

Part I

Comments by the Ethiopian Civil Aviation Authority on the Accident Investigation of Ethiopian Flight 409, Boeing 737-800, ET-ANB, January 25, 2010

Executive Summary

Introduction

1. The Ethiopian Civil Aviation Authority finds that the draft final report is biased, lacking evidences and incomplete, and that it does not present a full account of ET-409 accident.
2. The Ethiopian Civil Aviation Authority observed with serious regrets that before the formal investigation process started too many speculative statements were publicly released by officials of the Lebanese Government, including the very Ministry of Public Works and Transport, which established the investigation committee on the probable cause of the accident. It was noted that the Lebanese Minister of Transport publicly speculated on 26 January 2010 (one day after the accident) *“that the pilot’s failure to follow instructions from the control tower caused the crash”*. He also ruled out sabotage. Likewise regrettably, the investigation process was guided and was monitored to prove and justify the speculations made by the officials.
3. Secondly, information released by Wikileaks, available on internet, revealed a message from the US Ambassador in Lebanon on 17 February 2010 (23 days after the accident) stating: *“Although the result of the investigation is not yet public, it will likely place blame for the crash on the actions of the aircraft’s two pilots.”* The source of the information was given as *“the NTSB representative leading the investigation”* (the full transcript of the Wikileaks cable is attached).
4. The Ethiopian Civil Aviation Authority believes that the deficiencies of the investigation process, the preliminary draft report and the draft final report are only the result of such speculative opinions and biases, which deprived the investigation process independence and strict compliance with Annex 13 to the Convention on International Civil Aviation.

The Flight and Accident

5. The flight was initially cleared by Air Traffic Controllers (ATC) on a LATEB 1 D departure from Beirut to Addis Ababa. This clearance was changed many times by the ATC with contradicting and confusing instructions using non-standard phraseologies, as noted in the ATC transcript.
6. According to the FDR, the flight first experienced uncommanded over bank when turning to heading 315° as instructed by ATC.
7. On a left turn to heading of 270°, cockpit crew was heard on the CVR mentioning an unusual and alarming occurrence. The repeated questions by the Captain recorded on the CVR are likely a reference to the force and sounds of external impact on the aircraft in the form of explosion or the glaze of fire ball. However, as the CVR was incomplete with missing segments in-between, it is not possible to know for certain what they were referring to.
8. The data obtained from the FDR and the loud noise at the end of the CVR recording indicated that the recorders stopped recording at an altitude of 1'300 feet, likely due to the breaking up or disintegration of the aircraft in the air. The simultaneous disappearance of the aircraft from the ATC radar confirms the disintegration.
9. The recovery of the wreckage (92%) would have been crucial in determining whether fire was involved in the air. Regrettably, the Lebanese side rejected the retrieval and the use of the wreckage in the investigation.
10. The significant eyewitness accounts, including the ATC controllers and pilots from other flights in the area, contained statements regarding a "fire ball" at altitude in the sky. ATC incident report states that "*some orange light falling into the sea.... we saw an orange explosion on the sky over the sea before the aircraft fell down*" (ATC incident report attached). These clearly indicate to an explosion in the air, such as shoot-down, sabotage, or lightning

strike, which finally resulted in the break-up of the aircraft in the air at an altitude of 1'300 ft.

11. The documentation of the established facts and the analysis in the draft report did not contain any evidence for the crew mismanagement of the aircraft. The FDR data shows a significant number of stabilizer and roll movements without any related control inputs, which strongly suggests damage in the tail section. This probably resulted in the aircraft making erratic maneuvers through much of the five minute flight, as recorded on the FDR.
12. The draft final report erroneously concludes that the crew failure to abide by CRM principles of mutual support and calling deviations and loss of situational awareness similar to subtle incapacitation of Captain and the F/O failure to recognize and intervene were contributory factors of the accident. However, good CRM and mutual support between the pilots were well evidenced in the CVR until the recording starts to break-up and have gaps at critical moments.
13. Moreover, the CVR and DFDR clearly show that both flight crew members were making control inputs in an effort to control the aircraft, contradicting the investigation's assertion that the Captain was under subtle incapacitation while he was struggling to control the aircraft even under heavy G load. Moreover, the draft final report contradicts itself as it affirms in p.64 "*...that he [the Captain] was struggling to save the situation...*"
14. It is probable that the work load of the pilots was further exasperated by the ATC, which used non-standard phraseologies, had poor coordination among its units in issuance of clearances and separation among conflicting traffic, deviated from the established Lebanese Civil Aviation SOP, and vectored the aircraft into thunderstorm cell west of the airport. This is evidenced in the ATC voice record and radar transcripts. The Lebanese Civil Aviation Authority practice of 24 hour consecutive work schedule of ATC officers and manning, with one ATCO per unit, likely contributed to the fatigue of the ATC officers, which degraded their performance.

The Crew and the Aircraft

15. The flight ET-409 with aircraft registration ET-ANB of 25 January 2010 was certified, equipped and maintained in accordance with existing regulations and approved procedures. The aircraft was air worthy when dispatched for the flight.
16. The flight crew were properly licensed and qualified in accordance with existing regulations. They were in compliance with the flight and duty time limitation.
17. The flight crew had current first class medical certificates.
18. Crew pairing was in accordance with approved policy.
19. The Captain was an experienced pilot with 20 year service with total flying time of 10,233 hours.
20. The pilots were well trained on CRM which includes Threat and Error Management and the effect of possible subtle incapacitation.

Ethiopian Response to the Accident

21. Immediately right after the accident, Ethiopia has dispatched an emergency flight to Beirut to transport the emergency response team of 18 people, in accordance with the national and international practices.
22. However, the Ethiopian team's efficiency and effectiveness was seriously affected by the lack of single point of contact from the Lebanese side.
23. The fact that different Lebanese Government ministers were giving various and contradictory news in the media about the account of the accident made it difficult for the emergency response team to perform the necessary standard tasks, As a result, a complete confusion and disorganization was observed with all concerned.

The Investigation Process

24. Despite the documented agreement by all parties of the investigation to follow the international standards for such an investigation, which has three stages:-
- 1st stage - factual data collection
 - 2nd stage - analysis of the facts
 - 3rd stage - conclusion and safety recommendation

The investigation process failed to comply with its own procedures. Access to factual information and data were limited and in most cases denied in violation of Article 5.25 of Annex 13 to the Convention on International Civil Aviation.

Article 5.18 and 5.25 (h) of Annex 13 to the Convention on International Civil Aviation entitles participating States to take part in the compilation of factual information, verification, and in the deliberations of the analysis and conclusion parts of the investigation process. However, Ethiopia was denied to take full part in this process.

No joint technical review and analysis work were done. On two occasions, Ethiopian members of the investigation team went to Lebanon and France for joint technical review and analysis work but were told that the other members were not available.

The Investigation Team and Ethiopian Cooperation

25. Right from the start of the accident investigation task, Ethiopia expressed its willingness, commitment and transparency to cooperate with the investigation team.
26. Ethiopia has provided access to all required documents, records, and evidences to the investigation team, including confidential company policies, manuals, and individual's private information.
27. Upon the request of the investigation team, Ethiopia welcomed to Addis Ababa in January 2011 an investigation team of 11 experts to inspect Ethiopian Airlines and Ethiopian Civil Aviation Authority working manuals. The team was provided with all required documents and working procedures, access to individuals for interview including family members of the crew.

28. Ethiopia availed technical and operational expertise whenever the Investigator In-Charge required such assistance.
29. Ethiopia officially requested the retrieval of the aircraft wreckage and to avail it to the State of occurrence (Lebanon), at its own cost. However, the Investigator In-Charge declined the offer and, thus, over 92% of the wreckage, which could shed light on the probable cause of the accident, remains in the sea bed.
30. With a view to enable a thorough investigation that addresses pending issues and activities to be performed in the investigation process, Ethiopia initiated tripartite meeting with the participating States and signed four Memoranda of Understanding from January 24-27, 2011.
31. Ethiopia exercised utmost patience and made all effort to cooperate in good faith, in compliance with Annex 13 of the Convention of International Civil Aviation and in accordance with the Memoranda of Understanding.
32. In spite of the unreserved efforts made by the Ethiopian team to correct the investigation process to comply with the provisions of Annex 13 of the Convention on International Civil Aviation and guidance materials, the Lebanese side did not fulfill their obligations by availing all relevant data.
33. According to the Memoranda of Understanding, the draft final report was expected to be jointly developed. However, it was submitted unilaterally without any consideration for the substantial input of the Ethiopian side in the draft final report.
34. Ethiopia deeply regrets that the investigation process was completed without agreement and, therefore, as State of registry and operator, the Ethiopian team decided to append its factually correct findings and conclusion. The decision is in accordance with Article 6.3 note 2 of Annex 13 to the Convention on International Civil Aviation.

The Accident Investigation Approach

35. The investigation process failed to collect and analyze the following crucial and relevant facts, information and evidences:-

- **Wreckage of the aircraft:** 92% of the aircraft wreckage remains unrecovered from the sea. Despite the Ethiopian side repeated pleading to recover the wreckage at its own cost, the Lebanese side denied the recovery and analysis of the aircraft wreckage for reasons unknown to the Ethiopian side.
- **CVR recovery and read out:** The recovery of the CVR was entirely under the command of the Lebanese investigators.

The Lebanese investigators announced the recovery of the CVR on February 10, 2010. However, when the investigation team requested for access to the CVR, the Lebanese investigators advised the investigation team that the recovered CVR part was only the chassis. A week later, the Lebanese investigators made another announcement that they recovered the small memory unit of the CVR in deep waters. The Ethiopian team wanted to have access to the memory unit of the CVR before it was packed for shipment. But again this was denied.

This unusual and mysterious process casts serious doubt on the integrity of the investigation. As a result, there is no evidence, which proves that the memory unit of the CVR has reached the laboratory untampered. In fact upon reading out of the memory unit, it was found that the memory chip has two gaps of missing records (one 10 seconds and the other 11 seconds) a total of 21 seconds of records at critical moments of the accident.

Due to serious doubt on the integrity of the CVR, the Ethiopian team requested for recovery of the missing 21 seconds of the record through destructive testing at Honeywell, which is the Original Equipment Manufacturer (OEM) of the component.

MoU signed in January 2011 confirmed that the destructive testing will be conducted at Honeywell. Later on the Lebanese investigators changed their mind and sent the memory chip to BEA facility in Paris and claimed that the prescribed destructive testing could not recover the missing part. The Ethiopian team has not witnessed the claimed destructive testing. Hence, the full conversation among the cockpit crew could not be retrieved and analyzed to contribute for possible cause of the accident.

- **Bodies of victims:** while the bodies of victims could have provided crucial evidence to the investigation process, the bodies which have been recovered on the date of the accident were buried without any medical examination or autopsy, which have provided the necessary evidence to the investigation. The Ethiopian team strongly questioned as to why such normal and standard practice of conducting medical examination was willingly ignored by the State of occurrence.
- **Detailed passengers profile:** passenger personal profile like passport details, immigration record, full residence address, etc..., was denied by Lebanon. This vital information could have helped the investigation process to identify the background and identity of the passengers and this, in turn, could have given some indication if sabotage was involved in-flight.
- **Baggage screening x-ray records, passenger security walk-through records and terminal CCTV recorders:** these were requested by the Ethiopian team. But in the same pattern, the Lebanese officials denied access to these vital documents. The Ethiopian team firmly believes the investigation could not be complete without these evidences.

Overall Review of the Draft Final Report

36. The draft report contains factual inaccuracies, internal contradictions and hypothetical statements that are not supported by evidences and renders an unbalanced account. In the analysis section, unfounded judgments are made, hypotheses are put forward and opinions are expressed, which are not based upon either factual evidence or researched data.

37. The draft report uses selected information and leaves out pertinent facts, critical for determining the probable cause of the accident such as:-
- The data from FDR, CVR and ATC transcript, which indicate disintegration of the aircraft;
 - Significant eye witness accounts and testimonies, including ATC controllers and pilots from other flights in the area, sighting the aircraft in a "ball of fire";
 - 92% of aircraft wreckage, which are all critical to have a full understanding of the circumstances of the accident.
38. The draft report erroneously concludes from an incomplete CVR data reference to subtle incapacitation of the Captain of the aircraft. However, no evidence proving symptoms of this incapacitation from the CVR exists. The CVR and DFDR clearly show that both flight crew members were making active control inputs in an effort to control the aircraft, contradicting this assertion.
39. Contrary to the draft report, good CRM and mutual support among the pilots were recorded in the CVR until it started to have gaps of missing recording at critical moments.
40. The FDR data shows a significant number of uncommanded stabilizer and roll movements without any related control inputs, probably due to damage in the tail section of the aircraft.
41. In view of the foregoing, Ethiopia as State of registry and operator, hereby, submits this official letter and all its attachments be appended in full to the final report.

Summary

42. From the analysis of the data collected from FDR, CVR, ATC recordings and eye witness accounts, the most probable cause of the accident on ET flight 409, ET-ANB on 25 January 2010, was the breaking-up or disintegration of the aircraft as a result of explosion in the air at 1300 ft because of possible shoot down, sabotage or lightning strike.
43. The ATC use of non-standard phraseologies, poor coordination among its units in issuance of clearances and separation among conflicting traffic, and vectoring the aircraft into thunderstorm cell west of the airport, contributed to the accident by adding work load and stress on the pilots.