Im Browser ansehen

Waypoints

VEREINIGUNG COCKPIT

Vereinigung Cockpit Flight Safety Newsletter Nr. 05 2019

Dear Members,

we are looking forward to welcome you to our spring party at the Chamäleon Beach in Flörsheim to celebrate Vereinigung Cockpit's 50th anniversary on 25 May 2019. Please note that this year's spring party replaces VC's usual summer party. For further information please refer to the member area of the VC website.

Our VC Waypoints represent one aspect of our aim to constantly contribute to the improvement of flight safety. Next to our popular links to publications of IFALPA, ECA, and EASA todays Waypoints edition covers the following topics:

- Dutch Safety Board Recommendations for flying over conflict zones
- First APEG AIRPROX Magazine
- IFALPA Briefing Leaflet on Remote Pilots
- IFALPA Position Paper on Non-Routine Operations

I invite you to browse through the contents to learn the latest about your topic of interest.

As we continuously strive to improve our Waypoint we require and seek your feedback. Please forward your inputs to flightsafety@vcockpit.de or just use the reply function of your mail provider should you have any suggestions for improvement, tips, or wishes regarding topics to address. We will do our best to keep the Waypoints as informative and interesting as possible for your convenience.

Kind regards,

Your Technical Director Flight Safety

Flying over conflict zones

The dutch safety board issued a follow-up recommendations report of the Malaysian Airlines flight MH17 crash on 17 July 2014. Overflying conflict zones ist still a current risk in aviation. The report identifyies eleven recommendations to manage these risks more effectively while focusing on airspace management, sharing threat information, and risk assessment.

First AIRPROX Magazin published!

The Aircraft Proximity Evaluation Group (APEG) published its first AIRPROX Magazine (only availabe in German). APEGs objective is to increase aviation safety by analysing air proximities and by providing recommendations to prevent similar occurences in the future.The VC ATS working group participated in the development of the magazine, which contains anonymised analyses of dangerous air proximities in german airspace, recommendations for further actions and general information material.

Further information about the air proximity reporting system and a reporting form are availabe here.
Note: the reporting form **does not** replace mandatory reporting of occurences according to Regulation (EU) No. 376/2014 and 996/2010.

IFALPA Briefing Leaflet: Remote Pilots

IFALPA offers its initial thoughts on one of the fastest growing and technologically advanced forms of aviation - Remotely Piloted Aircraft Systems (RPAS). IFALPAs Briefing Leaflet considers and encourages potential membership of Remote Pilots in Member Associations as cooperation can provide a number of benefits. Thus, as the role of Remote Pilots may have a major impact on the avation industry of the future, all groups of pilots should cooperate and connect their interests for better working conditions.

IFALPA Positionspapier: Non-Routine Operations

In this Position Paper, IFALPA adresses possible safety risks generated by non-routine operations. More and more flights are conducted outside the scope of Standard Operating Procedures, e.g.:

- Ferry flights with known technical defects,
- Post maintenance flights,
- Trial flights for new procedures or equipment.

Furthermore, these flights are carried out by line pilots without any specific training instead of specifically trained test pilots. To reduce this identified safety risk, IFALPA issued recommendations for non-routine operations.

IFALPA, ECA and EASA News

We would like to draw particular attention to the following position papers and publications:

IFALPA

- Loss of Control In-flight and Aircraft Trim System
- Fire Protection of Cargo Compartments

ECA

- Passengers and Pilots tired of delays

EASA

- Unruly passenger behaviour on board flights is a threat to safety
- Easy Acess Rules for Aircrew

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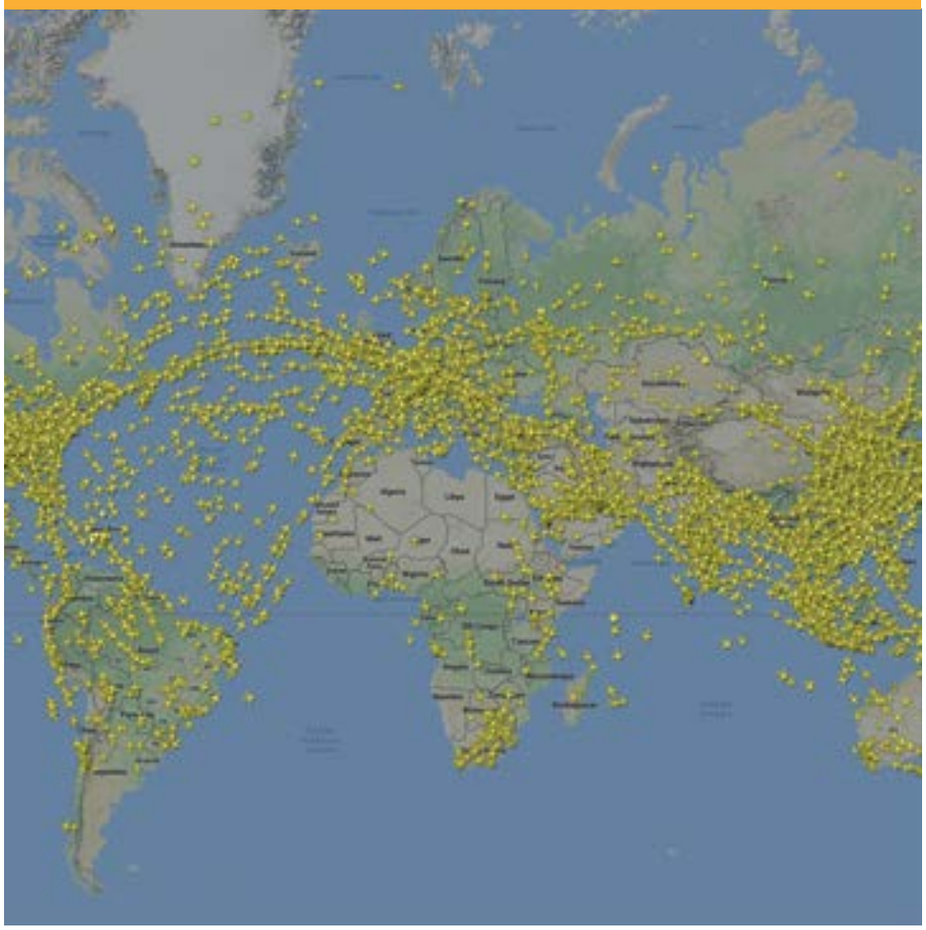
DUTCH
SAFETY BOARD

Flying over conflict zones

Follow-up recommendations

MH17 Crash investigation



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Flying over conflict zones

Follow-up recommendations *MH17 Crash* investigation

The Hague, February 2019 (amended on 28 February 2019)

The reports issued by the Dutch Safety Board are open to the public and available on safetyboard.nl.

Cover image: Flightradar24

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The Dutch Safety Board

When accidents or disasters happen, the Dutch Safety Board investigates how it was possible for these to occur, with the aim of learning lessons for the future and, ultimately, improving safety in the Netherlands. The Safety Board is independent and is free to decide which incidents to investigate. In particular, it focuses on situations in which people's personal safety is dependent on third parties, such as the government or companies. In certain cases the Board is under an obligation to carry out an investigation. Its investigations do not address issues of blame or liability.

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This report is published in the Dutch and English language. If there is a difference in interpretation between the Dutch and English version, the Dutch will prevail.

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SUMMARY AND CONSIDERATION

On 17 July 2014, 298 people lost their lives when the Malaysia Airlines aeroplane they were in crashed near Hrabove, Ukraine. The disintegration of the aeroplane during the flight was the result of the detonation of a warhead above the left hand side of the cockpit. The aeroplane crashed over the eastern part of Ukraine, an area in which an armed conflict arose in April 2014. Initially, the conflict mostly took place on the ground, but as from the end of April 2014 it expanded into the airspace. The crash of flight MH17 immediately raised the question why the aeroplane was flying over an area where there was an ongoing armed conflict.

The *MH17 Crash* report published by the Dutch Safety Board in October 2015 responded to this question and explained the decision-making process with regard to flying over conflict zones at the time. The report contained eleven recommendations for better management of the risks associated with flying over conflict zones. Due to the global importance of the recommendations, they were addressed to the International Civil Aviation Organization (ICAO), the International Air Transport Association (IATA), all States and all airlines.

In all of its investigations, the Dutch Safety Board evaluates how organizations have implemented its recommendations. Given the size of the disaster and the great value the Safety Board attaches to the formulated recommendations, the Board started an investigation into the follow-up to the recommendations regarding flying over conflict zones in the beginning of 2018. The investigation focused on whether the eleven recommendations from 2015 were followed up on and whether the parties concerned were successful in eliminating the safety shortcomings underlying the recommendations. The Dutch Safety Board stresses that this follow-up investigation only serves as a follow-up to the recommendations and therefore does not address the cause and circumstances of the crash of flight MH17.

The subject of flying over conflict zones is not an obvious subject for an aviation accident investigation. From 2014 to 2015, the Dutch Safety Board carried out its investigation into the crash of flight MH17 in accordance with Annex 13 of the Convention on International Civil Aviation, which sets out the international standards on independent accident investigation. Although this annex is intended for investigations aimed at increasing civil aviation safety, it was also possible to carry out an investigation within that framework in which the essence of the risk was more about security. This follow-up investigation confirms that entities that conduct independent investigations on aviation accidents can also contribute to improving safety in the context of security risks.

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Developments after the crash of flight MH17

On a global level, ICAO launched various initiatives aimed at better management of the risks associated with flying over conflict zones. These initiatives have included amending standards, recommended practices and manuals (henceforth referred to as 'ICAO documents') in order to embed and promote the sharing of threat information and the performance of risk assessments. Some of the proposed amendments have now been implemented, while others are yet to be carried out. This is a long-term process due to the involvement of 192 ICAO Member States with differing views and interests. The first steps towards amending the ICAO documents were taken in 2014, but it will take until at least 2020 for all of the foreseen amendments to be implemented.

Another important ICAO initiative is the publication of a manual offering support to States, airlines and other parties concerned in the performance of risk assessments with regard to flying over or near conflict zones. Since it is not possible to provide a thorough explanation in international standards of how the risk assessments should be performed, the publication of a manual containing guidelines for performing risk assessments is a valuable initiative. There is no obligation attached to the manual. ICAO has indicated that they are to provide workshops and presentations in order to bring the manual to the attention of those concerned. Through the publication and dissemination of the manual, ICAO is helping to increase the quality and harmonization of the implementation of risk assessments for flying over conflict zones by States and airlines.

Although none of the Dutch Safety Board's recommendations are addressed to European Union (EU) institutions, in response to the crash of flight MH17, the European Aviation Safety Agency (EASA) and the European Commission have launched initiatives aimed at better management of the risks associated with flying over conflict zones. EU Member States now exchange relevant intelligence information in order to arrive at a joint assessment of the risks associated with flying over conflict zones. The advantage of this cooperation is that intelligence information and risk analysis capabilities of both larger and smaller States are combined. If the outcome of the assessment is that the risk for a certain area is considered 'high', EASA publishes a Conflict Zone Information Bulletin. These bulletins are not only used within the European Union, but also as an information source by States and airlines based outside of Europe. This European initiative thus contributes to a better global understanding of the risks. Various States (such as the USA, the UK, France and Germany) also publish information about conflict zones across the world, for example in the form of a Notice to Airmen (NOTAM). These NOTAMs also serve as important information sources for States and airlines around the world.

On a national level, several States have taken initiatives that contribute to better management of the risks related to flying over conflict zones. In the Netherlands, an agreement has been drawn up regarding the sharing of threat information for civil aviation. The Netherlands has translated the text of the agreement into English and made this translation available to serve as an example to other countries inside and outside Europe, as well as to ICAO. In addition, the Netherlands has taken the lead in initiating amendments to the ICAO documents. To support the ICAO Secretariat in effecting the work programme, the Netherlands seconded a senior safety expert at ICAO for a two-year period (2017 and 2018). This way, the Netherlands (the Dutch Ministery of Infrastructure and Water Management), in collaboration with various other States,

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contributes to ensuring that the subject of flying over conflict zones remains on the international agenda.

Airlines now play a more active role in gathering information about the risks that conflict zones pose to civil aviation than they did at the time of the crash of flight MH17. They also have access to more and generally better threat information. Risk assessments are performed in a more structured manner and some airlines explicitly state that they take uncertainties and risk increasing factors into consideration as part of the risk assessment process. Furthermore, there is evidence to suggest that, if there are doubts about the safety of a flight route, airlines are more inclined not to fly. IATA has made the assessment of risks related to flying over conflict zones part of their prescribed management systems in order to manage the risks for aviation. Airlines that are members of IATA are periodically tested on their implementation of these systems. However, the results of these audits are not published, meaning that the extent to and manner in which airlines have given the risks of flying over conflict areas a place in their management systems is not transparent.

Areas of attention for the years to come

This follow-up investigation has also shown that not all of the amendments proposed by the Dutch Safety Board have been implemented. The full assurance provided by ICAO standards has not yet been achieved. Moreover, these amendments will need to be incorporated into the States' national legislation.

In the past years, no or minimal changes have been made to the airspace management by States involved in armed conflicts in their territory. The Board realizes that States involved in an armed conflict will have difficulty when it comes to guarding the safety of their airspace. This indeed turns out to be the case in practice. With the exception of Ukraine, States have not implemented airspace restrictions related to the overflying of conflict zones. Although ICAO is in a position, as an intergovernmental organization, to urge and support States to safeguard the safety of their airspace, ICAO is not doing so.

Another area of attention is that airlines are indicating that the level of detail of the information available is not always sufficient in order to perform an adequate risk assessment. There are also obstacles in relation to sharing non-public information. Conditions for exchanging threat information include a proper information network and mutual trust. For access to relevant information, a good relationship and mutual communication between airlines and the intelligence services of the State in which the airline is based are essential. However, these are not a given everywhere in the world.

The mechanisms that have been created for the purposes of sharing threat information and risk classifications are better suited to tackling long-term conflicts than to tackling new conflicts or sudden escalations of existing conflicts. Information sharing about abrupt changes in the threat level occurs on an ad hoc basis and through informal networks. As a result, it is not guaranteed that airlines can access accurate information about new threats timely and adjust their flight routes accordingly.

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The Dutch Safety Board considers public accountability for flight routes chosen to be the final link in keeping airlines focused with respect to their responsibility for performing thorough risk assessments for flying over conflict areas. However, airlines do not or hardly account publicly for their chosen flight routes, and this is not being encouraged by IATA either.

Throughout history, safety and security have been separate worlds; worlds with their own laws and regulations, for which the responsibilities are assigned to various parties and departments within organizations. However, as the crash of flight MH17 shows, safety and security are intertwined. To manage the risks related to flying over conflict zones and other risks at the interface of safety and security as good as possible, closer cooperation between both worlds is necessary.

This follow-up investigation has shown that over the past few years, important steps have been taken with the aim of better management of the risks associated with flying over conflict zones. It is important that the amendments already implemented are perpetuated and that parties take the announced follow-up steps. Vital to this is the willingness of parties to actively inform each other about threats and potential threats, in order to protect civilians and passengers across the world.

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LIST OF ACRONYMS

A4E	Airlines for Europe (European airline association)
ACI	Airports Council International
AGL	Above Ground Level
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
AIVD	General Intelligence and Security Service, the Netherlands (*Dutch: Algemene Inlichtingen- en Veiligheidsdienst*)
ANC	Air Navigation Commission (of ICAO)
ATB	Air Transport Bureau (of ICAO)
AVSEC-panel	Aviation Security panel (of ICAO)
CANSO	Civil Air Navigation Services Organisation
CTIVD	Review Committee on the Intelligence and Security Services, the Netherlands (*Dutch: Commissie van Toezicht op de Inlichtingen- en Veiligheidsdiensten*)
CZIB	Conflict Zone Information Bulletin
CZIR	Conflict Zone Information Repository
DG HOME	Directorate-General for Migration and Home Affairs (of the EC)
DG MOVE	Directorate-General for Mobility and Transport (of the EC)
EASA	European Aviation Safety Agency
EC	European Commission
ECAC	European Civil Aviation Conference
EEAS	European External Action Service (of the EC)
EU	European Union
FAA	Federal Aviation Administration (United States)
FIR	Flight Information Region
GANP	Global Air Navigation Plan (of ICAO)
GASeP	Global Aviation Security Plan (of ICAO)
GASP	Global Aviation Safety Plan (of ICAO)
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IOSA	IATA Operational Safety Audit
ISM	IOSA Standards Manual (of IATA)
MANPADS	Man-portable air-defence systems
MIVD	Defence Intelligence and Security Service, the Netherlands (*Dutch: Militaire Inlichtingen- en Veiligheidsdienst*)

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NCTV	National Coordinator for Security and Counterterrorism, the Netherlands (*Dutch: Nationaal Coördinator Terrorismebestrijding en Veiligheid*)
NM	Network Manager (of EUROCONTROL)
NOP	Network Operations Portal (of EUROCONTROL)
NOTAM	Notice to Airmen
RCZ	Risks to civil aviation arising from Conflict Zones
SAMs	Surface-to-air missiles
SARPs	Standards and Recommended Practices (of ICAO)
SeMS	Security Management System (of IATA)
SFAR	Special Federal Aviation Regulation (United States)
TF RCZ	Task force on Risks to Civil Aviation arising from Conflict Zones (of ICAO)
USAP	Universal Security Audit Programme (of ICAO)
USOAP	Universal Safety Oversight Audit Programme (of ICAO)
VNV	Dutch Airline Pilots Association (*Dutch: Vereniging Nederlandse Verkeersvliegers*)
WGTR	Working Group on Threat and Risk (of ICAO)

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1 INTRODUCTION

1.1 Rationale

On 17 July 2014, 298 people lost their lives when the Malaysia Airlines aeroplane that they were travelling in crashed in the eastern part of Ukraine. On 13 October 2015, the Dutch Safety Board published the results of its international investigation into the crash of aeroplane MH17. The investigation showed that the crash was caused by the detonation of a 9N314M-model warhead carried on a 9M38-series of missiles, launched from a Buk surface-to-air missile system. The investigation also showed that the missile was launched from the eastern part of Ukraine, where there was an ongoing armed conflict.[1]

At the time, the Dutch Safety Board not only investigated the cause of the crash but also why the aeroplane was flying over a conflict zone and how the decision-making process relating to flying over conflict zones is generally organized. That investigation resulted in eleven recommendations that aim to manage as best as possible the risks associated with flying over conflict areas (see Table 1). Since the aim of the recommendations is to bring about better risk management globally, they are addressed to the International Civil Aviation Organization (ICAO), the International Air Transport Association (IATA), all States and all airlines.

No.	Addressed party/parties	Recommendation
1	ICAO	Incorporate in Standards that States dealing with an armed conflict in their territory shall at an early stage publish information that is as specific as possible regarding the nature and extent of threats of that conflict and its consequences for civil aviation. Provide clear definitions of relevant terms, such as conflict zone and armed conflict.
2	ICAO	Ask States dealing with an armed conflict for additional information if published aeronautical or other publications give cause to do so; offer assistance and consider issuing a State Letter if, in the opinion of ICAO, States do not sufficiently fulfil their responsibility for the safety of the airspace for civil aviation.
3	ICAO	Update Standards and Recommended Practices related to the consequences of armed conflicts for civil aviation, and convert the relevant Recommended Practices into Standards as much as possible so that States will be able to take unambiguous measures if the safety of civil aviation may be at issue.

1 Dutch Safety Board, *MH17 Crash*, October 2015.

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No.	Addressed party/parties	Recommendation
4	ICAO Member States	Ensure that States' responsibilities related to the safety of their airspace are stricter defined in the Chicago Convention and the underlying Standards and Recommended Practices, so that it is clear in which cases the airspace should be closed.
5	ICAO and IATA	Encourage States and operators who have relevant information about threats within a foreign airspace to make this available in a timely manner to others who have an interest in it in connection with aviation safety. Ensure that the relevant paragraphs in the ICAO Annexes concerned are extended and made more strict.
6	ICAO	Amend relevant Standards so that risk assessments shall also cover threats to civil aviation in the airspace at cruising level, especially when overflying conflict zones. Risk increasing and uncertain factors need to be included in these risk assessments in accordance with the proposals made by the ICAO Working Group on Threat and Risk.
7	IATA	Ensure that the Standards regarding risk assessment are also reflected in the IATA Operational Safety Audits (IOSA).
8	States (State of Operator)	Ensure that operators are required through national regulations to make risk assessments of overflying conflict zones. Risk increasing and uncertain factors need to be included in these assessments in accordance with the proposals made by the ICAO Working Group on Threat and Risk.
9	ICAO and IATA	In addition to actions already taken, such as the website (ICAO conflict zone information repository) with notifications about conflict zones, a platform for exchanging experiences and good practices regarding assessing the risks related to the overflying of conflict zones is to be initiated.
10	IATA	Ensure that IATA member airlines agree on how to publish clear information to potential passengers about flight routes over conflict zones and on making operators accountable for that information.
11	Operators	Provide public accountability for flight routes chosen, at least once a year.

Table 1: Recommendations from the MH17 Crash report.

For all its investigations, the Dutch Safety Board evaluates how the parties have followed-up on the recommendations.[2] The Board is also authorized to conduct an investigation into the follow-up to recommendations. Considering the scope of the crash and the value that the Dutch Safety Board places on the recommendations formulated, the Board started an investigation into the follow-up to the recommendations with regards to flying over conflict zones at the beginning of 2018.[3] The Dutch Safety Board considers it important to emphasize that this follow-up investigation only concerns the

2 Kingdom Act concerning the Dutch Safety Board, Article 76. The Dutch Safety Board earlier conducted a follow-up investigation into the follow-up to recommendations from the report 'Capsizing of shell dredger Frisia (HA38)' from 2012, the report 'Odfjell Terminals Rotterdam Safety, during the 2000-2012 period' from 2013 and the report 'Earthquake risks in Groningen' from 2015.

3 On 15 September 2016, the Dutch Safety Board announced this via a news item.

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follow-up to the safety recommendations and does not relate to the cause and circumstances of the crash of flight MH17.[4]

1.2 Objective and research questions

This investigation into the state of affairs regarding the follow-up to the recommendations from the *MH17 Crash* report – henceforth called the 'follow-up investigation' – aims to provide insight into the way in which ICAO, IATA, States and airlines currently, over four years after the crash of flight MH17, tackle the issue of flying over conflict zones. In particular, this follow-up investigation aims to clarify whether the formulated recommendations are being followed up and whether the parties involved have been successful in eliminating the safety shortcomings underlying the recommendations. The key question of this follow-up investigation is as follows:

> What changes have the parties involved implemented since the crash of flight MH17 in order to adequately manage the risks associated with flying over conflict zones, and to what extent has this led to better management of these risks?

The key question is divided into the following sub-questions:

- What have the addressed parties (ICAO, ICAO Member States, IATA and airlines) done in order to implement the recommendations from the *MH17 Crash* report and to improve the management of risks associated with flying over conflict zones?
- Have other parties developed activities for the purpose of improving the management of risks associated with flying over conflict zones? If so, what are these activities?
- To what extent have the recommendations concerning flying over conflict zones from the *MH17 Crash* report been followed up, and have the safety shortcomings underlying the recommendations been eliminated?

1.3 The approach of the investigation

The Board used various investigative methods for the purposes of this follow-up investigation, including conducting interviews, gathering documents and distributing surveys. The information gathered was then analysed in order to answer the research questions. For each type of organization listed below, there follows a description of the investigative approach followed. More information about the investigative approach is available in Appendix A "Explanation of the follow-up investigation".

4 In addition to the 'MH17 Crash' report, in October 2015 the Dutch Safety Board also published the 'MH17 Passenger information' report, which contains three recommendations that were aimed at improving and accelerating the process of informing relatives. In 2016, the Board found that the recommendations from that investigation were being adequately followed up. The Board saw no reason for further investigation into the follow-up to these recommendations.

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International organizations - The *MH17 Crash* report contains six recommendations that are addressed to the International Civil Aviation Organization (ICAO). The main objective of the recommendations is to improve the international standards on flying over conflict zones. In order to investigate whether the changes to the standards proposed by the Board have been implemented, information has been requested from ICAO. ICAO has provided information, and the information received has been analysed.

In addition to the recommendations to ICAO, the report contains three recommendations that are addressed to the global trade association of airlines, IATA (International Air Transport Association). In order to establish whether the changes proposed by the Board have been implemented, information was requested from IATA and an interview was held.

States - The *MH17 Crash* report contains two recommendations addressed to States. One of these recommendations, recommendation 4, is aimed at all ICAO Member States and calls on them, at the ICAO level, to stricter define the responsibility of States with regard to the safety of their airspace, such that it is clear in which cases the airspace must be closed. The report encourages the countries that were most involved in the investigation into the crash of flight MH17[5] to take the initiative in this respect. The Dutch Safety Board held interviews with the Dutch Ministry of Infrastructure and Water Management about the initiative of the Dutch government in collaboration with a number of countries involved and the EU Member States.

The other recommendation addressed to States is recommendation 8. This recommendation calls on States to require the airlines based in their country to draw up risk analyses for conflict zones. Since it is not feasible to investigate the efforts of all ICAO Member States within the context of this follow-up investigation, a survey was distributed to a selection of countries in order to explore whether they have followed this recommendation (see Appendix A "Explanation of the follow-up investigation" for more information on the survey distributed).

In the survey, the Board also asked about the information exchange between States and airlines. The internal functioning of the intelligence and security services in the Netherlands and other countries did not form part of this follow-up investigation.

Airlines - The *MH17 Crash* report contains one recommendation addressed to all airlines. This concerns the recommendation to give public account for chosen flight routes at least once per year. Since it is not feasible to investigate the efforts of all airlines within the context of this follow-up investigation, a selection of airlines has been approached through a survey (see Appendix A "Explanation of the follow-up investigation" for more information). Also, a visit was paid to a limited number of airlines in order to conduct interviews. The interviews investigated how threat information is gathered, the manner in which airlines perform risk assessments and whether they give public account for chosen flight routes.

5 The MH17 investigation was conducted by the Dutch Safety Board. Accredited representatives from the following participating States were involved in the investigation: Ukraine, Malaysia, the United States, the United Kingdom, Australia and the Russian Federation.

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Other relevant parties - Although the report did not contain any recommendations for other parties, it became apparent during this follow-up investigation that other parties developed initiatives following the crash of flight MH17 in order to manage as best as possible the risks associated with flying over conflict zones. For this reason, the Board also requested information from other organizations and held interviews. Appendix A "Explanation of the follow-up investigation" lists all parties where information was gathered (for example by conducting interviews) as part of this follow-up investigation.

1.4 Assessment framework

The assessment framework drawn up by the Dutch Safety Board for the *MH17 Crash* investigation, which as such formed the foundation for the recommendations, was also used as an assessment framework in this follow-up investigation. The assessment framework is based on ICAO Annexes, legislation and regulations and best practices on the one hand, and on the Board's views on management of safety risks that is as effective as practically possible on the other. For this follow-up investigation, the assessment framework has been developed per theme (airspace management, gathering and sharing threat information, conduct of risk assessments) in the relevant chapters. A general overview of the assessment framework is given below.

The Chicago Convention states that every State has sovereignty over the airspace above its territory.[6] This means that the relevant State exercises complete and exclusive control over its own airspace. The Dutch Safety Board therefore expects that States do everything reasonably possible to guarantee safety for flights through their airspace. This means that they need to timely close their airspace or restrict its use if there is reason to do so. For example, this may be necessary during times of armed conflict in their territory. The Board realizes that States involved in an armed conflict will have difficulty in practice when it comes to guarding the safety of their airspace and as a result the fundamental principle of sovereignty can give rise to vulnerability. Firstly, this means that it is important that ICAO does encourage and support Member States to guard the safety of the airspace. Secondly, it means that airlines and other aviation parties involved cannot assume beforehand that the airspace above a conflict zone is safe.

Airlines are responsible for ensuring safe flight operation.[7] They determine which flight routes they use within the available airspace and perform their own assessments when choosing a particular flight route. Various factors play a role in their considerations. Since airlines cannot assume that the airspace above a conflict zone is safe, they have to assess the risks of flying over that area themselves. When conducting the risk assessments, they must consider not just specific threats but also risks for which intentions, capabilities or activities are uncertain. This includes increasing tension between armed groups and/or countries.

6 Convention on Civil Aviation ("Chicago Convention"), 7 December 1944, 15 U.N.T.S. 295, ICAO Doc. 7300/9.
7 ICAO Annex 6, Part I, Tenth edition, July 2016.

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To be able to perform an accurate risk assessment it is essential that airlines have access to the relevant information. In the first instance, it is the airlines themselves who are responsible for gathering this information. It may be the case, however, that States possess information about conflict zones that is difficult for airlines to obtain. In that case, the Dutch Safety Board expects that States that possess relevant information share this information promptly and in as much detail as possible with airlines flying over or near conflict zones.

Passengers need to be confident that airlines are adequately fulfilling their responsibility to manage the risks associated with flying over conflict zones. It is for this reason that the Board considers it important that airlines give public account for chosen flight routes. Transparency helps airlines stay focused on their responsibility to perform adequate risk assessments.

1.5 Reading guide

Chapter 2 sets out the international organizations involved in managing the risks associated with flying over conflict zones and which initiatives they have developed. The analysis of the changes that have taken place in the management of these risks follows in Chapters 3 to 5. These chapters describe the changes that have taken place since the crash of flight MH17 in the area of airspace management (Chapter 3), gathering and sharing threat information (Chapter 4) and assessing the risks associated with flying over conflict zones (Chapter 5). Chapters 3 to 5 follow the same structure. The first section of each chapter contains the assessment framework for the topic addressed in the chapter in question. The second section contains factual information about what has changed since the crash of flight MH17 and the third section contains analysis of the state of affairs, including sub-conclusions. The fourth and last section contains the conclusions related to the topic addressed in the chapter in question. Appendix D describes for each recommendation to what extent the addressed parties have followed up the recommendation. Chapter 6 contains the overall conclusions of this follow-up investigation.

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2 INTERNATIONAL ORGANIZATIONS AND INITIATIVES

Since the crash of flight MH17, various international organizations have developed initiatives in order to reduce the risk of a similar crash happening in the future. Section 2.1 describes the organizations concerned and Section 2.2 explains the initiatives they have developed. This last section contains an overview of the initiatives developed by international organizations that concern a number of topics. Chapters 3 to 5 subsequently provide more detail about the aspects of these initiatives that are relevant to the chapters involved.

2.1 International organizations concerned

As described in Chapter 1, the majority of the recommendations in the *MH17 Crash* report are addressed to ICAO and/or IATA. Below a description of these two parties is provided. This section also addresses initiatives taken in the European Union to improve management of the risks involved in flying over conflict zones. Although the *MH17 Crash* report does not issue any recommendations to European institutions, this follow-up investigation reveals that the European Commission and the European Aviation Safety Agency (EASA) have taken measures to improve risk management. Therefore, this section also contains a short description of these parties.

2.1.1 The International Civil Aviation Organization

The International Civil Aviation Organization (ICAO) is an agency of the United Nations. ICAO establishes the international framework for civil aviation. The principles on which ICAO's work is based are defined in the Chicago Convention.[8] The Convention has been ratified by 192 Member States.

ICAO's main bodies are:

- The ICAO Assembly. The Assembly is made up of representatives of all ICAO Member States and convenes every three years. The Assembly reviews ICAO's activities and establishes the priorities and the policy for the next few years. The Assembly also elects the ICAO Council and establishes the budget for the next three years.
- The ICAO Council. The Council, composed of 36 Member States, establishes the ICAO work programme and gives direction to the work of ICAO. The Council is assisted by a number of committees, including the Air Navigation Commission (in technical matters), the Air Transport Committee (in economic matters) and the Committee on Unlawful Interference (security).

8 Convention on Civil Aviation ("Chicago Convention"), 7 December 1944, 15 U.N.T.S. 295, ICAO Doc 7300/9.

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- The ICAO Secretariat. The Secretariat is led by the Secretary-General and consists of the Air Navigation Bureau, the Air Transport Bureau, the Technical Co-operation Bureau, the Legal Bureau, the Bureau of Administration and Services, and seven Regional Offices around the globe. The Air Navigation Bureau is responsible for matters related to safety and air navigation and the Air Transport Bureau focuses on aviation security, economics and the environment.

The principles set out in the Chicago Convention are elaborated in Annexes, documents (Docs) and Manuals. The Chicago Convention has nineteen Annexes that address various topics, including aviation safety and aviation security. The Annexes contain Standards as well as Recommended Practices (together abbreviated as SARPs). The difference between Standards and Recommended Practices is that in principle Standards must be followed up by Member States and Recommended Practices are more noncommittal in nature. However, Member States may also inform ICAO of their intention to deviate from Standards. The most powerful tools ICAO possesses to promote the introduction of SARPs are the Universal Safety Oversight Audit Programme (USOAP) and the Universal Security Audit Programme (USAP). Member States are periodically audited as part of these programmes.

The Annexes most relevant to this follow-up investigation are:

Annex 2 'Rules of the Air'	This Annex includes SARPs related to the use of airspace and airports, including flight altitudes and access rules.
Annex 6 'Operation of Aircraft'	This Annex includes SARPs for flight operation.
Annex 11 'Air Traffic Services'	This Annex describes the responsibility of the Member State to organize the airspace and regulate the associated air traffic services provision. This Annex also describes the SARPs related to air traffic services with a particular focus on the need for coordination between civil and military authorities charged with air traffic services provision.
Annex 15 'Aeronautical Information Services'	The objective of this Annex is to ensure the flow of information necessary for safe and efficient flight operations. The Annex describes various resources that Member States can employ for this provision of information, such as the Aeronautical Information Publication (AIP), Aeronautical Information Circular (AIC) and the Notices to Airmen (NOTAM). The latter specifically aims to inform parties concerned about modified conditions or the availability of aviation facilities, services, procedures or dangers.
Annex 17 'Security'	This Annex describes that the primary objective of each Member State must be to protect passengers, crew, ground staff and citizens from acts of unlawful interference such as the destruction of an aircraft. To this end requirements are imposed related to the establishment of the national organization necessary for this purpose.
Annex 19 'Safety Management'	This Annex contains the principles for a safety management system. It includes the requirements for Member States as well as airlines and other aviation service providers.

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A structured process has been established for developing or amending SARPs. In principle, proposals for new SARPs or amendments to existing SARPs arise from the ICAO work programme. The proposals are elaborated by one of the 19 expert panels, one panel for each Annex. 17 out of the 19 Annexes to the Convention are of a technical nature and therefore fall within the responsibilities of the Air Navigation Bureau. The related 17 panels report to the Air Navigation Commission (ANC). The remaining two Annexes – Facilitation and Security – are under the purview of the Air Transport Bureau. The associated Aviation Security (AVSEC) Panel for Annex 17 reports to the Committee on Unlawful Interference.

As soon as the panel has prepared a technical proposal, after it has been approved by the ANC, it is presented to the States and the aviation industry by means of a State Letter in which these parties are asked to respond. All the feedback received is processed into a final proposal that the ANC after approval presents to the Council for adoption. As a rule, it takes approximately two years from the initial proposal for a new or amended SARP until it is formally approved. The lead time may be shorter or longer depending on the prioritization or complexity of the subject and time needed to reach a consensus. More information about ICAO's standards-making process can be found in Appendix C.

2.1.2 The International Air Transportation Association

The International Air Transport Association (IATA) is the global trade association of airlines. IATA has approximately 290 affiliated members from 120 countries that are jointly responsible for 82% of total air traffic. IATA's objective is to support, represent and lead the aviation industry in developing a safe, reliable, profitable and sustainable aviation industry. IATA membership is on a voluntary basis.

One of the pillars of IATA's service involves performing audits. The IATA Operational Safety Audit (IOSA) is the audit programme for airlines. The programme was designed to assess an airline's operational management systems. The assessment criteria were developed by IATA in the form of standards and guidance. The IOSA audits are mandatory for all IATA members.

2.1.3 The European Commission and EASA

In the European Union (EU) legislation related to aviation safety is established in European regulations, which are directly binding for EU Member States. Since EU Member States are also connected to ICAO, European requirements must be consistent with ICAO SARPs. In this way, the EU makes it compulsory for all EU Member States to implement the global requirements. The parties most relevant to this follow-up investigation are the European Commission (in particular the Directorates-General DG MOVE and DG HOME) and the European Aviation Safety Agency (EASA). The European Commission is the executive body of the European Union. The European Commission is responsible for proposing legislation, managing the EU budget, enforcing EU law (in conjunction with the Court of Justice) and representing the EU at an international level. EASA is a specialized agency of the European Union that acts as the aviation safety authority.

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EASA has 32 Member States.[9] The tasks of the EASA include preparing proposals for European legislation, certifying aviation products such as aircraft, engines and parts, oversight and support of EASA Member States and approval of aviation organizations. With the entry into force of Regulation (EU) 2018/1139[10], the mandate of EASA has been broadened, including in the area of aviation security.

2.2 Initiatives developed by international organizations

This section contains an overview of the initiatives of the international organizations described in Section 2.1. It mainly focuses on the state of affairs at the time of this report, without describing in detail all preceding steps, developments and initiatives.

2.2.1 Work Programme of the Task force on Risks to Civil Aviation arising from Conflict Zones

On 29 July 2014, ICAO, IATA, Airports Council International (ACI) and the Civil Air Navigation Services Organisation (CANSO) issued a joint statement in response to the crash of flight MH17. In the statement the organizations condemned the use of weapons against civil aviation and announced the creation of a task force with the aim of discussing the issue of flight routes over conflict zones.[11]

The ICAO Secretary-General then set up the Task force on Risks to Civil Aviation arising from Conflict Zones (TF RCZ), composed of representatives from ICAO Member States, international organizations and the aviation industry. The TF RCZ developed a work programme comprising 12 activities (see Table 2) and 31 underlying subtasks. The TF RCZ handed this work programme over to the ICAO Secretariat after the last meeting of the task force in December 2014.

9 28 EU Member States, Norway, Iceland, Switzerland and Liechtenstein.
10 This regulation was published on 22 August 2018.
11 In the run-up to 29 July 2014, during its 7221st session, the United Nations Security Council unanimously adopted Resolution 2166 (2014), in which the Security Council expresses its support for an independent international aviation investigation into the crash. This resolution also gave extra support to the role of ICAO.

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WORK PROGRAMME	
1.	*Development of processes, including types of reliable, timely and relevant information that States require to effectively discharge their responsibilities in sovereign or delegated airspace and for the operation of their own operators outside of that airspace.*
2.	*Consolidation of available information as it relates to conflict zones in a centralized system accessible to all relevant stakeholders, including States and industry.*
3.	*Development of best practice guidance for conducting risk assessments for civil aircraft operations conducted over or near conflict zones, including consideration on how efforts can be assisted through cooperation on a regional basis, as appropriate; and the sharing of the results of these assessments with industry players in their States and regions.*
4.	*Development of modalities for the timely exchange of these risk assessments and supporting information with other States or with industry players from other regions; and recommendations as to whether this is best done bilaterally, regionally, through industry groupings, or via ICAO.*
5.	*Identification of specific types of information, required from States by airspace users, ANSPs and airports relevant to civil aircraft operations over or near conflict zones.*
6.	*Improvement of processes to share operationally derived risk information taking into consideration ways in which safety occurrences are currently shared.*
7.	*In order to enhance transparency, develop best practices on the provision of information to passengers and flight crew regarding the use of airspace over or near conflict zones.*
8.	*Reinforcing and clarifying the responsibilities of States under the framework of the Chicago Convention system for safe operations in their sovereign and delegated airspace and for the operation of their own operators outside of that airspace.*
9.	*Consistent with the agreed outcomes, modifications to aviation safety and security auditing and assessment programmes so as to ensure that accountabilities, including those related to contingency planning, are properly discharged.*
10.	*Development of a set of possible changes to ICAO Annexes, guidance and/or other materials so as to give effect to the recommendations made on enhancements of risk assessments for civil aircraft operations near or over conflict zones.*
11.	*Building on the current provisions and guidance on contingency planning, expand so as to enable States to meet air traffic services needs of changes in traffic flows.*
12.	*Recommendations for ICAO, States and industry action to support the agreed outcomes, including recommendations to ensure effective implementation of any new SARP, supported by the provision of assistance when necessary.*

Table 2: Work programme of the Task force on Risks to Civil Aviation arising from Conflict Zones.

The work programme consists of various activities that ICAO has to elaborate in association with other relevant parties, such as clarifying the Chicago Convention and amending Annexes, documents and manuals. The Netherlands has seconded a senior safety expert at ICAO for a two-year period (2017 and 2018) to support the ICAO Secretariat to effect the work programme. The ICAO Secretariat reports the progress of the work programme to the ICAO Council and ultimately to the Assembly. ICAO has indicated that 23 of the 31 subtasks have been completed. According to ICAO, the remaining eight tasks will be completed between 2018 and 2020.

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EU Member States continued to raise the topic of flying over conflict zones at ICAO through submitting papers (initiated by the Netherlands). For the 2016 Assembly, the EU Member States, together with member countries of the European Civil Aviation Conference (ECAC)[12] that are not in the EU, EUROCONTROL, and supported by Australia and Malaysia, submitted an information paper[13] and a working paper[14] regarding this topic. The information paper contains (among other things) an overview of the *MH17 Crash* report recommendations and their links to related tasks in the work programme and the ICAO Annexes. The same stakeholders submitted a working paper[15] for the Air Navigation Conference[16] in October 2018 to draw attention to the rapid completion of the ICAO work programme on conflict zones, to further development of a framework for risk assessments and to invite ICAO to promote information sharing about conflict zones at the regional level. This paper received broad support during the conference.

2.2.2 Initiatives developed by ICAO

Below a number of specific results of the initiatives taken by ICAO are described.

Conflict Zone Information Repository

The work programme of the TF RCZ includes an action for setting up a centralized system for sharing information about risks to civil aviation in relation to conflict zones. At the beginning of April 2015, ICAO launched a prototype of the Conflict Zone Information Repository (CZIR) for a one-year test period. States could publish information in the CZIR on a voluntary basis, including information related to another country's airspace. At first, this was actually done. From the outset there were differences of opinion among ICAO Member States with regard to the repository, concerning verification of the information, the definition of conflict zones (whether information actually related to a conflict zone, and as such should be included in the repository) and political sensitivities. Over a year later the repository was converted into a simplified library of weblinks, after which ICAO did not post any more information on the ICAO website, but referred to the websites of States containing information about conflict zones. In November 2017, ICAO decided, partly as a result of a survey that ICAO conducted among airlines and the finding that sufficient information is available outside the CZIR, to discontinue the library (see Chapter 4 for more information).

Risk Assessment Manual - Doc 10084

Another action in the work programme involved compiling a manual for the conduct of risk assessments. In November 2016, ICAO published the document *Civil Aircraft Operations Over Conflict Zones (Restricted)*. This document related to the risks of targeted as well as unintentional attacks on civil aviation. The guidance in this document

12 ECAC is an intergovernmental organisation for the promotion of the continued development of a safe, efficient and sustainable European air transport system. ECAC harmonizes civil aviation policies and practices among its Member States and promotes understanding on policy matters between its Member States and other parts of the world.
13 ICAO Working Paper A39-WP/297 (Information paper), 20 September 2016.
14 ICAO Working Paper A39-WP/108 Revision No.1, 13 September 2016.
15 ICAO Working paper AN-Conf/13-WP/45_rev1, 10 September 2018.
16 The Air Navigation Conference is a formal ICAO meeting for Member States and aviation stakeholders. The technical discussions at the conference aim to lead to a more efficient and effective decision-making process during the ICAO Assembly and allow for the focus to be on strategic issues based on sound technical advice.

originated from the Working Group on Threat and Risk (WGTR)[17], a working group of the ICAO Aviation Security Panel that already existed before the crash of flight MH17. In April 2017, the document was published as Doc 10084 (Restricted).

In May 2018, the second edition of Doc 10084 was published under the title *Risk Assessment Manual for Civil Aircraft Operations Over or Near Conflict Zones*. In this version ICAO made amendments to expand the guidance for States and airlines related to risks of surface-to-air missiles (SAMs) and to supplement the risk factors that need to be included in risk assessments. The manual also includes an overview of already adopted and intended amendments to the ICAO Annexes. To make this information more widely accessible to States, airlines and other parties, ICAO published the document on the ICAO website. That way, the document is easily accessible.

ICAO currently organizes presentations and workshops to promote the document's implementation, particularly by States. ICAO intends to monitor the risk assessment mechanisms in the different States and Regions in association with its regional offices.

Global Aviation Safety Plan

ICAO publishes strategic plans to give direction to the ICAO's technical work programme. One of the strategic plans is the Global Aviation Safety Plan (GASP). This plan covers a period of three years and aims to continuously improve aviation safety and prioritize activities that contribute to it. The second edition of the GASP (2017-2019) was published in 2016. The risks of flying over conflict zones are specifically cited as one of the emerging priorities with reference to the CZIR and Doc 10084. The November 2017 edition of the Global Aviation Security Plan (GASeP) calls for action in raising the level of implementation of Annex 17 and lists as a global action the monitoring and addressing of emerging and evolving risks, such as risks arising from conflict zones. Inclusion of the subject of 'risks of flying over conflict zones' in these plans is important to keep the subject on the agenda, since these plans will determine the focus of ICAO's activities in the coming years.

Future developments of the plans in relation to the topic of flying over conflict zones were discussed at the *Air Navigation Conference* that took place in October 2018 in preparation of the next ICAO Assembly in 2019. As stated in the report of the conference, the Committee that discussed the related agenda item agreed that efforts and items related to conflict zones be included in the GASP, the GASeP and the Global Air Navigation Plan (GANP[18]). The Committee also agreed to recommend to ICAO to further develop risk management capabilities and facilitate implementation of multilateral arrangements for the sharing of risk information and (regional) contingency plans for unexpected events related to civil aircraft operations over or near conflict zones.

17 The Working Group on Threat and Risk is a working group of the ICAO Aviation Security Panel and issues ICAO and the Aviation Security Panel with recommendations related to risk assessments.

18 The GANP is the strategy to achieve a global interoperable air navigation system.

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2.2.3 Initiatives developed by IATA

The IATA Operational Safety Audit (IOSA) is an audit programme for airlines, designed to assess an airline's operational management systems. The IOSA audits are mandatory for all IATA members. IATA has developed standards for airlines' management systems, which are included in the IOSA Standards Manual (ISM). The ISM is a living document based on ICAO standards, and is updated annually as required. In addition to IATA standards the document contains guidance for implementation. After the crash of flight MH17, guidance related to the conduct of risk assessment was expanded in several places in the ISM and risks related to flights over areas involved in an armed conflict were specifically included. In October 2017, IATA published a special manual to assist in the implementation of a Security Management System, the SeMS Manual.

2.2.4 Initiatives taken in the European Union

In addition to ICAO-related global initiatives, after the crash of flight MH17 the European Union also initiated activities in which a number of States and international organizations are involved.

High Level Task Force on conflict zones

After the MH17 crash, on 29 September 2015 EASA and the national aviation authority of Romania organized a meeting on flight routes over or near conflict zones. As a result of this meeting a European task force was set up in order to evaluate the processes and responsibilities related to risk assessments of flight routes over or near conflict zones and make recommendations where necessary. In March 2016, the task force issued the final report to the EU Commissioner for Transport. In addition to several recommendations the report includes a proposal for a European warning system for conflict areas (Conflict Zone Alerting System): a cooperation partnership between EU Member States, the European Commission, EASA and other relevant parties. The main objectives of such a system are to join up intelligence sources and risk analysis capacity, and perform a joint risk assessment. The result is the Common EU Risk Assessment and the publication of Conflict Zone Information Bulletins.

Common EU Risk Assessment

Pursuant to the report of the European task force the European Commission established a process at the EU level to perform risk assessments for flight routes over or near conflict zones. Led by the Directorate-General for Migration and Home Affairs (DG HOME), the Directorate-General for Mobility and Transport (DG MOVE) and the EU Intelligence and Situation Centre (INTCEN, part of the European External Action Service EEAS) meetings are organized each quarter involving representatives of EU Member States and – as of November 2018 - EASA. During these meetings of the so-called EU Aviation Security Risk Assessment Group, risk assessments of conflict zones are performed based on information provided by the intelligence services. There are no direct communication lines between the Common EU Risk Assessment process and airlines. Meetings involving DG HOME, DG MOVE and airline associations IATA and Airlines for Europe (A4E, European airline association) are organized prior to each meeting of the EU Aviation Security Risk Assessment Group in order for airlines to provide their input.

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Conflict Zone Information Bulletin

After the crash of flight MH17 and the recommendations of the European task force, EASA has taken on the task of compiling and disseminating information about risks to civil aviation related to flying over conflict zones. The task assigned to EASA is now legally embedded with the entry into force of Regulation (EU) 2018/1139. EASA publishes Conflict Zone Information Bulletins (CZIBs) on the EASA website. This means that the CZIBs are accessible worldwide to States, airlines and passengers.[19]

A CZIB is only published in close consultation with a network set up for this purpose: the Conflict Zones Network of Focal Points or RCZ network[20]. This network consists of representatives from EASA, the European Commission, European civil aviation authorities, and the airline associations IATA and A4E. The network serves as a platform for exchanging information about conflict zones and for validating the content of a CZIB prior to its publication. The RCZ network also plays a major role if EASA shares information about a new threat or risk. The network makes it possible to quickly disseminate information, according to the principle that access is exclusively provided to strictly necessary information ("need-to-know basis"). In this case States are responsible for sharing the information with their airlines.

EASA compiles a CZIB or disseminates information in the following cases:

- An area (high or medium altitude) is classified as 'high' risk as a result of the Common EU Risk Assessment process. In certain cases the CZIB includes an operational recommendation for airlines in addition to the risk classification. Following up these recommendations is not compulsory and no flight ban applies. Imposing a flight ban on airlines is beyond the mandate of EASA.
- If the Common EU Risk Assessment process results in a risk classification that is lower than 'high' or in the event that no Common EU Risk Assessment is performed, EASA may consider a CZIB in which the agency refers to national publications and information provided by States.[21]
- In the event of a sudden emerging threat, EASA may request to organize an ad hoc Common EU Risk Assessment to allow EASA to draft a CZIB. In case a meeting is not possible, EASA will disseminate a draft CZIB upon European Commission approval to the representatives of the European aviation authorities in the RCZ Network for endorsement.

CZIBs have a validity period of 6 months. Before the end of the validity date and if needed, the conflict zone is reassessed in a Common EU Risk Assessment and EASA will update the CZIB. CZIBs that only refer to published aeronautical information (Aeronautical Information Publications, NOTAMs) will be updated without consultation if necessary.

19 The CZIBs are published in the EASA *Safety Publications Tool*, https://ad.easa.europa.eu/czib-docs/page-1.
20 The abbreviation RCZ refers to Risks arising from Conflict Zones.
21 The method for drawing up CZIBs is not yet stable and will continue to be developed and improved by EASA.

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Figure 1: List of current EASA CZIBs, status on 1 February 2019 (Source: EASA).

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3 AIRSPACE MANAGEMENT

3.1 Necessary improvements based on the MH17 Crash report

For reasons of safety, States can impose prohibitions or restrictions on the use of their airspace and determine along which routes and at which minimum altitude aircraft may fly within that airspace. The application of such prohibitions or restrictions is a potential important measure for managing risks related to flying over conflict zones.

The *MH17 Crash* report found that when a State is faced with an armed conflict in its territory, the State concerned will find it difficult to prohibit or restrict use of its airspace. Therefore, it is important that sovereign States in such situations are be given more incentives and support in fulfilling this responsibility. The Dutch Safety Board believes that the following improvements must be made in order to achieve this:

- The Chicago Convention and the underlying Standards and Recommended Practices must clarify the responsibility of States related to the safety of their airspace so that States are clear about the cases in which the airspace must be closed. This is in line with Recommendations 3 and 4.
- ICAO must play an active role in urging States facing an armed conflict to prohibit or restrict the use of their airspace in a timely manner in line with the tightened agreements. This is in line with Recommendation 2.

3.2 Developments following the MH17 crash

This section describes the various developments related to airspace management following the crash of flight MH17. Appendix D describes the specific follow-up to the recommendations issued by the Dutch Safety Board on this subject (Recommendations 2, 3 and 4).

3.2.1 Amendments to ICAO documents

ICAO has implemented a number of actions and initiated developments to amend Annexes and documents relevant to airspace management. Standard 3.1.3 in Annex 17 ('Security - Safeguarding International Civil Aviation Against Acts of Unlawful Interference')[22] has been amended. According to this standard, ICAO Member States must continuously review threats to civil aviation and include these assessments in their civil aviation security programme. The new standard explicitly stipulates that the State must continuously monitor the nature of the threat to civil aviation, in addition to its level, and that this also applies to the airspace above its territory.

22 ICAO Annex 17, Tenth Edition, April 2017.

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On 16 November 2018, ICAO sent a State Letter[23] to its Member States with the proposed amendments for Annex 11 and 15. The amendment for Annex 11 ('Air Traffic Services', Fourteenth Edition, July 2016) requires the Air Traffic Services authority of a State to ensure that a risk assessment is conducted for activities potentially hazardous to civil aircraft and that appropriate risk mitigation measures are implemented. Possible measures to mitigate the risks for civil aircraft are airspace restrictions or temporary withdrawal of routes. ICAO expects the amendments of Annex 11 to enter into force on 5 November 2020.

The amendment to Annex 15 ('Aeronautical Information Services')[24] requires that States with a conflict zone[25] issue a NOTAM[26] concerning the risks for civil aviation. This obligation is discussed further in Chapter 4 on gathering and sharing threat information.

The new Doc 10084, devoted to assessing risks to civil aviation over or near conflict zones, contains elements relevant to airspace management. The document provides a further description of the responsibilities of States related to airspace management.[27] Moreover, in anticipation of the proposed amendment to Annex 15, it specifies that States should issue a NOTAM about their airspace when there is a conflict zone. In addition, the manual contains guidelines related to assessing risks in conflict areas that could constitute the rationale for restricting or closing the airspace.

ICAO has announced several more amendments to other Annexes and manuals that could be relevant to airspace management.[28] The exact changes are still being developed by ICAO at the moment and are consequently not yet known to the Dutch Safety Board. They concern the following components:

- Doc 9554 "Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations" (First edition, 1990). This manual, which concerns coordination between a State's military authorities and civil aviation authorities to manage the risks to civil aviation, is being reviewed. An unedited version[29] was expected in 2018; the finalized version in 2020.
- Circular 330 AN/189 - Civil/Military Cooperation in Air Traffic Management (2011). This circular is being reviewed and converted into a manual (Doc 10088). The manual provides guidelines for cooperation between a State's military authorities and civil aviation authorities. The publication will be ready in 2019.

23 ICAO State Letter AN 13/35-18/106, 16 November 2018.
24 ICAO Annex 15, Fifteenth Edition, July 2016.
25 In Doc 10084 (2018) '*conflict zone*' is defined as follows: "*Airspace over areas where armed conflict is occurring or is likely to occur between militarized parties, and is also taken to include airspace over areas where such parties are in a heightened state of military alert or tension, which might endanger civil aircraft.*"
26 NOTAM stands for 'Notice to Airmen'. It concerns a message disseminated via telecommunication to airmen with information about the establishment, condition or change of any aviation facility, service, procedure or danger, of which it is necessary that operational aviation personnel are informed in a timely manner.
27 See paragraphs 3.1.1, 3.1.2 and 3.1.3 in Doc 10084.
28 In 2018, ICAO also published a new version of the manual on Air Traffic Flow Management (Doc 9971 "Manual on Collaborative Air Traffic Flow Management", third edition, 2018). This publication serves as a guide for the effective and efficient regulation of air traffic flows. This subject has overlaps with airspace management in or near conflict zones but does not elaborate the role of States related to airspace management.
29 An 'unedited version' of an ICAO document is a document that has not yet been approved as final, but that is made available for information purposes. The contents of the document may still change.

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3.2.2 The situation in practice

There are a number of States in which armed conflicts are ongoing that involve risks to civil aviation flying over them. In order to obtain an idea of the measures taken in the airspace above or near conflict areas the Dutch Safety Board has compiled an inventory of information available publicly about known conflict areas; see Appendix E.[30]

Figure 2: Airspace restrictions of eastern Ukraine (Source: State Aviation Administration Ukraine, 7 November 2018).

Ukraine Case

The State Aviation Administration of Ukraine publishes the results of threat and risk assessments regarding the security of civil aviation within the territory of Ukraine and the airspace above it, including airspace over or near conflict zones. For the prompt notification of airspace users, the State Aviation Administration publishes, among other things, NOTAMs.

The authority issued two NOTAMs (valid from September to the end of December 2018) with restrictions related to the airspace of the Dnipropetrovsk (UKDV) flight information region, the area where MH17 was flying at the time of the crash.

A2340/18

…. PROHIBITED AREA BOUNDED BY COORDINATES: 500530N 0374550E 485500N 0361230E 473846N 0353706E 471448N 0354724E 465400N 0354700E 462230N 0361200E 460809N 0370518E 464700N 0373000E 465900N 0382000E 470642N 0381324E THEN ALONG STATE BOUNDARY UNTIL POINT 500530N 0374550E IS ESTABLISHED OVER CONFLICT ZONE AND MINIMUM 120 KM BUFFER AROUND. FLIGHT OPERATIONS WITHIN THIS AREA ARE PROHIBITED EXCEPT PERMITTED BY GENERAL STAFF OF ARMED FORCES OF UKRAINE. RISK OF INTERCEPTION FOR OFFENDERS …..

A2341/18

…SEGMENTS ATS ROUTES CLOSED: …(specification of routes)… FROM SFC UP TO FL660.

In addition, Ukraine has also imposed restrictions on the airspace over Crimea by means of information in the AIP, an AIC and NOTAMs.

30 Here use was made of the EASA Conflict Zone Information Bulletins and information on the website 'safeairspace.net'. The information was gathered on 4 September 2018.

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There are States that share information about potential risks in their airspace; see the case of Somalia mentioned below. A development that has occurred since the MH17 crash is that countries (in any case the United States, the United Kingdom, Germany[31] and France) do issue advice to their country's airlines, or impose requirements related to using the airspace above areas in which an armed conflict is ongoing. This information in the form of a NOTAM, AIP[32], AIC[33] or national regulation[34] is public and therefore available to other States and airlines. EASA also includes this information in a Conflict Zone Information Bulletin (CZIB) as substantiation for indicating areas with a high risk.[35] In case no CZIB is published, EASA shares this information within the RCZ network.

Somalia case

The Somali authorities issued a NOTAM that indicates armed conflicts form a safety and security risk to aircraft that fly to Mogadishu Airport:[36]

"OPERATORS SHOULD EXERCISE EXTREME CTN AND FULLY ASSES THE POTENTIAL RISKS TO FLIGHT SAFETY AND SECURITY WHEN PLANNING OR CONDUCTING OPS INTO MOGADISHU AIRPORT DUE TO LACK OF INFORMATION ON ARMED CONFLICTS. 13 APR 09:30 2018 UNTIL 13 JUL 09:30 2018 ESTIMATED."

The situation in Somalia was also assessed in Europe:[37]
"Due to the hazardous situation, with the presence of terrorist organizations with confirmed anti-aviation weaponry, possibly MANPADS (man-portable air-defence systems) and ongoing military operations, it is assessed that the risk of operation and overflight below FL 250 is HIGH."

The airspace and airport have not been closed by the Somali authorities. The European aviation authorities adopted a risk classification of HIGH for the entire airspace below Flight Level 250.

31 In February 2017, Germany introduced a change in national legislation which gives the Ministry of Transport and Digital Infrastructure the option, in case of serious threats in foreign airspace, to impose restrictions on German-registered aircraft for flights over those regions. NOTAMS are used to publish the restrictions.
32 An Aeronautical Information Publication (AIP) is a publication issued by or with the authority of a State containing aeronautical information of a lasting character essential to air navigation (source: ICAO Annex 15: Aeronautical Information Services - Fifteenth Edition, July 2016).
33 An Aeronautical Information Circular (AIC) is a notice containing information that does not qualify for the origination of a NOTAM or for inclusion in the AIP, but which relates to flight safety, air navigation or technical, administrative or legislative matters (source: ICAO Annex 15: Aeronautical Information Services - Fifteenth Edition, July 2016).
34 The American Federal Aviation Administration (FAA) regularly issues Special Federal Aviation Regulations (SFAR) including civil aviation regulations that relate to a specific situation (such as flying over an area where an armed conflict is taking place) and that are usually valid for a certain period of time.
35 The CZIBs were published on the website https://ad.easa.europa.eu/czib-docs/page-1
36 Somalia NOTAM A0035/18, Issued 13 April 2018 (valid until: Jul. 13, 2018).
37 EASA, CZIB No.: 2017-05R2, Issued: 23 April 2018 (valid until 23 October 2018).

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ICAO does not play any role in airspace management. Sovereign States are fully responsible for this matter. ICAO may inform Member States and affiliated international organizations about the situation in the airspace above conflict areas by means of a State Letter or an Electronic Bulletin.[38] Following the MH17 crash ICAO has occasionally issued publications related to the risks to civil aviation above areas in which an armed conflict is ongoing or where exercises with ballistic missiles are taking place; see the following table. These publications concerned situations for which the information about risks to flight safety was not available via the 'normal' channels (such as NOTAMs). It is noted that ICAO communicates the States Letters to States and that this information is not directly disseminated among airlines.

Area concerned: ICAO publication	Content
Libya: State letter Ref: AN 13/4.3.Open-15/4 Date: 15 January 2015 (Also published as Electronic Bulletin EB 2015/9)	*Subject:* Safety of civil aircraft operating in Tripoli FIR *Action required:* Assess flight safety risk in Tripoli FIR and at airports of Libya
Iraq: Electronic Bulletin Ref: EB 2015/15 Date: 20 February 2015	*Title:* THE NEED TO ASSESS FLIGHT SAFETY RISK IN THE BAGHDAD FIR AND AT AIRPORTS OF IRAQ The following information has been received by ICAO and is addressed to you as the appropriate State Authority of aircraft operator(s) which may use the Baghdad flight information region (FIR). … States are therefore urged to use this, and any other pertinent information to assess flight safety risk in the Baghdad FIR and at airports of Iraq. …
Iraq, Syria, Iran: State letter Ref: AN13/4.3.Open-15/75 Date: 9 October 2015	*Subject:* Safety of civil aircraft operating in Baghdad, Damascus and Tehran FIRs *Action required:* Communicate to national civil aircraft owners and operators, intending to operate within the Baghdad, Damascus and Tehran FIRs, the need to fully assess the potential for risks to flight safety
North Korea: Electronic Bulletin: EB 2018/17; AN 13/29 Date: 6 April 2018	*Title:* CONTINUING ICAO COUNCIL CONCERN FOR THE SAFETY OF INTERNATIONAL CIVIL AVIATION CAUSED BY DPRK MISSILE LAUNCHES … From its discussion, the Council: *recalled*, with concern, that following the decision taken by the Council at the first meeting of its 212th Session on 6 October 2017 on the significant concern to the safety of international civil aviation caused by DPRK's ballistic missile launches there had been a ballistic missile launched by that State on 29 November 2017; *took note* that there had not been any subsequent ballistic missile launches by DPRK; and welcomed the constructive engagement and actions taken by ICAO with DPRK, in particular, the commitment made by that State through the said process, and in writing, to ensuring the safety of international civil aviation.

Table 3: ICAO publications related to the safety of civil aviation when flying over specific areas.

38 ICAO uses State letters and Electronic Bulletins to distribute information to States. State letters can require an action from States; Electronic Bulletins are for information purposes only and are often published on ICAO's public website.

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3.3 Analysis of the state of affairs

3.3.1 The role of States

Amendments to ICAO Annexes and documents

ICAO has taken steps to tighten the role of States concerning management of the airspace above or near conflict areas in the ICAO documents. The supplemented text in Annex 17 (Standard 3.1.3) clarifies the role of States with regard to assessing threats to civil aviation in their airspace. And with the proposed amendment to Annex 15 regarding a NOTAM obligation in relation to conflict zones, it is compulsory for States to communicate about conflict zones. This makes States' responsibilities more explicit.

The proposed amendment of Annex 11 is relevant in relation to airspace management above areas where an armed conflict is taking place. The amendment mandates the appropriate Air Traffic Services authority to ensure that a risk assessment of the airspace concerned for activities potentially hazardous to civil aircraft is conducted as soon as practicable and that appropriate risk mitigation measures are implemented.

In addition, the new Doc 10084 discusses aspects that affect the risks over or near conflict zones. This offers States guidelines for airspace management. Just like the SARPs in the Annexes, Doc 10084 does not provide States with any specific indications regarding the circumstances in which they should restrict or close their airspace.

The planned review of Doc 9554 is also potentially relevant in light of the airspace management above or near conflict zones. This document concerns safety measures during military action that could pose a risk to civil aviation. At the time this report was being compiled, the anticipated amendments to Doc 9554 were not known to the Dutch Safety Board. Consequently, the exact interpretation and effect on States' understanding of their duties is still unknown. In principle, information on when States should restrict or prohibit their airspace would fit with the content of Doc 9554.

In its *MH17 Crash* report the Dutch Safety Board recommended clarifying the responsibilities of States in the Chicago Convention so that the cases in which airspace must be closed are unambiguous. Stemming from the decisions of the 39th session of the Assembly in 2016, ICAO will upon completion of the work programme of the Taskforce RCZ, undertake a review of all relevant Annex provisions to reconsider the inclusion of "conflict zones" in the work programme of the Legal Committee, ICAO's special group to review the application of ICAO treaties.[39]

39 The discussion of the recommendation 4 in Appendix D also describes how ICAO has come to this position.

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Sub-conclusions
With the amendment of Annex 17 (Standard 3.1.3), the proposed amendment to Annex 11 and 15 and the publication of the risk assessment manual on flying over or near conflict zones (Doc 10084), ICAO has clarified and fine-tuned the role of States related to assessing threats to civil aviation and providing information about their airspace. However, there are no unambiguous requirements related to the cases in which a State must close or restrict its airspace.

The situation in practice
There are no known examples – with the exception of Ukraine after the crash of flight MH17 – in which States coping with a conflict zone have taken measures regarding the overflight of the airspace concerned and actively informed the relevant aviation parties of this matter. The *MH17 Crash* report found that States facing an armed conflict on their territory may find it difficult to guarantee the safety of their airspace. This finding still applies. Multiple factors, including safety as well as the political context and economic circumstances, play a role in States' consideration of whether to close or restrict the airspace. This has not changed. There are now several known examples of information being shared by the country in which an armed conflict is taking place. It concerns, for example, the situation at or around airports (see the Somali case). This is also potentially useful information for airlines that perform a risk assessment related to flying over this area.

Interviews and a survey conducted among airlines revealed that since the crash of flight MH17, airlines have become more aware of the fact that just because the airspace above a conflict area is open it is not automatically safe to fly over. Countries such as the United States, the United Kingdom, France and Germany have also become (more) active in issuing an urgent recommendation or obligation to their country's airlines related to the airspace of other States in which an armed conflict is ongoing or where certain threats exist.[40] This has also led to increased efforts to share information (see Chapter 4). One example of this is the conflict area in Mali; see the following case description.

40 Prior to the crash of flight MH17 the FAA also issued American airlines with bans and restrictions related to conflict areas.

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Mali Case

The United States has instructed airlines from the US to avoid Mali's airspace:[41]

"THOSE PERSONS DESCRIBED IN PARAGRAPH A BELOW SHOULD AVOID FLYING INTO, OUT OF, WITHIN OR OVER THE TERRITORY AND AIRSPACE OF MALI AT ALTITUDES BELOW FL260 DUE TO ONGOING FIGHTING AND EXTREMIST/ MILITANT ACTIVITY.

…

EXERCISE CAUTION DURING FLIGHT OPERATIONS DUE TO THE POSSIBILITY OF ATTACKS ON CIVIL AVIATION BY EXTREMISTS/MILITANTS. AIRCRAFT MAY ENCOUNTER FIRE FROM SMALL ARMS; INDIRECT FIRE WEAPONS, SUCH AS MORTARS AND ROCKETS; AND ANTI-AIRCRAFT CAPABLE WEAPONS, INCLUDING MAN-PORTABLE AIR DEFENSE SYSTEMS (MANPADS). SUCH WEAPONS COULD TARGET AIRCRAFT AT LOW ALTITUDES, INCLUDING DURING THE ARRIVAL AND DEPARTURE PHASES OF FLIGHT, AND/OR AIRPORTS AND AIRCRAFT ON THE GROUND"

EASA provides the following advice (CZIB No.: 2017-01R3, 23 April 2018):

"The presence of terrorist groups with the necessary capabilities (including anti-aircraft weaponry) is assessed to pose a HIGH risk to operations within the portion of the Niamey FIR which is situated above Mali territory, at altitudes below FL 250. Terrorist groups continue attacks on the country with the risk of mortar shelling on airstrips and airports. Additionally, the Agency draws the attention of the aviation community to the above referenced information, copies of which are attached to this CZIB.

Recommendation(s): Operators should take this information and any other relevant information into account in their own risk assessments, alongside any available guidance or directions from their national authority as appropriate."

The two recommendations are not the same with regard to the part of the airspace to which the increased risks apply. The FAA issued a recommendation about the area as a whole; the outcome of the European risk assessment relates to the eastern part of Mali (see the underlined sections of the texts above).

EASA and a number of States issue recommendations to airlines or impose obligations related to the airspace above other States. The recommendations and imposed obligations may vary in content, as in the Mali case. This can be caused by several factors. A possible cause is that differences exist in States' information positions. Secondly, the recommendations take account of the relationship between the State issuing the recommendation and the parties in the conflict area, as the recommendations or obligations are aimed at airlines from this State. Therefore, it is conceivable that a State with a form of involvement in the ongoing conflict will assess the threat differently than a State that is not involved. However, this background information will not be included in

41 FAA, KICZ NOTAM A0005/18 - Security - United States of America Advisory for Mali, 26 February 2018.

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the published information. This means that the available publications will not always provide a clear-cut view of the risks involved in flying over or near certain conflict zones and of the risk-mitigating measures to be implemented.

Furthermore, it should be noted that the absence of a NOTAM issuance by any individual State does not necessarily imply that there is no risk for the affected airspace. A State can also factor into their NOTAM issuance deliberation whether their flagged airlines and operators fly in the affected conflict areas and whether the affected State has issued a suitable NOTAM.

Sub-conclusions
At the time of the follow-up investigation, with the exception of Ukraine there are no known examples of States that take measures regarding their airspace for civil aviation flying over their territory when an armed conflict is taking place. In their risk assessment related to flying over conflict areas airlines must still take into account the fact that States will not close or restrict their airspace when this seems appropriate due to an armed conflict. There are States that occasionally disseminate information about risks resulting from an armed conflict in their country.

Since the crash of MH17, certain countries (the United States, the United Kingdom, Germany and France) have become active (or more active) in issuing recommendations or obligations to airlines from their country, related to flying over conflict zones. These recommendations or obligations issued to airlines are usually public and constitute a useful source of information for all airlines. These kinds of recommendations and obligations may differ due to differences in the information position of States, due to variations in how each State assesses the associated risks and determines the degree of mitigation necessary to sufficiently reduce the risk, and as a result of relationships between States.

3.3.2 The role of ICAO

ICAO indicates that only at States' requests ICAO provides advice and/or disseminates information about airspace restrictions. In the case of potential threats, ICAO may contact the State concerned and, if circumstances require, also inform other ICAO Member States accordingly. By its own account, ICAO is only in a position to offer support to States facing an armed conflict if the circumstances and the safety information received by ICAO require it. ICAO emphasizes that States are responsible for their airspace.

Subsequently ICAO indicates that in recent years there has been no reason to offer assistance or request additional information from States facing an armed conflict. It does happen that States ask ICAO to disseminate information. According to ICAO, this usually concerns States that have no diplomatic dealings with neighbouring States, with the threat being present in the flight information region of those neighbouring States.

ICAO Annex 17 makes it compulsory for States to perform an assessment of threats to civil aviation and compile a corresponding civil aviation security programme. A possible measure in this endeavour is that a State imposes restrictions for the use of its airspace.

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This means that ICAO is in a position to confront States about their role in airspace management if there are risks to civil aviation as a result of an armed conflict on their territory.

The most powerful tools that ICAO possesses to monitor and promote the introduction of SARPs are the Universal Safety Oversight Audit Programme (USOAP) and the Universal Security Audit Programme (USAP). Given the sovereignty of States, ICAO does not anticipate a proactive role for itself in confronting States about airspace management. Since States that are facing an armed conflict on their territory even now – after the crash of flight MH17 – often do not impose restrictions for their airspace, the Dutch Safety Board is of the opinion that ICAO could play a role in this respect and is in the position to urge States to take risk-mitigating measures.[42]

Sub-conclusions
Pursuant to ICAO Standards, States must take measures to manage the risks to civil aviation above or near conflict zones. This means that ICAO is in a position to urge States to ensure the safety of their airspace and to support them in this. This does not currently happen, because ICAO does not consider such a proactive role to be appropriate given the sovereignty of States. The Dutch Safety Board considers this appropriate, since in practice it is evident that States in which an armed conflict is taking place will not be likely to take measures related to their airspace of their own accord.

3.4 Conclusion on airspace management

With the exception of Ukraine, no States have imposed restrictions on their airspace for civil aviation flying overhead as a result of an armed conflict on their territory. To deal with this lack of active airspace management in countries with an armed conflict, some States (in any case the United States, the United Kingdom, Germany and France) have become active (or more active) in issuing recommendations or obligations to airlines from their countries related to flying over conflict zones.

ICAO is in a position to urge Member States to ensure the safety of their airspace and to support them in this. This is currently not happening, because ICAO does not consider such a proactive role to be appropriate given the sovereignty of States.

ICAO has clarified the role of States related to their responsibility for their airspace in ICAO Annexes and Documents, with regard to assessing threats as well as sharing information about conflict areas by means of a NOTAM. However, it does not establish when States must prohibit or restrict their airspace.

42 Pursuant to Annex 11 ICAO at any rate has a role to play in case of a disturbance of air traffic or air traffic services that influence international civil aviation and where the aviation authority of a State cannot meet its responsibilities. In such cases ICAO can initiate actions and coordinate with neighbouring States and air traffic organizations, for example by executing a regional ATM contingency plan. This does not involve issuing airspace restrictions over a conflict area.

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All in all, the Dutch Safety Board finds that that since the crash of flight MH17 steps have been taken to improve the management of risks of flying over conflict areas through airspace management by States. However, this has not led to a significant improvement in the practice of airspace management by States facing an armed conflict on their territory.

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4 GATHERING AND SHARING THREAT INFORMATION

4.1 Necessary improvements based on the MH17 Crash report

The first step in the process of assessing risks associated with flying over conflict zones is to gather information about potential threats. Essential to this step is that parties that hold relevant threat information share this information.

The *MH17 Crash* report found that improving the airlines' access to information is first of all a matter for the airlines themselves. Airlines will need to set up a process for gathering information as part of the risk assessment process, which allows them to gather sufficient, high-quality information timely. They should gather information about conflict areas more actively and should share relevant threat information with one another as much as possible.

The *MH17 Crash* report also establishes the important role that States play in gathering threat information because they have access to different information sources than those available to airlines. They can access confidential intelligence sources, for example. States that possess relevant threat information relating to the airspace should promptly share the information in question with airlines and other interested parties through a structured process. The safety of passengers, crew and aircraft can be increased if States make this information accessible to all airlines and not just for the airlines based in their own country. From the perspective of a State, this is relevant considering that its citizens do not only take flights with airlines based in their own country.

In its *MH17 Crash* report the Dutch Safety Board concluded that the improvements set out below are essential improvements.

Information gathering by airlines

- In order to perform an adequate risk assessment, every airline must actively look for threat information about conflict zones.

Information sharing by airlines

- Airlines that have information relating to conflict zones that can threaten the safety of aviation must share this information with other airlines in a structured, timely and active manner. This is in line with recommendation 5.

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Information sharing by States

- States that have (intelligence) information relating to conflict zones that can threaten the safety of aviation must share this information with airlines and other interested parties in a structured, timely and active manner. This is in line with recommendation 5.
- It must be established in ICAO standards that countries dealing with an armed conflict in their territory, must timely publish information that is as specific as possible about the nature and extent of threats of that conflict and its consequences for civil aviation. This is in line with recommendation 1.

The role of ICAO

- The International Civil Aviation Organization (ICAO) must promote the exchange of information about conflict areas by expanding and tightening the ICAO Annexes. This is in line with recommendation 5.

4.2 Developments following the MH17 crash

This section describes the various developments related to gathering and sharing of threat information since the crash of flight MH17. Appendix D describes the specific follow-up to the recommendations issued by the Dutch Safety Board on this subject (Recommendations 1 and 5).

4.2.1 Amendments to ICAO documents

ICAO has implemented a number of actions and initiated developments to amend documents relevant to the sharing of threat information. ICAO has initiated a process to amend Annex 15 (Aeronautical Information Services)[43] with respect to the requirements for publication of a NOTAM. The amendment should ensure that the presence of a conflict zone in a State's territory must constitute a reason for the State in question to publish a NOTAM on the matter. The information provided shall contain as specific details as possible about the nature and scope of (the threat of) the conflict and the consequences for civil aviation. This standard will come into force on 5 November 2020, according to ICAO.

ICAO has also included a new standard in Annex 17 (Security)[44], prescribing that a State must establish and implement procedures for sharing relevant information timely with end users (such as airport operators, aircraft operators and air traffic service providers) based in the State in question for the purposes of the risk assessments that they need to conduct. This standard has come into force on 16 November 2018. Discussions are ongoing to broaden this standard to all relevant airlines in the next amendment of Annex 17.

43 ICAO, Annex 15, Fifteenth Edition, July 2016.
44 ICAO, Annex 17, Tenth Edition, April 2017.

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4.2.2 New forms of sharing threat information

Since the crash of flight MH17, various parties have developed new forms of sharing threat information, as explained below.

Official publications about the airspace of other countries

The United States, the United Kingdom, France and Germany provide the airlines based in their countries with advice or impose an obligation relating to the use of the airspace above areas where there is an ongoing armed conflict. This information in the form of a NOTAM, AIP, AIC or national regulation is public and therefore available to other States and airlines. The survey distributed by the Dutch Safety Board and interviews with airlines show that airlines that are not directly addressed in these publications also use these publications as sources of information.

Sharing information at an EU level

At an EU level, States meet to exchange information about conflict areas and perform a joint risk assessment in the EU Aviation Security Risk Assessment Group (see Section 2.2.4). If an area is considered to be high risk (for high or medium altitudes), EASA publishes a Conflict Zone Information Bulletin (CZIB) on the matter. EASA also publishes CZIBs regarding conflict areas for which it is unclear as to whether there is a high risk, but about which information is known by States. The CZIBs are published on the public EASA website and are therefore globally accessible to States, airlines and passengers. IATA and A4E, as representatives of the airlines, are involved in reviewing draft CZIBs and sharing the information among their members.

At the same time, the EU Aviation Security Risk Assessment Group exchanges threat information confidentially. The participating countries can use the threat information to inform the airlines based in their own countries if the risks give reason to do so. Refer to the table describing how this is organized in the Netherlands.

Expert group for sharing threat information in the Netherlands

In the Netherlands, an agreement[45] has been drawn up regarding the sharing of threat information for civil aviation. The aim of the agreement is to ensure the sharing of threat information between the government and the Dutch airlines on a national level so that airlines, partly based on this information, can conduct an effective risk assessment for safe flight operations outside of Dutch airspace. →

45 The covenant was signed by the involved parties on 30 June 2016. The NCTV, the Ministry of Infrastructure and Water Management, the Ministry of Foreign Affairs, the AIVD and the MIVD are involved on behalf of the Dutch government. From the Dutch aviation sector, the involved parties are KLM (also on behalf of KLM Cityhopper, Martinair and Transavia), Corendon Dutch Airlines and TUIfly. The Dutch Airline Pilots Association (VNV) has also signed the covenant, but only has a role in the steering group in the execution of the covenant.

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Two consultation boards have been established based on the agreement: the steering group, which oversees the proper implementation of the agreement, and the expert group. It is the task of the expert group, in which the government and airlines hold a seat, to share and discuss in a confidential setting non-public threat information that is relevant for civil aviation, both in the case of acute, concrete threat information and in the case of non-acute, non-specific threat information. During the meetings, cases are discussed that are contributed by both the Dutch airlines and the government. The expert group discusses and aligns the contribution to and the feedback from the international consultations about flying over conflict zones (EU Aviation Security Risk Assessment Group, relevant EASA meetings and ICAO). The schedule of the expert group meetings are aligned with the EU Aviation Security Risk Assessment Group meetings. To illustrate the frequency: during the period of 30 June 2017 to 30 June 2018 inclusive, there were nine expert group meetings.

The contacts within the expert group are also used when an event arises that indicates an acute risk to civil aviation or when threat information of an urgent nature becomes available. If the classification so allows, the information is shared by email or telephone. If desired, the Chairman and Vice-Chairman of the expert group may decide to hold a meeting. Airlines can also address a specially appointed point of contact for the intelligence services with their incident-related questions.[46]

The agreement states that the participating parties evaluate the performance and functioning of the agreement on an annual basis. During the evaluation held in 2017, the airlines indicated that high-quality, useful information was being shared. Airlines actually used this information in performing risk assessments. The expert group also focused on the wish of the airlines for more explanation of weapon systems. The government parties also indicated that they were satisfied about the consultation, not only because it gives the airlines a better information position but because it offers the government parties the opportunity to bring more focus to international consultation.[47] From the evaluation held in 2018, it follows that the objective proposed in the covenant relating to sharing threat information is still being achieved.[48]

The Netherlands has translated the text of the agreement into English and made this translation available to other States inside and outside Europe, as well as to ICAO, as a possible example for these States for setting up a structured meeting between government and airlines for the purpose of information sharing.

46 This point of contact is located at the Dutch General Intelligence and Security Service (AIVD).
47 Dutch Parliamentary Papers (*Kamerstukken*) II, 24804, no. 95.
48 Dutch Parliamentary Papers (*Kamerstukken*) II, 24804, no. 97.

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As well as the regular information provision through the CZIBs, EASA uses rapid alerts when information is so urgent that it needs to be shared among the EASA Member States extremely quickly. EASA uses the RCZ network in order to do so. The focal points in the network can pass on the information quickly to the airlines based in their State. This allows an alert to be spread widely within a short space of time. For example, in April 2018 EASA sent a rapid alert notification containing safety information to the RCZ network anticipating possible military actions by air over the Mediterranean Sea towards Syria.

If the nature of the information and the available time allow, EASA may decide to publish the information after a shortened consultation round, in the form of a CZIB. The information then also becomes available to airlines and countries outside of Europe.

IATA Security Forum

In 2016, IATA launched an online Security Forum for IATA members, with the aim of exchanging and publishing information for aviation security stakeholders. IATA indicated that the website can be used for sharing public source information, but that it is not intended for exchanging more confidential or sensitive threat information between airlines.[49] IATA places general information about recent EU Aviation Security Risk Assessment Group meetings and EASA CZIBs on the website.

EUROCONTROL Portal

As an intergovernmental organization, EUROCONTROL is active in the field of air traffic management and air traffic control in Europe[50], and has been nominated as Network Manager[51] (NM) by the European Commission. EUROCONTROL has a website called the NM Network Operations Portal (NOP). This website contains air traffic management related information for EUROCONTROL's area of responsibility for stakeholders who have an operational interest. The portal has a public part and a secure part. Most airlines that frequently fly in the NM area have access to the secure NOP part using a password.

The secure NOP part contains a link to information about crisis management. Here, EUROCONTROL publishes a map of the NM area and bordering States with an overview of the airspace closures and published warnings relating to conflict areas (published NOTAMs, including NOTAMs issued by States about the airspace of other States, EASA CZIBs and ICAO State Letters). EUROCONTROL does not publish this information on the public part of the portal because EUROCONTROL does not consider all information (for example the ICAO State Letters) to be public. Twice per day, EUROCONTROL performs an automated inventory specifically targeting warnings and conflict areas.

49 Security incidents can be reported on the Security Forum website ('Security Incident Report'). The description of the various categories (security descriptors) indicates that it is possible to report both existing and potential threats. The 30 categories specifically target security matters in and around airports and in aeroplanes. The 'Sabotage or damage in flight' category can be used to detect incidents that are potentially relevant to the risks of flying over conflict areas. This incident gathering is unlikely to serve as an adequate information source for airlines for the purposes of assessing the risks of flying over conflict areas.

50 The EUROCONTROL organisation currently has 41 Member States.

51 The Network Manager manages the aviation navigation network of Member States in close cooperation with air traffic service providers, airspace users, military parties and airports. In collaboration with the States, the Network Manager coordinates the use of the airspace and the flight routes that fall within it.

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In the first instance, EUROCONTROL shares acute threats and changes to existing situations through headline news reports; depending on the information this is in the public or the secure part.

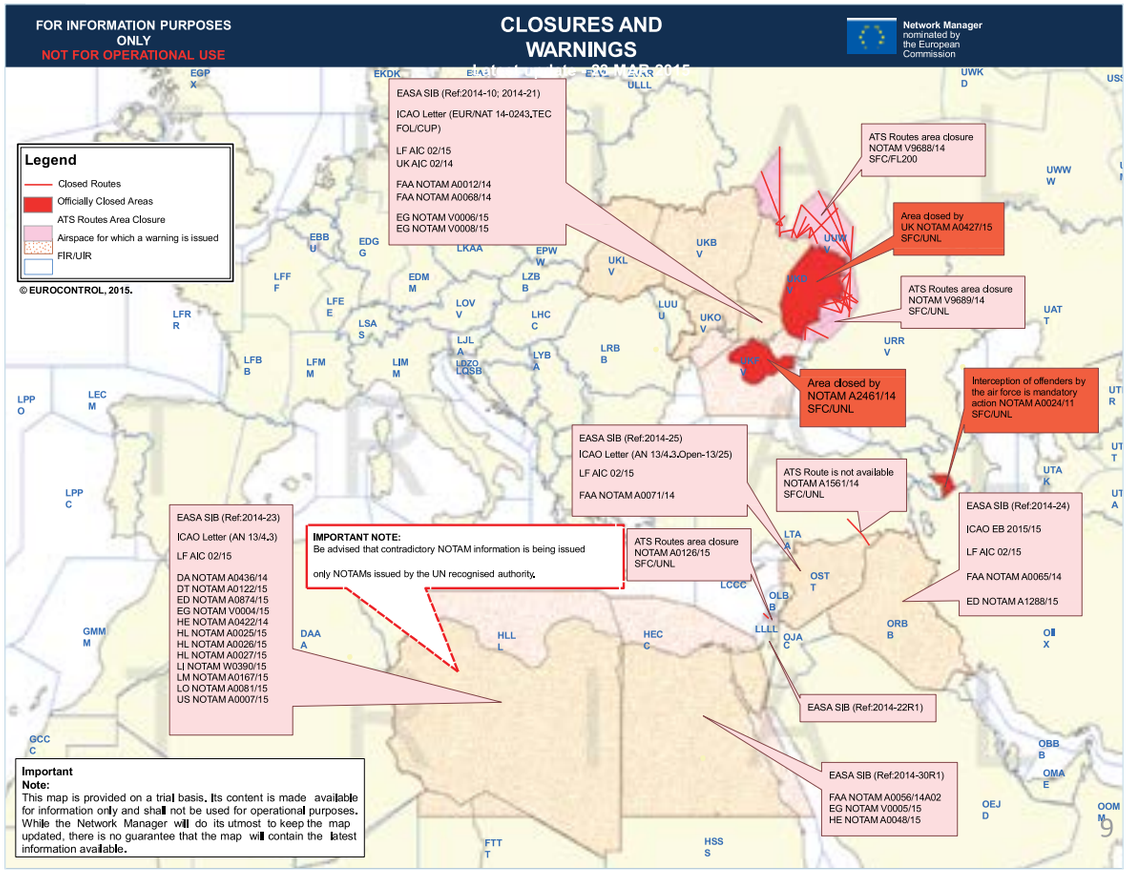

Figure 3: Overview of closures and warnings on the Network Operations Portal of EUROCONTROL. (Source: EUROCONTROL)

Services provided by commercial entities

A number of commercial entities offer global services to map out available information relating to potential conflict areas. These agencies use public information sources (such as news reports and social media) or individuals on site. The commercial agencies also partly publicly publish information through websites, such as safeairspace.net. The survey distributed by the Dutch Safety Board shows that since the crash of flight MH17, more airlines have been using the services provided by commercial entities.

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Figure 4: Screenshot of safeairspace.net (date: 30 January 2019).

The ICAO Conflict Zone Information Repository (no longer functional)

At the beginning of April 2015, ICAO launched a prototype of the Conflict Zone Information Repository (CZIR) for a one-year test period. From the outset, ICAO Member States were divided in their opinions about the repository. As well as strong supporters, such as the members of the ABIS Group[52], other EU Member States and the grieving nations[53], some Member States expressed mixed feelings. They were concerned about the publication of information by a country about the airspace of another country, considering this would involve political sensitivities. There were also doubts about the manner in which ICAO verified the accuracy of the information, the matter of whether the understanding of a conflict zone was being interpreted unambiguously by the ICAO Member States, and with regard to the role of ICAO as intermediary. In order to accommodate the objections, ICAO set up a Repository Review Group in order to monitor the use of the repository and any bottlenecks that arose. ICAO also drew up a procedure for the use of the repository, with the agreement that the information first be submitted to the State whose airspace it concerned for verification (the State in question had 72 hours to respond).

Initially, several ICAO Member States used the repository by publishing information on it. The number of publications then stalled. In November 2016, the ICAO Council noted that the aviation sector had launched various initiatives to make information concerning conflict areas available. It was partly for this reason that ICAO decided, in March 2017, to convert the repository into a library of weblinks. This was a website on which ICAO itself did not publish any information, but visitors were referred directly to the website of the Member State in question, where the information was available. Since States placed very few links in the library, the ICAO Council decided to terminate the library at the end of 2017. ICAO also maintained the argument that there was no longer a need for that kind

52 The ABIS group is a cooperative partnership that represents the civil aviation authorities of Austria, Belgium, Croatia, the Netherlands, Luxembourg, Ireland, Switzerland and Portugal.

53 These are the countries that mourned the loss of victims of the flight MH17 disaster. These countries are the Netherlands, Malaysia, Australia, Indonesia, the United Kingdom, Germany, Belgium, the Philippines, Canada and New Zealand. Note that 24 passengers had more than one nationality.

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of system deriving from ICAO: other international organizations had since developed initiatives that allowed them to fulfil States' and airlines' need for information. A survey by ICAO, IATA and the International Business Aviation Council[54] among airlines showed that sufficient alternatives were available.

4.2.3 The situation in practice

The Dutch Safety Board distributed a survey among airlines and States.[55] In total, 12 States and 36 airlines completed the survey. The following information arose from the analysis of the survey responses received.

Information sharing by States

- 9 of the 12 States indicated that they, following the crash of flight MH17, have launched initiatives to improve the information position of airlines. States have taken measures to obtain better information on threats and risks to civil aviation (e.g. by better cooperation between civil aviation authorities and intelligence services or by the establishment of separate units for threat and risk analysis), and to share this information with operators (e.g. by establishing an agreement between government authorities and airlines or by publishing this information on a website).
- 5 of the 12 States indicated that they also make threat information available to airlines not based in their own country. One State specifically indicated that they communicate with foreign airlines through a special working group. Another State indicated that information was only provided on request.

Information gathering by airlines

- 28 of the 36 airlines indicated that after the crash of flight MH17, they took measures to improve their own information position relating to the risks of flying over conflict zones.
- 25 of the 36 airlines indicated that the quantity of information has increased, and 20 of them indicated that the quality of the information has improved.

Airlines indicated the following in relation to the information sources that they use:

- All airlines indicated that they use multiple sources for gathering information.
- Many airlines also had a connection with their own State as a source of threat information prior to the crash of flight MH17. In total, 29 of the 36 airlines now have access to information from their own national intelligence services.
- 19 airlines use commercial entities, of which 7 airlines do so since the crash of flight MH17.
- 27 of the 36 airlines use other airlines for the purpose of gathering threat information. 9 airlines started this following the crash of flight MH17.

54 Interest organization for business aviation.
55 See Appendix A ("Explanation of the follow-up investigation") for an explanation of these investigation activities.

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Within the various cooperative partnerships, associations (such as IATA) and aviation alliances, a security working group often forms the basis of mutual contacts and therefore for exchanging information. For example, in response to the crash of flight MH17, the security working group of one alliance drew up an overview of the various conflict areas and threats. All airlines in the alliance indicate in this overview whether, and if so, which restrictions they apply to these areas. The overview does not provide background information. Based on this kind of overview, airlines themselves can contact other airlines in order to discuss further background information. In the interviews, airlines also indicate that, for confidentiality reasons, they cannot share threat information with other airlines.

4.3 Analysis of the state of affairs

4.3.1 Information sharing by airlines

In the interviews that the Dutch Safety Board conducted with airlines, the airlines indicated that the exchange of information on conflict areas between airlines most notably occurs through informal networks and contacts on an ad hoc basis. The confidential nature of the information is the reason for this. Among other factors, the size of the airline and factors such as the region in which the airline operates determine how many resources airlines devote to developing and maintaining these networks.

IATA, the global trade association of airlines, indicated that they do not play a specific role in sharing information between airlines, but they state to encouraging this. The IOSA Standards Manual (ISM) does not contain any specific standards relating to the sharing of information by airlines. The Security Management System (SeMS) manual drawn up by IATA does not specifically address information sharing between airlines themselves. However, the SeMS does state that an airline should set up and maintain an extensive internal and external security network for sharing information. The manual does not explain how an airline should set up that kind of network or further guidelines for sharing information.[56] IATA has developed the online Security Forum for its members. However, this website is not intended as a platform for sharing information in a structural manner, which airlines can use to perform risk assessments for flying over conflict zones. IATA does fulfil an active role in distributing EASA CZIBs among its members.

Sub-conclusions

Since the crash of flight MH17, airlines are sharing more information between each other. There is no organized, structural working method for doing so. Due to the confidential and sensitive nature of the information, information sharing between airlines takes place through informal networks and contacts on an ad hoc basis. The resources available to airlines determine how these networks are developed and maintained.

56 The IATA SeMS manual states that "*information sharing is essential to enhance the level and quality of information exchange through increasing involvement in information sharing by all relevant stakeholders*". In the manual, this particularly relates to the security reporting of occurrences.

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4.3.2 Information sharing by States

In the surveys, States indicated that since the crash of flight MH17, they have done more to improve the information position of airlines. This follow-up investigation does not provide an unambiguous picture of how States across the world assist airlines in gathering information for the purposes of assessing the risks of flying over conflict zones. However, the Board can use the findings to identify developments that are helping airlines to obtain a good information position. A number of States make information relating to conflict areas in other States public in the form of a NOTAM, AIP, AIC or national regulations, and therefore available to other countries and airlines. The airspace restrictions promulgated by the Federal Aviation Administration are a mandatory regulation for American operators. They are also applicable to the non-American operators who have entered into a codeshare agreement[57] with an American airline.

The EU Aviation Security Risk Assessment Group, the EU model in which States regularly meet to exchange information, is also a positive development for the information position of airlines. Participating States benefit from a shared, structured information picture regarding conflict areas. This collaboration is certainly useful for States with a restricted intelligence capability (about a certain area). The outcomes of the EU Aviation Security Risk Assessment Group meetings are shared with airlines on a need-to-know basis through a representative from the EU Member State, or through an EASA CZIB in case the risk has been assessed as high.

The airlines are not represented during the confidential meetings. Public information sources such as CZIBs and NOTAMs usually do not contain background information and considerations with regard to the advice given. Airlines indicate that they need this underlying information for their decision-making process. In order to understand the context of the information shared, it is essential for airlines to develop a good relationship with their intelligence services. In the Netherlands, this has been interpreted by drawing up an agreement and establishing an expert group (see case description in Section 4.2.2).

The Dutch Safety Board sees the information sharing on a European level in the EU Aviation Security Risk Assessment Group as a good practice for achieving a shared information picture of existing conflict areas for the purposes of risk assessment by participating States and their airlines. At the same time, this kind of model – in which there are pre-scheduled meetings – is less well equipped to respond to rapidly evolving threat situations. For this, the airlines are dependent on their own information sources which receive and share new threat information in a timely manner, such as their State's intelligence services.

57 A codeshare agreement is a commercial agreement in which the airline operating a flight permits another airline to offer the flight as if it was operating the flight itself.

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Sub-conclusions
A number of States actively publish information relating to conflict areas in other countries. At a European level, EASA CZIBs are also published about high-risk areas. Both information sources are useful for airlines across the world. As a general rule, this information does not contain any explanation about the backgrounds or considerations regarding the outcome of the risk assessment. Airlines do need this information for the purposes of their decision-making process. A good relationship between airlines and State intelligence services is essential in order to obtain access to such information and for the timely provision of information about escalating conflict areas.

4.3.3 Amendments to ICAO documents

Before the crash of flight MH17, Annex 17 ('Security') already contained a standard requiring States to establish and implement procedures for sharing threat information with other ICAO Member States.[58] This standard does not focus specifically on flying over conflict zones and is furthermore ambiguous about what is expected from States when it comes to sharing threat information relevant to flying over conflict areas.

Given the proposed amendment to Annex 15 regarding the NOTAM obligation in relation to conflict areas it will be compulsory for States to communicate about conflict zones. The amendment to Annex 15 has not yet entered into force.

The amendment that has since been implemented in Annex 17 concerning the sharing of information by States with, among others, the airlines based in their own State is a step towards improving the information position of airlines. On a further amendment of this ICAO standard, that States are obliged to share threat information with all relevant airlines (as well as the airlines based in their own State), has not yet been decided. In the new Doc 10084, this aspect is also not included in the usual roles that ICAO envisages for a State. Therefore, the manual only describes the roles of a State regarding airspace management ('State that manages the Airspace') and the roles of a State regarding its own airlines ('State of the Operator').

At the moment, there are no amendments ongoing to include the exchange of information between airlines themselves in the ICAO Annexes. Doc 10084 does encourage airlines to share information relating to the risk assessments performed with other airlines and air traffic services providers.

58 ICAO Annex 17, Ninth Edition, March 2011, standard 2.4.3 (the Ninth Edition was effective at the time of the crash of flight MH17).

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Sub-conclusions
Through the intended NOTAM obligation for conflict areas in Annex 15 and the amendment already implemented in Annex 17 concerning the sharing of information by States with the airlines based in their own country, ICAO has better embedded information sharing about conflict areas in ICAO standards.

At the same time, there are still points for improvement. ICAO has not yet established the exchange of threat information between States with airlines not based in their own country in ICAO Annexes and ICAO does not mention this explicitly in Doc 10084, the manual for risk assessment for flying over conflict zones. ICAO has also not laid down the sharing of threat information between airlines themselves in the standards. ICAO does encourage this aspect in Doc 10084.

4.3.4 Information gathering by airlines

The survey distributed among airlines shows that the majority of airlines are of the opinion that they now possess more threat information than before the crash of flight MH17 and that this information is of better quality. Several airlines mention specifically that there is noticeably more awareness regarding flying over conflict areas. At the same time, there are major differences in how airlines gather threat information. The scope of the airline, the route network and the resources that airlines devote to this purpose are all factors in this.

Since the crash of flight MH17, airlines have had access to more sources for obtaining information. The United States, the United Kingdom, France and Germany publish information about conflict areas across the world through NOTAMs and other official publications. The Dutch Safety Board has some observations on this. The NOTAMs containing information on conflict areas are important to the flight planning stage. At the start of a specific flight, the flight crew often receives multiple pages of NOTAM notices for the entire route. A NOTAM about a conflict area does not have a specific format, meaning that it is not particularly recognisable as a NOTAM relating to a conflict area. NOTAMs also identify areas through geographical coordinates instead of visualizing the areas. In a recent investigation, the United States National Transportation Safety Board concluded that the NOTAM system presents limitations in terms of raising awareness of certain aspects among the crew.[59]

The surveys received show that the EASA CZIBs are also used as an information source by airlines and States outside of the European Union. Furthermore, EUROCONTROL has collected available publications relating to closures and warnings for the NM area and bordering States. Commercial entities can support airlines in analysing public sources and monitoring potential threats.

59 National Transportation Safety Board, *Taxiway Overflight Air Canada Flight 759*, 25 September 2018.

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Although airlines have indicated that more and better information is available, the depth of the shared information remains a point of concern for the airlines. The timeliness of the current forms of information sharing is an aspect that a number of airlines consider to be a point for improvement. New conflicts and sudden escalations of existing conflicts are the main focal point in this regard. By nature, the sharing of threat information is a complex process. Factors such as building up trust in informal networks, the confidentiality of the threat information, the protection of the sources and not endangering one's own people determine the rules of play for exchanging and swapping threat information. If information exchange finally takes place, there is a field of tension as to whether the information is detailed enough for airlines to be able to make an accurate risk assessment. For airlines with limited or no access to the threat information of intelligence services, this has an impact on their risk assessments and final decision-making (see Chapter 5 for more information).

Sub-conclusions
Airlines indicated that they are more aware of the risks related to flying over conflict zones. Since the crash of flight MH17, many airlines are making greater efforts to obtain a good information position with respect to the conflict areas relevant to them. Since the crash of flight MH17, there are more sources for gathering information, a number of which are public sources. The airlines do have concerns about the depth of the shared information and the timeliness of information sharing in the event of new conflicts and sudden escalations of existing conflicts.

4.4 Conclusion on gathering and sharing threat information

Since the crash of flight MH17, various measures have been taken that contribute to more and better threat information being available for the purposes of the risk assessment of flight routes by airlines. Some States actively report on conflict areas in other countries. CZIBs, information bulletins, are also published at a European level about high-risk areas. Both serve as an information source for airlines across the world. Airlines are also increasingly contracting commercial entities to gather relevant information about conflict areas.

The following developments consolidate the improvement in information sharing:

- Through the intended NOTAM obligation for conflict areas in Annex 15 and the amendment already implemented in Annex 17 concerning the sharing of information by States with the airlines based in their own country, ICAO has better embedded information sharing about conflict areas in ICAO standards.
- At an organized European level, the EU Aviation Security Risk Assessment Group, a shared and structured information picture is being formed about conflict areas for the benefit of participating States and their airlines.

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The structured consultations on sharing threat information and the official publications are designed to tackle long-term conflicts. In dealing with new conflicts and sudden escalations of existing conflicts, the airlines depend on informal and ad hoc networks for their information. The resources available to airlines determine how these networks are developed and maintained. For example, there will be a difference between a small airline and a large airline that forms part of an alliance of airlines.

Since the crash of flight MH17, many airlines are making greater efforts to obtain a good information position in general with respect to the conflict areas relevant to them. An observation here is that airlines have indicated that the depth of the shared information remains a point for concern. A good relationship between airlines and State intelligence services is essential in order to obtain access to such information.

Threat information is shared among airlines on an ad hoc, informal basis and not in a structural manner. No obligations on this matter have been included in ICAO standards.

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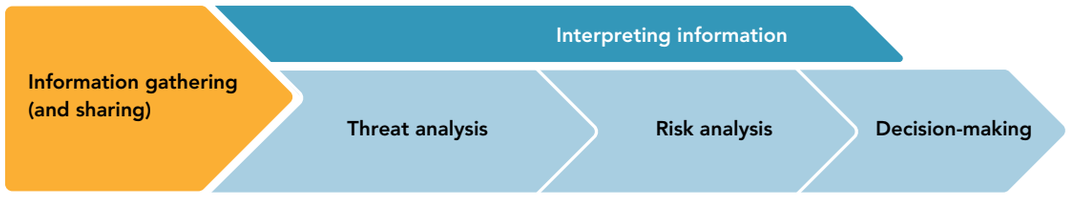
5 RISK ASSESSMENT

5.1 Necessary improvements based on the MH17 Crash report

Given the vulnerability of States that have to cope with an armed conflict on their territory, airlines and other parties involved in aviation should not assume in advance that the airspace above or near the conflict is safe. Airlines must assess the risks of flying over conflict areas and make an informed decision about whether or not to fly over or near conflict zones.[60] In this regard the Dutch Safety Board assumes the following risk assessment process.[61]



Threat analysis: determining the likelihood or probability of a threat occurring.
Risk analysis: estimating the risks to the operator, based on vulnerability and consequences.
Decision: to fly or not to fly. If the decision is made to fly, are additional measures necessary?

Figure 5: Steps in the risk assessment process (Source: Dutch Safety Board).

The *MH17 Crash* report established that when assessing the risks to civil aviation above areas where an armed conflict is taking place, risks in which there is no certainty regarding intention, capability or activity must be taken into consideration besides specific threats.

Subsequently, it is important that airlines are publicly accountable for their chosen flight routes, because this keeps airlines attentive to their responsibility to conduct thorough risk assessments regarding flying over or near conflict zones.

60 This applies to situations in which the airspace is open, and the competent national authorities have not imposed a flight ban on airlines.
61 Source: Dutch Safety Board, *MH17 Crash*, October 2015.

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The Dutch Safety Board believes that the following improvements must be made to conduct more effective assessments of threat information:

- In the risk assessment related to flying over conflict zones performed by airlines:
  - The airline includes threats to civil aviation in the airspace at cruising altitude;
  - The airline takes account of uncertainties regarding threat information, including threats not necessarily directed at civil aviation, but in which the latter could be affected;
  - The airline applies risk increasing factors (factors as those cited in the proposals made in 2015 by the Working Group on Threat and Risk (WGTR) of ICAO).

  This is in line with Recommendation 6.
- ICAO standards and national regulations secure the working method for performing the risk assessment. This is in line with Recommendations 6 and 8.
- ICAO and IATA promote this working method for airlines to perform risk assessments. This is in line with Recommendations 7 and 9.
- Airlines are publicly accountable for their chosen flight routes and thus ensure they conduct adequate risk assessments. This is in line with Recommendations 10 and 11.

5.2 Developments following the MH17 crash

This section describes the various developments related to the conduct of risk assessments of conflict areas since the crash of flight MH17. Appendix D describes the specific follow-up to the recommendations issued by the Dutch Safety Board on this subject (Recommendations 6 up to and including 11).

5.2.1 Amendments to ICAO documents

ICAO has initiated a number of actions and developments to amend standards and documents relevant to risk assessments by airlines.

Annex 6 ('Operation of Aircraft') addresses airlines' responsibilities for safely operating aircraft. One proposed new standard 4.1.2 requires that the airline shall not carry out the flight if, by every reasonable means available it cannot be established that the airspace for the entire flight route, including the alternate aerodromes, can be used safely. The standard also prescribes that an airline must perform a risk assessment for a flight route over or near a conflict zone, and if necessary take measures to ensure a safe operation. ICAO has indicated that this standard will enter into force on 5 November 2020. In an explanatory note to the standard, ICAO will specify that it also concerns the use of information that becomes available after departure – during the flight – to the airline and that could or must lead to the route being adjusted. ICAO has presented this proposal in August 2018 to its Member States for review through a State Letter.

In the note ICAO also refers to Doc 10084[62] *Risk Assessment Manual for Civil Aircraft Operations Over or Near Conflict Zones*. The document provides guidelines to States, airlines and other parties involved regarding the different steps in the risk assessment process.

62 ICAO, Doc 10084, Second Edition, 2018.

Doc 10084 cites the diverse risks related to conflict areas and the risk increasing factors, which airlines must include in a risk assessment. This manual also explains the proposed amendments to Annex 6.

It is notable that Doc 10084 does address risks to civil aviation from fixed and large mobile air defence systems for anti-aircraft missiles with a significant reach (including surface-to-air missiles, SAMs), but for information about the risks posed by portable and small mobile air defence systems with a shorter reach (including man-portable air-defence systems (MANPADS) the document refers to other restricted ICAO documents. As a result, Doc 10084 does not offer a complete picture of all potential threats.

ICAO is now focusing on the implementation of the document by States, airlines and other parties, using presentations, workshops and (digital) flyers. ICAO intends to organize additional training sessions and workshops where necessary in association with its regional offices.[63]

5.2.2 Amendments implemented by IATA

The IATA Operational Safety Audit (IOSA) is an audit programme for airlines, designed to assess an airline's operational management systems. The IOSA audits are mandatory for all IATA members and are based on standards developed by IATA, included in the IOSA Standards Manual (ISM). In March 2007 security management systems became part of the mandatory IOSA audits.

Shortly after the crash of flight MH17, IATA implemented changes to the ISM.[64] Additional amendments were included in later editions of the ISM. The changes concern the guidance material for standards related to the Safety Management System (SMS) and the security management system (SeMS).[65]

In the current 12th edition of the ISM, standards FLT1.12.2 and DSP1.12.2 stipulate that an airline must have a risk assessment programme (as part of the SMS), in which potential risks and hazards are identified and mitigating measures are identified where necessary. The guidance for both standards contains a list with potential risks and hazards related to flight operation. After the crash of flight MH17, IATA added 'operations in airspace affected by armed conflict' to this list with examples.

Furthermore, in the part of the ISM related to security management IATA added a standard concerning identifying threats (SEC4.1.1, threat management). In the guidance to this standard IATA states that the threat analysis should not only consider airports, but also flight routes.

In 2017, IATA published the first edition of the IATA Security Management System manual (SeMS Manual) with the aim of providing more details about the various aspects involved in an SeMS. In doing so IATA provides direction to airlines for implementing an SeMS. The document also includes a practical example of flying over conflict zones.

63 ICAO working paper AN-Conf/13-WP/33, 23 August 2018.
64 First amendments in the 9th edition of the IOSA Standards Manual (ISM), 1 September 2015.
65 SMS and SeMS: systematic approach for managing safety and security risks respectively.

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5.2.3 The situation in practice

The Dutch Safety Board conducted a survey among a selection of airlines. In their response the majority of airlines (26 out of 36) indicated that after the crash of flight MH17 they modified the process used to conduct risk assessments related to conflict zones. Of the airlines that did not modify their risk assessment, four indicated that their working method already sufficed. As far as the remaining six airlines are concerned, based on the response to the survey it is unclear why they did not modify their working method. In the survey thirty-one airlines stated that there is now a more explicit assessment of the risks to flight routes over conflict areas.

Interviews with airlines revealed that the way in which the risk assessment process of conflict zones is embedded in the organization depends, for example, on an airline's size, the degree of contact with and guidance from the government in their country of origin, and the destinations/flight routes. Larger airlines often have a specific department for performing threat and risk analyses as part of the risk assessment process, while smaller airlines partially or fully outsource this activity. The interviews also revealed that nowadays, airlines examine the risks to flight routes over conflict areas more specifically, which means that the decision-making process is more structured, often as part of a safety management system or a security management system. This means that airlines currently adopt a more conscious approach to the subject than before the crash of flight MH17.

In the risk analyses related to flying over conflict areas airlines generally use risk matrices, which assess the likelihood and consequences. Since the consequences of a missile attack on an aircraft in the air are significant, possibly resulting in many victims and the loss of the aircraft, airlines also classify the resulting risk as high. In the interviews airlines indicated that the possible mitigating measures related to the risks of flying over or near conflict zones are limited. In a number of situations flying at a high altitude can provide adequate safety. If this is not the case, avoiding the airspace is the only remaining option.

In their decision-making process airlines also take into account additional aspects and assessments for the flight concerned, such as possibilities for deviating to other airports, procedures in the event of a sudden loss of cabin pressure (decompression), which means that the aircraft must descend, as well as economic factors (destinations, available alternative routes) or changing weather conditions. In the interviews various airlines indicated that compared to the situation prior to the crash of flight MH17 airlines now sooner opt for not flying or of flying at a higher altitude, unless there is conclusive evidence that it is safe.

A risk assessment of a flight route may also be adjusted shortly before or even during the flight. The interviews revealed that pilots can contact their operational centre 24 hours a day, for example to establish whether their flight plan is still satisfactory after a news report.

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5.2.4 Public information about flight routes

Airlines proactively publish little or no information about selected flight routes. The surveys and interviews indicated that they do respond to individual questions submitted by passengers. However, the interviews show that few questions are asked by the public and that according to the airlines there appears to be little to no interest in public information about flight routes. Airlines that operate business or charter flights generally inform their customers about the selected flight routes and considerations.

Airlines cite the following aspects as limiting factors: the confidentiality of information (threats as well as the security measures taken), the protection of sources, potential commercial harm, liability if the route taken is effectively different, the unpredictability of flight routes (including as a result of weather conditions), the desire not to worry passengers and the difficulty for passengers to genuinely comprehend the considerations and risk assessments involved.

IATA indicates that it is not straightforward for airlines to make flight routes public. IATA points out that passengers can consult the IOSA register on the IATA website and can see that the 290 airlines affiliated to IATA possess systems and processes to manage the risks associated with their activities. According to IATA, accountability for the choice of flight routes is provided with this register, along with the individual reporting obligations of airlines and travel advice issued by countries. IATA therefore considers that passengers are able to take an informed decision about whether they want to fly with a particular airline. However, the IOSA standards related to risk assessments and the way in which airlines have organized their management process related to flying over conflict zones are not accessible for passengers via the IOSA register on the IATA website.

IATA stated that it will not insist that airlines implement the recommendation on transparency. IATA does not assume an active role in this matter.

Several Dutch airlines provide information on their websites about flight routes and flying over conflict zones; see the following screenshots of the websites concerned. The form and content of the information differ. All airlines generally describe how they have selected a particular flight route, without providing any detail about the exact flight routes. KLM also provides a Flight Routes Map that illustrates the possible routes that may be flown. Airspace restrictions, flight altitudes or choices are not made transparent on this map.

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Figure 6: Screenshot of the KLM Flight Routes Maps, 11 February 2019.

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Welke vluchtroutes gebruikt TUI fly?

Graag deten wij zo open mogelijk met onze reizigers hoe de vluchtroutes tot stand komen naar uw vakantiebestemming. U kunt er in ieder geval van overtuigd zijn dat de veiligheid van onze passagiers en crew daarbij onze hoogste prioriteit heeft. Bij het plannen van de vluchtroutes houdt TUI fly rekening met verschillende zaken zoals: de vliegafstand, vluchtduur, weersomstandigheden, beperkingen in het luchtruim en ook risico's die voortkomen uit dreigingen vanaf de grond. Deze informatie wordt verkregen uit beslissingen en aanbevelingen van de bevoegde instanties, die gepubliceerd worden in (luchtvaart)publicaties, zoals Notices to Airmen (NOTAM's) en EASA Conflict Zone Information Bulletins (CZIB's). Deze worden weer aangevuld met informatie uit publieke bronnen, vanuit inlichtingen- en veiligheidsdiensten en collega-luchtvaartmaatschappijen.

Wordt er een nieuwe beperking afgegeven voor bepaalde routes, dan wordt deze met onmiddellijke ingang doorgevoerd in het vliegschema. Aanbevelingen worden grondig bestudeerd en waar nodig toegepast. Wij maken bij de planning en uitvoering van de vluchten een voortdurende afweging op basis van alle beschikbare informatie. Hierbij staat veiligheid altijd voorop; wanneer een gebied onveilig wordt bevonden, dan wordt de vluchtroute daarop aangepast.

Mocht u vragen hebben over de vluchtroute van uw specifieke vlucht, dan kunt u uiteraard contact opnemen met ons Customer Services Center. Graag informeren wij u, echter met de beperking dat vertrouwelijke achtergrondinformatie niet gedeeld kan worden.

Figure 7: Screenshot of TUI fly Frequently Asked Question on flight routes , 24 September 2018.

Which flight routes does TUI fly use?

We would like to share as openly as possible with our passengers how we determine the flight routes to your holiday destination. In any case, you may rest assured that the safety of our passengers and crew is our highest priority. When planning the flight routes, TUI fly takes into account various issues such as the flight distance, flight duration, weather conditions, airspace restrictions and also risks arising from threats from the ground. This information is obtained from decisions and recommendations of the competent authorities, which are published in (aviation) publications, such as Notices to Airmen (NOTAMs) and EASA Conflict Zone Information Bulletins (CZIBs). These are supplemented with information from public sources, intelligence and security services and fellow airlines.

If a new restriction is issued for certain routes, this will be implemented in the flight schedule with immediate effect. Recommendations are thoroughly examined and applied where necessary. For the planning and execution of flights we continuously assess all available information. In this matter, safety always comes first; if an area is found to be unsafe, the flight route is adjusted accordingly.

If you have any questions about the flight route of your specific flight, you can always contact our Customer Services Center. However, we would like to inform you on the restriction that confidential background information cannot be shared.

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Vluchtinformatie

/ Uw vlucht / Vluchtinformatie

Corendon heeft als vakantie-luchtvaartmaatschappij geen vaste bestemmingen. Wel zijn er bestemmingen die regelmatig aangevlogen worden, maar ook voor deze bestemmingen kan de vliegroute van vlucht tot vlucht verschillen. Corendon probeert uiteraard de vliegroutes zo te kiezen dat de vliegafstand en vluchtduur zo kort mogelijk zijn. Er kunnen echter beperkingen gelden, bijvoorbeeld doordat delen van het luchtruim zijn afgesloten ten behoeve van militair gebruik. Daarnaast spelen de actuele weeromstandigheden mee bij het plannen van de route. Tenslotte wordt ook rekening gehouden met risico's die voortkomen uit dreigingen vanaf de grond. Corendon past de restricties toe zoals die gepubliceerd worden in de daartoe strekkende luchtvaartpublicaties, zoals Notices to Airmen (NOTAM's) en EASA Conflict Zone Information Bulletins (CZIB's), aangevuld met restricties voortkomend uit analyse van informatie uit publieke bronnen en van vertrouwelijke dreigingsinformatie vanuit inlichtingen- en veiligheidsdiensten en collega-luchtvaartmaatschappijen. Dit kan op ieder moment tot wijzigingen leiden. Een betrouwbaar beeld verstrekken van de vliegroute per bestemming is dan ook niet praktisch haalbaar. Mocht je echter vragen hebben over je vliegroute, dan kun je deze via het Corendon Contact Center stellen. Hierbij geldt wel de beperking dat vertrouwelijke informatie uiteraard niet kan worden gedeeld.

Figure 8: Screenshot of Corendon Frequently Asked Question on flight information, 24 September 2018.

Flight information
Corendon, as an airline for holiday travel, has no fixed destinations. However, there are destinations that are regularly flown to, but also for these destinations the flight routes can vary from flight to flight. Corendon naturally tries to select a flight route in such a way that the flight distance and flight duration are as short as possible. However, restrictions may apply, for example because parts of the airspace are closed for military use. In addition, the actual weather conditions play a part in the planning of the route. Finally, risks arising from threats from the ground are also taken into account. Corendon applies the restrictions as published in the relevant aeronautical publications, such as Notices to Airmen (NOTAMs) and EASA Conflict Zone Information Bulletins (CZIBs), supplemented by restrictions resulting from the assessment of information from public sources, confidential threat information from intelligence and security services, and fellow airlines. This may lead to changes at any time. Therefore, it is not practically feasible to provide a reliable picture of the flight route per destination. However, if you have any questions about your flight route, you can contact the Corendon Contact Center. Obviously, with the restriction that confidential information cannot be shared.

5.3 Analysis of the state of affairs

5.3.1 The conduct of risk assessments by airlines

The Dutch Safety Board finds that since the crash of flight MH17, airlines are more conscious in their approach to risks of flying over conflict zones. Airlines safeguard the risk assessment process by means of a safety management system or security management system. As airlines are now more structured in their risk analyses related to flying over conflict zones, risk increasing factors and uncertainties are also more likely to lead to airlines assessing the risk as higher. Some airlines indicated that nowadays if they find themselves in an uncertain information position regarding a conflict area they are more likely to decide not to fly over the area concerned.

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At the same time the Dutch Safety Board finds that there is no general and unambiguous picture of the way airlines perform risk assessments related to flying over conflict zones. The working method, information position, the country of origin and extent to which risks are accepted differ per airline. Moreover, the guidelines issued by the government (advice or obligation) may differ from one State to another. As a result, the ultimate decision may differ from one airline to another, ranging from a difference in the overflight altitude to the decision of whether or not to fly over a certain area.

Sub-conclusions
Airlines indicate that since the crash of flight MH17, they approach the risks of flying over conflict areas more consciously and that they perform risk assessments that they have fine-tuned for this purpose. They are aware of uncertainties in their risk assessments and take them into account in their decision-making process related to flying over conflict zones.

The decision taken by an airline regarding a flight route may differ from one airline to another. Decisive factors include the information position, risk profile (such as country of origin), risk acceptance and the degree of government guidance that exists.

5.3.2 Safeguarding in ICAO standards and national regulations by States

With the proposed amendment to Annex 6 ICAO makes it explicit that airlines must perform a risk assessment related to flying over conflict zones. The new Doc 10084 contains specific guidelines for performing such risk assessments. This document addresses the risk increasing factors that are important for a risk assessment. The manual is not binding but constitutes a potential resource for airlines. This does not yet guarantee that an airline will perform a risk assessment in line with Doc 10084.

Airline practice reveals that overflight risk assessments are performed as part of a safety management system or a security management system. Doc 10084 also indicates that there are various ICAO manuals and guidelines that provide a more detailed explanation of the risk assessment process. ICAO has introduced in its 4th edition of Doc 9859 'Safety Management Manual' (2018) the concept of integrated risk management, a unified framework for different management systems such as safety, security, quality, occupational health and environmental management systems.

In the survey States indicated whether they modified national regulations involving risk assessments performed by airlines for flight routes over and near conflict areas. Of the twelve States one indicated that changes had been made to national regulations and six referred to already existing regulations or practices related to the safety management system. Four States indicated that working methods or arrangements with airlines were modified. One State mentioned that they are waiting for European regulations before modifying national regulations. Three States did not provide any more information about why their regulations or working methods remain unchanged.

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Sub-conclusions
With the proposed amendment to Annex 6 ICAO is making it explicit that airlines must perform a risk assessment related to flying over conflict areas.

The publication of Doc 10084 provides airlines (and other parties) with a manual specifically for risk assessments related to flying over conflict zones. Doc 10084 is guidance material and as such airlines are not obliged to make use of the manual. The document assists in the implementation of ICAO standards.

In general, States did not amend their national legislation on the subject of performing risk assessments when flying over conflict areas. A number of States refer to existing legislation and practices on safety management systems for their reason not to do so.

5.3.3 Promoting conducting risk assessments

ICAO actively distributes the new Doc 10084 within the aviation sector: the document is accessible on the website and ICAO intends to organize workshops and training sessions. This could contribute to a quality boost for risk assessments performed by airlines worldwide.

IATA has modified its guidance for various IOSA standards in the ISM related to risk assessments and cites armed conflicts as a potential risk. Airlines use this manual to design their processes and to prepare for the IATA audit. Specifying the subject of overflight in the manual increases awareness of this subject. The IATA Security Management System manual (SeMS Manual) provides more information about conducting risk assessments for security aspects.

Sub-conclusions
By publishing Doc 10084, and as a result of the publicity surrounding it, ICAO has provided a positive impulse for the promotion of risk assessments being conducted for flying over conflict zones.

By continuing to develop the management systems that IATA affiliated airlines must adopt, IATA helps make the risk assessment process airlines use more professional and increases awareness of the subject.

5.3.4 Accountability

In the opinion of the Dutch Safety Board transparency and public accountability by airlines regarding selected flight routes must form the final step for airlines to demonstrate that they are adequately considering risks related to flying over conflict areas. However, airlines publish little or no information about their selected flight routes. IATA has not assumed an active role in bringing about a form of accountability either. The Dutch Safety Board realizes that passengers do not commonly ask for this information and that it cannot be expected from them that they urge airlines to provide public accountability,

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but does not see this as an adequate argument for not publishing this information. Because of the absence of some sort of public accountability, the final link in keeping airlines attentive to their responsibility for performing thorough risk assessments related to flying over or near conflict zones is lacking.

However, the Dutch Safety Board is also aware that publishing details of choices of individual flight routes is not straightforward, due to aspects such as the sensitivity of information and the complexity of the considerations. Nevertheless, this does not detract from the fact that airlines could look for a way to provide public accountability regarding the choices made, such as by explaining the reasons for avoiding certain areas. The examples of Dutch airlines also illustrate that it is possible to do more than the efforts made by most airlines at this time.

Current ICAO standards do not yet require that airlines perform a risk assessment for flying over conflict zones (the amendment to Annex 6 will only be applicable in 2020). This means that a safeguard is not yet guaranteed by the system of ICAO USOAP audits and oversight by the aviation authorities. Public accountability for the flight routes selected by airlines is a mechanism for keeping airlines attentive to when it comes to their responsibility for performing thorough risk assessments related to flying over or near conflict areas.

Sub-conclusions
Airlines account for their selected flight routes only very little or not at all and do not look for a way of doing so either. Neither does IATA assume an active role in bringing about a form of public accountability. In the opinion of the Dutch Safety Board the final link in keeping airlines attentive to their responsibility for performing thorough risk assessments related to flying over or near conflict zones is lacking.

5.4 Conclusion on risk assessment

Since the crash of flight MH17, various measures have been taken to encourage airlines to perform risk assessments of flight routes, including:

- ICAO Annex 6 is being amended to make it explicit that airlines must perform a risk assessment related to flying over conflict zones.
- ICAO Doc 10084 provides guidelines for performing a risk assessment of flight routes over conflict areas, paying attention to uncertainties and risk increasing factors. ICAO also promotes this by means of presentations and workshops. However, it is not a binding standard.
- In the prescribed management system IATA has included guidance indicating that armed conflicts pose a possible risk for overflying conflict areas. With this, awareness on the subject as part of the risk assessment process is safeguarded for IATA affiliated airlines, with the remark that coping with uncertainties and risk increasing factors is not an explicit subject.

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The Dutch Safety Board finds that many airlines now adopt a more conscious approach to the risks associated with flying over conflict zones than in the past, and are making an effort, or have done so, to improve their risk assessment process. There are also indications that airlines address uncertainties in a more conscious manner and are more inclined not to fly if there is any doubt. However, differences may exist in airlines' risk assessments, including as a result of differences in their working methods, the information position, risk profile (such as country of origin), risk acceptance, and the degree of government guidance that exists.

In general, States did not amend their national legislation on the subject of performing risk assessments when flying over conflict areas. A number of States refer to existing legislation and practices on safety management systems as their reason not to do so.

This follow-up investigation reveals that airlines publish little or no information about the selected flight routes. IATA does not assume an active role in bringing about a form of accountability either. The Dutch Safety Board views public accountability as a mechanism for keeping airlines attentive when it comes to their responsibility for performing thorough risk assessments related to flying over or near conflict zones.

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6 CONCLUSIONS

In this investigation into the follow-up to recommendations from the MH17 crash investigation, the Dutch Safety Board has made an inventory of the changes that were implemented in order to adequately manage the risks associated with flying over conflict areas. The Board finds that since the crash of flight MH17, important steps have been taken by various parties to better manage the risks, as evidenced by the following developments:

- Airlines are more aware of the risks posed by flight routes over conflict areas. They are more active in gathering information and generally have more sources at their disposal for this purpose. Risk assessments are also taking place in a structured manner, with attention being paid to uncertainties and risk increasing factors, and there is evidence that airlines are more inclined not to fly in cases of doubt.
- There are more information sources for airlines regarding conflict areas. Some States actively publish information on conflict zones in other countries, for instance through a Notice to Airmen (NOTAM). CZIBs, information bulletins about high-risk areas, are also published in Europe. Both form an information source for airlines across the world.
- In the European Union, States work explicitly together to exchange intelligence information about conflict zones and form a uniform view of the risks. Furthermore, States have taken action to arrive at a better exchange of information on a national level. For example, the Netherlands has drawn up an agreement regarding the sharing of threat information for civil aviation.
- With the (proposed) amendments to standards in Annexes, ICAO has embedded the importance of sharing information about conflict zones and the associated risk assessments. This is a good step towards maintaining awareness of the topic. With the publication of Doc 10084, ICAO has put together a publicly available manual, offering support to States, airlines and other parties involved in fulfilling the various steps of the risk assessment process. The Dutch Ministry of Infrastructure and Water Management has taken a lead in initiating amendments to the ICAO documents.
- IATA has made the risks of flying over conflict zones an explicit part of the management systems prescribed by IATA in order to manage the risks for aviation. This contributes to the professionalization of risk assessments by airlines and awareness of the topic.

On this basis, the Board concludes that the changes implemented have resulted in an impulse for better management of the risks of flying over conflict zones. Risk management relating to flying over conflict zones has become a well-established part of the safety philosophy of the aviation sector.

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On the other hand, the follow-up investigation has also highlighted the difficulties of implementation in practice. Few changes are visible in the airspace management performed by States. With the exception of Ukraine, there are no known examples of States that are taking measures for their airspace for civil aviation overflights in times of armed conflict on their territory. There is still room for improvement in the risk assessment process of airlines. For example, airlines would like to have more unambiguous and detailed threat information available. Also, when sharing threat information, there are practical obstructions when it comes to non-public information. It is worth pointing out here that airlines differ regarding to the extent to which they have access to threat information. Especially for airlines that have no or limited access to information held by the intelligence services of their country it can be difficult to obtain non-public threat information. Furthermore, not all airlines possess the resources and networks they need to gather threat information. For example, there can be a difference between a small airline and a large airline that forms part of an alliance of airlines.

Various parties have taken steps to improve risk management when it comes to flying over conflict zones. However, the process of safeguarding through amendments of ICAO standards has not been completed. In addition, those amendments will need to be implemented in States' national legislation. It is the opinion of the Board that, in order to maintain the chosen path and take risk management to a higher level, the following issues must be addressed:

- Practice shows that States in which there is an ongoing armed conflict will not implement restrictions for their airspace on their own initiative. The Board realizes that States involved in an armed conflict will have difficulty when it comes to guarding the safety of their airspace. Although ICAO, as an intergovernmental organization, is in this position, ICAO does not take an active role in urging States to ensure the safety of their airspace and to support them in this.
- Information sharing in rapidly escalating conflict situations occurs ad hoc and through informal networks. In this way, States and airlines do not ensure that threat information is shared timely and airlines are in the position to take measures. To ensure access to relevant information it is essential to maintain a good relation and reciprocal communication between an airline and the intelligence services of the State where the airline is established.
- The Board views public accountability of chosen flight routes by airlines as a final link in keeping airlines attentive to their responsibility for performing thorough risk assessments related to flying over or near conflict zones. Airlines account only little or not at all for their chosen flight routes. IATA does not stimulate this either.

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APPENDIX A

EXPLANATION OF THE FOLLOW-UP INVESTIGATION

A.1 Purpose of the investigation

In 2015 the Dutch Safety Board published the *MH17 Crash* report. This report includes eleven recommendations which are aimed at better managing the risks related to the overflying of conflict zones. These recommendations are addressed to international organizations (ICAO and IATA), States and airlines. Three years after publication of the report, the Safety Board wished to know whether the management of the risks related to the overflying of conflict zones has improved since the crash of flight MH17. Therefore, the Safety Board conducted a follow-up investigation to gain insight into the extent to which international organizations, States and airlines have followed up the recommendations and addressed the safety deficiencies underlying these recommendations.

A.2 Investigation questions

The follow-up investigation addresses the following key question:

> What changes have the parties involved implemented since the crash of flight MH17 in order to adequately manage the risks associated with flying over conflict zones, and to what extent has this led to better management of these risks?

The key question is divided into the following sub-questions:

- What have the addressed parties (ICAO, ICAO Member States, IATA and airlines) done in order to implement the recommendations from the *MH17 Crash* report and to improve the management of risks associated with flying over conflict zones?
- Have other parties developed activities for the purpose of improving the management of risks associated with flying over conflict zones? If so, what are these activities?
- To what extent have the recommendations concerning flying over conflict zones from the *MH17 Crash* report been followed up, and have the safety shortcomings underlying the recommendations been eliminated?

A.3 Scope of the investigation

The recommendations of the *MH17 Crash* investigation were aimed at better managing the risks related to the overflying of conflict zones on a global level, and therefore the Dutch Safety Board addressed its recommendations to international organizations (ICAO and IATA), to States and airlines. This follow-up investigation focuses on the activities initiated by the international organizations and other relevant parties to better manage the risks related to the overflying of conflict zones. It is beyond the scope of this investigation to provide a complete overview of all activities undertaken by States and airlines. However, the Dutch Safety Board did collect information on initiatives taken by a selection of countries and airlines. These examples are included in the report, some of them are highlighted as good practices.

A.4 Investigative approach

As the follow-up investigation covered a wide range of topics and a multitude of parties, several investigation methods were used to collect and analyse the information relevant to answering the investigation questions. These methods are described below.

Assessment framework
As part of this follow-up investigation, the Dutch Safety Board established an assessment framework describing what the Board expects from the parties involved. This assessment framework was based on the frame of reference developed for the *MH17 Crash* report. The assessment framework is outlined in Section 1.4.

Interviews
In the course of the investigation, the Dutch Safety Board conducted approximately 26 semi-structured interviews. Semi-structured interviews are conducted with a fairly open framework which allows focused two-way communication. Interviews were conducted with, among others, representatives of the following organizations:

- IATA (follow-up to the recommendations addressed to IATA);
- the European Commission: DG HOME and DG MOVE (information exchange among EU Member States);
- the European Aviation Safety Agency (information exchange at a European level);
- EUROCONTROL (information provision on the EUROCONTROL website);
- a selection of airlines (collection and exchange of threat information and methods used for risk assessment);
- Osprey Flight Solutions (collection of threat information).

Communication with the ICAO Secretariat was established through correspondence.

To gain a more detailed insight in the exchange of threat information on a national level, the Safety Board conducted interviews with representatives of several Dutch organizations, including the Ministry of Infrastructure and Water Management, the National Coordinator for Security and Counterterrorism (NCTV), the General Intelligence and Security Service (AIVD), the Defence Intelligence and Security Service (MIVD), and the Dutch Airline Pilots Association (VNV).

Document analysis
The investigation team studied a large number of documents. The team made use of public sources (including legislation, policy documents, NOTAMs, CZIBs, etc.) and requested the parties involved to provide all information relevant to the purpose of answering the investigation questions.

Surveys
To gain an insight into the activities that States and airlines have undertaken since the crash of flight MH17 to manage the risks related to civil aircraft operations over or near conflict zones, the Dutch Safety Board designed two surveys (one for national civil aviation authorities and one for airlines), distributed these surveys, and analysed the results. In order to distribute these surveys to a selection of States and airlines, the Dutch Safety Board requested the support of safety investigation authorities in 23 other countries inside and outside the European Union. These authorities were asked to circulate the surveys to their national civil aviation authority and to the airlines established in their country. Thanks to the support of these authorities, the Dutch Safety Board received responses from 12 national civil aviation authorities and 36 airlines, from 18 different countries, both inside and outside the EU. To safeguard the anonymity of the responding aviation authorities and airlines, this report presents the results of the surveys at group level, and does not address the answers provided by individual authorities or airlines.

A.5 Quality assurance

Reflection meetings, falsification, challenging assumptions
To manage the risk of bias (such as hindsight bias or tunnel vision), the Dutch Safety Board carried out a number of activities to assure the quality of the follow-up investigation. These activities included sessions with colleagues who were not involved in the investigation. These sessions were organized at various stages of the investigation, and focused on critically challenging hypotheses, assumptions and underlying theoretical frames.

Stakeholder analysis
To arrive at independent and authoritative conclusions in a complex system, it is important that the investigative body has an effective understanding of these forces: what interests do the various parties have, how could they influence the course of the investigation and how can the investigative body best deal with those forces? A stakeholder analysis was performed to answer these questions systematically.

Consultation
The draft report was sent for consultation to the parties directly involved. These parties were requested to check the contents of the draft report for factual inaccuracies and ambiguities (please refer to Appendix B for more information).

A.6 Role and composition of the guidance committee

The Dutch Safety Board installed a guidance committee for the purpose of this follow-up investigation. This committee included external members with expertise relevant to the investigation and was chaired by a member of the Dutch Safety Board. The external members were on the guidance committee in a personal capacity. The guidance committee consisted of the following people:

M.B.A. van Asselt Chairman of the guidance committee (from 1 September 2018)	Board member of the Dutch Safety Board
E.R. Muller Chairman of the guidance committee (until 1 September 2018)	Board Member of the Dutch Safety Board (until 1 September 2018)
A.P.J.M. Rutten	Associate Member of the Dutch Safety Board
M. Beringer	Independent Air Traffic Management consultant
R.D. van Dam	President of the International Foundation for Public Aviation
G.H. Kroese	Former CEO, ATC the Netherlands
M.A.G. Peters	CEO, NLR (Netherlands Aerospace Center)
A. Verberk † (until August 14th, 2018)	Former CEO, Martinair Holland

The guidance committee convened on two occasions during the investigation to exchange views with the members of the Dutch Safety Board and the project team on the approach and the results of the investigation. The committee acted in an advisory capacity. The Dutch Safety Board bears the responsibility for the report.

A.7 Project team

The project team comprised the following people:

S.M. Berndsen	Investigation manager
S.M. van Hijum	Project manager
M. van het Loo	Investigator
L.P. Sluijs	Investigator
A.H. de Ruijter	Investigator
G.J. Vogelaar	Investigator
G.J.M. Oomen	Investigator
H.T.M. van Rooij	Investigator
E.J. Willeboordse	Advisor
A. van der Zande	Investigator (until July 11th, 2018)

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Appendix A. Explanation of the follow-up investigation

Appendix B. Responses received following consultation on draft report

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RESPONSES RECEIVED FOLLOWING CONSULTATION ON DRAFT REPORT

A draft version of this report was submitted to the parties directly involved. The following parties were requested to check the report for any factual inaccuracies and ambiguities, and to present their views on the findings of the investigation:

- ICAO
- IATA
- Dutch Ministry of Infrastructure and Water Management
- European Commission (DG HOME and DG MOVE)
- EASA
- The accident investigation boards of the countries which have actively participated in the collection of information through our survey

The Dutch Safety Board received a response to the draft report from these parties.

The Board has processed incoming responses in the following manner:

- Factual inaccuracies, ambiguities, additions at a detailed level and editorial comments were, where relevant, adopted.
- Comments that were not adopted and the motivation of the Dutch Safety Board are listed in a table which is available on our website safetyboard.nl.

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ICAO STANDARDS-MAKING PROCESS

ICAO organization

The International Civil Aviation Organization (ICAO) is an agency of the United Nations. ICAO establishes the international framework for civil aviation. The principles on which ICAO's work is based are defined in the Chicago Convention. The Convention has been ratified by 192 Member States.

Representatives of ICAO Member States convene every three years during the ICAO Assembly. This Assembly reviews ICAO's activities and establishes the priorities and policy for the next few years. The Assembly also elects the ICAO Council and approves the budget for the next three years.

The ICAO Council establishes the focus of the activities of ICAO and consists of 36 Member States. The Council also provides direction for the activities and work programme. Moreover, the Council is the body that ultimately adopts the international Standards and Recommended Practices (SARPs). The Council is supported by the Air Navigation Commission (ANC) in technical matters and the Air Transport Committee in economic matters.

The ICAO Secretariat, led by the Secretary-General, consists of the Air Navigation Bureau, the Air Transport Bureau, the Technical Cooperation Bureau, the Legal Bureau and the Bureau of Administration and Services. The Air Navigation Bureau is responsible for matters related to safety and air navigation and the Air Transport Bureau focuses on aviation security, economics and the environment.

Compiling or amending SARPs

ICAO has established a structured process for developing or amending SARPs. In principle, proposals for new or amendments to existing SARPs arise from the ICAO work programme, as established by the ICAO Council. The sources of the proposals can be diverse: recommendations resulting from accident investigation reports, proposals made by the ICAO Assembly, or proposals put forward by regional organizations, Member States or the aviation sector.

The proposals are elaborated by one of the 19 permanent expert panels, one for each Annex. The panels cover various disciplines and generally consist of State representatives and experts from the sector. Each panel is supported by the ICAO Secretariat. 17 out of 19 Annexes to the Convention are of a technical nature and therefore fall within the responsibilities of the Air Navigation Bureau (ANB) and its sections. The 17 related panels report to the Air Navigation Commission (ANC). The remaining two Annexes, Annex 9 'Facilitation' and Annex 17 'Security', are under the purview of the Air Transport Bureau (ATB).

The associated Aviation Security (AVSEC) Panel for Annex 17 reports to the Committee on Unlawful Interference.

As soon as the panel has prepared a technical proposal for a new or amended SARP, after being approved by the ANC it is presented to States and the aviation sector in a State Letter for a response. All the feedback received is processed into a final proposal that the ANC, after approval, presents to the Council for adoption.

Usually this process takes approximately two years, from the initial proposal for a new or amended standard or recommended practice until the formal adoption. The lead time may be shorter or longer depending on the prioritization or complexity of the subject and time needed to reach a consensus.

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FOLLOW-UP TO THE RECOMMENDATIONS

For the assessment of the responses to the safety recommendations, the Dutch Safety Board makes use of the guidance[66] provided by ENCASIA, the European Network of Civil Aviation Safety Investigation Authorities, regarding the EU Regulation[67] on the investigation and prevention of accidents and incidents in civil aviation. The following categories are used: Adequate / Partially adequate/ Not adequate / Awaiting Response/ Superseded.

Category	Guidance
Adequate	The response clearly shows that the safety issue identified by the recommendation has been addressed. The response shows that there is a high probability the action will be taken in the future to address the safety issue or intent. The response may not meet the intent of the recommendation as written but does address the underlying safety issue or has been superseded by other evidence/action.
Partially adequate	The response goes some way to addressing the intent of the recommendation or safety issue in that some action is taking place, but there is: • a likelihood the action may not take place, or • little or no likelihood of any further action by the addressee.
Not adequate	The recommendation response did not address the intent or safety issue, or the recommendation was rejected by the addressee and is not likely to be acted upon by them.
Awaiting response	Awaiting the first response from the addressee.
Superseded	The safety recommendation has been superseded.

Tabel 4: Summary of the categories used.

66 ENCASIA, *Guidance on assessing responses to Safety Recommendations to Article 18 of EU996/2010*, 6 December 2016.
67 Regulation (EU) No. 996/2010.

1. *Recommendation to ICAO:*

Incorporate in Standards that States dealing with an armed conflict in their territory shall at an early stage publish information that is as specific as possible regarding the nature and extent of threats of that conflict and its consequences for civil aviation. Provide clear definitions of relevant terms, such as conflict zone and armed conflict.

Developments relevant to the follow-up to the recommendation

ICAO has taken the following steps:

- Amendment to Annex 15 "Aeronautical Information Services" is being progressed with the proposed applicability of 5 November 2020: text will be added to Annex 15, within the list of operations when a NOTAM shall be originated, in terms of conflict zones including the nature or extent of threats related to conflict zones. Increased detail would support the assessment by operators of the risks associated with conflict zones.
- Annex 17: Amendment 15 to Annex 17 (applicable as of 3 August 2017) reinforces the principle that each State should monitor threat/risk on its territory and airspace above it. Amendment 16 to Annex 17 (applicable as of 16 November 2018) requires the establishment and implementation of procedures for the practical and timely sharing of relevant information by governments with its aviation entities concerned.
- Publication of Doc 10084 "Risk Assessment Manual for Civil Aircraft Operations Over or Near Conflict Zones" (Second Edition, 2018). This concerns a publicly available manual in which (among other things) the responsibilities of States with regard to airspace management are described. It states that States should issue a NOTAM in case of a 'conflict zone' as stipulated in the planned amendment to Annex 15. The document also contains a definition of 'conflict zones'. This document is a manual and as such not binding.
- Amendment to Doc 9554 "Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations" is being progressed within the ICAO Secretariat with broader coordination expected subsequently. This amendment will be published coincident with, and potentially support, the proposed amendments to Annexes 11 and 15. It is not clear to the Dutch Safety Board what will be amended and how this will affect airspace management and the promulgation of information regarding conflict zones.
- Doc 10088 is an update to "Civil/Military Cooperation in Air Traffic Management" (Circ 330) and is expected to be published during 2019. It is not clear to the Dutch Safety Board what will be amended and how this will affect airspace management and the promulgation of information regarding conflict zones.

Assessment of the follow-up to recommendation 1

- Partially adequate

Explanation of the assessment

With Amendment 16 to Annex 17 (applicable as of 16 November 2018), which requires the establishment and implementation of procedures for the practical and timely sharing of relevant information, ICAO has taken an important step in safeguarding the timely availability of necessary threat information. However, the Dutch Safety Board deems this recommendation not to be adequately fulfilled until the proposed amendment to Annex 15 (ICAO State Letter AN 13/35-18/106) concerning the origination and issuance of a NOTAM for conflict zones is effective.

It is not clear to the Dutch Safety Board which adjustments will be made to Doc 9554 and Doc 10088; these documents could not be assessed. ICAO states that the amendment to Doc 9554 ("Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations") is expected to be published coincident with, and potentially support, the amendments to Annexes 11 and 15. Doc 10088, an update to "Civil/Military Cooperation in Air Traffic Management" (Circ 330), is expected to be published during 2019.

The second part of the Dutch Safety Board recommendation: "Provide clear definitions of relevant terms" has been implemented with the publication of Doc 10084 in which a definition of conflict zones is provided. This document is guidance material and not a Standard.

2. *Recommendation to ICAO:*

Ask States dealing with an armed conflict for additional information if published aeronautical or other publications give cause to do so; offer assistance and consider issuing a State Letter if, in the opinion of ICAO, states do not sufficiently fulfil their responsibility for the safety of the airspace for civil aviation.

Developments relevant to the follow-up to the recommendation

ICAO has made no specific changes to the way it urges States dealing with an armed conflict to share information. In response to the recommendation ICAO states:

"Under the Convention on International Civil Aviation (Doc 7300), States maintain authority over their airspace. ICAO's role is to provide advice to States and circulate details of airspace restrictions, on request. Regarding potential hazards, ICAO may write to the State concerned and, if circumstances dictate, circulate information to all ICAO Member States for the safety of civil aircraft. These circumstances normally relate to ICAO receiving information that is not available to the community but is of such nature that it would affect the operators' assessment of the safety of flight operations. Therefore, ICAO would only be in a position to support States dealing with armed conflict as circumstances and the receipt of safety information dictate."

The second edition of Doc 10084 "Risk Assessment Manual for Civil Aircraft Operations Over or Near Conflict Zones" includes comprehensive guidance regarding the roles of all parties concerned, including best practices. With regards to the role of States specifically, paragraph 3.1 "The State that manages the airspace" provides comprehensive guidance on how States should manage their airspace in light of States' exclusive sovereignty of airspace over their territories.

Assessment of the follow-up to recommendation 2

- Not adequate

Explanation of the assessment

ICAO sees no proactive role for itself in urging States dealing with an armed conflict to share information, as envisaged in this recommendation. Starting point of ICAO is the sovereignty of States when it comes to the decision-making regarding their airspace. ICAO will provide advice or circulate information on airspace restrictions at the request of a State.

3. *Recommendation to ICAO:*

Update Standards and Recommended Practices related to the consequences of armed conflicts for civil aviation, and convert the relevant Recommended Practices into Standards as much as possible so that States will be able to take unambiguous measures if the safety of civil aviation may be at issue.

Developments relevant to the follow-up to the recommendation

ICAO states that it intends to comply with this recommendation through a package of inter-related amendments in the following Annexes and related guidance materials: Annex 6 (Operation of Aircraft, Part I International Commercial Air Transport - Aeroplanes), Annex 11, Annex 15, Annex 17, Doc 9554, Doc 9971, Doc 10088 and Doc 10084.

In relation to airspace management, the following developments are noted:

- Annex 11 – "Air Traffic Services": an amendment to Annex 11, paragraph 2.19 with proposed applicability date of 5 November 2020. Paragraph 2.18.2 of Annex 11 prescribes that coordination of activities potentially hazardous to civil aircraft shall be effected in accordance with 2.19. The proposed amendment to 2.19 would substantiate the need for a safety assessment, normally when advice is received that airspace may be affected in some manner. The amendment also facilitates technical expertise being made available during the evaluation of potential hazards to civil aircraft operations and their subsequent mitigation. Guidance will be developed, as necessary, and included in the amendment to the "Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations" (Doc 9554).

The elevation to Standards of existing Recommended Practices related to coordination of activities potentially hazardous to civil aircraft was not deemed necessary.

- Annex 15 – "Aeronautical Information Services": an amendment to Annex 15, paragraph 6.3.2 with proposed applicability date of 5 November 2020. The proposed amendment includes additional text within the list of operations when a NOTAM shall be originated, with regard to conflict zones including the nature or extent of threats related to conflict zones. Increased detail would support the assessment by operators of the risks associated with conflict zones.
- Annex 17 – "Security - Safeguarding International Civil Aviation against Acts of Unlawful Interference": Amendment 15 to Annex 17 (applicable as of 3 August 2017) reinforces the principle that each State should consider implementing processes and procedures to allow operational differentiation of screening and security controls based on clearly defined criteria and shall keep under constant review the level and nature of threat to civil aviation within its territory and airspace above it. Amendment 16 to Annex 17 (applicable as of 16 November 2018) requires States to establish and implement procedures to share, with its airport operators, aircraft operators, air traffic service providers or other entities concerned, in a practical and timely manner, relevant information to assist them to conduct effective security risk assessments relating to their operations.
- Amendment to Doc 9554, "Manual Concerning Safety Measures Relating to Military Activities Potentially Hazardous to Civil Aircraft Operations", is being progressed within the Secretariat with broader coordination expected subsequently. This amendment will be published coincident with, and potentially support, the amendments to Annexes 11 and 15.
- Doc 9971, "Manual on Collaborative Air Traffic Flow Management" (third edition) was published in 2018. While this guidance is focused on Air Traffic Flow Management and Collaborative Decision Making, ICAO states that there is sufficient reference to non-routine traffic restrictions and disruptions.
- Doc 10088 is an update to "Civil/Military Cooperation in Air Traffic Management" (Circ 330) and expected to be published during 2019.
- Doc 10084, "Risk Assessment Manual for Civil Aircraft Operations over or near Conflict Zones", contains guidance material and refers to the amendments of the aforementioned Annexes.

ICAO indicated in 2015 that it will examine whether Recommended Practices with respect to the consequences of armed conflicts for civil aviation should be upgraded to Standards. It is not known to the Dutch Safety Board what the result is, with the exception of the Recommended Practices from Annex 11 for which it is indicated that this is not deemed necessary. The further proposed and implemented adjustments to the ICAO documents do not indicate that Recommended Practices have been converted into Standards.

Assessment of the follow-up to recommendation 3

- Partially adequate

Explanation of the assessment

Part of the recommendation was followed up by ICAO with amendments to the Standards in Annex 17 and proposed (but not yet effective) amendments in Annexes 11 and 15. ICAO also refers to other modifications of ICAO documents. For Doc 9554 and Doc 10088 it is not clear how this gives substance to the recommendation, as the exact proposed changes are not known to the Dutch Safety Board. The proposed and implemented adjustments to the ICAO documents do not indicate that Recommended Practices have been converted into Standards. The Dutch Safety Board concludes that the ICAO SARPs currently do not fully guarantee that States take unambiguous measures if the safety of civil aviation is at stake.

4. *Recommendation to ICAO Member States:*

Ensure that States' responsibilities related to the safety of their airspace are stricter defined in the Chicago Convention and the underlying Standards and Recommended Practices, so that it is clear in which cases the airspace should be closed.

Developments relevant to the follow-up to the recommendation

It should be noted that the Dutch Safety Board did not send this recommendation actively to all ICAO Member States and, as a consequence, did not receive responses from the individual States.

The Dutch government has taken the initiative to follow-up this recommendation on the amendment of the Chicago Convention. They sought support from other European States (EU and ECAC Member States) and from the countries involved in the MH17 investigation. In 2015 the Netherlands presented the recommendations from the MH17 crash investigation to the Legal Committee of ICAO through a working paper. Furthermore, the ICAO Legal Committee (ICAO's Special Group to review the application of ICAO treaties) was approached and this committee concluded that it was not necessary to amend the Chicago Convention and to leave it to the ICAO Council whether the work programme should be adapted. The Assembly stated that an adjustment of the Chicago Convention would be premature, but could be considered at a later stage if stricter definitions of Member States' responsibilities related to mandatory closure of their airspace (related to the safety of that airspace) in SARPs will prove to be insufficient.

Assessment of the follow-up to recommendation 4

- Not adequate

Explanation of the assessment

ICAO has made, and intends to make, adjustments to Annexes and guidelines (see the developments described in the context of the follow-up to Recommendations 1 and 3). These adjustments do not include a stricter definition of the States' responsibilities related to the safety of their airspace in order to make clear in which cases the airspace should be closed. Thus far, the Chicago Convention has also not been amended in order to more strictly define the responsibilities of States regarding the safety of their airspace so that it is clear in which cases the airspace should be closed. The Dutch government has taken the initiative to table possible amendments to the Chicago Convention on this subject. Ultimately, it has been achieved that the need to amend the Chicago Convention will be reviewed after ICAO has adjusted the underlying Annexes and guidelines. In view of the planned timeframe for these adjustments (i.e. not earlier than 2020), a decision regarding amendments to the Chicago Convention is expected to take a long time.

5. *Recommendation to ICAO and IATA:*

Encourage States and operators who have relevant information about threats within a foreign airspace to make this available in a timely manner to others who have an interest in it in connection with aviation safety. Ensure that the relevant paragraphs in the ICAO Annexes concerned are extended and made more strict.

Developments relevant to the follow-up to the recommendation

Developments at ICAO
ICAO states that it recognizes the critical importance of effective threat and risk information sharing between Member States, including information on the safety of airspace over conflict zones. Specifically with regard to airspace over the territory of a Member State, Article 1 of the Chicago Convention provides that each State has complete and exclusive sovereignty over the airspace above its territory.

ICAO informed the Dutch Safety Board that in relation to this recommendation Annex 17 (Security) already contains a requirement for each State to establish and implement procedures to share threat information that applies to the aviation security interests of those States to the extent practicable. The scope of this Standard is not limited to information concerning threats within a State's national borders.

Amendment 16 to Annex 17 (applicable as of 16 November 2018) introduces a new requirement for a contracting State to establish and implement procedures to share, as appropriate, with its airport operators, aircraft operators, air traffic service providers or other entities concerned, in a practical and timely manner, relevant information to assist them to conduct effective security risk assessments relating to their operations. Discussions are ongoing to see if this requirement can be further amended to include information sharing with all relevant operators (foreseen next Amendment).

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Furthermore Doc 10084 "Risk Assessment Manual for Civil Aircraft Operations Over or Near Conflict Zones" contains guidance regarding the roles of all parties concerned and activities and best practices related to the collection and sharing of information.

Developments at IATA
According to IATA, airlines rely on governments to provide threat information. In 2016, IATA introduced a new web-based Security Forum platform for all its members. In addition, IATA has identified two new strategic partners specialized in information sharing in order for all IATA members to be able to access multiple information sharing sources if they decide to.

IATA has developed a new SeMS Manual (1st Edition in 2017) and states that, as part of the Risk Management process, an extensive internal and external security network should be established and maintained to share information and recommended practices. The IOSA Standards Manual does not contain standards on information sharing by airlines.

IATA does share EASA Conflict Zone Information Bulletins (CZIB) with its members.

Assessment of the follow-up to recommendation 5

- Partially adequate

Explanation of the assessment

The applicable standards in ICAO Annex 17 focus on information sharing between Contracting States and on information provision from States to operators (as State of Operator). The sharing of information by a State with other airlines than its own is currently not addressed. The foreseen amendment to expand the requirement to *relevant* operators allows for broader sharing of information.

The sharing of information between airlines is not specifically addressed in SARPs.

Guidance material from ICAO and IATA refers to setting up informal networks and internal and external security networks for gathering information. No specific platforms or networks for information sharing have been set up by ICAO or IATA (the ICAO Conflict Zone Information Repository (CZIR) has been discontinued).

6. *Recommendation to ICAO:*

Amend relevant Standards so that risk assessments shall also cover threats to civil aviation in the airspace at cruising level, especially when overflying conflict zones. Risk increasing and uncertain factors need to be included in these risk assessments in accordance with the proposals made by the ICAO Working Group on Threat and Risk.

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Developments relevant to the follow-up to the recommendation

ICAO has taken the following steps:
Annex 6 addresses the responsibility of operators for the safe execution of flights. A new provision 4.1.2 will be inserted in Annex 6 on 5 November 2020, which stipulates that the operator will not carry out the flight if it has not been established that the airspace can, by every reasonable means available, be safely used for the entire flight route, including alternate aerodromes. For a flight over or near a conflict area, the airline conducts a risk assessment of the airspace before the start of the flight and if necessary takes measures for a safe flight operation. This includes assessment of relevant information only available after take-off.

Concerning Annex 11, the amendment being progressed with the proposed applicability date of 5 November 2020 includes new provisions 2.19.3 and 2.19.3.1 (reproduced below), which are intended to substantiate the need for a safety assessment for activities potentially hazardous to civil aircraft, and also facilitate technical expertise being made available during the evaluation of potential hazards to civil aircraft operations

> *2.19.3 The appropriate ATS authority shall ensure that a safety risk assessment is conducted, as soon as practicable, for activities potentially hazardous to civil aircraft and that appropriate risk mitigation measures are implemented.*
>
> *2.19.3.1 States shall establish procedures to enable the organization or unit conducting or identifying activities potentially hazardous to civil aircraft to contribute to the safety risk assessment in order to facilitate consideration of all relevant safety-significant factors.*

Standard 3.1.3 of Annex 17 was amended (applicable as of 3 August 2017) to ensure that risk assessments cover threats in the airspace at cruising levels, as follows: "Each Contracting State shall keep under constant review the level and nature of threat to civil aviation within its territory and airspace above it and establish and implement policies and procedures to adjust relevant elements of its national civil aviation security programme accordingly, based upon a security risk assessment carried out by the relevant national authorities."

Doc 10084 contains guidance material for the risk assessment processes that should lead to decision-making for safe flight operations. In this context, the manual draws attention to the importance of applying qualitative assessment methods in addition to quantitative methods.

Assessment of the follow-up to recommendation 6

- Partially adequate

Explanation of the assessment

The amendments to the Annexes 6, 11 and 17 address the intent of the safety recommendation. Annex 6 makes it explicit that operators need to conduct a risk assessment when overflying conflict zones. The other Annexes furthermore require that States and/or Air Traffic Services authorities have to keep the level and nature of threat to civil aviation within their territory and airspace above it under constant review, conduct their own risk assessment and implement appropriate risk mitigation measures. The amendment to Annex 17 is applicable as of Augustus 2017. The proposed amendments to Annex 6 and Annex 11 are foreseen to be applicable from 5 November 2020 and are therefore not effective yet.

Further details on the risk assessment process are provided in Doc 10084. As this is guidance material, this is a tool to support the implementation of the (proposed) standards, but it is not mandatory.

7. *Recommendation to IATA:*

Ensure that the Standards regarding risk assessment are also reflected in the IATA Operational Safety Audits (IOSA).

Developments relevant to the follow-up to the recommendation

IATA has taken the following steps:
As of September 2016, IATA mandated all the safety management provisions on SMS, which include the 4 major components and the 12 elements that make up the basic structure which are aligned with the ICAO Annex 19 and Doc 9859 - Safety Management Manual (SMM), for all IOSA registered operators.

Guidance materials relating to IOSA Standard DSP1.12.2 and FLT1.12.2 were amended to include armed conflicts as a possible risk to be assessed.

Guidance material relating to IOSA Standard SEC4.1.1 was amended to include usual flight routes in threat management.

In 2017, IATA published a SeMS manual to provide further guidance on SeMS implementation. This document includes a case study on flying over conflict zones.

Assessment of the follow-up to recommendation 7

- Adequate

Explanation of the assessment

Since recommendation 6 has not (yet) been implemented, IATA cannot follow up on recommendation 7. IATA's activities, however, are in line with the recommendation.

In the area of Safety Risk Management, "Operations in airspace affected by armed conflict" is specifically mentioned as a hazard in the guidance material. For the Security Management System, threat assessment is more generally discussed, but a reference is made to threat assessment for usual flight routes.

8. *Recommendation to States (State of the Operator):*

Ensure that operators are required through national regulations to make risk assessments of overflying conflict zones. Risk increasing and uncertain factors need to be included in these assessments in accordance with the proposals made by the ICAO Working Group on Threat and Risk.

Developments relevant to the follow-up to the recommendation

Results from the survey indicate that States have not amended national regulations regarding the conduct of risk assessments by operators for overflying conflict zones. Several States remarked that the conduct of risk assessments is already covered by the fundamentals of a safety management system (or management system in EU-regulation).

Assessment of the follow-up to recommendation 8

- Partially adequate

Explanation of the assessment

As ICAO Member States are in principle required to incorporate ICAO standards into national legislation, it is not uncommon for States to await the ICAO Standards before changing national legislation.

9. *Recommendation to ICAO and IATA:*

In addition to actions already taken, such as the website (ICAO Conflict Zone Information Repository) with notifications about conflict zones, a platform for exchanging experiences and good practices regarding assessing the risks related to the overflying of conflict zones is to be initiated.

Developments relevant to the follow-up to the recommendation

Developments at ICAO
ICAO has taken the following steps:

- In February 2017 it was noted that the ICAO Conflict Zone Information Repository (CZIR) had ceased to function as a means to gather and disseminate specific risk-based information concerning operations over or near conflict zones. As a consequence, ICAO discontinued the CZIR and provisionally approved its transition into a library of links on the ICAO public website, containing links to States' own aeronautical information related to risks to civil aircraft operations over or near conflict zones. In November 2017 ICAO noted developments in the aviation sector which led to the information that had been provided on the ICAO web-library of risk-based information now being provided by other international organizations in real-time. In light of these developments and noting the limited number of links posted on the web-library, ICAO decided to discontinue the ICAO web-library of risk-based information and to devote increasing efforts to provide training and capacity-building initiatives in order to assist States to further develop their risk management capabilities, as well as multilateral arrangements for the sharing of risk information.
- The "Risk Assessment Manual for Civil Aircraft Operations Over or Near Conflict Zones" (Doc 10084) contains consolidated guidance to support the implementation of relevant ICAO Standards and Recommended Practices (SARPs).

Developments at IATA
IATA has developed a new SeMS manual (1st Edition from October 2017). This manual contains some examples and good practices, including a specific example on conflict zone risk assessments.

IATA has launched a new Security Forum platform. IATA has identified two new strategic partners specialized in information sharing in order for all IATA members to access multiple information sharing sources.

Assessment of the follow-up to recommendation 9

- Partially adequate

Explanation of the assessment

Regarding ICAO
In its response to Recommendation 9, ICAO refers to the Conflict Zone Information Repository and the reasons for closing down its activity. However, the recommendation asked ICAO to organize a platform for exchanging experiences and good practices. Although the propagation of Doc 10084 by ICAO will be an opportunity for highlighting good practices regarding the conduct of risk assessments for conflict zones, it cannot be regarded as the recommended platform.

Regarding IATA
IATA has initiated a Security Forum platform, still under development. At the time of publication of this report there are no indications that this platform is being used to exchange experiences and good practices regarding risk assessments for conflict zones.

10. *Recommendation to IATA:*

Ensure that IATA member airlines agree on how to publish clear information to potential passengers about flight routes over conflict zones and on making operators accountable for that information.

Developments relevant to the follow-up to the recommendation

IATA replied in 2015 to this safety recommendation. IATA is of the opinion that the IOSA Registry is available in the public domain and that this provides a mechanism for the public to see that airlines around the world use systems and processes to mitigate the multiple risks associated with flight operations. This, in conjunction with airlines' individual reporting obligations and State-sponsored travel warning mechanisms, should provide travellers with the opportunity to make informed decisions on their travel plans and can provide sufficient accountability to the public in relation to the selection of flight routes.

Therefore, IATA has not taken additional steps with regard to this recommendation.

Assessment of the follow-up to recommendation 10

- Not adequate

Explanation of the assessment

IATA has not taken initiatives to try to harmonize the information that airlines make available publicly about flight routes over conflict zones. The Dutch Safety Board is of the opinion that merely making a reference to the IOSA registry is not sufficient, as to the public it is not transparent how risk assessments for conflict zones are being dealt with through IOSA.

11. *Recommendation to operators:*

Provide public accountability for flight routes chosen, at least once a year.

Developments relevant to the follow-up to the recommendation

This safety recommendation has not been actively distributed by the Dutch Safety Board to all civil air operators and therefore no reply was received from airlines. During the follow-up investigation, a survey was distributed to a selection of operators.

The results of the survey indicate that most airlines that replied to the survey do not publish information to the public and passengers.

Several Dutch airlines provide general information about how they choose flight routes, without going into details of the process of risk assessments for flying over or near conflict zones, the decisions made or restrictions applied.

Assessment of the follow-up to recommendation 11

- Not adequate

Explanation of the assessment

Airlines indicate that they do not provide public accountability for flight routes over or near conflict zones. The Dutch Safety Board is aware that publishing details of choices for individual flight routes is a complicated matter, due to aspects such as the sensitivity of information and the complexity of the considerations. Nevertheless, the fact remains that airlines could look for a way to provide accountability regarding the choices made, such as explaining the reasons for avoiding certain areas. The examples of Dutch airlines also illustrate that it is possible to do more than the efforts made by most airlines at this time.

APPENDIX E

OVERVIEW OF COUNTRIES WITH ONGOING ARMED CONFLICTS

For the overview use has been made of Conflict Zone Information Bulletins published by EASA and information on the website safeairspace.net. The information was gathered on 4 September 2018.

The overview is available on our website safetyboard.nl.

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IFALPA
The Global Voice of Pilots

Professional & Government Affairs
Briefing Leaflet

19PGABL01 3 April 2019

Remote Pilots

This BL addresses the Federation's initial thoughts on the growing industrial and representational demands of pilots in one of the fastest emerging and technologically advanced forms of aviation: Remotely Piloted Aircraft Systems (RPAS). Remotely Piloted Aircraft (RPA) and their impact in all areas of aviation are potentially enormous.

A Remote Pilot is *a person charged by the operator with duties essential to the operation of a remotely piloted aircraft and who manipulates the flight controls, as appropriate, during flight time.*

The ICAO RPAS Manual (2015) opens with the following description of its scope:

> *RPAS are envisioned to be an equal partner in the civil aviation system, able to interact with air traffic control (ATC) and other aircraft on a real-time basis. The scope of ICAO provisions in the next 5 to 10 years is to facilitate integration of RPAS operating in accordance with instrument flight rules (IFR) in controlled airspace and at controlled aerodromes.*

The consideration of potential membership or inclusion of Remote Pilots (RPs) in IFALPA is based on the fact that pilots are better off if they cooperate, rather than splitting into smaller groups. RPs are likely to become a key element of the piloting workforce of the future. Fragmentation should be avoided by appropriately expanding, rather than limiting, membership.

In July 2018, ICAO published an updated version of Annex 1 Personnel Licensing, which incorporated a dedicated remote pilot license (RPL) to support international flights operating under instrument flight rules. While this was a much-anticipated step forward in the development of a global framework for RPs, it will necessarily be some time before significant numbers of States implement the relevant Standards.

Some key definitions are:

- **Remote pilot.** A person charged by the operator with duties essential to the operation of a remotely piloted aircraft and who manipulates the flight controls, as appropriate, during flight time.

- **Remote pilot-in-command.** The remote pilot designated by the operator as being in command and charged with the safe conduct of a flight.

- **Remote co-pilot.** A licensed remote pilot serving in any piloting capacity other than as remote pilot-in-command but excluding a remote pilot who is in the remote pilot station for the sole purpose of receiving flight instruction.

- **Remote flight crew member.** A licensed flight crew member charged with duties essential to the operation of a remotely piloted aircraft system during a flight duty period.

- **Remote pilot station (RPS).** The component of the remotely piloted aircraft system containing the equipment used to pilot the remotely piloted aircraft.

"Traditional" pilots and RPs share many issues. Fatigue management is an essential issue for RPs, so policies and procedures for flight and duty time, operation shift schedules, and crew rest periods should be based on scientific principles for shifts and crew scheduling schemes.

Professional, commercial, and other related RPs (as defined by ICAO), should abide by the same standards of airmanship and professionalism as manned aviation pilots. IFALPA should continue to have a defining and leading role in curating the best practices internationally for dissemination among, and education for, all MAs and their members.

A potential way to foster engagement between "traditional pilots of manned aircraft" and professional RPs, could be to offer them membership in Member Associations. By bringing RPs into an MA, it is more likely that a cohesive aviation-centric piloting profession will expand in scope which serves to:

- Maximize the interests of MA members;

- Add another potentially powerful stakeholder to the process of coordinating significant actions (e.g. regulatory, administrative);

- Prevent other stakeholders (e.g. manufacturers, airlines) from pitting air line pilots against RPs and RPAS-operators;

- Give MAs a genuine insight into RPAS developments;

- Ensure that if RPs are Members it gives MAs technical and safety arguments on RPAS additional credibility;
- Assist and encourage RPs/RPAS-operators to attain and maintain the highest technical and professional standards (advancing the mission of IFALPA).

It is only by organizing/representing RPs that we can influence their terms and conditions of employment. It would be reasonable to bring RP wages up towards traditional airline pilots' wages as that sector develops.

IFALPA believes that all RPAS/UAS should be integrated into common airspace. However, this goal cannot be realized without consideration of existing users, which, in civil air transport, primarily includes the broad membership of IFALPA's MAs.

While the working conditions and career pathways of RPs may be very different than that of traditional

manned aviation, the need to have working conditions preserve mental and physical wellbeing, allow RPs to fully serve in their role as pilot in command of an aircraft, and protect themselves and the public should an emergency arise, are no different than that of manned aircraft pilots. RP working conditions must be at the same level as those of traditional manned aircraft. Any attempt to reduce or degrade their working environment would ultimately erode safety within the entire aviation system.

IFALPA encourages MAs to admit RPs to their membership in a manner consistent with their own understanding of their jurisdictions' needs and outlook on the RPAS industry, allowing for the varying ways MAs structure themselves.

IFALPA's Safety and Technical positions on how to properly integrate RPAS operations into that of manned aircraft can also be found in 17POS08 Unmanned Aircraft Systems, and 18POS21 UAS Security.

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IFALPA
The Global Voice of Pilots

Position

19POS01

7 March 2019

Non-Routine Operations

BACKGROUND

The air transport industry faces a constant pressure to operate flights on time and in a safe and efficient manner. Under normal operations, pilots are trained to fly according to Standard Operating Procedures (SOPs). Most Aviation Authorities only stipulate that a flight needs to be conducted "in a safe manner under specifically prescribed rules and regulations". It is then the responsibility of the Operators, and in turn the pilots, to ensure that these rules and regulations are followed in every phase of flight. Many flights, however, are conducted outside the scope of normal operations. Such examples include, but are not limited to:

- Ferry flights with known technical defects
- Post maintenance flights
- Trial flights for procedures yet to be approved by Authorities
- Trial flights for new equipment

LACK OF TRAINING

Some Operators use a dedicated set of very experienced pilots to perform non-routine operations such as Type Inspection Authorisation (TIA) and Functional Check Flights (FCF). Many Operators, however, do not use these specifically trained pilots, and allow regular line pilots on these operations, provided the aircraft meets the relevant airworthiness requirements. Similarly, trial flights designed to test new airborne technology and check for bugs or operational constraints are often carried out on routine commercial flights by ordinary line pilots with little or no specific training.

POSITION

In order to mitigate the possible safety risks generated by non-routine operations, IFALPA believes that the following actions should be implemented:

- Only experienced crews should be assigned to flight operations expected to – or likely to – exceed normal parameters;
- Crews should always be notified of the exact state of the aircraft and any defects (or recurring defects) they may encounter for a period of time post maintenance;
- Specific training standards should be implemented so that pilots obtain the necessary experience in environments that would be considered 'non-normal' or 'non-routine. This could be achieved by simulator sessions, observation flights, and/or crew pairing with pilots familiar with these operations;
- Dedicated, thorough pre-flight briefing should be carried out for flights involved in such operations. Guidance material should be available.
- Operators should identify hazards and assess all risks related to non-normal operations, considering the pilot's ability to conduct these operations without specific experience or familiarity with the particular flying environment and the presence of passengers onboard.
- The impact of non-routine operations on pilot workload, task sharing, and possibly stress and fatigue should not be underestimated.

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Position

19POS03 07 March 2019

LOC-I and Aircraft Trim Systems

BACKGROUND

Loss of Control In-flight (LOC-I) are accidents or incidents in which the control of the aircraft in flight is lost, resulting in major deviations from the intended flight path. In the last decade 2004-2014, LOC-I airplane accidents have overtaken CFIT, Controlled Flight into Terrain-related ones as the first contributor to fatalities in commercial aviation.[1]

PRELIMINARY ANALYSIS

Trim system

Historically, an aircraft trim system was needed to reduce control loads on the three axes: pitch, roll, and yaw. With the development of flight control systems as well as Fly-By-Wire (FBW) designs, pilots are now fully assisted in trimming the aircraft throughout the entire flight envelope. Therefore, depending on aircraft type, trim can be partially or completely transparent to flight crews.

Loss of Control related to trim system

Recent occurrences involving trim issues have happened in all phases of flight. The out-of-trim conditions resulted principally from:

- Unsafe automatic trimming due to previous system failures (trim runaway, auto trim beyond normal limits up to mechanical or electrical stops, trim failure or trim degraded modes).
- Normal automatic trimming for a specific phase of flight immediately followed by large aerodynamics and thrust modification. Under-speed high-nose-up trimmed approach followed by a go around maneuver is a typical example and there is currently rulemaking activity happening on this specific subject.[2] [3]
- Improper manual trim (switch confusion, spatial disorientation).

In most cases, and regardless of the initial scenario, the maximum out-of-trim condition happened quickly (less than one minute) and was reached before, or at the very beginning of, the overall event. It was often not recognized as such by crews. Typical subsequent warnings included auto-pilot disconnection alarms (manual or consequently to failures), stick shaker and/or bank angle warnings with or without flight law reconfiguration and protections activation.

Most of the time, crews have only indirect cues and are not fully aware of the trim setting. In other words, they don't know the position of some of the main flight control surfaces in terms of authority (i.e. rudder or trimmable horizontal stabilizer). There have been numerous accidents and incidents in recent years where flight crews did not even try to operate trim switches at all. If they did so, it was only after 1 or 2 minutes.

1 IATA, 2016, "2010-2014 LOC-I Accident Analysis Report", 1st edition
2 EASA, 2017, "Rulemaking Program, RMP EPAS, 2017-2021
3 EASA, 2015, "RMT.0647 Loss of control or loss of flight path during go-around"

Moreover, some occurrence reports have considered an out-of-trim condition as the initial failure rather than a contributing factor. There is often a lack of full data on trim position (on the three axes), and stress is preferentially put on the controls and thrust inputs and not on trim dynamics.

POSITION

Prevention objectives

In order to mitigate such trim-related risks, IFALPA recommends the following actions:

- To provide flight crews with tools allowing them to detect and recognize immediately dangerous out-of-trim conditions as well as trim degraded mode operation or failures.
- To enhance and maintain pilot proficiency and skills to deal with full or partial out-of-trim conditions.
- To enhance knowledge and awareness of this type of accident by systematically including and analysing trim data as part of the occurrence reporting process.

Display of trim information, alerts, warnings

While the display of trim information and/or associated alerts can be designed in various ways, any detected or predicted abnormal trim conditions should trigger, in a timely manner, clear visual/aural alerts or warnings with as much information as relevant to understand the situation.

Since the trim system can be faulty by itself (i.e. trim overrun) or in degraded mode (i.e. icing), the monitoring should be as simple as possible and could rely, for example, on direct surface sensing. Priority of alerts and warning should be considered, since most trim upsets lead to multiple alarms conditions. Particular attention should be paid to the avoidance of false positive alarms.

Additionally, IFALPA would welcome the introduction of any display designed to help pilots recognize an impeding excursion outside the flight envelope as an additional tool to avoid out-of-trim conditions.

Out-of-Trim detection and recovery training[4]

Even if trimming is now simplified in modern FBW aircraft, trim-related training is important during initial and operational and recurrent training. The following elements should be included in the training:

- Manual flying skills, in non-normal flight laws when manual trimming is required. This should include all three axes.
- Stalls or Upset recovery from partial or full out-of-trim conditions on different axis. (i.e. “trimmed stalls”) in order to mitigate the startle effect. Training should include increased awareness of the possibility of out-of-trim condition upon autopilot disconnection.
- Review of normal, abnormal, and emergency manoeuvres or conditions where trim may be required as per SOP.
- Flight controls characteristics, specificity of the trim system design, elevators or ailerons authority limitations (if they exist) and thrust pitch moment management.

4 ICAO, 2014, “Doc 10011 - Manual on Aeroplane Upset Prevention and Recovery Training”

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IFALPA
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Position

19POS02 7 March 2019

Fire Protection of Cargo Compartments

Please note: This paper supersedes 16POS02 - Fire Protection of Cargo Compartments

BACKGROUND

On 11 May 1996, a McDonnell Douglas DC-9 operated by ValuJet Airlines, Inc. as Flight 592 crashed into the Everglades approximately ten minutes after take-off from Miami International Airport. The accident occurred as Flight 592 was attempting to return to Miami and was the result of an uncontrolled fire in the aeroplane's forward Class D cargo compartment.

At the time of the ValuJet accident, five cargo compartment classifications were available in the United States: Classes A, B, C, D, and E. Lower lobe cargo compartments on large passenger aeroplanes, which would be inaccessible in flight and used mostly for passenger baggage, could be Class C or Class D compartments. As mentioned above, the ValuJet fire occurred in a Class D compartment.

The fire protection approaches for Classes C and D differ. Class C relies on active fire control through fire detection and suppression systems, whereas Class D relied on passive control through oxygen starvation. Class C requirements are essentially unchanged since the accident. Following the accident, the U.S. Federal Aviation Administration (FAA) modified their certification rules to remove the Class D classification. In addition, operators of aeroplanes with Class D compartments were required under operational Regulations to upgrade these compartments to the Class C Standard.

Class C fire protection relies on detecting the fire early and suppressing it for the duration of the flight. The fire suppression system releases an extinguishing agent like Halon into the compartment at a concentration level that inhibits combustion. The fire-resistant liner helps prevent leakage of the extinguishing agent so that an effective concentration can be maintained and protects adjacent structure and systems. Ventilation to the compartment following fire detection is also limited to maintain extinguishing agent concentrations.

Class D fire protection relied on passive oxygen starvation, i.e., the compartment being small and sealed enough so that a fire would quickly expend available oxygen and extinguish or remain so small that it would not threaten the aeroplane. This was accomplished by limiting the size of and ventilation to the compartment. Class D compartments did not require fire detection or suppression systems, so fires occurring therein were expected to stay at a non-threatening level for the duration of the flight. As part of the lessons learned after the ValuJet accident, the FAA removed the Class D cargo compartment classification.

Class E fire protection relies on oxygen starvation by aircraft depressurization. Class E compartments are main deck compartments on all-cargo aircraft. There are cargo compartment liner requirements, but they are not as rigorous as Class C requirements, except where protection of critical structure and systems is concerned. Where not protecting non-critical aircraft systems and structure, there is often no separate cargo liner installed since the existing insulation or wall material can satisfy existing liner requirements.

Tests by the FAA have shown that the suppression can be adequate as long as the aircraft maintains sufficiently high cabin altitude (approximately FL 180), but significant hazards present themselves during descent for landing. This is primarily due to the build-up of flammable gasses and vapours in the oxygen poor environment at high altitude, but when the oxygen concentration increases during descent, the fuel air mixture can cause flashover, resulting in the likely loss of the aircraft.

Class F compartments were originally envisioned to replace Class B compartments but are now considered by some to enhance fire protection when used in Class C, D, or E compartments. For example, if a shipment is deemed unsuitable for a Class E compartment due to flammability, a special Class F compartment might be deemed appropriate for transport if located inside a Class E compartment due to special fire containment capabilities of the Class F compartment. Some examples are fire containment covers, fire resistant containers, and main deck (Class E) fire suppression systems.

ICAO PROVISIONS

ICAO Annex 8 does not define or specify Classes of cargo compartments, but does specify (Part IIIB, para. 4.2 g) that each *cargo compartment not accessible to a crew member should be equipped with a built-in fire detection system and a built-in fire suppression system*. But the Annex does not include two other components found in Class C compartments: means to exclude hazardous quantities of smoke, flames, or extinguishing agent from any occupied compartment, and means to control ventilation.

Most importantly, the above Standard is included in Part IIIB of the Annex which only applies to *aeroplanes over 5 700 kg for which application for certification was submitted on or after 2 March 2004*. Consequently, there are aeroplanes currently in commercial air transport that have Class D cargo compartments. These aeroplanes do not have an equivalent level of safety as aeroplanes with Class C cargo compartments.

POSITION

IFALPA believes the following cargo compartment fire protection requirements should be applied to all aircraft engaged in commercial air transport:

1. Each cargo compartment should have an approved means of fire suppression so that any fire remains suppressed for enough time for the crew to land safely at a suitable aerodrome.

2. There should be a separate, approved smoke detector or fire detector system for each cargo compartment that provides a warning at the pilot station in time for the crew to land safely at a suitable aerodrome.

3. Requirements for Class E compartment cargo liners should provide equivalent protection to those of a Class C compartment.

4. Current Class D cargo compartments should be upgraded to at least a Class C standard.

5. All cargo compartments, regardless of size, should be lined with insulating material capable of containing the maximum fire intensity associated with the cargo being carried during all operating conditions.

6. Class F compartments should be tested to demonstrate the capability of suppressing any fire likely to occur given the type of cargo to be transported in the compartments.

7. Each cargo compartment should have a means to prevent hazardous quantities of smoke, flames, or suppressing agent, from entering any compartment occupied by the crew or passengers.

8. Each cargo compartment should have a means to control ventilation and drafts within the compartment so that the suppressing agent used can control any fire that may start within the compartment.

9. When cargo is placed within a Unit Load Device (ULD) in a cargo compartment, there should be a means to detect a fire within the ULD. Extinguishing systems should be designed to extinguish a fire within a ULD before it spreads to other cargo.

10. There should be a means for the flight crew to monitor the affected compartment's condition following activation of the fire extinguishing system.

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