FINAL
KNKT.08.08.12.04

KOMITE NASIONAL KESELAMATAN TRANSPORTASI

Aircraft Serious Incident Investigation Report

PT. Sriwijaya Airline
PK–CJG
Boeing Company 737-200
Sultan Thaha, Jambi,
Republic of Indonesia
27 August 2008

KOMITE NASIONAL KESELAMATAN TRANSPORTASI
REPUBLIC OF INDONESIA
2015

This Final report was produced by the Komite Nasional Keselamatan Transportasi (KNKT), 3rd Floor Ministry of Transportation, Jalan Medan MerdekaTimur No. 5 Jakarta 10110, Indonesia.

The report is based upon the investigation carried out by the KNKT in accordance with Annex 13 to the Convention on International Civil Aviation Organization, the Indonesian Aviation Act (UU No. 1/2009) and Government Regulation (PP No. 62/2013).

Readers are advised that the KNKT investigates for the sole purpose of enhancing aviation safety. Consequently, the KNKT reports are confined to matters of safety significance and may be misleading if used for any other purpose.

As the KNKT believes that safety information is of greatest value if it is passed on for the use of others, readers are encouraged to copy or reprint for further distribution, acknowledging the KNKT as the source.

When the KNKT makes recommendations as a result of its investigations or research, safety is its primary consideration.

However, the KNKT fully recognizes that the implementation of recommendations arising from its investigations will in some cases incur a cost to the industry.

States participating in KNKT investigation should note that the information in KNKT reports and recommendations is provided to promote aviation safety. In no case is it intended to imply blame or liability.

TABLE OF CONTENTS

TABLE OF FIGURES

ABBREVIATIONSAND DEFINITIONS

ARFF	:	Airport Rescue and Fire Fighting
ATIS	:	Automatic Terminal Information Services
ATPL	:	Air Transport Pilot License
ATR	:	Avions de Transport Regional
ATS	:	Air Traffic Service
BMKG	:	*Badan Meterologi Klimatologi dan Geofisika* (Metrological Climatology and Geophysical Agency)
°C	:	Degrees Celsius
CPL	:	Commercial Pilot Licence
CVR	:	Cockpit Voice Recorder
DGCA	:	Directorate general Civil Aviation
EGPWS	:	Enhanced Ground Proximity Warning Systems
FA	:	Flight Attendant
FCOM	:	Flight Crew Operation Manuals
FDR	:	Flight Data Recorder
IAF	:	Initial Approach Fix
ICAO	:	International Civil Aviation Organization
ILS	:	Instrument Landing System
Km	:	Kilometer(s)
mbs	:	Millibars
ND	:	Navigation Display
KNKT/ NTSC	:	Komite Nasional Keselamatan Transportasi/ National Transportation Safety Committee
PF	:	Pilot Flying
PIC	:	Pilot in Command
PM	:	Pilot Monitoring
QNH	:	Height above mean sea level based on local station pressure
S/N	:	Serial Number
SIC	:	Second in Command
UTC	:	Universal Time Coordinate
VOR	:	VHF Omni-directional Range

INTRODUCTION

SYNOPSIS

On 27 August 2008, a Boeing 737-200 aircraft, registered PK-CJG, was being operated on a scheduled passenger service from Soekarno-Hatta International Airport, Jakarta to Sultan Thaha Airport, Jambi with flight number SJY 062. On board on this flight were two pilots, four flight attendants, and 124 passengers.

The Pilot in Command (PIC) acted as Pilot Flying (PF) while the Second in Command (SIC) acted as the Pilot Monitoring (PM).

The flight time from Jakarta to Jambi estimated about one hour and the aircraft was dispatched with approximate for 4 hours of fuel endurance. At 09:18 UTC the SIC contacted Thaha Tower controller and reported that the aircraft was descending and passing FL160 and has been cleared by Palembang Approach control to descend to 12,000 feet. The PIC flew the aircraft direct to intercept the final approach runway 31. While descending through 2500 feet and about 8 miles from the VOR, the flap one degree and flap 5° were selected. Subsequently the landing gear extended and flap 15° was selected. 13 seconds after flap 15 selection, the pilots noticed that the hydraulic system A low pressure warning light illuminated, and also the hydraulic system A quantity indicator showed zero. The PIC continued the approach and adived the SIC that he aimed to fly the aircraft slightly below the normal glide path in order to get more distance available for the landing roll.

The aircraft touched down at 0930 UTC , and during the landing roll the PIC had difficulty to select the reversers while applying manual braking. The aircraft drifted to the right of the runway centre line about 200 meters prior went out of the runway, stopped at about 120 meters from the end of the runway 31 on a surface 6 meters below the runway surface. Three farmers who were working on that area hit by the aircraft and seriously injured.

All crew and passengers safely evacuated the aircraft. No significant property damage was reported

The SSCVR and SSFDR were good, examined and subsequently downloaded using the ATSB facilities.

The contributing factors were as the following of:

- The Loss of Hydraulic System A occurred requires the pilots to refere the QRH. At the time of occurrence, the pilots has sufficient time to do the procedure and determine all the consequences prior to land the aircraft. However the pilot did not use the QRH which will assist and guide with the detail of procedures and steps to do before decision to land was made, therefore the KNKT recommends that the operator shall ensure that pilots when facing the non normal situation should use the QRH and other references procedures.
- Crew Resource Management is the application of team management concepts and the effective use of all available resources to operate a flight safely and in addition to the

crew, it includes all other groups routinely working with the aircrew are involved in decision required to operate a flight. In fact, there was no discussion concerning to the non normal situation as described on the CRM before decision to land was made.

At the time of issuing this final report, the Komite Nasional Keselamatan Transportasi (KNKT) has received any safety actions taken by the operator following this serious incident.

According to factual information, the findings and the contributing factors, on this final report the Komite Nasional Keselamatan Transportasi (KNKT) issued several safety recommendations addressed to PT. Sriwijaya Air and Directorate General of Civil Aviation (DGCA).

1 FACTUAL INFORMATION

1.1 History of the Flight

On 27 August 2008, a Boeing 737-200 aircraft, registered PK-CJG, was being operated on a scheduled passenger service from Soekarno-Hatta International Airport, Jakarta to Sultan Thaha Airport, Jambi[1] with flight number SJY 062. On board the flight were two pilots, four flight attendants, and 124 passengers (Figure 1).

The Pilot in Command (PIC) acted as Pilot Flying (PF) while the Second in Command (SIC) acted as Pilot Monitoring (PM).

Figure 1: Archive photo of the aircraft

The flight time from Jakarta to Jambi was estimated to be about one hour and the aircraft was dispatched with approximately 4 hours of fuel endurance. The number one electrical engine driven generator was unserviceable, as such the Auxiliary Power Unit (APU) generator was used during the flight to maintain two generators operation.

Prior to descent into Jambi, the PIC conducted the crew briefing and stated a plan for makinga straight-in approach to runway 31 with flap 40°, reviewed the go-around procedures and stated that Palembang [2] was the alternate airport.There was no abnormality recorded nor reported until the PIC commencedthe approach to Jambi.

At 09:18 UTC, the SIC contacted Thaha Tower controller and reported that the aircraft was descending and passing FL160 and had been cleared by Palembang Approach control to descend to 12,000 feet. The Thaha Tower controller issued a clearance to descend to 2500 feet and advised that runway 31 was in use.. The SIC asked about the weather conditions and was informed that the wind was calm, rain over the field and low cloud on final approach to runway 31.

The PIC flew the aircraft direct to intercept the final approach to runway 31. While

1 Sultan Taha Airport, Jambi will be named Jambi for the purposes of this report.

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

descending through 2500 feet, and about 8 miles from the VOR, the flap one degree and flap 5° were selected. Subsequently the landing gear was extended and flap 15° was selected.

13 seconds after flap 15 selection, the pilots noticed that the hydraulic system A low pressure warning light illuminated, and also the hydraulic system A quantity indicator showed zero. The PIC commanded the SIC to check the threshold speed for the existing configuration of landing, weight and with flap 15°. The SIC called out that the threshold speed was 134 kts and the PIC decided to continue with the landing.

The PIC continued the approach and advised the SIC that he aimed to fly the aircraft slightly below the normal glide path in order to get more distance available for the landing roll.

The aircraft touched down at 0930 UTC and during the landing roll, the PIC had difficulty selecting the thrust reversers. The PIC the applied manual braking. During the subsequent interview, the crew reported that initially they felt a deceleration then afterward a gradual loss of deceleration. The PIC reapplied the brakes and exclaimed to the SIC about the braking condition, then the SIC also applied the brakes to maximum in responding to the situation.

The aircraft drifted to the right of the runway centre line about 200 meters prior to departing off the end of the runway, and stopped about 120meters from the end of the runway 31 in a fieldabout 6meters below the runway level. Three farmers who were working inthat area were hit by the aircraft. One was fatally injured and the other two were seriously injured.

The pilots reported that, after the aircraft came to a stop, they executed the Emergency on GroundProcedure. The PIC could not put both start levers[3]to the cut-off position, and also could not pull the engines and APU fire warning levers[4]. The PIC also noticed that the speed brake lever did not extend. The radio communications and the interphone were also not working.

The flight attendants noticed a significant impact before the aircraft stopped. They waited for any emergency command from the PIC before ordering the evacuation. However, the passengers started to evacuate the aircraft through the right over-wing exit window before commanded by the flight attendants. The flight attendants subsequently executed the evacuation procedure without command from the PIC.

The left aft cabin door was blocked by the left main landing gear that had detached from the aircraft andthe flight attendants were unable to open the door. The right main landing gear and both engines were also detached from the aircraft (Figures 3).

The Airport Rescue and Fire Fighting (ARFF) come to the crash site and activated the

---

3 Start levers, are levers in the cockpit to open or close the fuel supply to the engine. To open the levers are in idle position and to close are in cut-off position.

4 Engine and APU warning switches are the levers to stop the fuel and hydraulic supply to the engines and APU. These levers are operates in an emergency condition only.

extinguishing agent while the passengers were evacuating the aircraft. The PIC, SIC and FA1 were the last persons to evacuat the aircraft.

The APU was still running after all passengers and crew evacuation completed, afterward one company engineer went to the cockpit and switched off the APU.

All crew and passengers safely evacuated the aircraft. No significant property damage was reported.

Figure 2: The last aircraft position and condition

1.2 Injuries to Persons

Injuries	Flight crew	Passengers	Total in Aircraft	Others
Fatal	-	-	-	1
Serious	2	10	12	2
Minor/None	4	114	118	-
TOTAL	6	124	130	3

1.3 Damage to Aircraft

The aircraft was substantially damaged. Both engines had detached from the pylons, and the left main landing gear had separated and blocked the left rear door. The nose raddome and the nose landing gear also detached.

Figure 3: Showing both engines detached

1.4 Other Damage

No significant damage reported.

1.5 Personnel Information

1.5.1 Pilot in Command

Gender	:	Male
Date of birth	:	36 years old
Marital status	:	Married
Nationality	:	Indonesia
License	:	Air Transport Pilot License (ATPL)
Valid to	:	20 October 2004
Aircraft type rating	:	B737-200
Medical certificate	:	First class
Last of medical	:	24 June 2008
Validity	:	24 December 2008
Medical limitation	:	None
Last line check	:	28 April 2008
Last proficiency check	:	09 March 2008
Flying experience		
Total hours	:	7,794 hours 07 minutes
Total on this type	:	6,238 hours 07 minutes
Last 90 days	:	233 hours 30 minutes
Last 60 days	:	125 hours
Last 24 hours	:	02 hours 49 minutes
This flight	:	01 hour 15 minutes

1.5.2 Second in Command

Gender	:	Male
Date of birth	:	34 years old
Marital status	:	Indonesia
Nationality	:	Married
License	:	CPL
Validity	:	25 March 2008
Aircraft type rating	:	B737-200
Medical certificate	:	First Class
Last of medical	:	26 March 2008
Validity	:	26 September 2008
Medical limitation	:	None
Last line check	:	22 September 2007
Last proficiency check	:	15 March 2008
Flying experience		
Total hours	:	5,254 hours
Total on this type	:	4,143 hours
Last 90 days	:	275 hours 50 minutes
Last 60 days	:	181 hours 40 minutes
Last 24 hours	:	02 hours 49 minutes
This flight	:	01 hour 15 minutes

1.6 Aircraft Information

1.6.1 General

Registration Mark	:	**PK-CJG**
Manufacturer	:	Boeing Company
Country of Manufacturer	:	United States of America
Type/ Model	:	Boeing 737-200
Serial Number	:	23320
Date of manufacture	:	1985
Certificate of Airworthiness		
Issued	:	11 August 2008
Validity	:	10 August 2009

Category	:	Transport
Limitation	:	None
Certificate of Registration		
Number	:	2124
Issued	:	03 May 2008
Validity	:	02 May 2009
Time Since New	:	49,996.53 hours
Cycles Since New	:	54,687 cycles
Last major inspection	:	47,963.06 Flight Hours/ November 2007
Last minor check	:	-

1.6.2 Engines

Manufacturer	:	Pratt and Whitney, Canada
Type/Model	:	JT8D-9A
Serial Number-1 engine	:	P707317B
Time Since New	:	34,718.06 hours
Cycles Since New	:	35,956 cycles
Serial Number-2 engine	:	P687755B
Time Since New	:	42,690.37 hours
Cycles Since New	:	46,254 Cycles

1.6.3 Weight and Balance

The aircraft departed from Jakarta within the weight and balance envelope and the load specifications were as follows:

Takeoff weight	:	106,095 lbs (Maximum 111,521 lbs)
Takeoff fuel	:	18,600 lbs
Trip fuel	:	6,521 lbs
Landing Weight	:	99,574 lbs (maximum 105,000 lbs)

1.7 Meteorological Information

The weather forecast issued by World Area Forecast Centre (WAFC) London that was valid for FL 250 - 630 on 27 August 2008. The red circle shows that there was significant cloud formation over Jambi (Figure 4).

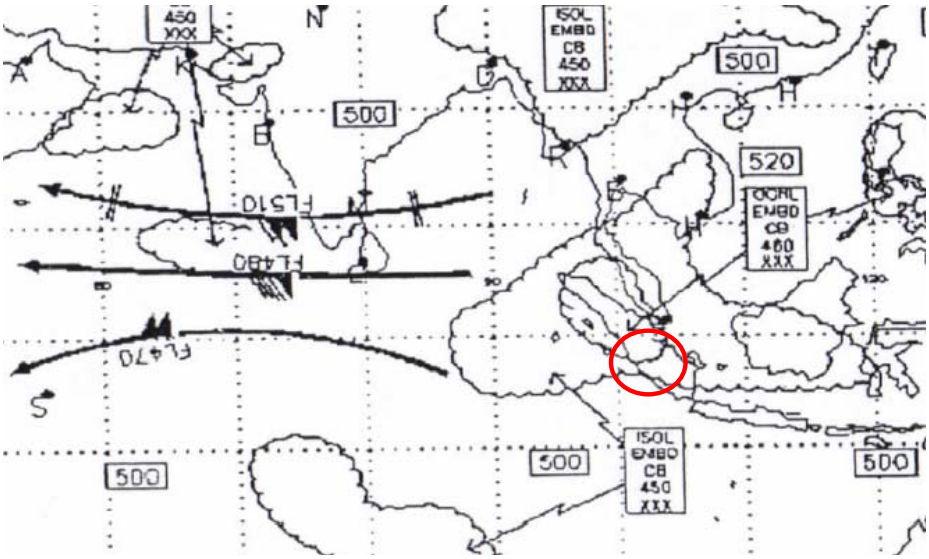


Figure 4: Weather Chart issued by WAFC on 27 August 2008

The METAR issued by the Sultan Thaha Meteorology Office Jambi at 09:12 UTC:

Surface wind	300/04
Visibility	8 Km
Present weather	continuous rain
Clouds	Few CB 1000; BKN 1000
Temperature / dew point	25° C /24° C
QNH / QFE	1008 /1005

1.8 Aids to Navigation

There were two non-precision approaches provided by Sultan Thaha airport of Jambi which were used for both runways 31 and 13. The navigation aids consisted of Very High Frequency Omnidirectional Radio Range (VOR) combined with Distance Measuring Equipment (DME) on a frequency of 117.5 MHz, and the Non-Directional Beacon (NDB) on frequency 365 KHz. Other facilities such as, Approach Light System (ALS), Precision Approach Path Indicator (PAPI) lights and runway lights were available.

During the day of the occurrence all the navigation aids and facilities were operating

normally and considered not related to the accident.

1.9 Communications

The communications between air traffic services and the pilots were recorded by ground-based automatic voice recording equipment and the cockpit voice recorder (CVR) for the duration of the flight. The quality of the voice recording was good.

1.10 Aerodrome Information

1.10.1 Refer to Aeronautical Information Publication (AIP) published by DGCA:

Airport Name	:	Sultan Thaha
Airport Identification	:	WIPA/ DJB
Airport Operator	:	PT. AngkasaPura II (Persero)
Coordinate	:	01° 38’ 08” S; 103° 38’ 35” E
Elevation	:	88 feet
Runway Direction	:	13-31
Runway Length	:	7283 feet/ 2220 meter
Runway Width	:	30 m
Surface	:	Asphalt
RESA	:	31 90 x 90 m, available on runway

1.10.2 The Airport Rescue and Fire Fighting facilities

The airport Rescue and Fire Fighting (ARFF) facilities was category VI, equipped with 4 crash car units, 2 rescue car units, 1 command car unit, 2 ambulance units and 23 trained personnel. The rescue and firefighting equipment was not suitable to remove the wreckage.

1.11 Flight Recorders

The aircraft was equipped with Solid State Digital Flight Data Recorder (SSFDR) and Solid State Cockpit Voice Recorder(SSCVR). Both recorders were recovered from the accident site and transported to NTSC head office.

In accordance with clause 5.23 of Annex 13 to the Convention on International Civil Aviation, the KNKT requested assistance from the Australian Transport Safety Bureau (ATSB) in the recovery and analysis of information from the Solid State Digital Flight Data Recorder (SSFDR) and Solid State Cockpit Voice Recorder (SSCVR).

The SSCVR and SSFDR were examined and subsequently downloaded using the ATSB facilities.

The SSFDR was downloaded and found to contain more than 68 flights including the

accident flight. Examination of the SSFDR found that the aircraft landed on runway 31 at an indicated air speedof 165 knots.

During the landing roll, the aircraft drifted right of the runway centreline. The SSFDR and SSCVR data ceased as the aircraft stopped (Figure 5).

1.11.1 SSFDR Specification

Manufacturer	:	Fairchild
Model	:	F1000
P/N	:	S603-1000-00
S/N	:	00326
ARINC	:	5424

Specific events and systems recorded by SSDFR

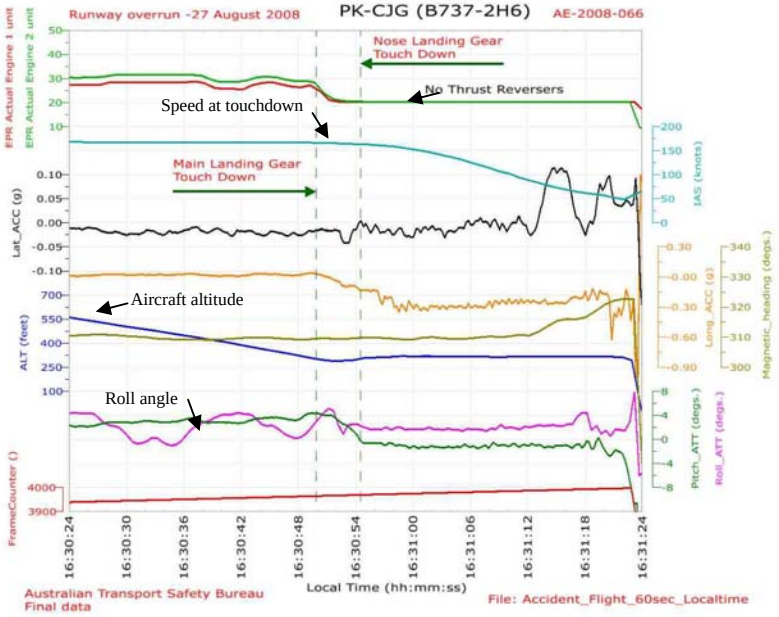


Figure 5: FDR data graph from aircraft altitude 500 feet until end of recording

The FDR graph shows that, when the aircraft was 550 feet, the aircraft speed was 171 kts and slight rolled to the left and right in average to 4°.At touch down the aircraft speed was 165 kts (Figure 6).

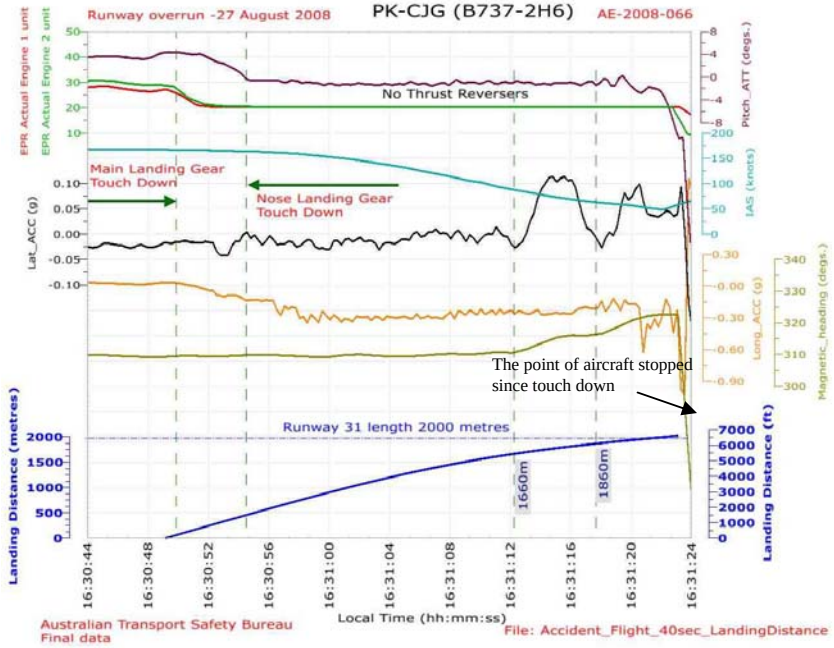


Figure 6: The FDR data graph indicated the distance from touchdown to stop

The graph shows that after the aircraft main and nose landing gear touched down, there was no reverse thrust, the heading remained relatively steady on 310° and then changed to approximately 320° after the aircraft rolled 1660 meters and then stopped at 2020 meters which was the end of the recording.

1.11.2 CVR Specification

Manufacturer	:	Fairchild
Model	:	A100
P/N	:	93-A100-30
S/N	:	50980
Level	:	18
Date	:	12/85

The aircraft was equipped with a Solid State Cockpit Voice Recorder (SSCVR) with 30 minutes recording time.

The SSCVR was downloaded and found to contain about thirty-two minutes of data from the accident flight on four channels including an Area Microphone channel. The audio downloaded from the CVR was provided to KNKT investigators for further analysis.

A translation of the cockpit audio from SSCVR was prepared by the KNKT at the ATSB facility. The investigation combined the SSFDR and SSCVR significant events in the transcript for analysis purposes.

Time	Altitude (feet)	IAS(knots)	Heading (deg)	Event
9:18:09				Pilot first contact with Thaha Tower controller and was informed that wind calm, rain over the field and low cloud on final runway 31.
9:19:05	14243	278	336	Pilot and Co-pilot discuss 'go-around' at Jambi airport and whether there is any difficulties doing that at Jambi airport,pilot suggested landed at Palembang airport.
9:20:32	11510	258	336	Pilot asked concerning the MDA, minimum visibility, approach go around procedure.
9:26:19	2797	202	319	Altitude alert
9:26:31				Flaps one
9:27:31	1911	176	326	The pilot reported runway insight.
9:27:33	1894	176	326	Clear to land
9:28:06				Landing gear down and flap selected to 15°.
9:28:35	1638	169	319	"Flight attendant landingposition..."
9:28:39				Pilot noticed hydraulic problem
9:28:45	1573	165	318	The PIC confirming the hydraulic quantity that was empty.
9:28:54	1551	159	317	The PIC decided to continue landing and asked the approach speed for flap 15.
9:29:55				The SIC informed that the approach speed for existing condition was 134 kts.
9:29:59	582	171	311	"Don't sink.." (five times)
9:30:06				The PIC intended to fly slightly below glide.
9:30:52	66	165	309	Touch down
9:30:54	81	164	310	"No reverse ...no reverse... pullout parking brake...brake ....pull out ...!!!"and hard collision sound
9:30:57	89	160	310	Nose landing gear touchdown
9:30:58				The PIC exclaimed that brake only once and no reverse
9:31:06				The PIC asked the SIC to assist the braking.
9:31:19	91	59	319	Sounds similar to impact
9:31:23	-246	58	323	End of CVR data

Table 1: Sequence of events developed from recorded SSFDR and SSCVR data

1.12 Wreckage and Impact Information

An examination of the accident site including the cockpit area found that, the standby compas showed 330°, the speed brake lever was forward (stowed position), the flaps position handle at 15 and thrust reverser levers stowed.

The aircraft examination showed that the spoilers were stowed in the flush position, leading edge slats deployed, both overwing emergency windows opened and evacuation doors opened, except the left rear door that was blocked by the left main landing gear. The escape slide of the aft right door was not deployed.

Wheel marks were found at about 200 meters before the runway end and continued 120 meters past the Runway End Safety Area (RESA) until the aircraft came to rest (Figures 7 to 9).

Other information is displayed in the figure below:

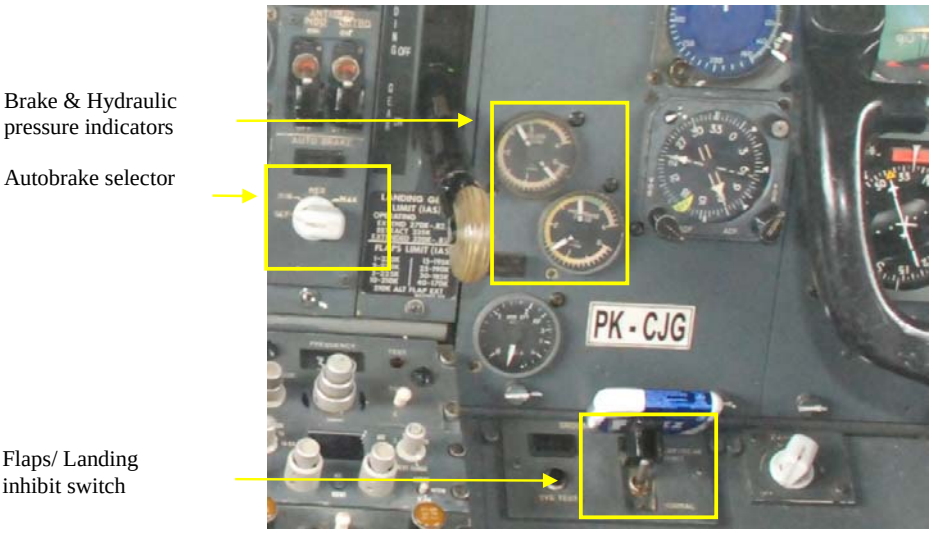


Figure 7: **Hydraulic system indicator and auto brake selector**

The yellow boxes in Figure 7 shows the Auto brakes off, flap/ landing gear inhibit guard switch opened and brake pressure and hydraulic pressure system B on green band while on system A loss.

Figure 8: Main wheel marks on the taxiway to apron

Figure 9: Wheel marks on the RESA runway 31

1.13 Medical and Pathological Information

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

1.14 Fire

There was no fire.

1.15 Survival Aspects

The Airport Rescue and Fire Fighting (ARFF) arrived at the crash site during the passenger evacuation and sprayed extinguisher agent to the tail section of the aircraft at 09:38 UTC.

Figure 5: Shows during and after the ARFF operation

1.16 Tests and Research

There was no test and research conducted at this investigation.

1.17 Organizational and Management Information

Aircraft Operator : PT. Sriwijaya Air

Address : Jl. PangeranJayakarta No. 68C

Certificates Number : AOC /121-035

Operator Designator : SJY

The operator structure of organization was in accordance with CASR 121 and specified in the AOC/OPSPEC. Sriwijaya Air operated several B737- 200 and B737 300/400 and served domestic and international routes specified in the route approvals.

For the aircraft maintenance, Sriwijaya Air had an agreement with Aero Nusantara Indonesia (ANI) who held the Aircraft Maintenance Organization (AMO) 145 issued by the Directorate General of Civil Aviation (DGCA).

The company manuals stated that the pilot proficiency and training including Crew Resources Management (CRM) recurrent training performed for all flight crew atits due time. Refer to the information from the operator management the initial CRM, and recurrent trainings conducted by the third parties.

The Flight Crew Training Manual (FCTM) described the details of crew coordination for a non-normal situation including pilot decision making, which contains information that the pilot in command has the authority and responsibility for the safety of the flight.

The Flight Crew Operation Manual (FCOM) described the detailed aircraft system and operation performance including the normal and non-normal landing distance with hydraulic system failures with specified aircraft weight and flaps setting.

During the type rating training the pilots have been trained for hydraulic system failure included loss of system A, loss of system B and loss of both hydraulic systems (manual reversion).

1.17.1 Operator Manuals

1.17.1.1 Flight Crew Training Manual (FCTM) 8.3: Non-Normal Procedure

Approach and Landing

When a non-normal situation occurs, a rushed approach can often complicate the situation. Unless circumstances require an immediate landing, complete all corrective actions before beginning the fmal approach.

For some non-normal situations, the possibility of higher airspeed on approach, longer landing distance, a different flare profile or a different landing technique should be considered.

Plan an extended straight-in approach with time allocated for the completion of any lengthy NNC steps such as the use of alternate flap or landing gear extension systems. Arm autobrakes (as installed) and speedbrakes unless precluded by the NNC.

Note: *The use of autobrakes (as installed) is recommended because maximum autobraking may be more effective than maximum manual braking due to timely application upon touchdown and symmetrical braking. However, the Advisory Information in the PI chapter of the FCOM provides Non-Normal Configuration Landing Distance data based on the use of maximum manual braking. When used properly, maximum manual braking provides the shortest stopping distance.*

Fly a normal glide path and attempt to land in the normal touchdown zone. After landing, use available deceleration measures to bring the airplane to a complete stop on the runway. The captain must determine if an immediate evacuation should be accomplished or if the airplane can be safely taxied off the runway.

1.17.1.2 Crew Resource Management (CRM) FCTM 1.2

Crew resource management is the application of team management concepts and the effective use of all available resources to operate a flight safely. In addition to the aircrew, it includes all other groups routinely working with the aircrew who are involved in decisions required to operate a flight. These groups include, but are not limited to, aircraft dispatchers, flight attendants, maintenance personnel, and air traffic controllers.

Throughout this manual, techniques that help build good CRM habit patterns on the flight deck are discussed. For example, situational awareness and communications are stressed. Situational awareness, or the ability to accurately perceive what is going on in the flight deck and outside the aircraft, requires on going questioning,

crosschecking, communication, and refinement of perception.

It is important that all flight deck crewmembers identify and communicate any situation that appears unsafe or out of the ordinary. Experience has proven that the most effective way to maintain safety of flight and resolve these situations is to combine the skills and experience of all crewmembers in the decision making process to determine the safest course of action.

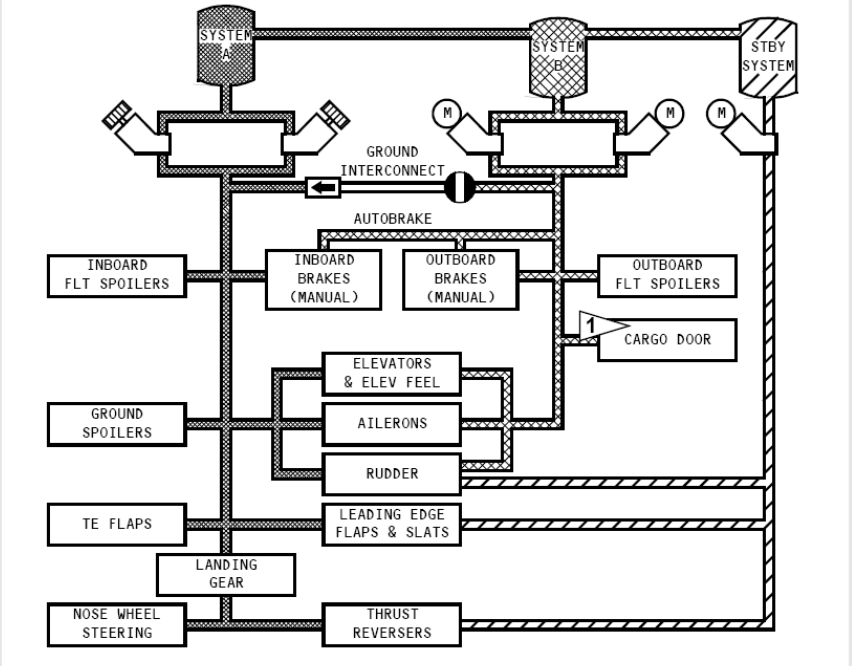
1.17.1.3 Hydraulic system FCOM 13.20.1/2/3/4

Introduction

The airplane has three hydraulic systems: A, B and standby. The standby system is used if system A and/or B pressure is lost. The hydraulic systems power the following airplane systems:

- *flight controls*
- *leading edge flaps and slats*
- *trailing edge flaps*
- *spoilers*
- *landing gear*
- *wheel brakes*
- *nose wheel steering*
- *thrust reversers*
- *yaw damper*
- *autopilots*
- *cargo door (cargo airplanes only)*

Hydraulic Power Distribution Schematic



A and B Hydraulic Systems

Components powered by hydraulic systems A and B are:

System A	System B
• ailerons	• ailerons
• rudder	• rudder
• elevator	• elevator
• inboard flight spoilers	• outboard flight spoilers
• inboard brakes	• outboard brakes
• ground spoilers	• yaw damper
• thrust reversers	• autobrake
• nose wheel steering	• autopilot B
• landing gear	• cargo door (cargo airplanes only)
• leading edge flaps and slats	
• trailing edge flaps	

Each hydraulic system has a fluid reservoir located in the main wheel well area. The reservoirs are pressurized by engine bleed air directed into the system A reservoir. Fluid balance lines interconnect all reservoirs. Pressurization of all reservoirs ensures positive fluid supply to all hydraulic pumps and controls the fluid level in the reservoirs.

The ground interconnect valve allows system B to pressurize system A for systems check when the airplane is on the ground, the parking brake is set and electrical power is available.

Hydraulic System A

System A pressure is provided by an engine driven pump on each engine. The ENG 1 and ENG 2 pump ON/OFF switch controls the engine–driven pump output pressure. Positioning the switch to OFF isolates fluid flow from the system components. However, the engine–driven pump continues to rotate as long as the engine is operating. Pulling the engine fire switch shuts off the fluid flow to the engine–driven pump and deactivates the related LOW PRESSURE light.

Hydraulic fluid used for cooling and lubrication of the pumps passes through a heat exchanger before returning to the reservoir. The heat exchanger is located in main fuel tank No. 1 and must be covered with fuel for operation of the pumps.

Pressure switches, located in the pump output lines, send signals to illuminate the related LOW PRESSURE light if pump output pressure is low. A check valve, located in each output line, isolates each pump from the system. The A system pressure transmitter sends the combined pressure of the pumps to the A HYDRAULIC SYSTEM PRESSURE indicator needle.

Hydraulic System B

System B pressure is provided by two electrically driven hydraulic pumps. The ELEC 1 or ELEC 2 pump ON/OFF switch controls the related electric motors.

The system B reservoir is connected to the system A reservoir and the standby reservoir through balance lines for single point pressurization and servicing. The B LOW QUANTITY light illuminates when reservoir fluid is low.

Hydraulic fluid used for cooling and lubrication of the pumps passes through a heat exchanger before returning to the reservoir. The heat exchanger for system B is in main fuel tank No. 2. If a pump or the fluid becomes overheated, the OVERHEAT light illuminates.

CAUTION: Minimum fuel for ground operation of electric pumps is 760 Kgs (1675 Lbs) in fuel tank No. 2.

Pressure switches, located in the pump output lines, send signals to illuminate the related LOW PRESSURE light if pump output pressure is low. Check valves isolate the two pumps. The system pressure transmitter sends the combined pressure of the electric motor–driven pumps to the B HYDRAULIC SYSTEM PRESSURE indicator needle.

The automatic load shedding feature deactivates the respective system B hydraulic pump when a generator is lost. The LOW PRESSURE light illuminates and the pump switch remains in the on position. When the bus is powered again, the pump is activated and the LOW PRESSURE light extinguishes.

Standby Hydraulic System

The standby hydraulic system is provided as a backup if system A and/or B pressure is lost. The standby system reservoir is connected to the System B reservoir through a balance line for pressurization and servicing. The standby system LOW QUANTITY light is always armed and indicates low quantity in the standby reservoir. The LOW PRESSURE light is armed only when standby pump operation has been selected. The standby system uses a single electric motor–driven pump to power:

- *thrust reversers*
- *rudder*
- *leading edge flaps and slats (extend only)*

System Operation

Positioning either FLT CONTROL switch to STBY RUD:

- *activates the standby electric motor–driven pump*
- *shuts off the related hydraulic system pressure to ailerons, elevators and rudder by closing the flight control shutoff valve*
- *opens the standby rudder shutoff valve*
- *deactivates the related flight control LOW PRESSURE light when the standby rudder shutoff valve opens*
- *allows the standby system to power the rudder.*
- *(after RSEP modification) illuminates the STBY RUD ON, Master Caution, and Flight Controls (FLT CONT) lights.*

Positioning the ALTERNATE FLAPS master switch to ARM (see the Flight Controls chapter for a more complete explanation):

- *activates the standby electric motor–driven pump*
- *arms the ALTERNATE FLAPS position switch*
- *allows the standby system to power the leading edge flaps and slats and thrust reversers.*

With the loss of System A the standby system will provide pressure to operate the thrust reversers.

Automatic Operation (after RSEP modification)

Automatic operation is initiated when the following conditions exist:

- *FLT CONTROLS switch A is not in the STBY RUD position,*
- *FLT CONTROLS switch B is in the ON position,*
- *ALTERNATE FLAPS arming switch is in the OFF position*
- *the main PCU Force Fight Monitor (FFM) trips.*

1.1.1 Normal Configuration Landing distance flap 15 and assumed with Medium Reported Braking Action

737-200ADV/JT8D-15A
FAA

737 Flight Crew Operations Manual

Performance Inflight — **Chapter PI**
Advisory Information — **Section 12**

ADVISORY INFORMATION

Normal Configuration Landing Distance - Autobrake System
Flaps 15
Dry Runway

	LANDING DISTANCE AND ADJUSTMENT (FT)											
	REF DIST	WT ADJ	ALT ADJ	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		TEMP ADJ PER 10°F		VREF ADJ	REVERSE THRUST ADJ	
BRAKING CONFIGURATION	100000 LB LANDING WEIGHT	PER 5000 LB ABV/BLW 100000 LB	PER 1000 FT ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	ABV ISA	BLW ISA	PER 10 KTS ABOVE VREF15	ONE REV	NO REV
MAX MANUAL	2820	180/-110	90	-140	510	30	-30	50	-50	330	90	200
MAX AUTO	3730	150/-140	90	-150	520	0	0	50	-50	400	0	0
MED AUTO	4730	210/-190	120	-210	720	0	0	70	-70	550	0	0
MIN AUTO	6090	350/-300	220	-300	1050	160	-180	90	-90	500	920	1010
Good Reported Braking Action												
MAX MANUAL	3600	150/-130	90	-150	550	70	-70	40	-40	270	280	710
MAX AUTO	3770	160/-140	90	-160	570	40	-10	50	-50	400	130	550
MED AUTO	4730	210/-190	120	-210	730	0	0	70	-70	550	0	80
MIN AUTO	6090	350/-300	220	-300	1050	160	-180	90	-90	500	920	1010
Medium Reported Braking Action												
MAX MANUAL	4630	230/-200	140	-220	850	150	-130	60	-70	350	760	2260
MAX AUTO	4630	230/-200	140	-220	850	150	-130	60	-70	350	760	2260
MED AUTO	4930	220/-200	140	-240	890	100	-60	70	-70	500	470	1960
MIN AUTO	6090	350/-300	220	-300	1090	170	-180	90	-90	500	960	1570
Poor Reported Braking Action												
MAX MANUAL	5580	310/-270	200	-300	1240	270	-210	80	-80	410	1500	5700
MAX AUTO	5580	310/-270	200	-300	1240	270	-210	80	-80	410	1500	5700
MED AUTO	5650	300/-260	190	-300	1250	250	-180	80	-80	470	1430	5640
MIN AUTO	6220	360/-310	230	-330	1340	260	-220	90	-90	500	1400	5130

Reference distance is for sea level, standard day, no wind or slope, VREF15 approach speed and two engine detent reverse thrust.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above threshold (1000 ft of air distance).

Figure 6: Normal configuration landing distance

The red box shows the distances adjustment for specified condition landing with flaps 15°. The Vref adjustment above 10 kts is 350 feet and if no reversers added by 2260 feet.

ADVISORY INFORMATION

Non-Normal Configuration Landing Distance
Medium Reported Braking Action

		LANDING DISTANCE AND ADJUSTMENT (FT)							
		REF DIST FOR	WT ADJ PER	ALT ADJ PER	WIND ADJ PER 10 KTS		SLOPE ADJ PER 1%		APPROACH SPEED
LANDING CONFIGURATION	VREF	100000 LB LANDING WEIGHT	5000 LB ABV/BLW 100000 LB	1000 FT ABOVE SEA LEVEL	HEAD WIND	TAIL WIND	DOWN HILL	UP HILL	PER 10 KTS ABOVE VREF
ALL FLAPS UP	VREF40+55	6200	280 / -240	530	-260	940	160	-150	360
ANTI-SKID INOPERATIVE	VREF40	4880	225 / -195	135	-280	1135	265	-145	330
HYDRAULICS-LOSS OF SYSTEM A (FLAPS 15)	VREF15	4950	230 / -210	260	-230	870	150	-140	400
HYDRAULICS-LOSS OF SYSTEM B (FLAPS 15)	VREF15	4510	210 / -190	190	-220	820	130	-110	340
HYDRAULICS-MANUAL REVERSION (LOSS OF BOTH SYSTEM A & B)	VREF15	5150	250 / -220	290	-240	890	170	-150	450
STABILIZER TRIM INOPERATIVE	VREF15	4400	200 / -180	220	-210	800	120	-110	310
JAMMED OR RESTRICTED FLIGHT CONTROLS	VREF15	4400	200 / -180	220	-210	800	120	-110	310
LEADING EDGE FLAPS TRANSIT	VREF15+5	4730	230 / -190	260	-220	840	140	-120	350
ONE ENGINE INOPERATIVE	VREF15	5000	240 / -210	270	-250	940	190	-160	390
TRAILING EDGE FLAP ASYMMETRY (1≤ FLAPS <15)	VREF40+30	5450	240 / -210	380	-230	870	140	-120	320
TRAILING EDGE FLAPS UP (FLAPS < 1)	VREF40+40	5100	230 / -200	320	-230	850	130	-120	320

Reference distance assumes sea level, standard day, with no wind or slope.
Actual (unfactored) distances are shown.
Includes distance from 50 ft above runway threshold (1000 ft of air distance).
Assumes maximum manual braking and maximum reverse thrust when available on operating engine(s).

Figure 7: Non normal configuration landing distance

The red boxes shows the distances adjustment for specified condition of hydraulic loss on system A with flaps 15°. The Vref adjustment above 10 kts is 400 feet. Refers to normal landing distance table, if no reversers the landing distance added by 2260 feet.

VREF (KIAS)

WEIGHT (1000 LB)	FLAPS		
	40	30	15
130	149	154	161
125	146	150	158
120	142	146	154
115	139	142	150
110	135	139	146
105	132	135	142
100	128	131	138
95	124	127	134
90	121	124	131
85	117	120	127
80	113	116	123
75	110	112	119
70	106	109	115

For approach speed add wind factor of 1/2 headwind component + gust (max 20 knots).

Figure 8: Table of the Vref in specified weight and flaps setting

The above table shows the Vref of 138 kts for the aircraft landing weight 100,000 lbs with flap 15 (red boxes).

Refer to landing distance as stated FCOM chapter PI.12.1 normal and PI 12.9non normal and no reversers with reference of Vref 138 kts were summarized as the following table:

Adjustment of	Normal flaps 15° (feet)	Non normal hydraulic loss of system A flaps15° (feet)
Landing weight 100,000 lbs	4630	4950
Elevation	14	26
Wind (tail/ head)	0	0
Temperature 25 C	300	300
Vref 138 kts	0	0
No reverse	2260	0
Total	7204	5276

The table shows with the Loss of Hydraulic System A, with the existing aircraft weight and conditions at the time of occurrence the landing distance will be 5276 feet.

.

1.17.2 Quick Reference Handbook QRH 13.2

LOSS OF SYSTEM A

FLT CONTROL A: LOW PRESSURE

A HYD PUMPS: LOW PRESSURE | LOW PRESSURE

Condition: Hydraulic system A pressure is low.

1 System A
FLT CONTROL switch . . . . Confirm . . . . STBY RUD

2 System A
HYD PUMP switches (both). . . . . OFF

Inoperative Items

Inboard flight spoilers inop
Roll rate and speedbrake effectiveness may be reduced in flight.

Trailing edge flaps normal hydraulic system inop
The trailing edge flaps can be operated with the alternate electrical system. Alternate flap extension time to flaps 15 is approximately 2 minutes.

Leading edge flaps and slats normal hydraulic system inop
The leading edge flaps and slats can be extended with standby hydraulic pressure. Once extended, they can not be retracted.

Normal landing gear extension and retraction inop
Manual gear extension is needed.

Ground spoilers inop
Landing distance will be increased.

▼ Continued on next page ▼

▼LOSS OF SYSTEM A continued▼

Both thrust reversers normal pressure inop
Thrust reversers will deploy and retract at a slower rate.

Inboard brakes normal hydraulic system inop
Inboard brakes have accumulator pressure only.

Nose wheel steering inop
Do not attempt to taxi the airplane after stopping.

3 Plan a flaps 15 landing.

4 Set VREF 15.

5 Plan to extend flaps to 15 using alternate flap extension.

Note: Maximum airspeed is limited to 210 knots. The drag penalty with the leading edge devices extended may make it impossible to reach an alternate field.

6 Plan for manual gear extension.

Note: When the gear has been lowered manually, it cannot be retracted. The drag penalty with gear extended may make it impossible to reach an alternate field.

7 Check the Non–Normal Configuration Landing Distance table in the Advisory Information section of the Performance Inflight chapter.

8 **Checklist Complete Except Deferred Items**

Deferred Items

Descent Checklist

Pressurization. . . . . CAB ALT ___, LAND ALT ___

Gravel protect (as installed) . . . . . ___

▼ Continued on next page ▼

▼LOSS OF SYSTEM A continued▼

Recall . . . . . Checked

Autobrake . . . . . ___

Landing data **. . . . . VREF 15, Minimums** ___

Approach briefing . . . . . Completed

Approach Checklist

Altimeters . . . . . ___

Alternate Flap Extension

During flap extension, set the flap lever to the desired flap position.

210K maximum during alternate flap extension.

ALTERNATE FLAPS master switch . . . . . ARM

Note: The landing gear configuration warning may sound if the flaps are between 10 and 15 and the landing gear are retracted.

Note: The LE FLAPS TRANSIT light will stay illuminated until the flaps approach the flaps 10 position.

▼ Continued on next page ▼

▼LOSS OF SYSTEM A continued▼

If flap asymmetry occurs, release the switch immediately. There is no asymmetry protection.

ALTERNATE FLAPS
position switch . . . . . Hold DOWN to extend flaps to 15 on schedule

As flaps are extending, slow to respective maneuvering speed.

Manual Gear Extension

LANDING GEAR lever. . . . . OFF

Note: On gravel deflector equipped airplanes, slow to 150 knots before extending the landing gear.

Manual gear extension handles. . . . . Pull

The uplock is released when the handle is pulled to its limit.

The related red landing gear indicator light illuminates, indicating uplock release.

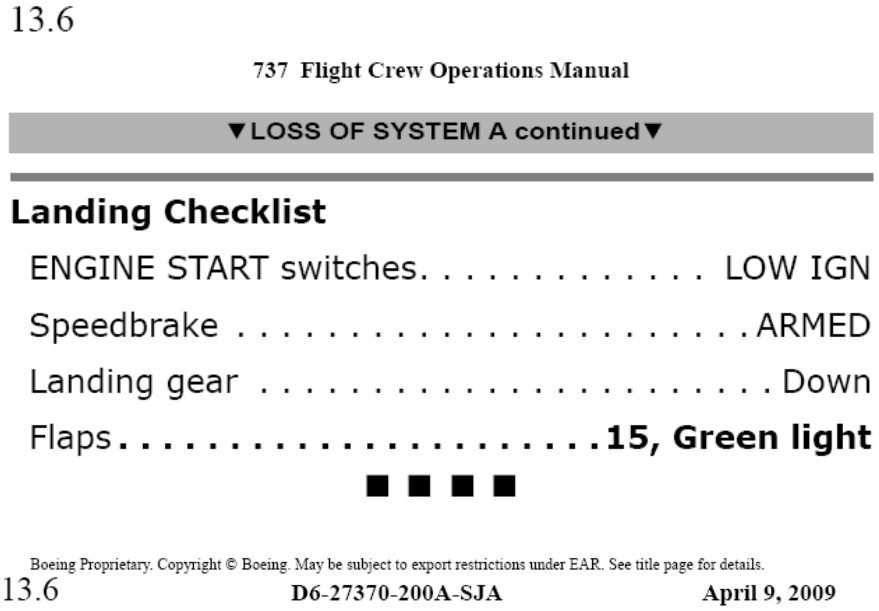
Wait 15 seconds after the last manual gear extension handle is pulled:

LANDING GEAR lever . . . . . DN

Additional Deferred Item

GROUND PROXIMITY
FLAP/GEAR INHIBIT switch . . . FLAP/GEAR INHIBIT

▼ Continued on next page ▼



13.6

737 Flight Crew Operations Manual

▼LOSS OF SYSTEM A continued▼

Landing Checklist

ENGINE START switches. . . . . LOW IGN

Speedbrake . . . . . .ARMED

Landing gear . . . . . .Down

Flaps. . . . . .**15, Green light**

■ ■ ■ ■

1.17.3 Non normal Checklist FCT- 737-200 (TM) chapter8.4 April 30, 2009

A suitable airport is defined by the operating authority for the operator based on guidance material, but in general must have adequate facilities and meet certain minimum weather and field conditions. If required to divert to the nearest suitable airport (twin engine airplane with an engine failure), the guidance material also typically specifies that the pilot should select the nearest suitable airport "in point of time" or "in terms of time." In selecting the nearest suitable airport, the pilot-in-command should consider the suitability of nearby airports in terms of facilities and weather and their proximity to the airplane position. The pilot-in-command may determine, based on the nature of the situation and an examination of the relevant factors, that the safest course of action is to divert to a more distant airport than the nearest airport. For example, there is not necessarily a requirement to spiral down to the airport nearest the airplane's present position if, in the judgment of the pilot-in-command, it would require equal or less time to continue to another nearby airport.

For persistent smoke or a fire which cannot positively be confirmed to be completely extinguished, the safest course of action typically requires the earliest possible descent, landing and evacuation. This may dictate landing at the nearest airport appropriate for the airplane type, rather than at the nearest suitable airport normally used for the route segment where the incident occurs.

Air Systems

Cabin Altitude Warning

There have been several reports of cabin altitude warning alerts caused by improperly configured engine bleed air and air conditioning pack switches. This condition is often the result of crews failing to reconfigure switches following a no engine bleed takeoff. Additionally, there have been reports of crews delaying their response to the cabin altitude warning alert because it was confused with the takeoff configuration warning horn.

In order to address the problem of incorrectly positioning switches that affect pressurization, the normal takeoff procedure has been modified to direct the crew to set or verify the correct position of the engine bleed air and air conditioning pack switches after flap retraction is complete. Engine bleeds and air conditioning packs have also been included as specific items in the After Takeoff normal checklist. Additionally, when doing a no engine bleed takeoff, reference to the No Engine Bleed Takeoff supplementary procedure, in conjunction with good crew coordination, reduces the possibility of crew errors.

1.17.4 Thrust Reversers FCOM 7.20.8

Reverse thrust is accomplished by two doors which block engine exhaust and deflect the exhaust flow forward. The doors operate by system A hydraulic pressure through the gear down hydraulic line. Alternate operation at a reduced rate is available with the standby hydraulic system (the reverser may not stow). A REVERSER UNLOCKED light located on the center instrument panel will illuminate when either thrust reverse door is not in the stowed and locked position.

With the engine fire warning switch down and the engine low oil pressure switch sensing pressure, an electrical circuit including the nose gear, or main gear air/ground safety sensors, allows the thrust reversers to deploy. When all three electrical conditions are satisfied, the isolation valve will be solenoid-held to the open position. Loss of any electrical condition will cause the isolation valve to spring closed. The selector valve is controlled by the reverse thrust lever and directs hydraulic pressure to unlock, extend,retract or lock the doors.

The amber ISOLATION VALVE light will illuminate whenever a comparator senses a disagreement between the electrical condition to either isolation valve and the hydraulic pressure condition (the isolation valve open in flight, or closed on the ground). Positioning the guarded switch to the OVERRIDE position bypasses the oil pressure switch and the air/ground safety sensor and opens the isolation valve (if the fire switch is down). The override switches should not be used by flight crews for normal operations in flight or on the ground.

An engine control/reverser interlock system is provided. This interlock limits the thrust increase command if the reverser remains stowed when the reverse thrust lever is moved to a reverse position. The interlock is withdrawn during reverser translation from the stowed position to the deployed position. If the reverser

remains deployed when the reverse thrust lever is moved to the forward thrust position, thrust increase commanded by the forward thrust lever is limited. The interlock is withdrawn during reverser translation from the deployed position to the stowed (flight) position. Freedom of motion of the forward thrust levers is not an absolute indication that the thrust reverser is fully deployed or stowed and locked, since the interlocks are withdrawn during reverser motion.

WARNING: Actuation of the thrust reversers on the ground without suitable precautions is dangerous to ground personnel.

Thrust Reverser Schematic

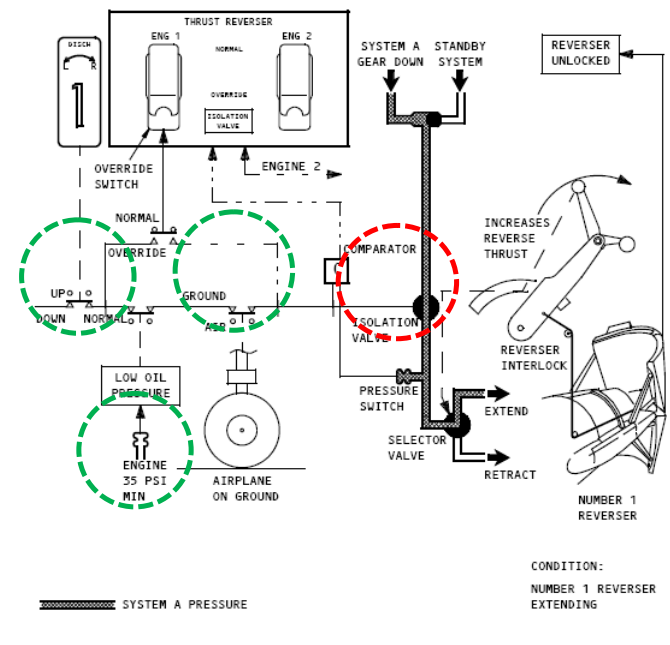


Figure 9: Thrust Reverers Schematic

The thrust reverser schematicon figure 11 shows that with the engine fire warning switch down and the engine low oil pressure switch sensing pressure, an electrical

circuit including the nose gear, or main gear air/ground safety sensors (the three green circles). If all three electrical conditions aresatisfied,the solenoid will be held in the open position(red circle) and allowing the thrust reversers to deploy.

1.18 Additional Information

1.18.1 The InterviewStatement Summary

The Pilots recollection

During final approach (visual approach) to runway 31 at Sultan Thaha airport – Jambi (WIPA), a B737-200 flight SJY 062, shortly after the landing gears were down and flaps 15° degrees configuration, the crew selected the flaps to 25 degrees, the crew noticed the the low pressure light of hydraulic system illuminated.

According to the pilot,the aircraft position was about 8 Nm from the VOR while descending passing 2500 feet to 2000 feet (2000 feet was their requested altitude to the ATC).

The captain (PF) and the first officer (PM) also confirmed that the low pressure condition was also indicated by low pressure indication of system A hydraulic pressure indicator. The captain also stated the hydraulic brake pressure on the indicator was at the green band.

The captain ordered first officer to carry-out QRH. The first officer stated that he preferred the captain to make go-around in order to properly carry out the QRH, but not verbally stated, whereas the captain decided to continue approach with the existing configuration of flaps 15 degrees reasoning that the existing aircraft weight (approx. 90,000 lbs) and flaps 15 configurations landing distance was not exceeded the available runway length.

The first officer continued to complete the QRH, but he stated that he was not sure whether he did the correct QRH actions. The captain also stated that he did not verify the first officer action of the QRH.

The captain stated, he flew the approach of “duck-under” method (below glide path) as he believed this method would achieve the shortest distance result when the aircraft touchdown well before normal touchdown zone.

Both flight crew stated the touchdown was smooth, the captain stated that after touchdown when he tried to apply reverser, and he could not be able to raise the thrust lever reverser because it felt very heavy. The captain then applied the brake manually with one steady full application. Both pilots stated that the aircraft was initially decelerated but afterward lost its deceleration. The captain stated that he reapplied the brake and exclaimed to the first officer about the braking condition. The first officer stated that he also pressed the brake pedals to maximum deflection in responding to the situation. Both pilots stated that the aircraft unable to decelerate and stopped within the runway and the overrun was very likely.

The aircraft drifted to the right of the runway about 200 meters before end of runway. The final position of the aircraft rested at coordinate 01˚ 37’ 52.56” S 103˚ 38’ 12.84 E, elevation 104 feet. Compass heading reading of 033 degrees. The aircraft was substantially damaged (both engine are detached from the pylons. left

main landing gear was detached from its position and ”stacked” with in-board flaps and engine number 1 blocking the left rear door, nose landing gear was detached, front section of the fuselage was structurally collapsed; especially on its upper structure, right main gear was still on its position below the right wing;however the cockpit and cabin generally intact; its floor relatively level and doors (except left hand rear door) was in good shape and operational.

The captain later added that after the aircraft stopped, he noticed that the speed brakes lever had never extended. He also stated that he performed Passenger Evacuation drill items, he could not put both start levers to cut-off, and he was also unable to pull the engine and APU fire switches. Both pilots stated that their radio communication and interphone did not work as well.

1.18.2 The Flight Attendant recollection

All flight attendant stated that the touchdown was very smooth which worried them as they knew that airport does not have quite long runway. They also stated that no sound of engine reverser was heard after touchdown as normally they heard. They also stated that they felt initially a marked deceleration but then suddenly loss the deceleration. The forward flight attendants stated that before touchdown they heard a machine voice from GPWS activated but could not identify what kind of voice. The forward flight attendant also stated that during the landing rollout after the aircraft loss its initial deceleration, they heard the captain yelling about the brake condition.

1.18.3 The on board Mechanic recollection

The mechanic onboard stated that the touchdown was very smooth, he also remarked that he did not hear engine reverser noise as he usually expected during landing rollout. He also stated that initially the aircraft decelerate positively but suddenly it accelerated as it loss its deceleration. He was seated in row number 5C.

1.18.4 The Air Traffic Controllerrecollection

The SJY 062 at 09:25.45 UTC reported that the position was 14 Nm from the VOR passing 3000 feet and requested to descend to 2000 feet. At 09:26.56 UTC, SJY 062 reported that they have runway insight so the ATC to continue the approach. At 09:27.39 UTC, the ATC stated that the SJY 062 aircraft was visually insight and then the landing clearance was given. According to the ATC, the crew of SJY 062 read back the landing clearance as well as details of their aircraft registration. The landing and rollout decribed by the ATC on duty was normal, when the aircraft passed the VASIS runway 13 at 09:31.17UTC, the ATC on duty gave landing time and taxi clearance to apron. The ATC on duty stated that after that landing time and taxi clearance no response was received from the SJY 062. Afterward, the ATC on duty stated that after noticing that the aircraft did not slow down an appeared to overrun then they activated emergency alarm.

1.18.5 The Airport Fire Fighting Crew recollection

During the passenger evacuation as well as the crew left the airplane, the APU was still running. They asked the engineer of other airline based in Jambi to shut down the APU from the cockpit. The engineer of other airline stated that he did shutdown

the APU was witnessed by the airport securities.

The mechanic on board SJY 062, later added that after he evacuated from the aircraft, he decided to return to the aircraft, went into the cockpit and switched off the battery.

1.18.6 Laboratory examination of failed component

No components were examined in the laboratory.

1.19 Useful or Effective Investigation Techniques

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

2 ANALYSIS

The analysis will discuss the relevant safety issues resulting from the investigation to the runway excursion involving a Boeing 737-200 on 27 August 2008, registered PK-CJG.

For the purpose of analysis the parts of the FCTM of Non Normal operation FCT 737-200 (TM) 8.3, CRM 1.2 and FCOM on Hydraulic system 13.20.1/2/3/4 were summarized to identify the relevant systems, procedures and consequences prior to the decision to land was made by the pilots.

The investigation determined that, prior to the occurrence, the aircraft experienced aloss of hydraulic system A after the flaps were extended to 15°and the landing gear selected down. The analysis will therefore discuss issues relating to the following:

1. Loss of Hydraulic System A.
2. Non-Normal flight crew Coordination.
3. Landing Distance required with loss of hydraulic system A.

2.1 Loss of hydraulic System A

The hydraulic system A failure during the approach affected a number of aircraft systems required for aircraft deceleration during the landing phase.These systems includes brakes,spoilers,speed brake,flaps and engine thrust reversers.

According to the FCOM, LOSS OF SYSTEM A the following conditions occur:

- Inboard flight spoilers inoperative - Roll rate and speed brake effectiveness may be reduced in flight.
- Trailing edge flaps normal hydraulic system inoperative - the trailing edge flaps can be operated with the alternate electric-driven system. Alternate flap extension time to flaps 15 is approximately 2 minutes.
- Leading edge flaps and slats normal hydraulic system inoperative - The leading edge flaps and slats can be extended with standby hydraulic pressure. Once extended, they cannot be retracted.
- Normal landing gear extension and retraction inoperative - Manual gear extension is needed.
- Ground spoilers inoperative.
- Both thrust reverser normal pressure inoperative - the thrust reversers could be deployed and retracted at a slower rate.
- Inboard brakes normal hydraulic system inoperative. - Inboard brakes have accumulator pressure only.
- Nose wheel steering inoperative.

In addition, other information described in the QRH page 13.3 loss of hydraulic system Astates as follows:

- The landing gear configuration warning may sound if the flaps are between 10 and 15 and the landing gears are retracted.
- Maximum airspeed is limited to 210 knots.
- The LE FLAPS TRANSIT (Leading Edge Flaps Transit) light will stay illuminated until the flaps approach the flaps 10 position.

The investigation could not determine the cause of the Hydraulic system A failure due to the subsequent components and system damage as a result of the accident. However, irrespectiveof the particular hydraulic system A failure, the procedures and the consequences arising were described in the specified chapter of FCTM, FCOM and QRH issued by the aircraft manufacturer.

2.2 Crew Coordination for a Non-Normal Situation

According to the FCTM of Non Normal operation FCT 737-200 (TM) 8.3 When a non-normal situation occurs, a rushed approach can often complicate the situation. Unless circumstances require an immediate landing, all corrective actions should be completed before beginning the final approach.

Furthermore, for some non-normal situations, the possibility of higher speed on approach, longer landing distance, a different flare profile or different landing technique should be considered. Therefore, planning an extended straight-in approach with time allocated for the completion of any non-normal checklist (NNC) steps such the use of alternate flaps or landing gear extension system.

The Quick Reference Handbook assists flight crew in the decision making process by indicating those situations where “nearest suitable airport” is required. These situations are described in the checklist instruction or individual non-normal checklist. In all cases, the PIC is expected to take the safest course of action.

During this flight, when at 08:28 UTC the flaps was at 15° and the landing gears extended by the pilot, the hydraulic system A low pressure light illuminated and the SSFDR recorded that the aircraft altitude was 1800 feet. A short discussion and verification from the PIC to the SIC concerning to the hydraulic failure were recorded by the SSCVR, and the PIC decided to continue the approach with the existing aircraft configuration for runway 31.

The SSCVR did not record any detail of pilots conversation in respect to the abnormal procedure associated to that particular hydraulic system A failure, either to the flight attendant or the air traffic controller. Apart from the approach briefing, there was no discussion in regard to consideration of conducting a missed approach (go-around) once the hydraulic system failure became apparent.

At the time when the hydraulic system A pressure loss followed by the illumination of the warning light, the remaining fuel endurance was approximately 2 hours. With such remaining time the pilots had more than one hour to conduct a missed approach, review the QRH procedure and explore the risks and consequences prior to making a decision

to land.

Crew Resource Management is the application of team management concepts and the effective use of all available resources to operate a flight safely and in addition to the crew, it includes all other groups routinely working with the flight crew are involved in decision required to operate a flight.

As a consequence from the loss of hydraulic system A, there were several systems inoperative which reduced the landing performance of the aircraft. However, the pilots did not refer tothe QRH which would have assisted them with the details of procedures and steps required, nor were there discussions with all crew members as required using CRM principles before the decision to land was made.

2.3 Landing Distance Required With Loss of Hydraulic System A

The Loss of Hydraulic system A requires the pilots to land the aircraft with a number of aircraft systems degraded and several conditions have to be considered which affect the landing distance.

Referring to the landing distance required as stated in the FCOM chapter PI.12.1 normal and PI 12.9 with the existing landing weight and condition at a Vrefof 138 kts calculated from Non- Normal were summarized as the following table:

Adjustment of	Non normal hydraulic loss of system A flaps15° (feet)
Landing weight 100,000 lbs	4950
Elevation	26
Wind (tail/ head)	0
Temperature 25 C	300
Vref 138 kts	0
No reverse	0
Total	5276

The table shows that with the Loss of Hydraulic System A, with the existing aircraft weight and conditions at the time of occurrence the landing distance will be 5,276 feet.

At an altitude of 550 feet, the SSFDR showed that the aircraft speed was 171 kts and slight rolled to the left and right in average to 4°, then decreased to 165 kts at touchdown on the runway, no reverse thrust and the aircraft heading relatively maintained at 310°, then this heading changed to approximately 320° after 1,660 meter rolled on the runway. The aircraft stopped at 2,020 meters and it was the end of recording.

Based on the calculation referred to the above particular data recorded and used such similar method and calculation as on aforesaid above, the result showed as the following

table;

Adjustment of	Non normal hydraulic system A fail (feet)
Landing weight 100,000 lbs	4950
Elevation	26
Wind (tail/ head)	0
Temperature 25 C	300
Vref 165 kts	1070
No reverse	2260
Total	8606

Note: additional distance with no reverse refer to normal landing distance for flap 15°.

As stated in the QRH, the thrust reversers could be operated at a slower extension rate. In this occurrence during the landing roll, the pilot found it difficult to select the thrust reversers. Observation at the cockpit after the occurrence showed that the speed brake lever at forward, the flaps selector position was 15°, Spoilersstowed, slat deployed and thrust reverser levers stowed.

Referring to FCOM 7.20.8 the Reverse thrust is accomplished by two doors which block engine exhaust and deflect the exhaust flow forward. The doors operate by system A hydraulic pressure through the gear down hydraulic line. Alternate operation at a reduced rate is available with the standby hydraulic system (the reverser may not stow). With the engine fire warning switch down and the engine low oil pressure switch sensing pressure, an electrical circuit including the nose gear, or main gear air/ground safety sensors, allows the thrust reversers to deploy. When all three electrical conditions are satisfied, the isolation valve will be solenoid-held to the open position. Loss of any electrical condition will cause the isolation valve to spring closed. The selector valve is controlled by the reverse thrust lever and directs hydraulic pressure to unlock, extend, retract or lock the doors.

The thrust reversers werenot being able to be deployed by the pilot, while the systems described that it could be operated but at the slower rate. Examination from several data such of smooth touchdown (all crew stated smooth touchdown) with a speed 27 kts greater than Vref and the absence of speed brake selection which might result in the spoilers staying in the stowed position.

The condition of the spoilers stowed, smooth landing and higher landing speed created less stress on wheels which lead to the reversers could not be deployed.

As summary, the investigation concludes;

- The available runway length at Thaha Airport was 7283 feet.
- The assumed no deviation from the configuration and condition as described on the non-normal table calculation the landing distance will be 5276 feet.

- The landing distance calculation based on the factual data recorded by SSDFR and existing conditions, the landing distance will be similar to 8606 feet.
- Assuming that the aircraft was flown correctly by the pilot when in the condition of loss of hydraulic system A, the landing distance available was sufficient.

3 CONCLUSION

3.1 Findings

According to factual information during the investigation, the National Transportation Safety Committee founded any findings as follows:

1. The aircraft was airworthy prior to this occurrence.
2. The flight crew had valid licenses and medical certificates.
3. The aircraft departed Jakarta within the proper weight and balance envelope and the load specification.
4. On board the flight were 130 persons consisting of 2 pilots, 4 flight attendants, and 124 passengers on board.
5. The Pilot in Command (PIC) acted as Pilot Flying (PF) while the Second in Command (SIC) acted as the Pilot Monitoring (PM).
6. Prior to descent, the PIC conducted the crew briefing concerning to make a straight in approach runway 31 with flap 40°, reviewed the Go-around procedures and stated that Palembang as alternate airport.
7. Thaha Tower controller informed the crew that the wind was calm and rain over the field.
8. At 0927 UTC a SSCVR recorded the SIC noticed to the PIC that the hydraulic system A low pressure warning light illuminated, and also the hydraulic system A quantity indicator showed zero.
9. The PIC commanded the SIC to check the threshold speed with the existing weight and configuration of landing flap 15°.
10. The Vref stated by SIC was 134 kts and the table showed that on landing weight 99,574 lbs the Vref showed 138 kts.
11. Refers to CRM, It is important that all flight deck crew members identify and communicate any situation that appears unsafe or out of the ordinary.
12. The pilot did not use the QRH which will assist and guide with the detail of procedures and steps to do, nor discussion as described on the CRM before decision to land was made.
13. Consideration was not made to conduct a missed approach to consider the implications of the loss of hydraulic system A.
14. All crews stated that the touchdown was smooth, the captain stated that after touchdown when he tried to apply reverse thrust, and he was not able to raise the thrust reverser lever because it felt very heavy.
15. The Vref with flaps 15°adjustment above 10 kts is 350 feet and with no reversers should be added by 2,260 feet.

16. The thrust reverser schematicshows that with the engine fire warning switch down and the engine low oil pressure switch sensing pressure, an electrical circuit including the nose gear, or main gear air/ground safety sensors (the three green circles). If all three electrical condition satisfied the solenoid held in open (red circle) and allowing the thrust reversers to deploy.
17. The PIC applied manual braking with one steady full application.
18. Both pilots reported that initially they felt a deceleration then afterward gradually loss of the deceleration.
19. The aircraft drifted to the right of the runway centre line about 200 meters prior went out of the runway and stopped at about 120 meters from end ` of the runway 31 and at a down slope surface area of 6meters.
20. Three farmers who were working on the area alongside the runway were hit by the aircraft. One was fatally injured and two were seriously injured.
21. The passengers started to evacuate the aircraft through the right over wing exit window before a command from the flight attendants.
22. The flight attendants subsequently executed the evacuation procedure without command from the PIC.
23. The left aft cabin door was blocked by the left main landing gear that had detached from the aircraft.
24. The right main landing gear and both engines were also detached from the aircraft.
25. The METAR issued by the Sultan Thaha Meteorology Office Jambi at 09:12 UTC: Wind 300/04, 8 Km, continuous rain, Few CB 1000, BKN 1000, 25/24, 1008 /1005.
26. TheCVR and FDR were examined and subsequentlydownloaded using the ATSB Technical Analysis facilities and The SSFDR data was downloaded at the Garuda Maintenance Facility under the supervision of NTSC investigators.
27. The Airport Rescue and Fire Fighting (ARFF) come to the crash site and activated the extinguishing agent while the passengers were evacuating the aircraft.
28. No significant property damage was reported.
29. At 550 feet of aircraft altitude, the SSFDR showed that the aircraft speed was relatively constant at 160 kts and 3° and the rolls left and right. 4°.
30. The Loss of Hydraulic System A, with the existing aircraft weight and conditions at the time of occurrence the landing distance will be 5276 feet.
31. Loss of Hydraulic System A affects number of aircraft systems required for aircraft deceleration during the landing phase. These systems includes brakes, spoilers, speed brake, flaps and engine thrust reversers.

32. After the aircraft touched down there were no reveres thrust and heading relatively stayed on 310° then changed to approximately 320° after 1,660 meter rolled and stopped at 2,020 meters.
33. The Airport Rescue and Fire Fighting (ARFF) come to the crash site and activated the extinguishing agent while the passengers were evacuating the aircraft.
34. The airport Rescue and Fire Fighting facilities was category VI, equipped with 4 units crash car, 2 units rescue car, 1 unit commando car, 2 unit ambulance and 23 trained personnel.
35. In this flight, when at 0828 UTC the flaps was at 15° and the landing gears extended by the pilot, the hydraulic system A low pressure light illuminated and the SSFDR recorded that the aircraft altitude was 1800 feet. The PIC decided to continue the approach with the existing flight configuration for runway 31.
36. The SSCVR did not record any detail of pilots conversation in respected to the abnormal procedure associated to that particular hydraulic system A failure, either to the flight attendant or air traffic the controller.
37. The Hydraulic system A failure requires the pilots to land the aircraft with number of aircraft system degradation and several condition has to be considered which might affect the landing distance.
38. The investigation could not determine the cause of the Hydraulic system A failure due to the related components and system damaged. However if this particular Loss of Hydraulic System A, the procedures and the consequences arise were described in the specified chapter of FCTM, FCOM and QRH issued by the manufacture.

3.2 Contributing Factors[5]

- When the aircraft approach for runway 31, the Loss of Hydraulic System A occurred at approximately at1600 feet. At this stage, there was sufficient time for pilots to conduct a missed approach and reviewthe procedures and determine all the consequences prior to landing the aircraft.
- The smooth touchdown with a speed 27 kts greater than Vref and the absence of speed brake selection, led to the aircraft not decelerating as expected.

5 Contributing Factors is defined as events that might cause the occurrence. In the case that the event did not occur then the accident might not happen or result in a less severe occurrence.

4 SAFETY ACTION

At the time of issuing this report, the Komite Nasional Keselamatan Transportasi (KNKT) has received any safety action.

PT. Sriwijaya Air

Safety and Security Department issued recommendation

1. On 28 august 2008: addressed to Service Manager to improve quick response according to ERP.
2. On 29 August 2008;addressed to Production Director with subject corrective training as follows:
    - Chief training should make further improvement to training about hydraulic fail.
    - Chief pilot should make preventive action emphasizes briefing to all pilot for passenger evacuation procedure.
    - Chief flight attendant should make preventive action emphasizes briefing to all flight attendant for passenger evacuation procedure.
3. On 29 August 2008;addressed to Maintenance Manager and Aero Nusa Indonesia (ANI) to improve progress for maintenance, especially hydraulic system A at B737-200 due to occurred hydraulic system A problems.
4. On 10 September 2008 addressed to Chief Operation Officer (COO) to analize runway limitation according:
    - Gross weight and runway length required for landing with flap 15 (B737-200/300/400)
    - Gross weight and runway length required for landing with flap 15 and loss of hydraulic system A (B737-200).
    - High risk airport with dry/ wet runway condition including DJambi (DJB).

5 SAFETY RECOMMENDATIONS

In respect to the occurrence and for the purpose of safety improvement the PT. Sriwijaya Air has issued safety actions on august and September 2008, the KNKT examined and considered that all the content of such safety actions were relevant.