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NATIONAL TRANSPORTATION SAFETY COMMITTEE

Aircraft Accident Investigation Report

Trigana Air Service

de Havilland DHC 6-300 Twin Otter; PK-YRU

Mulia Airstrip, Papua
Republic of Indonesia

1 June 2007

NATIONAL TRANSPORTATION SAFETY COMMITTEE
MINISTRY OF TRANSPORTATION
REPUBLIC OF INDONESIA
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TABLE OF CONTENTS

TABLE OF CONTENTS ..... **i**

TABLE OF FIGURES ..... **iii**

GLOSSARY OF ABBREVIATIONS ..... **v**

INTRODUCTION **1**

1 FACTUAL INFORMATION **3**

1.1 History of the flight 3

1.2 Injuries to persons 4

1.3 Damage to aircraft 4

1.4 Other damage 4

1.5 Personnel information 5

1.5.1 Flying instructor (Pilot in Command) 5

1.5.2 Pilot in Command under training 5

1.6 Aircraft information 5

1.6.1 General 5

1.6.2 Engine data 6

1.6.3 Propeller Data 6

1.6.4 Weight and Balance 7

1.7 Meteorological information 7

1.8 Aids to navigation 7

1.9 Communications 7

1.10 Aerodrome information 7

1.11 Flight recorders 7

1.12 Wreckage and Impact Information 8

1.13 Medical and Pathological Information 10

1.14 Fire 10

1.15 Survival Aspects 10

1.16 Tests and Research 10

1.17 Organisational and Management Information 11

1.18 Additional Information 11

2 ANALYSIS 13

3 CONCLUSIONS 15

3.1 Findings 15

3.2 Causes 15

4 SAFETY ACTIONS AND RECOMMENDATIONS 17

4.1 Safety Action 17

4.2 Recommendations 17

4.2.1 Recommendation to the Directorate General of Civil Aviation 17

TABLE OF FIGURES

Figure 1: Left main wheel track showing runway excursion to the right 3
Figure 2: View looking up slope back along the take-off track 4
Figure 3: Forward fuselage substantially damaged 8
Figure 4: The right shoulder of runway 27 showing rocks and ditch 8
Figure 5: Nose landing gear area indicated by arrow 9
Figure 6: Left main landing gear 9
Figure 7: The damaged right main landing gear wheel 9
Figure 8: Right wing substantially damaged 10
Figure 9: Arrow pointing to the nose-wheel steering lever 11
Figure 10: Left arrow Power Levers and right arrow Propeller Levers 12

TABLE

Table 1: Injuries to Persons 4

GLOSSARY OF ABBREVIATIONS

AD	Airworthiness Directive
AFM	Airplane Flight Manual
AGL	Above Ground Level
ALAR	Approach-and-landing Accident Reduction
AMSL	Above Mean Sea Level
AOC	Air Operator Certificate
ATC	Air Traffic Control
ATPL	Air Transport Pilot License
ATS	Air Traffic Service
ATSB	Australian Transport Safety Bureau
Avsec	Aviation Security
BMG	Badan Meterologi dan Geofisika
BOM	Basic Operation Manual
°C	Degrees Celsius
CAMP	Continuous Airworthiness Maintenance Program
CASO	Civil Aviation Safety Officer
CASR	Civil Aviation Safety Regulation
CPL	Commercial Pilot License
COM	Company Operation Manual
CRM	Cockpit Recourses Management
CSN	Cycles Since New
CVR	Cockpit Voice Recorder
DFDAU	Digital Flight Data Acquisition Unit
DGCA	Directorate General of Civil Aviation
DME	Distance Measuring Equipment
EEPROM	Electrically Erasable Programmable Read Only Memory
EFIS	Electronic Flight Instrument System
EGT	Exhaust Gas Temperature
EIS	Engine Indicating System
FL	Flight Level
F/O	First officer or Co-pilot
FDR	Flight Data Recorder
FOQA	Flight Operation Quality Assurance
GPWS	Ground Proximity Warning System
hPa	Hectopascals

ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
IIC	Investigator in Charge
ILS	Instrument Landing System
Kg	Kilogram(s)
Km	Kilometer(s)
Kt	Knots (NM/hour)
Mm	Millimeter(s)
MTOW	Maximum Take-off Weight
NM	Nautical mile(s)
KNKT / NTSC	Komite Nasional Keselamatan Transportasi / National Transportation Safety Committee
PIC	Pilot in Command
QFE	Height above aerodrome elevation (or runway threshold elevation) based on local station pressure
QNH	Altitude above mean sea level based on local station pressure
RESA	Runway End Safety Area
RPM	Revolution Per Minute
SCT	Scattered
S/N	Serial Number
SSCVR	Solid State Cockpit Voice Recorder
SSFDR	Solid State Flight Data Recorder
TS/RA	Thunderstorm and rain
TAF	Terminal Aerodrome Forecast
TSN	Time Since New
TT/TD	Ambient Temperature/Dew Point
TTIS	Total Time in Service
UTC	Coordinated Universal Time
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions

INTRODUCTION

SYNOPSIS

On Friday 1 June 2007, a de Havilland Twin Otter DHC 6-300, registered PK-YRU overran the right side of the runway during the take-off roll. The aircraft left the runway and impacted a ditch and rocks on the right shoulder of the runway. Main-wheel tire marks for more than 65 meters on the runway indicated that heavy braking action was being applied to the left brake.

A witness statement confirmed the tire track evidence on the runway, that during the early take-off roll the aircraft turned right, then left, and then back to the right before leaving the runway. The aircraft was substantially damaged. None of the occupants were injured.

The handling pilot was undergoing captaincy training under the supervision of an instructor.

The investigation was unable to determine why the aircraft commenced veering to the right during the early acceleration phase of the takeoff. The pilots continued the takeoff and directional control was lost during the take-off roll. The instructor pilot was unable to regain directional control of the aircraft before it left the runway.

No aircraft or system defect was found that could have contributed to the pilots' inability to maintain directional control during the take-off roll.

The pilot under training stated that "things happened fast" and he was "unaware that the power levers were still in the full on position", but was "conscious that his left hand was on the steering handle". He said that he did not immediately respond to a shout from the instructor to not use the steering handle.

The investigation considered that it was possible that the nose-wheel steering was not centred before commencing the take-off roll and that the pilot under training may have been unaware that he was holding an inappropriate nose-wheel steering position during the take-off roll.

The National Transportation Safety Committee made a recommendation to the Directorate General of Civil Aviation to review the safety of the Mulia runway shoulder area and require the airport operator to ensure that there are no obstacles to safety, such as ditches and rocks, to prevent an aircraft from safely negotiating the runway shoulder in the event of a runway excursion.

1 FACTUAL INFORMATION

1.1 History of the flight

On Friday 1 June 2007, a de Havilland Twin Otter DHC 6-300, registered PK-YRU was being operated on from Timika, to Mulia, to Wamena, Papua. During the flight sector from Timika to Mulia, the pilot in command (PIC) was the instructor who sat in the left cockpit seat. The copilot who was subsequently to be given PIC left seat training sat in the right seat. For the flight sector from Mulia to Wamena the instructor occupied the right seat and the copilot who was receiving PIC route training occupied the left seat. The aircraft departed from Timika at 0058 UTC1, arriving at Mulia at 0138. The turn around at Mulia took 15 minutes. There was one passenger for the flight to Wamena.

The pilots reported that after starting the engines, and during the pre-takeoff preparations, the aircraft was operating normally. The PIC under training lined the aircraft up for takeoff on runway 27, advanced the power levers, and the aircraft accelerated smoothly. As it approached a quarter of the distance along the runway, it veered to the right and then swerved to the left. The instructor reported that he attempted to correct the veer and swerve using rudder, differential brake and power, while attempting to abort the take off. Runway 27 has a 10% down slope, and the aircraft had already reached a relatively high speed. The instructor was unable to bring the aircraft to a stop on the runway, and it impacted a ditch and rocks to the right of the runway. It swung through 270 degrees and came to rest on a heading 90º from the runway 27 track, facing the side of the runway.

None of the occupants were injured.

Figure 1: Left main wheel track showing runway excursion to the right

1 The 24-hour clock in Coordinated Universal Time (UTC) is used in this report to describe the local time as specific events occurred. Local time in the area of the accident, Eastern Indonesia Standard Time (Waktu Indonesia Timur (WIT)) is UTC +9 hours.

Figure 2 : View looking up slope back along the take-off track

1.2 Injuries to persons

Table 1: Injuries to persons

Injuries	Flight crew	Passengers	Total in Aircraft	Others
Fatal	-	-	-	-
Serious	-	-	-	-
Minor	-	-	-	Not applicable
Nil Injuries	2	1	3	Not applicable
TOTAL	2	1	3	-

1.3 Damage to aircraft

The nose section, consisting of the radome and the nose landing gear housing was substantially damaged. The damaged radome separated from the fuselage. The nose landing gear was broken, the struts were separated from their housing and the nose wheel was damaged. The right main landing gear wheel was also damaged. The right wing tip was damaged as a result of the ground impact.

1.4 Other damage

There was no other damage to property and/or the environment.

1.5 Personnel information

1.5.1 Flying instructor (Pilot in Command)

Place / Date of Birth	: Lampung, 6 September 1974
Gender	: Male
Type of licence	: ATPL
Valid to	: 30 June 2007
Type ratings	: DHC-6 Twin Otter, F27, F28 PC- 6-300, Cessna 206, DHC-4 Caribou, ATR 42/72
Total flying time	: 7,505 hours 25 minutes
Total on this type	: 2,501 hours 30 minutes
Medical class	: Class one
Valid to	: 21 December 2007

1.5.2 Pilot in Command under training

Place / Date of Birth	: Kuningan, 18 April 1977
Gender	: Male
Type of licence	: CPL
Valid to	: 30 September 2007
Type ratings	: Tobago TB-10, Baron B-58, Sundowner C-23, Piper Dakota PA28, Caribou DHC-4, Twin Otter DHC6-300.
Total flying time	: 2,257 hours 25 minutes
Total on this type	: 1,324 hours 20 minutes

1.6 Aircraft information

1.6.1 General

Aircraft manufacturer	: de Havilland Canada
Model	: DHC 6-300 Twin Otter
Serial number	: 685
Year of manufacture	: 1980
Nationality and registration mark	: Indonesia, PK-YRU
Name of the owner	: Texas Regional Airlines Consultants,INC
Name of the operator	: Trigana Air Service
Certificate of Airworthiness	
Valid to	: 20 July 2007

Certificate of Registration	
Valid to	: 20 July 2009
Total Time Since New	: 40,507 hours 12 minutes

1.6.2 Engine data

Engine Type	: Turbo Propeller
Manufacturer	: Pratt & Whitney Canada
Type/ Model	: PT6A-27
Time between overhaul	: 4,500 hours
Engine number one (left)	
Serial Number	: PCE-PG-0203
Time since new	: 4,061 hours
Cycles since new	: 5,427 cycles
Engine number two (right)	
Serial Number	: PCE PG-0127
Time since new	: 3,365 hours
Cycles since new	: 8,937 cycles

1.6.3 Propeller Data

Propeller Type	: Variable Pitch
Manufacturer	: Hartzell
Model	: HC-B3TN-3D
Time between overhaul	: 3,000 hours
Propeller number one (left)	
Serial Number	: BUA 21094
Time since new	: 27,819.0 hours
Time since overhaul	: 2,844.9 hours
Propeller number two (right)	
Serial Number	: BUA 20906
Time since new	: 23,124 hours 12 minutes
Time since overhaul	: 1,850 hours 54 minutes

1.6.4 Weight and Balance

The aircraft was loaded within weight and balance limitations.

1.7 Meteorological information

Weather Conditions at Mulia, on 1 July 2007, at 10.53 Hours WITA

Surface Wind	: Calm
Visibility	: 15 to 20 Km

1.8 Aids to navigation

Not relevant to this accident.

1.9 Communications

Not relevant to this accident.

1.10 Aerodrome information[2]

Airport Name	:	Mulia
Airport Identification	:	WABQ
Coordinates	:	03° 44′ 00″ S, 137° 57′ 00″ E
Slope	:	10 % (down runway 27)
Elevation	:	5,500 feet
Runway Direction	:	09/27
Runway Length	:	900 meters
Runway Width	:	18 meters
Surface	:	Asphalt

1.11 Flight recorders

This aircraft was not fitted with flight recorders, nor were they required for this aircraft type (year of manufacture) by Indonesian regulations at the time of the accident.

2 Data from DGCA Aeronautical Information Publication dated 22 Dec 2005.

1.12 Wreckage and Impact Information

Figure 3 : Forward fuselage substantially damaged

The nose section, including the radome and the nose landing gear housing, was substantially damaged.

Figure 4 : The right shoulder of runway 27 showing rocks and ditch

The nose landing gear was fractured, the struts were separated from their housing, and the nose wheel was damaged. The nose landing gear strut was damaged as result of impacting rocks and a ditch.

Figure 5 : Nose landing gear area indicated by arrow

Figure 6: Left main landing gear

Figure 7 : The damaged right main landing gear wheel

The right main landing gear wheel was damaged as a result of its collision with rocks on the shoulder of the runway.

Figure 8 : Right wing substantially damaged

The outboard section of the right wing was substantially damaged as a result of ground impact. This occurred when the aircraft swung to the left as a result of the left main landing gear being stuck in a ditch. The aircraft then swung further left through 90 degrees, resulting in the right wing impacting the ground.

1.13 Medical and Pathological Information

Not relevant to this accident.

1.14 Fire

There was no pre- or post-impact fire.

1.15 Survival Aspects

The occupants of the aircraft disembarked unaided. Local residents ran to the aircraft to assist. There was no rescue fire fighting service stationed at Mulia, nor was one required by Indonesian regulations.

1.16 Tests and Research

Not relevant to this accident.

1.17 Organisational and Management Information

Aircraft Owner	:	TEXAS REGIONAL AIRLINES CONSULTANTS , INC
Aircraft Operator	:	Trigana Air Service
Certificate Number	:	AOC / 135-005

1.18 Additional Information

The instructor pilot informed the investigation that he was the assigned PIC for the flights. He said that after preparing the aircraft for the flight from Mulia to Wamena, the pilot under training started the engines and taxied to the end of the runway. He was the handling pilot from the left seat for the flight sector.

After brakes release the aircraft accelerated and as it approached a quarter of the distance along the runway, it veered to the right and then swerved to the left. The instructor said that he attempted to control the aircraft using differential braking, but the position of the nose-wheel steering handle was on the left control wheel of the cockpit. The power levers were also to his left. This meant that his ability to react was constrained.

The aircraft subsequently exited the runway, to the right, and stopped after colliding with rocks and a ditch.

Figure 9 : Arrow pointing to the nose-wheel steering lever

Figure 10 : Left arrow Power Levers and right arrow Propeller Levers

The pilot under captaincy training stated that he was sitting in the left cockpit seat. The flight to Wamena was to be his fifth sector of captaincy training. He said that when "power on" was applied, and as the aircraft accelerated "the nose of the aircraft veered to the right". He said that he attempted to corrected the swing using nose-wheel steering "towards the white bar, but it was too far. The aircraft exceeded the white bar as its acceleration increased".

He then turned the aircraft to the right, but the radius of the turn was becoming bigger and the speed was increasing because engine power had not been reduced and the down slope of runway 27 was 10%. He stated that "things happened fast" and he was "unaware that the power levers were still in the full on position", but was "conscious that his left hand was on the steering handle". He said that he did not immediately respond to a shout from the instructor to not use the steering handle.

The aircraft subsequently entered the runway shoulder, which had a ditch and was covered with slippery grass and large rocks.

A resident who witnessed the accident stated that the aircraft began to accelerate on the runway, but it turned a bit to the left and then as it got faster it turned to the right and its engine sound got louder. Then the aircraft seemed to sway as it left the runway and went into the grassed area where it "jumped" and then suddenly went to the left making the right wing hit the ground. When the aircraft stopped, the engines were still operating and the propellers were still rotating. The local residents and police then rushed to the aircraft to help.

1.19 Useful or Effective Investigation Techniques

The investigation was conducted in accordance with NTSC-approved policies and procedures, and in accordance with the standards and recommended practices of Annex 13 to the Chicago Convention.

2 ANALYSIS

During the take off from Mulia, the aircraft left the runway and impacted a ditch and rocks on the right shoulder of the runway. Main-wheel tire marks for more than 65 meters on the runway indicated that heavy braking action was being applied to the left brake.

A witness statement confirmed the tire track evidence on the runway, that during the early take-off roll the aircraft turned right, then left, and then back to the right before leaving the runway. The aircraft was substantially damaged.

The final position of the nose-wheel steering lever was down (indicating that the nose-wheel steering was selected to the left). That may indicate that the pilot under training attempted to steer the aircraft to the left using nose-wheel steering. However, the investigation could not conclusively determine if the steering lever had been moved after the accident.

The investigation determined that the power-lever position also did not necessarily indicate the position of the power lever at the time of the accident, because the pilot had shut the engines down after the aircraft came to a stop.

The investigation was unable to determine why the aircraft commenced veering to the right during the early acceleration phase of the takeoff. The pilots continued the takeoff and directional control was lost during the take-off roll. The instructor pilot was unable to regain directional control of the aircraft before it left the runway.

No aircraft or system defect was found that could have contributed to the pilots' inability to maintain directional control during the take-off roll.

The pilot under training stated that "things happened fast" and he was "unaware that the power levers were still in the full on position", but was "conscious that his left hand was on the steering handle". He said that he did not immediately respond to a shout from the instructor to not use the steering handle.

The investigation considered that it was possible that the nose-wheel steering was not centred before commencing the take-off roll and that the pilot under training may have been unaware that he was holding an inappropriate nose-wheel steering position during the take-off roll.

3 CONCLUSIONS

3.1 Findings

1. The aircraft was certified as being airworthy when dispatched for the flight.
2. The aircraft was loaded within weight and balance limitations.
3. There was no evidence of any defect or malfunction in the aircraft that could have contributed to the accident.
4. Both pilots were licensed and qualified for the flight in accordance with existing Indonesian regulations.
5. There was no evidence that incapacitation or physiological factors affected the flight crew performance.
6. During take-off, the aircraft began an uncommanded veer to the right.
7. The pilots were unable to regain directional control of the aircraft.
8. The aircraft was not equipped with a flight data recorder (FDR) or a cockpit voice recorder (CVR), nor were they required by Indonesian regulations.
9. The runway shoulder had a ditch and rocks

3.2 Causes

The investigation considered that it was possible that the nose-wheel steering was not centred before commencing the take-off roll and that the pilot under training may have been unaware that he was holding an inappropriate nose-wheel steering position during the take-off roll.

4 SAFETY ACTIONS AND RECOMMENDATIONS

4.1 Safety Action

At the time of writing the Final Report, the National Transportation Safety Committee had not been informed of any safety actions resulting from this accident.

4.2 Recommendations

4.2.1 Recommendation to the Directorate General of Civil Aviation

The National Transportation Safety Committee recommends that the Directorate General of Civil Aviation review the safety of the Mulia runway shoulder area and require the airport operator to ensure that there are no obstacles to safety, such as ditches and rocks, to prevent an aircraft from safely negotiating the runway shoulder in the event of a runway excursion.