

AA2020-5

**AIRCRAFT ACCIDENT
INVESTIGATION REPORT**

**S·G·C SAGA AVIATION CO., LTD.
J A 9 2 5 2**

August 27, 2020

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.

TAKEDA Nobuo
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

CRASH AFTER CONTACT WITH A POWER LINE
S·G·C SAGA AVIATION CO., LTD.
AEROSPATIALE AS350B, JA9252
CHIKUSEI CITY, IBARAKI PREFECTURE, JAPAN
AT ABOUT 08:18 JST, JULY 29, 2019

July 17, 2020

Adopted by the Japan Transport Safety Board

Chairman TAKEDA Nobuo
Member MIYASHITA Toru
Member KAKISHIMA Yoshiko
Member MARUI Yuichi
Member MIYAZAWA Yosikazu
Member NAKANISHI Miwa

1. PROCESS AND PROGRESS OF THE INVESTIGATION

1.1 Summary of the Accident	<p>On Monday, July 29, 2019, an Aérospatiale AS350B, registered JA9252, operated by S·G·C Saga Aviation Co., Ltd., being operated as a pesticide spray flight, contacted with a power line and crashed into a nearby paddy field.</p>
1.2 Outline of the Accident Investigation	<p>The Japan Transport Safety Board designated an investigator-in-charge and an investigator on July 29, 2019 to investigate this accident.</p> <p>An accredited representative and an advisor of the French Republic, as the State of Design and Manufacture of the rotorcraft involved in the accident, participated in the investigation.</p> <p>Comments were invited from parties relevant to the cause of this accident and the Relevant State.</p>

2. FACTUAL INFORMATION

2.1 History of the Flight	<p>According to the statement of the captain, the history of the flight is summarized below.</p> <p>On July 29, 2019, an Aérospatiale AS350B, registered JA9252, operated by S·G·C Saga Aviation Co., Ltd., was scheduled to perform pesticide spray flight operations 17 times after loading with pesticide at the helipad each time, while refueling repeatedly, with only the captain sitting in the right pilot seat.</p> <p>At around 05:12 Japan Standard Time (JST, UTC+9 hours, unless otherwise stated all times are indicated in JST on a 24-hour clock), the rotorcraft took off for the first pesticide spray operation.</p> <p>The captain intended to get the pesticide spray work done by around 08:00 when there would be increasing numbers of people coming and going; however, when the captain started the flight, the work was running behind the</p>
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schedule due to poor visibility caused by haze.

Around after finishing the 10th operation, the haze started to clear away, therefore, the captain started getting conscious of recovering from the delay. In addition, the captain thought he should be careful about the backlighting because the sun was coming out as the haze was clearing away.

After taking off from the helipad for the 15th pesticide spray operation at around 08:14, the rotorcraft turned right to a heading of southeast (with a horizontal angle of about 45° right from the sun direction) in order to avoid the flight route facing the sun, and started pesticide spraying at an airspeed of about 30 kt, about 12 m Above Ground Level (AGL). After the pesticide spray toward southeast was done, the captain intended to turn right to reverse at the paddy field right before the one that was located directly below the power lines.

As the captain visually recognized the power lines ahead on the left side in a position slightly higher and a short range while flying for spraying pesticide, he applied cyclic stick to the right aft immediately in order to avoid contact with the power line. And at that time, the captain felt something wrong as if the main rotor blades had contacted with the power lines and he thought the rotorcraft had lost its balance, but he did not remember anything after the evasive maneuver, and found himself in the cockpit that had crashed with its nose up and it's warning alarm was sounding. After shutting off the warning device and the electrical systems, the captain evacuated from the rotorcraft.

There were no abnormalities observed with the rotorcraft in the pre-flight check and during flight.

This accident occurred at around 08:18 on July 29, 2019, in a paddy field in Kuchido, Chikusei City, Ibaraki Prefecture (Latitude 36°20'56" N, Longitude 139°57' 47" E).

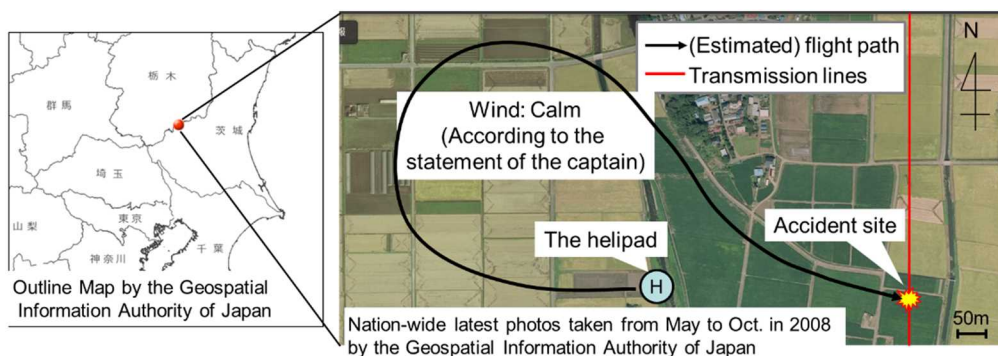


Figure 1: Accident site

2.2 Injuries to Persons

Captain: minor injury

2.3 Damage to the Aircraft

(1) Extent of damage: Destroyed



Figure 2: Damage situation of the crashed rotorcraft

(2) Damage to the Rotorcraft Components

- Forward fuselage, frame: Damaged, deformed
- Main rotor blades: All three damaged
- Tail boom: Separated at the connecting part to the fuselage and damaged
- Tail rotor blades: Damaged
- Landing gear: Damaged
- Pesticide spray apparatus: Damaged

(3) Information on damaged objects other than those of the rotorcraft

- Damage to a paddy field
- Damage to one power line

<p>2.4 Personnel Information</p>	<p>Captain: Male, age 49</p> <p>Commercial pilot certificate (Rotorcraft) May 7, 2002</p> <p>Type rating for single-engine turbine (land) September 4, 2001</p> <p>Specific pilot competence expiry of practicable period for flight: March 14, 2021</p> <p>Class 1 aviation medical certificate</p> <p>Validity date: August 2, 2020</p> <p>Total flight time 3,161 hours 52 minutes</p> <p>Total flight time on the type of aircraft 519 hours 03 minutes</p> <p>Flight time for the last 30 days 38 hours 25 minutes</p> <p>Recent flight for a pesticide spray</p> <p style="padding-left: 40px;">July 9, 2019: Kanoya City, Kagoshima Prefecture</p> <p>Recent flight for a pesticide spray in Chikusei City July 24 to 30, 2016</p> <p>Received training on aerial spraying and others organized by the Japan Agriculture Aviation Association April 5 to 9, 2015</p>
<p>2.5 Aircraft Information</p>	<p>Aircraft type: Aérospatiale AS350B, Serial number: 1238,</p> <p style="padding-left: 40px;">Date of manufacture: April 22, 1980</p> <p>Certificate of airworthiness: No. DAI-2019-071, Validity: April 26, 2020</p> <p>When the accident occurred, the weight and the center of gravity of the</p>

	rotorcraft were within the allowable ranges.
2.6 Meteorological Information	<p>According to the statements of the captain and witnesses near the accident site, the meteorological conditions in the vicinity of the accident site were as follows.</p> <p>Weather: Fine, Wind direction/velocity: Calm, Visibility: It was hazy when the pesticide spray operations started, but as time went by, the visibility was improved and the haze cleared away at the time of the accident.</p> <p>The weather values observed by the Automated Meteorological Data Acquisition System (AMeDAS) at Shimodate observation station, which is located about 11 km southwest of the accident site, during the time period when the accident occurred were as follows:</p> <p>08:10 Wind direction: south-southwest, Wind velocity: 0.3 m/s, Precipitation: none</p> <p>08:20 Wind direction: south-southwest, Wind velocity: 1.1 m/s, Precipitation: none</p> <p>Time of sunrise: 04:44</p> <p>Sun azimuth at the time of the accident: approximately 097°, Sun Altitude: approximately 42°</p>
2.7 Additional Information	<p>(1) Rest</p> <p>According to the captain, he went to bed at around 18:30 on July 28, got up at around 01:30 on July 29, and left his accommodation at around 03:30. Although the daily life rhythm becomes irregular during the pesticide spray period (July 24 to 29), the captain has been used to that life rhythm. As the captain slept seven hours on the previous day, he did not feel fatigued.</p> <p>(2) Confirmation of the site</p> <p>After the completion of the pesticide spray operations on July 26, the captain had a meeting about the pesticide spray operations for the next day with an official from the Ibaraki Kensei Agricultural Mutual Relief Association (hereinafter referred to as “the Official”) and electric power staff in accordance with the “Pesticide Spray Operating Procedures” (hereinafter referred to as “the Procedures”) specified by S·G·C Saga Aviation Co., Ltd.(hereinafter referred to as “the Company”). In this meeting, the captain confirmed the overall pesticide spray operations such as pesticide spray area, obstacles and hazardous materials, risk and damage preventive measures, and the spraying order with the Official. In addition, the captain confirmed the location of power lines and distance between the power lines and the rotorcraft (not allowed to go close to the lines, within 20 m), the past accidents in the area and others with the electric power staff.</p> <p>After the meeting with the electric power staff, the captain conducted a surface research on the planned area for spraying on the next day while traveling by car with the Official.</p> <p>The pesticide spray operations on July 27 and 28 were put off due to the typhoon, and the operations planned on July 27 were postponed to July 29.</p> <p>On the date of the pesticide spray operations, a research flight on the planned pesticide spray area is conducted every time before starting the</p>

operations. Accordingly, the captain also conducted the research flight with one Official on board on July 29.

On the day of the accident, no problems were recognized in any research for the planned pesticide spray area.

(3) Hazard signs

In this pesticide spray area, installed were hazard signs that were showcased in the “Guideline of the Safety Measures for Agriculture Aviation Operators (2019 edition)” (hereinafter referred to as “the Guideline”) published by the Japan Agriculture Aviation Association.

According to the Guideline, hazard signs shall be installed with emphasis in the site (where pilot judges as dangerous), depending on the degree of its safety hazard. The Guideline shows, as an example, one figure demonstrating that in the vicinity of power lines, the hazard signs are located in the normal direction 50 m away from the place right under the outermost line of a set of the six power lines, and installed on the both sides of a set of power lines at intervals of 30 to 50 m in parallel with those lines.

On the other hand, the hazard signs at the accident site were installed almost immediately under the outermost power line at intervals of more than 100 m. On the day of the accident, the captain did not request the Official to add the hazard signs or change its location, thinking he should use the hazard signs as a reference for the location of power lines.

(4) Condition of accident site (See Figure 3)

The crash site of the rotorcraft was a paddy field where the fuselage of the rotorcraft was lying with its nose facing up, and its tail boom was separated from it. And debris of the rotorcraft were found scattered around the fuselage.

On the east side of the crash site, there are six power lines and an overhead ground wire running in a north-south direction. Among those lines, on the closest to the crash site, scratch marks were recognized. This power line with the scratch marks was located about 27 m east side of the crash site and the length of the scratch marks was about 10 m and its height from the ground was about 14 m.

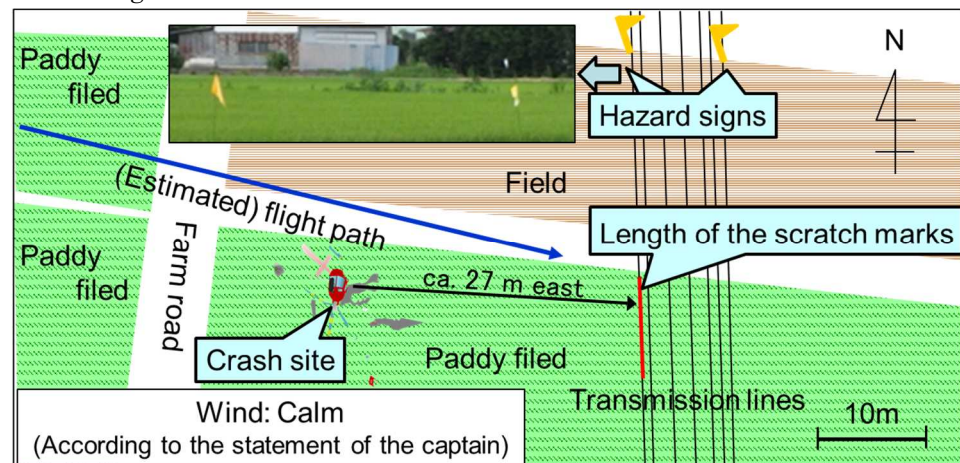
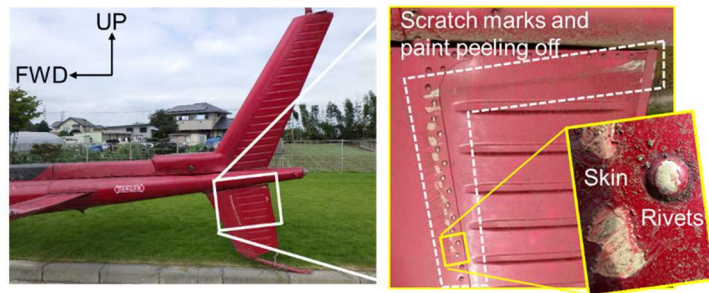


Figure 3: Condition diagram of hazard signs and accident site

(5) Condition of damage to the rotorcraft and the power line (See Figure 4)

Several scratch marks and airframe paint peeling off were found on the left outer skin of the lower fin of the vertical stabilizer (hereinafter referred to as “the Fin”) and a part of the rivets.

Several scratch marks and paints, and some frayed were observed on the power line.



The rotorcraft (Fin)



Transmission line

Figure 4: Condition of damage to the rotorcraft and the power line

3. ANALYSIS

3.1 Involvement of Weather	Yes
3.2 Involvement of Pilots	Yes
3.3 Involvement of Aircraft	None
3.4 Analysis of Findings	<p>(1) Rest</p> <p>The captain stated that the daily life rhythm was irregular during the pesticide spray period, but he was used to that life rhythm and slept seven hours on the previous day. Therefore, it is probable that the captain did not feel fatigued on the day of the accident.</p> <p>(2) Deviation from the flight route intended by the captain</p> <p>The captain intended to turn right to reverse, after the pesticide spray was done for the paddy field right before the one that was located directly below the power lines. It is probable, however, that the captain failed to change direction at the right position, and thus the rotorcraft came close to the power lines. (See Figure 5)</p> <p>It is somewhat likely that the captain failed to change direction at the right position because at the time of the accident, the pesticide spray had been delayed due to the haze in the early morning and it was already after 08:00, the time when the captain intended to have finish the pesticide spray, and his escalating irritation to try to recover from the delay made him less conscious of identifying the right positions of the rotorcraft and the power</p>

lines.

(3) Sun direction

When the captain started the 15th pesticide spray operation, the sun's position was about 45° to the left from the heading (southeast) of the rotorcraft. It is somewhat likely, however, that the heading of the rotorcraft had been gradually changing to the east as the rotorcraft was spraying along the service road, it came to face the sun almost straight in the vicinity of the power lines, and therefore, it became difficult for the captain to visually recognize the power lines due to the backlighting. (See Figure 5)

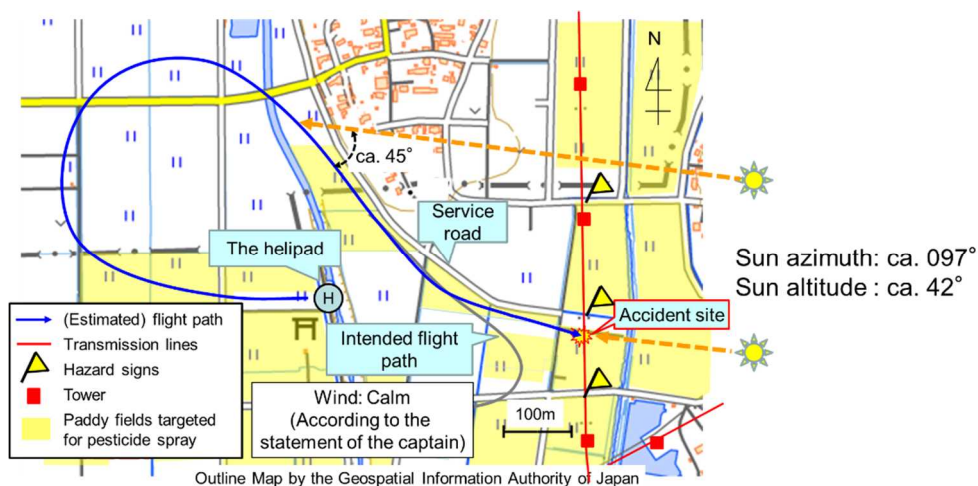


Figure 5: (Estimated) flight route

(4) Position of installed hazard signs

In the vicinity of the accident site, the hazard signs were installed almost just under the outermost power line.

On the day of the accident, the captain conducted the site investigation as specified in the Procedures, but he did not request the Official to add the hazard signs or change their locations, thinking that the hazard signs could be used as a reference for the locations of power lines.

It is somewhat likely that if the hazard signs had been located 50 m away from the power lines and installed at intervals of 30 to 50 m in parallel with the power lines as shown for one in the Guideline, the captain might have been able to correctly identify the position of the rotorcraft before getting closer to the power lines.

(5) Condition of the contact between the rotorcraft and the power lines

The captain applied cyclic stick to the right aft in order to avoid contact with the power lines because while flying for a pesticide spray at an airspeed of about 30 kt, about 12 m AGL, he visually recognized the power lines ahead on the left side in a position slightly higher and a short range. It is highly probable, however, that as the rotorcraft had been already coming too close to the power lines at that time, the left side of the Fin contacted with the power line during the evasion, and the rotorcraft lost its balance and crashed.

4. PROBABLE CAUSES

It is highly probable that in this accident, as the rotorcraft was coming close to the power lines while flying for a pesticide spray, the captain tried to perform an evasive maneuver just in front of the power lines, but a part of its airframe contacted with a power line, the rotorcraft lost its balance and crashed.

It is probable that the rotorcraft came close to the power lines because the captain failed to change direction at the right position to make a 180° turn.

5. PREVENTIVE ACTIONS

(1) After the occurrence of the accident, the Company took the following preventive actions.

① Key measures on the organization

a Safety education on pesticide spray operations

From the next pesticide spray operations, the safety education (on flight procedures in the vicinity of power lines, position to install hazard signs and others) shall be conducted for flight crew before performing the operations, and the operations shall be started after measuring their effectiveness.

b Review of pesticide spray areas

In the next fiscal year, the Company will make reviews on the pesticide spray areas including those where the spray operations have been performed for many years, and talk with other companies about whether the areas are suitable for the pesticide spray operations, and if it is judged as unsuitable, it would not be included in the planned pesticide spray areas as deemed inappropriate.

c The Company shall refrain voluntarily from pesticide spray operations until necessary preventive measures are established.

② Disseminating again the Pesticide Spray Flight Operating Procedures to flight crew

a Flight procedures in the vicinity of power lines

It shall be ensured that flight crew comply with the rule where they should fly in parallel with power lines at a distance of two times the rotor diameter (10.69 m) away. Especially, it shall be ensured that in the area where two sets of power lines intersect, flight crew comply with the rule where they should perform pesticide spray operations at a slower speed by carrying one quarter of the normal amount of pesticide (to make it lighter in weight so that an evasive maneuver can be easy to be performed).

b Full dissemination to all flight crew about ban on flying sunward

Make thorough complete ban on flying sunward. Even with some changes in the spraying order in the flight operation plan, it shall be ensured that every flight crew clearly understands that flying sunward means flying in the backlit state, which may make it difficult to identify obstacles like power lines, resulting in a collision accident

(2) After the occurrence of the accident, the Ibaraki Kensei Agricultural Mutual Relief Association took the following preventive actions.

① Use of industrial unmanned helicopter

As for the pesticide spray area where power lines intersect, if it is classified as having a high risk to the safety of pesticide spray operations by manned rotorcraft after the risk assessment, the operations shall be done by an industrial unmanned helicopter.

② Installation of the hazard signs

The persons representing their respective area who is in charge of installing the hazard signs shall be instructed to install the signs in accordance with the examples shown in the

Guideline. In addition, it shall be ensured that each official thoroughly confirm with the captain about the addition or location change of hazard signs at the site investigation to be conducted with the captain.