AIRCRAFT ACCIDENT SHORT REPORT

CA18/2/3/9697 : ZS-WLI, Aborted take-off due to engine power loss

Date and time	:	4 April 2018; 1033Z
Location	:	Rhino Park Airfield, approximately 85 m from the threshold of runway 09
Occurrence type	:	Accident
Aircraft registration	:	ZS-WLI
Aircraft manufacturer and model	:	Bellanca, Citabria 7ECA
Last Point of departure	:	Fly Inn Estate
Next point of intended landing	:	Fly Inn Estate
Location of accident site with reference to easily defined geographical points (GPS readings if possible)	:	S25°50'03.82", E028°32'06.02"
Meteorological Information	:	Wind: 280°/10 kts, visibility: >10 km, temperature: 21°C, dew point: 15°C
Type of operation	:	Private, Part 91
Persons on board	:	1 + 1
Injuries	:	1 + 1
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 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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1. SYNOPSIS

1.1 The pilot accompanied by a passenger took off from Fly Inn Estate with the intention to do a touch and go at Rhino Park Airfield and then return to Fly Inn Estate. The pilot stated that during take-off roll from Rhino Park Airfield, the engine revolutions per minute (RPM) dropped from 2 450 to 2 000 and the engine was running rough. The pilot then decided to abort take-off. The aircraft could not brake in time and overshot the runway.

1.2 The pilot said he applied brakes but the aircraft continued to skid on a muddy surface outside the runway and came to rest in a ditch approximately 85 m from the threshold of runway 09. The pilot stated that he suspected carburettor icing to be the cause of the accident.

1.3 Witnesses at Rhino Park Airfield rushed to the accident site to assist the injured. Both occupants were seriously injured and were rushed to the hospital. The aircraft sustained substantial damage.

2. FACTUAL INFORMATION

2.1 On 4 April 2018 at 1033Z, the pilot accompanied by a passenger on-board a Citabria 7ECA, with registration ZS-WLI, took off on a private flight from runway 24 at Fly Inn Estate with the intention to do a touch and go at Rhino Park Airfield and then return to Fly Inn Estate. The flight from Fly Inn Estate was uneventful and was conducted under visual flight rules (VFR). The aircraft landed safely on runway 09 at Rhino Park Airfield; taxied to the end of the runway and turned around facing runway 27.

2.2 The aircraft took-off at Rhino Park Airfield from runway 27 with the intention to land at Fly Inn Estate. The pilot stated that during take-off roll at Rhino Park Airfield, the aircraft picked up speed and he raised the tail for take-off. At about 45 miles per hour (mph), the engine RPM dropped from 2 450 to 2 000 with the engine running rough. The aircraft could not accelerate to 55 mph, which is the normal rotation speed and the pilot decided to abort take-off. The aircraft was approximately three-quarters down the runway when the engine lost power and began running rough. The length of the runway is 800 m. According to aircraft specifications, the aircraft needs between 538 and 640 m to take off at approximately 20°C. The aircraft needed approximately 300m to stop therefore it was not possible for the aircraft to have a successful stop as the available runway length was insufficient,

2.3 The pilot stated that he applied brakes after the tail had touched the ground but the brakes locked, resulting in the aircraft skidding on the runway and exiting the runway onto the muddy surface, eventually coming to rest in a ditch approximately 85 m from the threshold of runway 09.

Figures 1 & 2: The muddy skid marks (left) and the aircraft's final position after the accident (right)

2.4 Witnesses at Rhino Park Airfield rushed to the accident site to assist the injured. Both occupants were seriously injured and were rushed to the hospital. The aircraft sustained substantial damage to the propeller blades, engine cowlings, windshield, main landing gears and the left-hand wing.

Figures 3 & 4: Damage sustained by the aircraft

2.5 Additional information**:**

2.5.1 The information below was extracted from Citabria *Pilot's Operating Manual*:

NORMAL OPERATING PROCEDURES (Page 3-4)

- Starting
  1) Master Switch – ON
  2) Magneto Switches – ON (2)
  3) Throttle – CRACKED OPEN (1/2"-1")
  4) Carburettor Air – COLD
  5) Mixture – FULL RICH
  6) Prime – AS REQUIRED, CHECK locked
  7) Propeller – Clear, front and rear
  8) Starter Button – PUSH, release after engine starts
  9) Throttle – 1 000 RPM
  10) Oil Pressure – CHECK, must indicate pressure within 30 seconds maximum
  11) Radio/Light Switches – AS DESIRED

ENGINE FAILURE ON TAKE-OFF (Page 2-5)

- If sufficient runway remains:
  1) Throttle – CLOSED
  2) Land using maximum braking after touchdown

PARTIAL POWER LOSS/ ROUGH RUNNING ENGINE

1) Follow the engine air restart procedures
2) Land as soon as practical using "Precautionary Landing Approach" procedure.

Carburettor icing is indicated if a gradual RPM loss is noticed. The carburettor/alternator air should be FULL HOT as long as suspected icing conditions exist.

WEIGHT & BALANCE

ITEM	Inputs	Weight	Arm	Moment
EW-Empty Weight		1 138	14.7	16 728.6
Fuel		70	24.5	1 715.0
Pilot		220	11.5	2 530.0
Passenger		224	42.0	9 408.0
TOTAL	Initial	1 652	18.39	30 381.6
After 1 hour minus 54 lbs from the weight and 285.3 from the moment		1 696	17.7	30 096.3

Plane limits:

- Acrobatic max. gross: 1 750 CG, range 14.2–16.3
- Normal max. gross: 1 750 CG, range 14.2–18.2

2.5.2 Research:

Carburettor icing, or carb icing, is an icing condition that can affect any carburettor under certain atmospheric conditions. The problem is most notable in certain realms of aviation. Carburettor icing occurs when there is humid air, and the temperature drop in the venturi causes the water vapour to freeze.

The temperature range where carb icing can occur is equally surprising. According to the Federal Aviation Administration (FAA), carb icing is possible from 10°F to over 100°F (–12°C to over 37°C), with serious icing possible from 20°F to over 90°F (–7°C to 32°C).

In order to determine whether or not there was a probability of carburettor icing during the flight, a carburettor ice potential chart was used to determine if the weather conditions were indeed favourable to carburettor icing (Figure 5).

The weather information included on the pilot questionnaire was as follows: wind: 280°/10 kts, temperature: 21°C (70°F), dew point: 15°C (59°F), cloud: CAVOK, visibility: >10 km). With both temperature and dew point information available, dew point depression was determined to be 6°C. According to the carburettor icing-probability chart below, icing probability was moderate in cruise power and serious in descent power.

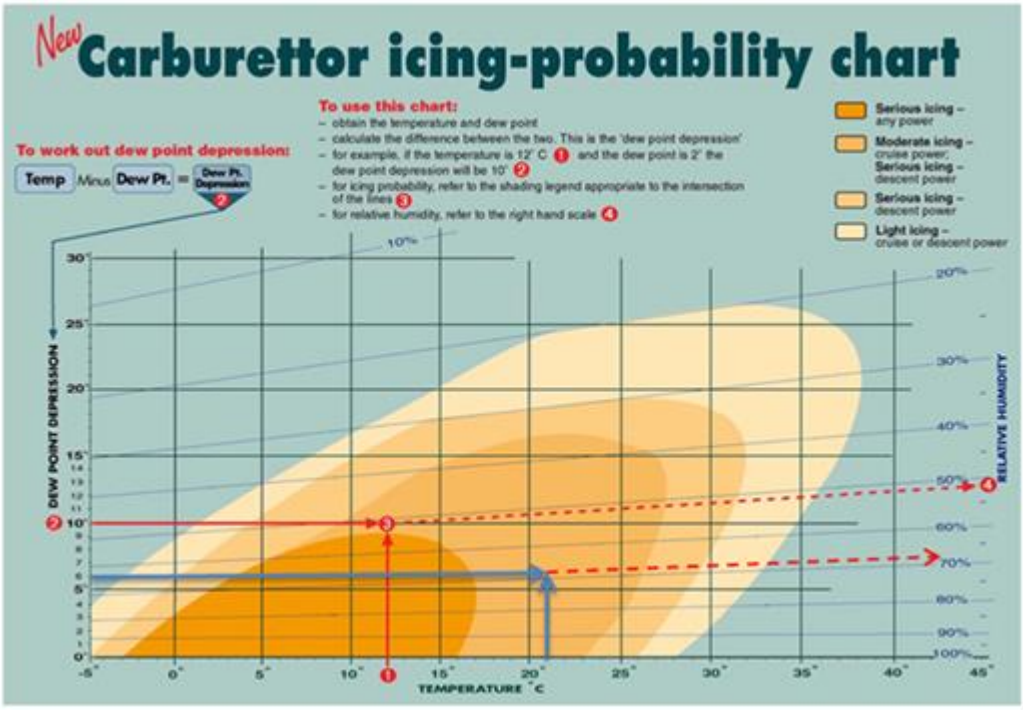

Figure 5: A carburettor icing-probability chart

3. Investigation revealed the following findings:

3.1 The pilot had a valid airline transport pilot's licence (ATPL), expiring on 30 November 2018, and a valid medical certificate, expiring on 31 July 2018.

3.2 The pilot had a total of 9 400.1 flying hours and 43.8 hours on aircraft type.

3.3 The aircraft had a valid Authority to fly certificate issued in terms of Civil Aviation Regulations Part 24, expiring on 6 February 2019.

3.4 According to the flight folio, the aircraft had a total of 1 245.62 hours at the time of the last annual inspection, which was carried out on 7 February 2018. The aircraft had 1 246.10 hours at the time of accident; therefore, it had only accrued 0.48 hours since the last inspection.

3.5 At about 45 mph, the engine RPM dropped from 2 450 to 2 000 and the aircraft could not reach 55 mph, which is the take-off speed. The engine started running rough and the pilot elected to abort take-off. The length of the runway is 800 m and the aircraft can take off within 538 to 640 m.

3.6 The aircraft needed approximately 300m to stop therefore it was not possible for the aircraft to have a successful stop as the available runway length was insufficient,

3.7 During the post-accident investigation, the propeller was turned by hand to check for evidence of engine seizure and it turned freely.

3.8 The aircraft's weight and balance was within limits, therefore did not contribute to the accident.

3.9 The pilot stated that he suspected carburettor icing to be the cause of the accident. According to the carburettor icing-probability chart, the engine had moderate icing probability in cruise power and serious icing probability in descent power.

3.10 The aircraft flew from Fly Inn Estate and landed at Rhino Park Airfield on runway 09, and back-tracked to take off again on runway 27.

3.11 According to the aircraft's pilot operating manual, the carburettor icing lever should be in the "cold" position during take-off.

3.12 It is possible that during the taxi at Rhino Park Airfield, the carburettor might have accumulated ice and that affected the engine performance during take-off.

4. PROBABLE CAUSE/CONTRIBUTING FACTOR

4.1 Unsuccessful aborted take-off after engine experienced partial power loss due to probability of carburettor icing.

5. REFERENCES USED IN THE REPORT

5.1 Citabria *Pilot's Operating Manual* – Pages 2-4 and 3-4.

5.2 Article on the internet by Colin Cutler (09/10/2015) (www.boldmethod.com/learn-to-fly/aircraft.../dont-let-carb-ice-happen-to-you/).

6. SAFETY RECOMMENDATIONS

6.1 The following recommendations were issued by the National Transportation Safety Board (NTSB) on Safety Alert number SA-029 December 2013, revised December 2015:

Carburettor Icing:

What can pilots do?

- Check the temperature and dew point for your flight to determine whether the conditions are favourable for carburettor icing. Remember, serious carburettor icing can occur in ambient temperatures as high as 90°F (32°C) or in relative humidity conditions as low as 35% at glide power.

Refer to your approved aircraft flight manual or operating handbook to ensure that you are using carburettor heat according to the approved procedures and that you properly perform the following actions:

- Check the functionality of the carburettor heat before your flight.
- Use carburettor heat to prevent the formation of carburettor ice when operating in conditions and at power settings in which carburettor icing is probable. Remember, ground idling or taxiing can allow carburettor ice to accumulate before take-off.
- Immediately apply carburettor heat at the first sign of carburettor icing, which typically includes a drop in RPM or manifold pressure (depending upon how your airplane is equipped). Engine roughness may follow.
- Consider installing a carburettor temperature gauge, if available.
- Remember that aircraft engines that run on automotive gas may be more susceptible to carburettor icing than engines that run on Avgas.

7. Organisation

7.1 None.

8. Type of safety action

8.1 None.

9. Safety message

9.1 None.