AIRCRAFT ACCIDENT SHORT REPORT

CA18/2/3/9706: ZU-RLE, Forced landing after take-off following an engine stoppage

Date and time	**:** 4 May 2018 at 0837Z
Location	: Honeymoon Game Farm, Limpopo Province
Occurrence type	**:** Accident
Aircraft registration	**:** ZU-RLE
Aircraft manufacturer and model	**:** AS341-F2 Gazelle
Last point of departure	**:** Honeymoon Game Farm
Next point of intended landing	**:** Makoppa
Location of incident site with reference to easily defined geographical points (GPS readings if possible)	**:** GPS co-ordinates 24°24'00.09" South 027°07'50.29" East
Meteorological information	**:** No wind was reported, Temperature: 28°C, CAVOK
Type of operation	**:** Private, Non-type certified aircraft (Part 94)
Persons on board	**:** 1 + 1
Injuries	**:** None
Damage to aircraft	**:** Tail boom was severed by the main rotor blades (Figure 1)

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 interests of the promotion of aviation safety and the reduction of the risk of aviation accidents or incidents and ***not to establish blame or liability****.*

Disclaimer:

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SYNOPSIS

On Friday 4 May 2018, at 0835Z, the pilot, accompanied by a passenger, departed from a private game farm. The engine stopped operating shortly after they became airborne. The pilot executed a forced landing straight ahead in savannah bush terrain. On impact with the ground, the main rotor blades severed the tail boom. Neither of the two occupants on board the helicopter was injured in the accident. Visual meteorological conditions (VMC) prevailed, and no flight plan was filed for the flight. This was a private flight conducted under the provisions of Part 94 of the Civil Aviation Regulations of 2011 as amended.

FACTUAL INFORMATION

The pilot, who was the holder of a valid private pilot licence, was accompanied by a passenger (his son). They departed from Honeymoon Game Farm, which was located approximately 20 nm to the north-west of Thabazimbi, for a flight to Makoppa. Prior to the flight, the pilot performed his pre-flight inspection and 162 L of Jet A1 were uplifted into the helicopter from a fuel trailer (bowser) (Figure 1), which was kept in a secure location on the farm. The fuel trailer was purchased on 6 November 2017 by the pilot, who was also the owner of the helicopter. The trailer was filled with aviation fuel for the first time on 16 March 2018, when 1 430 L were purchased from a service provider. The fuel trailer was also equipped with a 1-micron fuel filter. The pilot stated that he refuelled three times from the trailer/bowser, including the fuel uplift prior to the accident flight.

Figure 1: The fuel trailer/bowser that was used for refuelling the helicopter (photograph taken at Wonderboom Aerodrome (FAWB) by an Accident and Incident Investigation Division (AIID) investigator)

The pilot stated that the engine started normally and he waited for the engine parameters to settle in the green arc before he opted to take off. Once in hover flight, he checked all the engine parameters again, and all appeared normal. He then proceeded into forward flight. When they were above some nearby trees, the helicopter suddenly yawed to the right; the pilot thought his son might have touched the controls (dual flight controls were installed in the helicopter at the time). He then heard the engine sound change and they immediately started to descend. The pilot identified a small opening for an emergency landing. He performed a skid on landing but due to some trees in front of them he pulled back on the cyclic – he also had maximum collective pitch applied – to cushion the landing. Due to the low main rotor inertia and the aft cyclic control stick input, the main rotor blades made contact with the tail boom and severed the structure. The pilot stated that the helicopter then lifted off the ground and rotated clockwise through 90° before coming to a halt in an upright position (Figure 2).

Figure 2: The helicopter as it came to rest

The helicopter was an AS341-F2 Gazelle with serial number 1678. It was manufactured in 1977 and was registered in South Africa in February 2015. The helicopter was equipped with a single turbo-shaft engine and was registered in the non-type certified aircraft (NTCA) category. The last maintenance inspection that was carried out on the helicopter prior to the accident flight was an annual inspection, which was certified on 13 March 2018 at 3 393.5 airframe hours. The helicopter had flown a further 21 hours since the inspection. It was in possession of a valid Certificate of Release to service as well as an Authority to Fly.

The helicopter was recovered to an aircraft maintenance organisation (AMO) at FAWB where fuel was drained from the main fuel tank and fuel filter, which was located on the fuel control unit (FCU) (Figure 3). The FCU fuel filter displayed evidence of excessive amounts of contamination (water) (Figure 4). Fuel was also drained from the fuel trailer/bowser (Figure 5). The fuel sample, which nearly filled a 2L container, displayed a brownish colour with additional sediment (dirt) being present in the fuel.

The fuel drain / purge valve, which is located on the right-hand side of the helicopter, allowed fuel to be drained from the feeder tank and not directly from the main fuel tank during the pilot's pre-flight inspection.

The entire helicopter fuel system was then drained and the system was flushed, where after an engine ground run was performed. Normal engine start was achieved and the engine ran normally for several minutes at ground idle. Due to secondary damage, which was caused as a result of the accident, it was not possible to advance the throttle to flight idle.

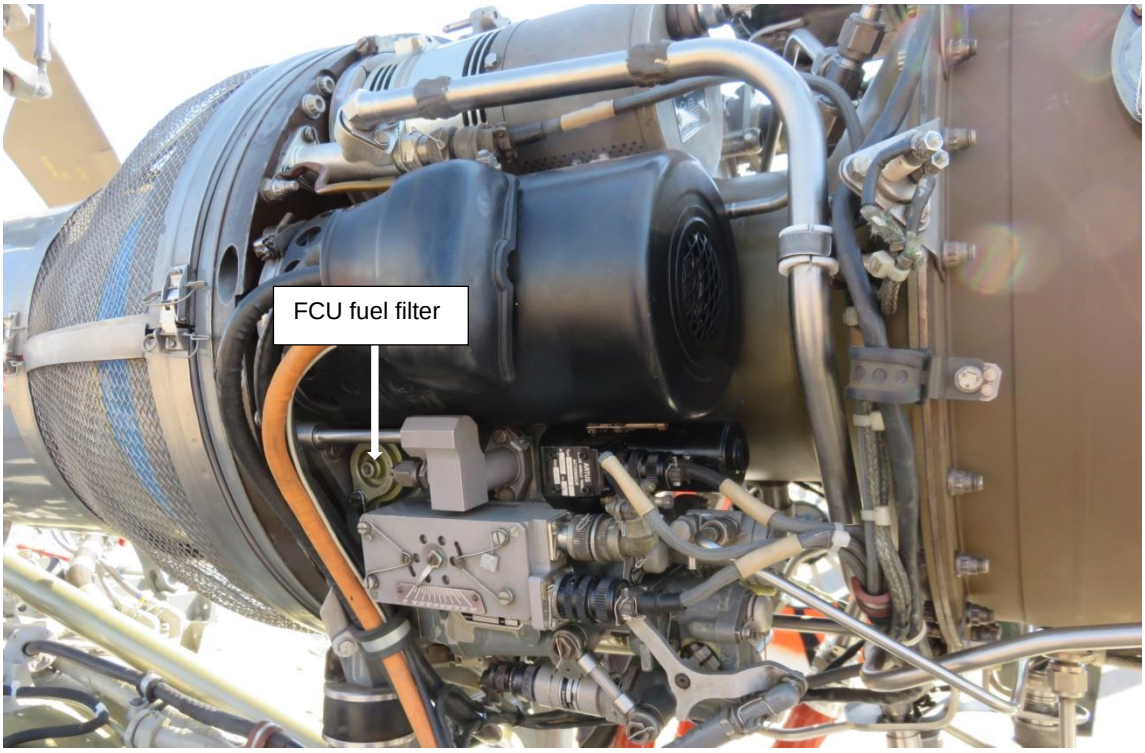

Figure 3: The location of the FCU fuel filter

Figure 4: Water droplets from the FCU fuel filter following the removal of the filter unit

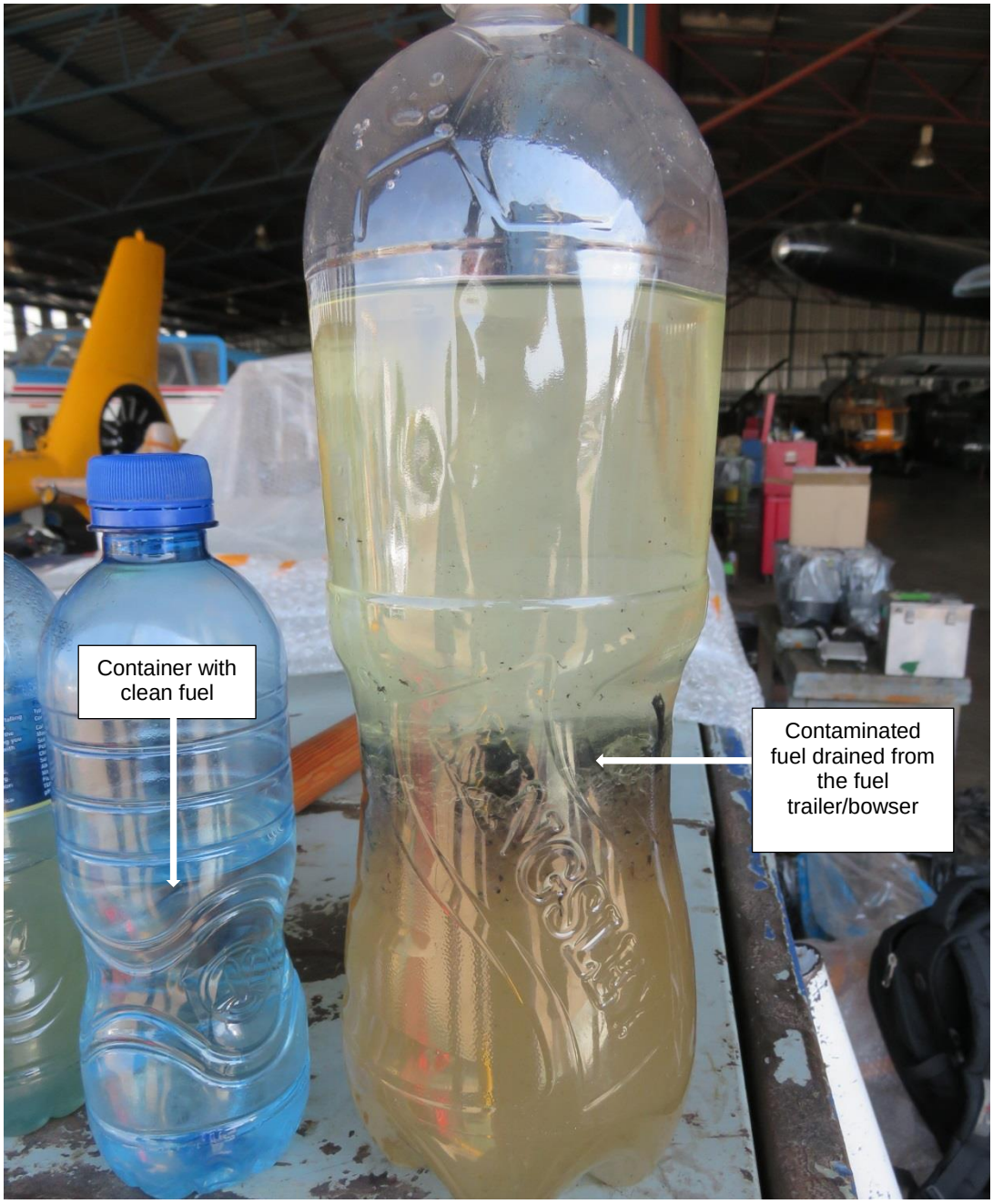

Figure 5: A fuel sample (right) taken from the fuel trailer/bowser, displaying contaminated fuel

The fact that the pilot was able to start the helicopter and lift off before the engine stoppage occurred can be attributed to engine being equipped with a feeder tank, which is located in the aft compartment below the main fuel tank. The feeder tank was most probably still filled with clean fuel from the previous flight, and this allowed normal engine operation for several minutes. Only once the clean fuel in the feeder was exhausted and the tank started to fill with contaminated fuel, which was fed to the engine, did the engine stoppage occur. Contamination, especially water, tends to settle at the bottom of the fuel tank or container and gets sucked into the fuel system fairly quick depending on the design of the fuel system. Even though there might be several fuel filters incorporated in such a

system, they do not have the capacity to stop excessive amounts of contamination/sediment, which can bypass the filter system and enter the engine fuel system.

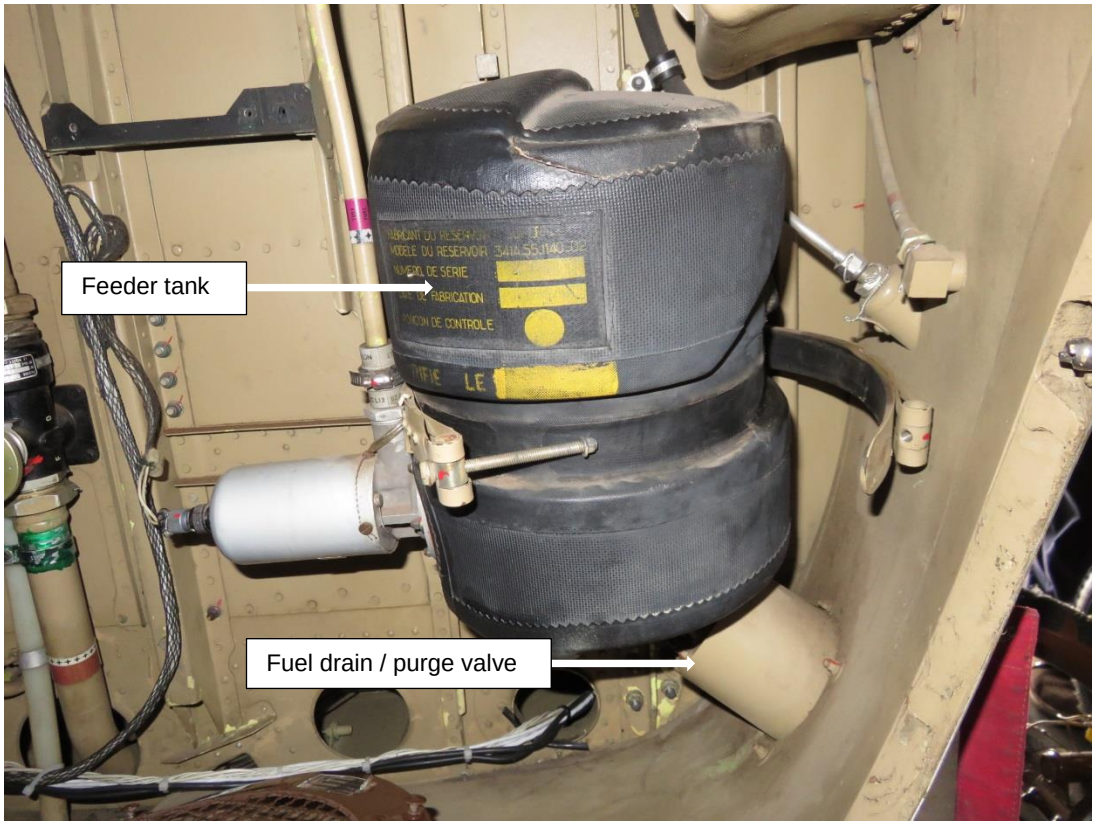

Figure 6: The feeder tank from where fuel is fed to the engine (photograph was taken at an AMO)

PROBABLE CAUSE

Unsuccessful forced landing following an engine stoppage after take-off, which was attributed to fuel contamination.

CONTRIBUTORY FACTORS

The pilot refuelled from the fuel trailer/bowser but did not check the fuel as the fuel trailer was parked in a secure location and was fitted with a 1-micron fuel filter. The fuel trailer was for the sole use of refuelling the helicopter.

The possibility that fuel was stolen from the fuel trailer/bowser and the content replaced with water could not be ruled out.

The fuel trailer/bowser refill cap was not equipped with a locking mechanism and could therefore be easily opened by hand. This was considered to be a serious safety shortcoming.

REFERENCES USED ON THE REPORT

South African Civil Aviation Regulations (CARs) of 2011 as amended.

SAFETY RECOMMENDATION

None

ORGANISATION

This was a private flight, operated under the provisions of Part 94 of the CARs of 2011.

TYPE OF SAFETY ACTION

None.

SAFETY MESSAGE

It is of paramount importance that all flying crew ensure that the fuel that they uplift, whatever the source might be, is clean and meets the requirements to ensure flight safety is not compromised in any way.