

Presented by **The Guardian Wing Corps,**
Global Chemicals' Conference,
And **Regule Aire Transportation Safety Committee**

The Third Edition of the
Final Report of
The Guardian Wing Corps' Aircraft
3W-CHT (Pltanago Asiatica)'s
Accident over Gomag
on November 25th, 438

Released in July 440



DEDICATION

This accident is mainly about Chtholly Nota Seniorious, who sacrificed herself and saved numerous crew members and passengers. Words can't fully express investigators' admiration to her.

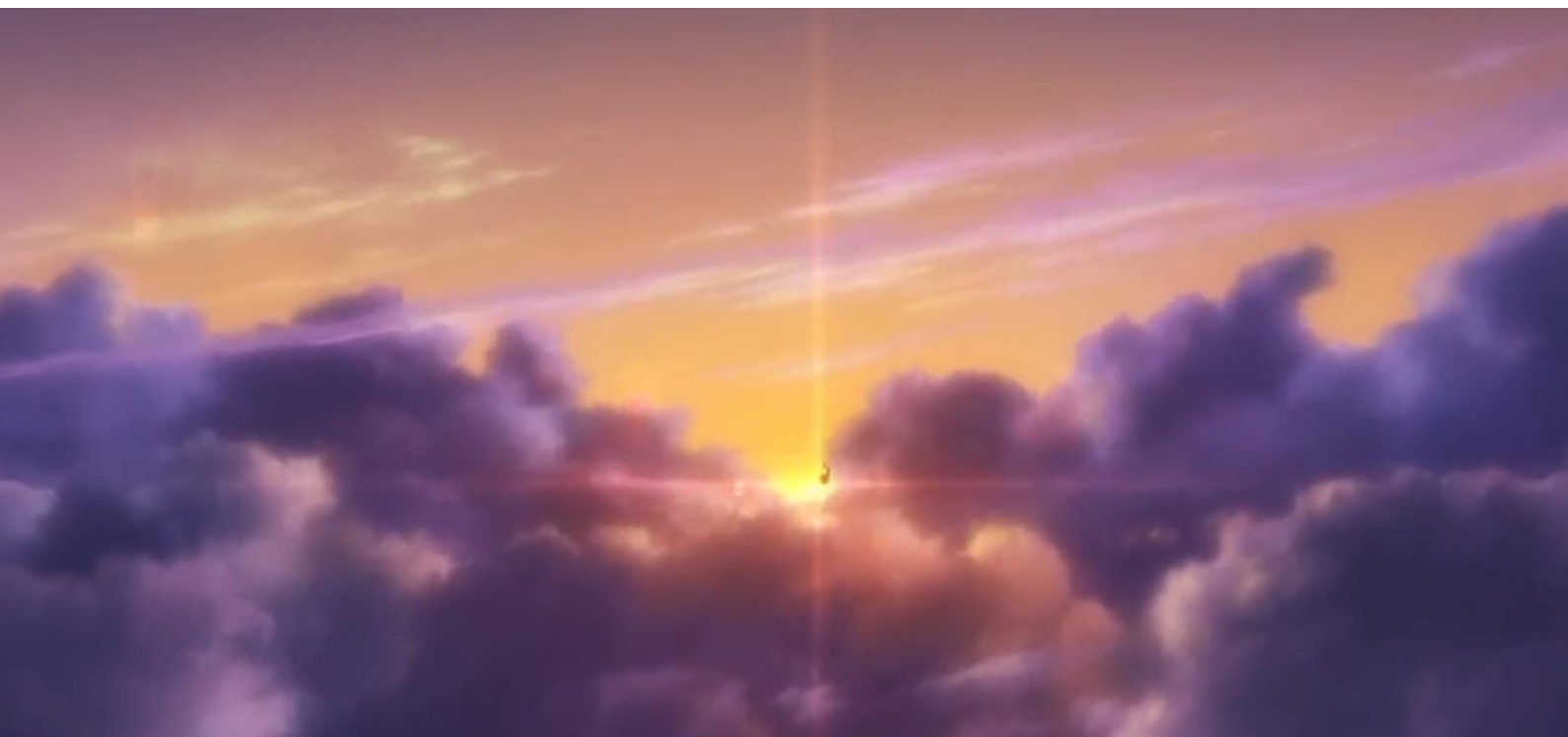
However, besides this, a passenger is still lost. She will be remembered by his family, friends, and colleagues, and never forgotten. Investigators believe that she will be found somewhere one day.

This investigation aims to discover the reason behind the accident despite the heroic experience and prevent tragedies from happening again.

In memory of

The 1 dead (Chtholly Nota Seniorious, 422 - 438)

and the 1 lost



ABBREVIATIONS

A

A400	Airbus A400
AP	Auto Pilot
APU	Auxiliary Power Unit
AT(C)	Air Traffic Control
ATPL	Airline Transportation Pilot License

C

CA(P)	Captain
CRM	Cockpit Resource Management
CVR	Cockpit Voice Recorder

D

DNA	Deoxyribonucleic Acid
-----	-----------------------

E

ECG	Electron Cardiogram
ENG	Engine(s)

F

FD	Flight Director
FDR	Flight Data Recorder
F/E	Flight Engineer
FMC	Flight Management Computer ¹
F/O	First Officer

G

GEN	Generator
GPWS	Ground Proximity Warning System

H

HYD	Hydraulic (A system an aircraft uses to move control surfaces)
-----	--

I

IAS	Indicated Air Speed
ILS	Instrument Landing System
IRS	Inertial Navigation System

K

kt	Knot (1 nm/h, i.e., 1.852 km/h)
----	---------------------------------

L

LPC	License Proficiency Check
-----	---------------------------

M

MEL	Minimum Equipment List ²
-----	-------------------------------------

N

ND	Navigation Display
----	--------------------

O

OPC	Operator Proficiency Check
-----	----------------------------

¹ A system which manages routes of an aircraft.

² To show what equipment is essential for an aircraft's departure.

P

PA	Passenger Announcement
PF	Pilot Flying
PFD	Primary Flight Display
PM	Pilot Monitoring

R

RATSC	Regule Aire Transportation Safety Committee
REAA	Regule Aire Aviation Administration

V

V/S	Vertical Speed
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VERSION INFORMATION CONTROL

Date	Status
3 Mar 439	Initial version of the report is printed.
5 Mar 439	1 st revision to the report in the Guardian Wing Corps.
5 Mar 439	The format is adjusted for better printing. Therefore, an additional empty page will be at the end of the whole report.
4 Jun 439	The second edition of the report is written.
16 Jun 439	The names and other translations are corrected.
24 Jul 439	More details have been added to this report.
14 May 440	Leprechauns' (including Nephren's) erosion is being discussed more.
25 May 440	Modified the text according to the requirement of REAA.
12 Jul 440	Update some factual information and related analyses with newly investigated facts.

BE ADVISED

This investigation is carried out under the requirements and restrictions of *The Chicago Convention*, Attachment 13. Notice that this report doesn't meet its standard and requirements in Section 5.12.3 and 5.12.6 in order to meet internal standard.

An investigation report aims to prevent accidents and incidents in the future. It is not used to pursue accountability.

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SYNOPSIS

FLIGHT NUMBER: (The Guardian Wing Corps) AF3403
OPERATOR: The Guardian Wing Corps Air Force
OWNER: Aviation Administration of The Guardian Wing Corps
MANUFACTURER: Airbus CO / The Guardian Wing Corps
AIRCRAFT TYPE: PLATANGO ASIATICA
REGISTRATION: 3W-CHT
PLACE OF ACCIDENT: Over Gomag Airspace
DATE AND TIME: NOVEMBER 25TH, 438 – 18:26:12

Note: All timepoints refer to the local time in this report.

Before the accident, there had been a research team going to the Gomag city to conduct civilization investigation. However, their aircraft was damaged by a beast, and they had to wait for rescuers. Therefore, the flight in this accident was dispatched to carry out this mission as well as an additional investigation mission led by Willem Kmetsch (See following sections).

During the missions, Chtholly Nota Seniorious, a soldier in the team, fainted and was sent to the aircraft. While the aircraft didn't suit the MEL, the general required an immediate takeoff. Then the aircraft was accidentally attacked by Timeres, during which the fuselages of the aircraft partially broke apart.

At the very moment, Chtholly woke up and bravely faced the Timeres. In order to rescue those who were injured and falling down from the cabin, she jumped down and fell to the ground. After that, she used up all her strength and continued to fight. This bought time for the crew members, and they successfully dealt with the malfunctions and diverted safely.

Soon after the accident, an investigation team was set up to investigate the accident. To better find out the reason of the accident, the Guardian Wing Corps Central Command invited Global Chemicals' (Chemistry) Conference and Regule Aire Transportation Safety Committee to join the investigation. An investigation committee was established in this way.

On December 21st, 438, a primary report was released. Then, with newly investigated facts and several updates, this final report came out by this investigation team. After the first investigation finished in March 439, investigators agree that the accident is mainly caused by:

- The failure of forecasting the appearance of Timeres and the indirect cause from the leprechauns' erosion, leading to the damage caused by this kind of beast,
- The irregular dispatch, which selected unskillful pilots and was partially against MEL requirement,
- Some incorrect response to the damage during the flight, such as steep turn, and
- The leprechauns' influence towards navigation and other devices.

However, after the first final investigation report came out, suggestions and criticisms came. Therefore, the investigation report is improved, with following major changes:

- More descriptions are added to *1.1 Flight Experience*,
- Diagrams are added to maintenance and other information,
- More background information is added (for *1.18 Additional Information*),
- Weather information is updated,

- The analysis, especially the chemical, zoology, and pathology parts, has become more objective and scientific,
- With the help of recent technology, more contents of CVR, FDR and internal audio system are decoded and added into the report,
- The engine and avionics' problems are discussed more, and
- The recommended procedure is updated.

To make the investigation more objective and scientific, investigators also invited certain specialists.

Later, the revision contains following minor changes:

- The composition of the investigation team is updated,
- The facts from former investigations are added,
- The recommended procedure is adjusted, and a procedure to defeat Timeres is added,
- More decoded parts into the FDR and CVR part are included, and
- The fact of the dispatch is taken into account.

In December 439, the Leprechauns' Armory (Battery) mentioned that the battle on board, with the erosion of Nephren, is controversial. Aiming to ensure leprechauns' safety and happiness, investigators discussed relevant problems with some experts (see the name list below), whose contribution is added into this investigation report.

Also, with the help of technical development, the CVR and other audio records are reconsidered, which contributes to scientific analysis.

Later, one of the passengers who was considered lost was found. His information is included in this report now.

Following text will discuss these problems in greater detail. Readers new to leprechauns are recommended to read *1.1 Flight Experience* and *1.18 Additional Information* before reading other parts.

The composition of the investigation team is:

Investigation team

Group leader of WGCC	Group leader of GCC	Group leader of RATSC
R. Raimusukin	Lithium Sulfate	Seabird Starch
Delegate from WGCC	Leprechauns' delegate	
Naught Sun	Ithea Myse Valgulous	

Experts invited to investigate details of leprechauns' erosion, taking Nephren as an example, consist of F. Jesuman.

Note: Some translations of names might be incorrect.

If the happiness had color, it must be blue that is not dyed by the ending-red.

-- Naught Sun

* Signatures of investigators are not provided for PDF versions.

1 Investigated Facts

1.1 Flight Experience

Before the aircraft taking off, the central command had received message that the former investigation team in the Gomag was threatened by Legitimitate³, and their aircraft (3W-RHT) was damaged⁴. To rescue them and further conduct the investigation, 3W-CHT was dispatched according to the plan submitted by Willem Kmetsch and instruction dispatched by the central command.

The flight number was AF3403⁵. It is also known as Pltanago Asiatica. It completed takeoff and landing cycles from Bethane airport⁶ for the missions for several times, each of which is mainly for refuel. The last takeoff was at 16:55:23 local time, and the aircraft was estimated to land at Bethane again. Before the takeoff, the aircraft had 122,345 pounds A-1 jet fuel, which means cruising for 8 hours. The takeoff and the beginning of the cruise was uneventful, and the aircraft soon land near Gomag, which is 141 miles away from Brisun, an airport not far from Bethane.

Not long before takeoff, a sudden earthquake took place. According to eyewitnesses' accounts, within 12 seconds, the soldiers stayed close to the cracks on the ground first witnessed beasts coming out from the cracks. Most of them were astonished and ran away.

Before taking off from Gomag, crew member received warning that the Engine No. 3 might be inoperative, which meant that the flight was unsuitable for takeoff by the MEL. However, as a general required an "immediate takeoff preparation", the aircraft still took off, regardless of the warning, in view of the urgent situation they believed.

The flight was also used to carry out an investigation led by Willem Kmetsch. However, during the exploration in a cave of the investigation, Chtholly Nota Seniorious⁷ was found dying and sent back to the aircraft. She was immediately sent to an intensive care unit with an ECG monitor.

At 18:26:12, the aircraft was suddenly attacked by Timeres⁸ over Gomag, thus, some passengers, as soldiers, started using their weapons to defend themselves, but most of the defense measures failed. Soon after that, part of the aircraft's fuselage was damaged, causing several systems on board, including hydraulic, engines and other flight controls, to malfunction. Crew members shut down overheated engines to avoid a fire and prepare for its in-flight maintenance⁹. However, at 18:35:55, due to steep turn and the broken fuselage, Willem was trying to pull another woman, Nephren Ruq Insania¹⁰, who was about to fall down through the hole of the fuselage back to the cabin, but both of them fell down. Meanwhile, Chtholly woke up again at about 18:35 and

³ A kind of beast.

⁴ See **WG-R-2529**.

⁵ In the whole report, "AF" is the callsign of the Guardian Wing Corps Air Force.

⁶ Some documents call this "aire-port". In this report, "airport" is used.

⁷ In the whole report, Chtholly refers to her.

⁸ One of the 17 beasts threatening the Regule Aire.

⁹ The Guardian Wing Corps allows soldiers to perform in-flight performance with essential equipment (e.g., wings or flying backpack).

¹⁰ Referred as "Nephren" or "Ms. Insania" in the further text.

walked straight towards the broken open door of the aircraft with clear mind. She expressed her intention to take part in the battle although others stopped her.

Seeing Willem and Nephren falling down, Chtholly jumped down “without thinking twice” and held them to decelerate. They touched the ground, but Willem and Nephren were hurt too badly to move. Chtholly took up the sword¹¹ and directly entered the war zone without anyone else. She struggled to fight until the last Timere was defeated, which used up all her strength. She even influenced on-board IRS navigation device. Then, she just stood straight by the cliffs at 18:53:32, with no sense of life.

At the same time, the attempt of fixing and restarting engines and recovering from an engine failure succeeded. The hydraulic systems were also partially fixed. Pilot regained control, and then the aircraft diverted to Brisun airport at 19:32:31.

The figure of flight path is provided in following sections.

1.2 Injuries to Persons

Injury type / status	Crews	Passengers	Other
Fatal	0	1 ¹²	-
Major	0	15	-
Minor	2	53	-
None	12	366	-
<i>Total confirmed</i>	14	435	-
Lost	0	1	-
<i>Total</i>	14	436	-

1.3 Damages to the Aircraft

The aircraft was seriously damaged. Many parts of fuselage, which are mainly around doors, separated from the aircraft. They will be described in the following sections.

Internal blood and other signs suggest that the whole fuselage was completely broken down by Timeres. This will be discussed more in following sections. For example:

¹¹ i.e., Dagr Weapon. See further sections.

¹² This is caused by beasts, so it shouldn't be considered an Aviation fatal injury.



Figure 1. Internal blood suggesting fight inside

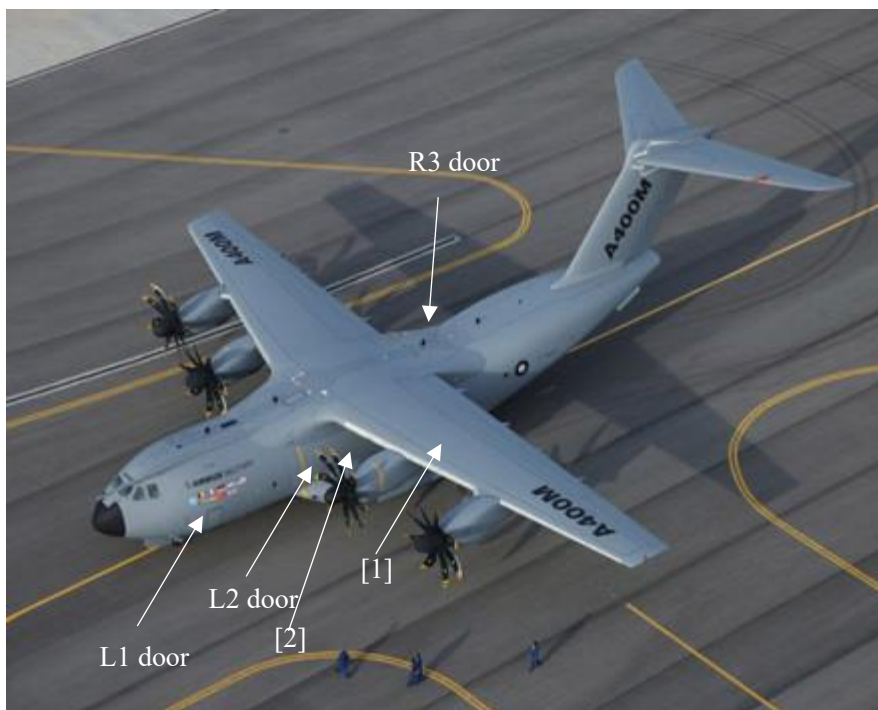


Figure 2. Damaged areas (An image of a standard A400M is used)

[1]: Several broken holes, with pipes exposed (See 1.12.4 Broken Pipes).

[2]: Broken fuselages with rivets exposed.

This kind of damage will also be discussed in *1.18.2 Beasts such as Timeres* and following analysis.

After diverting, the aircraft was repaired and returned to the fleet of the Guardian Wing Corps.

1.4 Other Damages

The fallen wreckages, including the separated doors, destroyed several empty houses.

1.5 Personnel Information

1.5.1 Crew Members

The captain was 35-year-old Chris Lead, who had 3,453 hours on Airbus A400 and 2,393 hours on Boeing 747-400. He had both ATPL and military aviation license. He joined the Guardian Wing Corps on March 12th, 422, after working for Air Regule Aire for 2 years. This flight was his second flight in the week, and his previous flight was 56 hours ago.

The captain had few negative comments. His colleagues and passengers said that “his flight was as comfortable as commercial flights.”

The first officer was 33-year-old Aluminum Sulfate, who had only 124 hours on Airbus A400. His experience mainly came from Airbus A320, which he had flown for 1,233 hours. He had only ATPL and just joined the Guardian Wing Corps after working for Lyell Airlines for 5 years. This flight was part of his test. This flight was his first flight in the week.

Another first officer, who was on-duty during the accident, was 15-year-old Glick Gureikurakku¹³. He had 3,433 hours on Boeing 757. He was issued both ATPL and military aviation license when he graduated from aviation college and joined the Guardian Wing Corps on June 15th, 429. He previously took 3W-RHT, which was damaged by a beast on the ground. When other passengers on 3W-RHT and he were rescued by 3W-CHT, facing the increasing work of crew members, he offered to join crew members. However, he had never flown larger aircraft.

Glick had been trying to get licenses of larger aircraft such as Boeing 747. However, “limited by skills and experiences on smaller aircraft” (his own words), he had never passed essential examinations, despite his outstanding scores in subjects including most of emergency items.

The flight engineer was 41-year-old Barium Sulfate, who had 3,555 hours on Airbus A400. He had both ATPL and military license. He joined the Guardian Wing Corps on June 8th, 420 after getting a master’s degree on aviation. This flight was his first flight in the week.

¹³ His identity is partially unknown. He is also known as Gurikku. Referred as “Glick” in the following text.

Before getting on board, all pilots passed alcohol test.

The LPC/OPC, CRM examination and medical tests were carried out by the Guardian Wing Corps every 3 to 5 months. By the time when the accident happened, no restriction or disqualification had ever been given to crew members. All pilots' tests were done on August 11th, 438.

1.5.2 Relevant Passengers (As Soldiers)

Commander Mr. Willem Kmetsch (Aged 18)¹⁴

He was second-level technical officer and was the manager of the “special armory (battery)”. He was also the organizer of the civilization investigation project.

His certificate was issued on July 5, 436, and his assignment was given on February 15, 437. According to the internal rating system, he was outstanding, but he owed debt. By the time the battle took place, he had almost paid off all the debt.

It is worth mentioning that it's believed that Gomag was once his hometown.

Soldier (as well as **secretary**) Ms. Chtholly Nota Seniorious (Aged 15)¹⁵

She was well trained and passed all tests on May 3, 432. Before Mr. Kmetsch took control of the “special battery”, she was one of the actual managers of it. She had taken part in many battles, almost all of which succeeded. However, her records showed that she would likely use up her strength too much, making herself in danger. More detailed, According to **WG-A-17044.3**, at 120h after the beginning, she was “eroded” but didn't quit. At 724h, she completely “cut down” the Timere as well as the whole island. It's believed that this overused her ability. See the investigation to learn more.

She was diagnosed unsuitable for taking part in battles several days before the event, after she lost her ability to fly and use the sword as usual. Therefore, she got such a job and wanted to live a happy life with Willem, according to her friends and colleagues.

Soldier Ms. Nephren Ruq Insania (Aged 13)

She also took the aircraft during the accident and fought against the Timeres on the aircraft. After Chtholly fainted, she joined the rescue team. However, when she was fighting against Timeres in the cabin, at that time, she fell off the aircraft from a hole on the fuselage. No more information can be provided because she is still lost so far.

Following **soldiers** followed the investigation team or the former investigation team:

Ms. Rhantolk Ytri Historia¹⁶ (Joined the army on August 7, 432, working for cultural investigation team in the air force)

¹⁴ Referred as “Wilem (Willem)” or “Mr. Kmetsch” in the further text.

¹⁵ Referred as “Chtholly” or “Ms. Seniorious” in the further text.

¹⁶ Her age is unknown.

Ms. Nofuto Que Desuperatio¹⁷ (Joined the army on December 3, 431, working for the air force)

1.6 Aircraft Information

1.6.1 General

The aircraft was manufactured in December 402, which was a “preview” version of Airbus A400, or, in other words, some of its parts were incomplete. Therefore, the avionics from Boeing 727 and what the Guardian Wing Corps manufactured were used. The engines were also redesigned into propeller ones. IRS device and some parts of the wings and fuselage was manufactured by the Guardian Wing Corps. For these reasons, the aircraft didn’t have formal serial number.

The aircraft had 4 engines from Lyell Mechanical Manufactory Co., whose serial numbers are 443532, 443533, 443536 and 443538. They were installed during the initial manufactory of the aircraft. The engine structure is given in *1.12.3 Wreckages of Engine Structures*.

For easier boarding and cargo delivery, the Guardian Wing Corps manufactory departments also added several doors to the fuselage, connected by domestic rivets.

On August 21st, 430, oxygen generators were installed to support breath when decompression occurs. This system worked during the accident, providing oxygen for all passengers and crew members for approximately 50 minutes.

During its career in the Guardian Wing Corps, it has accumulated 86,183 flying hours.

1.6.2 Weapons

The aircraft was equipped with cannons manufactured by the Guardian Wing Corps.



Figure 3. Cannons

The cannonballs’ sizes range from approximately 70 to 110 mm¹⁸. Guns are also provided for the aircraft and crew members. However, almost all interviewed soldiers reported that they had no effect on beasts. They reported that flames and “special weapons” (i.e., leprechauns) were the only

¹⁷ Her age is unknown.

¹⁸ Not military standard value.

effective measures.

1.6.3 On-board Control Panels

IRS module control panels in cockpit is given as follows:



Figure 4. IRS Panel

[1]: “FAULT” – indicates IRS module is in a failure and will not provide any information.

[2]: Mode selector, can be one of followings:

- OFF – The module is turned off;
- ALIGN – Use previous coordinate to initialize IRS module (only on the ground);
- NAV – Use normal navigation (can’t be configured if in-flight OFF/ATT is used); and
- ATT – Use attitude mode, only providing limited information such as attitude, heading and vertical speed.

1.6.4 Avionics and Normal Maintenance

On March 11th, 431, the PFD and ND of Boeing 757/767 were adapted to the aircraft as an “electronic update”. The upgrade work followed existing procedure and showed no sign of malfunctioning.



Figure 5. Updated avionics (from a similar aircraft)



Figure 6. Avionics before upgrading (photographed by crew members on a flight before, while climbing)

The last maintenance of the aircraft was done on September 3rd, 438 and the last examination was done on November 5th, 438, which were the same as the maintenance and examination done to other aircrafts which are commercially used and not facing such a risk of crossing war zone and facing beasts. This is because cargo aircraft, even if for military use, different from fighter jets and leprechauns, doesn't usually face the risk of beasts. The check suggested that there was no malfunctioning system. However, it was reported on August 5th that the left IRS of the airplane became inoperative during a mission.



Figure 7. Captain-side after-landing indication of the flight on August 5th

Despite the expectation of safety, the maintenance record also says that on July 15th, 436, the aircraft's engines were stuck by Timeres. It took crew members approximately 5 minutes to get rid of it, but after getting rid of it, the threat of Timeres significantly decreased. A complete examination was then done to the engine to ensure no tissue of Timere was left in the engine. No beast has ever come out from engine since then.

In general, the maintenance interval is given as follows:

Maintenance & Examination Type	Required Interval (Flying Hours)	Actual Interval (Flying Hours)
A	250	196
B	1,000	955
C	4,000	3,958
D	24,000	23,193

1.6.5 Emergency Maintenance of Engine 3

According to the requirement of the dispatch, or the general, they conducted an immediate emergency maintenance and made it temporarily suitable for flying, though it was still unstable. The maintenance generally considered replacing all broken exhausters (see 1.12.3 *Wreckages of*

Engine Structures) to temporary materials whose strength didn't meet military standards, according to a maintainer who participated in it.

1.6.6 In-flight Maintenance

To fix the inoperative systems caused by the attack of Timeres, in-flight repair was successfully conducted. All damaged engines and some parts of damaged hydraulic systems were fixed. Broken pieces were also well collected to prepare for investigation.

However, when asked about in-flight maintenance procedures, most of the maintainers and crew members from the Guardian Wing Corps told RATSC that they didn't have complete standard procedure about it.

1.7 Meteorological Information

The weather condition in Brisun was given by an automatic weather station as follows:

METAR PAUR 250730Z AUTO 30002KT CAVOK 15/M09 A2990

(Wind direction 300 deg, wind speed 2 kts, no cloud, visibility > 10 km, temperature 15 degrees, dew point 9 degrees, and altimeter 29.90)

The weather in the airspace where the accident took place was reported by following incomplete METAR text: *29004KTG11 OVC210 OVC280 16/M10 A2991*

(Wind direction 290, wind speed 4 kts with 11kts gust wind, overcast cloud at FL210 and FL280 (which covered the cruise altitude), temperature 16 degrees, dew point 10 degrees, and altimeter 29.91)

However, after Chtholly's scarification, the weather the automatic system collected became: *18012KTG15 SCT230 20/M12 A2989 BECMG FEW230*

(Wind direction 180, wind speed 12 kts with 15 kts gust wind, scattered cloud at FL230 (becoming fewer), temperature 20 degrees, dew point 12 degrees, altimeter 29.89)

1.8 Navigation Devices

According to the maintenance record, the navigation devices were correctly installed. However, the left IRS became inoperative during the flight after crew members saw "strange lights". This will be discussed in following sections.

IRS device was found on board. Its components were destructed and analyzed. See *1.12.2 Wreckages of IRS modules*.

From the FDR and CVR data, the right IRS worked properly. Both the ILS receiver on board and ILS device in the airport worked correctly, providing correct glide slope information, which helped the crew members a lot.

1.9 Communication

The communication between crew members and the ATC was loud and clear, which can be

told from both CVR and ATC's tape record.

The transponder worked correctly and displayed 7700 emergency code¹⁹ for ATC in time.

In an interview, ATC stated that he had noticed the aircraft's abnormal steep climb and descent approximately 19 minutes before emergency declaration. However, meanwhile, ATC received instruction to guide aircraft handed over to his airspace out of the threatened airspace, and under great working pressure, he considered the indication wrong until emergency declaration. He didn't receive any information about detailed distribution area of appearing beasts.

1.10 Airport Information

The Brisun airport, or PAUR, had 2 runways:

- 35L / 17R Length: 7855 ft (CAT II)
- 35R / 17L Length: 6510 ft (CAT III)

The airport was also equipped with ambulance and fire fighters, which helped a lot during the evacuation.

The Gomag airport has temporary grassland runway 18 / 36, whose length is 5522 ft. It is equipped with CAT I device.

1.11 Flight Recorders

The FDR and CVR were located at the tail of the aircraft. After the touchdown, the black boxes were immediately gotten and sent to BEA, an organization decoding black box data. BEA successfully downloaded some parts of data. However, some parts of the records are missing.

Detailed FDR data is partially given in the appendices.

1.11.1 On Board Audio

Before the audio record started, following malfunctions had appeared:

ENG 1+2+3+4 SHUT OFF

ENG 2+3 LOW OIL PRESS

HYD 1+5 LOW PRESS

GEN 2 DRIVE²⁰

L1+L2+R3 DOOR OPEN

CABIN ALTITUDE²¹

APU had been started to power the airplane at that time.

18:36:11 [Master Caution] Altitude²²: 29195ft Airspeed: 243kt V/S: -1223ft/min

¹⁹ 7700 Emergency code means that the aircraft is in a technical trouble.

²⁰ DRIVE means a situation where an engine's generator is disconnected from the engine.

²¹ Cabin altitude means an altitude whose air pressure is the same as current cabin air pressure. When this value is too high, this means that the air pressure is too low, suggesting decompression.

ENG 3 Decompression Valve Drive ... Why?
How can I die here!

S2 Put all materials here to fix this!
Altitude: 25838ft Airspeed: 271kts V/S: -753ft/min

18:39:13 F/O Gliding configuration established.
How long can we keep flying for if we still use these weapons?

CA I have no idea actually. Can you engage autopilot in this situation?
I'm still looking for my checklist.

F/O Roger.
AP2 engaged and set to V/S -800, ALT 10000 mode.

CA AP2, cross check.

18:40:02 *Altitude: 25033ft Airspeed: 260kts V/S: -799ft/min AP2*

S3 Emergency checklist of *(unreadable)* completed.
Start ignition.

S4 Ignition, roger.
Engine 1, 2, 3, 4 start valves open. N2 and N1 normally increased, and the FLT ignition was successful.

18:40:55 *[Master Caution] Hydraulic System 3,4 LO PRESS*

18:41:01 F/E Hydraulic 3,4 pressure low!

18:41:13 *AP2 was disengaged.*

18:41:35 *Positive climb rate was first established.*
Altitude: 24431ft Airspeed: 252kts V/S: +35ft/min

CA Switch to hydraulic system 2 and 6 ...

F/E What? I have never flown airplane with so many hydraulic systems!

18:41:42 F/E Hydraulic 3,4 control valve STBY RUD.

18:41:59 CA Communication. Squawk 7700.

18:42:02 F/O Squawk 7700. You take control, I'll communicate.

18:42:09 CA I take control.

18:42:13 F/O Mayday, Mayday, Mayday, AF3403 *(unreadable)* ...

18:42:33 AT AF3403, Roger Mayday. Say your intention.
Since the Mayday was declared, the ATC had been calling crews for further information, only to get no reply.

18:42:55 *[Another attack] [Master caution]*
The airplane started a sharp bank.

18:43:03 CA Hey, stabilize the aircraft!

18:43:19 F/O I've already done so!
The plane was stabilized again.
Altitude: 19323ft Airspeed: 299kts V/S: -331ft/min

18:43:53 F/E Hydraulic adjusted.
Another sudden attack. After that, the airplane made steep banks and dives.

18:44:03 CA What's that?
[Master Caution] Control valve 3 ~ 5 drive

²² The altitude is barometric value, and the airspeed is indicated airspeed (IAS).

18:44:32 F/E Control valve 3~5 drive!
 18:44:38 F/E Control valve 7 is also driven!
 18:44:43 F/O Be quick... Come with an idea to (*unreadable*).
 18:44:59 CA (*PA System*) Captain speaking. We're now trying to get rid of this airspace at a high speed. Hold other things firmly!
The aircraft's FD was turned to FLCH mode (maintaining a constant speed) and the speed was set to 250kts.
 Altitude: 20034ft Airspeed: 293kts V/S: +3349ft/min Bank: 16 deg
 18:45:44 GPWS Bank angle.
 Altitude: 24039ft Airspeed: 249kts V/S: +3122ft/min Bank: 31 deg
The GPWS alarm kept being triggered until 18:49:31, during which the aircraft reached the minimum altitude 19332ft, the maximum speed 304kts and the largest bank angle 34 deg.
 18:46:02 CA Watch out the bank angle!
The plane leveled at 18:49:22.
 Altitude: 23031ft Airspeed: 259kts V/S: +231ft/min Bank: 1 deg
 18:50:11 F/O What was that?²³
 18:50:45 CA Maybe our soldiers. I don't know.
[Master Caution] IRS L FAIL²⁴
 18:51:03 CA My display become malfunctioning!
 18:51:15 CA Switch IRS display to alternative display... What about your gyro?
 18:51:45 F/O The same as the alternative one... Checked. IRS BOTH ON R, and do not engage AP.
 18:52:01 CA Checked. Continue following preset right FMC route.
 18:53:49 CA Look, it disappeared.
 18:55:06 F/E Engines are now all recovered.
 18:55:45 CA Are these hydraulic systems enough? I take control, and you communicate.
 18:55:59 F/O You take control.
 18:56:32 F/E Let me check the checklist... I think it's enough for landing.
 18:56:39 AT AF3403, do you read me?
 18:56:45 F/O Loud and clear, AF3403.
 18:57:03 AT AF3403, say your intention?
 18:57:24 F/O We have dealt with malfunctions... We request direct divert to the nearest airport, AF3403.
 18:57:43 AT AF3403, Roger. Distract frequency 124.5 if you can.
 18:57:59 F/O 124.5, AF3403.
The frequency was correctly adjusted.
 18:55:34 CA So we still have doors open and separated...
 18:55:52 F/E Affirmative.

²³ That's probably when Chtholly started fighting. Here, eyewitnesses described "strange lights", which indicates the overuse of Chtholly's energy. See other parts of the report to learn more.

²⁴ Crew members point out that this warning message appeared as soon as the "insufficient precision" indication appeared on FMC.

In fact, IRS sprang to life a few minutes later.

18:56:23 AT AF3403, would you like to descend now or later?

18:56:53 F/O We need to descend now.

18:57:12 AT AF3403, Roger. Turn right heading 350, descend and maintain FL120, expected to land on runway 35L. The speed is on your own.

18:57:44 F/O Heading 350, descend to FL120, speed is on our own, AF3403.

18:58:32 CA Let's start approach briefing. The landing runway is 35L, direct approach, and the runway heading is 350. We'll use full auto brake and flaps 30. As for runway length...

18:58:59 F/O The runway length is 7855ft, just enough.

18:59:33 CA And go-around procedure...

18:59:55 F/O We will use WILAM1 procedure to climb and maintain 5000ft and join the hold pattern.

19:02:13 CA Seems difficult.

19:02:44 F/O Yes, but we don't have another chance.

19:03:01 CA So our first landing has to be successful. And for the MDA...

19:03:32 F/O 200ft.

19:03:45 CA 200ft, check. What about fuel?

19:04:11 F/E It's 54.1. It's enough and the gross weight is also OK.

19:04:33 CA Let's just try it. You are the pilot monitoring.

19:04:51 F/O You take control.

19:07:12 AT AF3403, descend to 6000, Brisun altimeter 29.90. You're at the runway heading. Contact Brisun approach at 115.25.

19:07:44 F/O *(To ATC)* Descend to 6000, contact 115.25, AF3403. *(To crew)* Descend and approach checklist: Compression is skipped. Auto brakes?

19:08:12 F/E Set to MAX.

19:08:33 F/O VREF?

19:08:55 CA 155kts.

19:09:11 F/O Approach brief is done. Altimeter?

19:09:33 CA 29.90, set.

19:09:45 F/O *(To crew)* Approach checklist complete. *(To ATC)* Brisun approach, AF3403, emergency aircraft, descending to 6000, expect runway 35L approach.

19:10:33 AT AF3403, radar contact. Continue descending. The speed is on your own. Can you tell me how many souls are on board?

19:11:01 F/O Roger... there are 449²⁵, AF3403.

19:11:12 CA Flaps 1.

19:11:19 F/O Speed check, flaps 1.

19:13:34 CA Flaps 5.

19:13:52 F/O Speed check, flaps 5.

19:15:03 CA Flaps 15, gear down.

19:15:33 F/O Speed check, flaps 15. Gear down, *(interruption)* three green.

19:17:31 AT AF3403, descend to 3000, report the field in sight.

19:17:55 F/O Descend to 3000, we'll call the field, AF3403.

²⁵ At that time, crew members had known that a passenger fell out through internal audio, which wasn't recorded in the CVR.

19:18:11 CA Flaps 20.
 19:18:34 F/O *(To ATC)* Brisun approach, AF3403, field in sight. *(To crew)* Speed check, flaps 20.
 19:19:02 AT AF3403, cleared to land.
 19:19:33 F/O Cleared to land, AF3403. We request ambulance and fire fighters after landing.
 19:19:55 AT AF3403, roger.
 19:20:11 F/O Landing checklist: Engine ignition?
 19:20:33 F/E Set to CONT.
 19:20:51 F/O Speed brake?
 19:21:12 F/E Armed.
 19:21:33 F/O Gear down, three green, checked. Flaps?
 19:21:55 F/E 30, green light.
 19:22:01 F/O Landing checklist completed.
 19:25:15 GPWS *Minimums.*
 19:25:33 CA Continue.
At 19:27:33, the plane touched the ground.
 19:27:55 CA Speed brake...
 19:30:02 F/E Full extended. Thrust reversers three green.
The plane stopped on the runway at 19:32:31. The CVR recorded applause.
 19:32:55 AT AF3403, would you like to evacuate on the runway?
 19:33:01 F/O *(To ATC)* Affirmative, AF3403. *(To crew)* Evacuation checklist: Park brake set, speed brake DOWN, flaps?
 19:33:35 F/E Set to 40.
 19:33:42 CA 40, check. Air valves open?
 19:33:53 F/E MAN and OPEN position.
 19:34:13 CA Flaps 40, cross check.
 19:34:33 CA Thrust levers? CUTOFF.
 19:34:55 CA Cabin notification. *(PA System)* Captain speaking. Evacuate now!
 19:39:12 F/O Is everyone evacuated?
Captain left and entered the cabin.
 19:42:32 CA Yes.
 19:42:55 F/O Let's go.
End of recording.

1.11.2 Soldiers' Audio

The Guardian Wing Corps equipped soldiers with an internal audio system. Following text is what it recorded during the accident.

Following audio text is decoded from Chtholly's and Willem's audio recording device²⁶. All records before 18:20 are corrupted due to unknown reasons, and existing records are cut to several pieces, among which are unreadable codes caused by probable radiology damage from the beasts.

²⁶ When Chtholly fainted, the text uses Willem's record; When Willem was falling, the text uses Chtholly's.

W = Willem C = Chtholly Sx = Other soldiers U = Unknown

Incomplete segment²⁷

(Chtholly's audio device only)

U Flying spaceship... *(unreadable)* Lights...²⁸

C It's like something²⁹ calling me. What's that? Under the ground.

(The ground broke down.)

- Discontinued audio component -

W There is a large empty hole under Gomag city. What's this for?

C What are you doing? It was a complete mass.

W Anyway, it's OK now.

S1 Escaping as soon as possible is better.

C/W Where?

S1 This channel must be the underground relic the idiot wants to look into.

(unreadable) ... Anyway, there are tags along the way. You can see the markers! Follow them and there won't be any problem unless it becomes discontinued.

C In the past, I could fly out.³⁰

W Don't be worried. I *(unreadable)* am here to protect you.

C But it should be me that have protected you.

W Anyway, the guardian *(unreadable)* has the responsibility *(unreadable)* to do so.

C So I have been your ... *(unreadable)*³¹

S1 What's that? The former investigation team? That's too bad...³²

- Discontinued audio component -

C Eruku... Yes, yes. *(Something dropping)* Do you want me to go there? I'm on the way. *(Chtholly flying)*

W Chtholly!

S1 Hey, the girl! Do you know what she is doing?

Segment 1 (Starting at 18:17)

W Chtholly?

Hey, Chtholly?

C *(Hesitant)* Wi..llem?

W It's me. But you need to focus on yourself. Don't lose sight of yourself!

S1 I haven't considered that I can see this treasure twice in my short lifespan *(unreadable)* ...

²⁷ Incomplete segments were recovered from the seriously broken audio device. Investigators can't be sure about the timeline in this part.

²⁸ The voice is weak, with an average strength of -82dBm. Its frequency is higher than the listening range of normal ears.

²⁹ Maybe "someone".

³⁰ See Section 1.17.5 to learn leprechauns' abilities.

³¹ The word is likely to be "wife".

³² According to the soldier, he saw the members of the former investigation team killed.

How poor! Seriously cut.

W Seniorious (*unreadable*).

S1 Seniorious' charm? What's that?

W Do you know the charm which turns princes into frogs in fairy tales? That's similar.
(*A short silence. During the conversation, the breath of Chtholly weakened.*)
That's a charm through which turns anyone into the death, even god, and it's for
this reason that the sword is believed to have the power to change the whole world³³.
(*Unreadable*) If it's used on her, there's no way that she is just an ordinary girl.

Segment 2 (Starting at 18:20)

(*Stone or ice crashing.*)

W Chtholly, let's go back.
Listen! Trying to keep control of yourself. I won't let anything happen to you.

W Chtholly!
I'm here, always be here.

C (*Very weak*) Willem...
(*The breath of Chtholly became beyond recognition.*)

C Emm... I (*unreadable*)...

S1 Willem, this direction! Be rush!

W Chtholly, Chtholly! Please ... say something! Chtholly!

Segment 3³⁴ (Starting at 18:23)

(*Shooting from unknown source.*)

C Where am I?
(*Interruption.*)

U³⁵ I'm doing this for one reason. That's (*interruption*) for my love.
(*unreadable*) Because Willem is ... (*unreadable*).
(*Interruption.*)

U³⁶ Welcome back to me, Chtholly.

C (*unreadable*)

U (*unreadable*) because I have something to tell Chtholly, (*unreadable*).

C What?³⁷

U Once upon a time, there is a species called "human beings" living on the ground.
To prevent their deconstruction, 3 gods and goddesses (*unreadable*) watching over the world
decided to remove them, but they were defeated. No one could stop humans from then on.
(*unreadable*) They turned into beasts, ruining everything (*unreadable*),
And the last goddess is called (*interruption*) ... Eruku Hallksten. Uh-uh This is also
the name of your soul.

³³ This part is newly encoded, compared with the former report.

³⁴ This segment is covered by waste data. Therefore, the decode result might be incorrect. The voice was as weak as the former remark to "Flying spaceship..." referred.

³⁵ Her voice differs from Eruku.

³⁶ A young girl's voice. It can be inferred from the context that she was Eruku (see the conclusions below).

³⁷ Unexpectedly, her voice was clear in this text, in spite of her breathless condition in the previous segments.

(Something flying.)

U You and your friends are souls whose owner died too young to realize their death ... I've been having dreams since my death, the dream of the being like her, *(unreadable)* protecting the ones they love. *(unreadable)* ... for all leprechauns.

C So what will I be turned into?

U You must have realized, *(interruption)* Ah-huh?

Dreams have endings. *(unreadable)*

C And (they'll) be forgotten, with nothing remaining?

U It's in no worry. You made it back to me just in time.

Segment 4 (Starting at 18:25)

W Chtholly, I don't know what to say *(unreadable)* ...

You're wrong! No, I just wanted to let her *(unreadable)* ... I failed. I didn't keep the promise, again. *(About crying)*

(Exploding)

And now, are you the one called beast? Welcome then, but you must know I'll use my energy of anger.

Segment 5³⁸

U Your mind and body are being completed been replaced, aren't they? They are becoming my body and my mind. *(unreadable)* But your feelings remain for someone. *(unreadable)* You still remember *(unreadable)*, don't you?

C Yes. A little (thought remains)³⁹.

U That's will be OK. Everything will be ready, and you will still be Chtholly.

(A short silence.)

C Wi...llem...

Segment 6 (Starting at 18:32)

W I have lost almost everything from my *(unreadable)*... I can't get them back. The only thing I can do is to fight. *(unreadable)* What was I doing?

(A mess caused by a sudden attack) *(Willem running)*

W Are Noft and others OK?

S3 I just saw them fighting against Timeres. I guess others are protecting crew members.⁴⁰

(Willem walking away)

S3 Hey, how was your wound there?

(Willem fainted but was alive. Following conversation took place after Willem's recover)

W How long has it been since I fainted?

S3 A few minutes. You're putting yourself in danger if you continue to fight with such wounds.

³⁸ Segments 4 and 5 were recorded at the same time. Segment 4 was Willem's, and the other was Chtholly's.

³⁹ This means abbreviations of speakers.

⁴⁰ Both according to this and the eyewitnesses' accounts, Nephren was fighting against Timeres on board, during which she nearly fainted (according to eyewitnesses) and was seen to have eyes become red, suggesting erosion.

(Unreadable) Fighting against Timeres without swords? Are all you humans⁴¹ so strong?

W I adjusted myself to the best status among almost all soldiers. But I could never save anyone, ranging from (unreadable) to Chtholly.

Segment 7⁴²

U (unreadable) No way!

C I remember my commitment... I said I'll inherit his responsibility.

U I've said there's no way.

C Please... (unreadable, weakened) and I have something to tell him.
Whatever it turns out, I want to do it.

U But Chtholly will completely disappear after that if you try this, uh-oh. It consists of memories, sweet feelings, etc., all of them.

C (Calmly and firmly) But I hate this ending more than disappearing.
So, please, let me get back.

(Something flying, Chtholly's breath recovering)

Segment 8⁴³ (Starting at 18:37)

S5 Hey, since you've woken up, find somewhere to hide!
(Chtholly stepped forward, regardless of her advice.)

S5 Stop, Chtholly! Since you can quit, don't take part in this fight!
Since you can get your happiness, go to get it!

C I'm sorry... I can never get more happiness. Because... (interruption)
Actually, I'm the happiest girl in the world.⁴⁴ (during which Chtholly jumped down)

U⁴⁵ Milk falling down from (unreadable)... Chtholly, come on.
(Chtholly was falling to the ground.)

W Chtholly?
[End of both Chtholly's and Willem's recording.]

Further audio is in chaos. 14 second after the chaos, the sound of impact came. Then, approximately 45 seconds after the chaos, another sound of impact appeared, which lasted for approximately 1 second.

Eyewitnesses said that they saw two lights, white and blue, ran into each other. This also suits the scenes captured by the internal camera and suggests that Chtholly embraced Nephren.

1.12 Wreckages

Wreckages were correctly collected and divided into several parts. Almost all of components were found, but three doors and fuselage nearby were missing. Rescue team found these parts in

⁴¹ Actually, she used another word to replace "human".

⁴² Segments 6 and 7 were recorded at the same time. Segment 6 was Willem's, and the other was Chtholly's.

⁴³ Since Willem's recorder had been damaged, Chtholly's is used here.

⁴⁴ At that time, the airplane was 27,107 feet to the ground. See Section 2.6.2.

⁴⁵ This voice was as weak as previous weak segments. It can be inferred that she was Eruku.

the area where the accident took place later. The general distribution as well as the flight path is given below.

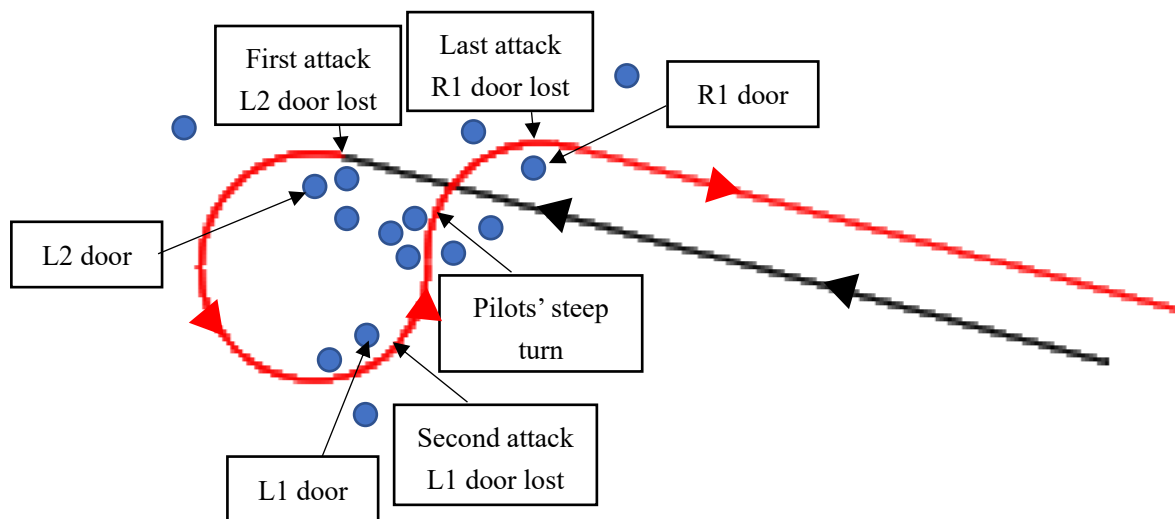


Figure 8. General flight path (with FDR and ATC data) and wreckages' distribution

●: Where fallen fuselages were found.

1.12.1 Wreckages of Doors

When the aircraft touched the ground, it was immediately examined by investigators. Investigators found that the door L1, L2 and R3, as well as the fuselage nearby (extended for about 40cm to 60cm), were missing. Other existing rivets nearby showed signs of separation. They have moved 20% to 50% out from their designated positions.

There is a significant metal transfer between the originally found components and the separated ones, which should have been connected to each other. For example, the figure below shows a picture of the locker of one of the doors flown away:

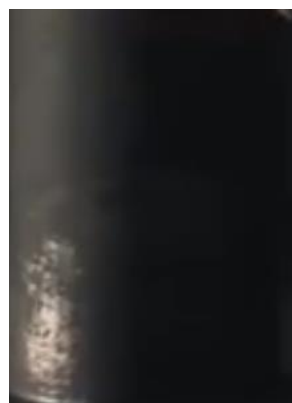


Figure 9. The metal transfer of the locker (the left-bottom part)

A picture of door locker structure is given in 2.7.2 *Damage to Doors*.

From the circumstances of the borders of the metals, the in-flight situation of the door is inferred as follows:



Figure 10. Simulated situation of L2 door; with a normal man standing behind



Figure 11. Inside view



Figure 12. Simulated situation of L1 door, with a leprechaun struggling not to fall down

1.12.2 Wreckages of IRS modules

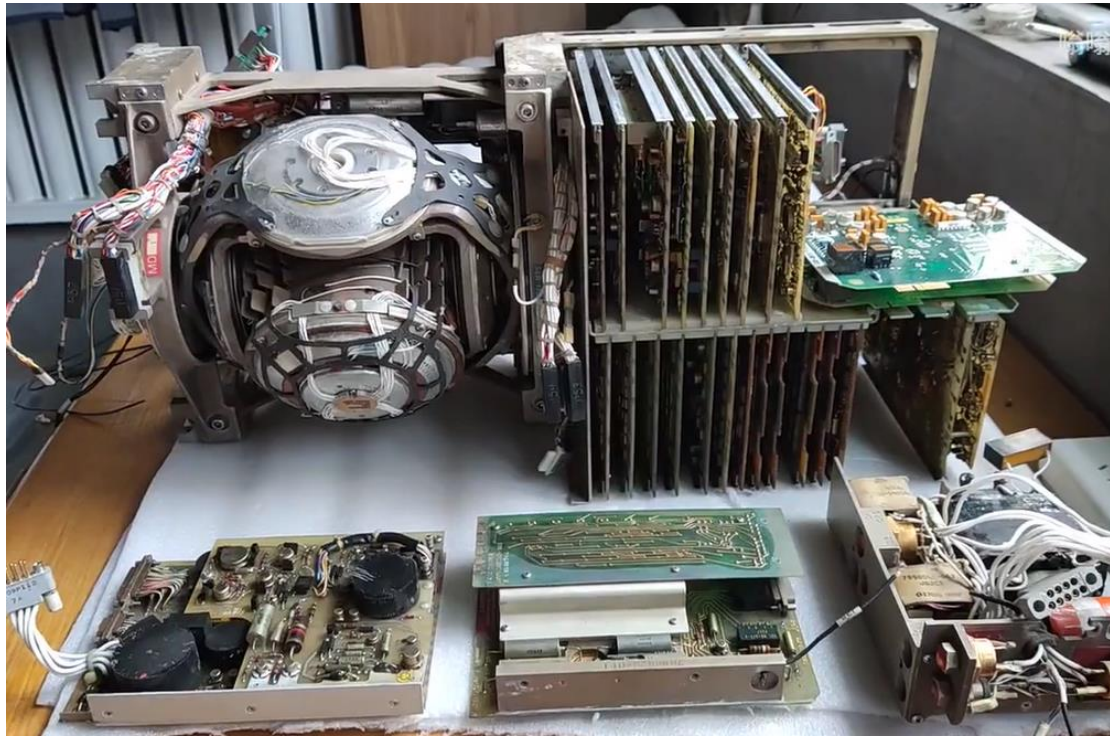


Figure 13. Destroyed IRS components

IRS components are generally complete, but investigators have found small cracks from the outer container.

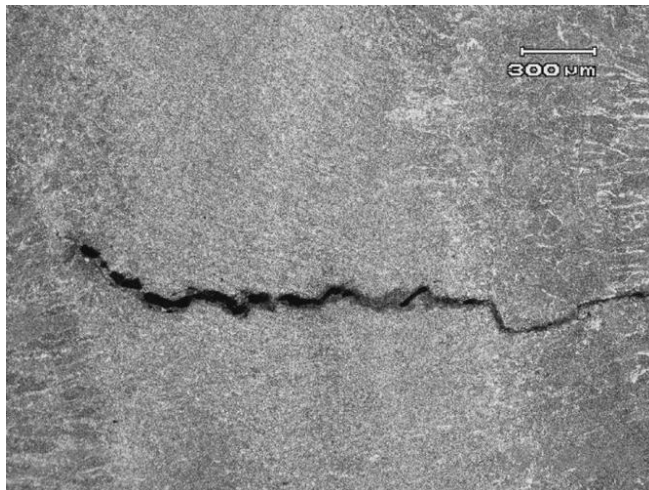


Figure 14. Cracks found (under microscope)

1.12.3 Wreckages of Engine Structures

Though the incomplete emergency maintenance before departure, the engine structures were

made generally complete by in-flight repair and maintenance.



Figure 15. The engine (after touching ground)

The structure of the turboprop engines can be described as:

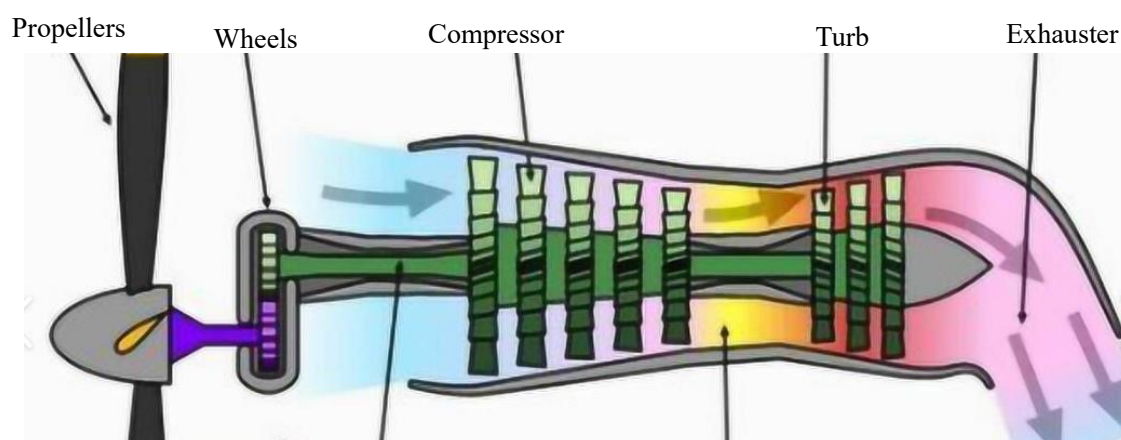


Figure 16. The engine structures

The exhaustor usually has material that can suffer high temperature, which is only provided in a limited number of airports including Scarborough, Brisun and Lyell.

During the analysis, investigators found that the areas near exhaustors were black, suggesting hot temperature.

Also, investigators found the signs of metal fatigue in the damaged areas of the engines.

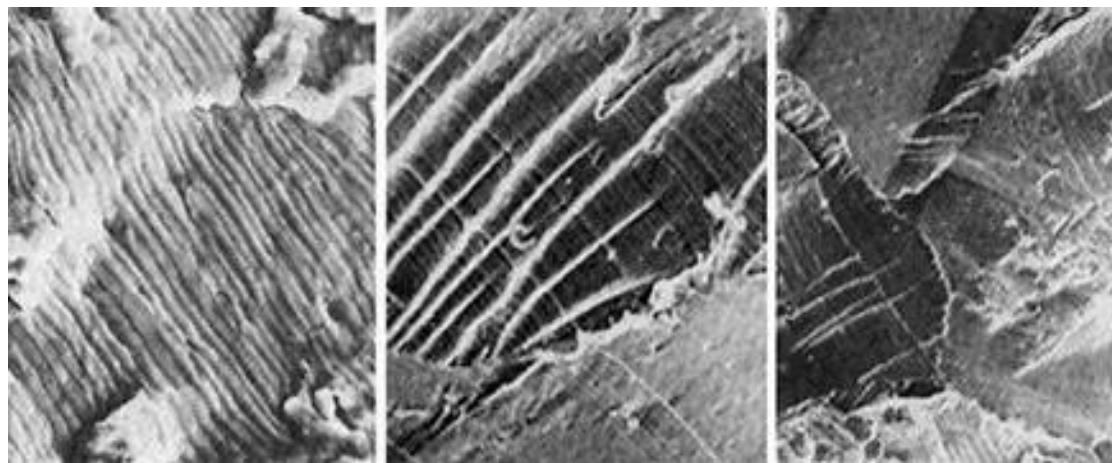


Figure 17. Metal fatigue found under microscope

1.12.4 Broken Pipes

From the external overview, investigators have found broken pipes exposed to the air. Further recognition revealed that following pipes were broken:

- A fuel pipe of engine 4 (there are 4 in total);
- Hydraulic pipe of system 4, 5 and 6; and
- Small hole of hydraulic pipe 1 (radius 0.2mm).

1.13 Medical Analysis

1.13.1 Medical Analysis

Several days before the accident, it was reported that Chtholly had her hair unexpectedly became partially red after the previous failed battle over the 15th region⁴⁶. Further examinations through the dissolved Ag^+ indicated that she wasn't suitable for fighting at that time. In view of this change, the central command let her take over a secretary position.

The only differences among the substances of blood and other body liquid are the existence of NO_2^- and the concentration of H^+ .

After her body was found by rescuers, the substances of blood were immediately tested. Experiments on Chtholly's body indicates that her blood had $c(\text{NO}_2^-) = 9 \times 10^{-6} \text{ mol/L}$, $c(\text{NO}_3^-) = 8 \times 10^{-6} \text{ mol/L}$, which means $c(\text{NO}_2^-) = 1.7 \times 10^{-5} \text{ mol/L}$ during her last

⁴⁶ See 1.5.2 Relevant Passengers (As Soldiers) and 1.18.1 Flight Schedule Related to Chtholly.

moment.

Zoology experiments have shown that her ion channels are more activated than usual during her last moment.

1.13.2 Autopsy Result

Chtholly's body was completely found, though some fingers had lost. 4 ligature marks were found. Large sizes of bruises, covering a total area of 650 cm², were also found. Internal organs were found broken and there was significant sign of internal bleeding. 12 internal fractures were also found. Following table provides more information:

Name	Position	Size	Remarks
Ligature 1 and Bruise 1	The whole left leg	Approximately 67 cm	
Ligature 2 and Bruise 2	Part of the right leg	Approximately 12 cm	
Ligature 3 and Bruise 3	Part of the left arm	Approximately 9 cm	
Ligature 4 and Bruise 4	Near neck	Approximately 15 cm	Fatal ⁴⁷
Bruise 5	Back area	Approximately 122 cm ²	
Bruise 6	Waist area	Approximately 44 cm ²	
Internal organ broken	Kidney area	/	Fatal
Fracture 1 ⁴⁸	Ribs		
Fracture 2	Ribs		
Fracture 3	Ribs		
Fracture 4	Left finger		Minor
Fracture 5	Left finger		Minor
Fracture 6	Right finger		
Fracture 7	Right finger		
Fracture 8	Right finger		
Fracture 9	Leg bone (upper part of left leg)		
Fracture 10	Ribs		
Fracture 11	Ribs		
Fracture 12	Ribs		

Blood test of Chtholly suggests that the histone of Chtholly has an increment of CH₃CO —, which suggests the change of ability and frequency of some genes. However, due to the damage to

⁴⁷ The result wasn't directly shown during the battle but caused breathing problem later.

⁴⁸ A broken surface is considered a fracture. Therefore, a bone might be counted more than once.

Chtholly caused by beasts' attack, natural factors and the long time, investigators can't obtain her complete DNA.

1.14 Fire

Despite smoke from engines, there was no fire alarm triggered during the accident, nor there was any sign of fire in all wreckages.

1.15 Search and Rescue

As the crew members required, ambulances and firefighters had been ready before the aircraft landed. The central command of the Guardian Wing Corps attached much importance to this accident after the deaths and injuries were reported, and a rescue team was immediately sent to search for missing soldiers and wreckages. All injuries were treated as much as the hospital could. All of them were saved at last.

After landing, it was reported that Willem and Chtholly were missing. Since the threat no longer existed, helicopters for rescue work started to hover above and immediately sent a rescue team. Also, with the help of internal locator, Chtholly was found dead 2 hours after the rescue started near the cliff. Mr. Kmetsch wasn't completely found, although several small skin parts of his body was found.

2 days after the rescue started, all wreckages were collected. However, Willem wasn't found. The rescue work ended 8 days after the rescue started, for it's impossible to find him alive in such a condition.

The only death is Chtholly Nota Seniorious. Willem Kmetsch was witnessed then⁴⁹, but Nephren Ruq Insania is still lost so far.

1.16 Experiment and Research

1.16.1 The Strength of the Doors

Investigators used a simulated door to see whether the door will be unlocked (can be opened with force of the pressure inside out) after being hit. A hard electronic spring ($k = 2 \times 10^6$ N/m) is used to control the force on the panel and the force was directly given to the locker to simulate the worst situation. The result is given below.

Test # ⁵⁰	Length of the spring (m)	Separated %	The average number of broken locks (8 in total)
1	2	0.9	0.4
2	2	2.5	1.6
3	4	15.3	3.3

⁴⁹ See 1.18.8 Search and Rescue Afterwards.

⁵⁰ Different sides of doors were used.

4	4	63.4	4.6
5	6	71.2	5.1
6	6	74.5	5.4
7	8	79.4	6.3
8	8	81.2	6.4
9	10	88.2	6.4
10	10	88.5	7.2

1.16.2 The Malfunctioning IRS System

It has been discovered that leprechauns, when extending wings or opening leprechauns' gate, may produce strong electric field. To test if this will influence the IRS, following experiment is conducted:

- Investigators put a micro vehicle on the desk, delivering the IRS component. The IRS component is then connected to a computer dealing with its output.
- Let the vehicle move towards a direction at a constant speed.
- When the speed became stable, an electric field was added, and the output was observed.
- The experiment was redone for many times, changing the direction of the movement and the electric field. It can be observed that the heading always turned towards the opposite direction of the electric field, regardless of actual heading. However, when another IRS from a new aircraft was used in this experiment, the IRS stayed operative.

However, when the malfunctioning IRS is connected to an actual aircraft's systems, which is completely manufactured by Boeing, with such a condition, there's neither FAULT indication nor "HDG" (as well as "ATT") error flag. The only indications are CAP-F/O disagree alarms and "UNABLE REQD NAV PREF" on FMC, suggesting insufficient precision. The similar phenomenon only appears on the Guardian Wing Corps' own aircraft systems.

1.16.3 Flight Simulation

By analyzing the FDR data and compare it with simulated extreme situations, the investigators agree that there are some movements such as steep turn, climb and descent that couldn't have been done by crew members.

Investigators also tested if an operative engine helps with the defense. It turned out that if the engine remains operative for extra 3 minutes, they will probably have enough time and speed to get rid of Timeres, and if the engine runs at a high speed, Timeres are more likely to be hurt seriously enough by the high temperature caused by the propellers.

During the simulation, investigators also find that if a small hole near key positions (including the connection, the gate, etc.) and the difference of air pressure keeps existing, the things nearby are likely to be blown away. This can be solved by an active decompression and

emergency descent.

Investigators have conducted following tests to find out the best configuration of landing with similar fuselage damage (the areas were randomly chosen):

Test #	Flap position (deg)	Touchdown IAS (kt)	Result (Success / Total) ⁵¹
1	0	195	0/8
2	1	185	0/8
3	2	175	1/8
4	5	170	1/10
5	10	165	2/10
6	15	160	3/12
7	20	155	5/12
8	20	150	8/12
9	20	145	4/12
10	30	155	10/12
11	30	150	9/12
12	30	145	8/12
13	40	155	9/12
14	40	150	9/12
15	40	145	6/12

Also, investigators have tried in what circumstance the IRS will present such a FAULT state. The simulation shows that it shouldn't have taken place, but in a real the Guardian Wing Corps Air Force's adapted aircraft, the problem remains.

Investigators also tested the survival probability of the aircraft without the help of Chtholly. To do this, investigators initially created virtual beast characters which can:

- Block the engine exhauster,
- Block the vision of crew members,
- Damage fuselage, represented as random system malfunctions based on their distances to the fuselage, and
- Sudden change of in-flight attitude and path.

Investigators invited 35 pilots from the Guardian Wing Corps and commercial airlines, including Air Regule Aire, to join the flight simulation. All systems on board were configured to be normal and the aircraft was cruising. The results turned out to be:

- 11 of 35 (31.4%) engine fire, while others shut down engines;
- 1 of 35 (2.8%) spatial disorientation;
- 6 of 35 (17.1%) electronic system failure;
- 15 of 35 (42.9%) hydraulic system failure, with 9 of 35 (25.7%) losing control of all flight control surfaces; and
- 29 of 35 (82.9%) high acceleration ($> 3g$ or $< 0.5g$).

Eventually, the endings of the simulations are distributed as follows:

⁵¹ Success means the aircraft successfully lands with no payload lost in restricted acceleration.

- 9 of 35 (25.7%) landed at airport safely, in which 2 of 35 (5.6%) had more than 80% passengers survived (calculated based on acceleration) survived and another 2 of 35 (5.6%) had fewer than 30% passengers survived;
- 6 of 35 (17.1%) landed on the ground safely, in which 3 of 35 (8.5%) had more than 80% passengers survived;
- 2 of 35 (5.6%) had aircraft damaged in the air due to overspeed or the fatal damage caused by attacks;
- 9 of 35 (25.7%) had aircraft plunged into the ground ($V/S > 2\,000\text{ ft/min}$); and
- 10 of 35 (28.6%) attempted to land but touched ground too heavily and crashed.

Besides, after adding configuration of engine 3 failure, the number of crash cases increased by 9.5%, despite investigators' flight simulation revealed that it had few influences on aerodynamic performances.

The flight simulation later involved in-flight maintenance, which allows crew members fix malfunctioning systems. In this case, the percentage of survival cases increased by 28.6%.

1.16.4 The Damage Process of Fuselages

Investigators used a similar zoological material, whose composition is similar to the ones on the surface of beasts, to test the impact it causes to the fuselage. The result is given below.



Figure 18. Normal state of fuselage metal



Figure 19 (Left). Fuselage components after 1st impact

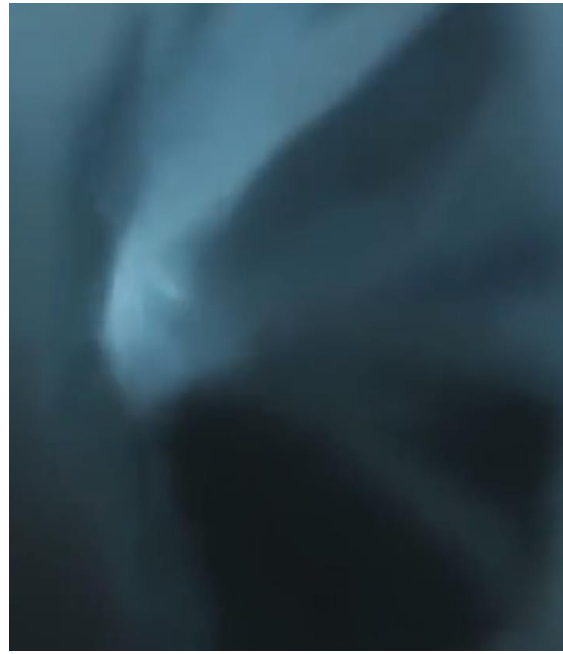


Figure 20 (Right). Fuselage components after 2nd impact



Figure 21. Fuselage completely damaged by the machine, or beast

Besides, according to former investigations⁵², the impact usually takes 30 seconds. Therefore, the emergency evacuation time is less than this value.

Investigators also analyzed wreckages from 3W-CHT to test if any parts of Timere stayed on board. Chemical and zoological analyses revealed that the engine area contained dead Timere's tissues and dead cells of Timeres are distributed throughout the cabin but not found on cockpit avionics.

1.16.5 Oxygen Leakage

Investigators tested oxygen generation and leakage speed on an aircraft whose fuselage is broken (20cm × 20cm). At 29,000 ft (open air pressure 4.45psi), with 6,000 ft (open air pressure 11.53psi) compression, the result (air pressure, psi) is given below.

Distance (cm) to generator (columns) / damage (rows)	50	100	150	200
50	10.96	9.83	9.62	9.23
100	8.54	8.10	7.69	7.13
150	6.45	6.12	5.85	5.44
200	5.96	5.67	5.54	5.31

1.17 Organizational Information

1.17.1 The Guardian Wing Corps

The Guardian Wing Corps, or the Winged Guard, is an independent military organization defending the whole Regule Aire against 17 beasts on the ground and internal illegal forces in the Regule Aire. This organization doesn't rely on any national organization but has limited mutual connection with internal aviation organizations including REAA and RATSC.

Part of the structure of the Guardian Wing Corps can be presented as follows:

⁵² See **WG-BS-7.29**.

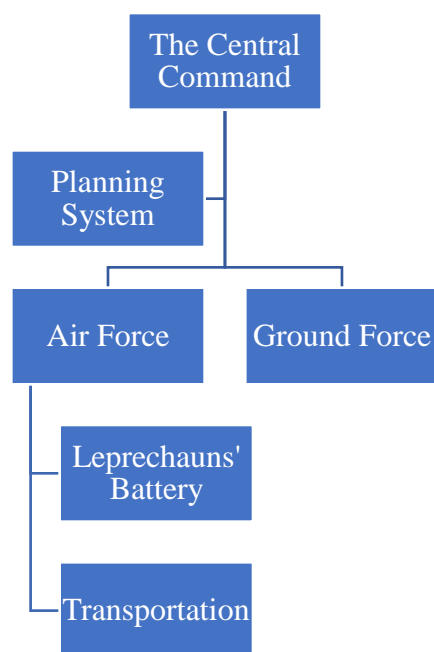


Figure 22. The structure of the Guardian Wing Corps

The Guardian Wing Corps has devoted itself to the military defense of the Regule Aire. Leprechauns have been being sought and forced to join the Guardian Wing Corps for years. Approximately 50 years ago, the living conditions of the leprechauns, treated as weapons, were as bad as the ones for horses. According to internal documents of RATSC, the bad treatment likely contributed to an accident over Lontis, in which more than 3 000 people were killed, partially due to the uncontrollable emotions of leprechauns. This has begun to be reformed since approximately 20 years ago. To investigators' surprise, the scarification still continues regardless of the treatment they receive.

The Guardian Wing Corps has several parts of its systems, including some military transportation aircraft and ATC systems, adapted from commercial ones.

The MEL of the aircraft requires that:

Name	Installation Number	Minimal Required Number	Remarks
...			
Engines	4	4	For maintenance takeoff inconvenient for engine repair, 3 is acceptable, but the safety must be confirmed.

Non-normal checklists inherited from commercial airlines in the Guardian Wing Corps include IRS failure procedure. The procedure given to pilots when the accident took place is given as follows:

IRS FAULT (IRS Failure)	
Status: One or more situations below: <ul style="list-style-type: none"> ● IRS FAULT light was illuminated, or ● The position input to the FMC is incorrect, causing ALIGN illuminated at the same time. 	
1	Consider one of them: <ul style="list-style-type: none"> ◆ On the ground: <ul style="list-style-type: none"> ▶▶ Go to step 2. ◆ In the air: <ul style="list-style-type: none"> ▶▶ Go to step 6
... On the ground ...	
2	Consider one of them: <ul style="list-style-type: none"> ◆ ALIGN extinguished: Call for maintenance. ■■■■■ ◆ ALIGN also illuminated: IRS Mode selector ... OFF ... FAULT will extinguish and ALIGN will extinguish within 30 seconds. ▶▶ Go to step 3.
3	After ALIGN extinguished : IRS Mode selector ... NAV Input current position.
4	Consider one of them: <ul style="list-style-type: none"> ◆ ALIGN flashing: Input current position again. ▶▶ Go to step 5. ◆ ALIGN not flashing: ▶▶ Go to step 5.
5	Consider one of them: <ul style="list-style-type: none"> ◆ FAULT illuminates again: Call for maintenance. ■■■■■ ◆ FAULT no longer illuminates: ■■■■■
... In the air ...	
6	IRS ATT and/or NAV may be inoperative. In ATT mode, IRS may provide limited information, which only contains attitude, heading and some essential data.
7	Consider one of them: <ul style="list-style-type: none"> ◆ FAULT still illuminates: ▶▶ Go to step 8. ◆ FAULT no longer illuminates:

■■■■■		
8	<p>Consider one of them:</p> <ul style="list-style-type: none"> ◆ ATT is necessary for the inoperative IRS: <ul style="list-style-type: none"> ▶▶ Go to step 9. ◆ ATT is not necessary for the inoperative IRS: <ul style="list-style-type: none"> ▶▶ Go to step 11. 	
9	<p>Consider one of them:</p> <ul style="list-style-type: none"> ◆ The main attitude display of the captain or the first officer is inoperative: IRS mode selector (The inoperative side) ... ATT This action is not revokable! Keep the wing level and fly straight until the attitude display appears, which takes approximately 30 seconds. ◆ The main attitude display of the captain or the first officer is working: ■■■■■ 	
10	<p>Consider one of them:</p> <ul style="list-style-type: none"> ◆ FAULT extinguishes: Input original heading in POS INIT page of FMS or overhead panel. Update heading value from time to time. Never engage autopilot. ■■■■■ ◆ FAULT still illuminates: ▶▶ Go to step 11. 	
11	<p>IRS transfer switch</p> <p>Never engage autopilot. ■■■■■</p>	<p>... BOTH ON L Or BOTH ON R (As required)</p>

In training courses of the Guardian Wing Corps, the occasions when ATT mode is necessary is described as follows:

- In a battle (e.g., threatened by beasts);
- Failure of NAV mode of both IRS devices; or
- In some other emergency situations, when attitude information is urgently needed but navigation can be provided by others like ATC.

Procedures and strategies to defeat beasts are taught to fighter jet pilots as well as leprechauns. However, as for military cargo transportation pilots, they are usually taught to simply “ask for assistance” and “directly get rid of threatened airspace or ground (i.e., takeoff as soon as possible)”. Leprechauns are usually used to safeguard air routes in front of military cargo aircrafts. According to interviews on crew members, they attempted to search for related checklists but

failed.

1.17.2 Aviation Administration Departments

Regule Aire Aviation Administration (REAA) and Regule Aire Transportation Safety Committee (RATSC) are independent organizations founded under the requirement of *The Chicago Convention*.

More detailed, RATSC is only responsible for accident and incident investigation, and has a few mutual connections to the Guardian Wing Corps.

REAA doesn't manage the leprechauns' aviation affairs. They are managed by the Guardian Wing Corps.

By the time when the accident took place, no aviation authority had given the Guardian Wing Corps checklists about fuselage damage or beasts' attack. Aviation authorities also didn't receive any contributing procedural recommendation from the Guardian Wing Corps, partially due to confidential reasons.

1.17.3 ATC Departments

Emergency workflow of ATC when encountering beasts in managed airspaces near Gomag required "first inform the Guardian Wing Corps and ask if they can offer help" and "guide aircraft not in threatened airspace to avoid entering it".

The ATC workflow mentioned that there were few helps ATC could offer in such a case. Also, it mentioned that altitude information might be incorrect due to electric field "produced due to the use of certain weapons".

1.18 Additional Information

1.18.1 Flight Schedule Related to Chtholly

The accident this report investigates took place on the ground in Gomag.

The stimulation of Timeres was indirectly caused by another investigation project started by Willem in order to find out the source of beasts by looking into human civilization by investigating an underground relic site and rescue the former trapped investigation groups. However, during the discovery, according to the audio, after Chtholly felt being called on, the ground suddenly crashed, and they fell into an underground cave.

They started trying to investigate the cave and go out, during which the wall of the cave they were in crashed. While they were struggling to escape, Ms. Seniorious seemed to be attracted by something and she rushed towards another direction. At the end of the cave, at that direction, there was a frozen body, which was further recognized as Eruku Hallksten⁵³. Seeing and touching

⁵³ She probably had physical existence and part of her stories were probably made-up. Based on these stories, she

frozen ice nearby, Chtholly's hair grew redder until it became completely red. She soon fainted and was carried back to the aircraft by Mr. Kmetsch, with weak breath and ECG indication. This circumstance kept on when the aircraft joined the holding pattern in the area to conduct more investigations.

The plan of rescue and investigation led by Mr. Kmetsch had been granted by the central command 9 days ago, with no extra change.

However, the plan didn't mention transportation, according to the internal record.

According to an interview with a member in the Leprechauns' Battery, Chtholly communicated with her before the accident and asked the meaning of happiness. She, in general, told Chtholly that happiness differs among people.

1.18.2 Beasts such as Timeres

Beasts such as Timeres are aggressive creatures living on or under the ground. When they are stimulated and awakened, they will climb into the air. They are so full of strength that they can easily destroy many kinds of structures. Following pictures show the photos taken by on-board camera during the accident.

According to former investigations like **WG-BS-6.15**, Timeres have the ability to immediately recover from any injuries except burns and Dagr Weapons' injury.

It has also been measured in **WG-BS-6.29** that the speed of Timeres can reach 40m/s and their weight of arms can reach 1000kg.

Leprechauns fighting against beasts in this accident reported to RATSC that some beasts blocked the exhausters and some of them saw smoke coming out from it.

is believed as a former goddess, also known as Eliza (in some text).



Figure 23. Timeres breaking through the fuselage and entering the cabin



Figure 24. Timeres sticking into the engine (These two pictures are

photographed by a leprechaun)

1.18.3 Colored Chtholly



Figure 25. Chtholly whose hair had 2 colors

Chtholly's hair had 2 colors, blue and red, before the accident. It is reported that the change of color started from the end of the hair.

After her body was found by rescuers, chemical experiments were conducted. It showed that her hair had litmus⁵⁴.

According to Glick, when she fainted in the cave, despite her red hair, her eyes were still blue (See the first photo). However, more than 3 witnesses on board reported that her eyes were red after she woke up.

⁵⁴ The color of litmus is one of the followings: Red (pH < 4.0), purple (pH < 9.0) or blue.

1.18.4 Geographical Investigation on and under Gomag

The ancient construction of the Gomag city has been seriously damaged by the Timeres and the fallen fuselage. Investigators tried to recover the situation on ground.



Figure 26. Broken buildings (recovered simulation)



Figure 27. Simulated original situation on the ground of Gomag

Glick mentioned that Willem, Chtholly and him was looking at a poster before the sudden earthquake.



Figure 28. Poster in Gomag

The poster showed Jade Nail, Carmine Lake (Also ancient god/goddess, also known as “visitors”), et al, fighting against humans.

The detail of the underground part is still unknown, since it’s too dangerous to investigate this area. However, the frozen body has been confirmed. For safety reasons, it was kept frozen. However, through X-Ray and other skills, investigators have confirmed that the body was a true one.

Since the investigation started, there have been several earthquakes struck the city, damaging the structure of the cave underground, making it impossible for investigators to go down.

The composition of the underground part was also taken. Further chemical tests suggest that it contains a large amount of CaCO_3 .

1.18.5 Leprechauns’ Information

Leprechaun, also known as (golden) fairy, is a race. It should be clear that leprechauns are virtual beings which are caused by the world’s “pointer error”.⁵⁵ More detailed, they are created from early died creatures, and as they “inherit” genetic material, they seem to inherit the former souls from ancestors. The relationship between leprechauns and the Guardian Wing Corps is described in 1.17.1 *The Guardian Wing Corps*.

They often have a sword to control and wings to fly, although its detailed factors are still unknown, while the connection between the ability and the NO_2^- has been confirmed by former

⁵⁵ For its detailed reason, see **WG-B-37.1**, **WG-B-37.2** (January 383) and related reports. According to these documents, this means that leprechauns are born either from ovum with gene X^L disposed to the nature and had chromosome doubled by Colchicine or low temperature and becoming X^LX^L or components from a dead body, which works like cloning but use NO_2^- to have variation. This gene contributes to the features of leprechauns. For its detailed influences in this event, see following sections.

investigations. However, before the accident took place, Chtholly had lost her ability to fly for a long time, while this ability recovered during the accident. See Section 2.



Figure 29. Standard flying situation of leprechauns, which was photographed by internal camera in the cabin

Besides, it has been frequently reported that the erosion take place, which is usually caused by the overuse of their energy⁵⁶ and represented by the changes of colors of hair and eyes, usually becoming red, which is similar to Chtholly's experience. Most of the eroded ones failed to recover and soon died, but some of them successfully recovered. One of the success examples is Ms. Valgulous (Ithea) in our investigation team, but she couldn't remember anything else special besides keeping and reading her own diary. This showed few contributions to others' recovery.

Leprechauns also have the ability to open the "leprechauns' gate", with their lives as cost. There have been records about that:



Figure 30. The situation of opened Leprechauns' Gate, provided in the former report WG-A-2213.3 (May 399, printed paper version)

⁵⁶ Called Venom/Venenum in some documents.

Aircraft's camera also captured similar situations when Chtholly was almost burning herself to fight:



Figure 31. The situation captured by the aircraft's camera (1)⁵⁷



Figure 32. The situation captured by the aircraft's camera (2)

1.18.6 Leprechauns' Aerodynamic Performances

It has been mentioned in 1.18.5 *Leprechauns' Information* that leprechauns can fly through wings. It has been evaluated by the Guardian Wing Corps that their wings usually have air resistance like $f = kv^2$ in which $k \approx 0.02$ when diving.

⁵⁷ The date information of the camera was incorrectly configured.

1.18.7 Interviews on Crew Members

According to the crew members, the part of Timeres had entered or at least approached the cockpit, which made it necessary to use guns and other weapons to defend themselves. Timeres also destroyed part of the CVR and FDR record as the “clear” button might be unexpectedly pressed at that time.

Crew members also mentioned that some Timeres approached windshield area.

As for controlling the aircraft, they mentioned that thrust was increased every time when they attempted to climb after reigniting engines. They also noticed the slow response of engine 3 and observed the blocked exhauster. They also mentioned that the force from Timeres was “more astonishing than roller coaster.”

Crew members provided RATSC some skills about how to minimize negative influences of Timeres, such as pulling yoke and adjusting trim to up position in advance to resist the dragging force of Timeres.

1.18.8 Search and Rescue Afterwards

It was reported that Willem was found “beastized” (being turned into Aurora/Emergent/Shiantor⁵⁸), with eyewitnesses’ accounts. Some people believed that the similar process happened to Nephren.

More information can’t be gotten, as it’s difficult and dangerous to approach him.

1.18.9 The Former Flight and Related Accidents

The rescue mission aimed to rescue Saxifrage (3W-RHT), an aircraft threatened and damaged by Legitimitate.

It was said by Glick that an investigation team going underground with more than 7 persons may attract beasts. Before the accident of this aircraft took place, there had been 9 or more investigators assigned to the underground cave.

In the final report of this accident, investigators mentioned the correct procedure to deal with beasts on the ground, i.e., not starting the engine to prevent making loud noises, so that the aircraft won’t be found and damaged.

Besides, there have been cases where navigation and communication devices were influenced by electric field produced by leprechauns.

⁵⁸ All of them refer to a beast, i.e., #1.

2 Analyses

2.1 FDR Reconstruction

2.1.1 Data Integrity

FDR data provided in appendices ranges from 18:36:10 to 18:49:22, a time period from the first attack to Chtholly's scarification. Following analyses will stress on this period.

The FDR the aircraft installed didn't provide some essential information such as speed-brake position. Their data will be inferred in the following text if necessary.

The earlier data is uneventful, recording normal takeoff, climbing and cruising. The later data is only about approach under standard abnormal procedure, whose analyses won't be about detailed data and will be given in following sections.

2.1.2 Altitude and Airspeed

The airspeed and altitude were generally unstable throughout the FDR data. Investigators agree that the damaged fuselage influencing aerodynamic performance, the beast grabbing and dragging the aircraft and the slow control response caused by the leakage of hydraulic caused this.

In the first 80 seconds of the record (18:36:10 ~ 18:37:30), the aircraft generally kept a constant sink rate and had speed increased. However, in the next approximately 30 seconds (until 18:38:10), the airspeed dropped while the sink rate didn't significantly decrease. Thus, investigators inferred that speed-brake was applied to stabilize the aircraft, which was proved by an interview with crew members.

However, speed-brake is not usually applied in no-thrust gliding configuration, for its significant decelerating consequence, which creates a risk of stalling. As investigators expected, since 18:38:11, the airspeed began to increase. Investigators agreed that the speed-brake was retracted at that time. When the aircraft already had speed-brake retracted and a stable attitude, the F/O reported to the captain that "gliding configuration established", which suits normal procedure.

Since approximately 18:39:25, autopilot was engaged and took control of the aircraft. As a result, the aircraft began to decelerate. Then, at 18:40:02, at the approximately same time when the crew members started to reignite engines, the aircraft's sink rate decreased. Investigators inferred that the crew members wanted an in-advance control input to avoid negative effects of slow-responding system. This is believed to be acceptable.

Within the next 150 seconds, the attitude of the aircraft remained generally stable, contributed by generally stable thrust output. During this period, crew members encountered hydraulic problems, which will be discussed in following sections.

At approximately 18:42:55, the first trough of V/S appeared. Given that there had a sudden change of V/S, investigators agreed that it was caused by either deconstruction of crucial fuselage parts (e.g., wings) or a strong force of beasts. Investigators agreed that the latter was correct after investigating the damage distribution of fuselage mentioned in *1.3 Damages to the Aircraft*, and

following dives had similar causes. This also suits interview with crew members and CVR data in *1.11.1 On Board Audio*. Also, normally, with the aircraft having a steep dive attitude and continuous increasing airspeed, the aircraft tends to rise its nose due to the increasing lift caused by increasing speed. This also suits the FDR result as the sink rate continuously increased since approximately 18:43:05.

At approximately 18:43:19, crew members regained control. Then, in the next 22 seconds, they kept a generally stable attitude until another attack took place at approximately 18:43:55. This time the dive was not so serious because crew members applied correct measures to avoid it, including applying full-up stabilizer trim in advance, according to an interview with them.

At approximately 18:44:14, after recovering from a dive caused by beasts, FDR recorded a mild and constant climb rate. Thus, investigators agreed that the crew members had a reliable control of aircraft at that time. This suits the results of hydraulic in-flight repair (discussed in following sections).

At approximately 18:44:58, after an announcement recorded by CVR, crew members started steep climb. However, investigators considered if it's too early to start a steep climb only a few seconds after the announcement. Investigators agreed that it was out of the urgent situation they were in. The climb rate was decreased at approximately 18:45:50.

Despite the given thrust and trim input, according to FDR, the aircraft went into another dive at approximately 18:46:36. Investigators agreed that beasts were pulling the aircraft down towards a direction. This lasted until 18:48:05.

2.1.3 Engines

Engine thrust had two major increments. One is about reignition, and the other is about the steep climb input. All 4 engines, except engine 3, generally followed the thrust input instruction.

Engine 3 responded slowly. FDR data revealed that its EGT was significantly higher. Investigators agree that this was probably because beasts blocked the exhausters, according to interviews with crew members and leprechauns. However, investigators agreed that this had no significant influence on aircraft's control. Investigators agreed that the additional crash cases in the simulation were caused by distraction of dealing with probable engine fire.

Engine 4 has lower temperature than engine 1 and 2 throughout FDR record. By comparing engine EGT data with normal flights, investigators agree that some parts of engine 1 and 2's exhausters were also blocked.

The generators worked the same as the engines themselves.

2.1.4 Hydraulic

FDR data revealed that hydraulic system 2 and 6 were always operative. System 1 and 5 were initially inoperative, and system 1 was partially successfully repaired. Both inferences based on FDR data and interviews with maintainers revealed that during maintenance of system 5, sudden attacks made it impossible to continue the work. System 3 and 4 became inoperative due to the damage of hydraulic pipes caused by beasts.

2.2 Crew Members

2.2.1 Performances

Although they weren't calm enough at first, according to *2.6.1 CVR Audio* in the analyses, generally speaking, the qualification of the team was excellent, and they had the ability to finish the flying task and deal with the problems.

2.1.2 Altitude and Airspeed has mentioned that crew members climbed too fast, contributing the fallout of some passengers. However, in the face of beasts, it's common to have anxiety and hope to get rid of them as soon as possible. Moreover, they had to keep the aircraft in control. Multiple factors made it impossible for crew members to think about probable fallout of passengers.

Both the CVR and FDR suggest that the crew members correctly carried out the checklist. However, the procedure they follow can be improved. Following sections will discuss this.

However, the decision of stopping using AP because of malfunctioning IRS may cause much trouble to their emergency procedure, although they succeeded without using AP after that.

According to the CVR, the CRM is that the captain worked as PF and the first officer worked as PM. This is an outstanding decision since the captain was skillful.

2.2.2 External Affairs

According to the interview, crew members had to directly face and fight against beasts entering the cockpit. Though the defense, whose effects are proved through experiments, is believed to be successful, This increased the amount of their work and made it more difficult for them to regain control or deal with malfunctions.



Figure 33. Simulated situation in the cabin

In addition, crew members reported “strange lights”. In fact, according to timepoints recorded by CVR, what they actually saw was probably Chtholly extending her wings instead of

an opening of leprechauns' gate. But it is also a fact that Chtholly, at her last moment, sacrificed herself, which was recorded by external camera.

2.3 Planning, Dispatch and ATC Workflow

2.3.1 Pre-flight

As the plan didn't mention transportation, probably because of the urgent situation of rescuing 3W-CHT, the central command and dispatch assigned several new pilots, some of whom hadn't completed complete training at that time, to deliver them. This might have caused the part of the accident.

What's more, despite the sign of the appearance of Timeres, no forecast system of beasts' movement such as Timeres could be used, nor was statistical results of Timeres. This made it impossible for them to consider the safety. To make matters worse, before the actual appearance, the signs were considered an earthquake. Although there were witnesses, most of them were too astonished, increasing the difficult of communication. Thus, it became even more difficult to deal with it, and even if the signs were recognized, there were no proper approach to avoid it. It had only approximately 12 seconds for the commanders to response the signs of the appearance of beasts. Investigators agree that an automatic warning system, instead of manual warning system, is the only effective measure, limited by responding speed of people.

The *1.1 Flight Experience* section has mentioned that the flight aimed to rescue former flight which accidentally stimulated another beast (Legitimitate). Independent investigation on this accident has discovered that the startup of engine or APU might further stimulate a beast on the ground.

The stimulation of these voices in the air can also be inferred from this accident's outcomes. Investigators agree that it might be either the movement of the aircraft or the noise of the aircraft that eventually stimulated the beast. This requires further zoological analyses.

After the primary report came out, the general, working as dispatch, added to the report that through "make an immediate takeoff preparation", he meant to let crew members takeoff and repair the malfunctioning engine in flight at the same time. Investigators took this account and reached following findings and conclusions:

Investigators agree that whatever his actual intention is, due to its position, tone and accent, others will likely consider it an immediate takeoff instruction and ignore the maintenance meaning (which needs inference to understand), or be stuck in confusion because they, especially those who used to work in commercial airlines not allowing in-flight equipment area access and related maintenance, knew little about in-flight maintenance and its related knowledge such as its strategies and limitations. The effective way to avoid it is to clarify the language by making it more specific, like mentioning the actual thing to repair or "takeoff now and fix it in flight".

Therefore, before taking off, the dispatch, or the general, objectively, didn't follow the MEL requirements, which partially contributed to the accident, as the trouble might be not so serious if the engine weren't so seriously malfunctioning during the accident, but this result wasn't

significant. However, in the face of Timeres' threat, the time was extremely limited. Investigators couldn't expect another solution other than immediately takeoff and have engine maintenance at the same time, because putting off takeoff probably leads to further fatal damage caused by Timeres.

2.3.2 In-flight ATC

Given that no detailed distribution of beasts is given, ATC could hardly offer help to crew members. On the assumption that distribution had been given, ATC could have navigated crew members to escape threatened airspace efficiently.

2.4 Physical, Chemical and Biology Analysis (Towards Chtholly and Leprechauns)⁵⁹

2.4.1 Chemical Analysis: Substances of Chtholly

It is measured that this connections between leprechauns and their former souls⁶⁰, or ancestors, are implemented by H^+ (but not spent), while the force it brings comes from spending NO_2^- , which are the only differences of substances between humans' and leprechauns'.

From this, we can say that the key difference between other creatures and leprechauns is H^+ , because it indicates how leprechauns suppress their connection to their ancestors to stop being eroded, while others needn't. As for NO_2^- , it might be introduced to increase the pH of leprechauns and increasing their ability to fight is probably an unexpected effect.

In Chtholly and other Leprechauns, following balance exists due to this feature:

(In the whole body, especially blood):

$HNO_2 \rightleftharpoons H^+ + NO_2^-$, where $K_a = 5.6 \times 10^{-4}$ in normal world. This reaction is also used to balance pH in their bodies.

During fighting, NO_2^- is spent too fast, and to support the balance, more H^+ is produced, causing stronger connection, and leading to the erosion. This can also show how Chtholly is "enhanced": The K_a or the concentration of HNO_2 was probably adjusted to increase them at the same time.

As for Chtholly, her hair had litmus, which presents red when $pH < 5.0$ (others may have different indication or no indication).

Generally speaking, while $c(NO_2^-)$ became higher, $c(H^+)$ had also had a fatal increment. More fatally, when NO_2^- is spent, $c(H^+)$ is expected to continue growing, leading to her disaster. When the concentration values of HNO_2 and NO_2^- is confirmed, the pH diagram of the balanced state is shown below:

⁵⁹ This part is finished by the Global Chemicals' Conference.

⁶⁰ This is not only mental but also zoological. See 1.18.5 *Leprechauns' Information*.

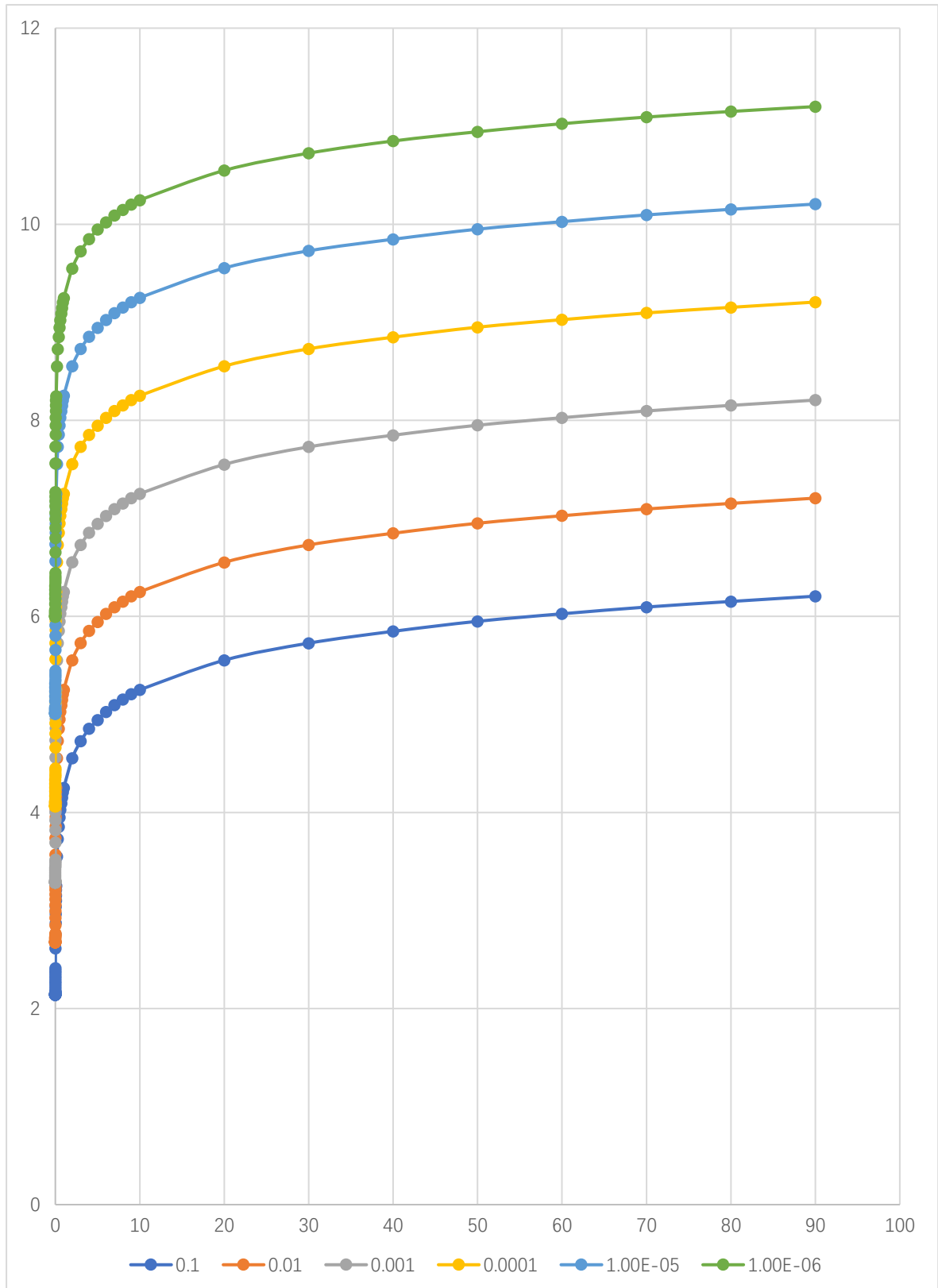


Figure 34. The result pH after the balance (The detailed graph can be seen in the appendices)

Some factors increase the K_a and make the erosion easier to happen. From Chtholly's experience, we can infer that anxiety might cause this. Other factors, however, remain to be seen.

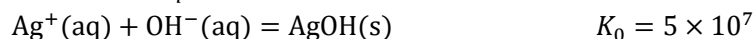
There have been many reports saying that the Chtholly's "red move" is a long-lasting process, and it sometimes stops. Regardless of its verbose process boosted by many factors, it can be like:



The enthalpy change is inferred because when she touched ice pieces, her temperature dropped, making the balance moving towards positive direction, therefore, the positive reaction inhales heat.

This also matches the experimental result, as an examination returned negative result of Ag^+ , which is described in *1.13.1 Medical Analysis*. We can know that it's because:

As for AgOH , its $K_{sp} = 2 \times 10^{-862}$, coming with following balance:



Thus, when balanced,

$$c(\text{Ag}^+) = \frac{K_{sp}}{c(\text{OH}^-)} = \frac{K_{sp}c(\text{H}^+)}{K_w}$$

When $\text{pH}=8$, or $c(\text{H}^+) = 10^{-10} \text{ mol/L}$, we have required $c(\text{Ag}^+) = 0.02 \text{ mol/L}$. This shows why the test is sensitive. However, to effectively tell high pH creatures like leprechauns from normal pH creatures (whose pH is usually 7.5), the concentration should be lower than 0.5. When $\text{pH}=4$, the required concentration was $c(\text{Ag}^+) = 200 \text{ mol/L}$, which is next to impossible. Since the result turned out to be negative, it can be inferred that Chtholly's internal pH value had been lower than this value ever since.

2.4.2 Zoology Analysis

The result of the ion channels might be because her anxiety, but this might also relate to the erosion.

As for her recovery, both the factors above and the hypoxia the low air pressure might have caused this.

Given that the expression of genes can be suppressed or stimulated depending on the change of environment through the change of chemicals, investigators agree that the experience of Chtholly stimulated the expression of the originally suppressed genes.

The change of the color of her eyes relates to genes including *OCA2* and *HERC2*. Investigators agree that the increasing concentration of H^+ damaged her genes. However, this damage should be undirected and random. Therefore, investigators agree that some other factors were engaged during the connection with "former souls". All of them are signs of specific inherited genes working, but limited by technical conditions, investigators can't determine the actual process.

⁶¹ Obviously, Chtholly is a mixture of substances. Here they're shrunk.

⁶² See <https://owl.oit.umass.edu/departments/Chemistry/appendix/ksp.html> to learn more.

2.4.3 Physical Analysis

It can be inferred that the two sounds of impact come from different origins: One is about embracing falling Willem and Nephren, and the other is about touching the ground.

From the aviation analyses we can know that when Chtholly jumped down, she was at approximately 27,107⁶³ feet above the ground. Her situation is:

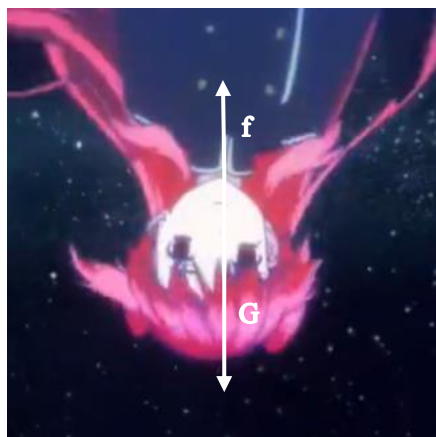


Figure 35. The airborne Chtholly

[f]: Air resistance.

[G]: Gravity.

There has:

$$f = kv^2, g = mg$$

i.e.,

$$a = g - \frac{kv^2}{m}$$

Due to the precision of calculation, we consider 0.01s a small period in which the object's acceleration remained the same.

According to the weight data of her body 49.15kg, the latest Willem's weight data 63.4kg and Nephren 40kg, and the time when she embraced Willem and Nephren at 14s, and the impulse of gravity and air resistance during the combination can be ignored as the time is very short, so that it can be considered an immediate collision and the dynamic situation can be inferred as follows:

⁶³ See 1.11.1 On Board Audio. This is not included in FDR data.

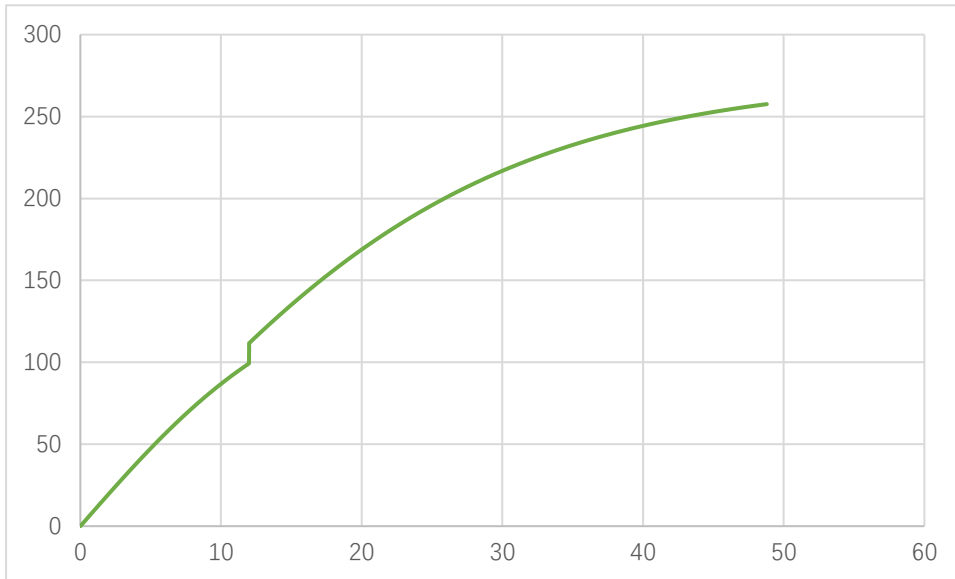


Figure 36. $v - t$ graph

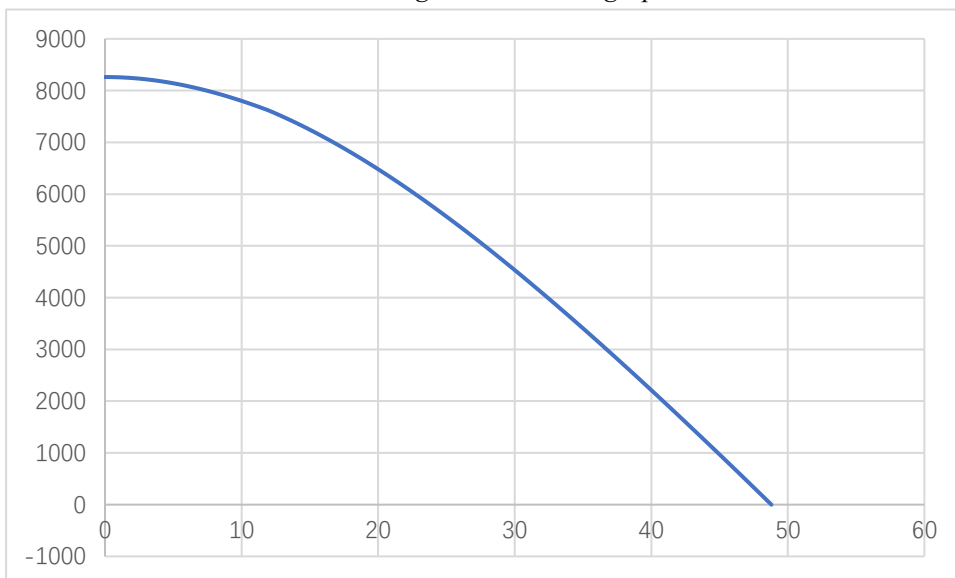


Figure 37. $h - t$ graph

Here, the final speed is 257.57 m/s after 48.8 s.

With the impact time 1s measured by the audio recording device, the final force evaluated through impulse is:

$$F = \frac{I}{\Delta t} = \frac{mv}{\Delta t} \approx 39292.75 \text{ N}$$

No one can suffer from such a hit, but the force was mainly suffered by Chtholly. This indicates that something must have “enhanced” her and she had also overused her energy.

Investigators agreed that Chtholly served as an elastic buffer which increased impact time (Δt) of Nephren and Willem, providing them probability of survival. However, despite this, even if taking Venom into account, the additional time Chtholly provided was limited and the injury was likely to remain serious.

The energy Chtholly released didn’t only work as electric field. The sudden rise of the air temperature and the sudden change of the wind direction suggests the work to the air. This also

shows how strong the force was.

2.5 Risk of Beasts and Geographical Environment

Plan revision had confirmed that the area is not considered at high risk of beasts at the time when the plan was submitted because no sufficient historic material is given in the analyses. Therefore, the sudden appearance of Timeres was considered an accident, although it was related to Chtholly's or Willem's relationship and the action of former investigation team stimulating the beasts.

Through the concentration mentioned in *1.18.4 Geographical Investigation on and under Gomag*, it can now be confirmed that they were in a Karst landform hole. That's why the construction easily fell.

Before the departure of the aircraft, some passengers, working as soldiers or adventurers discovering the ground, must have noticed the probable appearance of beasts. It was for this reason that the commander and some soldiers demanded an immediate takeoff, out of both standard procedure of the Guardian Wing Corps and the inner anxiety and fear.

However, taking former investigations and statistical data into account, investigators agree that once the beasts have been stimulated and begun or been ready to attack the aircraft, gaining sufficient speed and departing as soon as possible are better strategies, as the moving speed of beasts is usually slower and it's impossible to let beasts ignore the aircraft.

2.6 Audio Record and Its Analysis

2.6.1 CVR Audio

The audio at 18:36:11 suggests that the crew members are not calm enough. This is probably because the first officer offering to help wasn't experienced enough. This wasted their time, but this is normal among stressful and anxious crew members and didn't significantly influence the final result.

The checklists were correctly followed and executed during the accident. For example, "Hydraulic 3,4 control valve STBY RUD." is what the checklist requires.

The approach method they selected was also corresponding. Generally speaking, the audio shows the excellent cooperation among crew members. See *2.2.1 Performances* of analyses to crew members to learn more about their CRM.

The crew members were responsible for their passengers. However, what was regretful was that they didn't notice that someone had lost. Anyway, their performance was still outstanding.

The alternative systems worked properly, and the performance of these systems were correctly monitored and considered by crew members.

They made a decision about how to land with some parts of fuselage missing. They selected flaps 30, which has been proved in flight simulations to be one of the best solutions.

2.6.2 Chtholly's and Willem's Audio

Following statements can be inferred from the audio.

The discontinued segment suggests that the connection between Chtholly and her former soul, Eruku, was strengthen as their physical distance got closer. This kind of connection often had unexpected results and power. In this example, it is inferred that the Timeres' appearance was partially because of this, but there's no evidence strong enough so far, as it may also because of Willem's historic relationship with the region. Whatever it is, it is strongly connected to history.

It can be also confirmed that the former investigation team has been killed.

From both the discontinued segment and segment 1, It can be inferred from the audio that they were talking about Eruku. It can also be inferred that Chtholly was approaching Eruku's body, triggering her erosion. This kind of erosion is also mentioned by Ms. Valgulous in our investigation team, recorded in documents like **WG-A-3533.1**. Therefore, the probable origin of Chtholly was her. This can also be inferred from further audio.

The "Seniorious" might refer to Chtholly, but might also refer to the sword, or both of them. This also proves the connection between them.

The segment 2 simply indicates that the cave was ruined and Chtholly was dying.

The segment 3 suggests that Chtholly's soul came from the former goddess Eruku, and so are other leprechauns, although it's almost impossible to prove this. This can explain Chtholly's erosion, sword-matching⁶⁴, power, etc.

The meaning of the described history remains to be seen.

Willem's courage and determination were shown in segment 4 and 6.

Segment 5 and Segment 7 suggest that the former souls can "communicate" with leprechauns in this case represented by leprechauns' own voices but differing from it, and from this conversation, it can also be inferred that the erosion is controlled by the former souls.

These kinds of conversation can be recorded but can't be cut in. Probably, they can help with Leprechauns status' analysis and diagnoses.

Segment 8 provides very complete representation of Chtholly's courage and determination. Her power also seems to be boosted and enhanced, probably by Eruku.

According to eyewitnesses' accounts, the chaos is about how Chtholly fought against the Timeres. This also indicates her admirable and outstanding courage and determination.

Investigators studied the motivation of Chtholly to do this. From Chtholly's perspective, investigators agree that she was achieving her own happiness, i.e., to save Willem she loved, and

⁶⁴ Leprechauns have a sword to use. They will have a chance to test what sword matches them best.

more respectably, to save all crew members and passengers from the attack of Timeres. This kind of interpretation of happiness provided by Chtholly might be hard to understand for many people. Investigators agree that it was the comparison between her, even the whole race's acceptance of "designated life" (becoming a weapon and sacrificing herself) and her actual experience (falling in love with Willem) that gave her such an idea.

2.7 Mechanical Analysis

2.7.1 General Damage to Fuselage

The major damage is caused by beasts' attack. During such attack, the fuel pumps and pipes were damaged, making the engine inoperative before the FDR record. The engine was qualified in this situation because no fire was caused in spite of the extreme damage to the oil pipes and the high temperature caused by the blocked exhausters. Hydraulic systems were damaged in the similar ways. Since the whole fuselage had been broken, damage was completely unavoidable.

During the malfunctioning of the control systems, the alternative systems perfectly worked, pulling the airplane out of danger with the correct control of crew members.

The damages caused several passengers' fallout. They were sucked out through the holes by the air pressure.

2.7.2 Damage to Doors

Analyses to wreckages collected from the location where the aircraft was when the cabin altitude alarm was first triggered suggests that the separation of fuselage was caused by a strong force through the paint and metal transfer detected⁶⁵. This suits the result of Timeres well.

However, even though the fuselage was under such a pressure, it should have not broken apart. Examination has proved that this is because when a strong force is given directly towards the locker, the locker of the door first breaks down, making the door blown away because of the difference of the pressure (See the image below).

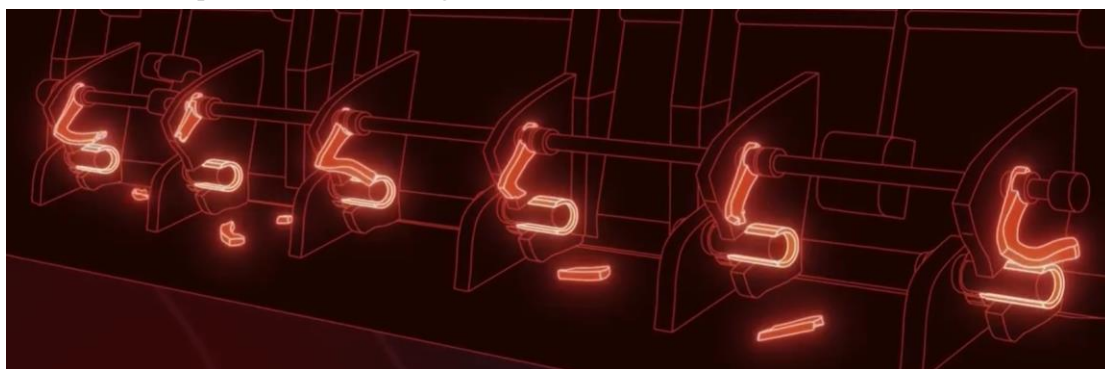


Figure 38. The broken locker and its structure (Simulation)

⁶⁵ See 1.12.1 Wreckages of Doors.

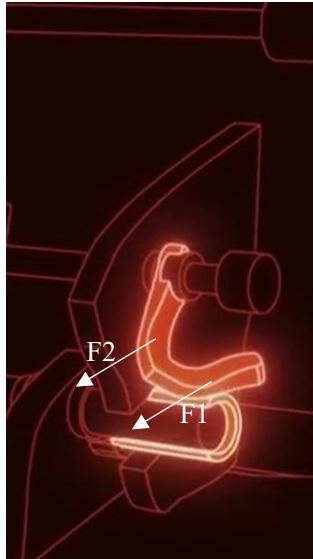


Figure 39. The forces on a single component

[F1]: The force the down part given to the locker to lock the door caused by the difference of the air pressure.

[F2]: The force Timeres given by hitting.

More detailed, the force inside out is

$$F = pS \approx 4.8 \times 10^6 \text{ N}$$

With $\Delta P = 487.6 \text{ hPa}$. Notice that the force of the air pressure and the Timeres works towards the same direction in this case because they are too close to the locker.

Therefore, the force outside in the locker can suffer is only approximately $3.2 \times 10^6 \text{ N}$, with the total square of the door is 200 m^2 . When the lockers remained generally complete, they suffered the impact of the Timeres. According to 1.18.2 *Beasts such as Timeres*, the force calculated through the impulse of the Timeres is:

$$F = \frac{I}{\Delta t} = \frac{mv}{\Delta t} = \frac{1000 \text{ kg} \times 40 \text{ m/s}}{0.01 \text{ s}} = 4 \times 10^6 \text{ N}$$

, which is a value larger than the material can suffer, even though the air pressure is still suitable.

To make matters worse, the force is suffered by Aluminum covering 0.01 m^2 after two third of the structure is damaged, which means 320 MPa , a value much greater than this kind of material can suffer⁶⁶, so there's no doubt that the door will fly away.

Besides, the connections of the fuselage are connected through rivets. With the part of fuselage breaking down, other parts become unstable and easier to fall. Therefore, much more trouble than it should have been was caused by the separation of the doors.

The damage to the doors might also be caused by the fight inside. Willem's audio recorded an unreadable loud sound, which is believed to be the separation of doors as he probably leaned on it or pushed it.

⁶⁶ The maximum pressure this kind of material can suffer is approximately 290 MPa (6061-Type).

2.7.3 Damage to IRS

The failure of the IRS was probably caused by Chtholly's action. Her energy came out in such a high speed that was high enough to influence devices nearby. This can be proved because the time the IRS failed matches the time Chtholly started her fight.

The failure suggests that the electrostatic shielding no longer works. By examining the IRS module, investigators discovered small cracks near screws, which are large enough to destroy the shield. Therefore, the module used to detect acceleration suffers another force from electric field, making the result incorrect.

The analysis to systems points out that the IRS failure indication of overhead panel and front PFD directly comes from IRS insufficient precision output, and once IRS is considered failed, all displays are hidden by the adapted PFD. This can explain why IRS was considered failed in flight, and this means that once IRS gets influenced, all information it presents becomes inaccessible. This is an improper design which negatively influenced people-objects and objects-objects relationships.

The broken IRS metal container probably means metal fatigue, which is mainly mentioned in *1.12.2 Wreckages of IRS modules*, whose metal fatigue is the most significant and frequent.

2.7.4 Damage to Engines

The turboprop engine is sometimes unreliable, especially in this case. When beasts come, the engine might be stuck by them with the fuel still being burnt, and no adjustment in the cockpit can be done to solve this other than shutting down the engine, causing the loss of power, although soldiers directly killed the Timeres on the engine in this accident. In this case, the Timeres probably blocked the exhausters, causing the engine to be overheated.

It will be easy for engines to be overheated and even on fire. In this case, jet engines are safer, because their exhausters can't be easily blocked, and a jam is less likely to occur. However, to better defend the aircraft, propellers have their own advantages. See *2.9.2 In-Flight Measures* about the defense strategies.

Also, the metal fatigue shouldn't have taken place so early if the maintenance work is correctly and carefully conducted. By looking up other similar aircraft's maintenance record and conducting experiments on them, investigators found that although the time since the last maintenance is the same, the metal fatigue is more likely to happen to the aircrafts whose routes go through airspaces threatened by Timeres. This is probably because of the need of external control input.

The consequence of simple engine flameout (not including fire, other leakage, and other related systems) is not so significant as expected. Most of skillful pilots are able to adjust rudder trim to balance the influence of imbalance thrust output. Also, according to both MEL and manufacturer's performance data, having only 3 engines won't significantly influence the

climbing performance of the aircraft.

2.7.5 Damage to Hydraulic Systems

The hydraulic pipes after the adaption are just close to the fuselage. When the door broke, it hit the other parts of fuselage, causing these pipes to deform and leak. Steep input sped up this kind of leakage. More seriously, the leakage of certain hydraulic systems made it necessary to make the input steeper and the aircraft harder to control.

Besides, related flying surfaces also showed the similar metal fatigue.

By studying the structure of the hydraulic system and analyzing FDR data, investigators found that some hydraulic systems might influence each other. For example, hydraulic system 3 and 4 is a hydraulic “loop”. Therefore, when one of them leaks, the other also leaks.

2.7.6 Distribution of Fuselages’ Damages

The distribution of fuselages’ damages is uneven. The fuselages far from the impact areas are either minorly or not damaged, which didn’t help suffering the strong force of impact during the Timeres’ attack.

Aerodynamic analyses pointed out that crucial flying surfaces supporting lift of the aircraft was not damaged or only minorly damaged.

2.7.7 Other Systems’ Damage

The autopilot could and should have worked longer after the IRS sprang to life so that crew members would have more time and chances to adjust other systems to better situation. The closure of the autopilot was based on both the program and the procedure.

Investigators suspected that the radiology or other damages caused by Chtholly’s energy release broke the protection of black boxes and caused the data corruption. However, investigators couldn’t prove this because no experiment on this can be conducted.

2.8 Configuration of the Aircraft

From the experiment in *1.16.3 Flight Simulation* we can know that the 30 deg flaps configuration is approximately the best configuration. This is probably because when the speed is too fast, the structures next to the cracks can’t suffer or stir up the air, and the aircraft is at the risk of overspeed; when the speed is too slow, the aerodynamic performance is also influenced, and the aircraft is at the risk of stalling.

The high speed also causes its payload to fall.

In some cases, the broken fuselages stop the flap from reaching the correct position when the flap extends to 40 from 30 by blocking control pipes.

Given the checklist of IRS failure, switching IRS to attitude (ATT) mode suits the procedure. However, crew members didn't realize that the IRS damage caused by electric field of Chtholly or other leprechauns is temporary.

2.9 The Defense Strategies

2.9.1 The Way in Which Leprechauns Fight

It has been said that Willem taught leprechauns, especially Chtholly, a new method, in which they don't have to give up their own lives. This method has partially been proved effective, which can be seen from the recent performances from the leprechauns⁶⁷. However, with more efforts like what have been done in this case, the effect can be more significant.

Besides, whether it's worthy, reasonable and valuable to sacrifice leprechauns, remains to be seen, as it is still the most efficient way to defend Regule Aire.

2.9.2 In-Flight Measures

According to the facts, Timeres can be defeated by fire or heat, but can't be defeated by anything else due to their strong mechanical strength. Therefore, a sharp, sudden, hot and continuous attack is effective. Engines are an unsafe but effective tool to finish this, and other weapons, such as guns with a bit fuel to ensure continuous flame on board, as well as fire extinguishers in order to avoid accidental use of them, should be prepared.

Investigators considered the survival aspects on the assumption that Chtholly had not offered to fight against Timeres. However, the experiment in *1.16.3 Flight Simulation* has suggested the difficulty of this. Investigators agree that this is mainly because of the high working pressure about stabilizing and diverting the aircraft throughout defeating Timeres. In such a situation, they couldn't have sufficient resources, time and concentration to focus on defeating Timeres, which actually increased their working pressure. To make matters worse, Timeres might make continuous damage to aircraft. Only with the help of Chtholly and/or other soldiers can Timeres be distracted and defeated so that crew members concentrate on diverting aircraft and survive with passengers. The escape with only aviation measures is impossible.

⁶⁷ See WG-A-31235.1, WG-A-31235.2 and WG-A-31236.1 (January 410).

2.9.3 To Nephren⁶⁸

It was reported that Nephren had signs of erosion, but the record is controversial. While most leprechauns represent erosion through strange voices or recalls, it is said that the situation differs among leprechauns, usually taking Ms. Valgulious as an example, as she is believed to have completed an erosion cycle with no appearance's change.

Experts who doubt this believe that Nephren is about to open her "leprechauns' gate" mentioned in *1.18.5 Leprechauns' Information* to help with the battle. Eyewitnesses' accounts also proved that Nephren believed that she was about to open it by accident as her power was believed to be beyond control⁶⁹. There are also experts who believe that the erosion and the opening of the gate were happening at the approximately same time.

Due to the lack of the record of erosion and the detailed evidence, investigators as well as experts couldn't reach a detailed conclusion.

2.9.4 To Willem

Willem got "beastize", or, in other words, was turned into a beast. This might be caused by exposing to beasts for a long time after the accident, and their injuries might be cured by the ability of the beasts.

The similar circumstance has been reported for a few times in the Guardian Wing Corps' database. For victims left on the ground, if not killed by beasts, they might be turned into one.

2.10 Passengers

2.10.1 Decompression Factors

1.6.4 Avionics and Normal Maintenance has mentioned oxygen provider installation on board. However, for areas near broken fuselages, oxygen, even generated, tends to leak from the aircraft until air pressure reaches a balance where air pressure is similar to the one in the open air outside. Experiments have proved the significant leakage. Therefore, oxygen generation system can never replace traditional oxygen masks unless improved. However, oxygen generators have wide distribution and fast generation speed, providing sufficient oxygen for passengers.

⁶⁸ This part is mainly contributed by experts in Central Academy of Chtholly (CAC), an organization studying leprechauns and their battles against beasts named after Chtholly in memory of her, and comes from its independent investigation:

<https://wiki.sukasuka.cn/%E5%85%B3%E4%BA%8E%E5%8A%A8%E7%94%BB%E7%BB%93%E5%B0%B%E5%A5%88%E8%8A%99%E8%8E%B2%E6%98%AF%E5%90%A6%E4%B8%BA%E4%BE%B5%E8%9A%80%E7%9A%84%E7%A0%94%E8%AE%A8%E8%AE%B0%E5%BD%95>.

⁶⁹ This was not recorded in soldiers' audio, because this happened near the broken door and the sound of wind was too loud.

2.10.2 Fallout

Analyses above have pointed out that the fallout of passengers was contributed by the broken door, air pressure difference and steep bank of aircraft. This section will have physical calculations about it.

Given an active dragging force F , the bank angle θ and friction coefficient μ , with the definition that the positive direction is going downwards:

$$a = mg \sin \theta - \mu(F + mg \cos \theta)$$

, in which F only works as pressure on the surface as no handrail is provided. On the assumption that cabin decompression occurred near the damaged areas.

Normally we have $\mu = 0.2, m = 40$ kg. Therefore, when it's about to fall out,

$$F = \frac{mg(\sin \theta - \mu \cos \theta)}{\mu}$$

With the largest bank angle $\theta = 34^\circ$ (not taking pitch into account), the force will be 786 N. This will use up most of the strength of a normal person. With the increasing pitch and loss of strength caused by hypoxia near broken fuselage area, it will be much more difficult to maintain the force.

After falling out from cabin and touching ground, the passenger will suffer fatal impact calculated in 2.4.3 *Physical Analysis*. In conclusion, investigators agreed that the impact will likely cause fatal or major injury. It is for this reason that although Nephren was not found by rescuers, investigators considered that she suffered serious injury and defined this event an accident, regarding *The Chicago Convention* (which defines that an aviation event involving fatal or major injury caused by aircraft is an accident).

3 Conclusions

3.1 To the Crew Members

The crew members did the right thing well in the accident. The outstanding technique, calmness and courage of the crew members are inspiring.

The decision to protect the engines made by crews are generally correct and worth learning from.

Crew members' performances were influenced by various factors, ranging from the invasion of Timores to the unknown situation they were facing.

Crew members' decision to start a steep bank was effective, but also brought negative effects. Their landing configuration was correct and outstanding.

3.2 To the Design of the Aircraft

The structures of the fuselage were damaged by both the Timeres' attack and the locker itself. Therefore, the strength of the fuselage, especially the locker, can be improved through changes in both material and structure. Iron or other strengthened materials are recommended to replace current Aluminum material, which is too weak under such a condition. Its related electronic switches should be replaced as well.

The defense approaches against Timeres also decreases the life of the metal components and makes the fatigue easier to happen, which partially contributed to the accident.

The IRS module should also be strengthened rather than dismissed. When it comes to another accident, the IRS failure may be fatal. Also, the malfunctioning input should no longer come from the IRS insufficient precision output.

The turboprop engines are also unreliable. They're at risk of being stuck. However, they have their own advantages, as they can be used as a defense measure.

The oxygen generators had positive effects during the accident. With the lack of the oxygen at the altitude and the obvious lack of the oxygen mask and other devices, this prevented crew members and passengers from fainting. However, oxygen generators can't replace oxygen masks.

3.3 To the Procedures

The procedure dealing with IRS failure can also be improved. More detailed, the leprechauns and the Timeres should be taken into account. More detailed, pilots should not turn the switch to ATT mode too early and they may retry later.

The checklist to follow when encountering Timeres or other beasts and parts of fuselage lost should also be given.

The conflict of internal requirement in the face of beasts and MEL now contributed to the accident. Not following MEL increased the working pressure and risk of crew members. However, according to flight simulation, the negative consequence of not following MEL is not significant.

3.4 To Leprechauns

3.4.1 To Chtholly and Willem

It can be inferred that Chtholly is probably the virtual descendant of the goddess Eruku, which not only gave her ability, courage and determination but also eroded her, and all of them were boosted by the encounter and the probable stimulation of certain genes. Whether it's true, as a soldier, she did a lot more than she was required and fought until the last moment, which greatly contributed to the survival of other passengers and crew members on board. She killed all Timeres, making hundreds of cities are no longer threaten. It was the overuse of her energy during this fight that finally caused her heartbreaking death. Her courage and determination were inspiring. However, from another point to view, according to analyses above, due to mechanical failures, her

death was unavoidable.

The way to evaluate Chtholly's and other leprechaun's health and ability has also been confirmed.

According to eyewitness' accounts, Willem also fought until the last moment, opening the Leprechauns' Gate and giving up her own lives. Although he failed to plan the transportation correctly, which indirectly made a difference to the accident, he is also worth learning from.

What's more, Chtholly's connection to the Eruku might have another aspect. The sword Chtholly suits probably killed "her" hundreds of years ago. The effect of this kind of mixed connection might have caused such a complex result. However, how it works in detail remains to be seen.

The symptoms of the leprechauns' erosion on Chtholly include fainting and the change of gene expression, which led to the change of her appearance. Leprechauns can be classified and better treated through the similarity of symptoms if eroded.

3.4.2 To Nephren

As the Section 2.8.3 mentioned, due to the lack of evidence, investigators couldn't determine whether Nephren was opening her "leprechauns' gate" or being eroded. However, investigators admire her determination and courage to fight.

Nephren as well as Willem had probably been turned into beasts, as the rescue wasn't done in time.

3.4.3 To Other Leprechauns

The "mental" source of leprechauns is probably the Eruku, or, in other words, leprechauns may have to approve this through unavoidable erosion. Whether the acceptance helps with recovery of erosion remains to be seen.

Besides, Chtholly's experience can be applied to other leprechauns, since they're in the same race. This means other leprechauns may also have such a chemical balance discussed in Section 2 and the influence of the erosion.

Generally speaking, the influence is that the more power they use, the more eroded they are, and that approaching objects related to their former souls triggers the erosion. Investigators agree that it has to do with the behavior of genes. Related treatment might be developed in this way.

3.5 To Commanders

The commanders failed to forecast the Timeres' appearance, leading to the accident. However, limited by knowledge and responding speed, in no way could they have made the correct forecast, so it's not their responsibility. Therefore, investigators agree that an automatic warning system is

urgently needed. Generally speaking, the instructions during and after the accident were correct and effective.

They successfully carried out rescue work after the accident, so their work still worth receiving positive words.

3.6 To Dispatch

Though the dispatch didn't follow MEL, limited by the urgent situation where the aircraft had been threatened by Timeres. Also, the situation didn't significantly become worse. Therefore, the work of dispatch required is correct.

However, objectively, his ambiguous instruction increased the working pressure of the crew members and other maintainers.

3.7 General Process of the Accident

Overall, the damaged systems during the accident were:

System	Causes	Consequences
Engines	Easily jammed and damaged by the Timeres because of the improper maintenance	Making controlling difficult (not significant)
Hydraulic	Damaged because of the broken fuselage destroyed by Timeres	Making controlling difficult
Doors	Damaged because of the broken fuselage destroyed by Timeres (or someone leaning on it)	Making passengers sucked out
IRS	Influenced by Chtholly	Making navigation difficult (not significant)
Autopilot	Influenced by the inoperative IRS	Making controlling difficult, increasing working pressure of pilots

The overview of the aircraft can be simulated as follows:



Figure 40. Simulated exterior view of the aircraft during the accident

4 Safety Recommendations

4.1 To the Aircraft

The material of the door locker should be changed to more reliable ones. The connection between the door and the other parts of the fuselage should also be strengthened. The position of hydraulic pipes and other important control pipes should also be adjusted to avoid malfunctioning caused by sudden hit. The material of fuselage can also be improved.

Response: Iron lockers have been applied to the similar aircrafts by the end of March 439. The material of the fuselage hasn't been improved, because the increasing weight causes more safety problems during a battle, which is represented by simulations, according to the Guardian Wing Corps.

The structure of the fuselage can also be improved. Sponges are recommended to add as an interlayer of the fuselage in order to balance the impact.

Response: By the end of January 440, for some aircrafts whose routes are at risk, sponges are added during maintenance works.

Emergency valves can be provided for these hydraulic pipes, so that one pipe's leakage won't influence others.

Response: Emergency valves have been added to the pipes by the end of April 439.

In the cabin, handrails can be added to prevent passengers from being sucked out.

Response: There have already been similar structures in commercial aircrafts. In military

aircraft, several aircraft whose space is efficient have been equipped with handrails by the end of March 439.

The integrity of IRS should be checked, and the way the IRS and other systems are connected should also be considered. The IRS failure indication and insufficient precision indication should be independent and individual.

Response: During maintenances of the aircrafts in the Regule Aire from December 438 to May 438, the IRS components have all been carefully checked, 3 of which had cracks found and repaired.

The cockpit should have more security measures, including strengthened doors, to prevent unexpected beasts' entrance.

Response: By the end of February 439, all cockpit doors have been strengthened.

Besides, A jet engine is better than a turboprop engine for safety, but propellers are better for fighting. They can be used for different situations.

Response: The Guardian Wing Corps have chosen to continue using propellers.

4.2 To the Procedures

4.2.1 IRS FAULT Procedure

The checklist of IRS FAULT is recommended to adjust to:

IRS FAULT (IRS Failure)	
Status: One or more situations below:	
<ul style="list-style-type: none"> ● IRS FAULT light was illuminated, or ● The position input to the FMC is incorrect, causing ALIGN illuminated at the same time. 	
1	Consider one of them: <ul style="list-style-type: none"> ◆ On the ground: <ul style="list-style-type: none"> ▶▶ Go to step 2. ◆ In the air: <ul style="list-style-type: none"> ▶▶ Go to step 6
... On the ground ...	
2	Consider one of them: <ul style="list-style-type: none"> ◆ ALIGN extinguished: Call for maintenance. ■■■■■ ◆ ALIGN also illuminated: IRS Mode selector ... OFF ... FAULT will extinguish and ALIGN will extinguish within 30 seconds.

	▶▶ Go to step 3.
3	<p>After ALIGN extinguished:</p> <p>IRS Mode selector ... NAV</p> <p>Input current position.</p>
4	<p>Consider one of them:</p> <ul style="list-style-type: none"> ◆ ALIGN flashing: Input current position again. ▶▶ Go to step 5. ◆ ALIGN not flashing: ▶▶ Go to step 5.
5	<p>Consider one of them:</p> <ul style="list-style-type: none"> ◆ FAULT illuminates again: Call for maintenance. ■■■■■ ◆ FAULT no longer illuminates: ■■■■■
	... In the air ...
6	IRS ATT and/or NAV may be inoperative. In ATT mode, IRS may provide limited information, which only contains attitude, heading and some essential data.
7	<p>Consider one of them:</p> <ul style="list-style-type: none"> ◆ Leprechauns are working in this area: (Aircraft under update⁷⁰) or IRS overhead panel shows the inoperative IRS display is the same as the operative ones for required parts: ▶▶ Go to step 12. ◆ Leprechauns are not working in this area: Wait for 15 seconds. ▶▶ Go to step 8.
8	<p>Consider one of them:</p> <ul style="list-style-type: none"> ◆ FAULT still illuminates: ▶▶ Go to step 9. ◆ FAULT no longer illuminates: ■■■■■
9	<p>Consider one of them:</p> <ul style="list-style-type: none"> ◆ ATT is necessary for the inoperative IRS: ▶▶ Go to step 10. ◆ ATT is not necessary for the inoperative IRS: ▶▶ Go to step 12.
10	<p>Consider one of them:</p> <ul style="list-style-type: none"> ◆ The main attitude display of the captain or the first officer

⁷⁰ Means the change towards IRS.

	<p>is inoperative:</p> <p>IRS mode selector (The inoperative side) ... ATT</p> <p>This action is not revokable!</p> <p>Keep the wing level and fly straight until the attitude display appears, which takes approximately 30 seconds.</p> <p>◆ The main attitude display of the captain or the first officer is working:</p> <p>▶▶ Go to step 13.</p>
11	<p>Consider one of them:</p> <p>◆ FAULT extinguishes:</p> <p>Input original heading in POS INIT page of FMS or overhead panel.</p> <p>Update heading value from time to time.</p> <p>Never engage autopilot.</p> <p>■■■■■</p> <p>◆ FAULT still illuminates:</p> <p>▶▶ Go to step 12.</p>
12	<p>IRS transfer switch ... BOTH ON L Or BOTH ON R (As required)</p> <p>Never engage autopilot.</p>
13	<p>Consider one of them:</p> <p>◆ Leprechauns are working in this area:</p> <p>Checklist completed except delayed items.</p> <p>■■■■■</p> <p>◆ Leprechauns are not working in this area:</p> <p>■■■■■</p>
Delayed items	
1	Execute this checklist when the work of leprechauns is completed.
2	<p>Consider one of them:</p> <p>◆ FAULT illuminates again:</p> <p>Restart the IRS FAULT checklist.</p> <p>■■■■■</p> <p>◆ FAULT no longer illuminates:</p> <p>Repeal all restrictions to the use of autopilot.</p> <p>■■■■■</p>

(Major changes are item 6,7,8, and newly added delayed items)

4.2.2 Procedures in Case of Fuselage Broken

Also, it is recommended to add a table in QRH indicating the performance of the aircraft

without certain parts of fuselage and add a “Fuselage Broken” checklist like:

Fuselage Broken	
Status: One or more in-flight situations below: <ul style="list-style-type: none"> ● Master Caution triggered indicating damaged fuselage, but not referring to detailed system, or ● A general damage to fuselage, which not refers to any detailed system, has been confirmed. 	
1	Avoid steep turn, climb, or descent. Decelerate if faster than 250 kts.
2	Consider one of them: <ul style="list-style-type: none"> ◆ Compression is normal: ▶▶ Go to step 17. ◆ Compression is abnormal: ▶▶ Go to step 3.
... Abnormal Compression ...	
3	Wear oxygen mask. Crew oxygen ... 100%, Checked
4	Establish crew communication.
5	Passenger sign ⁷¹ ... ON
6	Passenger oxygen ... ON Ensure that passengers can breathe.
7	Bleed mode ... MAN Bleed valve ... OPEN before the (In order to prevent large pressure difference) valve completely opens
8	Consider one of them: <ul style="list-style-type: none"> ◆ Have reached cruising altitude: ▶▶ Go to step 9. ◆ Climbing to cruising altitude: Do not continue climbing. Reset FLT ALT to current altitude. ▶▶ Go to step 9.
9	Immediately descend to 9,000 feet or minimum descend altitude. Select the higher.
10	Engine starter (both) ... CONT
11	Thrust lever (both) ... IDLE or as anti-ace requirement
12	Consider one of them: <ul style="list-style-type: none"> ◆ Confirm wing area damage or unsure if wing area damage: ▶▶ Go to step 13.

⁷¹ For military aircraft, it's recommended for passengers, mainly as soldiers, to preventing approaching or leaning on the doors.

	<p>◆ Confirm wing area undamaged: Speed brake ... FLIGHT DETENT ▶▶ Go to step 13.</p>
13	Set target speed to 250 kts.
14	<p>When approaching level altitude, consider one of them:</p> <p>◆ Confirm wing area damage or unsure if wing area damage: Use head-up or other measures to slow down. Do not use speed brake. ▶▶ Go to step 15.</p> <p>◆ Confirm wing area undamaged: Speed brake (fluently) ... DOWN Add thrust as required to stable. ▶▶ Go to step 15.</p>
15	Crew oxygen ... Normal
16	Engine starter (both) ... As required
... Normal Compression ...	
17	<p>Consider one of them:</p> <p>◆ Confirm equipment area damage: Do not use fuel jettison. ▶▶ Go to step 18.</p> <p>◆ Unsure if equipment area damage or confirm equipment area undamaged: ▶▶ Go to step 18.</p>
18	<p>Consider one of them:</p> <p>◆ Confirm wing area damage: Always ensure that the speed is faster than 190 knots. Do not extend flaps beyond 5 if any parts of flap are damaged. ▶▶ Go to step 19.</p> <p>◆ Unsure if wing area damage or confirm wing area undamaged: ▶▶ Go to step 19.</p>
19	Land as soon as possible.
20	<p>Checklist completed except delayed items. ■■■■■</p>
Delayed items	
... Descend ...	
1	<p>Compression ... MAN (If the compression was abnormal) ... OPEN</p>
2	RECALL ... Checked
3	<p>Consider one of them:</p> <p>◆ Confirm wing area damage or unsure if wing area</p>

	<p>damage:</p> <p>Autobrake ... MAX</p> <p>▶▶ Go to step 4.</p> <p>◆ Confirm wing area undamaged:</p> <p>Autobrake ... ____</p> <p>▶▶ Go to step 4.</p>	
4	<p>Consider one of them:</p> <p>◆ Confirm flap area damage:</p> <p>Landing data ... VREF 5, Minimum ____</p> <p>▶▶ Go to step 5.</p> <p>◆ Confirm other wing area damage:</p> <p>Landing data ... VREF __,</p> <p>Ensure that the speed is faster than 170 knots. Minimum ____</p> <p>▶▶ Go to step 5.</p> <p>◆ Unsure about wing area damage:</p> <p>Landing data ... VREF 30,</p> <p>Ensure that the speed is faster than 160 knots. Minimum ____</p> <p>▶▶ Go to step 5.</p> <p>◆ Confirm wing area undamaged:</p> <p>Landing data ... VREF 40,</p> <p>▶▶ Go to step 5. Minimum ____</p>	
5	<p>Approach briefing ... Completed</p> <p>■■■■■</p>	
... Landing ...		
1	Engine starter	... CONT
2	<p>Consider one of them:</p> <p>◆ Confirm wing area damage or unsure if wing area damage:</p> <p>▶▶ Go to step 3.</p> <p>◆ Confirm wing area undamaged:</p> <p>Speed brake ... ARMED</p> <p>▶▶ Go to step 3.</p>	
3	Gear	... DOWN
4	<p>Consider one of them:</p> <p>◆ Confirm flap area damage:</p> <p>Flaps ... 5, ____</p> <p>Finish overspeed landing checklists.</p> <p>■■■■■</p> <p>◆ Confirm other wing area damage:</p> <p>Flaps ... __, Green</p> <p>Ensure that the speed is faster than 170 knots.</p> <p>■■■■■</p> <p>◆ Unsure about wing area damage:</p>	

Flaps	... 30, Green
Ensure that the speed is faster than 160 knots.	
■■■■■	
◆ Confirm wing area undamaged :	
Flaps	... 40, Green
■■■■■	

In order to prevent messy situations, emergency descending procedure is included in this checklist.

4.2.3 Ways to Defend Against Timeres

For in-flight defense, a checklist can also be prepared like this:

Encountering Timeres	
Status: Encountering Timeres.	
Aim: Get rid of Timeres or defeat Timeres.	
1	Passenger sign ... ON
2	Inform passengers about Timeres. Inform flight attendants to prepare for attacks. Call for help (especially from leprechauns) if possible.
3	Consider one of them: ◆ On the ground : ▶▶ Go to step 4. ◆ In the air : ▶▶ Go to step 8.
... On the ground ...	
4	Engine throttle (both) ... IDLE
5	Engine starter (both) ... OFF
Note: Otherwise, Timeres might notice the aircraft.	
6	Do not start/restart engine or increase engine power.
7	Ask for assistance. ■■■■■
... In the air ...	
8	Auto pilot (if engaged) ... Disengage
9	Auto throttle (if engaged) ... Disengage
10	Consider one of them: ◆ Engines can work normally : ▶▶ Go to step 11. ◆ Engines are abnormal : ▶▶ Go to step 13.
11	Engine ignition (both) ... CONT
12	Engine thrust (both) ... Maximum This makes the engines run fast enough to cut Timeres'

	muscles.
13	Fly towards the furthest arm of the Timeres as soon as possible. This points out the direction of getting rid of them.
14	Be aware of pieces of Timeres. Call for assistance if confirmed Timeres entering the cabin.
15	When possible, inform ATC.
16	Land as soon as possible. ■■■■

In the Engine Fire checklist, it's also recommended to add notes to let crew members wait for a few moments so that the fire can be used to defeat Timeres if the safety is guaranteed. However, if the fire becomes a threat, the original checklist still has to be carried out immediately.

The on-ground checklist of encountering beasts is given in the investigation of 3W-RHT.

Besides these procedures defeating Timeres and defending aircrafts, more procedures are urgently needed. In the long run, there should be more measures to defeat beasts discovered and designed by the Guardian Wing Corps.

Response: The Guardian Wing Corps has set up a department to design these emergency procedures.

Besides, as for weapons, as the report has mentioned, it is recommended for the Guardian Wing Corps to equip soldiers with flamethrower and related fire extinguisher in case of fire accidents.

Response: The Guardian Wing Corps has started equipping flamethrowers on board.

4.2.4 Other Workflows

The way the dispatch works should also be adjusted. A system should be established to evaluate the risk and the experienced should have higher priority to take part in dangerous missions. The commanders and dispatches should never select unskillful pilots to carry out these kinds of risky missions. The erosion of leprechauns should also be considered when a plan is being revised, so that they won't get too close to those objects triggering their erosion.

The normal dispatch workflow, inherited from commercial airlines, should be adapted to the in-flight maintenance. For example, the MEL can be flexible by involving "in-flight maintenance allowance" to guide dispatch to give departure clearances more quickly in emergency situations.

4.2.5 To Search and Rescue Activities

When there are beasts, search and rescue are recommended to be done more rapidly, or, in

other words, before creatures are turned into beasts.

4.2.6 Related Responses

The Wing Guard said that they had prepared another procedure for dispatching works, which ensured that the skillful pilots would be selected for the challenging jobs. MEL has also been more flexible. For example, the “engines” item now includes “when encountering stimulated beasts, 3 becomes the minimum of the number of engines. An additional flight engineer should be on board for 3-engine takeoff”.

Besides, all checklists have been updated by the end of March 439.

4.3 To Leprechauns

Officials may find leprechauns’ ancestors without telling them and prevent them from encountering their ancestors’ body or other related things. They can also consider how to enhance leprechauns by using their ancestor’s (i.e., former souls’) energy. The detailed actions are recommended to be done confidentially⁷² so that leprechauns themselves won’t be eroded, but the common procedure is recommended to be published.

The way in which leprechauns fight can also be improved as Willem recommended.

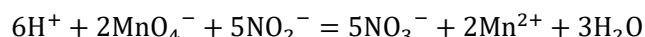
Response: The Guardian Wing Corps agreed that they will start related researches and publish their conclusions.

While leprechauns are recommended to learn from Chtholly, leprechauns might also need to learn to save themselves’ lives. However, whether it’s more beneficial to save more leprechauns’ lives, remains to be seen. The report itself can be seen as a response of this.

Chemical analysis suggests that the leprechauns can be boosted by NO_2^- , as this is the true reason why they can fight, but its negative effects are unknown. The detection using Ag^+ to evaluate their ability is outdated and should be stopped, therefore, but the function of examining their health is approved. Instead, use reducer or oxidant to detect is a better idea.

Response: The Leprechauns’ Hospital in Corna di Luce now use another reaction to measure the amount of NO_2^- , using oxidant:

- Initially remove other reducers.
- Conduct following titration experiment using KMnO_4 and see when the purple color disappears:



Therefore, by measure the use of KMnO_4 solution, the concentration can be calculated.

Besides, A simple evaluation table is also given, which can be used to check the ability to fight during a battle. To use this table, initially confirm the concentration of HNO_2 , then look for the NO_2^- axis for the expected result. Entering red areas (which may differ among leprechauns)

⁷² i.e., not letting leprechauns themselves know about the detail.

should be avoided.

4.4 To Commanders and Dispatches

4.4.1 General Advice to Commanders

A new forecast system which can predict beasts' appearance for commanders and dispatches is urgently needed. This can help them make decisions more correctly. It is also recommended to involve historic information. The response can be partially seen in Section 4.4.3.

The emergency and rescue procedure are proved correct, and they should continue being used, with some minor adjustments. For example, after a short battle, time permitting, the number of soldiers should be dynamically checked to ensure that no one is left or missing.

Also, Gomag can be considered as a danger location for further missions because of the appearance of the Timeres.

Response: These changes have been applied to The Guardian Wing Corps' internal workflows.

4.4.2 General Advice to Dispatches

Dispatches should more carefully evaluate the situation of the flight, even if it's military and it seems to be in an emergency. MEL is still a rule to follow, or more accidents are likely to happen, while in-flight maintenance is acceptable and effective.

Response: These changes have been applied to The Guardian Wing Corps' internal workflows.

4.4.3 Detailed Implementation of the Warning System

Current equipment has already supported the warning when Timeres were on the ground. It has also been confirmed that Timeres will invade a floating island and then divide into 2 same individuals on it and continue flying up from the two sides.

There have also been floating islands that have been descended too much to live in, and a maximum acceptable altitude Timeres can reach can be confirmed in this way. Therefore, here is a quicker way to predict their positions through segment trees. With the number of empty island m and initial Timeres n , as well as the position and size of islands and the initial positions given, following program shows a way to solve this program (Notice that in this example, the final result is taken modulo 998244353):

```
#include <iostream>
#include <vector>
#include <set>
```

```
#include <map>
#include <algorithm>
using namespace std;
```

```
/*
```

This code is written based on the requirement of the Section 4.4 (Recommendations: To Commanders and Dispatches).

(aka The Chtholly's accident)

The original text is given below:

| A new forecast system which can predict beasts' appearance for commanders and dispatches is urgently needed.

| This can help them make decisions more correctly.

```
*/
```

```
inline void train() {
    ios::sync_with_stdio(false);
    cin.tie(0);
    cout.tie(0);
}
```

```
const long long MODER = 998244353;
const int N = 4e5+12;
const int RS = 1e5 + 3;
```

```
long long val[N], lazy[N];
int cnt[RS];
```

```
#define maxi(a,b) ((a) > (b) ? (a) : (b))
#define mini(a,b) ((a) < (b) ? (a) : (b))
```

```
void build(int l, int r, int root) {
    if (l > r) return;
    lazy[root] = -1;          // No lazy tag
    if (l == r) {
        val[root] = cnt[l];
    } else {
        int mid = (l+r) >> 1;
        build(l, mid, root<<1);
        build(mid+1, r, (root<<1)|1);
        val[root] = (val[root << 1] + val[(root << 1) | 1]) % MODER;
```

```

    }
}

void passdown(int at, int l, int r) {
    if (lazy[at] < 0) return;
    int mid = (l + r) >> 1;
    val[at<<1] = (lazy[at] * (mid-l+1)) % MODER;
    val[(at<<1)|1] = (lazy[at] * (r-mid)) % MODER;
    lazy[at << 1] = lazy[at];
    lazy[(at << 1) | 1] = lazy[at];
    lazy[at] = -1;
}

long long query(int l, int r, int root, int ql, int qr) {
    if (l > r || ql > qr) return 0;
    if (ql <= l && qr >= r) {
        return val[root];
    }
    passdown(root, l, r);
    int mid = (l+r) >> 1;
    long long lval = query(l, mid, root<<1, maxi(l, ql), mini(mid, qr));
    long long rval = query(mid+1, r, (root<<1)|1, maxi(mid+1, ql), mini(r, qr));
    return (lval + rval) % MODER;
}

void update(int l, int r, int root, int ql, int qr, long long req) {
    if (l > r || ql > qr) return;
    if (ql <= l && qr >= r) {
        val[root] = (req * (r - l + 1)) % MODER;
        lazy[root] = req;
        return;
    }
    passdown(root, l, r);
    int mid = (l+r) >> 1;
    update(l, mid, root<<1, maxi(l, ql), mini(mid, qr), req);
    update(mid+1, r, (root<<1)|1, maxi(mid+1, ql), mini(r, qr), req);
    val[root] = (val[root << 1] + val[(root << 1) | 1]) % MODER;
}

struct seg {
    int start, end;
    seg() {

```



```

    }
    seg(int start, int end) : start(start), end(end) {

    }
};

bool cmp(const seg &a, const seg &b) {
    return a.start < b.start;
}

map<int, vector<seg> > islands;

int n,m;
constexpr int L = 0, R = 1e5, C = 1;

int main() {

    train();

    cin>>n>>m;
    for (int i = 0; i < m; i++) {
        int a,b,c;
        cin>>a>>b>>c;
        islands[-c].push_back(seg(a,b));
    }
    for (int i = 0; i < n; i++) {
        int x;
        cin>>x;
        cnt[x]++;
    }
    build(L, R, C);
    for (auto &i : islands) {
        sort(i.second.begin(), i.second.end(), cmp);
        for (auto &j : i.second) {
            long long carea = query(L, R, C, j.start, j.end);
            if (j.start == j.end) {
                update(L, R, C, j.start, j.start, (carea << 1) % MODER);
            }
            else {
                update(L, R, C, j.start, j.start, carea);
                update(L, R, C, j.end, j.end, carea);
            }
            update(L, R, C, j.start + 1, j.end - 1, 0);
        }
    }
}

```

```

    }
}
cout<<query(L, R, C, L, R) % MODER<<endl;    // Should mean: val[C].
return 0;
}

```

The program is also added into the warning system of the Guardian Wing Corps.

4.5 To Further Maintenance

Since the metal fatigue is more likely to happen to certain aircraft, the frequency of maintenance work towards the aircraft threatened by beasts is recommended to increase to prevent this.

Also, during the maintenance, if at such a risk, it is recommended for maintainers to check the protection of IRS and other electronic modules.

The response is the same as the ones in *4.1 To the Aircraft* in the recommendations.

4.6 To Aviation Authorities

Aviation authorities including REAA and RATSC are recommended to supervise if these recommendations and related safety guidelines are actually followed.

RATSC is recommended to further conduct the research mentioned in Section 4.7.

Response: The document has been sent to these aviation authorities and archived. By the end of March 440, all local authorities received a copy.

It is also recommended to improve cooperation between aviation authorities and the Guardian Wing Corps in order to better ensure the aviation safety.

Response: In March 440, a document was signed to improve the cooperation, which included

- A communication channel between the Guardian Wing Corps and aviation authorities,
- A permission for REAA officials and RATSC investigators to access essential documents to ensure aviation safety and objective aviation accident investigation, and
- A document management system to share documents and investigation results among them.

4.7 To Pilots' Training

From the investigations, it can be seen that the calmness of the pilots is not enough, and they can be more skillful in dealing with Timeres. Therefore, it's recommended to add the procedure of dealing with these beasts to the training projects of pilots.

Response: In February 440, REAA announced new category of training items, including this.

4.8 Following Research

Although the investigation is done, there are still some problems unsolved:

- A new effective mechanical way to defeat beasts, probably an application of flames,
- The detailed aerodynamic performance when certain parts of fuselage are lost,
- The detailed historic and zoologic sources of leprechauns, which may have to do with the erosion,
- The detailed reason why certain ions work for leprechauns, and
- The detailed factors of the connection of leprechauns, as well as its related influences.

AFTERWORD

The accident as well as the battle in Gomag is heartbreaking. While powder of the battle fading away from our sight, it still has something for us to learn from to be more well-prepared for next challenge. It is for this reason that this investigation team was set and worked hard for several months to present this final report.

From this investigation, we have discovered where the problems exist, and we're looking forward to related improvements to save more people's lives. We hope that everyone can come back and enjoy butter cakes in warmth, whether in a rainy or sunny day⁷³.

Throughout the investigation, investigators approve every passenger's and soldier's effort in saving the aircraft and fighting against Timeres and admire their determination, wisdom and courage.

Chtholly Seniorious was focused on in the investigation, since she sacrificed herself, while she could have her own happiness, to fight against Timeres and indirectly saved hundreds of, or even thousands of lives. She colored happiness and courage with blue covered by red in her memory. Her death was heroic, and although her physical existence has ended, her spirit lasts long. Next time when you see "*3W-CHT influenced by the service bulletin*", that will be the evidence of her existence.

The investigation team

*The way, if it's all predetermined,
And the way I should go all my life.
I swear to go whatever will be.
'Cause there'll be something to see and to find.
I don't know the meaning of life,
But I know what's truly precious
The way, it leads me to be in love,
No fear, I can find me always in my heart.
The life, it's not for comparing things
So I hold both of light and shadow.
The rays of stars will bring me to you
Through the dark nights, I see the way to be shined.
I don't know what's right for our lives,
But I know the truth of my love.
The way, if it's all predetermined,
And the way I should go all my life,
I swear to go whatever will be.
Those memories I wouldn't have will always in my heart.
Those memories I wouldn't have will always in my heart.*

-- Always in my heart

⁷³ This is a leprechauns' tradition to congratulate those who safely come back from a battle.

APPENDIX 1

Detailed pH Result After Balanced

In this table, the X axis is the concentration of HNO_2 and the Y axis is the concentration of NO_2^- .

	0.1	0.01	0.001	0.0001	1.00E-05	1.00E-06
90	6.205957	7.205957	8.205953	9.205914	10.20552	11.19992
80	6.152	7.151999	8.151995	9.151949	10.1515	11.14997
70	6.095191	7.095191	8.095187	9.095143	10.0947	11.0925
60	6.026294	7.026294	8.026289	9.026239	10.02574	11.0249
50	5.949639	6.949639	7.949635	8.94959	9.949148	10.94303
40	5.847492	6.847519	7.847512	8.847417	9.846441	10.84859
30	5.726832	6.728782	7.728778	8.728739	9.728346	10.72444
20	5.552717	6.550917	7.549355	8.551866	9.552281	10.54837
10	5.250589	6.250589	7.250584	8.250543	9.250128	10.24597
9	5.20598	6.20598	7.205976	8.205936	9.205543	10.20162
8	5.15196	6.15196	7.151956	8.15191	9.151455	10.14685
7	5.095102	6.095103	7.095098	8.095054	9.094612	10.09014
6	5.02539	6.025405	7.025402	8.025349	9.024822	10.01938
5	4.944025	5.944173	6.944181	7.944111	8.943389	9.946366
4	4.853382	5.853829	6.853071	7.853031	8.852631	9.848643
3	4.726354	5.728348	6.728345	7.728812	8.728419	9.724511
2	4.552699	5.552672	6.552822	7.552783	8.551307	9.548482
1	4.250744	5.25073	6.250724	7.250682	8.250266	9.246091
0.9	4.206233	5.206208	6.206201	7.206162	8.205767	9.201837
0.8	4.151421	5.151484	6.151485	7.151439	8.150965	9.146163
0.7	4.093417	5.093661	6.09368	7.093633	8.093138	9.088058
0.6	4.027942	5.028551	6.0286	7.028554	8.028042	9.022417
0.5	3.949604	4.951035	5.948419	6.94971	7.947937	8.946824
0.4	3.853783	4.853645	5.853627	6.853585	7.853185	8.849197
0.3	3.729808	4.729675	5.729585	6.729541	7.729076	8.72524
0.2	3.551354	4.553975	5.551834	6.553872	7.553479	8.54957
0.1	3.252688	4.251915	5.251818	6.251765	7.251323	8.246887
0.09	3.209974	4.208386	5.208191	6.208131	7.207719	8.203607
0.08	3.155017	4.156866	5.156829	6.156779	7.156331	8.151703
0.07	3.101274	4.098919	5.100276	6.099142	7.0998	8.095932
0.06	3.04039	4.033282	5.029332	6.033779	7.032276	8.028666
0.05	2.964619	3.955735	4.954499	5.953183	6.947607	7.948401
0.04	2.872642	3.859514	4.859278	5.859408	6.85245	7.854706
0.03	2.760485	3.739393	4.737066	5.729626	6.736376	7.732466
0.02	2.613298	3.570376	4.561776	5.564709	6.563805	7.5604
0.01	2.411241	3.294687	4.273623	5.270928	6.269187	7.268663

0.009	2.386699	3.25093	4.234367	5.232122	6.22737	7.223731
0.008	2.362026	3.214143	4.18618	5.182543	6.181889	7.178126
0.007	2.334719	3.167316	4.134349	5.130131	6.129373	7.125511
0.006	2.308478	3.116494	4.07295	5.062954	6.062225	7.058959
0.005	2.280952	3.058983	4.003278	5	5.996396	6.992494
0.004	2.255422	2.994869	3.921954	4.911596	5.91023	6.902187
0.003	2.227927	2.926859	3.820836	4.804811	5.802934	6.798859
0.002	2.199695	2.850539	3.69289	4.663606	5.659354	6.654995
0.001	2.170993	2.766407	3.51995	4.45132	5.445219	6.44489
0.0009	2.168115	2.757451	3.500527	4.426101	5.415849	6.408282
0.0008	2.164687	2.748199	3.479916	4.394126	5.386157	6.379542
0.0007	2.162322	2.738408	3.454384	4.366416	5.350362	6.347172
0.0006	2.159399	2.72761	3.435113	4.333144	5.316161	6.311768
0.0005	2.155676	2.722236	3.411798	4.294545	5.278247	6.272126
0.0004	2.153684	2.712868	3.387737	4.255984	5.236108	6.227837
0.0003	2.149566	2.702506	3.360756	4.215538	5.187265	6.181815
0.0002	2.147868	2.695245	3.337763	4.16915	5.136124	6.12673
0.0001	2.144631	2.685346	3.310827	4.118345	5.076162	6.067565
9.00E-05	2.144665	2.68422	3.308649	4.113068	5.069808	6.060156
8.00E-05	2.14443	2.683044	3.304187	4.107715	5.063316	6.053825
7.00E-05	2.14396	2.68181	3.30357	4.102289	5.056696	6.047245
6.00E-05	2.140499	2.680504	3.300299	4.096792	5.049356	6.040444
5.00E-05	2.143368	2.679112	3.298154	4.091225	5.042841	6.033456
4.00E-05	2.143277	2.677617	3.295018	4.08559	5.03605	6.026079
3.00E-05	2.142987	2.679863	3.292813	4.078898	5.029038	6.019006
2.00E-05	2.140017	2.678932	3.28974	4.073471	5.021715	6.011537
1.00E-05	2.142271	2.677991	3.287396	4.067895	5.014543	6.004085
9.00E-06	2.141963	2.677896	3.286523	4.06733	5.013809	6.003342
8.00E-06	2.141339	2.677801	3.2865	4.066763	5.012869	6.002588
7.00E-06	2.140166	2.677706	3.286232	4.066195	5.012183	6.00178
6.00E-06	2.142283	2.677611	3.28628	4.065626	5.011485	6.001056
5.00E-06	2.14216	2.677515	3.286066	4.065055	5.010777	6.00028
4.00E-06	2.141883	2.67742	3.285706	4.064483	5.01006	5.999475
3.00E-06	2.141265	2.677324	3.285161	4.063909	5.009334	5.998762
2.00E-06	2.139955	2.677228	3.284893	4.063335	5.0086	5.997972
1.00E-06	2.142124	2.677132	3.285032	4.062758	5.007861	N/A ⁷⁴

⁷⁴ The value in this block can't be correctly confirmed, because the concentration is really small.

APPENDIX 2

FDR Data

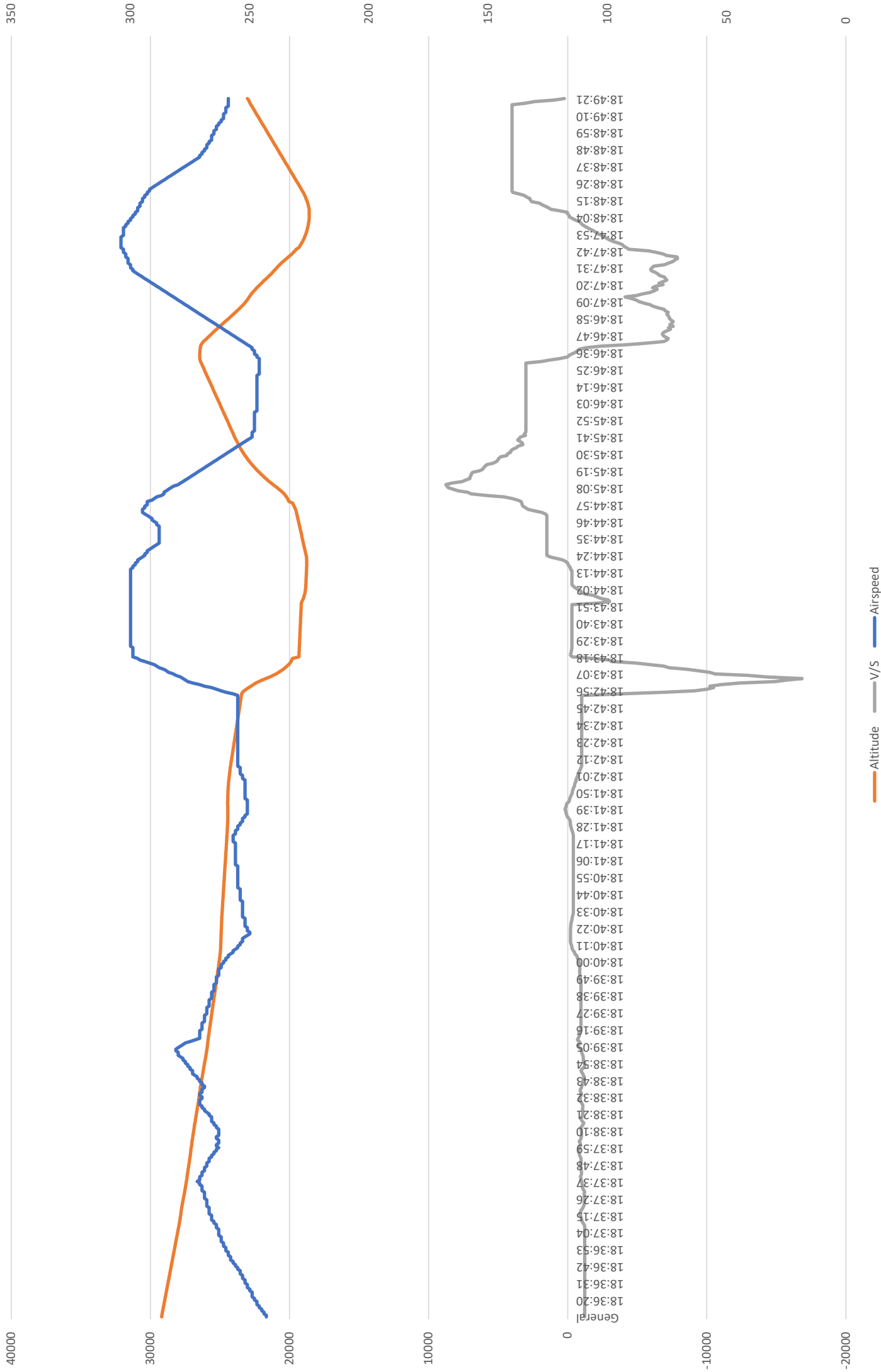
Following diagrams are a part of FDR data stored in FDR device mentioned in *1.11 Flight Recorders*.

They include:

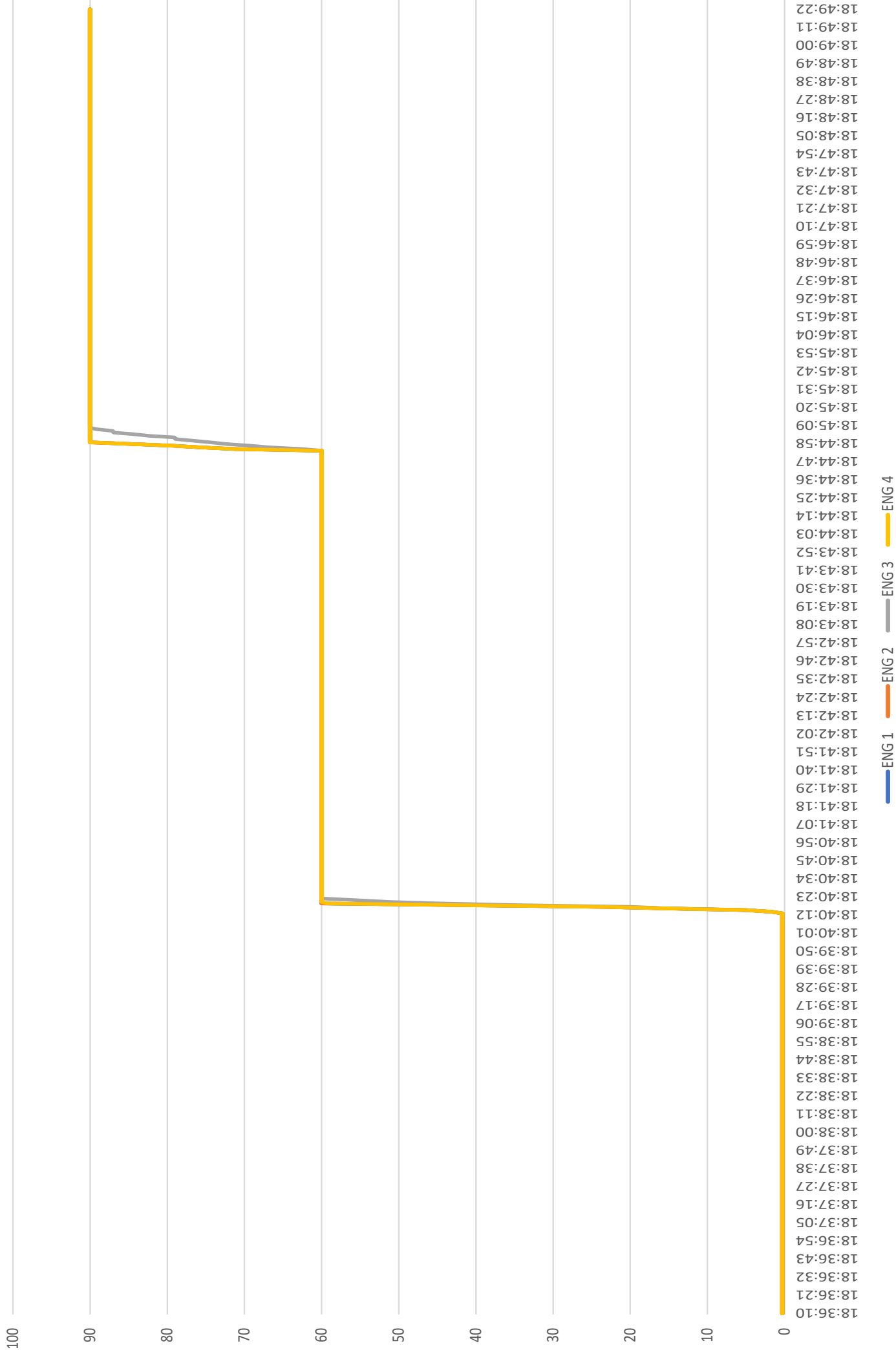
- Airspeed, altitude, and V/S data (The 1st page),
- Engine torques (The 2nd page),
- EGT temperature (The 3rd page),
- Generator voltage (The 4th page), and
- Hydraulic pressure (The 5th page).

Note: FDR and CVR timepoints may differ for no more than 20 seconds.

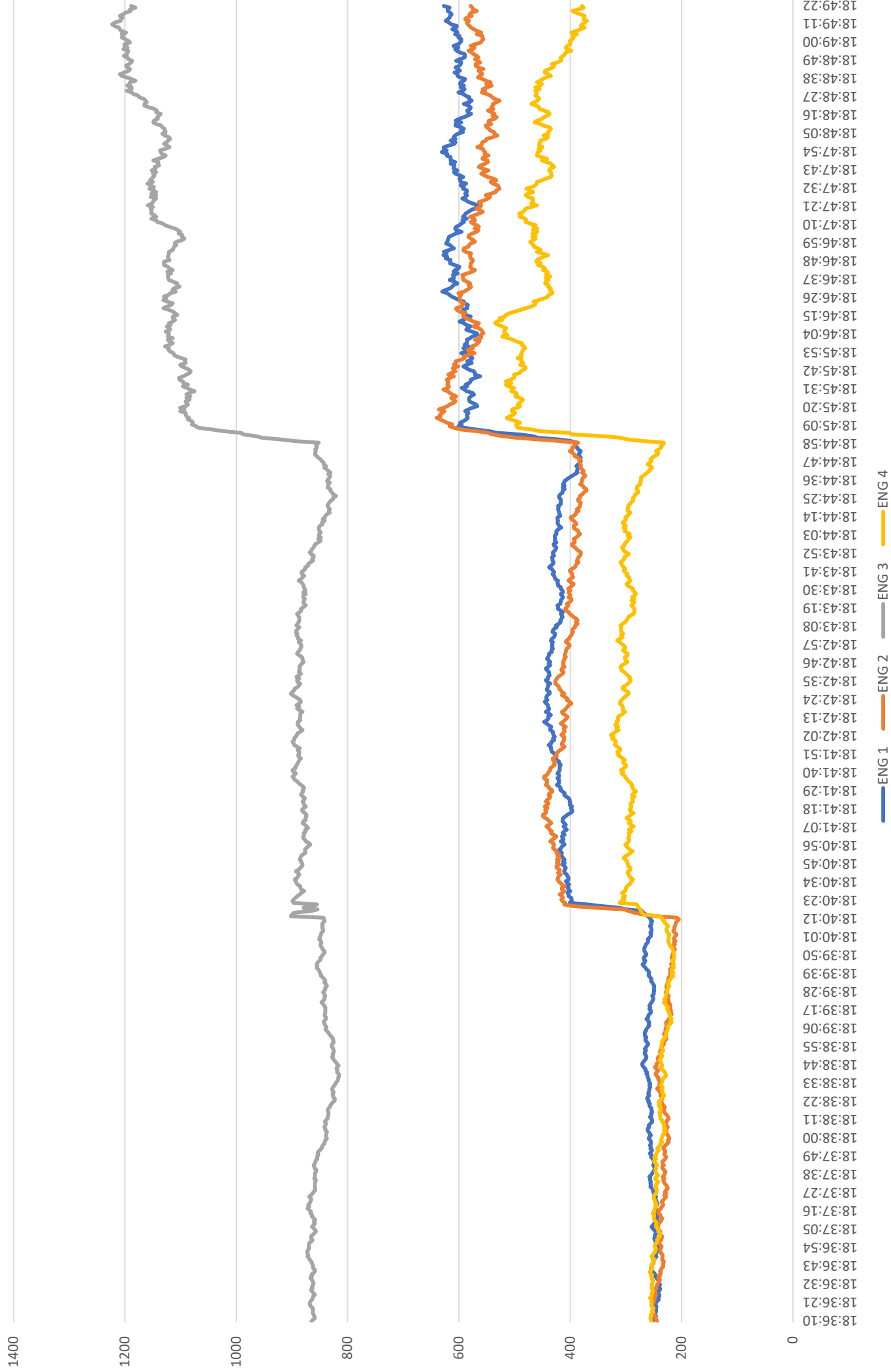
3W-CHT Gomag Accident
FDR Data (Nov 25, 438) – Altitude, Airspeed and V/S



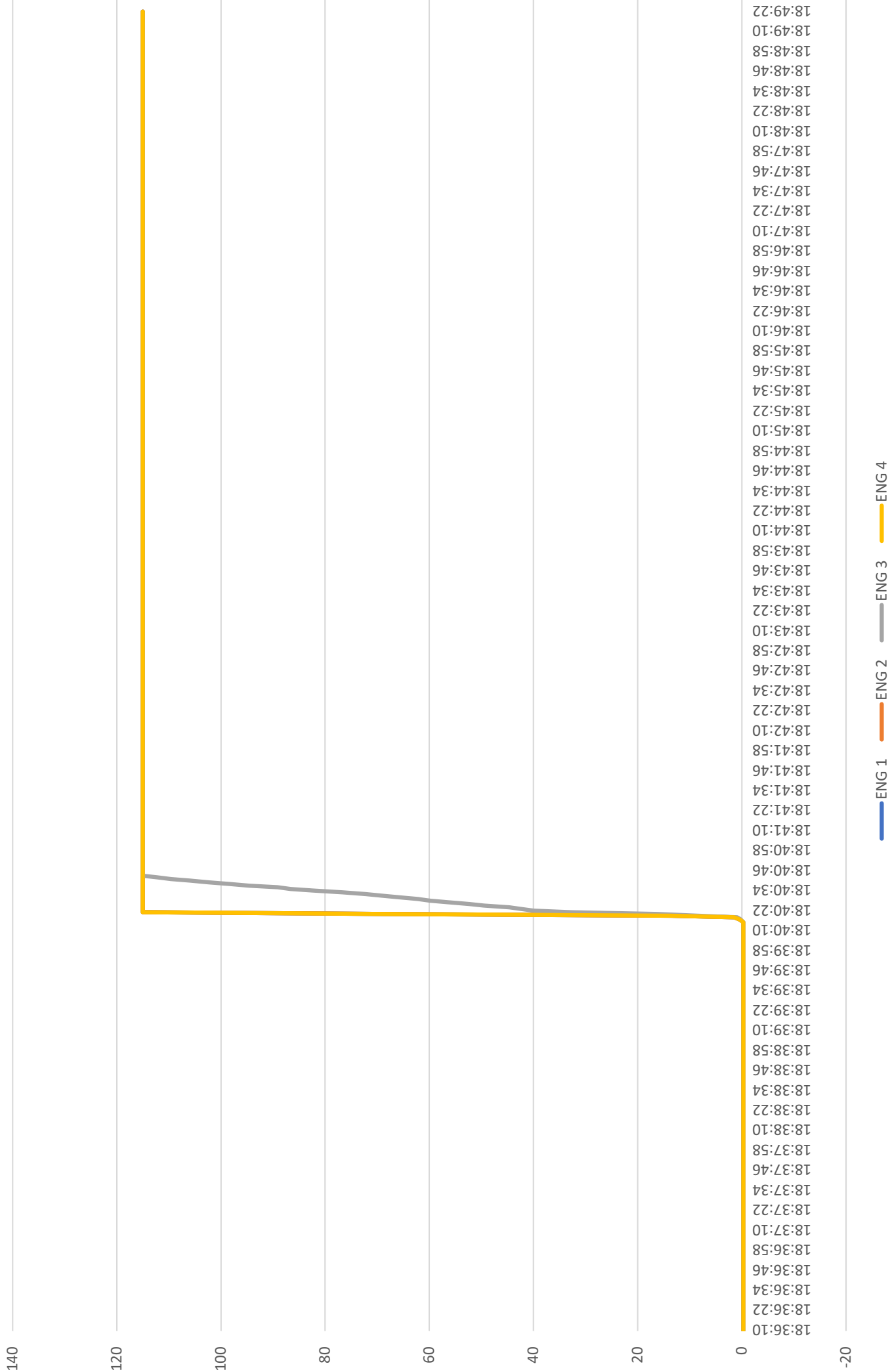
3W-CHT Gomag Accident
FDR Data (Nov 25, 438) – Engine Torque



3W-CHT Gomag Accident
FDR Data (Nov 25, 438) – Engine EGT



3W-CHT Gomag Accident
FDR Data (Nov 25, 438) – Generator Voltage



3W-CHT Gomag Accident
FDR Data (Nov 25, 438) – Hydraulic Pressure

