary: problems with passports, travel agencies going bankrupt, the risk of terrorism, and airlines' operating crews going on strike (Reviews.com LLC 2017).

As McDonald and Korcok (2009) note, prices and insurance packages have not changed much in the last 10 years. Moreover, they conclude that the pricing for travel insurance products has been declining, questioning the hypothesis that passengers could be willing to overpay for air-travel insurance. On the contrary, the article suggests that people have been becoming more aware of how to manage their costs.

6. Analysis of forms of compensation for airline passengers

As discussed in previous chapters, the value of financial loss is generally used to calculate estimates of compensation amounts. Victims of airlines incidents and accidents are protected by the Montreal Convention, which legally states that compensation is obligatory. However, the amount of compensation and the extent to which such compensation actually covers the costs of damages caused remains uncertain (Jacobs and Kiker 1986: 590-591).

Generally, passengers are not completely informed about the amounts of compensation detailed in both the Montreal and Warsaw conventions. Moreover, when purchasing flight tickets, very few people understand that, by doing so, they agree that the airline accepts liability in case of an incident. However, at the same time they also agree on the limited compensating amounts, described in the respective conventions (Sheinfeld 1980: 655).

As discussed in sections four and five of this thesis, both the risk management of airline companies as well as passengers' attitudes toward insurance prices have changed over time (Savage 2013: 20). The struggles of insurance companies to set higher prices for insurance products are also part of the current market situation (AON Risk Solutions 2014: 7). This section analyzes how passengers receive compensation from airlines using examples from real aircraft accidents.

6.1. Jurisdiction

The term *compensation* depends on the following aspects: legal, financial, economic, social, and psychological factors. The aforementioned factors make it very difficult to analyze and compare the compensation volumes of each aircraft incident in the world, as every country has its own laws, culture, political structure, financial and economic situation and many other influential aspects. These factors often lead to significant differences in the amount of compensation victims of exactly the same accident ultimately receive. Fairness, legitimacy and accuracy are hard to judge in such cases. Therefore, there are ongoing debates regarding the establishment of a single internationally acknowledged rule which would be valid for everyone regardless of their citizenship (Ji 2015: 139). As discussed in 2.2.3, the Montreal Convention ensures the rights of passengers to receive compensation. However, it does not identify compensation amounts. Instead, what occurs in practice is that the minimum amounts are paid out in accordance with and depending on the respective national legislation (cf. Montreal Convention 1999: 64, Chapter III Article 17).

On November 21, 2004, an aircraft accident happened in China which claimed the lives of 47 passengers, 6 crew members and 2 people on the ground. The aircraft – a Bombardier CRJ100 / 200 / 440 – was scheduled to have a flight from Baotou Airport to Shanghai Airport (Aviation Safety Network 2018). The accident took place on Chinese territory and was therefore subject to Chinese jurisdiction. The lawsuit had been going on for over five years, yet no measures had been taken. In 2009, the lawyer who worked on this case submitted it to “the Court of California” (Ji 2015:140), due to the fact that the aircraft was produced by General Electric Company, which is the US company. Doing so meant that the case would be classified as an international one. The case would then be reviewed under U.S. jurisdiction. Also, the nature of this legal case changed to foreign manufacturers’ product liability (Ji 2015: 139).

The accident Asiana Airlines 214 took place on July 6, 2013. The flight was scheduled from Incheon International Airport to San Francisco International Airport, with 307 people on board. As a result of this crash, 3 people died and 181 passengers were injured (Cockpit Voice Recorder Database n.d). According to the Montreal Convention, this case was classified as an international accident. The jurisdictions of the United States, China and South Korea could review the accidents. Nevertheless, many passengers preferred to submit the case to “the Court of California” (Ji 2015:140), for example, to receive compensation for the purchased return flight tickets. As stated above, compensation for passengers is regulated by each state. Therefore, the amount of compensation passengers receive depends on their decision to bring the case before a certain federal court under a given jurisdiction. The question is whether international conventions, such as the Montreal and Warsaw Conventions, take all the significant aspects and complexity of an air crash into account. Another matter of discussion is whether existing differences in current compensation standards are fair or not. Additionally, time is a crucial factor. How long will victims have to wait before they receive their compensation? Experience has shown that they have to wait around 5 years (Ji 2015: 139). As most air crash victims attempt to “get through the trial” as fast as possible, they often sign the settlement agreements provided by airline companies. As a part of such settlement agreements, passengers often have to agree to waive any possible further claims that might arise during the investigation. It is not unrealistic that the settlement agreements set the amount of compensation at the legal minimum (Ji 2015: 140-141).

In general, all victims of air crash incidents face legal trials and administrative procedures that last several years. This is understandable; first of all, it is hard to identify who is responsible for the accident. Usually, passengers consider airlines to be the responsible entities, due to the fact that a flight ticket is considered to be an agreement between an airline and a passenger. Generally, however, it depends on whether an accident happens because of the airline’s actions. The jurisdiction can be determined by considering the locations of departure and landing, the location of the airline’s registered headquarters and where it has its aircrafts serviced. However, there are cases when airlines insure themselves against legal proceedings under jurisdictions of other countries. It is also very likely that victims often do not have connections to the jurisdiction under which the case should be reviewed (Reese 1982: 1314-1315).

As previously discussed, each accident is subject to a particular state jurisdiction. However, taking a closer look at U.S. jurisdictions and the complexity of each case, it turns out that, in the event a fatal accident involving aircraft takes place above a body of water around three miles away from the U.S. coastline, the case may be tried under the Death on the High Seas Act instead of falling under the jurisdiction of the federal court. Depending on the circumstances, the Workmen’s Compensation Act might also be used. After each individual case has been reviewed, it is possible to identify which legal mechanism is best suited to each case. However, the current jurisdictions in terms of reviewing aircraft crashes are not entirely complete (Goldberg 1948: 41- 42).

6.2. Compensation received by passengers

According to the study conducted by the RAND's Institute for Civil Justice, which was based on the data of US airline aviation accidents between 1970 and 1984, on average the complainants received USD 363,000 per death (USD 291,000 net plus USD 72,000 for legal fees). The respondents' costs for legal fees equaled USD 49,000 per death, which results in USD 121,000 for legal costs per case (Kakalik et al. 1988: 5). The average amount of compensation corresponds to the minimum amount of USD 300,000 that is dictated by the Code of Federal Regulations (Legal Information Institute n.d.-a). The study also shows that the average amount of compensation increased. From 1970-1976, it equaled USD 321,300, while between 1977 and 1982, it was USD 408,500. The legal fees remained constant over both periods, despite the fact that the amount of compensation increased (Kakalik et al. 1988: 10-15).

On October 31, 2000, Flight SQ 006 was scheduled to depart from Taipei to Los Angeles. Singapore Airlines operated this flight. An almost new Boeing 747- 400, with 159 passengers and 20 crew members, crashed due to human error. 82 people died. The victims received compensation in the amount of USD 400,000. The company assumed full responsibility for the accident. Staff members supported the surviving victims and their relatives emotionally and financially (Henderson 2003: 280-282).

The events of September 11th raised the issue of fair compensation once again. As already mentioned, the terrorist attacks influenced the aviation and insurance markets drastically (Towers Watson 2001: 4). The market was under a great deal of pressure, and thus government support was provided. For the purpose of compensation, the Victim Compensation Fund was founded. (Rabin 2001: 574-575). This fund covered both types of losses: economic and non-economic. The scope of economic loss varied between USD 300,000 and USD 4,350,000. Generally, it is very complicated if not almost impossible to estimate the amount of suffering, pain and psychological damage victims experience in monetary terms (Williams 2006: 3). Therefore, victim compensation is mostly based on economic losses. However, the Victim Compensation Fund announced that it would provide compensation for moral and psychological damage as follows:

USD 250,000 for each victim plus USD 100,000 for each family member, i.e. spouses or children (Rabin 2001: 585).

On March 24, 2015, Flight 4U9525, operated by Germanwings, crashed into the French Alps. The psychologically unstable pilot killed all 150 people on board by intentionally crashing the aircraft. The issue about whether all pilots hired by airline companies should undergo full medical checkups on a regular basis, including psychological tests, was raised immediately. The airline industry was criticized by mass media all over the world (Werfelman 2015: 12-13). As a result, Lufthansa, as the owner of Germanwings, assumed full responsibility for the accident before its liability was officially proven and confirmed. The German government was instantly involved in the investigation process. The case was reviewed on an EU level, including the immediate measures to improve safety guidelines. The company offered the relatives of the victims EUR 50,000 per death plus additional compensation on a case-by-case basis, for example, if a passenger had children. The families claimed higher compensation and appealed against the Training Airline Training Center Arizona, Inc., the ATCA, registered in the U.S. (Kirmse n.d.: 23).

Any aircraft accident usually raises new concerns in terms of safety measures, legislation and how airline companies react to these crises. Their reactions, the durations of lawsuits and amounts of compensation may directly influence the image of an airline in the public eye (Kirmse n.d.: 17-18). Due to the public eye and the amplitude of each airline accident, these cases are not forgotten and contribute to the learning process of both airline companies and international law (Henderson 2003: 285).

7. Conclusion

The purpose of this thesis was to determine whether the prices for insurance products supplied on the aviation insurance market are reasonable and fair or if airline companies and passengers are overpaying for securing their safety. The hypothesis that insurance policies are potentially overpriced was chosen given the opinion that understanding risk exposure is often associated with behavioral finance theory (Kunreuthner, Pauly and McMorrow 2013: 177-178). The choice to purchase an insurance policy for security against possible losses can be influenced by external factors, such as mass media and the global political climate, to a large degree. Kasperson et al. discuss how risk perception might be magnified by mass media coverage, as journalists tend to concentrate on the volumes and values of losses rather than understanding actual risk exposure and preventative measures (Kasperson et al. 2003: 22). Terrorist attacks and political and economic tensions between countries are covered by various news channels within a short period of time (Kitzinger 1999: 55). Travelling to different countries means being confronted with the problems in other parts of the world (Sönmez 1998: 429); travelling on an airplane means an individual experiences a biologically unnatural situation (Bor and Hubbard 2006: 13). If aviation is considered to be a key tool for travelling (Becken 2010: 114), and safety measures are considered to be the key tool for aviation (Hartwig 2006: 1), it is possible to assume that it is easy to influence people's understanding of the risk they are facing during the flight and raise psychological issues in their minds (Sönmez 1998: 421). In this regard, it was hypothesized that insurance companies may use their knowledge of actual risk exposure in the aviation industry and charge higher prices for passengers and airline companies (Kunreuthner, Pauly and McMorrow 2013: 177-178).

The complexity of the aviation industry might be defined by the multiplicity of insurance tools presented on the aviation insurance market, which was discussed in chapter two. After the 9/11 attacks in the United States, the insurance market experienced an unsteady transformation; this ultimately influenced aviation insurance as well (Elias et al. 2014: 1-6). The United States introduced new regulations: the statute 49 U.S.C. § 44301 et seq. (Legal Information Institute n.d.-b) and the Terrorism Risk Insurance Act of 2002 (Elias et al. 2014: 15-16). The terror and war risk liability toward third parties was excluded from the general liability insurance product, making it more complicated both for airline companies and the aviation insurance market to define the ideal premium. The magnitude of the accidents caused by air catastrophes has not only raised safety concerns, but also raises questions about the ability of insurance companies to cover the associated losses (9/11 Memorial Website n.d.: 5). Nonetheless, the aviation is considered to be the safest mode of transportation according to various statistical sources. Savage (2013: 20) concludes that the aviation industry demonstrated the most successful safety improvement rate over the last 35 years, with fatality rates dropping by 80%. However, it is important to note that the number of aircraft passengers continues to increase (World Bank 2017). The United States Bureau of Transportation and Statistics collects and presents the statistical data for different transportation modes every year. According to this data, the fatality rates for air transport have been decreasing since 1960, and aviation is considered to be a much safer transportation mode than highway or railroad transport (BTS n.d.-b). However, the magnitude of every single accident remains the biggest concern in aviation, which casts doubt on the applicability of the law of large numbers in this industry (El-Kasaby et al. 2003: 304). These accidents are mostly caused by human error, and terrorism has become the biggest safety concern in the modern aviation industry (AON Risk Solutions 2016: 4). These factors are quite complicated, and, therefore, preventative measures are always both costly and unpredictable (Bent and Chan 2010: 305-308). For example, the Tenerife Airport Disaster is reported to be one of the deadliest accidents in the world, causing the death of almost 600 people. The reasons for this disaster were both the human factor and terrorism (Fitzgerald 2010: 7-14).

It turns out that, even though aviation is not categorized as a high-risk transportation mode, and technological developments improve safety measures every year, there are still many issues in the aviation industry that insurance companies must consider. During the past 5 years, insurance companies have continued to reduce insurance premiums, whereas the claims they received from airline companies fluctuated from year to year (Doyle et al 2015: 2). According to the AON Risk Solutions team’s research, insurance companies did not show any profit in 2013 and 2014; on the contrary, they were experiencing difficulties associated with a 65% decrease in premiums over the past 15 years (AON Risk Solutions 2016: 8-9). On the one hand, technological developments made aviation safer; on the other hand, they made the value of new aircraft much higher and therefore each claim, including minor claims, was very costly for the insurance company (Marsh 2015: 2). Also, when taking rising claim costs into account, underwriters made forecasts to decrease insurance premiums, due to the fact that the insurance market's capacity is enormous and is still growing from year to year (JLT 2016: 11-12). The same is true for the reinsurance market: in 2013 and 2014, reinsurance companies also reported an increase in the amounts of claim values and a decrease in the amount of premiums (AON Risk Solutions 2014: 5).

Psychological, social, political and economic factors amplified by the mass media may also have had an influence on travelers. This can be seen in the increasing number of the travel insurance policies purchased by citizens of the United States. According to the US Travel Insurance Association, by 2014 approximately 33.5 million people purchased a travel insurance policy, spending more than USD 2 billion (Walsh 2014: 1). However, these numbers might also be influenced by growing volumes of passengers (cf. World Bank 2017), since the prices of insurance packages have not changed very much during the last 10 years. In this regard, it is possible to conclude that passengers have become aware of how to insure themselves against accidents while travelling and are also aware of how to manage their budgets (McDonald and Korcok 2009).

The research conducted for this thesis concludes that the technological progress of the aviation industry influences average risk exposure. However, every single accident may still incur enormous losses and claim many lives at once (El-Kasaby et al. 2003: 304). Nevertheless, aviation has become the safest transportation mode in the world. The development of the industry influenced the insurance market (Doyle et al. 2015: 2), terrorism reshaped the structure of insurance tools (9/11 Memorial Website n.d.: 5), and new insurance companies penetrated the aviation insurance market. As a result, there was a decreasing tendency for insurance premiums in the last number of years. The market for air-travel insurance for passengers has also developed over the years, whereas the prices for the insurance products have remained steady. The analysis points out the declining trend in insurance premiums, as well as increasing claims over the years (Marsh 2015: 2).

It takes a very long time for victims and their families to receive compensation, and the process is very complicated. It is governed both by international and national law. On average, an aircraft accident trial lasts for about five years. The amounts of compensation are defined by international conventions. However, they only dictate which national jurisdiction is to be applied for a given case (Ji 2015: 140-141).

In short, the existence or absence of overpricing or underpricing on the insurance aviation market cannot be identified conclusively. The airline industry, the insurance market, and national and international legislation have been developing over the past few decades (Rose 1991: 29). Even though the profits of insurance companies have been decreasing over years due to stiff competition and increasing amounts of compensation for victims, it is impossible to conclude that there is no overpricing in the industry (AON Risk Solutions 2016: 3). Psychological and social factors as well as irrational concerns raised by the mass media cannot be said to cause overpricing of insurance premiums (Kasperson et al. 2003: 22). Alternatively, it can be hypothesized that insurance premiums are influenced by different factors analyzed in this thesis, including amounts of compensation prescribed by law. Payoff amounts vary significantly from country to country legislation (cf. Montreal Convention 1999: 64, Chapter III Article 17). Airline companies purchase insurance products to protect themselves from being prosecuted under the jurisdictions of other countries (Reese 1982: 1314-1315). The legal fees and court cases take years, and passengers, airline companies and insurance companies are part of a process that costs a great deal of time and money for all parties involved (Ji 2015:139-140).

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Appendix 1

Table 2-1: Transportation Fatalities by Mode

	1960	1965	1970	1975	1980	1985	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
TOTAL fatalities	**U**	**U**	**U**	**U**	**U**	**U**	**47.297**	**44.391**	**41.947**	**42.736**	**43.514**	**44.507**	**44.732**	**44.412**	**43.863**	**43.975**
Air, total	**1.286**	**1.290**	**1.456**	**1.473**	**1.382**	**1.595**	**866**	**1.039**	**988**	**811**	**1.057**	**963**	**1.093**	**724**	**670**	**683**
U.S. air carrier [a]	499	261	146	124	1	526	39	62	33	1	239	168	380	8	1	12
Commuter carrier [b]	N	N	N	28	37	37	6	99	21	24	25	9	14	46	0	12
On-demand air taxi [c]	N	N	N	69	105	76	51	78	68	42	63	52	63	39	45	38
General aviation [d]	787	1.029	1.310	1.252	1.239	956	770	800	866	744	730	734	636	631	624	621
Highway, total	**36.399**	**47.089**	**52.627**	**44.525**	**51.091**	**43.825**	**44.599**	**41.508**	**39.250**	**40.150**	**40.716**	**41.817**	**42.063**	**42.013**	**41.501**	**41.717**
Passenger car occupants	N	N	N	25.929	27.449	23.212	24.092	22.385	21.387	21.566	21.997	22.423	22.505	22.199	21.194	20.862
Motorcyclists	790	1.650	2.280	3.189	5.144	4.564	3.244	2.806	2.395	2.449	2.320	2.227	2.161	2.116	2.294	2.483
Truck occupants [e], light	N	N	N	4.856	7.486	6.689	8.601	8.391	8.098	8.511	8.904	9.568	9.932	10.249	10.705	11.265
Truck occupants [e], large	N	N	N	961	1.262	977	705	661	585	605	670	648	621	723	742	759
Bus occupants	N	N	N	53	46	57	32	31	28	18	18	33	21	18	38	59
Pedestrians	7.210	7.990	8.950	7.516	8.070	6.808	6.482	5.801	5.549	5.649	5.489	5.584	5.449	5.321	5.228	4.939
Pedalcyclists	490	690	760	1.003	965	890	859	843	723	816	802	833	765	814	760	754
Other incident [f]	27.909	36.759	40.637	1.018	669	628	584	590	485	536	516	501	609	573	540	596
Railroad, total [g]	**N**	**N**	**N**	**N**	**1.417**	**1.036**	**1.297**	**1.194**	**1.170**	**1.279**	**1.226**	**1.146**	**1.039**	**1.063**	**1.008**	**932**
Train accidents	N	N	N	N	29	8	10	19	6	67	12	14	25	17	4	9
Highway-rail grade crossing	N	N	N	N	833	582	698	608	579	626	615	579	488	461	431	402
Tresspassers	N	N	N	N	457	391	543	524	533	523	529	494	471	533	536	479
Other incident [h]	N	N	N	N	98	55	46	43	52	63	70	59	55	52	37	42
Transit, total [i]	**N**	**N**	**N**	**N**	**N**	**N**	**339**	**300**	**273**	**281**	**320**	**274**	**264**	**275**	**286**	**299**
Passenger/Occupant	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Employee/Worker	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Other incident	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
Water, total [j]	**N**	**N**	**1.418**	**1.466**	**1.360**	**1.116**	**865**	**924**	**816**	**800**	**784**	**829**	**709**	**821**	**815**	**734**
Passenger vessel [k]	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0
Freight vessel [l]	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Industrial/Other [m]	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Recreational boating [n]	739	1.360	1.418	1.466	1.360	1.116	865	924	816	800	784	829	709	821	815	734
Pipeline, total	**N**	**N**	**30**	**15**	**19**	**33**	**9**	**14**	**15**	**17**	**22**	**21**	**53**	**10**	**21**	**22**
Hazardous liquid pipeline	N	N	4	7	4	5	3	0	5	0	1	3	5	0	2	4
Gas pipeline	N	N	26	8	15	28	6	14	10	17	21	18	48	10	19	18

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	(R) 2014	2015
TOTAL fatalities	**44.276**	**44.873**	**45.292**	**45.121**	**45.028**	**45.641**	**45.061**	**43.347**	**39.542**	**35.978**	**(R) 35.036**	**(R) 34.570**	**(R) 35.696**	**(R) 34.685**	**34.641**	**36.982**
Air, total	**764**	**1.166**	**616**	**699**	**637**	**603**	**774**	**540**	**568**	**548**	**477**	**(R) 499**	**(R) 450**	**430**	**444**	**404**
U.S. air carrier [a]	92	531	0	22	14	22	50	1	3	52	2	0	0	9	0	0
Commuter carrier [b]	5	13	0	2	0	0	2	0	0	0	0	0	0	5	0	1
On-demand air taxi [c]	71	60	35	42	64	18	16	43	69	17	17	41	12	25	20	27
General aviation [d]	596	562	581	633	559	563	706	496	496	479	458	(R) 458	(R) 438	391	424	376
Highway, total	**41.945**	**42.196**	**43.005**	**42.884**	**42.836**	**43.510**	**42.708**	**41.259**	**37.423**	**33.883**	**32.999**	**32.479**	**33.782**	**32.894**	**32.744**	**35.092**
Passenger car occupants	20.699	20.320	20.569	19.725	19.192	18.512	17.925	16.614	14.646	13.135	12.491	12.014	12.361	12.037	11.947	12.628
Motorcyclists	2.897	3.197	3.270	3.714	4.028	4.576	4.837	5.174	5.312	4.469	4.518	4.630	4.986	(R) 4.692	4.594	4.976
Truck occupants [e], light	11.526	11.723	12.274	12.546	12.674	13.037	12.761	12.458	10.816	10.312	9.782	9.302	9.418	(R) 9.187	9.103	9.813
Truck occupants [e], large	754	708	689	726	766	804	805	805	682	499	530	640	697	(R) 695	656	667
Bus occupants	22	34	45	41	42	58	27	36	67	26	44	55	39	54	44	49
Pedestrians	4.763	4.901	4.851	4.774	4.675	4.892	4.795	4.699	4.414	4.109	4.302	4.457	4.818	4.779	4.910	5.376
Pedalcyclists	693	732	665	629	727	786	772	701	718	628	623	682	734	749	729	818
Other incident [f]	591	581	642	729	732	845	786	772	768	705	709	699	729	701	761	765
Railroad, total [g]	**937**	**971**	**951**	**865**	**891**	**884**	**903**	**851**	**804**	**695**	**(R) 735**	**682**	**(R) 674**	**700**	**768**	**759**
Train accidents	10	6	15	4	13	33	6	9	27	4	8	6	9	11	5	13
Highway-rail grade crossing	425	421	357	334	371	359	369	339	290	248	261	246	(R) 231	232	262	235
Tresspassers	463	511	540	498	472	458	511	470	457	416	(R) 441	400	410	425	470	459
Other incident [h]	39	33	39	29	35	34	17	33	30	27	25	30	24	32	31	52
Transit, total [i]	**295**	**267**	**182**	**202**	**177**	**149**	**162**	**188**	**172**	**226**	**221**	**228**	**264**	**266**	**236**	**254**
Passenger/Occupant	N	N	47	51	33	48	20	26	30	48	49	36	67	60	58	30
Employee/Worker	N	N	5	8	8	7	9	9	8	11	6	3	5	10	4	4
Other incident	N	N	130	143	136	94	133	153	134	167	166	189	192	196	174	220
Water, total [j]	**701**	**681**	**890**	**844**	**815**	**829**	**883**	**842**	**854**	**865**	**821**	**904**	**765**	**650**	**674**	**692**
Passenger vessel [k]	15	0	48	52	55	52	91	79	65	62	87	96	84	26	14	14
Freight vessel [l]	U	U	48	39	37	33	37	42	34	30	22	18	14	19	18	40
Industrial/Other [m]	U	U	44	50	47	47	45	36	46	37	40	32	16	45	32	12
Recreational boating [n]	701	681	750	703	676	697	710	685	709	736	672	758	651	560	610	626
Pipeline, total	**38**	**7**	**12**	**12**	**23**	**16**	**19**	**16**	**8**	**13**	**19**	**12**	**10**	**(R) 8**	**19**	**10**
Hazardous liquid pipeline	1	0	1	0	5	2	0	4	2	4	1	1	3	1	0	1
Gas pipeline	37	7	11	12	18	14	19	12	6	9	18	11	7	(R) 7	19	9

Other counts, redundant with above																																
Railroad, killed at public crossing with r	N	N	N	786	708	480	568	497	466	517	501	455	377	378	325	309	306	315	271	249	256	258	267	227	199	161	136	138	(R) 135	141	143	126
Rail, passenger	N	N	N	40	52	79	202	178	175	292	196	211	176	227	196	188	220	242	226	182	201	202	180	216	229	214	215	189	199	195	216	250
Train accidents	U	U	U	U	U	U	0	9	0	55	3	2	14	4	0	1	2	1	7	1	2	14	0	2	25	1	4	0	0	5	3	12
Highway-rail grade crossing[p]	U	U	U	U	U	U	74	54	70	77	57	81	53	72	70	70	72	95	69	72	72	70	74	87	70	82	74	58	62	75	60	78
Trespassers	U	U	U	U	U	U	117	U	U	U	U	U	U	U	U	U	135	138	141	103	117	109	100	116	127	125	131	123	126	108	144	152
Rail, other	U	U	U	U	U	U	11	U	U	U	U	U	U	U	U	U	11	8	9	6	10	9	6	11	7	6	6	8	11	7	9	8
Rail, freight	N	N	N	1.520	1.365	957	1.095	1.016	995	987	1.030	935	863	837	812	745	717	729	725	683	690	682	723	635	575	481	(R) 520	493	(R) 476	505	553	503
Train accidents	U	U	U	U	28	U	10	U	U	U	U	U	U	U	U	U	8	5	8	3	11	19	6	7	2	3	4	6	9	6	2	1
Highway-rail grade crossing[p]	U	U	U	U	821	U	624	U	U	U	U	U	U	U	U	U	353	326	288	262	299	289	295	252	220	166	187	188	(R) 170	157	203	156
Trespassers	U	U	U	U	426	U	426	U	U	U	U	U	U	U	U	U	328	373	399	395	355	349	411	354	330	291	(R) 310	277	284	317	326	302
Rail, other	U	U	U	U	90	U	35	U	U	U	U	U	U	U	U	U	28	25	30	23	25	25	11	22	23	21	19	22	13	25	22	44
Transit, non-rail	N	N	N	N	N	N	110	91	99	85	110	88	112	116	113	103	98	100	93	136	95	92	121	122	88	91	100	96	114	122	101	103
Transit, rail	N	N	N	N	N	N	229	209	174	196	210	186	152	159	173	196	197	167	89	66	81	54	41	65	84	134	120	132	150	144	135	151
Water, Vessel-related[q]	N	N	178	243	206	131	85	30	97	105	77	53	55	48	69	58	53	53	29	44	65	46	45	31	31	34	37	27	25	16	14	40
Water, Not related to vessel casualties	N	N	420	330	281	130	101	56	119	121	131	134	142	120	149	136	134	94	64	76	69	67	70	65	82	72	58	43	60	74	50	26

KEY: N = data does not exist; R = revised; U = data are unavailable.

Appendix 2

Table 2-1: Transportation Fatalities by Mode	(R) 1993	(R) 2003	(R) 2013
Air, total	811	699	430
Highway, total	40150	42884	32894
Train accidents	67	4	11
Water, total j	800	844	650

As a percent of all occupational fatalities	(R) 1993	(R) 2003	(R) 2013
Highway	19,62	24,27	23,97
Aircraft	4,45	3,78	2,97
Water vehicle	1,88	1,24	1,31
Railway	1,36	0,77	0,89
Other	12,16	12,34	11,54
Transportation-related fatalities, total	39,47	42,40	40,68

ble 1-40M: U.S. Passenger-Kilometers (Millions)	1993	2003	2013
Air	**582.948**	**813.687**	**949.018**
Air carrier, certificated, domestic, all services	582.948	813.687	949.018
Highway, total	**6.064.114**	**7.629.479**	**6.930.887**
Light duty vehicle, short wheel base[a,b,c]	N	N	4.638.407
Passenger cars[a,d]	3.561.931	5.214.853	N
Motorcycle[b,c]	19.609	23.267	35.304
Light duty vehicle, long wheel base[a,b,c]	N	N	1.297.112
Other 2-axle 4-tire vehicles[a,d]	2.016.283	1.474.098	N
Truck, single-unit 2-axle 6-tire or more[c]	91.366	181.410	171.526
Truck, combination	165.949	279.284	271.071
Bus[e]	208.977	456.569	517.466
Rail	**9.976**	**9.141**	**11.721**
Intercity/Amtrak[j]	9.976	9.141	11.721

Fatality per Passenger-Kilometer	1993	2003	2013
Air, total	0,0000000014	0,00000000086	0,00000000045
Highway, total	0,0000000066	0,0000000056	0,0000000047
Railroad, total g	0,0000000067	0,00000000044	0,00000000094
Water, total j	U	U	U

KEY: N = data does not exist; R = revised; U = data are unavailable.