MH17 About the investigation
The Hague, October 2015

The reports issued by the Dutch Safety Board are open to the public. All reports are available on the Safety Board’s website www.safetyboard.nl.

Source photo cover: Dutch Safety Board
The aim in the Netherlands is to limit the risk of accidents and incidents as much as possible. If accidents or near accidents nevertheless occur, a thorough investigation into the causes, irrespective of who are to blame, may help to prevent similar problems from occurring in the future. It is important to ensure that the investigation is carried out independently from the parties involved. This is why the Dutch Safety Board itself selects the issues it wishes to investigate, mindful of citizens’ position of dependence with respect to authorities and businesses. In some cases the Dutch Safety Board is required by law to conduct an investigation.

Dutch Safety Board

Chairman: T.H.J. Joustra
E.R. Muller
M.B.A. van Asselt

Associate members of the Board: B.J.A.M. Welten
A.P.J.M. Rutten

General Secretary: M. Visser

Visiting address: Anna van Saksenlaan 50
2593 HT The Hague
The Netherlands

Postal address: PO Box 95404
2509 CK The Hague
The Netherlands

Telephone: +31 (0)70 333 7000
Fax: +31 (0)70 333 7077

Website: www.safetyboard.nl

NB: This report is published in the English and Dutch languages. If there is a difference in interpretation between the English and Dutch versions, the English text will prevail.
CONTENTS

Foreword ............................................................................................................................................... 6

List of Abbreviations .......................................................................................................................... 8

1 The Dutch Safety Board’s Working Method .................................................................................. 10
   1.1 Why this report about the investigation? .................................................................................. 10
   1.2 Which subjects did the investigation look into? .................................................................... 11
   1.3 Legal framework ..................................................................................................................... 12
   1.4 Conducting the investigation ................................................................................................. 17

2 Preliminary Report .......................................................................................................................... 28
   2.1 Introduction ............................................................................................................................ 28
   2.2 Provisions of Annex 13 ........................................................................................................ 28
   2.3 Publication of the preliminary report .................................................................................... 28
   2.4 Erratum .................................................................................................................................. 29

3 Crash: Causes .................................................................................................................................. 30
   3.1 Design of the investigation ..................................................................................................... 30
   3.2 Data collection ....................................................................................................................... 30
   3.3 Analysis and assessment ....................................................................................................... 32

4 Crash: Flight Route ......................................................................................................................... 38
   4.1 Design of the investigation ..................................................................................................... 38
   4.2 Data collection ....................................................................................................................... 39
   4.3 Analysis and assessment ....................................................................................................... 42

5 Crash: The Occupants ..................................................................................................................... 44
   5.1 Design of the investigation ..................................................................................................... 44
   5.2 Data collection ....................................................................................................................... 45
   5.3 Analysis and assessment ....................................................................................................... 46

6 Passenger Information ..................................................................................................................... 48
   6.1 Design of the investigation ..................................................................................................... 48
   6.2 Data collection ....................................................................................................................... 49
   6.3 Analysis and assessment ....................................................................................................... 51

7 Exceptional Circumstances ............................................................................................................. 52
   7.1 Visiting the wreckage area and recovery of the wreckage ..................................................... 52
   7.2 Reconstruction of the aeroplane ............................................................................................. 58
   7.3 International data collection .................................................................................................. 59
   7.4 Concurrence with the criminal investigation ....................................................................... 63
   7.5 Classified information ........................................................................................................... 65
Statement by the Board .............................................................................................................. 68

APPENDICES .......................................................................................................................... 69

Appendix A. Project team ........................................................................................................... 70
Appendix B. Notification to the Dutch Safety Board ................................................................. 71
Appendix C. Memorandum of Understanding Ukraine-the Netherlands with regard to the delegation of the investigation .............................................................. 72
Appendix D. Agreement NBAAI - Dutch Safety Board with regard to the delegation of the investigation .................................................................................................. 74
Appendix E. Confirmation of participation in the investigation by Australia........................................ 78
Appendix F. Invitation to the Russian Federation to participate in the investigation ................. 79
Appendix G. Agreements about the recovery of the wreckage .................................................... 80
Appendix H. Request with regard to recovery of the wreckage .................................................. 82
Appendix I. Priority list of wreckage pieces ............................................................................... 83
Appendix J. Request with regard to the removal of the remaining pieces of wreckage ............... 91
Appendix K. Analysis techniques used ....................................................................................... 93
Appendix L. Response to the comments of the Russian Federation .......................................... 94
Aviation disasters shock the world. In today’s society an incredible amount of information regarding the circumstances, the possible causes and who could be responsible is shared immediately after a crash. This instantly reveals the extent and the impact of the crash to the world, but brings uncertainties with it as well. A thorough investigation determines exactly the causes of a crash, presents the facts and removes the distress of speculations. This can contribute to aviation safety and also provides clarity to the relatives of the victims.

The Dutch Safety Board is appointed by law to investigate aviation accidents. Because of the large number of victims with Dutch nationality, the Dutch Safety Board was ready to contribute to the investigation into the crash of flight MH17. Therefore, when Ukraine requested that the Netherlands take over the investigation into the causes of the crash, the answer could only be positive.

Right from the start, the investigation applied four principles: maintaining independence; aiming for high quality; focusing on determining the causes as accurately as possible in order to exclude other scenarios; aiming to achieve as much international acknowledgment as possible for the investigation.

The investigation was carried out under exceptional circumstances. The Dutch Safety Board was not blind to the geopolitical implications of the crash but in the investigation deliberately kept its distance from international politics. The facts were leading in the investigation and the views of parties were evaluated against those facts, a proven protocol that is used worldwide for aircraft accident investigations under the guidelines of the International Civil Aviation Organization (ICAO). The Dutch Safety Board has endeavoured to complete the investigation in the shortest possible time, without compromising on content quality. Within fifteen months, it has completed the investigation into four different subjects regarding the crash of flight MH17.

Immediately after the crash of flight MH17, initiatives were taken at international level to further improve aviation safety, which is a complicated diplomatic process. Now that the recommendations of the Dutch Safety Board are available, they can be included in the initiatives for improvement.

The relatives of the victims have the right to know the answers to their questions. What happened, why did the aeroplane fly over that area, were the passengers aware of anything and why did it take two to four days to confirm who were on board? Those were questions that arose immediately after the crash, but could only be answered after thorough investigation that required time. In the meantime, the relatives of the victims were confronted with all kinds of stories in the media. The conclusions in the Dutch Safety Board’s reports regarding the crash of flight MH17 are based on facts,
originating from several sources. I hope that these reports will answer questions of the relatives and society at large and that the recommendations will help prevent a repeat of this tragedy.

T.H.J. Joustra
Chairman, Dutch Safety Board
<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>AAIB</td>
<td>Air Accidents Investigation Branch</td>
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<tr>
<td>ACI</td>
<td>Airports Council International</td>
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<tr>
<td>AIVD</td>
<td>General Intelligence and Security Service (Algemene Inlichtingen- en Veiligheidsdienst)</td>
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<td>AWACS</td>
<td>Airborne Warning and Control System</td>
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<td>azM</td>
<td>Maastricht University Hospital (Academisch Ziekenhuis Maastricht)</td>
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<td>CANSO</td>
<td>Civil Air Navigation Services Organisation</td>
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<td>CTIVD</td>
<td>Dutch Review Committee on the Intelligence and Security Services (Commissie van Toezicht betreffende de Inlichtingen- en Veiligheidsdiensten)</td>
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<td>EASA</td>
<td>European Aviation Safety Agency</td>
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<td>FL</td>
<td>flight level</td>
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<td>HCSS</td>
<td>The Hague Centre for Strategic Studies</td>
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<td>IAC</td>
<td>Interstate Aviation Committee</td>
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<td>IATA</td>
<td>International Air Transport Association</td>
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<td>ICAO</td>
<td>International Civil Aviation Organization</td>
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<td>IIC</td>
<td>Investigator-In-Charge</td>
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<td>JIT</td>
<td>Joint Investigation Team</td>
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<tr>
<td>KNMI</td>
<td>Royal Netherlands Meteorological Institute (Koninklijk Nederlands Meteorologisch Instituut)</td>
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<tr>
<td>LTFO</td>
<td>National Forensic Investigation Team (Landelijk Team Forensische Opsporing)</td>
</tr>
<tr>
<td>MIVD</td>
<td>Military Intelligence and Security Service (Militaire Inlichtingen- en Veiligheidsdienst)</td>
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<tr>
<td>NATO</td>
<td>North Atlantic Treaty Organization</td>
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<tr>
<td>NBAAI</td>
<td>National Bureau of Air Accidents Investigation of Ukraine</td>
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<tr>
<td>NCC</td>
<td>National Crisis Centre (Nationaal CrisisCentrum)</td>
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<tr>
<td>NCTV</td>
<td>National Coordinator for Security and Counterterrorism (Nationaal Coördinator Terrorismebestrijding en Veiligheid)</td>
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NFI: Netherlands Forensic Institute (Nederlands Forensisch Instituut)
NLR: National Aerospace Laboratory (Nationaal Lucht- en Ruimtevaartlaboratorium)
NOTAM: Notice to Airmen
NTSB: National Transportation Safety Board
OSCE: Organization for Security and Cooperation in Europe
SES: State Emergency Service
STAMP: Systems-Theoretic Accident Model and Processes
STEP: Sequentially Timed Events Plotting
TF RCZ: Task Force on Risks to Civil Aviation arising from Conflict Zones
TNO: Netherlands Organisation for Applied Scientific Research (Nederlandse organisatie voor Toegepast Natuurwetenschappelijk Onderzoek)
UN: United Nations
1.1 Why this report about the investigation?

On 17 July 2014, a Malaysia Airlines passenger aeroplane crashed in the eastern part of Ukraine. All 298 people on board the Boeing 777-200 lost their lives. Flight MH17 had taken off from Amsterdam Airport Schiphol in the Netherlands for a flight to Kuala Lumpur International Airport in Malaysia.

The National Bureau of Air Accidents Investigation of Ukraine (NBAAI) instituted an investigation into the crash, in which the Dutch Safety Board was asked to participate. In addition to the Ukrainian investigation into the causes of the crash, the Dutch Safety Board decided on 18 July 2014 to launch its own investigation into the decision-making related to flight routes over conflict areas and the availability of passenger information following the crash.

On Wednesday 23 July 2014, Ukraine delegated the execution of the investigation into the causes of the crash to the Netherlands. As the accident investigation authority of the Netherlands, the Dutch Safety Board was effectively put in charge of the investigation. From that moment, the Dutch Safety Board’s objective was to obtain an accurate picture of the crash and the relevant circumstances within the shortest time frame possible. This included the decision-making related to the flight route and the availability of passenger information. In a later stage, the question of what happened to the occupants of the aeroplane became subject of investigation as well.

When the investigation was delegated to the Netherlands, it was clear that the investigation into the crash of flight MH17 would take place under exceptional circumstances. Soon after the crash, which received a great deal of international media attention, suspicions circulated that the crash of flight MH17 could not be attributed to a technical defect or pilot error, but that the aeroplane had been shot down. Wreckage of the aeroplane was scattered over a large area, spanning a total of approximately 50 km² in the Dnipropetrovsk region - an area where, at the time, there was an armed conflict. Because of regular fighting, the safety situation in the area initially did not allow the investigation to be conducted at the crash site. The scenario that the aeroplane had been shot down meant that it was of great importance for the investigation to be conducted in an independent manner. There were calls for an independent investigation into the causes and the circumstances of the crash of flight MH17, underlined by a UN Security Council Resolution. The geopolitical dimension meant that it was even more important to substantiate the findings of the investigation with as many sources as possible, so that the answer to the question of what happened to flight MH17 will be totally indisputable.

The course of the investigation into flight MH17 could not be delineated prior to the investigation. The Dutch Safety Board always acted according to circumstances within the national and international legal frameworks. Its principle was that what the legal frameworks have in common: to conduct an impartial and thorough investigation based on learning that helps prevent similar accidents from recurring in the future, without apportioning blame or liability. These last issues are addressed in the international criminal investigation (see Section 7.4).

In this document the Dutch Safety Board explains how the investigation into the crash of flight MH17 was conducted and the choices that were made. The Dutch Safety Board wants to provide insight into the working method that was adopted and to explain how it arrived at its conclusions. This report about the investigation entails the entire investigation, from the moment that it was known that flight MH17 had crashed in the eastern part of Ukraine up until the moment that the Dutch Safety Board concluded the reports for publication.

1.2 Which subjects did the investigation look into?

Under the Chicago Convention, the causes of any civil aviation incident must be investigated. The investigation, which in principle is conducted by the state in which the accident occurred, must at least include the technical condition of the aircraft, the history of the flight, the flight crew’s actions, the circumstances encountered during the flight and all relevant background information. This is stipulated in Annex 13 to the Chicago Convention; Aircraft Accident and Incident Investigation.

Apart from this Annex 13 investigation, the Dutch Safety Board had decided to conduct an investigation into the decision-making related to the flight routes over conflict areas and into the availability of passenger information, even before it took over the investigation from its Ukrainian sister organisation. This decision by the Dutch Safety Board was prompted by astonishment at the fact that Malaysia Airlines and other airlines were flying over the conflict area, and the fact that passenger information was not immediately available. In the course of the investigation the question arose to which extent the occupants of the aeroplane were aware of the crash. Victims’ relatives felt the need to know if their loved ones had experienced the crash consciously. The Dutch Safety Board decided to also include this aspect in its investigation and also devote attention to the transportation of the human remains to the Netherlands.

During the investigation, the Dutch Safety Board decided to publish the findings with regard to these four subjects simultaneously in two investigation reports. The causes of the crash of flight MH17, the decision-making related to the flight route and what happened to the occupants, are discussed in one report. The investigation into the availability of passenger information makes up a separate report. Given the fact that there is an enormous international as well as national interest in the investigation, the Dutch Safety Board has published the reports in English and in Dutch.

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2 Convention on International Civil Aviation, ICAO Doc 7300, 7 December 1944.
1.3 Legal framework

The provisions of Annex 13 to the Chicago Convention are followed for investigations into civil aviation accidents. The position, working method and authority of the Dutch Safety Board are stipulated in the Kingdom Act Dutch Safety Board. Annex 13 and the Kingdom Act Dutch Safety Board have the same objective: to conduct an impartial, thorough, learning based investigation that helps prevent similar accidents from recurring in the future, without apportioning blame or liability.

As previously pointed out, the Dutch Safety Board had already started its own investigation, based on the Kingdom Act Dutch Safety Board, into the decision-making related to flight routes and the availability of passenger information when it took over the investigation from its Ukrainian sister organisation. This meant that the investigation had to be conducted within a legal framework consisting of two regimes.

This section explores specific provisions of Annex 13 and the Kingdom Act Dutch Safety Board, and explains the choices made in the investigation. It also deals with the agreements made between Ukraine and the Netherlands when the international investigation was delegated.

1.3.1 Chicago Convention

Article 26 of the Chicago Convention provides for investigations into civil aviation accidents. Ukraine and the Netherlands, as well as the other states involved in this investigation, have ratified this Convention.

**Article 26. Investigation of accidents**

‘In the event of an accident to an aircraft of a contracting State occurring in the territory of another contracting State, and involving death or serious injury, or indicating serious technical defect in the aircraft or air navigation facilities, the State in which the accident occurs will institute an inquiry into the circumstances of the accident, in accordance, so far as its laws permit, with the procedure which may be recommended by the International Civil Aviation Organization. The State in which the aircraft is registered shall be given the opportunity to appoint observers to be present at the inquiry and the State holding the inquiry shall communicate the report and findings in the matter to that State.’

Annex 13 to the Chicago Convention provides Standards and Recommended Practices for the investigation of accidents. Some relevant aspects are explained below.

According to Annex 13 investigations into civil aviation accidents should focus exclusively on preventing future incidents. Article 3 of the Annex reads as follows: ‘The sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents. It is not the purpose of this activity to apportion blame or liability.’ To this end, the Annex establishes that states should have an independent accident investigation
authority that decides on the investigation’s format and implementation. In the Netherlands, the Dutch Safety Board has been appointed as the accident investigation authority.

According to Annex 13 the investigation shall at least include the gathering, recording and analysing of all available relevant information about the accident or incident and that this must be reported. If possible, the investigation determines causes. If appropriate, safety recommendations may be issued as well.

The Annex also stipulates how international cooperation is organised in the event of a civil aviation accident. In principle, the accident investigation authority of the State of Occurrence (the state in the territory of which an accident or incident occurs) conducts the investigation. However, it may delegate the investigation. After receiving notification about the investigation, certain states must provide relevant information as quickly as possible. This concerns the following states:

- the state on whose register the aircraft is entered (the State of Registry);
- the state in which the operator’s principal place of business is located or, if there is no such place of business, the operator’s permanent residence (the State of the Operator);
- the state having jurisdiction over the organisation responsible for the type of design (the State of Design);
- the state having jurisdiction over the organisation responsible for the final assembly of the aircraft (the State of Manufacture).

These states have the right, through appointment of an accredited representative, to participate in the investigation. This includes among others visiting the scene of the crash, examining the wreckage, interviewing witnesses and viewing investigation material.3

In addition, other states also have the responsibility, if requested, of providing all information, facilities or expertise relevant to the investigation that they have. In that case, they may, also through designation of an accredited representative, participate in the investigation. But the state that conducts the investigation may restrict the participation of these accredited representatives to those matters about which they were requested information. States having suffered fatalities have more restricted rights. Among other things, they have the right to visit the crash site and to receive information about the progress of the investigation. They may designate an expert to that end.

The compilation of the investigation report and the consultation thereof is also addressed in Annex 13. The state conducting the investigation can either incorporate the comments of the reviewing states in the definitive report or include them in an appendix.

1.3.2 Delegation of the international investigation to the Netherlands
In accordance with Annex 13, the State of Occurrence shall institute an investigation into the circumstances of the accident and is responsible for conducting the investigation. Annex 13 offers the possibility of delegating the investigation in part or full, with mutual arrangement

3 See Article 5.25 of Annex 13.
and consent, to another state. Ukraine made use of this option and, a few days after the crash, asked the Netherlands to conduct the investigation into the crash of flight MH17.

The delegation of the investigation by Ukraine to the Netherlands, which took place in consultation with the International Civil Aviation Organization (ICAO), was laid down in two agreements, being a Memorandum of Understanding between the Ukrainian and the Dutch Ministers of Foreign Affairs and an agreement between Ukraine’s NBAAI and the Dutch Safety Board. Both documents are included as appendices to this report (Appendices C and D). As from 23 July 2014, the Dutch Safety Board was effectively in charge of the international investigation into the causes of the crash.

The preamble to the Memorandum defines the objective of the investigation: ‘...to ensure that the investigations [...] will be conducted with the maximum impartiality and objectivity that will meet the expectations of the international community.’ The Memorandum and agreement therefore stipulate that the investigation into the crash of flight MH17 is conducted in accordance with Annex 13 to the Chicago Convention.

1.3.3 The Kingdom Act Dutch Safety Board

The tasks, responsibilities and authorities of the Dutch Safety Board are defined in the Kingdom Act Dutch Safety Board. The Dutch Safety Board’s statutory task is to explain how an accident or incident could have occurred, how to prevent a similar accident from happening in the future or how to limit its impact. In relation to this, the legislator considers that an investigation performed by the Dutch Safety Board can help alleviate public unrest caused by an incident.\(^4\) The Kingdom Act Dutch Safety Board stipulates that the Dutch Safety Board must refrain from statements that apportion blame or liability.

The Kingdom Act Dutch Safety Board provides for the Dutch Safety Board’s independent position, which allows it to decide autonomously whether to conduct an investigation without taking into account the interests of the parties concerned, political officials or other stakeholders.\(^5\) This concerns independence from parties that are involved in an accident or incident as well as independence from the (central) government. Members of the Dutch Safety Board are appointed, suspended and dismissed by Royal Decree, after consultation with the Board. The members sitting on the Board are not bound by a mandate. The way in which the Dutch Safety Board is funded, does not offer any possibility for exercising influence over the organisation.

The Kingdom Act Dutch Safety Board and the subordinate regulations include provisions related to the investigation process and the way in which the Dutch Safety Board must handle investigation material. In brief, these provisions give the Dutch Safety Board extensive authority to request data and information that it needs for its investigations, or to request that parties cooperate with the investigation. Statements made to the Dutch

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\(^5\) In certain circumstances, the Dutch Safety Board is obliged to conduct an investigation. Certain political officials can also request the Dutch Safety Board to conduct an investigation. However, the Dutch Safety Board does not have to respond to these requests.
Safety Board may not be used as evidence in legal processes. With this provision, the legislator aims to encourage the persons involved to provide full disclosure, since they do not have to fear (criminal) legal repercussions.

1.3.4 Using the legal framework in the investigation

Crash: Causes
An important objective of the investigation was to provide the international community and the victims’ relatives with an accurate and truthful picture of the causes of the crash of flight MH17 on 17 July 2014. Another objective of the Dutch Safety Board was to draw lessons for the future, based on the findings of the investigation.

The investigation into the causes of the crash of flight MH17 was conducted in accordance with the provisions of Annex 13 to the Chicago Convention by an international investigation team in which, after the initial phase, the following states were represented by an accredited representative:

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<tr>
<th>State</th>
<th>Explanation</th>
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<tbody>
<tr>
<td>The Netherlands</td>
<td>The state that conducted the investigation and that supplied the investigator-in-charge (IIC).</td>
</tr>
<tr>
<td>Ukraine</td>
<td>The state in which the incident occurred.</td>
</tr>
<tr>
<td>Malaysia</td>
<td>The state in which the aeroplane was registered and in which the operator is based.</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>The state in which the manufacturer of the engines is based.</td>
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<tr>
<td>United States</td>
<td>The state in which the aircraft manufacturer is based.</td>
</tr>
<tr>
<td>Australia</td>
<td>The state that provided information at the request of the Dutch Safety Board, such as photos of the wreckage in the wreckage area.</td>
</tr>
<tr>
<td>Russian Federation</td>
<td>The state that provided information at the Dutch Safety Board’s request, such as radar and communication data and weapon’s information.</td>
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Apart from these states, representatives of various states and international organisations were present in Ukraine or assisted Ukraine in other ways during the initial phase of the investigation when the Netherlands was not yet conducting the investigation.

Crash: Flight route
The fact that two judicial regimes apply, namely the Kingdom Act Dutch Safety Board and Annex 13 to the Chicago Convention, was especially noticeable in the investigation into how the decision-making related to the flight route of flight MH17 was organised, and how

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6 After a request to the Russian Federation for radar information, the Dutch Safety Board asked the Russian Federation to participate in the investigation. This invitation is included as Appendix F. The confirmation that Australia assigned an accredited representative is included as Appendix E to this report.

7 This involved France, Germany, Italy, the European Aviation Safety Agency (EASA), the International Civil Aviation Organization (ICAO) and the Interstate Aviation Committee (IAC).
decisions about flying over conflict areas are made in general. For the investigation into flying over conflict areas, the Dutch Safety Board approached various parties in and outside the Netherlands to request their cooperation in the investigation. It was not always clear to these parties whether the Dutch Safety Board requested them to cooperate on the basis of Annex 13 to the Chicago Convention, or on the basis of the Kingdom Act Dutch Safety Board. These parties, such as sister organisations and airlines, provided information to the Dutch Safety Board and cooperated with this part of the investigation anonymously and on a voluntary basis.

During the investigation it became increasingly clear that parties all over the world attach great value to improving the safety of civil aviation regarding flying over conflict areas. This was demonstrated, for example, by a joint declaration (on 29 July 2014) from ICAO, the international branch organisations of airlines (IATA), airports (ACI) and air navigation service providers (CANSO). Following the crash, various international initiatives were taken with the aim of reducing the chance of an accident, such as that involving flight MH17, occurring in the future. In August 2014, for example, ICAO set up a task force to advise on adapting roles and procedures focused on limiting risks that conflict areas pose to civil aviation. On 27 October 2014, ICAO also adopted a resolution advocating for the investigation into the crash of flight MH17 to be used to improve international standards and to share best practices for the safety of civil air traffic flying over conflict areas. The subject was also on the agenda of the ICAO High Level Safety Conference in Montreal in February 2015. Flying over conflict areas and MH17’s flight above the eastern part of Ukraine was a recurring theme in the media too.

In the investigation into the decision-making related to flight routes, the Dutch Safety Board attempted to do justice to these international developments and included them in its investigation where possible. In addition, because of the international importance of the investigation into flight routes, the Dutch Safety Board followed the provisions of Annex 13 to the Chicago Convention as closely as possible. The Dutch Safety Board involved representatives of sister organisations where possible and when necessary for the investigation. The investigation into the general decision-making related to flying over conflict areas made it possible to place the outcomes of the investigation into flight MH17’s route in an international perspective and created the opportunity to learn deeper and broader lessons from this disaster.

_Crash: Occupants_

According to Annex 13 to the Chicago Convention the investigation should include the injuries suffered by the victims, medical and pathological information and their chances of survival, depending on the circumstances of the accident. The provisions of Annex 13 do not primarily focus on answering questions that relatives may have about what the occupants may have experienced of the accident. The Dutch Safety Board decided to conduct a more thorough investigation into the consequences of the crash for the occupants than is customary on the basis of Annex 13. Apart from the aspects listed there, the Dutch Safety Board attempted to answer the question as to what conditions

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8. Task Force on Risks to Civil Aviation arising from Conflict Zones (TF RCZ).
the occupants were exposed to during the crash and what the influence of this was on their bodies, consciousness and awareness. In addition, the Dutch Safety Board has investigated how the human remains were handled following the crash. The investigation into these questions was conducted on the basis of the authority provided by the Kingdom Act Dutch Safety Board.

Passenger information
The investigation into passenger information looked into the time needed to provide the relatives of the Dutch victims of flight MH17 with official confirmation that their loved ones were on board the aeroplane. This investigation was conducted fully within the authority granted to the Dutch Safety Board by the Kingdom Act Dutch Safety Board. On the basis of this authority, the Dutch Safety Board can conduct an investigation into the way the Netherlands has managed the consequences of incidents abroad of which the impact extends to the territory of the Netherlands.\(^\text{10}\)

1.4 Conducting the investigation

The Dutch Safety Board conducts its investigations within the applicable legal framework respecting its core values: independent - professional - transparent. In this section, the Dutch Safety Board explains how these terms in general are put into practice and what this meant for the investigation into the crash of flight MH17.

1.4.1 Independence
The Dutch Safety Board’s objective in conducting its investigations is to provide a definite answer about what happened and how, and to draw authoritative conclusions and lessons from this. From that objective, it is important that the Dutch Safety Board is able to formulate its own autonomous opinion about the facts and their interpretation. In this respect, the legal framework offers several guarantees.

In the context of an accident investigation, independence is not absolute. Firstly, there is always a certain interdependency between the investigator and the subject of the investigation, because parties directly involved have knowledge of unique facts and circumstances that are necessary for understanding the incident. Although the Dutch Safety Board benefits from legal powers it can use to enforce cooperation with its investigation, that does not totally eliminate the type of dependency referred to above. Secondly, due to the scope of its field of work, the Dutch Safety Board will always depend on the expertise of others to effectively conduct its investigations. Thirdly, to be able to arrive at authoritative conclusions it is important that the Dutch Safety Board also takes account of the views and interests of others.

The Dutch Safety Board therefore cannot and does not wish to wholly isolate itself in conducting its investigation. It is rather a matter of the Dutch Safety Board guarding its conclusions against the disproportionate influencing by other parties while ensuring

\(^{10}\) Article 4, second paragraph, under a, Kingdom Act Dutch Safety Board.
observance of the aforementioned dependencies. The Dutch Safety Board must at all
times be able to formulate an autonomous and impartial perspective, fed by the
perspectives of others.

The investigation into the crash of flight MH17 took place in an extraordinary context. The
large number of victims, the considerable media attention and the public involvement in
the crash, the simultaneous occurrence of an international criminal investigation and the
geopolitical interests involved, made it even more important for the Dutch Safety Board
to safeguard its independence. To this end measures were taken in the investigation
process, which are explored in more detail in the following part of this section. The way in
which the investigation by the Dutch Safety Board was related to the international criminal
investigation is described separately in Section 7.4.

The Dutch Safety Board would like to state that neither the Cabinet, nor the judicial
authorities nor other parts of the Dutch (central) government at any time attempted to
influence the investigation into the crash of flight MH17. Naturally, the central government,
as well as other interested parties, put forward its requests and expectations with regard
to the subjects to be investigated. The central government was occasionally informed
about the schedule of the publishing of the investigation reports.

Reflection meetings
From the very beginning of the investigation into the crash of flight MH17, the Dutch
Safety Board was aware that the risk of political influence could be higher than usual,
given the tense international relations. To effectively identify and manage this risk, the
Dutch Safety Board held two reflection meetings with experts that have extensive
experience in conducting investigations in a political playing field. These meetings
focused on obtaining advice about the right strategy for working and interacting with
parties in this context. The meetings also aimed to explore what the Dutch Safety Board
could do to ensure that the results and recommendations of the investigation optimally
matched the expectations of the outside world. The Dutch Safety Board used the results
of these meetings in its decision-making processes throughout the investigation.

Stakeholder analysis
To arrive at independent and authoritative conclusions in a complex array of forces, 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 stake-
holder analysis was performed to systematically answer these questions.

International collaboration in aviation accident investigation
Annex 13 to the Chicago Convention provides for the participation of states having a
special interest in the investigation into a civil aviation accident. Depending on the
nature of their involvement in the occurrence, states can participate in the investigation
through an accredited representative or an expert. The rationale behind involving
various states in the investigation is that parties with potentially conflicting interests
have the opportunity to take note of the facts first-hand and present their views in the
investigation. The fact that the interests of the states most involved in the investigation are represented in this manner enables the state that conducts the investigation to formulate autonomous conclusions based on the various views.

In conducting the investigation into the causes of the crash and the flight route of flight MH17, various interested states were involved. In a natural manner, this working method led to counter-arguments, in addition to the usual internal and external assessments of findings that the Dutch Safety Board organises for its investigations. By involving people who view the findings of the investigation from different angles and with different interests, critical questions are put forward. Because of the international collaboration, various perspectives in the investigation arise for discussion, which contribute to the quality of the analyses.

In international aviation accident investigation, it is customary for the state that is conducting the investigation to organise progress meetings with the participating states. The objective is to share relevant information within the team. Holding such meetings is not required, nor is the number of meetings or their frequency set. The investigator-in-charge (IIC) invites the accredited representatives and their advisors. In the investigation into the causes of the crash of flight MH17, this was done on three occasions. During these meetings, the Dutch Safety Board explained the state of affairs of the investigation. The meetings were held in the Netherlands. Due to the circumstances in the eastern part of Ukraine it was impossible to arrange for a joint visit to the crash site to examine the wreckage in its original position.

Joint examination of the wreckage first took place at Gilze-Rijen Air Base during the first progress meeting (16 - 25 February 2015). All states in the investigation team were represented. Also, all states having suffered fatalities were invited, although, of these, only representatives from Germany and Belgium were present. Lastly, an observer of ICAO was present.

During this meeting, the fracture surfaces, failure mechanisms and the impact damage pattern were examined. The meeting was concluded with a plenary meeting during which all the findings that had been agreed were recorded, and during which agreements were made about the matters that required further investigation. It was concluded that the aeroplane was most likely downed by a missile that was launched from the ground. The conclusion was endorsed by the accredited representatives of all the states involved.

At the second progress meeting (6-7 May 2015), all of the states in the investigation team, with the exception of Australia, were represented. During the meeting, the progress of the investigation into the causes of the crash was discussed, including the question of which type of weapon could have caused the damage to the aeroplane and the weapon’s possible trajectories. Additionally, all participating states were once again offered the opportunity to examine the wreckage more closely. Furthermore, an explanation was given of the work on the reconstruction of the aeroplane.

A significant part of the meeting was taken up by the presentation of the Dutch National Aerospace Laboratory (the NLR) that discussed which type of weapon could have caused the damage to the aeroplane and the possible missile trajectories. In addition, the company
Almaz-Antey provided a presentation on behalf of the Russian Federation. The results presented differed on three important aspects from the presentation by the NLR. These aspects concerned the angle at which the weapon approached the aeroplane, the location of the detonation relative to the aeroplane and the possible missile trajectories.

The meeting was closed with conclusions, with mutual agreement on the conclusions that the aeroplane was hit in flight by high-energy objects from a surface-to-air missile, that the missile concerned was equipped with a warhead as found in missiles installed on Buk firing systems and that the location of detonation was on the left side of the aeroplane close to the cockpit. The Russian Federation did not concur with the findings about the possible missile trajectories presented by the NLR on behalf of the Netherlands.

During the third progress meeting (11 - 12 August 2015), the final state of affairs was discussed. All states in the investigation team were represented. An observer of ICAO also attended the meeting. During the meeting, the comments that the Dutch Safety Board received from consulting the other states regarding the investigation into the causes of the crash and the flight route of flight MH17 that needed explaining were discussed. An outline of the recommendations was also presented. Furthermore, the reconstruction of a section of the aeroplane was shown to those present. The reconstruction allowed those present to examine the different damaged parts of the aeroplane in relation to one another and thereby acquire more insight into the nature of the damage.

During the meeting, the Russian Federation presented its own ballistic investigation. It is customary to inform the state that is conducting the international accident investigation of such an investigation in advance. In these cases an invitation is sent to the state conducting the investigation and possibly to the other participating states to propose suggestions for the investigation and to be present at the investigation. The investigation by the Russian Federation was not announced beforehand. It was not part of the international investigation into the crash of flight MH17, since the Dutch Safety Board and other participating states did not have the opportunity to form an opinion on the content. The Russian Federation indicated that the aeroplane was downed by a missile that could have been fired from either the ground or an aeroplane. This standpoint deviated from what was jointly subscribed during the first and second meetings (also by the Russian Federation). The third meeting was closed with the joint conclusion (thus by the Russian Federation as well) that the aeroplane was hit by high-energy objects of a missile that detonated in front of and to the left of the cockpit. This joint conclusion is less far-reaching than the conclusions in the investigation report on the crash of flight MH17.

Relationships with knowledge institutions and experts
During the investigation the Dutch Safety Board made use of knowledge and information from third parties. The basic principle consistently adopted was that the Dutch Safety Board be provided with sufficient information to enable the Board to form a picture of the reliability of the expert assessment obtained. The Dutch Safety Board used the expert assessment to arrive at its own and autonomous conclusions.

Guidance committee
To be able to form autonomous conclusions, the Dutch Safety Board obtains advice about the weighting of the findings drawn up by the investigation team. For this it
employs a Guidance committee. A separate Guidance committee was set up for each of the four subjects of the investigation into the crash of flight MH17. For this organised critique, the Dutch Safety Board attempted to incorporate all the required expertise in the committees. The members of the guidance committees are mentioned in the appendices of the investigation reports.

The members of the guidance committees have relevant expertise and are appointed in a personal capacity. Each committee convenes several times in the course of an investigation, and advises the Dutch Safety Board on the focus and the findings of the investigation, the comments from the parties concerned on the draft report, the conclusions to be formulated, and the recommendations, insofar applicable. On occasion guidance committees met jointly when this was helpful to the investigation.

*Bringing the outside world inside*

During the course of the investigation, the Dutch Safety Board consistently tried to keep an open eye to facts, information, investigations, suspicions and theories presented by ‘outsiders’ pertaining to the crash of flight MH17. It did so with the conviction that the quality of its conclusions would be improved if all kinds of perspectives were incorporated in its formulation. The perspectives of parties other than the states and parties already involved and their experts, can add great value to the process.

In order to identify what statements were circulating about the causes of the crash and the flight route, the Dutch Safety Board asked Publistat (an organisation that monitors media) to analyse the reports in international (social) media. This analysis served as the basis for the hypotheses that the Dutch Safety Board included in the investigation (see Section 3.3).

Regarding the results of investigations into the crash conducted by other parties, the Dutch Safety Board examined the sources that formed the basis of these investigations, for as much as possible. If the sources were accessible, the Dutch Safety Board assessed whether it was useful to incorporate the findings of the other parties in its investigation.

### The investigation by RTL4 into fragments found at the crash site

One of the investigations conducted by other parties the Dutch Safety Board looked into, concerns an investigation conducted on behalf of television station RTL4. At the crash site one of its journalists found fragments that possibly originated from a weapon and had them examined.

The fragments were handed over to the Dutch Safety Board on 20 March 2015. The Dutch Safety Board had the NLR examine the fragments. The results were no different from what the Dutch Safety Board already knew from the examination of other fragments which the Dutch Safety Board knows for a fact came from the wreckage or from the bodies of the victims.
Various persons and organisations approached the Dutch Safety Board on their own initiative with information that could possibly be relevant to the investigation. The Dutch Safety Board assessed this information for relevance and reliability, and, if relevant and reliable, incorporated it in the investigation.

1.4.2 Professionalism
The Dutch Safety Board’s objective in conducting its investigations is to provide a definite answer about what happened and how this happened, and to draw authoritative conclusions and lessons from its findings. From that objective, it is important that the Dutch Safety Board’s investigations are conducted in such a way that the findings and conclusions are valid and reliable. This implies that the Dutch Safety Board guarantees that the investigation is conducted by persons who have relevant and up-to-date expertise in both content and methods.

The next part of this section describes how the Dutch Safety Board guaranteed the professional execution of the investigation into the crash of flight MH17. In this context it should be noted once more that dependence on expertise forms a risk to the Dutch Safety Board’s autonomous conclusions. The previous paragraph described how the Dutch Safety Board approached this issue.

Composition of the investigation teams
The Dutch Safety Board strives to have all the necessary knowledge and skills among its own personnel and tries to realise this through recruitment, selection and training. The investigation teams for each project are multidisciplinary and consist of investigators that possess the knowledge and skills required for the investigation at hand. For the investigation into flight MH17 the Dutch Safety Board called upon investigators having expertise on the subject of aviation, defence, health, crisis management, administrative processes and risk management.

The investigation into flight MH17 was an exceptionally large and complex project for the Dutch Safety Board. The project took up a great deal of the available resources: approximately three-quarters of the 72 staff members were at some point assigned to the investigation or to activities in support of it.

Involving external investigators and support
The Dutch Safety Board is an organisation with a broad scope of activity. Thus bringing in specific external expertise is unavoidable, especially for extensive investigations such as that into the crash of flight MH17. The most relevant selection criteria when involving external staff are relevant expertise, proven quality and impartiality of the external employee. The Dutch Safety Board prefers to use its own network in the sector related to an investigation, contacts in sister organisations and independent knowledge institutions such as universities when recruiting external investigators.

To prevent any conflicts of interest with an external investigator, the Dutch Safety Board tries not to recruit any persons that work for organisations that are or could become directly involved in the accident or incident. Each external employee is subject to strict

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11 The Dutch Safety Board permanently employs circa 46 investigators (full-time equivalents).
confidentiality with regard to all that he or she will have access to during the course of the investigation. He or she must also declare to be of irrepachable behaviour and he or she must provide a certificate of good conduct (verklaring omtrent gedrag) or undergo a security screening.

**Third party investigations**

Regularly, the Dutch Safety Board outsources parts of an investigation to third parties, such as when the Dutch Safety Board does not have the right resources or knowledge to conduct that particular part of the investigation. Such investigation assignments are conducted under the responsibility of the Dutch Safety Board by renowned research agencies and bodies that guarantee quality. The results of sub-investigations outsourced by the Dutch Safety Board are treated as recommendations. The Dutch Safety Board assesses the results in terms of their reliability, in some cases by asking a different organisation to assess the results of an outsourced investigation. The outcomes of the outsourced sub-investigations form part of the Dutch Safety Board's investigation. The Dutch Safety Board will only make their results public in the final investigation report or its appendices. When the reports of the outsourced sub-investigations are integrally included in the appendices, they are so in their original state and have not been edited by the Dutch Safety Board.

Parts of the investigation into the crash of flight MH17 were outsourced. This applied to the following sub-investigations:

<table>
<thead>
<tr>
<th>Sub-investigation</th>
<th>Conducted by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Forensic investigation and material analysis of the fragments recovered</td>
<td>NFI; NLR; Element Materials Technology</td>
</tr>
<tr>
<td>Investigation of the fracture lines in relation to the failure analysis</td>
<td>NLR; TU Delft</td>
</tr>
<tr>
<td>Weapon simulations</td>
<td>NLR*, TNO*</td>
</tr>
<tr>
<td>Blast damage simulations</td>
<td>TNO*</td>
</tr>
<tr>
<td>Possible trajectories of the missile</td>
<td>NLR*</td>
</tr>
<tr>
<td>List of publicly available information related to the threats and reduced safety</td>
<td>HCSS</td>
</tr>
<tr>
<td>of the airspace above the eastern part of Ukraine</td>
<td></td>
</tr>
<tr>
<td>Role of the Dutch intelligence services AIVD and MIVD in the decision-making</td>
<td>CTIVD*</td>
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<tr>
<td>related to the safety of flight routes</td>
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* The reports of these sub-investigations are included in the appendices of the investigation report regarding the crash of flight MH17.

**Internal and external assessment of the findings**

During the investigations, the Dutch Safety Board obtained advice from various experts and institutions, such as Victim Support the Netherlands (Slachtofferhulp Nederland) and grief counselling experts. In addition, Dutch Safety Board staff members not involved in the investigation team read and assessed one or more investigation reports in terms of different quality aspects such as comprehensibility, substantiation and consistency. Meetings held with experts during the investigations allowed them to critically assess the
analysis of the investigation results and comment on the reports. The feedback from these internal and external assessments were included in the continued investigations and incorporated in the reports.

*Using statements made by experts and parties involved*

An important part of the investigation material received by the Dutch Safety Board, in addition to documents and technical sources, consists of verbal or written statements by experts and persons that are involved in an accident or incident in some way. As the way in which the statements are taken is a decisive factor for their reliability, the Dutch Safety Board devotes special attention to its interviewing techniques. All the investigators employed by the Dutch Safety Board receive regular training in this area. A key component of the training course focuses on the interviewer avoiding affecting the interviewee (intentionally or accidentally). Moreover, usually two investigators are present and generally an audio recording is made of the interviews. The Dutch Safety Board works with reports on the interviews, signed by those interviewed.

Even when a statement has been taken in accordance with the highest standards imaginable, it still constitutes source material with a relatively low degree of reliability. Therefore, the Dutch Safety Board adopts the basic principle that a statement alone is not sufficient for substantiating a finding. A statement must be corroborated by as many other types of source material as possible.

1.4.3 Transparency

The Dutch Safety Board attaches great value to conducting its investigation in a way that is comprehensible to others, so that in turn they can form their own opinion on the investigation’s validity and reliability. Moreover, it is important that the Dutch Safety Board informs the different stakeholders (relatives, other parties involved, the general public) about the investigation and its findings in such a way and at such times that they are not unnecessarily obstructed from coming to terms with their grief or drawing lessons from the event.

The extent to which the Dutch Safety Board can practise transparency is limited due to the legal obligation to protect its sources. Other than the information in the final report, the Dutch Safety Board does not release any underlying source information related to the investigation, except in exceptional cases.\(^\text{12}\) The purpose of this source protection is to enable those involved in an accident or incident to give the Dutch Safety Board full disclosure without fearing any disciplinary measures or (criminal) prosecution. This means that the Dutch Safety Board is in an optimal position for discovering the true causes of an incident and for drawing lessons from it.

The following part of this section describes how the Dutch Safety Board, taking into account the limitation mentioned above, achieved transparency in the investigation into the crash of flight MH17.

\(^{12}\) Kingdom Act Dutch Safety Board, Article 59, 5th paragraph jo Article 69.
Preliminary report

According to Annex 13 to the Chicago Convention when there is an accident involving an aircraft with a maximum mass of over 2,250 kg, a preliminary report is sent to the states involved and to ICAO. Given the scope of the disaster and its impact on Dutch society and on other nations that suffered victims, the Dutch Safety Board chose to publish this report after a consultation period. In publishing the preliminary report, the Dutch Safety Board aimed to provide the relatives of the victims, while the investigation was still in progress, with factual information about the crash and the findings up until that time.

Dutch relatives received the preliminary report an hour before it was published on 9 September 2014 under embargo via the family liaison officers deployed by the National Police. This allowed the relatives to become acquainted with the report’s content before it was released by the media.

Consultation and review

Both Annex 13 to the Chicago Convention and the Kingdom Act Dutch Safety Board include provisions concerning to which parties and in what manner the draft report must be presented for consultation, as well as the way in which the resulting comments are to be processed. The objective of these provisions is to ensure that the final report does not contain any factual inaccuracies and to be informed of interested parties’ views on the findings and conclusions that the Dutch Safety Board has drawn on the basis of the facts investigated.

Discussed below are comments arising from the Annex 13 consultation with regard to the results of the investigation into the causes of the crash and the flight route of flight MH17. The rationale for this is that the Dutch Safety Board considers it important to explain in a general sense which comments on these subjects were not incorporated. The exact comments on all investigated aspects by all parties that were not incorporated in the investigation reports are available in the tables of comments published on the website of the Dutch Safety Board.

On 2 June 2015, the Dutch Safety Board presented the results of the investigation into the causes of the crash and the flight route to the accredited representatives of Australia, Malaysia, Ukraine, the Russian Federation, the United Kingdom and the United States for consultation. The results were also presented for consultation to the European Aviation Safety Agency (EASA) and EUROCONTROL. Parties were requested to provide significant and substantiated comments. The Dutch Safety Board received comments from all states, varying from textual comments and proposals to clarify texts to indications of factual inaccuracies. The Dutch Safety Board examined all comments and determined whether or not they should be incorporated in the report. The main issues that were not incorporated in the report are summarised below.

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13 In the Netherlands, family liaison officers were used to provide the relatives of the victims with information on behalf of the authorities. They function as a personal contact point between the authorities and the relatives.
The Russian Federation submitted a substantial number of comments during the consultation. Many of those comments contributed to the quality of the report and were incorporated in it. Some of the comments were not incorporated.

For example, the Russian Federation has stated that it is not possible to ascertain the type of warhead that detonated and the type of missile that carried it. In its comments, the Russian Federation referred to outcomes of various tests and calculations that were made available during the last progress meeting. These concerned among other things the location of the detonation, the way in which the fragments spread after detonation and the direction from which these fragments perforated the aeroplane. More information can be found in Appendix L.

The Russian Federation also commented on the presence of weapon systems in the eastern part of Ukraine with respect to the fighting parties. However, the investigation only examined weapon systems that were known to be common in use in the region. The question of what weapon systems were in the possession of which parties was not part of the investigation into the causes of the crash.

Lastly, the Russian Federation did not consider the references to the unrest in Crimea at the beginning of 2014 a possible sign of deteriorating safety in the Ukrainian airspace. However, these references were made in the report to understand why airlines were prohibited from flying over Crimea. The impossibility of flying over Crimea was relevant to the decision-making with respect to flight routes above the eastern part of Ukraine.

The comment from Ukraine requesting the removal of the conclusions pertaining to airspace management was not accepted. The essence of Ukraine's comment was that the risk to civil aviation at cruising altitude posed by the armed conflict in the eastern part of the country was adequately assessed. However, the facts that were gathered contradict this.

Communication policy
The needs, expectations and perceptions in the outside world have influenced the choices the Dutch Safety Board made concerning the type and scope of its reporting. During the investigation, the Dutch Safety Board publicised information about the investigation process more than had been customary. The Dutch Safety Board also published a number of relevant documents on its website to provide clarity about some of the agreements that were made. This concerns the agreements between the Dutch Safety Board and other parties with regard to taking charge of the investigation into the crash of flight MH17 and with regard to the recovery of the wreckage.

On several occasions members of the House of Representatives of the Dutch Parliament asked the involved members of cabinet questions about the investigation. Since the members of cabinet do not have access to the Dutch Safety Board’s work and have no insight into its progress, the Dutch Safety Board supplied them with information to enable them to answer these questions. This information was limited to the investigation process and was not related to the investigation’s approach or findings.
The press and news reports published by the Dutch Safety Board were not shared with other parties in advance, leaving aside some exceptions. In certain cases, the Dutch Safety Board believed it was necessary to supply parties with the information that it was going to publish prior to the moment of publication. In particular, in cases where information was directly related to a (joint) mission carried out by (or with) another party, the content of the news report was shared in advance with the party concerned. Visiting the crash site to recover wreckage pieces, for example, was carried out in a joint operation with the Ministry of Defence. For this reason the Dutch Safety Board shared the related news reports with this Ministry in advance.

**Informing the relatives**

The Dutch Safety Board wanted to keep the relatives of the victims informed of the progress of the investigation as effectively as possible. Never before did the Dutch Safety Board have to deal with such a large group of relatives originating from so many different countries during an investigation. The Dutch central government organised information meetings for the relatives and the Dutch Safety Board attended these meetings to provide information about the process of the investigation and to answer the questions of relatives.

During the investigation, the Dutch Safety Board maintained contact with the MH17 Aviation Disaster Foundation (Stichting Vliegramp MH17), Victim Support the Netherlands (Slachtofferhulp Nederland) and the family liaison officers and sought their advice prior to having meetings, publicising reports or other kinds of communications. The relatives of the victims received information via a special forum before it was shared with the media. Where possible, questions asked to the Dutch Safety Board by relatives via a dedicated forum, family liaison officers or via Victim Support the Netherlands were answered immediately.

The relatives were offered the opportunity of being present when the wreckage pieces arrived at the Gilze-Rijen Air Base. About 40 relatives were present at that time. Some time later, the relatives were also invited to view the wreckage themselves (2 - 6 March 2015). This opportunity was used by 533 relatives of 151 of the victims. They were allowed to leave flowers in the hangar with the wreckage pieces. Among them were a number of relatives of victims from other countries. The Dutch Safety Board produced a video recording of the wreckage pieces to provide relatives who were not able to visit Gilze-Rijen with an impression. Other interested parties, such as the media and those involved in the investigation into the crash of flight MH17, were also invited to view the wreckage pieces.¹⁴

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¹⁴ In total about 65 journalists made use of the opportunity. Among these, media reporters and correspondents from different countries and various (international) press agencies.
2.1 Introduction

On 9 September 2014, the Dutch Safety Board published its preliminary report (Rapport van eerste bevindingen) regarding the causes of the crash. In this report, the Dutch Safety Board reported the first results of the investigation, which was still in full swing at that time. For the preliminary report use was made of the investigation material that was available at that time, including the data from the flight data recorder, the cockpit voice recorder, data regarding the crew, the flight plan, the state of the maintenance of the aeroplane, flight-relevant meteorological information, Notices to Airmen (NOTAMs) and data from the relevant air traffic control services. The Dutch Safety Board also had access to photographs and satellite images of the area (Google Earth), on which pieces of wreckage of the crashed aeroplane were visible.

It is important to note that the findings in the preliminary report were established on the basis of the investigation material that was available up until then. Caution was called for when drawing conclusions at that time. After the preliminary report was published, additional investigation material became available, such as a part of the wreckage, the human remains of the occupants and other physical evidence, which enabled the Dutch Safety Board to draw authoritative conclusions about the causes of the crash. The Dutch Safety Board wanted to be very careful at all times not to draw conclusions before the investigation was fully completed.

2.2 Provisions of Annex 13

According to Annex 13 a preliminary report should be submitted to the relevant states and ICAO within thirty days after an accident involving an aeroplane with a maximum mass of over 2,250 kg. The preliminary report may also include safety warnings. The content depends partially on the progress of the investigation and the need to report certain results. The Dutch Safety Board chose to publicise the preliminary report.

2.3 Publication of the preliminary report

Given the exceptional circumstances in which the investigation into the causes of crash of flight MH17 occurred, the time needed to draw up the preliminary report exceeded the thirty days specified by Annex 13 for this. Because of this, the report was published about three weeks later, on 9 September 2014. At the time of publication of the preliminary report, the investigation into the causes of the crash was still in full swing. The findings were therefore based solely on the sources that the Dutch Safety Board had at its disposal at that time. These data were compared and analysed. Based on these analyses, first insights in the crash could be given.
The Dutch Safety Board considered it important to report findings on which the representatives of the states participating in the investigation had been able to give their view. The draft of the preliminary report was therefore submitted to them for comment. At the request of the Dutch Safety Board, all representatives sent their responses to the draft report within the consultation period of 48 hours. The Dutch Safety Board assessed the reactions and amended the report where the Dutch Safety Board deemed it was necessary.

At the request of the Russian Federation, the preliminary report was discussed in the Security Council of the United Nations on Friday, 19 September 2014. The other state members considered the investigation to be transparent up to that date and insisted on the completion of the follow-up of the investigation.

After the preliminary report was published, more investigation material became available (including wreckage pieces of the aeroplane that could be recovered from the wreckage area as from November 2014) and the investigation was continued with the additional investigation material. Also, the investigation material that was already available prior to the publication of the preliminary report was analysed further.

2.4 Erratum

Because of a difference between the Dutch and English version of the reports, on 10 September 2014, one day after the publication of the report, an amendment was made to the Dutch version. On page 14, the following sentence was deleted: ‘De NOTAM met luchtruimbeperking was uitgevaardigd in reactie op het neerschieten van een Antonov 24 vliegtuig op 14 juli dat op een hoogte van FL210 vloog.’ ['The NOTAM with airspace restrictions was issued in reaction to the shooting down of an Antonov 24 aeroplane flying at an altitude of FL210 on 14 July.'] The sentence was deleted because, in this phase of the investigation, it could not be established with complete certainty that this information was accurate. In translating the original English report into Dutch, the relevant sentence was accidentally not removed. Also, Figure 2 in the report did not always mention the correct type of aeroplane. But this had no effect on the tentative conclusions in the preliminary report.
3 CRASH: CAUSES

3.1 Design of the investigation

The international investigation into the causes of the crash of flight MH17 aimed at
determining what caused the aeroplane to crash and, where possible, learn safety lessons
from it. In order to determine the causes of the crash as reliably as possible, and thereby
inform the relatives and others involved as best possible, the investigation was aimed not
only at determining the causes but also at negating other explanations. To answer the
question as to why the aeroplane went down, the following questions were discussed in
the investigation:

Initially:

1a. What caused the crash?
1b. Which possible causes of the crash can be excluded?

After it was determined that the aeroplane had been hit from outside:

2a. What hit the aeroplane of flight MH17?
2b. What did not hit the aeroplane of flight MH17?

3.2 Data collection

Annex 13 forms the guideline for the international investigation and the collection of
data about a civil aviation incident or accident. Annex 13 has an appendix that specifies
various aspects that can be addressed in the investigation, and therefore what information
can be collected. Systematically applying the aspects listed in the appendix has the
objective to prevent possible causes of an aviation accident from being overlooked. The Manual of Aircraft Accident and Incident Investigation formulates which data are relevant
and how the data collection can be performed. Both the Annex and the manual were
used for the data collection regarding the crash of flight MH17. The chapter ‘Factual Information’ of the investigation report offers a detailed understanding of the information
that was used in the investigation. For this reason, only a short description of the
collection of data from various sources is given here.

16 ICAO Doc. 9756, part 1 - 4.
Crash site and wreckage
In case of an aviation accident, at the location where the aeroplane crashed usually investigation is done and the wreckage is secured. In this case, because the remains of the aeroplane layed in an area of on-going armed conflict, it was not possible to secure the physical investigation material and an extensive investigation could not be conducted at the crash site. For this reason, initially use was made of photographs taken by Ukrainian and Malaysian investigators, the Australian Federal Police and the Organization for Security and Cooperation in Europe (OSCE) shortly after the crash of the aeroplane. Later, the Dutch Safety Board was able to partly secure the wreckage. The wreckage pieces were removed from the area, transported to the Netherlands and made accessible to the relevant international parties there.

The wreckage pieces, the photographs and the manner in which the wreckage was spread over the area offered a great deal of information about what had happened to the aeroplane. The pieces of wreckage were also used for a reconstruction of a part of the aeroplane. Chapter 7 deals with the access to the wreckage site, the choices that were made with regard to the removal of wreckage, the reliability of the evidence and the reconstruction of the aeroplane.

Flight recorders (cockpit voice recorder and flight data recorder)
The flight recorders (black boxes) of the aeroplane were an important source of information. The flight recorders were not recovered by the investigators of the investigation team themselves, but by persons unknown to the Dutch Safety Board. A Malaysian official handed the flight recorders over to the Dutch Safety Board in Ukraine on 22 July 2014. Chapter 7 details how the flight recorders came into the possession of the Dutch Safety Board and what the condition and reliability of the data files of the recorders were.

Radar data
For the investigation into the causes of the crash of flight MH17, radar data were used in order to verify the data of the flight recorders. In addition, the data were used to map what happened in the vicinity of the aeroplane. In this investigation, the radar data from radar stations in Ukrainian and Russian territory were relevant.

There also was a request for a reproduction of the communications recorded between the air traffic control services in Ukraine with flight MH17 and the coordination communications between the Ukrainian and Russian air traffic controllers. The latter are of interest because as soon as the aeroplane would cross the border, flight MH17 would have been transferred to the Russian air traffic control services concerned.

Chapter 7 provides more detail as to how the radar data were collected, the problems that arose and which radar data the Dutch Safety Board finally did and did not receive.

Satellite images
For the investigation, use was made of an overview photograph of the wreckage area that came from various satellite images. Initially, images from Google Earth were used. Later, the Dutch Safety Board was able to get a view of other, classified, satellite images, on the basis of which the images from Google Earth could be verified (for an explanation of classified information, see Section 7.5).
Injury information
The investigation into the occupants of the aeroplane (see Chapter 5) produced factual information for the medical and pathological aspects and the survival aspects (from the appendix to Annex 13). In addition, the injuries of the crew members that were in the cockpit contributed to gain insight into the causes of the crash.

Fragments and information on weapons
The preliminary report states that the damage to the forward fuselage of the aeroplane appears to be consistent with the aeroplane being perforated by a large number of high-energy objects from outside the aeroplane. In order to discover what kind of objects perforated the aeroplane, the fragments found were analysed. A distinction was made between metal and non-metal fragments. Of these, the metal fragments were relevant to the investigation. These concerned objects found in and on the wreckage or found in and on the human remains and that do not belong to the aeroplane or the personal belongings and do not stem from the ground.

Certain fragments were only removed from the pieces of wreckage at a late stage in the investigation, because the pieces of wreckage had to be kept intact for the accident investigation and the criminal investigation, and removal without further damaging the wreckage pieces was not possible.

Because the metal fragments could originate from a weapon, for the investigation into this possible source of the fragments knowledge was needed about weapons, parts of weapons and the damage pattern that weapons cause.

Eye witnesses
The safety situation in the eastern part of Ukraine meant that it was not possible to interview eye witnesses in the days following the crash. The Dutch Safety Board chose not to interview the witnesses at a later stage because the reliability of the statements could be affected by the passage of time. Various people and organisations did, of their own accord, share their findings with the Dutch Safety Board and information was gathered from the media. The Dutch Safety Board took note of those statements and, if of value to the investigation, included them in the investigation.

Other information
For the investigation, the organisations involved were requested to provide information about the maintenance and the equipment of the aeroplane and the functioning of relevant components such as the engines. Information was also gathered with a view to other possible explanations for the damage incurred. For instance, this involved information about the presence of meteors and space debris.

3.3 Analysis and assessment
To determine what happened with flight MH17, the sequence of events and circumstances were reconstructed, from the departure (including the airworthiness of the aeroplane and data about the crew) up to and including the break-up and downing of the aeroplane. The facts were compared with what is known about the usual course of events during a
passenger flight. Various areas of knowledge and expertise were used to understand the facts found. This involved, among others, technical, aeronautical, radar and ballistic knowledge and knowledge of weapon systems. For this, knowledge gained from earlier aviation investigations was also used.

In order to best determine the causes of the crash, an analysis of competing hypotheses was done. These hypotheses concerned, among other things:

- The qualifications of the crew and the actions of the crew during the flight;
- The technical condition of the aeroplane, particularly the functioning of the pressure cabin and of the engines;
- The weather conditions throughout the flight and how the route was adapted to those conditions;
- A fire or an explosion in the aeroplane;
- The impact of lightning, space debris or a meteor;
- The impact of bullets from an air-to-air gun/cannon;
- The impact of an air-to-air missile;
- The impact of a surface-to-air missile;
- The impact of more than one of the aforementioned weapons;
- A combination of the impact of a weapon and the technical condition of the aeroplane.

These aspects were selected based on the list of investigation aspects that is included in the appendix of Annex 13 and based on explanations for the crash of flight MH17 that circulated in the media. With regard to the functioning of the aeroplane, the functioning of the pressure cabin and the engines was examined specifically. Previous aviation accidents have revealed that the failure of the pressure cabin - such as can be the result of (inferior) repairs of the fuselage skin of the rear pressure bulkhead, fatigue or corrosion of fuselage parts - can lead to an in-flight break-up of the aeroplane. In addition, serious motor trouble - the so-called ‘uncontained engine failures’ where parts of the engine are ejected - can lead to impact damage to the fuselage and wing parts.

It was checked which facts were necessary to confirm the various hypotheses. If these facts were not encountered or if facts were encountered that proved the contrary, that hypothesis was rejected.

For the investigation into the causes of the crash of flight MH17, the Dutch Safety Board chose to substantiate its findings with as many sources as possible. Each factual finding had to be substantiated by various sources. The following is an explanation of how the investigation questions were answered by analysing the various data sources.

1. **What caused the crash (and what did not)?**
   With the aid of the gathered data, the course of the flight and the crash was reconstructed. To that end, various aspects were discussed, such as the technical condition of the aeroplane, the qualifications of the crew, the planned route and the one actually flown. Based on these findings, it was checked whether any unusual events occurred.
Flight recorders

For the reconstruction of the flight, the time at which the flight recorders stopped recording was relevant. It was clear that the causes of the crash must be sought for around that time. In order to determine that time accurately, the recording by the flight recorders were compared with other data sources, such as radar images, and satellite communication data. In this way it was determined accurately at what time the 'usual' course of flight MH17 came to an end.

Just before the end of the sound recording, the cockpit voice recorder recorded a sound peak. This did not fit with the noise that is customarily heard during a flight. It was a high tone, not perceptible to the ear. The location of the source of the sound could be determined roughly. The sound appeared to come from outside the aeroplane. Its cause was determined later in the investigation.

Injury crew in the cockpit

The analysis of the injuries of the crew in the cockpit contributed to the determination of the causes of the crash. From the injuries of both pilots and the purser present in the cockpit, it was possible to deduce that the crew in the cockpit had been hit by metal fragments travelling at high velocity.

Pieces of wreckage

The pieces of wreckage were an important source of information for determining what had happened to the aeroplane. First, the damage to the wreckage pieces was relevant. In order to interpret this damage, a distinction was made between damage that originated in the air, damage that originated due to contact with the ground and damage that was caused or arose later. In making this distinction, photographs of the wreckage taken shortly after the crash were used. The distinction was made by aviation investigators, by looking at the nature of the damage (length of tears, shape of the holes through the various layers of material) and by interpreting this nature based on their expertise.

A part of the damage to the wreckage that originated in the air consisted of holes and marks resulting from perforating by, penetrating of and ricocheting of high-energy objects, also called the impact damage. The general direction from which the high-energy objects impacted the aeroplane was determined based on the shape of the holes. To make the trajectories of the objects visible, lines were drawn (this technique is called stringing) to roughly determine where the objects came from. The direction was among others compared with the direction of the sound wave, which was recorded by the cockpit voice recorder.

In addition to the impact damage to the pieces of wreckage, the fracture surfaces of the broken-up pieces of the aeroplane were examined. The fracture surfaces provide understanding in the sequence in which the aeroplane broke up. This sequence is of importance because it can be inferred from this where the aeroplane started to break up; this is related to the location where the aeroplane was hit from outside. The manner in which the aeroplane broke up can also be derived from the locations on the ground where the several wreckage pieces came down.
The damage to the wreckage pieces was also needed for the exclusion of possible causes. Pieces of wreckage were examined to determine if parts of the aeroplane could have torn due to metal fatigue, corrosion or poorly executed repairs.

The results of the analyses of the impact damage, the fracture surfaces and the break-up of the aeroplane, the locations of the wreckage pieces at the wreckage area, the injuries of the crew in the cockpit and the sound peak were combined. Based on these results, the investigators came to the conclusion that the aeroplane was hit on the forward left side and from the outside.

2. What hit the aeroplane of flight MH17 (and what did not)?
In order to ascertain what hit flight MH17 and what did not, analyses were performed on the metal fragments found and the impact damage to the pieces of wreckage.

Metal fragments
The shape and size of the metal fragments made it possible to issue statements about their source. A number of these fragments had a special shape, which can basically be described as cubic and bow-tie shaped. Knowledge of weapons was used to establish that fragments having this shape are released at the detonation of a certain type of warhead. Using knowledge about different types of weapons, a corresponding weapon was sought that could contain fragments with this type of shape. Traces (of aluminium and glass) that were discovered on the fragments were also relevant, because this enabled the investigators to deduce whether, and with what, the fragments had collided.

The Dutch Safety Board attempted to obtain reference material of the suspected weapon in order to further substantiate the origin of the fragments. The objective was to establish that the chemical composition of the fragments was consistent with that of the suspected weapon. This was not achieved, so this verification could not take place.

During the recovery of the aeroplane, other objects were found that correspond with parts of a specific missile in terms of shape and appearance. Two shards were discovered in the aeroplane (in the cockpit and the left wing tip). The paint and traces on the shards and traces on pieces of the wreckage were compared with paint and traces of an explosive on the objects that were found. These analyses were performed by the Netherlands Forensic Institute (NFI) at the request of the Public Prosecution Service and shared with the Dutch Safety Board.\(^\text{17}\)

Wreckage
Another part of the analysis to determine what hit the aeroplane involved the analysis of the impact damage to the pieces of wreckage. This concerned the number of holes and ricochet marks and their size. The position of the holes and ricochet marks in relation to each other (density), the direction from which the high-energy objects impacted the aeroplane and the blast damage caused by the explosion of the warhead were also important for the analysis. The various characteristics of the damage pattern were compared with the various known

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\(^{17}\) Not all the detailed information related to the items specified is included in the investigation report so as not to harm the criminal investigation.
characteristics of certain weapon systems. With the help of these comparisons, certain types of weapon systems were excluded because their expected damage pattern was not consistent with the damage pattern found on the wreckage.

Other external causes that could have resulted in the crash of flight MH17, such as space debris, a meteor or a lightning strike could be excluded as a result of the damage pattern that was found on the wreckage.

**Simulations**
The combined analyses resulted in the conclusion about the type of warhead used, which is carried on a particular type of missile. Simulations were performed by the Dutch National Aerospace Laboratory (the NLR), the Netherlands Organisation for Applied Scientific Research (TNO) and the Kyiv Research Institute for Forensic Expertise of the Ukrainian Ministry of Justice to investigate the location of the detonation. In these simulations, the characteristics of the flight and the aeroplane as well as those of the weapon were reconstructed. The results of the simulations were compared with the actual damage pattern. The findings from the analyses of the damage pattern on the wreckage and from the simulations were consistent, which validated the conclusion with regard to the weapon used.

Each of the simulations provided an estimated location of the detonation of the warhead. The detonation locations calculated by the NLR, TNO and Ukraine differed but were close together. The Dutch Safety Board took account of uncertainties in the models by defining a volume of space enclosing the results of the different simulations instead of a single point in space.

On behalf of the Russian Federation, the company Almaz-Antey performed similar simulations and compared the results with their interpretation of the damage pattern, which differed from the analysis of the Dutch Safety Board (more information on the differences can be found in Appendix L of this report and Appendix V of the investigation report about the crash). The detonation point which resulted from the calculations by Almaz-Antey was not within the volume of space defined by the results of the simulations by the NLR, TNO and Ukraine.

The volume of space where the warhead detonated was used by the NLR and Ukraine to calculate possible missile trajectories. The NLR’s simulation model contained characteristics of both the aeroplane and the missile. It took into account uncertainties about, for example, the exact operation of the missile, the orientation angles on the ground and the missile’s speed. The origins of the possible missile trajectories were visualised in an area on the ground. The results of the simulations showed that missiles that could have carried the type of warhead that caused the damage pattern found on the wreckage could not have been launched outside this area. Ukraine performed similar calculations. The area calculated by Ukraine is situated in the area identified by the NLR’s calculations. In addition, Almaz-Antey on behalf of the Russian Federation performed calculations using the same volume of space as the Dutch Safety Board to simulate the possible trajectories of the missile. The areas calculated by Almaz-Antey were consistent with the results of the calculations by the NLR and Ukraine. The Russian Federation provided the results to the Dutch Safety Board without confirming the type of warhead and missile used in the crash.
Whilst the results of the three studies all point to a similar geographic area, further forensic research is required to establish the launch location. The Dutch Safety Board concluded that this fell beyond the scope of the mandate of the Annex 13 investigation.
4 CRASH: FLIGHT ROUTE

4.1 Design of the investigation

After the crash of flight MH17, there was astonishment on international level at the fact that Malaysia Airlines and other airlines were flying over the eastern part of Ukraine while there was an armed conflict going on in that region. The airspace above the conflict area was open to civil air traffic from a certain altitude. Because the Dutch Safety Board shared in this amazement, on 18 July 2014 it decided to initiate an investigation into the decision-making related to flight routes over conflict areas. After the Dutch Safety Board had taken charge of the international investigation from its sister organisation in Ukraine on 23 July 2014, the question of how and why it was decided that flight MH17 would fly this route became more central in the investigation.

The purpose of the investigation into the flight route was to find out what Ukraine’s considerations were regarding airspace management and why Malaysia Airlines used this route to fly to Kuala Lumpur. The findings of the investigation into the decision-making related to flight routes over conflict areas were used to put the results of the investigation into the specific route followed by MH17 on 17 July 2014 into an internationally comparative perspective.

The points for improvement that emerged from the investigation into the decision-making related to the route of MH17 also appeared to apply to the decision-making related to flight routes over conflict areas. The recommendations for improving the process of decision-making regarding flight routes which were formulated on the basis of the investigation findings therefore have a broad foundation. This is why the recommendations are addressed not only to the airline that operated this specific flight, but also extend to the international aviation sector as a whole.

The following questions were key in the investigation:

1. How and why were decisions made to use MH17’s flight route?
2. How is the decision-making process related to flight routes over conflict areas generally organised?
3. What lessons can be learned from the investigation to improve flight safety and security?
4.2 Data collection

1. How and why were decisions made to use MH17’s flight route?
To answer this question, information was gathered about the management of the airspace above the eastern part of Ukraine, the choice for MH17’s flight route, signs of possible reduced safety regarding the use of the airspace, the choices made by other airlines whether or not to fly over the eastern part of Ukraine prior to 17 July 2014 and the role of the Netherlands and other states.

Management of airspace above the eastern part of Ukraine
It was up to the Ukrainian authorities to decide whether and, if so, under which restrictions the airspace was open to civil aviation. To find out which decisions were taken regarding the use of the airspace, all relevant Notices to Airmen (NOTAMs) that had been published were studied. Interviews were also conducted with the air traffic control services and the civil aviation authority of Ukraine and additionally they were asked written questions. In order to put the decision-making pertaining to the Ukrainian airspace into perspective, information was collected on airspace management in ten other countries where armed conflict is ongoing.¹⁸

Route of flight MH17
For the reconstruction of the flight, the Dutch Safety Board used information from the pre-flight briefing for flight MH17, air traffic control information and radar data from Ukraine. To investigate what Malaysia Airlines knew about the safety situation in the eastern part of Ukraine, how it assessed potential risks and what constituted the basis for the decision to fly the route of flight MH17, interviews were held with various Malaysia Airlines officials involved in safe flight operation. In addition documents were consulted and written questions were asked. Despite many attempts using various channels, the Dutch Safety Board did not succeed in acquiring information from the Malaysian authorities.

Signals of reduced safety of the airspace
In order to determine if there had been signals that indicated risks for civil aviation overflying the eastern part of Ukraine, an inventory was taken as to what information was available from public and non-public sources regarding the situation in the eastern part of Ukraine during the period between 1 March and 17 July 2014. The key question was whether there had been events or developments (prior to the crash) that states or airlines could have interpreted as signals of a possible decrease in the safety of the airspace above the area.

The Dutch Safety Board requested the Hague Centre for Strategic Studies (HCSS), to compile an inventory of threat and security information available in public sources in the period prior to the crash.¹⁹ The central question was which hypothetical risks could have been identified ex ante on the basis of this public information; that is to say, without

¹⁸ Northern Mali, South Sudan, Libya, Syria, Iraq, Sinai (Egypt), Afghanistan, Somalia, Yemen en the Democratic Republic of the Congo.
¹⁹ The HCSS investigation team consisted of Western European, Ukrainian and Russian analysts from various professional (civil and military) disciplines. HCSS was neither involved nor aware of the technical investigation into the causes of the crash as performed by the Dutch Safety Board in any way whatsoever.
hindsight. HCSS consulted primary sources (such as public sector information and NOTAMs) and secondary sources (such as media reports). These sources were categorised on the basis of reliability. The Dutch Safety Board used the information provided by HCSS as source material. Only the most reliable information was used for this.

The Dutch Safety Board also consulted non-public sources, whether or not not classified (see Section 7.5). This mainly concerned sources from the Dutch diplomatic services in Ukraine. Much of this information came from or was shared during closed briefings, which were used by - mostly Western - diplomats and military attachés to discuss the political and military developments in and around the conflict area.

Other airlines overflying the eastern part of Ukraine
Immediately after the crash of flight MH17, it was reported in the media that some airlines had already decided not to fly over the eastern part of Ukraine because of the threat in the area. The Dutch Safety Board held interviews with EUROCONTROL and requested data about flights operated in the airspace above the eastern part of Ukraine from January 2014 to July 2014 (winter and summer flight schedules). From the information it was deduced which airlines had flown over the area, although it should be noted that this concerned the airlines under whose flight number the flight was registered and to whom the route charges were billed. These are not necessarily the airlines that actually operated the flights and chose the flight route.

To obtain information from multiple sources, various airlines in countries outside the Netherlands were questioned about overflying the conflict area in the eastern part of Ukraine. By means of a survey, participated in by nineteen airlines, they were asked to indicate whether they had flown over the conflict area prior to the crash of flight MH17 and what the considerations were to fly or not fly there (any longer). The Dutch Safety Board approached the airlines through its sister organisations in the relevant countries. In addition, the Dutch Safety Board obtained background information on this subject from three more airlines.

Role of the Netherlands in flight MH17
Soon after the crash of flight MH17, the question arose in the Netherlands whether the Dutch government could have done anything to prevent Malaysia Airlines from flying over the eastern part of Ukraine. Initially there was the idea, also with the Dutch Safety Board, that the Dutch State had a role in the provision of information and advice as to the choice for the route of flight MH17. It quickly became apparent from the investigation that, with regard to this matter, the country of departure - in this case the Netherlands - bears no responsibilities with regard to the foreign-based airline, Malaysia Airlines. Nevertheless, the Dutch Safety Board wanted to further investigate the subject and to include it in the investigation report, as it was conceivable that the Netherlands could have exerted some influence.

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20 Within Europe, EUROCONTROL on behalf of its member states calculates the charges for using the airspace and invoices them to the respective airlines that made use of that airspace.
Moreover, the discussion about this in Dutch society continued, partially because in January 2015 the media reported that prior to the crash of flight MH17 the Dutch government was aware of the downing of a military aeroplane in the eastern part of Ukraine that had possibly been shot down by an anti-aircraft system that was able to reach high altitudes. The reports suggested that the Dutch government should have issued a warning. Questions were asked about this in the House of Representatives of the Dutch Parliament.\(^{21}\)

The Dutch Safety Board used internal documents of the National Coordinator for Security and Counterterrorism (NCTV), the National Crisis Centre (NCC) (including the Ministerial Crisis Management Committee) and communications between the Dutch embassy in Kyiv and the Ministries of Foreign Affairs and of Defence, to investigate what information was available to these bodies about the conflict area in the eastern part of Ukraine and what possible threats for civil aviation were identified. To that end, interviews were held with staff members of the Dutch embassy in Kyiv. To obtain insight into the responsibilities and procedures of the Dutch government, interviews were held with staff members of the Dutch Ministries of Infrastructure and the Environment, of Security and Justice, of Defence and of Foreign Affairs.

To determine what the Dutch intelligence and security services (AIVD and MIVD) knew about the risks of overflying the conflict area and the extent to which they shared any information with the relevant parties, the Dutch Review Committee on the Intelligence and Security Services (CTIVD) was requested to map this for the Dutch Safety Board.\(^{22}\) At the request of the Dutch Safety Board, the Ministers of the Interior and Kingdom Relations and of Defence commissioned the CTIVD to do so. The Dutch Safety Board could not carry out this part of the investigation itself, because access was needed to confidential (classified) information of the intelligence services. A more detailed explanation is included in Section 7.5.

The Dutch Safety Board also organised a meeting with aviation law specialists regarding the judicial possibilities for the Dutch government to impose restrictions on Dutch airlines in the use of a foreign airspace.

2. How is the decision-making process related to flight routes over conflict zones generally organised?

To get an idea of the decision-making practice in the aviation sector, the Dutch Safety Board carried out a comparative investigation among thirteen airlines in different countries. The selection accounted for geographical spread and the size of the countries and the airlines. The Dutch Safety Board submitted written questions to the selected airlines about how they, and possibly their national authorities, generally made decisions about flight routes, particularly those over conflict areas.

\(^{21}\) See, for example, Parliamentary documents II, 2014/2015, 33997, No. 36.

\(^{22}\) The Intelligence and Security Services Act 2002 (Wiv 2002) defines the task of the CTIVD. The CTIVD monitors the legality of the AIVD’s and the MIVD’s operations. The investigation questions that the Dutch Safety Board submitted to the CTIVD were not directly subject to this, but the investigation was carried out with due observance of the Wiv 2002. The CTIVD has far-reaching powers for the execution of its legal task, has access to all relevant information of the AIVD and the MIVD and may interrogate all staff members of these services.
The investigation focused on the structure of the decision-making process related to the safety of flight routes in different states, the role of the national authorities and the airlines and the ways both parties interact. For this part of the investigation the Dutch Safety Board was assisted by sister organisations in six countries. In all of the countries taking part, the sister organisations on behalf of the Dutch Safety Board held interviews with airlines and, in some countries, with the national authorities as well.

With some airlines, participant observations were conducted with the objective of acquiring a realistic picture of the practice. This meant that the investigators observed the decision-making related to flight routes from behind the scenes in order to get an inside view. This investigation focused on how processes of gathering and sharing information, analyses of threats, risk assessment and decision-making are carried out in practice, what mechanisms and considerations play a role in the decision-making regarding the safety of flight routes and how these processes deal with statistically improbable scenarios.

For the interviews and participant observations, the sister organisations used an investigation protocol set up by the Dutch Safety Board. They recorded their findings in a report that was made available to the Dutch Safety Board for use as source material.

The airlines and authorities cooperated in this part of the investigation on a voluntary basis and in anonymity. The results were incorporated into the investigation report anonymously (untraceable to the specific airline). The Dutch Safety Board chose to use this approach in order to increase the willingness of parties to take part in the investigation, with the objective of reaching as many safety benefits as possible.

### 4.3 Analysis and assessment

The Dutch Safety Board considered it relevant to analyse the actions of parties from the context in which those actions occurred. To that end a comparison was made, where possible, of what other parties did in the same situation or similar situations. The decision by Ukraine to keep the airspace open to civil air traffic above a certain altitude, was put into perspective by comparing it to the airspace management in other areas of armed conflict. The decision by Malaysia Airlines to fly over the eastern part of Ukraine was compared to the choices that other airlines and states made pertaining to this issue. The decision-making related to the route of flight MH17 was also compared to the common practice of decision-making in the aviation sector (processes and patterns) with regard to overflying conflict areas.

The Dutch Safety Board sought to explain the decisions that parties made with regard to the airspace and the route of flight MH17 from several perspectives. For each of these decisions, the investigators mapped as many arguments ‘for’ and ‘against’ as possible. This helped the investigators to form a picture as objective as possible of the considerations on which the decisions were based, disregarding today’s knowledge. The objective was to prevent findings from being assessed with hindsight bias or with prejudice.
To analyse the facts gathered, the general principles of multiple methodologies were used, including a time-line analysis and the Systems Theoretic Accident Model and Process (STAMP; see Appendix K for an explanation of various analysis techniques). The former was applied to place the factual findings in sequential order and using that as a basis for establishing links. Using STAMP it was made clear which parties were involved in the management of the airspace above the eastern part of Ukraine and in determining the route of flight MH17, what role these parties had in this and what their mutual interaction was. This gave an insight into the possibilities of the various parties to influence the process regarding the management of an airspace or determining a flight route.

The investigation findings were compared to a frame of reference that for this particular investigation was based on laws and regulations and best practices on the one hand and on the Dutch Safety Board’s view on managing safety risks as effectively as practically possible on the other. The general principles of the frame of reference in this case were derived from safety science and involve risk inventory and risk assessment, the presence of checks and balances and coping with uncertainty. The Dutch Safety Board included the aspect that passengers are completely dependent on third parties for the safety of the route of their flight.
5 CRASH: THE OCCUPANTS

5.1 Design of the investigation

After the crash of flight MH17, some relatives wanted to know what the occupants of the aeroplane consciously may have experienced during the crash. This question and thoughts about it became even more poignant in the (social) media after the speech by the Dutch Minister of Foreign Affairs in the Security Council of the United Nations on 19 September 2014.

For the investigation into the causes of the crash, the Dutch Safety Board had already considered the victims’ injuries, medical and pathological information and survival aspects, as required by the Appendix of Annex 13 to the Chicago Convention. On the basis of consultations with several technical specialists and experts in the field of psychological trauma and grief counselling the Dutch Safety Board concluded that a further investigation could be meaningful.

After the Dutch Safety Board had decided to investigate the experience of the occupants, a separate investigation team was compiled. This investigation team consisted of (medical) experts who were especially recruited by the Dutch Safety Board for this investigation.

At the advice of specialists and experts in the field of psychological trauma and grief counselling, an objective was added to the investigation: describing the way in which the recovery and transfer of the human remains to the Netherlands took place. The experts advised the Dutch Safety Board to include this topic in the investigation because of the different reports circulating about how the human remains of the victims in Ukraine were handled shortly after the crash. The Dutch Safety Board followed this advice.

The following questions were key in the investigation:

1. To which circumstances were the occupants exposed during the crash and what influence did they have on the body, the conscious awareness and perception?
2. What steps occurred in the recovery and the transport of the human remains to the Netherlands?

Reporting

The Dutch Safety Board incorporated the conclusions of the investigation into the occupants’ conscious awareness and the handling of the human remains in the investigation report about the crash. Extensive research was necessary to draw conclusions related to the occupants’ awareness, because little information was available on the subject. However, the final conclusions that could be made were too limited to include the findings in a separate report.
It turned out to be impossible to provide certainty with regard to awareness and perception of the occupants. This means that the Board has drawn conclusions on a few points with a probability bordering on certainty, yet cannot offer 100% certainty. Secondly, it is important to note that, as mentioned, the report does not make a statement about individual occupants because the necessary information is lacking.

5.2 Data collection

In order to answer the investigation questions as well as possible, an investigation was conducted into (1) the circumstances to which the occupants were exposed, (2) injuries, and (3) the human reactions to acute stress. Additionally, information was gathered about the recovery of the human remains of the victims. Below is a brief look at the information that was gathered for the various parts of the investigation.

Exposure
To describe the conditions to which the occupants were exposed, results were used from the investigation into the causes of the crash, the reconstruction of the aeroplane and the description of the failure dynamics of the aeroplane. For this part of the investigation, the expertise of the Royal Netherlands Air Force (Centre for Man and Aviation) and the Netherlands Organization for Applied Scientific Research (TNO) was used. On the basis of the sequence of events as from the moment that the aeroplane was hit, they determined what factors the occupants were exposed to during the crash of flight MH17. Use was made of (international) scientific literature and the knowledge and experience of the experts involved. Scientific knowledge about the effect of various exposure factors was derived from research done under controlled test conditions. The results of the investigations into previous aeroplane disasters were also included in the investigation, including Pan Am flight 103 (Lockerbie, 1988), United Airlines flight 811 (Honolulu, 1989) and Trans World Airlines flight 800 (Atlantic Ocean, 1996).

Investigation into injuries
In studying and analysing the injuries of the victims, photographs of the human remains of the victims (made for the purposes of identification), the CT scans of the victims and the NFI reports (made for the purpose of the forensic investigation) were used. With the aid of these data about the victims, the physical consequences of the crash were mapped as best as possible. Forensic radiologists from Maastricht University Hospital (azM) were commissioned by the Dutch Public Prosecution Service to describe the injuries found. This information was made available to the Dutch Safety Board.

Knowledge of human reaction to acute stress
In order to gain insight into the possible experiences of the occupants, physiological knowledge as well as knowledge about human reactions to acute stress and psychological

trauma was gathered. For this part of the investigation, use was made of the expertise of the Military Mental Health Research Centre (Onderzoekscentrum Militaire Geestelijke Gezondheidszorg), the Arq Psychological Trauma Expert Group (Arq Psychotrauma Expert Groep) and the department of Clinical and Health Psychology (Klinische en Gezondheidspsychologie) of Utrecht University. They also made use of scientific research into physiological and psychological reactions to the exposure factors that may occur in a crash such as this one.

Interviews about the recovery of the human remains
For the investigation into the recovery of the human remains, interviews were conducted with professionals who had played a role in the recovery and transport of the human remains from Ukraine to the Netherlands. Due to circumstances it proved impossible to speak with those involved locally about the recovery of human remains and the transport of human remains to the Netherlands (State Emergency Services, local emergency services and the mortuary in Donetsk). The Dutch Safety Board did speak with those involved from the International Red Cross in Ukraine. It also spoke with Dutch citizens who worked side by side with the local people. The Dutch Safety Board also made use of the knowledge of its own staff members who were stationed in Ukraine.

5.3 Analysis and assessment
It was not possible to be certain as to what exactly happened on board the aeroplane. Nor was it possible to know exactly where the individual passengers were in the cabin during the crash: people could have been walking around, they could sit on exchanged seats or been visiting the lavatory. The analyses that led to the answering of the investigation questions are explained below.

What circumstances were the occupants exposed to during the crash and what was the influence on the body, the conscious awareness and perception?
For analysing the effect on the body, the expertise of a pathologist, two trauma surgeons (Erasmus University Medical Center Rotterdam and University Medical Center Groningen) and a specialist in cardiovascular physiology was called upon (Academic Medical Center in Amsterdam). They looked at the nature of the injury patterns in combination with the various factors to which the occupants were exposed.

In order to gain insight into the consequences for the awareness and the perception, in their analysis experts combined the information about the exposure factors with the gathered scientific knowledge about physiological and psychological reactions to acute stress. The findings from this analysis were submitted to a wider circle of experts for further interpretation. With the aid of their comments, a conclusion was drawn with regard to what the occupants may have experienced of the crash. The literature consulted is included in the report.

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24 This person, who had been involved in the past in the investigation of aviation accidents from within the NFI, contributed to the investigation in a private capacity.
What steps occurred in the recovery and the transport of the human remains? This investigation question was answered with the aid of the information acquired from interviews.
6 PASSENGER INFORMATION

6.1 Design of the investigation

After the crash of flight MH17, it became apparent that not all the information needed to provide the relatives of the Dutch passengers with confirmation of the presence of their loved ones on board the aeroplane was immediately available. The expectation was that - with today’s technology - it should be possible to retrieve all the information that passengers provide before they board the aeroplane from the computer systems at a single push of a button. This appeared not to be the case. It took two to four days before the Dutch authorities informed one or more of the relatives of all Dutch victims that their loved ones had been on the flight.

The observation that passenger information was not available immediately prompted the Dutch Safety Board to conduct an investigation into how passenger information was collected and verified to formally confirm the presence of Dutch passengers on board flight MH17. In deciding to launch an investigation into this matter, the Dutch Safety Board included bottlenecks encountered earlier pertaining to the availability of passenger information, such as after the crash of a Turkish Airlines aeroplane in Haarlemmermeer in 2009.

The investigation into the availability of passenger information concerned the situation in the Netherlands in the days following the crash. This, however, does not exclude other countries from learning from the results of this investigation. As a matter of fact, all relatives of victims of aviation accidents want to know as quickly as possible whether their loved ones were on board the aeroplane. Experience shows that, in many aviation accidents, a complete and reliable passenger list is not available immediately after the accident. The results of the investigation into passenger information can help authorities of other countries to assess, and, where necessary, improve their preparations for informing relatives about the fate of their loved ones. The report also shows the common international interest in expanding the information in passenger lists.

In the investigation into the passenger information of flight MH17 the following questions were key:

1. Why did it take two to four days before relatives of Dutch victims of the crash of flight MH17 received confirmation from the authorities that their loved ones were on board the flight?
2. Are there measures which could accelerate this process in future?
These questions were divided into the following sub-questions:

1. What passenger information did the airline have available? How can it be explained that the required information concerning the passengers of flight MH17 could not be generated immediately by the systems?

2. What steps were taken between the crash of flight MH17 on 17 July 2014 and the authorities’ informing relatives of Dutch passengers? How can it be explained that this took two to four days?

The objective of this investigation by the Dutch Safety Board was to draw lessons to ensure that relatives are informed as soon as possible in future.

The investigation focused on the period from the moment when information about the passengers of flight MH17 was registered (that is the moment when flight MH17 was booked) up to the moment when the relatives of the Dutch victims received confirmation from the authorities that their loved ones were on board the aeroplane. It was not investigated whether or to what extent underlying ICT systems for the processing of the various streams of passenger information were interconnected.

With regard to collecting passenger information after the crash and informing the relatives, the investigation focused on the steps taken by Malaysia Airlines and Dutch public and private parties. The Dutch Safety Board has not investigated how information was provided to the relatives in the other countries having suffered fatalities, as it was not feasible to carry out a detailed investigation into the functioning of the crisis organisations in those other countries. The functioning of the Dutch crisis management organisation after the crash of flight MH17 was only investigated insofar relevant for the initial contact the authorities made with the relatives to let them know formally that their loved ones were on the aeroplane.

6.2 Data collection

In order to be able to answer the investigation questions, it was necessary to understand what happens with the information that passengers provide from the moment they book a flight up until the moment they board the aeroplane. Insight into this registration process was required to ascertain what information could be provided by the airline to the authorities immediately following an accident or disaster. Next, the actions the parties involved had to take after the crash of flight MH17 so that the Dutch authorities could confirm to the relatives that their loved ones were on board the aeroplane, were relevant. Finally, to see what could be learned from this disaster, the Dutch Safety Board wanted to get an idea of how the relatives of the victims had perceived the provision of information.

In order to understand the involvement of various parties, their tasks and responsibilities and the activities they undertook, various sources of information were consulted. These information sources are explained below.
Registration of passenger information prior to the flight

In order to catalogue the compilation of the passenger list of flight MH17 and the influence this process had on the availability of passenger information after the crash, the Dutch Safety Board used various methods to gather information about the information flows from booking to departure.

The Dutch Safety Board requested and examined internal documents from parties involved, such as Malaysia Airlines and Amsterdam Airport Schiphol. In addition, the Dutch Safety Board conducted interviews with staff members of relevant parties including Malaysia Airlines (both in the Netherlands and in Malaysia), a travel agency, a tour operator, an online travel agency, a Dutch travel association, a ground handling agent, other airlines and authorities involved (such as the Royal Netherlands Marechaussee). Written questions were submitted to a developer and administrator of the computer systems that are used for reservation, preparation and handling of the flight. Finally, the Dutch Safety Board made working visits to airlines to see how passenger data is registered in practice.

In order to increase the willingness of the parties who were not involved with flight MH17 to cooperate with the investigation, the findings of the investigation were processed in the report anonymously. In this way, they cannot be traced back to the parties with whom the Dutch Safety Board spoke in the context of the investigation. The Dutch Safety Board opted to do so in this case for the purpose of achieving maximum safety gains.

Gathering and verifying passenger information after the crash

The Dutch Safety Board investigated what actions parties undertook after the crash in order to confirm to the relatives of the victims of flight MH17 that their loved ones were on the aeroplane and to what extent these parties were prepared for this. The Dutch Safety Board requested and examined internal documents from the parties involved (such as log books and minutes of meetings, manuals and crisis and emergency plans, whether or not in draft form), namely the Ministry of Security and Justice (the National Crisis Centre), the Ministry of Foreign Affairs, the Ministry of Defence (Royal Netherlands Marechaussee), the Kenneremerland Safety Region, the Municipality of Haarlemmermeer and Malaysia Airlines.

The Dutch Safety Board conducted interviews with staff members of parties involved, including the Municipality of Haarlemmermeer, the Kenneremerland Safety Region, the Ministry of Security and Justice, the Ministry of Foreign Affairs, the Ministry of Defence (Royal Netherlands Marechaussee) and the National Police (LTFO). The Dutch Safety Board also spoke with staff members of the Eurocross emergency centre, of embassies and of Malaysia Airlines (in the Netherlands and Malaysia).

During the investigation it proved impossible to examine all of the communication of all parties involved. Many parties shared information and made agreements with one another and discussed matters, using various means of communication (for example, telephone, e-mail or WhatsApp). Not all of these communications were recorded or requested. However, the information available to the Dutch Safety Board provided a clear picture of the parties who were in contact with each other, whether, how and when they shared information or made agreements, what information or agreements it concerned and when this all took place. This picture was confirmed in interviews with various parties involved.
Relatives’ perceptions
The Dutch Safety Board thought it of added value to gain an insight into how the relatives perceived the provision of information about the fate of their loved ones in the initial days after the crash. The Dutch Safety Board was also interested in their expectations and desires in that respect, partly with a view to lessons to be learnt. The relatives could sign up for an individual meeting or group meeting via the closed section of the internet forum for the relatives. In total, the Dutch Safety Board spoke with more than twenty relatives of Dutch victims about their attempts to obtain information about their loved ones in the initial days after the crash, the information they actually received during those first few days (from whom and when) and how they perceived the provision of information. The Dutch Safety Board analysed this information and took it into account in determining and formulating suggestions for improvement of the process of informing relatives of victims.

6.3 Analysis and assessment

In order to be able to analyse the data for this investigation, the Dutch Safety Board used various methods of analysis.

First, a time-line analysis (STEP; see Appendix K) was used to map the chronology of the various events, using information from documents, interviews and public sources.

After collecting the initial information from the most important parties involved, the investigation team drew up a conceptual model describing the phases of the information process (from the moment of booking a flight to the moment of informing the relatives), which parties were involved in this and how these parties related to each other. Based on this conceptual model, the investigation questions were supplemented with more detailed questions for the different parties involved in the process. The model was also used to determine which parties still needed to be approached and to provide an overview of the sequential phases in the provision of information.

Using the Systems Theoretic Accident Model and Process (STAMP; see Appendix K), gained insight into the interaction between parties, particularly regarding the information flows between the different parties involved and the opportunities those parties had to influence the process.

The Dutch Safety Board assessed the findings of this investigation into passenger information pertaining to flight MH17 against a frame of reference. This frame of reference comprised regulations and guidelines on the one hand, and the Dutch Safety Board's own frame of reference on the other. The latter pertains to the assessment by the Dutch Safety Board of what can be expected from the parties involved in addition to legislative provisions.
This chapter discusses the circumstances that made the investigation into the crash of flight MH17 exceptional. It concerns matters that require further explanation. This chapter has been written from the Dutch Safety Board’s perspective and focuses on the Dutch Safety Board’s investigation and therefore does not describe activities by other parties involved.

7.1 Visiting the wreckage area and recovery of the wreckage

7.1.1 The first weeks after the crash
When a civil aviation accident occurs, the aviation investigators usually visit the wreckage area as quickly as possible. During the first few days after the crash, the National Bureau of Air Accidents Investigation of Ukraine (NBAAI) was in charge of the investigation. The formal delegation of the investigation to the Dutch Safety Board took place on 23 July. Many efforts made during the initial period following the delegation focused on enabling the Dutch investigators in Ukraine to visit the crash site, so that they could examine the wreckage at the scene. There was no guarantee that it would be possible to safely conduct a (comprehensive) examination of the wreckage area in the short or long term due to the unstable safety situation. As long as the wreckage sites in the area could not be accessed in safety, the investigators worked on collecting and analysing as much other evidence as possible.

The safety situation in the wreckage area
Although Ukrainian aviation accident investigators (19-21 July), Malaysian investigators (22-24 July) and observers from the OSCE briefly accessed the wreckage area and took photographs, it was not possible to carry out an extensive investigation at the scene of the crash during the initial period after the crash of flight MH17.

Visiting the wreckage area was risky because there was regular fighting in and around the area. The Dutch Safety Board as an investigative body is not equipped for investigation in conflict areas and was dependent on the support of other parties for the investigators’ safety on site. New developments were closely followed and information about the local situation was obtained. A Dutch Safety Board delegation was stationed at the Dutch embassy in Kyiv. At the embassy, information from the NCTV, the OSCE, the embassy and the Dutch Intelligence Services was assessed at least once a day to see whether the situation was safe enough for the investigators to visit the site. The NCTV ultimately decided whether the situation was safe enough. The investigation bodies of other involved states made their own decisions about the way in which they would operate and how to manage their safety.

Investigators of the Dutch Safety Board joined a large-scale mission to transfer the human remains and personal belongings of the victims to the Netherlands. As soon as the wreckage area could be visited, the recovery of human remains and personal belongings
was given priority. Examining the wreckage was of secondary importance. The Dutch Safety Board received signals that entering the area could be dangerous, particularly to those taking part in the investigation.

The aviation investigators from various countries, including the Netherlands, were staying in the Ukrainian towns of Kharkiv and Soledar, ready to travel to the wreckage area as soon as the situation allowed. However, during this initial period they could not obtain access to conduct an investigation on site. While waiting for an opportunity to conduct an investigation on site, the investigators of the international team performed other investigation activities. A great deal of factual investigation data (flight recorders, air traffic control data, photographs of the wreckage site, et cetera) was collected and subsequently compared and analysed.

On 6 August 2014, the Dutch Prime Minister announced that the situation in Ukraine was too unsafe and that the mission would be aborted. Due to the worsening safety situation and the decision by the Dutch cabinet to pull out of the wreckage area, the Dutch investigators also returned to the Netherlands several days later.

The Dutch Safety Board was still represented by a liaison at the Dutch embassy in Kyiv because of the work agreements that had to be made with all parties involved.

7.1.2 Recovery missions
Flight MH17 crashed near the villages of Rozsypne, Petropavlivka and Hrabove in Ukraine. The wreckage of the aeroplane was spread over a large area that spanned a total of approximately 50 km². This area comprised six sites where most of the pieces of wreckage came down.

First recovery mission: November 2014
After the human remains had been transported to the Netherlands and after the return of the investigation teams in August, the wreckage remained in the area unguarded. The Dutch Safety Board made a new attempt to reach the wreckage area and to recover the wreckage in the beginning of October 2014. Ultimately this became a mission during which there was a further search for human remains and personal belongings while pieces of the wreckage were recovered at the same time. During this mission, the Dutch Safety Board was assisted by Dutch authorities - namely the Ministry of Defence, the National Police, the Ministry of Foreign Affairs and the NCTV - all participating in the search for human remains and personal belongings. Compared to the situation in the summer of 2014, the front line where the fighting was taking place had stabilised. During the summer there was fighting in the wreckage area, in November the fighting had moved, though it was still close to the wreckage area.

On 4 November 2014, a Dutch Safety Board investigator travelled to the wreckage area to make preparations for the first recovery mission. The Dutch Safety Board was in charge of recovering the wreckage pieces. The recovery mission lasted from 4 to 22 November 2014. The actual recovery took place from Sunday 16 November up to and including Friday 21 November 2014, during which period two Dutch Safety Board investigators were present in the crash area.
In order to facilitate the recovery mission, the Dutch Safety Board conducted consultations with a representative of the Ministry of Emergency Services from the Donetsk Region Administration to ensure that the investigators could perform their work at the wreckage area without obstruction. It was agreed that this representative would hand over the pieces of wreckage to the Dutch Safety Board, being the leader of the internationally authorised investigation team. It was also agreed that all states represented in the investigation team would be enabled to participate in the investigation into the wreckage in the Netherlands (see Appendix G). The formalisation of the agreements took place through the mediation by the OSCE, which did justice to the Dutch opinions in this matter.

Efforts were also made to build mutual trust at local level so that the work at the crash site could be performed in relative safety. To this end a special request was issued (see Appendix H). The Dutch Safety Board’s investigators were afforded the protection of the Dutch Ministry of Defence. The Dutch Safety Board received help from the OSCE, the SES (State Emergency Services of Ukraine) and other local authorities. The local police provided escorts for the visits to the wreckage area.

Even though a lot of relevant information that could be used to investigate the causes of the crash (such as photographs, flight recorders), had already been collected during the period prior to the recovery missions, the wreckage was of great value to the investigation. It was necessary to examine the wreckage to be able to draw solidly supported conclusions about the causes of the crash. After recovering the pieces of wreckage, all the international parties involved could view and study these for themselves and together discuss the findings undisturbed (in progress meetings). The substantive contribution of the wreckage pieces to the investigation is described in Chapter 3. Finally, the wreckage pieces were needed to explain clearly to the outside world what happened to flight MH17.

**Choices made at the wreckage sites**
The safety situation was still unstable when the investigators obtained access to the wreckage area. The people taking part in the recovery mission performed their work very close to the area where fighting still was going on. During the first recovery mission (November 2014), the front line ran through the north-western part of the wreckage area and therefore the Dutch Safety Board was unable to access this part during this first mission (later, in the spring of 2015, they were able to do so). Other supplemental safety measures were also necessary: it was required to wear bulletproof vests and travelling and working was restricted to daylight hours. There was the risk that the activities could be called off at any time. These circumstances had an impact on the choices that were made on site. The situation created the pressure of transporting important pieces of wreckage that had been recovered to a safe place as quickly as possible.

Normally, in the event of an accident investigation, the initial investigation is carried out at the crash site before the wreckage and components are confiscated by the investigators. This often involves mapping out the situation at the crash site by, for instance, taking photographs. Given the unstable safety situation when visiting the wreckage area in the eastern part of Ukraine, the priority was to recover the most relevant pieces of wreckage. Extensive investigation activities at the site would have been of limited added value because the pieces of wreckage had been lying unguarded in the intermediate period. The situation no longer resembled that of shortly after the crash.
Using the photographs taken directly after the crash the investigators had already been able to gain an impression of what they would find in the wreckage area and at which location. Prior to the recovery mission, a list was compiled with the pieces of wreckage that would have priority during the recovery (see Appendix I). Anything else that could be recovered in the time available at the wreckage site concerned, was also taken. During this mission it was not possible to collect all the pieces of wreckage on the priority list, among others due to the fact that not all six wreckage sites in the area were accessible. It also turned out that certain pieces of wreckage were no longer present at the expected location (as earlier documented in the photographs).\(^{25}\)

**Registration and transportation of wreckage during the first recovery mission**

On site the pieces of wreckage of the aeroplane were fitted with a label, photographed and registered in a database. When the pieces were transferred at the various sites, they were inspected with use of this registration.

The pieces of wreckage were first transported by truck to a train station near the town Torez. From there, the pieces were transported in twelve train wagons to Kharkiv, Ukraine, under the supervision of the Dutch Safety Board and the Dutch Ministry of Defence. Parts of the tail of the aeroplane were transported to Kharkiv using two trucks. Once in Kharkiv, the pieces of wreckage to be transported to the Netherlands were transferred from the twelve train wagons and the two trucks onto sixteen trucks. The first convoy left Kharkiv on 6 December 2014 and arrived in Gilze-Rijen on 9 December 2014. The final convoy left on 8 December and arrived in Gilze-Rijen on 12 December.

During the first recovery mission, the Dutch Safety Board concluded an agreement with the Minister of Emergency Services of the Donetsk Region Administration, requesting the Minister’s assistance with regard to the removal of the remaining pieces of wreckage when the Netherlands ended its first recovery mission (see Appendix J). It was also agreed that these remaining pieces of wreckage could be recovered without any Dutch Safety Board representatives being present.

**Second and third recovery missions**

In the spring of 2015, the situation at the wreckage area was more stable. The front line had shifted compared to the situation in November and winter was over, making it easier to physically reach the wreckage area and carry out recovery activities. It was also easier to obtain access to the area and work there because of the contact with local support workers and authorities during the first mission.

From 4 to 7 February 2015, an investigator from the Dutch Safety Board inspected the pieces of wreckage that were stored in containers under the supervision of the Minister of Emergency Services of the Donetsk Region Administration. The investigator was able to join the ongoing repatriation mission conducted by the Dutch National Forensic Investigation Team (LTFO). Subsequently recovery missions were carried out from 20 to 28 March 2015 and from 19 April to 2 May 2015. The latter mission was an LTFO mission.

\(^{25}\) A list of the pieces of the wreckage that were not found is included in the investigation report of the crash of flight MH17.
to excavate the area, which the Dutch Safety Board joined. During this period, the pieces of wreckage from the second mission already stored in Kharkiv were transported to the Netherlands. More pieces of wreckage were recovered in the region and brought to Kharkiv by truck. Lastly, during the third mission, house visits were made in the villages surrounding the wreckage site to collect more pieces of wreckage.

While the recovery mission in November 2014 focused mainly on recovering as many relevant pieces as quickly as possible and securing them, the missions in spring focused on recovering everything the investigators could lay their hands on. During the final mission, the north-western part of the wreckage area was also accessible. The Dutch Safety Board hoped to find the upper section of the cockpit there. Photos and satellite images had shown earlier that it was located in this area but, upon arrival in the area, it appeared it was no longer there. Eight more containers of wreckage were recovered during the second and third recovery missions in spring. The containers held various parts of the outside of the aeroplane, parts of the inside of the aeroplane and a large quantity of mostly small, burnt parts. The eight containers were transported to the Netherlands at the end of the third mission.

After the recovery activities had finished, the Dutch Safety Board had sufficient aeroplane wreckage at its disposal to be able to reliably establish the causes of the crash and to perform a physical reconstruction of a relevant part of the aeroplane.

**Cooperation with other authorities**

During the recovery missions the Dutch Safety Board worked in close cooperation with other Dutch authorities. This was done for security reasons and because the missions for recovering human remains, personal belongings and wreckage pieces were combined. That is why the Dutch Safety Board joined the operational meetings concerning the missions for as long as deemed necessary to carry out the recovery work. These meetings were organised by the Dutch Ministry of Defence and were attended by the Dutch authorities that took part in the recovery missions, namely the Ministry of Defence, the Royal Netherlands Marechaussee, the National Police, the Ministry of Foreign Affairs, the MIVD, the AIVD and the NCTV. For the purpose of coordinating the activities there were also bilateral consultations between the Dutch Safety Board and the involved public bodies.

**7.1.3 Reliability of the material at the wreckage area**

**Wreckage pieces**

The material that was found at the wreckage sites was not unscathed. The wreckage had been lying at the wreckage sites unguarded for several months and was prone to being damaged, altered or removed. The wreckage was partially affected by weather and by the handling that was necessary during the first few weeks to recover the human remains and personal belongings. The latter in some cases required moving pieces of wreckage. Furthermore, there had been repeated fighting in the area, which could also have had repercussions on the state of the wreckage when it was recovered.

The wreckage was still valuable to the investigation, even though it had been exposed to the conditions mentioned above. It was possible to verify the reliability of the wreckage for the investigation and the damage to the wreckage caused by the crash using
photographs that were taken at the wreckage area shortly after the crash. Sufficient reliable photographic material was available for this purpose. Only photographs were used in this process from official authorities and of which the moment and location that they were taken could be established. As described earlier, experts were able to distinguish the damage to the wreckage that was caused in the air or by the impact on the ground from damage caused at a later stage.

Flight recorders
On 22 July 2014, a Malaysian official in Kyiv handed over the flight recorders from flight MH17 to the Dutch Safety Board. The recorders had not been recovered by investigators, but by unknown individuals. Immediately after the handover the recorders were transported by aeroplane to the laboratory of the Air Accidents Investigation Branch (AAIB) at Farnborough in the United Kingdom, accompanied by an international team comprising aviation safety experts from the following states or organisations: Germany, France, the Interstate Aviation Committee, Malaysia, the Netherlands, Ukraine, United Kingdom, United States of America, an observer of ICAO and the Dutch police.

Both recorders had suffered external damage, but the data files were intact and contained valid data from flight MH17. There was no indication that the flight recorders had been manipulated. The serial numbers were verified to establish that no parts had been replaced in the meantime. Once the data on the recorders had been read, the recorders were transferred to the Dutch Safety Board’s office in The Hague and secured in a safe.

Fragments
It was important to know whether the fragments that were found in and on the human remains and the wreckage, concerned the high-energy objects that had perforated the aeroplane. For a number of fragments this relationship was shown. A thin layer of melted cockpit glass and/or or a thin layer of melted aluminium from the cockpit skin were found on these fragments. These traces were examined using reference material from the wreckage of the cockpit (cockpit glass and material from the skin).

7.1.4 Storage in Gilze-Rijen
The Dutch Safety Board was allowed the use of a hangar and two shelters on the Gilze-Rijen Air Base for storage of the wreckage pieces, the examination of the wreckage pieces and the partial reconstruction of the aeroplane. The Ministry of Defence staff did not have access to this hangar and shelters.

Upon arrival at the air force base, all individual pieces of wreckage were again verified, registered and photographed using a fixed procedure and then forensically examined. They were then sorted and a selection was made of the pieces of wreckage that were needed to ascertain the causes of the crash and that were required for making the reconstruction. On 10 December 2014, this process started for the wreckage that had been loaded onto sixteen trucks after being recovered from the wreckage area during the first recovery mission. For the other eight containers of wreckage recovered during the second and third recovery missions, this process started on 12 May 2015.
7.2 Reconstruction of the aeroplane

Only in rare cases aeroplanes are reconstructed following a crash or accident. Such a process is labour-intensive and time-consuming. Nevertheless, on 20 January 2015, the Dutch Safety Board decided to reconstruct the part of the aeroplane that was the most relevant to ascertain the causes of the crash. The objective of the reconstruction was to further verify the conclusions drawn in the investigation report about the causes of the crash and to demonstrate the consequences for the aeroplane.

First the outline of the aeroplane was drawn on the floor of the hangar in Gilze-Rijen. The pieces of wreckage that were relevant to the investigation were placed inside the outline at their original position in the aeroplane. Then a set up of the pieces of wreckage with high-energy object damage was produced for the analysis. Based on the pattern found on the wreckage, the direction from which the high energy objects approached the aeroplane was roughly ascertained, using stringing (see paragraph 3.3).

Once the relatives of the victims had had the opportunity to view the wreckage, the forward part of the aeroplane, consisting of the skin of the cockpit, business class and a small section of economy class, was reconstructed. It was decided to only reconstruct the forward part of the aeroplane as this was sufficient to be able to investigate the causes of the crash. In order to reconstruct this part of the aeroplane true to fact, only pieces of wreckage that the Dutch Safety Board had actually retrieved from the crash site were used. The missing pieces were not reproduced. The reconstruction of the forward part of the aeroplane underpinned the conclusion that the aeroplane was impacted by high-energy objects originating from a missile.

Prior to the three-dimensional reconstruction, the Dutch Safety Board studied the reconstruction of TWA flight 800 in the United States and parts of the reconstruction of the aeroplane of the Pan Am flight 103 in Scotland. On the basis of these studies, the Dutch Safety Board decided to use a steel structure, which was best suited to a reconstruction that had to be realised in a short time. In the reconstruction, the Dutch Safety Board used the exact dimensions of the aeroplane. These dimensions were requested from Boeing. The remaining sizes were determined, based on a scan made by the police of a similar Boeing 777-200. The steel frame was designed and constructed using these dimensions. Upon delivery of the frame in May 2015 the pieces of wreckage were fitted on the frame. Because the pieces of wreckage risked being damaged when they were being attached to the frame the reconstruction only began after all pieces of wreckage had been thoroughly examined. The reconstruction was completed mid July 2015.

26 An explosion occurred in the Trans World Airlines aeroplane that crashed near New York in 1996, as a result of fuel vapours igniting in the central fuel tank. The fuel vapours probably ignited as a result of a spark caused by a short-circuit in poor wiring. In 1988, the Pan Am aircraft fell apart above Lockerbie as the result of a bomb attack.
7.3 International data collection

The investigation into the crash of flight MH17 is largely based on evidence that the Dutch Safety Board was only able to obtain with the cooperation of other parties. They provided relevant investigative information by giving interviews, providing documents and other data. The Dutch Safety Board gathered these different types of data, to a large extent from parties that were established abroad.

International cooperation and information exchange is self-evident in a civil aviation accident investigation according to Annex 13 to the Chicago Convention. In addition to the investigative authority conducting the investigation, representatives from other states are involved. Via these so-called accredited representatives, foreign parties provide investigative information to the investigator-in-charge.

It is less common for international data to be collected for investigations conducted on the basis of the Kingdom Act Dutch Safety Board. The Dutch Safety Board sometimes needed information from parties that were not obligated to provide this information. In those cases, the Dutch Safety Board called on these parties to cooperate voluntarily, explaining to them as effectively as possible why information was requested and why the information was needed for the investigation.

Many parties in the Netherlands as well as abroad were willing to cooperate with the investigations. They provided information (whether made anonymous or not) to the Dutch Safety Board, cooperated in interviews or were willing to offer investigators of the Dutch Safety Board an insight into their working methods through observations or working visits.

Given the complex and politically sensitive environment in which the investigation had to take place, not all parties approached by the Dutch Safety Board were (immediately) willing to cooperate in the investigation. Besides that, for some parties it was not clear on which judicial regime the Dutch Safety Board was basing its investigation. For these parties, it was not clear to what extent they were obliged to cooperate with the Dutch Safety Board’s investigation and how the confidentiality of the information to be supplied would be safeguarded. Certain parties also found it difficult to distinguish between the investigation conducted by the Dutch Safety Board into the crash of flight MH17 and the international criminal investigation into the crash coordinated by the Dutch Public Prosecution Service (OM).

Consequently, the Dutch Safety Board could not obtain all the information that it would have ideally liked to use in its investigations. Outlined below are the efforts made by the Dutch Safety Board to obtain certain information, as well as the kind of information it did not receive and the consequences thereof for the investigation.

The Malaysian government and Malaysia Airlines
For the investigation into the crash of flight MH17 the Dutch Safety Board needed information from the Malaysian government and the airline, Malaysia Airlines.
The Malaysia Airlines branch in the Netherlands initially cooperated with the investigation and gave the Dutch Safety Board the opportunity to interview various employees of the airline in the Netherlands. It also provided a part of the requested information. However, at a later stage this cooperation was (temporarily) suspended by order of the airline's headquarters.

From the start of the investigation it proved to be more complicated to organise interviews with employees of the Malaysian government and the airline in Kuala Lumpur. The same applied to obtaining the documents the investigators requested them. Over time, in January 2015, investigators from the Dutch Safety Board were given the opportunity to talk to a few relevant employees from Malaysia Airlines in Kuala Lumpur regarding the investigations into passenger information and the decision-making related to the flight route. For these investigations, the investigators in the end did not entirely succeed to obtain all information from the Malaysian government. For the investigation into the causes of the crash Malaysia Airlines provided all information the Dutch Safety Board requested.

Ukraine and the Russian Federation
For the investigation into the crash of flight MH17, the Dutch Safety Board tried to acquire all primary and secondary surveillance radar data from the involved air navigation service providers in Ukraine and the Russian Federation. The use of raw radar data in the investigation into aircraft accidents is common because the images that the air traffic controllers use are the result of the processing of these raw data.

Primary and secondary surveillance radar data

Primary radar provides an image of the aircrafts in the airspace based on the reflection of emitted radio waves. The positions and velocities of aircrafts in the airspace are mapped by the radar station receiving a reflection of the aircrafts present. Primary radar data are a reliable source for determining which aircrafts are in an airspace at a certain moment.

Secondary surveillance radar interrogates the aircraft’s transponder, which can only occur if there is a working transponder on board the aircraft. The transponder’s signal contains information about the identity, altitude and speed of the aircraft as measured in the aircraft. Primary and secondary surveillance radar data are often combined on a screen into one single image of the airspace by and for air traffic control.

The international team investigating the causes of the crash convened on various occasions during the project, as is common in an aircraft accident investigation, to discuss and establish the findings to date. After the first progress meeting with the international investigation partners in February 2015, the Dutch Safety Board identified which relevant information was missing and what efforts would be required to obtain it after all. The Dutch Safety Board subsequently deployed its special envoy for international affairs, a former diplomat. He tried to establish international relations at a high political level with the aim of obtaining the information required for the investigation. Because the Russian
accredited representative in the investigation team committed to provide information during the progress meeting of the international investigation partners, diplomatic efforts during the subsequent period focused primarily on obtaining information from Ukraine. In the meantime it had become apparent that also for the investigation into the flight route of flight MH17 supplemental information was needed from Ukraine.

At the end of March, a team of investigators from the Dutch Safety Board travelled to Ukraine together with the Dutch Safety Board’s special envoy for international affairs. The objective of this trip was to obtain primary radar data\(^\text{27}\) and documents from the Ukrainian military authorities related to the management of the airspace. The latter involved a request by Ukraine’s military authorities to Ukraine’s air traffic control services to close the airspace for civil aviation below a certain altitude. The delegation also wanted an answer to supplemental questions about the airspace management by Ukraine and to establish relations at the highest possible level in order to ascertain which other information was still missing. The visit yielded documents from the Ukrainian military authorities, but no raw primary radar data. During the visit, the Ukrainian authorities explained why the radar data were unavailable to the Dutch Safety Board. They also provided written answers to questions about the decision-making related to closing the airspace.

From Ukraine the Dutch Safety Board only received the data from the secondary surveillance radar (raw and processed). In addition, Ukraine also provided a video replay of a radar screen from the processed secondary surveillance radar data.

During the second progress meeting in May 2015, the Russian accredited representative announced that the data from the primary and secondary surveillance radar were not available. The Russian Federation declared that it had not saved this information, because it was not obliged to do so since the crash had not taken place on Russian territory. In July 2014, the Russian Federation supplied a video recording of the processed primary and secondary surveillance radar data.

**NATO**

Following the crash of flight MH17, international media devoted attention to events and developments that had taken place prior to the crash, which possibly indicated risks to aircrafts overflying the conflict area in the eastern part of Ukraine. The media highlighted two events. On 24 June 2014, before the crash of flight MH17, the American Permanent Representative to the United Nations spoke about the situation in the eastern part of Ukraine at the UN Security Council. One of the issues she raised was the crash of a military transport aeroplane during landing at Luhansk airport. On 30 June 2014, NATO General Breedlove spoke at a press conference about the build up of Russian troops on the eastern side of the border with Ukraine. He stated:

“What we see in training on the east side of the border is big equipment, tanks, APCs, anti-aircraft capability, and now we see those capabilities being used on the west side of the border.”

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\(^\text{27}\) The (raw) secondary surveillance radar data had already been provided.
“We have not seen any of the air defense vehicles across the border yet, but we’ve seen them training in the western part of Russia, et cetera. So I think that there are several types and capabilities of heavy weaponry that are moving across that border.”

The Dutch Ministers of Security and Justice, of Foreign Affairs and of Defence also sent information to the House of Representatives of the Dutch Parliament on 13 October 2014. The ministers stated that on the day of the crash of flight MH17, NATO AWACS aeroplanes had carried out missions in Poland and Romania.

The Dutch Safety Board was interested in the information sources on which the statements by General Breedlove and the Dutch ministers were based. These sources were of interest for the investigation into the causes of the crash and for the investigation into the flight route. For this reason, the Dutch Safety Board asked NATO to provide information about the number of military aircrafts that had been shot down since the beginning of the conflict and about radar data or other data that NATO’s AWACS aeroplanes had collected that could be relevant to the investigation into the crash of flight MH17.

NATO stated that since NATO is not responsible for Ukraine’s airspace, it could not supply any definitive data. NATO also declared that NATO specialists, at request of the Dutch Safety Board, had re-examined the data from the AWACS aeroplanes but that these data did not contain any information relevant to the investigation into the crash of flight MH17.

Consequences for the investigations of not receiving information
As explained, the Dutch Safety Board was not able to talk to everyone it wished in relation to the investigation into the crash of flight MH17. For various reasons the Dutch Safety Board did not receive all the requested information. In some cases, the interviews or other information exchanges only took place during a late stage of the investigation, causing a delay. Relevant parties in Ukraine and Malaysia could only be interviewed in 2015, and various documents requested from (parties in) these countries only became available in the course of that year. The investigations into the flight route and the causes of the crash in particular, were hindered by the fact that this information had not been available for a long time.

The Dutch Safety Board put much effort into obtaining access to all information relevant to the investigation. Not all of the requested information turned out to be available and not all information available was provided to the Dutch Safety Board. Nevertheless, the Dutch Safety Board was able to substantiate the findings in the report with various sources.

In one case the lack of information caused the Dutch Safety Board to be unable to draw conclusions on a specific aspect of the investigation. The extent to which Malaysian intelligence services or government possessed information about the situation in the eastern part of Ukraine, did not become clear in the investigation into the flight route.
7.4 **Concurrence with the criminal investigation**

Following the crash of flight MH17, an international criminal investigation started on 7 August 2014. This investigation is conducted by a Joint Investigation Team (JIT), in which police and judicial authorities from the Netherlands, Australia, Malaysia, Belgium and Ukraine cooperate. The Netherlands coordinates the investigation. The objective of the criminal investigation differs from that of the investigation conducted by the Dutch Safety Board. The Dutch Safety Board focused on the question of what happened and what can be learned, and not on the question of who is to blame. The Joint Investigation Team, on the other hand, focuses on the causes of the crash in response to the question of whether punishable offences have been committed and who can be held responsible in terms of criminal law.

Since both investigations considered the same events, they partly relied on the same evidence - each from their own perspective. This situation required coordination between the crash investigation and the criminal investigation to prevent both investigations, each responding to a legitimate social need, from frustrating each other. This necessary alignment was achieved through agreements between the Dutch Safety Board, being the accident investigation authority, and the Dutch Public Prosecution Service as coordinator of the Joint Investigation Team.

The agreements constitute a detailed elaboration of the existing Dutch Safety Board - Dutch Public Prosecution Service Coordination Protocol (Afstemmingsprotocol Onderzoeksraad voor Veiligheid - Openbaar Ministerie). This protocol regulates the coordination between both organisations in general sense if a criminal investigation and an investigation by the Dutch Safety Board into an occurrence are conducted simultaneously. Additional agreements were required given the complexity of both investigations, their concurrence and the international context in which these investigations took place. These agreements related to the reciprocal exchange of investigative information, the seizure of physical evidence and documents, the examination of the pieces of wreckage and the fragments and periodical coordination consultation.

**Sharing information related to investigations**

In order to determine the causes of an accident or crash, it is of great importance that those involved can speak freely and are able to provide the Dutch Safety Board with information without having to fear prosecution under criminal law. Both Annex 13 to the Chicago Convention and the Kingdom Act Dutch Safety Board include various provisions on the subject of maintaining the confidentiality of information related to the investigation. Insofar as these provisions offered this possibility, information that was also needed for the success of the international criminal investigation was shared with the Dutch Public Prosecution Service. The idea was not to withhold information if that would hinder the progress of the criminal investigation. Thus the Dutch Safety Board continually considered whether sharing information could in any way be detrimental to its own investigation. Vice versa, the Dutch Public Prosecution Service also shared information pro-actively if it was relevant to the accident investigation.
Examination of the wreckage

As mentioned elsewhere in this report, the Dutch Safety Board was responsible for recovering the wreckage pieces and their transport to the Netherlands. The recovered material was inspected and sorted at Gilze-Rijen Air Base in the presence of the Dutch Public Prosecution Service, who indicated which pieces could be relevant to the criminal investigation. These pieces were marked.

After this, the material became available for examination to both parties simultaneously. Destructive examination (meaning: an examination of an irreversible nature) could only take place once both parties had investigated the relevant material for damage patterns and traces, and after both parties consented. All pieces of wreckage, parts or secured evidence were only to leave the hangar in Gilze-Rijen for investigation after the Dutch Safety Board and the Dutch Public Prosecution Service had agreed. This applied, for example, to material analyses that were performed by external agencies.

Examination of the human remains

The Dutch Public Prosecution Service seized the human remains when they arrived in the Netherlands, after which the injuries and the fragments that were found in the bodies were forensically examined. The Dutch Safety Board was informed of the results of these examinations, and used these for its own investigation. The Dutch Safety Board did not perform its own examination of the human remains.

Recorders from flight MH17

During the investigation, the Dutch Safety Board provided the Dutch Public Prosecution Service with the data files from the flight data recorder and some of the data from the cockpit voice recorder. The Dutch Safety Board was very cautious with providing the recordings in order to guarantee the cockpit crew’s privacy. In the presence of the Dutch Safety Board and the Public Prosecution Service, specialised staff listened to the sound recordings on the Dutch Safety Board’s premises, with the objective of determining what information could be essential to the criminal investigation. The entire 30-minute recording was found not to be relevant in that respect, with the exception of the final milliseconds, the moment when the aeroplane was hit. After consultation with the Dutch Public Prosecution Service it was decided, for the abovementioned reasons, to hand over only the recording of this short period of time. The data carriers themselves were not handed over. These remained in the hands of the Dutch Safety Board.

Examination of the fragments

Both the Dutch Public Prosecution Service and the Dutch Safety Board arranged for the fragments found in and on victims’ bodies and in and on the pieces of wreckage to be analysed. Both parties outsourced this process separately to external agencies, but jointly coordinated this process, since the outcomes constituted a substantial source of information for both the criminal investigation and the Dutch Safety Board’s investigation.

With regard to the fragments found in the victims’ bodies, a selection of human remains was made of which scans revealed that they contained ‘foreign’ fragments. The selection included the human remains of the crew in the cockpit. The fragments were removed from the bodies by forensic investigators commissioned by the Dutch Public Prosecution Service. The fragments were removed from the wreckage pieces by the Dutch Safety
Board and the Dutch Public Prosecution Service. The Dutch Public Prosecution Service and the Dutch Safety Board shared the results of the different analyses that they had arranged.

**Other evidence**
In addition to the aforementioned information, the Dutch Safety Board provided the Dutch Public Prosecution Service with the following information: photographs of the wreckage area, lists of the parts of the aeroplane that had been seized and information about the damage patterns on the wreckage pieces. Statements from individuals as well as medical and private information collected by the Dutch Safety Board were not shared with the Dutch Public Prosecution Service. In addition to the results of the forensic analyses of the fragments, the Dutch Public Prosecution Service shared other information with the Dutch Safety Board, such as the autopsy and inspection reports of the victims, photographic and video material and the results of the analyses concerning the found objects that probably originate from a missile.

**Periodic consultation**
Throughout the investigation frequent consultations took place between the Dutch Public Prosecution Service and the Dutch Safety Board, during which they discussed the progress of the investigation activities and matters related to this.

### 7.5 Classified information

All the Dutch Safety Board’s investigation material is of a confidential nature. However, in the investigation into the crash of flight MH17, confidential information was used that the Dutch authorities had categorised as ‘classified’ and which the Dutch Safety Board was not able to access at all times or could not include in its reports. The central government of the Netherlands adopts different levels of classification, from ‘Departmentally confidential’ to ‘Top State Secret’. It is unusual for the Dutch Safety Board to work with this type of material and to not have all the source material in its possession. This is why additional explanation of the working methods concerning classified information is given here.

The Kingdom Act Dutch Safety Board stipulates that the Minister of the Interior and Kingdom Relations, the Minister of Defence and the Minister of Security and Justice, or persons under their jurisdiction, may provide confidential information to the Dutch Safety Board. The provision of information on a confidential basis to the Dutch Safety Board takes place by applying Article 57 of the Kingdom Act Dutch Safety Board. This article describes situations in which the Dutch Safety Board does not include information in its report, such as information that might endanger the unity of the Crown or might harm the security of the Kingdom of the Netherlands.

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28 Classified information concerns all information that can harm the interests of the state in any way by its disclosure.
29 Article 40, paragraph 2 of the Kingdom Act Dutch Safety Board.
30 Article 57 of the Kingdom Act Dutch Safety Board.
How to handle classified information in the investigation into flight MH17 was determined in consultation with the organisations that were owner of the information. The central question in this consideration was whether use of this information could endanger the security of the Netherlands. An additional consideration was the extent to which the information was necessary for arriving at a conclusion or whether the information could also be used in a supporting capacity.

In the investigation into the crash of flight MH17, classified information was used in several ways. Firstly, there were classified documents that the Dutch Safety Board had requested in the context of the investigation and of which it kept copies at its The Hague office. Internal agreements applied to consulting, storing and archiving these documents, with special guarantees for the protection of and access to the information.

Secondly, it concerned classified information that was available for the Dutch Safety Board for inspection only. The Dutch Safety Board was able to see into relevant classified information regarding flight MH17 that was in the possession of the MIVD and the AIVD. This concerned information from the MIVD and the AIVD themselves and from intelligence services of other countries. This classified information included the results of the application of intelligence-gathering methods. The Dutch Safety Board used this classified information to verify its findings. The findings of the Dutch Safety Board as described in the report about the crash of flight MH17 agree with this classified information. The classified information confirms the findings about the causes of the crash described in de investigation report. Because of national security reasons, this classified information could not be publicised.

Since it is unusual for the Dutch Safety Board to make use of classified military information, an agreement was concluded between the Dutch Safety Board and the MIVD for this specific investigation. This agreement stipulates that both organisations may provide the other with the information it needs to perform its legal tasks, either or not on request. The Dutch Safety Board was allowed to consult classified information under strict confidentiality. Consultation of the secret information was limited to Board members and a small number of Dutch Safety Board employees who had undergone an extensive security screening for handling secret information.31

Lastly, classified information was included in the investigation which the Dutch Safety Board neither had access to nor was able to see into. This concerned information from the Dutch Intelligence and Security Services (AIVD and MIVD) related to the armed conflict in the eastern part of Ukraine. At the Dutch Safety Board’s request, the Minister of the Interior and Kingdom Relations and the Minister of Defence asked the Dutch Review Committee on the Intelligence and Security Services (CTIVD) in their letter dated 21 November 2014 to examine this information.32 The Ministers asked the CTIVD to report the findings directly to the Board members of the Dutch Safety Board. The letter also mentions the agreement that the Dutch Safety Board shall first submit the CTIVD report to both Ministers to check it for any state secrets prior to the Dutch Safety Board

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31 This concerns a so-called Level A security screening.
32 The CTIVD has far-reaching mandate for the execution of its legal task. It has access to all relevant information of the AIVD and the MIVD and may interrogate all staff members of these organisations.
making it public. Before finalising its report, the CTIVD submitted it with references to underlying classified sources to the AIVD and the MIVD for verification of the facts. Both intelligence services made only a few minor comments and on 10 April 2015, the CTIVD handed over the still classified report to the Dutch Safety Board members without any references to classified sources. In conformity with the letter of 21 November 2014, the Dutch Safety Board subsequently submitted the report to both Ministers to have it checked for potentially classified information. The Ministers did not find any state secrets in the report, which was then declassified.
In its reports, the Dutch Safety Board gives an account of the investigations it has conducted following the crash of flight MH17. In this document, the Dutch Safety Board gives an account of the manner in which the investigations were set up and carried out.

From the very beginning, the efforts of the Dutch Safety Board were aimed at executing the investigation independently, professionaly and transparently within the frameworks provided by the Chicago Convention and by Dutch law.

The Board concludes that the information gathered is sufficient and suitable for substantiating the findings and conclusions that are presented in the separate investigation reports.

The Board points out that the investigation and the related decision-making process were carried out in an independent manner. The Board was able to gather information without influence from other parties and arrive at autonomous conclusions based on that information. Consulting the accredited representatives and the organisations involved about the draft reports has contributed to the high quality of the reports and underlines the care that was taken in the work.

The Board feels it is unlikely that further investigation will lead to a noticeably greater certainty as to the reliability and completeness of the information obtained. In addition, the Board does not consider it desirable to make society, in particular the relatives, wait any longer for the answers that the investigation provides. For that reason, the Dutch Safety Board has decided to conclude its investigation and to publish its findings and conclusions.

T.H.J. Joustra
Chairman, Dutch Safety Board
Appendix A. Project team .................................................................70
Appendix B. Notification to the Dutch Safety Board ..................................................71
Appendix C. Memorandum of Understanding Ukraine-the Netherlands with regard to the delegation of the investigation ..................................................72
Appendix D. Agreement NBAAI - Dutch Safety Board with regard to the delegation of the investigation ..................................................74
Appendix E. Confirmation of participation in the investigation by Australia ..................................................78
Appendix F. Invitation to the Russian Federation to participate in the investigation ..................................................79
Appendix G. Agreements about the recovery of the wreckage ..................................80
Appendix H. Request with regard to recovery of the wreckage ..................................82
Appendix I. Priority list of wreckage pieces ..................................................83
Appendix J. Request with regard to the removal of the remaining pieces of wreckage ..................................................91
Appendix K. Analysis techniques used ..................................................93
Appendix L. Response to the comments of the Russian Federation ..................................................94
PROJECT TEAM

The project team of this report ‘MH17 - About the investigation’ was made up of the following individuals:

<table>
<thead>
<tr>
<th>Name</th>
<th>Role</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.K. Verolme</td>
<td>Investigation Manager</td>
</tr>
<tr>
<td>E. Leydesdorff</td>
<td>Project Manager</td>
</tr>
<tr>
<td>M. Giesen</td>
<td>Investigator</td>
</tr>
<tr>
<td>A.J. van der Kolk</td>
<td>Investigator</td>
</tr>
<tr>
<td>S. Pijnse van der Aa</td>
<td>Investigator</td>
</tr>
<tr>
<td>N. Smit</td>
<td>Investigator</td>
</tr>
<tr>
<td>A. van der Zande</td>
<td>Investigator</td>
</tr>
</tbody>
</table>
NOTIFICATION TO THE DUTCH SAFETY BOARD

UKRAINIAN NATIONAL BUREAU OF AIR ACCIDENTS AND INCIDENTS INVESTIGATION WITH CIVIL AIRCRAFT (NBAII)

14 Peremogy ave., Kiev
01135, UKRAINE
Tel.: +38 044 351 4338
Fax: +38 044 351 4316
E-mail: info@nbaai.gov.ua

NOTIFICATION OF AN ACCIDENT (INCIDENT)

<table>
<thead>
<tr>
<th>Dutch Safety Board</th>
<th>E-mail: <a href="mailto:aviation@safetyboard.nl">aviation@safetyboard.nl</a></th>
<th>Fax: (31) 70 333 70 77</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Type of event (ACCID/INCID):</td>
<td>FATAL ACCIDENT</td>
<td></td>
</tr>
<tr>
<td>b) Manufacturer, model, nationality and registration marks, and serial number of the aircraft:</td>
<td>B-777-200 9MMRD</td>
<td></td>
</tr>
<tr>
<td>c) Name of the owner, operator and hiree, if any, of the aircraft</td>
<td>Operator - &quot;Malaysia Airlines&quot;</td>
<td></td>
</tr>
<tr>
<td>d) Name of the pilot-in-command, nationality of crew members and passengers:</td>
<td>unknown</td>
<td></td>
</tr>
<tr>
<td>e) Date and time (local time or UTC) of the incident</td>
<td>17.07.2014, 13:20 UTC</td>
<td></td>
</tr>
<tr>
<td>f) Last point of departure and point of intended landing of the aircraft:</td>
<td>Scheduled flight MAS17 en route EIHAM-WMKK.</td>
<td></td>
</tr>
<tr>
<td>g) Location of the incident with reference to some easily defined geographical point, and latitude and longitude (elevation if known):</td>
<td>50km to the west from TOMAK radio navigational point, in the region of Grabovo village, city of Shalchtarsk area, Donetsk region, Ukraine.</td>
<td></td>
</tr>
<tr>
<td>h) Number of crew and passengers: aboard, killed and seriously injured, others: killed and seriously injured:</td>
<td>unknown</td>
<td></td>
</tr>
<tr>
<td>i) Nature of the incident, and the extent of damage to the aircraft so far it is known:</td>
<td>As to the ATS report, during the aircraft flight on FL 330 in Donbompson STA, the aircraft radar mark disappeared to the west of TOMAK radar point, and the communication with the crew was lost. A signal from the aircraft COSPARSAR beacon has been received, the AC coordinates have been determined.</td>
<td></td>
</tr>
<tr>
<td>j) An indication to what extent the investigation will be conducted or is proposed to be delegated by the State of Occurrence:</td>
<td>Investigation is conducted by NBAII. We request you ASAP to: - provide NBAII with the information about your Appointed Representative; - send us the list of the passengers, who were on board of the AC.</td>
<td></td>
</tr>
<tr>
<td>k) Physical characteristics of the incident area:</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>l) Identification of the incident area:</td>
<td>50km to the west from TOMAK radio navigational point, in the region of Grabovo village, city of Shalchtarsk area, Donetsk region, Ukraine.</td>
<td></td>
</tr>
<tr>
<td>m) Presence and description of dangerous goods on board the aircraft</td>
<td>unknown</td>
<td></td>
</tr>
</tbody>
</table>

Please confirm your receipt of this notification and send your answer ASAP by fax +380 44 351 43 33, or e-mail:

Respectfully,

[Signature]

Air Accidents and Incidents Inspector
NBAII

N.B. For privacy reasons, names of individuals, their signatures and some contact details have been blanked out in this document.
MEMORANDUM OF UNDERSTANDING UKRAINE-THE NETHERLANDS WITH REGARD TO THE DELEGATION OF THE INVESTIGATION

MEMORANDUM OF UNDERSTANDING

BETWEEN

THE MINISTER OF FOREIGN AFFAIRS OF THE KINGDOM OF THE NETHERLANDS

AND

THE MINISTER FOR FOREIGN AFFAIRS OF UKRAINE


THE MINISTER OF FOREIGN AFFAIRS OF THE KINGDOM OF THE NETHERLANDS

AND

THE MINISTER FOR FOREIGN AFFAIRS OF UKRAINE

Hereinafter referred to as "Participants",

In their common aim to ensure that the investigations regarding the accident of the downing of civilian aircraft, Malaysian Airlines flight MH 17 on July 17, 2014 will be conducted with the maximum impartiality and objectivity that will meet the expectations of the international community,

Have decided that the following arrangements will apply:

1. Taking into consideration that the overwhelming majority of the victims of the accident are citizens of the Kingdom of the Netherlands, Ukraine, as the State of Occurrence, will delegate investigation into the accident to the Netherlands through a legally binding agreement between the Ukrainian National Bureau for Accidents and Incidents investigation with Civil aircraft and the Dutch Safety Board on delegation of investigation in respect of aircraft accident involving Boeing 777-200, "Malaysia Airlines" flight MH17.

2. The Participants will cooperate to the fullest extent possible in returning the victims of the accident, Ukraine will facilitate the transfer of the remains of the deceased and those of their personal effects. The Netherlands, as the investigating State, will arrange for complete examination of the bodies of injured passengers and crew on evidence related to the causes of the accident by experts experienced in accident investigation. The examinations will be expeditious and complete.

3. The Netherlands will coordinate the investigation into the circumstances of the accident and will be responsible for the conduct of the investigation in line with the provisions of Chapter 5 of Annex 13 to the Chicago Convention. The Netherlands will ensure the participation of other parties concerned, in particular Ukraine as the State of Occurrence, Malaysia as the State of Registry, the United States of America as State of Manufacture and the International Civil Aviation Organization (ICAO). The Netherlands will communicate the report and findings to the concerned states. Ukraine will use every means available to facilitate the investigation.
4. The Participants will make every effort to ensure that the implementation of the cooperation under this Memorandum of Understanding is executed fairly and expeditiously and to coordinate and to cooperate with related agencies in order to ensure the effective and efficient achievement of the objective of the cooperation.

5. The Participants are in full understanding that further arrangements may be made on specific issues related to the investigation.


This Memorandum of Understanding will come into effect upon signature.

This Memorandum of Understanding does not create any rights or obligations under international law.

Done in duplicate in Kyiv on 24 July 2014 in the English language,

Frans Timmermans,
Minister of Foreign Affairs of the Kingdom of the Netherlands

Pavlo Klimkin,
Minister for Foreign Affairs of Ukraine
AGREEMENT NBAAI - DUTCH SAFETY BOARD WITH REGARD TO THE DELEGATION OF THE INVESTIGATION

Published on the Dutch Safety Board’s website on 13 October 2014.

AGREEMENT

BETWEEN

the National Bureau of Air Accident and Incidents Investigation with Civil Aircraft (NBAAII)

of

Ukraine

AND

the Dutch Safety Board

of

the Netherlands

on

DELEGATION OF INVESTIGATION

IN RESPECT OF

AIRCRAFT ACCIDENT INVOLVING

BOEING 777-200, REGISTRATION: 9M-MRD

“MALAYSIA AIRLINES”

FLIGHT MH17
1. INTRODUCTION

1.1 An accident has occurred in the territory of Ukraine on 17 July 2014 involving Malaysia Airlines Flight MH17.

1.2 The flight originated in the Netherlands and a large number of the deceased passengers were of Dutch nationality.

1.3 This Agreement expresses the delegation in whole of the investigation of the abovementioned accident by the National Bureau of Air Accidents and Incidents Investigation with Civil Aircraft (NBAAI) of Ukraine to the Dutch Safety Board of the Netherlands, hereinafter referred to as the Parties to this agreement. The Dutch Safety Board of the Netherlands is expected to be responsible for the conduct of the investigation, including issuance of the Final Report and the ADREP reporting.

1.4 It is recognized that both Ukraine, and the Netherlands, are parties to the Convention on International Civil Aviation (The Chicago Convention) and that they are therefore bound by the Standards contained in Annex 13 — Aircraft Accident and Incident Investigation to the Chicago Convention (hereinafter referred as Annex 13) concerning accident and serious incident investigation.

Note.— Both States shall advise each other of their respective existing differences that have been filed or that will be filed against the Standards of Annex 13.

1.5 The Parties recognize that the investigation is conducted under factual circumstances which does not allow Ukrainian authorities to exercise effective control over the territory of crash site, including wreckage and flight recorders.

1.6 Both parties to this agreement are authorized by their respective Governments to act as the national authority in respect of aircraft accident and serious incident investigation matters.

1.7 This Agreement is in accordance with Annex 13, Standard 5.1, which states "The State of Occurrence shall institute an investigation into the circumstances of the accident and be responsible for the conduct of the investigation, but it may delegate the whole or any part of the conducting of such investigation to another State or a regional accident investigation organization by mutual arrangement and consent. In any event, the State of Occurrence shall use every means to facilitate the investigation."

1.8 In accordance with Annex 13, Standard 5.18, the State of Registry, the State of the Operator, the State of Design and the State of Manufacture shall each be entitled to appoint an accredited representative to participate in the investigation. Additionally, in accordance to Annex 13, Standard 5.23, any State which on request provides information, facilities or experts to the State conducting the investigation shall be entitled to appoint an accredited representative to participate in the investigation.

1.9 The Parties agreed that accredited representative of Ukraine, Ukrainian advisors and experts shall be entitled to participate in investigation.

1.10 The Parties agree that the procedures for the transfer of the accident victims' corps and remains shall be subject for separate arrangements.

2. TERMINOLOGY

2.1 The definitions used in this document have the same meaning as that ascribed to them in Annex 13 — Aircraft Accident and Incident Investigation.
3. **THE PURPOSE OF INVESTIGATION**

3.1 The purpose of investigating accidents or incidents in accordance with Annex 13 is the prevention of accidents and incidents. It is not the purpose of such an investigation to apportion blame or liability.

4. **CODE OF CONDUCT**

4.1 This Agreement serves to foster cooperation and mutual assistance between the parties in implementing the provisions of Annex 13. Each party shall strive to overcome difficulties that may arise due to differences in languages, national cultures, legislative systems or geographic locations.

5. **DELEGATION OF INVESTIGATION BY THE STATE OF OCCURRENCE**

5.1 The two parties agree to work together to ensure that a competent investigation is conducted in accordance with the procedures and intent of Annex 13.

5.2 The Parties shall exchange with information necessary for the purposes of this accident investigation. In accordance with the relevant laws of the respective States, any such information provided should be treated with at least the same rules with respect to confidentiality as those to which the providing party is bound.

6. **ROLE OF ICAO**

6.1 The Parties acknowledge that the International Civil Aviation Organization (ICAO) assists in the conduct of the investigation and that flight recorders shall remain under the control of ICAO.

7. **COORDINATION**

7.1 The contact person in *National Bureau of Air Accidents and Incidents Investigation with Civil Aircraft (NBAA)* of Ukraine for the implementation of this agreement is:

Mr. Oleg Babenko  
Director....................... *(Title)*  
National Bureau of Air Accidents and Incidents Investigation with Civil Aircraft  
*(Agency/Authority)*  
Peremohy av., 14, Kyiv, 01135, Ukraine................................................. *(Address)*

Tel.:  
Fax:  
E-mail:

7.2 The contact person in *Dutch Safety Board of the Netherlands* for the implementation of this agreement is:

Mrs. Iep Visser, LLM ........................................................................... *(Name)*  
General Secretary............................................................................. *(Title)*  
Anna van Saksenlaan 50, 2593 HT The Hague, Netherlands.

Tel.:  
Fax:
8. ENTRY INTO FORCE AND TERMINATION

8.1 This Agreement will come into effect on the date of signature.
8.2 The Agreement may be terminated by mutual consent of the Parties.

DONE at Kyiv, the 23rd day of July, 2014, in duplicate, in the English and Ukrainian languages, both texts being equally authentic.

For National Bureau of Air Accidents and Incidents Investigation with Civil Aircraft

Oleg Babenko
Director

For Dutch Safety Board

Iep Vissers
General Secretary

N.B. For privacy reasons, names of individuals, their signatures and some contact details have been blanked out in this document.
CONFIRMATION OF PARTICIPATION IN THE INVESTIGATION BY AUSTRALIA

Australian Government
Australian Transport Safety Bureau

9 September 2014

Mr
Investigator in Charge
Dutch Safety Board

Dear [Name]

Appointment of Australian Representation to the Netherlands investigation of Malaysian Airlines flight MH17

In accordance with the Convention on International Civil Aviation, Annex 13 Aircraft Accident and Incident Investigation, Clause 5.23, the Australian Transport Safety Bureau has appointed Mr [Name] as Accredited Representative to the Netherlands investigation into the loss of Malaysia Airlines flight MH17.

Yours sincerely

[Signature]
Manager Aviation Investigations
Australian Transport Safety Bureau

N.B. For privacy reasons, names of individuals, their signatures and some contact details have been blanked out in this document.
INVITATION TO THE RUSSIAN FEDERATION TO PARTICIPATE IN THE INVESTIGATION

Minister of Transport of the Russian Federation
Mr Maksim Sokolov
Rogdestvenka st., 1, bld.1
109012, MOSCOW
RUSSIA

Sent by e-mail: info@mintrans.ru

Subject: Invitation to participate in accident investigation

Dear Mr Sokolov,

The Dutch Safety Board is conducting the air accident investigation into the crash of flight MH17 of Malaysia Airlines on Thursday, 17 July 2014, near the city of Donetsk in Ukraine.

The Netherlands was requested by Ukraine, the State of occurrence, to conduct the investigation on their behalf, as per ICAO Annex 13, article 5.1.

According to ICAO Annex 13, investigators of states of occurrence, state of operator, states of manufacturers, alongside other states supporting the investigation, are working as part of an international team of air accident investigators. The Dutch Safety Board would like to invite (an) air accident investigator(s) of the Russian Federation to participate in the international investigation team.

If you accept this invitation, please inform us of the name, position and contact details of the accredited representative of the Russian Federation at your earliest convenience.

Yours sincerely,

T.H.J. Joustra
Chairman
AGREEMENTS ABOUT THE RECOVERY OF THE WRECKAGE

Published on the Dutch Safety Board’s website on 9 December 2014.

Protocol

Transfer of the wreckage

Malaysian Airlines flight MH17

14 November 2014
The Dutch Safety Board (DSB), at the request of the Ukrainian Government and after consultation with the International Civil Aviation Organization (ICAO), was entrusted on 23 July 2014, on the basis of Annex 13 of the Convention on International Civil Aviation (ICAO Convention), with leading the independent international investigation into the cause of the crash of flight MH17 on 17 July 2014.

The details of the decision to give the DSB the leading role in the independent international investigation are elaborated in a Memorandum of Understanding between the Governments of Ukraine and the Kingdom of the Netherlands, and an agreement between the Ukrainian National Bureau of Air Accidents Investigation and the DSB.

Since 23 July 2014, the DSB has been leading the international team which consists of aviation experts from Malaysia, Ukraine, the Russian Federation, the United Kingdom, the United States, Australia and the Kingdom of the Netherlands. This is in line with Annex 13 of the ICAO Convention and Resolution 2166 of the UN Security Council, in which the need was underlined for a “full, thorough and independent international investigation into the incident in accordance with International civil aviation guidelines”.

We shall ensure that Malaysia, Ukraine, the Russian Federation, the United Kingdom, the United States, Australia and the Kingdom of the Netherlands shall be able to participate in the investigation of the wreckage in the Netherlands.

The DSB shall take over the wreckage and shall undersign this protocol in its capacity as leader of the independent international investigation on the basis of Annex 13 of the ICAO Convention.

Hereby there is an agreement of the representative of the Ministry of Emergency Services, Donetsk region administration to hand over the MH-17 wreckage to the Dutch Safety Board as to the leader of independent international investigation team authorized to receive MH-17 wreckage.

On behalf of the Dutch Safety Board

[Redacted]
Co-ordinator
Operations MH17

Representative of the Ministry of Emergency Services

A. Kostrubitskly

As witness
OSCE Special Monitoring Mission to Ukraine

N.B. For privacy reasons, names of individual, their signatures and some contact details have been blanked out in this document.
REQUEST WITH REGARD TO RECOVERY OF THE WRECKAGE

Joint Control and Coordination Center (JCCC) in Debaltseve
To the attention of:
General Askarov - Ukraine
General Letsov - Russian Federation

Date: 17 November 2014
Subject: URGENT REQUEST with regard to the removal of wreckage of Malaysian Airlines flight MH17 around the village of Petropavlivka

Esteemed Generals,

The Dutch Safety Board (DSB), at the request of the Ukrainian Government and after consultation with the International Civil Aviation Organization (ICAO), was entrusted on 23 July 2014, on the basis of Annex 13 of the Convention on International Civil Aviation (ICAO Convention), with leading the independent international investigation into the cause of the crash of flight MH17 on 17 July 2014.

The details of the decision to give the DSB the leading role in the independent international investigation are elaborated in a Memorandum of Understanding between the Governments of Ukraine and the Kingdom of the Netherlands, and an agreement between the Ukrainian National Bureau of Air Accidents Investigation and the DSB.

On 14 November, the DSB and a representative of the Ministry of Emergency Services of the Donetsk region administration signed a protocol to ensure the removal of the MH17 wreckage and the transfer to the DSB as the leader of the independent international investigation team authorized to receive the MH17 wreckage. This operation commenced Sunday 16 November 2014, first of all in and around the village of Hrabove.

The operation will soon commence in the villages of Rossnipye and Petropavlivka as well. It is my understanding that in Petropavliva, in particular, the wreckage and debris is located near the line of contact? I would be grateful if you could confirm whether this is the case. If it is, I would be grateful if the JCCC could jointly co-ordinate an effective ceasefire in the area as soon as possible, in order to make possible the removal of debris of the MH17 wreckage in and around the village Petropavlivka. Weather permitting, I would expect this to take a few days.

I should also like to ask for a guarantee of safety for the Dutch Safety Board and those working with them on this salvage operation.

On behalf of the Dutch Safety Board

[Signature]
Co-ordinator Operations MH17

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## PRIORITY LIST OF WRECKAGE PIECES

### Dutch Safety Board

**Accident to Boeing 777 9M-MRD near Rozsypne, Ukraine, on 17 July 2014**

**Priority Wreckage for Recovery to Kiev**

The following parts of wreckage are of high priority for recovery to Kiev for further detailed investigation by the international air safety investigation team, led by the Dutch Safety Board.

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Skin panel below left cockpit window. Dimensions: App. 2 x 1.5 m, 5 – 10 kg.</td>
<td>48°08'22.5&quot; N, 38°31'57.04&quot; E</td>
</tr>
<tr>
<td>2</td>
<td>Whole cockpit structure including avionics, seats and surrounding material shown here. Dimensions: App. 5 x 6 M. May be transported in parts (see next picture). All surrounding instruments and electronic.</td>
<td>48°07'21.56&quot; N, 38°33'25.94&quot; E</td>
</tr>
<tr>
<td>Item</td>
<td>Image</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
<td>-------------</td>
</tr>
<tr>
<td>3</td>
<td><img src="image1.png" alt="Image" /></td>
<td>Boxes could be important for the investigation. Picture at end of document.</td>
</tr>
<tr>
<td>4</td>
<td><img src="image2.png" alt="Image" /></td>
<td>Cockpit floor impact holes / direction Dimensions: App. 3 x 3 m Grey part (including part in circles) may be detached from other parts Weight: app 300 kg Fuselage skin piece</td>
</tr>
<tr>
<td>Item</td>
<td>Image</td>
<td>Description</td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
<td>-------------</td>
</tr>
</tbody>
</table>
| 5    | ![Image](image1.png) | Fuselage skin section  
Dimensions: App. 2 x 3 m  
Weight: 10 – 20 kg | possibly 48°07'59" N 38°36'27" E |
| 6    | ![Image](image2.png) | Fuselage skin section  
Dimensions: App. 2,5 x 2,5 m  
Weight: 20 – 30 kg | possibly 48°07'59" N 38°36'27" E |
| 7    | ![Image](image3.png) | The Quick Access Recorder, Location TBD.  
Photo below shows it installed on another aircraft near the FDR rack.  
Dimensions: 0,3x0,3x0,8 m  
Weight: 5 kg | Unknown |
<table>
<thead>
<tr>
<th>Num.</th>
<th>Image</th>
<th>Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td><img src="image1.jpg" alt="Image" /></td>
<td>Left wing tip. Dimensions: App. 2.5x6 m. Weight: 100 – 150 kg.</td>
<td>48°07'48.65°N 38°37'59.34°E</td>
</tr>
<tr>
<td>9</td>
<td><img src="image2.jpg" alt="Image" /></td>
<td>Detail: Left wing tip. Scan impact holes/direction.</td>
<td>48°07'48.65°N 38°37'59.34°E Of 48°07'47.90°N 38°30'57.57°E</td>
</tr>
<tr>
<td>10</td>
<td><img src="image3.jpg" alt="Image" /></td>
<td>Any other parts that show evidence of high velocity projectile damage.</td>
<td>Unknown</td>
</tr>
<tr>
<td>Item</td>
<td>Image</td>
<td>Description</td>
<td>Location</td>
</tr>
<tr>
<td>------</td>
<td>-------</td>
<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>11</td>
<td><img src="image1.png" alt="Image" /></td>
<td>Both ELTs. One is located on the forward right hand door, and the other is in the mid-cabin crown area – they both look identical. (below is a photo of an ELT from another 777), 0.4x0.2x0.2 m 3 kg.</td>
<td>Possible locations: 48°08'42&quot; N 038°37'1.2&quot; E and 48°08'12&quot;N 38°37'12&quot;E</td>
</tr>
<tr>
<td>12</td>
<td><img src="image2.png" alt="Image" /></td>
<td>Engine Dimensions Diameter: 1.5m Weight: 1000 - 2000 kg</td>
<td>48°08' 16.30&quot;N 38°38' 20.84&quot;E</td>
</tr>
<tr>
<td>13</td>
<td><img src="image3.png" alt="Image" /></td>
<td>Engine detail Scan impact / direction</td>
<td>48°08' 16.30&quot;N 38°38' 20.84&quot;E</td>
</tr>
<tr>
<td>Item</td>
<td>Affair</td>
<td>Description</td>
<td>Location</td>
</tr>
<tr>
<td>------</td>
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<td>-------------</td>
<td>----------</td>
</tr>
<tr>
<td>14</td>
<td></td>
<td>EEC, with possibly electrical connectors and coloured wires still attached. When received a picture will be added.</td>
<td>One EEC on each engine, so in total 2. Based on crash site pictures, these boxes might have been burned or heavily damaged.</td>
</tr>
</tbody>
</table>

Other actions and components:

- More detailed pictures from different angles/positions with distance markings of prominent aircraft structure parts to support 3D-animaton and reconstruction of foreign parts trajectories.
- More information (such as pictures) of wreckage parts which have not (sufficiently) been observed, identified and examined, which include fan rotors of both engines and in particular larger wreckage parts of the fuselage.
- The negative pressure relief valves in the fuselage structure.
- Proximity Switch Electronic Unit, an avionics box.
- The electronic controller box of the pressurization system.

Note: when available pictures of the components/boxes will be added.

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example electronic boxes
N.B. For privacy reasons, names of individuals and some contact details have been blanked out in this document
REQUEST WITH REGARD TO THE REMOVAL OF THE REMAINING PIECES OF WRECKAGE

To Mr A. Kostrubitskiy  
Ministre of Emergency Services  
Donetsk Region Administration

Date: 20 November 2014  
Subject: Removal of wreckage of Malaysian Airlines flight MH17

The Dutch Safety Board (DSB), at the request of the Ukrainian Government and after consultation with the International Civil Aviation Organization (ICAO), was entrusted on 23 July 2014, on the basis of Annex 13 of the Convention on International Civil Aviation (ICAO Convention), with leading the independent international investigation into the cause of the crash of flight MH17 on 17 July 2014.

The details of the decision to give the DSB the leading role in the independent international investigation are elaborated in a Memorandum of Understanding between the Governments of Ukraine and the Kingdom of the Netherlands, and an agreement between the Ukrainian National Bureau of Air Accidents Investigation and the DSB.

On 14 November, the DSB and a representative of the Ministry of Emergency Services of the Donetsk region administration signed a protocol (which was witnessed by the OSCE) to ensure the removal of the MH17 wreckage and the handover to the DSB as the leader of the independent international investigation team authorized to receive the MH17 wreckage. This operation commenced Sunday 16 November 2014.

The representative of the DSB designates which elements of the MH17 wreckage are to be handed over to the DSB. In this letter the DSB confirms that all debris remaining after the handover to the DSB falls outside the scope of the above mentioned independent international investigation.

The DSB therefore requests the assistance of the Ministry of Emergency Services of the Donetsk region administration with regard to the disposal of all remaining debris of the MH17 wreckage.

Any operation to remove all remaining debris of the MH17 wreckage will only start after the handover of the designated elements of the MH17 wreckage to the DSB has been completed. This additional operation can commence and be concluded without the presence of representatives of the DSB.

On behalf of the Dutch Safety Board

Co-ordinator Operations MH17

N.B. For privacy reasons, names of individuals, their signatures and some contact details have been blanked out in this document.
Г-ну А. Кострубицкому
Министерство чрезвычайных ситуаций
Администрации Донецкого региона

Date: 20 Ноября 2014
Subject: Передача обломков самолета Малазийских Авиалиний рейса МН17

23 июля 2014 года в ответ на обращение правительства Украины, а также после проведения консультаций с Международной организацией гражданской авиации (ИКАО) на основании Приложения 13 Конвенции о международной гражданской авиации (Конвенции ИКАО) Совету безопасности Нидерландов (СБН) было поручено руководство независимым международным расследованием причин крушения борта МН17, произошедшего 17 июля 2014 года.

Подробности решения об отведении руководящей роли в проведении независимого международного расследования Совету Безопасности Нидерландов изложены в Протоколе о намерениях (при свидетельствованиях ОБСЕ), заключенном между правительством Украины и правительством Королевства Нидерландов, а также в соглашении между Национальным бюро по расследованию авиационных происшествий и инцидентов с гражданскими воздушными судами Украины и Советом Безопасности Нидерландов.

14 ноября СБН и представитель Министерства чрезвычайных ситуаций в Донецкой области подписали протокол с целью обеспечения передачи обломков борта МН17, в частности их передачи СБН в качестве независимой международной группы экспертов по расследованию, уполномоченной принять обломки борта МН17. Данная операция была начата в воскресенье 16 ноября 2014 года.

Представитель СБН обозначает, какие фрагменты обломков борта МН17 следует передать СБН. Данным письмом СБН подтверждает, что все обломки, оставшиеся после передачи СБН, не входят в рамки вышеуказанного независимого международного расследования.

В связи с этим СБН просит Министерство чрезвычайных ситуаций администрации Донецкого региона оказать содействие в утилизации всех оставшихся обломков самолёта рейса МН17.

Любая операция по уборке оставшихся обломков борта МН17 может начаться только после завершения передачи СБН обозначенных фрагментов МН17. Такая дополнительная операция может начинаться и завершаться без присутствия представителей СБН.

От имени Совета безопасности Нидерландов

[signature]
Координатор операций по
ликвидации последствий авиакатастрофы рейса МН17

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ANALYSIS TECHNIQUES USED

STEP
Sequentially Timed Events Plotting (STEP) is a multi-linear technique in which events are grouped in a matrix according to a fixed format. The horizontal axis gives the timeline, the vertical axis gives the actors involved in the event. This manner of structuring offers the investigation team the opportunity to identify causal and temporal relationships between events in the circumstances of an incident. These relationships can be subjected to closer examination in further analysis steps.

Tripod Beta
Tripod Beta was developed in order to be able to explain and control the origin of human error. This technique assumes four general principles:

1. Accidents occur when barriers fail or are lacking
2. Barriers fail due to human error
3. Human error is determined by the context in which the barrier should have been maintained
4. The context in which human error occurs is determined by actions or lack thereof at management level in the organisation

The Tripod technique offers a rigid terminological framework and a syntax that makes it possible to identify barriers, human error, context factors and the underlying causes at management level systematically.

STAMP
Systems-theoretic Accident Model and Processes (STAMP) is a non-linear analysis technique that views the occurrence of hazards as a systems theory control problem. The assumption of STAMP is that safety is an emergent characteristic of complex socio-technical systems, in which both the individual components and their underlying interactions need to satisfy certain conditions. STAMP offers a terminology and syntax that allow for systematic examination of potentially inadequate control.

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RESPONSE TO THE COMMENTS OF THE RUSSIAN FEDERATION

During the last joint meeting, the Russian Federation endorsed the notion that flight MH17 was hit by pre-formed fragments coming from a warhead that detonated to the left of the cockpit. The Russian Federation questioned the findings on the basis of which the Dutch Safety Board concluded that the crash of flight MH17 was caused by the detonation of a 9N314M warhead. The Russian Federation’s comments with regard to each finding of the Dutch Safety Board are listed in the table below, together with a response by the Dutch Safety Board.

<table>
<thead>
<tr>
<th>Finding Dutch Safety Board</th>
<th>The Russian Federation’s comment</th>
<th>The Dutch Safety Board’s response</th>
</tr>
</thead>
<tbody>
<tr>
<td>The sound peak recorded</td>
<td>None</td>
<td>All parties, including the Russian Federation, endorse the conclusion that the sound peak as recorded by the cockpit voice recorder is associated to the detonation of a warhead to the left and above the cockpit.</td>
</tr>
<tr>
<td>The damage pattern observed</td>
<td>The Russian Federation provided three different argumentations to reason that the analysis of the damage pattern and the location of detonation based thereon were incorrect.</td>
<td>1. The Russian Federation established a detonation location for the warhead on the basis of its own observations and assessments of the damage pattern, using the so-called stringing method. This point was closer to the aeroplane and outside the volume of space in which the warhead must have detonated as established by the Dutch Safety Board. Because the detonation point established by the Russian Federation is closer to the aeroplane, the Russian Federation arrived at a different conclusion about the type of warhead. The method used by the Russian Federation cannot be used to determine the exact detonation location of a warhead on the basis of the impact damage caused by fragments, as the trajectory described by such fragments before and after impact is not linear. The stringing method that was used only yields a general indication of the direction from which fragments approached the aeroplane.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In addition, the Dutch Safety Board investigated whether the detonation of a smaller warhead could have caused the damage found. TNO simulations, however, proved that the effects of the detonation of a smaller warhead at the detonation point established by the Russian Federation are not consistent with the damage pattern observed, in</td>
</tr>
<tr>
<td>Finding Dutch Safety Board</td>
<td>The Russian Federation's comment</td>
<td>The Dutch Safety Board's response</td>
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<tr>
<td>---------------------------</td>
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</tr>
<tr>
<td></td>
<td>been considerably more extensive. For this reason, the Russian Federation posited that a smaller warhead must have caused the damage pattern observed.</td>
<td>particular with regard to the boundaries of the impact pattern.</td>
</tr>
</tbody>
</table>

2. The Russian Federation also applied the stringing method to establish a detonation location in an other way. In this, the Russian Federation also took into account the impact damage on the inside of the fuselage. For this purpose, use was made of photographs showing holes in various frames and stringers (the inside of the fuselage). Strings were run from the holes in the frames and stringers through the holes in the fuselage in order to arrive at a detonation location. The detonation location established in this manner lies outside the volume of space in which the detonation must have taken place as established by the Dutch Safety Board. Besides that, the location deviates from the detonation location established by the Russian Federation mentioned under point 1.

As indicated above, the stringing method that was used is not a sound method for determining an exact detonation point on the basis of impact damage. Moreover, the damage on the inside of the fuselage cannot be included in such an analysis, as the fragments of a warhead that penetrate an object do not continue in the same direction; instead, they deviate from their course and ricochet. Therefore, the trajectory that would be described by a warhead fragment inside an airplane’s fuselage cannot be deduced and cannot be used to determine a warhead’s detonation location. Only the impact pattern caused by penetrations, perforations and ricochets visible on the outside can be used to determine the general origin of the fragments.

3. The Russian Federation stated that the operation of the so-called ‘proximity fuse’ - a sensor inside the missile - is of such a nature that a 9N314M warhead carried by a 9M38-series missile would not have detonated in the volume indicated by the Dutch Safety Board. According to the Russian Federation, the detonation location for the combination of the type of missile and warhead concerned would be about 3 to 5 metres further to the rear.

The data pertaining to the sensor involved were received - through the Russian Federation - from the manufacturer of this type of missile. The data was used in new calculations and on the basis of these calculations, the Dutch Safety Board concluded that it was technically possible that a 9N314M warhead carried by a 9M38 series missile detonated in the volume of space as indicated by the Dutch Safety Board.

The bow-tie shaped fragments

The Russian Federation provides three general reasons why the discovery of the pre-formed (cubic and bow-tie shaped) fragments would be insufficient evidence to demonstrate that the aeroplane was hit by a 9N314M warhead that detonated to the upper left-hand side of the cockpit, in close proximity to it.

The Dutch Safety Board’s conclusion that the crash of flight MH17 was caused by the detonation of a 9N314M warhead is not just based on the discovery of these pre-formed fragments. The Dutch Safety Board has used all of the findings cited in the left-hand column of this table to substantiate this conclusion.
The Dutch Safety Board stated that, assuming that a 9N314M warhead detonated close to the aeroplane, the number of bow-tie shaped and cubic fragments found is too small. In addition, the Russian Federation stated that the ratio of the different shapes of the particles found is not commensurate with the ratio between these shapes in a 9N314M warhead.

The detonation of the warhead took place at an altitude of ten kilometres, and only a fraction of the pre-formed fragments present in the warhead will have hit the aeroplane. Moreover, fragments do not necessarily get stuck in the aeroplane after impact and will have come loose and will have been lost during the break-up of the aeroplane, the fall of the pieces of wreckage, during the search for victims at the crash site, or during the recovery and transport of the wreckage. In addition, the fragments’ shape and weight may have changed as a result of the impact, making it more difficult to recognise the fragments’ original shape. This means that the chance of finding recognisable pre-shaped fragments is very small.

Two bow-tie shaped and two cubic fragments were recovered from the bodies of crew members and from the wreckage. The Dutch Safety Board’s investigation has demonstrated that these particular fragments originated from a warhead that detonated in close proximity to the aeroplane. The bow-tie shaped fragments are typical of a 9N314M warhead. Such bow-tie shaped fragments are not unique to this type of warhead, but - insofar as the Dutch Safety Board has been able to establish - other warheads containing such fragments are not common in use in the region. The discovery of two of such fragments in the remains of the flight crew members and the wreckage is a significant substantiation for a warhead of that type being the cause of the break-up of flight MH17.

The Russian Federation stated that, based on a test performed by Almaz-Antey, the weight of the pre-formed fragments found does not match with the fragments originating from a 9N314M warhead. The fragments are supposedly too light.

The Dutch Safety Board was not invited to be present during the test, but the results of the test were presented during the last Annex 13 meeting. The test was performed in a stationary situation on the ground, which is completely different from the detonation of a warhead at an altitude of about ten kilometres. The air density at an altitude of ten kilometres and the speeds of the missile and the aeroplane have a substantial influence.
<table>
<thead>
<tr>
<th>Finding</th>
<th>The Russian Federation’s comment</th>
<th>The Dutch Safety Board’s response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dutch Safety Board</td>
<td></td>
<td>on the spread of the fragments at the moment of detonation and, stemming from that, the impact, the impact pattern and the final shape and weight of the fragments. As indicated before, the fragments’ shape and weight can change as a result of the impact, among other things by deformation and the abrasion of material. The extent to which this happens strongly depends on the location where the detonation took place and on the material that the fragments impact. Therefore, the results of the tests are irreconcilable with the weight of the fragments actually found.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. The Russian Federation stated that the discovery of such pre-formed fragments is insufficient evidence for concluding that these originated from a specific type of surface-to-air missile. According to the Russian Federation, such pre-formed fragments are present in other weapon systems as well, including air-to-air missiles.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>The damage pattern observed does not match the damage pattern expected from an air-to-air missile. Insofar as the Dutch Safety Board has been able to establish, air-to-air missiles carrying a warhead containing bow-tie shaped fragments are not common in use in the region. In addition, no other aircraft that could have launched an air-to-air missile was observed on the radar data as provided by the Russian Federation.</td>
</tr>
<tr>
<td>Injuries of the three crew members in the cockpit</td>
<td>None</td>
<td>At a late stage the Dutch Safety Board could share with the Annex 13 parties that the injuries to the three crew members in the cockpit could be related to pre-formed fragments from the warhead. No comments with regard to this matter were received from the Russian Federation.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>By not commenting, the Russian Federation endorses the analysis which states that the in-flight break-up of the aeroplane was caused by a warhead containing pre-formed fragments exploding to the left of the cockpit.</td>
</tr>
<tr>
<td>The in-flight break-up of the aeroplane</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Finding Dutch Safety Board</td>
<td>The Russian Federation’s comment</td>
<td>The Dutch Safety Board’s response</td>
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<tr>
<td>---------------------------</td>
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</tr>
<tr>
<td>Discovered traces of an explosive device and the paint</td>
<td>None</td>
<td>At a late stage the Dutch Safety Board could share with the Annex 13 parties that objects had been found whose form and appearance match parts of a specific missile. The Netherlands Forensic Institute analysed these parts and two fragments that were found in the aeroplane. This entailed the analysis of traces of an explosive device and of paint. The results of these analyses were only made available to the Dutch Safety Board after the last Annex 13 meeting. As a result, they were not known to the Russian Federation and no comments with regard to this matter were received from the Russian Federation.</td>
</tr>
</tbody>
</table>

| The calculated missile trajectory | The Russian Federation stated that the possible trajectories that the missile could have followed to the detonation location volume were calculated incorrectly. It was alleged that the calculations had been based on faulty conditions. The Russian Federation especially stated that the detonation location was calculated incorrectly. On the basis of its own calculations, the Russian Federation stated that the missile trajectory would have originated from a limited area to the south of the village of Zaroshchenskoye. | The Russian Federation based its calculations on an incorrect detonation point and orientation of the weapon, resulting in an incorrect missile trajectory. |