AIRCRAFT ACCIDENT INVESTIGATION COMMITTEE
MINISTRY OF TRANSPORT, THAILAND

AIRCRAFT ACCIDENT FINAL REPORT

ONE TWO GO AIRLINES COMPANY LIMITED
MCDONNELL DOUGLAS DC-9-82 (MD-82)
HS-OMG

PHUKET INTERNATIONAL AIRPORT
THAILAND

16 SEPTEMBER 2007

The investigation process of the Aircraft Accident Investigation Committee of Thailand follows the procedures in ICAO Annex 13 Aircraft Accident and Incident Investigation which the objective of the investigation of an accident or incident shall be the prevention of accidents and incidents. It is not the purpose of this activity to apportion blame or liability.

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SYNOPSIS

On 16 September 2007, at approximately 14:30 hours, an airplane MD-82 of One Two Go Airlines Company Limited (One Two Go), nationality and registration mark HS-OMG, departed from Don Mueang International Airport to Phuket International Airport on a domestic flight OG 269 with 130 crew members and passengers on board.

At 15:40:10 hours, during conducting a go-around at Phuket International Airport, the airplane veered off and hit an embankment located in the North of Runway 27, broke up in flames, and was completely destroyed. As a result, 90 crew members and passengers died, 26 were seriously injured and 14 suffered minor injuries.

The Aircraft Accident Investigation Committee of Thailand (AAIC) conducted an investigation and notified the International Civil Aviation Organization (ICAO) and the National Transportation Safety Board (NTSB) of the United States of America as the State of airplane and engine Design and Manufacture. In addition, the United States sent accredited representatives from NTSB and Federal Aviation Administration (FAA), as well as advisors from Boeing Commercial Airplanes Company Limited and Pratt & Whitney Company Limited to participate in the investigation.

Moreover, the AAIC notified the representatives of the United Kingdom, Commonwealth of Australia, Japan, France Republic, State of Israel, Northern Ireland, Islamic Republic of Iran, Federal Republic of Germany, and Republic of Indonesia as the States having suffered fatalities or serious injuries to theirs citizens.

LOCAL TIME IS USED IN THIS REPORT

1. FACTUAL INFORMATION

1.1 History of the Flight

On 16 September 2007 at approximately 14:30 hours, One Two Go Airlines' McDonnell-Douglas MD-82 airplane with Nationality and Registration Mark HS-OMG, departed on a scheduled passenger flight number OG269 from Don Muang International Airport for Phuket International Airport with 123 passengers and 7 crew members on board. The Pilot-in-Command (PIC) seated on the left was a Pilot not Flying (PNF)/Pilot Monitoring and the Co-pilot seated on the right was a Pilot Flying (PF). The flight was en route on airways G458 at Flight Level (FL) 320 (32,000 feet) and the estimated time of arrival at Phuket International Airport was 15:50 hours.

At 15:36:21, during the time that flight OG269 was approaching the Phuket International Airport, the Orient Thai Airlines flight OX2071, while vacating from Runway 27 after landed at the Phuket International Airport, reported the Air Traffic Controller (ATC) of the weather condition prior to landing that Cumulonimbus (CB) was over the airport area and there was windshear at 5 nautical miles before reaching the Instrument Landing System (ILS) station, resulted in airspeed gain and loss of 15 knots. The ATC asked flight OG269 whether they acknowledged the weather conditions reported by flight OX2071, because both flights were on the same aerodrome radio frequency (118.1 MHz). The PIC of flight OG269 acknowledged the information and extended the landing gears for landing.

At 15:37:31, the ATC informed flight OG269 of surface winds from 240 degrees at 15 knots and gave clearance to land on Runway 27 with wet runway precaution.

At 15:38:27, the ATC informed flight OG269 of surface winds from 240 degrees at 30 knots and asked the flight OG269 to state its intention of landing. The flight OG 269 affirmed.

At 15:39:00, the flight OG269 requested for information of surface wind condition. The ATC informed a surface wind condition of 240 degrees at 40 knots and the flight OG 269 acknowledged. At that instant, the Radio Altitude Aural

Call-Out system automatically called out '500 feet' and the PIC called out that the airspeed was at 136 knots.

At 15:39:23, the PIC ordered for more engine power and reminded the Co-Pilot that the airplane was descending below the ILS glide path. The Co-pilot affirmed the correction. The PIC then ordered to increase engine power three more times. During that time, the airplane was at the altitude of 100 feet.

At 15:39:45, the Radio Altitude Aural Call-Out system automatically called out '40 feet' and the Enhanced Ground Proximity Warning System (EGPWS) called out 'sink rate – sink rate'.

At 15:39:49, the Co-Pilot called out for a go-around and the PIC said 'Okay, Go Around'.

At 15.39.50, the Co-Pilot called for 'flaps 15' and transferred the airplane control to the PIC. Then, the PIC told the Co-Pilot to set the autopilot airplane heading and to retract the landing gear.

At 15:40:11, the airplane veered off and hit an embankment located in the North of Runway 27 and broke up in flames.

1.2 Injuries to Persons

Injuries	Crew	Passengers	Other	Total
Fatal	5	85	-	90
Serious	2	24	-	26
Minor/None	-	14/-	-	14
Total	7	123	-	130

1.3 Damage to Aircraft

The airplane was destroyed.

1.4 Other Damage

Approximately 60 meters of the fence enclosing the embankment at Phuket International Airport was damaged.

1.5 Personnel Information

1.5.1 Pilot in Command

Age:	57 years old
Nationality:	Indonesian
Pilot License:	Airline Transport Pilot License No. 4094 was issued by Directorate General of Civil Aviation (DGCA) of Indonesia on 21 January 1994. It was last extended on 23 April 2007 and valid until 31 October 2007. A Rendering Certificate N0. 031 of the Personnel License was issued by Department of Civil Aviation (DCA) of Thailand on 1 November 2006. It was last extended on 27 June 2007 and valid until 31 October 2007.
Rating:	According to the License No. 4094 F-100 F-70 B737-200 MD 80's According to the Rendering Certificate N0. 031 PIC for MD 80's (MD 82/83)
Medical Certificate:	Medical Certificate Class 1 was issued by DGCA of Indonesia on 15 June 2007 and valid until 31 December 2007

Medical Limitations: Holder shall wear lenses that correct for distant vision and possess glasscs that correct for near vision.

Flying Experience

Total flight time	16,752:00 hours
Flight time on DC-9-82 (MD-82)	4,330:00 hours
Flight time on DC-9-82 (MD-82) for the last 90 days	241:57 hours
Flight time on DC-9-82 (MD-82) for the last 30 days	106:05 hours
Flight time on DC-9-82 (MD-82) for the last 7 days	30:39 hours

Flight Time and Flight Duty Period

(1) Flight time on DC-9-82 (MD-82) for the last 24 hours:	
Flight Time	5:08 hours
Flight Duty Period	8:03 hours
(2) Rest Period Before Duty on 16 September 2007	13:07 hours
(3) Accumulated flight time from 10 September 2007 to the flight before the accident flight which exceeded the limitation stated in the Flight Operations Manual (FOM) of Orient Thai Airlines: the accumulated flight time shall not exceed 30 hours within any 7 consecutive days.	30:39 hours
(4) Flight duty period on 13 September 2007	9:10 hours
Rest Period before 14 September 2007 which was less than the limitation stated in the FOM of Orient Thai Airlines: the rest period is at least 10 hours.	8:25 hours

Training Record

The PIC attended the Crew Resource Management (CRM) training course on 12-16 February 2001, at Merpati Training Center, Jakarta, Indonesia. However, no record of any recurrent training in CRM thereafter was found.

Pilot Proficiency Check

The PIC passed the last Pilot Proficiency Check on 21 April 2007, at Lion Training Center, Jakarta, Indonesia.

1.5.2 The Co-Pilot

Age:	30 years old
Nationality:	Thai
Pilot License:	Commercial Pilot License No. B-3082 issued by DCA of Thailand on 18 December 2005. It was valid until 17 October 2007.
Rating:	Single & Multi engine-land. Instrument Rating Co-pilot for MD-82
Medical Certificate:	Class 1 issued by Institute of Aviation Medicine Directorate of Medical Services, Royal Thai Air Force (RTAF), on 24 October 2006. It was valid until 10 November 2007.
Medical Limitations:	None

Flying Experience

Total flight time	1,465:00 hours
Flight time on DC-9-82 (MD-82)	1,240:00 hours
Flight time on DC-9-82 (MD-82) for the last 30 days	120:27 hours
Flight time on DC-9-82 (MD-82) for the last 7 days	32:49 hours

Flight Time and Flight Duty Period

(1) Flight time on DC-9-82 (MD-82) for the last 24 hours:	
Flight Time	4:37 hours
Flight Duty Period	7:25 hours
(2) Rest Period Before Duty on 16 September 2007	19:30 hours
(3) Accumulated flight time on 14 September 2007 which exceeded the limitation stated in the FOM of Orient Thai Airlines for domestic route: the accumulated flight time shall not exceed 8 hours within any 24 consecutive hours.	9:29 hours

(4) The accumulated flight time exceeded the limitation stated in the FOM of Orient Thai Airlines: the accumulated flight time shall not exceed 30 hours within any 7 consecutive days. The Co-Pilot had flight time as follows:

- Accumulated flight time from 10 September 2007 to the accident flight — 32:49 hours
- Accumulated flight time from 20 to 26 August 2007 — 31:09 hours
- Accumulated flight time from 2 to 8 July 2007 — 38:01 hours

(5) The accumulated flight time exceeded the limitation stated in the FOM of Orient Thai Airlines: the accumulated flight time shall not exceed 110 hours within any 30 consecutive days.

- Accumulated flight time from 18 August 2007 to the accident flight — 120:27 hours
- Accumulated flight time from 19 June 2007 to 18 July 2007 — 111:17 hours

(6) The Co-Pilot had rest period less than the limitation stated in the FOM of Orient Thai Airlines: for the flight duty period exceeding 12:00 hours but not exceeding 14:00 hours, the minimum rest period shall be 14 hours before the next flight, as follows:

- Flight duty period on 14 September 2007 — 12:52 hours
- Rest period before the next flight — 11:43 hours

(7) The Co-Pilot had rest period less than the limitation stated in the FOM of Orient Thai Airlines: for the flight duty period exceeding 14:00 hours but not exceeding 16:00 hours, the minimum rest period shall be 16 hours before the next flight, as follows:

- Flight duty period on 8 July 2007 — 14:10 hours
- Rest period before the next flight — 9:45 hours
- Flight duty period on 7 July 2007 — 14:10 hours
- Rest period before the next flight — 9:55 hours

- Flight duty period on 6 July 2007 14:35 hours
- Rest period before the next flight 9:20 hours

Training Record

No record of CRM training was found.

Pilot Proficiency Check

The Co-Pilot passed the last Pilot Proficiency Check on 21 March 2007, at Alteon Boeing, Kunming, People's Republic of China.

1.6 Aircraft Information

1.6.1 Airplane

Type:	DC-9-82 (MD-82)
Manufacturer Company:	McDonnell Douglas
Date of Manufacture:	1983
Owner:	Grandmax Group Company Limited, British Virgin Island, who leased the Airplane to Orient Thai Company Limited, which later sub-leased the Airplane to One Two Go Company Limited.
Nationality and Registration Mark:	HS-OMG
Serial No. :	49183
Date of Registration:	21 March 2007
Time Since New:	65,965:10 hours; 35,498 cycles
Last C-Check:	September 2005; Time Since New 63,333:00 hours at American Airline Company Limited.

Time Since Last C-Check:	2,632:10 hours
Last A1-Check:	8 May 2007; Time Since New 65,028:70 hours.
Last A2-Check:	30 June 2007; Time Since New 65,436:60 hours.
Last A3-Check:	31 August 2007; Time Since New 65,851:40 hours.

1.6.2 Left Engine

Engine Type:	JT8D-217A
Manufacturer:	Pratt & Whitney, United States of America.
Serial No. :	709710
Time Since New:	53,317:10 hours; 28,729 cycles

1.6.3 Right Engine

Engine Type:	JT8D-217A
Manufacturer:	Pratt & Whitney, United States of America.
Serial No. :	717364
Time Since New:	38,718:70 hours; 20,943 cycles

Note: Time Since New was calculated until the last flight before the accident flight on 16 September 2007.

1.7 Meteorological Information

1.17.1 Special Weather Reports (SPECI) provided by the meteorological station at Phuket International Airport to ATC on 16 September 2007 were as follows:

1.17.1.1 At approximately 15:35, the surface wind direction of 270 degrees at 9 knots with visibility of 4 kilometers in heavy rain, scattered cloud layer at 1,500 feet, broken cloud at 11,000 feet and 30,000 feet, surface air temperature

was 26 degrees Celsius (°C) and dew point temperature was 24 °C. Atmospheric pressure above mean sea level was 1,006 hectopascals (hPa).

1.17.1.2 At approximately 15:45, the surface wind direction of 270 degrees at 28 knots with visibility of 800 meters in heavy rain, scattered cloud layer at 1,500 feet, broken cloud at 11,000 feet and 30,000 feet; surface air temperature was 25 °C and dew point temperature was 22 °C. Atmospheric pressure above mean sea level was 1,006 hPa.

1.17.2 Surface wind information provided by ATC at Phuket International Airport to the accident flight crew as follows:

1.17.2.1 At approximately 15:37, the surface wind was from 240 degrees at 15 knots.

1.17.2.2 At approximately 15:38, the surface wind was from 240 degrees at 30 knots.

1.17.2.3 At approximately 15:39, the surface wind was from 240 degrees at 40 knots.

1.8 Aids to Navigation

The navigation aids at Phuket International Airport functioned normally during the time of accident.

1.9 Communications

The communications between the ATC at Phuket International Airport and the flight crew were normal.

1.10 Aerodrome Information

1.10.1 Phuket International Airport is located at latitude 8 degrees 6 minutes 38 seconds North and longitude 98 degrees 18 minutes 45 seconds East. The runway 09/27 is 45 meters wide, 3,000 meters long with an asphaltic concrete surface. The aerodrome elevation is 25 meters above mean sea level. The aerodrome has an

embankment along with Runway 27 to the North, with a distance of 90 meters from the runway centerline. Another embankment is located to the South of Runway 27 where the air traffic control tower is located.

1.10.2 The Low Level Windshear Alert System (LLWAS) is installed at Phuket International Airport by the Meteorological Department as a supplemental equipment to measure and report the current wind speed and direction to the air traffic control tower and also as the primary means of detecting windshear and/or microburst at the surface and aloft. However, this installation was not officially announced in the Aeronautical Information Publication (AIP). The LLWAS had six remote anemometers sensors stations located strategically throughout the airport property. Three of which failed to function during the time of accident. The absence of data from the three was therefore significant enough to decrease the performances of LLWAS algorithms and alert/warning issuance.

1.10.3 Runway Strip

Phuket International Airport is categorized as Aerodrome Reference Code 4 E. ICAO Standard and Recommendation of Annex 14 states that the width of runway strips, classified as precision approach runway, shall extend laterally to a distance of at least 150 meters on each side of the center line of the along the entire runway. However, Phuket International Airport has the geographical constraints on the location of embankments at the side of the runway; therefore limits the width of runway strip to only 75 meters on each side of the center line. This limitation is declared in Aeronautical Information Publication (AIP) Thailand. (Detailed in Appendix 1).

1.11 Flight Recorders

1.11.1 Digital Flight Data Recorder (DFDR) and Cockpit Voice Recorder (CVR) were brought forth by the AAIC to be read out at the NTSB, U.S.A. The participants in the reading out comprise the representatives from NTSB, FAA, Boeing Company, Pratt & Whitney, and the AAIC.

1.11.2 DFDR, manufactured by L3 Communications Fairchild Company, part number 2100-4042-00 and serial number 1196, installed in the aft section of the airplane, was successfully read out. (Detailed in Appendix 2).

1.11.3 CVR, manufactured by L3 Communications Fairchild Company, part number 2100-1020-00 and serial number 000199420, installed in the aft section near the DFDR, was read out and transcribed. (Detailed in Appendix 3).

1.11.4 Data obtained from the DFDR and CVR indicated that:

1.11.4.1 During the operation of the accident flight, the flight crew incorrectly communicated (read-back and hear-back) several times, i.e. incorrect call sign identification and incorrect response to the ATC.

1.11.4.2 Data obtained from the DFDR and CVR during the descending and go around indicated that:

- The flight crew conducted the ILS approach with the airplane aligned just to the north of the Runway 27 center line.

- Between 15:39:41 and 15:39:43, as the airplane was descending through 115 feet above threshold level (ATL), the airspeed dropped from 140 KCAS to 126 KCAS. (Detailed in Appendix 2, Plot 1). At 15:39:43, the PIC called for power (Detailed in Appendix 3, page 12-21), and the engine pressure ratio (EPR) subsequently increased toward 'go around thrust'. The EPR for both engines increased from about 1.16 to 2.0 in approximately three seconds and remained about 2.0 for the following 2 seconds, until about 15:39:48.

- Between 15:39:40 and 15:39:47, the pitch angle increased from 0 degrees to 5 degrees, and then decreased to about 2 degrees at 15:39:48; reaching an altitude of 48 feet ATL before starting to climb. (Detailed in Appendix 2, Plot 1).

- Between 15:39:43 and 15:39:48, the airspeed increased during this time, from 126 KCAS to 166 KCAS at 15:39:48. (Detailed in Appendix 2, Plot 1). At 15:39:47, the crew received a "sink rate" warning from the EGPWS. (Detailed in Appendix 3, Page 12-21).

- At 15:39:48, as the airplane descended below 50 feet ATL, the autothrottle system initiated an automatic reduction of all engine thrust. The engine EPR decreased from 2.0 ('go around thrust') to about 1.14 ('idle thrust') at 15:39:53. This reduction of power occurred at a rate consistent with an autothrottle command. (Detailed in Appendix 2, Plot 1).

- At 15:39:49, the Co-Pilot called for a go-around (Detailed in Appendix 3, Page 12-21), and the pitch of the airplane increased from about 2 degrees to about 12 degrees at 15:39:54, as the airplane climbed. The thrust

continued to decrease towards its 'idle' position, while the airspeed decreased from 165 KCAS to about 122 KCAS at 15:39:57. (Detailed in Appendix 2, Plot 1).

- At 15:39:50, the Co-Pilot transferred airplane control to the PIC (Detailed in Appendix 3, Page 12-22), as the thrust was reaching idle EPR.

- The EPR remained at the 'idle' level for about 13 seconds (from 15:39:53 to 15:40:06), as the airplane continued to climb to a maximum altitude of 262 feet ATL at 15:40:01, and then started descend again. During this time, the landing gear was retracted, and the flaps were set to 15 degrees (Detailed in Appendix 2, Plot 7); however, the take off/go-around (TO/GA) switch was never activated. (Note: the autopilot was "off" during the approach, and the autothrottle was "on", and selected to the "speed" mode.)

- Between 15:39:57 and 15:40:08, the pitch angle decreased from 12 degrees to 0 degrees, while the airspeed remained relatively constant at around 122 KCAS, with about +/- 4 knot excursions about this average. (Detailed in Appendix 2, Plot 1).

- Between 15:40:06 and 15:40:07, two 'don't sink' warnings from EGPWS sounded in the cockpit, as the airplane was descending through approximately 175 feet ATL.

- At 15:40:08, a 'Sink Rate' warning from EGPWS, followed by a 'pull up' warning sounded in the cockpit. (Detailed in Appendix 3, Page 12-23).

- During these warnings, the pitch began to increase from 0 degrees to approximately 5 degrees over the next second. The EPR began to increase again, reaching 'go around thrust' at 15:40:09.

- At 15:40:10, a sound similar to windshear alert from the Windshear Alerting and Guidance System and then the sound of impact were heard. (Detailed in Appendix 3, Page 12-23).

- At 15:40:11, the recording ended.

1.12 Wreckage and Impact Information

The airplane wreckage was at latitude 8 degrees 6 minutes 51.2 seconds north and longitude 98 degrees 19 minutes 10.4 seconds east; after the airplane hit the embankment and went up in flames. The airplane completely broke into 3 parts. The nose section was heading to 010 degree, while the fuselage section was heading to approximately 300 degree and the tail section beginning from the engine was aligned parallel with Runway 27. The nose section collapsed and twisted. The right wing hit the embankment and was torn from the fuselage, causing the fuel leak. The left wing came to rest across the ditch along the runway. The post-crash fire burned from the nose section to the mid of fuselage section. (Detailed in Appendix 4)

1.13 Medical and Pathological Information

The external examination of the body of the flight crew by the Royal Thai Police are as follows:

1.15.1 Pilot-in-Command

The examination by the Institute of Forensic Medicine, Police General Hospital, presumes that the cause of death is from the severe burns. However, there is no information on laboratory tests indicating any use of substances that could potentially effect the flight operation.

1.15.2 Co-Pilot

The examination by the Institute of Forensic Medicine, Police General Hospital, presumes that the cause of death is from the lack of Oxygen. However, there is no information on laboratory tests indicating any use of substances that could potentially effect the flight operation.

1.14 Fire

After the airplane hit the embankment and then the ground, the post-crash fires burnt from the nose section of the plane, with no indication of pre-impact fire.

1.15 Survival Aspects

1.15.1 Witness statements regarding the rescue and fire fighting at Phuket International Airport are as follows:

1.15.1.1 Statements from the rescue and fire fighting staff

The rescue and fire fighting staff said, "At approximately 15:40 hours, the fire fighting staff received an emergency call from the ATC reporting that the airplane of One Two Go Airlines, Flight OG 269, MD-82 series, departed from Don Mueang International Airport and was scheduled to land at Runway 27, veered off the runway along with the fence in Mai Khao district. There were 130 passengers and crew on board. The airplane was refueled with 22,000 pounds from Don Mueang International Airport.

The rescue and fire fighting staff, with 3 fire trucks (the trucks no. 1, 2 and 4), reached the accident site within 2 minutes. The staff managed to control the fire. The fire station called another 18 staff who were at rest to assist the team, with another fire truck (the truck no. 3) and water rescue truck to extinguish the fire and rescue passengers. The assisting staff reached the accident site at approximately 15:46 hours and controlled the fire successfully."

Fire Truck Characteristics

Truck No.	Capacity of Water (Liter)	Discharge Rate of Foam Solution (Liter/Minute)
1	3,785.-	1,893.-
2	9,463.-	4,732.-
3	9,463.-	4,732.-
4	11,356.-	4,452.-

At approximately 16:01 hours, fire trucks no. 1, 2, and 4 returned to the fire station to refill water, while the truck no. 3 stayed at the accident site, spraying water to cool down the heat around the fuselage area. At approximately 45 minutes after the commencement of rescuing and fire fighting , the supporting staff from Phuket Municipality, Thep Krasattri Municipality, Choeng Tale Municipality, Medical services from many hospitals, rescue foundations of Phuket

and nearby provinces, and the Narenthon Center (currently, the Emergency Medical Institute of Thailand), assisted the rescue staff.

1.15.1.2 Statements from the Survivors

The survivors escaped from the airplane through an exit door over the left wing, slid off the airplane, and ran to the runway. The first fire truck reached the accident site within approximately 3-5 minutes. The ditch barricaded between the fire truck and the airplane was the obstacle for the spraying water/foam to reach the airplane. At that time, there was one ambulance present to help casualties.

1.15.1.3 Statement from staff of Orient Thai Airlines Co., Ltd.

The mechanic of Orient Thai Airlines stated that "at approximately 15:45 hours, there was heavy rain, strong wind and the maximum visibility of 15 meters. The Load Master staff of Thai Airways International Public Company Limited informed the mechanic that the airplane flight OG 269 veered off from the Taxi Way and therefore, the mechanic drove a car to the accident site. When he arrived at the accident site, there was one fire truck spraying water/foam and two stand-by fire trucks."

1.15.1.4 Statement from Tower Controller and Watch Supervisor

The Tower Controller and the Watch Supervisor of the Aero Thai Company Limited who were on duty during the accident, concurrently stated that when the airplane was over Threshold, it could not land. Then, the airplane nose was up and maintained its height for a moment. After that, the airplane yawed to the right, then started to continuously descend, and finally collided with the ground at Marker no. 6 near the ditch, located to the north of runway. Then, it exploded and was on flame with smoke covering the accident site.

At approximately 15:41 hours, the Tower Controller informed the rescue and fire fighting station via the hot line. Then, the Watch Supervisor ordered the Ground Controller to contact the rescue and fire fighting station immediately via the airport radio: Channel F2, to inform the occurred accident at the North of runway, near the ditch area, and ordered the Approach Control to hold all airplanes in its control air space: Nok Airlines, flight 7625, departed from Had Yai International Airport. Approximately 2-3 minutes after the

hot line was used, the rescue and fire fighting staff reached the accident site and the Watch Supervisor ordered the Approach Control to inform flight 7625 to return to Hat Yai International Airport.

1.15.2. Rescue Difficulties

1.15.2.1 There is the ditch, 3.5-meter in width and 1.3-meter in depth, located to the North and paralleled with Runway 27 of the airport. The airport has entrances for rescue and fire fighting at both ends of the runways. However, these entrances were not used in this accident.

1.15.2.2 After the accident, staff from different foundations assisted the rescue and moved casualties from the accident site. However, some foundations never attended Phuket International Airport's Emergency Plan Exercise; leading to inefficiency in coordinating with the rescue and fire fighting teams and incomplete performing in curing the casualties e.g. unsuitable protection equipment used and incorrect method of transporting the casualties, which may lead to more serious injuries.

1.15.2.3 The Aeronautical Radio of Thailand Company Limited (Aero Thai) has not included 'Crash on Airport' procedures in Manual of Air Traffic Services for the Phuket International Airport, as to be consistent with the Airport Emergency Plan: Airplane Accident on Airport.

1.15.2.4 The Narenthorn Center, a division in the General Department, Ministry of Public Health, has duty on emergency medical support and transfer injured casualties to hospitals. However, the Airport Emergency Plan of Phuket International Airport did not include the Narenthron Center in the contact list; thus, the Narenthorn Center did not attend the emergency training, resulting to the lack of experience in coordination with the rescue and fire fighting team.

1.16 Test and Research

1.16.1 The non-volatile memory of the systems, the Windshear Alerting and Guidance System, the EGPWS, the Autothrottle, and the Digital Flight Guidance System (DFGS) were sent to examine at the NTSB, Washington D.C, U.S.A., as the State of Design and Manufacture, whether the systems were functioning normally as

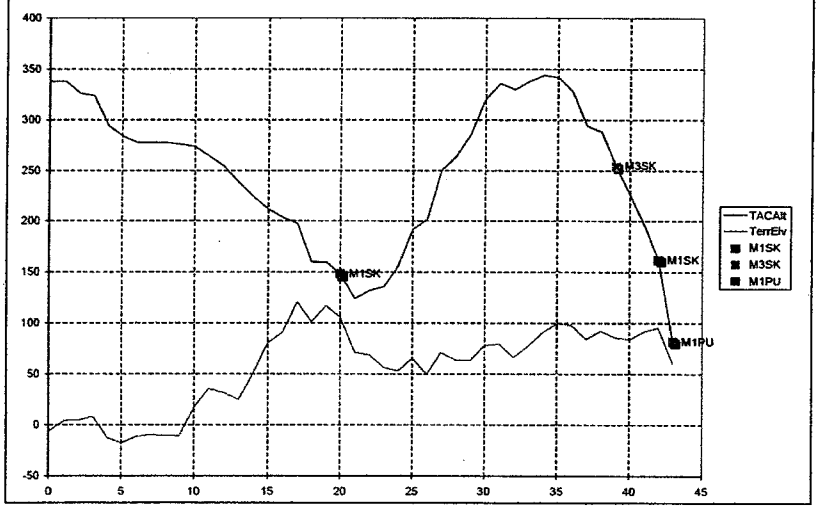
designed during the accident. The data downloaded from these systems along with the data from the DFDR were used for the investigation. Results indicated that:

1.16.1.1 During the accident, the Windshear Alerting and Guidance System, the EGPWS, the Autothrottle, and the DFGS functioned as regularly as designed.

1.16.1.2 The airplane was equipped with a Honeywell 'Legacy' reactive windshear warning system. An assessment of the DFDR data indicates that the only windshear warning issued during the accident occurred at about 15:40:09 (approximately 1 second before the end of DFDR data). The legacy windshear warning system performed its function as designed.

1.16.1.3 The EGPWS, Mark V EGPWS part number 965-0976-003-216-216 and serial number 18254, produced by Honeywell, was sent to Redmond, Washington, Honeywell facility for examination. The initial examination of the unit was conducted with the presence of a representative from the NTSB and FAA. The data indicated that four alerts were recorded over an approximate 43-second span. The first alert (Sink Rate) was recorded at 20 seconds of the data. The second alert (Sink Rate) was recorded at 39 seconds of the data. The third alert (Sink Rate) was recorded at 42 seconds of the data. The fourth alert (Pull Up) was recorded at 43 seconds of the data. After the last alert, the data recording ended, presumably the time the airplane had impacted.

Figure 2 EGPWS Alerts



1.16.1.4 The autothrottle system is controlled by the DFGS. The assessment of the DFDR data indicated that throughout the final approach phase, the autothrottle system was engaged and functioning. Its modes fluctuated between the speed mode (SPD SEL), Clamp Mode, and the Low Limit Mode (Low Lim) until the RETD mode was activated at 15:39:47. When the speed mode function of the autothrottle system is operating, the autothrottle system seeks to maintain the Reference Airspeed/Mach that the flight crew selected in the SPD/MACH window. Since the DFDR data did not receive confirmed Airspeed/Mach parameter, the specific selected Reference Airspeed/Mach was unidentified.

At 15:39:41, the data indicated that during the decent at about 150 feet (RA), the left and right engines were commanded to accelerate. The EPR for both engines increased from about 1.16 to about 2.0 in approximately 3 seconds and remained above 2.0 for almost 3 seconds. According to the Boeing Company, the MD-82 autothrottle system has the capability of commanding the autothrottle levers at a maximum rate of about 8 degrees per second. At 8 degrees per second, it would take the throttles approximately 5.5 seconds to go from idle to take off position. According to the Boeing Company, the engines are capable of accelerating faster than the autothrottle system can command. Therefore, the manufacturer concludes that the 3-second engine acceleration rate is consistent with manual operation of the throttle levers. This would have overridden the autothrottles but the autothrottles would remain engaged.

At about 15:39:47, with the airplane in the SPD mode at about 50 feet (RA), the airplane HS-OMG experienced an automatic reduction of all engine thrust from about 2.0 EPR to about 1.1 EPR due to the Retard (RETD) Mode function of the autothrottle system, automatically activating. Both engine's EPR remained at about 1.1 for approximately 13 seconds, allowing the airspeed to drop below 120 knots. According to the Boeing Company, the RETD mode is automatically activated as a function of radio altitude and landing flap configuration when the autothrottle is not in the EPR G/A mode. With the approach slat/flap logic applied to the autothrottle system, the flaps positioned to at least 20 degrees, and the radio altitude less than or equal to 50 feet, the Retard Mode of operation is automatically established. The DFDR data indicates the RETD mode activating when the flaps are positioned at 40 degrees and the airplane descend below the 50-feet

autothrottle retard altitude. Once activated, the FMA displays "RETD" and both throttle levers are driven to the aft stop at a rate dependant upon thc radio altitude. The autothrottle retard mode is independent of the autopilot or flight director-operating mode.

1.16.2 The NTSB submitted the accident investigation report to the AAIC on 1 July 2008, consistent with available evidence as follows:

1.16.2.1 The summary of the accident sequences and the possible cause(s) of the accident: The investigation relied on evidence at the site, the CVR, the DFDR, and the component of related system examination (Detailed in Appendix 5).

1.16.2.2 The details of the investigation, consisting of the on-scene examination, meteorological conditions, emergency response, and system examination. (Detailed in Appendix 6).

1.16.2.3 The operational and human performance (Detailed in Appendix 7)

1.16.2.4 Appendix A Honeywell EGPWS Report (Detailed in Appendix 8)

1.16.2.5 Appendix B Honeywell Windshear Report (Detailed in Appendix 9)

1.16.2.6 Appendix C Human Performance Questions (Detailed in Appendix 10)

1.16.2.7 Appendix D Operational Documents Provided to the NTSB (Detailed in Appendix 11)

1.16.3 The AAIC conducted a flight test by using the flight simulator of MD-80 at Lion Air, Jakarta, Indonesia. The flight simulator simulated a go around in the same condition as recorded in the DFDR of the accident flight. It indicates that, at 40 feet, the autothrottle system is activated to the retard (RETD) mode and the co-pilot did not activate the TO/GA switch, when he wanted to increase engines power for the go-around. Whereas, he pushed the throttle levers forward, then released his hand, resulting that the autothrottle system automatically retarded the throttles levers for decreasing engines power in the Speed Mode Control.

1.17 Organizational and Management Information

1.17.1 One-Two-Go Airlines Company Limited

1.17.1.1 The Air Operating License (AOL) was issued to the carrier on 18 January 2006 and valid until 17 January 2011. The Air Operator Certificate (AOC) No.15/2549 was issued to the carrier on 15 September 2006 and valid until 17 January 2011.

1.17.1.2 The headquarters is located at 138/70 17th Fl., Suite 1, Jewellry Center Building, Nares Road, Si Phraya, Bangrak, Bangkok.

1.17.1.3 The Company wet lease five MD-82 airplanes, one MD-83 airplane, and two MD-87 airplanes from Orient Thai Airlines Company Limited

1.17.1.4 The Company has 148 flight attendants and 10 dispatchers.

1.17.2 Orient Thai Airlines Company Limited

1.17.2.1 The AOL was issued to the carrier on 25 October 2002 and valid until 17 January 2011. The AOC No. 04/2545 was issued to the carrier on 29 October 2006 and valid until 17 January 2011.

1.17.2.2 The headquarters is located on 138/70 17th Fl. Suite 1, Jewellry Center Building, Nares Road, Si Phraya, Bangrak, Bangkok.

1.17.2.3 The Company operates three Boeing 747-100 Series, five Boeing 747-200 Series, three Boeing 747-300 Series, five MD-82 airplanes, one MD-83 airplane, and two MD-87 airplanes.

1.17.2.4 The Company has 95 flight crew, 284 flight attendants, 2 flight crew scheduling officers, and 3 dispatchers.

1.17.3 The FOM of One-Two-Go Airlines and Orient Thai Airlines are approved by the DCA and prescribe the procedures on go around, stabilized approach, EGPWS, and flight time & flight duty period limitation. However, the CRM training and transfer of control between flight crew procedures were left incomplete.

1.17.4 The flight simulator for Pilot Proficiency Check did not install the Windshear Alerting and Guidance System and EGPWS.

1.17.5 The flight crew scheduling officers of One-Two-Go Airlines are managed by the flight management center of Orient Thai Airlines, a lessor of the wet leased airplane.

1.17.6 The audit result of One Two Go Airlines and Orient Thai Airlines, by the Thai DCA after the accident, found that:

- The training and proficiency checks of all flight crew of Orient Thai Airlines did not comply with the Crew Training Manual (CTM), Revision 1, effective on 22 January 2004, Volume VI, Section 6.500, Article B, which was approved by the DCA, saying that there were no trainings of Ground Training, Emergency Training, Qualification, and Special Operations Training (when applicable).

- Orient Thai Airlines has the flight time and flight duty period recorded system. However, the system were not overseen, resulting in the exceeding flight times and shortage of rest times of the pilot, as prescribed by flight time and flight duty period limitation in the FOM, approved by the DCA.

- There were no evidences indicating that 3 dispatchers of Orient Thai Airlines and 10 dispatchers of One Two Go Airlines were trained as required in the Flight Operations Officer Manual (FOOM), Dispatcher Qualification, Article 1 Basic Indoctrination and Article 2 Emergency Training.

1.17.7 Corporate Culture

The One Two Go Airlines Company Limited and Orient Thai Airlines Company Limited comprise staff varying in many basics such as nationalities, languages, values, beliefs, and religions, especially in the flight operation division where flight crew come from many foreign countries. The management levels did not seriously encourage personnel to have unique corporate culture in having values and beliefs to carefully perform their jobs, in accordance with laws and regulations and did not support the personnel training which may come of use for improving task efficiency and increasing safety performance.

1.18 Additional Information

None

1.19 Useful or Effective Investigation Techniques

None

1.20 Crew Resource Management (CRM)

1.20.1 The DCA has announced the Flight Standards Bureau concerning the Pilot Training Program, on 2nd July 2007, prescribed in article 1.2.7 of the Crew Resource Management training. However, there were no guidelines and details of the CRM training for the operator. (Detailed in Appendix 12).

1.20.2 The Flight Crew Training Manual (FCTM) of One Two Go Airlines Company Limited requires that flight crewmember should complete the major elements of the full length initial CRM Course over a three-year recurrent training cycle and the company will conduct CRM Recurrent Training every 12 calendar months. However, there were no guidelines and details of the training. (Detailed in Appendix 13).

1.20.3 The Flight Time and Flight Duty Period Limitations in the FOM of One Two Go Airlines (Detailed in Appendix 14) and Orient Thai Airlines (Detailed in Appendix 15) comply with an promulgation on Flight Time and Flight Duty Period Limitations of the Flight Standards Bureau, Department of Civil Aviation: announced on 7 March 1996. (Detailed in Appendix 16).

1.20.4 The crew scheduling for Pilot-in-Command and Co-Pilot of flight OG 269 did not comply with the FOM.

1.20.5 The Flight Time and Flight Duty Period Limitations in the recent FOM of both Companies were not amended to comply with the promulgation of Department of Civil Aviation on Flight Time and Flight Duty Period Limitations, announced on 26 June 2007 (Detailed in Appendix 17).

1.21 Department of Civil Aviation's Regulatory Supervision over One Two Go Airlines Company Limited and Orient Thai Airlines Company Limited

The DCA has regularly audited, according to the annual audit plan, One Two Go Airlines Company Limited and Orient Thai Airlines Company Limited as the holder(s) of the Air Operator Certificate (AOC), in both flight operation and airplane maintenance aspect. Also, the random checks were conducted regularly.

1.22 Flight Crew Training

The Flight Crew Training Manual (FCTM) of Orient Thai Airlines is deficient, resulting in missing two parts of the ground training in the proficiency check.

The flight crew training of Orient Thai Airlines did not comply with the standards prescribed in the FCTM.

2. ANALYSIS

2.1 The PIC had the valid Airline Transport Pilot License and the Instrument Rating issued by Directorate General of Civil Aviation (DGCA) of Indonesia and had the rendering license issued by the DCA. The PIC was eligible to operate according to Thai laws and regulations.

2.2 The Co-pilot had the valid Commercial Pilot License and the Instrument Rating issued by the DCA. The Co-pilot was eligible to operate according to Thai laws and regulations.

2.3 The PIC was medically fit and had a valid Class I Medical Certification issued by Indonesia DGCA. The Co-pilot was medically fit and had a valid Class I Medical Certificate issued by Institute of Aviation Medicine, Directorate of Medical Services, RTAF.

2.4 Both ATCs on duty at Phuket International Airport had the valid Air Traffic Controller License and the Rating of Aerodrome Control, Approach Control and Radar Approach Control (Phuket International Airport) issued by the DCA. Both ATCs were eligible to operate according to Thai laws and regulations.

2.5 Both ATCs on duty at Phuket International Airport were medically fit and had been issued the valid Class III Medical Certificate by Institute of Aviation Medicine, Directorate of Medical Services, RTAF.

2.6 The record of airplane inspection schedule indicates that the airplane, engines, and all systems, had undergone inspection schedule according to laws and regulations of the DCA. The airplane has a valid Certificate of Airworthiness. The engines operated normally at the time of accident. (Detailed in Appendix 5 and Appendix 6).

2.7 After the Co-pilot pushed the throttle levers forward to increase the engine thrust in order to maintain the approach speed of the airplane, as advised by the PIC, but the sink rate was still high. The Co-Pilot therefore decided for a go-around, with the PIC consenting, and the Co-pilot transferred the control of airplane to the Pilot. The data from DFDR indicates that the TO/GA switch was never activated during the go-around, resulting in the airplane's

autothrottle to automatically command engines in approach condition to retard the throttles. It could be possible that both flight crew did not comply with the go-around procedures, by did not monitor and call out, as prescribed in the standard operating procedure (SOP) (Detailed in Appendix 18). The examination from the NTSB indicates that during the accident sequence, the autothrottle system function as designed, the throttles moved to idle as the airplane descended through approximately 50 feet AGL. Because the flight crew omitted a critical step in the go-around procedures, i.e. activation of the TO/GA switch, therefore, the autothrottle system remained in designed RETARD mode, and as the airplane transitioned to a climb, the airspeed rapidly decreased. Had the flight crew followed the prescribed go-around procedures, activation of the TO/GA switch, would have allowed the autothrottle system to increase the engine power to the go-around thrust.

2.8 The transfer of control of the airplane during a critical time from the Co-pilot to the PIC, after making the decision to go-around, did not comply with the SOP. In the proper transfer of control, the Pilot Flying is required to fly the airplane until the end of phase or had the Pilot not Flying is the PIC, he would consider to ask for the control. The flight crew who received the transfer of control may not know the situation of all entire flight operation; also the FOM did not have the complete details in transfer of control procedure. (Detailed in Appendix 19).

2.9 The data from CVR and DFDR and the examination from the NTSB indicated that before the accident, four EGPWS alerts were recorded over an approximate of 43-second span. The computer recorded 20 seconds prior to the first alert and approximately 23 seconds after the alert. The computer recorded three additional alerts: a Sink Rate alert occurring 19 seconds after the first alert, another Sink Rate alert three second later, and a final Mode 1 warning (PULL UP) one second later. After the last alert, the data recording ended, presumably at the time of impact. Both pressure altitude and radio altitude were recorded by the computer. A comparison of the pressure altitudes and radio altitudes has been obtained from DFDR and EGPWS.

2.10 The data from CVR and DFDR could be summarized as follows:

2.10.1 Both of the flight crew did not have any conflict during the operation of the accident flight. However, the flight crew incorrectly communicated (read-back and hear-back) several times.

2.10.2 During the flight, there were no malfunctions of engines, flight instruments, flight control system and all other systems of the airplane.

2.10.3 The Co-pilot was the Pilot Flying who conducted the ILS approach at runway 27.

2.10.4 Before the time of accident, the flight crew of OG269 confirmed acknowledgement of the weather condition reported to the ATC by flight OX2071 after landing. The report noted that there was cumulonimbus (CB) over the airport and windshear at 5 nautical miles before reaching the ILS station, resulted in airspeed gain and loss of 15 knots.

2.10.5 The Co-Pilot deactivated the autopilot at 1,500 feet, resulting in the increase of workload. Also, there was weather deterioration in the approach glide path, resulting in the airplane incapable of maintaining the stabilized approach as approaching the airport.

2.10.6 As the airplane was descending through 500 to 300 feet ATL, the airplane went through the oscillation of head wind, causing unstable airspeed during this ATL.

2.10.7 From 200 feet ATL, the airplane lost approximately 1,800 feet per minute. The airspeed decreased 15 knots within 3 seconds. These might be resulted from downdraft and decreased performance windshear. The decreased rate exceeded the prescribed Stabilized Approach Procedures in the FOM of Orient Thai Airlines Company Limited (Detailed in Appendix 20).

2.10.8 The PIC called for power when the airplane was descending below 200 feet and called again when the airplane was descending below 100 feet. At the same time, the airplane experienced downdraft while

descending through 51 feet, with a rate of descend at 1,800 feet per minute. The Co-pilot decided to abort the approach.

2.10.9 The Co-pilot call for missed approach and performed the go-around. The PIC confirmed without any argument. The Co-Pilot then pushed the throttle levers forward in order to increase the engine power. However, the TO/GA switch was never activated.

2.10.10 The Co-Pilot ordered the PIC to set the flaps to 15 degrees and called for the transfer of control. At the time, the Co-pilot pushed the thrust levers forward as advised by the PIC in order to increase the engine power.

2.10.11 The PIC took control of the airplane and ordered the Co-pilot to set the airplane heading and retract the landing gear. It is assumed that both hands of the PIC held the control wheel as the Co-pilot released the throttle levers after the transfer of control of the airplane. Therefore, neither the PIC nor the Co-Pilot had control of the thrust levers.

2.10.12 Both the PIC and Co-Pilot may not have noticed that the airspeed and the throttle levers continually decreased, resulted from the fact that the autothrottle was set to the Approach Speed Mode, while the airplane continued to climb to 300 feet.

2.10.13 There were three consecutive landing gear alerts during the go-around because the landing gears were not at the proper position for landing and the engine power decreased to the flight idle.

2.10.14 While the airplane continued to climb to 300 feet, the airplane was shifted towards to the right of runway 27 due to the gust of wind. The airspeed increased 10 knots, possibly because of the increased of headwind speed, and aircraft nose up. (Increased Performance)

2.10.15 The airplane loss its altitude and the airspeed continually decreased, the airplane nose down, with a rate of descend at approximately 1,800 feet per minute. The PIC increased the engine power to maximum.

2.10.16 In the last 5 seconds, the EGPWS was alerting.

2.10.17 The Windshear Alerting and Guidance System was recorded 'ON' over the next second, until the airplane veered off onto the embankment and hit the ground.

2.11 Interview Information

According to the information from passengers and ATC on duty of flight OG 269, the airplane conducted the approach to the airport with the landing gear down. As the airplane descended, it was unsteady due to the poor weather conditions. While the airplane was about to touchdown, it climbed up again, the landing gear was retracted and then the airplane shifted toward to the right of runway. The airplane then descended and veered off onto the embankment, hit the ground, and sparked up into flames.

2.12 Meteorological Condition

According to the report of weather condition from the meteorological station at Phuket International Airport, the surface wind information that the ATC informed the flight crew, the data from CVR transcript between the ATC and the flight crew of OG269, and the data from DFDR, the airplane descended and the airspeed decreased at the rate of descend at approximately 1,800 feet per minute. The airplane was descending through 51 feet above threshold level, resulting that the Co-pilot aborted the approach, and decided to go-around. However, the go-around failed and the accident occurred. The data from DFDR indicated that in the last second, the Windshear Alerting and Guidance System was recorded 'ON' which meant the airplane might encounter the windshear during the impact. The weather condition at the time of accident, at approximately 15:41 hours, deteriorated. The visibility and weather condition, at about 6 minutes before the accident or at approximately 15:35 hours, had been clear to land. However, the weather condition at about 4 minutes after the accident or at approximately 15:45 hours, changed rapidly resulting in heavy rain and strong gust wind. The visibility reduced to 800 meters due to heavy rain was lower than a standard that airplane could make landing.

2.13 Crew Resource Management

2.13.1 The Automation System (Man-Machine Interface) during the descent found that the Co-pilot deactivated the autopilot at 1,500 feet in order to manually control the airplane to the airport. As the ILS at

Phuket International Airport was offset, the workload and situation awareness of the Co-pilot increased, resulting that the Co-Pilot must monitor the altitude, speed, gilde path angle of airplane, which caused the accumulation of stress and fatigue of body and mind.

2.13.2 The accumulation of stress could lead to improper decision making and inappropriate solutions.

2.13.3 The improper decision making and inappropriate solutions could be analyzed from the data in CVR, as well as the communication between the flight crew and ATC. The flight crew acknowledged the weather conditions from ATC, via the report made by the previous flight that landed at the airport, about severe weather condition and instability of wind speed over the airport. The ATC also directly reported the flight crew about an increasing of strong wind; however, the flight crew confirmed to land. At this moment, the Co-pilot started to experience difficulty in controlling the airplane and could not maintain stabilized approach, which is a standard procedure prescribed in the SOP.

2.13.4 According to the SOP, there were the operations that did not comply with many procedures; such as the flight crew being incapable of maintaining Stabilized Approach during the approach below 1,000 feet, and the Co-pilot failed to activate the TO/GA switch during the go-around (as data from DFDR) but instead, he increased the thrust by moving the thrust levers forward. Moreover, when the Co-Pilot released his hand from the thrust levers after the transferring of control to the PIC, the PIC took control of the airplane whose his hands may not at the throttle levers; thus, the autothrottle pulled back the thrust levers in order to decrease the engine power, according to the selected RETARD mode. Because of this, the engines were not properly configured to increase maximum power and could not maintain the power level. Also, the flight crew failed to call out the go-around as prescribed in the procedures.

2.13.5 The PIC lacked of leadership. He should acknowledge the capability and experience of the Co-pilot who was operating the airplane. Also, the Co-pilot should know his own capability, which in the situation

that exceeded his capabilities should immediately transfer the control of airplane to the PIC. In this accident, the Co-pilot transferred the control of airplane to the Pilot at a critical point.

2.13.6 Threat: according to the analysis of all above fact, the weather condition was considered as the threat that could have been avoided by the go-around, since the Co-pilot was incapable to maintain stabilized approach at the first time or from the weather condition reported by the flight crew of the prior flight reporting that there was windshear, causing the airspeed gain and loss of 15 knots. However, the flight crew did not avoid the threat, resulting in the accident.

2.14 The Windshear Alerting and Guidance System

The data from DFDR indicated that the Windshear Alerting and Guidance System alerted in the last second before the airplane veered off onto the embankment. Thus, there was windshear at that time. The alert happened 0.7 seconds faster than usual, but still in the limit. (However, the meteorological information from the ground was not enough to prove there was an actual occurrence of windshear.)

2.15 The Autothrottle System

From the examination of the autothrottle system reported by the NTSB, the autothrottle system functioned as designed. The data from DFDR indicated that during the final approach phase, the autothrottle system was activated and properly functioned.

2.16 The Automatic Weather Observation System and the Low Level Windshear Alert System at Phuket International Airport

The Automatic Weather Observation System (AWOS) was installed at Phuket International Airport by the Meteorological Department as the main equipment to report current weather conditions to the Air Traffic Controller. The Low Level Windshear Alert System (LLWAS) was installed as additional equipment for generating a windshear alert or warning severe weather condition. During the accident, three out of six LLWAS wind sensors did not provide wind data as there was not enough power for them to function properly. (As the Phuket LLWAS used solar cell to generate power and it was very cloudy for several days before the day of accident, resulting in the lack

of power for the system. Therefore, it was significant enough to degrade the system performance.

2.17 The Airport Geography

There is the ditch, 3.5-meter in width and 1.3-meter in depth, located to the North and paralleled with Runway 27 of the airport. The ditch led to difficulties for rescue and fire fighting. The airport has entrances for rescue and fire fighting at both ends of the runways. However, these entrances were not used in this accident.

2.18 Close Circuit Television (CCTV)

From the pictures recorded in CCTV at Phuket International Airport during the time of accident, the airplane was visible through the CCTV and then invisible. Shortly after, there were flames and smoke from the accident site. This indicates that the visibility may be difficult for landing.

2.19 Flight Time and Flight Duty Period of the PIC and Co-pilot

The investigation on flight time and flight duty period of the flight crew for the last 3.5 months found that the flight crew's duty time did not comply with the Flight Time and Flight Duty Period Limitations announced by the Flight Standards Bureau, Department of Civil Aviation. Also, the flight time and flight duty period for the last 3.5 months of both flight crew did not comply with the FOM of One Two Go Airlines and Orient Thai Airlines, concerning the Flight Time and Flight Duty Period Limitations. (Detailed in Appendix 21).

2.19.1 Pilot-in-Command

2.19.1.1 The flight time exceeded the limitation within 7 consecutive days by one flight. (On 16 September 2007).

2.19.1.2 The rest period less than the requirement by one period. (Before the duty on 14 September 2007)

2.19.2 Co-pilot

2.19.2.1 The flight time exceeded the limitation within 24 consecutive hours by one flight. (On 14 September 2007).

2.19.2.2 The flight time exceeded the limitation within 7 consecutive days by eight flights.

- Between 15 to 16 September 2007 3 flights
- On 26 August 2007 2 flights

- Between 7 to 8 July 2007 3 flights

2.19.2.3 The flight time exceeded the limitation within 30 consecutive days by seven flights.

- Between 14 to 16 September 2007 5 flights
- On 18 July 2007 2 flights

2.19.2.4 The rest period was lesser than the requirement by 4 periods. (Before the duty on 15 September, 7, 8, and 9 July 2007).

2.19.2.5 The exceeding of flight time and flight duty of both flight crew could cause the accumulation of stress. When they encountered the deteriorating weather conditions and critical situations, they may not perform the operation effectively.

2.20 Corporate Culture

The Orient Thai Airlines Co. Ltd. and One Two Go Airlines Company Limited have the FOM on the report of incident(s) and deficiency(s) in flight operation and maintenance. The incident(s) and deficiency(s) reports were reviewed; however, they have not been explicitly amended in order to improve safety in the operation. Each department(s) did not encourage personnel to have corporate culture in having values and beliefs to perform their jobs, in accordance with laws and regulations, and to report any deficiency(s) which may come of use for improving task efficiency and increasing safety performance. The personnel's future career was not secure enough; thus, the personnel did not feel properly connected to the company(s). The organization management lacked of governance.

2.21 The ATC at Phuket International Airport reported a short message, without details, to the rescue and fire fighting station. This due to the fact that the Aero Thai Company Limited has not included 'Crash on Airport' procedures in the Manual of Air Traffic Service, as to comply with the Airport Emergency Plan: Aircraft Accident on Airport.

2.22 Some of the flight simulators used in the Pilot Proficiency Check were not equipped with the Windshear Alerting and Guidance System and the EGPWs; which did not match the configuration of MD-82 that the company operates. This may lead to the incomplete Pilot Proficiency Check as required by the course.

3. CONCLUSIONS

3.1 Finding

3.1.1 Phuket International Airport is categorized in Aerodrome Reference Code 4E. However, its runway strips is 75 meters in width on each side of the center line, which did not comply with the Standard and Recommendation of Annex 14: Precision Approach Runway that the width of runway strips shall extend laterally to a distance of at least 150 meters on each side. This is due to the fact that the airport has physical limitation surfaces: the embankment on the side of its runway. This limitation is announced in the AIP Thailand.

3.1.2 There is the ditch of 3.5 meters in width and 1.3 meters in depth located to the North and paralleled with Runway 27 of the airport. The ditch led to difficulties for rescue and fire fighting. The airport has entrances for rescue and fire fighting at both ends of the runways. However, these entrances were not used in this accident.

3.1.3 During the accident the AWOS, installed at Phuket International Airport by the Meteorological Department as the main equipment to report current weather condition to the Air Traffic Controller, was properly functioning. The LLWAS, installed as additional equipment for generating a windshear alert or severe weather warning, performed poorly as some of the LLWAS sensors did not provide wind data; thus, it was significant enough to degrade the performance of LLWAS algorithm and issuing the alert or warning. However before the accident, the flight crew of the prior landing airplane informed the flight crew about the windshear and the flight crew had confirmed the acknowledgement of severe weather condition with the ATC. The accident flight crew had been fully aware of the prevailing weather and extreme condition at the Airport.

3.1.4 The PIC and Co-pilot did not comply with the SOP in Stabilized Approach, Call Out, Approach Checklist, Operation in Deteriorative Weather, Transfer of Control, and Go Around.

3.1.5 Within the last 7 days before the accident, the PIC had exceeded flight time and flight duty period and had less rest period than the indicated requirement.

3.1.6 Within the last 30 days and 7 days before the accident, the Co-pilot had exceeded flight time and flight duty period and had less rest period than the requirement.

3.1.7 Corporate Culture

The Orient Thai Airlines Co. Ltd. and One Two Go Airlines Company Limited have the FOM on the report of incident(s) and deficiency(s) in flight operation and maintenance. The incident(s) and deficiency(s) reports were reviewed; however, they have not been explicitly amended in order to improve safety in the operation. Each department did not encourage staff to believe in corporate culture of reporting deficiency(s) in operation and conception of compliance with laws and regulations of civil aviation. The staff's future career was not secure enough; thus, the employee did not feel properly connected to the company(s). The organization management lacked of governance.

3.1.8 Meteorological Information

The weather and wind condition during the landing approach of the airplane at Phuket International Airport are threats to landing. The visibility decreased and the surface wind had suddenly gained speed.

3.1.9 Crew Resource Management (CRM)

The failures directly related to the accident are as follows:

3.1.9.1 The Automation Man-Machine Interface arrangement was deficient because the localizer was offset from the centerline of the runway by 1.4 degrees. The Co-pilot had to manually control the airplane for landing to the centerline of the runway; thus, the Autopilot was not used for landing which created the workload, monitoring, and situation awareness, and increased the accumulation of stress and fatigue of body and mind, resulted to improper decision making.

3.1.9.2 The problem solving was incorrect. The flight crew directly received weather conditions from the ATC, as reported by the prior landing flight, indicating that there was unstable wind speed and rapidly increasing surface wind speed. Also, the data from DFDR indicates that, during that time, the airplane was experiencing an oscillating of airspeed without engine power changed; however, the pilot insisted on landing rather than deciding for a go around.

3.1.9.3 The PIC and Co-pilot did not comply with the SOP, i.e. the Co-pilot could not maintain the Stabilized Approach of the airplane below 1,000 feet, the Co-pilot did not activate the TO/GA switch during the go around, but instead, increased the power by moving the thrust levers forward, and there was no call out from both the PIC and the Co-pilot, as required in the go around procedures.

3.1.10 The Aero Thai Company Limited has not included 'Crash on Airport' procedures in the Manual of Air Traffic Service, as to comply with the Airport Emergency Plan: Aircraft Accident on Airport.

3.1.11 The Airport Emergency Plan did not include the Narenthorn Center, which has emergency medical services, in the contact list as an agency that could be called for assistance. Thus, there was lacked of coordination with the rescue and fire fighting station(s).

3.1.12 The autopsy samples (specimens) of both the PIC and Co-pilot were not kept for the laboratory examination.

3.1.13 The flight simulators that used in the Pilot Proficiency Check did not install the Windshear Alerting and Guidance System and the EGPW; it does not match the configuration of MD-82 that the company operates.

3.1.14 The Pilot Proficiency Check was incomplete as required by the course.

3.1.15 The operation of Orient Thai Airlines Company Limited was deficient in the Flight Crew Scheduling, Pilot Proficiency Check, and CRM training.

3.2 Probable Causes

After thorough investigation, the AAIC determined that the probable causes of accident are as follows:

3.2.1 The flight crew did not follow the SOP of Stabilized Approach, Call Out, Go Around, and Emergency Situation as specified in the airlines' FOM.

3.2.2 The Take Off/ Go Around (TO/GA) switch was not activated, resulting in the inability of the airplane to increase in airspeed and altitude during the go around. Also, there was no monitoring of the change in engine power and movement of throttle levers, especially during the critical situation.

3.2.3 The flight crew co-ordination was insufficient and the flight crew had heavy workloads.

3.2.4 The weather condition changed suddenly over the airport vicinity.

3.2.5 The flight crew had accumulated stress, insufficient rest, and fatigue.

3.2.6 The transfer of aircraft control took place at a critical moment, during the go around.

4. SAFETY RECOMMENDATIONS

4.1 The Orient Thai Airlines Company Limited and One Two Go Airlines Company Limited should:

4.1.1 establish Cockpit Resource Management (CRM) course, approved by the DCA, for all related personnel in every concerned sections. The course should comprise of initial and recurrent trainings, having contents according to ICAO requirements.

4.1.2 strictly train flight crew according to the flight crew training course and flight procedures in SOP.

4.1.3 amend the Operating Procedures on 'Transfer of Control during Critical Phase of Flight' in SOP to be most clear and definite

4.1.4 perform the pilot training check, as appointed by the DCA, to meet applicable standards, especially the pilot proficiency check.

4.1.5 use a flight simulator that could simulate the systems, equipment and instruments of the airplane with the same configuration the Airlines operates.

4.1.6 arrange the crew schedule, according to the requirements in Flight Time and Flight Duty Periods Limitation, by establishing a checking system with advance warning function before exceeding the limitation. The system should also enable the flight crew to check their status.

4.1.7 establish a Safety Management System (SMS) in order to identify and mitigate the risk leading to any accident or incident, and to improve the safety of flight operations to meet the required standards.

4.1.8 direct all management levels to encourage personnel to have unique corporate culture in having values and beliefs to perform their jobs, in accordance with laws and regulations, and to report any wrongful misconduct where may come of use for improving task efficiency and increasing safety performance. This could be done through training and motivation

4.2 The Airport of Thailand Public Company Limited should:

4.2.1 expedite the improvement of runway strip to meet the standard prescribed in Annex 14 of ICAO or revise the category of instrument approach procedure to suit the current runway strip. The Company shall also establish a Safety Management System (SMS) in order to identify and mitigate the risk.

4.2.2 Rescue and Fire Fighting

4.2.2.1 construct more access roads across the ditch along runway 27 to inaccessible areas at Phuket International Airport to facilitate any rescue and fire fighting team in order to reach any accident area in due time. The Company should also arrange the rescue and fire fighting exercise in those areas in order to mitigate the difficulties in rescue and fire fighting.

4.2.2.2 include the Emergency Medical Institute of Thailand (formerly Narenthorn Center), which is the government institute that co-ordinate and provide medical emergency service, in the Airport Emergency Plan.

4.2.2.3 perform a full scale emergency exercise which should cover the participation of all responsible sectors and personnel to comply with the Airport Emergency Plan in most efficient manner, when an accident occurred.

4.3 The Department of Civil Aviation of Thailand should:

4.3.1 oversee the operation of One Two Go Airlines Company Limited and Orient Thai Airlines Company Limited in order to improve their safety efficiency. The DCA should also issue regulations indicating the guidelines and practices of CRM training.

4.3.2 improve the measure for regulating and overseeing the air operators under the DCA supervision to achieve the most efficiency.

4.3.3 co-ordinate with the Aero Thai Company Limited in order to specify operational guidelines of 'Crash on Airport' into 'Manual of Air Traffic Services'. The guidelines should also be detailed in accordance with Doc. 9137/An898 Airport Service Manual, Part 7: Airport Emergency Planning, Chapter 4, Responsibility and Role of Each Type of Emergency.

4.3.4 co-ordinate with the Meteorological Department to review all LLWAS installation to identify possible deficiencies in performance, similar to those identified at the Phuket International Airport and correct such deficiencies to ensure optimum performance of the LLWAS. Furthermore, the DCA should consider the installation of efficient LLWAS with advance system to cover other airports, as considered necessary.

4.3.5 co-ordinate with the following medical centers that perform medical examinations on post-accident of flight crew involved.

4.3.5.1 Institute of Aviation Medicine, RTAF to

4.3.5.1.1 perform a physical examination on post-accident of surviving flight crew.

4.3.5.1.2 perform an autopsy and collect samples for laboratory examination by physicians from Ministry of Public Health and/or physicians from the Institute of Forensic Medicine, Royal Thai Police.

4.3.5.2 Institute of Forensic Medicine, Royal Thai Police to

4.3.5.2.1 collect and send samples of autopsy to the Institute of Aviation Medicine, RTAF for further laboratory examination, in case where the Institute of Forensic Medicine, Royal Thai Police arrive at the accident site first.

4.3.5.2.2 perform an autopsy and collect samples for laboratory examination with the Institute of Aviation Medicine, RTAF and/or physicians from Ministry of Public Health.

4.3.5.3 Ministry of Public Health to

4.3.5.3.1 collect and send samples of autopsy to the Institute of Aviation Medicine, RTAF for further laboratory examination, in case where physicians from Ministry of Public Health arrive at the accident site first.

4.3.5.3.2 perform an autopsy and collect samples for laboratory examination with the Institute of Aviation Medicine, RTAF and/or the Institute of Forensic Medicine, Royal Thai Police.

5. SAFETY IMPROVEMENT

5.1 Department of Civil Aviation has conducted as follows:

5.1.1 notified Orient Thai Airlines Company Limited and One Two Go Airlines Company Limited to set up a re-current training on flight operation in a critical situation for all flight crewmembers and instructors who operate the MD-80 series airplane.

5.1.2 issued a regulation regarding foreign licenses surveillance, prescribing that the foreign flight crew shall pass a theoretical test on Air Navigation Act, and Human Factors and Human Performance, and a practical test on a flight simulator.

5.1.3 required both of the Companies to improve flight scheduling of flight crew to comply with the FOM of the Companies.

5.1.4 required both of the Companies to have the Safety Management System (SMS) by, at a first stage, setting up a Flight Data Analysis Program and using its results to improve flight operation of flight crew.

5.1.5 required both of the Companies to improve Quality Assurance: to be complete in both the flight operation and maintenance.

5.1.6 required the Airports of Thailand Public Company Limited to improve the Safety Management System (SMS) of all airports under its responsibility.

5.1.7 required the Aero Thai Company Limited to amend the Manual of Air Traffic Services in order to have complete content.

5.2 The Meteorological Department had improved the LLWAS by using a power station of the Provincial Electricity Authority as the main power station for LLWAS and using the solar cells system as a reserve power station: for more stable function of the LLWAS.

APPENDIX 1

AIP announcement on Runway Physical Characteristics

VTSP AD 2.12 RUNWAY PHYSICAL CHARACTERISTICS

Designations RWY NR	TRUE & MAG BRG	Dimensions of RWY(m)	Strength(PCN) and surface of RWY and SWY	THR coordinates	THR elevation and highest elevation of TDZ of precision APP RWY
1	2	3	4	5	6
09	085° 085 MAG	3000X45	59/F/A/X/T Asphaltic Concrete	0806.6N 9818.4E	THR 5.792 m/19 ft
27	265° 265 MAG	3000X45	59/F/A/X/T Asphaltic Concrete	0806.8N 9820.0E	THR 24.94 m/81.8 ft

Slope of RWY-SWY	SWY dimensions (m)	CWY dimensions (m)	Strip dimensions (m)	OFZ	Remarks
7	8	9	10	11	12
+0.12% +0.01% +1.0% +0.08% (500 m 1000 m 2500 m 3000 m)	60X45	Nil	3 240X150	Nil	Nil
+0.80% -1.0% -0.01% -0.12% (1000 m 2000 m 2500 m 3000 m)	60X45	Nil	3 240X150	Nil	Nil

VTSP AD 2.13 DECLARED DISTANCE

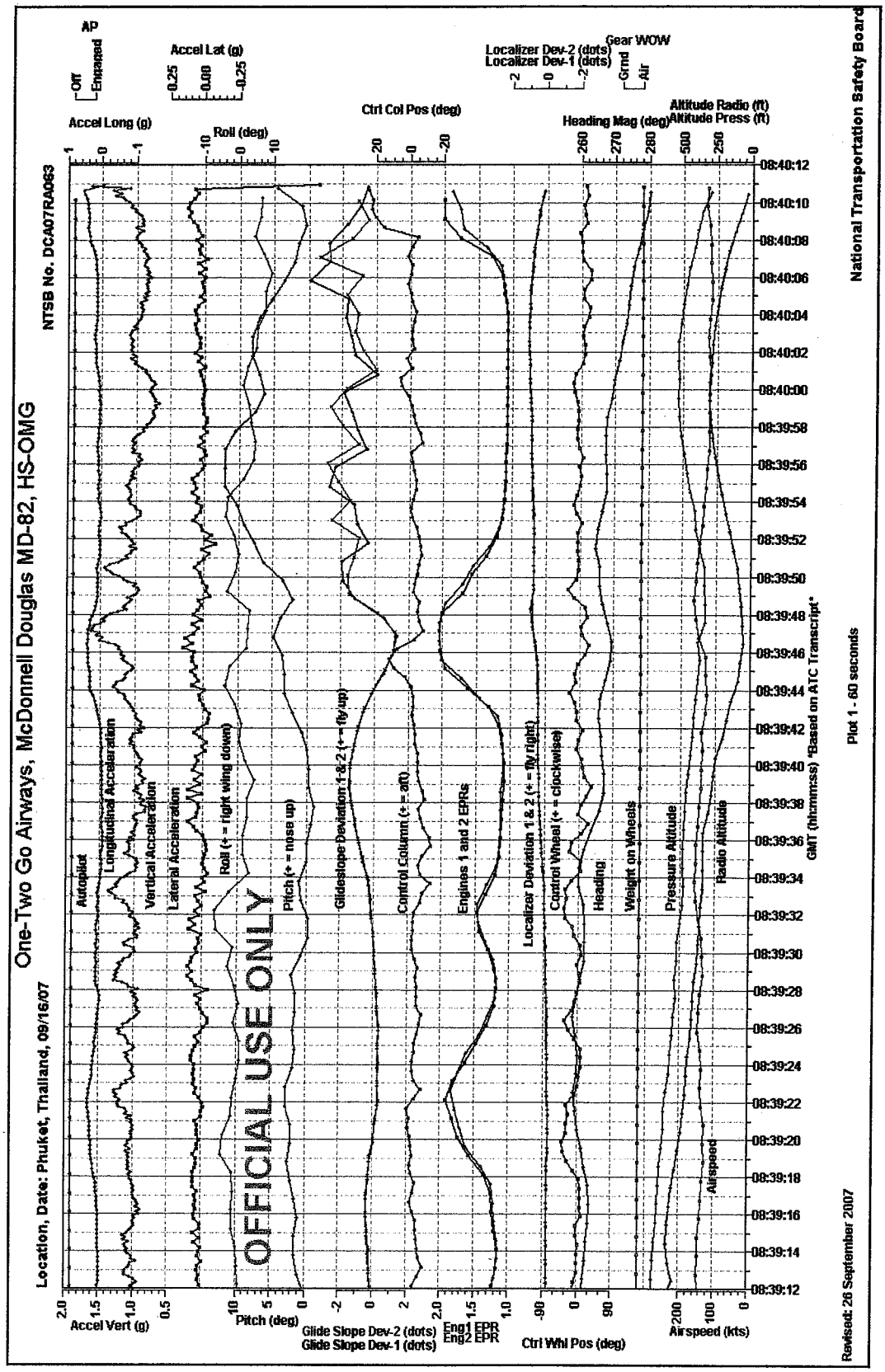
RWY Designator	TORA (m)	TODA (m)	ASDA (m)	LDA (m)	Remarks
1	2	3	4	5	6
09	3 000	3 000	3 060	3 000	-
27	3 000	3 000	3 060	3 000	-

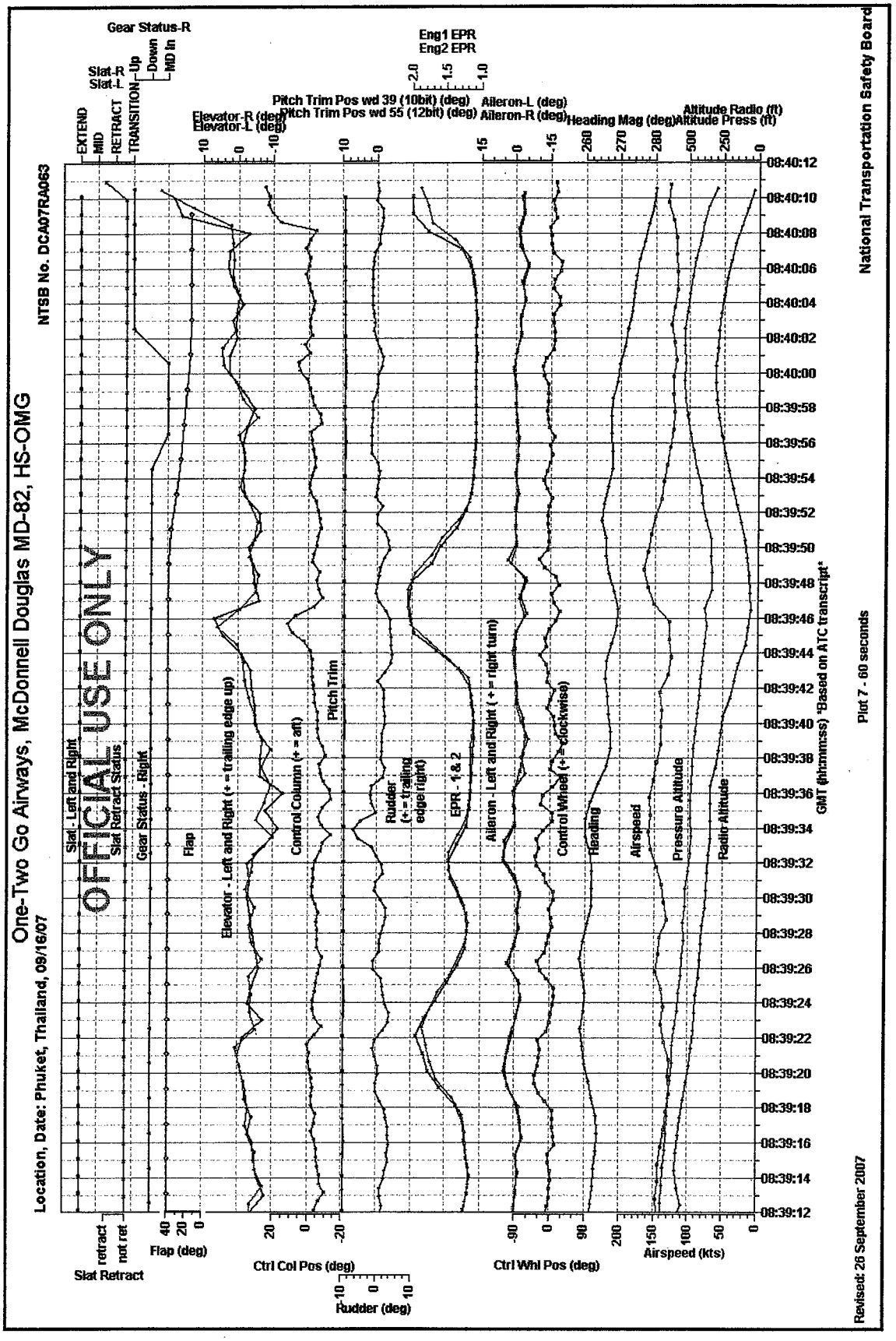
VTSP AD 2.14 APPROACH AND RUNWAY LIGHTING

RWY Designator	APCH LGT type LEN INTST	THRLG colour WBAR	VASIS (MEHT) PAPI	TDZ,LGT LEN	RWY Centre Line LGT Length, spacing, colour, INTST	RWY edge LGT LEN, spacing colour INTST	RWY End LGT colour WBAR	SWY LGT LEN (m) colour	Remarks
1	2	3	4	5	6	7	8	9	10
09	REIL	GREEN	PAPI Left/Right 3° (19.53 m)	Nil	Nil	3 000 m,60 m WHITE: FM2 400 3 000 m YELLOW; LIH	RED	Nil	Nil
27	SIAL (5 BAR) 300 m LIH	GREEN	PAPI Left/Right 3.2° (19.80 m)	NIL	NIL	3 000 m,60 m WHITE: FM2 400 3 000 m YELLOW; LIH	RED	Nil	Nil

APPENDIX 2

Information from Digital Flight Data Recorder (DFDR)




One-Two Go Airways, McDonnell Douglas MD-82, HS-OMG
Location, Date: Phuket, Thailand, 09/16/07
NTSB No. DCA07RA063
OFFICIAL USE ONLY
National Transportation Safety Board
Plot 7 - 60 seconds
Revised: 26 September 2007
GMT (hh:mm:ss) *Based on ATC transcript*
Gear Status-R
Slat-R
Slat-L
Up
Down
MD in
EXTEND
MID
RETRACT
TRANSITION
Eng1 EPR
Eng2 EPR
Pitch Trim Pos wd 39 (10bit) (deg)
Pitch Trim Pos wd 55 (12bit) (deg)
Elevator-R (deg)
Elevator-L (deg)
Aileron-L (deg)
Aileron-R (deg)
Heading Mag (deg)
Altitude Radio (ft)
Altitude Press (ft)
Slat - Left and Right
Slat Retract Status
Gear Status - Right
Flap
Elevator - Left and Right (+ = trailing edge up)
Control Column (+ = aft)
Pitch Trim
Rudder (+ = trailing edge right)
EPR - 1 & 2
Aileron - Left and Right (+ = right turn)
Control Wheel (+ = clockwise)
Heading
Airspeed
Pressure Altitude
Radio Altitude
Slat Retract
retract
not ret
Flap (deg)
Ctrl Col Pos (deg)
Rudder (deg)
Ctrl Whl Pos (deg)
Airspeed (kts)

APPENDIX 3

Transcript from Cockpit Voice Recorder

Transcript of a L-3 Communications FA2100-1020 solid state cockpit voice recorder installed on a One-Two-Go Airlines Boeing/McDonnell Douglas MD-82 (HS-OMG) which crashed during landing at Phuket, Thailand.

LEGEND

CAM	Cockpit area microphone voice or sound source
RDO	Radio transmissions from HS-OMG
BKK	Radio transmission from Bangkok controller
APP	Radio transmission from the Phuket Approach controller
TWR	Radio transmission from the Phuket Tower controller
OE2071	Radio transmission from Orient Thai flight 2071
INT	Communication via cabin intercom
-1	Voice identified as the captain
-2	Voice identified as the first officer
-3	Voice identified as the flight attendent
-?	Voice unidentified
*	Unintelligible word
[ ]	Editorial insertion

Note 1: Times are expressed in GMT.

Note 2: Generally, only radio transmissions to and from the accident aircraft were transcribed.

Note 3: Words shown with excess vowels, letters, or drawn out syllables are a phonetic representation of the words as spoken.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
08:18:48.3 CAM-?	**.		
08:19:39.3 CAM-?	* thousand *.		
		08:19:44.5 RDO-1	Thai Express two six nine approaching uh two four zero.
		08:19:50.1 BKK	Thai Express two six nine maintain flight level * four zero due to traffic.
		08:19:55.3 RDO-1	maintain two four zero two six nine.
08:19:57.5 CAM-1	awww.		
08:20:25.0 CAM-2	what?		
08:20:25.7 CAM-?	how does the captain feel about it?		
08:20:44.8 CAM	[sound similar to trim in motion horn]		
08:21:01.8 CAM	[sound similar to trim in motion horn]		
		08:21:17.7 RDO-1	Thai Express two six seven umm two six nine request traffic.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
		08:21:25.0 BKK	Express two six nine recleared descend flight level one three zero.
		08:21:28.8 RDO-1	one three zero Thai Express two six nine.
		08:22:20.8 BKK	Thai Express two six nine cleared present position direct to Phuket VOR.
08:22:26.1 CAM	direct Phuket VOR.		
		08:22:29.6 RDO-1	direct Phuket VOR Thai Express two six nine.
		08:22:30.7 BKK	six nine cleared present position direct to Phuket VOR. contact Phuket approach one two four decimal seven.
		08:22:37.3 RDO-1	contact Phuket VOR one two four seven. sawasdee krub.
		08:22:42.0 RDO-1	Phuket approach sawasdee krub Thai Express two six nine.
		08:22:44.9 APP	Thai Express two six nine Phuket approach sawasdee krub radar identified descend to eight thousand feet QNH one zero zero six ILS runway two seven approach direct to ANFIL.
		08:22:58.3 RDO-1	eight thousand one zero zero six ILS for runway two seven direct ANFIL Thai Express two six nine.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
08:23:13.0 CAM-2	request direct to intermediate fix.		
08:23:35.7 CAM	[sound similar to knocking on door]		
08:23:38.1 CAM	[sound similar to cockpit door opening]		
08:23:38.6 CAM-3	cabin clear ka.		
08:23:40.3 CAM-1	okay.		
08:23:44.0 CAM-2	request direct to the * fix.		
08:23:45.5 CAM	[sound similar to cockpit door closing]		
08:23:46.6 CAM-2	request direct intermediate. request direct intermediate.		
08:23:49.5 CAM-1	intermediate?		
		08:23:51.5 RDO-1	Thai Express two six nine request direct to intermediate fix.
		08:23:55.9 APP	Thai Express two six nine direct intermediate fix approved.
		08:23:58.9 RDO-1	thank you.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
08:24:01.2 CAM-2	**.		
		08:24:25.3 OE2071	and Orient Thai two zero seven one we're gonna request a three sixty to our left to lose altitude.
		08:24:33.6 APP	Orient Thai two zero seven one orbit to the left approved descend and maintain three thousand feet.
		08:24:38.8 OE2071	descending three thousand feet and orbit to the left is approved Orient Thai two zero seven one.
08:24:43.9 CAM-1	too high.		
08:24:45.3 CAM-2	what?		
08:24:46.6 CAM-1	he's too high and losing altitude.		
08:25:34.5 CAM-2	* to Phuket *.		
08:26:00.4 HOT	[sound similar to navaid morse code identifier]		
08:26:08.5 CAM-?	**.		
08:26:11.3 CAM-?	**.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
		08:26:12.4 OE2071	and we're complete on * orbit to the left Orient Thai two zero seven one ready to join the ILS.
		08:26:19.8 APP	Thai two zero seven one roger direct to intermediate fix.
		08:26:25.5 OE2071	and track direct to intermediate fix Orient Thai two zero seven one.
		08:26:37.5 APP	Orient Thai two six niner descend four thousand six hundred reduce to minimum approach speed.
		08:26:45.8 RDO-1	descend four thousand six hundred reduce to minimum approach speed Thai Express two six nine.
08:26:50.5 CAM-2	four thousand six hundred.		
08:26:52.4 CAM-1	what?		
08:26:53.4 CAM-2	four thousand six hundred.		
08:27:16.3 CAM-2	we are now fifteen miles *.		
08:27:19.4 CAM-1	keep minimum six thousand.		
08:27:34.7 CAM-2	slats *.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
08:27:36.8 CAM-1	slats?		
08:27:40.0 CAM	[sound similar to slat handle movement]		
08:27:44.6 CAM-?	[sound of cough]		
08:27:55.1 CAM	[sound similar to trim in motion horn]		
		08:27:57.4 OE2071	Orient Thai two zero seven one three thousand approaching intermediate fix.
		08:28:03.2 APP	Orient Thai two zero seven one descend two thousand five hundred feet cleared ILS approach runway two seven.
		08:28:09.6 OE2071	descending two thousand five hundred feet and we're cleared ILS approach runway two seven Orient Thai two zero seven one.
08:28:10.3 CAM	[sound similar to trim in motion horn]		
08:28:43.4 CAM-?	**		
08:28:48.1 CAM	[sound of metallic click]		
08:29:17.0 CAM-?	[sound of cough]		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
08:29:44.5 CAM-?	*.		
08:30:05.3 CAM	[sound similar to trim in motion horn]		
08:30:34.2 CAM	[sound similar to trim in motion horn]		
		08:30:40.7 APP	Thai Express two six nine turn left heading one six zero descend three thousand feet radar vectors for spacing.
		08:30:48.8 RDO-1	* one six zero...contact tower...three thousand confirm?
		08:30:52.9 APP	Thai Express two six nine descend to three thousand feet.
		08:30:57.6 RDO-1	descend three thousand feet Thai Express two six nine heading one six zero.
08:31:01.6 CAM-1	**.		
08:31:05.0 CAM	[sound similar to trim in motion horn]		
08:31:06.3 CAM-?	about ten miles from *.		
08:31:17.7 CAM-2	request uh heading one eight zero for weather.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
		08:31:21.0 RDO-1	Thai Express two six nine request heading one eight zero due to weather.
08:31:23.5 CAM	[sound similar to trim in motion horn]		
		08:31:26.8 APP	Thai Express two six nine heading one eight zero approved.
		08:31:30.9 RDO-1	roger that.
08:31:32.6 CAM-1	two six niner.		
		08:31:58.1 OE2071	Orient Thai two zero seven one established on the ILS one zero miles out.
		08:32:02.4 APP	Orient Thai two zero seven one contact tower on one one eight decimal one sawasdee krub.
		08:32:06.7 OE2071	tower one one eight decimal one Orient Thai two zero seven one sawasdee krub.
		08:32:18.9 APP	Thai Express two six niner continue heading one eight zero and stand by for right turn for spacing descend two thousand five hundred feet.
08:32:19.2 CAM	[sound similar to trim in motion horn]		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
		08:32:29.7 RDO-1	maintain one eight zero stand by for right turn descend two five zero zero Thai Express two six nine.
08:32:36.3 CAM-?	[sound of cough]		
		08:32:53.3 APP	Thai Express two six nine take cross localizer for short delay.
08:32:57.3 CAM	[sound similar to trim in motion horn]		
		08:32:58.8 RDO-1	say again please.
08:32:59.8 CAM-2	cross localizer.		
		08:33:00.4 APP	Thai Express two six nine continue heading one eight zero take cross localizer for spacing.
		08:33:06.0 RDO-1	roger cross localizer for spacing Thai Express two six nine.
08:33:13.5 CAM	[sound similar to trim in motion horn]		
08:33:30.5 CAM-2	* request uhhhh.		
08:33:41.1 CAM-2	request right heading two one zero avoid charlie bravo.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
08:33:44.7 CAM-1	two one zero?		
		08:33:48.8 RDO-1	Thai Express two six nine request heading two one zero avoiding CB.
08:33:51.5 CAWS	twenty five hundred.		
		08:33:52.8 APP	Thai Express two six nine heading two one zero approved.
		08:33:57.0 RDO-1	two six nine.
08:34:01.1 CAM	[sound similar to trim in motion horn]		
		08:34:08.4 APP	Thai Express two six nine continue right heading two niner zero clear ILS approach runway two seven.
		08:34:15.5 RDO-1	continue two nine zero clear ILS approach runway two seven Thai Express two six nine.
08:34:18.9 CAM-2	heading two nine zero.		
08:34:20.5 CAM-1	*.		
08:34:30.6 CAM	[sound similar to trim in motion horn]		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
08:35:01.8 CAM-?	right.		
		08:35:29.6 RDO-1	Thai Express two six nine established localizer.
		08:35:32.2 APP	Thai Express two six nine contact tower one one eight decimal one sawasdee krub.
		08:35:36.7 RDO-1	contact tower sawasdee krub.
		08:35:40.0 RDO-1	Phuket tower sawasdee krub Thai Express two six nine established localizer.
		08:35:44.0 TWR	Thai Express two six nine continue approach.
		08:35:48.7 RDO-1	continue approach two six nine.
08:35:58.5 CAWS	twenty five hundred.		
		08:36:15.3 TWR	Orient Thai two zero seven one taxi straight ahead left turn via bravo contact ground one two one nine when vacated.
		08:36:21.4 OE2071	straight ahead then vacate via bravo Orient Thai two zero seven one. be advised the CB over the airport this time * you have a windshear gain and loss of fifteen knots on the last five nautical miles from the ILS.

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
		08:36:33.7 TWR	thank you.
		08:36:36.2 TWR	Thai Express two six nine do you copy information from landing aircraft?
08:36:38.5 CAM-2	uh huh.		
		08:36:42.2 RDO-1	copy Thai Express two six nine.
		08:36:43.3 TWR	roger take caution.
		08:36:45.4 RDO-1	yes.
08:36:49.1 CAM-1	*.		
08:36:55.1 CAM-2	gear down *.		
08:36:58.5 CAM	[sound similar to landing gear handle movement]		
08:36:59.8 CAM	[sound similar to landing gear deployment]		
08:37:00.9 CAM	[sound of metallic clicks]		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
08:37:09.2 CAM-?	**.		
08:37:24.5 INT-1	flight attendants prepare for landing.		
		08:37:25.4 OE2071	Orient Thai two zero seven is vacated via bravo one two one decimal nine sawasdee krub.
		08:37:29.8 TWR	thank you.
08:37:30.7 CAM-1	one forty.		
		08:37:31.5 TWR	Thai Express two six nine wind two four zero degrees one five * cleared to land runway two seven.
		08:37:37.8 RDO-1	two four zero one five clear to land Thai Express two six nine.
		08:37:40.8 TWR	and caution runway wet.
		08:37:42.8 RDO-1	roger.
08:37:47.3 CAM-?	*.		
08:38:15.0 CAM-2	*.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
08:38:17.4 CAM-1	yes.		
08:38:23.7 CAM-2	before landing.		
08:38:26.0 CAM-?	*.		
		08:38:27.8 TWR	Thai Express two six niner strong wind two four zero degrees three zero knots.
08:38:30.1 CAWS	one thousand.		
08:38:32.4 CAM-1	[sound similar to trim in motion horn]		
		08:38:33.6 RDO-1	two six niner.
08:38:34.3 CAM-1	*.		
08:38:35.7 CAM-2	yes.		
		08:38:36.0 TWR	say your intentions now.
08:38:37.6 CAM-2	landing.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
		08:38:38.7 RDO-1	landing.
08:38:43.4 CAM-?	*.		
08:38:56.6 CAM-?	*.		
		08:39:00.0 RDO-1	say again the wind condition.
		08:39:02.2 TWR	two four zero degrees forty knots.
		08:39:04.6 RDO-1	two four zero at forty roger.
08:39:10.2 CAM-2	speed one three six.		
08:39:11.8 CAWS	five hundred.		
08:39:16.5 CAM-?	**.		
08:39:18.3 CAM-?	**.		
08:39:21.0 CAM-?	**.		
08:39:21.3 CAM-?	**.		

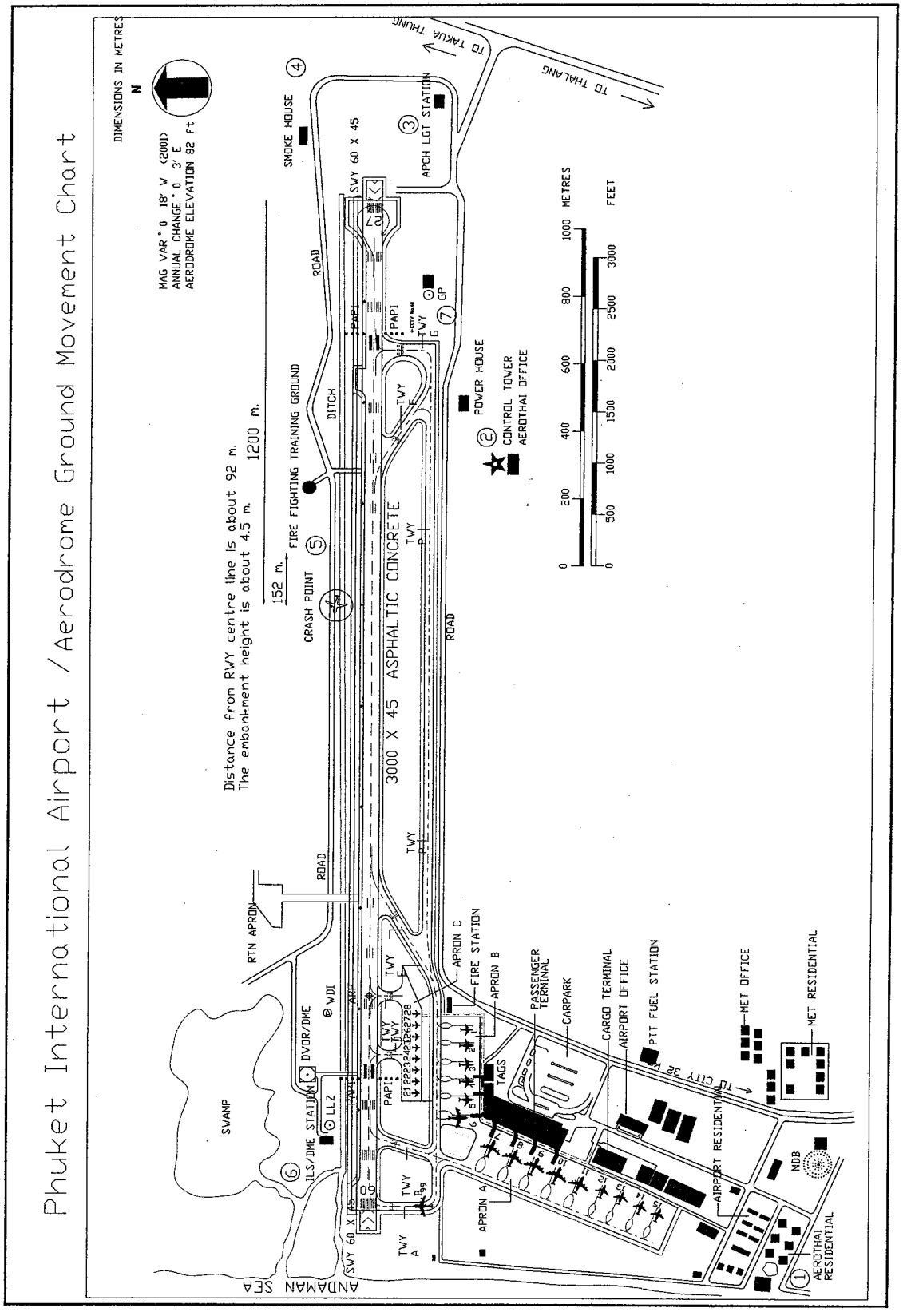
TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
08:39:23.9 CAM-1	power.		
08:39:27.9 CAM-?	**.		
08:39:29.4 CAM-1	below.		
08:39:31.1 CAM-2	correcting.		
08:39:33.8 CAM-1	power.		
08:39:39.6 CAM-?	**.		
08:39:43.5 CAM-1	power power power.		
08:39:44.4 CAWS	one hundred.		
08:39:45.2 CAM-1	more more more.		
08:39:46.5 CAWS	forty.		
08:39:47.2 CAWS	sink rate. sink rate.		
08:39:49.2 CAM-2	go around.		

INTRA-COCKPIT COMMUNICATION		AIR-GROUND COMMUNICATION	
TIME and SOURCE	CONTENT	TIME and SOURCE	CONTENT
08:39:49.5 CAM-1	okay go around.		
08:39:50.6 CAM-2	flaps fifteen your control.		
08:39:51.9 CAM-1	set my heading.		
08:39:54.5 CAM-1	landing gear?		
08:39:55.1 CAM-2	gear is up.		
08:39:55.6 CAM-1	yes.		
08:39:56.0 CAWS	[sound of tone] landing gear.		
08:39:58.6 CAWS	[sound of tone] landing gear.		
08:40:00.0 CAM	[sound of thump]		
08:40:01.2 CAWS	[sound of tone] landing gear.		
08:40:02.5 CAM-?	**.		
08:40:06.0 CAWS	don't sink.		

TIME and SOURCE	INTRA-COCKPIT COMMUNICATION CONTENT	TIME and SOURCE	AIR-GROUND COMMUNICATION CONTENT
08:40:07.7 CAWS	don't sink.		
08:40:08.3 CAM-?	*.		
08:40:08.7 CAWS	sink rate.		
08:40:09.3 CAWS	pull up.		
08:40:10.0 CAWS	[sound similar to windshear alert]		
08:40:10.9 CAM	[sound of impact]		
08:40:11.2 END OF TRANSCRIPT END OF RECORDING			

APPENDIX 4

Accident Site Layout



APPENDIX 5

NTSB report: Introduction and Summary

One-Two-Go Airlines Flight OG269, HS-OMG
September 16, 2007, Phuket, Thailand

A. INTRODUCTION:

This paper relates to the September 16, 2007, accident of One-Two-Go Airlines flight OG269, Thailand registration HS-OMG, a Boeing-McDonnell Douglas MD-82 that crashed during an attempted go-around at the Phuket International Airport (HKT), Phuket, Thailand. The flight departed the Don Muang Airport (DMG), Bankok, Thailand on a regularly scheduled passenger flight destined for (HKT). There were 123 passengers and 7 crewmembers on the flight, of which 89 persons were fatally injured. Among the fatalities were both pilots and 3 of the 5 cabin crewmembers.

As the State of Design and Manufacture of MD-82 airplanes, a U.S. Accredited Representative and advisers[1] participated in the Aircraft Accident Investigation Committee of Thailand (AAIC) investigation.

To evaluate the role of the airplane and its systems in this accident, the investigative team relied on evidence at the site, the cockpit voice recorder (CVR), flight data recorder (FDR), and component systems testing.

B. SUMMARY:

On September 16, 2007, at 1541 local time, One-Two-Go (OTG) Airlines flight OG269, Thailand registration HS-OMG, a McDonnell-Douglas MD-82, crashed during an attempted go-around at the Phuket International Airport (HKT), Phuket, Thailand.

The flight from DMG was conducted uneventfully and as the flight arrived in the PKT area, the flight crew conducted the ILS RWY 27 approach to the airport, with the first officer as the flying pilot. After the flight crew reported to Air Traffic Control (ATC) that they were "established [on the] localizer," the crew that preceded the accident flight to the airport (HKT), reported weather information that they encountered during their approach. This information included an airspeed gain and loss of 15 knots during the final portion of the approach and noted a "CB over the airport." The flight crew of OTG269 acknowledged the transmission and they were cleared to land at 1537, with a wind report of 240 degrees at 15 knots. One minute later, the controller issued another wind report, "OTG269, strong wind 240 degrees 30 knots." The pilot of OTG269 acknowledged the report, and shortly after, inquired again about the wind

[1] Advisers to the U.S. Accredited Representative included representatives from the National Transportation Safety Board, Federal Aviation Administration, Boeing Commercial Airplanes, Pratt&Whitney and Honeywell.

condition. The tower responded "240 degrees 40 knots," and the pilot acknowledged the report.

Information obtained from the CVR and FDR indicated that the flight crew conducted the ILS approach with the airplane aligned just to the north of the runway 27 centerline.

Between 0839:41 and 0839:43, as the airplane was descending through 115 feet above threshold level (ATL),[2] the airspeed dropped from 140 KCAS to 126 KCAS. At 0839:43 the captain called for power, and the engine pressure ratio (EPR) subsequently increased toward 'go around thrust.' The EPR for both engines increased from about 1.16 to 2.0 in approximately three seconds and remained about 2.0 for the following 2 seconds[3], until about 0839:48. Between 0839:40 and 0839:0839:47, the pitch angle increased from 0 degrees to 5 degrees, and then decreased to about 2 degrees at 0839:48.

Despite the increase of thrust and pitch, the airplane continued to descend until about 0839:48, reaching an altitude of 48 feet ATL before starting to climb. However, the airspeed increased during this time, from 126 KCAS at 0839:43 to 166 KCAS at 0839:48. At 0839:47, the crew received a "sink rate" warning, and at 0839:48, as the airplane descended below 50 feet ATL, the autothrottle system initiated an automatic reduction of all engine thrust. The engine EPR decreased from 2.0 ('go around thrust') at 0839:48 to about 1.14 ('idle thrust')[4] at 0839:53.

At 0839:49, the first officer called for a go-around, and the pitch of the airplane increased from about 2 degrees to about 12 degrees at 0839:54, as the airplane climbed. The thrust continued to decrease towards its 'idle' position, while the airspeed decreased from 165 KCAS to about 122 KCAS at 0839:57.

At 0839:50, the first officer transferred aircraft control to the captain as the thrust was reaching idle EPR.

The EPR remained at the 'idle' level for about 13 seconds (from 0839:53 to 0840:06), as the airplane continued to climb to a maximum altitude of 262 feet ATL at 0840:01, and then started descend again. During this time, the landing gear was retracted, and the flaps were set to 15 degrees; however, the takeoff/go-around (TO/GA) switch was never pressed.[5]

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[2] The ATL altitudes are based on corrected pressure altitude and field elevation at the runway threshold.
[3] According to Boeing, the throttles accelerated faster than the autothrottle system would have commanded (as discussed further in this paper). Therefore, this increase of thrust was most likely a result of manual operation of the throttle levers.
[4] This reduction of power occurred at a rate consistent with an autothrottle command.
[5] The autopilot was "off" during the approach, and the autothrottle was "on," and selected to the "speed" mode

Between 0839:57 and 0840:08, the pitch angle decreased from 12 degrees to about 0 degrees, while the airspeed remained relatively constant at around 122 KCAS, with about ± 4 knot excursions about this average.

At 0840:06, a "don't sink" warning sounded in the cockpit, as the airplane was descending through approximately 175 feet ATL. The EPR began to increase again, reaching 'go around thrust' at 0840:09; however, the altitude and pitch continued to decrease.

At 0840:09, a "sink rate" warning, followed by a "pull up" warning sounded in the cockpit. During these warnings, the pitch began to increase from 0 degrees. The pitch increased to approximately 5 degrees over the next second, until the sound of impact was heard at 0840:11, and the recording ended.

This paper provides the U.S. investigative team's position on the possible cause(s) of this accident, consistent with available evidence as follows:

- The EGPWS, Windshear and Autothrottle systems functioned as designed.
- Failure to activate the TO/GA switch during the go-around resulted in the airplane's flight management system automatically retarding the throttles, since the approach slat/flap logic for landing was applied[6].
- Lacking power application, the airplane slowed and descended until contact with the terrain.
- The crew did not properly perform the go-around maneuver or monitor the throttles during the go-around.
- Regardless of autopilot or autothrottle use, the throttles remained available to the crew to advance power, during the entire accident sequence.
- A transfer of controls, from the copilot to the pilot, occurred at a critical point in the go-around.
- The FDR data was consistent with the engines producing power as requested by the autothrottle system and/or flight crew up to the beginning of the accident sequence, and the on-scene physical evidence was consistent with both engines rotating during the accident sequence.
- Although the weather deteriorated in the later stages of this flight, windshear was not a factor in this accident.

APPENDIX 6

NTSB report: Details of the Investigation

C. DETAILS OF THE INVESTIGATION:

C.1 On-Scene Examination

The airplane and associated wreckage was removed from the accident site and taken to an outdoor area on the airport, prior to the arrival of the U.S. Team. As heavy equipment was used to clear the accident site, both the condition of the site and wreckage were compromised. Photographs taken prior to wreckage removal were provided and access was granted to the airplane and the actual accident site. The following wreckage description is based on the photographs, examination of the accident site, and observation of the wreckage after it was relocated.

The accident site consisted of a grass area adjacent (to the north) of runway 27, which was divided by a concrete ditch, and which terminated at a vegetation-covered hillside.

A ground scar was noted on the north (runway) side of the pavement surrounding the ditch, approximately adjacent to the 5,000 feet marker on runway 27. Glass and metal fragments were noted in the vicinity of the ground scar.

A measurement was taken from the pavement ground scar to the initial impact point on the berm, which was measured on an angle, in the direction of the wreckage path, and was approximately 128 feet in length. The scar in the berm was measured to be approximately 6 feet, on an approximate 55-degree angle. Three (parallel) ground scars were observed in the grass area, forward of the berm scar, in the direction of the wreckage path. The two outer scars were aligned with each other, and the center scar was just prior to the outer scars, in the direction of the wreckage path. The distance between the two outermost scars was approximately 21 feet, 8 inches, and the distance between the center and outermost (toward berm) scar was approximately 14 feet. The wreckage path continued in the grass area along the berm on an approximate heading of 300 degrees.

The airplane came to rest on an approximate heading of 340 degrees, in the vicinity of the 6,000-foot marker on runway 27. The empennage section of the airplane remained attached to the fuselage, and came to rest across the ditch. Two circumferential breaks were noted on the empennage section of the fuselage, forward of the tail. The post-crash fire burned a hole in the top of the fuselage just aft of the wings. Severe impact damage was concentrated in the forward fuselage and cockpit area.

The cockpit pedestal control quadrant was located along the wreckage path, separated from the cockpit area. Examination of the quadrant revealed the "suitcase handles" (pitch trim) were in the full forward position (note: the handles could be easily moved). The spoiler speed brake was in the full forward/unarmed detent. The throttles were also in the full forward position. The number "11" was observed in the longitudinal trim setting window. The flap handle was observed in the 28-degree detent.

The left wing remained attached to the fuselage at the wing root.

The right wing was separated from the fuselage at the wing root. The following measurements were taken of the right flap actuators (from washer to gland):

- Inboard actuator = 3 and 7/8 inches
- Mid actuator = 5 inches
- Outboard actuator = 3 and 3/8 inches. [7]

A measurement was taken of the horizontal jackscrew (from bottom of ACME nut to top of bottom stop), which was 11 ½ inches. According to Boeing this measurement equates to 10 ½ units of Aircraft Nose Up (ANU) trim. It was noted that the jackscrew was well lubricated.

The nose landing gear separated from the aircraft and was found in the debris field.

The main landing gear remained attached to the fuselage. None of the nose or main gear tires was found deflated. One of the main gears went to an extended position during the post accident relocation of the wreckage.

The number one powerplant, with pylon attached, was separated from the aircraft and positioned next to the wreckage in its approximate correct location and orientation but skewed pointing away from the aircraft centerline. There were no indications of a pre-impact failure including no indications of undercowl fire, case rupture, or uncontainment. There were no indications of casing intrusion into the rotor system. The presence of gentle cusping and bending of the fan blade leading edges (LEs) and tips (soft body damage), sporadic localized tearing and breakout damage on the fan blade LE's (hard body damage), and the finding of a light dirt deposit on the fan blade convex side tips are all consistent with the engine rotating and ingesting dirt and/or mud during the accident sequence.

The number two powerplant separated from the aircraft during the accident sequence. The pylon for the number two powerplant remained attached to the aircraft. The powerplant was located next to the wreckage in the approximate correct location relative to the fuselage but was pointing rearward. There were no indications of a pre-impact failure including no indications of undercowl fire, case rupture, or uncontainment. The fan blades were all bent against the direction of rotor rotation and exhibited transverse airfoil fractures ranging from tip fractures to full span fractures. There was a heavy caking/coating of dirt and mud on the visible gas path surfaces, including the inlet

[7] It should be noted that these measurements may not accurately reflect the position of the flaps at the time of the accident, due to the fact that when hydraulic pressure is lost (during an accident sequence), the actuators are not hydraulically held in position.

to the low pressure compressor, when looking into the front of the engine. Distress consistent with clashing was observed on the rear stage low pressure turbine blades. The distress documented on the number two engine was consistent with the engine rotating at the time of its impacts during the accident sequence.

The thrust reversers separated from both powerplants during the accident sequence. It was not possible to ascertain if the reversers were stowed or deployed during the accident sequence during the on-scene investigation.

C.2 Meteorological Conditions

According to a printout of recorded weather information, provided by the AAIC, the weather at the time of the accident was:

0730 UTC: 330/04KT 3000 -RA SCT015 BKN110 BKN300 26/24
0800 UTC: 270/07KT 4000 SCT015 BKN110 BKN300 26/24
0830 UTC: 240/12KT 4000 SCT015 BKN110 BKN300 26/24
SPECI 0835 UTC: 270/09KT 4000 +RA SCT015 BKN110 BKN300 26/24
SPECI 0845 UTC: 270/28KT 0800 +RA SCT015 BKN110 BKN300 25/22
0900 UTC: 270/12KT 1000 RA SCT015 BKN110 BKN300 24/23

Doppler radar images were provided by the AAIC. These images indicated light to moderate rain at the airport between 0833 and 0933 (images were recorded at 0833, 0845, 0853, 0913, and 0933 UTC).

According to recorded weather data and Doppler radar images, at the time of the accident, the wind increased from 270 degrees at 9 knots to 28 knots. The visibility decreased from 4,000 meters 800 meters, and light to moderate rain occurred at the airport.

The airport was equipped with a Low Level Windshear Alert System (LLWAS), which consisted of 6 sensors placed around the airport. At the time of the accident, 3 of the 6 sensors were out of service, resulting in the system being unusable. According to the AAIC, a NOTAM was issued to reflect the LLWAS out of service.[8]

C.3 Emergency Response

The Airport Rescue and Fire Fighting (ARFF) response was initiated from the fire station on the airfield. The first responders were on-scene approximately five minutes after the accident.

[8] A search of several databases was unsuccessful in identifying this NOTAM, and a paper copy was not provided to the U.S. Team.

The airplane impacted a grass area located on the north side of Runway 27. An approximate 6-foot-wide ditch dissected the grass area, with no means available to transverse the ditch.

Firefighters, witnesses, and survivors noted difficulty in the rescue response, as there was no road available to cross the ditch, to be able to reach the accident airplane. The airplane was severely damaged by a post-crash fire.

The survival factors associated with this situation should be further examined by the AAIC. The accessibility of all areas on an airport is crucial in the event of an aircraft accident. Further guidance can be found in the following sources:

- *Annex 14, Aerodromes – Volume I: Aerodrome Design and Operations*, Published by ICAO, in July 2004.
- *Title 14, U.S. Code of Federal Regulations Part 139.19, Aircraft rescue and firefighting: Operational requirements*, Published by the Federal Aviation Administration.
- *Advisory Circular 150/5200-31A, Airport Emergency Plan*, Published by the Federal Aviation Administration, in September 1999.
- *Guide for Aircraft Rescue and Firefighting: NFPA 402*, Published by the National Fire Protection Agency, in 1993.

C.4 Systems Examination

The focus of the systems group study is to determine and analyze how the functions of the autothrottle, enhanced ground proximity system (EGPWS) and windshear system performed during the approach phase of the accident flight

To evaluate the role of the airplane and its systems in this accident, the Systems group relied on evidence such as CVR and FDR information.

It should be noted that the engineering units conversions used for the parameters recorded on the FDR were based on documentation from the previous operator of the accident airplane. A review of the converted data revealed that the majority of the parameters converted as expected. However, the linear conversion provided for the radio altitude parameter did not produce accurate values when compared with recorded FDR pressure altitude data. A review of the unconverted radio altitude data recorded on the FDR indicated that the data trended as expected and did not indicate any problem with the source of the data, the radio altimeter. Other options were pursued to obtain a more accurate radio altitude conversion including using the original piecewise linear/exponential equation obtained from the airplane's manufacturer and using a conversion based on a correlation performed by the accident airplane's former operator on a sister airplane. While these other conversions produced radio

altitude values that were more consistent with pressure altitude data at some low altitudes, significant differences remained at other altitudes. This is most likely due to variations among airplanes as modifications were made to the FDR systems. Without being able to perform a correlation on an intact accident airplane, an accurate conversion for radio altitude could not be determined. As a result, all citations of RA values in this section are based on the radio altitude recorded on the Enhanced Ground Proximity System (EGPWS).

The evidence indicated that just prior to landing, a "sink rate" alert was automatically annunciated by the EGPWS. Shortly thereafter, the autothrottle system transitioned into "retard mode" commanding both throttle levers to retract to idle at a radio altitude of about 50 feet. This resulted in the left and right engine EPR being reduced from about 2.0 to about 1.1; EPR remained in this position for about 13 seconds. Approximately two seconds later, the CVR indicated that the flight crew verbalized their intent for a "go-around" and FDR data indicated that flaps started to transition from "flaps 40" to "flaps 15". The TO/GA palm switches, located on the throttle levers, were not selected. After 7 additional seconds, the data indicated that the status of the right main gear transitioned from down to in-transit. An assessment of the FDR data indicates that the only windshear warning issued during the accident flight occurred at about 08:40:09[9] (approximately 1 second before the end of FDR data).

C.4.1. Autothrottle System

Airplane HS-OMG was equipped with an autothrottle system that is controlled by the Digital Flight Guidance System (DFGS). The autothrottle/speed control functions are available for operation from takeoff to landing. The autothrottle function is engaged by moving the AUTO THROT switch from OFF to the AUTO THROT position. The switch will not remain in the AUTO THROT (on) position unless all interlocks and engage logic requirements are satisfied. The switch will automatically revert to OFF when a malfunction is detected or the autothrottle disconnect button on either throttle is pushed. The red THROTTLE warning light, located on the Flight Mode Annunciator (FMA), flashes when the AUTO THROT switch is manually moved to OFF[10]. Pushing either autothrottle disconnect button or manually turning the AUTO THROT switch on extinguishes the throttle light.

An assessment of the FDR data indicates that throughout the final approach phase of flight 269, the autothrottle system was engaged and functioning; its modes fluctuated between the speed mode (SPD SEL), Clamp Mode and the Low Limit Mode (Low Lim) until the RETD mode was activated at about 08:39:47 (Reference Figure 1.). When the speed mode function of the autothrottle system is operating, the autothrottle system seeks to maintain the reference airspeed/Mach that the flight crew selected in the SPD/MACH window.

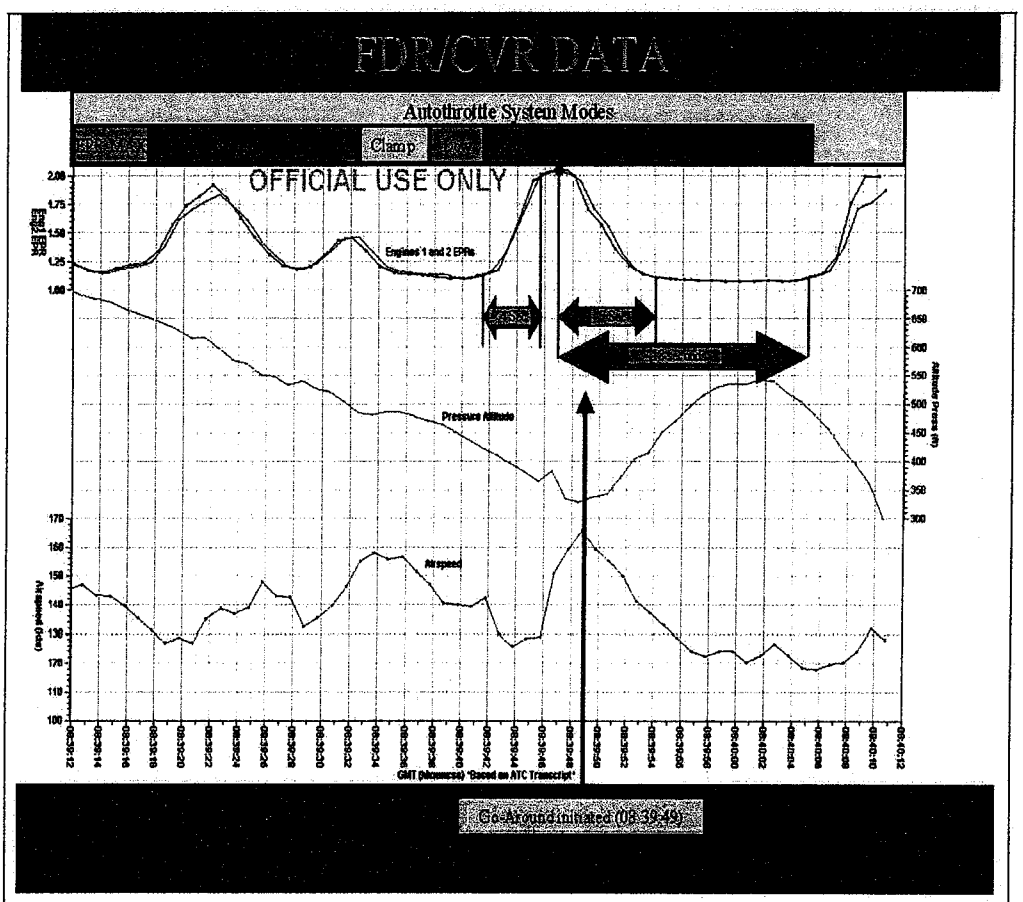
[9] All times in this report are in Greenwich Mean Time (GMT).
[10] The red THROTTLE warning lights flash for all autothrottle disconnects both manual and automatic.

The FDR data did not contain the selected Airspeed/Mach parameter and therefore, the specific airspeed was not confirmed.

At 08:39:41, the data indicated that during decent as airplane HS-OMG descended through about 150 feet (RA), the left and right engines were commanded to accelerate. The EPR for both engines increased from about 1.16 to about 2.0 in approximately three seconds and remained above 2.0 for almost 3 seconds. According to the Boeing Company, the MD-82 autothrottle system has the capability of commanding the autothrottle levers at a maximum rate of about 8 degrees per second. At 8 degrees per second, it would take the throttles approximately 5.5 seconds to go from idle to takeoff position. According to the Boeing Company, the engines are capable of accelerating faster than the autothrottle system can command them. Therefore, the manufacturer concludes that the 3-second engine acceleration rate is consistent with manual operation of the throttle levers. This would have overridden the autothrottles but the autothrottles would remain engaged.

At about 08:39:47, with the aircraft in the SPD mode, at about 50 feet (RA), airplane HS-OMG experienced an automatic reduction of all engine thrust from about 2.0 EPR to about 1.1 EPR because the retard (RETD) mode function of the autothrottle system automatically activated. Both engine's EPR remained at about 1.1 for approximately 13 seconds allowing the airspeed to drop below 120 kts. According to Boeing, the RETD mode is automatically activated as a function of radio altitude and landing flap configuration when the autothrottle is not in the EPR G/A mode. With the approach slat/flap logic applied to the autothrottle system, the flaps positioned to at least 20 degrees and the radio altitude less than or equal to 50 feet, the retard mode of operation is automatically established. The FDR data indicates the RETD mode activated when the flaps were positioned at 40 degrees and the aircraft descended below the 50-foot autothrottle retard altitude. Once activated, the FMA displays "RETD" and both throttles are driven to the aft stop at a rate dependant on the radio altitude. The autothrottle retard mode is independent of the autopilot or flight director-operating mode.

Figure 1 Autothrottle System Modes



C.4.2. Enhanced Ground Proximity Warning System (EGPWS)

General

At the time of the accident, airplane HS-OMG was equipped with one Honeywell Mark V EGPWS computer having part number 965-0976-003-216-216, and serial number 18254.

As part of the investigation, this EGPWS computer was removed from the accident site and shipped to the National Transportation Safety Board, located in Washington D.C. The computer was removed from its original shipping container, photographed, re-packaged and shipped to the Honeywell, facility located in Redmond Washington. The computer was received into Honeywell's Redmond Washington facility on January 31, 2008, where it was placed in a secured area. Honeywell was asked (by the NTSB) to retrieve and analyze any flight history data that might have been recorded within the computers non-volatile memory.

The initial examination of the unit was conducted in the presence of a representative of the US National Transportation Safety Board and Federal Aviation Administration. After the initial evaluation, the unit was secured pending a more thorough technical evaluation. The technical evaluation of the unit was reconvened on February 28, 2008.

Description of the Mark V EGPWS Computer

The Mark V EGPWS is a Terrain Awareness and Alerting system providing terrain alerting and display functions with additional features. It uses aircraft inputs including geographic position, attitude, altitude, groundspeed, and glideslope deviation. These are combined with an internal terrain, obstacle, and airport database to predict potential conflicts between the assumed aircraft flight path and any fixed external objects within the database. The system also utilizes airspeed and groundspeed information to provide warning of potential wind shear conditions. Except, this system is not active on MD80 due to the presence of another windshear system.. If the logic for any programmed warning condition is satisfied, the EGPWS system will provide both visual and audio warning in the cockpit. Additionally, the EGPWS provides alerts for excessive sink rate, glideslope deviation, too low with flaps or gear not in landing configuration, and optional bank angle and altitude callouts, based on system configuration from the Honeywell Enhanced Ground Proximity Warning System and Runway Awareness Advisory System Pilot Guide, MK V and MK VII:

The EGPWS contains an internal database consisting of several sets of data:

1. A worldwide terrain database of varying degrees of resolution.
2. A worldwide airport database containing information on runways 3500 feet or longer in length.
3. An Envelope Modulation database

With the use of accurate GPS or Flight Management System (FMS) information, the EGPWS is provided present position, track, and ground speed. This enables the EGPWS to present a graphical plan view of the aircraft relative to the terrain and advise the flight crew of a potential conflict with the terrain or obstacle. Conflicts are recognized and alerts provided when terrain violates specific computed envelope boundaries on the projected flight path of the aircraft. Alerts are provided in the form of visual light annunciation of a caution or warning, audio enunciation based on the type of conflict, and color enhanced visual display of the terrain or obstacle relative to the forward look of the aircraft. The terrain display is provided on the Weather Radar Indicator, EFIS display, or a dedicated EGPWS display and may or may not be displayed automatically.

The MK V EGPWS captures and internally saves flight history information for up to 71 parameters over a timeframe from 20 seconds before to 10 seconds after any warning is triggered. Information for up to 200 EGPWS warning 'events' may be retained in memory. New event data replaces the oldest data

once the flight history memory area becomes full. Not all parameters are utilized in every installation. Some parameters remain blank, as their slots are saved for future use. Stored information may later be downloaded by the manufacturer. This capability is intended primarily for systems engineering and quality control purposes. There is no formal documentation concerning the definition of the parameters stored in EGPWS memory.

EGPWS Computer Examination

The flight history data from the EGPWS computer's non-volatile memory of aircraft HS-OMG, was downloaded by Honeywell Engineering. Honeywell produced a report that provides an overview of the examination and an analysis and summary of the data that was obtained from the computer. This report was provided to the NTSB and is referenced in Appendix A of this report

The data indicates that during the accident aircraft's last flight leg, four alerts were recorded over an approximate 43-second span (Reference Figure 2). The EGPWS computer began recording data when the first alert, M1SK (sink rate), was triggered. The computer recorded 20 seconds of data prior to the first alert and approximately 23 seconds of data after the alert. After the first alert was recorded, the computed recorded an additional three alerts; a Mode 3 sink rate alert occurred 19 seconds after the first alert, then three seconds later another Mode 1 sink rate alert, and a final Mode 1 warning (PULL UP) was given one second later. After the last alert, the data recording ended, presumably at the same time as aircraft impact. Both pressure altitude and radio altitude were recorded by the computer. A comparison of the pressure altitudes and radio altitudes obtained from the FDR and EGPWS are indicated in Figure 3[11].

[11] As mentioned previously, an accurate conversion for radio altitude data recorded on the FDR could not be determined. The FDR radio altitude presented in Figure 3 is based on one of the conversions that was evaluated and is included to show the trend of the data compared to the radio altitude recorded on the EGPWS.

Figure 2 EGPWS Alerts

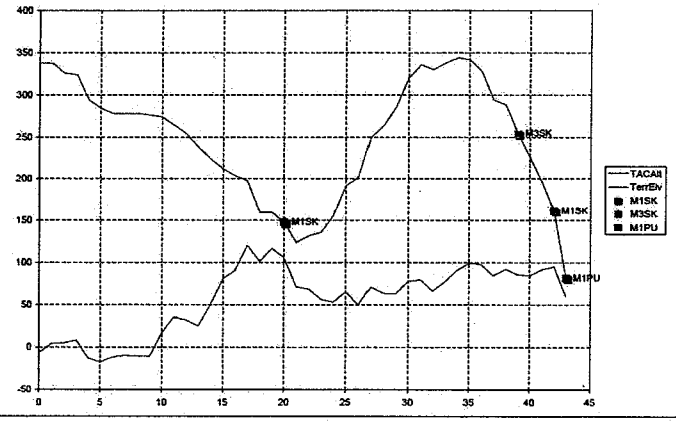
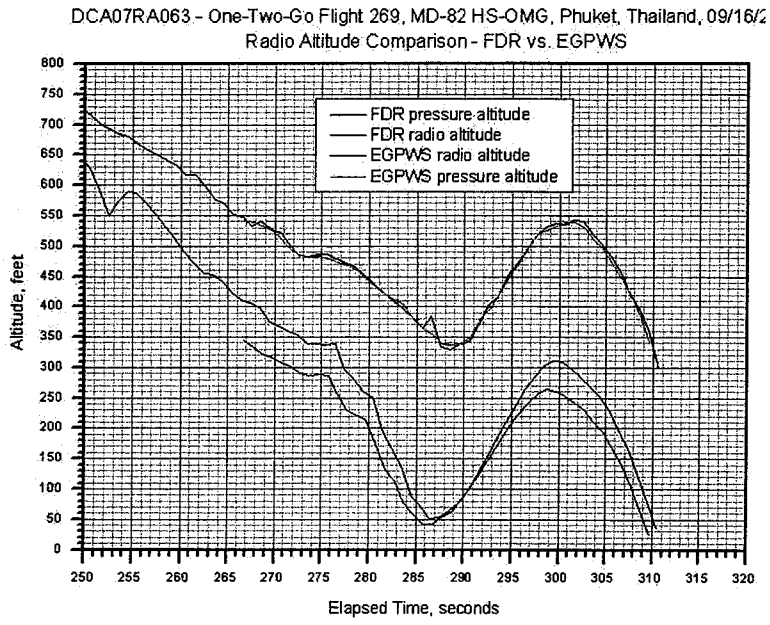


Figure 3 Comparison of EGPWS and FDR data



C.4.3. Windshear Alerting and Guidance System

General

At the time of the accident, airplane HS-OMG was equipped with a Honeywell 'Legacy' reactive windshear warning system. An assessment of the FDR data indicates that the only windshear warning issued during the accident flight occurred at about 08:40:09 (approximately 1 second before the end of FDR data).

Trans World Airlines originally installed this windshear warning system by installing one additional line replaceable unit (LRU), a Honeywell Wind Shear

Computer (WSC) part number 4059845-902, into the airplane per Douglas Service Bulletin 34-226. In 1998, Trans World Airlines replaced the originally installed computer with a computer, P/N 4059845-911. This computer met the requirements of Airworthiness Directive AD 96-02-06[12].

Description of the windshear alerting and guidance system (WAGS)

The windshear alerting and guidance system (WAGS) provides detection, alerting, and guidance through hazardous windshear conditions. The system consists of a windshear computer (WSC), which receives attitude, acceleration, and other data from the digital flight guidance computer (DFGC). The WSC also receives air data from the central air data computer (CADC) and stick shaker margin from the stall warning computers (SWC). The WSC uses the data from the DFGC, CADC and SWC to provide windshear and guidance during a windshear encounter. Upon detection of a windshear condition, the WSC provides both aural and visual cockpit annunciations.

The WSC detects two types of windshear: increasing performance (increasing headwind or updraft) and decreasing energy shears (increasing tail wind or downdraft). An increasing performance windshear (increasing head wind or up draft) results in an amber caution to be annunciated. A decreasing performance windshear (decreasing tail wind or down draft) causes a red warning to be annunciated on the glare shield and on the Primary Flight Display (PFD).

The WSC also enables the Central Aural Warning System (CAWS) to generate a warning tone. The actual voices that the CAWS delivers are operator selected options and can be either the "head wind shear" or "tail wind shear" warnings or the more common "wind shear wind shear". The FMA will display appropriate windshear annunciations. The WSC provides pitch guidance commands for all windshear encounters during all takeoff (after rotation) and go-around operations.

During approach, when the WSC detects a windshear, "WND SHR" will flash five times and then go steady in the FMA throttle window. An aural warning will sound when a decreasing performance windshear is detected. If the A/T are engaged in the speed mode when the wind shear is detected, the WSC will provide an input to the DFGC that will cause the DFGC to automatically control the auto throttles to maintain at least 1.3Vs + 20 knots.

The CAWS monitors discrete signals from the WSC and will annunciate a windshear unique tone followed by three repetitions of "windshear" in response to

[12] AD 96-02-06 was mandated to prevent significant delays in the Honeywell Standard Windshear Detection Systems (WSS) detecting hazardous windshear, which could lead to the loss of flight path control. The AD requires upgrading a wind shear computer by incorporating new software that eliminates delays in the WSS detecting windshear when the flaps of the airplane are in transition.

the setting of these discretes. According to Honeywell, the operator can choose to inhibit certain aural warnings by enabling certain pins on the windshear computer; the pins are 8, 11, 14, and 23. The following provides a description of the program pins and if grounded, what they will inhibit:

1. Program pin 8: Takeoff Roll Increasing Shear Aural Annunciation Inhibit. A ground will inhibit the W/S aural annunciation during the Takeoff Roll mode in response to an increasing performance shear.
2. Program pin 11: Takeoff/Go-Around Increasing Shear Aural Annunciation Inhibit. A ground will inhibit the W/S aural annunciation during the Takeoff or Go-Around modes in response to an increasing performance shear.
3. Program pin 14: Approach Increasing Shear Aural Annunciation Inhibit. A ground will inhibit the W/S aural annunciation during the Approach mode in response to an increasing performance shear.
4. Program pin 23: Aural Warning - WINDSHEAR. A ground w1ll provide for the annunciation of WINDSHEAR for decreasing performance wind shears. (If this option is selected, options 8, 11, and 14 must also be selected.) An open will provide for independent discrete outputs to the CAWS for aural annunciation of TAILWIND SHEAR and HEADWIND SHEAR.

If the system is configured in such a way that none of these 4 pins are grounded, the system would allow the "increasing shear" aural on takeoff roll, takeoff/ go around, and approach. However, if pins 8, 11 & 14 were all grounded then the aural warnings for those functions would be inhibited. To understand how the accident airplane was configured, a review of the operator's aircraft records for airplane HS-OMG could be examined.

Windshear Alerting and Guidance System Evaluation

The windshear computer P/N 4059845-911 contains non-volatile memory in which any detected system failure occurring on a previous flight is recorded within the computer. Because of the usefulness of the non-volatile memory in logging failures and detections, the investigation attempted to recover the windshear computer hardware (specifically the printed circuit board that contains the non-volatile memory chips). Five printed circuit boards were recovered from the accident site and shipped to the National Transportation Safety Board, located in Washington D.C. The printed circuit boards had assembly and serial numbers printed on them. The circuit boards were identified as indicated:

1. Circuit Board # 1: 58960 ASSY4053337-971 Rev G, Serial number G2025553 side B
2. Circuit Board # 2: 58960 ASSY4035022-902 Rev M, Serial number 7101468 side B
3. Circuit Board # 3: 58960 ASSY4058344-901 Rev G, Serial number G2035780 side B

4. Circuit Board # 4: ASSY 42-807??
5. Circuit Board # 5: ASSY 42-80719

A review was conducted to determine if any of the circuit boards contained the non-volatile memory chips from the windshear computer. This recovery effort was unsuccessful in recovering the card with the non-volatile memory. None of the recovered hardware was helpful in this analysis. The number "58960" is the Honeywell Phoenix identification "cage" code. These circuit boards most likely originated from the Digital Flight Guidance Computer. However, this computer does not contain any Non-volatile memory. The circuit boards having "ASSY 42-" could not be identified.

To evaluate the expected response of the windshear alerting and guidance system to the winds encountered by the accident aircraft, Honeywell constructed a windshear simulation model. Their simulation indicated that the legacy Honeywell windshear detection system would have been expected to produce an alert approximately 0.3 seconds before the end-of-data. The FDR data shows that the system on the accident airplane issued a windshear warning approximately 1 second before end-of-data. Details of Honeywell's model and the results obtained from it are indicated in Appendix B.

APPENDIX 7

NTSB report: Operational and Human Performance

D. OPERATIONAL AND HUMAN PERFORMANCE:

The systems investigation revealed that all airplane systems functioned as designed and that the airplane remained controllable during the approach and intended go-around. Because the pilots did not properly perform the go-around procedure or identify that the power was reduced during the go-around, the decisions and actions of the pilots should be further addressed by the AAIC. It is understood that during the accident sequence, the pilots were potentially distracted by the weather conditions; however, that distraction should not cause a loss of control of the airplane. Substantial investigative effort should be devoted to understanding the pilots' actions as the scenario unfolded.

Additional investigative effort should also be devoted to understanding why the first officer transferred control of the airplane to the captain at low altitude, during a go-around. The pilots were faced with challenges during the approach and go-around, exacerbated by the transfer of control at low altitude. This created a situation in which critical checklist items were missed, and the airplane was allowed to descend into the terrain.

Investigation of these issues will require the collection of adequate human factors and operational data, which should be just as methodical and complete as the collection and analysis of information pertaining to the aircraft and its systems. Some general guidelines for the investigation of human factors in aircraft accidents can be founds in ICAO Circular 240, *Human Factors Digest No. 7, Investigation of Human Factors in Accidents and Incidents.*

In order to thoroughly investigate this subject, data should be collected (and substantiated) in reference to: pilots' experience, rest periods, and 72-hour personal histories. Additionally, company procedures and training should also be collected and evaluated.

Data pertaining to the individual pilots routinely includes the following focus areas:

- 72-hour history
- Fatigue
- Stress
- Recent health
- Medications
- Experience
- Training
- Proficiency
- Personality/cockpit behavior

This data can be obtained, for example, by examining pilot records, interviewing other pilots who may have flown with the accident crew, the pilots' families, the pilots' physicians, instructors who trained the pilots, and any pilot examiners who may have evaluated them. A detailed list of example questions is attached to this report as Appendix C.

Fatigue has proven to be a considerable detriment to pilot performance and the potential for its appearance in this accident should be investigated. A family member of one of the passengers killed in the One-Two-Go accident provided documents to the NTSB, which reference pilots exceeding flight time limitations as well as other safety issues at the airline. While the validity of these documents cannot be substantiated, extensive investigative effort should be focused in examining these issues[13].

Significant investigative effort should also be placed on examining the procedures, training, and corporate culture at the accident airline. During the accident sequence, the autothrottle system design function, RETARD, moved the throttles to idle as the aircraft descended through approximately 50 feet AGL. Because the pilots omitted a critical step in the go-around procedure; *i.e.*, activation of the TO/GA switch, the autothrottle system remained in the designed RETARD mode, and as the airplane transitioned to a climb the airspeed rapidly decayed. Had the crew followed the prescribed go-around procedures, activation of the TO/GA switch would have allowed the autothrottle system to advance to go-around thrust.

[13] These documents are attached as Appendix D.

Examination of an excerpt from the Orient Thai MD-82 Manual, revealed an "SOP Profile" for a "Missed Approach/Rejected Landing." The procedure states that the maneuver should be performed as follows:

"1. AUTOPILOT OFF:

PF pushes TO/GA button, advances power and calls "max power, flaps 15" (flaps 11 if landing flaps 28), PNF will repeat flaps 15 (11) and selects flaps 15 (11), verifies throttle FMA reads EPR GA and roll and pitch FMA's read GO RND. Rotate to arrest sink while advancing the throttles to go-around thrust setting. PNF confirms that thrust is set for go around.

On a rejected landing, touchdown may occur but is not desired. Rotate to 20 degrees maximum while climbing at no less than go around speed. When a positive rate climb is assured, the PNF calls "positive rate," the PF commands "gear up; bug up." The PNF retracts the gear on command and sets 200, 250 or clean maneuvering speed, as appropriate, in speed select window. Continue with normal missed approach procedure. Disarm spoilers when time permits.

2. AUTOPILOT ON/AUTOTHROTTLE ON

PF pushes TO/GA button, advances throttles and calls "max power, flaps 15" (flaps 11 if landing flaps 28). PNF will repeat "flaps 15 (11)" and selects flaps 15 (11), verifies throttle FMA reads EPR GA, roll and pitch FMA's read GO RND, and throttles are set for go around. When a positive rate of climb is assured, the PNF calls "positive rate," the PF commands "gear up, bug up." The PNF retracts the gear on command and sets 200, 250 or clean maneuvering speed, as appropriate, in speed select window. Continue with normal missed approach procedure. Disarm spoilers when time permits."

This accident bears a resemblance to similar accidents that involve automation and a loss of aircraft control. As an example, a McDonnell Douglas MD-83 aircraft veered off the runway during landing at the Kajaani Airport, Finland, on November 3, 1994. During the ILS approach, the autopilot was disconnected, at an altitude of approximately 490 feet. However, the autothrottle remained engaged and the first officer continued to fly the approach manually.

At an altitude of 150 feet, the captain took control of the airplane, as he believed the airplane was slightly above the glide slope. At an altitude of 120 feet, the autothrottle thrust mode changed to go-around mode, since the speed was selected at 141 knots, and the system required 1.25-1.30 EPR to maintain the selected speed. The captain continued to retard the throttles against the autothrottle movement. Three seconds before touchdown, the autothrottle was disengaged and the airplane touched down 600 meters from the normal touchdown point, 26 knots over touchdown speed. As a result, a runway excursion occurred.

Both the One-Two-Go accident and the Finland accident display the importance of pilots understanding aircraft automation and how to operate it properly. Substantial investigative efforts should be concentrated in this area, to address the failures of the flight crew. Numerous publications are available in reference to flightdeck automation. One comprehensive, detailed publication can be found in *The Interfaces Between Flightcrews and Modern Flight Deck Systems*, published in 2004, by the Federal Aviation Administration, in Washington D.C.

APPENDIX 8

Appendix A Honeywell EGPWS Report

Report to National Transportation Safety Board
September 16, 2007 One-Two-Go Airlines MD83 Accident

Prepared By: **Paul Gipson, Honeywell Product Integrity**
Prepared For: **Mike Hauf, NTSB**
Date: **April 29, 2008**

Unit Data:
Honeywell Enhanced Ground Proximity Warning System computer
Part Number 965-0976-003-216(Mod 2)-216(Mod 1), Serial Number 18254;

Honeywell was requested by the US National Transportation Safety Board and the Government of Thailand to assist in the investigation of the September 2007 One-Two-Go MD83 accident. Specifically, Honeywell was asked to retrieve and analyze any flight history data that might have been recorded in the Honeywell Enhanced Ground Proximity Warning System (EGPWS) computer that was installed in the subject aircraft.

The computer is designed to store certain flight history data surrounding EGPWS caution, warning, or fault events. Fault data is recorded as it is recognized by either the unit self tests or the continuous monitor. If the EGPWS detects a condition that warrants a "Caution" or "Warning" message, the flight history data, consisting of several different parameters is recorded. This data is recorded at one second intervals, for the period 20 seconds before until 10 seconds after the event. Any data recorded is stored to a Non Volatile Memory (NVM) and retained, even if power is lost to the unit. This Flight History data was retrieved and analyzed for this report.

This report describes the investigation, analysis and findings as performed by Honeywell. The report is outlined as follows:

- Participants
- Findings
- Mode Descriptions
- Data Plot
- Flight History Parameters
- Unit Photographs

Participants:

The unit was received into Honeywell's Redmond Washington facility on January 31, 2008. The initial examination of the unit was conducted in the presence of Joe Sedor of the US National Transportation Safety Board and Eric West of the US Federal Aviation Administration. After the initial evaluation the unit was secured pending a more thorough technical evaluation.

The technical evaluation of the unit was reconvened on February 28, 2008, at Honeywell's Redmond, Washington facility. Present for the subsequent evaluation were:

- Pete Brown — Quality Engineer, Honeywell
- Kevin Allen — EGPWS Technical Manager, Honeywell
- Wally Ward — EGPWS Hardware Engineer, Honeywell
- Wes Goo — EGPWS Systems Engineer, Honeywell
- Jim Mulkins — EGPWS Systems Engineer, Honeywell
- Kevin Conner — EGPWS Research and Development Engineer, Honeywell
- Yasuo Ishihara — EGPWS Research and Development Engineer, Honeywell
- Bill Pickens — EGPWS Technician, Honeywell
- Steven Johnson — EGPWS Technician, Honeywell

Findings:

The EGPWS unit as received had been severely damaged in the accident. Honeywell removed the appropriate memory chip and reinstalled this onto an exemplar card. The flight history data from the chip was then downloaded and analyzed.

During the last flight leg there were 4 alerts recorded in the data over an approximate 43 second span. These alerts are depicted in the chart, attachment 3. The EGPWS began recording data when the first alert was provided. The unit recorded the prior 20 and next 10 seconds of data. A list of data items recorded is in attachment 5.

The first alert was a Mode 1 sink rate alert. The next alert, 19 seconds later, was a Mode 3 sink rate alert. 3 seconds later there was another Mode 1 sink rate alert. A final Mode 1 warning (this time a PULL UP) was given 1 second later. At this point data recording ended, presumably at the same time as aircraft impact.

Mode 1 Alert -- Mode 1 alerts are provided when the EGPWS senses an excessive descent rate close to the terrain. The warnings are both altitude and descent rate sensitive. Mode 1 is active in all aircraft configurations. If the aircraft penetrates the outer alert boundary, the voice aural "**SINKRATE, SINKRATE**" is generated, and the caution lights illuminate. If the aircraft penetrates the inner alert boundary, the voice aural "**PULL UP**!" is generated and the warning lights illuminate.

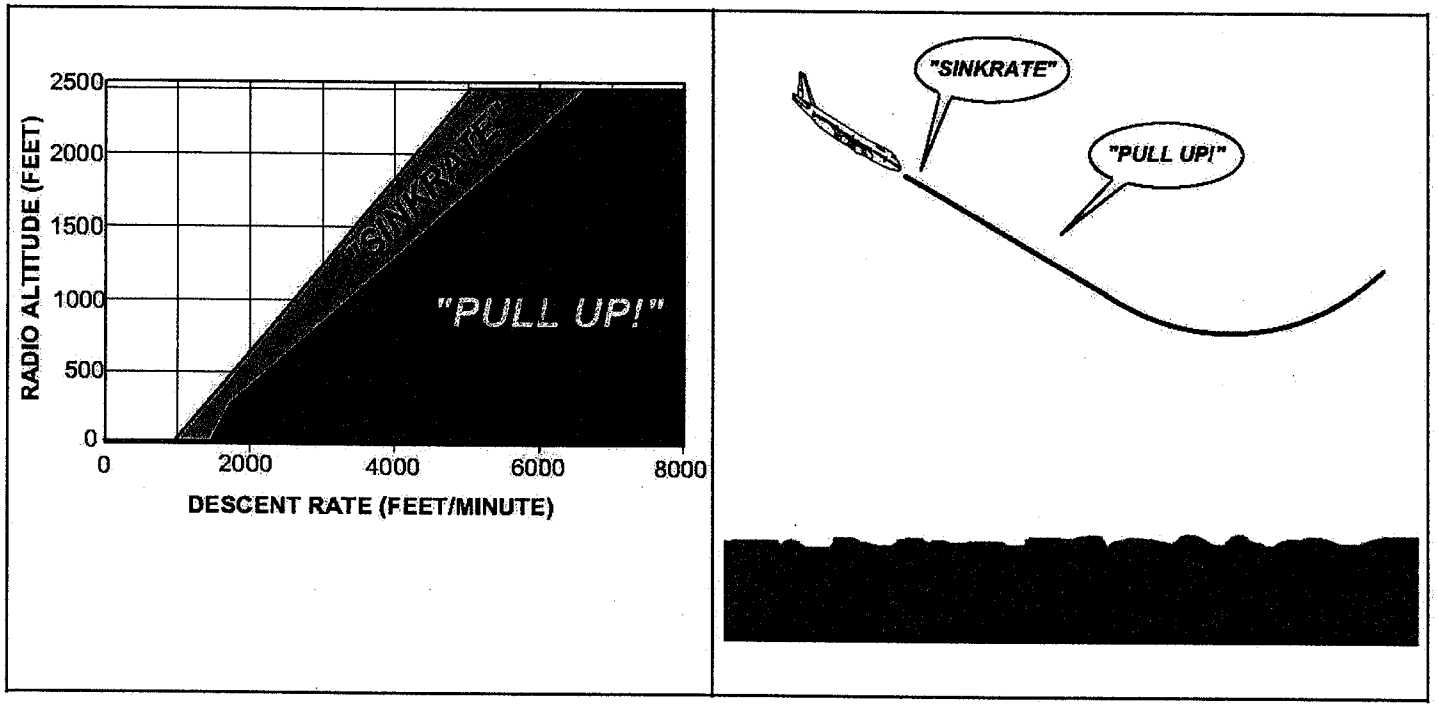
Mode 3 Alert -- Mode 3 alerts are provided when the EGPWS senses a significant altitude loss during takeoff or during a missed approach. This alert is given if the gear or flaps are not in the landing configuration. The aural alert is "**DON'T SINK, DON'T SINK**" and the caution lights are illuminated.

The plot of the downloaded data is Attachment 3 of this report. The raw data (in excel format) used to compile the chart was provided to the NTSB.

Attachment 1

Mode 1 - Excessive Descent Rate

Mode 1 provides alerts when the aircraft has excessive descent rate close to the terrain (see figure 2).



MODE 1 - EXCESSIVE DESCENT RATE

If the aircraft penetrates the outer alert boundary, the voice aural *"Sinkrate"* is generated, and alert discretes are output by the computer for driving visual annunciators. If the aircraft penetrates the inner alert boundary, the voice aural *"Pull Up!"* is generated and visual alert discretes are also output. The alert boundaries are defined in terms of aircraft vertical speed (barometric vertical speed supplemented by inertial vertical speed when available) and radio altitude.

Attachment 2

Mode 3 - Altitude Loss After Takeoff

Mode 3 provides alerts when the aircraft loses a significant amount of altitude immediately after takeoff or during a missed approach, as shown in Figure 1

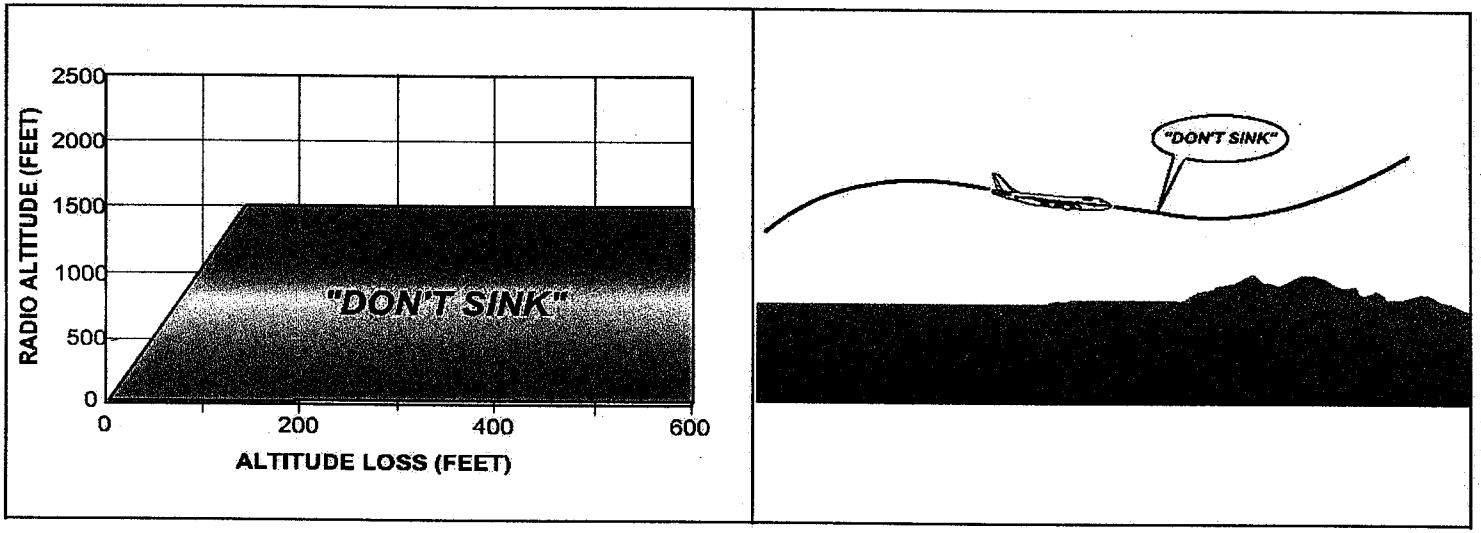
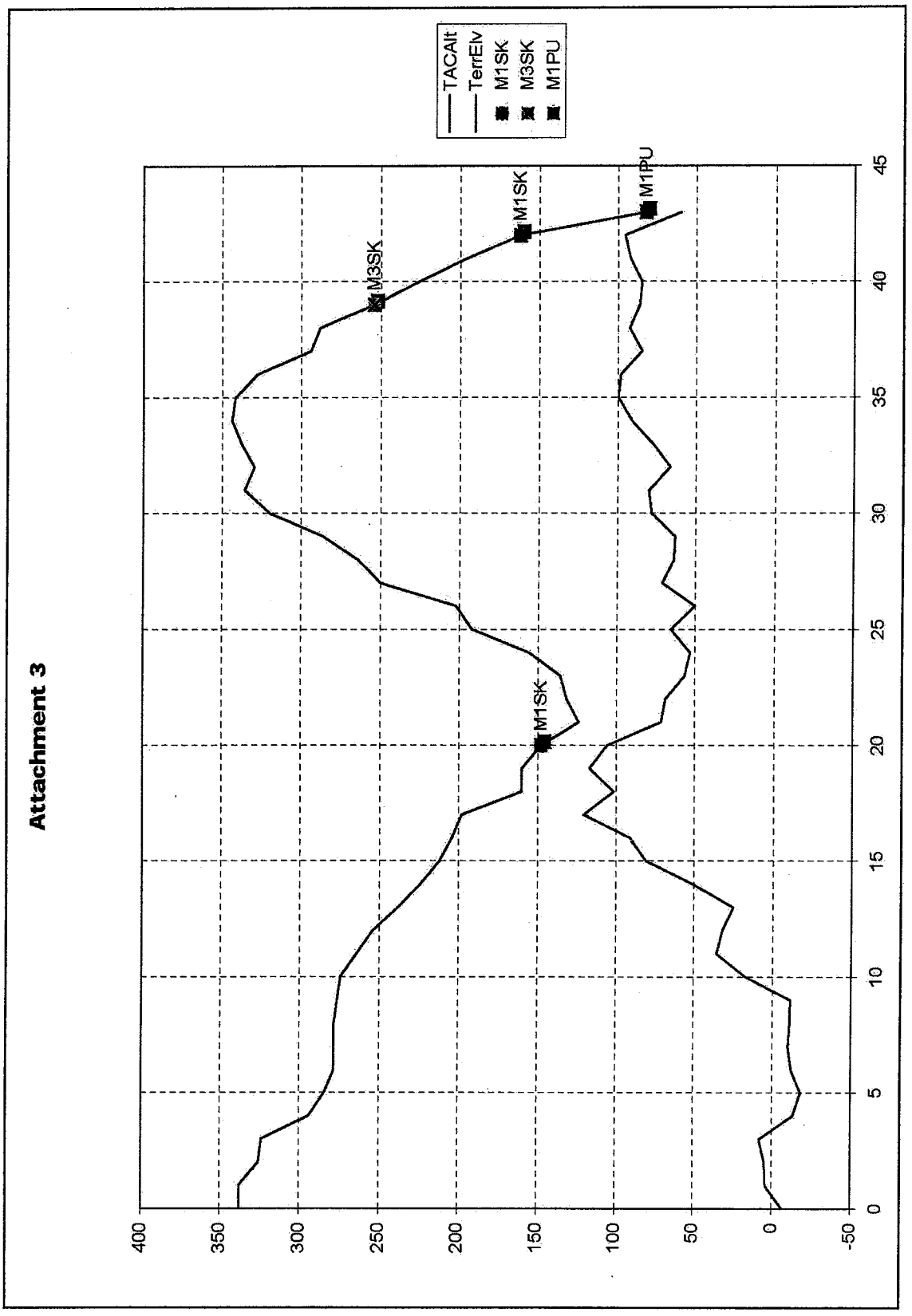


FIGURE 1 MODE 3 - ALTITUDE LOSS AFTER TAKEOFF

The altitude loss variable is based on the altitude (MSL) value from the time of the beginning of the inadvertent descent. The amount of altitude loss, which is permitted before an alert is given, is a function of the height of the aircraft above the terrain, as shown in Figure 1. Mode 3 is enabled after takeoff or go around when landing gear or flaps are not in landing configuration, and stays enabled until the EGPWS computer detects that the aircraft has gained sufficient altitude that it is no longer in the takeoff phase of flight.

If the aircraft penetrates the mode 3 boundary, the voice aural *"Don't Sink"* is generated, and alert discretes are provided for activation of visual annunciators. The visual annunciators remain active until a positive rate of climb is re-established.

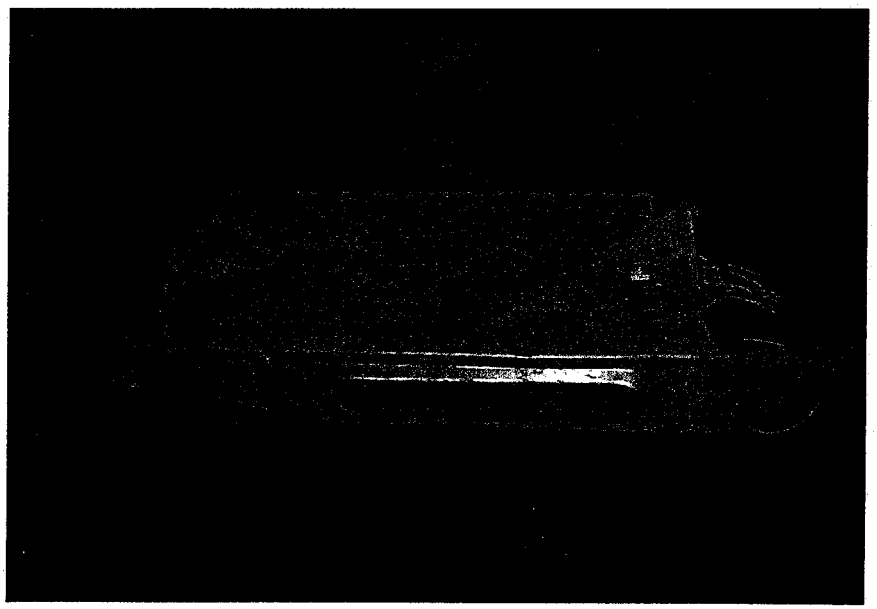

Attachment 3
TACAlt
TerrElv
M1SK
M3SK
M1PU
M1SK
M3SK
M1SK
M1PU
400
350
300
250
200
150
100
50
0
-50
0
5
10
15
20
25
30
35
40
45

Attachment 4

EGPWS Flight History Parameter List

System Operation Time
Latitude
Longitude
Position Uncertainty (HFOM)
VFOM
CAS
Ground Speed
GPS Altitude
Uncorrected Baro Altitude
Geometric Altitude
Radio Altitude
Terrain Database Elevation
Altitude Rate (Vertical Speed)
Magnetic Track
True Track
True Heading
Pitch
Roll
Glideslope Deviation
Loc Deviation
Position Source
TERR Display Range 1
TERR Display Range 2
Landing Gear Discrete
Landing Flaps Discrete
TERR Inhibit (Override)
TERR Display 1 Selected
TERR Display 2 Selected

PHOTO 1

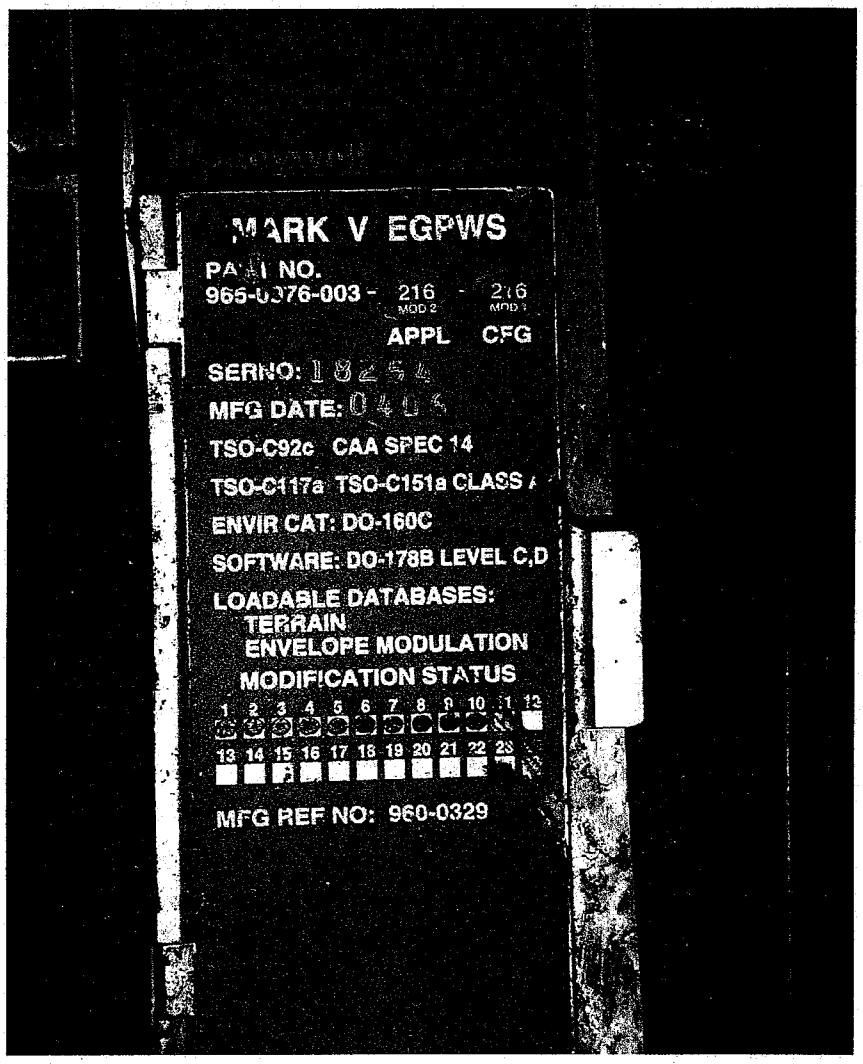


Unit as received at Honeywell Redmond facility

PHOTO 2

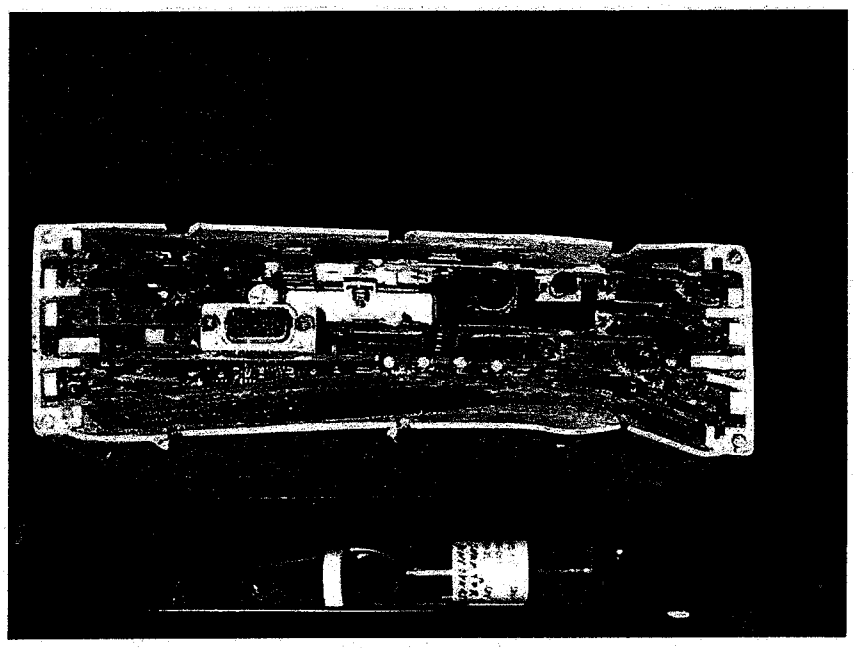
Unit removed from aircraft rack

PHOTO 3



Unit Data Plate

PHOTO 4



Unit with front end cap removed

APPENDIX 9

Appendix B Honeywell Windshear Report

Simulation of Honeywell Legacy Reactive Windshear Algorithm

J. Howard Glover, Honeywell Advanced Technology
30 November 2007

References

1. Honeywell Document 5141-01298, Rev A, February 2002, "Detection Algorithms in Honeywell (Legacy) Reactive Windshear Systems – Description of the MD-80/90 System and Comparison to other Honeywell (Legacy) Windshear Systems".
2. FAA Technical Standard Order TSO-C117, "Airborne Windshear Warning and Escape Guidance Systems for Transport Aircraft".
3. NTSB spreadsheet data from flight data recorder of accident to MD-82, HS-OMG, Phuket, 9/16/2007.

Background

The MD-82 aircraft HS-OMG involved in an accident at Phuket on 9 September, 2007 was equipped with a Honeywell 'legacy' reactive windshear warning system. In order to investigate the expected response of this warning system to the winds encountered by the accident aircraft, a simple simulation model was constructed. The model and the results obtained from it are described below.

Simulation

Using the algorithm descriptions and diagrams contained in the Honeywell legacy windshear warning system description document (Reference 1), a Matlab® *Simulink* model of the algorithms was constructed. The *Simulink* model includes a simulation of the dynamics of a jet transport airplane. The model has some limitations:

- Detailed aerodynamic data for the MD-82 was not readily available, and data for a typical transport airplane of the size and performance of the MD-80 series was used,
- Some of the alerting and mode switching logic of the windshear detection algorithm was simplified. However the simplifications are not expected to have a significant effect on the results from the simulation.

The wind, aircraft flight path and airspeed data from the Phuket accident (Reference 3) were imported into the model, and the responses of the simulated windshear detection system were recorded.

For comparison purposes, a second Honeywell reactive windshear algorithm (the "legacy Sundstrand" algorithm was also included in the simulation, and subjected to the accident wind data. This algorithm was originally certified to the FAA TSO-C117 performance standard, and its behavior was used as a baseline for intended functioning of a reactive windshear detection system.

Results

For the following time history charts, the time scale is referenced from an 'end-of-data' zero time corresponding to a GMT time of 31210.875 seconds in the original recorded data set in the spreadsheet provided by the NTSB.

The simulation indicated that the legacy Honeywell windshear detection system would have been expected to produce an alert approximately 0.3 seconds before end-of-data. The flight data recorder data shows that the system on the accident airplane issued a windshear warning approximately 1.1 seconds before end-of-data.

The simulation of the legacy Sundstrand windshear detection system provided a windshear warning at 0.6 seconds before end-of-data.

These results are compatible with each other, and well within the tolerance expected from the simulation.

The wind data provided by the NTSB (Reference 3) shows that there was a relatively insignificant vertical component of wind during the landing approach (Figure 1), and it is not expected that a windshear alert should have been issued based on the vertical shear. The variable within the legacy Honeywell algorithm which is most responsive to vertical shear is the variable TVERT, and the response of this variable is shown in Figure 3.

The horizontal wind component (Figure 2) shows a general increase from a headwind of 3 knots to a headwind of 47 knots during the majority of the approach, and then a rapid decrease to 10 knots at the end-of-data time. During the 'increasing' phase the wind speed oscillated considerably. These oscillations were attenuated by the gust filters of the windshear algorithm, as intended.

Towards the end of the approach, the headwind component (Figure 2) decreases, and the negative shear value eventually reaches a magnitude sufficient to cause the system to issue a warning alert (Figure 5).

The variables within the legacy Honeywell algorithm which are most responsive to horizontal shear are the variables TAIR1, TWIND1 and the 'wind vector rotation' variable TVIV. Plots of these variables against time from the simulation are shown in Figure 4. It is the variable TAIR1 which finally exceeds the threshold and causes an alert, as shown in Figure 5.

From the simulation data and accident data, the preliminary conclusion is that the legacy windshear detection system performed its function as intended, and that the performance was compatible with the requirements of FAA TSO-C117.

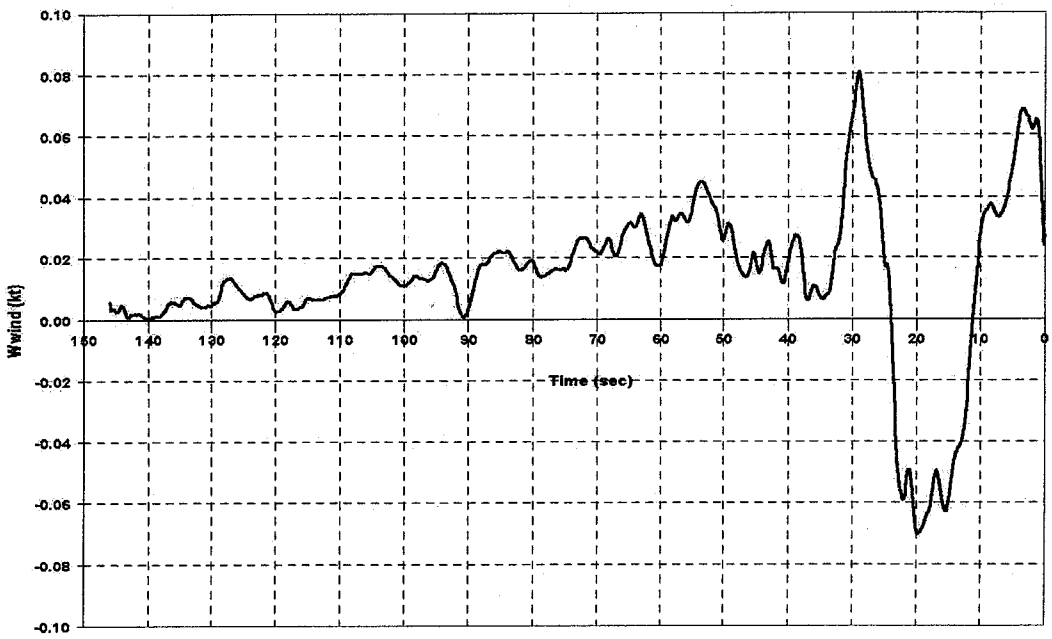


Figure 1. Vertical Wind

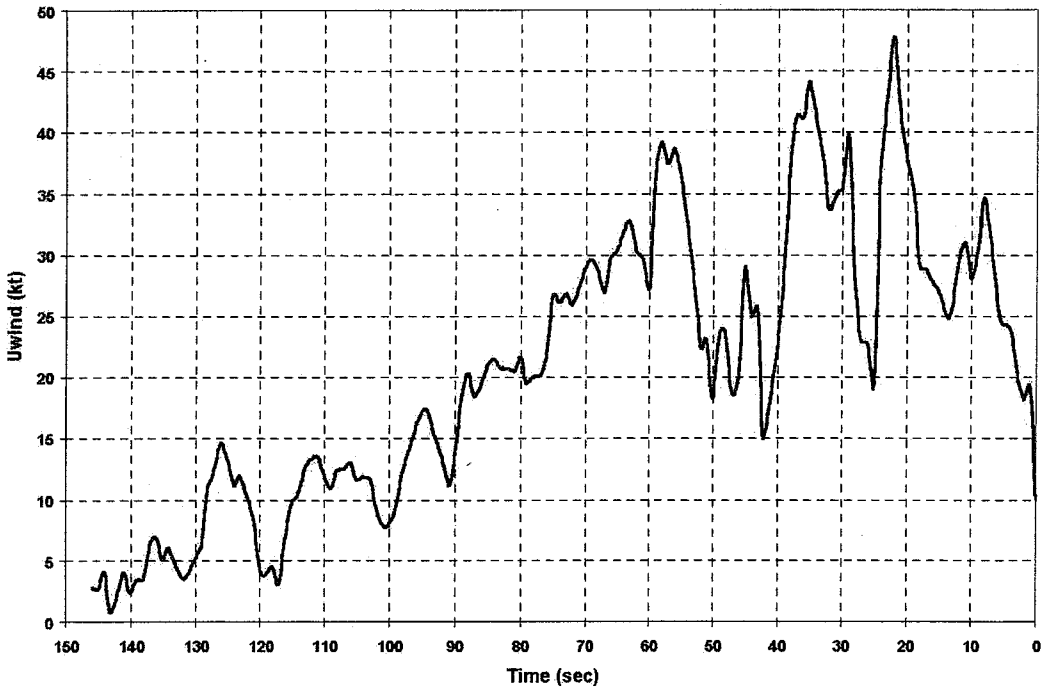


Figure 2. Horizontal Wind

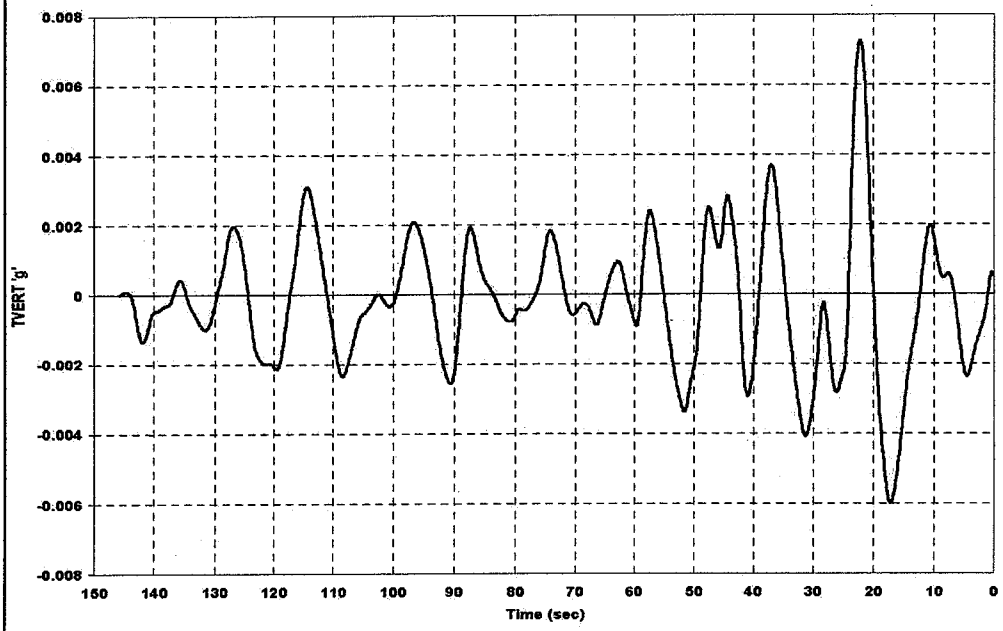


Figure 3. Simulation Time History of Windshear Algorithm Variable TVERT

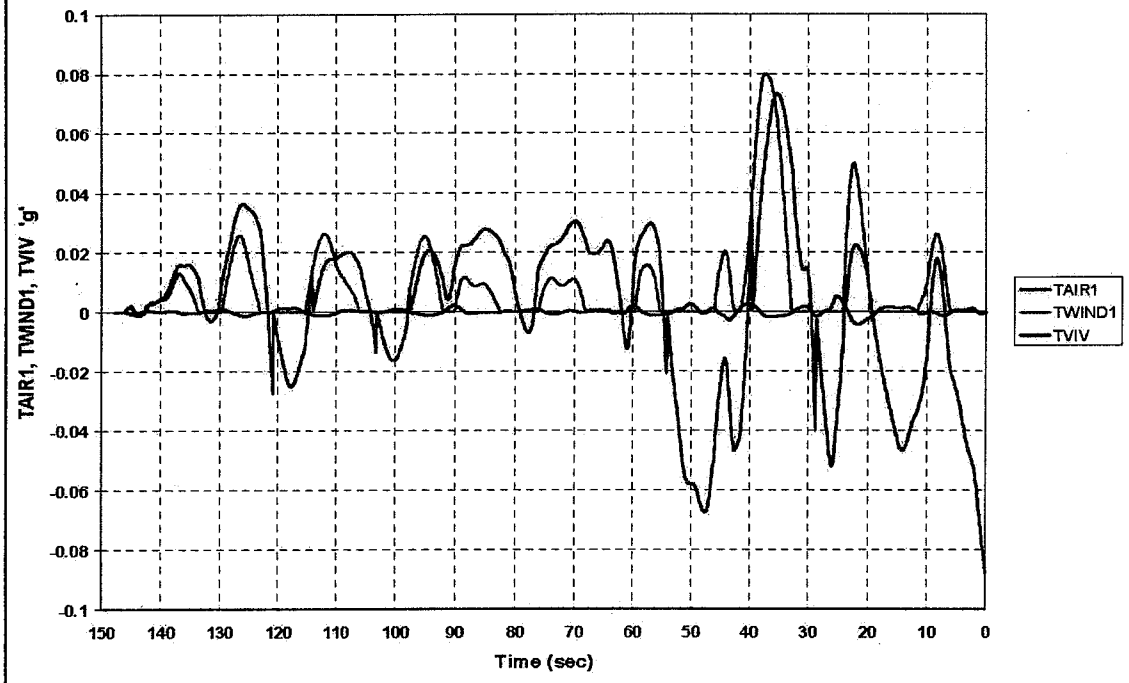


Figure 4. Simulation Time Histories of Windshear Algorithm Variables TAIR1, TWIND1 and TVIV

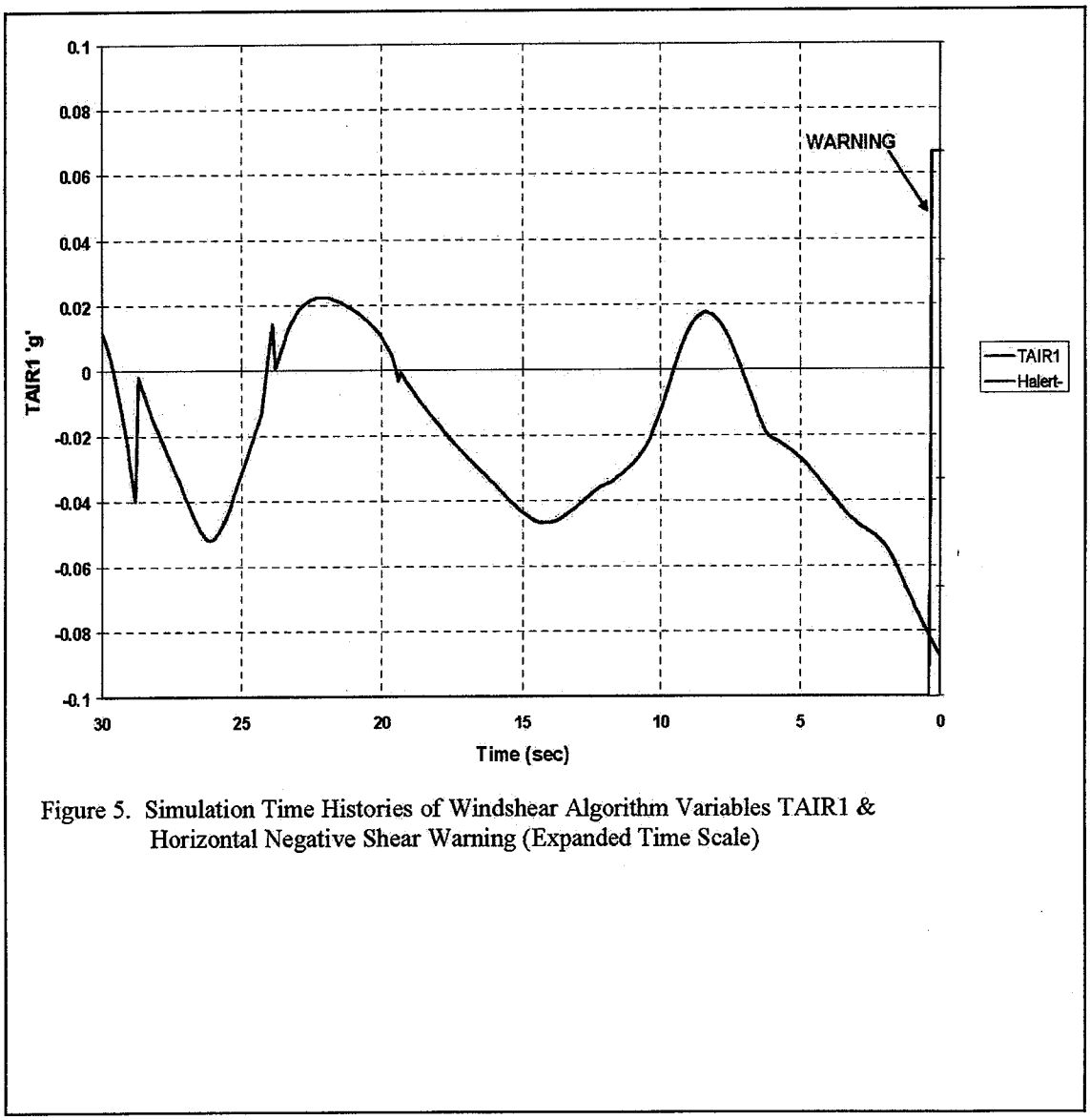


Figure 5. Simulation Time Histories of Windshear Algorithm Variables TAIR1 & Horizontal Negative Shear Warning (Expanded Time Scale)

APPENDIX 10

Appendix C Human Performance Questions

A. PILOT PERCEPTION AND EVALUATION OF THE WEATHER CONDITIONS

Evaluate whether the pilots of One-Two-Go Airlines flight #269 failed to identify and respond to the weather conditions in a timely manner; evaluate whether the pilots failed to appreciate the severity of the conditions.

1. The crew that preceded the accident flight to the airport, reported weather information that they encountered during their approach. This information included an airspeed gain and loss of 15 knots during the final portion of the approach. From CVR information, document and evaluate the accident crews' response to this information. Determine whether the accident crew should have continued the approach at that time or whether the approach should have been abandoned or delayed.

2. Evaluate One-Two-Go Airlines severe weather recognition and avoidance training and their Windshear recognition and avoidance training.

3. Document One-Two-Go Airlines definition of windshear conditions. Document One-Two-Go Airlines procedures for operating in an area of windshear. Document One-Two-Go Airlines procedures for a Windshear Escape Maneuver. Determine and document whether the accident pilots should have considered the weather for the approach to be windshear conditions.

4. Document Boeing definition of windshear conditions. Document Boeing procedures for operating in an area of windshear. Document Boeing procedures for a Windshear Escape Maneuver.

B. APPROACH PROCEDURES & TRANSFER OF CONTROL PROCEDURES

Document One-Two-Go Airlines procedures or guidance for additional speed additives to be used during approaches into areas of high winds and/or into areas where known loss and gain of airspeed has been reported. Determine whether the accident crew followed company procedures for airspeed additives during these conditions.

1. Document Boeing procedures or guidance for additional speed additives to be used during approaches into areas of high winds and/or into areas where known loss and gain of airspeeds has been reported.

2. Document One-Two-Go Airlines guidance and procedures for a first officer operating as the flying pilot during approaches into areas of high winds and/or into areas where known loss and gain of airspeeds have been reported. Determine and document any One-Two-Go Airlines limitations on the first officer operating as the flying pilot.

3. Document One-Two-Go Airlines guidance and procedures for transfer of controls and determine whether these procedures were followed. As the transfer of controls occurred at a critical point in the go-around, document and determine whether this transfer of control resulted in errors during the missed approach/go-around procedure.

C. GO-AROUND AND WINDSHEAR ESCAPE PROCEDURES

Based on One-Two-Go Airlines procedures and training, evaluate and document whether the accident pilots should have recognized a windshear condition and performed a Windshear Escape Maneuver rather than a missed approach/go-around maneuver.

1. Document One-Two-Go Airlines and Boeing procedures for a missed approach/go-around.

2. Document One-Two-Go Airlines and Boeing Windshear Escape Maneuver procedures.

3. Document the specific duties, call-outs, and challenges of both the pilot flying and the pilot monitoring during Go-Around, Missed-Approach, and Windshear Escape Maneuvers.

4. Document whether the use of the autothrottles without use of the autopilot is consistent with One-Two-Go airlines guidance and procedures, including during Go-Around and Windshear Escape Maneuvers.

5. Document that One-Two-Go Airlines and Boeing procedures called for the flying pilot to push the TO/GA button, advance the power, and call for max power during a missed approach/go-around. Document that the TO/GA button was not pushed and that this allowed the throttles to retard to idle during the missed approach/go-around.

6. From the FDR information, document that the throttles retarded to idle and remained at idle thrust for approximately 14 seconds. Document that the throttles retarded to idle because the pilots failed to push the TO/GA button during the missed approach/go-around.

7. From FDR and CVR information, determine and document why the pilots failed to monitor the engine power setting and allowed the engine power to remain at idle power for about 14 seconds during a critical point in the missed approach/go-around.

8. Determine and document whether One-Two-Go Airlines training and guidance provides sufficient information to pilots concerning the effects of a failure to push the TO/GA button during a missed approach/go-around.

9. Determine and document whether One-Two-Go Airlines training provides sufficient guidance to pilots concerning the need to apply, monitor, and maintain sufficient power during a missed approach/go-around.

10. Document that weather conditions were not the cause of this accident, but may have been a contributing factor.

APPENDIX 11

Appendix D Operational Documents Provided to the NTSB

Demko (Andrews) Jill

From: [redacted]
Sent: Thursday, May 29, 2008 10:02 AM
To: Demko (Andrews) Jill
Subject: Fwd: Thailand IASA - 1st email for Jill - resending 1C

Date: Tue, 20 May 2008 09:48:44 -0400
To: Danuta.Pronczuk@faa.gov
From: [redacted]
Subject: Thailand IASA
Cc: marlene.livack@faa.gov

Danuta,

Attached is:

1) Orient-Thai 11.jpg: The image of a document, written by Ron Allendorfer (but not signed), explaining the other images. What it says (in a nutshell) is: A Capt. Latief signed and approved PPC checks for 4 crew members in December, 2007 while he was on leave from Orient Thai. Since the signatures and comments differ in ink and handwriting style, Ron speculates that Capt. Latief signed the documents before going on Hajj. Ron recommends a complete and thorough IOSA Audit by an independent firm, specifically not one from Thailand.

2) Orient-Thai 12.jpg: An image of Capt. Latief's leave application, on Orient Thai stationary, signed by Capt. Latief and other writing presumably in his hand.

3) Orient-Thai 13-16.jpg: 4 images of the signed check rides on Orient Thai stationary. Even in black and white the different ink and handwriting are obvious.

4) Orient-Thai 2.jpg: An image of the MD-80 roster for the month of Dec, 2007 showing Latief to be "LV" during the dates of the check rides.

These images came from Ron Allendorfer through X X to me, with the intention of having them go public. In the email, Mr. Allendorfer says: "I sent an email to the DCA as a courtesy and to give them a heads up that others are aware of the condition of the carriers and it will be very embarrassing if the alleged fraudulent check rides and other things get out without them investigating. I feel nothing will be done, there's got to be some strong political connection for this to continue. "

warmly,
[redacted]

Reviewing the training records of December 2007, I found records that could possibly be fraudulent. On 1 November 2007, Capt. Latief, an instructor, requested and received approval from the DFO for leave from 1 December 2007 to 15 January 2008 to do the Hajj Pilgrimage. The official company crew schedule for December 2007 indicates that Capt. Latief was on leave for the entire month.

After reviewing the company Pilot Proficiency forms for the month of December 2007, Capt. Latief signed/approved PPC checks for the following crewmembers:

1.	17-12-07	PPC Simulator	Capt. Anwar Haryanto
2.	05-12-07	PPC Simulator	Capt. Nasrun Natsir
3.	10-12-07	PPC Simulator	Capt. Harry Purwanto
4.	12-12-07	PPC Simulator	Capt. Hendrarto

The question is: If Capt. Latief was on the Hajj Pilgrimage during December, how could he have conducted the Pilot Proficiency Checks?

I spoke with the Chief Pilot in regards to this and he explained that Capt. Latief was present during all the checks in question. He also relayed to me that Capt. Latief was on the Hajj from 20 December 2007. If that was the case and he did do the checks before he left for the Hajj, did the company pay him for those checks? If he did the checks, why did the official crew list for December not reflect that he was working? Does his logbook reflect that he conducted these checks? Does the Flight Simulator Log reflect that he was present?

I recommend that the aforementioned questions be investigated. It is my opinion that the forms were signed by Capt. Latief prior to his departure to the Hajj Pilgrimage. This is suspected because his signature is a different color of ink from the General Assessment, and the General Assessment printing appears to be done by another person. The Simulator Instructor ink and printing appears to be the same as what's written in the General Assessments.

Besides these possible irregularities, I would recommend that all of the training records and flight and duty time records be investigated for irregularities.

Based on the observations and information I provided on the state of Orient-Thai/One-Two-Go Airlines, I highly recommend that Orient-Thai/One-Two-Go be directed to undergo a complete and thorough IOSA Audit by an independent firm (not one from Thailand) beginning no later than 30 days from notification.

Depending on the results of the IOSA, reasonable and strict dates should be established to comply with any and all major findings.

APPENDIX 12

Flight Standards Bureau Promulgation: Pilot Training Program

Rule and Practice Guidelines on Pilot Training Program
Flight Standards Bureau
Department of Civil Aviation

By virtue of the Civil Aviation Board Rule No. 4 and Announcement of Department of Civil Aviation on Aeroplane Flight Crew prescribe that the pilot training programs conducted under the Air Operator Certificate, must be approved, in order to be used as guidelines for implementation of programs for pilots. Department of Civil Aviation hereby issues rules and practice guidelines, as follows:

The Pilot Training Program could be categorized into 6 types, as follows:

1. Initial Training Program is the training program that provides a pilot the training on a specific aircraft type that would be the first aircraft type rating.

2. Conversion/ Transition Training Program is the training program that trains a pilot to fly from one aircraft type to another such as from flying B737-300 airplanes to A300-600 airplanes.

3. Difference Training Program is the training program required for pilot to operate a common type rating that is different in performance, weight and configurations, for example, changing from B757 to B767 airplanes.

4. Upgrade Training Program is the training required for a pilot as a Second in Command to be qualified to fly as Pilot In Command.

5. Recurrent Training Program is the periodic training for a pilot to practice operations under normal, abnormal and emergency situations.

6. Requalification Training Program is the training required for a pilot who holds a type rating but has not flown exceeding the six months, but not exceeding 1 year.

The Pilot Training Program shall comprise as follows:

1. Ground School Subjects

1.1 Aircraft Systems Knowledge to include:

1.1.1 Aircraft General

1.1.2 Powerplant

1.1.3 Electrical System

1.1.4 Hydraulic System

1.1.5 Fuel System

1.1.6 Pneumatic System

1.1.7 Air Conditioning and Pressurization

1.1.8 Flight Control

1.1.9 Landing Gear

1.1.10 Ice and Rain Protection

1.1.11 Equipment and Furnishing

1.1.12 Navigation Equipment

1.1.13 Auto Flight System

1.1.14 Flight Instrument

1.1.15 Communication Equipment

1.1.16 Warning System

1.1.17 Fire Protection System

1.1.18 Oxygen System

1.1.19 Lighting

1.1.20 Emergency Equipment

1.1.21 Auxiliary Power Unit (APU)

1.2 General Subjects to include:

1.2.1 Basic Indoctrination,

1.2.2 Dispatcher Procedures,

1.2.3 Weight & Balance Procedures,

1.2.4 Adverse Weather Practices Procedures such as Icing, Turbulence, Heavy Precipitation, Thunderstorms with windshear and microburst phenomena, Low visibility, Contaminated runways, etc,

1.2.5 Determination of aircraft performance in normal, abnormal, and emergency situations, including the utilization of flight operation related documents properly such as chart, tables, manual information, MEL/CDL, special operational conditions,

1.2.6 Dangerous Goods Procedure,

1.2.7 Crew Resource Management,

1.2.8 Preventive Corrective Action of Sabotage and Unlawful Interference.

1.3 Aircraft Systems training to include:

1.3.1 Standard Operating Procedure (SOP) in the proper utilization of checklist in Flight Procedure Trainer/ Cockpit Procedure Training,

1.3.2 Flight planning based on performance limitations, required fuel loads, and weather planning,

1.3.3 Operating Weather Radar,

1.3.4 Operating Navigation Systems,

1.3.5 Operating auto flight and flight director systems,

1.3.6 Cockpit Familiarization,

1.3.7 Flight Management System (FMS), RNP, RVSM, TCAS and MNPS.

1.4 Safety and Emergency Procedures to include:

1.4.1 Emergency Equipment and Emergency Procedure in any situation,

1.4.2 Wet Drill, Fire Drill and Door Drill.

1.5 Flight Time for Theoretical Subjects shall be as follows:

Theoretical Subjects	Initial Training (Hrs.)	Conversion /Transition Training (Hrs.)	Difference Training (Hrs.)	Upgrade Training (Hrs.)	Requalification Training (Hrs.)
1.1	80	60	40	20	10
1.2	30	20	20	20	10
1.3	12	12	12	10	10
1.4	12	8	8	-	-

2. Flight Simulator Training

2.1 Airplane

Family of Aircraft	Initial Training (Sections)	Conversation /Transition Training (Sections)	Difference Training (Sections)	Upgrade Training (Sections)	Recurrent Training (Sections)	Requali-fication Training (Sections)
Turboprop	PIC – 12 SIC – 12 F/E - 10	PIC -10 SIC – 8 F/E – 10	PIC – 8 SIC – 8 F/E - 8	SIC to PIC – 10 F/E to SIC - 11	PIC - 1 SIC - 1 F/E - 1	PIC – 2 SIC – 2 F/E - 2
Turbojet/ Turbofan	PIC – 14 SIC – 14 F/E – 10	PIC – 12 SIC – 12 F/E – 10	PIC – 10 SIC – 10 F/E - 8	SIC to PIC – 12 F/E to SIC - 14	PIC – 1 SIC – 1 F/E - 1	PIC – 2 SIC – 2 F/E - 2

2.2 Helicopter

Helicopter	Rule of Flight	Initial Training (Sections)	Transition Training (Sections)	Upgrade Training (Sections)	Recurrent Training (Sections)	Requali-fication Training (Sections)
	IFR/VFR	PIC -10 SIC – 10	PIC – 8 SIC – 8	SIC to PIC – 8	PIC - 1 SIC - 1	PIC – 2 SIC – 2
	VFR	PIC – 6 SIC – 6	PIC – 6 SIC – 6	SIC to PIC – 5	PIC – 1 SIC – 1	PIC – 2 SIC – 2

Note: 1. PIC = Pilot in Command, SIC = Second in Command, F/E = Flight Engineer

IFR = Instrument Flight Rule, VFR = Visual flight rule

2. As indicated in 2.1 and 2.2, 1 Section means 4 hours, with a commencement as Pilot flying 2 hours, as Pilot not flying 2 hours. The number of session required above does not include the checking session.

3. School Flight Training

After passing the flight simulator training examination, the trainee pilot shall undertake at least two school flights, for his or her proficiency in operations for the trained position, to include:

3.1 In the first school flight shall include:

3.1.1 Cockpit preparation, engine start, after start

3.1.2 Taxi

3.1.3 Normal takeoff

3.1.4 Takeoff or T/G with engine fail (simulated) at V2

3.1.5 ILS approach (with or without FD) & T/G (all engine)

3.1.6 ILS approach (with or without FD) & T/G (1 engine simulated failure)

3.1.7 Visual circuit approach & T/G (all engine)

3.1.8 Visual circuit approach & T/G (1 engine simulated failure)

3.1.9 Go Around (all engine)

3.1.10 Go Around (1 engine simulated failure)

3.2 In the second school flight shall include:

3.2.1 Cockpit preparation, engine start, after start

3.2.2 Taxi

3.2.3 Normal Takeoff

3.2.4 Takeoff or T/G with engine fail (simulated) at V2

3.2.5 ILS approach (with or without FD) & T/G (all engine)

3.2.6 ILS approach (with or without FD) & T/G (1 engine simulated failure)

3.2.7 Visual circuit approach & T/G (all engine)

3.2.8 Visual circuit approach & T/G (1 engine simulated failure)

3.2.9 Go around (all engine)

3.2.10 Go around (1 engine simulated failure)

3.2.11 Non precision approach

3.3 School Check Ride Requirements shall include:

3.3.1 Cockpit preparation, engine start, after start

3.3.2 Taxi and Normal Takeoff

3.3.3 Takeoff or T/G with engine fail (simulated) at V2

3.3.4 ILS approach (with or without FD) & T/G (all engine)

3.3.5 ILS approach (with or without FD) & T/G (1 engine simulated failure)

3.3.6 Visual circuit approach & T/G (all engine)

3.3.7 Non precision approach & landing

3.3.8 Go Around (2 engine simulated failure)

Note: T/G = Touch and Go, FD = Flight director, V2 = 1.2 x Vstall

4. Route Training

When pilot passing the School Check Ride Requirements, the pilot shall undergo the Route Training with a Check Airman designated by the DCA, in accordance with the required route training or the Airman Route Check, as follows:

	No. of Flight
Initial Training	70
Conversion / Transition Training	40
Difference Training	30
Upgrade Training	40

Upon completion of the required route training, the trainee pilot must be qualified to fly in position seeking for the required route training. Then the trainee pilot shall be checked by the DCA or a Check Airman designated by the DCA, before endorse rating in his or her license.

5. Conditions Required to Continue Training

5.1 Upon completion of the Ground School Training, but a trainee pilot stops his training on the Flight Procedure Trainer Training more than 1 month, but not more than 6 moths, the trainee pilot shall take the refresher course on Aircraft System Knowledge reviewing and Ground School Test.

5.2 Upon completion of the Ground School Training, but a trainee pilot stops his training on the Flight Procedure Trainer Training and the Flight Simulator Training more than 6 months, the trainee pilot shall re-take the entire training programs.

5.3 Upon completion of the Flight Simulator Training, but a trainee pilots stops his training on the School Flight Training more than 1 month, but not more than 3 months, the trainee pilot shall take the refreshment courses on Aircraft System Knowledge reviewing, Ground School Test, Flight Simulator Training 1 section and pass Flight Simulator Training check ride 1 section.

5.4 Upon completion of the Flight Simulator Training, but a trainee pilots stop his training on School Flight Training more than 3 months, but not more than 6 months, the trainee pilot shall take the refreshment courses on Aircraft System Knowledge reviewing, Ground School Test, and Flight Simulator Training 2 sections and pass Flight Simulator Training check ride 1 section.

5.5 Upon completion of the Flight Simulator Training, but a trainee pilots stop his training on School Flight Training more than 6 months, the trainee pilot shall take shall re-take the entire training programs.

5.6 Upon completion of the School Flight Training, but a trainee pilots stop his training on Route Training more than 1 month, but not more than 3 months, the trainee pilot shall take the refreshment courses on Aircraft System Knowledge reviewing, Ground School Test, and Flight Simulator Training 1 sections and pass Flight Simulator Training check ride 1 section.

5.7 Upon completion of the School Flight Training, but a trainee pilots stop his training on Route Training more than 3 months, but not more than 6 months, the trainee pilot shall take the refreshment courses on Aircraft System Knowledge reviewing, Ground School Test, and Flight Simulator Training 2 sections and pass Flight Simulator Training check ride 1 section.

5.8 Upon completion of the School Flight Training, but a trainee pilots stop his training on Route Training more than 1 year, the trainee pilot shall re-take the entire training programs.

5.9 Upon endorsement the Type Rating in the Pilot License, but a trainee pilots stop his flight operations more than 3 months, but not more than 6 months, the trainee pilot shall re-take the Flight Simulator Training 1 section and pass Flight Simulator Training check ride 1 section.

5.10 Upon endorsement the Type Rating in the Pilot License, but a trainee pilots stop his flight operations more than 6 months, but not more than 1 year, the trainee pilot shall take the Requalification Training.

5.11 Upon endorsement the Type Rating in the Pilot License, but a trainee pilots stop the Route Training more than 1 year, the trainee pilot shall re-take the entire training programs.

5.12 The Recurrent Training Program shall be trained every 6 months, since the date of endorsement the Type Rating in the Pilot License, and the trainee pilot shall take the System Paper Test or Knowledge Oral Test.

5.13 The score of Ground School Test in Section 1.1, 1.2 and 1.3 shall not less than 70 percent and in Section 1.4 shall not less than 90 percent.

5.14 The training in Section 1.4 shall be re-trained annually.

5.15 The classroom of Ground School Training shall have the following equipments: White Board, Lesson Plan, Computer Software Program, Projector, Audiovisual Presentations, Aircraft Operating Manual Flight, Operations Manual and Handouts, etc. The capacity of one class room shall not exceed 25 trainee pilots.

5.16 The Ground/Simulator/ Flight Instructor, Check Airman or Designated Check Pilot who received duty in training or examining shall has qualification and shall commence duty as prescribed in the promulgation of Flight Standards Bureau, Department of Civil Aviation.

5.17 The Pilot Training Manual shall last 2 years since the date of approval and, if the Flight Standards Bureau, Department of Civil Aviation considers that the holder of Air Operator Certificate complies with its approved Pilot Training Manual, the Pilot Training Manual shall be approved permanently. In the case of any approved Pilot Training Manual before the date of enforcement of this Announce, it shall be revised in according with this Announce within 2 years.

Announced as of the 2nd July B.E. 2550 (2007)

(Signed) Vutichai Singhamany

(Mr. Vutichai Singhamany)

Director of Flight Standard Bureau

APPENDIX 13

FCTM of One Two Go Airlines: CRM

4.11.6 LINE CHECK (INCLUDING ILC)

The period of validity of a Line Check (including an ILC) shall be 12 calendar months in addition to the remainder of the month of issue.

If revalidated within the last 3 months of validity of a previous Line Check (including ILC), the new period of validity shall until 12 calendar months from the expiry date of the previous Line Check (including ILC).

4.11.7 LVP CHECK

The period of validity of a LVP Check shall be 6 calendar months in addition to the remainder of the months of issue.

If revalidated within the last 3 months of validity of a previous LVP Check, the new period of validity shall extend until 12 calendar months from the expiry date of the previous LVP Check.

LVP Checks will normally be included within OPC's if applicable.

4.11.8 SEP-ANNUAL CHECK

Refer to SEP Instructor Manual.

4.11.9 SEP- TRIENNIAL CHECK

Refer to SEP Instructor Manual.

4.11.10 CRM RECURRENT TRAINING

Flight crewmembers should complete the major elements of the full length initial CRM Course over a three- year recurrent training cycle.

The Company's interpretation of this requirement will be to conduct CRM Recurrent Training every 12 calendar months.

The period of validity of a CRM Recurrent Training shall therefore be 12 calendar months in addition to remainder the month of issue.

If revalidated within the last 3 months of validity of previous CRM, the new period of validity shall extend until 12 calendar months from the expiry date of the previous CRM Recurrent Training.

APPENDIX 14

FOM of One Two Go Airlines: Flight Time Limitation

If a crewmembers discovers a duty period in the roster which does not comply with the DCA approved flight time and flight duty period limitations, reports the error immediately to Crew Scheduling, Dispatch, or Director Flight Operations for rectification.

3.3 ROSTERING SCHEME

3.3.1 Flight Time and Flight Duty Period Limitation

Crew Composition			Flight	Duty	Landing	7 days	Calendar days	Calendar years
Standard Crew	Within 24 Consecutive Hours	Domestic Route	8 hrs.	14 hrs.	6 Landing for any aircraft type (Not including technical landings)	30 hrs.	110 hrs.	1000 hrs.
		International Route	10 hrs.	15 hrs.		36 hrs.		
Augmented Crew 1. Standard Crew + 1 Additional 2. Standard Crew + 2 Additional			12 hrs. 15 hrs	15 hrs. 20 hrs				

Flight time and flight duty period limitation table

When calculating the flight /duty time, include 1 hour 30 minutes reporting time plus 30 minutes post flight duties. When positioning or deadheading on company flight or any other air carrier, reporting time will be 1 hour prior to departure time

The 15 hours flight time and 20 hours flight duty time for augmented crews are only applicable on long haul flights where crew rest fascilities are available. They are not to be used for short sectors.

NOTE :Duty period may by adjusted for augmented crew as indicated on the flight time duty period limitation table. There is no extension of duty period for abnormal operations.

3.3.2 Minimum rest period

Flight duty period	Minimum rest period
Not exceed 8 hours	8 hours
Exceeding 8 hours but not exceeding 10 hours	10 hours
" 10 ----- " ----- 12 "	12 hours
" 12 ----- " ----- 14 "	14 hours
" 14 ----- " ----- 16 "	16 hours
" 16 ----- " ----- 18 "	18 hours
" 18 ----- " ----- 20 "	20 hours
" 20 ----- " ----- 22 "	26 hours
" 22 ----- " ----- 24 "	32 hours

Minimum rest period table

3.3.3 Applicability

The provisions of this section set limits on the allowable duty hours and minimum periods of rest for flight crew employed by One Two Go Airlines.

3.3.4 Mixed Duties

When a crew member is required to report for duty in advance of the stipulated report time for a scheduled flight to carry out a task at the request of the company, then the time spent on that task shall be part of the subsequent FDP.

3.3.5 Mixed Simulator and Aircraft Flying

When a crew member flies in the simulator either on a check or training flight, or as a Training Captain or Instructor, and then within the same duty period flies as a crew member on a public transport flight, all the time spent in the simulator is counted in full towards the subsequent FDP. Simulator flying does not count as a sector, but the FDP allowable is calculated from the report time of the simulator details.

APPENDIX 15

FOM of Orient Thai Airlines: Flight Time Limitation

C. In accordance with the provisions herein, it is the responsibility of each flight crew member to notify that the Company of all flying he has undertaken within the previous 28 days, other than flying in an aircraft not exceeding 1600 Kgs minimum weight and not flying for the purpose of public transport or aerial work.

D. Individual crew members should make the best use of their rest periods in order to prevent cumulative sleep deficits.

3.3.9 REVIEW OF OPERATORS' SCHEME

The operators' scheme can be reviewed at any time at the insistence of any of the parties ie. DOA, Orient Thai Airlines. Any changes will be done with the concurrence of all parties concerned.

3.3.10 FLIGHT TIME AND FLIGHT DUTY PERIOD LIMITATION.

Crew Composition			Flight Time	Duty Time	Landing frequency	7 days Consecutive	Calendar Month	Calendar Year
1. 1 Captain + 1 Co-Pilot OR 2. 1 Captain + 1 Co-Pilot+ 1 FE/Co-Pilot	Within 24 Consecutive Hours	Domestic Route	8 hrs.	14 hrs.		30 hrs.	110 hrs.	1000 hrs.
		Internatio-nal Route	10 hrs.	15 hrs.		36 hrs.		
1. 1 Captain + 2 Co-Pilot + 1 FE / Co-Pilot OR 2. 2 Captain + 1 Co-Pilot + 1 FE/ Co-Pilot			15 hrs.	20 hrs.				

Flight time and flight duty period limitation table

When calculating the flight duty time, include 1 hour 30 minutes reporting time plus 30 minutes post flight duties. When positioning or deadhearding on Orient Thai Airlines or any other air carrier, reporting time will be 1 hour prior to departure time

The 15 hours flight time and 20 hours flight duty time for augmented crews are only applicable on long haul flights where crew rest fascilities are available. They are not to be used for short sectors.

Minimum rest period

Flight duty period	Minimum rest period
Not exceed 8 hours	8 hours
Exceeding 8 hours but not exceeding 10 hours	10 hours
" 10 ----- " ----- 12 "	12 hours
" 12 ----- " ----- 14 "	14 hours
" 14 ----- " ----- 16 "	16 hours
" 16 ----- " ----- 18 "	18 hours
" 18 ----- " ----- 20 "	20 hours
" 20 ----- " ----- 22 "	26 hours
" 22 ----- " ----- 24 "	32 hours

Minimum rest period table

NOTE : Duty period may by adjusted for augmented crew as indicated on the flight time duty period limitation table. There is no extension of duty period for abnormal operations.

3.4 DUTY TIME LIMITATIONS FOR DISPATCHERS

A. The Company will provide enough dispatchers to ensure proper operational control of each flight.

B. The Company will schedule Dispatchers in a manner that permits the individual to become thoroughly familiar with existing and anticipated weather conditions along the routes to be used before that individual dispatches or assumes flight watch responsibilities for any aircraft.

C. Except in cases of emergency or circumstances beyond the Company's control:

1. The company will not schedule Dispatchers for more than 10 consecutive hours of duty.
2. If a Dispatcher is scheduled for more than 10 hours of duty in any 24 consecutive hours, the individual will be scheduled for at least 8 hours of rest at or before the end of 10 hours of duty.
3. Each dispatcher will be scheduled to be off duty for 24 hours at least once in any consecutive 7 day period.

D. An On-Duty Dispatcher will remain on duty until relieved by another qualified Dispatcher, unless all aircraft for which he or she is responsible have landed and have been closed out, at which time the Dispatcher may be taken off duty.

APPENDIX 16

Rule and Practice Guidelines on Flight Time and Flight Duty Period Limitations Flight Safety Division, Department of Aviation

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By virtue of the Civil Aviation Board Rule No. 4, Section 5 and the Standards set forth in the International Civil Aviation Organization Annex 6 Part 1, Chapter 9, Article 9.6 concerning Flight Time and Flight Duty Period Limitations, the Flight Standards Bureau, Department of Civil Aviation, hereby issues the Flight Time and Flight Duty Period Limitations of Crew Member, as follows:

1. Definitions

1.1 "crew member" means a person assigned by an operator to duty on an aircraft during flight time.

1.2 "flight crew member" means a licensed crew member charged with duties essential to the operation of an aircraft during flight time.

1.3 "cabin attendant" means a crew member who performs, in the interest of safety of passengers, duties assigned by the operator or the pilot-in-command of the aircraft, but who shall not act as a flight crew member.

1.4 "flight time" means the total time from the moment an aircraft first moves under its own power for the purpose of taking off until the moment it comes to rest at the end of the flight.

1.5 "flight duty period" means the total time from the moment a crew member commences duty, immediately subsequent to a rest period and prior to making a flight or a series of flights, to the moment the flight crew member is relieved of all duties, having completed such flight or series of flights, and shall include:

1.5.1 The time spent by crew member in training and/or test of professional fitness on the ground and/or on the synthetic training equipment as well as on other activities scheduled by the operator in relation to his specific function.

1.5.2 The time spent by crew member in being transported by air for the operator's convenience, in order to take up duties assigned to them or to return from such duties.

1.5.3 The duty period, whether it includes one or several consecutive legs of flight shall be considered to commence at least one hour before the first take off and terminate at least half an hour after the last landing.

1.6 "technical landing" means the out scheduled landing, in case of emergency situation or which endangers the safety of the aircraft or persons.

1.7 "rest period" means any period on the ground during which a crew member is relieved of all duties by the operator.

2. Flight time and flight duty period limitation.

<table>
<tr><th colspan="3">Crew Composition</th><th>Flight Time</th><th>Duty Time</th><th>Landing Frequency</th><th>7 days Consecutive</th><th>Calendar Month</th><th>Calendar Year</th></tr>
<tr><td rowspan="2">1.1Captain+
1Co-Pilot
OR
2.1 Captain +
1 Co-Pilot +
1FE/Co-Pilot</td><td rowspan="2">Within 24
Consecutive
Hours</td><td>Domestic Route</td><td>8 hrs.</td><td>14 hrs.</td><td rowspan="3">6 landing for any aircraft types (not include technical landing)</td><td>30 hrs.</td><td rowspan="3">110 hrs.</td><td rowspan="3">1000 hrs.</td></tr>
<tr><td>International Route</td><td>10 hrs.</td><td>15 hrs.</td><td rowspan="2">36 hrs.</td></tr>
<tr><td colspan="3">1. 1 Captain + 2 Co-Pilot + 1 FE/Co-Pilot
OR
2. 2 Captain + 1 Co-Pilot + 1 FE/Co-Pilot</td><td>15 hrs.</td><td>20 hrs.</td></tr>
</table>

Flight time and flight duty period limitation table

3. Minimum rest period

Flight duty period	Minimum rest period
Not exceed 8 hours	8 hours
Exceeding 8 hours but not exceeding 10 hours	10 hours
" 10 " 12 "	12 hours
" 12 " 14 "	14 hours
" 14 " 16 "	16 hours
" 16 " 18 "	18 hours
" 18 " 20 "	20 hours
" 20 " 22 "	26 hours
" 22 " 24 "	32 hours

Minimum rest period table

Announced as of the 7th March B.E. 2539 (1996)

(Signed) Vichai Prateepprecha

(Mr. Vichai Prateepprecha)

Director of Flight Standard Bureau

APPENDIX 17

Department of Civil Aviation Announcement on Flight Time and Flight Duty Period Limitations

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By virtue of the holder of Air Operator Certificate, operating schedule and non-schedule, domestic and international flight to comply with the Civil Aviation Board Rule No. 4, Section 5 and the Standards set forth in the International Civil Aviation Organization Annex 6 Part 1, Chapter 9, Article 9.6 concerning Flight Time and Flight Duty Period Limitations, the Department of Civil Aviation, hereby issues the Flight Time and Flight Duty Period Limitations of Crew Member, as follows:

1. Definitions

1.1 "crew member" means a person assigned by an operator to duty on an aircraft during flight time, namely, flight crew member, flight engineer, and cabin crew member.

1.2 "flight crew member" means a licensed crew member charged with duties essential to the operation of an aircraft during flight time.

1.3 "cabin crew member" means a crew member who performs, in the interest of safety of passengers, duties assigned by the operator or the pilot-in-command of that flight, but who shall not act as a flight crew member.

1.4 "flight time or block time" means the total time from the moment an aircraft first moves from the parking bay to destination airport for the purpose of taking off until the moment it comes to rest at the end of the flight.

1.5 "flight duty period (FDP)" means the total time from the moment a crew member commences duty, immediately subsequent to a rest period and duty prior to making a flight until the moment the flight crew member is relieved of all duties having completed such flight or a series of flights, and shall include:

1.5.1 The time spent by crew member in test of professional fitness and training on the synthetic training equipment.

1.5.2 The time spent by crew member in being transported by air in order to take up duties assigned to them or to return from such duties.

1.5.3 The duty period, whether it includes one or several consecutive legs of flight shall be considered to commence at least one hour before the first take off and terminate at least half an hour after the last landing.

1.6 "duty period" means a consecutive period which start when a crew member commences duty or being a passenger as required by a holder of the Air Operator Certificate, including a period of commences flight operations, positioning, ground operations, and airport standby, whereas stand by at home or hotel are not counted as duty period.

1.7 "rest period" means the time from the moment a crew member is free from duty assigned by a holder of the Air Operator Certificate. In the flight operations, rest period starts at 30 minutes after an on-block (check-in) period. In the positioning, a rest period stars after on-block. In both flight operations and positioning, a rest period ends 1 hour before the next scheduled departure time or the latest notice of estimate time of departure.

1.8 "standby" means a defined period of time during which a crew member is required by the holder of Air Operator Certificate to be available to receive an assignment for duty.

1.9 "positioning" means the transferring of crew member from place to place, at the behest of the holder of Air Operator Certificate to commence as assigned, excluding traveling time from the rest place to a designated reporting place.

1.10 "local night" means a period between 10.00 p.m. and 6.00 a.m. local time.

1.11 "augmented crew" means an augmented crew which more than the minimum number of flight crew members required for operations in which an augmented crew can commence duty instead of the flight crew member of that flight.

1.12 "origin" means a location located in the same country in which a crew member stay over 120 consecutive hours.

1.13 "rest facility" means

1.13.1 Adequate rest facility as follows:

1.13.1.1 One business class reclining seat blocked off for one resting crew, preferably separated and screened from the galleys and the passenger, or when a business class seat is not sufficiently available, shall use,

1.13.1.2 One economy class reclining seat, preferably separated and screened from the galleys and the passenger.

1.13.2 Suitable rest facility as follow:

1.13.2.1 A bed or a bunk separated and screened from the cockpit, galleys and the passenger, or

1.13.2.2 A reclining seat, preferably separated and screened from the galleys and the passengers, or

1.13.2.3 Any applicable horizontal rest facility as such.

1.14 "student pilot" means a person who currently under control, directs, and administer of an instructor pilot.

1.15 "instructor pilot" means a person who instructs a student pilot in a private pilot training course, a commercial pilot training course, an instrument rating training course, and a multi-engine training course.

2. Flight Time and Flight Duty Period Limitation of Crew Member

2.1 Within 24 consecutive hours, the flight duty period of crew member shall not exceed as follows;

2.1.1 The flight duty period for airplane with single pilot operation shall be as follow;

Flight Duty Period (FDP) for single pilot operations					
Local time of departure	Sectors				
	Up to 4	5	6	7	8 or more
06:00 – 07:59	10	9:15	8:30	8	8
09:00 – 14:59	11	11:15	9:30	8:45	8
15:00 – 21:59	10	9:15	8:30	8	8
22:00 – 05:59	9	8:15	8	8	8

(In a case of an instructor pilot, the flight duty period shall not exceed 8 hours and a student pilot shall not exceed 5 hours)

2.1.2 The flight duty period for airplane with two pilots or two pilots and one flight engineer shall be as follow;

Flight Duty Period (FDP) for multi pilot and flight engineer operations								
Local time of departure	Sectors							
	1	2	3	4	5	6	7	8 or more
06:00 – 07:59	13	12:59	11:45	11:15	11:45	9:45	9	9
08:00 – 14:59	14	13:15	12:30	11:45	11:15	10:45	9:30	9
15:00 – 21:59	13	12:15	11:30	10:45	10	9:15	9	9
22:00 – 05:59	11	10:15	9:30	9	9	9	9	9

2.1.3 The flight duty period for helicopter operations shall be as follow;

Helicopter Operations				
Local time of departure	Single Pilot		Two Pilot	
	Block Time	FDP	Block Time	FDP
06:00 – 06:59	5	7	6:30	9
07:00 – 13:59	5:30	8	7	10
14:00 – 21:59	5	7	6:30	9
22:00 – 05:59	4	6:30	5:30	8

(In a case of an instructor pilot, the flight duty period shall not exceed 8 hours and a student pilot shall not exceed 5 hours)

2.2 The local night operation which flight time exceeds three hours shall have at least one augmented crew.

2.3 If the flight duty period is in or partially in 00:00 – 05.59 a.m. of local time at origin and the flight time in each series of flight less than three hours, the flight time in 2.1.1, 2.1.2 and 2.1.3 shall be reduced to half.

2.4 Within seven consecutive days, the flight duty period of a crew member shall not exceed 55 hours, the flight duty period of an instructor pilot shall not exceed 40 hours, and the flight duty period of a student pilot shall not exceed 30 hours.

2.5 Within 28 consecutive days, the flight duty period of a crew member shall not exceed 160 hours, with flight time not exceeding 110 hours. The flight duty period of an instructor pilot shall not exceed 120 hours, with flight time not exceeding 90 hours and the flight duty period of a student pilot shall not exceed 90 hours, with flight time not exceeding 70 hours.

2.6 Within 12 consecutive months, a crew member shall not have flight time exceeding 1,000 hours and an instructor pilot shall not have flight time exceeding 900 hours.

2.7 In each flight, the calculation of flight time limited in Section 2.5 and 2.6 for a flight crew member shall be as follows;

- 80 percent of flight time when the flight has one augmented crew.

- 75 percent of flight time when the flight has two augmented crew.

- 70 percent of flight time when the flight has three augmented crew.

The calculation of flight time for a cabin crew member shall be calculated as follows;

- 80 percent of flight time for a flight having flight time exceeding 8 hours.

- 75 percent of flight time for a flight having flight time exceeding 10 hours.

- 70 percent of flight time for a flight having flight time exceeding 12 hours.

3. Rest Period of a Crew Member

When a crew member is relieved of all duties;

3.1 If the flight duty period does not exceed 8 hours, a crew member shall have a rest period at least 8 hours.

3.2 If the flight duty period exceeded 8 hours, but not exceeded 12 hours, a crew member shall have completed a rest period of 12 hours, and a rest period shall exceed 4 hours if it is in or partially in 00:00 -06:00 a.m., before back to commence duty.

3.3 If the flight duty period exceeded 12 hours, but not exceeding 16 hours, a crew member shall have a rest period of 24 hours before back to commence duty.

3.4 If the flight duty period exceeded 16 hours, but not exceeding 20 hours, a crew member shall have a rest period of 48 hours before back to commence duty.

3.5 If the performing of flight duty followed 2.2 and/or 2.3, without considering the time of flight duty period, a crew member shall have a rest period of 24 hours before back to commence duty.

4. The maximum flight duty period could be extended when,

4.1 An augmented crew shall have a qualification and license at an equivalent level of augmentation flight operations, by indicating in a flight operation manual of the holder of Air Operator Certificate.

4.2 An aircraft with 2-man crew, a flight crew member could extend the maximum flight duty period, as indicated in 2.1.2, as follow:

4.2.1 A flight with 1 augmented crew, the extended maximum flight duty period is 14 hours, with the provision of an adequate rest facility, or 16 hours with a provision of a suitable rest facility.

4.2.2 An aircraft with 2 augmented crew, the extended maximum flight duty period is 16 hours with the provision of an adequate rest facility, or 20 hours with a provision of a suitable rest facility.

4.3 An aircraft with 3-man crew and 1 augmented crew, the extended maximum flight duty period is equivalent to as indicated in 4.2.1, except an aircraft in which a flight engineer could operate as a Cruise pilot, the extended maximum flight duty period is equivalent to as indicated in 4.2.2.

4.4 Cabin Crew Member.

Hours of Rest for Each Cabin Crew Member	Max. hours of FDPs after Extension	
	With Adequate Rest Facility	With Suitable Rest Facility
00:00 – 01:59	No extension	No extension
02:00 – 02:59	Up to 14:00	Up to 16:00
03:00 – 03:59	Up to 16:00	Up to 18:00
04:00 up	Up to 18:00	Up to 20:00

Announced as of the 26th May B.E. 2550 (2007)

(Signed) Chaisak Angsuwan

(Mr. Chaisak Angsuwan)

Director-General of the Department of Civil Aviation

APPENDIX 18

Go Around Procedure

MD-80
FLIGHT CREW OPERATING MANUAL

GO AROUND FROM FLIGHT DIRECTOR APPROACH

At decision height,

TO/GA Button . . . . . PUSH

PF manually advance throttles, push TO/GA button and hold for at least 1 second.

NOTES

When pressure on throttles is released, autothrottle system will refine go-around thrust setting.

The thrust rating computer automatically changes to go-around (GA) if not previously selected.

Autothrottle mode changes from SPD (plus selected value) to EPR GA. Arm mode goes blank. Roll and pitch modes change from LOC TRK and G/S TRK to GO RND.

Go-Around Maneuver . . . . . PERFORM

PF maneuver airplane to satisfy roll and pitch commands.

NOTES

Flight director command bars command fly up (maximum 20° airplane nose up).

Flight director command bars command go-around reference speed, wings level and maintains existing heading when roll attitude is less than 3°.

Fast/Slow indicator on each PFD will provide guidance to go-around speed (which equals approximately 1.3 V_S +5 knots for landing flaps).

The speed reference will be the speed at go-around initiation (TO/GA switch depressed) but not less than 1.3 V_S +5 KIAS or greater than 1.3 V_S + 25 KIAS of the landing flap configuration with autothrottles engaged or disengaged.

(Continued)

GO AROUND FROM FLIGHT DIRECTOR APPROACH (Continued)

If immediate climbing turn is required,

HDG Select Knob..... PULL

Momentarily pull out HDG select knob to engage heading select mode. Verify bank angle limit is set at 15°. Rotate HDG select knob until desired heading is displayed in HDG readout. FMAs will display EPR GA / / HDG SEL / GO RND.

For all contingencies,

ALT Set Knob..... PULL

Momentarily pull out on ALT set knob to arm FGS for missed approach altitude capture. Arm mode will display ALT.

Pitch Control Wheel..... ROTATE

Rotate pitch control wheel as required to accelerate for flap/slat retraction. Pitch mode changes to VERT SPD.

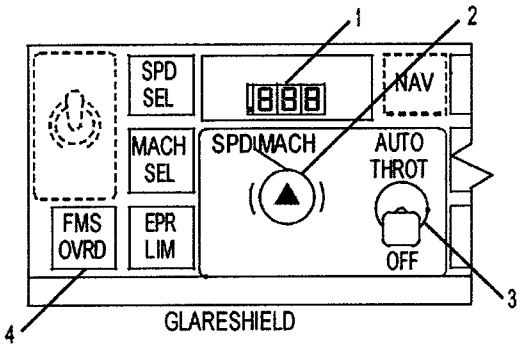
CL Mode Button..... PUSH

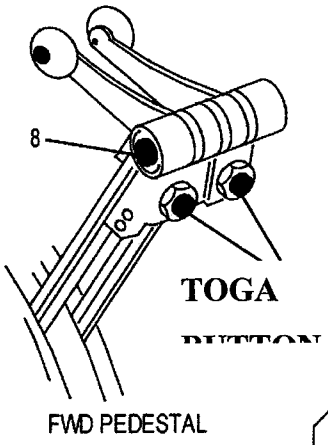
Push CL mode button. EPR limit for climb thrust will be displayed in EPR LIM readout and EPR reference bug on EPR gage will be automatically positioned. Autothrottle mode changes from EPR GA to EPR CL.

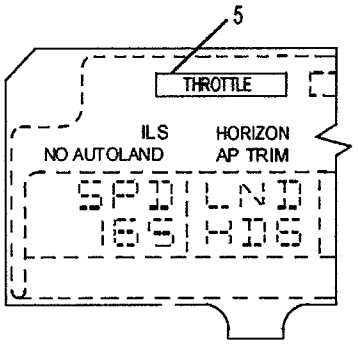
SPD/MACH Readout..... SET

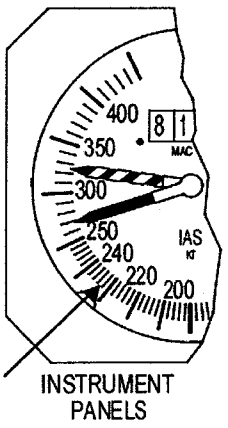
Rotate SPD/MACH select knob until desired speed appears in SPD/MACH readout.

FGCP - Autothrottle Controls









JB1-3-0898A

- FMA's reflect proper DFGC programming, normally SPDxxx/---/HDG SEL (HLD)/ALT HLD.
- SPD SEL as desired.

NOTE

Throughout the approach as flap or gear configurations change, slowly reduce SPD SEL to avoid throttle surges. Do not reduce speed below min maneuver / final approach speed.

When on an intercept heading and cleared for the approach, push ILS buttons and confirm FMA annunciates IILS.
When Localizer captures occurs:

- Confirm FMA annunciates LOC CAP and then LOC TRK.
- Set 15° on bank selector.
- Set Missed Approach heading in heading select.

NOTE

Autopilot will not capture glide slope until LOC CAP occurs.

During localizer capture, the bank limiter is overridden and wind correction begins as LOCK TRK is annunciated

At GLIDESLOPE ALIVE: GEARDOWN

At one dot: If landing flaps 40, select FLAPS 28

After glide slope capture and descent has begun:

- Confirm FMA annunciates G/S CAP then G/S TRK.
- Select landing flaps.
- Select final approach speed on SPD SEL.
- Set missed approach altitude in altitude alert. (Altitude alert is canceled upon G/S CAP)

AUTO G/A will annunciate on FMA when radio altimeter indicates 1500 ft and flaps/slats are in landing configuration.

Disconnect autopilot no lower than DA/MDA

FMA Will change to F/D G/A.

ILS MANUAL – FLIGHT DIRECTOR ONLY

Initial setup is the same except the AP is off. If auto-throttles are used, throttle FMA displays will be the same as autopilot approach. ILS mode will be selected and displayed on the arm FMA's. When established on the approach, the roll and pitch FMA'S will display LOC TRK and G/S TRK to touchdown. The arm FMA's will display F/D G/A if logic is satisfied. If unsatisfactory, MAN GA will be displayed. If unsatisfactory, MAN GA will be displayed.

ILS AUTOLAND APPROACH

Use of AUTOLAND is currently not authorized. Do not use AUTOLAND function at any time.

AUTOPILOT / FLIGHT DIRECTOR MISSED APPROACH / GO AROUND MODE

A missed approach can be made with the autopilot. If not engaged, use flight director. To make a go around under IFR conditions, or where performance is limiting, push the TO/GA button and manually advance the throttles the throttles to go-around EPR limit. Although the auto throttles are engaged manually advance them as a safety precaution. The auto throttle FMA's will display GO RND.

NOTE

If a go-around is required in VMC and performance is not limiting, disconnect the auto throttles and advance the power manually to CL. Avoid using GA thrust unless required.

Move the flap handle up to the go-around gate, flaps 15 (11 for high altitude airports).

As the autopilot initiates the go-around maneuver, check that the airplane pitch increases to center the flight director command bars.

When a positive climb is observed, the pilot not flying calls POSITIVE RATE, the pilot flying verifies a positive climb and calls GEAR UP. The pilot not flying then repeats GEAR UP and moves the gear handle to the gear UP position. Disarm the spoiler handle when time permits.

After gear retraction, set Speed Command bug to 200KTS or slightly above clean minimum maneuver speed as required or ATS will revert to the higher of Alpha Spd or LAST speed command bug setting upon altitude capture.

Continue with missed approach using normal departure procedures.

Confirm missed approach altitude in altitude pre-select window and check that ALT is displayed in the FMA's.

The autopilot / flight director will maintain the heading being flown when the TO/GA button is pushed if wings are level. If you are in a bank at that time, the autopilot/flight director will roll the airplane to a wings level altitude and then maintain that heading. Both flight director systems will provide autopilot monitoring during the go-around, in the pitch axis will command V2 speed.

Minimum speed during go-around:
Flaps 28 V_{REF} + 5 knots

Flaps 40 V_{REF} + 10 knots

If the autopilot is engaged the rudder system will remain in the parallel mode to provide engine out compensation if required. When any other pitch or roll mode is selected, parallel rudder will fade out.

NOTE

If an engine is lost during an automatic go-around, the autopilot will remain engaged. Upon selection of the basic modes in this situation, the flight crew should be aware that the autopilot may disengage due to loss of parallel rudder inputs and miss trim forces resulting from the engine loss. Once the aircraft is re-trimmed, the autopilot can be engaged normally.

AFTER LANDING: EXPANDED PROCEDURES

SPOILERS	RETRACTED	F
FLAPS / SLATS	15° / TO	F
RADAR	STBY	F
LANDING & EXT LIGHTS	SET	F
ICE PROTECTION	OFF	F
IGNITION	OFF	F
APU / AIR SWITCH	START / COLDER	F
PNEUMATIC X FEED	SET	F
AFTER LANDING CHECKLIST	COMPLETED	F

When landing roll is completed or during taxi the Captain will request after landing check list:

Captain will request 'Flaps Up and Slats retract' when closing to the gate.

[redacted]

Push down on the spoiler handle and observe that it moves forward to the DISARMED position.

[redacted]

After landing flaps to 15 degrees to prevent FOD from the main wheels to the engines.
When approaching to the Gate, move the Flap / Slat handle to UP/RET. Observe flap indicators move to 0° and the slat LAND, AUTO, DISAG and T/O lights are off.

NOTE

A feedback force will be felt on the Flap / Slat handle when it is moved to UP / RET before the flaps are fully retracted. When the flaps reach the retracted position, a metallic 'click' sound may be heard. Slats remain extended until flaps are up.

[redacted]

[redacted]

During the hours of daylight operation all exterior lights should be turned OFF and retracted except for Anti-Collision and Position lights.

During night operation lights will be set at the discretion of the Captain for existing conditions.

[redacted]

[redacted]

[redacted]

If the start switch was not placed to ON prior to landing switch to ON now and wait one minute before starting the APU.

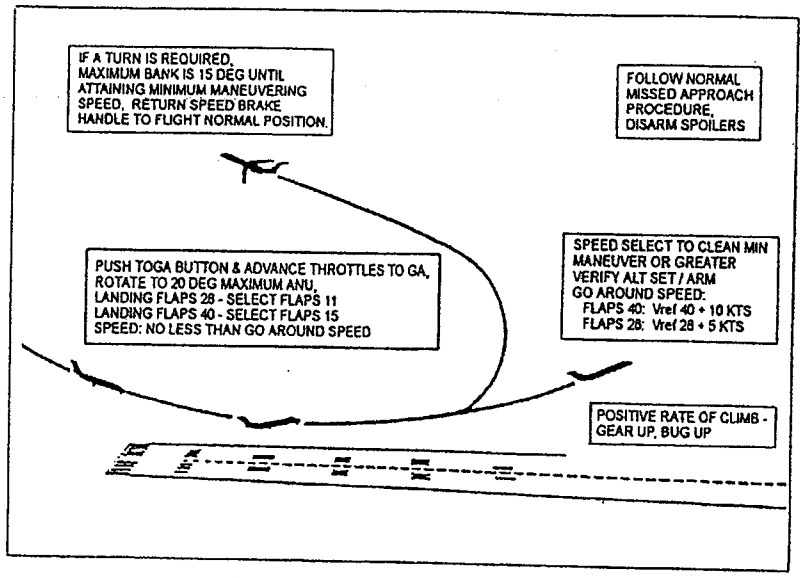
NOTE

After landing, normally do not start the APU if:

Ground electrical power is to be used at the gate.

APU will not be required for air conditioning or heating at the gate.

MISSED APPROACH / REJECTED LANDING



1. AUTOPILOT OFF:

PF pushes TO/GA button, advances power and calls "max power, flaps 15" (flaps 11 if landing Flaps 28), PNF will repeat flaps 15 (11) and selects flaps 15 (11), verifies throttle FMA reads EPR GA and roll and pitch FMA's read GO RND. Rotate to arrest sink while advancing the throttles to go-around thrust setting. PNF confirms that thrust is set for go around.
On a rejected landing, touchdown may occur but is not desired. Rotate to 20° maximum while climbing at no less than go around speed. When a positive rate climb is assured, the PNF calls "positive rate", the PF commands "gear up, bug up". The PNF retracts the gear on command and sets 200, 250 or clean maneuvering speed, as appropriate, in speed select window. Continue with normal missed approach procedure. Disarm spoilers when time permits.

2. AUTOPILOT ON / AUTOTHROTTLE ON

PF pushes TO/GA button, advances throttles and calls "max power, flaps 15" (flaps 11 if landing Flaps 28). PNF will repeat "flaps 15 (11)" and selects flaps 15 (11), verifies throttle FMA reads EPR GA, roll and pitch FMA's read GO RND, and throttles are set for go around. When a positive rate of climb is assured, the PNF calls "positive rate", the PF commands "gear up, bug up". The PNF retracts the gear on command and sets 200, 250 or clean maneuvering speed, as appropriate, in speed select window. Continue with normal missed approach procedure. Disarm spoilers when time permits.

APPENDIX 19

Transfer of Control Procedure

4.2.38.1 MAINTAINING OUTSIDE VIGILANCE

At least one Crew Member should remain vigilance at all times. For collision avoidance purposes Crew Member should scan the horizon for other traffic, especially in a turn or when the other Crew Member is programing the INS, GPS or FMS.

4.2.38.2 TRANSFER OF CONTROL

When the Pilot Flying is required to focus his attention on another task other than flying the aircraft. He will relinquish control of the flight control by saying "You have control". The other pilot will respond "I have control".

4.2.38.3 KEEPING BOTH PILOT "IN THE LOOP"

After a Crew Member returns to the Flgiht Deck after being absent for any reason the other pilot should brief the other pilot on what changes have taken place in the flight deck during his absent ie., frequency change, direct to.

4.2.38.4 CREW MEAL POLICY

Only one pilot on flight deck duty may eat at a time. The Captain and First Officer should not eat the same crew meal if there is a choice. When meals are provided from the same vendor and are of the same type, the pilots may not eat within 30 minutes of each other.

Flight Attendants are allowed to eat after all passenger meal and beverage service is completed. Flight Attendant must eat away from passenger's view.

APPENDIX 20

Stabilized Approach Control

1.3.19 UNSCHEDULED LANDING/DIVERSION OF AIRCRAFT

A. In case of an unscheduled landing and grounding of an aircraft, all air crew shall remain at the airport until Engineering decides the mechanical status of the aircraft. The Commander and Crew shall render all assistance that may be required by the ground staff in such circumstances.

B. The Commander shall maintain a close liaison with the Maintenance Engineer regarding serviceability/rectification of the grounded aircraft. All efforts should be made to bring the aircraft, after rectification, home or complete the trip within the provisions of the flight and duty time limitations as soon as possible.

1.3.20 USE OF STOP WATCH

The procedure for the use of the Stop Watch for engine starts and take-off will be as laid down in the respective AOM. Pilots are encouraged to use the Stop Watch on all take-offs to ensure that timing is not overlooked on an engine on take-off, or in a noise abatement/special procedure.

1.3.21 STABILISED APPROACH

A Stabilized Approach consists of accomplishing the following no later than 1000 ft AGL on a Precision Approach and no later than 500 ft AGL on a visual approach. In case of Non-Precision/Circling Approach the aircraft should be stabilised on establishing the "Required Visual Segment" and leaving MDA.

1. Aircraft in Landing configuration:

   a. On profile (ILS glideslope, published non-precision profile, or when a glidepath (approx.3 degrees) has been established visually and conditions have been met to allow descent below the DA (DH) or MDA (MDH)

   b. Speed up to 10 knots of target speed/ V_{ref}: -0, +10

   c. Rate of descent not in excess of 1000 FPM (up to 1200 fpm authorised on a precision approach when conditions require) and not less than 400 fpm.

   d. The landing gear must be down and the landing check list must be completed prior to the OM/FAF on an ILS Approach, or the FAF on a Non-Precision Approach, or at the VFR equivalent on a Visual Approach unless otherwise stated in the Aircraft Operating Manual.

e. If the approach becomes destabilised below the limits laid down, an immediate go around must be executed. The execution of go-around for reasons of safety is a prudent maneuver when the outcome of an approach becomes uncertain.

1.3.22 MANDATORY MISSED APPROACH

On all instrument approaches the pilot shall execute an immediate missed approach:

1. If a Navigation Transmitter or flight instrument failure occurs which will affect the ability to safely complete the approach in instrument conditions.
2. When on Cat I ILS approach: either localiser or glide slope show two dots deflection at 500 ft above MDA in IMC; OR if not not stabilized in the proper slot at *500* ft altimeter height on a visual approach.
3. When Captain's and First Officer's primary flight instruments show a significant disagreement in IMC (eg. icing up of pitot tubes).
4. The approach is not stabilised as laid down in para 1.3.21
5. Whenever in doubt of making a safe landing.
6. The aircraft is destabilised during windshear and/or the Pilot is unable to maintain the aircraft within the prescribed flight path on approach.
7. Whenever a GPWS "pull up" warning is triggered in Instrument Meteorological Conditions (IMC).

1.3.23 SUBSEQUENT APPROACHES

After a missed approach only one subsequent approach is permitted. This approach will be flown by the commander of the aircraft and, before starting the approach, should be confident that the second approach has a high probability of success. After two missed approaches it is mandatory to divert.

1.3.18 UNSCHEDULED LANDING/DIVERSION OF AIRCRAFT

A. In case of an unscheduled landing and grounding of an aircraft, all air crew shall remain at the airport until Engineering decides the mechanical status of the aircraft. The Commander and Crew shall render all assistance that may be required by the ground staff in such circumstances.

B. The Commander shall maintain a close liaison with the Airport Manager regarding serviceability/rectification of the grounded aircraft. All efforts should be made to bring the aircraft, after rectification, home or complete the trip within the provisions of the flight and duty time limitations as soon as possible.

1.3.19 USE OF STOP WATCH

The procedure for the use of the Stop Watch for engine starts and take-off will be as laid down in the respective AOM. Pilots are encouraged to use the Stop Watch on all take-offs to ensure that timing is not overlooked on an engine on take-off, or in a noise abatement/special procedure.

1.3.20 STABILISED APPROACH

A Stabilized Approach consists of accomplishing the following no later than 1000 ft AGL on a Precision Approach and no later than 500 ft AGL on a visual approach. In case of Non-Precision/Circling Approach the aircraft should be stabilised on establishing the "Required Visual Segment" and leaving MDA.

1. Aircraft in Landing configuration:

   a. ***On profile (ILS glideslope, published non-precision profile, or when a glidepath (approx.3 degrees) has been established visually and conditions have been met to allow descend below the DA (DH) or MDA (MDH)?????????***

   b. Speed up to 10 knots of target speed/^{V}REF: -0, +10

   c. Rate of descend not in excess of 1000 FPM, (up to 1200 fpm authorised on a precision approach when conditions require), and not less than 400 fpm.

d. The landing gear must be down and the landing check list must be completed prior to the OM/FAF on an ILS Approach, or the FAF on a Non-Precision Approach, or at the VFR equivalent on a Visual Approach unless otherwise stated in the Aircraft Operating Manual.

e. If the approach becomes destabilised below the limits laid down, an immediate go around must be executed. The execution of go-around for reasons of safety is a prudent maneuver when the outcome of an approach becomes uncertain.

1.3.21 MANDATORY MISSED APPROACH

On all instrument approaches the pilot shall execute an immediate missed approach.

1. If a Navigation Transmitter or flight instrument failure occurs which will effect the ability to safety complete the approach in instrument conditions.

2. When on Cat I ILS approach either localiser or glide slope show two dots deflection at 500 ft above MDA in IMC. If not stabilised in the proper slot at ***500*** ft altimeter height on a visual approach.

3. When Captains and First Officers primary flight instruments show a significant disagreement in IMC (eg. icing up of pilot tubes).

4. The approach is not stabilised as laid down in para 1.3.20.

5. Whenever in doubt of making a safe landing.

6. The aircraft is destabilised during windsheer and/or the Pilot is unable to maintain the aircraft within the prescribed flight path on approach.

7. Whenever a GPWS "pull up" warning is triggered in Instrument Meteorological Conditions (IMC).

1.3.22 SUBSEQUENT APPROACHES

After a missed approach only one subsequent approach is permitted. This approach will be flown by the commander of the aircraft and, before starting the approach ,should be confident that the second approach has a high probability of success. After two missed approaches it is mandatory to divert.

Maximum wind additive is V_{REF} + 15K on final approach or V_{REF} + 20K in Wind shear

All wind corrections are added to V_{REF}

AUTOTHROTTLES - WIND CORRECTION

With auto throttles engaged set the computed final approach speed in the SPD / MACH readout window. This will also set the Speed Command bug in the airspeed indicator. The auto throttle system will reference to Speed Command bug, no lower than alpha speed.

NOTE

In gusty conditions with flaps greater than 26° the airspeed command reference speed may increase as much as 5 knots above the bug. If new reference speed becomes excessive, reduce bug accordingly.

Manual throttles: The above procedure will apply except that the computed wind corrections will be added to V_{REF} and that speed will be manually maintained. The computed final approach speed should be set on the speed command bug to reference the fast / slow indicator.

STABILIZED FINAL APPROACH

The most important factor in a smooth, safe landing is a stabilized approach. The point on final where an approach should be stabilized varies with the type of approach and weather conditions. (See Operations Manual for definition of Stabilized Approach). Use the following criteria for final configuration and stabilization of the approach:

NOTE

With gear down, approach idle is engaged for the purposes of a stabilized approach, the engines are considered "spooled up" when approach idle is engaged.

IFR APPROACH IN IMC

Final Configuration: The aircraft will have final flaps set and gear down passing the outer marker, except on circling approach where final flaps should be selected when turning on final:

Stabilized Approach: The aircraft will be stabilized on final no later than 1000 ft AGL, except that a circling approach should be stabilized after leaving the MDA. Air speed will be no higher than final approach speed.

IFR OR VFR APPROACH IN VMC

Final Configuration: The aircraft will have final flaps set, gear down and engines spooled up no Lower than 1000 ft AGL.

Stabilized Approach: The aircraft will be stabilized on final no lower than 500 ft AGL with the airspeed stabilized at final approach speed. if not stabilized a go around is recommended.

PITCH CONTROL ON FINAL

As early as possible, establish the glide path so that the aim point on the runway is at approximately 1000 ft from the threshold. A 3 deg glide path is desired. Normally plan on crossing the threshold at 50 ft except where other threshold crossing heights are published or runway is slippery (see Adverse Weather Section).

Normally do not exceed 1000 fpm rate of descent on final approach. Where a higher descent rate is required, do so above the final configuration altitude where possible. In all cases do not exceed 1000 fpm below 1000 ft AGL. If a 1000 fpm rate of descent will not allow a touchdown within the touchdown zone and with adequate runway remaining for a normal rollout, a missed approach should be executed.

Use stabilizer trim throughout the approach to keep elevator forces near zero. Do not trim during the flare as excess nose-up trim could result in unacceptable nose high altitude in case of a rejected landing.

AIRSPEED CONTROL

The airspeed indicators are to be used as the primary speed reference as long as both are in agreement. The slow-fast indicators are used as a backup to monitor the selected approach speed. Final approach/threshold speed (V_{REF} + additives, minimum V_{REF}+ 5) will be maintained until crossing the threshold. Adjust speed so that at initiation of flare, usually about 20 ft, the stabilized speed or, if gusts are present, the bottom of the observed airspeed fluctuations will be no less than V_{REF} and V_{REF} – 2 knots.

NOTE

If strong crosswinds are present, initiate cross control (wing low) early enough so that threshold and flare speed will not be destabilized.

APPENDIX 21

Flight Time records of the Pilot and Co-pilot

Captain : Mr. Arief

10 - 16 September 2007 (week 1)

Local Time

Date	A/C Reg	Flight No	From	Time	To	Time	Flight Time	Flight Duty Period (FDP)	Flight Time 1 Day	Flight Time 7 Days	Flight Time 30 Days	Rest Period Before Next Flight	Minimum Rest Period
16-Sep	HS-OMG	OG266	HKT	12:20	DMK	13:38	01:18			[illegible]	106:01		
	HS-OMG	OG267	DMK	10:30	HKT	11:45	01:15			29:21	104:43		
15-Sep	HS-OMG	OG163	CEI	18:45	DMK	19:53	01:08	08:03	05:08	28:06	103:28	13:07	10:00
	HS-OMG	OG162	DMK	17:00	CEI	18:20	01:20			26:58	102:20		
	HS-OMG	OG260	HKT	15:10	DMK	16:25	01:15			25:38	101:00		
	HS-OMG	OG261	DMK	13:20	HKT	14:45	01:25	(12:20-20:23)		24:23	99:45	(20:23-9:30)	
14-Sep	HS-OMC	OX830P	BKK	11:35	DMK	12:08	00:33	05:43	03:13	22:58	98:20	23:42	08:00
	HS-OMC	OX2307	HKG	8:55	BKK	10:35	02:40	(7:55-12:38)		22:25	97:47	(12:38-12:20)	
13-Sep	HS-OMC	OX2306	BKK	19:00	HKG	23:00	03:00	[illegible]	05:44	19:45	95:07	[illegible]	10:00
	HS-OMC	OX8410	DMK	17:45	BKK	18:10	00:35			16:45	92:07		
	HS-OMC	OG292	URT	15:55	DMK	17:00	01:05			16:10	91:32		
	HS-OMC	OG291	DMK	14:20	URT	15:24	01:04			15:05	90:27		
12-Sep	HS-OMB	OG266	HKT	12:20	DMK	13:35	01:15	08:05	04:55	14:01	89:23	23:15	10:00
	HS-OMB	OG267	DMK	10:30	HKT	11:45	01:15			12:46	88:08		
	HS-OMB	OG161	CEI	8:35	DMK	9:45	01:10			11:31	86:53		
	HS-OMB	OG160	DMK	7:00	CEI	8:15	01:15	(6:00-14:05)		10:21	85:43	(14:05-13:20)	
11-Sep	HS-OMC	OG266	HKT	12:30	DMK	13:40	01:10	08:20	04:48	9:06	84:28	15:50	10:00
	HS-OMC	OG267	DMK	10:37	HKT	11:48	01:11			7:56	83:18		
	HS-OMC	OG161	CEI	8:32	DMK	9:44	01:12			6:45	82:07		
	HS-OMC	OG160	DMK	6:50	CEI	8:05	01:15	(5:50-14:10)		5:33	80:55	(14:10-6:00)	
10-Sep	HS-OMG	OG127	CNX	12:15	DMK	13:15	01:00	08:30	04:18	4:18	79:40	15:50	10:00
	HS-OMG	OG126	DMK	10:20	CNX	11:25	01:05			3:18	78:40		
	HS-OMG	OG250	NST	8:05	DMK	9:10	01:05			2:13	77:35		
	HS-OMG	OG257	DMK	6:15	NST	7:23	01:08	(5:15-13:45)		1:08	76:30	(13:45-5:50)	

The flight having flight time exceeded within 24 hours.

The flight having flight time exceeded within 7 consecutive days.

The flight having flight time exceeded within 30 consecutive days.

Inadequate rest period

Co-Pilot : Mr. Montri

10 - 16 September 2007 (week 1)

Local Time

Date	A/C Reg	Flight No	From	Time	To	Time	Flight Time	Flight Duty Period (FDP)	Flight Time 24 Hours	Flight Time 7 Days	Flight Time 30 Days	Rest Period Before Next Flight	Minimum Rest Period
16-Sep	HS-OMG	OG266	HKT	12:20	DMK	13:38	01:18						
	HS-OMG	OG267	DMK	10:30	HKT	11:45	01:15						
15-Sep	HS-OMD	OX2070	HKT	11:50	BKK	13:20	01:30	07:25	04:37			19:30	08:00
	HS-OMD	OX219	HKG	08:25	HKT	10:32	03:07	(7:25-13:50)		28:46		(13:50-9:30)	
14-Sep	HS-OMD	OX218	HKT	16:40	HKG	21:12	03:22			25:39			
	HS-OMD	OX2071	BKK	14:20	HKT	15:40	01:20		09:29	22:17	109:55		14:00
	HS-OMD	OX2070	HKT	12:00	BKK	13:27	01:27			20:57	108:35		
	HS-OMD	OX219	HKG	08:50	HKT	11:10	03:20			19:30	107:08		
13-Sep	HS-OMD	OX218	HKT	16:40	HKG	21:17	03:37	07:07	04:45	16:10	103:48	10:57	08:00
	HS-OMD	OX2071	BKK	14:40	HKT	15:48	01:08	(13:40-21:47)		12:33	100:11	(21:47-7:50)	
12-Sep	HS-OME	OG256	NST	20:35	DMK	21:40	01:05			11:25	99:03		
	HS-OME	OG255	DMK	19:00	NST	20:07	01:07	07:55	04:20	10:20	97:58	15:30	08:00
	HS-OME	OG252	NST	16:55	DMK	18:00	01:05			9:13	96:51		
	HS-OME	OG253	DMK	15:15	NST	16:18	01:03	(14:15-22:10)		8:08	95:46	(22:10-13:40)	
11-Sep	Not Found												
10-Sep	HS-OMA	OG163	CEI	18:40	DMK	19:47	01:07			7:05	94:43		
	HS-OMA	OG162	DMK	16:57	CEI	18:08	01:11			5:58	93:36		
	HS-OMA	OG260	HKT	15:05	DMK	16:17	01:12	11:27	07:05	4:47	92:25	41:58	12:00
	HS-OMA	OG261	DMK	13:17	HKT	14:30	01:13			3:35	91:13		
	HS-OMA	OG165	CEI	11:28	DMK	12:40	01:12			2:22	90:00	(10 Sep 20:17-	
	HS-OMA	OG166	DMK	09:50	CEI	11:00	01:10	(8:50-20:17)		1:10	88:48	12 Sep 14:15)	

The flight having flight time exceeded within 24 hours.

The flight having flight time exceeded within 7 consecutive days.

The flight having flight time exceeded within 30 consecutive days.

Inadequate rest period

Co-Pilot : Mr. Montri

20 - 26 August 2007 (week 4)

Local Time

Date	A/C Reg.	Flight No.	From	Time	To	Time	Flight Time	Flight Duty Period (FDP)	Flight Time 1 Day	Flight Time 7 Days	Flight Time 30 Days	Rest Period Before Next Flight	Minimum Rest Period
26-Aug	HS-OME	OG256	NST	20:45	DMK	21:50	01:05	08:10	04:17		40:19	15:17	10:00
	HS-OME	OG255	DMK	18:55	NST	19:57	01:02				39:14		
	HS-OME	OG252	NST	17:02	DMK	18:08	01:06			29:02	38:12		
	HS-OME	OG253	DMK	15:10	NST	16:14	01:04	(14:10-22:20)		27:56	37:06	(22:20-13:37)	
25-Aug	HS-OMG	OG163	CEI	18:40	DMK	19:48	01:08	11:23	07:11	26:52	36:02	17:52	12:00
	HS-OMG	OG162	DMK	17:08	CEI	18:19	01:11			25:44	34:54		
	HS-OMG	OG260	HKT	15:20	DMK	16:30	01:10			24:33	33:43		
	HS-OMG	OG261	DMK	13:20	HKT	14:40	01:20			23:23	32:33		
	HS-OMG	OG165	CEI	11:35	DMK	12:42	01:07			22:03	31:13		
	HS-OMG	OG166	DMK	09:55	CEI	11:10	01:15	(8:55-20:18)		20:56	30:06	(20:18-14:10)	
24-Aug	HS-OMB	OX2307	HKG	08:20	BKK	10:00	02:40	07:45	05:17	19:41	28:51	23:25	08:00
	HS-OMB	OX2306	BKK	03:45	HKG	07:22	02:37	(2:45-10:30)		17:01	26:11	(10:30-8:55)	
23-Aug	HS-OME	OG282	HDY	12:47	DMK	14:08	01:21	08:41	05:13	14:24	23:34	12:07	10:00
	HS-OME	OG283	DMK	10:45	HDY	12:10	01:25			13:03	22:13		
	HS-OME	OG264	HKT	08:50	DMK	10:04	01:14			11:38	20:48		
	HS-OME	OG265	DMK	06:57	HKT	08:10	01:13	(5:57-14:38)		10:24	19:34	(14:38-2:45)	
22-Aug	HS-OMC	OG127	CNX	11:48	DMK	12:50	01:02	07:50	04:12	9:11	18:21	16:37	08:00
	HS-OMC	OG126	DMK	10:07	CNX	11:06	00:59			8:09	17:19		
	HS-OMC	OG250	NST	08:08	DMK	09:12	01:04			7:10	16:20		
	HS-OMC	OG251	DMK	06:30	NST	07:37	01:07	(5:30-13:20)		6:06	15:16	(13:20-5:57)	
21-Aug	HS-OME	OG282	HDY	12:55	DMK	14:12	01:17	08:40	04:59	4:59	14:09	14:50	10:00
	HS-OME	OG283	DMK	10:50	HDY	12:05	01:15			3:42	12:52		
	HS-OME	OG264	HKT	08:45	DMK	10:00	01:15			2:27	11:37		
	HS-OME	OG265	DMK	07:00	HKT	08:12	01:12	(6:00-14:40)		1:12	10:22	(14:40-5:30)	
20-Aug	Off												

The flight having flight time exceeded within 24 hours.

The flight having flight time exceeded within 7 consecutive days.

The flight having flight time exceeded within 30 consecutive days.

Inadequate rest period

Co-Pilot : Mr. Montri

16- 22 July 2007 (week 9)

Local Time

Date	A/C Reg.	Flight No.	From	Time	To	Time	Flight Time	Flight Duty Period (FDP)	Flight Time 1 Day	Flight Time 7 Days	Flight Time 30 Days	Rest Period Before Next Flight	Minimum Rest Period
22-Jul	Not Found												
21-Jul	Not Found												
20-Jul	HS-OMH	OG256	NST	21:05	DMK	22:10	01:05	08:25 (14:15-22:40)	04:24	15:26	8:50		10:00
	HS-OMH	OG255	DMK	19:31	NST	20:43	01:04			14:21	7:45		
	HS-OMH	OG252	NST	17:10	DMK	18:18	01:08			13:17	6:41		
	HS-OMH	OG253	DMK	15:15	NST	16:22	01:07			12:09	5:33		
19-Jul	HS-OMH	OG256	NST	20:45	DMK	21:53	01:08	08:13 (14:10-22:23)	04:26	11:02	4:26	15:52 (22:23-14:15)	10:00
	HS-OMH	OG255	DMK	18:55	NST	20:03	01:08			9:54	3:18		
	HS-OMH	OG252	NST	17:05	DMK	18:10	01:05			8:46	2:10		
	HS-OMH	OG253	DMK	15:10	NST	16:15	01:05			7:41	1:05		
18-Jul	HS-OMH	OG256	NST	20:50	DMK	21:59	01:09	08:08 (14:21-22:29)	04:33	6:36	[redacted]	15:41 (22:29-14:10)	10:00
	HS-OMH	OG255	DMK	19:05	NST	20:16	01:11			5:27			
	HS-OMH	OG252	NST	17:00	DMK	18:07	01:07			4:16	108:57		
	HS-OMH	OG253	DMK	15:21	NST	16:27	01:06			3:09	107:50		
17-Jul	HS-OME	OG129	CNX	20:20	DMK	21:20	01:00	04:25 (17:25-21:50)	02:03	2:03	106:44	16:31 (21:50-14:21)	08:00
	HS-OME	OG128	DMK	18:25	CNX	19:28	01:03			1:03	105:44		
16-Jul	Off												

[redacted] The flight having flight time exceeded within 24 hours.

[redacted] The flight having flight time exceeded within 7 consecutive days.

[redacted] The flight having flight time exceeded within 30 consecutive days.

[redacted] Inadequate rest period

Co-Pilot : Mr. Montri

2 - 8 July 2007 (week 11)

Local Time

Date	A/C Reg.	Flight No.	From	Time	To	Time	Flight Time	Flight Duty Period (FDP)	Flight Time 1 Day	Flight Time 7 Days	Flight Time 30 Days	Rest Period Before Next Flight	Minimum Rest Period
8-Jul	HS-OMB	OX219	HKG	17:50	HKT	20:15	03:25		06:35		75:59		16:00
	HS-OMB	OX218	HKT	07:35	HKG	11:45	03:10				72:34		
7-Jul	HS-OMB	OX218	HKT	16:40	HKG	21:10	03:30		06:35		69:24		16:00
	HS-OMB	OX217	HKG	08:30	HKT	10:35	03:05			27:56	65:54		
6-Jul	HS-OMB	OX218	HKT	17:10	HKG	21:40	03:30		06:47	24:51	62:49		16:00
	HS-OMB	OX219	HKG	08:35	HKT	10:52	03:17			21:21	59:19		
5-Jul	HS-OMB	OX218	HKT	16:30	HKG	20:50	03:20	04:50 (15:30-21:20)	03:20	18:04	56:02	10:15 (21:20-7:35)	08:00
4-Jul	HS-OMA	OG262	HKT	20:10	DMK	21:28	01:18	08:23 (13:35-21:58)	05:05	14:44	52:42	17:32 (21:58-15:30)	10:00
	HS-OMA	OG263	DMK	18:30	HKT	19:43	01:13			13:26	51:24		
	HS-OMA	OG268	HKT	16:28	DMK	17:47	01:19			12:13	50:11		
	HS-OMA	OG269	DMK	14:35	HKT	15:50	01:15			10:54	48:52		
3-Jul	HS-OMH	OG256	NST	20:35	DMK	21:43	01:08	07:58 (14:15-22:13)	04:24	9:39	47:37	15:22 (22:13-13:35)	08:00
	HS-OMH	OG255	DMK	18:50	NST	19:53	01:03			8:31	46:29		
	HS-OMH	OG252	NST	16:57	DMK	18:08	01:11			7:28	45:26		
	HS-OMH	OG253	DMK	15:15	NST	16:17	01:02			6:17	44:15		
2-Jul	HS-OMG	OG262	HKT	20:40	DMK	22:05	01:25	08:25 (14:10-22:35)	05:15	5:15	43:13	15:40 (22:35-14:15)	10:00
	HS-OMG	OG263	DMK	18:55	HKT	20:08	01:13			3:50	41:48		
	HS-OMG	OG268	HKT	16:55	DMK	18:20	01:25			2:37	40:35		
	HS-OMG	OG269	DMK	15:10	HKT	16:22	01:12			1:12	39:10		

The flight having flight time exceeded within 24 hours.

The flight having flight time exceeded within 7 consecutive days.

The flight having flight time exceeded within 30 consecutive days.

Inadequate rest period

APPENDIX 22

US Summary Comments on the Draft Final Report

National Transportation Safety Board
Washington, D.C. 20594

Office of Aviation Safety

U.S. Summary Comments on the Draft Final Report of the Aircraft Accident Involving HS-OMG, 16 September 2007, Phuket, Thailand

INTRODUCTION

This letter relates to the 16 September 2007 accident involving HS-OMG, a Boeing-McDonnell Douglas MD-82 operated as One-Two-Go Airlines flight OG269. As the State of Design and Manufacture of the airplane, a U.S. Accredited Representative and advisors[1] participated in the Aircraft Accident Investigation Committee of Thailand (AAIC) investigation. Around January 1, 2010, the U.S. Accredited Representative received the draft final accident report from AAIC. The U.S. investigative team's comments are submitted to the AAIC pursuant to section 6.3 of Annex 13 to the Convention on International Civil Aviation.

SUMMARY

The U.S. Accredited Representative and advisors responded to the accident notification and traveled to Thailand. Additional advisors supported the team from the United States, including flight recorder readout at the NTSB Vehicle Recorder Laboratory with AAIC participation. Follow-up activity included aircraft component systems testing (autothrottle, enhanced ground proximity warning system (EGPWS) and windshear alerting and guidance system).

Extensive examination of the material factors relative to the aircraft and its equipment revealed no pre-accident failures or significant malfunctions.

The U.S. team would like to congratulate the AAIC for the completion of a lengthy, complex investigation and a thorough final report. Additionally, we appreciate the opportunity to comment on this report and contribute to this important investigation and its effect on worldwide air safety.

SUGGESTED CHANGES

General Changes

After reviewing the report, the U.S. team provides the following suggested changes:

1. Page 11, paragraph 1.10.3: The report states: "However, Phuket International Airport has geographical constraints on location of embankments at the side of the runway; therefore limits the width of the runway strip to only 75 meters on each side of centerline." The U.S. team believes this number should be 45 meters instead of 75 meters.

[1] Advisors to the U.S. Accredited Representative included representatives from the National Transportation Safety Board; Federal Aviation Administration; Boeing Commercial Airplanes; Pratt&Whitney and Honeywell.

2. Page 13, paragraph 1.12: The report states "the fuselage and tail section were aligned parallel with runway 27". The U.S. team believes this sentence should be changed to "the fuselage and tail section were aligned perpendicular with runway 27." The photographs provided to the U.S. team indicate this alignment.
3. Page 13, third paragraph: "The EPR began to increase again, reaching 'go around throttle' at 15:40:09." The words "go around throttle" should be changed to "go around thrust" for technical accuracy.
4. Page 24, paragraph 2.9: It appears this sentence is incomplete: "A comparison of the pressure altitudes and radio altitudes obtained from DFDR and EGPWS."
5. Page 24, paragraph 2.10: For this sentence, "The data from CVR and DFDR could be summarized as follow," the letter "s" needs to be added to 'follow.' The sentence should read, "The data from CVR and DFDR could be summarized as follows."
6. Page 24, paragraph 2.10.2: An "s" should be added to the word "flight instrument" in this sentence: "During the flight, there were no malfunctions of engines, flight instrument, flight control system and all other systems of the airplane." For technical accuracy, the sentence should be written: "During the flight, there were no malfunctions of engines, flight instruments, flight control system and all other systems of the airplane."
7. Page 25, conclusions 2.10.7 & 2.10.8 refer to the airplane encountering a "downdraft" affecting the airplane during final approach. The U.S. team is concerned that the report does not provide enough factual basis to make this statement. One example of factual support would be a plot referencing wind speed and direction vs. time. During the investigation, the NTSB and Boeing performed wind calculations which indicated a vertical wind oscillation of about + 8ft/sec/ - 7 ft/sec at about 50 feet radio altitude. However, this oscillation occurred in a dynamic condition (i.e. when the airplane is beginning to pitch up rapidly), which could result in distorted calculations. Therefore, the U.S. team suggests including additional factual documentation to support the "downdraft" circumstance, if it exists.
8. Page 26, conclusion 2.10.14: The report states, "While the airplane continued to climb to 300 feet, the airplane was shifted towards to the right of runway 27 due to the windshear." The U.S. team believes the word "windshear" should be replaced with "wind" or "gust of wind." The U.S. team believes a steady wind from 240 degrees would have pushed the airplane to the right, and therefore the term "wind" is probably more appropriate than "windshear" in this sentence. Additionally the next sentence states: "The airspeed increased to 10 knots, possibly because of the increased of headwind speed, and aircraft nose up." The U.S. team believes the sentence should read, "The airspeed increased 10 knots…" instead.
9. Page 27, paragraph 2.12: As mentioned above, the report lacks the factual evidence to state "…it could be summarized that the airplane experienced downdraft current and decreased performance windshear…" The first time the word "downdraft" appears in the report is in conclusion 2.10.7, and it appears the only factual basis for referencing the downdraft was the tower report of wind, which did not mention a downdraft. The U.S. team suggests providing more factual evidence to determine if the word "downdraft" is appropriate. If this evidence does not exist, and if the case for a "downdraft" is not justified, the the U.S. team believes this conclusion should be removed.
10. Page 34, paragraph 3.2.2: The report states: "The Takeoff/Go Around (TO/GA) switch was not activated, and the engine power (thrust levers) did not increase, resulting in the

airplane failure to increase in airspeed and altitude during the go around." The U.S. team believes this sentence should be clarified to read: "The Takeoff/Go Around (TO/GA) switch was not activated, resulting in the inability of the airplane to increase in airspeed and altitude during the go around.

Rescue Difficulties

The U.S. team believes more attention should be given to the rescue difficulties encountered as a result of the approximate 6-foot-wide ditch located to the north, and parallel to Runway 27. During the on-scene examination of the accident site, the U.S. team noted the airplane impacted terrain on the far (north) side of the ditch. The fire station was on the south side of the ditch, with no means available to transverse the ditch and reach the airplane. Additionally, firefighters, witnesses, and survivors noted difficulty in the rescue response because of this impediment.

There was no mention of the ditch in the "Rescue Difficulties" section of the report (page 16) under the "Survival Factors" heading. The U.S. team believes this information should be included in this section because the presence of the ditch presented significant difficulties to the first responders.

Operational Information

The U.S. team would like to commend the AAIC for identifying critical operational issues in this accident, to include the failure of the flight crew to follow the standard operating procedures (SOP) and their failure to activate the Takeoff/Go Around (TO/GA) switch.

During the investigation, the U.S. team was not provided with any operational documents from the AAIC; therefore, we were unable to evaluate operational information regarding the airline and flight crew.

However, the U.S. team agreed with the operational sections of the AAIC report and commend the AAIC for identifying critical factors such as failure to adhere to flight duty time regulations, and deficiencies in standard operating procedures and training.

Probable Causes and Recommendations

The U.S. team is in agreement with the probable causes stated in the AAIC report, citing the flight crews' actions as improper and causal to the accident. Additionally, the U.S. team agrees with the recommendations proposed by the AAIC, particularly as they relate to the operational factors which contributed to the accident.

APPENDIX 23

AAIC Reply to US Comments on the Draft Final Report

No. AAIC 148/2553

The Aircraft Accident Investigation Committee of Thailand
Flight Standards Bureau
Department of Civil Aviation
71 Soi Ngamduplee, Rama IV Road
Bangkok 10120, THAILAND
Tel: 66 2287 3198 Fax: 66 22862913

7 June B.E. 2553 (2010)

Dear Madam,

Subject: US Summary Comments on the Draft Final Report of the Aircraft Accident Involving HS-OMG, 16 September 2007, Phuket, Thailand

The Aircraft Accident Investigation Committee of Thailand (AAIC) would like to take this opportunity to thank the US team comprising the Accredited Representative and advisors for their valuable comments on the Draft Final Report of an accident of the One Two Go Airlines Company Limited HS-OMG MD-82 aircraft submitted to the AAIC on 11 March 2010 pursuant to Paragraph 6.3 of Annex 13 to the Convention on International Civil Aviation.

The AAIC has considered the changes to the Draft Final Report suggested by the US team and then reached the following conclusions:-

1) Paragraph 1.10.3: The AAIC has considered the NTSB comment on Paragraph 1.10.3 concerning the width of runway strip at Phuket International Airport and would like to confirm that the width of runway strip is 75 meters on each side of the runway centreline as shown in the Aeronautical Information Publication (AIP) Thailand in Attachment No. 1. As a result, the AAIC has decided not to change Paragraph 1.10.3 as recommended by NTSB.

Ms. Jill M. Andrews
Air Safety Investigator
US Accredited Representative
The National Transportation Safety Board
Office of Aviation Safety
Mid-Atlantic Regional Office
45065 Reverside Parkway
Ashburn, VA 20147, USA

2/ 2) Paragraph 1.12:

2) Paragraph 1.12: The AAIC has considered the NTSB comment on paragraph 1.12 concerning the aircraft wreckage information and went through photos of wreckage taken after the accident. The photos showed that after the hit, the airplane broke into 3 parts. The nose section was heading to 010 degree. The photos taken from the right side of the airplane showed that the fuselage section was heading to approximately 300 degree and the tail section beginning from the engine was aligned parallel with Runway 27 because its bottom was found resting on the half top of the ditch paralleled with Runway 27 as shown in Attachment No.2. As a result, the AAIC has decided to change the commented phrase in Paragraph 1.12 to "the fuselage section was heading to approximately 300 degree and the tail section beginning from the engine was aligned parallel with Runway 27".

3) Paragraph 1.11.4.2: The AAIC has considered the NTSB comment on Paragraph 1.11.4.2 that the words "go around throttle" should be changed to "go around thrust" for technical accuracy. The AAIC has decided to change the commented word as recommended by the NTSB.

4) Paragraph 2.9: The AAIC agreed with the NTSB that the commented sentence is incomplete and decided to change the sentence to "A comparison of the pressure altitudes and radio altitudes has been obtained from DFDR and EGPWS."

5) Paragraph 2.10: The AAIC agreed with the NTSB that the sentence "The data from CVR and DFDR could be summarized as follow" should read "The data from CVR and DFDR could be summarized as follows.", and decided to change the sentence as recommended.

6) Paragraph 2.10.2: The AAIC agreed with the NTSB that an "s" should be added to the word "flight instrument" in this sentence, and decided to change the sentence as recommended.

7) Paragraphs 2.10.7 & 2.10.8: The AAIC has considered the NTSB comment on paragraphs 2.10.7 & 2.10.8 regarding insufficient factual information to support the statement concluded in both paragraphs that the airplane encountered a downdraft affecting its operations during the final approach. The AAIC agreed with the NTSB and therefore decided to change paragraph 2.10.7 to "From 200 feet ATL, the airplane lost approximately 1,800 feet per minute. The airspeed decreased 15 knots within 3 seconds. These might be resulted from downdraft and decreased performance windshear. The decreased rate exceeded the prescribed Stabilized Approach Procedures in the FOM of Orient Thai Airlines Company Limited (Detailed in Appendix 20)."

8) Paragraph 2.10.14: The AAIC has considered the NTSB comment on paragraph 2.10.14 that the word "windshear" should be replaced with "wind" or "gust of wind", and that the word "to" in the next sentence should be deleted. The AAIC agreed with the NTSB and therefore decided to change paragraph 2.10.14 to "While the airplane continued to climb to 300 feet, the airplane was shifted towards to the right of runway 27 due to the gust of wind. The airspeed increased 10 knots, possibly because of the increased of headwind speed, and aircraft nose up. (Increased Performance)"

3/ 9) Paragraph 2.12:

9) Paragraph 2.12: The AAIC has considered the NTSB comment on paragraphs 2.12 regarding insufficient evidence to support that there was a downdraft during the accident. The AAIC agreed with the NTSB and therefore decided to change paragraph 2.12 to "According to the report of weather condition from the meteorological station at Phuket International Airport, the surface wind information that the ATC informed the flight crew, the data from CVR transcript between the ATC and the flight crew of OG269, and the data from DFDR, the airplane descended and the airspeed decreased at the rate of descend at approximately 1,800 feet per minute. The airplane was descending through 51 feet above threshold level, resulting that the Co-pilot aborted the approach, and decided to go-around. However, the go-around failed and the accident occurred. The data from DFDR indicated that in the last second, the Windshear Alerting and Guidance System was recorded 'ON' which meant the airplane might encounter the windshear during the impact. The weather condition at the time of accident, at approximately 15:41 hours, deteriorated. The visibility and weather condition, at about 6 minutes before the accident or at approximately 15:35 hours, had been clear to land. However, the weather condition at about 4 minutes after the accident or at approximately 15:45 hours, changed rapidly resulting in heavy rain and strong gust wind. The visibility reduced to 800 meters due to heavy rain was lower than a standard that airplane could make landing."

10) Paragraph 3.2.2: The AAIC agreed with the NTSB comment and decided to change the sentence in paragraph 3.2.2 to "The Take off/Go around (TO/GA) switch was not activated, resulting in the inability of the airplane to increase in airspeed and altitude during go around."

11) Rescue Difficulties: The AAIC has considered the NTSB comment on the rescue difficulties encountered as a result of the ditch located parallel to Runway 27. The AAIC has decided to change the related paragraphs as follows:-

- Add paragraph 1.15.2.1, " There is the ditch, 3.5-meter in width and 1.3-meter in depth, located to the North and paralleled with Runway 27 of the airport. The airport has entrances for rescue and fire fighting at both ends of the runways. However, these entrances were not used in this accident."

- Original paragraphs 1.15.2.1, 1.15.2.2 and 1.15.2.3 become 1.15.2.2, 1.15.2.3 and 1.15.2.4, respectively

- Change paragraph 2.17 to "There is the ditch, 3.5-meter in width and 1.3-meter in depth, located to the North and paralleled with Runway 27 of the airport. The ditch led to difficulties for rescue and fire fighting. The airport has entrances for rescue and fire fighting at both ends of the runways. However, these entrances were not used in this accident."

- Change paragraph 3.1.2 to "There is the ditch, 3.5-meter in width and 1.3-meter in depth, located to the North and paralleled with Runway 27 of the airport. The ditch led to difficulties for rescue and fire fighting. The airport has entrances for rescue and fire fighting at both ends of the runways. However, these entrances were not used in this accident."

The Final Report, attached with this letter for the NTSB in accordance with Paragraph 6.4 of Annex 13 to the Convention on International Aviation, has been incorporated with those changes decided by the AAIC based on NTSB comments. Copies of the original document sent by the NTSB addressing the US Summary Comments on the Draft Final Report and this letter have also been appended to the Final Report as Appendices 22 and 23 because some changes recommended by NTSB still remain unchanged as reasons explained above.

Finally, the AAIC would like to express our sincere appreciation to NTSB assistances kindly given throughout the investigation process, especially in sending the US Accredited Representative and advisors to support the on-scene investigation, and helping in the readout and analysis of data downloaded from flight recorders and related non-volatile memories. Without the NTSB assistance, it would have been much more difficult to complete the investigation.

With best regards.

Yours sincerely,

(Vutichai Singhalamany)
Director General
Vice Chairman, The Aircraft Accident Investigation Committee of Thailand

Attachment No. 1

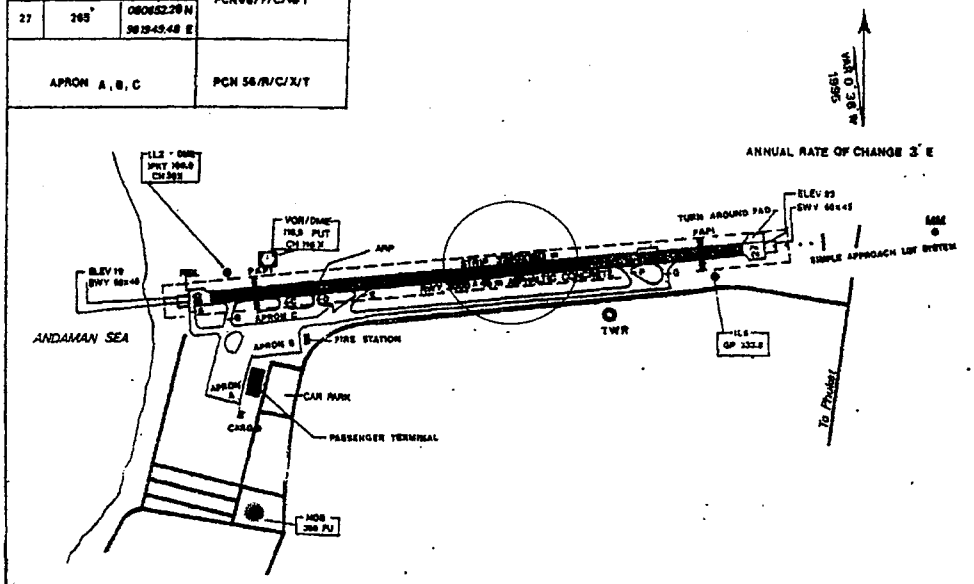
AIP
Thailand

VTSP AD 2-15
19 NOV 98

AERODROME CHART - ICAO 080645 N 0981833 E ELEV 82 ft TWR 118.1 PHUKET / Phuket Intl

RWY	DIRECTION	THR	BEARING STRENGTH
09	85°	080643.12N 0981171.92 E	PCN 66/F/C/W/T
27	265°	080652.29 N 0981945.48 E	
APRON A, B, C			PCN 56/R/C/X/T

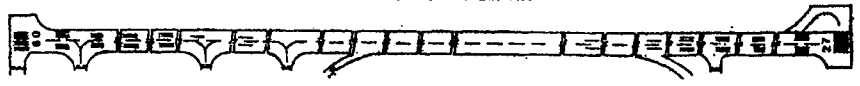
ELEVATIONS IN FEET AND DIMENSIONS IN METRES
BEARINGS ARE MAGNETIC



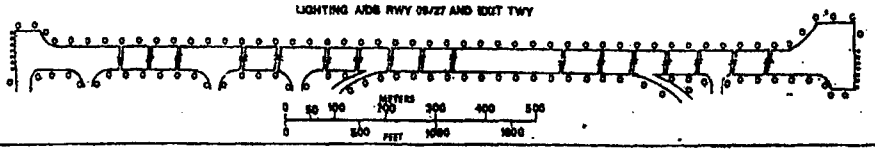
LIGHTING AIDS : RWY LIGHTS : WHITE
TWY LIGHTS : BLUE
THRESHOLD LIGHTS : GREEN

Remark: Coordinates are WGS-84

MARKING AIDS RWY 09/27 AND EXIT TWY



LIGHTING AIDS RWY 09/27 AND EXIT TWY



Attachment No. 2