



**ISLAMIC REPUBLIC OF AFGHANISTAN
MINISTRY OF TRANSPORT
CIVIL AVIATION OPERATION**

REPORT ON

**INVESTIGATION OF ACCIDENT
KAM AIR B-737-200 AIRCRAFT EX-037
NEAR KABUL INTERNATIONAL AIRPORT
ON 03 FEBRUARY, 2005**

FEBRUARY 2006

**ISLAMIC REPUBLIC OF AFGHANISTAN
MINISTRY OF TRANSPORT
CIVIL AVIATION OPERATION**

Kabul, Afghanistan

AIRCRAFT ACCIDENT REPORT

**CONTROLLED FLIGHT INTO TERRAIN
KAM AIR B-737-200 AIRCRAFT EX-037
NEAR KABUL INTERNATIONAL AIRPORT
03 FEBRUARY, 2005**

Abstract: This report explains the accident involving a Boeing B-737-200, operated by Kam Air Airline that impacted mountainous terrain near the Kabul International Airport while on a revenue flight from Herat to Kabul on February 3, 2005. Safety issues in this report include the conduct of approaches into airports with mountainous terrain and limited radar coverage. Recommendations concerning these issues are made for the Ministry of Transport of the Islamic Republic of Afghanistan and the Military Approach Control.

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EXECUTIVE SUMMARY

On February 3, 2005, a Boeing 737-242 aircraft (the "Aircraft") with Kyrgyz Republic registration EX-037, operated by Phoenix Aviation, was conducting Kam Air Flight 904 from Herat to Kabul. There were a total of 105 occupants on board the Aircraft, including eight crew members and ninety-seven passengers. The Aircraft was cruising at flight level 270 when it contacted Bagram Radar Approach Control ("Bagram") for descent and landing. The flight was normal until it failed to level at flight level 130 during the VOR/DME approach.

At 1043:24 UTC, Bagram cleared the flight to descend at its discretion and to expect the VOR approach to runway 29. The prevailing weather was also passed on to the Aircraft. Visibility was reported 2 kilometers with snow, ceiling 2200 feet broken, wind calm and altimeter setting QNH 1016.

AT 1043:58 UTC, when the Aircraft was 35 miles west of the Kabul VOR, radar contact was established with Bagram. The Aircraft was advised by Bagram to cross the VOR at or above flight level 130 and cleared it for the VOR/DME approach to runway 29. At 1048:41 UTC the Aircraft reported flight level 130. Bagram again cleared the Aircraft for the VOR approach to runway 29 and advised the Aircraft to report procedure turn inbound. The crew replied that they would report proceeding inbound for the VOR approach to runway 29. This was the last transmission from the Aircraft.

At about 1050:11 UTC, Bagram stated that radar contact had been lost with the Aircraft. Bagram and Kabul Air Traffic Control Tower attempted to locate the Aircraft through radar and radio communication, but were not successful. Search for the Aircraft was delayed and hampered due to a severe snowstorm in the region. The Aircraft was located approximately three days later by an International Security Assistance Force (ISAF) helicopter approximately 30 kilometers southeast of Kabul International Airport at N 36 27.900 E 69 30.185. The Aircraft was destroyed by force of impact from colliding with the mountain. All 105 occupants on board the Aircraft had received fatal injuries. Subsequently, all bodies were recovered and identified.

The Flight Data Recorder (FDR) was recovered, but the Cockpit Voice Recorder (CVR) could not be found. The FDR was sent to the National Transportation Safety Board (NTSB) laboratory in the United States for read out. No data was found recorded.

The investigation was severely affected due to non-availability of FDR and CVR data read outs. The investigation was finalized to the extent possible based on the limited evidence available.

The investigation revealed that the Aircraft did not proceed to the VOR as instructed by the air traffic controller and descended below the minimum assigned altitude prior to being established on any segment of the approach. As a result, the Aircraft collided with a mountain. The cause of descending below the assigned altitude could not be determined due to inadequate data and evidence.

1. FACTUAL INFORMATION

1.1. History of Flight. On February 3, 2005, Kam Air Flight 904 (KMF 904), a Boeing 737-242 holding Kyrgyz Republic Registration EX-037 (the "Aircraft") chartered pursuant to a wet lease agreement by Kam Air, a company registered and licensed under the laws of Afghanistan and holding an Air Operator Certificate (AOC) issued by the Ministry of Transport of the Islamic Republic of Afghanistan, from Phoenix Aviation, a company registered under the laws of the United Arab Emirates, departed from Herat (Afghanistan) to Kabul (Afghanistan) at 1002 UTC with 97 passengers and eight crew members on board. The Aircraft was registered with the Civil Aviation Authority of the Kyrgyz Republic. The estimated time of arrival (ETA) at Kabul International Airport was given to be at 1055 UTC.

The pilot of KMF 904 made his initial transmission to Bagram Radar Approach Control (hereinafter "Bagram") at approximately 1041 UTC. Bagram replied that "aircraft calling Bagram you were weak and broken up, give me a call in another one zero miles." The pilot of KMF 904 responded "Roger."

At 1042:29 UTC the pilot contacted Bagram again and said "Bagram, Kam Air 904 is 45 [nautical miles] from Kabul VOR, we're squawking 4743, request descent." Bagram requested the type of aircraft and altitude. The pilot advised that they were operating a Boeing 737 at flight level 270. At 1043:13 UTC the pilot reported that his position was 40 miles from Kabul and again asked for descent clearance. Bagram responded that the Aircraft could descend using Visual Flight Rules (VFR) at the captain's discretion and that Kabul was landing runway 29. Bagram also advised KMF 904 of the prevailing weather "...wind calm, visibility is 2 kilometers with snow, they are SVFR, the ceiling is 2200 [feet] broken, 5000 [feet] broken and the QNH is 1016, expect a VOR approach runway 29."

At 1043:50 UTC, Bagram requested the pilot to "Ident" and the pilot did so. At 1043:58 UTC Bagram said "904 radar contact 35 miles west, cross the VOR at or above flight level 130. You're cleared the VOR approach runway 29." The crew responded "Roger, cleared for the VOR approach Runway 29...." The approach plate for Kabul indicated that the approach is the VOR/DME runway 29 but the Bagram air traffic controller and the pilot continually refer to it as the VOR approach.

At 1050:11, Bagram said, "KMF 904, radar contact lost." There was no response by the flight crew and there were no further communications with the flight crew. According to the Bagram air traffic controller's written

statement, radar contact was lost with KMF 904 when the Aircraft was approximately 2 miles west of the VOR at FL 130. Recorded MPN 25 radar data indicated that the Aircraft passed about three miles south of the VOR on an easterly heading and did not join the approach course before radar contact was lost.

When Bagram lost radar contact with the Aircraft, the Bagram air traffic controller requested that Kabul Air Traffic Control Tower (hereinafter "Kabul Tower") inform Bagram when the Aircraft had landed. When the Aircraft did not land when expected, a search began to locate the Aircraft. Kabul Flight Information Center (FIC) checked with authorities in neighboring countries. In the first contact with Lahore FIC, Lahore FIC confirmed that KMF 904 was on the ground in Peshawar, the nearest airport to Kabul International Airport and the most likely airport for diversion at the time. Kabul FIC contacted Lahore FIC again for reconfirmation and this time Lahore FIC responded that KMF 904 was not at Peshawar Airport and that it was another aircraft that had diverted to Peshawar airport.

The prevailing weather on February 3, 2005, at and around Kabul International Airport was snowy with low visibility. Search and rescue mission started on the evening of February 3rd and intensified on February 4th by the International Security Assistance Forces (ISAF) helicopters, U.S. Air Force planes, Afghan Air Force helicopters, the Afghan National Army troops, and the Kabul City Police Force. However, due to bad weather conditions and poor visibility the search and rescue teams did not succeed in locating the Aircraft.

The wreckage of the Aircraft was located by ISAF helicopters after three days of search. The Aircraft had collided with the peak of Shapiri Ghar Mountain in Khak-e-Jabar district about 30 kilometers South East of Kabul International Airport at 9,960 feet. Search and rescue continued for several days. During the search and rescue mission, all the bodies were recovered by the Afghan National Army troops. During the search and rescue mission it was discovered that the area where the wreckage of the Aircraft was located had been infested with land mines. One Afghan National Army soldier was killed and three others injured as a result of a mine explosion during the search and rescue mission.

During the search and rescue mission, the FDR of the Aircraft was recovered and later checked by the National Transportation Safety Board (NTSB) experts at the NTSB laboratory in Washington, D.C., but nothing was found to have been recorded. Several attempts were made to recover the CVR, including the last search conducted by the Ministry of Transport staff using a Ministry of Defense helicopter in November, 2005, but the CVR was not located.

1.2. Injuries to Persons.

INJURIES	CREW	PASSENGERS	OTHERS
Fatal	8	97	0
Serious	0	0	0
Minor	0	0	0

1.3. **Damages to Aircraft.** The Aircraft crashed into the mountain at 9,960 feet, and as a result of the impact the Aircraft was completely destroyed.

1.4. **Other Damages.** There were no other damages.

1.5. Personal Information.

- (i) **Pilot In Command (Captain)**
Name: Vasily Simonov
Position in the Cockpit: On the left side
Date of Birth: September 6, 1954
Nationality: Russian
Type of License: ATPL and Instructor
Medical Date with Status Class (1): Valid until 08/12/2005
Type Rating: Boeing 737-200
License No. 00281 issued by the Kyrgyz Republic
P.I.C Type: Boeing 737-200
- (ii) **First Officer**
Name: Iouri Zotov
Position in the Cockpit: On the right side
Date of Birth: November 6, 1958
Nationality: Canadian of Ukrainian Origin
License No. IP 003 03 Issued by the Kyrgyz Republic
Medical CKD: Valid up to 22/10/2005
- (iii) **Cabin Crew Members:**
Name: Ksenia Silikhova
Date of Birth: 3/04/1984
Nationality: Russian
License No. FA No. 00235 Issued by the Kyrgyz Republic
Validity: Valid until 20/11/2005

Name: Ekaterina Pigasova
Date of Birth: 27/06/1980
Nationality: Russian
License No. FA 00248 Issued by the Republic of Moldavia
Validity: Valid until 02/09/2005

Name: Victor Novoslougine
Date of Birth: 24/04/68
Nationality: Russian
License No. 0028357 Issued by the Russian Federation
Validity: Valid until 02/09/2005

Name: Aliona Coritchi
Nationality: Moldavia
Date of Birth: 14/03/1977
License No: FA 00235 Issued by the Republic of Moldavia
Validity: Valid until 02/09/2005

(iv) Cabin Crew Trainees

Name: Haseena Sarwari D/O Abdul Rhiam
Nationality: Afghan
Date of Birth: 1986 (1365)
License: None
Validity: N/A

Name: Obaidullah S/O Abdul Wakil
Nationality: Afghan
Date of Birth: 1984 (1363)
License: None
Validity: N/A

1.6. Aircraft Information.

Certificate of Air Worthiness
Certificate of Air Worthiness Inspection done in 2004
No problems were indicated on the Aircraft during the inspection,
which was done by Phoenix Aviation maintenance staff

1.6.1. Aircraft General Data (Dated 31/01/05):

Aircraft Model: Boeing 737-242 ADV

Aircraft Type: Air Frame A 16 WE

Certificate Number: Engine 2 EA

Manufacture Date: 31/01/ 1980

Serial No: 22075/#

Variable No: K223

Line No: 630

Registration No: EX 037

Aircraft TSN: 51,363,08 FH

Aircraft CSN: 42,055, FC

Owner: Phoenix Aviation

Operator: Phoenix Aviation

1.6.2. Power Plant

Engine Model: JT8D-17

Manufacturer: Pratt-Whiney Posi-Pes 2

Serial No: P49290b; P702722b

TSN: 48,286,45 flight hours; 42,012,37 flight hours

CSN: 44279FC; 27675 flight cycles

Date of xxxx: September 3, 1993

Last Overhaul: January 1, 1996

Time Since Overhaul: 7,224,35 flight hours

Cycles Since Overhaul: 5,232 flight cycles

Time Between Overhaul: On Condition

1.6.3. Inspection

C Check Frequency: 4000 FH

Last C Check: 48,500 TSN

Type C Date: 4/10/2000

40.264 CSN

D Check Frequency: 22400 FH

Last D Check: 4212 TSN

Type D Date: 21/05/1997

3566CSN

B Check Frequency: 1000 FH

Last B Check: 50769 TSN

Type B Date 07/10/20049

41751 CSN

B+A +2A6+5A

Type of Fuel: JP-1 Phoenix SHARJAH

1.7. Meteorological Information. On the first contact with Kabul ATC, the Kabul ATC had given the actual weather to the Aircraft. The pilot confirmed to have copied the reported weather information, and had previously copied the reported weather from Kabul Tower. The Kabul Meteorological Report at 031050 UTC was as follows: wind 100/03; visibility two kilometers with light snow and mist; sky scattered at 2700 feet, broken at 3000 feet, overcast at 5000 feet; outside temperature +1, dew point -1 deg C; QNH 1016. The weather information for February 3, 2005 is attached as Annex IV.

1.8. Aids to Navigations. VOR/DME co-located, frequency 112 MHZ-57 CH. The ILS system on that day was not available as installation and calibration had not taken place at the time of accident. Before the accident, the VOR/DME was working normally and there were no problems reported. Bagram cleared the Aircraft for the VOR approach to runway 29. Radar contact with the Aircraft was lost at 1048 UTC when the Aircraft was approaching the VOR/DME approach Initial Approach Fix.

1.9. Communication. The Aircraft (KMF 904) was coming from Herat to Kabul. According to the Kabul Air Traffic Control communication transcripts, the Aircraft first contacted Kabul Tower at 1040:09 UTC and requested Kabul weather report and gave the estimated time of arrival to Kabul as 1055 UTC. Kabul Tower passed the weather to the Aircraft through VHF frequency 118.1 MHZ and also advised the Aircraft to contact Bagram on frequency 133.35 MHZ to be with them until Bagram released the Aircraft to Kabul Tower. Bagram called the Aircraft twice and then the Aircraft responded to calls from Bagram and the pilot gave his location as 45 miles from Kabul VOR and said they are squawking 4743 and requested clearance to descend. Bagram requested the type of aircraft and flight level. The pilot informed Bagram that the type of aircraft was Boeing 737-200 and flight level was 270. Then the pilot informed his position 40 miles from Kabul VOR at flight level 270 and requested to start descent. Bagram cleared the Aircraft for the VOR approach using runway 29 and advised the Aircraft to descend at its discretion. Bagram also advised the Aircraft that the wind was calm, visibility was two kilometers with snow, the ceiling was 2200 broken, 5000 broken, and the QNH was 1016. Bagram also advised the Aircraft that conditions were special VFR.

1.10. Aerodrome Information. Kabul International Airport is the only airport in Afghanistan used by international commercial air carriers. This airport is located to the north side of Kabul City, approximately three miles from the center of the city. Relevant data for Kabul International Airport is given below.

Runway physical characteristics:

Runway 29

Bearing: TRUE – 287
MAGNETIC – 285
Length 3,500 meters
Width 60 meters
Strength: Pavement Classification Number 59 Asphalt
Threshold Coordinates: 34 33.40 N; 69 13.50 E
Elevation Threshold: 5,869 feet Above Mean Sea Level

Declared Distances

Take off run available: 3,500 meters
Take off distance available: 3,500 meters
Accelerate Stop Distance Available: 3,560 meters
Landing Distance Available: 3,500 meters

Runway 11

Bearing: TRUE – 107
MAGNETIC – 105
Length: 3,500 meters
Width: 60 meters
Strength: Pavement Classification Number 59 Asphalt
Threshold Coordinates: 34 34.14 N; 69 11.39 E
Elevation Threshold: 5,869 feet Above Mean Sea Level

Declared Distances

Take off run available: 3,500 meters
Take off distance available: 3,500 meters
Accelerate Stop Distance Available: 3,560 meters
Landing Distance Available: 3,500 meters

1.11. Flight Data Recorder (FDR) & Cockpit Voice Recorder (CVR).

1.11.1. The FDR. The FDR of the Aircraft was manufactured by Honeywell (SSUFDR) model 980-4120-RQUS, serial number 20434. The FDR, which was located at the site of the crash, was sent to National Transportation Safety Board's (NTSB) Vehicles Recorder Laboratory for readout, and they received the FDR on February 18, 2005. When the FDR information was downloaded by the NTSB experts, the Flight Data Acquisition Unit (FDEU), which was manufactured by Teledyne, revealed that no flight data had been recorded.

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Some type of malfunction or change to the FDR system had corrupted the data stream. The FDR had sustained minor impact damage and moisture infiltration. See Annex VI for NTSB Specialist's Factual Report on FDR. There was a possibility of damage to the electronics of the FDR by the impact damage and moisture infiltration. The memory of the FDR was downloaded four times by different methods, but the result was the same and no useful data was found recorded. Originally the Aircraft FDR had recorded 13 parameters, which are as follows:

- 1- TIMES
- 2- ALTITUDE
- 3- AIR SPEED
- 4- MAGNETIC HEADING
- 5- VERTICAL ACCELERATION
- 6- PITCH
- 7- RADIO KEY LING
- 8- THRUST OF EACH ENGINE
- 9- AUTO PILOT STATUS (EXCEPT PITCH ENGAGE)
- 10- CONTROL COLUMN POSITION
- 11- RUDDER PEDAL POSITION
- 12- CONTROL WHEEL POSITION
- 13- HORIZONTAL STABILIZER TRIM POSITION

In August 2000, TACA, a Central American company that owned the Aircraft at the time, issued an engineering order to modify the Aircraft FDR's 22 parameters based on Boeing SB 737-A1-1100 attachment 1 and 2 Parameters added by engineering order EONB 737 MD 31-018100. The added parameters were as follows:

- 1- LONGITUDINAL ACCELERATION
- 2- ALERON POSITION
- 3- RUDDER SURFACE POSITION
- 4- LETRAL ACCELERATION
- 5- POLL ALTITUDE
- 6- TRAILING FLAPS CONTROL SELECT
- 7- LEADING FLAPS CONTROL SELECT
- 8- EACH THRUST RERERS POSITION
- 9- ELEVATOR POSITION

In January 2004, the FDR was returned to Honeywell by TACA for re-certification. Honeywell documentation indicates that the FDR was from the

Aircraft N238TA, which was the registration number of the Aircraft prior to the Aircraft being sold by TACA.

1.11.2. Cockpit Voice Recorder (CVR). CVR model Fairchild P/N -93a 100 – 30, S/ NO 460 was installed on the Aircraft. The CVR was not recovered when the investigation team went to the accident site after the accident. There was heavy snow at the accident site and it was decided to search for the CVR after the snow melted. The investigation team along with the representatives of Kam Air and Phoenix Aviation and de-miners made the last attempt to locate the CVR, using Afghan Air Force helicopters on November 22, 2005. Despite extensive search in the area of accident, the team did not find the CVR.

1.12. Wreckage Information. The Aircraft collided with the mountain at altitude of about 9,960 feet and was completely destroyed. The tail section of the Aircraft remained at the top of the mountain and the fuselage of wings and L/G engines were broken into many pieces. The altitude alert selector indicator was one of the few useful items found by the search team. It was set to 13,000 feet.

1.13. Medical and Pathological Information. On February 3, 2005, KMF 904 was en route from Herat to Kabul with 97 Passengers and 8 crew members and as a result of the crash all passengers, including crew, received fatal injuries. An investigation group was assigned consisting of representatives and experts from the Ministry of Transport, Ministry of Defense, National Police, Military Health Hospital and representatives of Kam Air to collect all bodies and to bring them to Kabul Military Hospital. From the 105 bodies that were recovered 78 persons were citizens of Afghanistan, and 27 others were foreign nationals.

1.14. Investigation. The investigation steering committee included the Minister of Transport, the Minister of Defense, the Minister of Health and Representatives from the Ministry of Interior, the National Directorate of Security, the International Security Assistance Force, and the Coalition Forces. Representatives from the all the countries that had their nationals on KMF 904, Kam Air, Phoenix Aviation, Kyrgyz Republic and others also attended the Steering Committee meetings. The investigation team that investigated the crash included a team of four experts from the Civil Aviation Operations Department of the Ministry of Transport, a team from the U.S. National Transportation Safety Board (NTSB), the U.S. Federal Aviation Administration, an Italian Government investigator and a Turkish Team of investigators. The NTSB was invited by the Ministry of Transport under the provisions of ICAO Annex 13 as Accredited Representatives and Advisors from the State of Design

and State of Manufacture of the accident airplane. Both the Turkish and Italian governments sent investigators because their nationals were on KMF 904. A medical team consisting of representatives from the Ministry of Health, Ministry of Transport, Ministry of Defense Hospital and the Ministry of Interior conducted the body identification and DNA analysis of the victims.

Separate reports were prepared by the various agencies that conducted the investigation. The report of the NTSB team is attached to this report as Annex VII.

1.15. Fire. There were no signs of fire on the recovered pieces of the Aircraft wreckage. The Aircraft impacted with the mountain and was completely destroyed.

1.16. Survival Aspects. The accident was non survivable.

1.17. Tests and Research. No test and/or research were carried out about any part of the Aircraft.

1.18. Organizational and Management Information. Phoenix Aviation was operating the Aircraft under wet lease contract with Kam Air. Kam Air was not responsible for the maintenance of the Aircraft.

2. ANALYSIS

2.1. The evidence available for analysis was very limited. The wreckage was lying in difficult mountainous terrain having no easy access and in a mine-infested area. No eyewitnesses were available at the accident site to give account of the accident. At the time of accident it was snowing heavily. At the site of the accident and the wreckage, there was over one meter of snow on the ground. Unfortunately, no crew or passenger survived the accident that could give information about the accident.

2.2 The Cockpit Voice Recorder could not be traced and retrieved from the Aircraft wreckage. The Flight Data Recorder was recovered from the wreckage and sent to National Transportation Safety Board in Washington, D.C. for read out. No data was found recorded in the FDR. Non-availability of the FDR data and CVR recordings was a major handicap in the investigation. Records do not show that read out of the FDR had been checked by the operator at any time. Proper recording of the data should be ensured by all operators operating Afghan registered or wet-leased aircrafts. For this purpose the FDR and CVR recordings should be checked periodically to ensure not only proper functioning of the recorder units but also proper recording of the data and voices.

2.3 The only useful information available were transcripts from the Kabul Air Traffic Control and Bagram Radar Approach Control tapes provided by Bagram (U.S. Air Force) giving account of conversations between the Aircraft and the ATC Unit at Bagram and Kabul Tower which are attached to this report as Annex I. From the transcripts, the following observations can be made:

2.3.1. The pilot of KMF 904 made initial contact with Kabul Tower at 1040:21 UTC and reported their time of arrival as 1055 UTC. The Aircraft requested actual weather, which was transmitted by Kabul Tower. The Aircraft copied the weather and informed that they would call back when released by Bagram.

2.3.2. The Aircraft made initial contact with Bagram at 1041:37 UTC. Bagram continued to handle the Aircraft until the time of accident.

2.3.3. At 1043:13 the Aircraft reported that it was 40 miles from Kabul and requested start of descent. Bagram advised KMF 904 VFR descent at their discretion and informed them that runway 29 was being used for landing, winds calm, visibility two kilometers with snow, ceiling 2200 broken, QNH 1016

and to expect a VOR approach. The crew read back only the last part of the transmission i.e. "expect VOR approach runway 29".

2.3.4. At 1043:58 Bagram informed the Aircraft that radar contact was established 35 miles west, advised the Aircraft to cross the VOR at or above flight level 130 and cleared the Aircraft for the VOR approach to runway 29. The flight crew again read back only part of the clearance relating to VOR approach.

2.3.5. At 1048:41 the crew reported flight level 130. In reply Bagram again cleared the Aircraft for the VOR approach to runway 29 and asked the Aircraft to report procedure turn inbound. The crew replied that they would report proceeding inbound for the VOR approach runway 29. This was the last transmission from the Aircraft.

2.3.6. At 1050:11 Bagram transmitted to the Aircraft that radar contact was lost. There was however, no response from the Aircraft possibly because it had hit the mountain before that.

2.3.7. From the ATC tape transcripts the following observations can be made:

- (i) No in-flight emergency was transmitted by the crew.
- (ii) The flight crew had twice not read back parts of the clearance relating to the flight level to be maintained while crossing the VOR, nor the instruction to cross the VOR

2.4 According to the Letter of Agreement between Bagram Radar Approach Control and Kabul Air Traffic Control Tower, transfer of control of arriving aircraft to Kabul Tower should be at or above 13000 feet Mean Sea Level (MSL). Further, as per the VOR/DME let down procedure for runway 29 given at Annex II, the aircraft is required to maintain 13000 feet and start descending below this altitude only during the inbound leg. Bagram informed that the last radar return was recorded on their MPN – 25 radar at 1050 UTC when the Aircraft was on the Kabul VOR radial 149, 3.2 DME and at 11,800 feet and heading 110 degrees. This shows that the Aircraft was not adhering to the published VOR/DME let down procedure as it had descended below the minimum assigned altitude. Kabul International Airport is surrounded by high mountains and weather also becomes poor during winter. This situation is critical to safety of operations to/from Kabul International Airport. It would therefore be, in the interest of safety that flight crew adhere to ATC clearances.

2.5 Although the instructions to the flight from the air traffic controller could have been more precise, the air traffic controller cleared KMF 904 to 13000 feet, instructed it to "maintain VFR" and also cleared it for the VOR approach. Based on these instructions and in accordance with standard instrument approach procedures, the flight crew should have proceeded to the Initial Approach Fix (LANNI) at 13000 feet. At LANNI the flight crew should have performed a procedure turn and intercepted the 282 degree radial inbound. The flight should never have descended below 13000 feet until they were established on the approach and had crossed LANNI inbound. Also, it should be noted that it was not possible to "maintain VFR" because of the prevailing weather conditions.

2.6 The last radar return was recorded by Bagram radar at 1050 UTC. Thereafter, at 1050:11, Bagram observed that radar contact was lost on the Aircraft and transmitted the same to the crew but there was no response. The Aircraft collided with the mountain sometime after that time.

2.7 From the Altitude Alert Select window recovered from the Aircraft wreckage, it was observed that the flight crew had selected FL 130, which was the correct level to maintain during outbound leg of the VOR approach. However, from the descent profile plot prepared by the NTSB using the Bagram radar altitude data given at Annex III, it is observed that the Aircraft was continuously descending until radar contact was lost and had not leveled out at 13000 feet. The flight crew should have gotten the Altitude Alert horn just before approaching the selected altitude (13000 feet) and also soon after leaving the selected altitude. The CVR data was not available to establish whether the altitude horn had sounded or not.

2.8 The descent profile plot given in Annex III shows a gradual descent of the Aircraft prior to the accident, specifically descending from 24,000 feet. There is no evidence of a sudden loss of altitude before radar contact was lost on the Aircraft. This would indicate that the Aircraft was controllable until the time of impact.

2.9 A question arises why the pilot descended below the assigned altitude of 13000 feet during the outbound leg. Availability of CVR recordings could possibly have provided vital information to answer this question. In the absence of CVR recordings, it is difficult to arrive at any conclusion in this regard.

2.10 The Aircraft was equipped with Ground Proximity Warning System which should have provided warning to the crew while coming close to terrain. This would have been recorded in the CVR. Due to non availability of CVR it

could not be confirmed whether the warning had come or not and what action did the crew take.

2.11 The airport was Special VFR; visibility reported at the time of accident was two kilometers with snow and the ceiling was 2200 feet broken. The Aircraft hit the mountain at approximately 9960 feet. Under the prevailing weather conditions it appears that the flight crew did not see the mountain ahead in time to take appropriate action to clear it.

2.12 Examination of the NGA approach plate depicted the transition altitude as 12000 feet. In IFR conditions that altitude may not provide adequate terrain clearance. It is, therefore, essential that high enough transition altitudes and transition levels should be established and published to ensure terrain clearance regardless of weather conditions. These altitudes should then be published in the Aeronautical Information Publication (AIP).

3. CONCLUSIONS

3.1 Findings. As pointed out earlier in the analysis section, only the Kabul ATC and Bagram communication transcripts were available. No FDR or CVR data read out was available. Based on the very limited information available, the following findings have been drawn.

3.1.1. The Aircraft belonged to Phoenix Aviation and had a valid Certificate of Airworthiness issued by the Kyrgyz Republic. It was operating under a wet lease agreement with Kam Air.

3.1.2. The flight crew held appropriate valid licenses issued by the Kyrgyz Republic.

3.1.3. Visibility reported at the time of the accident was about 2000 meters with snow and the ceiling was 2200 feet.

3.1.4. No emergency was reported by the flight crew during the flight.

3.1.5. The Aircraft was cleared by Bagram to conduct the VOR approach to Kabul runway 29.

3.1.6. The Aircraft collided with a mountain at about 9960 feet before reaching the Initial Approach Fix of the VOR/DME approach, south of the inbound track sometime after radar contact was lost on the Aircraft. The Aircraft was destroyed by the force of impact.

3.1.7. The accident was non-survivable. All the 105 occupants on board, including eight crew members and ninety seven passengers, received fatal injuries.

3.1.8. The Cockpit Voice Recorder could not be retrieved from the accident site. The Flight Data Recorder was recovered but no data was found recorded in it. According to NTSB, something corrupted the data stream to the recorder.

3.1.9. The Aircraft did not adhere to the minimum altitude (13000 feet) of the VOR/DME approach.

3.1.10. The Aircraft was continuously descending until the time of impact at about 9960 feet and had not leveled out at 13000 feet as required during the outbound leg of VOR/DME approach.

3.1.11. There was no recorded sudden loss of altitude before collision of the Aircraft with the mountain. The Aircraft was evidently controllable until the time of the accident.

3.1.12. The Aircraft was under Bagram radar coverage and the last radar return showed that the Aircraft was on Kabul radial 149 and at 11,800 feet indicating that the Aircraft was not adhering to the VOR/DME approach procedure. The Bagram air traffic controller did not warn the Aircraft about the deviations from the altitude.

3.1.13. The flight crew had not read back parts of the clearances given by Bagram. Bagram did not repeat these parts of the clearances to ensure that the Aircraft crew had fully understood the clearance.

3.2 Probable Cause. The accident occurred probably due to the premature descent by the Aircraft below its minimum assigned altitude of 13,000 feet during approach in weather conditions below VFR requirements. The reason for descending below the minimum altitude could not be determined due to inadequate evidence.

4. SAFETY RECOMMENDATIONS

4.1. All operators should advise their flight crew to strictly adhere to the laid down instrument approach procedures. This aspect should be checked during their periodic proficiency checks and refresher courses.

4.2. Bagram controllers should instruct flight crew to cross LANNI at the assigned altitude inbound to ensure terrain clearance by flights. In case of any deviation in altitude, ATC should warn the flight crew.

4.3. Installation of effective radar that ensures coverage of the airspace around Kabul airport should be expedited. In addition, Minimum Safe Altitude Warning System (MSAW) software should be provided in the radar system.

4.4. All operators must check the read outs of FDR and CVR at least once in six months to ensure proper recording of the data and voices. Certificate of Airworthiness renewal of aircrafts should be done by the Flight Safety office only on demonstrating satisfactory performance of the recorders.

4.5. Transition altitude and transition level high enough should be established to ensure terrain clearance regardless of weather conditions.

4.6. All operators should advise their flight crew to read back fully the clearances granted by air traffic control. The air traffic controllers should repeat the clearance in case the crew does not read back fully.

4.7. The air traffic controllers should clear aircrafts for VFR approaches only under circumstances where VFR can be effectively and safely implemented.

5. MINISTRY OF TRANSPORT RESPONSE TO THE ACCIDENT

5.1 Communication Capability. Since the crash of KMF 904 in early 2005, the Ministry of Transport has established the Area Control Center which enables Kabul Airport to communicate with aircrafts that enter Afghanistan's airspace. This has improved the capability to provide information on weather conditions.

5.2. Navigational Aid and Safety Measures. Over the last year, the Ministry of Transport has installed an Instrument Landing System (ILS) at Kabul International Airport which improves the safety for aircrafts on approach to the airport. Moreover, the Ministry of Transport, with the help of the U.S. Government, has installed approach control radar at Kabul Airport. Therefore, aircrafts flying in and out of Kabul Airport no longer rely only on Bagram Radar Approach Control. Additionally, the runway rehabilitation has been completed and the runway has been equipped with runway lights and sequenced approach flashing lights. Lastly, Instrument Flight Rules are monitored and enforced upon all aircrafts flying in and out of Kabul and the use Visual Flight Rules is limited.

5.3 Approach Procedures Changes. Over the past year, several safety improvements have been made at the Kabul International Airport. The changes include increasing the Initial Approach Fix minimum altitude on the VOR/DME approach to ensure greater terrain clearance; installing, flight checking and publishing a new approach for an Instrument Landing System (ILS); installing runway lights and runway approach lights; and securing the installation of approach control radar. The Ministry of Transport, with the help of the U.S. Air Force, installed temporary approach control radar at Kabul before the winter season in Afghanistan. The Ministry of Transport has initiated a plan to install permanent radar in 2006.

6. ANNEXES

- I. Transcript of the Conversations between Kam Air Flight 904 and Kabul Air Traffic Control Tower and Bagram Radar Approach Control
- II. VOR/DME Approach Chart of Kabul International Airport
- III. Descent Profile Plot of Kam Air Flight 904
- IV. Aviation weather forecast for Kabul and Bagram
- V. Kam Air 904 Ground Track – Preliminary Data
- VI. National Transportation Safety Board Vehicle Recorder Division Specialist's Factual Report on Flight Data Recorder
- VII. National Transportation Safety Board Specialist's Factual Report on the Crash of Kam Air Flight 904