JA-2011-05

AVIATION ACCIDENT REPORT FOR

CESSNA 152

REGISTRATION 6Y-JGA

11 April 2013

JAMAICA CIVIL AVIATION AUTHORITY

AVIATION ACCIDENT

DRAFT REPORT

Occurrence Number:	JA-2011-05
Type of accident:	Runway excursion after rejected takeoff
Operator:	Private
Type of Aircraft:	Cessna 152
Aircraft Registration:	6Y-JGA
Occurrence Location:	Palisadoes Road at the end of runway 12 at the Norman Manley International Airport, Kingston N 17° 56.08′ W 076° 47.15′
Date and Time:	04 March 2011 at approximately 10:04 AM local time

1. FACTUAL INFORMATION

1.1 History of the flight

On the morning of March 04, 2011 the Cessna 150 aircraft, 6Y-JGA, was flown from Kingston Tinson Pen (KTP) Aerodrome to the Norman Manley International Airport (NMIA) for the purpose of refueling. A full run-up was done prior to the flight and the captain reported that all was normal. The duration of flight was 0.2 hours. On board were the captain and one passenger. The aircraft proceeded to gate 11 for refueling. The captain reported an uplift of 7 gallons of fuel making a total of 10 gallons in the right wing and 9 gallons in the left wing. The captain reported sampling fuel from all sump points in the wings and at the strainer at the nose wheel area after refueling, and stated that all samples were clean. For the return flight to Tinson Pen start-up was normal. NMIA tower gave permission for an intersection takeoff on runway 12 from the taxiway Delta intersection and advised that another aircraft was on final for runway 12. Before brake release the captain did a magneto and full power check at 2350 RPM, both of which were reported as normal. NMIA tower cleared the aircraft for takeoff at 10:03 AM local.

The captain reported that just after lift-off the engine backfired, and lost power. He reported that the aircraft was not climbing and started vibrating and so he decided to re-land. He reduced power to idle, landed and applied maximum brakes. The aircraft skidded down the runway, went through the wire fence at the end of the runway and came to rest on the Port Royal Road.

The NMIA Tower tried to contact the aircraft just after 10:04 AM local but got no response.

1.2 Injuries to Personnel.

Both the captain and passenger received minor cuts and bruises, and walked away from the aircraft after the accident.

1.3 Damage to Aircraft.

The aircraft sustained major damage to the fuselage nose section. The skin on the aircraft fuselage just aft of the doors showed evidence of wrinkles, and the passenger door had evidence of deformation. The right wing tip sustained impact damage at the leading edge. The windshield was shattered and the compass broke loose and was thrown forward of the aircraft. The nose landing gear snapped at the attachment point.

One propeller blade was bent back onto the lower right side of the engine and the other blade was undamaged. The damage to the propeller was consistent with it turning at impact.

The entire engine shifted aft into the firewall. The crankshaft flange for the attachment of the propeller was bent and the generator was damaged. The carburetor body was broken off at the neck which resulted in all the fuel draining from the aircraft.

The flaps were found in the fully down position.

Photo 1. Major damage to fuselage nose section, nose landing gear and propeller

1.4 Other Damage.

The threshold light fixture second from the south end of runway 12 was destroyed by contact with the aircraft.. Approximately 30 feet of the chain link and barbed wire perimeter fence was damaged.

1.5 Personnel Information.

The captain was a Jamaican citizen, age 40 years, and holder of a Jamaican Commercial Pilot License – Aeroplane. The license was class rated for all single-pilot, non-high performance, single or multi-engine aeroplanes of 5700 Kg or less MCTOW, and had a B190 type-rating. His instrument rating had expired since 01 June 2010 and his flight instructor rating had also expired. He was the holder of a Class 1 Pilot Medical Certificate, valid until 31 August 2011.

The passenger was an aircraft maintenance student, who had no flying experience in small aircraft.

1.6 Aircraft Information.

The aircraft was manufactured by Cessna Aircraft Company in 1978 under Type Certificate number 3A19, with serial number 15281353. The Certificate of Airworthiness was issued on 12 March 2010 with an expiry date of 11 March 2011. The aircraft's insurance certificate had an expiry date of 11 June 2011.

The aircraft was fitted with a Lycoming engine model number O-235-L2C, serial number L-20832-15. It was last overhauled on 12 November 2002 at a total time of 2,399.25 hours since new and was fitted to the aircraft on 16 June 2004. At the time of the occurrence the engine was at 3,184.5 hours since new and underwent an annual inspection on 05 March 2010 at 3,148.0 hours since new. The time since the last overhaul was 785.2 hours. The fuel used by this engine was 100LL.

The records indicated a total of 11,362.6 hours on the airframe since manufacture. The airframe had an annual inspection on 05 March 2010 at 11,326.1 hours.

The propeller was a model 72CK56-0-54 manufactured by Sensenich Corporation, serial number K9224. It was installed on 01 June 2006 with zero time, had an annual inspection done on 05 March 2010 at 607.3 hours, and at the time of the accident had accumulated 643.8 hours.

The aircraft was privately registered, and was leased to another party. The pilot had borrowed the aircraft from the lessee.

1.7 Aircraft Maintenance Records.

A review of the aircraft maintenance records revealed the following discrepancies:

a) The Life Limited component record for the vacuum relief filter RA-B3-5-1 showed that it was due for change at 11,249.7 hours aircraft total time, but the records do not show that this task was accomplished at that time. However a check of the annual inspection on 05 March 2010 (Work Order # 376) showed that the filter was replaced then at aircraft total time of 11,326.1 hours, which was an over-run of 76.4 hours.
b) The record for Special Inspection item 1 – Engine oil system inspection, was due on 04 September 2010, but the records show no evidence of compliance.
c) The record for Special Inspection item 10 – Gyro central filter, showed a replacement interval of 500 hours or 1 year, whichever came first. The record shows that the task was due on 28 May 2009, but there was no record of it having been done. It should be noted that the 1-year interval was not included in the manufacturer's maintenance program for the aircraft.

d) The record for Special Inspection item 11, Battery check, had an interval of 30 days or 100 hours, whichever came first, and was last done on 05 March 2010. There was no evidence in the records showing compliance with this inspection since then.
e) The record for Special Inspection item 13, control systems check, had an interval of 1,000 hrs or 3 years, whichever came first. The records showed that this task was due on 14 August 2010, but showed no record of compliance.
f) The Special Inspection task for the Elevator Trim Tab actuator lubrication and inspection was also due on 14 August 2010 but there was no record of compliance.
g) The Airworthiness Directive (AD) compliance record had no evidence of compliance to AD 2009-10-09 R1. This AD was effective 11 December 2009 and was to be complied with within 100 hours or by 17 June 2010, whichever occurred first. The aircraft records show that a related Service Bulletin SEB01-1 had been complied with in June 2006 but the AD was not evaluated and recorded as being in compliance.
h) Engine oil changes were not being accomplished at the recommended intervals in accordance with Lycoming SB 480E.

1.8 Aircraft Fuel System.

The aircraft fuel system included a glass bowl through which fuel passed before going to the engine; this was designed to trap any water in the fuel, and it was normal to find a small quantity of water in this bowl from condensation in the fuel tanks. A small amount of water was found in this glass bowl, but no other contamination was found.

1.9 Aircraft Fuel.

A few hours after the accident the fuel supplier, Chevron, was visited to take samples of the fuel from the fuel truck that was used to refuel the aircraft before the accident flight. The fuel was 100LL, the correct fuel for this aircraft. Fuel samples from the fuel truck were found to be clean and uncontaminated. The records for this batch of fuel were also inspected at the Chevron offices and were found to be satisfactory.

During the accident most of the fuel had drained from the aircraft due to the damage, except for about a one litre, which was collected from the wing sump drains. This was checked and found to be the correct fuel, and it was clean, with no evidence of water or any other contamination.

1.10 Engine Magneto System.

The engine was equipped with two magneto systems. One magneto system provided electrical power to the upper spark plugs in two of the cylinders of the engine, and the lower plugs in the other two cylinders, and the other magneto system provided electrical power to the other spark plugs, in the same manner: thus, if one magneto system failed,

the other magneto system would provide all cylinders with a source of ignition, via two upper spark plugs and two lower spark plugs.

1.11 Aircraft Performance.

In the Cessna 152 Pilot Operator Handbook the take-off distance required for the Cessna152 aircraft under the conditions at the time of the accident with calm wind was approximately 785 feet ground roll. The required landing distance in calm wind was approximately 495 feet.

1.12 Meteorological Information.

At the time of the accident the wind from the southeast at 5 knots, visibility greater than 10 kilometers, few clouds at 2,000 feet above ground level (agl), broken layer at 3,200 feet agl, temperature 26 degrees Celsius, dew point 15 degrees Celsius and QNH 1016 HPa.

1.13 Communication.

Communication between the aircraft and NMIA tower on frequency 118.65 MHz was normal and played no part in this accident.

1.14 Aerodrome information.

At the time of the accident, runway 12 was bare and dry. There was approximately 2,600 feet remaining for takeoff on runway 12 from the intersection of runway 12 and Delta taxiway.

1.15 Captain's Report.

The captain reported the following sequence between take-off and impact:

1. The take-off was performed with the flaps at 10 degrees.
2. Take-off roll started on runway 12, at the Delta taxiway intersection.
3. Lift-off was at about 850 feet from Delta.
4. Aircraft climbed at approximately 60 knots to about 4 feet above the runway.
5. Engine problems with loss of power developed.
6. Pilot leveled off the aircraft.
7. At approximately 1,500 feet from Delta the pilot decided to abort the take-off and re-land.
8. At approximately 2,000 feet from Delta and about 600 feet from the end of the runway the pilot landed the aircraft, with full flaps extended, landing first on the right main gear.
9. The pilot applied maximum braking and retracted the flaps.
10. As the aircraft went through the fence the pilot lowered full flap.

1.16 Wreckage and Impact Information.

There were tire skid marks for the last three hundred and sixty (360) feet of runway 12. Both main wheel tires exhibited flat spots. Just prior to the aircraft exiting the end of runway, the right main gear struck a threshold light assembly which resulted in the light being broken and destroyed. The propeller hit the chain link fence, and the right wing tip came in contact with one of the vertical fence posts, which resulted in damage to the right wing tip leading edge.

Photo 2. Main wheel tire skid marks, which continued to the end of the runway.

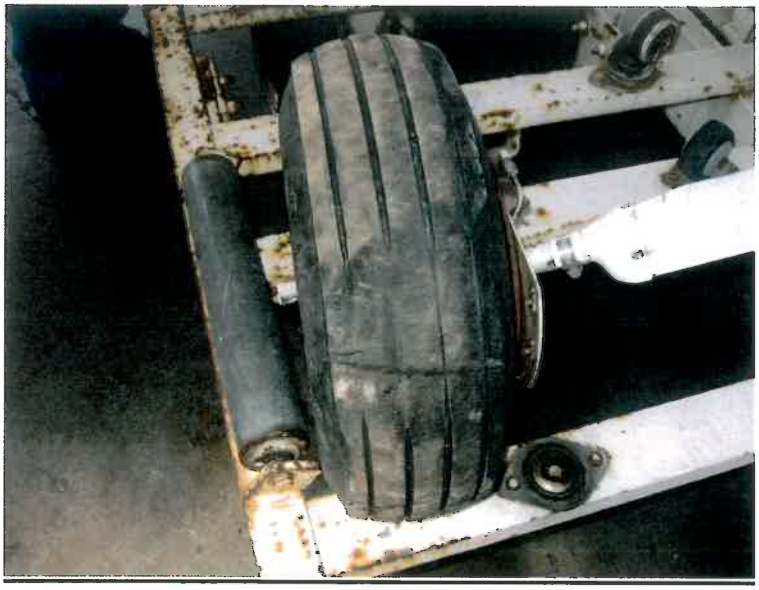

Photo 3. Left main gear tire flat spot.

The aircraft then fell onto the Palisadoes Road, which is about 12 feet below the end of runway 12, and came to rest on the eastern side of the roadway against the embankment. The fuselage and empennage protruded westerly across the left lane of the roadway (heading towards Port Royal) and partially blocked the roadway.

Following a preliminary inspection by the Jamaica Civil Aviation Authority (JCAA), the aircraft was placed onto a dolly and transported to the airport perimeter fence near the 'Flag Pole' roundabout. From this point it was hoisted by crane over the fence and placed in the Air Jamaica hangar for further evaluation.

1.17 Road and Runway Closures.

The road was closed to vehicular traffic for approximately 3-4 hours. The airport was temporarily closed for approximately 30 minutes (10:10 AM to 10:40 AM). This had no effect on departure of flights, as none was scheduled. Three incoming flights were affected, with one diverting to Montego Bay while two decided to hold, then landed when the airport re-opened.

1.18 Airport Rescue and Fire Fighting.

Within the first few minutes of the accident, the threat of fire from the leaking fuel was neutralized by the NMIA Airport Rescue and Fire Fighting (ARFF) crew.

1.19 Medical Information.

The pilot reported that he was medically examined at Kingston Public Hospital after the accident. The doctor's report stated a diagnosis of musculoskeletal trauma, and

recommended medication for pain, and two days sick leave. There was no evidence that toxilogical tests were conducted, and there was no toxilogical report available.

1.20 Tests and Research.

The aircraft and engine were examined, with the following results:

a) Rudder attachment and control check carried out and found satisfactory.
b) Aileron attachment and control check carried out and found satisfactory.
c) Elevator attachment and control check carried out and found satisfactory.
d) Flap attachment and control check carried out and found satisfactory.
e) The brakes were inspected and found to be in satisfactory condition.
f) Both main landing gear tires appeared to be nearly new, had good tread on them, and each one had a significant flat spot on it.
g) The fuel bowl was drained and a small amount of water was seen. The screen was clean.
h) The fuel supply from the tanks was clear and continuous.
i) The fuel vent lines were clear and continuous.
j) The left and right fuel caps were removed, inspected and found satisfactory.
k) The fuel selector valve, which was found in the "on" position, was checked in the "on" and "off" positions and found to be satisfactory.
l) Although the carburetor had broken off at the neck, where the throttle control cable was attached, it was possible to determine that the throttle control had full travel.
m) The mixture cable was checked and the mixture control was found to be satisfactory.
n) The spark plugs were all inspected and all gaps were found to be within limits.
o) On all cylinders the top plugs were free of any contamination and the lower plugs had some lead build-up.
p) Insulation checks done on the spark plug leads were all satisfactory.
q) The left and right magnetos were removed, inspected and the gear drives were found to be satisfactory.
r) The oil filter was removed, opened and inspected. No metal cuttings or other contamination was found.
s) The damage to the propeller indicated that it was turning at impact.
t) The crankshaft flange was found bent from the impact, however the crankshaft rotated freely.

1.21 Engine Examination by Lycoming.

The engine manufacturer, Lycoming, performed a disassembly of this engine on 13 July 2011 at its manufacturing plant in Williamsport, Pennsylvania, USA. In attendance were investigators from the JCAA and the National Transportation Safety Board of the USA.

Prior to the disassembly, the top spark plugs and rocker box covers were removed. The crankshaft was found to rotate freely and completely in both directions. Rocker arm

continuity was noted at all cylinders in the proper sequence. All accessory gears were moving. All cylinders had good thumb compression and suction. With the rear accessory case removed and the Number 1 cylinder in compression and at top dead center, all timing marks on the crankshaft gear, left magneto idler gear and camshaft gear lined up as they should.

The magnetos were hooked up to a magneto bench tester one at a time. Both produced spark across a calibrated gap at all RPMs from impulse coupling speeds up to 2500 RPM.

Normal wear and tear was noted on the internal parts. There were no broken parts or large discrepancies to any of the engine parts that might have caused a loss of engine power.

The lower spark plugs were found to have large accumulations of lead deposits. According to Lycoming's summary report, this "could result in a few hundred RPM loss at take-off power setting". When tested, each of these plugs did produce a spark, but not with the intensity of an almost new plug.

Lower plugs installed in each cylinder

1.22 Consultation with Cessna Safety Investigator.

The Air Safety Investigator for the Cessna Aircraft Company was consulted by the JCAA, outlining the circumstances of the accident, and the following question was asked:

'Would it have been possible for the aircraft to travel 360 feet along the runway with the wheels locked and the power ... at idle at landing?'

Cessna's response was as follows:

'No. The normal ground roll distance under the conditions you describe, without wind, is approximately 450 feet. We would expect to see tyre scrub marks substantially shorter than 360 feet under the circumstances you described. We don't know the length of the ground roll before the tyres began to slide and from your description of the accident, the aircraft was carrying sufficient energy at the end of the runway to take out a runway light and make it passed the perimeter fence to the east side of Palisadoes Road. These two observations make it even more unlikely that the engine power was at idle during the accident. As a general rule, the faster the aircraft is moving the lighter it is on the gear, creating less braking action, and lighter skid marks on the runway surface. I would think 360 feet of heavy braking action would have done more damage to the tyres than your photograph documents. Your runway photographs indicate to me the full weight of the aircraft may not have been on the gear during the skid.'

1.23 Other Information.

The passenger reported that he did not touch any of the controls, including brakes, during the landing sequence. His report regarding the sequence of events was consistent with that of the captain.

The purpose of the flight was to bring avgas to Tinson Pen Aerodrome to be transferred into C172 aircraft 6Y-JJR, for a test flight, as no avgas was available at Tinson Pen Aerodrome.

2. ANALYSIS

2.1 Aircraft Maintenance.

The investigation revealed several instances where the aircraft was not being maintained in accordance with the manufacturer's maintenance program.

2.2 Engine.

As described, the engine was disassembled and examined by the Manufacturer, and no discrepancies were found other than the accumulations of lead on the lower spark plugs. Nothing was revealed during the engine examination that would have caused a loss of engine power.

2.3 Airframe.

No discrepancies were found with the airframe that might have contributed to causing the accident.

2.4 Fuel and Fuel System.

The investigation revealed no evidence of incorrect fuel, fuel starvation or fuel exhaustion. There was no evidence of any malfunction in the aircraft's fuel system. Apart from the small amount of water found in the fuel bowl, which was considered to be normal, there was no evidence of fuel contamination in the aircraft's fuel system, nor in the fuel truck from which the aircraft had been refueled.

2.5 Landing Gear / Brakes.

The evidence indicated that the pre-accident condition of both tires was fairly new. The flat spots found on both main tires and the continuous skid marks on the runway indicated that the brakes were fully functional and were applied heavily during the last 360 feet of the landing roll.

The comments of the Air Safety Investigator for the Cessna Aircraft Company in paragraph 1.22 suggest that the full weight of the aircraft may not have been on the wheels and that the engine was not at idle during the ground roll.

2.6 Weather.

The weather at the time of the accident was calm and fair, and there was no evidence that weather was a factor in this accident.

3. CONCLUSIONS

1. The pilot's report of a significant loss of engine power was not substantiated by the examination of the engine carried out by the Manufacturer (Lycoming).

2. The aircraft landed 600 feet from the end of the runway, which should have been sufficient distance within which to stop the aircraft safely, as the landing distance required was approximately 495 feet under normal circumstances.

3. The evidence indicates that the full weight of the aircraft may not have been on the main gear, and the power may not have been at idle, during the landing roll.

4. The instances where the maintenance of the aircraft did not conform to the maintenance program did not contribute to this accident.

5. RECOMMENDATIONS

1. It is an industry practice that fuel should not be transferred from one aircraft to another due to the risk of contamination. Should this become necessary at one of our aerodrome where fuel is not available then it should be done in accordance with a procedure approved by the JCAA.

2. Depending on demand and need at Tinson Pen, fuel could be supplied using mobile trucks from the suppliers at the main international airports.