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NATIONAL TRANSPORTATION SAFETY COMMITTEE

Aircraft Accident Investigation Report

**PT. Adam SkyConnection Airline (Adam Air)
Boeing 737-300 ; PK-KKV
Juanda Airport, Surabaya, East Java
Republic of Indonesia**

21 February 2007



NATIONAL TRANSPORTATION SAFETY COMMITTEE
MINISTRY OF TRANSPORTATION
REPUBLIC OF INDONESIA
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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

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

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

INTRODUCTION

SYNOPSIS

On 21 February 2007 at 15:25 local time (0825 UTC¹), a Boeing Company 737-300 aircraft, registered PK-KKV, was being operated by PT. Adam SkyConnection Airlines (Adam Air) on a scheduled passenger flight from Soekarno Hatta Airport, Jakarta to Juanda Airport, Surabaya, East Java². There were 155 person on board consist of seven crew and 148 passengers.

During descend approach at 1,500 feet, the flight crew did not informed about any technical problem.

Weather condition was thunderstorm rain with visibility 8,000 meters, as reported by ATC.

On final approach on runway 28 passing 800 feet approach light insight and landing clearance was receipt.

During the aircraft touchdown, the cockpit voice recorder recorded ground proximity warning systems sound “Sink Rate” and “Pull Up”, and transferred control from co pilot to PIC.

After the aircraft touchdown on runway 28 and right wheel track outside shoulder at about 4 meters from edge shoulder. The PIC succeeded carrying back the aircraft to the centre. The aircraft stooped for about 100 meters from taxiway N3 and ROW 16 aft cabin condition reached touch the ground.

The two passengers were minor injured; seven crews and 146 passengers were safely.

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

² Juanda Airport, Surabaya, East Java, will be called Surabaya in this report.

1 FACTUAL INFORMATION

1.1 History of the flight

On 21 February 2007 at 1525 local time (0825 UTC), a Boeing Company 737-300 aircraft, registered PK-KKV, was being operated by PT. Adam Sky Connection Airlines (Adam Air) on a scheduled passenger flight from Soekarno-Hatta Airport, Jakarta to Juanda Airport, Surabaya, East Java. There were 155 persons on board, consist of 7 crew and 148 passengers.

During the flight there was no abnormality declare by the flight crew.

Weather condition at Surabaya was thunderstorm and rain, wind 240/7 knots with visibility 8,000 meters.

The CVR revealed that there was conversation in the cockpit that was not related to the progress of the flight, the conversation was relating to the company fuel policy and training program until 2000 feet. The CVR did not reveal approach briefing and any checklist reading.

On final approach of runway 28 passing 800 feet approach light insight and landing clearance was received.

Prior to touchdown, control of the aircraft was transferred from co-pilot to PIC. The CVR recorded that the Ground Proximity Warning Systems (GPWS) warned "Sink Rate" and "Pull Up".

The right wheel track was found out of the runway for about 4 meter away and return to the runway. The aircraft stopped for about 100 meters from taxiway N3.

After aircraft touched down, the fuselage aft of passenger seat row 16 was bended down. The passengers were panic. Flight attendants evacuated the passengers via all exits available and door slides were inflated.

The two passengers were minor injured, and the aircraft suffered severe damage.



Figure 1: The aircraft condition after accident

1.2 Injuries to persons

Injury	Flight crew	Passengers	Total in Aircraft	Others
Fatal	-	-	-	-
Serious	-	-	-	-
Minor	-	2	2	-
None	7	146	153	-
TOTAL	7	148	155	-

1.3 Damage to aircraft

Severe damages were found on the aircraft, the details are as follows:

1.3.1 Fuselage: bended / buckled skin, and broken keel beam

In general the fuselage was bended starting from wheel well area or seat row number 16. (Figure 2) The damages were skin buckling and twisting.

The keel beam of the lower fuselage in the wheel well area was damaged due to excessive bending moment and torsion load. The aft part of the keel beam was crushed and twisted counter clock wise, displaced about 15 cm. (Figure 3 and Figure 4)



Figure 2: The fuselage was broken



Figure 3: The Keel beam was broken



Figure 4: The fuselage was broken viewed from passenger cabin

1.3.2 Wheel well: deformed (Figure 5)

A large deformation was observed on the wheel-well area. The deformation was due to bending load and crushing of the keel beam. The aft section of the landing gear bay area was displaced forward about 35 cm.



Figure 5: Wheel bay deformed

1.3.3 Main landing gear: bottoming marks on both main landing gears

Bottoming marks were found on the bottom on the shock strut on both of the main landing gears. Bottoming marks appear indicated that there was an excessive impact load. The mark on the right main landing gear (Figure 7) was deeper than the mark on the left main landing gear (Figure 6). This indicated that the right main landing gear suffered a higher impact load.



Figure 6: Bottoming marker on left main landing gear



Figure 7: Bottoming mark on right main landing gear

1.3.4 Nose landing gear: broken wheel hub (Figure 8)

The right hand of the nose landing gear showed crack on wheel hub and damage on its bearing.



Figure 8: Wheel hub of the nose landing gear: crack

1.4 Other damage

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

1.5 Personnel Information

1.5.1 Pilot in command

This information was not made available to the investigation.

1.5.2 Copilot

This information was not made available to the investigation.

1.6 Aircraft Information

1.6.1 Aircraft data

Manufacturer	Boeing Company Ltd.
Model	B737-300
Serial number	27284
Registration	PK-KKV
Nationality	Indonesia
Certificate of airworthiness Validity	7 December 2007
Certificate of registration Validity	7 December 2007
Total time since new	37.936 hours
Total cycles since new	23,824 cycles

1.6.2 Engine data

Manufacturer	CFM International
Model	CFM 56-3C1
Serial number #1	724-662
Serial number #2	857854

There was no evidence of any engine malfunctions that might contribute the accident and considered to be not relevant.

The investigation determined that there was no abnormality recorded prior to the accident.

1.6.3 Weight and balance

Actual take-off weight	:	58,967 Kg
Actual landing weight	:	51,130 Kg
Fuel at take off from Jakarta	:	8.300 Kg

1.7 Meteorological information

The meteorological data issued by Meteorology office Station Surabaya, reported at 08.00 UTC visibility was 9,000 meters, and at 08.27 UTC (5 minutes after aircraft stopped on runway 28) the visibility gradually reduced to was 1,500 meters.

1.8 Aids to navigation

Not relevant to this accident.

1.9 Communications

Not relevant to this accident.

1.10 Aerodrome information

Airport Name	:	Juanda Airport
Airport Identification	:	SUB/WARR
Airport Operator	:	PT. Angkasa Pura I
Runway Direction	:	10 / 28
Elevation	:	9 feet
Runway Length	:	3,000 m
Runway Width	:	45 m
Surface	:	Asphalt

1.11 Flight Recorders

1.11.1 Digital Flight Data Recorder (DFDR)

The aircraft was equipped with the Digital Flight data Recorder (DFDR) and Cockpit Voice Recorder (CVR).

Manufacturer : Chec Stroke
Type/Model : TSO-C51a
Part Number : 980-4100-DXUS
Serial Number : 8558
ULB battery : June 2008
ULB serial number : S10888

1.11.2 DFDR readout

The DFDR data was downloaded at Aviation Safety Council, Taiwan under supervision of the NTSC investigators.

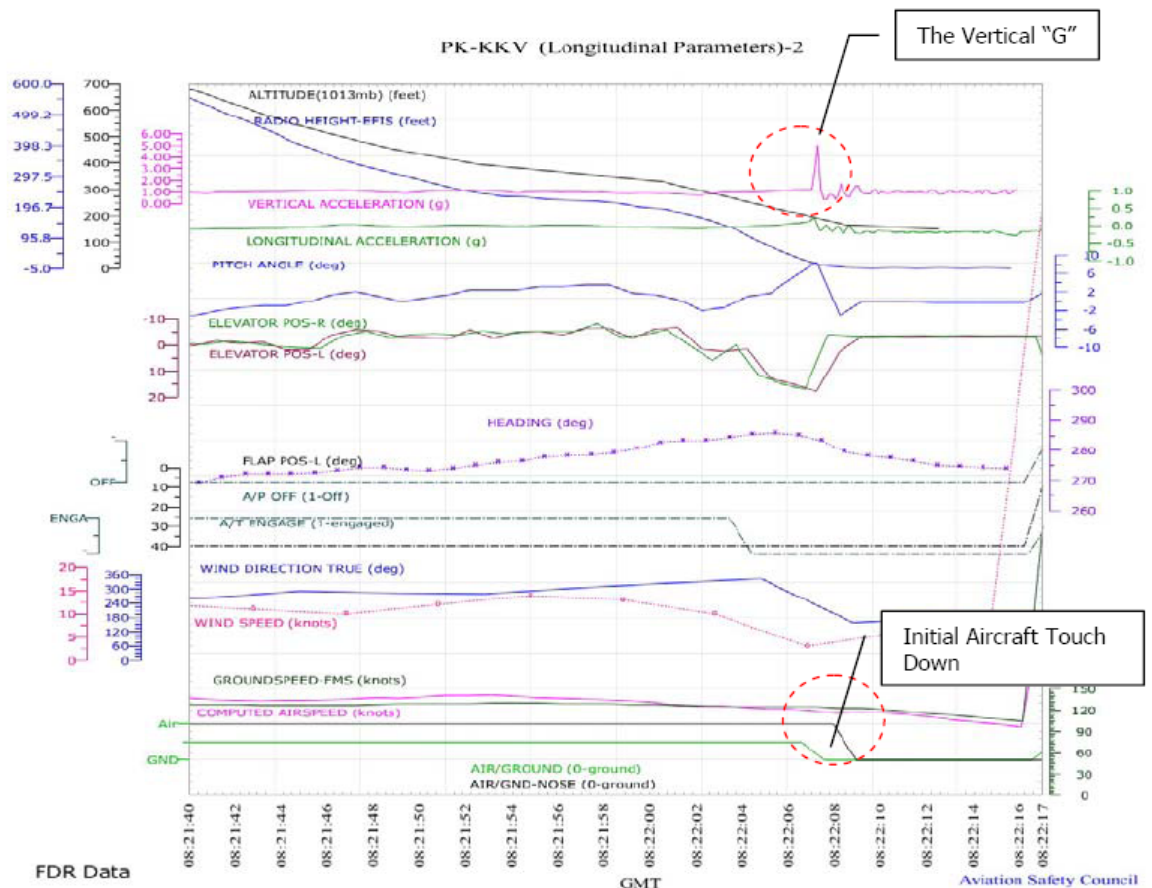


Figure 9: The DFDR readout

1.11.3 Cockpit Voice Recorder (CVR)

Manufacturer: Fairchild

Type/Model : A100S

Part Number : S100-0080-00

Serial Number : 01809

Date manufacturer : August 1997

ULB battery : 30 October 2010

ULB serial number : S18205

The CVR was downloaded at MMF (Merpati Maintenance Facility) Surabaya under supervision of NTSC investigators. The CVR recording quality was in good quality and recorded last 30 minutes of the flight. The recorded ended after the aircraft landed.

1.11.4 Notable facts from the FDR and CVR

Sequence of events:

- Surabaya Approach informed to Adam 172 for continue descen to 2,000 feet and heading 115.
- The crews discuss about initial approach altitude of the VOR/DME approach
- 08:17,06: Reaching 2000 feet
- 08:19.08: Instructed to Heading 230 and clear VOR/DME approach
- 08:19.09 The PIC suggested the co-pilot to engage the VOR LOC button³
- 08:19.09 Crew discussed about descend point of the VOR/DME approach
- 08:19.10 The aircraft established on final course runway 28 at distance 8 miles from the runway.
- 08:19.27 The aircraft started descend from 1600 feet for approach
- 08:19.44: the landing gear down selected
- 08:20.29: PIC report suggested the aircraft was to high
- 08:20.39: GPWS warning one thousand feet
- 08:20.44 The PIC reminded to select flap 40
- 08:20.52 Autopilot disengaged

³ VOR LOC button is the option of the autopilot to maintain selected VOR radial or localizer of an ILS.

- 08:20.57 Flap 40 selected
- 08:21.07 GPWS alerting five hundred and sink rate(two times)
- 08:21.23 PIC reminded that the aircraft was too high
- 08:21.24 GPWS alerting two hundred
- 08:21.26 PIC took over the control
- 08:21.33 GPWS warning sink rate and whoop whoop pull up (two times)
- 08:22.08 The aircraft touchdown.

1.12 Wreckage and impact information



Figure 10: Tire marking

1.13 Medical and pathological information

Two passengers was treated by nearest hospital, since they experiences backbone pain.

1.14 Fire

There was no pre or post-impact fire.

1.15 Survival aspects

This accident was survivable.

1.16 Tests and research

Not relevant to this accident.

1.17 Organisational and management information

Aircraft Operator : PT. Adam Sky Connection Airlines

Trading as : AdamAir

Address : Jl. Gedong Panjang No.28 Jakarta Barat

Certificate Number : AOC / 121-036

The PT. Adam SkyConnection Airline (Adam Air) was closed on May 2008.

1.18 Additional information

There was no additional information required.

1.19 Useful or Effective Investigation Technique

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

2 ANALYSIS

2.1 Distraction to the pilot

According to the Boeing Flight Crew Training Manual (FCTM) under the subtitle “Callout” states that:

Both crew members should be aware of altitude, airplane position and situation.

Avoid nonessential conversation during critical phase of flight, particularly during taxi, takeoff, approach and landing. Unnecessary conversation reduces crew efficiency and alertness and is not recommended when below 10,000 feet MSL / FL 100. At high altitude airport, adjust this altitude upward as required.

The CVR revealed that there was intense and non-stop conversation among the flight crew started from the beginning of the CVR recording and was ended when the aircraft altitude was about 2000 feet.

This conversation has distracted the flight crew to their cockpit tasks and procedures. The CVR did not reveal any checklist reading and approach crew briefing.

2.2 Approach procedure

In the Boeing FCTM under subtitle “Approach Briefing” states that:

Before start an instrument approach, the PF should brief the PM of his intention in conducting the approach. Both pilots should review the approach procedure. All pertinent approach information, including minimum and missed approach procedure, should be reviewed and alternate courses of action considered.

The flight crew discussed about initial approach altitude and approach descend point. This showed that both pilot did not familiar with the VOR/DME approach profile.

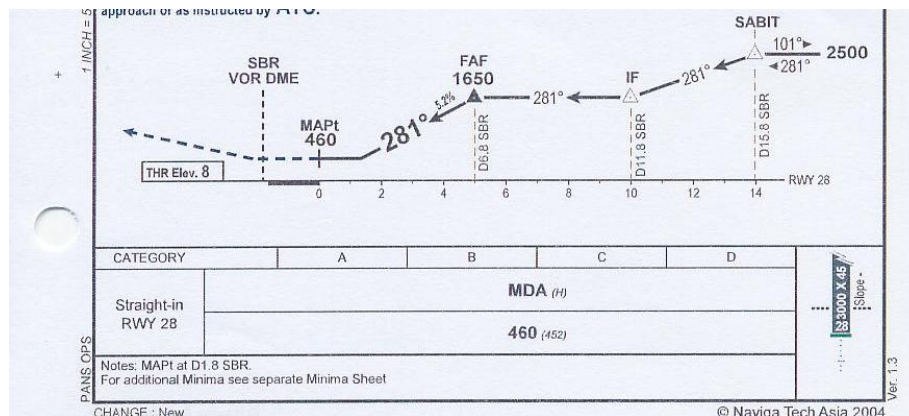


Figure 11: Descend profile VOR/DME approach runway 28 Surabaya

In the Boeing FCTM under the subtitle “Instrument Approach” the flaps 5 should be selected prior to intercept the inbound track.

2 NM before the Final Approach Fix (FAF) should select the landing gear down, Flap 15, arm speed brake and set Minimum Descend Altitude (MDA).

At FAF, the pilot should set the landing flaps, set V/S (for approach using vertical speed mode (VS mode) and do the landing checklist.

The VOR/DME approach runway 28 Surabaya showed that the FAF is on 6.8 NM from SBR VOR at altitude 1650 feet.

According to the Boeing FCTM, during the VOR/DME approach runway 28 at Surabaya, the landing gear down and flaps 15 should be selected at 8.8 NM from SBR VOR. While at 6.8 NM, the flap 40 (landing flap) and landing checklist should be performed.

During intercepting the inbound course, the PM told the PF that he selected to VOR/LOC. PM also reminded the PF to select flap 40. The flap was selected at altitude below 1000 feet. These showed that the PF was not aware to the progress of the flight.

2.3 Stabilized approach

In the Boeing FCTM, it is recommended a Stabilize Approach that meets several criteria of the stabilized approach:

All approaches should be stabilized by 1,000 feet above airport elevation in instrument meteorological conditions (IMC) and by 500 feet above airport elevation in visual meteorological conditions (VMC).

An approach is considered stabilized when all of the following criteria are met:

- The airplane is on the correct flight path;
- Only small changes in heading/pitch are required to maintain the correct flight path;
- The airplane speed is not more than VREF + 20 knots indicated airspeed and not less than VREF;
- The airplane is in the correct landing configuration;
- Sink rate is no greater than 1,000 fpm; if an approach requires a sink rate greater than 1,000 fpm, a special briefing should be conducted;
- power setting is appropriate for the airplane configuration;
- All briefings and checklists have been conducted.

Note: An approach that becomes un-stabilized below 1,000 feet above airport elevation in IMC or below 500 feet above airport elevation in VMC requires an immediate go-around.

These conditions should be maintained throughout the rest of the approach for it to be considered a stabilized approach. If the above criteria cannot be established and maintained at and below 500 feet AFE, initiate a go-around.

During the approach, PIC mentioned that the approach was too high twice, first when the aircraft altitude was 1000 feet, and 200 feet. At 500 feet, the GPWS alert of 'sink rate, sink rate' was recorded. This shown that the aircraft rate of descend was greater than 1500 feet. After the PIC reminded that the approach was too high at 200 feet, the PIC decided to take over the control.

After the PIC had the control of the aircraft, GPWS alert and warning of 'sink rate, sink rate' and 'whoop, whoop, pull up' was recorded in the CVR. The sink rate alert is triggered when the rate of descend was greater than 1500 feet/minute, while the warning 'whoop, whoop, pull up' is triggered when rate terrain closure is greater than 2500 feet/minute.

The FDR revealed that during this time, the pitch attitude was two degrees down and the rate of descend was greater than 2000 feet.

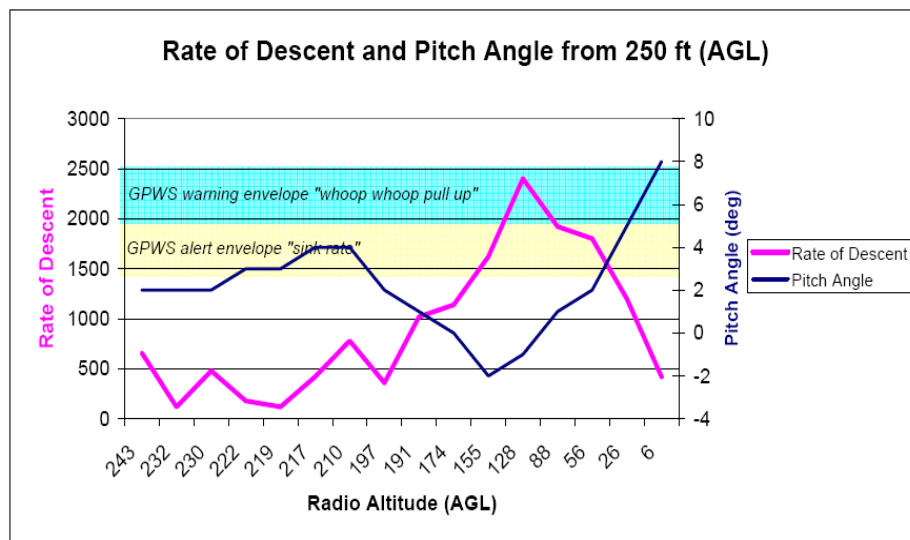


Figure 12: FDR graph of rate of descend and pitch angle below 250 feet

The Boeing FCTM also recommended the attitude of the aircraft during the approach. It is recommends that during cross the threshold, the aircraft attitude is between 3-4 degrees up. While flare out for touchdown, the aircraft attitude is between 5-7 degrees up.

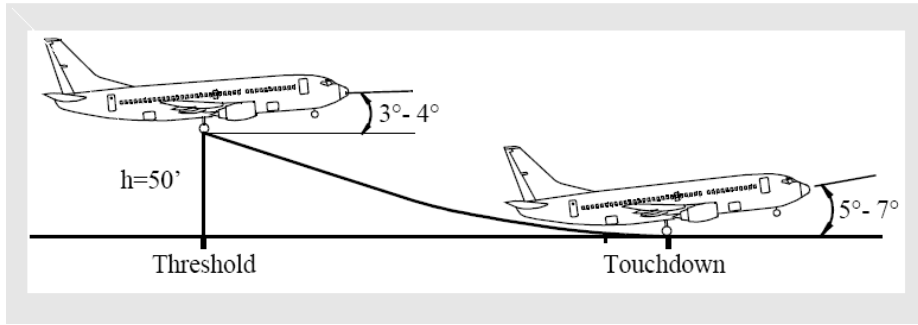


Figure 13: The Boeing recommendation for aircraft attitude during approach

The rate of descent, the pitch attitude and late of flap selection to 40 were the indication that a stabilized approach criteria was not met. According to the Boeing FCTM, the go around should be initiated.

3 CONCLUSIONS

3.1 Findings

- The crew were hold valid license,
- The aircraft had valid CoA and CoR
- The aircraft was flown within the correct CG envelope.
- There were no system and or component abnormality reported.
- There were several un-necessary communication between pilots during approach phase.
- There was no an indication that the normal check list was read
- The weather report when the accident occurred was in rainy while the horizontal visibility was 9 km and gradually reduced to 1500 meters in 5 minutes after the aircraft landed.
- The wind direction and speed was from. 240 and 7 kts
- The landing flaps had selected at below 1000 feet
- There were several task and procedure instructions given to PF by the PM since the aircraft left 2000 feet till final phase
- When at the final phase below 200 feet, the aircraft rate of descend shown above 2000 feet per minutes
- While during approach, all the GPWS voices had not been responded by both of pilots and also the standard callouts of "CONTINUE" or "GO - AROUND at the MDA had not sounded
- The aircraft was controlled by the Co-pilot until about 200 feet at which time the control was taken over by the PiC.
- The aircraft attitude was at two degree down when the aircraft over threshold
- The aircraft was in unstable approach.
- The FDR indicated that the vertical acceleration at the time of first touch-down was 5G.
- The flight recorders stopped recording at the time of the first impact.
- The aft section of the fuselage starting from seat row 16 suffered downward displacement.
- Several passengers suffered a back-pain.

3.2 Causes

From the findings, it is concluded that the aircraft experienced excessive sink rate upon the touch-down. The aircraft was in unstable approach even at below 200 feet.

The high vertical acceleration caused severe damage to the aircraft structure.

The flight crew did not comply to several procedures published by the Boeing company.

The flight crew did not respond to the GPWS alert and warnings.

4 SAFETY RECOMMENDATIONS

As a result of the investigation into this accident, the National Transportation Safety Committee issues the following recommendations.

4.1 Recommendation to the Directorate General Civil Aviation

The National Transportation Safety Committee recommends that the Directorate General Civil Aviation to ensure sufficient safety oversight to the operator concerning training.

4.2 Recommendation to the operators

The National Transportation Safety Committee recommends that the operators to enforce the cockpit procedure including approach briefing, CRM, call-out, checklist, as well as cockpit silent policy during significant phase of flight.