AIRCRAFT ACCIDENT SHORT REPORT

CA18/3/2/9858: In-flight engine failure that resulted in an unsuccessful forced landing.

Date and time	:	25 January 2020 at 1715Z
Location	:	On a beach next to Haga-Haga Holiday Resort, East London
Aircraft registration	:	ZU-RNJ
Aircraft manufacturer and model	:	Sanka AK 1-3
Last point of departure	:	Morgan Bay Hotel, East London (Eastern Cape)
Next point of intended landing	:	Glen Eden private farm, East London (Eastern Cape)
Location of accident site with reference to easily defined geographical points (GPS readings if possible)	:	S32º 45' 39.50" E028º 15' 12.56
Meteorological information	:	Temperature: 28°C; Wind Speed: 5 knots; Wind Direction: Easterly; Visibility: 10km
Type of operation	:	Part 94
Persons on-board	:	1 + 0
Injuries	:	None
Damage to aircraft	:	Substantial

All times given in this report are Co-ordinated Universal Time (UTC) and will be denoted by (Z). South African Standard Time is UTC plus 2 hours.

Purpose of the Investigation:

In terms of Regulation 12.03.1 of the Civil Aviation Regulations (2011), this report was compiled in the interest of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and ***not to apportion blame or liability.***

Disclaimer:

Figure 1*:* The Sanka AK 1-3 helicopter. (Source –https://images.app.goo.gl/MLKSV8F34KHXFynX9)

1. SYNOPSIS

1.1 On Saturday 25 January 2020, the pilot on-board the Sanka AK 1-3 helicopter with registration mark ZU-RNJ was conducting a local private flight from Morgan Bay Hotel to Glen Eden, a privately-owned farm, when the accident occurred. The flight, which was conducted under visual flight rules (VFR), was estimated to take about 18 minutes. The pilot reported that the helicopter engine had started without fault after a pre-flight inspection had been carried out outside Morgan Bay Hotel. Minutes later, after the pilot had confirmed that the engine instruments indications were normal, took off without incident and climbed to 600 feet (ft) above ground level (AGL) at 80 knots (kt) indicated airspeed (IAS). About 8 minutes into the flight whilst positioned overhead Haga-Haga Holiday Resort, the low rotor revolutions per minute (RPM) light illuminated and the engine's RPM dropped. A few seconds later, the engine started to run rough and it eventually stopped. The pilot entered autorotation, but as he flared the helicopter for landing, he did not sufficiently arrest the descent rate, resulting in the helicopter skids impacting the soft ground very hard. The helicopter came to rest in an upright position on the beach. The helicopter sustained substantial damage; and the pilot was not injured during the accident sequence. The investigation revealed that the engine stoppage was caused by the absence of spark in all four cylinders after the ignition plug had disconnected in-flight.

2. FACTUAL INFORMATION

2.1 On Saturday 25 January 2020, the pilot on-board the Sanka AK 1-3 helicopter with registration mark ZU-RNJ took off from Morgan Bay Hotel on a local private flight to Glen Eden, a privately-owned farm in East London, Eastern Cape. The flight was conducted under visual flight rules (VFR) and was estimated to take about 18 minutes to the intended destination. The helicopter was operated under Part 94 of the South African Civil Aviation Regulations 2011 as amended. The pilot reported that he had carried out a pre-flight inspection before take-off and had not detected any defects.

2.2 The helicopter had 40 litres of 95 Octane Unleaded motorcar fuel in a 72-litre capacity fuel tank prior to departure. The engine was started without fault. After the pilot had verified that the engine instruments readings were normal, he took off and climbed to 600 feet (ft) above ground level (AGL) at 80 knots (kt) indicated airspeed (IAS). About 8 minutes into the flight whilst positioned overhead Haga-Haga Holiday Resort, the low rotor revolutions per minute (RPM) light illuminated and the engine's RPM dropped. A few seconds later, the engine started to run rough and it eventually stopped. The pilot entered autorotation, but as he flared the helicopter for landing, he did not sufficiently arrest the descent rate, resulting in the helicopter skids impacting the ground very hard. The helicopter came to rest in an upright position on the beach. Before the helicopter came to rest, its main rotor had struck and damaged the tail boom. The helicopter sustained substantial damage, however, the pilot was not injured.

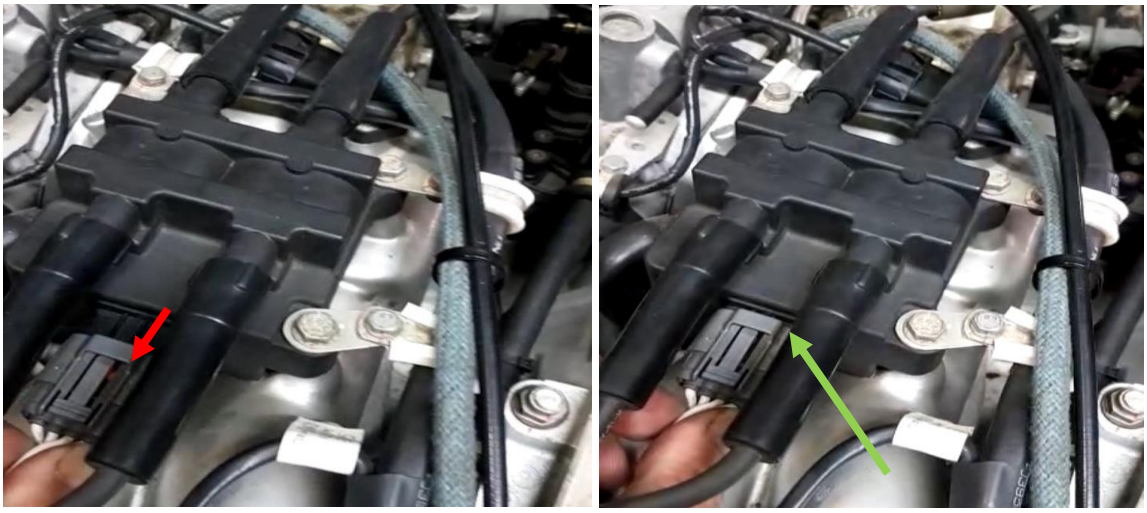
2.3 The accident occurred during daylight at geographical position determined to be S32º 45' 39.50" E028º 15' 12.56" at an elevation of 3ft above mean sea level (AMSL).

Figure 2: The helicopter as it came to rest on the beach. (Source: pilot)

3. Helicopter Description and Post-accident Engine Examination

3.1 The Sanka AK1-3 is a single-engine, two-seater, light utility helicopter constructed of aluminium alloy and powered by a Subaru EJ-25 motorcar engine developing 165 horsepower. The engine is a four-cylinder water-cooled with fuel injection and utilises Octane 95 Unleaded motorcar fuel. Spark plug leads for the cylinders are grouped on one weather-proof ignition coil plug fitted to the ignition coil connector, which has an internal resistor to prevent arching. The ignition coil connector has a strong hold and, should the plug disconnect during operation, there would be no spark to ignite the compressed fuel/air mixture in all four cylinders. Power is transmitted from the engine to the rotor system through a V-belt reduction drive, which incorporates a free-wheeling sprag clutch, a main drive transmission, a tail rotor transmission, and shafts. The clutch assembly allows the rotor assembly to freewheel when the engine power is reduced.

3.2 The last annual inspection on the helicopter was carried out on 18 March 2019 at 632.7 total recorded tachometer hours. The helicopter and the engine had logged a total of 640.2 hours at the time of the accident. Post-accident examination of the wreckage by the pilot at the accident site did not show any visible anomalies on the engine's exterior. The pilot reported that the helicopter had about 20 litres of fuel remaining in the fuel tank. Fuel was drained before the helicopter was recovered on a trailer to the pilot's residential area in Glen Eden, where it was parked in the garage. Parts of the rotor head were removed before the engine inspection was performed. Examination of the engine revealed a disconnected ignition coil plug.



Figures 3/4: A disconnected ignition coil plug found on the engine post-accident (left) and the ignition coil plug fitted back onto the connector (right).

3.3 Further examination of the ignition coil plug showed that the rubber latch on the inside top part of the plug (Figure 5) that was intended to hold the plug to its position was damaged (Figure 6). The plug was returned to its position; however, the latch was unable to lock, and it could be pulled out easily.

Figures 5/6: The ignition coil plug (left) with an arrow showing the position of a damaged latch; and a fixed engine connector on the ignition coil pack (right).

3.4 The anomaly on the ignition coil plug showed that its separation from the engine's fixed connector on the coil pack area went unnoticed until it was completely detached. A video of the position of the ignition coil plug was sent to the manufacturer for their comment. The manufacturer's response was that under normal circumstances, the ignition coil plug will not fail as it has an in-built strong hold. The only time the ignition coil plug is removed is when there is a need to work on the intake manifold area. There was no evidence of such task being recorded in the aircraft flight folio. The manufacturer informed the investigation team that it was the first time an anomaly of this nature was reported since the Subaru EJ-25 engine came into operation in 1996. The investigation was, therefore, unable to determine how the plug got damaged, however, previous maintenance defects could not be ruled out.

3.5 A decision was made to temporarily secure the ignition coil plug to the engine's fixed connector from which a small amount of fuel was uplifted to facilitate the engine function test. Before the test, the drive belts were removed, and the engine was started without difficulty. The engine was run up to 104% revolutions per minutes (RPM) and it operated normally. The investigation concluded that the engine stoppage was caused by the absence of spark in all four cylinders after the ignition plug had disconnected. The plug is removed by pressing the 'PRESS' key release tap (see Figure 7). To fit it back, it must be carefully inserted into the engine's fixed connector until the latch locks. The latch has a strong hold and, if properly fitted, will not disconnect.

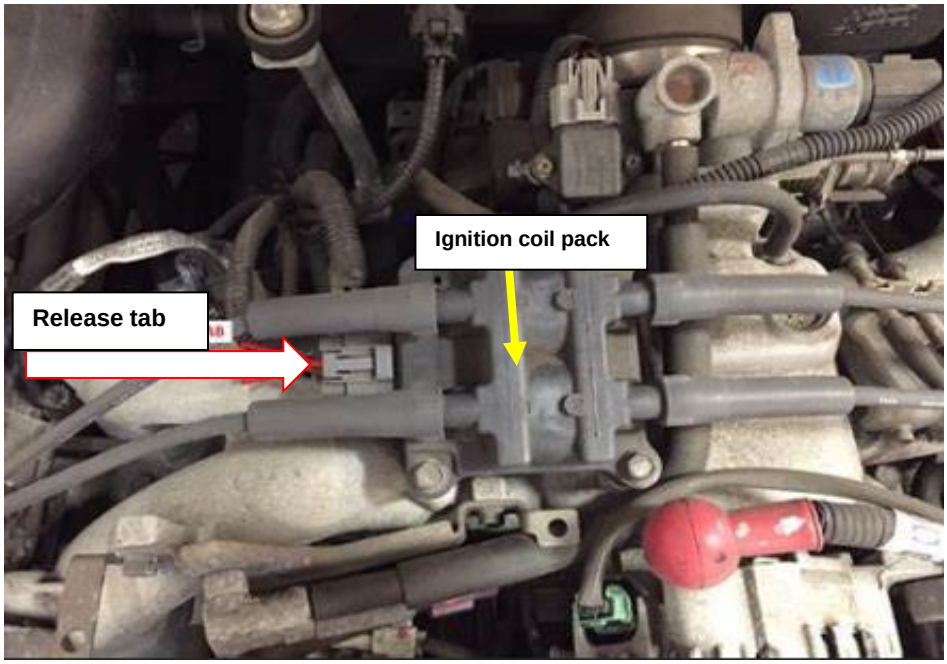


Figure 7: The “PRESS key” release tap.

4. CONCLUSION

4.1 **Findings**

4.1.1 The pilot was issued a Private Pilot Licence on 9 April 2019 with an expiry date of 31 March 2020.

4.1.2 The pilot was issued a medical certificate on 25 February 2019 with an expiry date of 28 February 2020, and with a restriction to wear suitable corrective lenses.

4.1.3 The pilot had logged a total of 504.3 flying hours of which 98 hours were on the helicopter type at the time of the accident.

4.1.4 The helicopter’s Authority to Fly certificate was issued on 18 November 2016 with an expiry date of 30 November 2020.

4.1.5 The last annual inspection was carried out on 18 March 2019 at 632.7 recorded tachometer hours. The helicopter was issued a certificate of release to service on 18 March 2019 with an expiry date of 17 March 2020 or at 732.7 tachometer hours, whichever occurs first. The helicopter had flown a total of 7.5 hours since its last annual inspection.

4.1.6 The helicopter was issued a certificate of registration on 4 October 2017.

4.1.7 The flight was conducted under visual flight rules.

4.1.8 Fine weather conditions prevailed around the time of the accident.

4.1.9 Post-accident inspection of the engine indicated that the ignition coil plug, which feeds spark to all four-cylinder spark plugs, had disconnected in-flight and had caused a loss of spark and thus, the subsequent engine stoppage.

5. PROBABLE CAUSE/S

5.1 The engine stoppage was caused by the absence of spark in all four cylinders after the ignition plug had disconnected in-flight.

6. CONTRIBUTING FACTOR/S

6.1 The ignition coil plug was not properly fitted during maintenance, as a result, it disconnected in-flight.

7. SAFETY RECOMMENDATION

7.1 None.

This report is issued by:

Accident and Incident Investigations Division
South African Civil Aviation Authority
Republic of South Africa