AIRCRAFT ACCIDENT INVESTIGATION REPORT

AIRCRAFT DAMAGE CAUSED BY FORCED LANDING

JAPAN COAST GUARD

TEXTRON AVIATION 172S, JA395A

USA CITY, OITA PREFECTURE

AT ABOUT 10:02 JST, APRIL 18, 2023

September 25, 2025

Adopted by the Japan Transport Safety Board

Chairperson	RINOIE Kenichi
Member	TAKANO Shigeru
Member	MARUI Yuichi
Member	SODA Hisako
Member	TSUDA Hiroka
Member	MATSUI Yuko

1. PROCESS AND PROGRESS OF THE AIRCRAFT ACCIDENT INVESTIGATION

1.1 Summary of the Accident	On Tuesday, April 18, 2023, a Textron Aviation 172S, JA395A, operated by the Japan Coast Guard, took off from Kitakyushu Airport, but during the flight, the engine power dropped, resulting in a forced landing on farmland in Usa City, Oita Prefecture. The aircraft was destroyed, but no fire broke out. On board the aircraft were the trainee and the instructor, both of whom suffered minor injuries.
1.2 Outline of the Accident Investigation	On April 18, 2023, the Japan Transport Safety Board (JTSB) designated an investigator-in-charge and two other investigators to investigate this accident. An accredited representative and an adviser of the United States of America, as the State of Design and Manufacture of the aircraft involved in the accident, and an accredited representative and an adviser of the Federal Republic of Germany, as the State of Design and Manufacture of the engine in the accident, participated in the investigation. Comments were invited from parties relevant to the cause of the accident and the Relevant State.

2. FACTUAL INFORMATION

2.1 History of the Flight	According to the statements of the trainee as captain, the instructor and the pilot of the nearby aircraft, JA391A, as well as air traffic control (ATC) communication records, the flight data records from the integrated instrument

panel (Garmin G1000, see Figure 3) as Flight Data Monitoring (FDM), the videos from the Appareo System's Vision1000 System on the aircraft and an action camera installed on board by the instructor, in addition, the engine data from the engine control unit (Full authority Digital Engine Control (FADEC)), the history of the flight is summarized as below.

On April 18, 2023, a Textron Aviation 172S, JA395A, operated by the Japan Coast Guard (JCG), was on a training flight to obtain a commercial pilot certificate, with the trainee seated in the left pilot seat and the instructor in the right pilot seat.

Due to a fuel leakage issue identified the day before the accident, the aircraft underwent maintenance work to replace the relevant components. On the day of the accident, the aircraft took off from Kitakyushu Airport at 09:19 (JST: UTC+9 hours; unless otherwise noted, all times are indicated in JST in this report on a 24-hour clock) after completing an engine run-up, including maximum output. This was the first flight after the component replacement. At about 09:52, the aircraft was conducting flight training over the Kunisaki Peninsula. Midway through the training, it began to climb from an altitude of about 3,250 ft with 100% engine output to regain the altitude that had been reduced for the stall training. At 09:53, at an altitude of about 3,400 ft, the trainee and the instructor heard a strange banging sound coming from the front of the aircraft while flying. At the same time, the engine output values displayed on the integrated instrument panel decreased from 100% to 60%. No warning indicating engine abnormality was issued at this time. The instructor suspended training, took control of the aircraft from the trainee, and reduced the power lever to 60% position as indicated on the panel. At about 09:56, the aircraft reported to JA391A, a Textron Aviation 172S training aircraft flying nearby and the Tsuiki Terminal Radar Control Facility (Tsuiki Radar) that it would return to Kitakyushu Airport. The JA391A pilot confirmed that black smoke was trailing from the exhaust pipes of the JA395A aircraft, which the JA391A aircraft had been following visually.

Although the aircraft was flying at about 90 kt, where horizontal flight is possible, with an engine output of 60%, it gradually lost altitude. At about 09:58, when the instructor moved the power lever to the 100% position to check how the engine output would change when operating the lever. However, the displayed engine output values did not exceed 65%. When the instructor then lowered the lever slightly, the displayed engine output values decreased in response to the movement of the lever. The instructor pulled the power lever almost back to its original position. And the instructor felt by intuition that the actual engine output would be lower than 60% as indicated on the integrated instrument panel and the aircraft continued to lose altitude, the instructor judged that reaching Kitakyushu Airport would be impossible. The instructor decided to take the aircraft's course southbound due to the prevailing southerly wind. At 09:59, the instructor reported to Tsuiki Radar that it would make a forced landing on a farmland. The instructor, who routinely flew while familiarizing himself with the surrounding terrain, selected a location for a forced landing that there were no high-voltage power lines and other overhead wires, expecting it would reduce the impact on the aircraft upon landing. The aircraft gradually descended while turning left. Below 1,000 ft, the instructor activated the aircraft emergency locator transmitter (ELT) and instructed the trainee to change the transponder code to "7700" for emergency transmission. The instructor anticipated the aircraft might flip over after landing. The instructor instructed the trainee to assume the brace position for impact, confirmed the seatbelt status for both the instructor and the trainee, and unlocked the left and right cockpit doors. While confirming no obstacles or people were present near the forced landing site, the instructor approached for landing. Just before touchdown, he firmly gripped the control column in preparation for impact. At 10:02, the aircraft made the forced landing in farmland, coming to rest upside down with its nose pointing in the opposite direction. The instructor exited through the right cockpit door, moved to the left cockpit door to assist the trainee out, and directed them away from the aircraft. Then the instructor moved away from the aircraft. Although the aircraft was destroyed, no fire broke out. The two people on board the aircraft sustained minor injuries.

This accident occurred at about 10:02, on April 18, 2023, on farmland in Usa City, Oita Prefecture (33° 33' 0" N, 131° 24' 8" E).

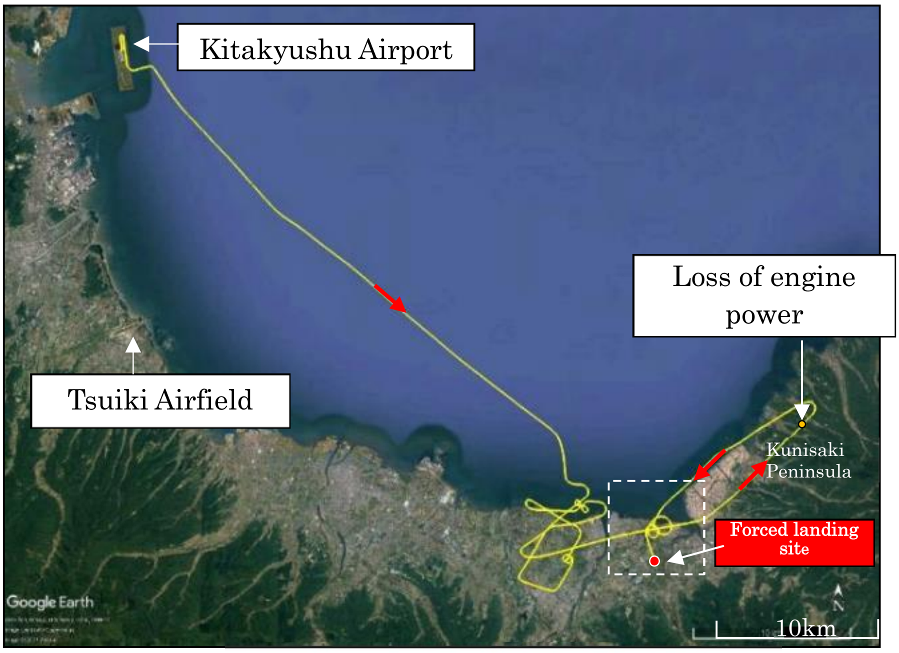

Figure 1: Flight Route based on GPS Data

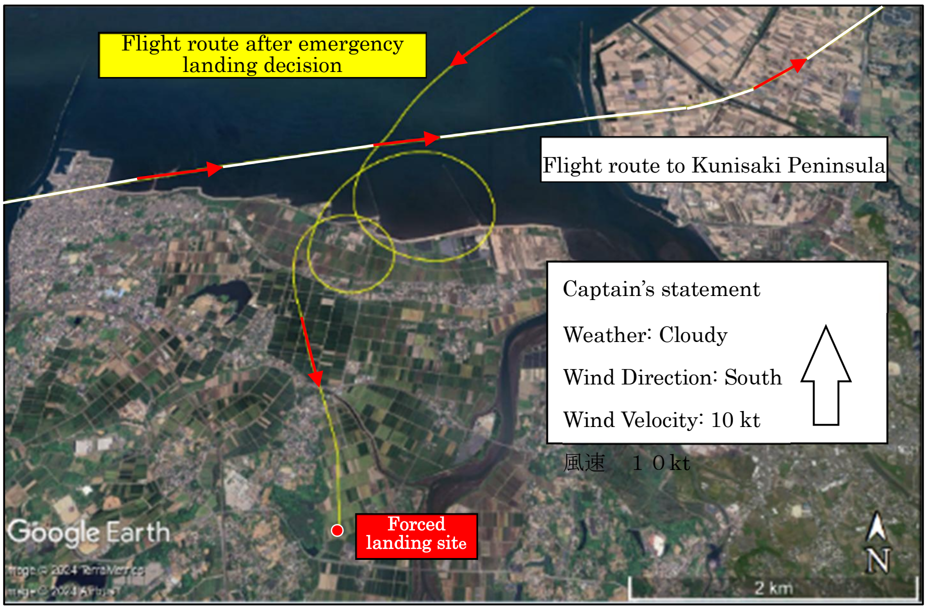

Figure 2: Flight Route to Forced Landing
(Enlarged view of the area enclosed by white dashed line in Figure 1)

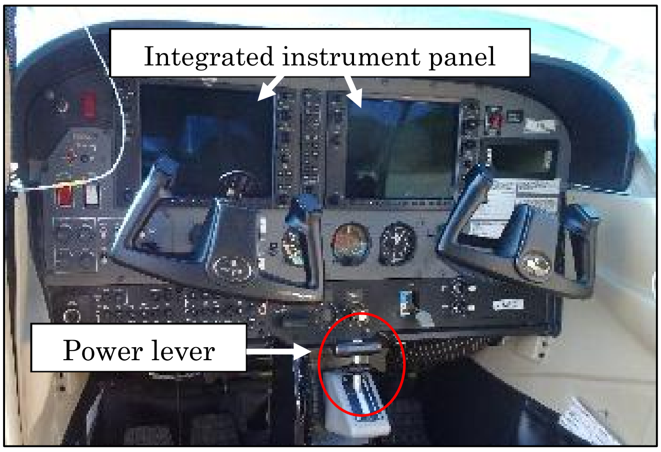

Figure 3: Control System of the Aircraft

2.2 Injuries to Persons	Two people suffered minor injuries.
2.3 Damage to the Aircraft	(1) Extent of damage: Destroyed (2) Damage to Aircraft Components Propellers: All three propeller blades broken. Right Wing: Wing tip buckled; Upper and lower surfaces of the wing damaged and deformed. Left Wing: Wing strut broken; Upper and lower surfaces of the wing damaged and deformed. Vertical Tail: Damage to the upper part that contacted the ground Fuselage: Aft structure deformed; Fuselage skin cracked

Engine : Although there was no significant exterior damage to the engine, the intake hose connecting the turbocharger to the engine's intake manifold via the intercooler had been disconnected at the intercooler outlet side. Of the two clamps that held the hose in place, the upper hose clamp remained in the intake hose, while the lower hose clamp had been detached. The lower hose clamp that had been detached was corroded. Battery liquid from the batteries installed in the cowling had leaked.

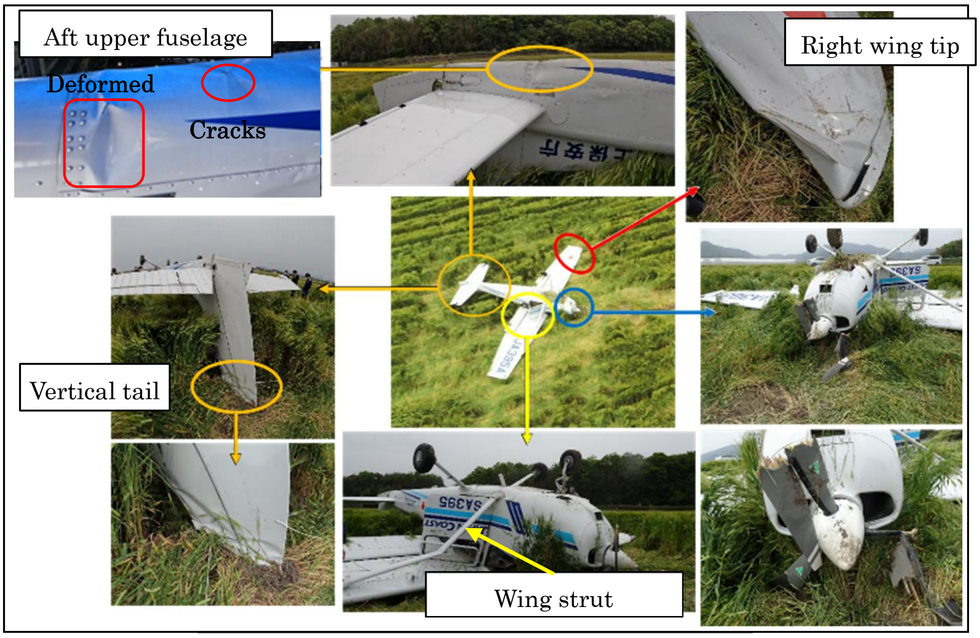

Figure 4: Damage to the Aircraft

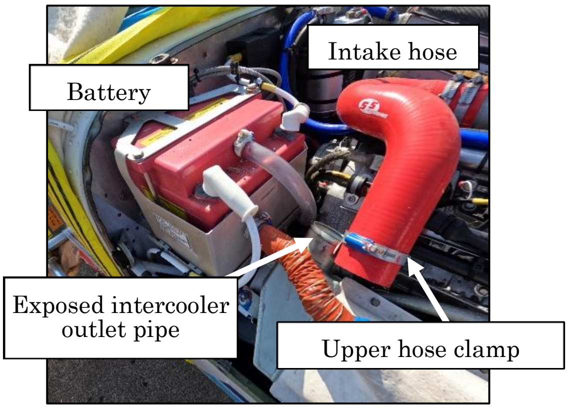

Figure 5: Intake Hose disconnected after the Accident

Figure 6: Lower Hose Clamp

2.4 Personnel Information	Trainee: Age 23 Private pilot certificate (Airplane) August 31, 2022 Ratings and limitations: Type rating for Land Single August 31, 2022 Pilot competency assessment Expiration date of piloting capable period: August 31, 2024

	Class 2 aviation medical certificate Validity: September 19, 2027 Total flight time 211 hours 25 minutes Flight time in the last 30 days 19 hours 50 minutes Total flight time on the type of aircraft 211 hours 25 minutes Flight time in the last 30 days 19 hours 50 minutes (2) Instructor: Age: 41 Commercial pilot certificate (Airplane) October 24, 2003 Ratings and limitations: Type rating for Land Single March 28, 2019 Pilot competency assessment Expiration date of piloting capable period: March 28, 2024 Instrument rating May 20, 2005 Flight instructor rating (Airplane) August 5, 2019 Class 1 aviation medical certificate Validity: October 13, 2023 Total flight time 5,960 hours 15 minutes Flight time in the last 30 days 11 hours 25 minutes Total flight time on the type of aircraft 924 hours 50 minutes Flight time in the last 30 days 11 hours 25 minutes
2.5 Aircraft Information	(1) Aircraft Type: Textron Aviation 172S Serial number: 172S11735, Date of manufacture: August 26, 2016 Airworthiness Certificate: No. Dai-2022-474 Validity: November 14, 2023 When the accident occurred, the Aircraft's weight is estimated to have been about 2,270 lb and the center of gravity is estimated to have been 40.8 in, both of which are estimated to have been within the allowable range. Category of Airworthiness Airplane, Normal N Total flight time 1,390 hours 25 minutes (2) Engine Type: Technify Motors TAE 125-02-114 Serial number: 02-02-10429 Date of manufacture: June 23, 2016 Total service time: 1,382 hours 55 minutes
2.6 Meteorological Information	(1) The weather observations at the Bungotakada Regional Meteorological Observatory Station around the time of the accident were as follows: 10:00 Temperature 17 °C, Wind direction: Northwest, Wind velocity: 2.2 m/s (2) According to the statement of the instructor, at the time of the forced landing, it was cloudy, with a south wind blowing at 10 knots and good visibility.
2.7 Additional Information	(1) Damage to the Aircraft due to Forced Landing The aircraft made a forced landing on farmland, coming to a stop upside down with its nose pointing in the opposite direction. Wheat up to 80 to 100 cm high was growing on the farmland where the aircraft made the forced landing. The ground was not muddy, but the soil was soft. There were tire tracks indicating that the aircraft had taxied about 20 m with its main wheels touching down first, and a further 5 m after the nose wheel touched down. The nose wheel had taxied 5 m ahead and the soil had risen to a height of around 12 cm there, and about 90 cm ahead, there was a mark where the propeller spinner seemed to have stuck into, as well as marks where the propeller had

hit the surrounding area.

The aircraft was destroyed, lying upside down with its nose pointing in the opposite direction about 5 m from this raised soil (see Figure 7). The distance from the aircraft's spinner tip to the tip of the nose wheel was measured to be about 90 cm. The aircraft's landing gears were covered with wheat and soil.

Between 15 and 16 May 2023, one month after the accident, the aircraft was moved from the forced landing site to a hangar at JCG Kitakyushu Air Station. It was then revealed that the intake hose of the engine had been disconnected and that the detached lower hose clamp had corroded.

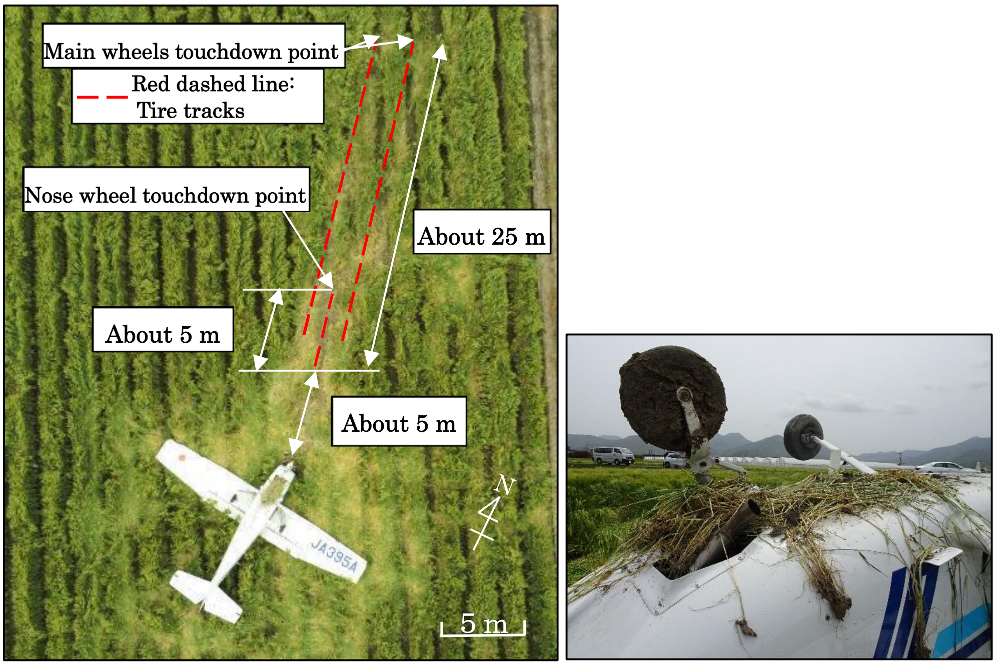

Figure 7: Forced Landing Site, and Soil and Wheat Covering Landing

(2) The Engine of the Aircraft

In accordance with the Supplemental Type Certificate (hereinafter referred to as "STC") held by the aircraft engine's design and manufacturing company, the aircraft is equipped with a liquid-cooled in-line four-cylinder, diesel injection engine with common-rail technology and a turbocharger (Technify Motors TAE 125-02-114). The engine can be operated with JET A-1, and both the engine and the propeller pitch are controlled by the FADEC. With the exhaust gases, the turbocharger of the engine rotates a turbine and coaxial compressor, which compresses air to a maximum of 2,375 mbar. The air is then cooled in an intercooler before being delivered to the cylinders for the intake stroke. According to the engine's design and manufacturing company, the FADEC calculates the required amount of fuel based on the power lever position and engine RPM. It also controls the opening degrees of the Waste Gate Valve (WG valve) on the turbine side based on the information from the Manifold Air Pressure (hereinafter referred to as "MAP") sensor to adjust the compressed air pressure and prevent the turbocharger from over-speeding.

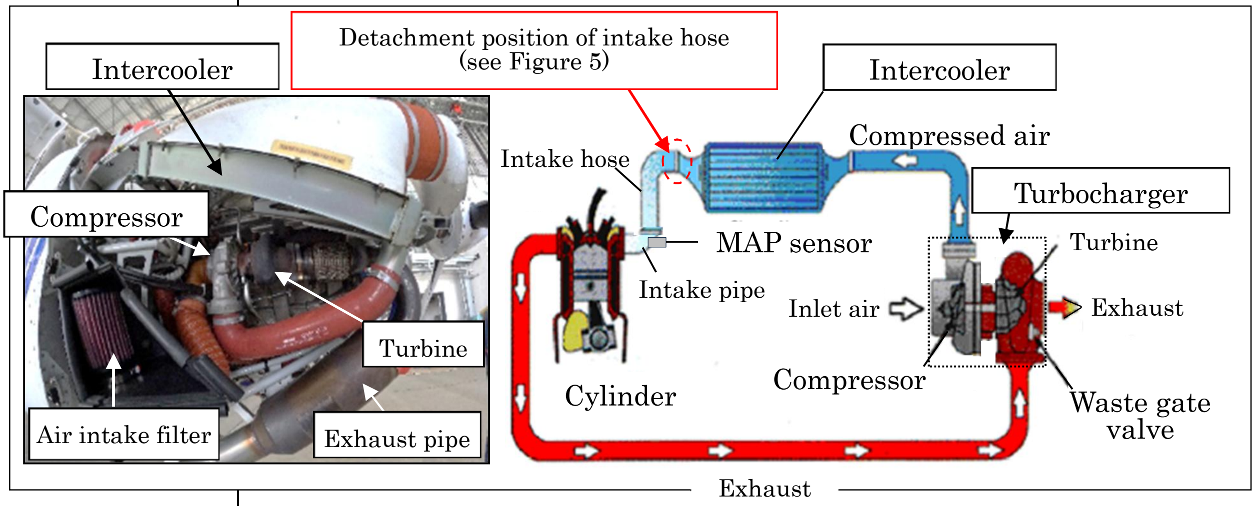

Figure 8: Turbo Diesel Engine System

(3) Maintenance Work Performed the Day before the Accident

After flight training in the morning on April 17, 2023, the day before the accident, the No.1 fuel injector of the aircraft's engine was replaced due to confirmed fuel leakage. According to the statements of the checking mechanic and the assistant mechanic who carried out the replacement, as well as the maintenance records, the replacement procedure was to remove the intake hose on the intercooler outlet side and replace the fuel injectors. After completing the work, the checking mechanic put intake hose back in place and installed the hose clamp while checking the proper tightening torque with a torque wrench. The checking mechanic then confirmed through an engine run-up including at the maximum output, that there would be no problems with the replacement of the fuel injector. They then prepared the maintenance records and entered them in the aircraft logbook. During the series of this work, the checking mechanic forgot to apply the torque seal to indicate the fastening position of the hose clamp, as instructed in the maintenance procedures. There were no abnormalities with the torque wrench used. According to JCG's maintenance records, in 54 cases, the injectors have been replaced on the five JCG aircraft equipped with the Technify Motors TAE 125-02-114 engine between October 2020 and 17 April 2023, including the aircraft. However, there have been no case of the intake hose being disconnected.

(4) Hose Clamp

a. To prevent the hose from pulling off, the intake hose is placed over the intercooler outlet pipe, and then the two hose clamps on top of the overlap between the pipe and the intake hose are tighten. The hose clamp is designed to fasten the belt by the thread and the groove on its side when the screw is turned towards the tightening side. Turning the screw by one turn changed the inside diameter by about 1 mm. These two hose clamps had the same part number (NM-0000-0017001).

The outside diameter on the aircraft's intercooler pipe was about 50.7 mm, and the intake hose was about 5 mm thick.

While it was still detached, the inside diameter of the lower hose clamp could be measured. However, it was not possible to measure the upper hose clamp, as it was difficult to detach the clamp, which remained installed even after the accident.

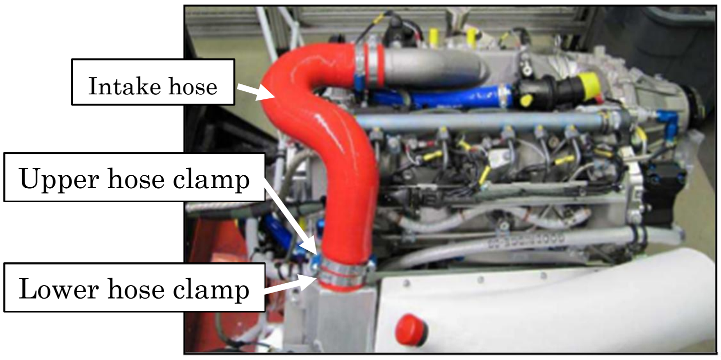

Figure 9: Normal Intake Hose Installation
(Extract from engine maintenance procedures)

b. The detached lower hose clamp had corroded, but no cracks or damage were confirmed when its interior was scanned using a CT scanner. Another normal hose clamp with the same part number was installed in the position of the aircraft's lower hose clamp. The inside diameter was measured when tightened to the correct value and compared with that of the detached lower hose clamp. The results are shown in Table 1.

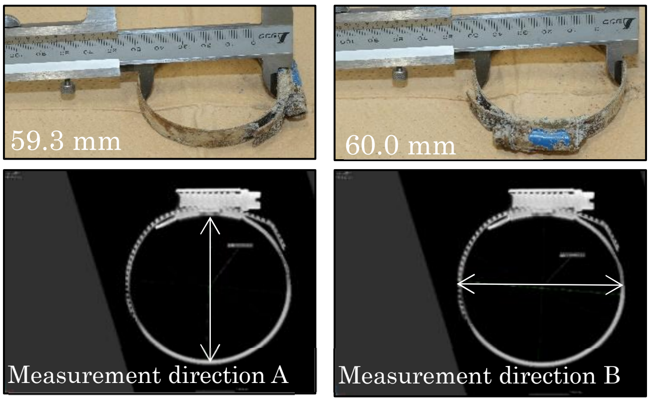

Figure 10: Measurement of the Detached Lower Hose Clamp

Table 1: Inside Diameter of the Hose Clamp that had been Installed on the Aircraft, then had been Detached, and
Inside Diameter of Another Hose Clamp with the Same Part Number when Installed

(Unit: mm)	Measurement direction A	Measurement direction B
Detached clamp	59.3	60.0
Another clamp	59.0	58.8
Difference	0.3	1.2

(5) Verification by the Engine's Design and Manufacturing Company

Upon receiving the report on previous cases of the intake hose being disconnected, other than this accident, the engine's design and manufacturing company conducted an engine bench run-up test to simulate natural aspiration conditions. They verified the change in engine output and produced Engineering Report No.05-0568-7200-PST-ER-01, issued on April 11, 2023 (hereinafter referred to as "the Report"). According to the Report, the display values of engine output are calculated by the FADEC based on engine RPM and the amount of fuel injection. The amount of fuel injection, calculated based on the position of the power lever and the engine RPM, is adjusted in reference to the MAP value so that the amount of air and the amount of fuel (air-fuel ratio) are appropriate. In naturally aspirated conditions resulting from the engine intake hose being disconnected, the amount of air decreases because compressed air is not sent to the engine by the turbocharger. This causes incomplete combustion due to the excessive fuel, resulting in a decrease in engine output. The WG valve closes to try to increase the MAP, and the exhaust pressure increases, resulting in a decrease in engine output. Incidentally, the FADEC did not issue any warnings during this test.

When asked about engine output when the turbocharger is not sending air due to a disconnected intake hose of the aircraft, the engine's design and manufacturing company responded that, at an engine output display value of 60%, the actual output would be around 35%. They also stated that, when the power lever was moved complete forward, at 2,000 ft the engine actual output display reads 72% while the engine actual output is 37% at 5,000 ft the engine output display reads 71% while the engine actual output is 28% and at 10,000 ft the engine output display reads 69% while the engine actual output is 19%.

(6) Generation of Black Smoke

In case of incomplete combustion, black smoke containing unburnt fuel components may be emitted from the exhaust pipes of the piston engine in the Textron Aviation 172S aircraft (Cessna 172S) equipped with the same engine as the aircraft.

(7) Similar cases

According to the engine's design and manufacturing company, there have been three similar cases in the past where the intake hose was disconnected in the same area. These cases all occurred after maintenance work involving the removal and reinstallation of the intake hose and hose clamp.

(8) Information related to Flight Records and Others

Figure 11 shows the flight recording from the start of the stall training (09:53:30) until the aircraft came to a stop (10:02:25), as recorded by the aircraft's integrated instrument panel and the FADEC. Both devices' flight recording functions were working as normal.

While the aircraft was climbing with 100% engine output, and a banging sound could be heard at 09:53, the following changes occurred to each item, as shown in Table 2. At this time, the flight altitude was 3,431 ft and the air pressure was 889 mbar.

After the engine output was lowered, the aircraft maintained a speed of around 90 kt (see Figure 11 a.). The pressure altitude changed from about 3,430 ft to about 1,430 ft over a period of about six minutes, from 09:53, when the engine output was lowered, to 09:59, when the aircraft reported making a forced landing. During this time, the aircraft descended by about 2,000 ft (see Figure 11 b.).

At about 09:58, the instructor pulled the power lever to the 100% position and then to the 68% to check the changes in the engine output display values. (see Figure 11 c.). With the power lever at its maximum position of 100%, the maximum engine output display value increased to 67% and the engine RPM increased by about 100 rpm, up to a maximum of 2,151 rpm, but no higher. When the power lever was lowered to the 68% position, the engine output display value and the engine RPM moved as if in response to operating the lever. It was the 79% position where the instructor returned the power lever after this operation. The WG valve remained fully closed and unchanged until the power lever was lowered before the forced landing. It was around 37 kt when the aircraft touched down, and the maximum vertical acceleration was -1.32 G when it flipped upside down and hit the ground. The fuel flow was about 5.0 gallon (US)/h (hereinafter referred to as "gph") at an engine output display value of 63% while the aircraft was cruising with normal engine status on that day. And it was 3.0 gph at an engine output display value of 35%.

Table 2: Changes in Engine-Related Items before and after the Occurrence of the Abnormal Noise

Items	At Engine Output 100%	After Occurrence of Abnormal Noise
Engine Output Display Values	100% →	About 60%
Engine RPM	About 2,300 RPM →	About 1,900 RPM
MAP Values	2,375 mbar →	About 900 mbar
Fuel Flow	About 8.8 gph →	About 5.2 gph
Amount of Fuel Injection	About 71 mm^3 →	About 49 mm^3

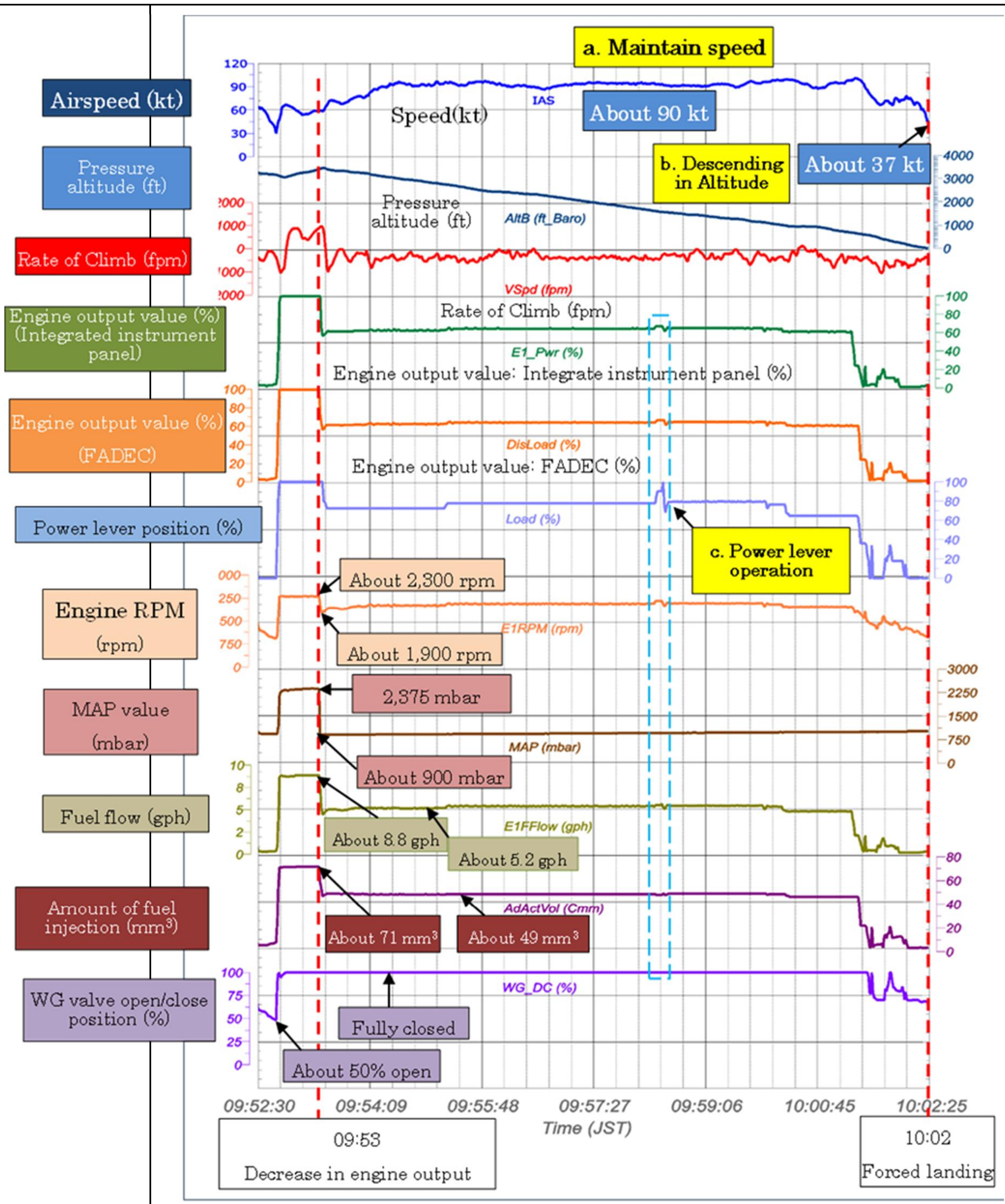

Figure 11: Flight Records

(9) Approach for Forced Landing

Regarding the approach for forced landing in small fixed-wing aircraft, the U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION Flight Standard Service FAA-H-8083-3C "Airplane Flying Handbook" (hereinafter referred to as the "FAA Handbook") states on pages 18-4 to 18-5 as follows:

When the pilot has time to maneuver, the planning of the approach should be governed by the following three factors:

- *Wind direction and velocity*
- *Dimensions and slope of the chosen field*

	• *Obstacles in the final approach path* *These three factors are seldom compatible. When compromises have to be made, the pilot should aim for a wind/obstacle/terrain combination that permits a final approach with some margin for error in judgment or technique.* (omitted)

3.ANALYSIS

(1) Damage to the Aircraft

The JTSB concludes that according to the statements of the flight crew members, the aircraft's flight records, the damage to the aircraft and the traces left on the farmland, it is most likely that the aircraft was in a nose over*1, during the forced landing on farmland in Usa City, flipped upside down, and came to a stop with its nose pointing in the opposite direction. It is highly probable that the aircraft flipped upside down because it touched down at around 37 kt with its main wheel first, then moved about 20 m, and a further 5 m after the nose wheel touched down, before the aircraft nosed over to suddenly come to a stop and rolled over forward since the nose wheel had become embedded in a mixture of dirt and wheat, making it difficult to rotate and causing the nose wheel to raise the soil to a height of about 12 cm. When the aircraft nosed over, the propeller hit the ground and broke. As the aircraft tilted to the right from an inverted position pivoting around the spinner, the tip of the right wing touched the ground first, causing it to buckle. Then, as the upper surface of the main wing touched the ground while the aircraft was tilting to the left, the left main wing strut broke. Lastly, the vertical tail hit the ground, most likely damage. In addition, it is most likely that as the vertical tail hit the ground, the lower aft fuselage was pushed up by the structure connecting the vertical tail to the fuselage. This caused deformation of the aft fuselage structure, resulting in the destruction of the aircraft.

(2) Engine Power Loss

The JTSB concluded that the engine intake hose on the intercooler outlet side had most likely been disconnected, accompanied by a banging sound, at 09:53. At this time, the MAP value dropped from a maximum of 2,375 mbar to about 900 mbar, which is almost the same as the air pressure of 889 mbar. This most likely resulted in natural aspiration conditions, causing a significant decrease in the volume of air supplied to the engine.

During cruising flight with an engine output display value of 63%, the fuel flow was about 5.0 gph in normal operating conditions before disconnecting the intake hose. After disconnecting the intake hose, the fuel flow was 5.2 gph, which did not seem to be a significant difference. However, when the volume of intake air decreased significantly, about 5.2 gph of fuel was supplied, which most likely caused incomplete combustion due to the excessive fuel. In addition, as described in the Report, it is highly probable that WG valve was closed, resulting in increased exhaust pressure, decreased engine compression pressure, and reduced engine output, probably leading to "this condition in which the actual output would be around 35%" as stated by the engine's design and manufacturing company.

It is highly probable that the fuel exceeded because the air volume decreased due to the disconnection of the hose, additionally, the amount of fuel calculated by the FADEC based on the lever position and engine RPM was supplied as the power lever was set to 79%.

It is most likely that the engine output display values were not correctly indicated because, as

*1 "Nose over" refers to the condition in which the aircraft tilts forwards, either causing the nose to touch the ground or resulting in the aircraft flipping forwards.

the amount of fuel to be supplied to the engine and the value calculated by the FADEC based on the engine RPM are designed to be displayed on the integrated instrument panel, incomplete combustion was caused by the excessive fuel, causing the engine output display values to be indicated as high as about 60% even though the engine output values dropped.

As the JCG JA391A aircraft confirmed that the presence of black smoke coming from the exhaust pipe during pursuit of the aircraft, it is highly probable that the aircraft was flying with an incomplete combustion engine.

(3) Hose Clamp

The JTSB concludes that it is highly probable that the detached lower hose clamp had corroded because battery liquid leaked from the battery when the aircraft flipped upside down, and the detached hose clamp was immersed in this liquid, which caused corrosion until it was collected once the aircraft had been moved to Kitakyushu Airport.

Regarding the disconnection of the intake hose, the accident flight of the aircraft was the first flight after the injector replacement work, during which the hose clamp and intake hose disconnected during the flight were removed and reinstalled, therefore this injector replacement works possibly have contributed to the disconnection.

As described in 2.7 (4) b., the inside diameter of another installed hose clamp with the same part number was compared with that of the detached lower hose clamp. This revealed that the inside diameter of the detached lower hose clamp was 0.3 mm wider in the measurement direction A and 1.2 mm wider in the measurement direction B. If the inside diameter differs by 1 mm, the circumferential length (i.e. the length of the fastening band) would increase by about 3 mm, which could cause the hose clamp to loosen. Based on this, it is possible that the clamp-fastening was insufficient for the two hose clamps that were removed during the injector replacement the previous day.

The hose clamp did not detach at the maximum engine output during the ground run-up after the replacement of parts, the pre-flight ground run-up, or during take-off. However, when the aircraft was climbing at maximum engine output in order to regain altitude (which had been reduced for the stall training), it is likely that the intake hose disconnected from the intercooler outlet side due to insufficient fastening of the hose clamp and the fact that the pressure inside the intake pipe at maximum output reached approximately twice the atmospheric pressure. Besides, given that the torque seal was not applied despite the instruction in the maintenance procedures, it is likely that the maintenance work and checks on the maintenance performed were not conducted properly.

To maintain the airworthiness of aircraft, it is important to ensure that maintenance work is conducted and that maintenance checks are performed in accordance with the relevant instructions, such as those in the maintenance manuals to maintain airworthiness established by aircraft and engine design and manufacturing companies.

(4) Future Actions to be Taken by the Engine's Design and Manufacturing Company

The JTSB concludes that when the intake hose is disconnected, the FADEC would be unable to control the fuel properly, and warnings and others would not be issued, therefore the engine output display would indicate values higher than the actual, which the pilots would not recognize as an abnormal condition, possibly leading to a misjudgment of the situation. Consequently, the aircraft engine's design and manufacturing company, who holds the STC, needs to change and improve engineering design so that the FADEC can control the fuel properly, and so that the pilots can recognize that the MAP has dropped due to the disconnection of the intake hose through warnings and others.

Additionally, it is necessary to update the FADEC software to ensure that the correct engine output values are displayed, even when the intake hose is disconnected.

(5) Forced Landing

The instructor more likely perceived the engine output to be lower than actual and judged it impossible to reach Kitakyushu Airport, subsequently approaching farmland within Usa City and performing a forced landing.

The instructor's approach to the forced landing site was into a headwind, with no power lines or other overhead wires present, making it a location where impact reduction during landing could be expected. This approach is probable that have been an optimal one, satisfying all three factors described in the FAA Handbook.

The instructor, anticipating the aircraft might flip over after the landing, more likely had taken precautions such as confirming seatbelt status and instructing the trainees to assume the brace position in preparation for the forced landing.

Since the fact that neither the instructor nor the trainee suffered life-threatening injuries, it is probable that the instructor's judgment and piloting skills are considered commendable.

The ideal location for a forced landing is, of course, an airport, but a large, open, flat area is also desirable. However, such ideal locations are not easily found. Pilots should always be mindful of potential forced landing sites while flying. Furthermore, when facing an emergency, pilots must be prepared to respond swiftly and appropriately. This may require accepting the situation, not being overly fearful of injury, and in some cases, making the decision to prioritize passenger safety even sacrificing the aircraft.

4. PROBABLE CAUSES

The JTSB concludes that the probable cause of the accident was that it is highly probable that the aircraft was unable to maintain altitude as the engine output of the aircraft was lowered, and when the aircraft made a forced landing on farmland, it flipped forward, resulting in the aircraft being destroyed when its vertical tail hit the ground.

The aircraft's engine output was most likely lowered because the engine was experiencing incomplete combustion due to natural aspiration conditions resulting from the disconnection of the engine intake hose.

It is likely that the engine intake hose was disconnected because the relevant intake hose, which had been removed during the previous day's maintenance work, was not installed properly.

5. SAFETY ACTIONS

5.1 Safety Actions Required	As described in 3. ANALYSIS, it is necessary for JCG and the engine's design and manufacturing company to take the following safety actions. (1) JCG is required to conduct maintenance work on the aircraft in accordance with the instructions for maintaining the airworthiness set out in the maintenance manuals for maintaining airworthiness established by the aircraft and engine design and manufacturing companies. (2) The design and manufacturing company of the aircraft engine, who holds the STC, is required to change and improve engineering design so that FADEC can properly control the fuel, and so that the pilots can recognize via

	warnings and others that the MAP has dropped due to the disconnection of the intake hose. Additionally, the FADEC software should be modified so that correct engine output values are displayed even when the intake hose is disconnected.
5.2 Safety Actions Taken after the Accident	(1) Safety Actions Taken by JCG a. For the four Textron Aviation 172S aircraft, except for the aircraft involved in the accident, ispections were conducted on the intercooler outlet area, and it was confirmed that torque seals had been applied to the hose clamps. b. The training materials for those engaged in maintenance were revised to include human factors content, and regular maintenance training was conducted to help those engaged in maintenance maintain their control skills based on topics of risk prediction, such as what would happen in the event of a deficiency when installing equipment during maintenance work. (2) Safety Actions Taken by the Engine's Design and Manufacturing Company The aircraft engine's design and manufacturing company, who holds the STC, made an engineering design change to enable the FADEC to control the fuel properly and issue warnings when the MAP drops due to the intake hose being disconnected. The FADEC software was also updated to display the correct engine output values even when the intake hose is disconnected.