

AA2011-7

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

GIFU AIR RESCUE TEAM

J A 9 6 G F

October 28, 2011

Japan Transport Safety Board

The objective of the investigation conducted by the Japan Transport Safety Board in accordance with the Act for Establishment of the Japan Transport Safety Board and with Annex 13 to the Convention on International Civil Aviation is to determine the causes of an accident and damage incidental to such an accident, thereby preventing future accidents and reducing damage. It is not the purpose of the investigation to apportion blame or liability.

Norihiro Goto
Chairman,
Japan Transport Safety Board

Note:

This report is a translation of the Japanese original investigation report. The text in Japanese shall prevail in the interpretation of the report.

AIRCRAFT ACCIDENT INVESTIGATION REPORT

**GIFU AIR RESCUE TEAM
BELL 412EP (ROTORCRAFT), JA96GF
TAKAYAMA CITY, GIFU PREFECTURE, JAPAN (NEAR MT.
OKUHOTAKA-DAKE OF NORTHERN ALPS)
AT ABOUT 15:22 JST, SEPTEMBER 11, 2009**

October 17, 2011

Adopted by the Japan Transport Safety Board

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1. PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Accident

On September 11 (Friday), 2009, the BELL 412EP, registered JA96GF (No. II Wakaayu), operated by the Gifu Air Rescue Team, took off from Gifu Air Base for a rescue activity at 14:09 Japan Standard Time (JST: UTC+ 9hr, unless otherwise stated all times are indicated in JST on a 24-hour clock) and crashed at about 15:22 during the rescue activity near a mountain trail at the so-called Roba-no-mimi (the donkey's ear) located near Gens d'Armes of Mt. Okuhotaka-dake of the Northern Alps Mountains of Takayama City, Gifu Prefecture.

Three of the five persons aboard the aircraft, the captain, a mechanic and a firefighter, excluding the two who descended from the aircraft at the rescue site, were dead.

The aircraft was destroyed and a fire broke out.

1.2 Outline of the Accident Investigation

1.2.1 Investigation Organization

On September 11, 2009, the Japan Transport Safety Board designated an investigator-in-charge and two investigators to investigate this accident.

1.2.2 Representatives from Foreign Authorities

An accredited representative of the United State of America, as the State of Design of the aircraft involved in this accident, and an accredited representative of Canada, as the State of Manufacture of the aircraft involved in this accident, participated in the investigation.

1.2.3 Implementation of the Investigation

September 12 to 18, 2009	On-site investigations and interviews
September 19, 2009	Interviews
October 29 to 31, 2009	Aircraft examinations
February 8 to 10, 2010	Interviews

1.2.4 Interim Report

On January 28, 2010, an interim report based on the results of the fact-finding investigation up to that date was submitted to the Minister of Land, Infrastructure, Transport and Tourism, and made public.

1.2.5 Comments from Parties Relevant to the Cause of the Accident

Comments were invited from parties relevant to the cause of the accident.

1.2.6 Comments from the Relevant States

Comments on the draft report were invited from the relevant States.

2. FACTUAL INFORMATION

2.1 History of the Flight

At 14:09 on September 11, 2009, the BELL 412EP, registered JA96GF (hereinafter referred to as “the Aircraft”), operated by the Gifu Air Rescue Team, took off from Gifu Air Base with five persons—a captain, a mechanic (hereinafter referred to as “the Mechanic A”), the Air Rescue Sub-Chief (hereinafter referred to as “the Sub-Chief”) and two firefighters (hereinafter referred to as “the Firefighter A” and “the Firefighter B”)—aboard, for the rescue of a mountaineer who had a cardiac pulmonary arrest (hereinafter referred to as “the Rescue-Requiring Person”) at a mountain trail near the Roba-no-mimi located near Gene d’Armes of Mt. Okuhotaka-dake of the Northern Alps Mountains of Takayama City, Gifu Prefecture. Before arriving at the site, the Aircraft picked up a physician at the Takayama Helipad Operation Site (hereinafter referred to as “Takayama Helipad”), and at about 14:50, it arrived at the Nabedaira Helipad Operation Site (hereinafter referred to as “Nabedaira Helipad”), where the physician and the Firefighter A disembarked from the Aircraft. Instead of the two persons, a police officer of the Gifu Prefectural Police Mountain Rescue Team (hereinafter referred to as “the Mountain Ranger A”) boarded the Aircraft there. Then, the Aircraft took off for Mt. Okuhotaka-dake at 14:51 with a total of five persons on board.

The outline of the flight plan for the Aircraft from Nabedaira Helipad onward was as follows:

Flight rules: Visual flight rules (VFR), Departure aerodrome: Nabedaira Helipad,

Estimated off-block time: 15:00, Cruising speed: 100 kt, Cruising altitude: VFR,

Route: Nishihotaka-dake, Destination aerodrome: Gifu Air Base,

Total estimated elapsed time: 1 h and 10 min, Fuel load expressed in endurance: 1 h and 29 min, Number of persons aboard: 5, Passenger Stop site: Nabedaira Helipad

The flight plan above was a version changed after the Aircraft’s take-off from Gifu Air Base. Under the original flight plan, the Aircraft was to leave Gifu Air Base and return there via Nishihotaka-dake.

The history of the flight up to the occurrence of this accident was summarized in 2.1.1 to 2.1.3, on the basis of statements by persons involved, materials submitted by the Disaster Prevention Aviation Center of Gifu Prefecture (hereinafter referred to as “the Center”) and the Takayama Fire Department of Gifu Prefecture (hereinafter referred to as “the Takayama Fire Dept.”) as well as interviews of officers at the Takayama Police Station of Gifu Prefecture (hereinafter referred to as “the Takayama Police Station) and statements by the chief of the Gifu Prefectural Police Aviation Unit (hereinafter referred to as “the Prefectural Police Aviation Unit”) and one of its officers (hereinafter referred to as “Prefectural Police Aviation Unit Officer A”)

2.1.1 The History of Events from Emergency Call Up to Report on the Aircraft’s Crash

About 13:34 The Matsumoto Regional Fire Bureau*¹ of Nagano Prefecture (hereinafter referred to as “the Matsumoto Fire Bureau”) received an emergency call for rescue from a mountain guide that a 66-year-old man had collapsed while climbing at Gens d’Armes of Mt. Okuhotaka-dake of the Northern

*¹ The Matsumoto Regional Fire Bureau of Nagano Prefecture is a fire Dept. operated by the Matsumoto Extended Association, rather than an organization set up under the prefecture as an ordinary local government. The Matsumoto Extended Association, which combines three cities and five villages—Matsumoto City, Shiojiri City, Azumino City, Yamagata Village, Asahi Village, Chikuhoku Village, Omi Village and Ikusaka Village, is a regional administrative association and a special local public body designated under the Local Autonomy Act (Article 1-2, Clause 3, Article 248, Clause 1, and others). A fire Dept. is a fire fighting organization established by cities, towns and villages, part of administrative cooperatives or regional administrative bodies in accordance with the Fire and Disaster Management Organization Act (Article 9, Clause 1).

Alps Mountains and relayed the request to the Takayama Fire Dept..

About 13:35 The Takayama Fire Dept. made its first call for rescue request to the Center that a 66-year-old man had collapsed due to a cardiac pulmonary arrest while climbing at Gens d'Armes of Mt. Okuhotaka-dake of the Northern Alps Mountains.

After the Center received the call, the captain started collecting necessary information for rescue and made an inquiry about whether a rescue request had been received by the Prefectural Police Aviation Unit.

Because no request had been made to the Prefectural Police Aviation Unit, Prefectural Police Aviation Unit Officer A made an inquiry with the Takayama Police Station whether the office had received any request and he confirmed that the office had received none.

About 13:36 The Takayama Fire Dept. obtained information about the exact whereabouts of the Rescue-Requiring Person (Latitude 36° 17' 09.32"N, Longitude 137° 38' 51.45"E) from the Matsumoto Fire Bureau.

About 13:39 The Takayama Fire Dept. gave the related information upon the rescue request to the Takayama Police Station and told the office that a notice had already been made to the Center.

About 13:47 Prefectural Police Aviation Unit Officer A went to the Center, located next to the building which houses the unit, and tried to find out the source of the rescue request. The officer received a reply that a 66-year-old man had collapsed at Gens d'Armes of the Northern Alps. Then, he was told by the captain that the request had come from the Takayama Fire Dept. to the Center and received a request from the captain whether the Aviation Unit could provide one pilot for the rescue because the Center would deal with the accident. Prefectural Police Aviation Unit Officer A told the captain that any decision cannot be made by himself alone and that the Takayama Police Station was considering what to do with the accident. He also said that two pilots shall be needed if the police office receives a rescue request. In reply, the captain said that the Center would deal with the accident because time should not be wasted.

About 13:54 The Center notified the Takayama Fire Dept. that it would deal with the rescue request.

About 13:56 The Takayama Fire Dept. received a notice from the Center that the Aircraft would be dispatched for rescue and sent a dispatch request sheet for an emergency flight to the Center.

The Center received the request sheet and sent it back to the Takayama Fire Dept. and then, the Aircraft's dispatch was formally decided.

About 13:57 The Aircraft's flight plan was submitted to the Civil Aviation Bureau (CAB) of the Ministry of Land, Infrastructure, Transport and Tourism.

About 14:00 The Manager of the Disaster Prevention Aviation Center (hereinafter referred to as "the Manager") notified the Disaster Prevention Division of the Gifu Prefectural Government that the Aircraft would be dispatched for an emergency rescue operation.

About 14:02 Prefectural Police Aviation Unit Officer A informed the chief of the Aviation Unit, who was away on business, of the development that with the urgent event at Gens d'Armes, the Center was ready to deal with the accident and that the Aircraft was planned to depart with the captain alone. The chief of the Prefectural Police Aviation Unit, concluding that the rescue request would be difficult to handle for the Center, instructed the officer to notify the Takayama Police Station through the Takayama Fire Dept. that the Police Office would urge the Center to stop the dispatch because the Prefectural Police Aviation Unit would deal with the rescue request.

About 14:03 The chief of the Prefectural Police Aviation Unit inquired the Deputy Executive Director for Crisis Management of the Gifu Prefectural Government about the planned dispatch of the Aircraft. However he was not aware of the matter, then the chief explained that the Center was ready to handle the rescue request with a single pilot operation – the captain, and he recommended the Deputy Executive Director to try to persuade the Center from dispatching the Aircraft because the rescue site is a very difficult place.

About 14:08 Upon hearing the Aircraft's engine start, another officer of the Prefectural Police Aviation Unit (hereinafter referred to as "Prefectural Police Aviation Unit Officer B) hurried to the the Aircraft and asked the captain to wait telling him that Prefectural Police would deal with the accident. But the captain replied "We cannot wait" and departed.

About 14:09 The Aircraft took off from Gifu Air Base.

About 14:10 The Takayama Police Station told the Takayama Fire Dept. that Prefectural Police would deal with the rescue and asked the Head Office to try to persuade the Center from operating the Aircraft.

About 14:11 The Takayama Police Station asked the Center to leave the matter to Prefectural Police, but the Center replied that it would deal with the rescue as the Aircraft already took off at 14:09.

About 14:15 The Takayama Police Station, while noting that there was information that the person involved had a cardiac pulmonary arrest, told the Center to allow one mountain ranger to be aboard the Aircraft because the person's company must be interviewed and photos must be taken at the site.

About 14:30 The Center replied to the Takayama Police Station that the Aircraft would pick up the mountain ranger after adjusting the weight by unloading goods and personnel.

About 14:37 The Aircraft took off from Takayama Helipad after picking up a physician there.

About 14:51 After the Aircraft arrived at Nabadaira Helipad, the physician disembarked from the Aircraft to stand by. The Firefighter A also disembarked from the Aircraft and instead, the Mountain Ranger A boarded the Aircraft and then the Aircraft took off from Nabadaira Helipad.

About 14:52	The change in the Aircraft's flight plan was submitted to the CAB.
About 15:03	The Aircraft arrived over the rescue site. The Firefighter B and the Mountain Ranger A descended from the Aircraft with the hoist and then, the Aircraft temporarily left the site.
About 15:10	The Firefighter A monitored a radio transmission from the Aircraft while standing by at Nabadaira Helipad and visually confirmed the Aircraft in flight. The message said, "Understood to rescue with the evacuation harness and when we reenter the clouds above are thick."
About 15:20	The Center tried to confirm with radio how the operation was going, but there was no reply from the Aircraft.
About 15:24	The Mountain Ranger A, who was engaged in rescue work at the site, made an initial report to the Takayama Police Station that the Aircraft has crashed.
About 15:30	The Center obtained the initial report from the Takayama Police Station that the Aircraft has crashed.

2.1.2 The History of the Aircraft's Flight from 15:00 On

Photos taken by several mountaineers who happened to be near Mt. Okuhotaka-dake and Mt. Karasawa-dake on the day of the accident were offered to the Takayama Police Station as eyewitness information. The history of the Aircraft's flight from 15:00 on based on the photos images information is as follows:

About 15:00	The Aircraft was flying eastwardly on the northern side of Gens d'Armes (the Gifu Prefecture side) at an altitude lower than its top.
About 15:03	The Aircraft approached a place near the col of Roba-no-mimi and while its nose was directed to the north to north-northeast, The Firefighter B and the Mountain Ranger A descended from the Aircraft.
About 15:04	While descending northwardly on the western side of Gens d'Armes from an altitude around the height of its top, the Aircraft passed near the northern side of Roba-no-mimi and then, flew with its nose directed to the north.
About 15:06	The Aircraft flew to the northeast on the northern side of Gens d'Armes and passed near a stream beneath Roba-no-mimi.
About 15:09	The Aircraft was flying eastwardly halfway up the mountain on the northwestern side of Gens d'Armes.
About 15:11	The Aircraft was flying over near Mt. Hotaka-dake Hut and then flying over near the peak of Mt. Okuhotaka-dake.
About 15:15	While directing itself to the north to north-northeast over near the rescue site, the Aircraft was flying with its right-side sliding door open.

2.1.3 Statements by Firefighter, Mountain Ranger and Eyewitnesses

(1) The Firefighter B

When I went to our office to report the end of a 25-hour check of the Aircraft, the Sub-Chief told me that a rescue-requiring event had occurred at the Northern Alps. At that time, the Prefectural Police Aviation Unit officer was talking to the captain, seemingly for some adjustments. Their discussion indicated that the Prefectural Police Aviation Unit had

not been aware of the occurrence of the accident at that time. The captain was asking the Prefectural Police Aviation Unit officer whether a Prefectural Police Aviation Unit pilot was ready to board the Aircraft as its copilot, but I think the officer was replying that it would be difficult to comply with the request because the Prefectural Police Aviation Unit had only two pilots available on that day. After that, it was decided to dispatch the Aircraft.

As the Aircraft was running its engines for take-off, after the preparations for departure, the Prefectural Police Aviation Unit Officer B came to the Aircraft and talked to the captain about something. But I could not hear what they were talking about. After the Aircraft took off, the Sub-Chief asked the captain if there was any problem with the matters he just discussed with the Prefectural Police Aviation Unit officer and then, the captain replied, "Because the matter has already been adjusted..." While the Aircraft was flying, we received a report that a mountain guide would wave something yellow at the site and the Rescue-Requiring Person is contained in a red sleeping bag.

After arriving at Nabedaira Helipad, the physician and the Firefighter A disembarked from the Aircraft and instead, the Mountain Ranger A boarded the Aircraft. We flew toward the rescue site with the guide of the Mountain Ranger A. I decided to do rescue work by myself with the guide of the Mountain Ranger A. After spotting the Rescue-Requiring Person and his company, we determined the rescue point and checked the Aircraft's power (to confirm the availability of its surplus output for hovering) just before descending, while temporarily hovering on the side of Gifu Prefecture. And then, we moved to the descent target point and made a hoist descent. I felt the altitude when I descended was slightly higher than usual. I think it was about 80 ft. After the descent, I moved to the place where the Rescue-Requiring Person was, after confirming the Aircraft's breakaway from the site.

After arriving at the site, I checked the condition of the Rescue-Requiring Person and informed the Aircraft with radio of our plan to lift the person with the evacuation harness. After finishing preparations for the lifting, I instructed the Aircraft to make a reentry and confirmed whether there was any problem with the present location. The Sub-Chief replied, "Roger. We will try." Then, the Aircraft came to approach the place after passing over the ridge of a precipice from the side of Nagano Prefecture, with its nose directed to the north to north-northeast. When it came just above the Rescue-Requiring Person, the Aircraft lowered its altitude and then, while flying sideways northwestwardly, it temporarily left the site. When the Aircraft moved to the farthest point from my place, I think its heading was directed to some extent toward my position. When the Aircraft came to the rescue site again, I was fixing my eyes on the hoist hook (hereinafter referred to as "the Hook"). The Hook came close to my place from the side of the valley, but I could not see the Aircraft itself because I was watching the Hook. I could not easily catch the Hook because it was dancing around me as far away as 5 m. Because I supposed it would be difficult for those aboard the Aircraft to observe the distance between the Hook and me, I issued instructions to them with radio, saying, for example, "Lower it by another 2 m" or "Maintain present height." Then, the Hook dropped toward the side of the valley so suddenly that I temporarily lost its sight, or conversely, the Hook floated gently up. Because the swing of the Hook did not come to a halt, those aboard the Aircraft appeared unable to follow my instructions, and I thought it was taking too much time compared to usual rescue work. The guide also tried to catch the Hook with his hands, but to no avail. Later, I could finally catch the Hook and fixed the carabiner of the Rescue-Requiring Person and mine on the Hook. When I was about to ask for lifting

after confirming the condition of the carabiners, the hoist cable came to sag behind me just like winding itself around my body. When I tried to give a sign for lifting after shifting the sagging hoist cable to my side, I heard a bang above me. When I looked up in response, I saw the Aircraft in an unnatural attitude in a thin mist with its body apparently placed sideways. I did not release the Hook immediately, but because the hoist cable above the Hook began to swing violently both ways, I detached the carabiners from the Hook and released the Hook. I did not see the Aircraft falling down. After the Aircraft crashed, I was momentarily thunderstruck. When I looked at the direction where it crashed, I saw the things which had been on the Aircraft widely scattered around. I tried to make an emergency call to Nabadaira Helipad with radio, but it was not working. My mobile phone was also out of the service area. When I descended to the valley, I saw the Aircraft burning at a place beneath. Later, I climbed up, and I saw the Mountain Ranger A making a call with his mobile phone.

The weather was good when the mountain ranger and I descended from the Aircraft. I think a thin mist was passing when we were making rescue work, but the Hook was visible. The closer the hoist cable get near to the Hook, the further away it appeared to have carried away to the side of the valley from the rock face.

Hoist training is usually made with a height of 70 ft, but I think the altitude was higher than usual at that time. When I caught the Hook and fixed the carabiners on the Hook, I felt the hoist operator was adjusting the hoist cable to keep a surplus length on the cable. But when I looked at the way in which the hoist cable was sagging, I thought it was sagging, not because a surplus length was controlled by the hoist operator, but because the altitude of the Aircraft was lowered.

I had no unusual feeling or fear about the latest flight to the Northern Alps Mountains. I only felt that we, firefighters, not Prefectural Police Aviation Unit staff, would deal with the rescue mission this time.

(2) The Mountain Ranger A

I was on duty at the Okuhida police box (small police station) near Nabadaira Helipad on that day. In the afternoon, I received word from the Takayama Police Station that a rescue-requiring event had occurred near Gens d'Armes. I called Hotaka-dake hut and tried to confirm actually what happened. People at the hut were not aware of the event. But they replied they were ready to go to the site if necessary. I conveyed this to the Takayama Police Station. Later, I was informed by the Takayama Police Station that a 66-year-old man collapsed while climbing near Gens d'Armes, and the Aircraft was ready to be dispatched. I was asked to relay this information to the employees at the hut and ask them to go to the site. I immediately conveyed the request to the hut. An employee at the hut told me that it would be desirable to dispatch a helicopter from the more experienced Prefectural Police Aviation Unit, rather than the Aircraft, and I relayed this desire to the Takayama Police Station. But I was told that the Aircraft had already been dispatched. I was also instructed to board the Aircraft at Nabadaira Helipad and go to the site to interview persons involved and take photos there. So, I immediately went to Nabadaira Helipad.

I waited for the Aircraft at Nabadaira Helipad. After its landing, the physician and the Firefighter A disembarked from the Aircraft and instead, I boarded the Aircraft and then it took off. Because I was asked by the captain about the location of Gens d'Armes, I guided the Aircraft to the site. The weather was fine and the visibility was good at that time. The ridge lines were clearly seen and we could see Gens d'Armes straight ahead. We could confirm the

Rescue-Requiring Person when we arrived at a place near Gens d'Armes. The captain made a power check hovering away from the mountain.

It was decided that the Firefighter B and I would descend from the Aircraft for rescue work, interviews and picture shooting. The Aircraft approached the rescue site while watching the mountain ridge to the left and then, the captain asked us for confirmation, "Can you descend down there?" After that, the Firefighter B and I made a hoist descent from the Aircraft and went to the place where the Rescue-Requiring Person was. The Firefighter B fixed rescue gear and others to the body of the Rescue-Requiring Person, while I took photos of the site. After we finished preparations for pickup, the Aircraft came to our place from the side of Nagano Prefecture. The Hook came down, but we could not easily catch it because it kept dancing around and its movement did not become stable. After a while, the Firefighter B could catch the Hook and then, we knelt down and took a wind-enduring posture to ease a downwash. I think it was just after that. I heard a dry bang-like sound from above, therefore I looked up and I saw the Aircraft falling toward us along with pieces of rocks and others. I ducked out of fear that I would also be hit by the falling objects, but the Aircraft fell down over my head diagonally from the right to the left. Later, the Aircraft hit the rock wall and fell just like sliding down on the slope to the stream. I tried to call the Takayama Police Station with my mobile phone, but it could not be connected immediately due to the poor connection. I moved to a different place and from there, I could call the Takayama Police Station at 15:24. It was about 15:22 when the Aircraft crashed.

(3) Mountain Guide

The latest walk tour traversing along the ridge of Mt. Okuhotaka-dake was joined by 10 attendants. On the day of the accident, we left Nishiho Hut early in the morning, expecting to reach Hotaka-dake Hut via Mt. Nishihotaka-dake and Mt. Okuhotaka-dake. Around the time when we were passing a place near Gens d'Armes of Mt. Okuhotaka-dake in the afternoon, a person at the rear of our party suddenly collapsed. When I checked his condition, he was in cardiac pulmonary arrest. I tried to call police for rescue with telephone, but the line could not be immediately connected. After I tried several times, I had a successful connection to a fire fighting office and asked for rescue. I urged other members of our party to stay near the col, a place a little ahead from there. We waited there for a while and then, we saw two persons from the Hut come to our place. The Aircraft also came to us and two persons descended from the Aircraft at a place near the col and they climbed up to our place. While the rescuer was making preparations for pickup, the Aircraft disappeared from our sight. But it returned again when preparations were completed. The Aircraft was directing its heading toward Mt. Okuhotaka-dake. Although the Hook came down near the Firefighter B and he tried to catch it, the Hook did not come within his reach, swaying far to the side of the valley or going up and down erratically. The Firefighter B gave signs many times to the Aircraft from down there, but I think it took about five minutes for him to catch the Hook. Initially, the Aircraft's altitude was seen lower and close to us, but later I felt the Aircraft was adjusting itself increasing its altitude. The Aircraft did not shake violently during this process, but it was moving constantly. I think this was because the Aircraft was moving in order to adjust the position of the Hook. Just after the Firefighter B caught the Hook, I heard a big sound above us and we saw the Aircraft falling straight down along with pieces of rocks and others.

No particularly unusual behavior was felt with the Aircraft while it was hovering. The

wind was blowing from the side of Gifu Prefecture, but it was not strong. There was no gust of wind, either. Thin clouds were seen from time to time, but there was not so thick a cloud as to hinder the rescue work.

(4) An Employee of the Hut (hereinafter referred to as “the Hut Employee A”)

I received a telephone call from the Mountain Ranger A and I came to know that a rescue-requiring event had occurred near Gens d’Armes and that the Aircraft would be dispatched for rescue this time. Because flight operations near Gens d’Armes require lot of experience and skill, I told the Mountain Ranger A that it would be absolutely advisable that well experienced Prefectural Police Aviation Unit personnel should fly aircraft, but I heard the Aircraft had already been dispatched.

I went to the site along with another employee of the hut to help locate the Rescue-Requiring Person and cooperate in rescue work. I arrived at the site at about 14:45. Later, the Aircraft came to the site and the Firefighter B and the Mountain Ranger A made a hoist descent from the Aircraft and climbed up to our place. At this time, the Aircraft was hovering with its tail boom directed toward the rock wall.

After preparations for rescue were complete, the Firefighter B called the Aircraft and it came in to the site again. While the Aircraft was hovering, the Hook came down. The Aircraft was hovering with its back directed at the rock wall, as was the case with the first time. As the Hook kept dancing vertically and horizontally, the Firefighter B could not catch it immediately. I think it took about five minutes for him to grab it. The Firefighter B finally caught the Hook. Because the hoist cable began to sag, I tried to keep it with my hand to avoid excessive expansion, considering it would otherwise be dangerous. I think the cable was let out by about 3 m. Later, I heard a bang above and when I looked up, the Aircraft was seen quickly pass away by my right side and fell toward the stream with its nose downward.

I cannot clearly remember the Aircraft’s altitude when it was hovering, but I think it was slightly lower than the top of Roba-no-mimi. I thought that the altitude was a little bit higher when a Prefectural Police Aviation Unit helicopter hovered at almost the same place last year. As the place is at a precipitous cliff, it is an unfavorable location for helicopter hovering. If possible, it is better to relocate a Rescue-Requiring Person to a better place, but the area around this mountain trail is a difficult place where climbers would easily slip down if handrail chains were unavailable. So, it is hard to relocate the Rescue-Requiring Persons from there.

(5) Member A of Mountaineering Tour

We, eight members except the collapsed person and the guide, were waiting at a place near the col with Gens d’Armes seen straight ahead. The helicopter initially came to our place from the side of Gifu Prefecture and after a circling the Aircraft descended two persons on a place very close to us and left the site. After a while, the Aircraft returned, this time from the side of Nagano Prefecture, and it hovered over the place and descended the hoist cable. But the two persons looked unable to catch the Hook quickly because it was dancing around. The helicopter was hovering throughout this time. A rescuer in yellow clothes was seen leaning his body out of the helicopter from the left side as seen from my position. Later, the Firefighter B managed to catch the tip of the hoist cable. I supposed relieved at that time, but just after that, I heard a big sound above and debris came down. The helicopter was seen falling headlong with its tail section lost.

The wind was blowing from the side of Gifu Prefecture, and fogs were seen climbing up

from the same side. Although there were fogs, they were not so thick as to affect the visibility. Fogs continued to disperse and reemerge. I felt nothing unusual with the sound of the helicopter's engine while it was hovering.

(6) Member B of Mountaineering Tour

I was with other members at the col and was sitting facing Roba-no-mimi. Rescue work started, hence, I felt relieved to see the Hook in the Firefighter B's hands, I heard an unusual sound. Almost at the same time, a pink-colored part on the aft side of the Aircraft appeared to come off and break. Because it was feared it to be torn apart and fly toward my position, I ducked my head. When the unusual sound was heard, though I'm not sure, I think the Aircraft was at a place lower than the top of Roba-no-mimi.

The accident occurred at about 15:22 near the so-called Roba-no-mimi of Mt. Okuhotaka-dake in Takayama City, Gifu Prefecture (Latitude 36°17' 16" N, Longitude 137°38' 41" E, an elevation of 3,148 m).

(See Figure 1-1 Estimated Flight Route, Figure 1-2 Estimated Flight Route, Figure 4-1 Layout of Accident Site, Figure 4-2 Layout of Accident Site, Figure 7 Layout of Related Locations, Figure 8 The Aircraft's Approach Path for Hovering before Start of a Hoist Lifting, Photo 1 The Accident Aircraft, Photo 4 Place Where the Rescue-Requiring Person Was, Photo 11 Evac Harness and Carabiners)

2.2 Injuries to Persons

The captain, the Mechanic A and the Sub-Chief were killed.

2.3 Damage to the Aircraft

2.3.1 Extent of Damage

Destroyed

2.3.2 Damage to the Aircraft Components

The fuselage and the cockpit Broken and seriously burned beyond recognition.

The main rotor blades (hereinafter referred to as "MRBs")

All of the four blades were fractured.

The engines Broken and burned.

The tail boom Severed at a point about halfway.

The tail rotor blades (hereinafter referred to as "TRBs")

Of the two blades, the red one was found fractured at a point about halfway, but there was no major damage to the white one.

(See Photo 5 Detached Tail Boom, Photo 6 TRBs, Photo 7 Engines, Photo 8 MRBs)

2.4 Personnel Information

Captain	Male, Age 57	
Commercial pilot certificate (Rotorcraft)		February 26, 1991
Type rating for Multi-turbine engine (land)		
BELL 212		September 26, 1997
Class 1 aviation medical certificate		

Validity	July 12, 2010
Total flight time	8,790 h 03 min
Flight time in the last 30 days	25 h 17 min
Total flight time on the type of aircraft	2,791 h 15 min
Flight time in the last 30 days	25 h 17 min

2.5 Aircraft Information

2.5.1 Aircraft

Type	BELL 412EP
Serial number	36124
Date of manufacture	March 22, 1996
Certificate of airworthiness	Dai-21-214
Validity	July 12, 2010
Category of airworthiness	Rotorcraft, Transport TA, TB or Special X
Total flight time	5,150 h 40 min
Flight time since last periodical check (25-hour check on September 11, 2009)	0 h 00 min

(See Figure 2 Three Angle View of BELL 412EP)

2.5.2 Engine

	No.1 Engine	No.2 Engine	Reduction Gear Box
Type	P. & W. C. PT6T-3D	3117400-01	P. & W. C.3117180-01
Serial number	CP-PS 140207	CP-PS 140206	CP-GP 11105
Date of manufacture	November 15, 1995	November 15, 1995	November 15, 1995
Total time	5,150h 40min	5,150h 40min	5,150h 40min

2.5.3 Weight and Balance

When the accident occurred, the Aircraft's gross weight is estimated to have been 9,283 lb and the center of gravity is estimated to have been longitudinally at 142.3 in aft of the reference point and laterally 1.5 in to the right of the airframe symmetry plane.

According to the manufacturer of the Aircraft, in the conditions of the altitude of 10,328 ft (the altitude where the MRBs hit marks were found), the outside air temperature of 4 °C, the generator working at 150A and the heater ON, the out of ground effect (OGE) hovering allowable maximum weight*2 was 9,318 lb; the weight and the center of gravity (CG) at the time of the accident were both estimated to have been within the allowable range (corresponding to the gross weight at the time of the accident: longitudinally 133.4 to 143.3 in aft of the reference plane and laterally within 4.5 in to the left and 4.5 in to the right of the airframe symmetry plane).

The gross weight just before the Aircraft descended the two persons after its arrival at the

*2 The out of ground effect hovering allowable maximum weight: The flight manual for the Aircraft has a remark in Article 5 titled "Aircraft Hovering Performance Limitation Chart (Figure 5-4)" which shows the OGE hovering maximum allowable weight with different combinations for the condition of the heater (ON/OFF), the barometric altitude and the outside air temperature. The weight involved in this report is defined as the OGE hovering allowable maximum weight. In the manual, two kinds of figures are shown for the weight. One of the figures means a weight based on a hovering performance with which the cyclic and directional maneuverability is fully verified with a relative wind velocity of up to 35 kt from any direction at a density altitude of 3,000 ft or lower. The other figure means a weight for a hovering performance when there is no wind or when the wind direction is out of the critical wind direction range. This report used the former figure for the weight.

rescue site at 15:03 is estimated to have been 9,849 lb, a figure that exceeds the OGE hovering allowable maximum weight. The gross weight when the Aircraft was hovering as of 15:19 before the lifting is estimated to have been 9,318 lb, a figure which is almost the same as the OGE hovering allowable maximum weight.

The maximum allowable wind velocity against the cross wind and the tail wind when the Aircraft was hovering is estimated to have been about 22 kt at a density altitude of 11,000 ft (the figure according to the density altitude chart for the Aircraft when its flying altitude is estimated at 10,300 ft and the outside air temperature at 4 °C). The critical relative wind direction range*³ for the Aircraft was 30° to 95° on its front right side (the pedal critical wind direction) and 180° to 270° on its rear left side (the longitudinal cyclic critical wind direction).

2.5.4 Changes in the Aircraft’s Allowable Maximum Weight in Accordance with its Flight History

Changes in the Aircraft’s allowable maximum weight and its residual fuel load from its takeoff from Gifu Air Base to its crash are shown in the table below.

According to the Center, the Aircraft’s average fuel consumption per hour is estimated to have been 709 lb (based on the fiscal 2008 records). The figures were used in calculations in the table below. For the operation of the Aircraft, the Center had estimated its per-hour fuel consumption in its daily flight at 720 lb including a safety leeway.

(Weight unit: lb)

Time	Condition	Allowable Maximun Weight	Residual Fuel Load
14:09	Takeoff from Gifu Air Base	10,487	1,560
14:37	Takeoff from Takayama Helipad	10,310	1,229
14:51	Takeoff from Nabedaira Helipad	9,990	1,064
15:03	Hovering just before 2 members descend	9,849	922
15:19	Hovering before start of the lifting	9,318	733
15:22	Crash	9,283	697

2.5.5 Fuel and Lubricating Oil

The fuel was Aviation Jet A-1 and the lubricating oil was MIL-PRF-23699.

2.6 Meteorological Information

2.6.1 General Information

According to the Asia-Pacific Surface Analysis Chart as of 15:00 on September 11, areas around Japan had been widely covered with high pressure systems located in the East China Sea and far to the east from Japan.

The weather chart in terms of 850 hPa at an altitude of 1,500 m as of 9:00 on September 11 showed a wind of 15 kt from the west-southwest at Wajima and a wind of 10 kt from the southwest at Tateno. The weather chart in terms of 700 hPa at an altitude of 3,000 m showed a wind of 25 kt from the west at Wajima and a wind of 10 kt from the northwest at Tateno. In the Chubu-Tokai region, the dew point was low in a dry condition. The humid area in which the temperature and the dew point had a difference of 3 °C or less had not been analyzed on either of the two weather charts

*³ The critical relative wind direction range denotes a critical wind direction range in which the pedal and longitudinal cyclic operations are influenced.

for the Chubu-Tokai region.

A wind profiler at Nagoya had observed a wind of 15 kt from the west at around an altitude of 3,000 m as of 15:20 on September 11.

2.6.2 Weather at Hotaka-dake Hut

Hotaka-dake Hut is located at an elevation of 2,983 m and about 700 m north-northeast of the accident site. An observation by the Hut Employee with a bane anemometer at around 14:00 showed a wind of 10 to 12 kt from the west. The weather was good and clouds were sporadically seen, according to the employee.

2.6.3 Weather at Yarigatake Hut

Yarigatake Hut is located at an elevation of about 3,000 m about 6 km north of the accident site. Meteorological observations around the time of the accident were as follows:

The temperature was about 4 °C around the time.

	Average Wind Velocity	Direction	Maximum Momentary Wind Velocity	Direction
15:10	4.0 kt	west-southwest	10 kt	southwest
15:20	5.0 kt	west	12 kt	southwest
15:30	5.0 kt	southwest	10 kt	west

2.6.4 Weather in Mountainous Areas

Generally speaking, mountainous areas are liable to the influence of the so-called Mountain and Valley Winds which blows from the valley to the top of the mountain in the daytime and blows down to the plains at night.

Because sloping areas on the mountain face to the sun almost vertically compared to the level ground, they can be easily heated by the sunlight in the daytime. As a result, the temperature on these slopes tends to be higher than those at the valley or the level ground at the same height, and heated air become lighter and climbs along the slope to create an upward current. As the sun goes up, the valley will also be heated by the sunlight and as a result, the average temperature there also becomes higher than at the level ground, prompting winds to come up to the top of the mountain from the plains via the valley accompanied humid air in the valley. This wind is called “Valley Wind” while humid air in the valley is cooled during soaring process and generates clouds up above the mountain.

In particular, the climate at higher mountainous areas with an elevation of over 3,000 m (hereinafter referred to as “Higher Mountainous Areas”) is directly influenced by the weather condition at an upper layer and changes quickly. In these areas, weather quickly changes also due to strong winds which are free from the influence of abrasion with the ground and convective clouds caused by certain geographical features. This kind of Higher Mountainous Areas has complex geographical features, such as a steep ridge and a line of ridges facing a deep valley. Therefore, winds in these areas are influenced by such geographical features and the wind direction and strength change erratically

2.6.5 Condition for Emergence of Clouds in the Area around Roba-no-mimi

Pictures taken by several mountaineers who happened to be near Mt. Okuhotaka-dake and Mt. Karasawa-dake on the day of the accident were offered to the Takayama Police Station of Gifu

Prefecture as eyewitness information. The condition in which clouds emerged from about 14:00 to about 15:18 around Roba-no-mimi, as indicated by the pictures, is as follows:

About 14:17 to 14:31

According to a picture taken near the peak of Mt. Okuhotaka-dake, clouds were seen around Roba-no-mimi just like surrounding its top on both the Nagano and Gifu prefectures sides.

About 14:40 to 14:57

Clouds disappeared at place from the stream beneath to the top on the side of Gifu Prefecture, while on the side of Nagano Prefecture, clouds remained at around the top.

About 15:00 to 15:04

According to a picture taken near the peak of Mt. Karasawa-dake, thin clouds had emerged west of Gens d'Armes and northeast of Roba-no-mimi on the side of Gifu Prefecture.

About 15:06 to 15:09

According to pictures taken near the peak of Mt. Karasawa-dake, clouds began to emerge from the side of Gifu Prefecture of Roba-no-mimi. A place around Roba-no-mimi had been completely enveloped with clouds at around 15:07 and west of the place a cumulus-like cloud had emerged at an altitude higher than the top. By about 15:09, the cloud had disappeared on the side of Gifu Prefecture of Roba-no-mimi from its middle point to its top.

About 15:14 to 15:18

According to a picture taken from near the peak of Okuhotaka-dake, a place near Roba-no-mimi was enveloped with a thin cloud. A picture taken near the Shiradashisawa forests also shows a thin cloud hanging over around Roba-no-mimi at around 15:18.

(See Figure 5 Asia-Pacific Surface Analysis Chart, Figure 6 Upper Analysis Chart, Photo 10 Pictures of Clouds)

2.7 Accident Site and Wreckage Information

2.7.1 Accident Site

(1) Accident Site

This accident occurred near the so-called Roba-no-mimi northeast of Gens d'Armes of Mt. Okuhotaka-dake. The top of Roba-no-mimi has an elevation of about 3,152 m and there is a cliff about 9 m north of the top. With the height of its edge about 3,150 m high, the cliff extends from the east to the west. Just to the northeast from Roba-no-mimi toward Mt. Kitahotaka-dake, there is a V-shaped place and ahead of the place, a mountain ridge extends beyond. The distance between the two points is about 100 m.

As far as the shape of the rock walls at the accident site is concerned, a rock wall extending from the east to the west (hereinafter referred to as "the East-West Rock Wall") with an elevation of about 3,150 to 3,136 m lies to the southwest from the place of the Rescue-Requiring Person, and east of this rock wall, there lies another rock wall extending from the north to the south (hereinafter referred to as "the North-South Rock Wall") with an elevation of about 3,130 to 3,120 m to the southeast from the place of the Rescue-Requiring Person. The two rock walls form the L-shaped. The mountain trail where the Rescue-Requiring Person was is located at the northeastern end of an area surrounded with an L-shaped rock walls. The elevation of the place was about 3,108 m, about 44 m below the top of Roba-no-mimi.

The hit marks left by the MRBs were found at the tip of a rock north-northwest of the

top of the East-West Rock Wall. The hit marks indicated the MRBs had hit the rock wall horizontally. There were no such hit marks on surrounding rock walls. Metal pieces of the tip of the MRBs were found stuck on the rock, while broken pieces of the blades had been widely scattered in the vicinity. The hit marks left by the blow of the MRBs were found at a place with an elevation of about 3,148 m, with a difference of about 40 m from the height of the place where the Rescue-Requiring Person was. The point right above the place where the person was and the place where the hit marks were found had a horizontal distance of about 21 m. The TRBs and the furthest part of the tail boom, which was about 4 m long, were found hanging on a rock on the North-to-South Rock Wall at a point about 11 m horizontally to the northeast from the place where the hit marks were found, with an elevation of about 3,128 m. The remaining parts and the airframe had fallen about 50 m almost straight down from the MRB hit marks. Other components of the fuselage had been scattered along the stream down the valley on the northern side. The floor structure of the airframe, including the engines, was found burning at a place down the valley.

The point right above the place where the Rescue-Requiring Person was and the face of the East-West Rock Wall had a horizontal distance of about 19 m. Assuming that the Aircraft was above the place of the Rescue-Requiring Person, the TRBs and the face of the East-West Rock Wall are estimated to have had a horizontal distance of about 9 m.

(2) Mountain Trail Where the Rescue-Requiring Person Was

The Rescue-Requiring Person was at a steep mountain trail with a width of about 3 m and a length of about 5 m between a cliff and a valley, and its elevation was about 3,108 m.

(3) Condition of Wreckage Scattering

The Aircraft had been separated into two parts—the furthest part of the tail boom and the fuselage—while it was crashing. The location of its major scattered components, with the distances from the place where the Rescue-Requiring Person was which is close to the crash point were as follows:

- (a) The blue MRB*⁴ was found at a place with a horizontal distance of about 38 m and an elevation of about 3,070 m.
- (b) The left side door was found at a place with a horizontal distance of about 42 m and an elevation of about 3,055 m.
- (c) The red and orange MRBs as well as the right side cargo door were found at a place with a horizontal distance of about 150 m and an elevation of about 2,960 m.
- (d) The transmission, the main rotor mast, the hoist motor, the main drive shaft and the green MRB were found at a place with a horizontal distance of about 170 m and an elevation of about 2,940 m.
- (e) The engines and the floor structure of fuselage were found at a place with a horizontal distance of about 250 m and an elevation of about 2,875 m.

(See Figure 4-1 Layout of Accident Site, Figure 4-2 Layout of Accident Site, Figure 7 Layout of Related Locations, Figure 9 Layout Showing Distance between TRBs and the East-West Rock Wall, Photo 2-1 Roba-no-mimi (1), Photo 2-2 Roba-no-mimi (2), Photo 3-1 Traces Left with the Blow of MRBs (1), Photo 3-2 Traces Left with the Blow of MRBs (2), Photo 4 Place Where the Rescue-Requiring Person Was)

*⁴ The four MRBs of the Aircraft had been color-coded in red, blue, orange and green to distinguish them from each other. The blue MRB is the blade color-coded in blue and hereinafter, in the same manner for other blades.

2.7.2 Aircraft Components

(1) Fuselage and Landing Gear

The fuselage was seriously damaged and burned due to the damage inflicted when it crashed and slid down, and nothing of the original form had been retained. The doors were found separated from the fuselage.

Of components for the landing gear, the cross-tube in the forward section had been retained to the fuselage but deformed, while the rear section had been detached from the fuselage. Both skids were found broken and detached.

(2) MRBs

The blue MRB had been broken into three parts at points about 2.5 m and about 5.5 m from the root. A section about 1.5 m long on the tip was not recovered. The orange MRB was found broken into three parts at points about 4 m and about 6.5 m from the root. A section of about 0.5 meter on the tip was not recovered. The red MRB was found broken into three parts at points about 2.1 m and about 5.5 m from the root, and a section of 1.5 m on the tip was not recovered. The green MRB was found broken into three parts at points about 2 m and 5.3 m from the root, and a section of about 1.7 m on the tip was not recovered. Of the green MRB, a section of about 2 m from the root and its hub were found retained to the main rotor mast, but the blue, orange and red MRBs had been broken and separated at the yoke.

(3) Engines

There were no distortion in the cases for the No.1 and No.2 engines, but the air intakes and exhaust pipes had been deformed and their outside had been burned.

The gas producer turbine for the No.1 engine was not manually rotated because the gear box had been deformed. But a bore scope inspection (BSI) found no abnormality with the turbine blades. The power turbine was rotated without a hitch, and a BSI found no abnormality with its turbine blades, either.

The gas producer and power turbines for the No.2 engine could be manually rotated without a hitch. A BSI found no abnormality with the blades for either of the gas producer and power turbines.

The combined gear box, connected to the power shafts of both engines, had been dropped.

(4) Transmission and Mast

Of the transmission components, the support case had been broken and detached from the mount. But it could be manually rotated without a hitch. There was no damage to the mast.

(5) Main Drive Shaft

The main drive shaft had been detached. The outer couplings on the left and right sides were found broken. The inner couplings for connection with the transmission had been broken, and some gear teeth had been lost in the rotational direction.

(6) Tail Rotor Drive Shafts

Of the tail rotor drive shafts, part of the gears in a section for connection with the transmission had been lost in the rotational direction. Among the six shafts, connected with each other in a series in the hanger assembly, two were found broken, just like wrenched off, in each middle point. The other shafts had been broken near each coupling points.

(7) Tail Boom

The tail boom had been broken and detached in a rivet-connected area about 3.7 m from the tail skid in the direction to the nose. In an area about 0.5 m backward from the opened part of the detached tail boom, outer skin had been broken from the upper part on the left side to the upper part on the right side.

Regarding details of the condition of the area where the tail boom was broken into two parts, right side outer skin was found torn with an apparent bending to the right, from the rear part to the front part of the airframe. There were a V-shaped bend with a force applied diagonally from the left above in the upper part on the left side, and cracks and distortion were found in outer skin around the bent area. In the opened area, rivet holes in the upper part of the left and right sides were found broken. But the lower part and the right side part remained with only rivets lost. The tail rotor mast cover in the area above was found crushed with abrasion marks. The bottom part remained almost intact, while the lower part of the vertical stabilizer was found severed by the TRBs.

(8) TRBs

Of the two TRBs, the red blade was found broken at around the middle point, but there was no major damage to the white blade. The red blade severed the lower part of the vertical stabilizer leaving its tip inside the stabilizer.

(9) Hoist Cable

The hoist cable was found fractured at four points, about 26 m, about 36 m, about 44 m and about 48 m respectively from the Hook end. The cross section of the broken cable looked torn off in three of the points which were closer to the Hook end, while the remaining point, about 48 m from the tip, had shown a sharply cut face just like done with a wire cutter. On the other hand, about 28.2 m of the hoist cable remained in the winder.

(See Figure 3 BELL 412EP Sketch and Damaged Part, Photo 5 Detached Tail Boom, Photo 6 TRBs, Photo 7 Engines, Photo 8 MRBs, Photo 9 Hoist)

2.8 Medical Information

According to an autopsy report prepared by Gifu Prefectural Police Headquarters, the cause for the captain's death was a traumatic rupture of the heart. Neither alcoholic content nor drug substance was found in his blood. The Mechanic A and the Sub-Chief died of cerebral contusion.

2.9 Search and Rescue Information

The developments in which the injured person and others were rescued after the accident is summarized below based on information provided by Gifu and Nagano Prefectural Police Headquarters.

After the occurrence of the accident, a report to the effect that the Aircraft had crashed, was sent from the Mountain Ranger A, who was at the accident site, to the Takayama Police Station, and it relayed the information to the Center.

Following the report, Wakaayu No. I (BK117) (hereinafter referred to as "the Aircraft No. I") of the Center and helicopters from the Prefectural Police Aviation Unit, the Nagano Prefectural Police Aviation Unit and the Toyama Prefectural Fire and Disaster Prevention Aviation Unit were dispatched for rescue to the accident site. Nagano Police Aviation Unit personnel arrived at the site ahead of others at about 16:23 and confirmed the scattered wreckage of the Aircraft and the burning fuselage down the stream at around 16:29. The rescue of the Firefighter B, the Mountain Ranger A and the Rescue-Requiring Person started at about 16:41. Their rescue was finished at

17:04, and they arrived at Nabadaira Helipad at 17:16.

The helicopter of Prefectural Police Aviation Unit hoisted down a few mountain rangers at a place about 20 m from the burning fuselage and returned to Nabadaira Helipad, and then, descended a few more mountain rangers with the hoist at a place 100 m above from the burning fuselage. They found the Aircraft's captain and the Mechanic A at about 17:08 at a place further above from the point for the second descent and at about 17:15, the Sub-Chief was found at a place further above. The bodies of the captain and the Mechanic A were transported to Nabadaira Helipad at about 17:23, while the body of the Sub-Chief was transported to Nabadaira Helipad at about 17:40. The three bodies were later transported to the Takayama Police Station. The three persons were confirmed dead at about 18:36.

2.10 Organizational and Management Information

2.10.1 Fire and Disaster Prevention Helicopters Owned by Local Governments

According to the Fire and Disaster Management Agency of the Ministry of Internal Affairs and Communications, a total of 55 local government-related organizations had been operating helicopters for fire fighting and rescue activities across the country as of July 2010, with 72 aircraft in their fleet. As to the formation of flight crews, 27 organizations have adopted a two-pilot operation system and the remaining 28 organizations a single-pilot operation system.

According to our survey of flight-related rules (an outline of flight operations and an emergency operation manual) prepared by a few local governments, the contents of many of them were similar to that of the manual adopted by Gifu Prefecture.

2.10.2 The Center

The Center belongs to the Disaster Prevention Division of the Crisis Management Department of Gifu Prefecture and has its base at Gifu Air Base in Kakamigahara City, Gifu Prefecture.

The Center has owned two disaster prevention helicopters—the Aircraft No. I and the Aircraft. The Aircraft No. I had been operated by a commissioned company since April 1994, while the Aircraft was introduced as a model for self operation in April 1997. In fiscal 2004, the Aircraft also started operating as a doctor helicopter which carries physicians directly to places where emergency live-saving activities must be done.

The operation system at the Center is registered in the Disaster Prevention Helicopter Operation Management Rule of Gifu Prefecture (hereinafter referred to as “the Rule”). Its personnel include the general manager, the operation manager, the manager of the Center, one back-office employee, two pilots and two mechanics, who are all employees of Gifu Prefecture, as well as 13 firefighters who are on loan from local fire fighting authorities in the prefecture. The Center had been staffed with 19 of them, led by the Manager of the Center.

The Aircraft was operated by the pilots and mechanics as prefectural employees who were mentioned above. Pilots, mechanics and an operation manager as employees of the commissioned company were in charge of the Aircraft No. I. The firefighters performed their duties boarding each of the two aircraft.

(See Figure 12 Structural Chart of Disaster Prevention Aviation Center of Gifu Prefecture)

2.10.3 Operational Management

Provisions related to the operation control and other matters for the Aircraft No.I and the

Aircraft had been registered in the Rule. They had been separated into clauses such as those for the operation system, operation control and safety management. (Excerpt)

Chapter 2 Operation System

Article 5 Overall responsibility for the operation control of aircraft rests with the Executive Director for Crisis Management (hereinafter referred to as “the Executive Director”).

Article 6 The Director of the Disaster Prevention Division (hereinafter referred to as “the Operation Control Manager”) shall be in charge of the personnel, budget and accounting affairs at the Aviation Center.

2. The Operation Control Manager shall process jobs related to the operation control of aircraft and to control operations in an appropriate manner, have necessary back-office staff stationed at the Center.

3. The Operation Control Manager shall have necessary personnel stationed at the Aviation Center to perform jobs for fire fighting and disaster prevention.

Article 7 The Manager of the Disaster Prevention Aviation Center (hereinafter referred to as “the Operation Control Supervisor”) shall be in charge of commanding and supervision as well as jobs related to the operation control of aircraft at the Aviation Center.

Article 8 In order to operate aircraft and carry out jobs for fire fighting and disaster prevention, the Gifu Air Rescue Team (hereinafter referred to as “the Air Rescue Team”) shall be established at the Aviation Center. The team shall consist of a management group, an operation group, a fire aviation group and a commissioned operation group.

1. (Omitted)

2. The operation group shall consist of pilots and mechanics as prefectural employees.

3. The fire aviation group shall consist of firefighters dispatched from fire fighting authorities in the prefecture.

4. The Air Rescue Team shall have an Air Rescue Chief and an Air Rescue Sub-Chief.

5. The Air Rescue Chief and the Air Rescue Sub-Chief shall be appointed from among members of the fire aviation group by the Director of the Disaster Prevention Division.

Article 9 The Air Rescue Chief shall direct and supervise the Air Rescue Sub-Chief and members of the Air Rescue Team to perform fire fighting and disaster prevention duties in a safe and effective manner.

Article 12 Pilots of the operation group, while on board Wakaayu II, shall perform operation control and fire fighting and disaster prevention jobs in a safe and effective manner, and direct and supervise personnel who are aboard aircraft for their duties.

Article 14 The operation commander’s post shall be filled by the Air Rescue Chief. But when the Air Rescue Chief is not on board the aircraft, the Operation Control Supervisor shall name an operation commander from among the Air Rescue Sub-Chief and members of the Air Rescue Team who are aboard the aircraft.

2. The operation commander, while on board the aircraft, shall direct and

supervise members of the Air Rescue Team to perform fire fighting and disaster prevention jobs thoroughly.

Chapter 3 Operation Control

Article 19 Aircraft shall be operated for activities mentioned below when their characteristics can be fully exploited and when a necessity for their use can be recognized.

(1) Emergency medical activities

a. Transportation of patients for first aid from villages, remote places and elsewhere

b. Transportation of physicians and medical equipment to places where injured and sick persons have emerged

(Omitted)

(2) Rescue activities

a. Search and rescue activities in water disasters in rivers, lakes and other places and accidents in mountains

(The rest is omitted)

(3) Fire fighting activities

a. Fire extinguishing from the air for fires in forests, fields and other places

(Omitted)

(4) Emergency fire-related activities

a. Activities to confirm the situation and collect information after such natural disasters as earthquakes, typhoons and torrential rains

(Omitted)

(5) Activities based on broader aviation fire fighting support and mutual aviation fire fighting and disaster prevention support

(6) Activities for disaster-related preventive measures

(Omitted)

(7) Activities for training own personnel

(8) Activities for general administrative affairs

(9) Other activities recognized as necessary by the Executive Director

Article 20 As far as operations for activities mentioned from Paragraph 1 to Paragraph 5 of Clause 1 in the previous article (hereinafter referred to as “the Emergency Operation”) are concerned, aircraft shall be dispatched based on requests or plans mentioned below.

(1) Operations for disasters mentioned in Article 1 of the Fire and Disaster

Management Organization Act (Act No. 226, 1947) shall be carried out

when a request is made on the basis of agreements with local governments (including part of administrative associations related to fire fighting jobs).

(Omitted)

Article 21 Emergency Operation shall have priority over ordinary operations.

- 2. The Operation Control Supervisor shall make a decision for the dispatch of an aircraft as quickly as possible when a situation which requires the Emergency Operation emerges and when an aircraft is in an ordinary operation, shall order the suspension of the ordinary operation and issue necessary*

instructions for the Emergency Operation.

Chapter 4 Safety management and others

Article 25 The Operation Control Supervisor, based on aviation-related laws and ordinances as well as the designation for operating limitation issued by the Minister of Land, Infrastructure, Transport and Tourism, shall establish a system to properly carry out fire fighting duties and take measures to prevent aviation accidents so that safety management will be properly maintained.

- 2. The Operation Control Supervisor, in carrying out fire fighting duties, shall strive to maintain thorough safety management while ensuring a proper execution of jobs or shared jobs by members of the Air Rescue Team and takes measures to prevent aviation accidents, and manage storage facilities for aircraft and other equipment in a proper manner.*

2.10.4 Disaster Prevention Helicopter Emergency Operation Guideline of Gifu Prefecture

The Disaster Prevention Helicopter Emergency Operation Guideline of Gifu Prefecture (hereinafter referred to as “the Emergency Operation Guideline”) stipulates necessary provisions regarding the Emergency Operation of disaster prevention helicopters. (Excerpt)

No.7 The Operation Control Supervisor, when a request is received for the Emergency Operation as registered in Article 5, shall decide on whether an aircraft should be dispatched or not, upon confirming the specific condition of a disaster involved and weather and other conditions at the accident site ... (The rest is omitted)

2.10.5 Disaster Prevention Helicopter Emergency Dispatch Procedure Manual of Gifu Prefecture

The Disaster Prevention Helicopter Emergency Dispatch Procedure Manual of Gifu Prefecture (hereinafter referred to as “the Manual”), based on the Rule, had stipulated dispatch procedures and other matters to establish a system to properly respond to a request for dispatching disaster prevention helicopters and to ensure that action can be taken quickly in an appropriate manner. (Excerpt)

1. Receipt of first report

**The Operation Control Supervisor, the Air Rescue Chief*

• shall consider whether to dispatch a helicopter when a request is made, confirming:

- (1) Whether the dispatch request is based on Article 20 of the Rule; or*
- (2) Whether a helicopter can be operated under VFR conditions.*

2. Preparations for dispatch

**The Operation Control Supervisor or base liaison personnel:*

• shall convey the first report to the Operation Control Manager, in doing so:

- (1) The report shall be conveyed basically by telephone to staff in charge of disaster prevention.*

**The Air Rescue Chief or the Air Rescue Sub-Chief shall:*

• issue orders for preparations of materials and equipment and related supplies;

• confirm the availability of a Helipad and other facilities to be used, confirming:

- (1) The availability of ground support personnel (from related fire Dept.s);*
- (2) Weather condition on the flight route;*

- (3) The contents of the request for helicopter dispatch for the Emergency Operation.*
• *issue instructions for flight preparations to the pilot and the mechanic or to those of the commissioned operation group.*

3. Receipt of dispatch request

**The Operation Control Supervisor or base liaison personnel shall:*

- *convey the request to the Operation Control Manager upon receiving it by telephone and facsimile.*

4. Decision on dispatch

**The Operation Control Supervisor shall:*

- *make a final decision on whether to dispatch an aircraft;*
• *notify the decision to the operating commander.*

**Base liaison personnel shall:*

- *notify a decision whether to dispatch an aircraft (by telephone) to the fire Dept. from which the request has come;*
• *make, when necessary, a notice to the Prefectural Police Aviation Unit.*

**The Air Rescue Chief or the Air Rescue Sub-Chief shall:*

- *make preflight consultations with the pilot and the mechanic and those of the commissioned operation group;*
• *issue an order for dispatch to crew members aboard the aircraft and others.*

5. Actions to be taken when any supervisor is unavailable.

(The rest is omitted)

2.10.6 Joint Operation of the Aircraft

- (1) Because the Aircraft was scheduled to be used for operation at the Center from fiscal 1997, Gifu Prefecture planned to start joint operations with the Prefectural Police Aviation Unit. Before the introduction of the Aircraft, Gifu Prefecture and Gifu Prefectural Police had meetings and prepared the minutes of their meetings as below. (Excerpts from the Minutes)

Meeting on operations of No. 2 disaster prevention helicopter February 24, 1997

1. to 4. (Omitted)

5. Operation Time

As safe operations must be basically pursued, and in consideration of the past records and the time needed, the operation time shall be adjusted once again in a range of up to 300 hours a year between officials in charge. But rescue activities in the Northern Alps shall be carried out by the police side, and emergency activities shall not be made by Air Rescue Team personnel. (The rest is omitted)

6. Agreement paper

An agreement will not be concluded, but a summary of essential points shall be documented between the division managers from both sides.

7. (Omitted)

8. Others

As far as rescue activities are concerned, upon receiving a request, consultation shall be made and action for rescue shall be taken. (The rest is omitted)

The passage of Clause 5 mentioned above "...rescue activities in the Northern Alps shall be carried out by the police side, and emergency activities shall not be made by Air Rescue Team personnel" is interpreted by the prefectural police and the prefecture as below.

The prefectural police's interpretation is: "When the Aircraft was introduced, rescue activities in the Northern Alps had been entirely covered by the prefectural police, and the Center had not owned any unit of ground personnel capable of operating for rescue in mountainous areas. The prefectural police understands that rescue activities in the Northern Alps require close cooperation between helicopters and mountain rangers and cooperation by private mountain rescue personnel, while the Center had not obtained this kind of experience and know-how. The Clause 5 was agreed that the prefectural police would basically take care of rescue activities in the area until the Center fully obtains necessary experience and know-how, but it never meant that the Center would be barred from any kind of rescue activities in the area".

Meanwhile, the Prefecture interprets that Clause 5 does not deny mountain rescue activities to the Center and that, although rescue activities in the Northern Alps will be basically covered by the Prefectural Police Aviation Unit, disaster prevention helicopters may be dispatched, depending on the situation.

- (2) The Executive Director of the General Affairs Department^{*5} of Gifu Prefecture and the Executive Director of the Community Safety Department of the Gifu Prefectural Police Headquarters, in order to jointly operate and manage the Aircraft, concluded an agreement on the operation and management of the Gifu Prefecture No. 2 disaster prevention helicopter (effective as from June 1, 1998, hereinafter referred to as "the Agreement")

(Excerpts)

(Operation Control Supervisor)

Article 4 (Omitted)

2. The Director of the Fire and Disaster Prevention Division of the General Affairs Department of Gifu Prefecture (hereinafter referred to as "the Fire and Disaster Prevention Division Director") shall be responsible for operation for disaster prevention activities, while the Director of the Regional Affairs Division of the Community Safety Department of the Gifu Prefectural Police Headquarters (hereinafter referred to as "the Regional Affairs Division Director") shall be responsible for operation and management for policing activities.

(Mutual Cooperation)

*Article 5 The Air Rescue Team and the Police Aviation Unit^{*6} shall cooperate with each other and strive to maintain close cooperation in order to operate their fleet and personnel in a safe and effective manner.*

(Implementation of Operations)

Article 7 In the use of aircraft, when a case which requires an emergency operation occurred, duties for this operation shall have priority over other duties.

In case of concurrent emergency events, the Fire and Disaster Prevention Division Director and the Regional Affairs Division Director (hereinafter referred to as "Both Directors") shall hold a meeting as quickly as possible.

(Commanding System)

^{*5} The Center had belonged to the Fire and Disaster Prevention Division of the General Affairs Department of Gifu Prefecture when the Agreement and the Operation and Management Procedure, as mentioned in the next page, were concluded. But later it was shifted to the Disaster Prevention Division of the Crisis Management Department of Gifu Prefecture following a structural change within the prefectural government.

^{*6} The Police Aviation Unit is called the "Police Aviation Unit" in the excerpt from the Agreement, in the same wording as in the Agreement, but it is called "Prefectural Police Aviation Unit" in other parts.

Article 8 In disaster prevention activities, when a Police Aviation Unit officer concurrently assigned to post at the Fire and Disaster Prevention Division is on board an aircraft, shall operate under the command of the Fire and Disaster Prevention Division Director.

2. In policing activities, when an Air Rescue Team member is concurrently assigned to a post at the Regional Affairs Division is on board an aircraft, shall operate under the command of the Regional Affairs Division Director.

(The rest is omitted)

(3) The Director of the Fire and Disaster Prevention Division of the General Affairs Department of Gifu Prefecture and the Director of the Regional Affairs Division of the Community Safety Department of the Gifu Prefectural Police Headquarters had concluded the Operation and Management Procedure for the Gifu Prefecture No. 2 disaster prevention helicopter (effective as from June 1, 1998, hereinafter referred to as “the Operation and Management Procedure”) (Excerpt)

4. (Response to Concurrently Reported Cases)

Concurrent events such as search and rescue activities shall be dealt with an organization which has received the first report.

2.10.7 Job Classification at Disaster Prevention Division of Gifu Prefecture

According to the job classification table for the Disaster Prevention Division, the Director of the Disaster Prevention Division supervises overall jobs at the division, while the Manager of the Center serves as the senior officer for general jobs related to disaster prevention aviation activities and jobs for the operation and management of disaster prevention helicopters. The captain, who was a Director for Aviation Management, was the deputy supervisor for these jobs. The Director for Aviation Management was the senior officer for jobs related to the operation and management of disaster prevention helicopters and planning for support and coordination of helicopter activities in cases of disasters.

2.10.8 Records of Mountain Search and Rescue Activities by the Aircraft

According to the Center, the Aircraft was dispatched for a search and rescue activity at a location with an elevation of 2,000 to 2,500 m one time between fiscal 1997 and fiscal 2009 (August). It was operated with one pilot on board at that time for a hoist-using rescue activity at a forest path. The Aircraft was dispatched for an activity with an elevation of over 2,500 m one time during the same period. It was an emergency transportation with landing at the Norikura-dake (Tatamidaira) Helipad. Most of the Aircraft’s activities had been carried out in mountains forests of up to 1,000 m.

Listed below is a reference material about the activity records for Prefectural Police Aviation Unit helicopters at elevations of over 2,500 m in the Northern Alps except Mt. Norikura-dake and in the Mt. Ontakesan/Mt. Norikura-dake area.

Activity Records for Prefectural Police Aviation Unit Helicopters at Elevation of Over 2,500 m

Location \ FY	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Northern Alps (Except Mt.Norikura-dake	20	12	30	29	40	80	30	20	30	63	23	37	33
Mt. Ontakesan, Mt.Norikura-dake	0	0	1	1	1	1	0	0	1	3	2	2	4
Total	20	12	31	30	41	81	30	20	31	66	25	39	37

(Figures compiled by Gifu Prefectural Police Aviation Unit)

2.10.9 Records of Training for the Aircraft at Mountainous Areas

Training for the Aircraft at an elevation of up to 2,500 m included lifting with the hoist as mountain rescue training and it was made 243 times at various places in the prefecture from fiscal 1997 to fiscal 2009. But the training was mostly made at an elevation less than 1,000 m. At an elevation of over 2,500 m, the Aircraft made operational training with hovering only. Listed below are details of the training records. Training in fiscal 1997, which was made jointly with the Prefectural Police Aviation Unit, involved another pilot at the Center (hereinafter referred to as “the Pilot B”), for whom operational training was made 13 times. Of this, the pilot made landing training at Hotaka-dake Hut heliport three times. The captain of the accident aircraft had not participated in the training, he joined the Center only in April 1997.

Training Records for the Aircraft at Elevation of Over 2,500mM

Location \ FY	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Northern Alps (Except Mt.Norikura-dake	13	0	0	0	0	0	0	0	0	0	0	0	0
Mt.Ontakesan, Mt.Norikura-dake	0	5	5	2	1	1	0	0	0	0	1	0	0
Total	13	5	5	2	1	1	0	0	0	0	1	0	0

(Figures compiled by Gifu Prefecture)

Listed below is a reference material about the training records for Prefectural Police Aviation Unit helicopters at elevations of over 2,500 m in the Northern Alps except Mt. Norikura-dake and in the Mt. Ontakesan/Mt. Norikura-dake area.

Training Records for Prefectural Police Aviation Unit Helicopters at Elevation of Over 2,500 m

Location	FY	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
	Northern Alps (Except Mt.Norikura-dake		15	28	20	34	34	20	34	21	29	32	27	19
Mt.Ontakesan, Mt.Norikura-dake		0	0	1	0	3	1	3	1	1	1	0	0	0
Total		15	28	21	34	37	21	37	22	30	33	27	19	16

(Figures compiled by Gifu Prefectural Police Aviation Unit)

2.10.10 Duties of Prefectural Police Aviation Unit

The duties of the Prefectural Police Aviation Unit is stipulated in “the Order on the Operation of Police-Use Aircraft of Gifu Prefecture.” An illustrative rule notification” (dated March 23, 1994) includes remarks about the aim, the interpretation and matters which must be heeded in the operation of police-use aircraft of Gifu Prefecture. Following are related clauses from the order and the notification which were mentioned above. (Excerpts)

(1) *Order on the Operation of Police-Use Aircraft of Gifu Prefecture*

(Duties)

Article 4 The mission of Prefectural Police Aviation Unit is to conduct policing activities, rescue activities, support for policing activities and others employing aircraft in accordance with an annual aviation duty plan prepared by the Prefectural Police chief.

(2) Illustrative rule notification (March 23, 1994)

Rescue activities mean the search and rescue of victims in accidents, transportation in emergency cases and other life-saving activities.

(The rest is omitted)

2.10.11 Statements by Persons Involved about the Aircraft’s Operations

Following are statements by persons involved in the operations of the Aircraft and rescue activities in the Northern Alps Mountains:

(1) Operation Control Supervisor (the Manager of the Center)

On the day of the accident, the Aircraft No.I had been dispatched for training, while the Aircraft became operable as periodic maintenance work had just finished. On duty on the day were myself as the Operation Control Supervisor, the captain, the Mechanic A, four firefighters and a back-office worker.

The initial report for request for a helicopter dispatch, which came from the Takayama Fire Dept., sought emergency rescue work for a man who had collapsed in the Northern Alps. Upon receiving the report, the captain and others quickly started collecting information on the location, weather and others. Then, a Prefectural Police Aviation Unit officer came in and told us that they had not yet received the information. At that time, I think the captain was apparently asking the officer about the possibility of having somebody dispatched as a copilot from the Prefectural Police Aviation Unit. Considering the fact that the Rescue-Requiring Person must be rescued as quickly as possible because of his cardiac pulmonary arrest and the fact that the Aircraft No.I was out for training, as well as an analysis of weather and

other related information, the captain told me that he was willing to depart with the Aircraft, and then, I confirmed his departure. After finally deciding on the dispatch of the Aircraft, we notified this to the Takayama Fire Dept. and the Disaster Prevention Division of the Gifu Prefectural Government. When I decided on the dispatch of the Aircraft, I did not have a three-person meeting with the captain and the Sub-Chief to reconfirm the dispatch decision of the Aircraft. When we received an initial report for rescue work, we usually collected necessary information and made preparations for dispatch assuming our aircraft would be dispatched.

After the takeoff, we contacted the captain by radio for coordination to pick up a physician at Takayama Helipad and the Mountain Ranger A at Nabadaira Helipad. I received an inquiry from the Director of the Disaster Prevention Division asking why the Aircraft was dispatched with only one pilot and whether a Prefectural Police Aviation Unit helicopter could not be dispatched. I replied another pilot at the Center was off duty and that there would be no problem with a flight with a single pilot because we have performed such style of rescue activity. I also told the director that the Prefectural Police Aviation Unit would be unable to dispatch its aircraft because they had not received any request.

Under the Rule, I, as the Manager of the Center, am in a position to make a final decision on whether to dispatch an aircraft. But I was unaware of the specific condition of the location near Gens d'Armes where the rescue work would be done. Nor did I recognize that the consultations had been made in the past between the Center and the Prefectural Police Aviation Unit about what to do with accidents which occurred in the Northern Alps. I had an understanding that the Center had made rescue flights in mountainous areas fairly frequently, but actually, any rescue activity had not apparently been made at areas deep in the Northern Alps.

I took up the current post only about six months ago and I am not familiar with aviation matters. I had actually left decisions on the dispatch of helicopters to the judgments of the captain, the Air Rescue Chief and other persons. In this case, I only endorsed the captain's judgment. When a new case occurred, a pilot at the Center and Prefectural Police Aviation Unit personnel always had talked to each other, but I did not go any further than recognizing their liaison and coordination activities as normal activities. I have not played a main role in coordination for an aircraft dispatch. I had entirely left the related matters to the judgment of the captain, who had been engaged in the job over 10 years.

In the job classification system at the Disaster Prevention Division, the captain, as the Director for Aviation Management, was in charge of the operation and management of aircraft at the Center and he was in a position to assist the Manager of the Center, and therefore, I also respected his opinion.

(2) Operation Control Manager (Director of Disaster Prevention Division of Gifu Prefecture)

After I received report from the Center that the Aircraft had been dispatched for emergency rescue to Gens d'Armes of the Northern Alps, I was asked by the Deputy Executive Director for Crisis Management about the circumstances which led to the dispatch of the Aircraft to the Northern Alps with only one pilot on board. Therefore, I asked the Center why the Aircraft was dispatched with only one pilot and received an explanation about a series of developments which led to the decision by the Center to deal with the case. The Deputy Executive Director for Crisis Management had warned that the location involved is a very difficult place, but I had no specific knowledge about Gens d'Armes.

Because the Center has pilots, mechanics and other staff who have professional knowledge and because I understood that the Center would make a decision based on various information, I thought the Center's judgment must be respected. I could not persuade them from dispatching the Aircraft because we had no stronger power or better information than the Center had.

At the time of the accident, I had been the Disaster Prevention Division Director for six months. I had obtained knowledge about rescue activities in mountainous areas mainly through statistical materials, but I had no knowledge that the Northern Alps are not included there. I was not aware, either, that the Prefectural Police Aviation Unit deals with accidents in the Northern Alps, because there were no documents clearly stating such a practice.

(3) Fire Fighter Chief, Takayama Fire Dept.

On the day of the accident, I received report from the Matsumoto Fire Bureau at 13:34 that there was a 119 call for rescue from Gens d'Armes of Mt. Okuhotaka-dake of the Northern Alps. The call which was received by the bureau said, "A 66-year-old man has collapsed while climbing at Gens d'Armes of Okuhotaka-dake". I immediately notified this to the Center. I received a reply from the Center that they would consult with the Prefectural Police Aviation Unit because the place is in a mountainous area. Later, I tried to connect to the mobile phone of the mountain guide who made the emergency call, but to no avail. Therefore, I collected information through official at the Matsumoto Fire Bureau, who could contact the guide. I obtained detailed information about the location of the Rescue-Requiring Person (Latitude 36°17' 09.32" N, Longitude 137°38' 51.45" E, according to a GPS-based location service) and about the condition of his symptom and conveyed the information to the Center. I also relayed the information to the Takayama Police Station.

I understand that when the Takayama Fire Dept. receives a disaster report, its communication control room staffers usually report this first of all to the Center and that the Center contacts the Prefectural Police Aviation Unit for coordination. A notice must also be made to the Takayama Police Station as a local police organization under the mutual consent, but there is no clearly written agreement to this effect. Later, we received report that the Aircraft would be dispatched from the Center at 13:56.

When disasters and accidents in the Northern Alps areas were found by people at mountain huts or private mountain rescuers, they usually call police even in cases injured persons and emergency cases are involved, because they have traditionally close ties with police. Reports of fallen climbers are usually sent as 110 call (same as 911 in USA) to police. I would say police have had dealt with most accidents in the area.

(4) Pilot B

I was employed by the Center before the introduction of the Aircraft. I underwent training to obtain a license for the Aircraft at the Center. Just after the Aircraft was inaugurated for operation, I underwent training along with personnel from the Prefectural Police Aviation Unit. I have joined training with them in the Northern Alps. But the captain did not take part in the training in the Northern Alps because he was then receiving training for changing his type rating of license. Later, I underwent training to confirm maneuverability and flight performance in high-altitude hovering at Mt. Ontakesan with an elevation of 3,067 m and Mt. Norikura-dake with an elevation of 3,026 m. Because I have

taken part in emergency activities many times lately, I had no opportunities for this kind of flight training. But I did not feel the necessity for us to train ourselves for activities in the Northern Alps because Prefectural Police Aviation Unit personnel have dealt with accidents there.

In general, when helicopters hover at a high altitude, their surplus power is limited because of the small air density at a high altitude. Therefore, after confirming the wind direction in flight, we should carefully direct an aircraft upwind. When we are forced to hover in a cross wind or a tail wind in an unavoidable circumstance, helicopters must be carefully controlled because the rudder pedal input becomes difficult, making it hard to control an aircraft as it becomes unsteady more easily. In hovering for the hoist operation, a path for an emergency exit must be secured keeping enough distances from obstacle and outside watch against obstacles is indispensable. Obstacles behind the aircraft are usually watched by a mechanic as the hoist operator or a firefighter as the onboard safety manager when necessary. But for firefighters who work with us on a three-year term, I think it is difficult to obtain a feeling to correctly grasp a safe distance between the obstacles and the tip of the MRBs. This usually happens when we have to use the hoist over a slope. Due to the inclination of the ground, the downwash is swayed along the inclination and as a result, the hoist cable inclines rather than extends straight down from the aircraft and because of this, we have to let out more of the cable, but the longer cable becomes, the more widely the cable swings. Therefore, when it becomes difficult to keep hovering, sometimes we have to start once again or ask for relocating the person to be rescued to a different place. We also encounter thin clouds in rescue activities in mountainous areas and this makes it difficult for us to maintain the proper sense of distance. Accordingly, when the visibility is poor, we have to keep the aircraft's position stable by selecting proper reference points in the near area and maintain the relative distance. In a weather condition where clouds come up on an upward current, this means that the air is turbulent, and if it is at a high altitude, the aircraft's altitude may temporarily decline due to the influence of turbulence, because the aircraft is usually operating near its power limitation. In an operation to correct the altitude loss, because we try to avoid an over-torque and continue to control the aircraft within the limits, an instantaneous corrective operation is very hard, sometimes results in a delayed response.

In preparing our flight plan before we depart, we fulfill requests for picking up a physician or transporting a person involved to a certain place if the points are clearly shown in the requests. Otherwise, we include the rescue point in our flight route and tentatively, we prepare a Gifu Local flight plan with Gifu Air Base as the departure and destination aerodrome via the rescue site. And then, after obtaining information at the rescue site or checking the condition of the rescued person after the lifting, we sometimes notify changes in the flight route, the destination, the number of persons aboard and others in our flight plan to the Center by radio. In order to manage the weight, the CG and other related matters, we have made a simplified chart, with data on the fuel load, the number of persons aboard, materials and equipment stored and sorted according to the altitude and temperature. Then, we calculate the weight and the CG at a given time beforehand and use these data as a yardstick to judge at each occasion whether hovering is possible. But because these are figures prepared beforehand with a certain margin of error, we have to make a go-no-go check by hovering at the site.

The standby fuel load for the Aircraft at the base is set to be 1,600 lb. This is a fuel

load to cover a mission for one and a half hours. The residual fuel load can be checked by reading a digital fuel meter installed on the Aircraft. Refueling along the route toward Takayama City can be made with prepositioned fuel at the Hida Air Park.

(5) Mechanic at the Center (Hereinafter referred to as “the Mechanic B”)

Mechanics get on board the helicopter as a hoist operator for training in which the hoist is used or for actual rescue activities.

I have participated in training and rescue activities on a slope, in forests and locations with projecting rocks, but I have no rescue activity experience at 3,000 m class mountainous areas or near rock walls.

Our hoist training is done in accordance with the BELL Activities Manual (to be described later in 2.11.3) which specifies procedures for hoist operation, and in actual rescue operations, the same procedures apply. The same is true to giving instructions to the pilot to get close to the target.

As to coordinated work between the hoist operator and personnel on the ground, the operator slightly spins out the hoist cable to provide a surplus length when the personnel on the ground catches the Hook for his easy handling of it. But when the cable is excessively extended, part of the cable may be stamped with the foot. So, we adjust the length of the cable while watching the situation in each occasion. Because the hoist cable can be damaged in rocky environment, we try to be careful so that the cable may not be extended excessively. When the hoist cable is down, the hoist operator is sometimes focused on controlling the cable and unable to pay additional attention to the situation around the aircraft. Because he looks further down and fixes his gaze on the tension and the movement of the cable, other crewmen aboard an aircraft keep a watch on the distance between an aircraft and obstacles in surrounding areas. We pay particular attention to this point in the course of training. I try to call my partner from time to time so that both of us may not excessively concentrate on our own duty. A hoist descent is done from about 70 ft in usual training.

(6) Air Rescue Chief

I was away for training aboard the Aircraft No.I when the accident occurred. I received report in a disaster radio message that a rescue-requiring accident had occurred and that coordination would start with the Prefectural Police Aviation Unit. I also notified the base that the Aircraft No.I was ready to take action. But because I heard by radio that the Aircraft would be dispatched for the accident, I continued the training and after returning to the base before 15:00, I obtained an explanation about the circumstances. Later, I remember it was a little past 15:00, we received a radio message from the Aircraft that it would shortly enter the rescue area and descend. But we did not receive any report that rescue work has ended, even after a lapse of about 15 minutes. We tried to contact the Aircraft again at about 15:20, but there was no reply. Shortly after this, we received a report that the Aircraft had crashed.

The daily work schedule for firefighters is determined beforehand. I also started the day's job according to my work shift. Our duty is to be carried with the aircraft and operate there. In my experience, operations have been canceled due to a weather-related reason, but there has been no cancellation because of the location.

I have been in this post at the Center for about six months. I had basically grasped the geographical features in Gifu Prefecture, but I had no recognition that Gens d'Armes -- the latest rescue site in the Northern Alps as such a steep area. We have not made mountain

rescue training at such steep locations so far. Our training has been conducted at forests on lower mountains.

The Prefectural Police Aviation Unit has many years of experience in rescue activities in the Northern Alps and I understand that the Center has not been actively engaged in rescue activities in the area. Since I came to my post, we have not dispatched our helicopters to steep locations in the Northern Alps Mountains after receiving 119 calls to our offices.

Before descent personnel from the aircraft, the pilot and the firefighter assess whether the descent is possible to a selected place. I believe the personnel involved followed this procedure this time, too.

(7) Chief of Prefectural Police Aviation Unit

On the day of the accident, while attending a 13 o'clock meeting in Nagoya, I received a report from my Police Aviation Unit that a rescue-requiring event involving a person who is suffering from a cardiac pulmonary arrest at Gens d'Armes of the Northern Alps Mountains and that the Center was going to dispatch the Aircraft for rescue with one pilot on board. Because the event occurred in a very difficult place, I instructed the Prefectural Police Aviation Unit Officer A to ask the Takayama Police Station to coordinate with the Takayama Fire Dept. for having a request issued for the Police Aviation Unit to handle the case and to try to persuade the Center into refraining from dispatching the Aircraft by stressing the Prefectural Police Aviation Unit was ready to deal with the case. I also thought that advice should be issued to the Center from the Deputy Executive Director for Crisis Management of the Disaster Prevention Division of the Crisis Management Department of Gifu Prefecture in order to persuade the Center from handling the case and I made a call to the division to this effect.

Later, I received a report that the Aircraft had taken off, followed by a report that the Aircraft had crashed around 15:25. I immediately returned to my Prefectural Police Aviation Unit Base and at about 16:00, I left Gifu Air Base. After arriving at Nabadaira Helipad at 16:35, I picked up mountain rangers there and departed for the crash site and started rescue activities.

The weather condition was not bad when we arrived at the crash site, but there were some clouds at a place far below Gens d'Armes in the direction to Shiradashizawa. As a wind of 4 to 6 knots was blowing from the west, rescue work was made amid a weak tail wind. .

The Prefectural Police Aviation Unit always operates helicopters with two pilots on board in accordance with an official notice from the National Police Agency. With two pilots aboard, they can keep a better watch than otherwise on the situation around them and check the instruments more properly. Depending on the relative direction of an obstacle, a captain has an advantage to let his copilot take control of the aircraft if necessary. In this case, the captain asked the Police Aviation Unit Officer A to provide a pilot from the Aviation Unit. This was because the Aviation Unit officer involved had been assigned to a concurrent post at the Center.

In most mountain rescue aviations, rescue-requiring persons are usually in a very critical condition. But we should not be excessively in haste to start action for rescue. I believe that we should start rescue activities after making full preparations. Places of rescue work are usually in steep areas and the weather condition in such a place is unfavorable. Because a high degree of aircraft control techniques is required, when the use of hoist is difficult, we sometimes relocate resqued-requiring persons to a better place. But when such a

place is not available, sometimes we have no choice but to give it up.

The Prefectural Police Aviation Unit orders personnel into action by considering their experience in actual rescue activities, the harshness of the rescue site and the degree of urgency.

When accidents occurred in the Northern Alps in the past, reports immediately came from local police offices to the Prefectural Police Aviation Unit. But in this case, a notice to us was slightly delayed because it came via the Disaster Prevention Aviation Center, not via the police channels.

(8) The Prefectural Police Aviation Unit Officer A

I received a telephone call from the captain. He said that a person had collapsed at Gens d'Armes of the Northern Alps, the Center received a request for rescue from the Takayama Fire Dept., and he confirmed whether any information has been received by the Prefectural Police Aviation Unit. Because the Prefectural Police Aviation Unit had not received any information by that time, I asked the captain to wait until we confirm with the Takayama Police Station. I made an inquiry to the Takayama Police Station and I obtained a reply that there was no information at the office. Later, I went to the Center to obtain as much information as possible and tried to confirm once again what was the source of the rescue request. The captain told me that the Center had received the request from the Matsumoto Fire Bureau of Nagano Prefecture via the Takayama Fire Dept. and asked me whether a pilot from the Prefectural Police Aviation Unit is available to be aboard the Aircraft as the Center would deal with the accident. But any decision cannot be made immediately by me in this kind of situation. At that time, the Takayama Police Station was also trying to confirm the information about the accident. Therefore, I told the captain that I am not in a position to make any decision and that the Takayama Police Station was considering its response to the accident. I also replied that if we received a request, we would have to dispatch a helicopter with two pilots aboard. Then, the captain said that the Center would deal with the accident, stressing time should not be wasted. Therefore, I quickly returned to our office and made a report to the Chief of the Prefectural Police Aviation Unit, who had been away to attend a meeting. I received instructions from the Prefectural Police Aviation Unit Chief, saying that it should be difficult for the Center to deal with the request. He instructed me to ask the Takayama Police Station to persuade the Center through the Takayama Fire Dept. from handling the accident, because the Prefectural Police Aviation Unit was ready to deal with the case. When I was trying to convey his instructions to the Takayama Police Station, the Aircraft started its engine. Therefore, I asked the Chief of the Prefectural Police Aviation Unit Officer B to go to the Aircraft and asked him to persuade the captain into waiting for a while. But the captain departed, after replying he would not be able to wait any longer.

2.11 Additional Information

2.11.1 Hoist

The hoist cable installed on the Aircraft is made of stainless steel and measures 76.2 m in total length and about 4.8 mm in diameter. It is capable of lifting up to 600 lb (272 kg) of weight. According to the manufacturer of the hoist, the hoist cable can be seldom pulled out of the winding drum even if a sudden tension is applied.

2.11.2 Hovering

Hovering is a maneuver in which a helicopter is maintained in nearly still flight over a reference point at a constant altitude and on a constant heading. Controlling techniques and points which must be kept in mind when a helicopter is flown in cross winds or a high altitude are described below.

(1) Hovering

(Source: "Helicopter Handbook" released by the Japan Aeronautical Engineers' Association, in 2004)

To start hovering, the heading of the helicopter must be directed straight to the wind as much as possible.

The pilot holds the helicopter over a selected point by use of cyclic control; maintains altitude by use of collective pitch control lever; and maintains a constant heading by use of antitorque pedals. Only by proper coordination of all controls can successful hovering flight be achieved. Therefore, corrective control input should not be made abruptly, but quickly before the helicopter starts to move. Small pressure controls are required to avoid overcontrolling.

The attitude of the helicopter is determined with its relative location with the ground. While the attitude required to hover varies with wind conditions and the CG location, there is a particular attitude to keep the helicopter hovering over a selected point. After this attitude has been determined, deviations can be noted and necessary corrections can be made before the helicopter actually starts to move from the point.

Hovering altitude is maintained by use of collective pitch lever, coordinated with the throttle, to maintain a constant RPM. The amount of collective pitch input needed to maintain hovering altitude varies with wind, air density (density altitude), and gross weight.

Coordination of all controls cannot be overemphasized. Any change on control will almost always require a coordinated correction on one or more of the other controls. A proper hovering can be accomplished only when corrections are small, smooth, and coordinated.

(2) About the effects of cross winds in hovering, loss of tail rotor effectiveness at high altitude, hovering at high altitude and aircraft weight

(Source: "FAA Rotorcraft Flying Handbook" released by Hobun Shorin Co., Ltd. in 2001)

(a) Effect of a cross wind

When hovering in a left cross wind, tail rotor thrust can change cyclically. Therefore, rapid and continuous pedal inputs are necessary to avoid changes in the direction to the heading. It is fairly difficult to maintain a precise heading in this region, but this presents no significant problem unless corrective action is delayed. However, high pedal workload, lack of concentration to make necessary corrections to maintain a proper heading and overcontrolling can lead to loss of tail rotor effectiveness (LTE).

(b) LTE at higher altitude

The hovering ceiling is limited by tail rotor thrust and power available.. At high altitudes, where the air is thinner, tail rotor thrust and efficiency are reduced. When hovering at high altitudes and with high gross weights, the tail rotor thrust may not be sufficient to maintain directional control and LTE can occur. In these conditions, gross weights need to be reduced and/or operations need to be limited to lower density altitudes.

(c) Lowering of main rotor r.p.m. at Higher altitude

Under certain conditions of heavy gross weight, high temperature, or high density altitude, a situation might occur in which the r.p.m. is declined even though a maximum throttle is used. This is usually the result of the main rotor blades having an angle of attack that has created so much drag that engine power is not sufficient to maintain or attain normal operating r.p.m. In a low r.p.m. situation, the lifting power of the main rotor blades can be greatly diminished.

A low main rotor r.p.m. may prevent the tail rotor from producing enough thrust to maintain directional control.

2.11.3 BELL Activities Manual

Air Rescue Team personnel, in training for hoist descent from aircraft, follow procedures set in the BELL Activities Manual established by the Center. They behave in accordance with the call-outs uttered by each member on each occasion, and in response to the call-outs, other members confirm the safety of the situation around them. They also follow the same steps in actual operations. In terms of the positions of members aboard aircraft, the hoist operator and the onboard safety manager are seated near the right side door in the cabin. The onboard safety manager sits behind the captain's seat, while the hoist operator is in aft position facing the safety manager, performing their respective jobs in accordance with the procedures. Listed below are the procedures which must be taken from the start of the Aircraft's reentry and the lowering of the Hook to the start of a cable winding operation after the Hook has been caught by a firefighter on the ground (Excerpts)

	<i>Pilot</i>	<i>Onboard Safety manager</i>	<i>Personnel on the Ground</i>	<i>Hoist Operator</i>	<i>Precaution</i>
<i>Reentry</i>		<p>Tells the pilot "Reenter" upon receiving a hand signal or a radio message from personnel on the ground.</p> <p>Watches safety on the right side.</p>	<p>Notifies those aboard the aircraft of the start of reentry by hand signal or by radio, upon completing work on the ground.</p> <p>Secures a surplus length on the hoist cable after catching the hook. When the surplus length reaches about 3 m, sends a hand signal to the hoist operator to stop the lowering of the hoist cable.</p>	<p>Lowers the hoist hook, and while telling the pilot how the hook is getting down, guides the pilot to keep the hook to be exactly above the target point, and when necessary corrects the place and tells the pilot how the hook is getting down.</p> <p>"XX more m to go," "Catch it," or "Lowering surplus length," upon receiving hand signals from personnel on the ground, tells the pilot "Stop it" or "Surplus length is XX m".</p>	
<i>Hoist-Lifting of Rescue-Requiring Person</i>		<p>Watches safety on the right side.</p> <p>(The rest is omitted)</p>	<p>After fixing the evac harness carabiner and the carabiner of the own anchor's ring on the hook, confirms the condition of the carabiners fixed and sends a hand signal for winding up the surplus length on the hoist cable.</p> <p>(The rest is omitted)</p>	<p>Upon receiving a hand signal for winding up the surplus length, declares "Surplus length winding up" and starts winding it up. After declaring "Tension will be applied," and upon receiving a hand signal from personnel on the ground, declares "Temporary halt".</p> <p>(The rest is omitted)</p>	<p>When the place for lifting the rescue-requiring person from the ground is considered inappropriate, the hoist operator starts the lifting only after adjusting the helicopter position.</p>

(See Figure 11 Sketch of Members Positions' on Duty Aboard)

2.11.4 Fire and Disaster Management Organization Act

Following provisions are registered in the Fire and Disaster Management Organization Act

(Law No. 226, 1947) regarding the management of fire fighting and disaster prevention at municipalities and the establishment of fire fighting and disaster aviation teams at prefectures as well as advice, recommendations and guidance to be provided by the Commissioner of the Fire and Disaster Management Agency: (Excerpts)

(Management of Fire Fighting and Disaster Systems at Municipalities)

Article 7 Fire fighting and disaster prevention at municipalities shall be managed by the municipal mayors in accordance with local regulations.

(Fire Fighting and Disaster Aviation Teams at Prefectures)

Article 30 In addition to those registered in the previous provision, the prefectures, upon request from the mayors of municipalities in their respective region, can support fire fighting and disaster prevention activities in the area involved by using aircraft.

2. (Omitted)

3. *The prefectural governors, for the support of fire fighting and disaster prevention activities in response to requests by municipalities based on the provision in Clause 1, shall establish air rescue teams in accordance with their respective regulations.*

(Advice, Recommendations and Guidance by the Commissioner of the Fire and Disaster Management Agency)

Article 37 The Commissioner of the Fire and Disaster Management Agency, when the necessity arises, can provide advice, recommendations and guidance for prefectures or municipalities regarding matters related to fire and disaster management.

3. ANALYSIS

3.1 Qualification of Flight Crew

The captain held both a valid airman competence certificate and a valid aviation medical certificate.

3.2 Airworthiness Certificate

The Aircraft had a valid airworthiness certificate and had been maintained and inspected as prescribed.

3.3 Meteorological Condition on the Day of the Accident and at the Accident Site

As described in 2.6.1, according to the Asia Pacific Surface Analysis Chart, areas around Japan had been widely covered with high pressure systems in a stable atmospheric condition. Regarding the wind direction and velocity, the wind profiler at Nagoya had observed a wind of 15 kt from the west. But as described in 2.6.2 and 2.6.3, observations at two huts near the accident site showed winds of 5 to 12 kt from the southwest or the west. In view of the average wind velocity at these observation points, when the Aircraft crashed, about 10 kt of winds are estimated to have been blowing from the west in an area around the accident site. According to the statement described in 2.1.3 (3), the wind was blowing from the side of Gifu Prefecture, but it was not strong. The statement also says that there was no gust of wind, either. Therefore, it is considered highly probable that any gust was not blowing around the area when the accident occurred.

As described in 2.6.1, an analysis with the Weather Chart in terms of 700 and 850 hPa at higher altitudes showed no humid area in the Chubu-Tokai region. Therefore, it is considered highly probable that the area was not in a weather condition in which so strong a turbulence accompanied with cumulonimbi may be created. As described in 2.6.5, clouds continued to emerge and disappear repeatedly over the top of Roba-no-mimi and beside Roba-no-mimi to the side of Gifu Prefecture from around 14:00 to around 15:30. Therefore, it is considered highly probable that an upward air current had been created on a wind called "Valley Winds," the wind which often appears in mountainous areas as described in 2.6.4. On the slope on the side of Gifu Prefecture, clouds sometimes had disappeared, but as described in 2.6.1, the 700 hPa weather chart had indicated the air was dry in the Chubu-Tokai region with the dew point at a low level. Therefore, it is considered highly probable that the clouds on the side had been blown away at one point by the prevailing dry wind from the west.

Accordingly, it is considered highly probable that the area around the accident site had been surrounded not only with upward air currents amid the prevailing wind from the west but also with a complex, quickly changing turbulence as a phenomenon which is particularly seen in the Higher Mountainous Areas, because the air currents there can be influenced by complex geographical features such as steep cliffs and valleys.

3.4 Selection of Direction of the Aircraft's Heading and Location and Altitude for Hovering

According to the statement 2.10.11 (4) and as described in 2.11.2 (1), hovering must be made with its aircraft directing upwind for easier control and stabilization of the aircraft. It is important to secure an emergency breakaway route on the opposite side from obstacles and to keep a watch on the obstacles. But, according to the descriptions in 2.1.2 and the statements in 2.1.3 (3) and (4), the captain was keeping the heading in the direction to the north-northeast when the two persons

descended onto the ground or when the helicopter was hovering before the start of the hoist-lifting. As described in 3.3, because the wind was blowing from the west around the accident site, it is considered highly probable that the Aircraft was receiving a cross wind from the left. But, because the Aircraft had been operated by a single pilot, it is considered probable that the pilot had given priority to keeping a watch at rock walls as obstacles and securing an emergency breakaway route over stabilizing the aircraft with the heading kept straight toward the wind.

According to the statement in 2.1.3 (3), the mountain guide stated that he had felt the Aircraft's initial altitude was low when it was hovering before the start of the lifting but that the altitude had become higher after that. Therefore, it is considered probable that when the Aircraft started hovering before the lifting, the captain tried to keep its altitude at around 80 ft, the same level as the hovering altitude when the two persons descended onto the ground. But the captain had to get the Aircraft closer to the South-North Rock Wall to the east, in order to bring the Hook within reach for the Firefighter B. As described in 2.7.1 (1), because this altitude was almost equal to the height of the South-North Rock Wall and also because the heading was kept to the north-northeast and as a result, the East-West Rock Wall and the tail had come close to each other with a distance of about 9 m, the rock wall had entered the captain's blind spot. Therefore, it is considered probable that the captain tried to raise the altitude. As far as the altitude is concerned, as described in 2.7.2 (9), the total length of the hoist-lifting cable let out was 48 m, including the surplus length after the Firefighter B caught the Hook. The place where the Rescue-Requiring Person was had an elevation of 3,108 m. With the total length of the hoist-lifting cable simply added to the elevation of the place, the altitude of the Aircraft became 3,156 m. But because the hoist-lifting cable had been slightly swayed by the downwash and the surplus length had been provided, it is considered probable that the Aircraft was hovering at an altitude almost the same as the top of Roba-no-mimi with an elevation of 3,152 m.

3.5 Influence of Downwash

As described in the statement in 2.10.11 (4), downwash flows down the slopes in the area involved. The hoist cable swings more widely as more of it is let out. The accident site is surrounded with the East-West Rock Wall and the South-North Rock Wall while the north on the opposite side is open to a valley. Therefore, it is considered probable that the downwash by the Aircraft partially blew down the rock wall without spreading widely around and eventually converged toward the valley on the northern side to create an even stronger current. Accordingly, it is considered probable that the hoist cable and the Hook were swayed toward the valley in the stream of the downwash and the hoist cable was swinging in front of the Firefighter B on the western side. Because the Aircraft raised its altitude further, the length of the wound hoist cable, according to the statement in 2.10.11 (5), became about 48 m, including the surplus length, which is more than twice as long as the usual training length of about 21 m, causing the cable to start swinging even more erratically. As a result, it is considered probable that it had taken nearly 5 minutes for the personnel on the ground to catch the Hook.

3.6 Developments from the Aircraft's Hovering to the Contact with the Rock Wall

According to the statements in 2.1.3 (1) and (4), when the Firefighter B was about to ask the operator to wind up the hoist cable after he caught the Hook, the hoist cable became loosened and then, a bang was heard above and the Aircraft crashed. According to the BELL Activities Manual described in 2.11.3, a hoist operator is required to take a surplus length on the cable after the Hook

is caught by those on the ground and after that, start the lifting after receiving a signal for winding up from the ground. Therefore, the operator will not let out the cable any more just before the lifting. Furthermore, the hoist cable became more loosened to lie behind the Firefighter B or it lay on the ground. Accordingly, it is considered highly probable that these movements of the cable did not reflect the hoist operator's action. Hence, the fact that the hoist cable had become loosened can be taken to mean the Aircraft's altitude had been reduced and as a result, it is considered highly probable that the Aircraft's altitude declined first of all followed by the MRB's hit against the rock wall.

From the fact that the Aircraft hit the rock wall after its altitude declined, it is considered possible that the Aircraft's altitude was reduced because of the influence of complex air currents which are particularly seen in the Higher Mountainous Areas, as described in 3.3. According to the statement in 2.10.11 (4), before starting hovering, a certain reference point must be selected to maintain the relative distance stable to stabilize the helicopter's location. It is considered probable that objects that were visible from the place where the Aircraft was hovering and that could become a target included a mountain about 100 m away across the valley and the North-South Rock Wall which is seen several ten m below on the right side from the cockpit of the Aircraft. According to the statement in 2.1.3 (3) and the description in 2.6.5, the area near the top of Roba-no-mimi had been covered with thin clouds. Therefore, it is considered possible that when the Aircraft moved with its altitude reduced, it became difficult for the captain to maintain the relative position of the aircraft to maintain safe distance from the obstacles, the Aircraft moved backward and its MRB hit the rock wall.

As described in 2.5.3 and 2.5.4, the gross weight when the Aircraft was hovering just before the descent of the two persons at 15:03 had surpassed the OGE hovering allowable maximum weight, while the gross weight when it was hovering just before the hoist-lifting at about 15:19 was almost the same as the OGE hovering allowable maximum weight. As quoted in 2.11.2 (2) (b), the hovering limitation for helicopters is determined by the limitations to the thrust the tail rotor can generate and to the power which can be used. When operating at high altitudes and with high gross weights, a LTE can occur. In this case, it may become difficult to maintain directional control. As quoted in 2.11.2 (2)(c), the handbook also says that while hovering at high altitudes, or high density altitudes, with a gross weight in excess of the operational performances, a situation may occur in which the main rotor r.p.m. declines even though a maximum throttle is used and in this case, the altitude of the aircraft may decline. Therefore, the Aircraft's altitude declined and its MRB's hit the rock wall, in view of the fact that the gross weight of the Aircraft when it crashed was almost equal to the OGE hovering allowable maximum weight, and in view of the fact that it was operating in an unfavorable condition in which its engine thrust or flight performance may be influenced by changes in air currents which are particularly seen in the Higher Mountainous Areas as well as by cross winds, as stated in 2.7.1 (1), 3.3 and 3.4. It is considered possible that the Aircraft had descended because the engine thrust became insufficient and as a result, it had become difficult to properly maintain the direction of the heading and then, the Aircraft hit the rock wall.

With the assumption that the Aircraft was above the Rescue-Requiring Person, the distance it covered in its backward movement was measured to be about 15 m horizontally on the map in Figure 10. But because the Hook had been swayed in the direction to the nose due to the influence of the downwash, the hovering position of the Aircraft was believed to be slightly backward to the southwestern side from the point above the Rescue-Requiring Person. Therefore, the actual distance in its backward movement is estimated to have been slightly shorter than about 15 m, but

any precise figure could not be obtained.

As described in 2.7.2 (2), the damage to the MRBs was conspicuous on the tip. As described in 2.7.1 (1), the hit marks left by the MRBs when they hit the rock wall were found at the tip of a rock north-northwest of the top of the East-West Rock Wall. Metal pieces of the tip of the MRBs were found stuck on the rock, indicating the MRBs had hit the rock horizontally. Therefore, it is considered highly probable that the tip of the Aircraft's MRBs had hit the rock. Because the radius of the Aircraft's MRBs is about 7 m and also because the hit marks were found at the tip of a rock north-northwest of the top of the East-West Rock Wall, it is considered highly probable that when the Aircraft hit the rock, it was at a place about 7 m to the north-northwest from the rock wall where the traces were found and at an altitude of about 3,148 m. The wind at that time, which was blowing at about 10 kt from the west, was within the critical wind direction range for the Aircraft, but it is considered highly probable that it was within the maximum allowable wind velocity range.

3.7 Fracture and Detachment of Tail Boom

As described in 2.7.2 (7), among the components of the detached tail boom, outer skin had been broken from the upper part on the left side to the upper part on the right side. The tail rotor drive shafts were found broken on the same path. Particularly, there was a V-shaped bend in the upper part on the left side, while outer skin near the bent area had cracks and deformation. Outer skin on the right side was torn with a force applied to the right toward the direction of the Aircraft's movement. There were no traces that indicate the Aircraft's tail boom had touched or hit the rock walls nearby.

With these facts, it is considered probable that because the right side of MRB's rotating plane hit the rock wall and the transmission leaned backward, and at the same time the MRBs hard hit the left side of the tail boom, resulting in a fractured tail boom. Regarding the fact that the tail boom had flown to the rock wall on the east side, it is considered probable that the fuselage had turned to the right with a torque force applied when the MRBs hit the rock wall and as a result, the broken tail boom got detached when it was directed to the east.

3.8 Fuselage and Engines

As described in 2.7.2 (3), the gas producer turbine for the No. 1 engine, which had been recovered along with the No. 2 engine, could not be manually rotated, because its gear box had been deformed due to the impact of the crash. But other turbines could be manually rotated without a hitch. A BSI found no abnormality with any of the turbine blades. As described in the statement in 2.1.3 (3), the mountain guide felt nothing unusual with the Aircraft's behavior when it was hovering. Therefore, it is considered probable that its engines were normally operating and that there was no abnormality with the fuselage. It is considered highly probable that the fire broke out due to an impact at the time of the crash.

3.9 Dispatch Decision of the Aircraft and Operational Management

According to the Rule as described in 2.10.3 and the Emergency Operation Guideline as described in 2.10.4, the Manager of the Center, as the Operation Control Supervisor, is in charge of commanding and supervising personnel at the Center and makes a decision on the dispatch of an aircraft. According to the statement in 2.10.11 (1), the Manager of the Center made a final decision to dispatch the Aircraft, in the form of endorsing the captain's judgment. The Manager of the Center himself had no professional knowledge nor experience related to aviation. He was not aware, either,

that the Center had no records of its aircraft dispatched for mountain rescue activities in the Higher Mountainous Areas in the Northern Alps Mountains. Therefore, it is considered probable that the Manager of the Center did not have a precise picture of the aircraft dispatch records at the Center for rescue activities.

Meanwhile, the captain, as a Director for Aviation Management, was the senior officer for jobs related to the operation and management of disaster prevention helicopters. He was also the deputy supervisor for the whole jobs related to the operation and management of disaster prevention helicopters which must be addressed by the Manager of the Center. According to the history of events as described in 2.1.1 and the statement in 2.10.11 (1), it is considered probable that the captain, as an expert in aviation and as the person to assist the Manager of the Center as the Director for Aviation Management, had been engaged in coordination with the Prefectural Police Aviation Unit, playing a central role for rescue activities on the part of the Center.

Therefore it is considered probable that the captain had been in effect in a position to make a judgment on whether to dispatch an aircraft. It is considered probable that the Manager of the Center simply decided to dispatch the Aircraft in the form of endorsing the captain's judgment and notified the decision to the Disaster Prevention Division of the Gifu Prefectural Government.

According to the statement in 2.10.11 (2), the Director of the Disaster Prevention Division, as the Operation Control Manager, sought an explanation from the Center about the circumstances which had led to the decision to dispatch the Aircraft, but the director had no knowledge about the place where the latest rescue activity was to be made, and the director had not been aware, either, that the records about mountain rescue activities by the Center had not included any case in the Northern Alps area. Furthermore, the director had not recognized that accidents in the Northern Alps must be covered by the Prefectural Police Aviation Unit. Because he concluded that the decision to dispatch the Aircraft had been made by an expert at the Center which is engaged in actual operations, the director respected its judgment. As a result, it is considered probable that the director stopped short of ordering the Center to stop the dispatch of the Aircraft. As described in 2.10.3, the Rule lacks a provision which authorizes the Director of the Disaster Prevention Division to decide on whether or not to dispatch the Aircraft. Therefore, it is considered possible that the director did not instruct the Center to stop the dispatch of the Aircraft for this reason.

According to the circumstances mentioned above, neither the Rule nor the Emergency Operation Guideline had a provision for checking the advisability of dispatching an aircraft from the Center. There was no provision, either, that requires the Operation Control Manager and the Operation Control Supervisor to have professional knowledge and experience related to aviation. As a result, there was no responsible person at the Center, except the captain, who can make a judgment on the dispatch of an aircraft. Accordingly, although the Rule and the Emergency Operation Guideline, as described in 2.10.1, resembled comparable regulations established by the other local governments in terms of their contents, it is considered probable that they lacked an appropriate provision to secure a safe operation for the Aircraft.

3.10 The Aircraft's Flight Plan and Allowable Maximum Weight

As described in 2.1, the Aircraft was originally scheduled to depart from Gifu Air Base and return there after the rescue work at Mt. Nishihotaka-dake, but the plan was changed because the Aircraft disembarked some persons and picked up others at Takayama Helipad and Nabadaira Helipad. As a result, the Aircraft needed to reconfirm its CG and other factors following the change in its flight plan. According to the statement in 2.10.11 (4), in preparing flight plans at the Center,

when details are not clear at the time of the receipt of a request, they collected necessary data before the departure and based on it, they sometimes started flights after making a simplified chart which shows the gross weight and the CG location of a helicopter. It is considered probable that the captain took this process in the latest flight operation and started his flight. But because a simplified chart believed to have been prepared by the captain was not recovered from the crash site, details could not be made clear.

The table in 2.5.4 shows changes in the Aircraft's gross weight and its residual fuel load. The Aircraft's allowable maximum weight was 9,849 lb just before the hoist descent of the two persons near the rescue site at 15:03. Therefore, it is considered highly probable that the allowable maximum weight had exceeded the OGE hovering allowable maximum weight, as described in 2.5.3, at the altitude involved. It is considered probable that the Aircraft was near the top of Roba-no-mimi, as described in 3.4, when it was hovering before the start of the lifting at around 15:19. It is considered highly probable that the Aircraft's allowable maximum weight at that time, estimated at 9,318 lb, was almost equal to the OGE hovering allowable maximum weight near the altitude involved.

As described in 2.1, after the takeoff, the captain changed his flight plan in order to pick up the Mountain Ranger A at Nabadaira Helipad. At that time, the captain submitted the flight plan to CAB that its fuel load expressed in endurance was one hour and 29 minutes. This fuel load translates into about 1,068 lb, when calculated based on the fuel consumption rate of 720 lb per hour for helicopters' routine flights at the Center. It is considered highly probable that a figure around this estimate had been shown on the Aircraft's digital fuel meter. Therefore, it is considered probable that the captain could estimate the Aircraft's allowable maximum weight by monitoring the fuel meter and using the simplified chart. But the Aircraft hovered later with its allowable maximum weight exceeding the OFE hovering allowable maximum weight. As to the hovering in this situation, it is considered possible that by checking the power of the helicopter at the rescue site, the captain had tried to confirm readings on the torque meter (TORQUE), the gas producer turbine rotation meter (N1) and the inter-turbine thermometer (ITT) to ascertain whether a sufficient hovering performance is available, and tried to confirm whether the given indications are within the allowable ranges and while considering the leeway of the movable ranges for the cyclic control lever and the rudder pedal, he tried to judge whether to start hovering for descending the two persons. It is considered probable that the captain started hovering because he could confirm in the course of the power check that the indications on the instruments are within the allowable ranges.

But, as described in 2.11.2 (2) (c), if a helicopter hovers with a allowable maximum weight exceeding its flight performance and at a high altitude, serious problems for its flight could occur. Therefore, when a plan has to be prepared for hovering at a high altitude, just like the rescue site, even in the case of an emergency operation, the allowable maximum weight in hovering needs to be precisely calculated beforehand so that the fuel load can be adjusted in an appropriate manner before takeoff. Given these facts, it is considered probable that the latest flight plan for the Aircraft had been ill prepared in view of its takeoff from and landing on helipads and the management of fuel.

3.11 Formation of Pilots

According to the statements in 2.10.11 (1) and (8), the captain tried to depart quickly in the rescue flight despite his failure to obtain a reply from the Prefectural Police Aviation Unit to his

request for providing a copilot to assist his flight. The Aircraft was a model which can be operated with a single pilot and it had actually been operated with only one pilot in the past. Also because the Rule and other regulations lacked a provision about the number of pilots, it is considered probable that the captain may have decided to use the Aircraft with a single pilot aboard, and it is considered probable that the Manager of the Center had endorsed the captain's judgment. But, according to the statement in 2.10.11 (7), operations with two pilots aboard make it possible to better cope with changes in the external environment, such as obstacles and the weather condition, and keep a more careful watch on the situation around the aircraft. Flights with two pilots aboard lead to a safer operation, also because the two pilots can support each other during the flight. Because the latest rescue flight was a single-pilot operation with the captain aboard, the Aircraft was hovering in unfavorable conditions. Specifically, it was hovering with its allowable maximum weight exceeding the OGE hovering allowable maximum weight at one point, as described in 3.10, because its flight plan had been ill prepared. The Aircraft was unable to hover in a head wind, as described in 3.4, because the choice of setting the direction of its heading was limited with rock walls located nearby. Had it been operated with two pilots, jobs before departure and judgment matters would have been shared, not overloading the captain alone, under the bustling atmosphere before an emergency dispatch. It is also considered probable that the Aircraft could have been operated in a better condition and made a safer hovering at the rescue site.

3.12 Watch and Relocation of Rescue-Requiring Person

During the hovering the captain raised the Aircraft to an altitude around the top of Roba-no-mimi in order to avoid the North-South Rock Wall and the East-West Rock Wall which was in his blind spot. As a result, it is considered possible that he had understood that he could have maintained a sufficient distance between the Aircraft and the rock wall which would be hit with its MRBs later. Regarding how to watch the right side behind the Aircraft, which was in the captain's blind spot, according to the statement in 2.10.11 (5), the Mechanic A, who was operating the hoist, had to focus on the job. As a result, in accordance with jobs specified in the BELL Activities Manual, as described in 2.11.3, the Sub-Chief, who was the airborne safety manager, is believed to have been in charge of keeping a watch on the area. But it is considered possible that just like the captain, he had also understood that a sufficient distance had been secured from the rock wall because the altitude of the Aircraft had been raised to near the height of Roba-no-mimi.

As described in the statement in 2.10.11 (7), when it is difficult to get the hoist down to the selected place, the possibility of relocating the Rescue-Requiring Person to a better place must be considered. But, as described in the statement in 2.1.3 (4), the rescue site in the latest case was so difficult a place that climbers had to move while holding to handrail chains. Because rescuers would have to pass so dangerous a place that climbers would easily slip down, it is considered highly probable that it was very difficult to relocate the Rescue-Requiring Person to a different place in the case.

3.13 Responses to a Rescue Request in Northern Alps and Dispatch of the Aircraft

According to "Chapter 3 Operation Control" of the Rule, as described in 2.10.3, and "Duties of Prefectural Police Aviation Unit", as described in 2.10.10, both the Prefectural Police Aviation Unit and the Center have had rescue activities as part of their respective jobs.

According to the minutes of the meeting, as described in 2.10.6 (1), it was agreed in the meeting that rescue activities in the Northern Alps shall be basically covered by the police side and

firefighters at the Center shall not be engaged in rescue activities there. But this had not been clearly stated in the Agreement or the Operation and Management Procedure, which were concluded later. As described in 2.10.6 (1), the Prefecture understands that the Agreement mentioned above does not deny mountain rescue activities of the Center and that while rescue activities in the Northern Alps will be basically covered by the Prefectural Police Aviation Unit, disaster prevention helicopters may be dispatched, depending on the situation. But there is nothing that clearly states such understanding. Therefore, it is considered possible that the Center had no clear picture of the division of jobs in rescue activities in the Northern Alps between the Center and the Prefectural Police Aviation Unit.

Judging from the aircraft dispatch and training records, as described in 2.10.8 and 2.10.9, as well as the statement in 2.10.11 (4), it is considered probable that the captain had been aware that the Prefectural Police Aviation Unit was always in charge of rescue activities in the Northern Alps, but it could not be clarified how this fact had been recognized by the captain. As described in the statement in 2.10.11 (8), the captain decided that the Center would dispatch the Aircraft in the case, without waiting for a reply from the Prefectural Police Aviation Unit. Then, he actually departed for rescue despite a request for him to wait, which came just before his departure from the Prefectural Police Aviation Unit. Furthermore, the Aircraft's gross weight had exceeded the OGE hovering allowable maximum weight in the course of its rescue flight. It is considered possible that the series of developments had reflected his judgment that an aircraft should be dispatched as quickly as possible from the point of view of life saving, in accordance with the provisions in Articles 19, 20 and 21 of the Rule, as described in 2.10.3, which state that an aircraft shall be operated when the dispatch of an aircraft is considered to be necessary and when a request based on the Agreement has been made for an emergency operation, as well as the provision, as registered in 2.10.6 (3), that action shall be taken by an organization which has received a request first of all under the Operation and Management Procedure. As described in 2.10.8 and 2.10.9, the captain is believed to have had general knowledge and experience about mountain rescue activities through his actual flights to the Norikura-dake and Ontakesan area, but he had no records of training or rescue activities in the higher Northern Alps areas. Therefore, it is considered probable that he did not fully recognize the difficulty of rescue activity at a place very close to a rock wall, just like the rescue site, in the Higher Mountainous Areas in the Northern Alps over the elevation of 3,000 m.

The Agreement, as mentioned in 2.10.6 (2), shows the responsible persons for operation control and the commanding system for joint operation of the Aircraft. According to Article 8 of the Agreement, as mentioned in 2.10.6 (2), and as described in 2.10.11 (7), Prefectural Police Aviation Unit officers and Air Rescue Team members are assigned concurrently to both the Fire and Disaster Prevention Division and the Regional Affairs Division in order to better cope with cases which require their joint operation. Therefore, it is considered probable that while keeping in mind this system, the captain had asked for providing a copilot from the Prefectural Police Aviation Unit. But the captain made this request to a rank-and-file Police Aviation Unit officer and sought a quick response whether the officer was ready to be aboard the Aircraft, without giving the officer time to report to the Police Aviation Unit Chief or to obtain an order from the Police Aviation Unit Chief. The Manager of the Center did not consult with the Director of the Disaster Prevention Division, either. As a result, it is considered probable that coordination efforts had not been made in an appropriate manner as stipulated in Article 5 of the Agreement for mutual cooperation between the two organizations.

If the above mentioned agreement between the Prefectural Police Aviation Unit and the

Center regarding rescue activities in the Northern Alps had been clearly documented and if their job sharing and conditions for dispatching their helicopters had been clarified, it is believed that the captain would have made a judgment under these rules on whether to dispatch the Aircraft. It is considered probable that comprehensive coordination between the Police Aviation Unit and the Center would have also been made among a range of persons, including the Sub-Chief and the Manager of the Center, who may have exchanged their views on not only the Center's receipt of a rescue request and the necessity for the Center to have a pilot provided from the Police Aviation Unit but also the fact that the Center has no team of ground personnel capable of operating in the Higher Mountainous Areas.

3.14 Rescue Activity and Training Records for the Aircraft in Mountainous Areas and Necessity for Training

As described in 2.10.8, the Aircraft's altitude-specific search and rescue activity records in mountainous areas mostly concerned mountains or forests up to 1,000 m. There was only one record for operation above 2,500 m, in which the Aircraft was dispatched for an emergency transportation mission. As described in 2.10.9, training for the Aircraft was made three times in fiscal 1997, one hovering in the Northern Alps Mountains and for landing on a helipad at Hotaka-dake Hut. But according to the statements in 2.10.11 (4) and (5), the captain did not participate in the training at that time. Training activities in later years were mainly carried out at Mt. Ontakesan and Mt. Norikura-dake area. The purpose was to confirm the controlling techniques and flying performances in hovering at a high altitude. There was no training in the higher Northern Alps areas. Therefore, it is considered possible that the captain did not have a precise picture of phenomena which cannot be observed on the level ground or on sloping places in forests, such as changes in air currents in the Higher Mountainous Areas, as described in 3.3, and the influence of the downwash on the hoist cable at a location which is close to a rock wall, as described in 3.5. The Center has carried out training in which firefighters actually descend from a helicopter with the hoist, at locations throughout the prefecture, but the places where the training was made mostly had an elevation of less than 1,000 m.

Given these facts, it is considered highly probable that the Center had not assumed that its helicopters would be dispatched for rescue activities in the higher Northern Alps areas, nor had it trained its firefighting staff on the assumption that they would be dispatched for the higher Northern Alps areas. Therefore, because the Center did not assume its personnel would operate anywhere in the Northern Alps, it was desirable for the Center to leave at least rescue activities in the steep Higher Mountainous Areas to the Prefectural Police Aviation Unit, which is well experienced in activities in those areas.

The Center's main duty is to carry out emergency rescue activities and in order to fulfill its mission, it is considered to be inevitable to dispatch its personnel to a place where some danger exists. But before the Center assumes a mission in such a situation, the Center needs to be able to assess various kinds of risk in aircraft operations and rescue activities by personnel on the ground. For this purpose the Center needs to know about limitations by obtaining more experience through training and it is necessary to shift to actual dispatch after having learned the ability that can manage the risk.

3.15 Recurrence Prevention Measures

As described in 3.14, it is considered highly probable that the captain had not fully obtained

experience to have a precise picture of characteristic meteorological phenomena and geographical features in the area involved, because he had no training or activities records in the higher Northern Alps areas. But, as described in 3.13, there was no clear provision between the Prefectural Police Aviation Unit and the Center that rescue operations in the higher Northern Alps areas will be basically handled by the Police Aviation Unit. As a result, it is considered highly probable that the captain had departed on his mission from the point of view of saving a human life in accordance with the Rule, the Emergency Operation Procedure and the Operation and Management Procedure, though it was the first request received by the Center for a mountain rescue activity in the Northern Alps.

A final decision at the Center for dispatching the Aircraft for an emergency operation, according to the Emergency Operation Procedure and the Manual, shall be made by the Manager of the Center, but actually, the captain had been in charge of the duty. It is considered probable that in making such a decision, the captain had to perform such jobs as coordination with related organizations and collection of necessary information with other personnel and at the same time, while preparing a flight plan, he had to consider various factors in a tense atmosphere before an emergency operation. As mentioned in “4. Decision on Dispatch” in the Manual in 2.10.5, the Air Rescue Chief or the Air Rescue Sub-Chief are required to make preflight consultations with a pilot, a mechanic and others, but as described in 2.10.11 (1), it is considered highly probable that a decision had been made while persons were performing their jobs in preparation for the dispatch and that any briefing was not made with the Manager of the Center and the Sub-Chief before the final decision.

Given these facts, the Center should establish a systematic decision-making process of aircraft dispatch, upon assessing the danger of the destination and conformity of its own preparedness in accordance with the Emergency Operation Procedure and the Manual. In order to make this process effective, the Center should assure its staff to ascertain the condition of the destination before a decision is made and require the chief of each group to have a briefing so that a clear judgment can be made on whether the groups will be able to operate in their respective areas before the Manager of the Center confirms an agreement among the groups and it makes a decision for the dispatch. As the Northern Alps are among the areas under the control of the prefecture, aircraft may be dispatched to places in the higher Northern Alps areas, and if its aircraft are to be dispatched to places where rescue work has to be done in a very difficult situation, just like the Higher Mountainous Areas in the Northern Alps, including the rescue site, it is considered necessary that the Center needs not only research and studies about geographical features, meteorological phenomena and other factors in advance but also hovering training at a high altitude, and on top of that, mission-oriented broad range of training in which the aircraft weight are closely controlled. Prior research and studies must be considered also for the purpose of securing safety for firefighters who work on the ground. It is considered necessary to fully study actual places for operation and rescue gears to be used there.

Furthermore, in case of the dispatch to the place where rescue work has to be done in a very difficult situation, just like the Northern Alps Mountainous Area, it is desirable to operate a helicopter with two pilots, because, as described in 3.11 and 3.14, a quick preparation of a flight plan, a decision making of dispatch and other things must be done quickly under bustled pre-launch situation.

The Center also needs to introduce a more appropriate system for helicopter operation by creating a clear provision about go-no-go decisions and the job adjustment with the Prefectural

Police.

4. CONCLUSION

4.1 Summary of Analysis

4.1.1 Meteorological Condition and Geographical Features Which Influenced the Aircraft

- (1) It is considered highly probable that the areas around the accident site had been influenced not only with upward air currents amid the prevailing wind from the west but also with a complex, quickly changing turbulence which is particularly seen in the Higher Mountainous Areas, where the air currents there can be influenced by complex geographical features, such as steep cliffs and valleys.
- (2) It is considered highly probable that the Aircraft was receiving a cross wind from the left when it was hovering. But because the Aircraft had been operated by a single pilot, it is considered probable that the captain had given priority to keeping a watch on rock walls as obstacles and securing an emergency breakaway route over stabilizing the aircraft with the heading kept straight toward the wind so that the rock walls can be under watch on his side. It is considered probable that the captain tried to set the hovering altitude before the lifting at about 80 ft, but it is considered probable that in order to keep away from the North-South Rock Wall and the East-West Rock Wall, which was in his blind spot, the Aircraft was hovering after its altitude was raised to almost the same height as the top of Roba-no-mimi.
- (3) While the Aircraft was hovering, its altitude was suddenly lowered due to the influence of complex air currents which are particularly seen in the mountainous areas and the Aircraft itself moved backward. As a result, it is considered possible that because it became difficult for the captain to maintain his sense of distance with the mountain across the valley, which he is believed to have set as his target in the initial hovering, making it hard for him to properly correct the location and the altitude of the Aircraft, and as a result, the Aircraft moved backward and its MRBs hit the rock wall. The allowable maximum weight of the Aircraft when it was hovering before the start of the lifting at about 15:19 was almost equal to the OGE hovering allowable maximum weight. Also because the Aircraft was operating at a high altitude in an unfavorable condition in which its engine thrust or flight performance may be influenced by changes in air currents as well as by cross winds, it is considered possible that the Aircraft's altitude declined due to an insufficient engine thrust and other reasons, making it difficult to maintain the direction of its heading, and then, the Aircraft's MRB hit the rock wall. It is considered highly probable that when the Aircraft hit the rock wall, it was about 7 m north-northwest from the rock wall where the hit marks by the MRB were found, and its altitude was about 3,148 m.
- (4) It is considered probable that the downwash of the Aircraft, without spreading widely amid the influence of geographical features around the accident site, had rather converged toward the valley on the northern side, creating an even stronger flow. It is considered probable that influenced by the strong air flow, the hoist cable and the Hook of the Aircraft had flown toward the valley to swing over the rescue site. It is considered probable that because the Aircraft raised its altitude further, the length of the hoist-lifting cable came to about 48 m, including the surplus length, which is more than twice as long as the usual length of about 21 m in training, making the cable swing even more widely, and as a result, it took more time than usual for the personnel on the ground to get it.
- (5) The captain raised the altitude of the Aircraft to almost the same height as the top of

Roba-no-mimi in order to avoid the North-South Rock Wall and the East-West Rock Wall, which was in his blind spot. As a result, it is considered somewhat likely that the captain had thought that he could maintain a proper distance of the rock wall which was hit by the MRBs. It is considered probable that the Sub-Chief, who was the onboard safety manager, was in charge of keeping a watch on the right side aft of the Aircraft, but, just like the captain, it is considered somewhat likely that the Sub-Chief had thought a proper distance has been maintained with the rock wall because the altitude of the Aircraft had been raised to around the same height of the top of Roba-no-mimi.

As to the possibility of relocating the Rescue-Requiring Person to a different place, there was so difficult a place near the rescue site that rescuers and others may easily slip down. Therefore, it is considered highly probable that it was extremely difficult to relocate the person to a different place.

4.1.2 Detachment of Tail Boom and Engines

- (1) As to the tail boom of the Aircraft, it is considered probable that because the right side of the MRB rotational plane hit the rock wall fracturing MRBs against the rock wall and the transmission leaned backward, making it difficult for MRBs to maintain a normal rotational plane, leading to the MRBs' hard hit against the left side of the tail boom resulting in the fractured tail boom.
- (2) It is considered probable that the engines of the Aircraft were normally operating and that there was no abnormality with the fuselage.

4.1.3 Flight Plan and Decision on Dispatch as well as Safety Management 1 Organization

- (1) It is considered probable that at the Center the captain had been in effect in a position to make a judgment on whether to dispatch an aircraft. It is considered probable that the Manager of the Center simply decided to dispatch the Aircraft endorsing the captain's judgment and notified the decision to the Disaster Prevention Division of the Gifu Prefectural Government.

The Rule and the Emergency Operation Guideline had no provision which requires the Operation Control Manager to examine the advisability of dispatching an aircraft from the Center. There was no provision, either, that requires the Operation Control Manager and the Operation Control Supervisor to have professional knowledge and experience related to aviation. As a result, there was no responsible person at the Center, except the captain, who can make a judgment on the dispatch of an aircraft.

Although the Rule and the Emergency Operation Guideline resembled comparable regulations established by the other local governments in terms of their contents, it is considered probable that they lacked an appropriate provision to maintain a safe operation for the Aircraft.

- (2) As to the rescue activity by the Aircraft, because the captain tried to depart quickly despite his failure to obtain a reply from the Prefectural Police Aviation Unit to his request for providing a copilot to assist his flight; because the Aircraft was a model which can be operated with a single pilot and it had actually been operated with only one pilot in the past; and because the Rule and other regulations lacked a provision about the number of pilots, it is considered somewhat likely that the captain may have decided to fly the

Aircraft with a single pilot aboard.

It is considered probable that if the Aircraft had been operated with two pilots, its flight could have been made in a better condition and its safety could have been increased.

- (3) According to the minutes of the meeting between the Prefectural Police Aviation Unit and the Center, it was agreed that rescue activities in the Northern Alps shall be basically carried out by the police side and firefighters at the Center shall not be engaged in rescue activities there, but this had not been clearly stated in the Agreement or the Operation and Management Procedure, which were concluded later.

It is considered somewhat likely that the Center had not clearly recognized the burden sharing of jobs for mountain rescue activities in the Northern Alps between the Center and the Prefectural Police Aviation Unit.

It is considered probable that the captain had been aware that the Prefectural Police Aviation Unit was always in charge of rescue activities in the Northern Alps, but it is considered somewhat likely that he had thought he would have to depart as quickly as possible from the life saving point of view in accordance with the Rule and the Operation and Management Procedure.

It is considered probable that the captain had knowledge and experience about mountain rescue activities as a whole, but because he had no experience in training or rescue activities in the higher Northern Alps areas, it is considered probable that he did not fully recognize the difficulty of flying for a rescue activity at a place which is very close to a rock wall, just like the rescue site, in the Higher Mountainous Areas in the Northern Alps Mountains over the elevation of 3,000 m.

If the agreement between the Prefectural Police Aviation Unit and the Center regarding rescue activities in the Northern Alps Mountains had been clearly stated in a document and if their burden sharing and conditions for dispatching their helicopters had been clarified, it is considered probable that the captain would have followed these rules in making a judgment on whether to dispatch the Aircraft. It is considered probable that coordination between the Police Aviation Unit and the Center would have also been made among a broader range of persons, including the Sub-Chief and the Manager of the Center, who may have exchanged their views on not only the Center's receipt of a rescue request and the necessity for the Center to have a copilot provided from the Police Aviation Unit, but also on the fact that the Center has no team of ground personnel capable of operating in the Higher Mountainous Areas.

- (4) Judging from the rescue activity and training records for the Aircraft, it is considered highly probable that the Center had no assumption that its helicopters would be dispatched for rescue activities in the higher Northern Alps areas.

Because the Center had no assumption that its personnel would operate anywhere in the Northern Alps, it is considered to be desirable for the Center to leave rescue activities in the Higher Mountainous Areas to the Prefectural Police Aviation Unit, which is well experienced in those areas.

- (5) The captain is believed to have prepared a simplified chart which showed such data as the weight and the CG of the Aircraft when he prepared a flight plan, but the chart could not be found after the accident. As a result, his flight plan for the day of the accident could not be determined.

The captain was hovering with the Aircraft's gross weight exceeding the OGE

hovering allowable maximum weight. It is considered probable that the captain started hovering because he could confirm in the course of the power check that the indications on the instruments are within the allowable ranges.

When a helicopter hovers with an allowable maximum weight exceeding its flight performance at a high altitude, serious problems could occur for its flight. When a flight includes a hovering at a high altitude just like the latest rescue site, even in the case of an emergency rescue operation, the hovering allowable maximum weight must be precisely calculated and the fuel load must be adjusted in an appropriate manner before the takeoff.

- (6) According to the Emergency Operation Procedure and the Manual, a final decision to dispatch the Aircraft at the Center was to be made by the Manager of the Center, but the captain was in effect in charge of this job.

The Center should establish a systematic decision-making process of aircraft dispatch, upon assessing the danger of the destination and conformity of its own preparedness in accordance with the Emergency Operation Procedure and the Manual. In order to make this process effective, the Center should assure its staff to ascertain the condition of the destination before a decision is made and require each group chief to have a briefing so that a clear judgment can be made on whether the groups will be able to operate in their respective areas, before the Manager of the Center confirms an agreement among the groups and it makes a decision for the dispatch.

The Northern Alps are among the areas under the control of the prefecture, and an aircraft may be dispatched to places in the higher Northern Alps areas, and if its aircraft are to be dispatched to places where rescue work must be done in a very difficult situation, just like the Higher Mountainous Areas in the Northern Alps, including the rescue site, it is considered necessary that the Center needs not only research and studies about geographical features, meteorological phenomena and other factors in advance but also hovering training at a high altitude, and on top of that, mission-oriented broad range of training with actual operations in mind.

As to the formation of pilots for similar rescue operations, because such tasks as work on a flight plan, a go-no-go decision and other things must be done quickly under bustling pre-launch situation, it is desirable to dispatch a helicopter with two pilots when it has to operate in an area where rescue work must be done in a very difficult condition, such as the Higher Mountainous Areas in the Northern Alps. The Center also needs to introduce a more appropriate system for helicopter operation by creating a clear provision about the decision making of dispatch and the job adjustment with the prefectural police.

4.2 Probable Causes

It is considered highly probable that the Aircraft crashed while it was operating for a rescue activity in the Higher Mountainous Areas in the Northern Alps, where training or rescue operations had not been made with the Aircraft, the altitude of the Aircraft declined when it was hovering near the top of Roba-no-mimi and the Aircraft moved backward and consequently, its MRBs hit an adjacent rock wall.

As to the MRBs' contact with the rock wall after the decline of Aircraft's altitude, it is considered somewhat likely that either of the following two factors listed below or both could have affected in the consequence.

- (1) The Aircraft's movement following a decline in its altitude amid complex air currents

which are particularly seen in the Higher Mountainous Areas, leading to the captain's difficulty to maintain his sense of distance with a mountain across a valley, which is obscured by thin clouds, although it is believed to have been set as his target during the initial hovering.

- (2) Difficulty to maintain the Aircraft's heading following a decline in its altitude due to an insufficient engine thrust and other factors which was caused by the Aircraft's gross weight at the time of the accident being almost equal to the OGE hovering allowable maximum weight, and by the high- altitude operation in an unfavorable condition in which its engine thrust or its flight performance may easily be influenced by cross winds and by changes in air currents which are common to the Higher Mountainous Areas and cross winds.

As to the rescue dispatch of the Aircraft to the Higher Mountainous Areas in the Northern Alps, as an area where training or rescue operations had not been made by the Gifu Air Rescue Team, it is considered somewhat likely that the absence of no clear provision between the Center and the Prefectural Police Aviation Unit regarding the burden sharing for mountain rescue activities in the Northern Alps lead to the Center's no clear recognition about the burden sharing with the police side.

5. REMARKS

This accident occurred when the disaster prevention helicopter of Gifu Prefecture (hereinafter referred to as “the Aircraft”) was operating for a mountain rescue activity. Following the results of the accident investigation, points listed below are believed to have been inappropriate in terms of the operation of the Aircraft.

- In making a decision to dispatch the Aircraft, there was no provision that requires the Operation Control Manager to examine whether the dispatch of the Aircraft is appropriate or not, nor were there a provision that requires the Operation Control Manager and the Operation Control Supervisor to have professional knowledge and experience related to aviation, and a provision regarding the number of pilots aboard an aircraft to be dispatched.
- A final decision at the Disaster Prevention Aviation Center of Gifu Prefecture (hereinafter referred to as “the Center”) to dispatch the Aircraft for an emergency activity had been in effect made by the captain. Therefore, the Center lacked a systematic process in which the Manager of the Center can make a decision for the dispatch after confirming an agreement from each group toward the dispatch.
- There was no clear provision between the Center and the Gifu Prefectural Police Aviation Unit regarding the division of jobs for mountain rescue activities in the Northern Alps. It is considered somewhat likely that the Center lacked a clear recognition about this burden sharing.
- Judging from the rescue activity and training records for the Aircraft, it is considered highly probable that the Center had not assumed that it would be dispatched for a rescue operation in the higher Northern Alps areas, but nevertheless, the Center dispatched the Aircraft for the rescue mission.

The urgent necessity to begin a rescue operation for the purpose of life saving as quickly as possible is fully understandable. However, many difficult factors are involved in rescue activities in Higher Mountainous Areas by helicopter. Therefore, in order to prevent subsequent accidents and ensure safety in such activities, efforts must be made not only to acquire high levels of techniques for helicopter operations and rescue activities but also to establish a safety management system under which the dispatch of a helicopter can be decided in a swift and appropriate manner.

Consequently local governments which use helicopters for rescue activities, while keeping in mind the points above, are strongly desired to review their own safety management systems, rules and other related matters to ensure the safety of helicopter operations. It is also desirable that the Fire and Disaster Management Agency, which has given recommendations to local governments up until now, will do so regarding their review.

6. ACTIONS TAKEN

6.1 Recurrence Prevention Actions Taken by Gifu Prefecture

Following this accident, Gifu Prefecture, in order to prevent a recurrence of similar accidents, has revised “the Disaster Prevention Helicopter Operation Management Rule of Gifu Prefecture” and newly established “the Safety Management Procedure for the Gifu Air Rescue Team” and “the Agreement on the Operation of Helicopters between the Gifu Air Rescue Team and the Gifu Prefectural Police Aviation Unit”. Listed below are major points of revision and newly established provisions. Besides, “the Disaster Prevention Helicopter Emergency Operation Manual of Gifu Prefecture” was revised, and “the Dispatch Decision Confirmation Sheet” and “the Dispatch Decision Confirmation Report Sheet” were created.

6.1.1 Major Points of Revision in “Disaster Prevention Helicopter Operation Management Rule of Gifu Prefecture”

- (1) A post for a manager in charge of safety control has been newly established to provide advice about safe operations of aircraft to the Manager of the Disaster Prevention Aviation Center of Gifu Prefecture (hereinafter referred to as “the Air Rescue Chief”). (Excerpt)

(Safety Control Manager)

Article 8

Advice to the Air Rescue Chief regarding the operation of aircraft and jobs related to safety measures shall be made by the Safety Control Manager.

- (2) A provision which requires two pilots to be aboard an aircraft has been added. (Excerpt)

(Designation of Persons Who Are Aboard Aircraft)

Article 14

The Air Rescue Chief shall ... designate two persons as pilots and appoint one of them as the captain.

- (3) Regarding emergency operations, a new provision was included for requiring a consultation with the Prefectural Police Aviation Unit Chief based on an agreement to be separately established with the prefectural police.

(Decision on Emergency Operations)

Article 24 (Omitted)

2 When an event which requires an emergency operation occurred, the Air Rescue Chief will immediately decide on whether to dispatch an aircraft....

A consultation about rescue activities will be made with the Prefectural Police Aviation Unit Chief based on an agreement to be separately established with the prefectural police. (The rest is omitted)

6.1.2 Newly Drew up “The Safety Management Procedure for the Gifu Air Rescue Team” (Excerpt from the Clause on Purpose)

(Purpose)

Article 1 This procedure establishes necessary matters regarding safety management for the Gifu Air Rescue Team, based on Article 31, Clause 2 of the Disaster Prevention Helicopter Operation Management Rule of Gifu Prefecture (hereinafter referred to as “the Rule”). (The rest is omitted)

6.1.3 Newly Drew up “The Agreement on the Operation of Helicopters between the Gifu

Air Rescue Team and the Gifu Prefectural Police Aviation Unit” (Excerpt)

The Executive Director for Crisis Management of Gifu Prefecture (hereinafter referred to as “the A”) and the Executive Director of the Community Safety Department of the Gifu Prefectural Police Headquarters (hereinafter referred to as “the B”), regarding the operation of disaster prevention helicopters owned by the Air Rescue Team and police helicopters owned by the Police Aviation Unit, have agreed on matters listed below.

Article 1 (Omitted)

(Liaison System Regarding Aircraft Operations)

Article 2 The two sides, in order to have a picture of the each other’s helicopter operations, shall mutually exchange their weekly schedules in the preceding week.

2. A liaison point on the part of the Police Aviation Unit for aircraft operations in case of an emergency shall be the Office of the Police Aviation Unit, whereas a liaison point on the part of the Air Rescue Team shall be either one of the following places.

(1) The No.1 office at the Disaster Prevention Aviation Center in the daytime on weekdays

(2) The No.2 office at the Disaster Prevention Aviation Center in the daytime on weekends and on holidays

(3) The Air Rescue Chief at night

(Information Sharing Regarding Rescue Activities)

Article 3 When either of the two sides received a first report with regard to a rescue activity, they shall immediately communicate with each other regarding an outline of the case, in the manner established in Article 2, Clause 2, in order to share information with each other.

(Consultation on Helicopter Dispatch)

Article 4 A helicopter shall be dispatched basically by an organization which has received a first report with regard to a rescue activity. But when both organizations simultaneously received first reports, they shall consult with each other on the dispatch of helicopter in line with provisions included in the attached table below.

2 Regardless of the previous provision, when a first report has been received only by one organization and if the organization is unable to deal with the request or when it is considered to be better for the organization to leave the case to its counterpart, the two organizations shall consult with each other. By so doing, when the case will be addressed by its counterpart organization, the organization which has received the first report shall ask request organizations (the local fire Dept. or the local police office) to make a request for the dispatch of a helicopter to the counterpart organization, specifically the local fire Dept. or the local police office.

(Rescue Activities in Higher Mountainous Areas)

Article 5 Regardless of the previous provision, rescue activities in the Higher Mountainous Areas in the Northern Alps Mountains and in the Mt. Hakusan area shall be basically carried out by the Police Aviation Unit. In this case, when an initial report has been received solely by the Air Rescue Team, it shall ask the local fire Dept. involved to make a request for the dispatch of a helicopter to the local police office.

(Procedures for Consultation)

Article 6 The consultation mentioned in Article 4 shall be made basically between the Air Rescue Chief (hereinafter referred to as “the C”) and the Police Aviation Unit Chief

(hereinafter referred to as “the D”). But when the C or the D is out of office, a consultation shall be made between the safety control manager on behalf of the C and the Sub-Chief on behalf of the D. (The rest is omitted)

Attached Table

<i>Response</i>	<i>Specific Activities</i>
<i>Disaster Prevention Helicopters</i>	<ol style="list-style-type: none"> 1. <i>When fire fighting is an organization which operates as a main player at the actual site</i> 2. <i>When it is considered that a disaster prevention helicopter will reach the actual site ahead of a police helicopter</i> 3. <i>When it is considered that a disaster prevention helicopter will better deal with the situation than a police helicopter, in view of on-board rescue equipment and firefighters’ professional knowledge and experience regarding life saving</i>
<i>Police Helicopters</i>	<ol style="list-style-type: none"> 1. <i>When police is an organization which operates as a main player at the actual site</i> 2. <i>When it is considered that a police helicopter will reach the actual site ahead of a disaster prevention helicopter</i>

6.2 Measures Taken by Fire and Disaster Management Agency

6.2.1 Regarding this accident, the Fire and Disaster Management Agency issued a notice containing recommendations listed below, effective January 13, 2010, to the directors of departments in charge of fire and disaster prevention at prefectural governments as well as the Tokyo Fire Department and the fire defense chiefs of related major cities under Article 37 of the Fire and Disaster Management Organization Act so that further measures will be implemented to ensure the safety of fire and disaster prevention helicopters. The Fire and Disaster Management Agency also sent the copy of “the Disaster Prevention Helicopter Operation Management Rule of Gifu Prefecture”, revised after this accident, and that of “the Safety Management Procedure for the Gifu Air Rescue Team” as reference materials to these organizations. Furthermore, the Tokyo Fire Department will provide the copy of the report on this accident to these organizations upon it is completed by the Japan Transport Safety Board.

(1) Review of safety management system

The safety management system established under an operation management rule shall be reviewed to further ensure that the rule will be thoroughly implemented.

(2) Thorough prior grasp of the terrain and other features

Meteorological and other conditions in view of geographical features and seasonal changes in regions under jurisdiction, particularly mountainous areas

(3) Thorough efforts to confirm situation grasp in emergency operation

- a. Geographical features and weather conditions around accident sites to which helicopters will be dispatched
- b. Early discovery of other aircraft and obstacles while in operation
- c. Conditions of aircraft parts (interior and exterior conditions of the aircraft, such as vibrations and freezing)

6.2.2 In view of the fact that series of crash accidents involving helicopters have occurred in mountain rescue activities by fire and disaster prevention helicopters, the Fire and Disaster Management Agency established a study group in November 2010 for the purpose of discussing what an appropriate mountain rescue activity should be, including the operation system and rescue techniques, in order to ensure the safety of mountain rescue operations by fire and disaster prevention helicopters.

Figure 1-1 Estimated Flight Route

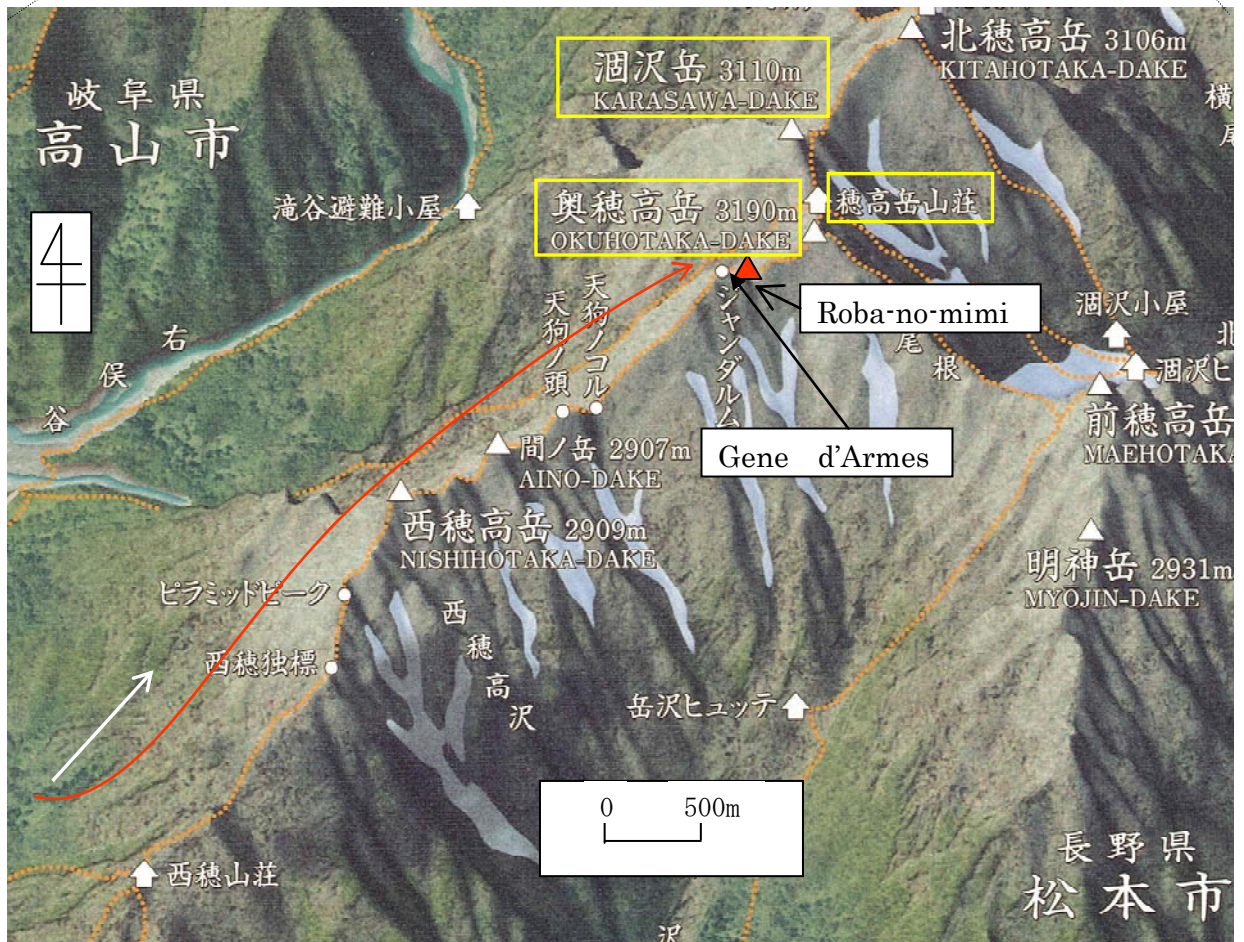
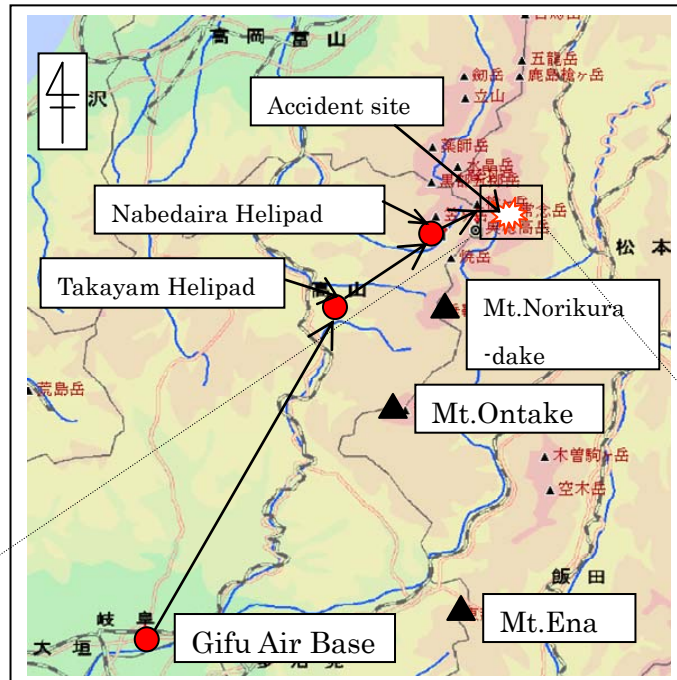


Figure 1-2 Estimated Flight Route

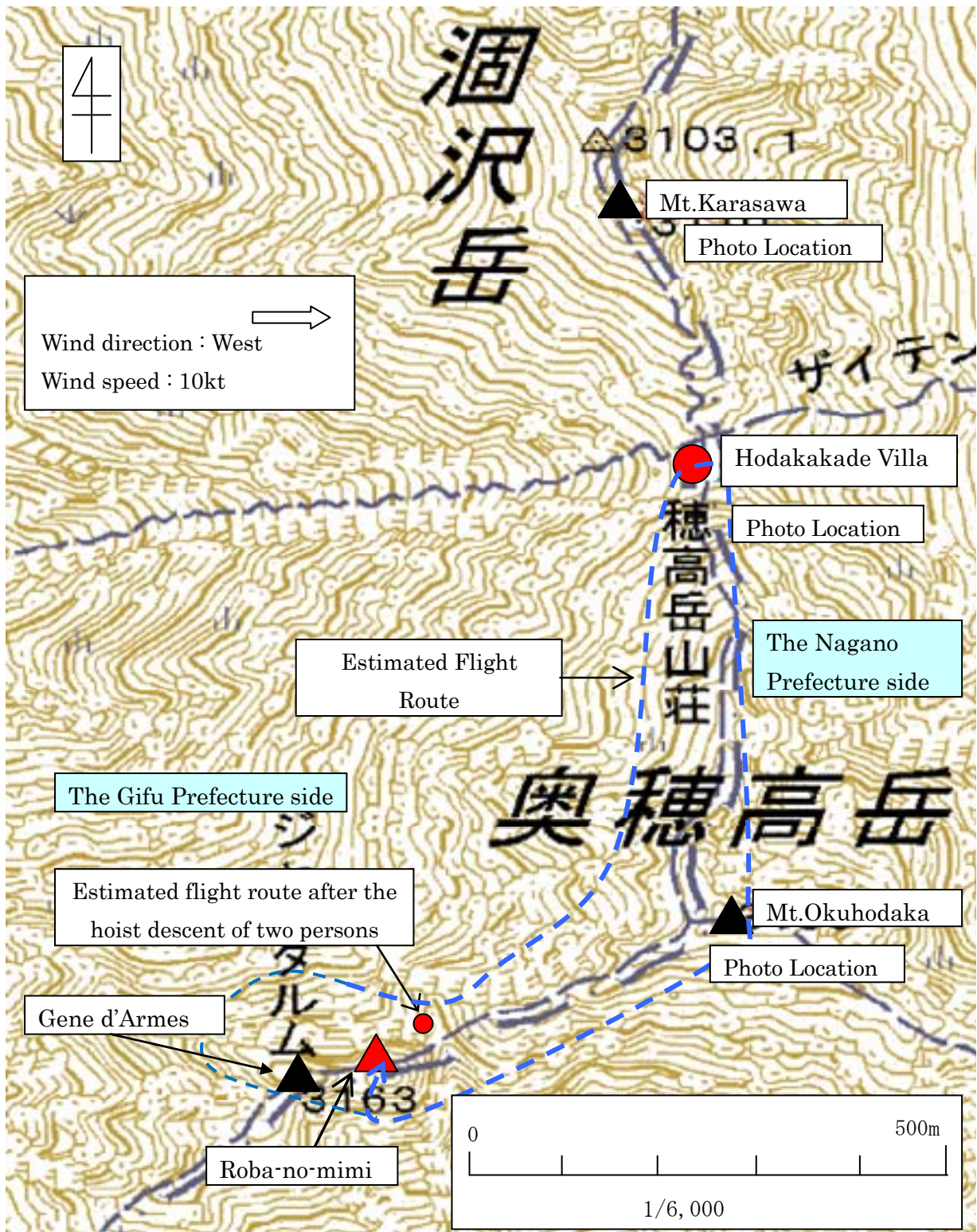


Figure 2 Three-Angle View of BELL 412EP

Unit : m

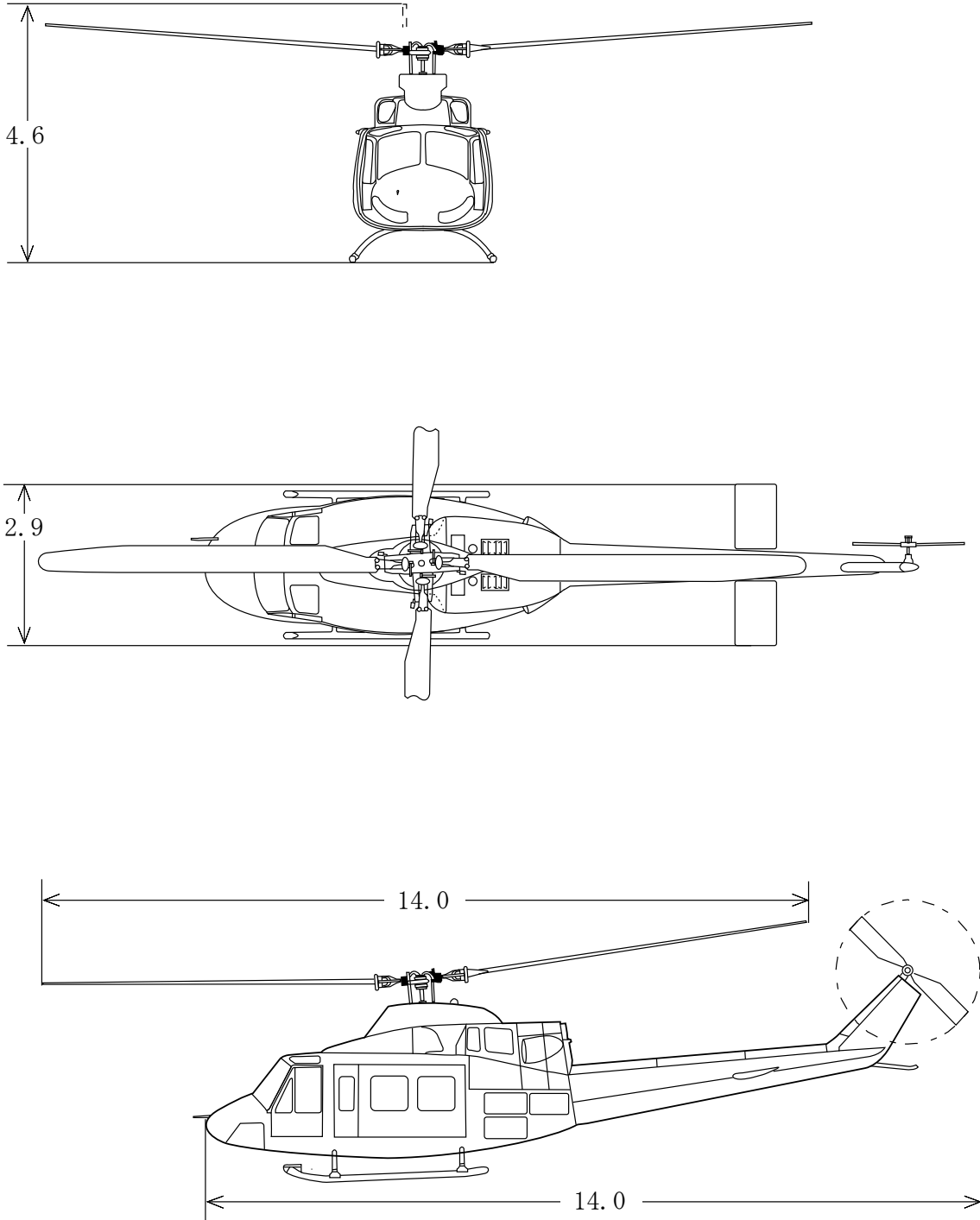


Figure 3 BELL 412EP Sketch and Damaged Part

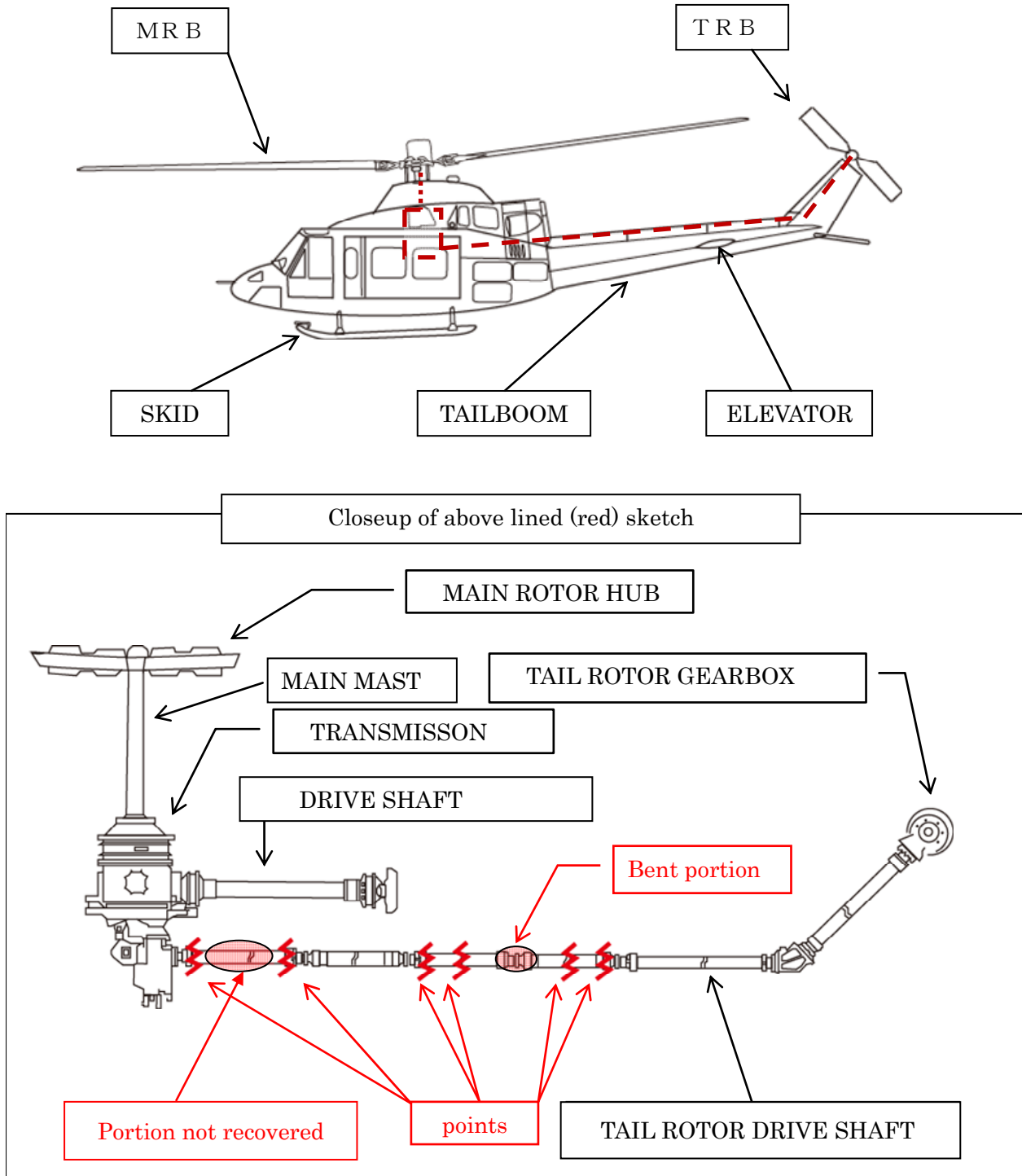


Figure 4-1 Layout of Accident Site

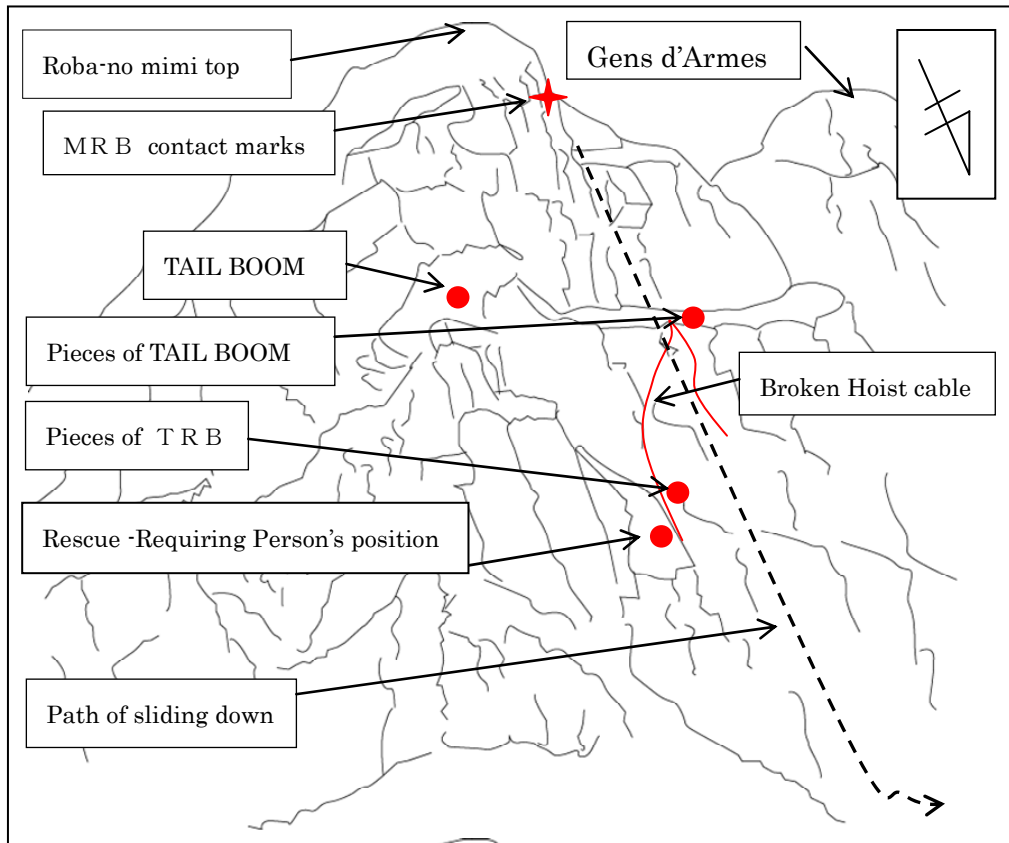


Figure 4-2 Layout of Accident Site

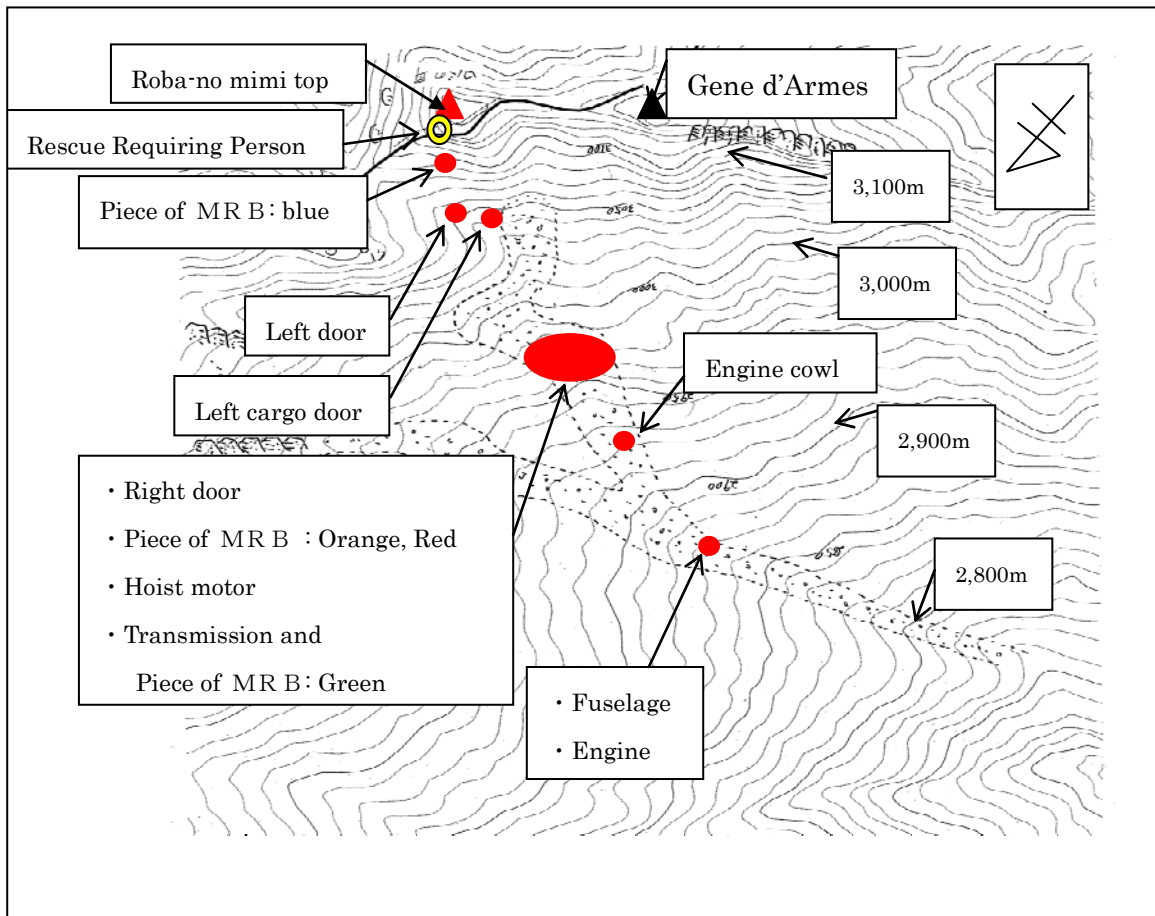
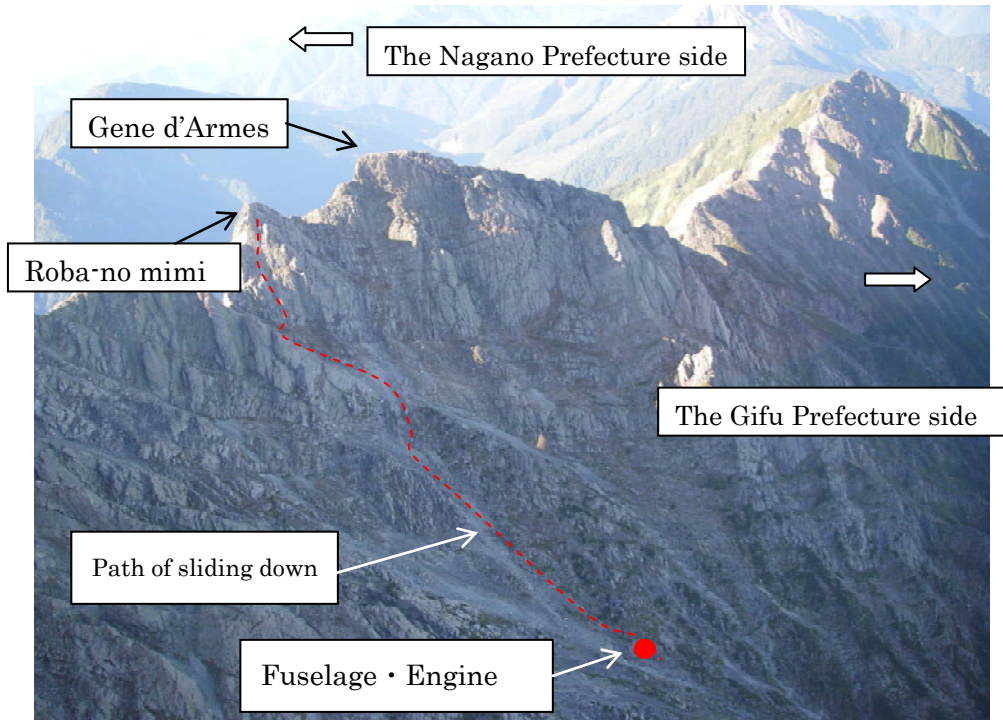


Figure 5 Asia-Pacific Surface Analysis Chart

September 11, 2009 06:00(UTC)

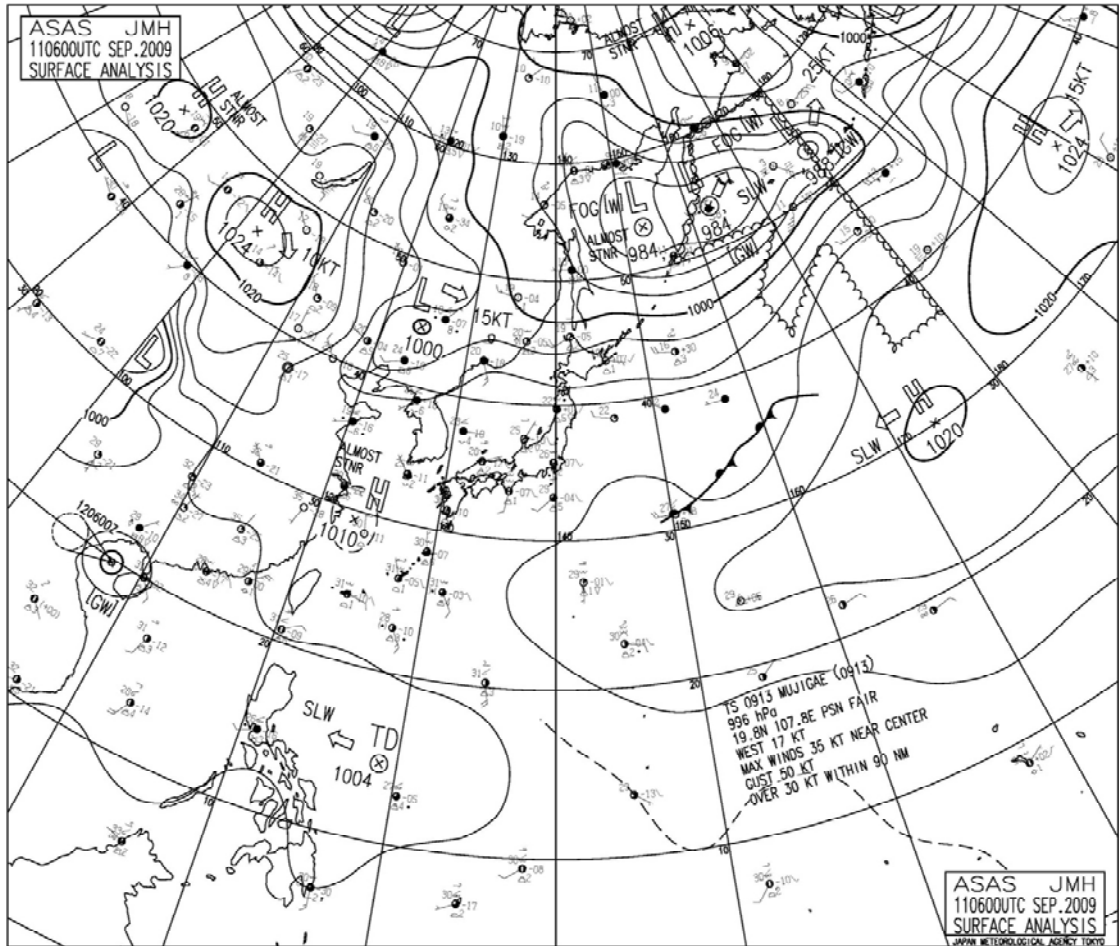
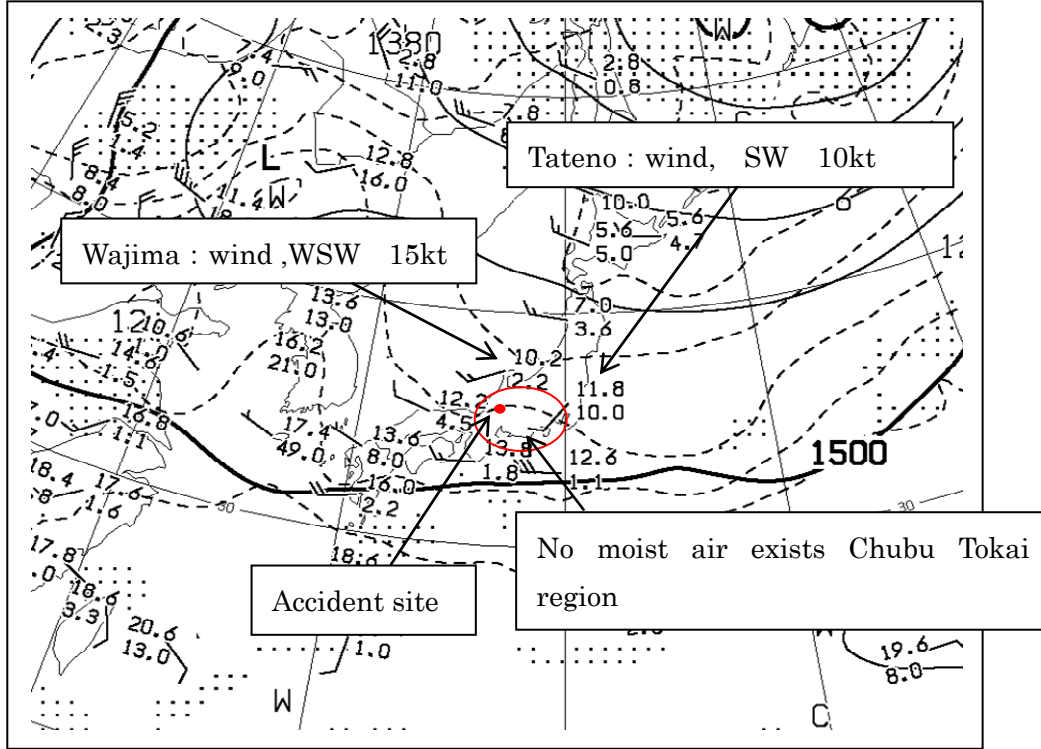


Figure 6 Upper Analysis Chart

September 11, 2009 00:00(UTC)

850 hPa



700 hPa

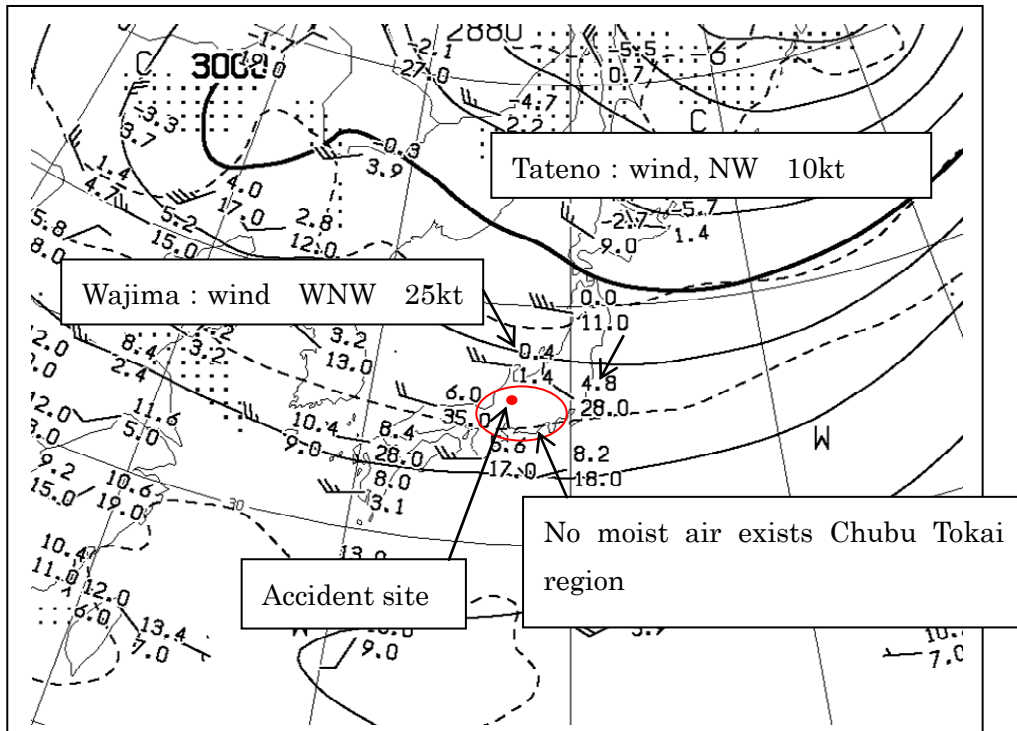


Figure 7 Layout of Related Locations

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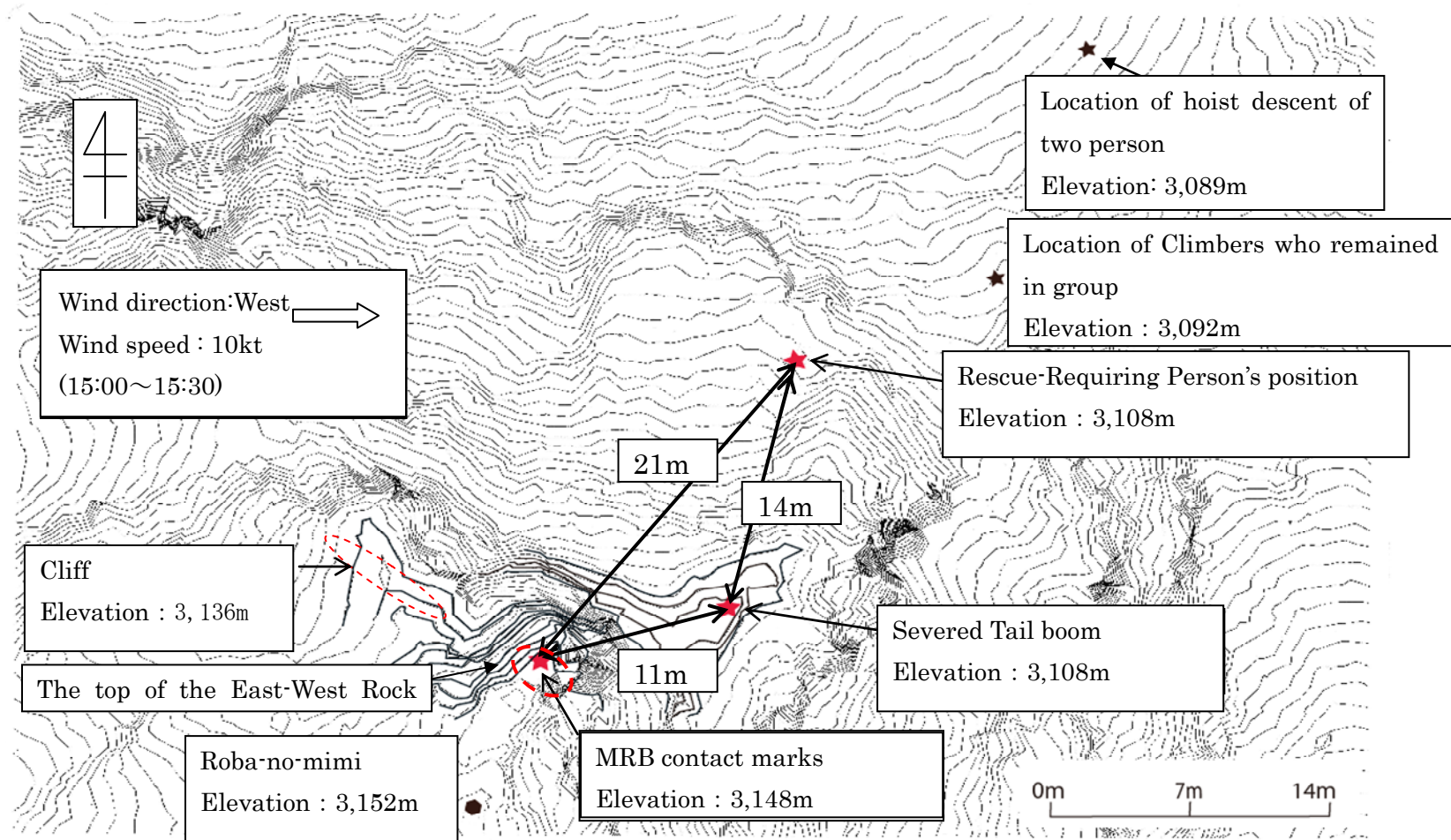


Figure 8 The Aircraft's Approach Path for Hovering before Start of the Lifting

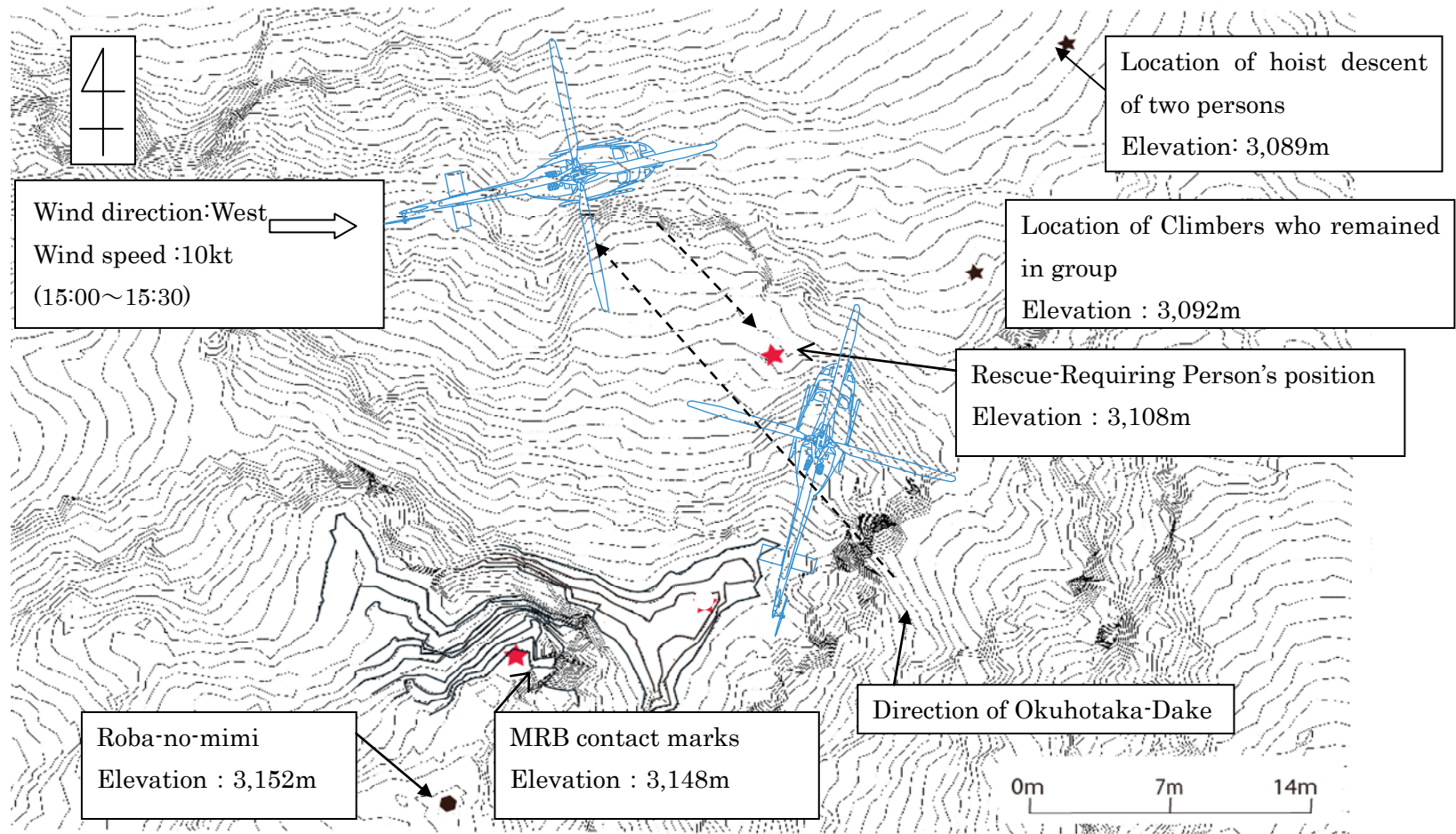


Figure 9 Layout Showing Distance between TRBs and East-to-West Rock Wall

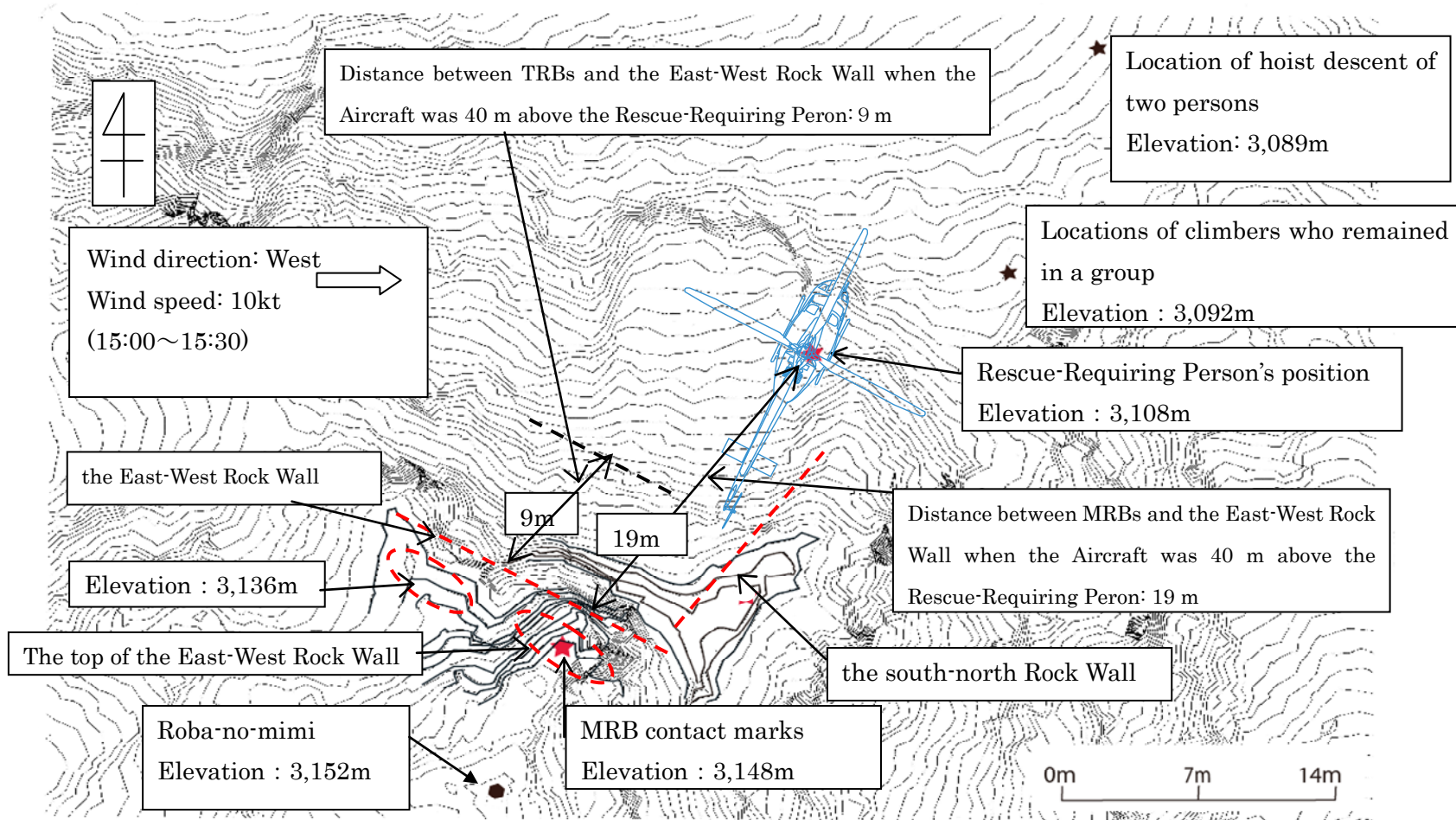


Figure 10 Layout of the Aircraft's Backward Movement and MRB Contact Point

69

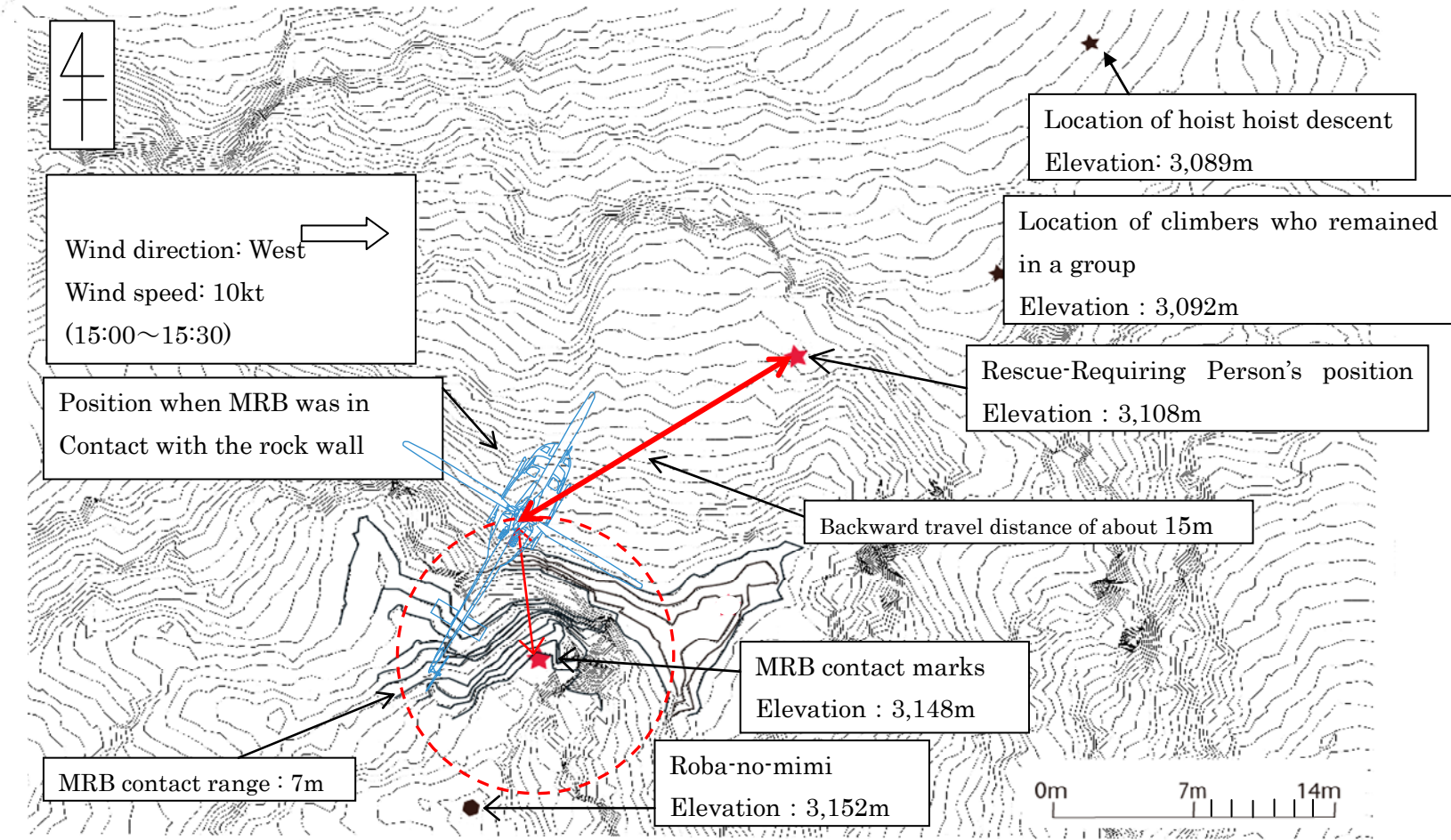


Figure 11 Layout of Members Positions' on Duty Aboard

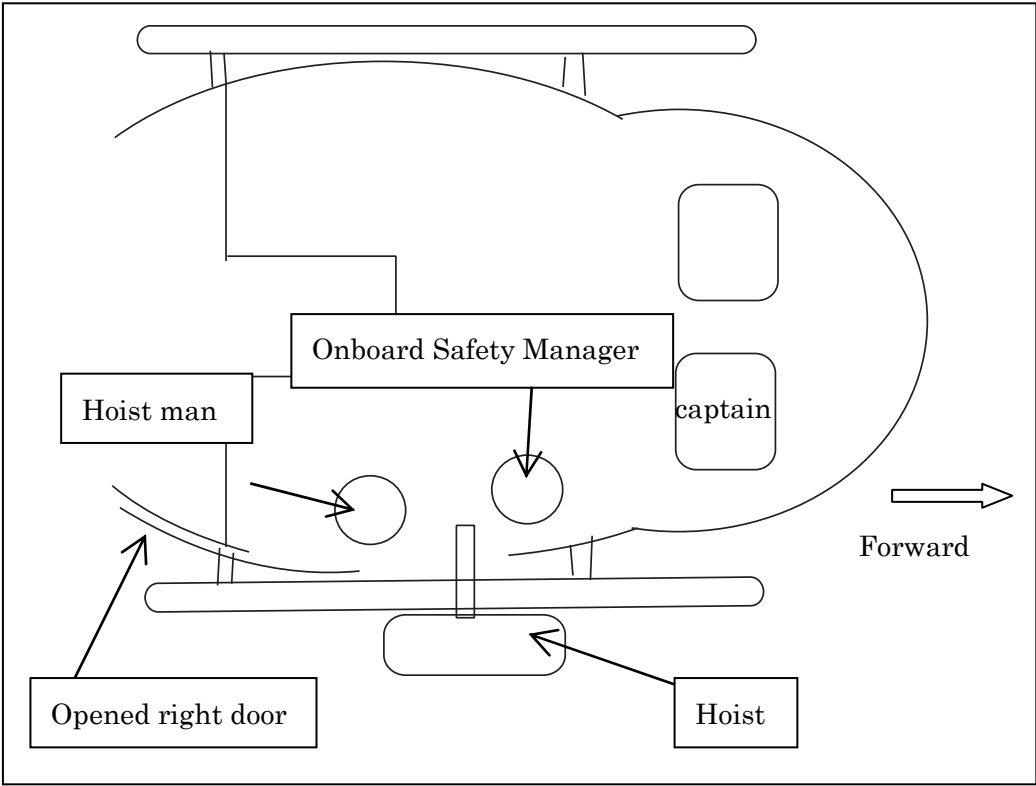


Figure 12 Structural Chart of Disaster Prevention Aviation Center of Gifu Prefecture

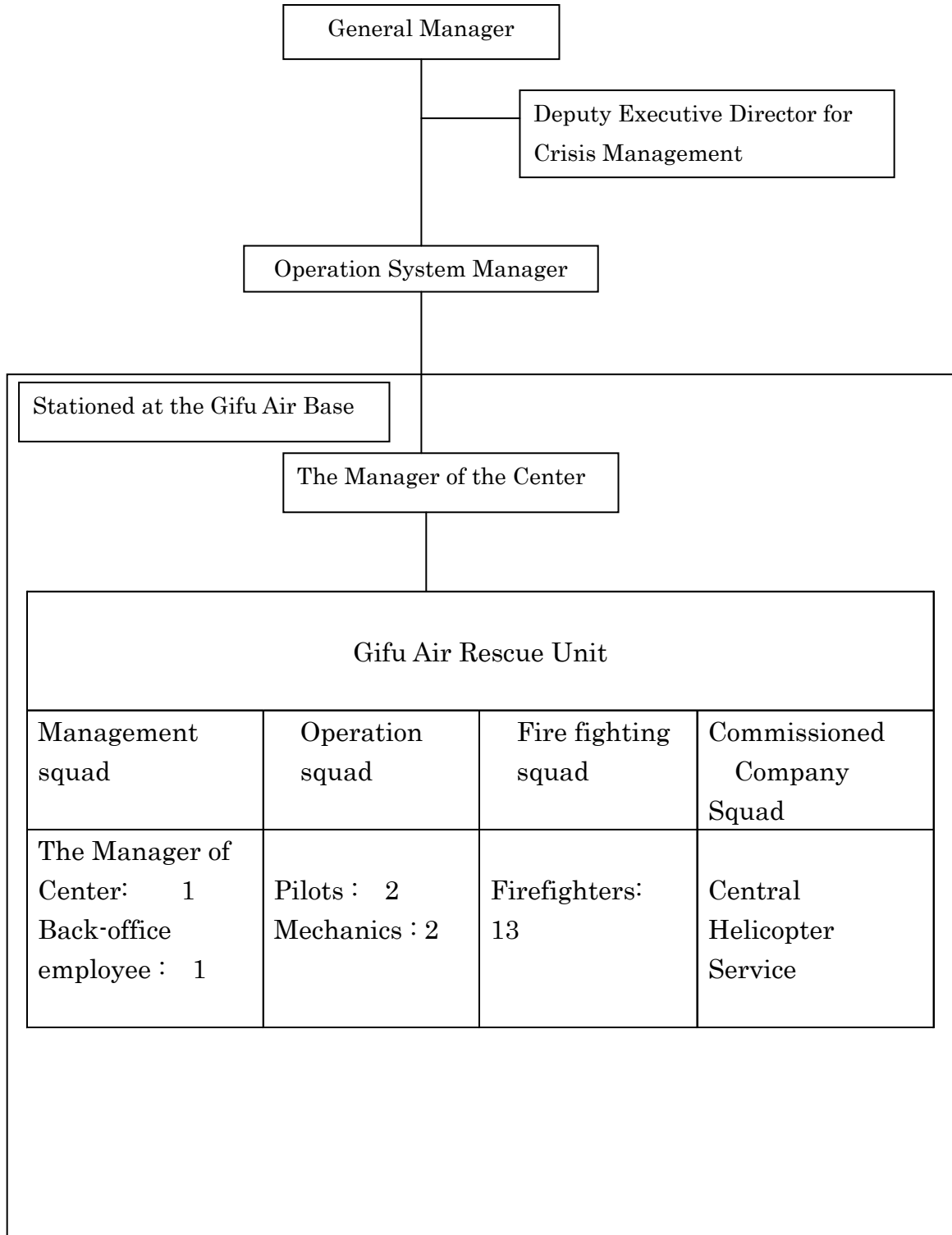


Photo 1 The Accident Aircraft



Photo 2-1 Roba-no-Mimi(2)

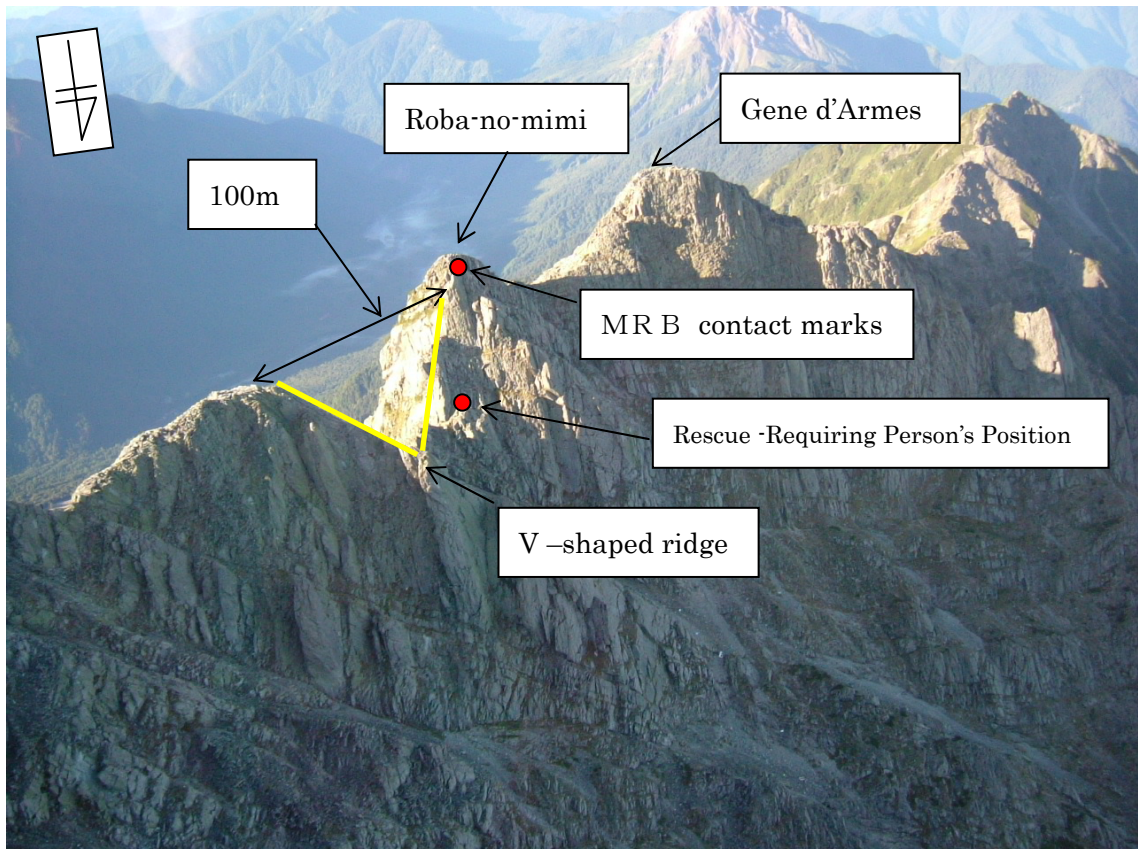
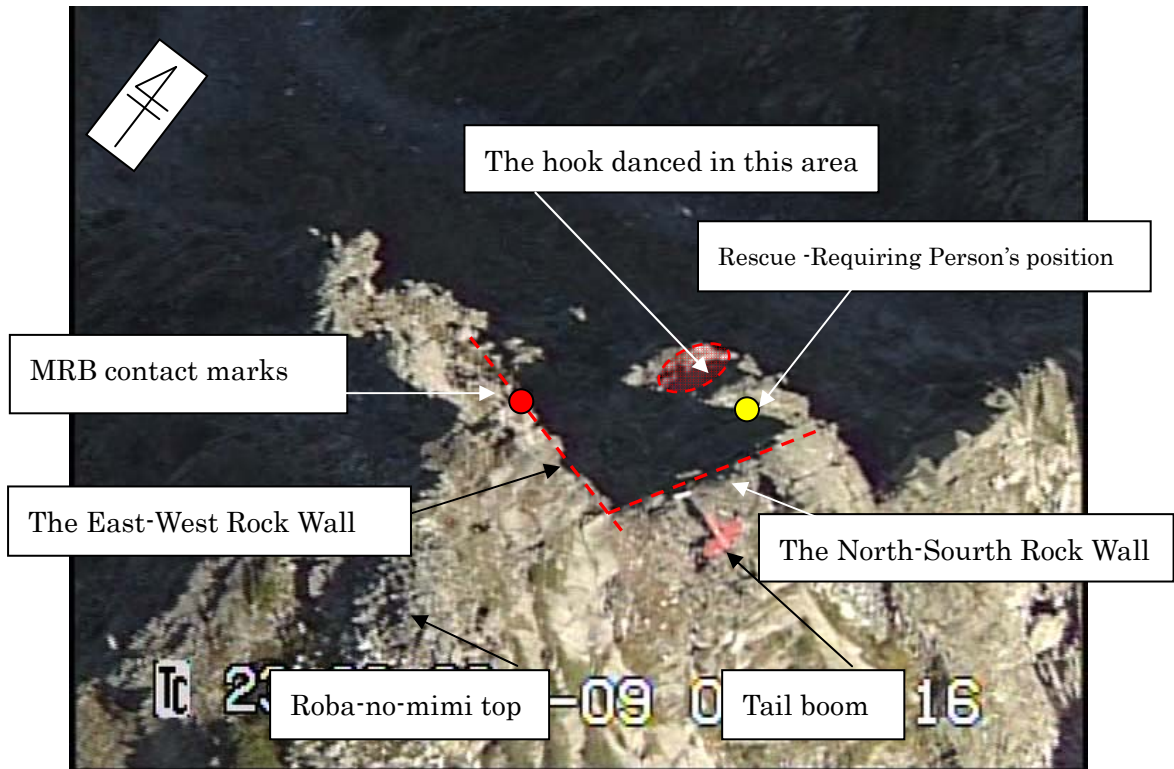
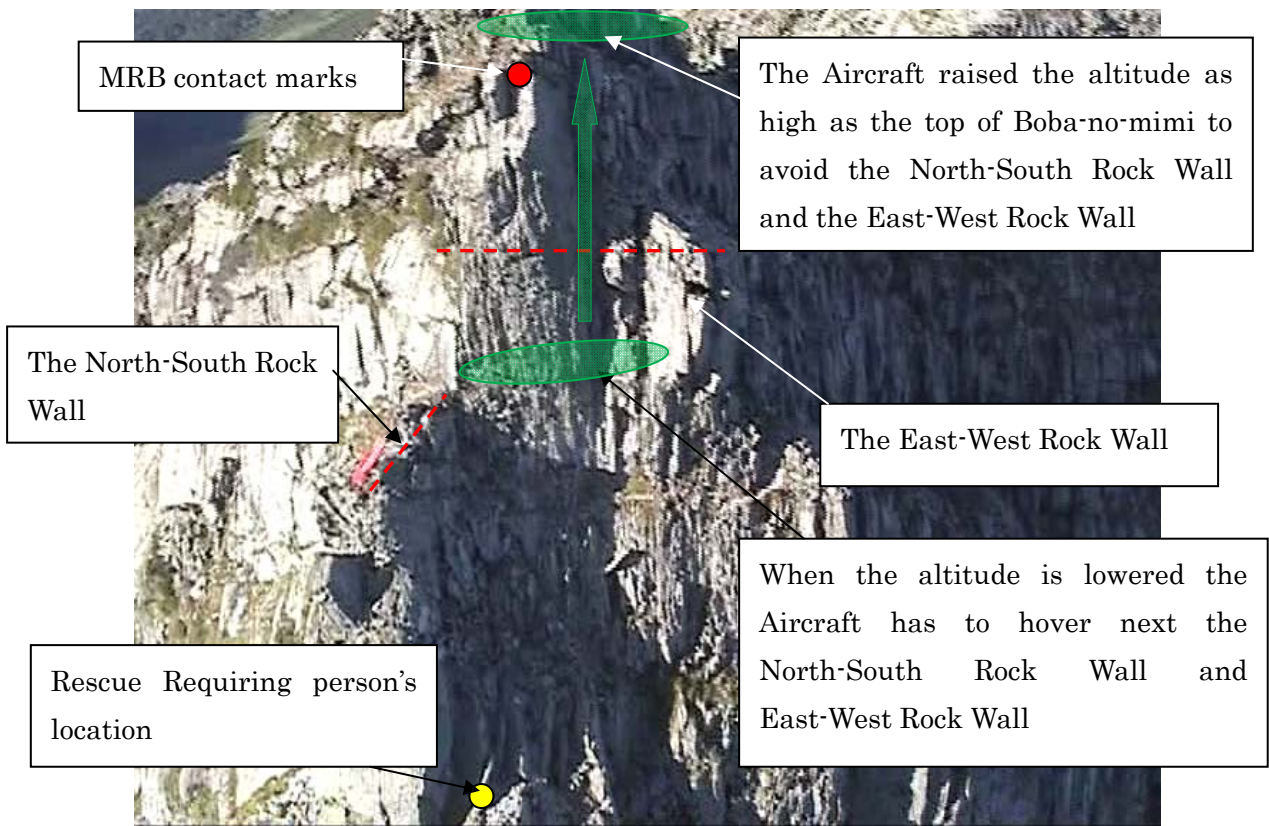


Photo 2-2 Roba-no-Mimi (2)



Viewed from above the Roba-no-mimi



Viewed from the northwest Roba-no-mimi

Photo 3-1 Traces Left with the Blow of MRBs

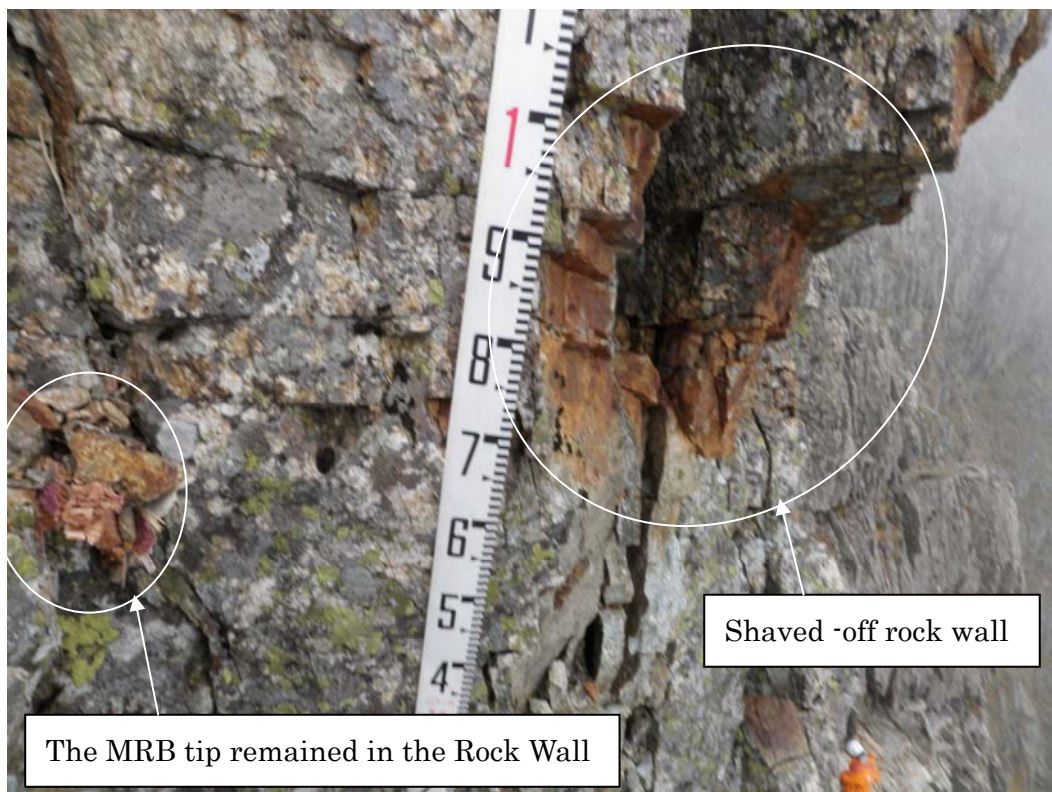
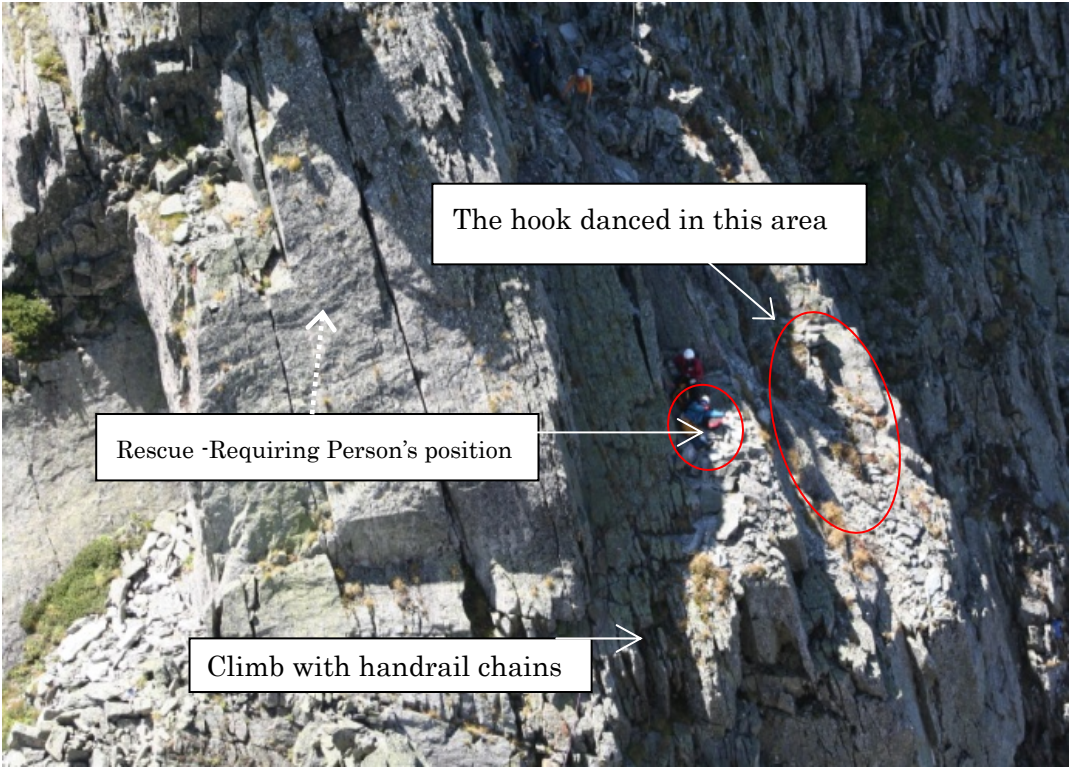


Photo 3-2 Traces Left with the Blow of MRB (2)



The area of MRB strike Viewed from above

Photo 4 Place where the Rescue-Requiring Person was



On-site post-accident inspection

Photo 5 Detached Tail Boom

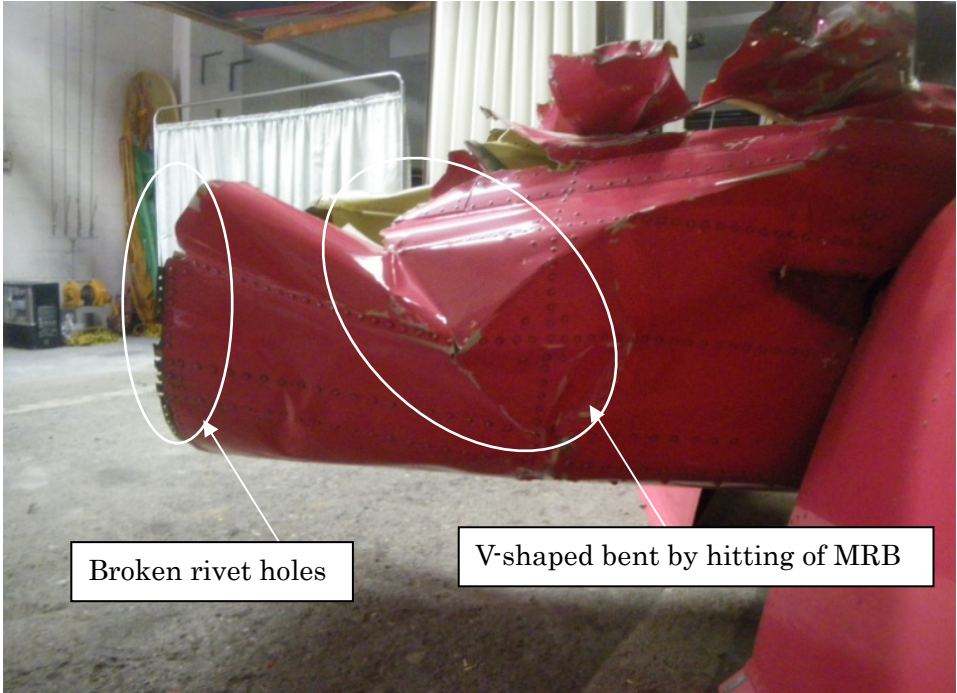
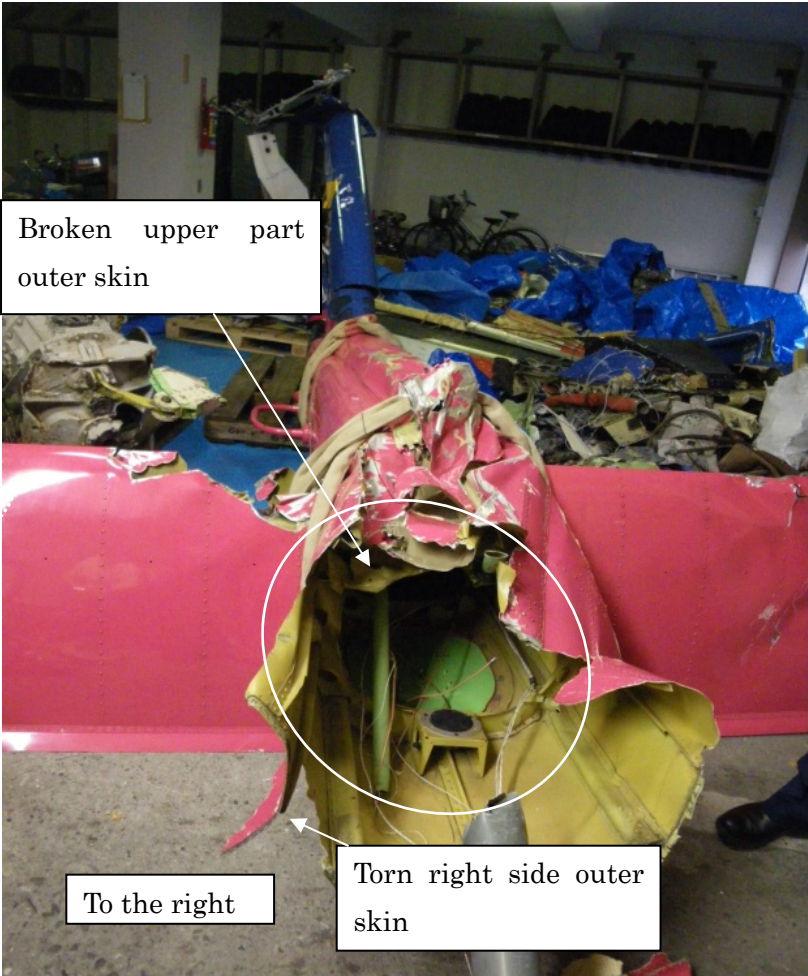
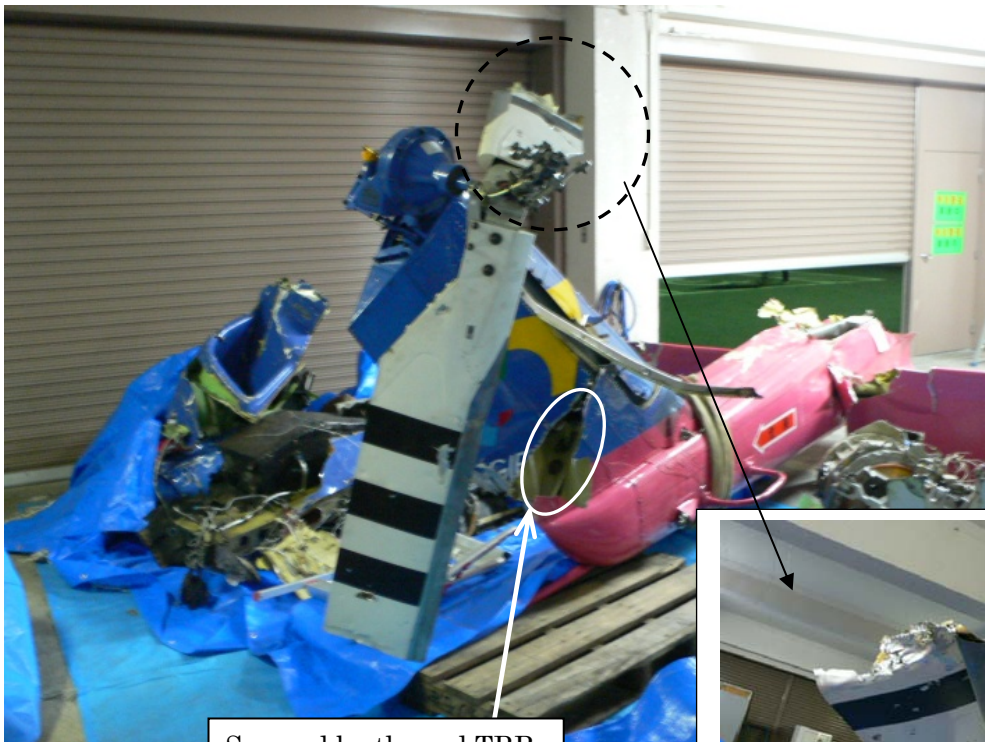


Photo 6 TRBs



Severed by the red TRB



Broken red TRB

Photo 7 Engines



Engines from the rear (Right: No.1, Left: No. 2)

Photo 8 MRBs

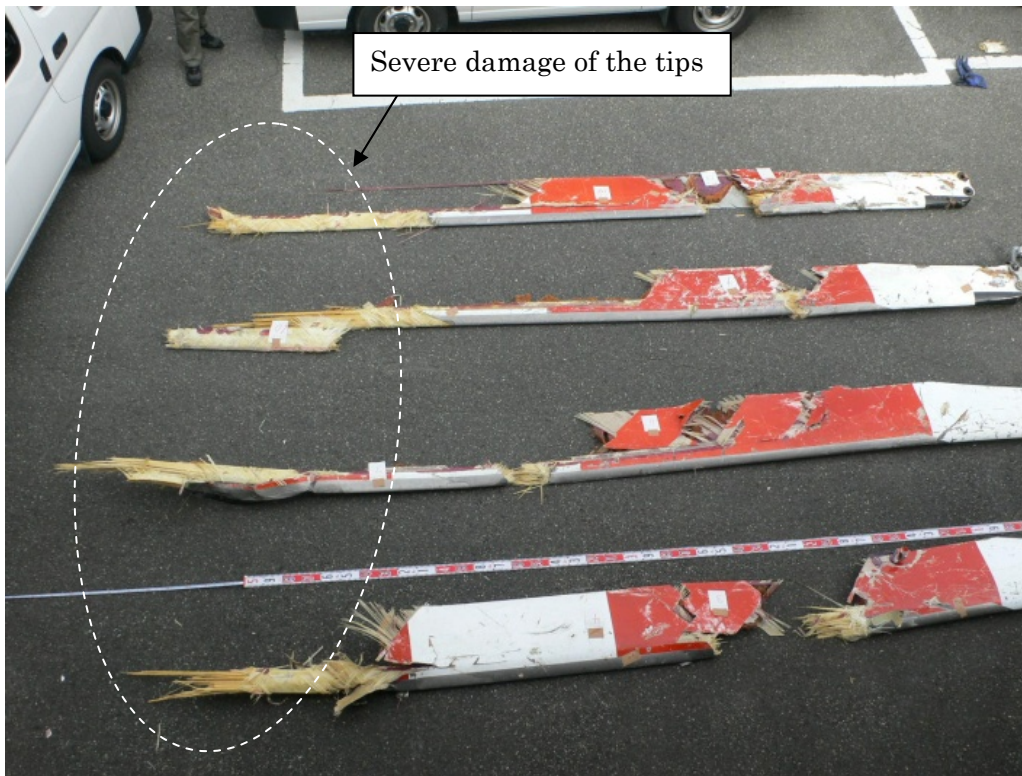


Photo 9 Hoist

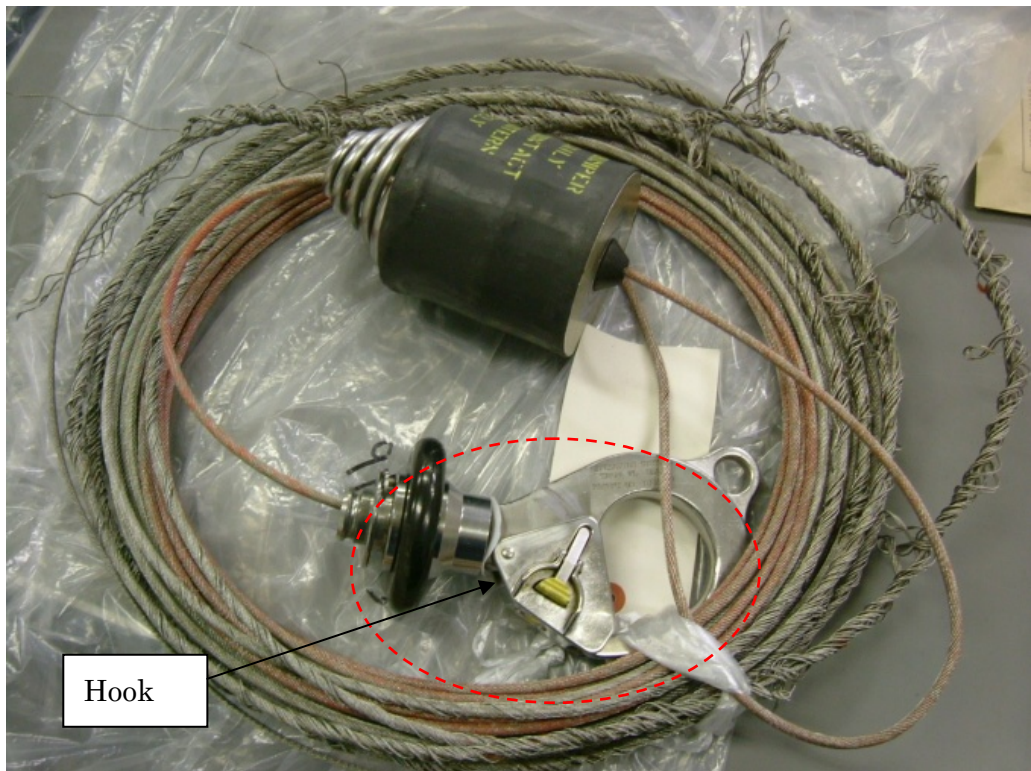


Photo 10 Pictures of Clouds

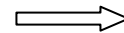
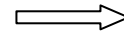


Photo 11 Evacuation Harness and Carabiners



Evacuation Harness

