



**PRELIMINARY REPORT ON ACCIDENT INVOLVING ASSOCIATED AIRLINE EMBRAER 120 AIRCRAFT REGISTERED 5N-BJY WHICH OCCURRED AT MMA ON THURSDAY 3<sup>RD</sup> OCTOBER, 2013.**

The following information has been determined from preliminary readout and analysis of flight 361's flight recorders. Flight 361 was equipped with both a COCKPIT VOICE RECORDER and a FLIGHT DATA RECORDER. Both recorders were replayed at the Accident Investigation Bureau's recently acquired flight recorder laboratory located in Abuja. International flight recorder experts from Canada who designed the laboratory assisted the investigation team with the readout and analysis process along with representatives from the aircraft manufacturer and aircraft operator, Associated Airlines. We are conducting the investigation in accordance with the provisions of International Civil Aviation Organization (ICAO) Annex 13, of which Nigeria is a member State.

The flight data recorder or FDR contained approximately 47 hours of data in solid state memory. The recorder downloaded without issue. There were approximately 50 parameters recorded. A few parameters were not working properly however we do not think, in this particular case, that it will hamper the overall investigation.

The cockpit voice recorder or CVR was an older generation magnetic tape based device. The CVR's magnetic tape recording was removed from the unit and replayed on an open reel 4 track tape deck specially adapted for replaying CVR's of this type. The CVR contained 32 and one half minutes of audio which included the internal conversation of the two pilots, radio calls and the overall aural environment in the cockpit on the cockpit area microphone. The CVR was of good quality and the team is in the process of generating a complete transcript of all relevant information. The AIB plans to release the transcript as part of its final report of the accident however the actual recording is, under international protocol, sensitive and therefore privileged information and will not be released at any time.

The following represents information that has been determined from our preliminary assessment of both flight recorders:



The crew discussed some concerns about the aircraft prior to departure but at this time we are not prepared to elaborate on those concerns as there remains a lot of work to complete on the CVR analysis in order to determine the specific nature of the crew's concerns.

Associated 361 was cleared for take-off on runway one eight left at Lagos international airport. The wind was calm and weather is not considered a factor in this accident. Approximately 4 seconds after engine power was advanced to commence the take-off roll, the crew received an automated warning from the onboard computer voice which consisted of three chimes followed by "Take-off Flaps...Take-off Flaps". This is a configuration warning that suggests that the flaps were not in the correct position for take-off and there is some evidence that the crew may have chosen not to use flaps for the take-off. The warning did not appear to come as any surprise to the crew and they continued normally with the take-off. This warning continues throughout the take-off roll. As we are in the process of verifying the accuracy of the flight data, we have not yet been able to confirm the actual flap setting however we expect to determine this in the fullness of time.

It was determined from the CVR that the pilot flying was the Captain and the pilot monitoring and assisting was the First Officer.

The 'set power' call was made by the Captain and the 'power is set' call was confirmed by the First Officer as expected in normal operations. Approximately 3 seconds after the 'power is set' call, the First Officer noted that the aircraft was moving slowly. Approximately 7 seconds after the 'power is set' call, the internal Aircraft Voice warning system could be heard stating 'Take off Flaps, Auto Feather'. Auto feather refers to the pitch of the propeller blades. In the feather position, the propeller does not produce any thrust. The FDR contains several engine related parameters which the AIB is studying. At this time, we can state that the Right engine appears to be producing considerably less thrust than the Left engine. The left engine appeared to be working normally. The aircraft automated voice continued to repeat 'Take-off Flaps, Auto Feather'.



The physical examination of the wreckage revealed that the right engine propeller was in the feather position and the engine fire handle was pulled/activated.

The standard 'eighty knots' call was made by the First Officer. The first evidence that the crew indicated that there was a problem with the take-off roll was immediately following the 'eighty knots' call. The First Officer asked if the take-off should be aborted approximately 12 seconds after the 'eighty knots' callout. Our investigation team estimates the airspeed to be approximately 95 knots. Airspeed was one of the parameters that, while working in the cockpit, appeared not to be working on the Flight Data Recorder. We were able to estimate the speed based on the radar data that we synchronized to the FDR and CVR but it is very approximate because of this. In response to the First Officer's question to abort, the Captain indicated that they should continue and they continued the take-off roll. The crew did not make a 'V1' call or a 'Vr' call. V1 is the speed at which a decision to abort or continue a take-off is made. Vr is the speed at which it is planned to rotate the aircraft. Normally the non-flying pilot calls both the V1 and the Vr speeds. When Vr is called the flying pilot pulls back on the control column and the aircraft is rotated (pitched up) to climb away from the runway. During the rotation, the First Officer stated 'gently', which we believe reflects concern that the aircraft is not performing normally and therefore needs to be rotated very gently so as not to aerodynamically stall the aircraft.

The First Officer indicated that the aircraft was not climbing and advised the Captain who was flying not to stall the aircraft. Higher climb angles can cause an aerodynamic stall. If the aircraft is not producing enough overall thrust, it is difficult or impossible to climb without the risk of an aerodynamic stall.

Immediately after lift-off, the aircraft slowly veered off the runway heading to the right and was not climbing properly. This aircraft behavior appears to have resulted in the Air Traffic Controller asking Flight 361 if operation was normal. Flight 361 never responded.

Less than 10 seconds after rotation of the aircraft to climb away from the runway, the stall warning sounded in the cockpit and continued to the end of the



recording. The flight data shows characteristics consistent with an aerodynamic stall.

31 seconds after the stall warning was heard, the aircraft impacted the ground in a nose down near 90 degree right bank.

The investigation is focussing on the following:

- 1) Mechanical and electronic engine control issues related to the Right engine and Right engine propeller systems.
- 2) Aural warnings related to auto-feather and the flap settings required for takeoff.
- 3) Take-off configuration issues with respect to flap settings.
- 4) Crew decision making and training with respect to proceeding with the flight despite concerns regarding the aircraft's suitability for flight.
- 5) When and how the number 2 engine fire handle was pulled.
- 6) Standard operating procedures with respect to continuing the take-off roll despite continuous automated voice warnings of both 'take-off flaps' and 'auto feather' when there was ample time to abort the take-off.
- 7) The airline management's safety culture fostered throughout the airline.

We are in the process of developing a comprehensive computer reconstruction of the flight which will help our team understand the sequence of events and will ultimately help us communicate our findings to the aviation community and the general public.

At this time we have no urgent safety recommendations. We will not wait for the final report to issue safety recommendations should any issue arise that we feel needs immediate attention.