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NATIONAL TRANSPORTATION SAFETY COMMITTEE

Aircraft Accident Investigation Report

Transall C-160

PK–VTQ

Wamena Airport, Wamena, Papua

Republic of Indonesia

6 March 2008

NATIONAL TRANSPORTATION SAFETY COMMITTEE
MINISTRY OF TRANSPORTATION
REPUBLIC OF INDONESIA
2009

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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 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 Copilot
FDR	:	Flight Data Recorder
FOQA	:	Flight Operation Quality Assurance
GPWS	:	Ground Proximity Warning System
hPa	:	Hectopascals

Hrs	:	Hours
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/hours)
Mm	:	Millimeter(s)
MTOW	:	Maximum Take-off Weight
NM	:	Nautical mile(s)
NTSB	:	National Transportation Safety Board (USA)
KNKT/NTSC	:	Komite Nasional Keselamatan Transportasi / National Transportation Safety Committee
PIC	:	Pilot in Command
QFE	:	Height above airport 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
ROV	:	Remotely Operated Vehicle
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
TPL	:	Towed Pinger Locator
TSN	:	Time Since New
TT/TD	:	Ambient Temperature/Dew Point
TTIS	:	Total Time in Service
UTC	:	Universal Time Coordinate
VFR	:	Visual Flight Rules
VMC	:	Visual Meteorological Conditions

INTRODUCTION

SYNOPSIS

On 6 March 2008, a Transall C-160 aircraft, registered PK-VTQ, operated by PT. Manunggal Air, was on an unscheduled freight flight from Sentani Airport, Jayapura, to Wamena Airport, Papua. There were six people on board; two pilots, one flight engineer, one AME (Aircraft Maintenance Engineer), one Mechanic, one FOO (Flight Operation Officer).

The Beta lights did not illuminate during the landing roll at Wamena, so reverse thrust could not be used. The pilots used maximum brake action to slow the aircraft, and rolled through to the end of runway 15, then backtracked the aircraft towards taxiway "E", about 450 meters from the departure end of runway 15.

The air traffic controller informed the Transall crew that heavy smoke was coming from the left main-wheels, and activated the crash alarm. The pilots stopped the aircraft on taxiway "E", and the occupants disembarked and attempted to extinguish the wheel-bay fire with a hand held extinguisher.

The airport rescue fire fighting service (RFFS) took 15 minutes to commence applying foam to the fire. The attempts to extinguish the fire were unsuccessful, and the fire destroyed the aircraft and its cargo of fuel in drums.

The investigation determined that the left main wheels' brakes overheated during the landing roll. Due to the extreme fire damage, the investigation was not able to determine the condition of the brake pads at the time of the landing, and if that may have contributed to the overheating.

A fire commenced in the brake area of one or more of the left main landing gear wheels. Sections of the left aft main wheels', inner and outer brake disks were substantially damaged, with sections missing; burnt away. The investigation was unable to determine the location of the source of the fire propellant. It is likely that brake system hydraulic fluid under pressure, was the propellant that fed the fire.

The National Transportation Safety Committee's report includes recommendations to the Directorate General of Civil Aviation to address safety deficiencies to ensure compliance with ICAO Annex 14 Standards. The safety deficiencies are with respect to the status of the RFFS equipment at Wamena, and the need to establish and exercise an Emergency Response Plan for Wamena.

1 FACTUAL INFORMATION

1.1 HISTORY OF THE FLIGHT

On 6 March 2008, a Transall C-160 aircraft, registered PK-VTQ, operated by PT. Manunggal Air, was on an unscheduled freight flight from Sentani Airport, Jayapura, to Wamena Airport, Papua. There were seven people on board; two pilots, two engineers, and three flight officers.

The pilots reported that the approach and landing were normal. However, they told the investigators that both Beta lights did not illuminate during the landing roll, so they could not use reverse thrust. They reported that they used maximum brakes to slow the aircraft, and rolled through to the end of runway 15. During the 180-degree right turn at the end of the runway, they felt the left brakes grabbing, and had to use increased thrust on the left engine to assist the turn. After completing the turn, the pilots backtracked the aircraft towards taxiway "E", about 450 meters from the departure end of runway 15.

The air traffic controller informed the Transall crew that heavy smoke was coming from the left main wheels, and that they should proceed to taxiway "E" and stop on the taxiway. Before the aircraft entered taxiway "E", the controller activated the crash alarm.

The pilots stopped the aircraft on taxiway "E", and the occupants disembarked and attempted to extinguish the wheel-bay fire with a hand held extinguisher.

Figure 1: Transall C-160, PK-VTQ, on taxiway "E" at Wamena

The airport rescue fire fighting service (RFFS) arrived at the aircraft 10 minutes after the aircraft came to a stop on taxiway “E”. It took a further 5 minutes to commence applying foam. The attempts to extinguish the fire were unsuccessful, and the fire destroyed the aircraft and its cargo of fuel in drums.

Investigators found molten metal on the runway along the left wheel track for about 16 meters, about 100 meters from taxiway “E”, between taxiway “E” and the departure end of runway 15. There was also molten metal along the left wheel track on taxiway “E”.

1.2 INJURIES TO PERSONS

None of the occupants or persons on the ground were injured.

1.3 DAMAGE TO AIRCRAFT

Fire destroyed the aircraft and its cargo of fuel in drums, after the aircraft stopped on taxiway “E”.

Figure 2: Burnt general freight, including diesoline and turbine fuel in drums

1.4 OTHER DAMAGE

There was no damage to other property or the environment.

1.5 PERSONNEL INFORMATION

Details for this section of the report for the pilots and Flight Engineer were requested from the operator, but at the time of finalizing the draft report some of the details had not been supplied to the investigation.

1.5.1 Pilot in command

Gender	:	Male
Date of birth	:	04 April 1974
Nationality	:	Indonesian
License	:	ATPL
Validity to	:	7 April 2008 – 30 April 2009
Type rating	:	Transall C-160
Medical certificate	:	Class 1
Date of last medical	:	14 February 2008
Total time	:	5,120 hours
In command C160	:	1,545 hours
Last 90 days	:	110:45
Last 7 days	:	27:45
Last 24 Hours	:	00:45

1.5.2 Copilot

Gender	:	Male
Date of birth	:	22 December 1964
Nationality	:	Indonesian
License	:	ATPL
Valid to	:	7 April 2008 – 30 April 2009
Type rating	:	Transall C-160
Medical certificate	:	Class 1
Date of last medical	:	14 February 2008
Total time	:	7,037 hours
Total as copilot C160	:	459 hours
Last 90 days	:	108:45
Last 7 days	:	27:45
Last 24 Hours	:	00:45

1.5.3 Flight Engineer

Gender	:	Male
Date of birth	:	28 June 1940
Nationality	:	Indonesian
License	:	FE
Valid to	:	11 July 2007 – 30 July 2008
Type rating	:	Transall C-160
Medical certificate	:	Class I
Date of last medical	:	11 July 2007

Total time	:	22,000 hours
Total as flight engineer C160	:	8,000 hours
Last 90 Days	:	115:10
Last 7 days	:	17:10
Last 24 Hours	:	00:45

1.6 AIRCRAFT INFORMATION

1.6.1 General

Registration	:	PK–VTQ
Manufacturer	:	Aerospatiale
Country of Manufacturer	:	France
Type /Model	:	C-160
Serial Number	:	F-235/AAI
Date of Manufacture	:	1985
Certificate of Airworthiness		
Valid to	:	28 March 2008
Certificate of Registration		
Valid to	:	9 December 2008
Category	:	Freight
Time Since New	:	11,593 hours 33 minutes
Cycles Since New	:	8,715 cycles

1.6.2 Engine

Not relevant to this accident.

1.6.3 Weight and balance

Not relevant to this accident.

1.6.4 Maintenance

The last maintenance the Landing Gear, D Check and 2D Check Inspection on dated 28 September 2007 were carried out.

1.7 METEOROLOGICAL INFORMATION

Not relevant to this accident.

1.8 AIDS TO NAVIGATION

Not relevant to this accident.

1.9 COMMUNICATIONS

Very High Frequency radio communications between the aircraft and the Wamena air traffic controller were normal.

1.10 AERODROME INFORMATION

Airport Name	:	Wamena
Airport Identification	:	WAJW
Elevation	:	5,084 feet
Airport Operator	:	Directorate General of Civil Aviation
Runway Direction	:	15/33
Runway Length	:	1,650 meters
Runway Width	:	30 meters
Surface	:	Asphalt

1.11 FLIGHT RECORDERS

The flight recorders were recovered from the aircraft under the supervision of NTSC investigators. The flight recorder boxes were fire damaged, but the contents of the boxes were not affected by fire or heat. The recorders were sent to the Australian Transport Safety Bureau (ATSB) in Canberra for replay and analysis.

1.11.1 Flight Data Recorder

Manufacturer	: Universal Flight Data Recorder
Part Number	: 980-4100-FWUS
Serial Number	: 8341

Figure 3: Fire damaged Universal Flight Data Recorder box

Figure 4: Undamaged contents of Universal Flight Data Recorder

The ATSB downloaded the data from the Universal Flight Data Recorder (UFDR) and found that only the following parameters were recorded:

- Elapsed time
- Pressure Altitude
- Indicated Airspeed
- Magnetic Heading
- VHF keying

1.11.2 Cockpit Voice Recorder

Manufacturer	: Sunstrand
Type/Model	: AV557C
Part Number	: 980-6005-074
Serial Number	: 9327

Figure 5: Fire damaged Cockpit Voice Recorder box

Figure 6: Undamaged contents of Cockpit Voice Recorder

The ATSB also sought to retrieve data from the cockpit voice recorder (CVR). However, recorded data only contained a previous flight sector and was extremely poor quality. The CV was not recording during the flight sector from Jayapura to Wamena, and did not record any data at the time of the occurrence.

1.12 WRECKAGE AND IMPACT INFORMATION

There was molten metal along the Transall's wheel tracks on the runway and taxiway "E".

Figure 7: Molten metal on the runway in the aircraft's wheel tracks

The left aft main wheels' inner and outer brake disks, hydraulic cylinders and lines were substantially damaged. However, the inner brake disc showed evidence of more severe burning, with sections of the disk missing.

Figure 8: The fire started in the left wheel bay. The wings collapsed onto the main wheel area

Figure 9: Arrows point to left main landing gear, front brake outer and inner discs. Right arrow also indicates hydraulic lines

Figure 10: Left main landing gear aft brake inner and outer discs

1.13 MEDICAL AND PATHOLOGICAL INFORMATION

Not relevant to this accident.

1.14 FIRE

The air traffic controller informed the pilots that heavy smoke was coming from the left main landing gear, but did not report seeing flames. No person reported seeing flames until the crew left the aircraft and saw flames in the left wheel bay. A fire erupted shortly after and rapidly engulfed the aircraft.

Figure 11: The RFFS was unable to extinguish the fire

1.15 SURVIVAL ASPECTS

Not relevant to this accident.

1.16 TESTS AND RESEARCH

Not relevant to this accident.

1.17 ORGANISATIONAL AND MANAGEMENT INFORMATION

Aircraft Owner : YAMABRI

Aircraft Operator : PT. Manunggal Air Service
Halim Perdanakusuma Airport
Terminal Building 1st Floor, Room 67
Jakarta 13610
Indonesia

Air Operator Certificate Number: 121-20

1.18 ADDITIONAL INFORMATION

1.18.1 Crew actions to extinguish the fire

The Flight Engineer was the first occupant to disembark. He left the aircraft through the forward left air-stair door, and saw smoke coming from the area of the left main landing gear bay.

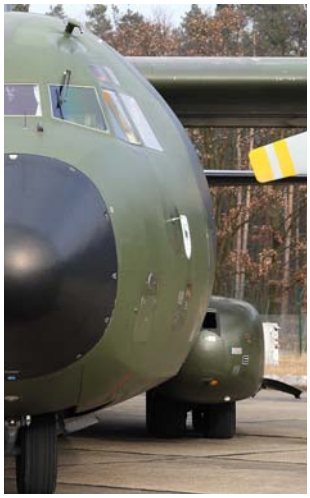

Figure 12: View of a Transall C-160 main landing gear. Note the wheels covered by the landing gear bay

The pilots reported that they left the aircraft after completing the engine shutdown checklist. They looked under the wheel bay and saw what they believed may have been a burning substance dripping from the wheels and flames coming from the left wheel-bay area. The pilots were unable to describe the dripping substance.

The Flight Engineer attempted to extinguish the flames using a fire extinguisher from the cabin of the aircraft. He exhausted the contents of the fire extinguisher on the area of the fire, but the fire intensified and rapidly spread and engulfed the cabin area. The fire self-extinguished after about 3 hours.

1.18.2 Transall C-160 hydraulic brake fluid

The brake system hydraulic pressure was 3000 psi. The brake system hydraulic fluid was AeroShell Fluid 41, a mineral hydraulic fluid used in aircraft systems operating unpressurized between minus 54°C and 90°C, and is pressurized between minus 54°C and 135°C. The United States Specification is MIL-PRF 5606H. AeroShell Fluid 41 has a minimum flash point of 83°C.

1.18.3 Airport Emergency Planning

There was no emergency response plan (ERP) for Wamena Airport.

1.18.4 ICAO Annex 14

ICAO Annex 14 contains Standards and Recommended Practices with respect to Airport Emergency Planning.

Paragraph 9.1.12;

The plan shall contain procedures for periodic testing of the adequacy of the plan and for reviewing the results in order to improve its effectiveness.

Note.— The plan includes all participating agencies and associated equipment.

Paragraph 9.1.13

The plan shall be tested by conducting:

a) a full-scale aerodrome emergency exercise at intervals not exceeding two years; and

b) partial emergency exercises in the intervening year to ensure that any deficiencies found during the full-scale aerodrome emergency exercise have been corrected; and

> reviewed thereafter, or after an actual emergency, so as to correct any deficiency found during such exercises or actual emergency.

Annex 14, Chapter 9, also details the requirements for fire suppressant and fire extinguishing agents.

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

The pilots reported that the approach and landing were normal. From the limited data on the flight data recorder, the investigation concluded that it was likely that the approach profile and speed were normal.

Reverse thrust could not be used during the landing roll, so the pilots used maximum brake action. Due to the destruction of the aircraft, the investigation was unable to determine why the Beta lights did not illuminate during the landing roll, precluding the use of reverse thrust.

There was molten metal along the Transall's wheel tracks on the runway and taxiway "E". Due to the damage caused by the fire, the investigation was not able to determine the origin of the molten metal.

The investigation determined that the left main wheels' brakes overheated during the landing roll. Due to the extreme fire damage, the investigation was not able to determine the condition of the brake pads at the time of the landing, and if that may have contributed to the overheating.

A fire commenced in the brake assembly of one or more of the left main landing gear wheels. Sections of the left aft main wheels', inner and outer brake disks were substantially damaged, with sections missing; burnt away. The evidence was not conclusive due to the extreme fire damage. However, it indicated that a brake cylinder and/or hydraulic line may have failed. The investigation was unable to determine the location of the source of the fire propellant. It is likely that brake system hydraulic fluid under pressure, was the propellant that fed the fire.

The RFFS arrived at the aircraft 10 minutes after the aircraft stopped on taxiway "E". It took the RFFS officers a further 5 minutes to assemble the hoses and commence foam application on the fire. They were unable to extinguish the fire, and the fire self-extinguished about 3 hours later. The RFFS delay in applying fire suppressant resulted in the fire engulfing the aircraft.

3 CONCLUSIONS

3.1 FINDINGS

3.1.1 Aircraft

1. The aircraft had no recorded defects before the accident.
2. The Beta lights did not illuminate during the landing roll, precluding the use of reverse thrust.
3. The brakes overheated due to stopping the aircraft using maximum braking, without the assistance of reverse thrust.

3.1.2 The pilots and flight engineer

1. The pilots and flight engineer were appropriately licensed to conduct the flight.
2. The pilots used maximum brake action because reverse thrust could not be used during the landing roll.
3. The flight engineer attempted to extinguish the fire using a portable fire extinguisher from the aircraft.

3.1.3 Communications

1. The controller provided appropriate advice to the pilots that heavy smoke was coming from the left main-wheels.
2. The controller activated the crash alarm before the aircraft entered taxiway “E”.

3.1.4 Rescue Fire Fighting Service

1. The RFFS team arrived at the aircraft about 10 minutes after the aircraft stopped on taxiway “E”.
2. The RFFS commenced applying foam suppressant to the aircraft 5 minutes after they arrived at the aircraft.
3. The fire, which started in the left main wheel bay, engulfed the aircraft.
4. There was no Emergency Response Plan at Wamena.

3.2 CAUSES

The aircraft's left main wheels' brakes overheated during the landing roll and a fire commenced in the brake assembly of one or more of the left main landing gear wheels.

The evidence indicated that a brake cylinder and/or hydraulic line may have failed. It is likely that brake system hydraulic fluid under pressure, was the propellant that fed the fire.

There was no Emergency Response Plan at Wamena. The RFFS delay in applying fire suppressant resulted in the fire engulfing the aircraft.

4 SAFETY ACTIONS AND RECOMMENDATIONS

4.1 SAFETY ACTIONS

Management of PT. Manunggal Air Service recommendations to phase out aircraft type Transall C-160, has been carried out effective on 10 July 2009.

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

As a result of the investigation into the accident involving Transall C160, registered PK-VTQ, at Wamena, Papua, on 6 March 2008, the National Transportation Safety Committee issues the following recommendations to address safety issues identified in this report.

4.2.1 Recommendation to Directorate General of Civil Aviation (DGCA)

The NTSC recommends that Directorate General of Civil Aviation (DGCA) review the status of the RFFS equipment at Wamena (a Class 2 airport) to ensure compliance with ICAO Annex 14 Standards.

4.2.2 Recommendation to Directorate General of Civil Aviation (DGCA)

The NTSC recommends that the Directorate General of Civil Aviation (DGCA) establish and exercise an Emergency Response Plan for Wamena in accordance with ICAO Annex 14 Standards.