



## TITLE



### GENERAL INFORMATION:

Name of Operator:	Wings Aviation Ltd. Limited
Aircraft Manufacturer:	Cessna Company
Aircraft Model:	Cessna U206G
Nationality and Registration Marks:	8R-GPR
Place of Accident/Region:	Eteringbang Airstrip (SYET) Region#7, Guyana – 5 32 06.66N 59 28 05.52W
Date of Accident:	8 <sup>th</sup> August 2017.
Time of Accident:	15:13hrs

### REPORT No. GAAIU 3/1/18

**This investigation was conducted in accordance with ICAO Annex 13 and therefore, it is not intended to apportion blame, or to assess individual or collective liability. Its sole objective is to draw lessons from the occurrence which may help to prevent future accidents. Consequently, the use of this report for any purpose other than for the prevention of future accidents could lead to erroneous conclusions.**

*Note: - All times in this report are Coordinated Universal Time (UTC) unless otherwise stated. UTC is four hours ahead of Guyana Standard Time (GST).*



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## **GLOSSARY OF ABBREVIATIONS**

AIP	-	Aeronautical Information Publication
AMEL	-	Aircraft Maintenance Engineer Licence
AMO	-	Approved Maintenance Organisation
AOC	-	Air Operator Certificate
ATS	-	Air Traffic Services
CMI	-	Continental Motors Inc
DATCO	-	Duty Air Traffic Control Officer
ELT	-	Emergency Locator Transmitter
FOM	-	Flight Operations Manual
GAAIU	-	Guyana Aircraft Accident and Incident Investigation Unit
GARs	-	Guyana Aviation Requirements
GCAA	-	Guyana Civil Aviation Authority
GCARs	-	Guyana Civil Aviation Regulations
ICAO	-	International Civil Aviation Organisation
MEL	-	Minimum Equipment List
NTSB	-	National Transportation Safety Board (USA)
OAT	-	Outside Air Temperature
S/N	-	Serial Number
SYEC	-	Eugene F. Correia International Airport
SYEK(B)	-	Ekereku Bottom Airstrip
SYET	-	Eteringbang Airstrip
TBO	-	Time before Overhaul
TSN	-	Time since New
TSO	-	Time since Overhaul



## **SYNOPSIS:**

The aircraft, a Cessna U206G, Registration Number – 8R-GPR crashed while taking off from Eteringbang Airstrip (SYET).

The pilot, who was the sole occupant of the aircraft, was injured.

The aircraft was destroyed by the impact.

There was no fire.



## 1. FACTUAL INFORMATION

### 1.1. History of the Flight.

On 8<sup>th</sup> August 2017, the pilot along with a company mechanic, departed the Eugene F. Correia International Airport (SYEC) for SYET in Cessna U206G aircraft, registration; 8R-GPR. This was a positioning flight to shuttle drums of diesel between SYET and Ekereku Bottom{SYEK(B)} Airstrips. They departed SYEC at 13:01hrs, with full fuel. The pilot said that during this flight, while passing the Essequibo River, the engine “sounded strange” “not rough”, for a short while. No significant vibrations and no abnormal parameters were observed. The mechanic, who was on board, was not aware of any strange sound, and the pilot did not share any concerns with him about this. The aircraft landed at SYET at 14:41hrs.

Before commencing the shuttle flight to SYEK(B), the pilot stated that he checked the aircraft. There were no oil leaks and no water was detected during the fuel check. The aircraft was defueled of about 12gls of fuel to lighten it, and it was then laden with its cargo of two drums of diesel. The pilot stated that he mentally calculated the weight and balance, as allowed for in the company’s Operations Manual. However, there is the requirement for certain elements of these calculations to be recorded in the operations flight plan before takeoff, but this was not done. The pilot considered that the aircraft was within limits for the conditions at the airstrip.

All seats were removed except the pilot’s seat.

The pilot did his pre-takeoff checks, including a full run-up and the engine was normal in all respects. He took off at 15:13hrs, with the flaps set at 20°. The aircraft became airborne at about 1400ft down the runway. It was rotated at 55 knots and was climbing at 65 knots. He reported that there was no wind for the takeoff. It was still and very hot. Shortly after takeoff, the pilot said that he felt the aircraft drop a little and he noticed the speed had decreased to 58-60 knots. During this time the stall warning sounded, so he pushed the nose down a little. Then he felt the RPM drop. Even though he had his hand on the throttle, he was unable to prevent the aircraft from going down. The engine was still running when the aircraft hit the trees.



## 1.2. Injuries to persons.

**Table: 1- Showing Injuries to Persons**

<b>Injury</b>	<b>Crew</b>	<b>Passengers</b>	<b>Others</b>	<b>Total</b>
<b>Fatal</b>	0	0	0	<b>0</b>
<b>Serious</b>	1	0	0	<b>1</b>
<b>Minor/None</b>	0	0	0	<b>0</b>
<b>Total</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>

## 1.3. Damage to aircraft

The aircraft was destroyed

## 1.4. Other Damage

There was no other significant damage

## 1.5. Personnel Information

### 1.5.1 Pilot Information:

Gender:	Male
Date of Birth/Age:	28 <sup>th</sup> December 1985
Nationality:	Guyanese
License:	CA000278
Date of issue:	10 <sup>th</sup> February 2009
Date of last medical:	9 <sup>th</sup> February 2017
Valid until:	31 <sup>st</sup> August 2017
Aircraft type rating:	C172, C206, C208, BN2A Islander
Last Proficiency Check on Type:	31 <sup>st</sup> March 2017
Total hours:	8311.3hrs
Total Hours on Type:	1726.5hrs
Hours in last 90 days:	213hrs
Hours in last 30days:	82.8hrs



Hours in last 7 days 18.3hrs

Hours in last 24 hours: 1.6hrs

There are no limitations on the pilot's Class 1 Medical, which is valid until 31<sup>st</sup> August 2017.

#### 1.5.2 Pilot Training Records.

The Pilot Training Record Summary in his company file indicates as follows:

1. Flight Training due April 2016.
2. Competency Check, C206, 31/03/2017, with Type Exam.
3. Ground Training 01/04/2015
4. Dangerous Goods, 25/6/2016. (Dangerous Goods Awareness).
5. Security and Emergency Procedures, done 30/3/2017; due 5/11/2017.

Other records in the file indicate as follows:

1. He received Human Factors Training on 25<sup>th</sup> June 2016. Expiry date – 1<sup>st</sup> July 2017.
2. Participated in Ground Personnel AVSEC Awareness training on 5<sup>th</sup> November 2016.
3. Completed recurrent Cessna 206 ground school on 8<sup>th</sup> February 2017.
4. Completed company Emergency Equipment and Drills on 24<sup>th</sup> May 2017.
5. Participated in Recurrent Airside training on 30<sup>th</sup> March 2017.

The Wings Aviation Limited Operations Manual, Section 6.2, Training Program, states:

*“All pilots will undergo ground training, at least once in any twelve (12) month period ...”*

on the following subjects:

1. Flight Operations – General.
2. Aircraft – Technical.
3. Maintenance.
4. Passenger Handling.
5. Emergencies.
6. Survival Equipment.

Section 6.3, Pilot Flight Training, states: *“Each pilot will undergo supervised flight training of no less than: ... 1.0 hour of flight time during **recurrent** training.”*



## 1.6 Aircraft Information

### 1.6.1 General Information.

Manufacturer:	Cessna Aircraft Company
Year of Manufacture:	1981
Aircraft Model:	Cessna U206G
Aircraft S/N:	U206-0257
Certificate of Registration:	Issued – 3 <sup>rd</sup> July 2002
Certificate of Airworthiness:	Valid until 11 <sup>th</sup> July 2018
Total Airframe Hours:	19598hrs 12mins
Maximum Take-off Weight:	3,600lbs
Last Scheduled Inspection:	100hrs
Time since last Inspection:	28hrs 56min
Next Inspection Due:	50hrs (21hrs 04mins)
Engine Model:	TCM IO-520-F12B
Engine S/N:	1011282
Engine Total Time:	1653hrs 53mins
Propeller Type:	Hartzell PHC-J3YF-1RF/F8468A-6R
Propeller S/N:	FP6124B
Propeller TSO:	1653hrs 53mins

The Cessna U206G is a six-seater, high-wing single-engine general aviation utility aircraft, with tricycle landing gear and a conventional tail unit. It is equipped with a pilot side door and double cargo rear doors serving the two rows of seats at the rear of the aircraft. This allows easy loading of oversized cargo. It is powered by a Continental IO-520F engine, rated at 300hp at 2850rpm for five minutes and 285hp at 2700rpm continuous. It has an all-metal, three bladed, constant speed governor regulated propeller.

### 1.6.2. Maintenance

Examination of the aircraft maintenance records indicates that there were no outstanding maintenance issues. All required and scheduled maintenance had been performed and all Airworthiness Directives had been complied with. There were no outstanding MEL items on the aircraft.



### 1.6.3. Mass and Balance

The aircraft departed Eteringbang with a payload of two drums of diesel weighing 800lbs. This was an estimated standard weight as there was no means available for weighing the cargo at the point of departure. The company's Operations Manual requires that the Weight and Balance portion of the Operational Flight Plan must be completed. Section 4.8 requires that actual cargo weights be used at all times for Weight and Balance calculations.

### 1.7. Meteorological Information.

This accident occurred in daylight. There is no weather observation or recording facility near to the accident site. The pilot described the weather as: wind calm, sunny with scattered clouds, temperature 38°C. Another pilot reported that, because of the heat, he checked his OAT gauge and the temperature recorded shortly before the accident showed 44°C.

### 1.8. Aids to Navigation.

Not applicable

### 1.9. Communications.

Not applicable.

### 1.10. Aerodrome information

The following information, pertinent to the Eteringbang Airstrip, was taken from the Guyana Aeronautical Information Publication.

Aerodrome Identification:	SYET
Coordinates:	06 43 00.92N 061 07 50.11W
Elevation:	276 ft.
Runway orientation:	03/21
Runway length:	1800ft
Runway width:	36ft

The airstrip is located in Region No.7, Cuyuni/Mazaruni, in the western area of Guyana, on the border with Venezuela. The area is hilly and heavily forested. The runway surface is finished with unsealed laterite. The surface is compacted but undulating and the finishing



material was dusty because of the dry weather. The airstrip slopes downward after the first 1000ft from the beginning of RWY21. Due to the presence of a Venezuelan military base located just off the threshold of RWY21, takeoff is restricted to this runway. There are no visual or other navigation aids at this runway.

On the day of the accident four aircraft were doing shuttle operations from this airstrip.

#### 1.11. Flight recorders.

Not applicable

#### 1.12. Wreckage and impact information.

The aircraft departed from RWY 21. The wreckage was located left of the runway centerline and approximately one mile from the end of RWY21, SYET, in a shallow ravine, the terrain was swampy and undulating. From the flight path of the wreckage, it was observed that the aircraft was initially descending almost horizontally through the trees, as it first sheared away the top most branches of several trees. The aircraft then impacted a large tree which broke at the trunk. The standing part of the trunk hooked the bottom of the fuselage near to the empennage and slowed the aircraft's descent. This changed the aircraft attitude causing it to assume a nose down position. The empennage was broken and inclined to the starboard. While on its downward path, the left wing of the aircraft came into contact with a large tree, which damaged this wing and its fuel tank. The aircraft was left dangling, nose down just above the ground.

The propeller spinner was resting on a huge boulder that was part of an outcrop of large rocks. The tips of all three blades were sheared.

As part of the cargo load, one of the drums of fuel was placed in a standing position on the right of the aircraft in the co-pilot's position. This drum moved forward on impact and damaged the right control yoke, which penetrated the drum causing some of its fuel to spill. The other drum was lying just outside the aircraft's rear door which was dislodged from the aircraft. The strap that held the drums in place was not damaged, however, the sudden impact forces of the crash may have caused the cargo to shift.

The flap actuator was set to 20°.



The right rudder pedal was pushed backward and severed the fuel line to the right fuel tank, causing the AVGAS in this tank to drain out.

The area around the wreckage was soaked with a combination of AVGAS and diesel.

#### 1.13. Medical and Pathological Information.

The pilot was hospitalized for four days after the accident. He suffered a shattered right elbow and lacerations on that elbow bled profusely. He also suffered a hairline fracture of the right ankle and other minor cuts and bruises. Surgery was done on his right elbow.

Blood alcohol and urology tests for prohibited substances were negative.

#### 1.14. Fire

There was no fire.

#### 1.15. Survival aspects.

The impact of the left wing with the large tree contributed to damage to the airframe around the pilot's door. This prevented the pilot from opening this door to evacuate the aircraft.

The pilot's seat had moved forward with the impact and was lodged under the instrument panel. However, the seat belt remained intact, and the pilot loosened it and crawled to the back of the aircraft, where he was able to exit through the right rear cargo door, which had fallen off the aircraft during the impact.

#### 1.16. Test and Research.

##### 1.16.1. Engine Examination.

The engine was sent to the manufacturer, Continental Motors Inc, Mobile Alabama, for examination under the supervision of the NTSB. This section of this report is extracted from the Continental Motors Engine Run Report – File Number 17-247.

##### Summary of Engine Report

The engine was placed on a test cell and ran through various throttle settings from idle to full power. The engine ran rough and backfired until the right ignition harness was replaced. In all, the engine was run for 30 minutes at 5-minute intervals that included



idle and full rated RPM. Additionally, rapid movement of the throttle from idle to full throttle did not result in any anomalies or hesitations. Examination of the right ignition harness revealed that the #5 top and #6 bottom ignition leads were damaged; however, it is unclear whether the harness damage was a result of the accident or a pre-existing condition. No additional anomalies were observed that would have prevented the engine from producing full, rated power.

#### 1.16.2. Propeller examination.

The propeller was sent to the Analytical Lab at Continental Motors in Mobile Alabama for examination under the supervision of the NTSB. This section of this report is extracted from the Hartzell Aircraft Accident Report No:170808; NTSB File Number ERA17RA315.

##### Summary and Analysis of Findings

Damage to all three blades was similar; between 2 to 6 inches of each blade tip were fractured, and all exhibited wave-like S-bends, characteristic of tree strikes, chordwise/rotational abrasion or scoring, and fractured pitch change knobs. Impact marks and internal hub damage indicate that the propeller was rotating with power “ON” at the time of impact with objects, including blade shank contact marks in the trail edge/face side quadrant of two blade apertures. Based on impact marks on the preload plates and internal hub damage, the propeller blade angle was in the low blade angle range of operation.

Analysis estimates that a minimum of 1,600 rpm would be required to fracture/shear one blade tip, and additional rotational energy would be required to fracture all three tips. Because the blades exhibited bending in the mid-blade region without evidence of ground contact, it was estimated the rpm was at, or near, full rated rpm when they impacted the trees.

Further examination of the propeller revealed there was no evidence of contact between the top of the pitch change rod and low pitch stop screw, suggesting the propeller was being governed by oil pressure at or near rated climb rpm. The leading edges of all three blades showed extensive erosion pitting, and a square leading edge that did not maintain the original airfoil shape. Neither of these conditions complied with the blade repair procedures in Manual 115N and Manual 133C.



### Conclusion

There were no discrepancies noted that would preclude or degrade normal operation. All damage was consistent with high impact forces. Propeller damage indicates that the propeller was operating with power ON at the time of impact with the trees.

#### 1.16.3. Other

Post-accident performance calculations, for runway distance, and distance to climb to 50ft, based on the weight, temperature and flaps setting, could not be done. The Aircraft Flight Manual does not show performance data for aircraft operations above a temperature of 40°C.

#### 1.17. Organizational and Management information.

##### 1.17.1. Operations Management Staff.

Wings Aviation Ltd is a commercial aircraft operator that holds Guyana Air Operator Certificate #002. It is a domestic charter operator, with operations from its base at SYEC. It is a small company that operates two aircraft; a Cessna 208 Caravan and the Cessna U206G which crashed.

A review of the Company's Operations Manual shows that at the time of the accident, the company's organisation structure included a Managing Director, Operations Manager and Chief Pilot. The duties and responsibilities of the Managing Director were not stated. The duties and responsibilities of the Operations Manager and the Chief Pilot were concisely listed. At the time of the accident, the company did not have an Operations Manager. The investigation was advised that the person listed as the Operations Manager in the Operations Manual was reassigned to the position of Safety and Quality Manager and the owner of the company was the designated, but not listed, Operations Manager. However, the aircraft captain was acting as the Operations Manager due to the busy schedule of the Owner/Designated Operations Manager. The changes in post holders were not notified to the GCAA until after the accident.

The Safety and Quality Manager said that he was not involved in the decision to start shuttle operations. When he became aware that this was happening, he advised the company's principals that to have the aircraft doing short legs with several landings was not safe for



the aircraft and its engine, thus the operation could not be safe, but his concerns were not considered.

The pilot was acting Operations Manager for about three months before the accident. During this time, the pilot was largely responsible for the ground operations staff, to whom he provided training and supervision. He ensured that staff understood what they were doing and were adhering to regulations. He noted that there was a high staff turnover in this area, so training was always ongoing. He felt that he was doing a good job in this area. He was also involved in attracting customers to the company.

The company has two other pilots, both of whom were senior to the accident pilot in terms of flying hours, but he had an excellent relationship with them. These other pilots were not involved in shuttle operations.

His tasks as acting Operations Manager were not difficult initially, however when the company started regular fuel shuttles it became a little taxing as he was the only pilot who was doing these shuttles, which sometimes required him to be away from base overnight. His flight and duty times were satisfactory, but time spent in management needed to be rationalized.

#### 1.17.2. Flight Documentation

Section 3.3.1 of the Company's Operations Manual lists the documents that should be completed and signed before departure. These include an operational flight plan, load manifest and applicable technical log page. It further states that "no person may takeoff ..... unless all flight release documents, signed by the PIC are retained and available at the point of departure."

However, the Ops Manual (Section 3.3.2) also allows for an Informal Operational Flight Plan, which is not necessarily written, but may be the pilot's mental plans for the flight. But even when the Informal Flight Plan is used, the Weight and Balance portion of the Operational Flight Plan must be completed. Section 4.8 of the Operations Manual requires that actual cargo weights be used at all times for Weight and Balance calculations.

#### 1.17.3. Company Maintenance

The company holds Guyana Approved Maintenance Organization Certificate AMO#007. The AMO has the required management, supervisory and line staff to effectively carry out



the tasks it undertakes and utilizes the AMEL system as the basis for maintenance certification. The maintenance facility is co-located with aircraft operations at SYEC and includes hangar space, offices, and several specialized workshops. Base and line maintenance are done on airframes, engines, avionics, instruments and propellers for aircraft below 5700kg. The company is approved to carry out these tasks on the aircraft types they own.

#### 1.17.4. The Guyana Civil Aviation Authority

The certifying authority for Wings Aviation Ltd is the Guyana Civil Aviation Authority (GCAA). The Authority's staffing and facilities for both operations and maintenance oversight of the company were satisfactory at the time of the accident.

In keeping with the GCAA AOC Surveillance Programme, the company should be audited annually. In 2016 and prior, the GCAA did not have its own Flight Operations Inspector (FOI), and depended on assistance from FOIs attached to the Caribbean Aviation Safety and Security Oversight System. This AOC was last audited in December 2014. From the previous audit, done in May 2013, several items were found to be non-compliant. The company submitted an action plan to close these items; but the next inspection done in December 2014 showed that some of these items were still outstanding. There is no record on the GCAA file of the corrective action taken. Regular auditing of this company may have revealed outstanding issues and could have resulted in subsequent resolution.

#### 1.18. Additional Information.

##### 1.18.1. Fuel Shuttling

The aircraft was assigned to shuttle fuel from SYET to SYEK (B), a distance of about 24 miles. It was anticipated that the aircraft and crew would be away from base for two days. The pilot stated that the intention was to do as many shuttles as possible each day but not exceeding eight hours flying per day.

On the day of the accident, the aircraft was scheduled to depart from SYEC at 12:00hrs. The load for this flight included two drums of AVGAS to be used for aircraft refueling between shuttles. One of these drums burst while being loaded. A new drum had to be sourced and the fuel transferred to it. This delayed the departure by one hour. The aircraft departed SYEC at 13:01hrs and landed at SYET at 14:41hrs.



Both the pilot and mechanic stated that the aircraft departed SYEC with full tanks and the operational flight plan for the SYEC/SYET flight indicated that the fuel load was 88gls. This quantity is in keeping with the amount stated for the aircraft in the Pilot's Operating Handbook.

The aircraft left SYEC with full tanks, 44gls of AVGAS in each tank. It flew for 1hr and 40 minutes to Eteringbang, using approximately 15gls of fuel per hour. The aircraft would have landed at SYET with approximately 63gls of fuel. It was reported that on arrival at SYET, 12gls of fuel was extracted from the left fuel tank of the aircraft. Approximately 51gls of fuel would have been remaining on board. The pilot reported that for the SYEC/SYET leg, the aircraft was flown mostly on the right tank, so it was not necessary to extract any fuel from that tank. The defueling was done using a hose to suction the fuel from the left tank into two containers holding 7gls and 5gls each.

The process of unloading, defueling, doing the required walk around and loading the aircraft with its cargo for the first shuttle took about twenty minutes. The aircraft was ready for departure at 15:00hrs. The pilot stated that he observed another aircraft taking off at this time and noted that this takeoff was a flat and slow climb and there was also a slight roll at the tree line. He thought that this aircraft was affected by turbulence, so he decided to delay his take off, by about 10 minutes to allow that aircraft's wake turbulence to dissipate. The accident aircraft departed on its first shuttle at 15:13hrs.

The pilot reported that shuttle operations usually started early; so, at this time he would have already completed at least two shuttles when it would have been cooler. He also stated that for shuttles normally done at this time of day, the aircraft would have a fuel load of about 10gls -15gls per side.

The company had no written procedure for fuel shuttling. The unwritten "fuel shuttling" procedure involved positioning the aircraft at Eteringbang with a pilot, and an aircraft mechanic for support. The understanding was that the mechanic was responsible for refueling and servicing the aircraft, and for minor maintenance. The pilot had the final say regarding all decisions made during the shuttle operation. There was no Operations Officer. Loaders were provided by the charterer. These loaders were responsible for filling the drums with diesel. They were required to seal these drums and load them on to the aircraft. They had no training from the aircraft operator that was specific to these duties. Generally,



the loaders were supervised by the aircraft mechanic, but the pilot had the final responsibility for overseeing the entire operation.

#### 1.18.2 Aircraft loading – weight.

The cargo on board was two drums of diesel. This fuel was transported in plastic barrels, each of which could hold a maximum of 62 US Gallons when filled to the brim. However, both the pilot and mechanic stated that the barrels were not filled to the brim, to allow space for expansion.

For the purpose of aircraft loading, the pilot reported that each barrel contained about 45 Gallons of fuel, weighing approximately 400lbs, including the weight of the drum. The pilot was not able to check or confirm the amount of fuel in each barrel. The weighing scale at Eteringbang was ineffective, thus the load could not be weighed. The pilot stated that he did not believe that each drum had more than 45gls, as this fuel is sold by the drum, so the charterer would lose if the drums were overfilled.

The rest of the load consisted of the pilot, his flight bag and the aircraft fuel load, which the pilot reported as 45 US Gallons. The pilot stated that with two drums of diesel and his body weight, the aircraft would be close to its maximum useful load.

All seats except the left front seat (pilot's seat) were removed from the aircraft.

The pilot reported that he did not prepare a printed Weight and Balance Report, but did one on his cell phone, using a figure of 420lbs per barrel. The pilot explained that although he used this heavy weight, his calculations showed that the takeoff weight of the aircraft was within limits for the airstrip.

The Maximum takeoff weight for the aircraft is 3600lbs. No takeoff weight was listed in the company's operations manual for takeoff from Eteringbang, or any other airstrip. However, there is a warning on the Wings Aviation Cessna 206 Load Sheet that states, "all loading staff must consult with the pilot for airfield regulated max takeoff and landing weights". The pilot estimated that the takeoff weight for Eteringbang would be about 3400lbs. He believed that the takeoff weight for the accident flight was less than 3400lbs. However, calculations show, that using the pilot's estimated weight of 840lbs of cargo, his weight of 200lbs, aircraft fuel of 306lbs and aircraft empty weight of 2234lbs, the takeoff weight would be 3580lbs. This was within the aircraft's maximum weight, but exceeded the pilot's estimated takeoff weight for Eteringbang by 180lbs



The pilot reported that one barrel of fuel was placed upright, in the co-pilot's position and slightly behind his right shoulder and was strapped down. The second barrel was loaded lying down, to brace the upright one, and was chocked with wooden wheel chocks so it braced the wall to prevent backward movement. Both drums were strapped with a single 1¼ inch strap, which is hooked into a rear seat stop with a clamp, passed over the drums and hooked to a seat stop near the front of the aircraft and is then ratcheted by the pilot to secure the drums firmly in place.

### 1.18.3. The Takeoff

For the takeoff, the wind was calm, as indicated by the flags on a nearby building. The pilot's major concern was the high temperature, which he estimated to be about 35°C to 38°C, but he had done flights before in similar conditions. (Nevertheless, another pilot at the aerodrome had stated that because of the heat, he had checked his aircraft OAT gauge shortly before the accident and it showed 44°C.)

The pilot started the aircraft and taxied to the threshold of the runway, where he did all the pre-takeoff checks, including a magneto check, and all aircraft parameters were normal. He started the takeoff run in calm wind, but he noted a shift to a slight tail wind further down the runway when he was about ¾ way down the runway and about 5ft off the ground. This gave rise to some turbulence. The pilot stated that he used about 70% of the runway before rotating the aircraft, when it reached a speed of about 50kts.

When the aircraft was about 5ft off the ground, he applied forward pressure to keep the aircraft in ground effect to build climb speed. The aircraft accelerated normally and did a normal short-field takeoff. When the aircraft reached 60-65kts, he observed an air speed fluctuation which he attributed to the change in wind. At this time the aircraft was climbing normally, and it cleared the first set of trees near the runway. However, it became more turbulent above the trees and the stall warning was going off intermittently. Shortly after, he started a very flat minor turn to keep the aircraft clear of trees and the terrain. This was when he heard the engine power decreasing and got the sensation of deceleration and the aircraft sinking. Through all this he concentrated on flying the aircraft. He did not attempt to climb the aircraft but pushed the nose down slightly to increase speed. He maintained



control of the aircraft through the descent as far as he was able. He felt the aircraft drop and hit the trees.

Another pilot had noted that when the aircraft was almost halfway down the runway, it still seemed to be too slow to achieve takeoff speed.

The aircraft mechanic said that he watched the aircraft from the time it started to taxi until it became airborne. The aircraft sounded normal. The runup is done parallel to the airstrip, mags are checked; and that momentum is used to turn the aircraft and taxi to the runway for takeoff. Its takeoff speed seemed normal to him, but the aircraft used up most of the runway before becoming airborne. He said that this was how the pilot normally operated and he had previously asked him why he stayed on the ground so long. The pilot's explanation was that he wanted to build airspeed on the ground. Shortly after takeoff the aircraft would turn behind trees and go out of sight, but he would still hear the aircraft engine singing. For the accident flight he did not hear the sound of the engine after the aircraft went out of sight and was advised by persons further up the airstrip that they heard a sound of trees crashing.

#### 1.18.4. Human Factors

Both the pilot and the aircraft mechanic are still traumatized by this occurrence.

The pilot said that he was contacted by the owners twice, once on the day after the accident and then again, the next day. There was no verbal or written communication since that time, until early February when he received a letter of dismissal effective 28<sup>th</sup> February 2018. His medical expenses are being covered by participatory insurance coverage and the National Insurance Scheme.

The mechanic said that when he returned to base his immediate engineering supervisors spoke to him about what had happened. He was interviewed by the accident investigation team two weeks after the accident. After this interview, the owner's wife, a Director of the company, summoned him to her office to enquire what he had told the interviewers. He said that he told her that he answered the questions truthfully. She seemed to be satisfied with this. However, later that afternoon she again called him to her office and put several suggestions to him which left him flabbergasted. He later submitted his resignation.



According to both the pilot and the mechanic, neither was offered any counselling or other comfort by the company.



## 2. ANALYSIS

### 2.1. The Pilot

The pilot was not current to operate the flight, since all the required flight and ground training, as mandated in the Section 6 of the company's Operations Manual, had not been provided to him to update his currency and the company's records, in keeping with GARS 8.10.1.33.

It is considered that the pilot may not have evaluated all the existing conditions and may not have considered the overall effect that these conditions would have on the aircraft's takeoff run and climb performance.

There was no evidence of any pre-existing medical or behavioural conditions which may have adversely affected the pilot's performance during this flight. His rest and duty period were within company limits.

### 2.2. The Aircraft

#### 2.2.1. Maintenance

The aircraft has a Certificate of Airworthiness which is valid until 11<sup>th</sup> July 2018. Records indicate that the aircraft was being maintained in accordance with the approved maintenance schedule. There were no noted defects or deferred maintenance items from the previous flight.

The extensive erosion pitting on the leading edges and the square shape of the leading edges of all three propeller blades as reported in the Hartzell Propeller Report No. 170808 was noted. Engineering staff of the company considered that the erosion pitting was normal to routine operation of the aircraft and could also be caused by rain. They were aware of the erosion and were carefully monitoring the blades but avoided too much blending in an effort to prolong the life of the blades. They also noted that the life of the propeller was coming to an end. They were advised that it was unacceptable to delay maintenance solely for economic reasons.

Neither the Lead Engineer nor the Quality Assurance Manager could provide any explanation for the changed airfoil of the blades. They were both adamant that while the aircraft was in operation the airfoils were maintained in their proper shape; only mild dressing was done with sand-paper and the blades were never filed. Further, no complaints



were made by pilots concerning any roughness or vibrations while the aircraft was in operation.

### 2.2.2. Mass and Balance

The aircraft's cargo was two drums of diesel. For Weight and Balance calculations, the pilot used an estimated weight of 420lbs per drum. The true quantity of fuel in each drum was unknown and since the drums could not be weighed, the cargo weight could not have been accurately determined.

It is further noted that the amount of aircraft fuel was also estimated, again, giving rise to an estimated weight. The amount of fuel drawn from the aircraft was not presented for verification. Furthermore, there was no load sheet for this flight which could have been used for fuel, load and takeoff weight verification. This is in violation of GCARS 8.7.1.4. In keeping with the pilot's decision that the takeoff weight for this airstrip is 3400lbs, the aircraft was overweight for takeoff at this airstrip by 180lbs. This was aggravated by the prevailing temperature. (NB. During the investigation a statement was given by another pilot that the OAT gauge on his aircraft showed a temperature of 44°C just before the accident aircraft took off). The Pilots' Operating Handbook has no provision for aircraft performance above 40°C.)

### 2.3. The Takeoff Roll

The pilot was not able to accurately determine the aircraft's takeoff weight. He also failed to take account of the high temperature, which would degrade the aircraft's climb performance, and the effect of the down-slope of the runway, which would necessitate a longer takeoff run, more so with the lack of a head wind to assist. Also, the presence of trees at the end of the airstrip, constituted an obstacle in the aircraft's takeoff path.

The decision to takeoff with the prevailing conditions, resulted in an unsafe takeoff.

### 2.4. Weather

This accident occurred during the morning in daylight. On this day several interviewees confirmed that it was extremely hot. The pilot in command stated that the temperature was about 38°C. When he checked his OAT gauge it was wavering between 34 and 40°C. Another pilot, who was operating at the airstrip on the day of the accident had noted that



his aircraft's OAT gauge showed a reading of 44°C shortly before the accident aircraft took off. The Approved Flight Manual does not provide for takeoff calculations with OAT in excess of 40° C

## 2.5. Fuel Shuttling

The company had started fuel shuttling operations about three months before the accident. There were no written procedures for this type operation, therefore established procedures set out in the company's Operations Manual should have been followed as referenced in Section 4.8 – Weight and Balance System; Section 4.13 – Pilot Qualifications and Proficiency Checks; Section 4.19 – Aircraft Refuelling; Section 4.20 – Use of Aircraft Flight Manuals/Checklists; and Section 4.21 – Adequacy of Operating Facilities.

There is no evidence to show that an assessment was made to determine the safety of this operation by this company. Although this was a new operation for the company, it was not discussed with the designated Safety and Quality Manager prior to its commencement and when he became aware of it and advised against its continuation, he was ignored.

The company was not properly equipped for this type of operation. The system of defueling the aircraft by sucking fuel out of its tank was unhealthy and unsafe. There was no means to accurately determine how much fuel was in the aircraft's fuel tanks, thus the weight of this fuel could not be accurately determined. Also, no provision was made to weigh the cargo.

The delayed departure from EFCIA resulted in the pilot conducting the first shuttle of the day, at a later time than normal, and the prevailing conditions at that time, that day, were very different from what would have been normal for the first shuttle.

## 2.6. The Company

The original issue of the company's Operations Manual was approved in November 2003. Two amendments were made, prior to the accident, in 2008 and 2010. The manual is still considered to be deficient in several areas. Notably in Section 2, its Organisation Structure, the Duties and Responsibilities of its management staff are not detailed enough and there are no duties and responsibilities for some positions that are listed in its structure. Also,



there is no list of Operating Limitations for the airstrips used by the company. This is a breach of paragraph 36 (1) of the GCARS.

Although the company has listed training requirements for pilot training and recurrency in Part 6 of its Operations Manual, this was not adhered to for this pilot. Thus, the company allowed the pilot to operate this flight when he was not current to do so. This is a breach of GARS 8.1.10.33.

This company did not benefit from regular audits and other inspections that should have been conducted by the Guyana Civil Aviation Authority. These inspections may have enhanced safety of aircraft operations and would have served to keep the company personnel alert that they were being monitored by the Authority.

#### 2.7. The GCAA

At the time of the accident, the Authority had two qualified Flight Operations Inspectors on its staff. However, only one of them was active in the field, as the other was appointed to a management position. It is considered that the Authority should have at least three Flight Operations Inspectors on its staff to ensure adequate coverage of aircraft operations in Guyana.

The Authority did not maintain its audit/inspection schedule for this company.

#### 2.8. GAAIU

Greater support should be provided to the GAAIU especially the provision of technical personnel; and infrastructural support for secure storage of aircraft wreckage and components.



### 3. CONCLUSION

#### 3.1. Probable Cause

The probable cause of this accident is due to the decision to takeoff in prevailing meteorological conditions that adversely affected the aircraft's takeoff run and initial climb performance.

#### 3.2. Contributory Causes

The aircraft's takeoff weight may have exceeded the allowable takeoff weight for the runway given the temperature and calm wind at the time.

#### 3.3. Findings

##### 3.3.1. The Pilot

1. The pilot's licence was valid, but he was not current to carry out the intended operation as required by Section 6 of the company's Operation Manual. This is a breach of GARS 8.10.1.33.
2. His last APC on type was satisfactorily completed on 31<sup>st</sup> March 2017.
3. The pilot was familiar with this type of operation.
4. The pilot failed to complete the weight and balance section of the operations flight plan as required by Section 4.8 of the company's Operations Manual. This is a breach of GARS 8.6.2.16.
5. The pilot's pre-flight planning and general analysis of existing conditions were inadequate. This is a breach of GCARS 39.
6. The pilot failed to comply with certain sections of the company's Operations Manual. This includes Section 3.3.1 – Operation Flight Plan; Section 4.19 – Aircraft Refuelling; Section 4.20 – Use of Aircraft Flight Manuals/ Checklists; Section 2.21 – Adequacy of operating facilities; Section 6 – Training Programme.
7. The pilot breached Regulation 39 (e) of the GCARS, by not ensuring that the load carried by the aircraft could be safely carried on the flight.

##### 3.3.2. The Company

1. The company holds an Air Operator Certificate and an Approved Maintenance Organisation Certificate.



2. The company's operations management structure needs to be developed (expanded) so that the position holders are given better guidance as to their duties and responsibilities.
3. The company's Operations Manual does not comply with all Regulations. Notably GCARS 33(2) – Public Air Transport Service; GCARS 36 – Aerodrome Operating Minima.
4. The company's record keeping process is not as efficient as it should be. Its records indicate that all the required training that should have been provided to the pilot was not completed. The record of Pilot Training is required in the Company's Operation Manual Section 6.1.
5. The company did not provide the required training to this pilot to ensure his competence and currency to operate the flight. This is a breach of GCARS Regulation 33. (2).
6. The company did not provide adequate support to this pilot in the performance of his duties.
7. The company failed to ensure that provisions were in place for safe aircraft refueling.
8. The company failed to provide facilities for weighing of cargo at the airstrip.
9. The company did not provide any counselling to its staff who were affected by the accident.

### 3.3.3. The Aircraft

1. The aircraft had a valid Certificate of Airworthiness and was maintained in compliance with regulations.
2. There were no outstanding maintenance or MEL issues with the aircraft.
3. The condition of the propeller blades is cause for concern. However, there were no discrepancies noted in the propeller examination, that would preclude or degrade normal operation.
4. The aircraft was destroyed in the accident.

### 3.3.4. The Weather

The high temperature contributed to the aircraft's degraded climb performance.



### 3.3.5. GCAA

1. The GCAA needs to pay more attention to this company by ensuring that audits and other scheduled and unscheduled inspections are carried out regularly.
2. In reviewing the revised Operations Manual GCAA must ensure compliance with all applicable Regulations

### 3.3.6. GAAIU

The GAAIU does not have adequate staff, and other resources necessary to function effectively, especially secure storage facilities for preservation of aircraft wreckage until completion of examination.



## 4.SAFETY RECOMMENDATIONS

### 4.1.The Pilot

The pilot should be required to satisfactorily complete the following areas before resumption of flying;

1. Aircraft Performance with emphasis on:
  - i. Takeoff techniques, including takeoff from short runways, and the effects of high temperature on the aircraft's takeoff run and climb performance.
  - ii. Weather and the various effects of taking off with a calm wind, tail wind, head wind and cross wind.
  - iii. The effect of runway gradient on aircraft takeoff.
2. Crew Resource Management with emphasis on single crew operations. This must include the need to guard against complacency and the importance of self-discipline, situational awareness, problem solving and decision making.
3. The importance of thorough preflight planning.
4. Review the aircraft flight manual to get a thorough understanding of the aircraft limitations and other sections of this document.
5. Review of the Company's Operations Manual to ensure compliance with all aspects of the company's operations.
6. Review both the GCARS and the GARS to ensure compliance with the Regulations and Requirements.
7. At least six short field takeoffs, with aircraft at maximum load, supervised by an experienced pilot.

### 4.2. The Airstrip

1. It is recommended that conditions at the airstrip should be urgently improved. Extending the length and width of the runway and sealing of the entire length and width should be part of the planned upgrade. The elimination or reduction of the downslope should be included in plans to upgrade the runway.
2. The trees on the takeoff/departure path should also be cut and maintained at an acceptable level in the interest of safe aircraft operations.
3. A windsock should be immediately installed at the airstrip.



### 4.3. The Company

1. The company must ensure that all flight crew are provided with the required company training, including initial and recurrent flight and ground training and initial crew resource management training. Recurrent training should be carried out as approved in the company operations manual, with emphasis on the performance capability of all the aircraft in the fleet. For example, takeoff and climb performance in different weight, altitude and temperature conditions.
2. Records of all training provided should be properly documented in accordance with the Regulations.
3. The company should review its Operations Manual, to ensure that limitations for airstrips to be used by the company are established and recorded in the manual. This will give guidance to its pilots and other staff for safe aircraft operations.
4. The company should provide more operational support to its shuttling operations away from base. This should include operations staff to assist in record keeping.
5. The company should consider reviewing the maximum number of flights that pilots are required to complete within the normal duty time during shuttle operations.
6. The company should set up a system which ensures that its pilots and other staff remain familiar with its Operations Manual, the Aircraft Flight Manuals, the Civil Aviation Regulations and Requirements and other technical and operational procedures.
7. The company must ensure that its Operations Manual is updated to provide its management and other staff with more guidance in relation to the duties and responsibilities of the positions they hold.
8. The company should develop a system to provide counselling to its staff who may experience trauma on the job and who may require assistance in this area.

### 4.4. The GCAA

1. The GCAA should ensure that regular inspections are conducted on this company. There should also be stringent follow up to ensure that recommendations for corrections are implemented and adhered to.
2. The GCAA must ensure that the approved revised Operations Manual is fully compliant with applicable Regulations and Requirements.



3. GAAIU is not self-sufficient and depends on the GCAA for physical and other support. The GCAA should obtain/provide suitable container space for secure storage of aircraft wreckage until accident investigators have completed examination of these.

## **5. ACTIONS TAKEN SINCE THIS ACCIDENT**

1. The company has advised that it is in the process of revising its Operations Manual to be submitted to the GCAA for approval.
2. The pilot has been dismissed from the company.
3. GCAA has carried out an audit of the company.

**END**