



LAO PEOPLE'S DEMOCRATIC REPUBLIC  
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## Summary of Final Report

### ON ATR 72-600 AIRCRAFT QV 301 ACCIDENT INVESTIGATION

#### Foreword

The provision is mainly included in Article 26 of the Chicago Convention on International Civil Aviation and Annex 13 to this Convention. It is elaborated into the Lao Civil Aviation Safety Regulations Part 13 and specified that:

**"The sole objective of the investigation of an accident or incident shall be the prevention of accidents and incidents" and that "It is not the purpose of this activity to apportion blame or liability".**

#### General Information

On 16<sup>th</sup> October 2013, an ATR 72-212A, registered RDPL-34233, operated by Lao airlines, took off from Vientiane bound for Pakse. The crew started the approach to runway 15 while a thunderstorm was in the vicinity of the aerodrome. After passing the MAP, the crew decided to perform a go-around and initiated a right turn at an altitude of about 600ft. During the missed approach the aircraft descended which resulted in an aural warning from the TAWS. The aircraft then climbed and started to descend again before impacting an island located on the Mekong River.

Up on receipt of the occurrence, the Lao investigator in charge, headed by the Minister of the Ministry of public Works and Transport appointed by the Prime Minister to recover this accident had notified the parties concerned in due time. In the process of this investigation, Laos has been involved as state of occurrence and operator. France has been involved as state of manufacture. BEA appointed ATR as technical advisor. AAIB Singapore has been involved as state providing assistance in the underwater search of the flight recorders. The investigation was shared into 3 groups led by 3 investigators from the Lao commission. BEA participated in each group. The task performed in each group is listed below:

- 1) Wreckage Recovery, Site survey, Structure, System Engines.
- 2) Recorder recovery, Recorder readout, Simulation setup, Flight data analysis.
- 3) ATC, Meteorological conditions, Crew training, Simulator session.

During this operation, the investigators mapped the site of the accident and collected evidence on the island. They performed an acoustic search for the ULB in order to locate the recorders on the riverbed. They recovered a large part of the fuselage and rear part of the cabin.

#### Details on aircraft accident

On October 16, 2013 at 07h40 UTC, QV301 departed from Vientiane to Pakse, after airborne turn left via Bangkok FIR to Ubon then direct to Pakse. On 08 h 50 UTC, the pilot started the approach facing South East. A local thunderstorm was around the airport. It was raining but the pilot continued the approach and lastly decided to go-around at an altitude below the MAP in a steep right turn. It

impacted the trees on an island located in the Mekong, the fuselage stroke the bank and plunged into the river.

### Injuries to persons

	Injuries		
	Fatal	Serious	Slight/none
Passengers	44	-	-
Crew members	5	-	-
Other persons	-	-	-

### Damage to aircraft

The aircraft was destroyed and the main part of the wreckage was immersed in the Mekong River.

### Aviation personnel information:

- **Pilot in Command**
  - Mr. Yong Som, 57 Years old, Air Transport Pilot's License (ATPL) No 113 dated July 1999 State Secretariat of Civil Aviation of Cambodia and validated by the Department of Civil Aviation of Lao PDR No 0254 dated 31/01/2013.
  - Medical Certificate: issued 31/01/2013 Expired on 31/01/2014
  - Type rating: ATR 72 -500 and ATR 72 -600
  - Former rating: AN26, AN24 and ATR 72 (February, 1997)
  - Flying hours: 5,600 hrs, including ATR 72 3,200 hrs
- **First officer (FO)**
  - Mr. Soulisack Hongvanthong, 22 years old, Commercial Pilot License (CPL) No 127 dated 24 June 2013 by the Department of Civil Aviation of Lao PDR.
  - Medical Certificate: issued 28 May 2013, expired on 27 May 2014
  - Type rating: ATR 72-500 on 11 May 2013 and ATR 72 -600 on 19 May 2013
  - F/O License: ATR 72-500/600 on 03 October 2013
  - Flying hours: +400 hrs
- **Air Traffic Controller (ATC) :**
  - Mr. Phouvieng Phommachanh, 63 Years old,
  - ATC License: No 033 dated: 15/08/2003 ADC/APP Non Radar
  - Medical Certificate: on 05/07/2012 expired on 04/07/2013
  - Duty time: on 16/10/2013, 00:30-09:50 UTC
- **Assistant Controller:**
  - Mr. Vongsounanh Xayviseth, 29 years old
  - Trainee
  - Training qualification : ATC Basic Course, CATC Lao PDR
  - Duty time: on 16/10/2013, 00:30-09:50 UTC
- **Assistant Controller :**
  - Mr. Vongphachanh Khamphaso, 23 Years old,
  - Trainee
  - Training qualification : ATC Basic Course, CATC Lao PDR
  - Duty time: on 16/10/2013, 00:30-09:50 UTC

The Pilot in Command was experienced and skilled on this type of aircraft. The First Officer was qualified and trained in France. His overall flight experience was not very high but his training was fresh in mind.

## **Aircraft information**

The ATR 72 is a high wing, twin turboprop, pressurized commuter aircraft. It is manufactured in France and was initially certified by the French DGAC in September 1989. The ATR72-212A version 600 is a derivative of the original ATR 72 (with improved engines and avionics) and was certified by EASA in August 2011. The overall length is 27 m with a wingspan of 27 m. It has a maximum capacity of 78 passengers, and a MTOW of 22,800 kg. The registration mark : RDPL 34233 on 03 April 2013 No. C of R 70 DCA/FSD, a Certificate of airworthiness was issued on 03 April 2013 No. C of A 70 DCA/FSD and valid to 02 April 2014. The total runtime as per 15 October 2013 was : 758 hrs

## **Meteorological information**

There was a local thunderstorm in the vicinity of the aerodrome. The sound of heavy rain striking the aeroplane could be heard on the CVR. The Captain who was flying the previous flight, which passed over about half an hour before the event flight, took a photograph. It shows a base of CB with SHRA.

The meteorological conditions during the approach as described by the ATCs were consistent with the picture gathered from FDR after the accident. The thunderstorm was approaching the airport from the Southwest.

## **Air Navigation facilities**

A VOR DME non-precision approach is available for runway 15. This approach was in force at the time of the accident. No anomalies were reported concerning ground equipment. No radar service was available at the aerodrome.

## **Communication**

- VHF TWR/APP 118.50 MHz was in used.
- VOICE RECORDER was normal operation.

## **Aerodrome information**

- Runway direction 15-33, dimension 2,400 m x 45 m, asphalt, runway strip 2,780 m x 150 m, elevation 345ft ;
- Rescue and Fire Fighting : Category 4.

## **Tests and research results**

The aircraft was equipped with two flight recorders. The FDR and the CVR were brought to the France BEA by the Investigator-in-Charge on 4<sup>th</sup> November 2013. They had been stored in a water-filled container after recovered from Mekong River. The investigator-in-charge (IIC) opened the box containing the recorders and participated in the opening and read-out operations. The opening and read-out operations were successfully performed following BEA procedures.

## **Analysis**

Under IMC conditions, with no reference to the ground, the SOPs lead to conducting an instrument approach. In Pakse the VOR DME approach procedure is in force. There is no radar service.

The flight crew has to fly to the initial approach fix or the intermediate fix at an altitude above 4600ft, then start the descent to 2300ft until final approach fix. Finally the flight crew descends to the minima (990ft), if visual references with the ground are available and sufficient the flight crew may continue until touchdown. If ground visual references are not available or not sufficient, the flight crew may level off up to the missed approach point and then must start the missed approach procedure.

From the FDR data, the flight crew set 600 ft as the minima. This is contrary to the published minima of 990 ft. Even if the flight crew had used the incorrect height as published in the JEPPESEN Chart at that time the minima should have been set to 645 ft or above. The choice of minima lower than

the published minima considerably reduces the safety margins. Following the chart would lead the flight crew to fly on a parallel path 345 ft lower than the desired indicated altitude.

The recordings show that the flight crew initiated a right turn according to the lateral missed approach trajectory without succeeding in reaching the vertical trajectory. Specifically, the flight crew didn't follow the vertical profile of missed approach as the missed approach altitude was set at 600 ft and the aircraft system went into altitude capture mode. When the flight crew realized that the altitude was too close to the ground, the PF over-reacted, which led to a high pitch attitude of 33°. The aircraft was mostly flying in the clouds during the last part of flight.

## **Conclusion**

### **Findings**

- The flight crew were licensed and qualified.
- There was a local thunderstorm in the vicinity of the aerodrome.
- Pakse IFR approaches are non-precision approaches.
- At the time of the accident, the VOR-DME Rwy15 approach chart dated 10 December 2010 published by JEPPESEN included an error on the vertical profile check table.
- The flight crew entered 600ft in the ALT SEL window.
- The published Minimum Descent Altitude was 990ft on the VOR DME approach chart.
- The flight crew disconnected the AP and aborted the approach at around 595ft indicated altitude with the intention to conduct a missed approach.
- After the aborted approach, the FD vertical mode switched to GA and immediately went into altitude capture mode because the altitude selected was 600 ft.
- The missed approach was followed by a right turn and not by a nominal climb as published in the VOR DME approach chart.
- The FDR recorded a pitch down input of up to -2.5° which caused the aircraft to descend below 600 ft.
- A series of EGPWS warnings sounded, the height reached the minimum value of 60ft above ground level and the roll reached approximately 37° to the right.
- The captain pulled up and the pitch angle progressively increased and reached values greater than 25°.
- The conditions for displaying the FD bars were no longer satisfied. The FD bars disappeared.
- The maximum altitude reached was about 1,750ft.
- A push on the control column was recorded and the pitch value significantly decreased.
- The FD vertical bar reappeared centred and the horizontal bar down.
- The engines were operating at nominal power until the end.

### **Causes of the Accident**

The probable cause of this accident were the sudden change of weather condition and the flight crew's failure to properly execute the published instrument approach, including the published missed approach procedure, which resulted in the aircraft impacting the terrain.

The following factors may have contributed to the accident:

- The flight crew's decision to continue the approach below the published minima
- The flight crew's selection of an altitude in the ALT SEL window below the minima, which led to misleading FD horizontal bar readings during the go-around
- Possible Somatogravic illusions suffered by the PF
- The automatic reappearance of the FD crossbars consistent with the operating logic of the aeroplane systems, but inappropriate for the go-around
- The inadequate monitoring of primary flight parameters during the go-around, which may have been worsened by the PM's attention all tunneling on the management of the aircraft flap configuration
- The flight crew's limited coordination that led to a mismatch of action plans between the PF and the PM during the final approach

### **Safety recommendations**

During the course of investigation and through the discussion with the investigation team, the following safety recommendations were issued:

#### **Operator**

- To ensure that its flight crew are competent in operating the conventional ATR-72 aircraft and glass cockpit ATR-72 aircraft after relevant training. One of the objectives of the transition course from the basic ATR72 to the ATR72-600 is to give pilots new references and to allow them to re-work their visual scan and the callouts linked to awareness of automated modes;
- To review its reporting system for its flight crew to report operations related issues such as error in the JEPPESEN chart or in other charts to be used in future;
- To include the effects of somatogravic illusions in its flight crew training;
- To ensure its flight crew communicate through headset during the critical phases of flight.

#### **Regulatory authority**

- To reinforce the oversight of the airline particularly regarding flight crew training related to non-precision approaches;
- To reinforce the oversight of the operator to ensure that the flight crew are competent in handling the conventional and glass cockpit ATR-72 aircraft after relevant training;
- To ensure that the operator implement flight data monitoring system;
- To review its regulation to require all flight crew to communicate through headset during critical phases of flight.

Aircraft Accident Investigation Committee (AAIC)



Yakua LOPANGKAO

END