

FINAL
KNKT.08.10.20.04

**NATIONAL
TRANSPORTATION
SAFETY
COMMITTEE**

Aircraft Serious Incident Investigation Report

**PT. Garuda Indonesia
PK-GWT
Boeing Company 737-4K5
Sultan Mahmud Badaruddin II, Palembang,
Republic of Indonesia**

2 October 2008



**NATIONAL TRANSPORTATION SAFETY COMMITTEE
MINISTRY OF TRANSPORTATION
REPUBLIC OF INDONESIA
2011**

This Final Report was produced by the National Transportation Safety Committee (NTSC), Ministry of Transportation Building 3rd Floor, Jalan Merdeka Timur No. 5 Jakarta 10110, Indonesia.

The report is based upon the investigation carried out by the NTSC in accordance with Annex 13 to the Convention on International Civil Aviation, the Indonesian Aviation Act (UU No. 1/2009) and Government Regulation (PP No. 3/2001).

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GLOSSARY OF ABBREVIATIONS

| | | |
|-------------|---|---------------------------------------------------------------------------------------------------|
| ALAR | : | Approach-and-Landing Accident Reduction |
| AOC | : | Air Operator Certificate |
| ATC | : | Air Traffic Control |
| ATPL | : | Air Transport Pilot License |
| ATS | : | Air Traffic Service |
| °C | : | Degrees Celsius |
| CASR | : | Civil Aviation Safety Regulation |
| CRM | : | Cockpit Recourses Management |
| CVR | : | Cockpit Voice Recorder |
| DME | : | Distance Measuring Equipment |
| F/O | : | First officer or Copilot |
| FCOM | : | Flight Crew Operation Manual |
| FDR | : | Flight Data Recorder |
| ICAO | : | International Civil Aviation Organization |
| IFR | : | Instrument Flight Rules |
| ILS | : | Instrument Landing System |
| KNKT / NTSC | : | Komite Nasional Keselamatan Transportasi / National Transportation Safety Committee |
| MNA | : | Minimum Descend Altitude |
| NM | : | Nautical mile(s) |
| NOTAM | : | Notice to Airmen |
| PIC | : | Pilot in Command |
| PF | : | Pilot Flying |
| PM | : | Pilot Monitoring |
| 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 |
| SSCVR | : | Solid State Cockpit Voice Recorder |
| SSFDR | : | Solid State Flight Data Recorder |
| TT/TD | : | Ambient Temperature/Dew Point |
| UTC | : | Universal Time Coordinate |
| VOR | : | VHF Omnidirectional Range radio |

INTRODUCTION

SYNOPSIS

On 2 October 2008, a Boeing Company 737-4K5 aircraft, registered PK-GWT was being operated on an Instrument Flight Rules (IFR) scheduled passenger service from Jakarta Soekarno-Hatta Airport¹ to Sultan Mahmud Badaruddin II Airport, Palembang².

The co-pilot who occupied left seat was a candidate captain under training was acting as Pilot Flying (PF) and the Pilot in Command (PIC) occupied right seat was a training captain (instructor) was acting as Pilot Monitoring (PM).

Prior to the departure from Jakarta, the pilots received a departure briefing consisting of weather, flight plan, and *notams*³. The *notams* contained significant information for Palembang Airport that the parallel taxiway from intersection Alpha to taxiway Bravo were closed due to work in progress, The runway 29 Instrument Landing System (ILS) was not in service due to the replacement of its localizer antenna.

When the aircraft entered Palembang's Controlled Airspace, the crew was instructed to descend to 2,500 feet for the VOR/DME approach to runway 29.

At 00:30 the PIC reported that he had the runway insight after assured the co-pilot that they all have seen the runway. The Aerodrome Controller gave the crew the clearance to land.

The co-pilot was concentrating on instrument scanning during approach by following the VOR radial. He wanted to improve his ability to fly manual during an instrument approach. The PIC then rechecking whether any item that has been missed prior to land.

The ATC saw that the aircraft was not on the approach path properly and came close to the parallel taxiway.

At 00:32 the aircraft landed on the parallel taxiway.

Both pilots were concentrating looking inside and not sufficiently cross checking to the outside situation. The aircraft was continuously descend below Minimum Descend Altitude (MDA) and landed.

Pilot monitoring was not sufficiently looked outside to cross-check the flight path to the runway.

There was misalignment of the VOR approach path.

The controller noticed that the aircraft was not aligned with the runway.

According to the ATS procedure, the controller could only command the pilot to go around whenever the runway is unsafe to land.

¹ Jakarta Soekarno-Hatta Airport will be named Jakarta for the purposes of this report.

² Sultan Mahmud Badarudin II Airport, Palembang will be named Palembang for the purposes of this report.

³ Notams (Notification to Airmen) is the information concerning the establishment condition or changes in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential for personal concerned with flight operation.

1 FACTUAL INFORMATION

1.1 History of the Flight

On 2 October 2008, a Boeing Company 737-4K5 aircraft, registered PK-GWT was being operated on an Instrument Flight Rules (IFR) scheduled passenger service from Jakarta Soekarno-Hatta Airport to Sultan Mahmud Badarudin II Airport, Palembang. There were two pilots, 4 flight attendants, and 49 passengers on board.

The co-pilot who occupied left seat was a candidate captain under training and the Pilot in Command (PIC) occupied right seat was a training captain (instructor). The co-pilot acted as the Pilot Flying (PF) during this flight, and the PIC acted as Pilot Monitoring (PM).

Prior to the departure from Jakarta, the pilots received a departure briefing consisting of weather, flight plan, and notams. The notams contained significant information for Palembang Airport that the parallel taxiway from intersection Alpha to taxiway Bravo was closed due to work in progress. The runway 29 Instrument Landing System (ILS) was not in service due to replacement of its localizer antenna.

The aircraft departed from Jakarta at 23:51 UTC. When it entered Palembang's Controlled Airspace at 00:13, the crew was instructed by the Palembang Approach controller to track direct to the initial approaches point BANJAR and descends to 2,500 feet for the VOR/DME approach to runway 29. During the approach, the PIC reported that they were conducting the VOR/DME instrument approach procedure for runway 29.

At 00:28 the PIC reported that the aircraft was on final approach for runway 29.

At 00:30 the PIC reported that he had the runway insight after assured the co-pilot that they all have seen the runway. The Aerodrome Controller gave the crew the clearance to land.

The co-pilot was concentrating on instrument scanning during approach by following the VOR radial. He wanted to improve his ability to fly manual (without auto pilot) during an instrument approach. The PIC then rechecked if there was any item missed prior to land.

The ATC saw that the aircraft was not on the approach path properly and came close to the parallel taxiway.

At 00:32 the aircraft landed on the parallel taxiway, touching down 500 meters from the eastern end. Both pilot then realized that they were on the taxiway and also saw the barrier on the taxiway indicated that some part of the taxiway was closed. The PIC immediately applied manual brake and the aircraft stopped at the intersection of taxiway Charlie. The landing roll distance was about 700 meters.

The aircraft was then instructed to taxi via runway and taxiway Echo to the apron. No one was injured in this serious incident.



Figure 1: Touch down marks of the main wheel



Figure 2: Brake marks of both main wheels and the barrier on intersection Charlie taxiway

1.2 Injuries to Persons

| Injuries | Flight crew | Passengers | Total in Aircraft | Others |
|--------------|-------------|------------|-------------------|----------|
| Fatal | - | - | - | - |
| Serious | - | - | - | - |
| Minor/None | 6 | 49 | 55 | - |
| TOTAL | 3 | 49 | 55 | - |

1.3 Damage to Aircraft

The number-2 main-wheel⁴ tyre was damaged. There was no other damage to the aircraft.

1.4 Other Damage

No other damage was reported.

1.5 Personnel Information

1.5.1 Pilot in command

| | |
|------------------------|--------------------|
| Gender | : Male |
| Date of birth | : 22 May 1957 |
| Marital status | : Married |
| Nationality | : Indonesia |
| License | : ATPL |
| Valid to | : 29 November 2008 |
| Aircraft type rating | : Boeing B737 |
| Instrument rating | : Valid |
| Medical certificate | : Class 1 |
| Date of medical | : 29 May 2008 |
| Valid to | : 29 November 2008 |
| Last line check | : 10 April 2008 |
| Last proficiency check | : 16 July 2008 |

Flight Time

| | |
|---------------|------------------------|
| Last 90 days | : 205 hours 22 minutes |
| Last 30 days | : 77 hours 4 minutes |
| Last 24 hours | : 55 minutes |
| This flight | : 55 minutes |

1.5.2 Co-pilot

Prior to being assigned to the Boeing 737 fleet, the co-pilot had spent 18 years on the operator's Boeing 747 fleet. His flight training on the Boeing 737 fleet commenced on 19 June 2008, and during the period up to the date of the serious incident, he had flown to Palembang seven times. His most recent landing at Palembang was on 28 August 2008.

⁴ The main wheels are numbered from left to right, with the left wheel of the left main landing gear being number 1 and the right wheel of the right main landing gear number 4.

| | |
|------------------------|--------------------------|
| Gender | : Male |
| Date of birth | : 26 September 1955 |
| Marital status | : Married |
| Nationality | : Indonesia |
| License | : ATPL |
| Valid to | : 24 October 2008 |
| Aircraft type rating | : Boeing B737, B747 |
| Instrument rating | : Valid |
| Medical certificate | : Class 1 |
| Date of medical | : 24 April 2008 |
| Valid to | : 24 October 2008 |
| Last line check | : 5 October 2007 |
| Last proficiency check | : 9 May 2008 |
| Total hours | : 9,947 hours 12 minutes |
| Total on this type | : 227 hours 17 minutes |
| Last 90 days | : 176 hours 12 minutes |
| Last 30 days | : 47 hours 59 minutes |
| Last 24 hours | : 55 minutes |
| This flight | : 55 minutes |

1.6 Aircraft Information

1.6.1 General

| | |
|-------------------------|----------------------------|
| Registration Mark | : PK-GWT |
| Manufacturer | : Boeing Company |
| Country of Manufacturer | : United States of America |
| Type/ Model | : Boeing 737-4K5 |
| Serial Number | : 26316 |
| Date of manufacture | : 1995 |
| Time Since New | : 8,079 hours 14 minutes |

Prior to commence the flight to Palembang, the aircraft was airworthy and has valid documentations. The aircraft condition is considered not relevant to this serious incident.

The aircraft was within weight and centre of gravity limits at the time of the serious incident.

1.7 Meteorological Information

The weather on Sultan Mahmud Badaruddin II was clear and met the Visual Meteorological Condition. The weather is considered not relevant to this serious incident.

1.8 Aids to Navigation

1.8.1 Instrument landing system (ILS)

Palembang has an ILS on runways 11 and 29. The ILS Localizer antenna for runway 29 had to be relocated because the runway was being extended from 2,500 meters to 3,000 meters. On 9 May 2008, the runway 29 ILS was declared unserviceable and was published on the *notams*.

1.8.2 VOR/DME Runway 29

The VOR/DME antenna was located 4 NM from the runway 29 departure threshold. It was last calibrated on 17 July 2008. The VOR/DME approach chart showed the approach track to the runway 29 VOR as 291 degrees.

There had been 10 pilot reports of misalignment of the final track for the runway 29 VOR/DME approach since May 2008.

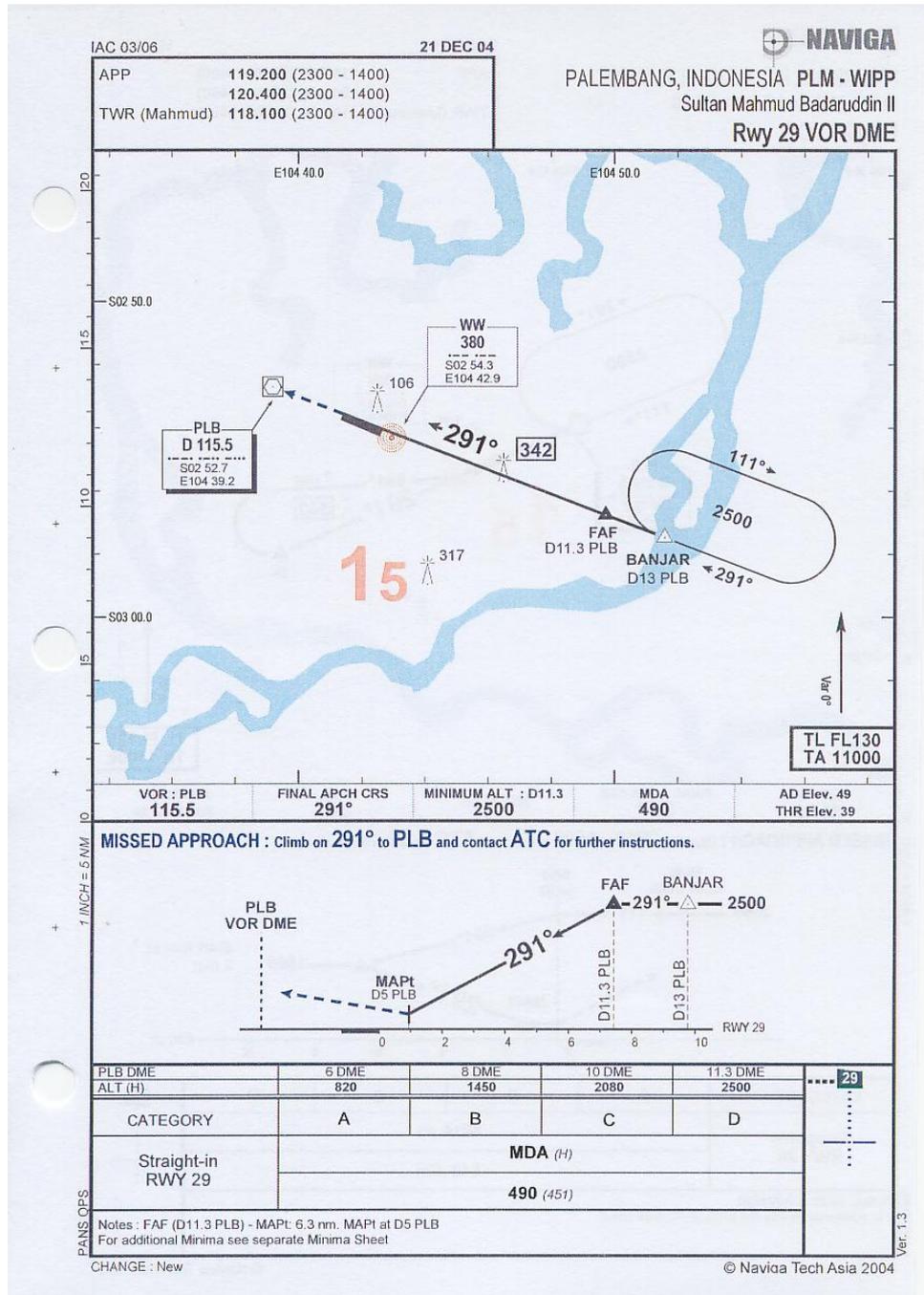


Figure 3: Palembang runway 29 VOR/DME approach chart

1.9 Communications

All communications between air traffic services (ATS) and the crew of GA110 were recorded by ground-based automatic voice recording equipment for the duration of the flight. The quality of the ground-based automatic voice recording and the aircraft's recorded transmissions was good. Radio transmissions from the crew of GA110 did not indicate any aircraft anomalies.

1.10 Aerodrome Information

Palembang Airport was a civil aerodrome and managed by PT. Angkasa Pura II. The reference point of the aerodrome was 39 ft AMSL.

The single runway was aligned 11/29 (111 degrees / 291 degrees magnetic). The runway width was 45 m and the length was 2,500 m.

During 2003, the 2000 meter runway was extended to 2,500 meters and a new passenger terminal was built on the north side of the runway to replace the old passenger terminal that was on the south side of the runway.

During this development, a temporary runway was built which became the parallel taxiway after the completion of the runway redevelopment work.



Figure 4: Parallel taxiway showing old threshold markings

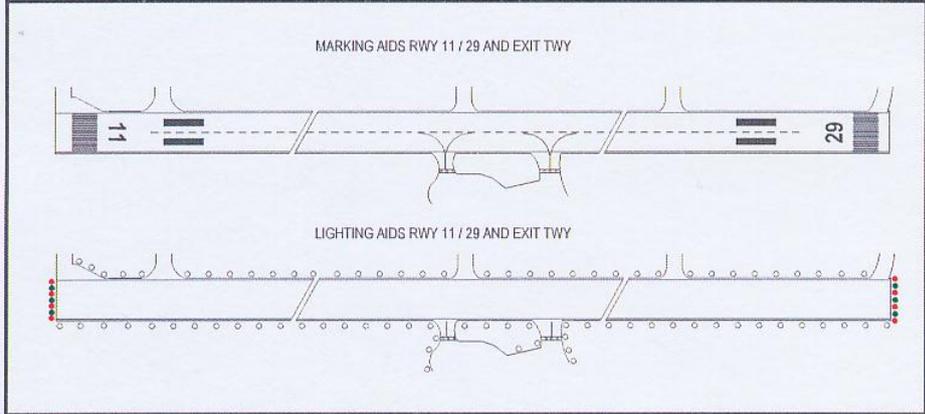
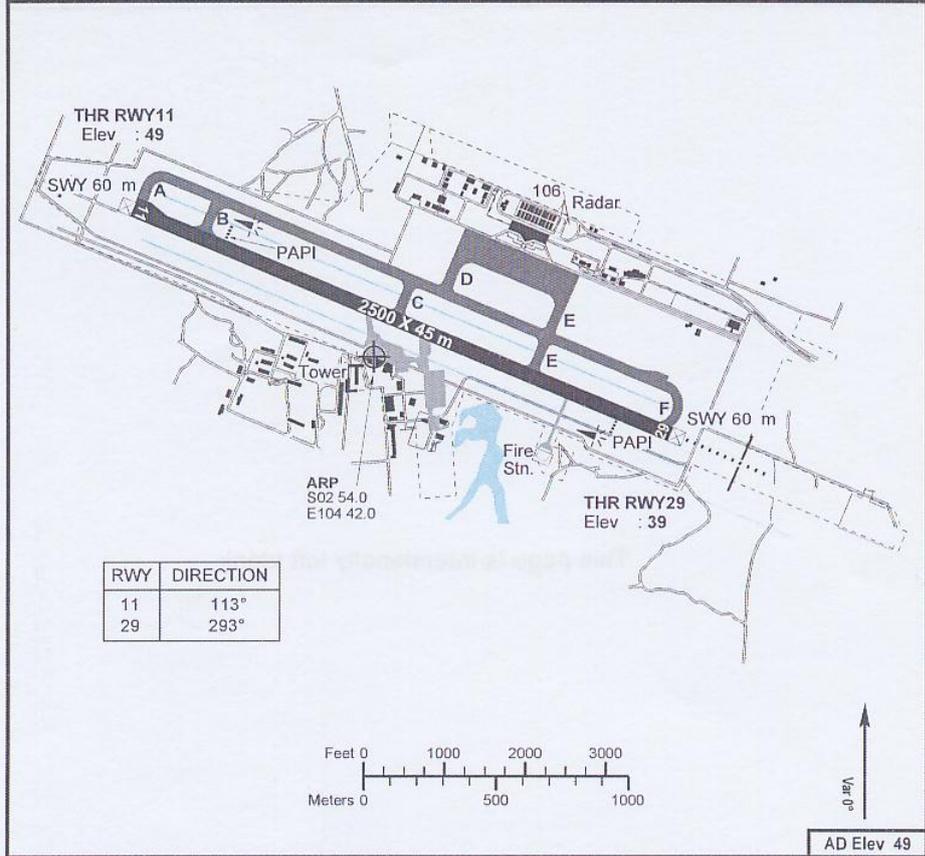
GND 01/02

02 SEP 04



| | |
|--------------|-----------------------|
| APP | 119.200 (2300 - 1400) |
| | 120.400 (2300 - 1400) |
| TWR (Mahmud) | 118.100 (2300 - 1400) |

PALEMBANG, INDONESIA PLM - WIPP
Sultan Mahmud Badaruddin II
AIRPORT CHART



CHANGE : New

© Naviaa Tech Asia 2004

Ver. 1.3

Figure 5: Aerodrome chart

1.11 Flight Recorders

The aircraft was equipped with a Solid State Digital Flight Data Recorder (SSFDR) and a Solid State Cockpit Voice Recorder (SSCVR) with a 30 minutes recording time. After the serious incident, the Auxiliary Power Unit was run for more than 30 minutes and so the significant information about the final approach and landing was not contained in the recorded data. The SSFDR data was downloaded at the Garuda Maintenance Facility under the supervision NTSC investigators.

1.12 Wreckage and Impact Information

Not relevant to this serious incident.

1.13 Medical and Pathological Information

No medical or pathological investigations were conducted as a result of this serious incident, nor were they required.

1.14 Fire

There was no pre- or post- incident fire.

1.15 Survival Aspects

None of the occupants were injured.

1.16 Tests and Research

Not relevant for this investigation.

1.17 Organisational and Management Information

1.17.1 PT. Garuda Indonesia

Operator : PT. Garuda Indonesia
Address : Management Building 3rd Floor
Garuda Maintenance Facility
Soekarno-Hatta Airport
Jakarta 19130

Air Operator Certificate (AOC) number: AOC/121-001

1.17.2 Sultan Mahmud Badaruddin Airport

Operator : PT. Angkasa Pura I
Location : Palembang – South Sumatera
Airport Certificate number: No: 014/SBU-DBU/VII/2010

1.18 Additional Information

Air Traffic Services Procedures

Air Traffic Services Procedures (ATS Procedure) stated that the controller was allowed to command a go around to the pilot when the runway was not safe to land. Runway classified as unsafe to land if there is any other aircraft, vehicle or any other hazard in the runway.

There was an experience where an aircraft made a VOR/DME approach runway 29 during the night and rain condition. It was found that the aircraft was closing to the airport entry road which was equipped with high intensity mercury light. The controllers were recognised that the aircraft was not approach the runway. The controller did not give a go around command to the pilot as he referring to the ATS procedure. The aircraft aborted the landing and made another approach.

1.19 Useful or Effective Investigation Techniques

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

2 ANALYSIS

2.1 Flight Procedures

At 00:30 the PIC reported that he had the runway insight and the Aerodrome Controller has gave the crew the clearance to land.

As the pilot declared that the runway was in sight and a clearance to land has been given, it was became the responsibility of the pilot to keep the runway in sight and adjust the flight to land safely.

During approach, the co-pilot who was acting as pilot flying was maintain the instrument flying and concentrating on instrument scanning. The co-pilot was intending to improve his ability to fly without auto pilot during an instrument approach. He looked outside in not quite often.

The PIC assured that the co-pilot has seen the runway, he then rechecking whether any item in the cockpit that has not been done prior to land.

This showed that both pilots were concentrating looking inside and not sufficiently cross checking to the outside situation. The aircraft was continuously descend below Minimum Descend Altitude (MDA) and landed.

Refer to CASR 91.175 an aircraft may descend below MDA unless:

1. The aircraft is in position from which a descent to a landing on the intended runway can be made at a normal rate of descent using normal manoeuvres and the descent rate will allow touchdown to occur within the touchdown zone of the runway of intended landing.
2. For a non precision approach, at least one of the visual references for the intended runway is distinctly visible and identifiable to the pilot. The visual references are; approach light system, threshold, threshold marking, threshold light, runway end identifier light (REIL), visual approach slope indicator (VASI), touchdown zone or touchdown zone marking, touchdown zone light, runway or runway marking, or runway lights.

During this flight, the weather was clear and the pilot reported that the runway was in sight while the aircraft altitude approximately 2500 feet. The visual references were visible to the pilot.

In the Boeing Flight Crew Operation Manual (FCOM revision 8 December 2006), Normal Procedures stated that the Pilot Monitoring responsibilities during the flight are:

- Checklist reading;
- Communications
- Tasks asked for by the pilot flying;

- Monitor taxiing, flight path, airspeed, airplane configuration and navigation.

Pilot monitoring did not sufficiently look outside to cross-check the flight path to the runway.



Figure 6: View of final approach runway 29

2.2 Air Traffic Procedures

Air Traffic Services Procedures (ATS Procedure) stated that the controlled was allowed to command a go around to the pilot if the runway was not safe to land. Runway classified as unsafe to land if there is any other aircraft, vehicle or any other hazard in the runway.

During GA 110 made an approach on runway 29, the ATC recognised that the aircraft was not properly on the approach path and came close to the parallel taxiway. Refer to the procedures; the controller did not command the pilot to go around.

2.3 Runway Marking

In 2003, there was airport development. The 2000 meter runway was extended to 2,500 meters and a new passenger terminal was built on the north side of the runway to replace the old passenger terminal on the south side of the runway.

During this development, a temporary runway was built which became the parallel taxiway after the completion of the runway redevelopment work.

The runway marking on the parallel taxi way was reappear. These markings were visible to the aircraft on final approach.

2.4 VOR Approach Path

The VOR/DME antenna was located 4 NM from the runway 29 departure threshold. It was last calibrated on 17 July 2008. The VOR/DME approach chart showed the approach track to the runway 29 VOR as 291 degrees.

There had been 10 pilot reports of misalignment of the final track for the runway 29 VOR/DME approach since May 2008.

During the airport development in 2003, a temporary runway was built which became the parallel taxiway after the completion of the runway redevelopment work.

The VOR/DME runway 29 approach track to the runway 29 VOR was 291 degrees while the runway direction was 293 degrees. The runway 29 threshold located approximately 4 Nm from the VOR. The 2 degrees differences between VOR approach path and runway direction has an off track to the right of approximately 200 meters off the runway centreline at the threshold runway 29.

3 CONCLUSIONS

3.1 Findings

- The aircraft was airworthy and has valid documentations.
- The weather on Sultan Mahmud Badaruddin II was clear and met the Visual Meteorological Condition.
- Both pilots were concentrating looking inside and not sufficiently cross checking to the outside situation. The aircraft was continuously descend below Minimum Descend Altitude (MDA) and landed.
- Pilot monitoring was not sufficiently looked outside to cross-check the flight path to the runway.
- There was misalignment of the VOR approach path.
- The controller noticed that the aircraft was not align with the runway.
- According to the ATS procedure, the controller could only command the pilot to go around whenever the runway is unsafe to land.

3.2 Causes

- Both pilots were concentrating looking inside and not sufficiently cross checking to the outside situation.
- There was misalignment of the VOR approach path.
- The controller noticed that the aircraft was not aligning with the runway.
- According to the ATS procedure, the controller could only command the pilot to go around whenever the runway is unsafe to land.

4 SAFETY ACTIONS AND RECOMMENDATIONS

4.1 Safety Action

On 8 October 2008, Palembang Airport Management informed the NTSC of two safety actions that had been taken, and three planned safety actions. The letter to NTSC contained an attachment, which was a letter from Palembang Airport Management to Angkasa Pura II Head Office which articulated a number of proposed safety actions.

The attachment stated the following proposed safety action.

1. Paint the runway marks on the parallel taxiway in black
2. Turn on the runway and approach lights, day and night, during aircraft approaches.
3. Speed up the activation of the runway 11 ILS;
4. Revise the instrument approach procedures.
5. Calibration. (The letter did not state what was to be calibrated).

The letter to the NTSC, dated 8 October 2008, stated the following safety action that has been taken or planned.

1. Painting of the runway markings in black.
2. Turn on the runway lights and approach lights during aircraft approaches. This is to continue until the ILS is return to service.
3. Inform pilots of approaching aircraft if there are any track deviations noted on the ATC radar, during the landing approach.
4. Speed up the installation of visual aids on the new section of the runway.
5. Speed up the activation of the ILS for runways 29/11.

4.2 Recommendations

The NTSC is not published safety recommendations for Sultan Mahmud Badaruddin II Airport. The safety actions taken by the airport authority as described on chapter 4 of this report have sufficient for the improvement.

As a result of this serious incident investigation, the National Transportation Safety Committee made the following recommendation.

4.2.1 Recommendation to PT. Garuda Indonesia

The National Transportation Safety Committee recommends that PT. Garuda Indonesia should:

- Improve crew resources management (CRM).
- Improve pilot awareness of scanning between inside and outside condition after visual references are established on final approach.
- Review ALAR training.

4.2.2 Recommendation to PT. Angkasa Pura II

The National Transportation Safety Committee recommends that PT. Angkasa Pura II should:

- Review the ATS procedure in case of misaligned final approach.

4.2.3 Recommendation to Directorate General of Civil Aviation

The National Transportation Safety Committee recommends that Directorate General of Civil Aviation should:

- Review the ATS regulation for the authority of the controller to command an aircraft to abort the landing in the case of unsafe situation arises.
- Review the instrument approach path to align with the runway.

5 APPENDIX

Appendix A: Taxiway before and after cleaning



Figure 5-1: Old touch down zone marks on taxiway before cleaning



Figure 5-2: Old touch down zone mark on parallel taxiway before cleaning



Figure 5-3: Old threshold marks on parallel taxiway before cleaning



Figure 5-4: Old runway number on parallel taxiway before cleaning



Figure 5-5: Old touch down marks on parallel taxiway after cleaning



Figure 5-6: Old touch down marks on parallel taxiway after cleaning



Figure 5-7: Old touch down marks on parallel taxiway after cleaning



Figure 5-8: Old touch down marks on parallel taxiway after cleaning