

## TITLE



### GENERAL INFORMATION:

Name of Operator:	Roraima Airways Limited
Aircraft Manufacturer:	Britten Norman Company
Aircraft Model:	BN2A-26
Nationality and Registration Marks:	8R-GRA
Place of Accident/Region:	Eteringbang Airstrip/Region#7, Guyana – 06 43.03N 61 7.80W
Date of Accident:	24 <sup>th</sup> August 2016
Time of Accident:	17:16hrs UTC

### **REPORT No. GAAIU 3/1/10**

**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
AMO	-	Approved Maintenance Organisation
AOC	-	Air Operator Certificate
ATC	-	Air Traffic Control
CPL	-	Commercial Pilot Licence
DME	-	Distance Measuring Equipment
EFCIA	-	Eugene F. Correia International Airport
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
RAI	-	Roraima Airways Inc.
RWY	-	Runway
S/N	-	Serial Number
Sta.	-	Station
TBO	-	Time before Overhaul
TSN	-	Time since New
TSO	-	Time since Overhaul
VMC	-	Visual Meteorological Conditions



GAAIU

### Synopsis:

During the takeoff roll the pilot observed standing water on the runway. He rotated the nose wheel before the water, but the main under carriage hit the water. This slowed the aircraft. The nose wheel contacted the runway and the aircraft veered to the right.

A decision was made to abort the takeoff. Brakes were applied, but the aircraft slid further to the right on the wet surface. Realizing that the aircraft would not stop on the runway, the pilot retarded the throttles to the closed position, moved the mixture controls to the cut-off position and turned off the fuel selectors. The aircraft did not respond to attempts to change its direction and eventually came to a stop after coming into contact with a boulder.

Six persons, the pilot and five passengers, who were on board the aircraft, suffered no injuries and were all able to exit the aircraft unaided.

There was no fire.

## 1. Factual Information

### 1.1. History of the Flight

The aircraft departed from the company base at the Eugene F. Correia International Airport (EFCIA) for Eteringbang Airstrip on 22<sup>nd</sup> August 2016. It was rostered to shuttle fuel between Eteringbang and Ekereku Bottom and Kaikan Airstrips for two days for a customer. The records indicate that the pilot did twenty-one flights between 11:59hrs and 21:32hrs on 22<sup>nd</sup> August; and fourteen flights between 13:52hrs and 18:46hrs on 23<sup>rd</sup> August 2016.

The pilot reported that when the aircraft landed after completing the last shuttle on the second day, it suddenly veered to the right. He inspected the aircraft and found that the torque link bolt of the starboard undercarriage was not in place. The bolt was not found. He reported this occurrence to his company and was advised to remove the aircraft from its position on the runway.

The damaged undercarriage was replaced on 24<sup>th</sup> August 2016. The aircraft was loaded in preparation for departure but was delayed by a heavy tropical downpour. After the rain had stopped the pilot walked out to the threshold and looked down the runway as far as he could see. The part of the runway that he could see did not have much water.

He then boarded the aircraft and started the takeoff roll. About midway down the runway, at its highest point, he observed that there were several areas of standing water. He rotated the aircraft early. The starboard main undercarriage made contact with the water, this slowed the aircraft significantly and pulled the nose wheel back to the ground.

A decision was made to abort the takeoff. Engine power and fuel were shut off and brakes were applied but the aircraft continued skidding along the wet grass and came to a stop when its nose wheel impacted a natural rock formation, 197ft from the end of and right of the runway.

## 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>	0	0	0	<b>0</b>
<b>Minor/None</b>	1	5	0	<b>6</b>
<b>Total</b>	<b>1</b>	<b>5</b>	<b>0</b>	<b>6</b>

## 1.3. Damage to aircraft

The nose of the aircraft was badly damaged. The nose gear was pushed backwards into the fuselage, causing damage to an area at the bottom of the aircraft and under the pilot's exit door. There were wrinkles on the top of the port wing.

Further inspection of the aircraft showed the following damage:

1. In the nose section, the floor of the avionics compartment was buckled in the center, forward and right side; the frame assembly at Sta.19 was torn and buckled; the lower frames, bottom stringers and the steering column were twisted and bent; the nose gear block securing plates and brackets were broken; the keel members were crushed and bent; the right side of Sta.46 frame had a slight deformation; the nose cone was smashed inward from the front and in the lower area and the rear lower side areas were broken.
2. At the lower longeron below the pilot door at Sta.71.5 – Sta.103.0, part of the edge on the bottom skin was torn off, approximately quarter inch by two inches; and the longeron section below the pilot's door was bent slightly inwards, forcing the bottom skin to bulge outward.
3. In the under fuselage area, the transponder and the DME antennae were damaged; the bottom skin was punctured in two places, eight inches inward on the right hand side of the fuselage just forward of Sta.46 and at Sta.103.0.
4. The right landing gear torsion box had a slight wrinkle on the forward, lower skin.
5. The port wing had a wrinkle on top between the rear spar and for approximately two inches over the closing member diaphragm and between wing Sta. 70.0-30.0. The left landing gear torsion box had multiple areas of damage. The skin on the



right side lower engine frame bolt down point was split open for approximately two inches. There were wrinkles on both sides of the torsion box; and bent skin on the rear torsion box.

#### 1.4. Other Damage

There was no other damage.

#### 1.5 Personnel Information - Pilot

Gender:	Male
Date of Birth/Age:	13 <sup>th</sup> May 1985/31 years
Nationality:	Guyanese
License:	Guyana CPL #271
Date of issue:	24 <sup>th</sup> January 2007
Date of last medical:	5 <sup>th</sup> July,2016
Valid until:	31 <sup>st</sup> January 2017
Aircraft type rating:	C172, C206, C208, BN2 Islander,
Last Proficiency Check on Type:	7 <sup>th</sup> April 2016
Total hours:	7000hrs (approx.)
Total Hours on Type:	2600hrs (approx.)
Hours in last 90 days:	123:33hrs
Hours in last 30days:	75:56hrs
Hours in last 7 days	23:30hrs
Hours in last 24 hours:	4:24hrs

The limitations on the pilot's Class 1 Medical, which is valid until 31<sup>st</sup> January 2017, requires him to wear corrective lenses and to have a second pair of spectacles readily available while exercising the privileges of his licence.

He was required to complete toxicological tests for psychotropic substances, the day after the accident. These tests returned negative results.



## 1.6 Aircraft Information

### 1.6.1 General

<b>Manufacturer:</b>	Britten Norman Aircraft Company
<b>Year of Manufacture:</b>	1981
<b>Aircraft Model:</b>	BN2A-26
<b>Aircraft S/N:</b>	3006
<b>Certificate of Registration:</b>	Issued – 11 <sup>th</sup> May 1995
<b>Certificate of Airworthiness:</b>	Valid until 20th April 2017
<b>Total Airframe Hours:</b>	24,133:04hrs
<b>Maximum Take-off Weight:</b>	6600lbs
<b>Last Scheduled Inspection:</b>	50hrs
<b>Time since last Inspection:</b>	44:14hrs
<b>Next Inspection Due:</b>	100hrs/5:46hrs
<b>Port Engine Model:</b>	Lycoming O-540-E4C5
<b>Engine S/N:</b>	L19576-40E
<b>Engine TSN:</b>	5766:09hrs
<b>Engine TSO:</b>	489:27hrs
<b>Starboard Engine Model:</b>	Lycoming O-540-E4C5
<b>Engine S/N:</b>	L22584-40E
<b>Engine TSN:</b>	128:32hrs
<b>Port Propeller Type:</b>	Hartzell HC-C2YK-2CUF
<b>Propeller S/N:</b>	AU14755B
<b>Propeller TSN:</b>	1498:07hrs
<b>Starboard Propeller Type:</b>	Hartzell HC-C2YK-2CUF
<b>Propeller S/N:</b>	AU11324B
<b>Propeller TSN:</b>	Unknown
<b>Propeller TSO:</b>	1381:44hrs
<b>Fuel Type:</b>	AVGAS 100LL

The BN2A Islander is a ten-seater, utility aircraft. It is a high-wing cantilever monoplane with a rectangular fuselage and two wing-mounted engines. The rectangular cross section fuselage, is furnished with a conventional tail unit and

fixed tricycle landing gear. Its fuselage is light alloy monocoque with aluminum spars, stringers, and frames covered by aluminum alloy skins. On the ground, the aircraft is steered by its nose gear and the rudder control.

#### 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.

It was reported that on the day before this accident, while landing, the starboard main landing gear torque link middle bolt had snapped. A decision was made to replace the starboard main landing gear. This repair was completed before the aircraft started on the accident flight.

#### 1.6.3. Mass and Balance

Information from the Load Sheet indicates a total payload of 835lbs, representing the weight of five passengers, stated as 785lbs and 50lbs of cargo. The computed takeoff weight was 5691lbs.

#### 1.7 Meteorological Information

The weather reported at the time of the occurrence by the pilot was – Wind calm, visibility – unlimited, with clear skies. The incident occurred during daylight hours, about 25 minutes after a heavy downpour had passed. The runway surface was waterlogged in parts.

#### 1.8 Aids to Navigation

Not applicable.

#### 1.9 Communications

At the time of the occurrence the aircraft was taking off. Thus, communication with the Air Traffic Services had not yet been initiated. The accident report was made by the pilot to company headquarters by telephone.



### 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 in the western area of Guyana, on the border with Venezuela. The runway surface is finished with unsealed laterite, with several potholes and ruts along its length. Drainage is very poor, the surface becomes waterlogged after a heavy shower and significant quantities of water settle in the potholes and ruts. The airstrip slopes downward after the first 1000ft from the beginning of RWY21. Both ends of the runway are obstructed by tall trees. Both takeoff and landing are restricted to one direction, due to the presence of a Venezuelan military base located just off the threshold of RWY21.

There are no visual or other navigation aids at this runway.

### 1.11 Flight Recorders

This aircraft is not required by regulation to be equipped with a flight recorder.

### 1.12 Wreckage and Impact Information

The aircraft skidded right, off the runway and stopped 197ft from the end of and right of the runway, after hitting a natural rock formation. The aircraft did not break up prior to or during impact.

### 1.13 Medical and Pathological Information

The pilot completed a toxicological test for prohibited substances. These tests were negative.

#### 1.14 Fire

There was no fire.

#### 1.15 Survival Aspects

The cabin and the cockpit of the aircraft were intact after the accident. The pilot's seat harness and seat belt were intact. The available seats remained secure in the seat rails, and their seatbelts were intact. The pilot and three passengers, who were accommodated in seats and who were secured with seatbelts at the time of the accident, were not injured. The two passengers who were not accommodated in seats were not injured.

The damage to the area under the pilot's door and the position in which the aircraft came to a stop in relation to the rock formation, prevented the pilot's door from opening. The emergency exit in the pilot's door was removed and the pilot and three passengers were able to exit the aircraft through this opening. The passengers at the rear of the aircraft, exited through its left rear door.

#### 1.16 Tests and Research

No special tests or research were carried out.

#### 1.17 Organisational and Management Information

##### 1.17.1 Roraima Airways Inc.

Roraima Airways Inc. has more than twenty years of experience as an aircraft operator in Guyana. The company operates a fleet of three BN2A Islanders and one BN2A Trislander aircraft. The company acquired its Guyana Air Operator Certificate No. 003 from the Guyana Civil Aviation Authority in 2004. The AOC was reissued in January 2016. The company does domestic scheduled and charter, passenger and cargo operations, and international mail/cargo operations.

The management structure includes the Accountable Manager, the Director of Operations, the Chief Pilot and the Safety Manager.

The company's Flight Operations Manual (FOM) was reviewed.

The company carries out its own maintenance and acquired an Approved Maintenance Organisation certificate No.008 issued by the GCAA in 2016.

## 1.18 Additional Information

### 1.18.1. Interview with the Pilot

The pilot was interviewed by the accident investigation team. He explained that on the day before the accident the torque link bolt of the starboard main landing gear was sheared. This prevented him from returning to base as scheduled. A decision was made at the base to replace the damaged undercarriage. This was done on the day of the accident. Following the repairs, the required ground checks were done, and he and the aircraft engineer were both satisfied with the repairs and the aircraft was released to service. He loaded the aircraft and prepared for departure, but this was delayed by a heavy tropical downpour. When the storm passed, he walked to the threshold and looked down the runway, as far as he could see. There was not much water on the part of the runway that he could see. He did not walk the entire length of the runway.

He then boarded the aircraft and started the takeoff roll. About midway down the runway, which is the highest point of the runway, he noticed that much water had settled on the low part of the runway. In attempting to have the aircraft airborne before the water, he pulled up the nose wheel, but the main starboard undercarriage hit the water, slowing the aircraft and caused the nose wheel to drop back on to the runway. Based on the remaining length of runway and the presence of another pool of water, he determined that there was not enough room to safely do the takeoff and decided to abort the takeoff. He retarded the throttles to the closed position, pulled the mixture controls to the shut off position and applied brakes. The aircraft pulled to the right and kept skidding until it stopped beyond the end of the runway and to the right of it.

He stated that he had been operating into this airstrip for over one year and was quite familiar with the airstrip. He expressed concerns about the condition of the airstrip especially when it was wet. He noted that take off is restricted to RWY21. As a result, take off would usually be with a tail wind, as the wind was usually from the north northwest. However, the wind was calm at the time of takeoff. He noted that the runway was eroded in several areas.



It was noted that the high trees at both ends of the runway are significant obstacles at the airstrip. Due to poor drainage, it is normal for water to settle on the runway and to accumulate in the ruts and potholes. As Pilot-in-Command he was concerned about the heavy downpour and that is why he walked to the threshold and looked down the runway. At the time, he did not think that water would have lodged in the low part of the runway. He acknowledged that this was a lapse in judgement on his part and he should have walked the entire length of the runway. He also agreed that if he had inspected the entire runway and had seen the amount of water lodged in the lower part of it, he would not have attempted the takeoff. He confirmed that the wind for takeoff was calm. He was taking off from the higher end of the runway. He agreed that while accelerating for takeoff, the ground run on a down slope would be of some assistance, but deceleration would be difficult. He was very hesitant in explaining the difference between ground roll, takeoff run and takeoff distance. He was urged to review his aircraft flight manual, to ensure that he remains current.

He also agreed that when he rotated the aircraft it was not yet ready to fly, and the aircraft could have stalled. The decision to abort came after this. He stated that he 'mashed' the brakes instead of modulating them. This caused the aircraft to skid, out of control, off the runway.

He stated that he was not aware if the company has a policy for operating into various airstrips. He had joined this company four months ago, in May 2016. He is one of two company pilots operating into Eteringbang Airstrip. Up to the time of the accident, he had not done company indoctrination training.

In reviewing the issue of the damaged torque link, he stated that he reported this to the company Safety Officer. He was then advised by the company to move the aircraft off the runway. He was also advised that this was reported to the GCAA by the company. He explained that the record of the damaged torque link bolt was recorded on the wrong page of the technical log by error, but he had pointed this out to the engineer who had come to do the repairs.

He stated that when he overnights away from base in the hinterland, which is usually for a series of shuttles, no maintenance staff is sent out with him. Thus, the



aircraft is inspected and signed off at the beginning of the next day by the pilot. He, as pilot can do minor checks, such as the oil level check. He is also responsible for refueling.

He confirmed that the load sheet was printed at the base. The information is usually passed to the head office, by phone, before takeoff, where the information is entered on the load sheet. He passed the weight of the passengers and the list of cargo. The cargo included a large tool kit, a jack, the undercarriage strut that was changed, a shaft, a radiator and several empty containers. He would normally sign the load sheet when he returned to the base.

He confirmed that he had five passengers on board but only had seats for three. Two passengers were seated on the ledge at the back of the aircraft. They did not have seats and seatbelts. He said that he had discussed this with his head office, prior to takeoff, but the final decision was his.

He normally completes a voyage report for flights. In the last report he stated that the airstrip needed weeding but made no reference to the ruts because everybody is aware of the condition of the airstrip. There is no windsock at the airstrip.

He admitted that he became complacent, in addition to which he wanted to come home, and he was being urged by the company to bring the aircraft back to base.

He considered that he had too many things to deal with, especially during the attempt to abort the takeoff. He thought that it would have helped if there was no passenger sitting in the co-pilot seat. He had also attempted to loop the aircraft at the end of the runway but could not because this aircraft has a full-castering nose wheel, which makes it a little difficult to control. The aircraft requires the use of brakes and differential power for steering during taxi, but no rudder. He had recommended that the castering nose wheel should be changed, but this was not done. The company's other Islander has a similar system, but it is functioning effectively. Snags are reported to the Safety Officer.

He was exposed to Crew Resource Management only very briefly during his initial flight school training. He has never done Performance or Aircraft General Examinations. He stated that it has been a while since he read the company's Flight Operations Manual (FOM). His last APC/IPC check was done in April 2016.

#### 1.18.2 Interview with the Company

The company's Director of Operations raised certain queries with the Accident Investigation Team and was invited to attend an interview. It was stated that the pilot was given company indoctrination training on 14<sup>th</sup> and 15<sup>th</sup> March 2014. This is supported by a Certificate. It was noted that the pilot joined the company in May of 2016 and the company's FOM is at Issue 2, dated September 2015. The Director of Operations stated that the pilot was a part time employee of the company in 2014 and no significant changes were made to the FOM since then. The training syllabus was the same for both full time and part time employees.

With regard to the non-reporting of the missing torque link bolt to the GCAA, the Director of Operations denied that any one in the company advised the pilot that it was reported. He agreed that this occurrence was not reported to the GCAA prior to efforts being made to move the aircraft or to carry out repairs. He said that the aircraft was moved to facilitate another aircraft that wanted to land.

The pilot had stated that the company was aware that passengers were being carried without the requisite seats and seat belts. This was strenuously denied by the Director of Operations, who advised that the pilot had initially reported two passengers. The company only became aware of the additional passengers after the accident and further the pilot did not mention that they were seated on the floor of the aircraft. When asked to explain the five passengers on the load sheet, which is prepared at the base, he stated that this represents what was actually on the aircraft, but not what was initially reported by the pilot. He also stated that when the pilot arrived at the base, the pilot spoke to a junior operations staff, who changed the number of passengers on the load sheet from two to five. The Director of Operations had also said that the company had based a few extra seats at Eteringbang to meet situations such as these. However, when further questioned he said that there were no seats at Eteringbang that day. He also raised the possibility of there being an economic component for the pilot.

The Director of Operations agreed that, for operations from some hinterland airstrips, the company's practice requires the pilot to report the passengers and load, by telephone, to the company's operations department. The information





passed is used to prepare the load sheet at the office and the pilot is expected to sign it on his return. He also stated that the company prepares its load sheets using an electronic system. When the load sheet is prepared in the office it is sent electronically to the pilot in the field, who is then expected to load the aircraft accordingly. He agreed that the pilot would not necessarily wait for the load sheet before loading the aircraft and also there is no guarantee that the pilot would receive the load sheet when it is sent.

The Director of Operations indicated that the aircraft was not scheduled for maintenance, therefore there was no pressure on the pilot to bring the aircraft back to base for maintenance. He initially stated that the aircraft had nine hours before the next scheduled maintenance but then agreed that it was in fact five hours. He further noted that the pilot was instructed to do two shuttles after the repair was carried out, but the pilot refused and determined that he was coming back to base. There was no pressure on the pilot to do the two shuttles.

The possibility of there being a planned maintenance programme and the probability that the AMO had informed the pilot of this was raised. The Director of Operations then stated that the AMO had probably moved the maintenance programme forward, but this does not translate into the company pressuring the pilot. He again mentioned that the two shuttles should have been done after the undercarriage was replaced. It was pointed out to him that two shuttles should not have been an option as the missing torque link bolt was a reportable occurrence and the aircraft should not have been interfered with (moved or repaired) without GCAA approval. He agreed with this. When asked, he stated that the decision to move the aircraft was made in the field. This was disputed. He then stated that he could not say who made the decision to have the aircraft moved, but as far as he was aware, this was done to facilitate the movement of another aircraft at the airstrip.

The Director of Operations stated that a company would give priority to a commercial operation over maintenance when there is still operating time on the aircraft. Again, he stated that the company would have preferred the aircraft to do the two shuttles rather than coming back to base. He further noted that when a

programme is not fully completed, the question arises as to who would pay for the flight.

The Director of Operations stated that the company has no record of the pilot's request to change the full catering system for the aircraft under carriage.

The Director of Operations stated that the company accepted, in hindsight, that the weight and balance of the aircraft was incorrect. He stated that the company relies on the honesty of the pilot to supply correct figures. He noted that the weight and balance was prepared based on information provided by the pilot to the Operations Superintendent. He was advised that the pilot did indicate that the weight of the five passengers was estimated by him, but he passed a list of cargo and not their weight. It was noted that it was impossible for the cargo on board to weigh only fifty pounds and the company was aware of this. He agreed that using the pilot's estimate for passengers' weight was not acceptable but noted that this was common practice.

## **2. Analysis**

### **2.1. The Pilot**

The pilot is 31 years old. He obtained his Guyana CPL #271 in 2007. He was not properly qualified for the flight, because he had not done all the required training as mandated in the company's FOM. There was no evidence of any pre-existing medical or behavioural conditions which may have adversely affected the pilot's performance during this flight. The toxicological tests which he completed the day after the accident, showed negative results for psychotropic substances.

The high number of movements over the two-day period, coupled with an unfavourable rest environment, may have contributed to the pilot suffering from fatigue, which could have affected his decision making and performance as a pilot. He was quite familiar with the airstrip, having operated there regularly for more than one year. Thus, he would have been aware of the condition of the airstrip especially the lack of drainage. Although he was concerned about the heavy downpour, he neglected to inspect the entire length of the runway after the heavy shower.

The pilot displayed lack of knowledge and uncertainty in areas that are considered to be basic knowledge areas for a pilot, he was uncertain of the performance specifications of the BN2A Islander aircraft and his knowledge of aircraft performance in general is limited.

Although he was aware of the physical limitations of the runway, he was not aware of the company policy for operating into various airstrips.

His decision to take off without enough seats and seat belts on the aircraft for all the passengers was in violation of GARs 8.9.1.3(a).

The incident of the damaged torque link bolt caused a delay in the pilot's return to base. After the damage was fixed the pilot made the decision to take the aircraft back to base.

## 2.2. The Aircraft

### 2.2.1. Maintenance

The aircraft has a Certificate of Airworthiness which is valid until 20<sup>th</sup> April 2017. Records indicate that the aircraft was being maintained in accordance with the approved maintenance schedule. The starboard main landing gear torque link center bolt broke the previous day, 23<sup>rd</sup> August 2016. The company decided to replace the entire starboard main landing gear on the day of the accident (24<sup>th</sup> August 2016). The required ground checks were satisfactorily carried out by appropriately licensed engineers. The completed task was recorded in the technical log book. There were no other noted defects or deferred maintenance items from the previous flight.

This incident related to the sheared torque link center bolt was not reported to the GCAA within the stipulated 72 hours' period required by the Regulations, but five days after.

### 2.2.2. Mass and Balance

The weight of the passengers was determined by the pilot's estimate, which was transmitted to the base along with the list of cargo. The weight and balance was then calculated and the load sheet was prepared at the office and was signed by the pilot on his return to base. It was noted that the weight of the listed cargo, which was confirmed by pictures, far exceeded the weight of cargo recorded on the load sheet. Section 8.1.6 of the company's FOM states that all passengers and cargo shall be weighed on an approved and calibrated scale. This was not done.

GARs 8.6.2.16 (a) (2) requires that the pilot shall complete and sign a load manifest, showing distribution of load, center of gravity takeoff and landing weights and compliance with maximum operating weight limitations and performance analysis of the aircraft. GARs 8.6.2.16 (b) states that no person may takeoff an aircraft in commercial air transport unless all flight release documents, signed by the pilot-in-command are retained and available at the point of departure. GARs 8.6.2.16 (c) requires that a copy of the documentation mentioned above must be carried on the aircraft to the destination aerodrome. This was not done.



It could not be determined if the load configuration of the aircraft was within the Center of Gravity envelope. Further, with two passengers seated on the floor of the aircraft, the Center of Gravity may have been adversely affected. It could not be determined if the aircraft was overweight at the time of the accident.

### 2.2.3. The Takeoff

In keeping with established procedure, the aircraft was positioned for takeoff from RWY21. The pilot reported that the wind at the time was calm. The pilot started the takeoff run, but when the aircraft reached the highest point of the runway, he realised that there was a significant amount of standing water on the runway ahead. He rotated the aircraft in an attempt to takeoff. The main starboard undercarriage made contact with a pool of water, which further slowed the aircraft and pulled its nose wheel back to the ground. The pilot then decided to abort the takeoff, retarded the throttle, pulled the mixture controls to shut-off, turned off the fuel selectors and applied the brakes. This caused the aircraft to pull to the right and it continued skidding until it impacted the rock formation. If the brakes pedals had been modulated, it may have allowed for better control of the aircraft and possibly prevented the brakes from locking and the aircraft from skidding. Further when the decision was made to abort, the immediate action should have been to close the throttles and apply brakes as necessary to bring the aircraft to a stop. In attempting this take off the pilot ignored the special procedures stated in the company's FOM, which advises that pilots should use extreme caution when the runway is wet due to danger of aquaplaning.

### 2.3. The Airstrip

The airstrip has a total length of 1800ft and width of 36ft. The entire surface is unsealed and is not properly prepared for aircraft operations. It is generally in a deplorable condition. This was compounded by a heavy tropical downpour about twenty-five minutes prior to the attempted takeoff, which resulted in a significant amount of water settling in the lower portion of the runway where drainage is non-existent. Thus, almost half of the runway was unusable. The aircraft was unable to achieve its required takeoff speed within the usable runway distance available.

#### 2.4. The Weather

This accident occurred during the afternoon following a heavy downpour. At the time of the accident, it was reported that there was bright sunshine and clear skies at the airstrip, wind was calm, ceiling and visibility ok. Weather conditions immediately prior to the takeoff contributed to this occurrence.

#### 2.5. Survival Aspects

The available seats and seat belts functioned satisfactorily. The safety of two persons was jeopardized when they were permitted to board the aircraft when no seats or seat belts were available for them. The aircraft Flight Manual and the company's FOM also both state that the total number of persons carried in the aircraft shall not exceed the number for which seats, equipped with seat belts, are provided.

#### 2.6. The Company

##### 2.6.1. General

The company was appropriately certified for the operation. Its FOM does contain limitations with regard to operations at Eteringbang Airstrip.

The review of the FOM showed that the individual identified as the Director of Operations is not listed therein. Further research revealed that a request was made and was found to be satisfactory by the GCAA in April 2016. There is no record of an amendment page being submitted for insertion into the FOM. Notwithstanding this, it was noted that the currency of this individual's Guyana CPL #279 expired since September 2014. Therefore, he does not meet requirements to hold this position as the FOM requires the position holder to hold a Guyana CPL with type ratings and current instrument rating among other things.

##### 2.6.2. The Pilot

The pilot displayed lack of knowledge pertaining to the limitations regarding operations at Eteringbang Airstrip contained in the FOM. His limited knowledge of company procedures and crew resource management training is not in keeping with the company's Flight Operations Manual. Section D – 1.1.3 a) requires that all

new flight crew members must successfully complete company procedures indoctrination training and 1.1.3. c) requires that all newly hired flight crew members must successfully complete initial crew resource management training. The company's Director of Operations presented a Certificate showing that the pilot was given Company Indoctrination Training in March 2014, but the pilot joined the company full time in May of 2016. There was no accompanying documentation in support of the 2014 training nor was there any record of any indoctrination training when he joined the company full time in 2016.

The pilot was dispatched for two days of work away from base, with no support staff. He was expected to do preflight inspections, refuel the aircraft, carry out minor maintenance checks, keep updated records and was also responsible for the safety and security of the aircraft while away from base.

The pilot had indicated that, apart from the fact that he wanted to get home, he also felt some amount of pressure from the company. This was denied by the Director of Operations. However, his insistence that the company would have preferred the pilot to do two shuttles after the replacement of the starboard main undercarriage, indicated that pressure may have been exerted on the pilot.

#### 2.6.3. The Missing Torque Bolt Link

The company failed to report the missing torque link bolt in a timely manner to the GCAA. The failed torque link bolt caused the starboard undercarriage to turn 90° and the aircraft could not move under its own power. This failure is a violation of GCARs 82 and the associated Circular issued by the GCAA that mandates the reporting of such occurrences. The Director of Operations agreed that the aircraft should not have been moved without informing the GCAA. He noted that this was a lesson learnt for the company. However, this company is experienced enough for this not to have happened.

As stated by the Director of Operations the decision to move the aircraft was made to facilitate movement of another aircraft. However, ATC traffic statistics indicate that this aircraft was the last one to land at Eteringbang on the day of this occurrence.

#### 2.6.4. Seating in the Aircraft

Although the Director of Operations stated that the company was initially not aware that five persons were on board the aircraft, the load sheet presented to the investigation team records five passengers and their individual weights. The aircraft only had enough approved seating for three passengers. The pilot loaded five passengers, two of whom did not have seats or seat belts. The Director of Operations claimed that the pilot colluded with operations staff to change the number of passengers on the load sheet. The GCAA Inspectors, who had returned from the accident site on the same flight as the pilot, were in the company's office, when the pilot was given the load sheet to sign. As soon as the pilot signed the load sheet it was collected by one of the GCAA Inspectors. It was also noted that the three extra passengers would have been obvious to the engineering staff on board. Further, if the accident had not occurred, all of the passengers would have deplaned on the ramp, in front of the company's office at the EFCIA. Thus, the company would have become aware that five passengers were on board. All of these things reduce the possibility of the company not being aware of the number of passengers on board. It was also noted that the company was aware that there were only enough seats to accommodate three passengers.



### **3. Conclusion**

#### 3.1 Cause

The probable cause of this accident was an attempted takeoff from a water-logged runway.

#### 3.2 Contributory Factors

1. Poor preflight planning. The existing conditions of the runway were not suitable for takeoff and the pilot did not do a complete inspection of the runway, which would have enabled him to make a proper assessment of its conditions.
2. There was some amount of eagerness by the pilot to get home after the mechanical failure was repaired.
3. The pilot expressed some amount of fatigue. In addition to two days of shuttling, he was also required to carry out ancillary tasks.
4. The aircraft was improperly loaded.
5. The rutted and potholed condition of the airstrip allowed significant amounts of water to accumulate after rainfall.

#### 3.3 Findings

##### 3.3.1. The Pilot

1. The pilot's licence was valid.
2. The pilot holds Guyana CPL #271 which he obtained in 2007.
3. His current medical is valid until 31<sup>st</sup> January 2017.
4. His last APC on type was satisfactorily completed on 7<sup>th</sup> April 2016.
5. The pilot was familiar with the airstrip conditions, having operated into the airstrip frequently for more than one year.
6. By not checking the entire length of the runway, he failed to prepare himself properly for the flight.
7. The pilot did not follow the proper procedure for an aborted takeoff.
8. The pilot's record of training for both part time and full-time employment with the company was incomplete, in that no documentation was available to

- support the Certificate of Training presented. Therefore, he was not qualified to carry out this operation in accordance with the company FOM.
9. The pilot, by his own admission, was complacent and displayed poor judgement during this occurrence.
  10. The pilot indicated that he was eager to return home.
  11. The pilot's actions and statements indicated that his knowledge and understanding of the aircraft performance were inadequate.
  12. The pilot breached the requirements of the Aircraft Flight Manual and GARS 8.9.1.3(a)&(b) when he did not ensure that there were enough seats and seatbelts for all persons on board the aircraft.
  13. The pilot breached GARs 8.6.2.16 (a)(2) which requires him to complete and sign a load manifest, showing distribution of load, center of gravity, takeoff and landing weights and compliance with maximum operating weight limitations and performance analysis of the aircraft, before taking off.
  14. The pilot breached GARS 8.6.2.16 (b) by not signing the completed load sheet and leaving one copy at the point of departure.
  15. The pilot breached GARs 8.6.2.16 (c) which requires that a copy of all the documentation mentioned above must be carried on the aircraft to the destination aerodrome.
  16. The pilot breached GARs 8.6.2.17 (c) which requires the Pilot to ensure that the loading and mass and balance calculations contained in the load manifest are accurate and comply with the aircraft limitations.

### 3.3.2. The Company

1. The company holds an Air Operator Certificate and an Approved Maintenance Operator Certificate.
2. The company did not provide enough away-from-base maintenance support and assistance for the planned operation in keeping with the approved BN2A Maintenance Schedule accepted by the GCAA.



3. The company did not ensure that the pilot successfully completed company procedures indoctrination training and initial crew resource management training, as required by its FOM.
4. The company was aware that there were seats available on board to accommodate three passengers, but the load sheet indicated that there were five passengers on board.
5. The company was aware that no additional seats were available at Eteringbang Airstrip.
6. The company failed to report the broken torque link bolt to the Authority within the specified time. This is a breach of GCARs 82 and the associated GCAA Airworthiness Circular – AC No: GCAA AC/AIR-008
7. Although the pilot is considered to be responsible for the breaches mentioned in Section 3.3.2 – 13. to 16. of this report, it was found that the company does not follow the procedures that would prevent these breaches from occurring.
8. The company's Director of Operations is not qualified to hold this position because he does not hold a current and valid Guyana Commercial Pilot Licence.

#### 3.3.3. The Aircraft

1. The aircraft had a valid Certificate of Airworthiness and was maintained in compliance with regulations.
2. It could not be determined if the aircraft was loaded in accordance with the signed load sheet.
3. It could not be determined if the aircraft was overweight.
4. The accident aircraft did not have the prescribed number of seats and seat belts for the number of passengers on board.

#### 3.3.4. The Weather

The weather at the airstrip at the time of the accident was VMC. However, a heavy downpour prior to the accident, resulted in a significant amount of standing water on the runway during the attempted takeoff.

3.3.5. The Airstrip

The airstrip was in a deplorable condition due to inadequate maintenance. The absence of a windsock at the airstrip is unacceptable. Plans are in place to carry out major upgrading works on this airstrip shortly.

3.3.6. GCAA

The GCAA gave approval for the company to appoint an unqualified person to hold the position of Director of Operations.

## 4. Safety Recommendations

### 4.1. The Pilot

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

- a) Company indoctrination training and provide supporting documentation as proof of satisfactory completion, with emphasis on the following:
  1. Aircraft Performance with emphasis on:
    - i. takeoff techniques, including takeoff from short runways, and the effects of heavy rainfall on unprepared surfaces.
    - ii. Weather and the differences of taking off with a calm wind, tail wind, head wind and cross wind.
    - iii. The effect of runway gradient on aircraft landing and takeoff.
  2. Crew Resource Management with emphasis on single crew operations. This must include attitude, the need to guard against complacency and the importance of self-discipline, situational awareness, problem solving and decision making.
  3. Review of the Guyana Aviation Requirements in relation to:
    - i. GARS 8.5.1.1 (a) which states that the PIC shall be responsible for the safety of the aircraft and all persons on board during flight.
    - ii. GARS 8.9.1.3(a) & (b) which requires the PIC to ensure that each person on board occupies an approved seat and is secured in his seat by a seat belt.
  4. In view of 3.i. & ii. It is recommended that the pilot re-sit the Regulations Examination
  5. It is recommended that the pilot should review the Company's FOM, to remind himself of company operating procedures into various airstrips.
  6. It was also noted that the pilot was very hesitant/unsure of some of the basic operating procedures of the aircraft. It is recommended that he should review the Aircraft Flight Manual.

#### 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. In the interim consideration should be given to proper compaction and grading with camber, to facilitate proper drainage of the existing 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 indoctrination training, initial and recurrent flight and ground training and maintain the documentation of such training in accordance with the Regulations.
2. The company should review its criteria, as stated in its FOM, for usability of certain airstrips, giving greater attention to safety of its staff, passengers and equipment.
3. In keeping with requirements, the company must be required to provide administrative, operational and maintenance support to its shuttling operations away from base. this should include technical/engineering staff to carry out preflight inspections and assist with refueling the aircraft.
4. The company should consider limiting the number of flights that pilots are required to complete within the normal duty time during shuttle operations.
5. The company must reinforce with its pilots and ground staff that, during aircraft operations, the final decision with regard to operation of its aircraft rest with the pilot. It must ensure that its ground-based staff have a clear understanding of the possible adverse effects that can result from attempting to exert pressure on pilots, for any reason.
6. The company must immediately provide the required company indoctrination training and initial crew resource management training to the pilot.

7. The company should set up a system which ensures that its pilots and other staff remain familiar with its FOM, the Aircraft Flight Manuals and other technical and operational procedures.
8. Recurrent training should also be carried out as approved in the company's FOM, 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.
9. The company must ensure that management staff are suitably qualified for the positions they are expected to hold.

#### 4.4. The GCAA

The GCAA should be more careful to ensure that requests made by the company are carefully considered before approvals are given.

### 5.Actions taken Since the Accident by the Company

1. A refueling pump has been deployed for shuttle operations and replaces the manual method formerly used.
2. A member of staff either Operations or Engineering accompanies the pilot on shuttles to assist in relieving the pilot workload.
3. The pilot was given the recommended training, which was completed on 29<sup>th</sup> September 2016. Copies of the training records were submitted to the GCAA.
4. The company has commenced its safety briefing sessions for the year.

**END**



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