

Document of the Guardian Wing Corps and the Regule Aire Transportation Safety Committee

Doc **WG-R-1452**

Status: ~~Confidential until December 31<sup>st</sup>, 445~~ Public

**The Guardian Wing Corps** and

**The Regule Aire Transportation Safety Committee** presents

# Final Report of Air Regule Aire 8L-LQC Boeing 777-200ER Accident over Lontis On March 13<sup>th</sup>, 415

Released in July 416

### **ABBREVIATIONS**

ATPL	Airline Transportation Pilot License
IRS	Inertial Navigation System
VHF	Very High Frequency
VOR	VHF Omni directional Positioning Beacons
FDR	Flight Data Recorder
ATC	Air Traffic Control
CAP	Captain
F/O	First Officer
TCAS	Traffic Collision Avoidance System
AC	Alternating Current
DC	Direct Current

## INTRODUCTION

The accident took place on March 13<sup>th</sup>, 415. Due to the war in the accident area, the investigation was extremely difficult to conduct. Facing the great challenge, The Guardian Wing Corps offered to provide The Regule Aire Transportation Safety Committee help to better figure out the truth. In this way, a joint investigation team was set up, whose composition is provided below. Investigators agree that the accident was mainly caused by:

- The failure of closing the airspace in the war zone because of the battle in the local aviation administration departments,
- Negative effects on soldiers caused by the polluted or influenced Dagr Weapon called Mourning, making soldiers lose control of themselves,
- The failure of the fire extinguisher system because of its inappropriate design, causing far greater damage to the aircraft than the air force's attack,
- The lack of communication between the air force and commercial flights, caused by both technique reasons and the war, and
- The flip instruction ordered by the central command without taking sufficient factors, including residents' injuries, into account, caused by the structure of the Guardian Wing Corps.

The composition of the investigation team is:

- Group leader of **The Regule Aire Transportation Safety Committee**: Claire Asplay, and
- Group leader of **The Guardian Wing Corps**: Naught Sun

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## MAIN TEXT

# 1 Investigated Facts

## 1.1 Flight Experience

Several months before the accident, the war caused by a betrayed general around the 6<sup>th</sup> Sky Island, which was ruled by the Winged Empire, kicked off, making the Guardian Wing Corps have to take on the responsibility to protect the sky islands from being fatally damaged.

Before the flight took off, the betrayed force required the Air Regule Aire to deliver 3 cargo boxes, which was described to contain “food and water” but actually contained weapons including guns, bombs, and parts of Mourning, a sword. Knowing the truth of the cargo, the Guardian Wing Corps instructed its air force to stop the aircraft from taking off, which turned out to be a failure as the soldiers arrived late due to the bad traffic condition. As a result, the aircraft, with flight number RE71, took off from Lontis at 17:33 local time<sup>1</sup>, estimating to land in Scarborough Airport in Corna di Luce.

The central command adjusted its instruction and soon instructed the air force to dispatch leprechauns<sup>2</sup> to make the aircraft divert or “use other measures to prevent the aircraft from arriving at its estimated destination” in order to prevent illegal weapon delivery and more injuries caused by this. At approximately 20:55, the central command received incorrect information that the aircraft’s passengers and pilots were all replaced by criminals<sup>3</sup>. Having trouble confirming the information, the central command decided to shoot down the aircraft “when necessary” after contacting with the owner of the aircraft.

At 21:17, when the aircraft was 5 miles away from waypoint ITHEA, which is 1,542 miles away from Lontis and 2,111 miles to the destination, leprechauns approached the aircraft and tried to communicate with the pilots. However, the military device couldn’t support commercial communication. With no response from pilots, the soldiers decided to shoot down the aircraft at 21:21 by launching exactly one attack, according to an eyewitness. The aircraft immediately went into dive, with its left wing and right wing components separating from it one after another, and eventually crashed into the ground at approximately 21:29, with fire either caused by the burning weapons or the criminals among passengers. During the dive of the aircraft, some passengers opened the cabin door on their own and tried to escape, ending up being a more fatal and heartbreaking dead end.

Seeing their mission killing innocent passengers, one of the soldiers (S1 in the following text<sup>4</sup>) blamed themselves, while the other (S2 in the following text)<sup>5</sup> believed that the sacrifice was “necessary”, according to the eyewitness’ accounts. This led to a battle between them, and the latter was minor hurt. However, when they were trying to reach an agreement, a commander

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<sup>1</sup> All time points refer to local time in the following text.

<sup>2</sup> Leprechaun is a race, which is believed to be good at taking part in certain battles. See following sections to learn more.

<sup>3</sup> Actually, only some of the passengers were criminals or terrorists. See further analysis.

<sup>4</sup> Investigators are not allowed to include their names in the investigation.

<sup>5</sup> She is believed to have eroded another leprechaun, R. N. Seniorious, today. See related documents. (Added in 442)

appeared and hurt S1. S2 couldn't bear this and reached Mourning, a sword polluted by Vincra<sup>6</sup>. Receiving Venemon<sup>7</sup> and memories from it, S2 lost control of herself and started attacking all residents nearby, causing more deaths, including the commander, and injuries, most of whom died from the lack of the treatment. S1 stopped this by killing her and soon died because of serious injury.

## 1.2 Injuries to Persons

Injury	Crew	Passenger	Other
Fatal	12	413	7,244 <sup>8</sup>
Major	0	0	15,582
Minor/None	0	0	-

## 1.3 Damages to Aircraft

The aircraft was completely damaged. The distribution of wreckage is provided in following sections.



<sup>6</sup> Vincra is one of the 17 beasts on the ground.

<sup>7</sup> A power leprechauns use to fight.

<sup>8</sup> The 2 soldiers are included.





*Figure 1. The wreckages*

## **1.4 Other Damages**

Fallen wreckages damaged houses in 12 blocks on 2 sky islands, causing some injuries mentioned in Section 1.2.

## **1.5 Individuals**

### **1.5.1 Crew Members**

The Captain was 31-year-old male, equipped with ATPL which valid until August 422. He had been well trained for flying Boeing 777, on which he had had 1,122 hours. He had also flown Boeing 737 for 1,955 hours. This was his first flight in the month because of the war. He wasn't significantly influenced by the war until the accident and was believed to have had a good rest before flying, according to his colleagues.

The First Officer was 29-year-old male, equipped with ATPL which valid until December 425. He had also been well trained for flying Boeing 777, on which he had 835 hours. According to his colleagues, despite the war, he slept well before the flight, "thinking about family reunion"<sup>9</sup>.

### **1.5.2 The Guardian Wing Corps**

The leprechaun soldiers' information was unknown.

The commanders mentioned above were all qualified, whose information will be provided in following sections.

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<sup>9</sup> The flight was estimated to land in the first officer's hometown, where his family lived at that time. This was said by his colleagues.

## **1.6 Maintenance of the Aircraft**

The aircraft was manufactured in September 410. During its lifespan, it had 1,232 takeoff-and-landing cycles, accumulating 10,354 flight hours. In July 411, its fire extinguisher became malfunctioning. Therefore, a local fire extinguisher system was installed. The components of the system was collected and analyzed in following sections.

The aircraft was well maintained. According to the maintenance record, the last maintenance was on January 11<sup>th</sup>, 415, which ensured that the strength of the fuselage met the standard.

## **1.7 Weather**

The airspace had few clouds, with no rain, fog, wind or other weather condition. According to the report from local aviation authorities, the visibility in the flight level in which the aircraft flew is expected to be more than 10 km.

## **1.8 Navigation Devices**

Navigation devices on board include IRS and VOR/DME devices. According to the data from FDR and ATC, the aircraft was on designated route and there was no sense of malfunctioning, which means that both of the devices were running normally.

## **1.9 Communication**

### **1.9.1 Communication Devices**

Analyses to wreckages, including electronic tests, suggest that the communication devices, such as VHF devices and push-to-talk button could work normally. CVR also proved that there were attempts that crew members tried to communicate with ATC.

### **1.9.2 Communication between the Flight and ATC**

The communication was limited because of the war. During the war, some of the ATC buildings were invaded and occupied, stopping ATC staff from arranging the aircraft. In this accident, this also stopped The Guardian Wing Corps from communicating with the aircraft through ATC.

### **1.9.3 Communication between the Flight and Soldiers**

The soldiers failed to establish communication with the flight because the radio device the

soldiers used only ranged from 200 MHz to 800 MHz, while the highest frequency of commercial devices is 200 MHz. In 243 MHz<sup>10</sup>, soldiers tried to communicate with the flight, only to get no response, according to the commanders.

Analyses to FDR data proved that one of the crew members was at 121.5 MHz<sup>11</sup>.

## 1.9.4 Communication in the Guardian Wing Corps

Communication in the Guardian Wing Corps was well secured. According to an internal encryption algorithm and integrity checker, all the communications were well protected and not modified.

The general content of the communication is provided in Section 1.1.

## 1.10 Airport

The Lontis Airport had 2 runways:

- 18L / 36R, whose length is 7,882 ft, and
- 18R / 36L, whose length is 6,525 ft.

Airport maintenance said that it has been made sure that the runway was clean.

## 1.11 FDR and CVR

The black boxes, including FDR and CVR, are located at the bottom of the aircraft. Though suffered from impact and fire, the storage module of FDR and CVR remained complete.



*Figure 2. The FDR and its storage module*

The data of CVR as well as part of FDR is given below. See attachments to learn more about FDR.

Time	Event
21:14:25	[F/O] Do you want to try contacting ATC again?
21:14:53	[CAP] Yes. (To VHF) Regule Aire Center, RE71.

<sup>10</sup> 243 MHz is the military emergency frequency.

<sup>11</sup> 121.5 MHz is the commercial emergency frequency.

21:15:22 [CAP] Negative. No response.

21:15:39 [F/O] Probably they're fighting against the forces ...  
(Missile flying outside).

21:15:59 [CAP] That's shocking. I hope that it's not flying towards us.

21:16:22 [F/O] I hope so. Anyway, the war doesn't seem to end.

21:16:45 [CAP] Should we follow our preset route? What's your idea?  
(Taking out maps)

21:17:12 [F/O] Maybe this has been the best. If we turn right now ... We might be shut down.

21:17:49 [CAP] TCAS says that we're the only aircraft turning on the transponder in ...  
(Turning switches) about 200 miles.

21:18:12 [F/O] Maybe they have closed the airspace, but we don't know.

21:18:43 [CAP] There's no announcement as well. I hope that they can just follow international rules ...

21:19:24 [F/O] Should we turn off our transponder?

21:19:45 [CAP] Just keep it there.

21:20:00 [F/O] Well... Do you think they will really follow those rules? The betrayed ones might have done everything.

21:20:55 [CAP] Yes. Anyway, that is ... Watch out, something is approaching!

21:21:03 (Something exploding)

FDR recorded master warning. Meanwhile, CVR recorded master caution.

In the following 43 seconds, the N1, EGT, EPR and other data of Engine 1 became unavailable. 2 Fire loops were all cut out and fire warning was triggered.

Meanwhile, all pressure values of hydraulic systems started to drop.

The Generator 1 was also cut off and the bus tie was automatically connected.

Throughout the following airborne time, FDR recorded that the aircraft continuously dived from the cruise altitude 38,000 ft and rolled to the right while the pilots' input was to the left. The vertical speed also kept growing until the last moment.

21:21:33 [CAP] Hey, what's the ...

21:21:55 [F/O] I don't know! How can I stable the a\*\*\*\*\*<sup>12</sup> ...

21:22:03 [CAP] Roll to the left! Pull the yoke!

21:22:39 [F/O] I'm trying...

Cabin altitude<sup>13</sup> kept climbing, and at this time, it reached 14,232 ft, triggering Cabin Altitude Warning.

21:22:45 [CAP] Wear the oxygen mask!

21:22:52 Over speed warning triggered.

21:23:01 [F/O] I can't reach it ...

21:23:35 [CAP] I got it. (Interruption) It isn't providing oxygen!

21:23:54 [F/O] Never mind. Stable the aircraft first!

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<sup>12</sup> The word is offensive.

<sup>13</sup> Cabin altitude means an altitude value whose air pressure equals to the air pressure in the cabin. When the value grows too large, it indicates a cabin decompression.

21:24:33 [CAP] It's a mess (unreadable)!  
FWD CARGO FIRE warning appeared.  
According to FDR, fire extinguishers were malfunctioning.

21:24:59 [F/O] Fire cargo forward!

21:25:12 [CAP] I can't manage it ... Just (unreadable) ...

21:25:33 FWD DOOR OPEN notice appeared.

21:25:59 [CAP] The aircraft is totally out of control! Can you contact ATC?

21:26:13 [F/O] (To VHF) Mayday, Mayday, Mayday, Regule Aire 71, out of control ...  
There's no response!

21:26:45 [CAP] Do you have any measure to regain control?  
AFT CARGO FIRE warning appeared.

21:27:03 [F/O] I don't know, and we have two fire warnings now!  
At approximately the same time, the aircraft reached 19,000 ft.

21:27:33 [F/O] We have only 10 thousand feet. Please ... I want to see my relatives ...

21:27:53 Generate 2 also disconnected. Both of the AC power failed, causing most of  
electronic systems to fail or switch to DC power.

21:28:24 [CAP] We're switching to DC power and ...

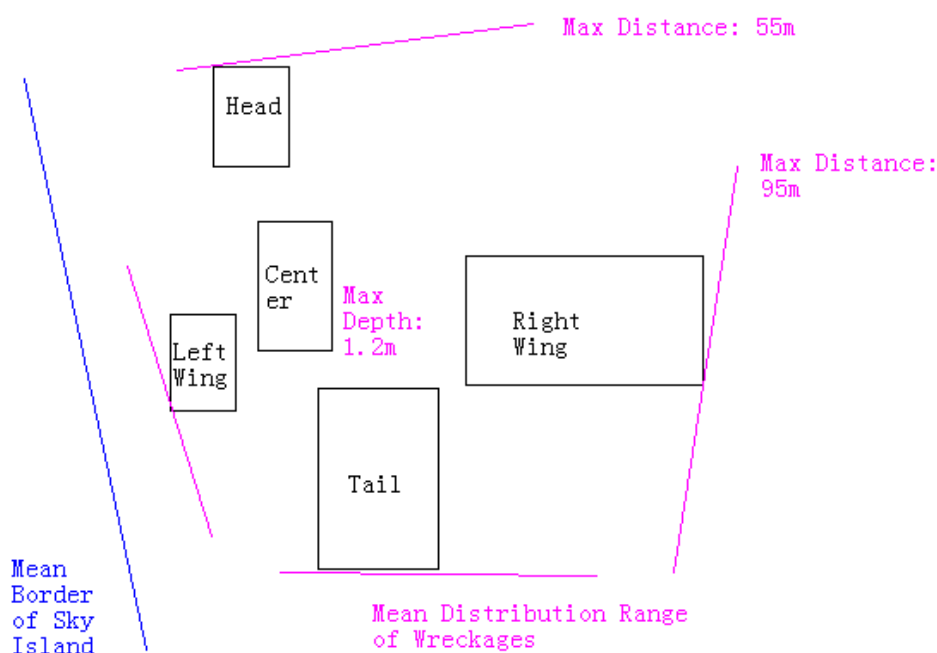
21:28:31 End of recording<sup>14</sup>.  
At that time, the aircraft was at 10,134 ft, with 529 kt speed.

## 1.12 Wreckages

The distribution of wreckages at the crash site is described as follows:

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<sup>14</sup> Probably because the wire towards the FDR and CVR had been broken.



*Figure 3. The approximate distribution of wreckages*

The distribution of the wreckages suggests that the aircraft banked steeply to the left when touching the ground.

It has been found that the only engine, recognized as the right engine (Engine 2), had inhaled soil. This suggests that the engine was still running when the aircraft touched the ground.

The wreckages of the cargo area have the signs of burning, suggesting fire inside, which suits the record of FDR and CVR. The electronic wires of fire extinguisher system were also broken.

The oxygen components were also found. The crew oxygen supplies were all broken from two or more directions, while passenger oxygen devices were either not broken or minor broken.

Burns were also found on almost all hydraulic pipes. The flying surfaces of ailerons and stabilizers remained full-up position.

Cracks whose direction opposes other damages caused by impacts were also found on the left side of the fuselage, near the center area, some of which are large enough to cause cabin decompression.

Besides, parts of the left wing fuselages, including the left engine, winglet, flaps and oil pipes, were found in other places, which is 2.4 miles away from the main crash site on average.

## 1.13 Medical Analysis

### 1.13.1 To Passengers

There are several types of hurt found on passengers:

- Wounds caused by sharp objects, which seems sharp, deep and fatal,

- Wounds caused by huge impact, causing body parts to fall apart, and
- Burns, probably because of fire on board and after crashing.

Some bodies without burns are probably because of attempts trying to get rid of the aircraft by opening the gate, which suits the FDR and CVR record in Section 1.11.

### **1.13.2 To Other Deaths and Injuries**

Other deaths and injuries are mainly residents in the area, which also mainly have 3 wounds above, caused by similar reasons.

### **1.13.3 To Soldiers**

The bodies of S1 and S2 were not completely found. It can be inferred that they died through disappearance<sup>15</sup>.

## **1.14 Fire**

The sense of fire is described in Section 1.12, 1.13.1 and 1.13.2. According to FDR and CVR, the fire started from the cargo area. The passengers' behavior suggests that the cabin might be also on fire after a few moments.

The fire extinguisher on board has been found malfunctioning in Section 1.12, and according to FDR, CVR and analysis to wreckages, it was inoperative during the accident.

The detailed reasons why the cargo area is on fire are provided in following sections.

## **1.15 Search and Rescue (SAR) Activities**

According to Section 1.3, the aircraft has been completely damaged. According to analyses in following sections, the passengers had no chance to survive unless they could fly on their own. Moreover, because of the war in the area, rescuers could hardly conduct search and rescue activities.

Besides, according to Section 1.4, residential areas were also damaged by fallen wreckages. The injuries could also hardly receive appropriate and sufficient treatment because of the war, pushing them to death in 30 days<sup>16</sup>.

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<sup>15</sup> When a leprechaun dies, bodies are usually not reserved (See **WG-A-2213.1**).

<sup>16</sup> Deaths in 30 days after the accident are all included in "Fatal" column in Section 1.2.



## 1.16 Experiments and Researches

### 1.16.1 Fuselage Strength

To test what damage will be caused by the air force, a similar fuselage structure was used by investigators. The result is provided below:



*Figure 4. The result of fuselage attacked in similar way (towards the back side) on the ground*

This suggests that the fuselage parts directly attacked will surely be completely damaged and separate from the aircraft, but other parts will likely remain partially complete. In the air, the attack is less precise and the damage will be less serious.

### 1.16.2 Fire

Investigators tested if those cargo including weapons will cause a fire when being hit. An



electronic spring and a box as large as the cargo area are used, and the result is given below.

Test #	The highest temperature after being hit (°C)	Result	The highest temperature after that (°C)
1	32	-	34
2	37	Fire	551
3	45	Fire	782
4	52	Fire	923
5	59	Fire	1,103
6	63	Fire	1,225
7	69	Fire	1,393



*Figure 5. Inside and outside screen in Test #4*

Investigators also tested a normal fire extinguisher. It turned out that normal fire extinguisher equipped on the aircraft has been enough to put out the fire.

### 1.16.3 Flight Simulation

First, investigators tried to figure out the complete flight path of the aircraft, as the black box data of the last moment is missing. The result is given below.

Test #	Final touchdown pitch (deg)	Final touchdown speed (kt)	Final wreckage distribution (m)	Final maximum wreckage depth (m)
1	-45.5	455	50x90	1.1
<b>2</b>	<b>-47.1</b>	<b>461</b>	<b>52x94</b>	<b>1.2</b>
3	-49.2	468	57x98	1.2
4	-51.3	472	60x102	1.3
5	-53.3	475	62x133	1.4
6	-55.6	477	71x152	1.6

Investigator also tested the air performance with partial fuselage separation and compared it with the actual flight data. It turned out that with no fuselage broken, any kind of stick input can't have similar result on the aircraft. The first statement, with 1.2 deg/s turn speed at first<sup>17</sup>, can be

<sup>17</sup> See attachments.

simulated with the loss of left winglet and engine while right engine outputting cruise thrust, which suits FDR data.

The following process, after the fire went off in the cargo area, with the inference in the analyses, is simulated as follows:

- The separation of more parts of left wing: The approximate complete separation of the left wing causes approximate 4.3 deg/s turn speed to the right at first, which suits the FDR data since 21:24:59.
- The separation of parts of right wing, including engines: The separation will trigger the engine fire warning and slightly balance the aircraft, which suits the FDR data since 21:27:53.

Investigators also tested if the pilots could regain control if no fire happened in the cargo area. To test this, investigators confidentially invited pilots from both Air Regule Aire and The Guardian Wing Corps. The result came out as follows:

- The damages to systems: Only AC 1 and the Engine 1 are malfunctioning, and most of flight controls remained operative.
- Operations and results: Most of the pilots realized the situation and regained control after losing 7,500 ft altitude on average. By adjusting rudders and landing as soon as possible, 5 out of 8 landings were successful.

When the fire is added, flight controls became inoperative, causing the aircraft to overspeed and the left wing to separate. Thus, Investigators also tried if the control can be recovered with left wing approximately completely separated:

- The damages to systems: AC 1, Engine 1, compression and most of the hydraulic systems are malfunctioning.
- Results: In Air Regule Aire, none of the pilots regained control, while in the Guardian Wing Corps, there was 1 successful attempt among 16 tries.

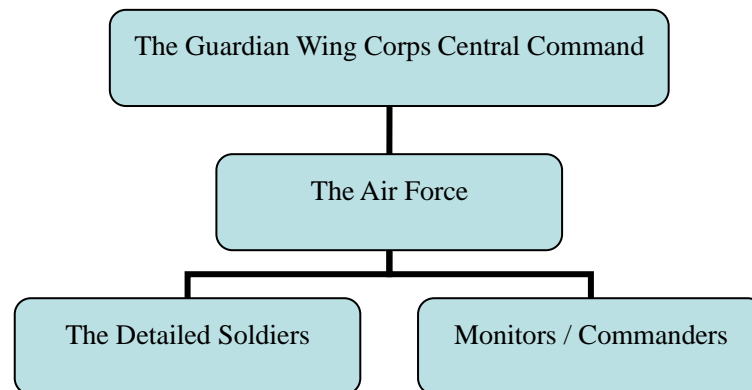
## **1.17 Organizations**

### **1.17.1 ATC Stations**

In the airspace where the accident took place, the only ATC station is 544 miles away, which was in the war zone and was invaded by the betrayed force, according to their record and eyewitness accounts.

### **1.17.2 The Guardian Wing Corps**

The way in which the Guardian Wing Corps give instructions to soldiers and the soldiers conduct them is described as follows:



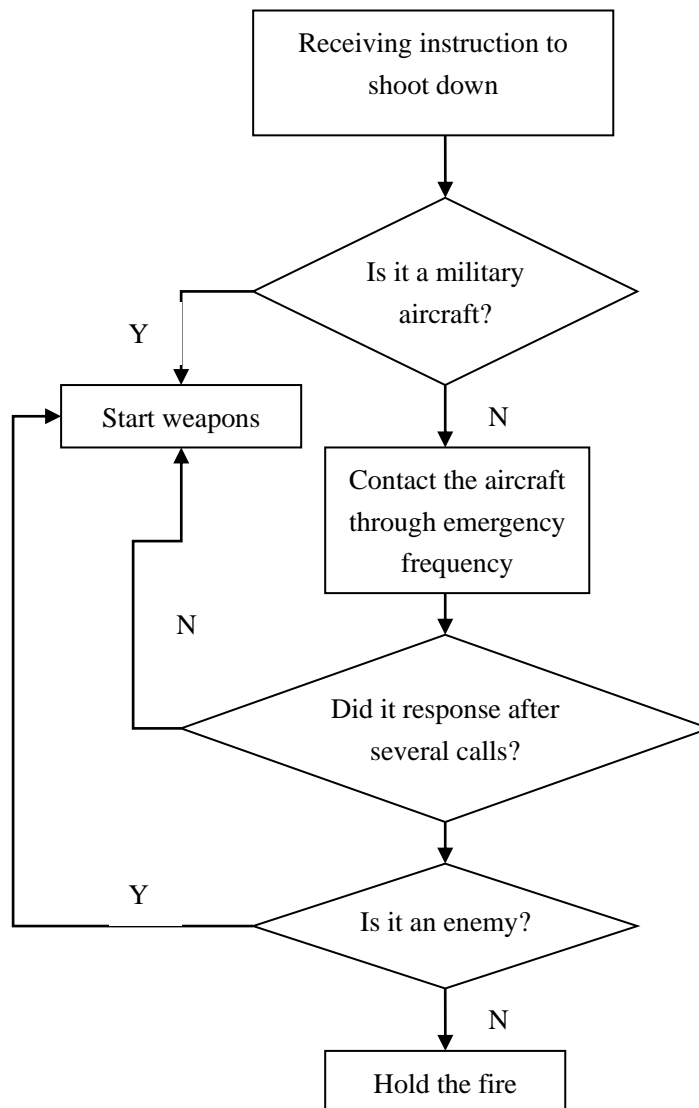
*Figure 6. The structure of the Guardian Wing Corps in the accident*

The structure ensured high response speed during the war, but it didn't provide chances for civil administrations to give advice.

## **1.18 Other Information**

### **1.18.1 The procedure of shooting down an aircraft**

The Guardian Wing Corps has its own procedure to shoot down an aircraft, which can be described as the following procedure:



*Figure 7. Procedure of shooting down an aircraft in The Guardian Wing Corps during the accident*

## 1.18.2 Mourning

Mourning is a sword designed in approximately BS 96 (i.e. approximately 500 years ago). Showing outstanding airborne performance, it is adapted as a weapon for leprechauns in the former text. However, Vincera was in it, affecting normal clear mind of any of the users of this sword. Leprechauns are the easiest to be influenced.

## 2 Analyses

### 2.1 Recovered Flight Experience

#### 2.1.1 Recovered Process

CVR proves that there was no hijacker and the crew members remained calm.

By taking the investigated facts into general account, the process of the flight experience after the aircraft was attacked can be inferred as follows:

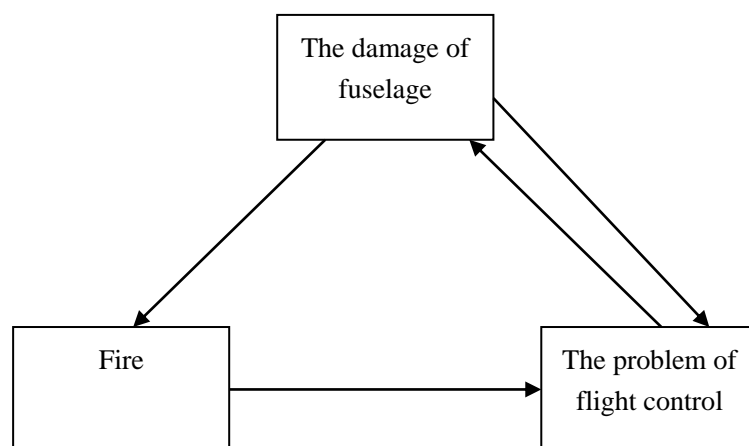
- Phase 1: The left winglet and engine were separated from the aircraft caused by the attack, causing the aircraft to imbalance. In this phase, there were still chances for pilots to regain control;
- Phase 2: The most parts of the left wing were separated from the aircraft because of the overspeed control, causing the aircraft to lose control by affecting the hydraulic system and the balance of the aircraft. In this phase, there was little chance for pilots to regain control;
- Phase 3: The right wing was separated from the aircraft because of the overspeed control, causing the aircraft to be completely out of control. The deceleration and the change of the banking direction suggest the complete loss of the designated aerodynamic performance.

#### 2.1.2 Effects of malfunctioning systems

During the accident, following system became malfunctioning. The chronological order of the events and their effects can be inferred as follows:

- Before the dive and almost immediately after the attack, the crew oxygen bottle had been damaged. Initial attack damaged the left winglet and engine
- The separation of the left winglet and the left engine caused initial mess and worked as an impact to the cargo area, causing its fire;
- The fire caused the slow response of flight controls, bringing trouble to the recover of the dive;
- The slow response of the flight controls led to the acceleration of the aircraft, causing the aircraft to overspeed and break apart, including the separation of more parts of the left winglet, making it more difficult to regain control; and finally,
- The separation of parts of the right wing completely deprived the chance of regaining control.

Since the engines had separated from the aircraft, the fire must be because of the cargo area. The relationship between them can be described as follows:



*Figure 8. The mind map representing the relationship between the damages*

In this mind map, only when all of the arrows (factors) worked, the accident could take place.

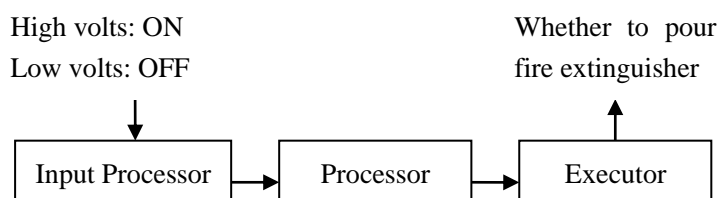
## 2.2 The Cause of Fire

### 2.2.1 The Cargo Articles

It can be inferred that the cargo articles contains dangerous weapons containing dangerous chemical substances like NaN<sub>3</sub>. After being hit, they were minor heated but the rise of temperature had been enough to ignite them. That's why they were on fire.

### 2.2.2 The Fire Extinguisher System

The fire extinguisher system's structure can be described as follows:



*Figure 9. The graph of the fire extinguisher control system*

In this system, the executor is based on mechanical structures, which won't be influenced by fire or electronic failure. However, the input processor and processor controls the executor based on the electronic input, which will obviously fail if the wire from detector or the button in the

cockpit is broken. When the wire is broken by the fire or other factors, there's no way to turn on the system. Therefore, the system is not fail-safe, not following the safety principle of the man-object relationship and not satisfying the target of extinguishing the fire.

## **2.3 The Procedure of the Guardian Wing Corps**

While the procedure of the Guardian Wing Corps had taken the commercial aircraft into account, it might still make trouble when the communication between the soldiers or the commanders and the commercial aircraft is limited, especially in this accident.

# **3 Conclusions**

## **3.1 To the Flight Experience**

The flight experience before the aircraft was attacked was normal. The crew members were qualified and excellent, and they were correctly on the designated and assigned route.

The flight experience after the aircraft was attacked consists of several phases, each of which led to the next phase, making the situation more and more troublesome and fatal. If one of all malfunctions in the first phase can be solved, the accident can be avoided.

## **3.2 To the Design of the Aircraft**

The general strength of the fuselage is qualified and acceptable, but the design of fire extinguisher actually boosted the disaster. The design of the fire extinguisher control system should have been fail-safe, or, in other words, be able to put out the fire without electricity supply, which will be probably cut off during a fire.

## **3.3 To the Procedure and Equipment of Authorities**

The procedure of the Guardian Wing Corps is likely to cause accident on commercial flights because of the limited communication caused by the inappropriate communication devices used by executive soldiers and the lack of other information.

The inappropriate management and use of the polluted sword Mourning also caused more disaster and had probably indirectly contributed to the aviation accident.

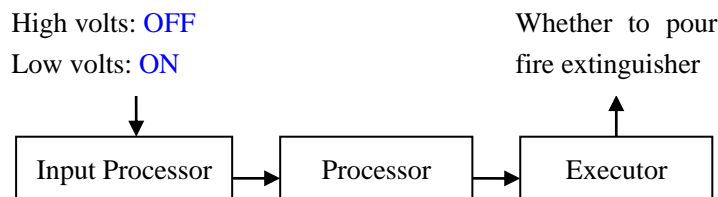
Besides, the Guardian Wing Corps, the Regule Aire Transportation Safety Committee and local aviation authorities failed to close the airspace in the war zone in time, causing the flight to fly into the controversial war zone and to be shot down.

Also, the lack of voice data and flight data of the soldiers caused trouble during investigation and further analyses.

## 4 Safety Recommendations

### 4.1 To the Design of the Aircraft

All commercial aircrafts are recommended to adjust its fire extinguisher control system's design. More detailed, the input should be changed: The low volt, instead of the high volts, should represents running state, so that when the electricity is cut off, the fire extinguisher can still work, thus, the system is fail-safe:



*Figure 10. The updated system*

(Components in blue are updated)

**Response:** This recommendation is delivered independently by the Regule Aire Transportation Safety Committee, not mentioning this accident due to confidential reasons. By the end of January 416, all fire extinguisher control systems have been checked and updated when necessary.

Besides, it's recommended for commercial aircraft to equip communication devices on 243 MHz.

**Response:** This recommendation is delivered independently by the Regule Aire Transportation Safety Committee through a recommendation bulletin, also not mentioning this accident due to confidential reasons. By the end of January 416, 24% of the commercial flights have been equipped with this kind of communication device.

### 4.2 To the Guardian Wing Corps

The Guardian Wing Corps is recommended to update its procedure to shot down certain aircraft as:



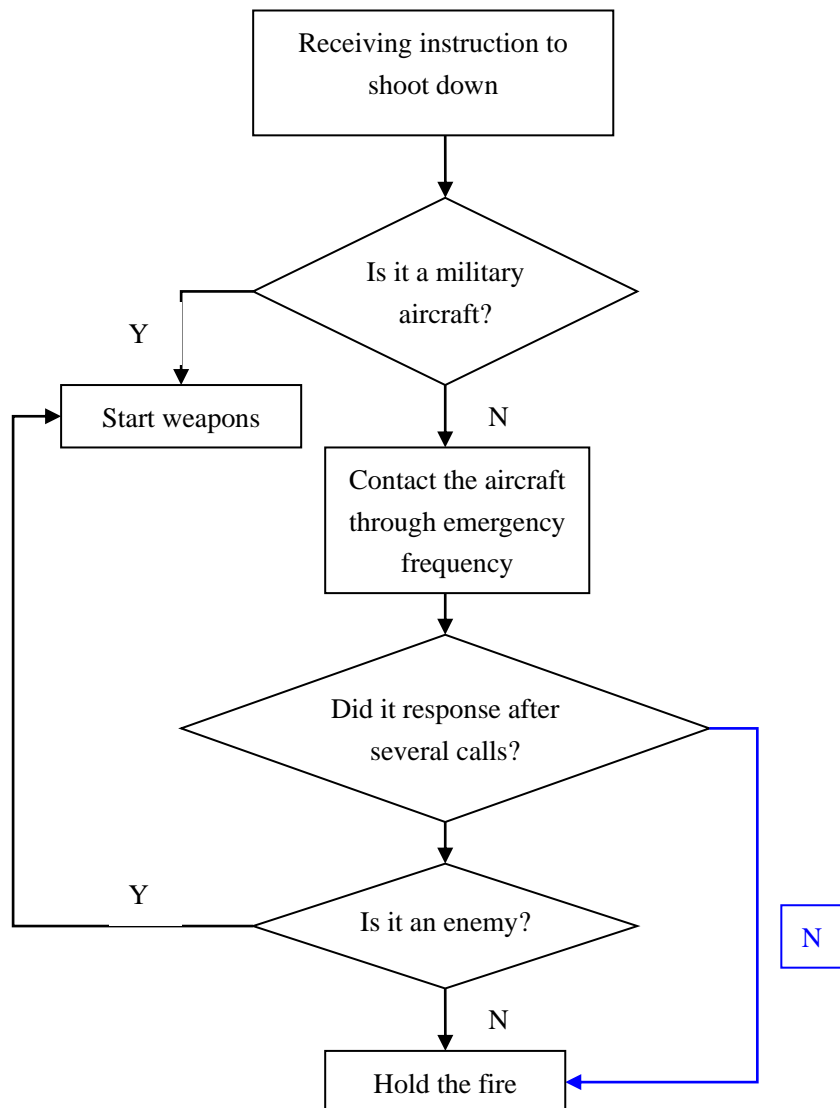


Figure 11. The updated procedure

(Components in blue are updated)

In this way, when the identity of the aircraft can't be confirmed, the mistaking is less likely to take place. Internal workflow and structure of the Guardian Wing Corps are also recommended to be adjusted by inviting officials from civil aviation to prevent damages to civil aviation.

**Response:** The internal working procedure of the Guardian Wing Corps has been updated in this way by the end of June 415.

It's also recommended for the Guardian Wing Corps to install 121.5MHz communication devices for its air force and encrypted voice recorders for soldiers when they carry out missions for further analysis.

**Response:** By the end of January 416, all soldiers in leprechauns' teams are equipped with these kinds of devices, most of which are equipped on their weapons.

Also, measures should be taken to prevent the sword Mourning from inappropriate use and producing unexpected influences.

**Response:** The sword has been confidentially secured by the Guardian Wing Corps.

## **4.3 To the Owners and Managers of Aircrafts**

Owners and managers of aircrafts should take measures to prevent dangerous or controversial articles, including weapons, to be delivered on commercial aircrafts without security conditions.

**Response:** This recommendation is delivered independently by the Regule Aire Transportation Safety Committee, not mentioning this accident due to confidential reasons. By the end of January 416, most of the sky islands have developed laws to prevent this.

## **4.4 To the Regule Aire Transportation Safety Committee and Local Aviation Administration Departments**

These aviation administration authorities are recommended to take effective measures to carry out recommendations in Section 4.3.

Besides, these aviation administration authorities are recommended to close their airspace in time when a war kicks off in their area in advance, or, in greater detail, before they are forced to stop working. When the local aviation authorities fail to response, it's recommended for Regule Aire Transportation Safety Committee to take on the responsibility to temporarily manage the airspace.

**Response:** This has been immediately added to the workflow of the Regule Aire Transportation Safety Committee.

## Appendix: FDR Data

FDR data are provided in following pages.

