



DUTCH  
SAFETY BOARD

# Aircraft proximity



# Aircraft proximity<sup>1</sup>

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*Source photo cover: USAFE*

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<sup>1</sup> An aircraft proximity (AIRPROX) is a situation in which, in the opinion of a pilot or air traffic services personnel, the distance between aircraft as well as their relative positions and speed have been such that the safety of the aircraft involved may have been compromised.

## **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 independence with respect to authorities and businesses. In some cases the Dutch Safety Board is required by law to conduct an investigation.

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

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# GENERAL INFORMATION

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Identification number: 2012041  
Classification: Serious incident  
Date, time<sup>2</sup> of occurrence: 19 April 2012, 10.23 hours  
Location of occurrence: Southwest of the Island of Sylt (Germany)  
N54°42'18" E007°40'48", near reporting  
point LEGPI

## **Aircraft 1:**

Aircraft registration: PH-KZI  
Aircraft type: Fokker F28 Mk0070  
Aircraft category: Airliner  
Type of flight: Scheduled commercial air transport  
Phase of operation: En route  
Damage to aircraft: None  
Flight crew: Four (two pilots, two cabin crew)  
Passengers: 41  
Injuries: None

## **Aircraft 2:**

Aircraft registration: LN 84-000019  
Aircraft type: F-15C  
Aircraft category: Fighter aircraft  
Type of flight: Military  
Phase of operation: Taking part in exercise Frisian Flag  
Damage to aircraft: None  
Flight crew: One  
Passengers: None  
Injuries: None

Other damage: None  
Lighting conditions: Daylight

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<sup>2</sup> All times in this report are local times unless otherwise specified.

The Fokker 70 with 45 people onboard, en route from Amsterdam Airport Schiphol in the Netherlands to Sandefjord Airport in Norway, flew over the North Sea southwest of the island Sylt in Germany at FL350.<sup>3</sup> A F-15C fighter aircraft came in close proximity of the Fokker 70. There was danger of a collision. The Traffic alert and Collision Avoidance System (TCAS)<sup>4</sup> in the cockpit of the Fokker 70 generated a resolution advisory to climb, whereupon the crew performed a climb to avoid a possible collision. The pilot of the F-15C took avoiding action as well. The F-15C participated in the international air force exercise Frisian Flag which took place from Leeuwarden Air Base in the Netherlands. Both aircraft continued their flight uneventfully. The minimum lateral distance between both aircraft was 0,39 NM (722 metre) with a difference in altitude of 512 feet (156 metre).

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3 A flight level (FL) is a standard nominal altitude of an aircraft, in hundreds of feet. This altitude is calculated from the international standard pressure datum of 1013.25 hPa, the average sea-level pressure.

4 For a description of TCAS, see appendix E.

# 1 FACTUAL INFORMATION

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## 1.1 History of the flight

### *Fokker 70*

PH-KZI, a Fokker 70, had taken off from Amsterdam Airport Schiphol at 09.53 hours and performed a scheduled passenger flight to Sandefjord Airport in Norway. The plane had 41 passengers and four crew members aboard. The flight deck comprised the captain acting as pilot monitoring and the first officer as pilot flying. The cruising level of the flight was planned at flight level (FL) 350.

The captain contacted Maastricht Upper Area Control (UAC)<sup>5</sup> at 10.02 hours. At that moment the flight was climbing to FL250 towards reporting point BEDUM in the northeast of the Netherlands. At 10.11 hours the Fokker 70 was cleared to climb to FL350. The flight continued at FL350 on ATS route<sup>6</sup> UN873 inbound point TUSKA on the border between Germany and Denmark. The approximate heading was 025 degrees. The pilots described the weather and visibility at FL350 as good. At 10.21 hours the flight was transferred to Area Control Centre Copenhagen. At 10.22:18 hours the air traffic controller of Copenhagen informed the crew that he had radar contact. Eighteen seconds later he passed traffic information to the crew regarding a fighter aircraft<sup>7</sup> at their twelve o'clock position at a range of ten miles flying at an unconfirmed FL352. The captain replied that they were visual with the traffic ahead.

At 10.23:06 hours the air traffic controller informed the crew that the fighter aircraft was descending and now showing FL351 on his radar screen. A traffic advisory appeared on the TCAS display, followed by a "CLIMB CLIMB" resolution advisory. The first officer switched off the autopilot and followed the TCAS command. Directly after following this command, the resolution advisory changed to an "INCREASE CLIMB, INCREASE CLIMB". The captain stated he remained visual with the traffic and saw the fighter aircraft passing just left of their aircraft and, as a result of the TCAS climb, slightly below. The captain described the traffic as "a large pale gray fighter" and it appeared to take no evasive or corrective action. The first officer stated that after his first visual contact with the traffic his focus was mainly on the flight instruments and the TCAS manoeuvre, so he did not see the traffic pass.

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5 The Maastricht Upper Area Control Centre, operated by EUROCONTROL on behalf of four States, provides air traffic control, flight information service and alerting service for the upper airspace (above FL245) of Belgium, the Netherlands, Luxembourg and north-west Germany.

6 An air traffic services (ATS) route is a designated route for channeling the flow of traffic as necessary for the provision of air traffic services. In this report ATS routes will be called airways.

7 Aircraft type: F-15C.

When the "CLEAR OF CONFLICT" message was announced by the TCAS system, the Fokker 70 had climbed to FL365. The first officer levelled off, re-engaged the autopilot and started a descent to FL350 while the captain informed air traffic control. The remainder of the flight was uneventful.

During the flight preparation of the event flight the crew did not give special attention to the published NOTAM regarding the "Frisian Flag 2012" exercise. On the return flight the next morning the crew paid more attention to the NOTAM and came to the conclusion that the event flight the day before was performed outside the exercise area which was located west of their route.

### *F-15C*

A formation of four F-15C fighter aircraft, with call signs Skimmer 51 until Skimmer 54, departed at 08.46 hours from Lakenheath RAF air base in the United Kingdom. The mission was in support of the exercise Frisian Flag in Dutch and German airspace. Upon entering the exercise airspace at 09.36 hours, the flight was under control of Control and Reporting Centre Schönewalde<sup>8</sup> in Germany. There was a broken layer of clouds from 4000 to 6000 feet above mean sea level and conditions were clear above. The fighter controller informed the pilots that tactical radar assistance<sup>9</sup> was provided for the time being.

Based on the low cloud layer, the mission commander called for a 'high war'. This required the four fighter aircraft, belonging to red air<sup>10</sup>, to remain in the airspace block between FL340 and FL360. The airspace block for blue air was between FL270 and FL330.

At 09.52 hours, the fighter controller called out airline traffic transiting through the exercise airspace at FL330, flying northeast, and limited the four fighter aircraft to FL310 and below. The altitude restriction put them in the blue airspace block. Ten minutes later the altitude restriction was lifted. At 10.06 hours the exercise began and the fighter controller called out airline traffic, a Boeing 737-400, transiting the airspace at FL340 in a southwest direction and restricted the Skimmer flight to FL320 and below. At this point, the 4-ship split into two separate 2-ships, one at FL320 and the other one at FL310.

At 10.11 hours Skimmer 53 and 54 climbed to FL340 and FL350 respectively. Skimmer 51 queried the controller if blue air knew that the Skimmer flight would be in their block due to the altitude restriction. The controller did not respond to this call, but instead pointed out again to the airline traffic transiting the airspace. Skimmer 51 responded that he was aware of the traffic, but could not provide deconfliction from both blue air and the airline traffic based upon the current altitude restriction. The controller did not respond.

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8 The military Control and Reporting Centre Schönewalde provides among other things fighter control in danger area ED-D101B.

9 Tactical radar assistance is a form of aircraft mission control in which the aircraft commander is responsible for collision avoidance. A definition is given in paragraph 1.4.3.

10 Blue air is the name for the aircraft that belong to the own coalition forces within the scope of the exercise. Red air is the name for the aircraft belonging to the opposing team.



At 10.15 hours Skimmer 53 and 54 were approaching a regen airfield at FL345. A regen airfield is a virtual airfield above which aircraft that were brought down within the scope of the exercise can return into the scenario. Skimmer 53 and 54 were directed by the controller to head west due to the airliner at FL340. They turned to the west. Twenty-four seconds later Skimmer 54 was instructed to proceed to the west immediately. The controller used the term 'hazzle west immediately'.

At 10.18 hours Skimmer 53 returned to Lakenheath Air Base as a single-ship due to its fuel state. Skimmer 54 subsequently proceeded back to the regen airfield as a single-ship. Skimmer 54 crossed over the regen airfield and flew from FL353 into area ED-D101B<sup>11</sup> on a heading of 110 degrees. At 10.22:50 hours, the fighter controller directed Skimmer 54 to proceed to the west immediately due to a stranger (the Fokker 70) and to maintain at FL350. Again he used the term 'hazzle west immediately'. Two more times he informed the pilot about the traffic and instructed him to proceed to the west. The pilot remained level at FL350 and continued a right turn to heading 230 degrees. He had visual contact with three airliners of which one, the Fokker 70, was at the same level. The fighter pilot assessed that there was no imminent risk of a collision. He stated that the radios were saturated and that he had not received a warning of the non-participating aircraft before.

At 10.24:26 hours the controller made the transmission to abort the Frisian Flag exercise. The three fighter aircraft rejoined and returned to Lakenheath Air Base.

## 1.2 Aircraft information

The Fokker 70 is a narrow-body, twin-engine, medium-range, jet airliner. PH-KZI was fitted with TCAS. See appendix E for more information about the TCAS system.



Figure 1: Fokker 70. (Source: KLM)

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11 Danger area ED-D101B is described in paragraph 1.4.1.



Figure 2: F-15. (Source: USAFE)

The McDonnell Douglas (now Boeing) F-15C Eagle is a single-seat, twin-engine, tactical fighter. The aircraft involved was not fitted with ACAS, but had an altitude-reporting mode C transponder.<sup>12</sup>

### 1.3 Organisational and management information

#### 1.3.1 Frisian Flag exercise

The international air force exercise Frisian Flag took place from Leeuwarden Air Base in the Netherlands from 16 April until 27 April 2012. The aim of the yearly exercise is to provide military aircrew from NATO countries with realistic training in a modern simulated air combat environment. The 323 Tactical Training, Evaluation and Standardization squadron from the Royal Netherlands Air Force (RNLAf), based at Leeuwarden Air Base, organized the exercise. At executive level the air base commander was responsible for the exercise.

In 1992 the exercise started small-scale at Leeuwarden Air Base under the name DIATIT. The following two decades saw the event growing bigger, with an increasing number of participants. The exercise in 2012 was the ninth under the name Frisian Flag and the sixteenth exercise since 1992.

In 2012 a total of 72 aircraft from nine countries participated. The USAFE<sup>13</sup> participated with four F-15C fighter aircraft, which operated from their home air base Lakenheath in the United Kingdom during the exercise.

The exercise staff for Frisian Flag 2012 consisted of the following functions: overall commander, project officer, operations officer, exercise director, fighter control coordinator, intelligence and security officer and a logistics coordinator. The fighter control coordinator was responsible for the coordination tasks and application for the airspace for the exercise.

<sup>12</sup> A transponder is a device on board of an aircraft that emits an identifying signal in response to an interrogating received signal. It is now standard practice to allocate a specific transponder code to each aircraft flying in controlled airspace so that the air traffic controller can readily identify a specific aircraft on a radar screen.

<sup>13</sup> United States Air Force in Europe.

Subsequently the airspace and control units concerned themselves were responsible for the further planning, preparation and execution.

Frisian Flag 2012 airspace was mainly over water and consisted of Danish, Dutch and German airspace.<sup>14</sup> A map of the Frisian Flag 2012 primary airspace, including height bands, is depicted below.

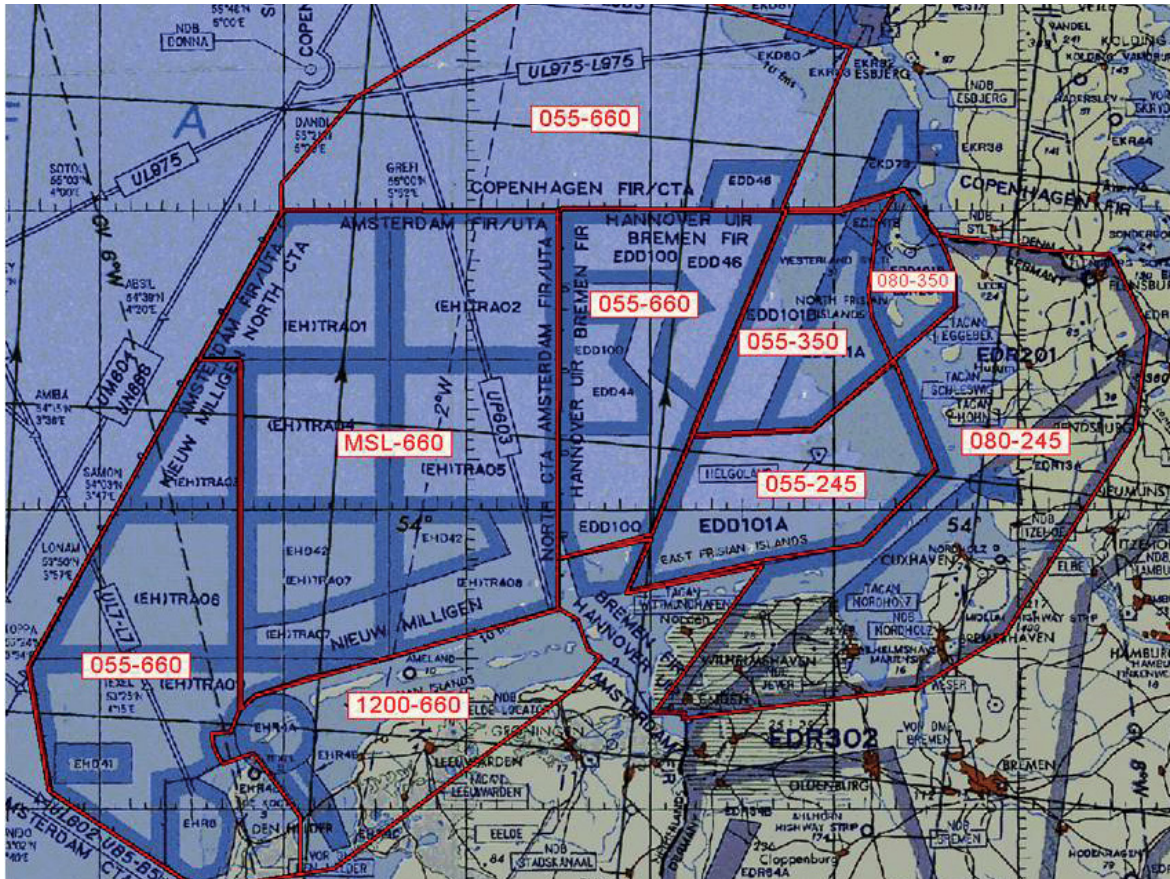


Figure 3: Exercise airspace Frisian Flag 2012. (Source: EXOPORD FF12-001, RNLAf)

### 1.3.2 Preparation Frisian Flag 2012

During the preparation of Frisian Flag 2012 the exercise staff used the Frisian Flag planning checklist<sup>15</sup> as a guideline for the planning of the exercise.

#### Risk analysis

The staff performed a risk analysis for the exercise in which, among other things, attention was paid to the following subjects:

- Reorganization within the Royal Netherlands Air Force (RNLAf). As a result of a reorganization more work had to be done with less people in the preparation of a big and complex exercise.

<sup>14</sup> The airspace covered the lateral boundaries of the CBA SEA, Dutch EH-Ds 1 till 9, the New Milligen TMA-A, German ED-D100, ED-D101A, ED-D101B, ED-R201 and Danish EK-D301 and EK-D304.

<sup>15</sup> Version 1.0, Draft 20 May 2010.

- Collisions on the ground. During the exercise the air base was running with a complement of approximately 800 people, which was about twice as much as during normal operation. About 60 extra aircraft were operating from the air base.
- Collisions in the air. The focus was on areas where aircraft come together. Those were the areas around the air base, holding patterns for refuelling aircraft and areas where aircraft were holding after which they simultaneously entered the simulated hostile area. The focus was on avoiding collisions between aircraft participating in the exercise. Danger area ED-D101B was not classified as a risk area.

### *Meetings*

In August 2011 the staff had a meeting to determine the exercise airspace for Frisian Flag 2012. Based on the expected high number of participants it was decided to request not only Dutch airspace but Danish and German airspace as well. The requests were made by the fighter control coordinator. An agreement for the Dutch and Danish airspace was made at an early stage.

On 6 October 2011 the request for the German airspace was presented to the Coordination and Scheduling Agency of the National Air Policing Centre in Germany. The request was approved, but the formal permission could only be confirmed one week before the start of the exercise.

On 26 October 2011 an initial planning conference was held at Leeuwarden Air Base. On 11 and 12 January 2012 a two-day meeting was organised for all organisations which were involved in the preparation of the exercise. Invitations for the meeting were sent to the following German organisations:

- Coordination and Scheduling Agency (COSA);
- Deutsche Flugsicherung GmbH (DFS);
- Coordination Center for Military Airspace Utilisation (COMIL) of the Bundeswehr Air Traffic Service Office (AFSBw);
- Control and Reporting Centre (CRC) Schönewalde.

The COSA and DFS were not present. A representative of the COMIL and experts of CRC Schönewalde were present on behalf of the German Air Force. On 11 January 2012 the command and control and airspace issues were discussed. The day after the final planning conference took place. During the airspace meeting, it was discussed among other matters which airspace to use, the issue of NOTAMs and the type of aircraft mission control to be used. It was decided to use advisory control service<sup>16</sup> during the exercise. According to the fighter control coordinator the presence of airways in the exercise airspace was not discussed. The staff did not make minutes of the meeting.

Two days after the final planning conference the fighter control coordinator of the Frisian Flag staff contacted the representative of the DFS with the request if a specific German airspace meeting should be organised, because of the absence of the DFS during the airspace meeting on 11 January 2012.

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<sup>16</sup> Advisory control service is explained in paragraph 1.4.3, Types of aircraft mission control.

The fighter control coordinator stated that the representative of the DFS said that there was no reason for a specific meeting, because he had spoken with the COMIL representative.<sup>17</sup> Furthermore the exercise was only conducted in established military training areas and therefore needed no special coordination meeting, according to the Deutsche Flugsicherung GmbH.

After the final planning conference had taken place the document 'Frisian Flag 2012, Exercise Operation Order'<sup>18</sup> was sent to all the exercise participants. This is the base document for the Frisian Flag 2012 exercise. It governs flying regulations, mission operation and logistics. The document did not mention the presence of airways in the exercise area. It stated that although primary Frisian Flag airspace should be clear of non-players, other traffic might be inside the airspace (e.g. emergencies, weather avoidance). In this case, the air traffic control and fighter control units might provide stranger warnings and may restrict operations as deemed necessary.

One week before the start of the exercise the formal permission for the use of the German airspace was confirmed without restrictions. It was the first time that airspace above FL240 in Germany was made available for the Frisian Flag exercise.

### **1.3.3 Briefings**

The mandatory exercise briefing for all aircrew took place on 15 April 2012 at Leeuwarden Air Base. Off-station participants were briefed by Frisian Flag staff or via their liaison officers. During this briefing aspects of importance for the exercise were discussed. It was explained that all exercise areas would be clear of non-participating traffic, unless this traffic is specifically cleared by a Control and Reporting Centre or an AWACS.<sup>19</sup> Furthermore, the staff briefed that advisory control service would be used as the type of aircraft mission control, unless otherwise specified by the controlling unit.

For the aircrew daily briefings were given on the days of the exercise which were compulsory to attend. For the F-15C pilots there was an exception to this rule because they were operating from their home air base in the United Kingdom. Liaison officers of the USAFE were present during the briefings to pass on briefing information to the F-15C pilots at Lakenheath Air Base.

### **1.3.4 Actions taken after civil traffic was observed on Monday and Tuesday**

On 16 and 17 April 2012, the first and second day of the exercise, non-participating aircraft, namely airliners, were observed by Frisian Flag participants in the German danger area ED-D101B which was part of the exercise area. Those airliners were flying on airway UN873. On 18 April the exercise only took place in Dutch and Danish airspace.

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<sup>17</sup> This was confirmed by an e-mail conversation between the fighter control coordinator and the DFS.

<sup>18</sup> EXOPORD FF12-001. Version 1.0, date 7 March 2012, status final.

<sup>19</sup> An Airborne Warning And Control System (AWACS) is an airborne radar system designed to detect aircraft at long ranges and control and command the battle space in an air engagement by directing fighter and attack plane strikes.

On 16 April 2012 the fighter control coordinator contacted the COMIL representative to inform him about the airliners flying in ED-D101B. The representative informed him that those airliners were authorised to fly in that danger area.

On 17 April 2012 the fighter control coordinator sent an e-mail to Bremen Area Control Centre<sup>20</sup> (ACC) and Lippe Radar<sup>21</sup> to inform them that the civil traffic flying in ED-D101A<sup>22</sup>/B was reducing the tactical freedom of the participants of the Frisian Flag exercise. He asked the units if there was anything they could do to keep the aircraft out of the danger areas concerned.

#### *Actions taken by Bremen ACC*

On 17 April 2012 a representative of Bremen ACC replied that there were no possibilities for a change as IFR traffic<sup>23</sup> on airways in this danger area is given priority over and separation from military traffic. However, he answered that Bremen ACC should inform the controlling unit about flights on the airways in the area under control by Bremen ACC.

The representative of Bremen ACC mentioned that a possible solution for the problem could be that the controlling unit of the exercise might ask for a level change of the crossing traffic on the airways in the area of Bremen ACC.

#### *Actions taken by Lippe Radar*

The fighter control coordinator stated that he received no reaction from Lippe Radar. However, the incoming message was read by the responsible staff of Lippe Radar. The responsible supervisor in charge made a phone call to CRC Schönewalde in order to investigate the possible nature of the problem described in the e-mail of the fighter control coordinator. Furthermore, the supervisor initiated to plan and man an additional special working position with an air traffic controller in order to permanently monitor the ongoing exercise within ED-D101B and provide CRC Schönewalde with adequate information on general air traffic<sup>24</sup> crossing that area, even if that is generally neither mandatory nor prescribed for that area within any of the letters of agreement.

The Lippe Radar supervisor also requested Maastricht UAC to inform the Lippe liaison controller for CRC Schönewalde about descending general air traffic on the airway UN873 during the times of exercise activities within ED-D101B.

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<sup>20</sup> Bremen ACC provides among other things air traffic control for the airspace below FL245 below danger area ED-D101B.

<sup>21</sup> The Air Navigation Service Provider Deutsche Flugsicherung GmbH Branch Maastricht (Lippe radar) is responsible for the provision of air traffic services to state aircraft operated as operational air traffic within the Hannover Upper Flight Information Region (UIR Hannover) above FL245. In accordance with the four States MUAC-agreement the unit is co-located within the premises of EUROCONTROL Maastricht UAC.

<sup>22</sup> ED-D101A (Deutsche Bucht) is a danger area with a lower limit of 5500 feet AMSL and an upper limit of FL245.

<sup>23</sup> Flights conducted in accordance with the instrument flight rules (IFR).

<sup>24</sup> General air traffic are flights which are conducted in accordance with the rules and regulations of the International Civil Aviation Organization (ICAO) and/or the national civil aviation law.

## 1.4 Other information

### 1.4.1 Danger areas

A danger area is an airspace of defined dimensions within which activities that are dangerous to the flight of aircraft may exist at specified times. The descriptions of a danger area in the Aeronautical Information Publication (AIP) the Netherlands and the AIP Germany can be found in appendix B.

The danger area Amrum with designation ED-D101B is situated above the North Sea. The lower limit is FL245 and the upper limit is FL350. The airway UN873 crosses this danger area. The AIP Germany<sup>25</sup> states for this danger area that IFR air traffic on the published airways is given priority handling over and separation from military training flights. The other airways which cross ED-D101B are designated as conditional routes category 2 during daytime on weekdays. These routes are only opened by the Airspace Management Cell Germany if ED-D101B is not booked.

### 1.4.2 Separation minima

The Frisian Flag 2012 Exercise Operation Order stipulates that main flight safety issues are traffic avoidance and airspace integrity. Radar equipped air controlling units (air traffic control and fighter control) will assist in traffic avoidance and preserving airspace integrity.

For separation with non-participants of the Frisian Flag exercise the standard ICAO IFR separation minima should be used:

- minimum lateral distance at least 5 NM;
- minimum vertical distance at least: 1000 feet between flights at and below FL290; 2000 feet between flights at and above FL290.

Reduced vertical separation minima (RVSM) procedures exist in airspace above FL290, based on regional air navigation agreements. However, most military aircraft do not comply with the RVSM requirements. The vertical separation minima in those airspaces are 1000 feet. Additional requirements exist for operators and their aircraft operating in RVSM airspace.

The Exercise Operation Order further states that when advisory control service is used as the type of aircraft mission control, the aircrew is responsible for maintaining a horizontal separation of at least 5 NM or a vertical separation of at least 5000 feet from non-participating traffic.<sup>26</sup>

The Manual of Operations, Air Traffic Services (MO-ATS) of the Deutsche Flugsicherung GmbH mentions in chapter 400 'Approach and area control procedures' under 430 'Separation' the vertical separation and radar separation minima. Those minima correspond to the standard ICAO separation minima.

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<sup>25</sup> ENR 5.1.-33 Danger Areas.

<sup>26</sup> The STANAG (Standardization Agreement) 3993 doesn't define the values for horizontal and vertical separation.

### 1.4.3 Types of aircraft mission control

The aircraft mission control types used for fighter pilots in contact with a fighter control unit during the Frisian Flag exercise are<sup>27</sup>:

- Positive control service;
- Advisory control service;
- Broadcast control.

The type of aircraft mission control defines the flight safety responsibilities for both controlling unit and aircrew.

Under advisory control service the aircraft commander is responsible for navigation and collision avoidance. The definition of advisory control service, as mentioned in the Exercise Operation Order, is depicted in appendix C.

The fighter controller of CRC Schönewalde used the term tactical radar assistance. Under this type of aircraft mission control the controller supports the aircrews in the best way to ensure lateral and vertical minimum separation to area boundaries and crossing traffic, using all systems available, by giving hazard warnings (e.g. stranger warnings, area boundary warnings).<sup>28</sup> The aircraft commander is responsible for collision avoidance. The same rules for separation apply as under loose advisory control.<sup>29</sup>

### 1.4.4 Transfer of communications and control

The transfer of communications from Maastricht UAC to ACC Copenhagen takes place before the transfer on control but not earlier than 30 NM before the area of responsibility boundary, unless otherwise co-ordinated. The transfer of control takes place at the area of responsibility boundary.<sup>30</sup>

### 1.4.5 AWACS

On 19 April the flight of the AWACS, which participated in the exercise, was aborted due to fumes in the cockpit. The consequence was that the whole exercise area in Germany was controlled by CRC Schönewalde and no AWACS oversight was available.

### 1.4.6 Safety Assessment for Frisian Flag exercise 2012

For Frisian Flag 2012 the Dutch Ministry of Defence had requested a temporary change in 'buffer procedures' between civilian and military aircraft. The possible scenarios considerably impacted the traffic flows and procedures for the part of the Maastricht UAC DECO sector group that is situated in the Amsterdam FIR.<sup>31</sup>

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<sup>27</sup> Source: EXOPORD FF12-001, 9.1.65 Flight Safety Conditions.

<sup>28</sup> Source: Besondere Anweisung für den Einsatzführungsdienst der Luftwaffe 103/355-01.

<sup>29</sup> Loose advisory control is a form of aircraft mission control in which the aircraft commander selects his own speed, altitude, heading and the appropriate tactics required to accomplish the assigned task. The controlling unit will advise the aircraft commander of the current tactical picture and will provide further advice if and when available. The controlling unit will provide adequate warnings of hazards affecting aircraft safety. The aircraft commander is responsible for navigation and collision avoidance (Source: STANAG 3993).

<sup>30</sup> Source: LoA between ACC Copenhagen and Maastricht UAC, 18.11.2010.

<sup>31</sup> Danger area ED-D101B is not situated in the Amsterdam FIR.



Maastricht UAC performed a safety assessment in order to identify all possible hazards and derive possible mitigations for two scenarios.

On 4 April 2012 Maastricht UAC issued an internal note regarding the military exercise Frisian Flag 2012. The note stated that the impact of the exercise on Maastricht UAC operations consists inter alia of a 2.5 NM restriction along a part of the airway UN873 in Dutch Airspace.

#### **1.4.7 Weather conditions**

The top of the present clouds was around FL310. Therefore the visibility at FL350 was not restricted by clouds.

As part of the investigation the Dutch Safety Board sent a list with questions for the F-15C pilot involved to the USAFE Headquarters in Ramstein Germany. The list is shown in appendix D. The USAFE did not provide answers to those questions. Via the Chief Accident Investigation of the Royal Netherlands Air Force, the Board obtained the sanitised investigation report of the USAFE.

### 2.1 Preparation Frisian Flag exercise

During the preparation of the Frisian Flag exercise the fighter control coordinator applied for the use of the airspace in Germany where the aircraft proximity occurred. The request was approved without restrictions and therefore the fighter control coordinator took it for granted that the whole airspace block was available for the exercise.<sup>32</sup> The exercise staff was not aware that an active airway, UN873, was present in danger area ED-101B, which is a part of the exercise area in Germany. The staff used military flying maps during the preparation, on which no civil airways are depicted. An airspace planning software tool was used as well. However the feature of this tool to depict airways was not used by the staff.

It was the first time that airspace above FL240 in Germany was made available for the Frisian Flag exercise. The Frisian Flag planning checklist had not been adjusted to this. The exercise staff had not invited an expert from Maastricht UAC during the airspace meeting, although exercise airspace above FL245 within the area of responsibility of Maastricht UAC was used. This expert might have drawn the attention of the exercise staff to the presence of the airway.

The absence of the expert is remarkable because the Dutch Ministry of Defence had requested a temporary change in 'buffer procedures' between civilian and military aircraft. Therefore, Maastricht UAC had performed a safety assessment, which was only related to Dutch airspace. It can be concluded that the Ministry of Defence felt only responsible for the consequences of the operational use of the Dutch airspace. It was assumed without verification that the German military and civil authorities would take their own responsibilities.

The RNLAf did perform a risk analysis for the total exercise Frisian Flag. However the increase in available airspace above FL240 in Germany was not seen sufficiently as a risk. The focus of collision avoidance in the air was on aircraft participating in the exercise, because during previous editions of the exercise the staff had not encountered problems with airliners and because airliners were not expected in the areas concerned in Germany.

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<sup>32</sup> The restrictions for the airspace are published in the AIP Germany.

A thorough risk analysis for the use of the exercise area, especially the area above FL240, might have revealed the presence of the active airway.

The fighter control coordinator stated that he never had thought about the presence of airways in the German exercise airspace. A reason was that this airspace consisted of danger areas. He had the experience that airways in Dutch and Danish danger areas were always closed after activation of the danger area. He had assumed that this was the same in Germany. However, in Germany airways can be used in an active danger area and in the area concerned airliners have priority over military traffic. Pilots are urgently requested to contact the air traffic control unit prior to entry of a danger area. In this case, the Fokker 70 cockpit crew contacted Maastricht UAC before entry of the danger area concerned.

During the two days meeting in January 2012 at Leeuwarden Air Base, where a representative of COMIL and experts of CRC Schönewalde were present, the presence of airway UN873 or any other airway within the German exercise area was never discussed, according to the fighter control coordinator. Therefore, he was still not aware of the presence of airways in the exercise area.

On the contrary, the representative from COMIL stated that the airway was discussed during the final planning conference by using the en route chart Germany and the AIP Germany. However, the outcome of this discussion never reached the fighter control coordinator. The reason for this has not been determined during the investigation.

The Deutsche Flugsicherung GmbH stated that during the preparation meeting for the previous Frisian Flag exercise in 2011 the issue of UN873 was discussed with the exercise planners in length, especially the fact that UN873 is an airway without restrictions and could therefore only be closed after a lengthy approval process by the Ministry of Transport. Therefore the existence of UN873 was definitely known in the past Frisian Flag planning processes.

An expert of CRC Schönewalde, who joined the meeting, stated that it was mentioned during the meeting that the planning for the Frisian Flag exercise had been done in the same way as the year before. This gave him the feeling that the airspace was already known for everyone involved. He also stated that there are many airways inside and outside the exercise airspace which could have become a factor in one or the other way. Analysing their impact would have been a good preparation, according to the expert.

The location of the regen airfield that was used by the F-15C pilot was close to the active airway UN873. This was not discussed during the meeting. The senior operations officer of CRC Schönewalde stated that their liaison officer at Leeuwarden Air Base made the exercise staff aware of the location of the regen airfield before 17 April, but nothing was changed.

#### *Aircraft mission control*

During the exercise briefing all participants were informed that advisory control service would be used as the type of aircraft mission control, unless otherwise specified by the controlling unit.

With this type of control the aircraft commander is responsible for navigation and collision avoidance. Upon initial radio contact the fighter controller of CRC Schönewalde informed the F-15C pilot that tactical radar assistance would be provided, which is similar to loose advisory control. In this case the aircraft commander was also responsible for navigation and collision avoidance.

The Royal Netherlands Air Force performed a risk analysis for the total exercise. However the increase in available airspace above FL240 in Germany was not sufficiently seen as a risk.

As a result of the assumption by the exercise staff that the assigned German airspace was available for the exercise without restrictions, no adequate measures were taken to ensure separation between participating and non-participating traffic.

The German authorities, which were involved in the preparation of airspace matters for the air force exercise, had the duty to inform the exercise staff about the characteristics of the airspace concerned in their country and the presence of airways. This was not done sufficiently. The exercise staff had the duty to gather more information about the airspace concerned. This was neither done.

The actions of the fighter control coordinator, who was responsible for the coordination tasks and application for the airspace for the exercise, were not checked thoroughly by another member of the exercise staff or somebody outside the staff.

The location of one of the regen airfields had been planned close to the airway UN873. This was possible because the exercise staff was not aware of the presence of the airway.

## **2.2 Actions by staff after airliners had been observed in exercise area**

After civil traffic had been observed in the exercise area on the first two days of the exercise, the fighter control coordinator sent a request to Bremen ACC and Lippe Radar if anything could be done to keep the aircraft out of the danger areas concerned. Although both units took action within the scope of their abilities and responsibilities, civil traffic kept crossing the danger areas. No further action was taken by the exercise staff and on the fourth day of the exercise, when the aircraft proximity took place, the danger areas concerned were still used for the exercise.

A liaison officer of CRC Schönewalde, who was present at Leeuwarden Air Base during the exercise, informed the exercise staff during the first two days of the exercise that an active airway was present in the exercise area and that civil traffic could be expected. The exercise staff did not pay attention to the message of the liaison officer and it was subsequently not mentioned during the daily briefings. However, after the second day of the exercise all fighter pilots at Leeuwarden Air Base were aware that airlines were present in the exercise area, because it was discussed among them in the briefing room. During the investigation, it has not become clear if the F-15C pilot was informed by the liaison officers about this.

On 18 April, the day before the aircraft proximity occurred, the liaison officer of CRC Schönewalde pointed the presence of airway UN873 to the mission commander<sup>33</sup> of the exercise. However, no action was taken by the exercise staff.

Inadequate action was taken by the exercise staff after civil traffic had been observed in the exercise area to avoid this to reoccur.

### **2.3 Loss of separation**

Based on radar data from Maastricht UAC the following sequence of events was determined.

The Fokker 70 was flying in a northeast direction at FL350 on the airway UN873 inside danger area ED-D101B. At 10.22:06 hours the F-15C exited area ED-D46, which is located west of area ED-D101B, on an east southeast heading and indicating FL353 on the radar screen. At 10.22:30 hours when the F-15C was just west of the centreline of UN873 it started a right turn. At 10.22:58 hours the horizontal separation between both aircraft was 4.7 NM with a vertical separation of 200 feet. The F-15C was now slightly east of the UN873 centreline and continued the right turn. At 10.23:13 hours the F-15C crossed in front of the Fokker 70 at the same level at a distance of 1.1 NM in a westerly direction. At 10.23:18 hours the horizontal separation was 0.6 NM. At that moment the altitude of the F-15C indicated FL349 and the altitude of the Fokker 70 indicated FL351. This was the start of the TCAS climb by the Fokker 70 crew.

The occurrence took place within the exercise area of Frisian Flag in the Hannover UIR (EDVV). This UIR is an upper control area between FL245 and FL660 with airspace classification C. General air traffic on airway UN873 inside this area is controlled by Maastricht UAC. State aircraft operated as operational air traffic within the Hannover UIR are controlled by Lippe radar.

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<sup>33</sup> The mission commander is in charge of the blue forces.

The ICAO separation minima between two IFR aircraft (at or above FL290) are a minimum lateral distance of 5 NM and a minimum vertical distance of 2000 feet. The reduced vertical separation minima procedures (RVSM)<sup>34</sup> are applicable in the area where the occurrence took place, but not between the fighter aircraft and the airliner, because the fighter aircraft did not comply with the RVSM requirements.

The EXOPORD states that under advisory control service a horizontal separation of at least 5 NM or a vertical separation of at least 5000 feet should be maintained from non-participating aircraft.

The minimum lateral distance between both aircraft was 0.39 NM with a difference in altitude of 512 feet. At this point, the Fokker 70 was in a TCAS climb. The separation minima were breached, so a loss of separation had taken place. There was a collision danger. See appendix E for a vertical profile of the event.

The transfer of communications for the Fokker 70 to ACC Copenhagen took place in accordance with the letter of agreement between ACC Copenhagen and Maastricht UAC. The aircraft was still flying within the area of responsibility of Maastricht UAC.

The same military aircraft was involved in another less serious infringement eight minutes earlier. At 10.15 hours a loss of separation took place between a southwest bound Boeing 737-400 maintaining FL340 on airway UN873 also in danger area ED-D101B. The closest horizontal radar distance was 4.6 NM with a vertical separation of 1400 feet.

Two loss of separation incidents occurred between the F-15C and an airliner within the Frisian Flag exercise area. A risk of collision existed between the F-15C and the Fokker 70. The minimum lateral distance between those aircraft was 0.39 NM with a vertical separation of 512 feet.

## **2.4 Actions by F-15C pilot and fighter controller**

Lippe Radar informed CRC Schönewalde about some airliners, among which the Fokker 70, proceeding on the airway UN873. The assistant of the fighter controller subsequently informed him about the traffic. The controller confirmed that he had heard the message.

At 10.06 hours the fighter controller restricted Skimmer flight to FL320 and below. This was confirmed by Skimmer 51. A location for the restriction was not given. However, at 10.11 hours while the restriction had not been cancelled, Skimmer 54 climbed to FL350. At 10.15 hours Skimmer 54 approached the regen airfield at FL345 where after he was directed to head west due to an airliner at FL340.

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<sup>34</sup> Vertical separation of 1000 feet above FL290 if an operator and its aircraft comply with several requirements.

This is where the F-15C pilot was involved with the first loss of separation occurrence that took place with the Boeing 737-400.

At 10.18 hour Skimmer 54 proceeded back to the regen airfield again at FL353, still not adhering to the restriction to stay at FL320 or below. The aircraft flew above the upper limit of FL350 of the danger area. The investigation report of the USAFE mentions that the pilot was unaware of the altitude restriction because a simultaneous call had come in. A few minutes later the pilot entered danger area ED-D101B and approached the airway UN873, where the Fokker 70 was flying at FL350. The assistant pointed out the approaching conflict situation. The fighter controller was focussed on providing tactical support to several fighter aircraft taking part in the exercise. Subsequently, he instructed the F-15C pilot to proceed to the west immediately and maintain its level. By doing this the fighter controller unintentionally brought the two aircraft at the same level and the aircraft proximity took place. Above the Fokker 70, at the same location on the radar screen of the fighter controller, another airliner was maintaining FL390 and flying in the same direction as the Fokker 70. The two labels on the radar screen with flight information, among which the flight level, of the airliners concerned overlapped and confused the controller.

It seems that the fighter controller, who suddenly had to switch from providing tactical support to separating the fighter aircraft from the airliners, had lost the overview at a certain moment and got saturated. There were nine aircraft on his frequency and he stated there was quite some background noise. The controller mentioned that he did not have a lot of experience with big exercise scenarios like this. Two days before the aircraft proximity occurred, he had expressed his concerns to the fighter allocator<sup>35</sup> regarding the conditions of the exercise, i.e. the location of the regen airfield close to an active airway and the airway itself. The fighter allocator had informed the liaison officer at Leeuwarden Air Base about this. This message did not result in any changes.

The fighter controller started his training in 2005 and obtained his licence in 2008. He had been working in this function for three years and was combat ready since two years. The day that the aircraft proximity took place, the controller had a day shift from 07.00 till 16.00 hours. He felt comfortable when he started that morning.

The fighter allocator of CRC Schönewalde mentioned that this kind of complex scenarios with many aircraft had not been trained very often. Normally, only on-the-job training was given.

The fighter controller used the term 'hazzle' several times. This is an old NATO term. According to the controller the term means that a fighter pilot should use maximum performance (speed and g-forces) and proceed in the direction given in combination with the term. The controller learned this term from more experienced colleagues. During the investigation it has not become clear if the F-15C pilot was familiar with this term.

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<sup>35</sup> A fighter allocator is responsible for the operation of the fighter controllers. One of his tasks is the command and control of the aircraft control section of the control and reporting centre Schönewalde.

A contributing factor for both aircraft proximities was the location of the regen airfield. In both cases the F-15C pilot proceeded to the regen airfield, which was located close to the airway concerned.

On initial radio contact the fighter controller informed the F-15C pilot that tactical radar assistance was provided. This means by definition that the controller supports the aircrew to ensure separation with crossing traffic by giving hazard warnings and that the aircraft commander is responsible for collision avoidance. As the term tactical radar assistance is only used in Germany it has not become clear if the F-15C pilot knew the meaning of it. The controller not only gave the pilot hazard warnings, but also controlled the aircraft for altitude because of the presence of non-participating aircraft. So the acting of the controller did not correspond to tactical radar assistance service.

The F-15C pilot did not adhere to the restriction to stay at or below FL320.

After the fighter controller noticed the conflict situation between both aircraft he aggravated the situation, because he had been focussed on the tactical situation, by unintentionally turning the fighter towards the airliner at the same level.

The fighter controller, who had expressed his concerns regarding the conditions of the exercise, was not able to handle the traffic situation, used non standard terminology and lost the ability to support the exercising aircraft with regard to collision avoidance.

## **2.5 NOTAMs**

The NOTAMs that were part of the briefing package, used by the pilots of the Fokker 70 during the flight preparation at Amsterdam Airport Schiphol, indicated that airway UN873 is situated outside the Frisian Flag exercise area.

Only the NOTAMs used by the pilots of the Fokker 70 were investigated by the investigation team.

## **2.6 Investigation report USAFE**

The internal investigation report<sup>36</sup> of the USAFE mentions that the airspace altitude restrictions made the mission planning difficult to ensure deconfliction from other

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<sup>36</sup> USAFE, '19 APR 2012, Aviation, Aircraft Flight, Aircraft/F-15C, RAF Lakenheath, AFSAS Report # 949501', 18 May 2012.



exercise participants as well as transiting civil traffic. Another contributing factor was the lack of clarification requested by the F-15C pilot regarding altitude restrictions after a simultaneous call came in. The report mentions the actions of the fighter controller as a third contributing factor. His altitude restrictions forced the Skimmer flight to either be in conflict with transiting airline traffic or blue air exercise participants. Additionally, an abort could have been initiated much earlier in the sequence of events by the controlling agency or any member of the flight to prevent the situation from developing. The report did not contain recommendations.

## 2.7 Investigation report RNLAf

The internal investigation report<sup>37</sup> of the RNLAf contains nine recommendations to prevent similar occurrences in the future. The most relevant of those recommendations are as follows:

- *Handover take-over*  
*In the future the former exercise staff should be enabled to provide a clear handover to the new exercise staff. The Frisian Flag planning checklist has to be rewritten in such a way that flight safety aspects, lessons learned and/or risk analysis results are taken into consideration.*
- *Communication*  
*A procedure should be used that guarantees that information, which is passed via among others the liaison officers, reaches the end user. This applies also to communication during flight.*
- *Organisation*  
*During the preparation and execution of the exercise, the staff should be made free of other duties for a certain period that still has to be determined.*
- *Safety official*  
*An independent safety official, who is not participating in the exercise, has to be assigned to check the above points.*
- *Fighter controller/organisation/terminology*  
*The exercise staff has to ensure that all participants are sufficiently prepared and trained in supporting large-scale exercises and are also informed of standard NATO terminology. Methods for this purpose are a 'work up' week and offering national training facilities.*
- *Assumptions*  
*By a complete reporting, assumptions should be excluded.*

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<sup>37</sup> Royal Netherlands Air Force, Investigation report 'Air proximity incident d.d. 19-4-2012, betreffende een USAFE F-15C en KLM Fokker 70'. Number: LW/CvO/2012023413. Date: 03-07-2012.

## **2.8 Investigation report CRC Schönewalde**

The internal investigation report of CRC Schönewalde was not handed over to the investigation team. The reason given was that part of the report is an internal analysis of the overall situation of the German Air Force Tactical Command and Control Service and therefore not relevant for the incident itself. Apart from that CRC Schönewalde was fully cooperative during the investigation.

## **2.9 Cooperation of USAFE**

Commercial air traffic provides a relatively safe way of transport. One of the reasons for the level of safety that has been reached, is the mandatory investigation of accidents and serious incidents in which airliners are involved. These investigations, following the provisions of ICAO annex 13, are performed only to learn from mishaps and to prevent their reoccurrence. For a thorough investigation and thus the further improvement of safety in aviation, the cooperation of all parties involved is essential. In this case, despite several requests, the USAFE refused to answer the Dutch Safety Board questions, relevant to the investigation (see appendix D). This hampered the investigation and, as a result, prevented the aviation system to enhance the level of safety as much as possible to prevent similar occurrences in the future.

Among other things it has not become clear during the investigation:

- if the F-15C pilot was informed by the liaison officers that civil aircraft had been observed in the exercise area on the first two days of the exercise;
- who was responsible for collision avoidance in the opinion of the F-15C pilot;
- why the F-15C pilot did not adhere to the altitude restriction;
- if the F-15C pilot was familiar with the terms tactical radar assistance and hazzle.

## **2.10 Military Aviation Authority**

On the basis of the investigation by the Royal Netherlands Air Force, the Netherlands Military Aviation Authority performed an inspection to check if sufficient control measures had been taken in order to prevent incidents between participating and non-participating air traffic. Based on this, it was concluded that the Air Force Command more than adequately responded to the proposal for improvement measures formulated by its own Investigation Committee.

The findings of the Royal Netherlands Air Force correspond to those of the Dutch Safety Board. Therefore the Dutch Safety Board has not drawn up its own recommendations.

## 3 CONCLUSIONS

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The aircraft proximity occurred because a fighter aircraft (F-15C ) participating in a military exercise passed an active airway on which an airliner (Fokker 70) was flying at approximately the same altitude. After the responsible fighter controller noticed the conflict situation between both aircraft he unintentionally aggravated the situation by turning the fighter towards the airliner. This resulted in the fighter aircraft crossing the airway again in front of the airliner at the same level.

A loss of separation occurred between the Fokker 70 and the F-15C. The minimum lateral distance between both aircraft was 0.39 NM with a vertical separation of 512 feet.

During the preparation of the air force exercise it was assumed by the exercise staff who organised the exercise that the assigned German airspace was available for the exercise without restrictions. As a result no adequate measures were taken to ensure separation between participating and non-participating traffic. During the first two days of the exercise, after civil traffic had been observed in the exercise area, the staff did not take adequate action to avoid this to reoccur.

Contributing factors were:

- The Royal Netherlands Air Force performed a risk analysis for the total exercise. However the increase in available airspace above FL240 in Germany was not sufficiently seen as a risk.
- The German authorities, which were involved in the preparation of airspace matters for the air force exercise, had the duty to inform the exercise staff about the characteristics of the airspace concerned in their country and the presence of airways. This was not done sufficiently. The exercise staff had the duty to gather more information about the airspace concerned. This was neither done.
- The actions of the fighter control coordinator, who was responsible for the coordination tasks and application for the airspace for the exercise, were not checked thoroughly by another member of the exercise staff or somebody outside the staff.
- The location of one of the regen airfields had been planned close to the airway UN873. This was possible because the exercise staff was not aware of the presence of the airway.
- The F-15C pilot did not adhere to the restriction to stay at or below FL320.
- The fighter controller, who had expressed his concerns regarding the conditions of the exercise, was not able to handle the traffic situation, used non standard terminology and lost the ability to support the exercising aircraft with regard to collision avoidance.

Despite several requests, the USAFE refused to answer the Dutch Safety Board questions, relevant to the investigation. This hampered the investigation and, as a result, prevented the aviation system to enhance the level of safety as much as possible to prevent similar occurrences in the future.

## 4 INVESTIGATION EXPLANATION

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On 19 April 2012 the aircraft proximity was reported by Maastricht UAC to the German Federal Bureau of Aircraft Accident Investigation (BFU). Due to the Dutch involvement in this serious incident (Dutch airline and air force exercise organised by Royal Netherlands Air Force (RNLAf)) and the location of it above international waters, the BFU sent a request to the Dutch Safety Board (DSB) to perform the investigation. The DSB answered in the affirmative and started the investigation.

The DSB sent a notification of the serious incident to the BFU, the Danish Accident Investigation Board (AIB), the European Union, the European Aviation Safety Agency and the International Civil Aviation Organisation. Both the BFU and the Danish AIB assigned an accredited representative.

The following parties performed an own investigation into the cause of the aircraft proximity:

- The commander of Leeuwarden Air Base of the RNLAf;
- The Control and Reporting Centre Schönnewalde;
- The United States Air Force in Europe.

The commander of Leeuwarden Air Base decided to perform an own investigation because the preparations for the next Frisian Flag exercise started already within several months after the occurrence had taken place. On 2 May 2012 the DSB deliberated with the RNLAf to make clear how the investigations by the DSB and the RNLAf related to each other. It was decided that an investigator of the DSB and an investigator of the RNLAf would bring a visit to CRC Schönnewalde.

KLM Cityhopper, who operated the Fokker 70, provided the TCAS computer to the DSB. On 27 April 2012 the TCAS computer was downloaded at Woensdrecht air base with the assistance of Fokker Services B.V. Thereafter the computer was returned to KLM Cityhopper who sent it to the manufacturer ACSS in the United States for calibration. The manufacturer analyzed the TCAS data, drew up a report and presented this to the DSB. KLM Cityhopper also provided the data of the quick access recorder and the flight data recorder to the DSB.

The flight safety department of KLM Cityhopper interviewed both pilots and drew up a report containing the history of flight. This report was presented to the DSB.

On 8 May 2012 two investigators of the DSB visited Maastricht UAC to have a conversation with the flight safety manager, an incident investigator, a procedures expert and the head of Lippe Radar. Maastricht UAC provided radar data of the occurrence to the DSB.

On 10 May 2012 an investigator of the DSB visited, together with the chairman of the committee of inquiry of the RNLAF, CRC Schönewalde in Germany. Separate from each other, several persons were interviewed, among which the fighter controller. The accredited representative of the BFU was present for support.

On 22 May 2012 two investigators of the DSB visited Leeuwarden Air Base where they spoke with several staff members of Frisian Flag, among which the fighter control coordinator.

Via the Chief Accident Investigation of the RNLAF, the DSB obtained the sanitised investigation report of the USAFE on 5 June 2012.

On 30 July 2012 the DSB received the investigation report of the investigation by the RNLAF. It contains nine recommendations to prevent a similar occurrence in the future.

The DSB sent a list with questions to the USAFE for the F-15C pilot involved. However, no answers were provided by the USAFE.

## COMMENTS PARTIES INVOLVED TO PRELIMINARY REPORT

A preliminary version of this report has been presented to the parties involved in accordance with the Dutch Safety Board Kingdom Act. These parties have been requested to check the report for any factual inaccuracies. The report has been presented to the following persons and organisations:

- Control and Reporting Centre (CRC) Schönewalde
- Coordination and Scheduling Agency (COSA)
- Coordination Center for Military Airspace Utilisation (COMIL)
- Danish Accident Investigation Board (AIB)
- Deutsche Flugsicherung GmbH (DFS)
- DFS GmbH Maastricht Airport
- Dutch Military Aviation Authority (MLA)
- Fighter controller, CRC Schönewalde
- German Federal Bureau of Aircraft Accident Investigation (BFU)
- KLM Cityhopper
- Maastricht Upper Area Control Centre (MUAC), Eurocontrol
- Pilot F-15C
- Pilots Fokker 70
- Royal Netherlands Air Force (RNLAf)
- United States Air Force in Europe (USAFE)

The Board received feedback from all these parties. The following parties indicated that they had no comment concerning content on the report: COMIL, COSA, Danish AIB, Eurocontrol, the pilot of the F-15C, the pilots of the Fokker 70 and the USAFE.

The Board has incorporated corrections of factual inaccuracies, additional details as well as editorial comments, were relevant. The relevant passages were amended accordingly in the final report.

The Board replied to the responses that were not included in the report. These responses are stated below. The paragraph and chapter numbers which have been quoted in the remarks refer to the numbering in the draft report and do not always correspond to the numbering in the final report.

## **Remark of CRC Schönewalde:**

### *2. Analysis*

*Page 11/line 20. Neither Lippe Radar, nor DFS Bremen*

Board response:

In paragraph 2.1 (Preparation Frisian Flag exercise) it is explained why it is remarkable that no expert of Maastricht UAC was invited. This in relation to the request of the Dutch Ministry of Defence for a temporary change in 'buffer procedures' between civilian and military traffic. The absence of other parties during the airspace meeting has already been described in paragraph 1.3.2 (Preparation Frisian Flag 2012).

## **Remark of DFS Maastricht Airport:**

*Appendix B : Danger Areas*

*You have listed the AIP publications and definitions originated by The Netherlands and by the State of Germany only.*

*Comments: What I do miss, is the relevant AIP publication / definition of the USAF (MOD) in order to recognize any possible difference between the respective documents. Do we really know whether the*

*F 15 pilot could / should have all the possible different definitions in mind and would be able to identify slight deviations from each other? It may be important to identify all the relevant national procedures.*

*Proposal: Kindly add the relevant US- internal or ICAO statements or definitions to the Appendix B. Thus, a comparison could become much easier .*

Board response:

The definitions of the danger areas in the AIP of the Netherlands and Germany have been incorporated in the appendix because the fighter control coordinator had assumed that danger areas are always closed after activation of the danger area. However, in Germany airways can be used in an active danger area.

As no cooperation was provided by the USAFE during the investigation, the definitions of danger areas, used by the USAF (MOD) have not been investigated in more detail.

## **Remark of DFS:**

*page 5 map:*

*The background depicting the airspace structure is outdated. For example, the lateral limits of ED-D100 in the southwestern corner have been changed some years ago. Also, the ATS-Routes over Germany are missing, only the ones in the Netherlands and Denmark are depicted.*

Board response:

It was decided to depict the map that was used in the document 'Frisian Flag 2012, Exercise Operation order' that was sent to all the exercise participants.

### **Remark of RNLAf:**

*As concerns the report as a whole, I note that it refers to agreements between the Ministry of Defence and Maastricht Upper Airspace Control (MUAC) that are not relevant to this particular incident. The role of MUAC in the incident is only briefly described, even though this organisation does have clear responsibilities when it comes to separating air traffic. Irrespective of the nature of the air traffic (military or civil), all authorities involved are under an obligation to respond if a dangerous situation arises. In my view the report fails to address this aspect, or addresses it only in the briefest terms.*

Board response:

The agreement between the Dutch Ministry of Defence and MUAC has been mentioned in the report to indicate that the Board is of the opinion that the absence of MUAC during the airspace meeting is remarkable because the Ministry had requested a temporary change in 'buffer procedures' between civilian and military aircraft. Therefore, MUAC had performed a safety assessment, which was only related to Dutch airspace.

The role of MUAC has been mentioned in the report. At a certain moment the fighter aircraft was ordered to proceed to the west immediately and maintain its level. By doing so the fighter controller brought the two aircraft at the same level to each other and the aircraft proximity took place. The air traffic controller of MUAC could not do a lot at that moment, because the transfer of communications to ACC Copenhagen had already taken place for the Fokker 70. For that reason the focus of the investigation has been on the whole preparation of the exercise and less on the role of MUAC.



## DESCRIPTIONS DANGER AREA

### *The Netherlands*

The Aeronautical Information Publication the Netherlands states that a danger area is an airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times.<sup>38</sup> This term is only used when the potential danger to aircraft has not led to the designation of the airspace as restricted or prohibited. The effect of the creation of the danger area is to caution operators or pilots of aircraft that it is necessary for them to assess the dangers in relation to their responsibility for the safety of their aircraft. Danger areas within the Amsterdam FIR are established either on a temporary or a permanent basis when considered necessary for the purpose of safety and not solely for air traffic control reasons. In the overview<sup>39</sup> of all danger areas within the Amsterdam FIR for each danger area the remark is made that the area is prohibited, unless permission from air operations control station Nieuw Milligen is obtained.

### *Germany*

The Aeronautical Information Publication Germany states that danger areas established by the Deutsche Flugsicherung GmbH are above the open sea outside the territory of the Federal Republic of Germany.<sup>40</sup>

In danger areas, the following dangers to aviation must be expected: artillery firing, anti-aircraft firing, ground-to-air and air-to-ground firing, air-to-air firing, air combat exercises, controlled and uncontrolled military training flight. Since penetration of danger areas is associated with considerable risks due to the dangers described, pilots are urgently requested to avoid these areas and/or establish radio contact with the air traffic services units concerned prior to entry.

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<sup>38</sup> AIP the Netherlands, ENR 5.1 Prohibited, restricted and danger areas, 1 Definitions, 1.3 Danger Area.

<sup>39</sup> AIP the Netherlands, ENR 5.1.6 Prohibited, restricted and danger areas.

<sup>40</sup> AIP Germany, ENR 5.1-31 Danger Areas.

## DEFINITION ADVISORY CONTROL SERVICE

Advisory Control Service<sup>41</sup>

*The Fighter Controller is responsible for:*

- Giving timely and repeated warnings about all air (stranger) traffic within 10 NM and 10.000 feet to the aircraft under his/her supervision;
- Obtain clearance for the use of the exercise airspace from the air traffic control service concerned, if applicable;
- Giving timely and repeated warnings about possible exercise airspace violations.

*Aircrew is responsible for:*

- Maintain a horizontal separation of at least 5 NM or a vertical separation of at least 5000 feet from non-participating air traffic;
- Navigation, to include maintaining within the allocated exercise airspace, and keeping a buffer of 2,5 NM to the border of the Amsterdam FIR;
- Maintain visual meteorological conditions;
- Maintain inner- and inter flight separation;
- Contacting the controlling agency on the primary check-in frequency if radio contact is lost with the fighter controller. If no radio contact with the controlling agency can be established, the mission must be terminated, and the aircrew must contact any control and reporting centre or air traffic control agency able to provide control

*Amplification:*

- Within the exercise airspace the aircrew will have tactical freedom to manoeuvre. The fighter controller will maintain to provide warnings about conflicting non-participating (stranger) traffic until the aircrew has reported radar- or visual contact or the aircrew has reported action to maintain separation criteria. The fighter controller can provide the aircrew with suggestions in order to help the aircrew to maintain the separation criteria.
- The fighter controller will maintain to provide warnings about airspace borders until the aircrew has reported action to maintain inside the allocated airspace. The fighter controller can provide the aircrew with suggestions in order to help the aircrew to maintain inside the allocated airspace.

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<sup>41</sup> Source: EXOPORD FF12-001, 13.3.2 Advisory Control Service (ACS).

*Conditions:*

- Continues 2-way radio contact;
- Full radar coverage of the airspace for which advisory control service is provided.

## QUESTIONS FOR F-15C PILOT

1. Did you know about the presence of airway UN873 within ED-D101B?

If so, did you know that the airway was active?

Did you have a display in your cockpit that shows the airway UN873?

2. Were you informed that civil aircraft had been observed in the exercise area on the Monday and Tuesday of the first week of the exercise?

If so, by whom were you informed?

If so, did you know in which particular area those civil aircraft were observed?

3. What kind of mission aircraft control did you expect when you checked in with Sunrise?

Are you familiar with the term Tactical Radar Assistance?

Who was responsible for collision avoidance in your opinion?

4. How did you ensure minimum separation criteria to the exercise area boundaries or with any civil traffic?

5. Was the fighter controller clearly audible?

6. Were you aware that you were crossing an active airway?

7. Are you familiar with the term 'hazzle'? (Hazzle west immediately due to stranger)

If so, what does it mean in your opinion?

8. What is in your opinion the cause of the airprox?

9. How can such an airprox be avoided in future Frisian Flag exercises or in general?

10. Any other remarks that could be relevant for our investigation?

## TRAFFIC ALERT AND COLLISION AVOIDANCE SYSTEM

### *General*

The Traffic alert and Collision Avoidance System (TCAS) is an electronic system on board of commercial airliners to mitigate the risk of airborne collisions between aircraft. The system works autonomously, separate from air traffic control and other aircraft systems, and works as a safety feature in case of a potential danger for a collision. TCAS is active continuously and detects other traffic within a certain range from the aircraft. The official name for the system is Airborne Collision Avoidance System (ACAS).

The system was not designed with the intent of being installed on tactical military aircraft (e.g. fighter aircraft). The F-15C was not equipped with ACAS. When a fighter aircraft, with altitude reporting enabled, intercepts an ACAS II<sup>42</sup> equipped aircraft, there is a risk that the ACAS aircraft will generate an undesirable Resolution Advisory (RA).

TCAS analyses the identified traffic on the risk of a (possible) collision. Whenever a conflict arises, the system provides a pre-warning Traffic Advisory (TA). The purpose of a TA is to help the crew identify any potential danger, but also to prepare the crew for any possible evasive actions. The responsibility for the separation in case of a TA remains with air traffic control. If the system calculates that there is a possibility of a collision and evasive action from the crew to prevent a collision is required, a TCAS RA warning is given. A RA manoeuvre is given in a vertical plane, the system will let the aircraft steer up or down. TCAS has no influence on increasing the distance between aircraft in the horizontal plane. In case of a TCAS RA warning, separation is done by TCAS and air traffic control is no longer involved. Only when the system indicates the danger of a collision is no longer there, the crew will inform air traffic control and the can take over responsibility of separation.

### *Present case*

In the present case when a RA to climb was generated by TCAS in the cockpit of the Fokker 70, the required climb rate was higher than it would have been in the case that the fighter aircraft was equipped with ACAS as well. A command for corrective action was now only generated for the Fokker 70 and not for the fighter aircraft. The maximum climb rate of the Fokker 70 during the TCAS manoeuvre was 5475 feet per minute.

First TCAS in the Fokker 70 issued a TA with regard to the F-15C. Ten seconds later a corrective RA to climb was generated to change the vertical path of the Fokker 70 and ensure vertical separation from the F-15C. Another ten seconds later a preventive RA was

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<sup>42</sup> ACAS II gives Traffic Advisories (TAs) and Resolution Advisories (RAs).

generated to maintain the present vertical speed. This to ensure vertical separation with a commercial aircraft at FL390. The minimum lateral distance between the F-15C and the Fokker 70 was 0,39 NM with a difference in altitude of 512 feet. See figure 4 for the vertical profile of the Fokker 70 during the TCAS event.

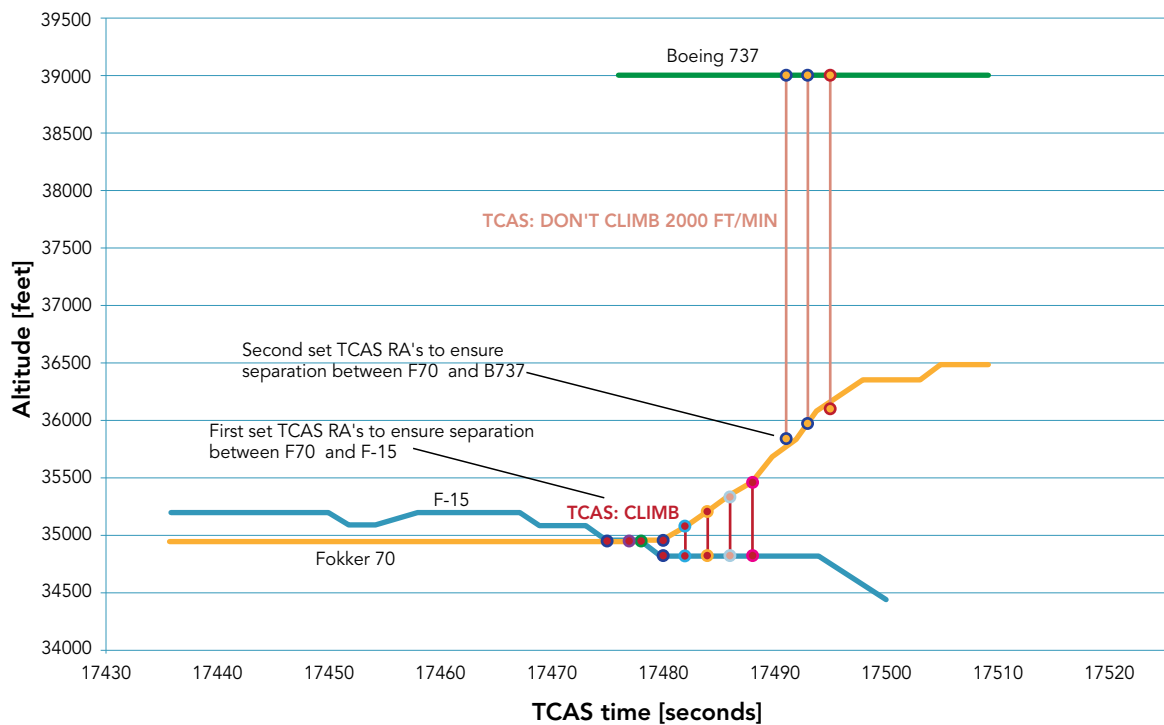


Figure 4: Vertical profile of Fokker 70 during TCAS event.



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