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**NATIONAL
TRANSPORTATION
SAFETY
COMMITTEE**

Aircraft Serious Incident Investigation Report

AIRBUS A320-321

PK-YVE

METRO BATAVIA AIRLINES

POLONIA AIRPORT, MEDAN

NORTH SUMATERA

REPUBLIC OF INDONESIA

1 JUNE 2008



**NATIONAL TRANSPORTATION SAFETY COMMITTEE
MINISTRY OF TRANSPORTATION
REPUBLIC OF INDONESIA
2009**

This report was produced by the National Transportation Safety Committee (NTSC), Karya Building 7th Floor Ministry of Transportation, Jalan Medan Merdeka Barat No. 8 JKT 10110, Indonesia.

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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 |
| 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 Copilot |
| FDR | Flight Data Recorder |
| FOQA | Flight Operation Quality Assurance |
| GPWS | Ground Proximity Warning System |
| 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) |
| Kts | 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 |
| °C | Degrees Celsius |
| 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 |

SYNOPSIS

On 1 June 2008, an Airbus A320 aircraft, registration PK-YVE, was being operated by Metro Batavia Airlines (Batavia Air) flight number 7P-591, on a scheduled passenger flight from Jakarta to Medan. The flight departed at 00:10 UTC (07:10 local time) with an estimated arrival time at Medan of 02:25. There were 140 people on board; two pilots, five cabin crew, and 133 passengers.

The aircraft touched down towards the departure end of the touch-down area of runway 05 at Polonia Airport, Medan at 03:04. After a landing run of 41 seconds, the aircraft stopped on the runway adjacent to taxiway 'D', approximately 1,200 meters from the estimated point of touch down. Three main-wheel tires and two main wheels were substantially damaged. The aircraft could not be taxied from the runway to the apron, nor could it be towed to the apron due to damage to the wheels.

The passengers and crew disembarked normally at taxiway 'D'; there were no injuries.

Following an inspection of the landing gear and replacement of the damaged wheels, the aircraft was towed to the apron at 10:10. The runway was closed for about 7 hours.

The investigation found that the left landing gear down-lock cable was broken. The aircraft touched down with the wheel brakes locked due to a hydraulic lock in the system, which was the result of an incorrect manual landing gear extension procedure being used by the pilots.

The pilots' actions indicated that they did not sufficiently understand the aircraft's landing gear system, resulting in them using inappropriate trouble shooting and rectification procedures.

The pilots were not sufficiently confident of the aircraft's fuel state to conduct a go around and fly past as cleared by ATC.

With the release of the final report, the National Transportation Safety Committee's (NTSC) issued two recommendations to address the safety deficiencies identified in the report. These covered flight crew technical knowledge of aircraft systems, fuel planning and flight management, and the regulatory oversight of the airline's training program.

1. FACTUAL INFORMATION

1.1 History of the Flight

On 1 June 2008, an Airbus A320 aircraft, registration PK-YVE, operated by Metro Batavia Airlines (Batavia Air) as a flight number 7P-591, was being operated on a scheduled passenger flight from Jakarta to Medan.

The aircraft departed from Soekarno – Hatta Airport, Jakarta at 00:10 Coordinated Universal Time¹ (UTC) (07:10 local time), under the instrument flight rules (IFR). The estimated time of arrival (ETA) at Polonia Airport, Medan, North Sumatera was 02:25. The pilot in command (PIC) was the handling pilot and the copilot was the support/monitoring pilot.



Figure 1: PK-YVE, Batavia Air Airbus A320 at Medan on 2 June 2008

There were 140 people on board; two pilots, five cabin crew, and 133 passengers.

The flight plan indicated that the aircraft was carrying sufficient fuel for the sector to Medan, plus fuel to fly to alternate airport Batam, holding at Batam and statutory reserves.

The aircraft touched down towards the departure end of the touch-down area of runway 05 at Polonia Airport, Medan at 03:04. After a landing run of 41 seconds, it stopped on the runway adjacent to taxiway 'D', approximately 1,200 meters from the estimated point of touch down. Three main-wheel tires and two main wheels were substantially damaged.

¹ The 24-hour clock is used in this report to describe the local time of day, Central Indonesia Standard Time (Waktu Indonesia Barat (WIB)) as specific events occurred. Central Indonesian Standard Time is Coordinated Universal Time (UTC) + 7 hours.

During the final approach the left main landing gear position indicator light was 'red' color and the ECAM (Electronic Centralised Aircraft Monitoring) system display indicator was 'amber' color. The PIC decided to abort the approach and with approval from air traffic control he conducted a go around.

In accordance with ATC instructions he flew the aircraft to the north of Medan on the 335 degree radial of the Medan VOR², and climbed to the holding altitude of 5,000 feet and held for about 45 minutes.

While holding, the PIC instructed the copilot to recycle the landing gear several times, but the indications remained the same; left landing gear indication red, and ECAM display amber. The PIC then instructed the copilot to do the landing gear extension manually, which he did several times without any change to the landing gear indication.

The PIC instructed the copilot to review the aircraft's Quick Reference handbook (QRH), page 2.12 "landing with abnormal landing gear". The items on the QRH required:

Anti skid and nose wheel steering "OFF".
Maximum brake pressure "1000 PSI"
Ground spoiler "Do not arm"

The airport authority was informed by air traffic control to prepare for an emergency landing. The airport authority then prepared for the pending emergency landing and fire fighting vehicles and personnel were positioned to stand by near taxiway 'D'.

The PIC decided to land the aircraft on runway 05 and subsequently landed with anti skid OFF in accordance with the QRH requirements at page 2.12. However the brake pressure was 4,032 psi, significantly higher than the QRH specified maximum brake pressure.

The PIC reported that the right main landing gear touched down first. There was no fire and the tire fuses did not melt.

An emergency evacuation was not required, and all of the aircraft's occupants disembarked normally through the aircraft's forward left door and using airstairs. There were no injuries.

The investigation found that the brakes for wheels 1, 2, and 3 were jammed, however there was no evidence of those wheel brakes overheating, and there was no evidence of excessive brake application by the pilots.

The PIC could not recall how many times the landing gear had been cycled in an attempt to resolve the indication anomaly. The copilot informed the investigator that he did cycle the landing gear several times (he could not remember exactly how many times) without any improvement of landing gear indication (red and amber). He had then lowered the landing gear manually. There was no published limitation on the number of times the landing gear can be cycled.

² Very High Frequency omni-directional radio range navigation aid.

The copilot reported that after a full turn (clockwise) of the landing gear cranking mechanism, he turned the cranking mechanism anti clockwise, returning it to the normal position.

In the touch-down area, tire marks for PK-YVE were only clear for wheels 1 and 2. (Figure 2 and Figure 3).

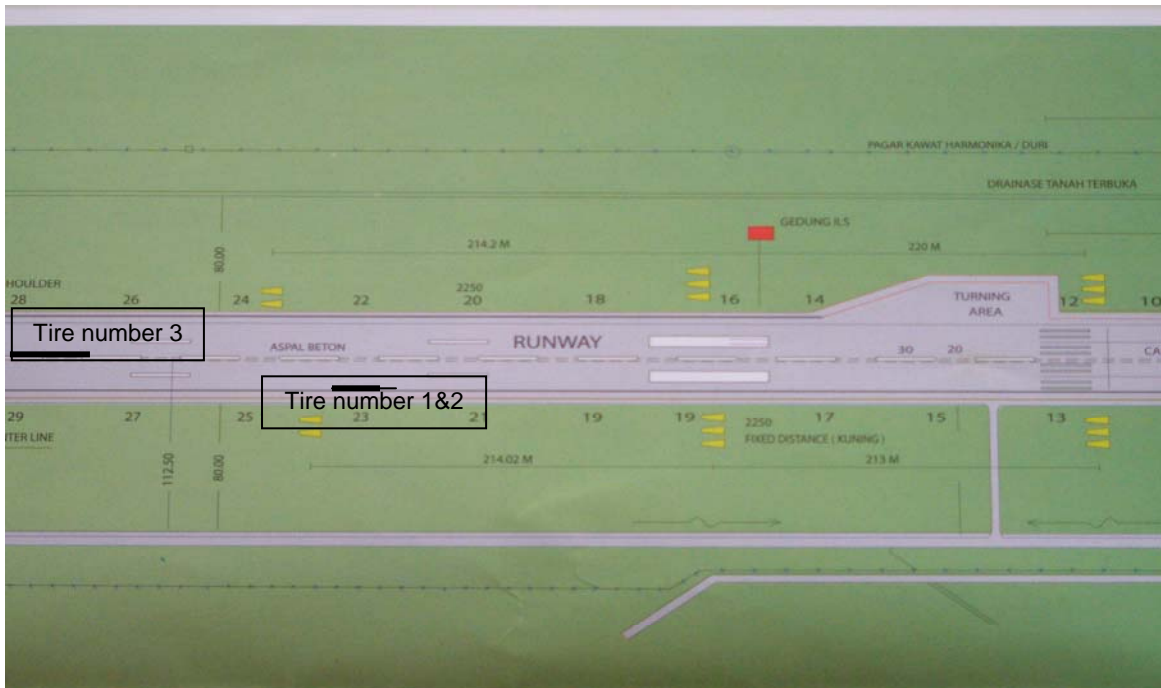


Figure 2: Touch down tire marks on touch down area

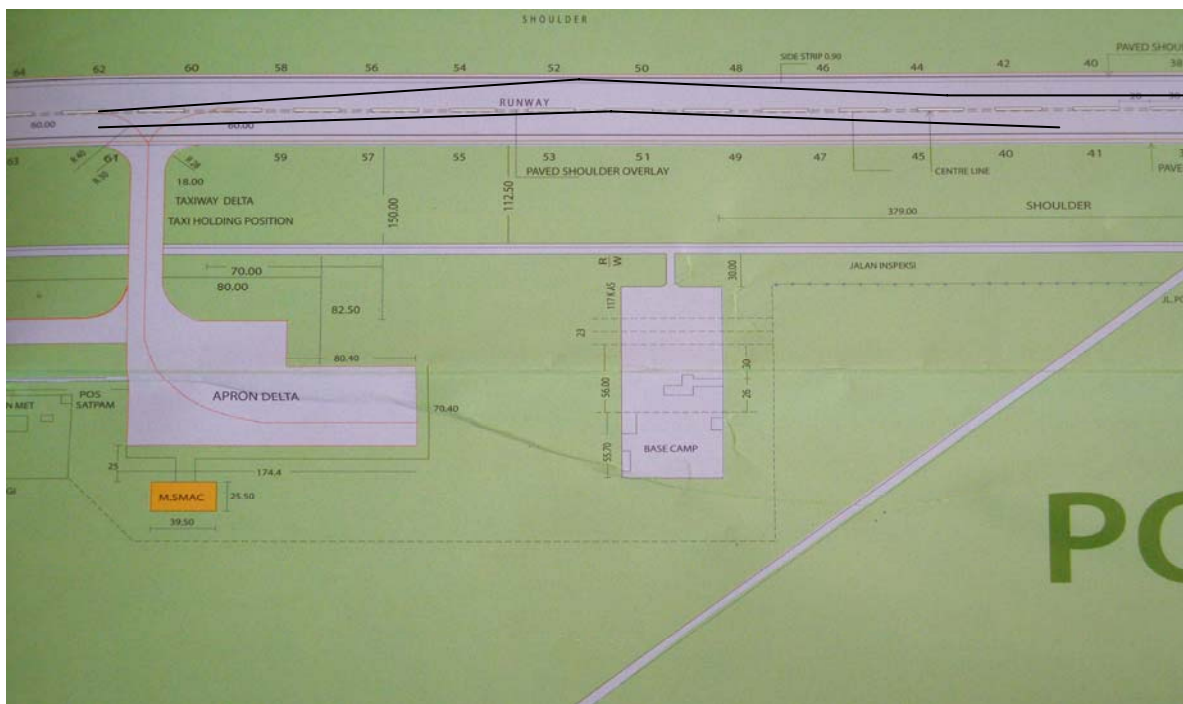


Figure 3: Rolling tire marks on runway up to final stop at adjacent to taxi way D

1.2 Injuries to Persons

| Injuries | Crew | Passengers | Others | TOTAL |
|----------------|----------|------------|----------|------------|
| Missing/ Fatal | 0 | 0 | 0 | 0 |
| Serious | 0 | 0 | 0 | 0 |
| None | 7 | 133 | 0 | 140 |
| TOTAL | 7 | 133 | 0 | 140 |

1.3 Damage to aircraft

Tire numbers³ 1, 2 and 3 were substantially damaged and wheel numbers 1 and 2 were also substantially damaged.



Figure 4: Wheel number 1

1.4 Other damage

There was no damage to other property.

1.5 Personnel information

1.5.1 Pilot in command

Gender : Male
Date of birth : 25 November 1973
Nationality : Indonesia
Marital status : Married
Date of joining company : August 2003
License : ATPL 4567

³ Main landing gear wheels/tires are numbered from left outer number 1, to the right outer number 4.

Date of issue : 27 July 2007
Valid to : 30 September 2008
Type rating : Airbus A320F
Date of last medical : 21 April 2008
Last line check : 21 May 2008
Last proficiency check : 20 March 2008

FLIGHT TIME

Total time : 6,047 hours
This make & model : 22 hours
Last 90 days : 171 hours
Last 30 days : 79 hours
Last 24 Hours : 7 hours 20 minutes

1.5.2 Copilot

Gender : Male
Date of birth : 12 November 1985
Nationality : Indonesia
Marital status : Single
License : ATPL 5972
Valid to : 30 June 2008
Type rating : A320F
Instrument rating : 31 January 2009
Date of last medical : 27 December 2007
Last line check : 1 April 2008
Last proficiency check : 27 January 2008

FLIGHT TIME

Total time : 616 hours
This make & model : 446 hours
Last 90 days : 145 hours
Last 30 days : 66 hours
Last 24 Hours : 3 hours 15 minutes

1.6 Aircraft Information

1.6.1 Aircraft Data

| | |
|------------------------------|------------------------------------|
| Registration Mark | : PK-YVE |
| Manufacturer | : Airbus |
| Country of Manufacturer | : France |
| Type/ Model | : A320 – 321 |
| Serial Number | : 441 |
| Date of manufacture | : April 1993 |
| Certificate of Airworthiness | |
| Issued | : 18 March 2009 |
| Validity | : 6 July 2008 |
| Certificate of Registration | |
| Issued | : 19 March 2008 |
| Validity | : 18 March 2009 |
| Category | : Transport |
| Crew (Cockpit/Cabin) | : 2/5 |
| Time Since New | : 23,153 hours 33 minutes |
| Cycles Since New | : 30,801 |
| Last C-10 Check | : 30 March 2007 (TSN=20,434:2 hrs) |
| Last D-01 Check | : 18 April 2003 (TSN=3852:13 hrs) |
| Next C-11 Check | : 26,434 hrs |
| Last Event 4 | : 14 April 2008 (TSN=22,852 hrs) |
| Next Event 5 | : 26 June 2008 |

1.6.2 Engine Data

| | |
|------------------------|-----------------|
| Manufacturer | : Rolls Royce |
| Type/Model | : V 2500-A1 |
| Serial Number-1 engine | : V 0232 |
| ▪ Time Since New | : 22,516 hrs. |
| ▪ Cycles Since New | : 29,327 cycles |
| Serial Number-2 engine | : V0259 |
| ▪ Time Since New | : 19,170 hrs |
| ▪ Cycles Since New | : 28,377 cycles |

1.6.3 Weight and Balance

Load and centre of gravity were within the allowable limits for the landing.

1.6.4 Maintenance

Maintenance had been carried out in accordance with the operators approved maintenance schedule.

The left landing gear down-lock cable had been broken since the previous landing. The cable was shorter than the original cable. The cable may have been shortened during previous maintenance to change the proximity switch, effectively creating tension on the cable during landing gear extension and retraction cycles.



Figure 5: Broken left landing gear down lock cable

1.7 Meteorological Information

| | 02:00 UTC | 02:30 UTC |
|------------|-----------|-----------|
| Wind | Calm | Calm |
| Visibility | 5,000 m | 6,000 m |
| Weather | Haze | Haze |
| Cloud | BKN 017 | BKN 017 |

1.8 Aids to Navigation

Not relevant to this serious incident.

1.9 Communications

Not relevant to this serious incident

1.10 Aerodrome Information

1.10.1 General

| | |
|------------------------|---|
| Airport Name | : Polonia Airport |
| Airport Identification | : WIMM / MES |
| Coordinate | : 03 33 059 N 098 40 094 E |
| Elevation | : 26.50 meters |
| Airport Operator | : Angkasa Pura II |
| Class | : Category 1 |
| Runway Direction | : 05 – 23 |
| Runway Length | : 2,900 meters |
| Runway Width | : 45 meters |
| Surface | : Asphalt concrete |
| Address | : Polonia International Airport Jl. Imam Bonjol Medan, North Sumatera |

1.11 Flight Recorders

The flight recorders were recovered from the aircraft on 2 June 2008 under the supervision of NTSC investigators. The data download and analysis was conducted by the Australian Transport Safety Bureau in Canberra, Australia.

1.11.1 Digital Flight Data Recorder (DFDR)

| | |
|---------------|---------------------|
| Manufacturer | : L3 Communications |
| Type/Model | : F-1000 |
| Part Number | : S800-3000-00 |
| Serial Number | : 000313063 |

1.11.2 Cockpit Voice Recorder (CVR)

| | |
|---------------|--------------|
| Manufacturer | : Fairchild |
| Type/Model | : A100A |
| Part Number | : 93-A100-83 |
| Serial Number | : 54416 |

1.11.3 Notable facts from the CVR

Power was left applied to the recorder after the aircraft came to a stop on the runway, so much of the CVR data for the flight was over written. Eight minutes of the flight was available, which covered the final approach and landing.

The cockpit voice recorder revealed that the pilots informed the approach controller that they had an ‘abnormal condition; a problem with the left main

landing gear'. The pilots subsequently informed the controller 'we have runway in sight and we need to land'. The controller replied, 'Batavia 591 confirm to go around and we'll check your landing gear'. The crew replied 'negative sir, I say again negative due to limited fuel'. The controller then cleared them to land and instructed them to contact the tower.

From an altitude of 400 feet (radio altitude 230 feet) on short final, the ground proximity warning sounded the alert 'Too low, gear' nine times until the automated command 'retard' (for power lever reduction) during the landing flare.

1.11.4 FDR Readout

At 02:46:35, while at an altitude of 3,428 feet, during the landing gear recycling, the brake pressure increased to 4032 psi. The brake pressure of 4,032 psi remained constant throughout the approach and landing roll. The aircraft touched down at 02:56:07 and the landing roll took 41 seconds until the aircraft was stopped on the runway. The flight data recorder showed that the aircraft touched down at a groundspeed of 126 knots, with a slight tail wind of 5 knots. Flaps were in the 40 degree, landing configuration.

1.12 Wreckage and impact information

Other than the damaged wheels and tyres there was no other damage to the aircraft as a result of the wheel brakes being locked at touchdown.



Figure 6: Tire mark on runway close to taxi way D



Figure 7: Tire number 1 and number 2 marks



Figure 8: Tire number 3 mark



Figure 9: Touch down number 1 and number 2 tire marks

1.13 Medical and Pathological Information

Not relevant to this serious incident.

1.14 Fire

There was no fire.

1.15 Search and survival aspects

Not relevant to this serious incident.

1.16 Test and Research

Not relevant to this serious incident.

1.17 Organizational and Management Information

1.17.1 Batavia Air

Aircraft Operator : Metro Batavia Airlines
Address : Jl. Ir. H. Juanda No. 15 Jakarta
Certificate Number : AOC 121-007

1.18 Additional Information

No additional information relevant to the occurrence.

2. ANALYSIS

The PIC reported that the aircraft touched down in the touch-down area, with the right main landing gear touching the ground first, and the left main landing gear touching down further along the runway. The investigators were unable to accurately determine the initial touch-down point for main wheels 3 and 4, specifically if that occurred before wheels 1 and 2 touched down.

The short distance of the tire marks for wheel numbers 1 and 2 indicated that the aircraft bounced, because the next evidence of tire marks was the tire marks for tire 3, approximately 200 meters beyond the initial touch-down marks for tires 1 and 2. This evidence showed that it was likely that the aircraft touched down with the left main landing gear, approximately at the departure end of the touch-down area. The aircraft then bounced and the right landing gear touched the runway followed shortly after by the left wheels contacting the runway again.

These marks were heavy and provided a continuous track of the aircraft along the runway to a position adjacent to taxiway D. There was evidence that the direction of those marks tracked initially right of centerline and then veered to the left of centerline. (See figures 3, 4, 5, 6, 7).

Tire marks on the runway indicated that wheels 1, 2, and 3 did not rotate during the landing. Other supporting evidence of wheels not rotating was the pattern of the damaged wheels and tires. (See figures 8 and 9). Wheel number 4 was not damaged and there were no distinctive tire marks on the runway from tire number 4. This indicated that wheel 4 was rotating during the landing roll. .

The brakes for wheels 1, 2, and 3 were jammed, however there was no evidence of those wheel brakes overheating, and there was no evidence of excessive brake application by the pilots. Brake pressure was excessively high at 4,032 psi.

The copilot lowered the landing gear manually while the landing gear selector handle was in the down position, and then returned the manual extension handle to the normal position. By cranking the manual landing gear extension handle when the landing gear lever was in the down position, the hydraulic pressure remained on the landing gear and brake system lines, and remained at 4,032 psi, because the return line to the reservoir was closed by the full cranking action. It was then not possible for the hydraulic pressure to be reduced.

The flight manual instructed that after cranking the landing gear down, the handle was not to be returned to the normal position.

The copilot stated that after the corrective action attempts, the landing gear indication was still illuminated (left landing gear 'red', and ECAM was still amber).

The pilots said that ECAM showed amber lights for all three landing gear. However, the aircraft flight manual states that there are other indications available to the crew to alert them to the landing gear position, but the pilots relied solely on the amber light indications. It is apparent that the landing gear red indication without a light on landing-gear lever did not alert the pilots that the gear indication was a false warning.

The investigation found that the left landing gear down-lock cable was broken. The aircraft touched down with the wheel brakes locked due to a hydraulic lock in the system, which was the result of an incorrect manual landing gear extension procedure being used by the pilots. All other landing gear systems were found to be normal.

The pilots' actions indicated that they did not sufficiently understand the aircraft's landing gear system, resulting in them using inappropriate trouble shooting and rectification procedures.

In response to the air traffic controller's instruction 'Batavia 591 confirm to go around and we'll check your landing gear', the crew replied 'negative sir, I say again negative due to limited fuel'. The flight plan allowed for diversion to alternate airport Batam and holding at Batam. Because the crew held north west of Medan for 45 minutes and did not divert to Batam, the investigation determined that there should have been sufficient fuel on board to execute a go around/flypast as cleared by ATC.

The reason the pilot stated 'limited fuel' was not explained and therefore remains undetermined.

3. CONCLUSION

3.1 Findings

1. The aircraft was maintained in accordance with approved schedule of maintenance.
2. The Pilot in Command (PIC) was appropriately licensed as pilot in command of Airbus A 320 aircraft.
3. The copilot was appropriately licensed as a copilot of Airbus A 320 aircraft.
4. The PIC and copilot were paired for the first time on the occurrence flight
5. The pilots did not follow correct procedures for the manual landing gear extension.
6. The brake pressure was excessively high; 4,032 psi.
7. The aircraft touched down with the brakes locked on.
8. The PIC and copilot did not have adequate technical knowledge of the aircraft's landing gear systems.
9. The pilots were not sufficiently confident of the aircraft's fuel state to conduct a go around and fly past as cleared by the air traffic controller.

4. SAFETY RECOMMENDATIONS

As result of investigation into the Batavia Air, Airbus 320, PK-YVE, serious incident that occurred on 1 June 2008 at Polonia Airport, Medan, North Sumatera, the National Transportation Safety Committee's (NTSC) issues the following recommendations to address the safety deficiencies identified in this report.

4.1 Recommendation to Batavia Air

The National Transportation Safety Committee recommends that Batavia Air should review its training of Airbus A320 flight crew to ensure they have adequate:

1. technical knowledge of the Airbus A320 systems, with particular attention to the landing gear system and abnormal indications; and
2. knowledge of fuel planning and flight management requirements.

4.2 Recommendation to Directorate General Civil Aviation

The National Transportation Safety Committee recommends that the Directorate General Civil Aviation, as part of its safety audit/surveillance oversight of Batavia Air, assess the adequacy of Batavia Air's training program.