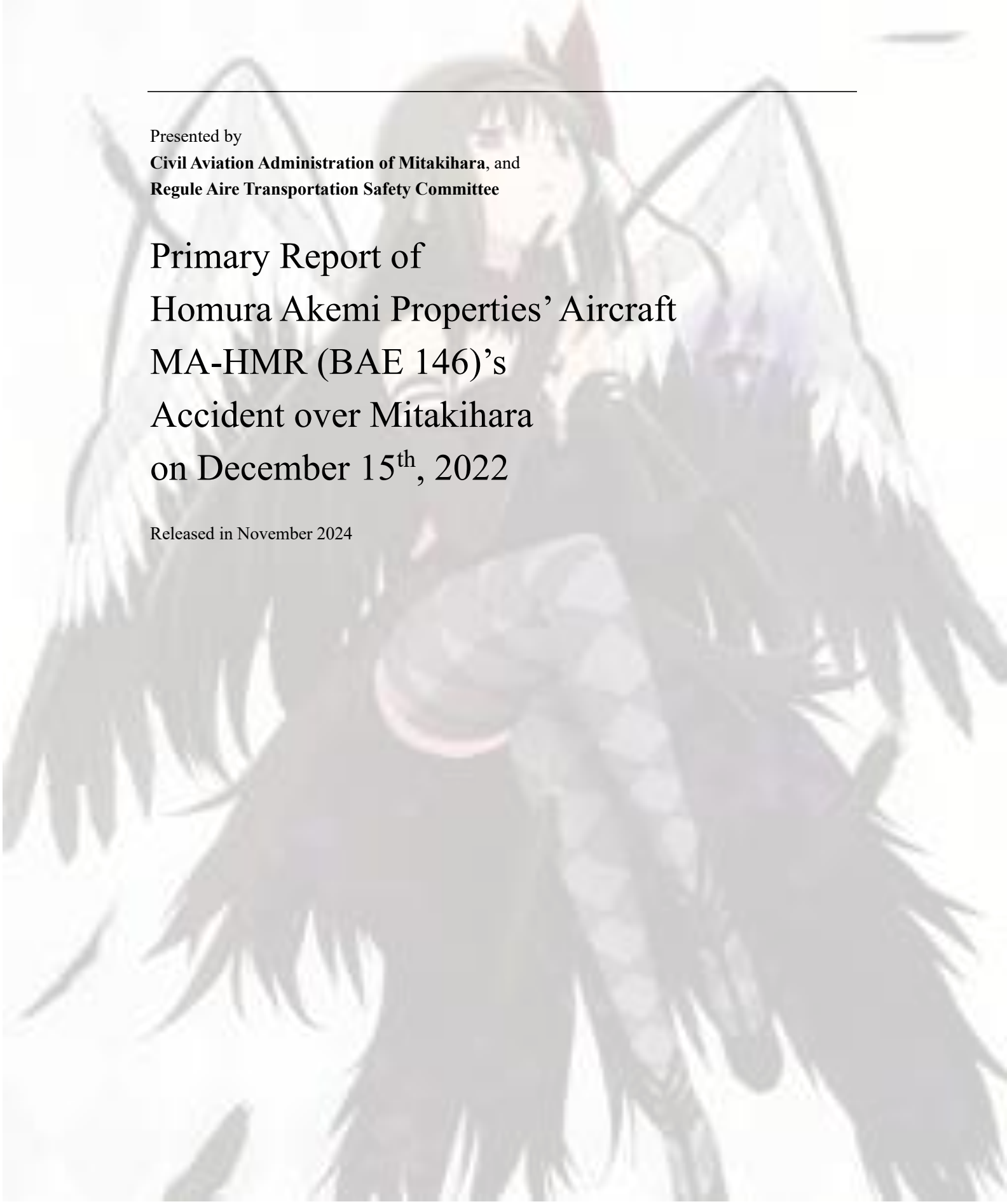

Presented by
Civil Aviation Administration of Mitakihara, and
Regule Aire Transportation Safety Committee

Primary Report of Homura Akemi Properties' Aircraft MA-HMR (BAE 146)'s Accident over Mitakihara on December 15th, 2022

Released in November 2024

ABBREVIATIONS

A	
ACC	(Air Traffic Control) Air Control Center
AFTN	Aeronautical Fixed Telecommunication Network
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
ATPL	Airline Transportation Pilot License
C	
CAM	Civil Aviation Administration of Mitakihara
CCTV	Close Circuit Television
CVR	Cockpit Voice Recorder
D	
DNA	Deoxyribose Nucleic Acid
E	
ELT	Emergency Locating Beacon
F	
FDR	Flight Data Recorder
FFT	Fast Fourier Transformation
FMC	Flight Management Computer
G	
GPWS	Ground Proximity Warning System
H	
HTTP	Hyper Text Transfer Protocol
I	
IRS	Inertia Navigation System
L	
LNAV	Lateral Navigation
LPC	License Proficiency Check
O	
OPC	Operator Proficiency Check
R	
RATSC	Regule Aire Transportation Safety Committee
S	
SSL	Secure Socket Layer
V	
VNAV	Vertical Navigation
VHF	Very High Frequency
VOR	Very High Frequency Omnidirectional Navigation Beacon

CONTENTS

SYNOPSIS

FLIGHT NUMBER:	**(Not applicable)**
OPERATOR:	**Homura Akemi Properties**
OWNER:	**Homura Akemi Properties**
MANUFACTURER:	**British Aerospace (Subcompany in Mitakihara)**
REGISTRATION:	**MA-HMR**
PLACE OF ACCIDENT:	Over Mitakihara Airspace, 12 nm away from Mitakihara Madoka Airport
DATE AND TIME:	**DECEMBER 15TH, 2022 – 17:33:35** Note: (1) All timepoints in this report refers to Mitakihara local time; (2) Timepoints of FDR and CVR may differ for no more than 30 seconds.

14 Days before the accident, according to Mitakihara Telecom Co., the owner of the aircraft made a phone call to her friends about "***risk in front of them***" and "***secret of Mitakihara***". On the day when the accident took place, the pilot arrived at Mitakihara Madoka Airport and entered the airport through crew member channel with an ATPL belonging to the owner (not the actual pilot). Then, on approximately 16:13, December 15th, 2022, the aircraft took off from Mitakihara Madoka Airport with clearance given by ATC.

As flight plan filled, the aircraft was scheduled to fly a holding pattern (not designed in any current procedure) over Mitakihara downtown at FL320. The takeoff, climbing and initial cruise of the aircraft was uneventful.

At 17:33:34, when the aircraft was about to fly over Mitakihara Airport for 6th time, the aircraft had a sudden unexpected climb and right-turn. After reaching maximum altitude, approximately 36,500 ft, the aircraft started to dive, during which ATC attempted to inquiry intention of the aircraft, only to get no reply.

At 17:35:52, when the aircraft descended through 21,350 ft, ATC received weak Mayday signal from the aircraft at Mitakihara Area Control frequency, reporting flight control issues and requesting to divert at Mitakihara Airport immediately. ATC guided the aircraft to the runway, but the pilot reported that she was unable to control the aircraft to fly towards the runway.

At 17:38:12, the aircraft crashed into downtown of Mitakihara with 414 kt speed. Noticing loss of radar signal, ATC immediately reported this to CAM. CAM then invited RATSC for technical assistance to establish joint investigation team and started investigation. British aviation authorities are not invited due to confidential reasons.

On August 16th, 2023, CAM and RATSC released the 1st primary report of this accident, providing information about currently collected wreckages and other evidence. Then, the 2nd primary report is released, providing more analyses to these evidence and currently inferred

causes. After that, on November 22nd, 2024, this 3rd primary report is released, providing more updates.

Note: This is not the final report. Conclusions might change in further updates.

The composition of the investigation team is:

CAM: Nagisa Momoe; and
RATSC: Seabird Starch Gunnhildr.

Autopsy Technical Support: Widegrace Evergarden

Signature is not provided for PDF version.

1 Factual Information

1.1 History of Flight

14 Days before the accident, the owner of the aircraft (identified by phone number left in registration) of the flight made a phone call to her friends, saying:
"***Do you understand the risk and responsibility of*** (unreadable)***? Can you fight against*** (unreadable) ***in this city?***"

Unknown voices (investigators are unsure whether they are the pilot's, or the owner's friends) then said "(unreadable) ***about secrets' secrets and …*** (unreadable) ***that is love. Hope will be brought by a*** (unreadable) ***that you don't know. Homura… You want to liberate*** (unreadable and followed by name of one of her friends')***, right?***"

10 Days before the accident, the owner of the aircraft submitted an individual flight plan about cruising over Mitakihara airspace, which was eventually passed by CAM after 3 days' arguments about safety and had extra limitations including no passenger or profit was allowed. In the submitted flight plan, the owner was registered as the pilot. No information about the intention of the flight was submitted to local authorities. Submitted telegraphs are given in *1.9 Communication*.

At 15:53, the pilot arrived at Mitakihara Madoka Airport. Then, at 15:59, with a small bag, the pilot got on board. Since there's no camera on board and FDR/CVR didn't have electricity, investigators could not determine what happened after she got on board and before startup.

At 16:04, all engines were started. Then, the pilot requested pushback clearance and it was given by ground controller at approximately 16:05. After that, the aircraft taxied to the runway and took off with further clearance.

At 16:17, the aircraft was handed over to Mitakihara Area Control when it reached approximately 8,300 ft. The pilot correctly contacted Mitakihara ACC.

At 16:35, the aircraft reached its estimated cruising altitude. The flight remained uneventful until 17:32. However, what noticed investigators is that CVR and FDR recorded the open of cockpit door for 4 times from 16:40 to 17:30. On average, approximately 9 minutes after the open of the cockpit door, it will be shut (see analyses).

Since 17:32:55, significant sound of breath can be heard in CVR record until the end of recording. Then, from 17:33:30, steep climbing input and unsteady bank input (initially to the right, then to the left) continuously appeared until 17:35:55.

At 17:35:52, the pilot declared Mayday emergency to Mitakihara Area Control and reported flight control issues: "***MAYDAY, MAYDAY, MAYDAY, Hotel Mike Romeo[1]… Here is flight control issue. Request*** (deep breath) ***… divert to Mi…Madoka Airport[2].*** (crying for 1.6 seconds.)"

ATC then replied as "***Hotel Mike Romeo, Roger MAYDAY. Fly heading 290, join the TIRO final[3] approach. You are 12 miles to Madoka.***"

The pilot didn't acknowledge this immediately. Therefore, ATC repeated "***Hotel Mike Romeo, Fly heading 290, to final approach***" twice.

At 17:37:01, the pilot replied that "***Area Control, Hotel Mike Romeo … is totally out of control!*** (unreadable, followed by a combination of crying, the sound of wind, GPWS warning and something breaking)", which was the last voice of the pilot. 71 seconds after this communication, the aircraft crashed into downtown of Mitakihara.

1.2 Injuries to Persons

	Crew	**Passenger**	**Other**
Fatal	1	0	9
Major	0	0	33
Minor/None	0	0	-

1.3 Damages to Aircraft

The aircraft was completely damaged. Wreckages of the aircraft, mixed with wreckages of houses in the downtown, distributed in a circle with approximately 32m radius. Most of wreckages were found in the collision site.

[1] "***Hotel Mike Romeo***" is the aviation pronunciation of "HMR", the registration number of the aircraft.
[2] Investigators inferred that "***Madoka Airport***" referred to Mitakihara Madoka Airport.
[3] "***TIRO***" is a waypoint on the short final of runway 29R of Mitakihara Airport. Investigators studied if the ATC wanted to say "Tiro Finale", and it turned out that the ATC attempted to say "TIRO Final" according to interviews.

Figure 1. MA-HMR's Wreckage Mixed with Houses' Wreckage

The distribution of wreckages can be described as follows:

Figure 2. 3D Map of Mitakihara, with Crash Site Symbolled

Legends: Arrow – Direction of flight; Square – Distribution area of wreckages

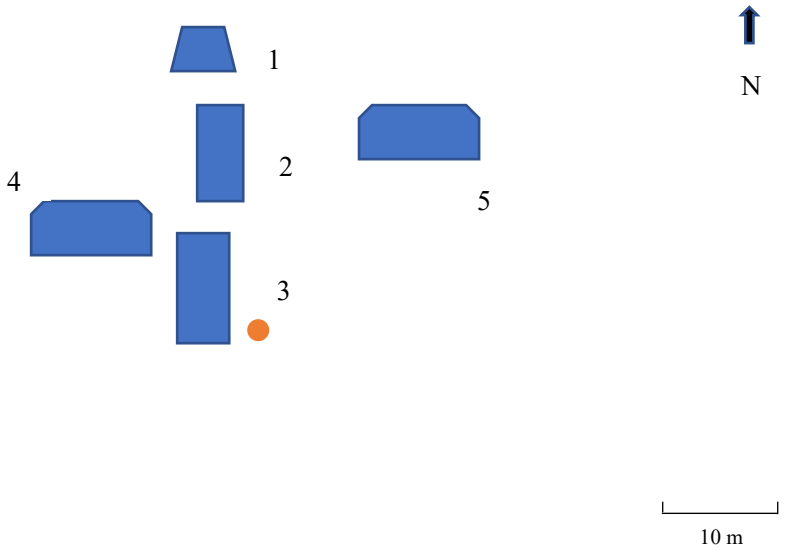

Figure 3. Distribution of MA-HMR's Wreckage

Legends: 1 – Cockpit; 2, 3 – Fuselages; 4, 5 – Wings; Orange – FDR and CVR (Black boxes). (Detailed distribution of key wreckages will be given in following sections)

1.4 Other Damages

The crashed aircraft damaged houses in downtown Mitakihara. In particular, 16 houses in 3 streets were completely damaged, and 4 houses were partially damaged.

1.5 Personnel Information

1.5.1 Pilot

The inferred pilot (i.e., the owner) was female, 27 years old[4]. She was recognized (by comparing airport camera with local resident database and reading information from licenses found in crash site. Following introduction are on the basis of this conclusion) the creator and the only owner of the company Homura Akemi Properties. The aircraft was the company's only aircraft.

The inferred pilot was issued an ATPL on February 2nd, 2015, 2 years after she graduated from

[4] The age information disagrees with household registration of local authorities. In household registration, her age was registered as 18. This is not the only corruption in her document in local authorities.

Mitakihara Senior High School. It was scheduled to expire in February 2025. She also had LPC/OPC certification issued on October 11th, 2016. Despite that she held ATPL, she never worked for any airline.

So far, investigators haven't collected any negative comment in her training record. However, according to her classmates in aviation school, "***She was good at almost everything… except making friends with others. She is always calm, and you can hardly see her excited.***"

Medical records suggest that she had heart diseases which was cured later after an operation (see *1.13 Medical and Autopsy Information*) and used to be near-sighted (-0.60) which was also cured, according to latest health check.

Investigators also attempted to track her activities before the flight. Her activities were all as usual, even after the telephone call mentioned in *1.1 History of Flight*.

On November 8th, 2024, investigators received updated autopsy result from Mitakihara Police, reporting that the DNA sample collected from crash site and stored in RATSC's warehouse doesn't match DNA information of the pilot recorded in local database. Then, Mitakihara Police and autopsy technical team provided investigators more facts about differences between the actual pilot and the registered information about the inferred pilot:

Figure 4. Different tattoo between the actual pilot's head (left) and the registered (right)

Investigators, after improving resolution of airport camera record by using FFT and other video analyses techniques, also found differences:

Figure 5. Differences between the actual pilot's head (left) and the registered (right),

after improving resolution of images[5]

In the figure above, differences including the color of hair and eyes (red for left and purple for right). However, since airport camera system also captured appearance of the pilot that was similar to the registration at the same time and same place, investigators are unsure if the difference was caused by an algorithm error.

Besides, investigators currently believe that the relationship between the two individuals is likely close, regarding similarities including similar relationship (according to interviews), similar names (called "***Homura***,") and similar Soul Gem (see following text).

Experts from Mitakihara Hospital pointed out that the inferred pilot, regarding her behavior with friends and others (according to interviews), likely had schizophrenia represented by symptoms including imagining a virtual partner called Madoka.

Despite investigators' attempts to contact with the inferred pilot's relatives, investigators have never succeeded in establishing communication with them. Therefore, as for the actual pilot, her/his information about the aviation career (including training and safety records) is unknown so far.

1.5.2 Air Traffic Controller

The Air Traffic Controllers were from Mitakihara ACC.

The ATC #1 who permitted the aircraft to take off graduated from Mitakihara Senior High School and entered Mitakihara University to study aviation. When the accident took place, he hadn't graduated from the university yet and was practicing being ATC, as a part of his courses. Before the accident, he had worked for 1.3 hours and rested for 5 hours beforehand.

The ATC #2 who contacted the aircraft after emergency declaration is from Takarazaki and worked for Takarazaki Airport ATC in the past. He had certification issued in July 2019. Before the accident, he had worked for 2.5 hours and rested for 4 hours beforehand.

1.6 Aircraft Information

1.6.1 General

The aircraft was a BAE 146-100 manufactured by British Aerospace, with 76 seats (including the ones for the crew members). Before the accident took place, it had accumulated 44,533

[5] Mitakihara local law allows publishing relevant individuals' images after granted by himself/herself, his/her relatives, or none of individuals above is alive, unless any other law forbids.

flying hours in 13,555 takeoff and landing cycles, most (44,122 flying hours) of which was accumulated in its career in Mitakihara Airlines. Before taking off, the aircraft loaded 14,333 kg A-1 jet fuel. The aircraft was equipped with 4 Avco Lycoming ALF 502 engines.

The aircraft was manufactured in a factory in Mitakihara in 2003 and was initially handed over to Mitakihara Airlines. In 2017, with updates of aircrafts in Mitakihara Airlines, it was sold to Homura Akemi Properties.

Cabin of the aircraft was always configured as economy seats.

Figure 6. Cockpit of MA-HMR

1.6.2 Maintenance Record

According to maintenance record, the aircraft has already had flight control issues before the flight. On March 19th, 2010, when the aircraft was cruising, pilots noticed unexpected movement of stabilizers and rudders[6]. By applying aileron input in time, the aircraft was stabilized and diverted to nearest airport safely.

Ground engineer then examined the aircraft and found that the screws of flying control surfaces were not correctly tightened. Further examinations revealed that flying near coast made the surfaces accumulating ions which eroded the screws. The maintenance work was then conducted as follows:

[6] Stabilizers and rudders are flying control surfaces controlling vertical and horizontal movements. Their input often has a large effect on final attitude of the aircraft.

"***9 Screws are tightened. Chemical protector is applied.***"

Then, no more malfunctions about flight control were recorded.

Records of routine maintenance are given as follows:

Type	**Actual Interval (Flying Hours)**	**Required Interval (Flying Hours)**
A	224	250
B	992	1,000
C	3,988	4,000
D	23,196	24,000

1.7 Meteorological Information

The meteorological information in Mitakihara was given as follows when the accident took place:

- CAVOK (No clouds, visibility > 10 km), and
- Temperature 21 degrees, dew point 18 degrees.

This information was given by an ATIS. Before departure, the pilot replied to the ATC that she had received ATIS information.

1.8 Aids to Navigation

According to FDR data, the aircraft was using LNAV/VNAV navigation with FMC guidance and IRS data when cruising before the accident took place. At that time, the IRS efficiency was acceptable, which was examined by VOR station near Mitakihara Airport (e.g., MDK, the central VOR station of the airport).

Investigators compared IRS output with ATC screen's display. The result turned out to be that the error was acceptable and won't influence normal navigation.

In the crash site, investigators found IRS components in the distribution area of cockpit wreckages.

Figure 7. IRS Modules (Cleaned[7])

Investigators also tested if IRS provided incorrect attitude information (the process can be seen in experiment part). The result was that the IRS worked correctly.

1.9 Communication

1.9.1 General

Investigators compared audio in CVR data and ATC's tape record as well as PTT button's activation record in FDR. It turned out that the timepoints differed for no more than 25 seconds, which is an acceptable error.

According to both ATC's tape record and interviews to Air Traffic Controllers, the communication was described "***loud and clear.***"

All communication except the last ones (after emergency declaration) requiring acknowledgment was correctly replied and acknowledged by the pilot.

As for telegraph for aviation, Mitakihara ACC uses following devices:

- Mitakihara Aviation Platform for airlines and internal officials, which used HTTP to construct web platform;

[7] Or wires for testing will be unable to connect to the module.

- Airbus Data Link service; and
- Traditional telegraph, if necessary.

Following telegraphs were received by the first measure above.

1.9.2 Telegraph of Departure

Following AFTN telegraph was sent to Mitakihara ACC before flight to register flight information:

```
ZCZCNVA0332 140912
FF PMMAZRZX[8]
(PLN
-MAHMR/A/1145
-I/X[9]
-B146/M
-DFGIOUV/S
-PMMA/0730
-N270/F320/MADOK3 SAYAK INCUB
-PMMA
-OPR/HOMURA AKEMI PROPERTIES)
NNNN
```

Telegraph above suits information of aircraft registration and flight plan submitted to CAM. Mitakihara ACC received the telegraph in time.

1.9.3 Emergency Declaration

After crashing, following telegraph was broadcasted by Mitakihara ACC:

```
ZCZCNVA0585 150938
SS PMMAZRZX
(ALR
-MAHMR/A/1145
-DETRESFA/PMMAZRX/AIRCRAFT LOST CONTROL AND CRASHED INTO
MITAKIHARA DOWNTOWN
-I/X
-B146/M
-DFGIOUV/S
```

[8] "PMMA" means Mitakihara Madoka Airport.
[9] This suggests that the category of the flight is undetermined.

-PMMA/0730
-N270/F320/MADOK3 SAYAK INCUB
-PMMA
-OPR/HOMURA AKEMI PROPERTIES
-E/0215 P/1 R/VE J/LFV A/WHITE WITH NO LIVERY C/HOMURA AKEMI[10]
-HOMURA AKEMI PROPERTIES/PMMAZR/0937/13725/MDK2700120937/RADAR/SEARCHING FOR SURVIVORS)
NNNN

(Noise for 82 seconds)

SS PMMAZRZX
(RCF
-(Noise, where should be aircraft registration)
-NIL/NIL/NIL/NIL/NIL/I COME ALONG WITH HOPE AND HOPE COME ALONG WITH YOU[11])
NNNN

The first part was standard aviation emergency telegraph.

The second part (after the noise) didn't satisfy the format of RCF (Radio Communication Failure) telegraph. More detailed, "ZCZC" header and aircraft identity information were missing. Investigators, currently, can't determine the sender of the latter telegraph. Mitakihara ACC and CAM officials all denied this.

In the 72 hours after the accident, there was no aircraft declaring communication failure. Therefore, investigators agree that the last telegraph was a false communication failure signal.

1.10 Airport Information

The Mitakihara Madoka Airport has 3 runways:

- **Runway 29L.** This runway is 4,525 ft long.
- **Runway 29C.** This runway is 4,111 ft long.
- **Runway 29R.** This runway is 5,355 ft long.

The runways are all flat (approximately 0% slope).

[10] According to crew member information registered before takeoff.
[11] Grammatical mistake reserved as the original text.

Before departure, the airport had examined the runways and found that there was no obstacle on the runway.

The landing information is not applicable.

1.11 Flight Recorders

Figure 8. Black Box Found in Crash Site

The data from the CVR and FDR were successfully downloaded 6 days after the accident by RATSC. Integrity check revealed that the data are reliable.

The FDR data revealed that at the beginning of the accident, there was steep climb and unsteady back inputs, and the aircraft generally responded to the input (see experiments). The input immediately disappeared and replaced by full nose-down input and trim[12] adjustment after 6 seconds, and FDR recorded increasing thrust input and engine output after that.

After that, both CVR and FDR recorded stall warning, and the speed reached the minimum 83 kt. 73 seconds after the initial steep climb, the aircraft started to dive, during which the aircraft's attitude was similar to a vertical spin (see experiments and analyses).

[12] "Trim" controls stabilizer.

1.12 Wreckage Information

1.12.1 General

The distribution of wreckages is given as follows:

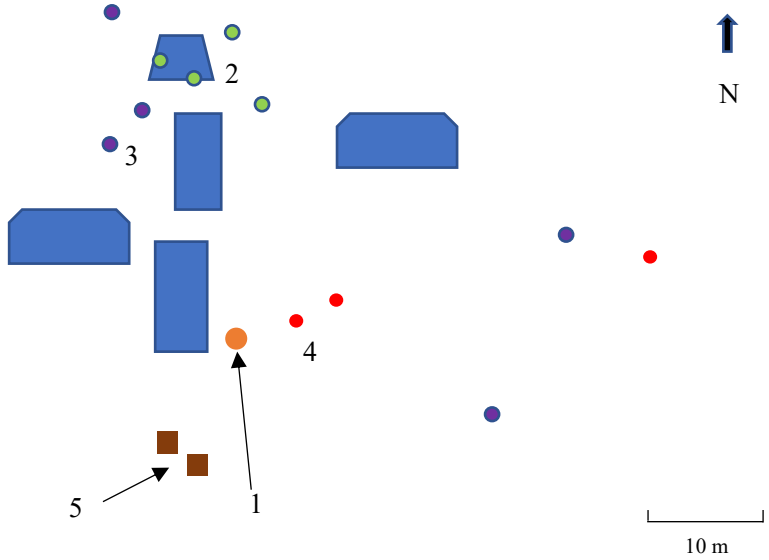

Figure 9. Distribution of Key Wreckages

Legends: 1 – Black boxes; 2 (Green) – Avionics; 3 (Purple) – Feathers; 4 (Red) – Components of "Soul Gem"; 5 (Brown) – Tail wing flying control surfaces (Stabilizers and Rudders).

As for flying control surfaces, investigators successfully collected all of them and examined if they can operate normally. See experiments.

Unusually, investigators collected black feathers which were not belong to any of the residents in the crash site near the aircraft. Further DNA and fingerprint examination revealed that it belonged, or at least used to belong, to the owner of the aircraft.

Investigators also collected broken pieces of an object with a shape similar to gem (inferred after putting broken pieces together). Interviews with the owner's friends revealed that it was actually a machine called "Soul Gem", which helps in providing the owner of the aircraft vital signs. See additional information to learn more.

Investigators eventually concluded that the aircraft didn't fall apart in the mid-air.

Also, the distribution range of wreckages was small. This suggests that the aircraft, at its final moment, dived towards the ground. This suits the FDR record and the consequence of spin.

1.12.2 Engines

Investigators examined all four engines of the aircraft. It turned out that the engine structure remained generally complete, and no component was lost. All engines inhaled grass and soil, which means that it kept running when the aircraft hit the ground. This also suits FDR record.

Investigators checked oil pipes connected from fuel tanks to engines and found no sign of breaking. Generators and bleed systems were also operating normally when the aircraft hit the ground. This also suits FDR record.

1.12.3 Hydraulic

Investigators collected all hydraulic pipes of the aircraft on board. Most of these pipes remained generally complete. Tests on reconstructed hydraulic system using devices found in wreckages revealed that the hydraulic system was operating normally.

1.12.4 Cabin Seats

Investigators examined all cabin seats found in the wreckages. None of them should sign of burning.

However, investigators found sign of blood on some of cabin seats. Further DNA analyses revealed that some of the samples were not from victims on the ground or the owner of the aircraft.

1.13 Medical and Autopsy Information

Before the accident, there was no record of any disease or abuse of drug on the (inferred) pilot's medical record after the pilot's operation on heart and eyes. According to the Mitakihara Central Hospital, the operation was successful, and CAM later evaluated that her situation was suitable for aviation.

The body of the (inferred) pilot didn't remain complete. In the crash site, it broke into at least 22 pieces and there were still a few components missing. Therefore, medical and autopsy information is not fully applicable.

Current medical and autopsy examination have revealed the identity of the pilot doesn't match the assumption of the investigators. See *1.5.1 Pilot*.

1.14 Fire

Examinations on wreckages revealed that there was no fire on board. FDR didn't report any fire warning, either. Therefore, fire information is not applicable.

After the aircraft crashed, there was fire in the crash site. Further examination revealed that it was caused by jet fuel.

1.15 Survival Aspects

After ATC reported the aircraft's crash, rescuers including firefighters and ambulances departed immediately and headed to the crash site (with location information provided by ATC), with on board ELT's assistance to locate the aircraft. 8 minutes after the crash, firefighters arrived and started to put out fire. The fire was completely put out 44 minutes after the crash.

12 minutes after the crash, ambulances arrived. Given that firefighters reported that no sign of survivor was found on the aircraft, ambulances attempted to rescue local residents hurt by the crashed aircraft. 42 people was sent to Mitakihara Hospital, and 9 of them were dead within 48 hours, mainly due to burning.

1.16 Experiment and Research

1.16.1 Experiments on Avionics

Investigators conducted experiments to examine avionics including IRS by powering the modules and rotating the modules randomly with an operative acceleration sensor. The result turned out that IRS module operated normally.

1.16.2 Experiments on Flying Control Surfaces

Investigators had successfully collected following wreckages from the crash site:

- Aileron;
- Flaps (including the leading and trailing edges);
- Slats;
- Stabilizers; and

- Rudders.

Their hydraulic pipes were also successfully collected. According to FDR data, hydraulic pressure remained normal during the whole flight. Therefore, investigators cleaned, repaired and refilled hydraulic pipes for further examination.

After these preparations, investigators reconstructed flight control subsystems of the aircraft and gave random input from a virtual stick (physically connected to all hydraulic components). During the experiment, the movement of flying control surfaces suited the expectation with little or no delay.

Investigators also conducted visual and microscope inspections. They revealed that components above showed little or no sign of metal fatigue or other issues.

1.16.3 Flight Simulation

Investigators conducted flight simulation to discover the actual situation of the aircraft by giving the input to a simulated aircraft with all systems operating normally and all parts of fuselages considered undamageable. The result turned out to be that:

- The initial climb can be done with the input; but

- The further descend wasn't deliberately done. By analyzing attitude data, investigators agreed that it entered vertical spin. See analyses.

Investigators also invited BAE 146 pilots from other airlines to roll out the vertical spin. It turned out that if they do their best with no other interference, with similar attitude, airspeed, altitude, and payload configuration, most (89%) pilots can roll out from the vertical spin. However, if their strength is reduced by approximately 50% (simulated by adding resistance to the stick), the percentage of successful attempts dropped to approximately 40%.

By interviewing with other BAE 146 pilots, investigators learned that the steep climb input is usually not used for any situation.

1.17 Organizational Information

1.17.1 Aircraft Operator and Owner

The operator and owner of the aircraft is company Homura Akemi Properties. Since its creation in 2015 with $50,000 for registration, its legal representative has been the (inferred) pilot. She had 100% stock of the company.

The OPC of the company was passed in July 2018, allowing the company to "own aircrafts and operate aircrafts for individual use". The company had no other clerks, and no extra service range was registered in local authorities.

In August 2019, the company delegated Mitakihara Madoka Airport Management Co. to conduct maintenance on its only aircraft, MA-HMR. As a return, the company offers $50,000 to airport management company annually.

After the accident, the company was written off by her friends on January 2nd, 2021.

1.17.2 Airport Management

Mitakihara Madoka Airport, established in January 2016, is the major airport of Mitakihara. On average, it delivers 30,000 passengers and 540,000 kg cargo each day. The collection of the airport's name started in March 2014 and ended in April 2014. Numerous names were recommended but rejected because they were ambiguous. The owner of Homura Akemi Properties, at that time, submitted the name "***Madoka,***" which had no conflict with other names.

The Mitakihara Madoka Airport has a crew member channel allowing crew members go on board after examining their licenses and a minimized safety check and customs check (if necessary).

Investigators attempted to hold ATPL that actually not belong to us to go through the crew member channel. The result turned out to be that the licenses were never carefully checked and anyone having an ATPL, even fake, can enter the crew member area.

1.18 Additional Information

1.18.1 Soul Gem

According to the aircraft owner's friends, a "Soul Gem" is a small device maintain her vital signs, usually $100\ cm^2$ in size. When the distance to her "Soul Gem" exceeds 100 m, she will be at risk. Also, when the soul gem is damaged, she immediately dies.

When the soul gem is undamaged, its color can represent its state. When it turns black, its owner will be at risk of "Majolized," after which a Soul Gem turns into Grief Seed. Specially, her friends told investigators that similar transformation had occurred once to her but later strangely revoked.

1.18.2 Erosion

Erosion is a phenomenon which is believed to be caused by inappropriate memory and its recall. During an erosion, the erode individual's sight turns red, with unexpected characters floating in his/her eyes. Former investigators like the one to 3W-CHT believes that it needs a "former soul" to inherit memory from and is caused by conflict between memories with different owners stimulated by particular circumstances.

It is possible for the eroded individual to feel the erosion. At that time, in order to escape from erosion, their breath and heartbeat usually accelerates.

Besides, during erosion, the individuals also might hear unexpected voices. In the erosions cases investigated in the past, it is actually from "former souls". Such voice, at a higher frequency and with a smaller volume, can be heard by people and voice recorders nearby.

Former investigations have pointed out that one complete erosion stimulates further erosions. Also, an erosion can be considered a loss of consciousness, which makes crew members fail to response to aircraft's situation, if in flight.

2 Analyses

2.1 To the Aircraft

Investigators, at first, suspected if the flight control issue was caused by damage or not-responding flight control surfaces. However, analyses to wreckages and flight simulation have revealed that during the initial climb input by the pilot, all control columns were working normally, and all control columns remained complete during the whole process of the accident. Therefore, the flight control issue was not caused by mechanical issues.

BAE 146 has T-shape tail design (stabilizer placed at the top of the tail, not the bottom). As a result, when it stalls, air passing through the tail immediately becomes turbulences (see following figures), which invalidates most of control input to the tail wing. It is for this reason that if the aircraft stalls, it's more likely to enter "deep stall"; when it enters "deep stall", or a state where the aircraft enters horizonal spin or long-lasting vertical spin (with airspeed sufficiently low), it becomes difficult for crew members to roll out, for which most pilots failed roll-out attempts in the *1.16.3 Flight Simulation* when an early roll-out fails because of the inefficiency of input caused by reduction of strength.

Figure 10. Normal BAE 146 Aircraft (The Airline is not Relevant to This Accident)

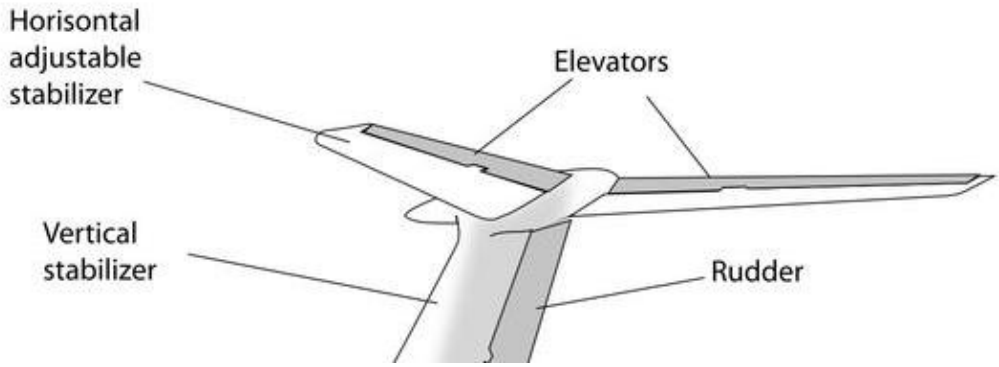

Figure 11. Standard T-Shape Tail

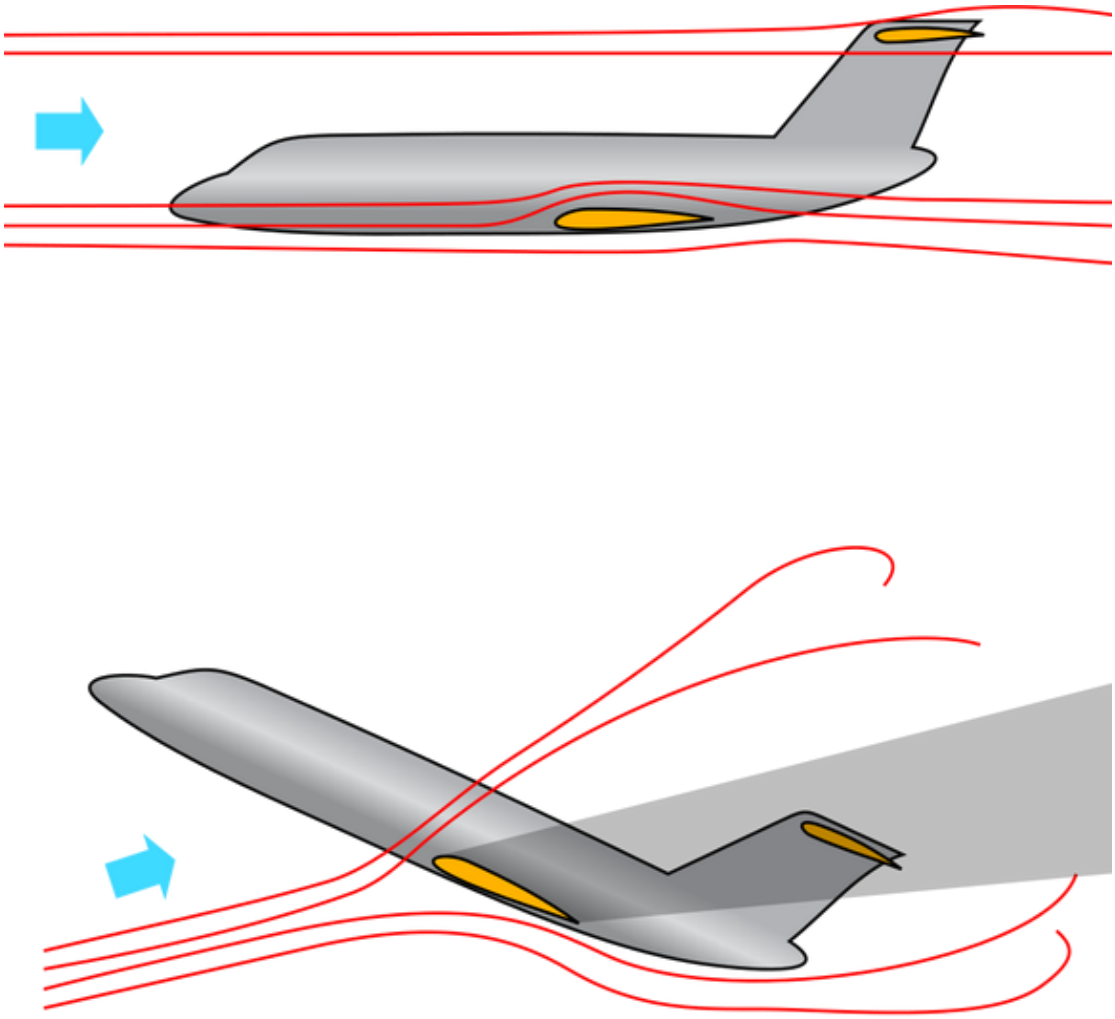

Figure 12. Aerodynamic Performance when T-Shape Tail Stalls (Gray: Turbulence Area)

2.2 To the Pilot

2.2.1 General

At the beginning of the investigation, investigators assumed the identity of the pilot as the owner of the aircraft (mentioned in *1.5.1 Pilot*). However, further examination has proved that the identity was incorrect.

However, given that investigators revealed a probable tight relationship between the actual pilot and the inferred pilot, and some analyses doesn't rely on the actual identity of the pilot, following analyses are still reasonable.

Currently, limited by evidence revealed, investigators couldn't determine if the inferred pilot (i.e., the owner of the aircraft) let, or at least grant, the actual pilot conduct the flight, since the

position of aircraft is public.

2.2.2 Before Flight

Given that the actual pilot was not the one registered on the submitted individual flight plan, the airport shouldn't have granted the pilot to the crew member area and get on board. However, the airport only checked ATPL of individuals attempted to enter the airport through crew member channel. They didn't check whether the person actually holds the ATPL. This gave chance to the pilot to enter the aircraft.

2.2.3 In-flight Bleeding

Investigators have found signs of blood on the surface of cabin seats, mentioned in *1.12.4 Cabin Seats*. To reveal its source, investigators made several assumptions.

One of the assumptions is that the pilot hurt herself/himself[13]. This can happen since there's probably only one person, the pilot, on the aircraft, which made it impossible for her/him to be notified by others when approaching danger. The lack of pilot also increased working pressure, making the pilot ignoring potential danger in the cabin.

After being hurt, the pilot might become anxious or irritable. This made her/him lost rationality and may made her/him incorrectly give steep input on control columns.

Another assumption is that there's more than one person on board and the blood was caused by fighting. This assumption can suit the DNA analyses but doesn't match CCTV record of the airport. One possible explanation is that the person hid himself/herself well to prevent being recorded. However, to prove this, more investigation and cooperation with police are needed. So far, police didn't provide investigators any information about getting rid of CCTV record. Given that the person's existence and identity are unknown, investigators couldn't conduct further analyses.

2.2.4 Motivation of Steep Input

Since the steep climb of the aircraft wasn't caused by mechanical failure, investigators attempted to study the actual motivation of pilots giving steep input.

Given that the visibility condition was good during the accident, investigators excluded the suspect of spatial disorientation.

By investigating activities of the pilot before the flight, investigators checked if the (formally

[13] Biological examination on pilot's body found XX chromosome. Therefore, investigators agree that the pilot is probably female.

inferred) pilot attempted to suicide. However, according to her friends, no unusual sign was found in her daily activities before the accident. Besides, if considering this behavior suiciding, investigators will be unable to explain the accelerated breath before the steep climb.

Investigators then incorporated with local police to check the (inferred) pilot's social media. It also showed no sign of suiciding intention.

In the former section, investigators mentioned suspect of extreme working pressure that caused loss of rationality.

Investigators have re-examined CVR audio and performed FFT to tell different frequency of voices. After that, investigators found a high-frequency voice speaking unreadable words 42 seconds before the steep input and lasted until the end of recording, which was similar to a background voice in the phone call made by the pilot 14 days before the accident. Regarding unusual signs such as significant sound of breath, investigators agreed that it might be erosion or schizophrenia that made the pilot lost consciousness. However, investigators couldn't determine the detailed scene of erosion so far.

With the fact of existence of erosion or schizophrenia revealed, investigators couldn't exclude the possibility of the pilot conducting an attack to the city (like a terrorist attack) due to mental diseases, given that a skillful pilots must have understood the aerodynamic performance.

Given that CVR actually didn't record any sign of fighting, investigators excluded the possibility of two (or more) people fighting for control.

2.2.5 Further Response to Spin

Investigators calculated the acceleration caused by the steep climb. It turned out that the average acceleration was approximately +1.7g to +2.1g, which can be suffered by trained pilots.

By comparing the pilot's input to normal BAE 146 pilot's roll-out input, investigators found out that the input was only approximately 65% of the actually needed input. This, as a consequence, made it impossible to roll out from the initial stall and brought the aircraft into a deeper stall, just like the result of flight simulation with input weakened by approximately 50%.

Investigators agreed that the effect of erosion or schizophrenia continuously existed during the accident, which was what the pilot continuously attempted to against with during the whole flight and was the actual cause of flight control issue, as what she expected and what the aircraft actually responded, i.e., she actually input, differed. Given that erosion or schizophrenia influences consciousness and the emergency situation caused by stalling, it's difficult for the pilot to find out it was the erosion or schizophrenia that actually interfered her.

During the former investigators, RATSC has warned other airlines and aviation authorities

about the risk of pilots being eroded in flight[14]. However, given that the probability of pilots being eroded is not significantly high, the warning was neglected.

2.2.6 Possible Sources of Erosion or Schizophrenia

Investigators conducted deeper investigation to find out the actual causes of erosion or schizophrenia. Following materials are then collected:

- The pilot used to have a friend called Madoka Kaname or something similar (the Mitakihara Madoka Airport is actually named after her, according to one of the registered pilot's friends), and she later developed deeper relationship with the friend;
- Madoka was then seriously hurt or lost[15], which depressed the pilot and made her regretful.

Investigators now suspect that it is this memory that created erosion. However, limited by the lack of evidence, investigators couldn't be sure about the actual source of erosion or schizophrenia so far.

3 Conclusions[16]

3.1 Findings and Conclusions

So far, investigators have had following findings:

- The aircraft was well maintained, and the aircraft's engines and control columns operated normally during the whole flight;
- The actual pilot was not the registered pilot;
- The airport condition and meteorological condition didn't contribute to the accident;
- The pilot was unwilling to simply suicide;
- The pilot faced probable erosion or schizophrenia, which led to loss of consciousness and unexpected input (including steep climbing input and insufficient roll-out input), and
- Eventually, the pilot was unable to roll out from the deep stall state, partially due to the T-

[14] See *The Third Edition of Final Report of The Guardian Wing Corps 3W-CHT Accident over Gomag on November 25th, 2012* (RATSC, July 2014).
[15] The pilot's friend had different accounts. Therefore, investigators could not determine the actual fact.
[16] This report is primary report. Therefore, conclusions might be updated or even completely changed in further updates. Please wait for final report for final conclusions.

shape tail design of the aircraft.

3.2 Unknown Aspects

So far, investigators are still unsure about details or facts of following aspects:

- The actual composition of people on board, if there's more than one, and relationship among them;
- The actual motivation of the pilot conducting the flight;
- The actual reason of symptoms, erosion or schizophrenia;
- The detailed relationship between the phone call and the flight;
- The source and actual use of the feathers found in the crash site;
- The actual source of erosion or schizophrenia of the pilot;
- The source of blood in the cabin area, and
- The actual sender of telegraph after the accident.

4 Safety Recommendations

4.1 To Aviation Authorities

Investigators recommend that aviation authorities should re-evaluate registered pilots' qualifications and evaluate their risk being eroded or having schizophrenia, which can be done by professional medical examination. For the pilots at high risk, medical assistance is recommended.

Investigators also recommend that aviation authorities might develop procedures to reduce the influence of crew members' in-flight erosion. For example, in case of erosion, pilots are recommended to inform each other and release the yoke/stick immediately, in order to prevent unexpected input.

Response (on November 9th, 2024)**:** A recognition of whether pilots are facing risk of erosion or other mental diseases is being conducted by aviation authorities. There are currently (until

the release of this updated report) 9 pilots recognized and advised to temporarily suspend flying, according to statistics of aviation authorities.

4.2 To Airport Management

This accident and a former severe incident happened in Scarborough[17] have pointed out the importance of improving airport security procedures. For this accident, it is recommended for all airports to examine the pilots' identity more carefully in order to prevent individuals holding licenses that not belonging to them to pass security check in crew member channels.

Response: Mitakihara Madoka Airport and 34 similar airports have added independent crew member channel requiring biological check to replace old crew member channels. Testers from RATSC failed to use the same bug of procedure again on November 21st, 2024.

Investigators also suggest that Mitakihara Aviation Platform should upgrade to HTTPS and enable SSL and other encryptions to ensure data integrity and security.

Mitakihara November 23th, 2024

[17] See *Final Report of The Guardian Wing Corps Seniorious SEN-001 Severe Incident in Scarborough on March 22nd, 2010* (RATSC, January 2011).