

ANNEXE 8

Moroni, 27th January 2012

To : HASSAN SOHBI

Accredited Investigator – Yemen

email : has708@yahoo.co.uk

Mob : ++ 967 711713225

Tel : ++ 967 1486173

Dear Sir,

Two years ago IY 626 crashed at Comoros and read out of the CVR and FDR has been in France at BEA. Comorian Government agreed to the Yemen Government a second read out of the CVR and FDR.

Many laboratories have been contacted without success to this request. Since our meeting in the USA at Honewell laboratory, Yemen delegation confirms that Egypt agreed to make the second read out. We have no other information from them. We have requested again to Egyptian laboratory without response.

We have one more month particularly February 2012 to do that request and the progress of Investigation will follow up.

On March 2012, the Investigation will continue the process with the information available:

- Second read out of the FDR and CVR at February 2012
- Analyze of the CVR and FDR at march 2012 with data available
- Analyze of the retrieved aircraft wreckage at mafia in Tanzania and all wreckage to be send at Moroni, Comoros.
- Fan blade analyze and test retrieved at Moroni
- Control of pilot training and competence with the rest of the Crew, Control of Yemenia engineering
- Analyze of autopsy report
- Analyze of surviving report
- Witness analyze
- Test and analyze with fan blade in Moroni at laboratory

The investigation committee cannot ignore any circumstance to be accomplished for the progress of the investigation process to get a Final report.

In accordance with Annex 13 to the Convention on International Civil Aviation, of which Comorian is a signatory, the investigation has not to be conducted so as to apportion blame, nor to asses individual or collective responsibility. The sole objective of the investigation is to establish the cause(s) of the accident, draw lessons from what happened and come with appropriate recommendations that may help to prevent future accidents.

BOURHANE Ahmed Bourhane

IIC, comairdirection@yahoo.fr

Aéroport International Moroni Prince Said Ibrahim

UNION DES COMORES

Unité – Solidarité – Développement

Ministère des Postes et Télécommunication, de la Promotion
des Nouvelles Technologies de l'Information et de la
Communication charge des Transports et du Tourisme

Investigator in Charge

Moroni, 28th March 2012

Dear Accredited Representations of Yéménia Crash,

In refer to the letter dated on 27th January 2012, February was supposed the dead line for the second read out of the CVR and FDR.

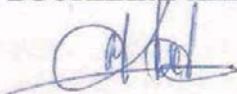
We did get any laboratory replying to make the second read out of 7O-ADJ CVR and FDR.

We invite the BEA to a meeting in April 2012 to validate the factual part of 7O-ADJ crash with the read-out of the CVR and FDR make by BEA in September 2009.

All Investigation team (Yémén, France, NTSB, AIR BUS and Comores) are invited to this meeting in Paris at BEA of which the read out has been done. We Invite all representation to send their contribution in English language by e-mail five working date before the meeting on factual part of the report.

Cordially

BOURHANE AHMED BOURHANE



Investigator In Charge

Aéroport International Moroni Prince Said Ibrahim

BP : 1734, Tél : 00 269 773 10 44

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Mob : 00 269 334 51 08

MORONI – COMORES

Copy : Ministère des Postes et Télécommunication, de la Promotion des Nouvelles Technologies de l'Information et de la Communication chargé des Transports et du Tourisme

Objet : RE: Re : Re: Meeting Invitation in France at BEA laboratory from 21 to 23 may 2012

De : Saandi Anzi Mohamed (cptanzi@hotmail.fr)

À : comairdirection@yahoo.fr;

Date : Samedi 19 mai 2012 19h26

Message bien reçu, j'espère qu'ils changeront d'avis !

A plus...

Anzi

Date: Sat, 19 May 2012 18:07:25 +0100

From: comairdirection@yahoo.fr

Subject: Re : Re: Meeting Invitation in France at BEA laboratory from 21 to 23 may 2012

To: has708@yahoo.co.uk

CC: JONESD@ntsb.gov; Guilhem.NICOLAS@bea-fr.org; christopher.courtenay@airbus.com;

Satelyteabdillah@yahoo.fr; hounadi_abdallah@yahoo.fr; cptanzi@hotmail.fr;

houssensaid@yahoo.co.uk; nakchamy@yahoo.fr; kassim@comorestelecom.km

Dear HASSAN SOHBI,

We have discus with Captain Soidiq and Mr.HOUSSEIN on sunday 13th may 2012 at Hahaya Airport and on board IY flight regarding the meeting and we confirm to him that meeting still on the date with the invitation.

The meeting remain at the same date at BEA in France from 21 may 2012 to 23 may 2012. All party of investigation of IY 626 Crash invited to that important appointment.

Best regards

BOURHANE AHMED BOURHANE

IIC

AEROPORT INTERNATIONAL MORONI PRINCE SAID IBRAHIM

BP : 1734, TEL : 00 269 773 10 44

FAX : 00 269 773 57 10

UNION DES COMORES

De : HASSAN SOHBI <has708@yahoo.co.uk>

À : comAir ASSISTANCE <comairdirection@yahoo.fr>

Cc : ABDILLAH MOUIGNI <Satelyteabdillah@yahoo.fr>

Envoyé le : Jeudi 17 mai 2012 18h12

Objet : Fw: Re: Meeting Invitation in France at BEA laboratory from 21 to 23 may 2012

Dear Mr. Bourhne,

We are still awaiting your reply to our email dated 10 May 2012 f

repeated below.

Best regards

Hassan Abdo Sohbi

--- On Thu, 10/5/12, HASSAN SOHBI <has708@yahoo.co.uk> wrote:

From: HASSAN SOHBI <has708@yahoo.co.uk>
Subject: Re: Meeting Invitation in France at BEA laboratory from 21 to 23 may 2012
To: "Jones Dennis" <JONESD@ntsb.gov>, "NICOLAS Guilhem" <Guilhem.NICOLAS@bea-fr.org>, "christopher.courtenay@airbus.com" <christopher.courtenay@airbus.com>, "comAir ASSISTANCE" <comairdirection@yahoo.fr>
Cc: "ABDILLAH MOUIGNI" <Satelyteabdillah@yahoo.fr>
Date: Thursday, 10 May, 2012, 12:48

**Dear Mr. Bourhane A. Bourhane,
Investigator – in – Charge**

Good day.

Thank you for your email dated 8th May 2012 regarding your invitation to the investigation committee to a meeting at the BEA on 21st May 2012 to validate the factual part of 70-ADJ crash with the BEA first read-outs of the SSCYR and SSFDR without providing us with any documentations.

We would like to respond as herein below:-

Firstly: your letter dated 28 March 2012 attached to your above mentioned email was received by us only on 8th May 2012, **and please note that we do not accept any deadline under any reasons for carrying out the second read-out** of the SSFDR and SSCVR. These read-outs were accepted by the Comoros Government, the IIC and the investigation committee. Also all the phases of the investigation should be professionally and fully completed including the testing of the engine four part blades at a specialised laboratory.

Secondly: Beside the very short notice given to us to attend the meeting at the BEA on 21st May 2012, we prefer to have the meeting in Moroni instead (with enough time notice) as already agreed and where all the facts of the crash are available on ground **SUBJECT TO PARAGRAPH SIXTHLY IN THIS EMAIL.**

Thirdly: We wonder how we can validate the facts which are not available yet or incomplete with incomplete data from the BEA first read-outs of the SSFDR and SSCVR taking into consideration that the investigation committee have not been called for a meeting since the issuance of the interim report (mid 2011).

Fourthly: We list below pending phases of the investigation process they are incomplete or not even started yet:

- 1- Second read-outs of the SSFDR and SSCVR and analysis.
- 2- Detailed testing and investigation of the four engine blades retrieved from the sea and the aircraft tail fin (as the BEA refused Yemeni request to retrieve at least one of the two engines from sea). These blades are in custody with the IIC to be send to a special laboratory for testing and analysis since 9th June 2010.
- 3- Engine investigation and analysis (only photos are available).
- 4- Structural investigation (some parts of the wreckage are still laying in Tanzania up date and some parts are missing).
- 5- Witnesses reports were not analysed though some witnesses reported seeing fire on the aircraft before the crash .of the aircraft.
- 6- The weather conditions prevailing at the time of the accident were not analysed.
- 7- Autopsy report not received yet to be analysed by the Investigation committee.

Fifthly: We believe that the cooperation of all the members of the Investigation is needed in order to complete all the phases of the investigation professionally and to reach realistic conclusions without ignoring any phase of the investigation proces and/or only concentrating on investigating selected items.

Sixthly: It is important to us , to make it clear that we should be assured again by the Investigator – in – charge that any analysis of the first BEA read-outs of the SSFDR and SSCVR will be be carried out simultaneously with the analysis of the agreed second read-out of the SSFDR and SSCVR including memory Chip U16 of the SSCVR.

Please acknowledge.

Best regards

Hassan A. Sohbi.

Advisor to Chairman - CAMA

Accredited Representative - Yemen

UNION DES COMORES

UNITE - SOLIDARITE - DEVELOPPEMENT

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AGENCE NATIONALE DE L'AVIATION CIVILE ET DE LA METEOROLOGIE

Moroni, 1st / 11 / 2012

Dear accredited representation of IY 626 Crash.

A meeting has been done on May 2012 to validate the read out of the CVR and FDR of the A310-300 Registration 7O-ADJ at BEA in Paris.

We invite all accredited representation of the 7O-ADJ (YEMEN, FRANCE, NTSB, AIR BUS and COMOROS) to process of analyses and comment of theses :

- 1) Weather at HAH Airport during the accident
- 2) Airport facilities
- 3) Witnesses' interview
- 4) ATC recording (Transcription) analyses
- 5) History of each crew member training since their ab-initio training
- 6) A copy of the training record for each crew members of 7O-ADJ
- 7) A 310 type rating-followed by the crew members and the name of the training organization
- 8) IY CKM training program followed by the crew
- 9) IY recurrent training program
- 10) Last policing line checking for each crew member (perform 23rd January 2009 captain and 6th June 2009 of the First Officer
- 11) Last proficiency base report for cabin crew member (12th mars 2009 for the captain 22nd may 2009 for the Fc)
- 12) Specific training received by the crew members for Moroni as describe in Yemenia OPS m OPS manual chap 8 . 1 . 2 . 6 . 2
- 13) Was there any specific training for a maneuver at the time of the accident, if yes was it followed by theses crew
- 14) FDR
- 15) CVR

Comments must be arriving not later than 10th December 2012.

Cordially

BOURHANE AHMED BOURHANE
INVESTIGATOR IN CHARGE

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MOB : + 269 334 51 08

MORONI

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AGENCE NATIONALE DE L'AVIATION CIVILE ET DE LA METEOROLOGIE

Moroni, 13 February 2013

THE OFFICE OF THE DIRECTOR GENERAL

To
Mr HAMED FARAG
Chairman, Civil Aviation and Meteorology Authority
Republic of Yemen
SANAA . .

YR ref: IY 626AC/2013

Our ref: N°13-150 CA-10/ACCID/DG/ANACM

R.E.Yemenia Accident on 30 JUNE 2009 at Comoros

Dear Sir,

Pursuant to your letter referred above, we are very surprised to notice that the Accredited Representatives of the Republic of Yemen as State of Registry and of the operator of the A310 aircraft accident at Comoros did not take in account all the steps achieved during the investigation in which they have taken a full participation.

Therefore, we would like to remind you that during all operations and steps of this investigation all the participation of your Accredited Representative and his team were assured and completed.

Your Accredited Representative participated to:

- The beginning of the investigation with the other parties
- The operations of the recovery of the bodies and part of the wreckage from the sea
- The read out of the FDR and CVR at BEA on August, September 2008
- The second read out on the memory chips of the CVR at the USA on October 2010 as requested by your side.



We regretted that you did not participate to the meeting held in Moroni on November 2010 in which you got an invitation. However, all the relevant documents were sent to your Representative in time before and after the meeting (reading and operating of the data's from the recorders).

An other meeting was held at the Bourget (BEA) on May 2012; you were invited but did not participate (validation of FDR and CVR data's).

Regarding what you call « significant areas where further investigation is both necessary and desirable in order to give credibility to the investigation and the published report », we are wondering where and when these can be done and how. You had and have full access to those parties, but not to use it as a mean for the non publishing of the final report of that accident in which most of the victims were from Comoros.

The autopsy reports were just transmitted to us by the French side on November 2012. Accordingly all the legal rights of your Accredited Representative and his advisors have not been denied but were fully complied according to annex 13 of Chicago Convention. At the time being, and in accordance with annex 13 provisions, that draft final report is maintained and your comments and contesting will be annexed. Consequently, we authorize an extension of time of thirty (30) days to the Accredited Representative of the Republic of Yemen for the issuance of the final report, starting on the date of receipt of this letter. If we did not receive a written response to this letter at the end of that extension of time, the final report will be issued.

Sincerely,



BOURHANE AHMED BOURHANE

CC.

- Ministère des Transports
- Mr Jones Dennis NTSB
- Mr Ncolas Guillen BEA
- ESAF-ICAO NAIROBI
- Mr Christopher Courtney. AIRBUS.

ANNEXE 9



*Comments of the Government of the Republic of
Yemen on the Comorian Draft Final Report on
the Accident of 29 June 2009 in the sea off the
coast of Moroni (Comoros) of the Airbus A310-
324 registration 70-ADJ operated by Yemen
Airways (dated 29 December 2012)*

Overview of the Republic of Yemen's Position:

1. The Republic of Yemen maintains that the investigation into the loss of Yemenia flight IY626 on the 30 June 2009 (the Accident) is incomplete for the reasons set out in Part2 - Background section of this document .It is therefore maintained that it is not currently possible to fully identify all the established facts, draw conclusions as to the possible cause or causes of the Accident or to make final recommendations either for the purposes of improving air safety or for the prevention of future accidents.
2. The Republic of Yemen hereby submits comments and observations on the content of the Draft Final Report issued by the Comorian Ministry of Transport and Tourism dated 29th December 2012 regarding the investigation into the Accident (the Draft Report).
3. In accordance with paragraph 6.3 of chapter 6 of Annex 13 of the Convention of the International Civil Aviation Organization (ICAO). The Republic of Yemen demands the amendment of the Draft Report to incorporate all our comments and observations as detailed herein. Should the State conducting the Investigation refuse to include the substance of those comments, the Republic of Yemen requires that these comments be fully appended to the Final Report.

Part 2 – Background:

The following Investigations were not commenced or completed as agreed by the Investigation Committee (IC) before issuing the Draft Report, the same being required and necessary in order to arrive at the realistic cause(s) of the Accident”.

- **Second read-out and analysis of the aircraft’s Flight Data Recorder (FDR)(as agreed by the IC and Comorian Ministry of Transport)**
- **Read out and analysis of memory chip (U16) and second read-out of the Cockpit Voice Recorder (CVR) (as agreed by the IC)**
- **Analysis of Aircraft wreckage**
- **Analysis of engine wreckage and associated performance data.**
- **Engine fan and core compressor parts analysis(retrieved from sea).**
- **Interview with the Accident survivor (Bahia Bakari).**
- **Analysis of witness interviews.**
- **Analysis of autopsy reports.**
- **Analysis of navigation aids, lighting and airport facilities at Moroni.**
- **Analysis of forecast and actual weather conditions at Moroni.**
- **Analysis of the ATC recordings.**
- **Acknowledgement of appropriate flight crew training and experience**

On 25th May 2012 the YIG, pursuant to a request of the Investigator-in-Charge (IIC), submitted a "Preliminary Findings Report". The same was prepared for the purposes of completing and issuing a draft Second Interim Report by the IC.

The YIG requested that the Preliminary Findings Report together with those prepared by the other IC accredited representatives be discussed by all IC participants in Moroni. The YIG request was accepted, however to date no meeting has been arranged. Despite requests no response has been received from the IIC on the substance of the Preliminary Findings Report.

In response to further request from the IIC dated 1st November 2012, the YIG submitted a second report dated 5th December 2012 titled "Preliminary Findings and Responses to the Investor-in-Charge letter dated 1st November 2012". This further report was again prepared with the understanding that it was for the purposes of the IC completing the second draft Interim Report on the Accident.

The anticipated draft Second Interim Report as promised by the IIC has not been received. Without consultation with YIG the IIC has prepared and "issued" the Draft Report (dated 29 December 2012). The YIG were first made aware of the issuing of the Draft Report on or about 5th January 2012, a copy of the Draft Report having been provided to Yemenia Area Manager in Moroni by the Comorian Ministry of Transport and Tourism. The issuing of the Draft Report is premature. Both the IIC and all the IC participants are aware that further investigations and enquiries necessary for the completion of the investigation into the Accident remain outstanding.

It is further noted that the IC have not met in full since October 2010. The YIG have cautioned on several occasions that the Government of the Republic of Yemen will not accept any conclusions reached as to the possible cause or causes of the Accident until the Investigation process has been completed.

The Republic of Yemen demands that the Investigation into the Accident be fully completed. Until completion of all investigations it will not be possible to reach any conclusions as to the cause or causes of the same nor it is possible to make appropriate recommendations for the improvement of flight safety.

**COMMENTS OF THE GOVERNMENT OF THE REPUBLIC OF YEMEN ON THE FACTS
ESTABLISHED BY THE "INVESTIGATION", "CONCLUSION" AND "RECOMMENDATIONS"
SECTIONS OF THE DRAFT REPORT**

Accepted Established Facts:

Notwithstanding that the Annex 13 Investigation has yet to be fully completed, YIG and the Republic of Yemen accept the following established facts as set out in the "Facts Established by the Investigation" set out in the Draft Report.

- The crew held the licenses necessary to perform the flight
- The aircraft had a valid certificate of airworthiness
- The aircraft took off from Sana'a without any known technical problems other than the problem relating to the APU [auxiliary power unit] mentioned below and to the fuel temperature gauge on the left ECAM [Electronic Centralised Aircraft Monitor] which did not work,
- The aircraft took from Sana'a with a delay due to air pressure generated by the insufficient APU, which required resorting to a ground power unit to start the engines; this did not cause operational consequences for the flight other than those due to the delay,
- No problem was reported by the crew at the time of their contact with the controller in Moroni,
- The approach chart mentions that, at night, the crew must check with the tower that the two approach lights are working¹,
- The Domoni approach lights² were not lit at the time of approach ; those at Ntsaoueni were out of order,
- No NOTAM [Notice for Airmen] indicating that the Ntsaoueni lights³ were out of order had been issued,

¹It is not accepted that the lights referred to in these "Established Facts" were approach lights.

²See footnote 1

³See footnote 1

Unaccepted Established Facts:

The Republic of Yemen does not currently accept that the following “Established Facts” as detailed “Facts Established by the Investigation” section of the Draft Report are established.

- No equipment malfunction was identified from the use of the recorders
- At the time of approach procedure VOR DEM [distance measuring equipment] ILS [Instrument landing system] runway 02 following the MVI for runway 20, the aircraft left the localizer axis 0.86NM after the point given,
- At the time of the visual maneuver, the aircraft descended under the MDA [minimum descent altitude] for the MVI,
- In part C of the usage manual of the company Yemenia, it is indicated that Moroni airfield is class C which implies that each member of the crew must complete training and a briefing before performing a flight to this destination. This specific qualification was not discovered in an assessment of the crew file,
- The GPWS SINK RATA, PULL UP and TOO LOW TERRAIN alarms had sounded; the minimal altitude radiosonde registered in this phase of the flight is 161ft; the subsequent procedure to the PULL UP alarm was not applied by the crew,
- The crew raised the landing gear, the flaps and the slats in succession,
- The emergency “alpha floor” protection, then several seconds later the stalling alarm, were triggered; the pitch of the aircraft therefore changed to higher values, namely between 16° and 28°, whereas the altitude remained lower at 1,100ft,
- The aircraft stalled at an altitude of around 1,000 ft without the crew being able to recover control, and then crashed into the surface of the water.
- The two engines were rotating with the power of lift-off at the time of impact; this implies that there was no failure in the two engines until impact.
- The crew did not use headsets below the FL100, as the usage procedures specify; this, added to the bad quality of recording on the cockpit area microphone, means that we cannot understand the verbal exchanges between the pilots during the approach.

CONCLUSION AND RECOMMENDATIONS OF THE COMORIAN DRAFT REPORT:

The derived conclusion as to cause of the Accident as detailed in the "Conclusion" section of the Draft Report are not accepted by the Republic of Yemen and/or the YIG. It is not possible for the IIC or the participants in the IC to reach any conclusions as to the cause or possible causes of the Accident until the outstanding investigation items detailed herein have been undertaken and completed and the analysis of the results has been completed by the IC.

Consequently recommendations 2 and 3 as detailed in the Recommendations section of the Draft Report are neither justified nor accepted as they are currently unsupported by any analysis or findings DFR and in Part 1 of the said report provides no factual evidence on these aspects that could be analysed..

Part 3

ESTABLISHED FACTS AND CONCLUSIONS BASED ON THE INFORMATION AND DATA AVAILABLE TO YIG UP TO 5th DECEMBER 2012

This section of the report provides further details of the areas of investigation which as at 5th December 2012 had yet to be considered or completed by the IC and were therefore ignored or not commented upon in the Draft Report. It is strongly believed that on completion of all the items of the Investigation including the items listed in this section will provide further information which should enable the IC to determine the possible causes of the Accident.

In this regard, the IC, in its search for the causes of the Accident, has failed to consider possible external events that may have interfered with or

compromised the operation or safety of the Accident Aircraft. The possibility of such external events should be carefully studied by the IC.

1. AIRCRAFT WRECKAGE:

During the period 4-9 June 2010, The Technical Working Group prepared a pictorial documents with brief descriptions of the aircraft wreckage retrieved from the sea which had yet to undergo any laboratory testing or detailed analysis. The said document contained three sections, namely Aircraft Structures, Aircraft Engines and Electronics Equipment.

1.1 Aircraft Structures:

1. Wreckage and parts were recovered from beaches and coast waters of mainland Africa. Despite requests from the YIG these items have not been shipped to Moroni nor have they been fully investigated or analysed by the IC.
2. The Nose Landing Gear was retrieved from the sea by the Arres ship and placed in the hangar with the other aircraft wreckage recovered in the Comoros. However the nose landing subsequently could not be located. This situation has prevented carrying out analysis of the Nose Landing Gear.
3. The Tail Fin, especially the Rudder part appears to have sustained heavy damage from engine debris. Part of fan blade and a series of compressor stator blades were found deep in the Rudder Structure. The rear part of the Rudder was heavily damaged with evidence of a large hole. Two of the metallic control rods in the vicinity of the hole were bent. The upper part of the Rudder was possibly broken off in flight. Further analysis should be completed in order to determine the cause and timing of the rudder damage, including any implications for the aircraft's characteristics. Without further investigation it is not possible to rule out the possibility that the damage was caused by a foreign object.

CONCLUSIONS:

1. The breakup of the upper part of the aircraft Rudder and substantial damage to the rear part of the Rudder (big hole), penetration of engine blade material inside the Rudder in-flight would have led to total loss of the aircraft stability and control. It is essential that a more comprehensive analysis of the rudder and engine blade material is completed in order to fully substantiate the timeline for these damages findings and the possibility that this occurred whilst the aircraft was in flight.
2. The substantial damage to the Rudder and its consequences on the aircraft was not investigated by the IC and should be fully investigated and discussed in the Draft Report.

1.2 Aircraft Engines:

1. Several requests were made by the YIG to the BEA to retrieve at least one of the two aircraft engines from the sea. This has not been done.
2. The Pratt & Whitney (the manufacturer of the two engines installed on the aircraft, prepared a report dated 20 November 2009 titled "Aircraft Accident Engine Analysis". This report was prepared on limited information and without physical examination of the engines or recovered parts and is primarily based on four photographs, the first BEA read-out of the FDR (which has yet to be verified by the agreed Second Reading read-out as agreed by the IC and not carried out up to date) and Engine Health Monitoring data.
3. All the Fan Blades with the exception of one (believed to be the left engine) appear to have been ejected forward from the Fan Hub.

4. The Fan / LPC module was separated from one engine (see photos in Appendix A of the "Preliminary Report"). The YIG has requested the further analysis of the possible timing of the separation. If it is established that the separation occurred in the left hand engine and in flight this could have resulted in a substantial loss of Lift, a high roll angle of 75 degrees (as is suggested occurred at approximately 22 hr 53 min 48 sec), a high pitch angle; erratic lateral, longitudinal and vertical oscillations of the aircraft between approx. 22 hr 53 min and 22 hr 54 min.
5. The No: 1.5 Bearing Support on one engine appears to have fractured. The current FDR data (which has yet to be verified by the agreed second reading) appears to show a steady drop of oil pressure on the left engine from 240psi at approximately 22 hr 51 min 40 sec to zero at approximately 22 hr 54 min). The possibility that the fracture resulted from the loss of oil pressure cannot be ruled out without further investigation.
6. The Exhaust Nozzle of one engine had separated. The timing of the separation has yet to be determined. The Exhaust Nozzle has yet to be recovered. Photographs show at least three holes in Exhaust Nozzle. Also the Exhaust Nozzle was ovalised and its outside casing ruptured especially at the area opposite to the larger of the three holes – possibly indicating that the holes were caused by objects that penetrated the Exhaust Nozzle from the outside (see photos in Appendix A of the "Preliminary Findings" report.)
7. Four part engines blades were retrieved from the sea by Arres ship. One part fan blade and a chain of stator blades were found deep in the Rudder. The observations listed herein below were recorded in the Aircraft Wreckage report prepared by the Technical Committee. You may see As a result of which it was decided by the Investigation Committee that these four part blades should be wrapped and handed over to the IIC to be sent to a specialized laboratory for further investigation, testing and analysis (refer to page 42 of the "Aircraft Wreckage" report dated 4-9 June 2010 respect of the:

- Damage to both leading and trailing edges of blades.
- Black spots on the blades

- Yellow, bluish and black pigmentation on the blade surfaces.
- Melted, shining and bright metallic material and droplets on the edges of the blades

The blades were handed to the IIC on the 9th June 2010. The blades remain in the custody of the IIC in Moroni. To date no action taken by the IIC to send them to a specialized laboratory for detailed investigation this despite the continuous follow up by the YIG. The YIG are concerned that further delay in the analysis of the blades could result in their deterioration.

CONCLUSIONS:

1. In consideration of the comments above and contrary to the conclusions reached by Pratt & Whitney in their "report" of the 20 November 2009, it is possible that one or both of the engines suffered a malfunction or damage prior to the impact. The YIG require that a comprehensive investigation of the timing and the cause of the damage sustained to the engines be carried out.
2. The engine investigations are incomplete. The current engine related findings are based on limited information and data.
3. The metallurgical analysis of blades as agreed by the IC has not been done and no reference to the same has been made in the Draft Report.
4. The cause, timing and effect of the separation of the Fan / LPC module and the separation, rupturing and ovalisation of the Exhausted Nozzle has yet to be fully determined. Further engine investigation is required.

5. The causes of the ejection of all the fan blades with the exception of one from the left engine was not fully investigated or mentioned in the Draft Report.

1.3 Electronic Equipment

After retrieval from the sea they received electronic equipment were rinsed three times with fresh water and put in ice boxes filled with fresh water to avoid corrosion. These boxes were stored in a locked container. On 4th June 2010 the equipment was found to have been removed from the boxes and left unprotected within the container. Heavy corrosion and damages were clearly visible on these units. **The same rendering the retrieval of useable data from them doubtful.** No actions were taken by IIC to investigate the interference with the storage of this equipment or its consequences to the investigation process. **No reference is made to the same in the Draft Report.**

CONCLUSIONS:

The corrosion of the Electronic Equipment has rendered the retrieval of useful information from the same doubtful. This should be considered and commented on by the IC.

2. THE BLACK BOXES:

Though the read-out of the FDR and the CVR had taken considerable long time, the data retrieved from these units were incomplete. Data from two memory chips of the CVR could not be read by the BEA. Consequently the Yemeni and Comorian Governments agreed to carry out the complete second read-out of the FDR and the CVR at a laboratory other than the BEA. Such requirement was later agreed to by the other members of the IC.

2.1 FDR:

1. During the first read-out of FDR and the CVR at the BEA Laboratories in Paris, the BEA permitted members of the French Judicial Authority and Police to be present at the BEA Laboratories, despite rejection of such inappropriate actions by the Yemeni and Comorian members. The YIG officially reported this case to the Director of the BEA and expressed their absolute rejection of the participation of members other than the Investigation Committee to be present during the process of opening, read-out and analysis of the Flight Recorders. With reference to ICAO Annex 13 Paragraph 5.4.1, it should be noted that "Any judicial or administrative proceedings to apportion blame or liability should be separate from the investigation conducted under the provisions of this Annex."
2. The agreed second read-out of the FDR has yet to be accomplished.
3. There remain several unread parameters following the first read-out of the FDR.

4. The IC neither participated nor approved the analysis at from the incomplete first read-out of FDR..
5. According to the current FDR data (which has yet to be verified by the agreed second reading), at 22 hr 52 min 49 sec, the recorded selected altitude was 8000 ft . The same indicates that under the prevailing conditions including the absence of natural light (no moon) and un-serviceability of the Threshold Flashing Lights; the lack of approach lights for runway 20 and the un-serviceability of the flashing lights at Ntsaoueni and Domoni, the Pilot-in-Command selected to climb to 8000 ft to make a final decision on whether to abandon the approach and landing on runway 20. The Comorian Civil Aviation should have closed runway 20 for night operations.
6. In addition to the complete black out of runway 20, Landing can still prove difficult because of the frequent changing weather conditions (the changing weather condition can be observed in the wind direction and speed depicted in the non-verified FDR read-out) and the surrounding mountains of the Moroni Island (refer the attached "Preliminary Finding" report).
7. The data listed below (but not limited) which has been taken from current FDR data appears to have been ignored by the IIC in determining the Established Facts and the Conclusion and finalising Recommendations as set out in the Draft Report
 - Oil pressure of Engine #1 dropped steadily from 240 psi at 22 hr 51 min 40 sec to zero at 22 hr 54 min (this sudden change could have resulted in the seizure of bearing No:1.5, break-up of the shaft and separation of the Fan/LPC module in flight).
 - Oil Temperature of Engines #1 and #2 readings prematurely terminated at approximately 22 hr 52 min 54 sec before impact.
 - The large erratic changes of the flight control parameters in the last approximately twelve seconds before the impact.
 - etc..

CONCLUSIONS:

- 1. The first read-out of the FDR did not include all the required parameters.**
- 2. The second read-out of the FDR, as agreed between the Yemeni and Comorian Governments, has not been completed and analysed to-date and means that the investigation process is incomplete.**
- 3. At approximately 22h53min, the alpha lock did not prevent the slates from retarding the angle of attack greater than nine degrees. This could be related to system design fault that was ignored in the Draft Final Report and should be investigated and analysed by the IC.**

2.2 CVR:

- 1. As a result of not reading the CVR memory chip U16. A second read-out of the CVR was carried out by the Honeywell in Seattle in the presence of the accredited representatives in October 2010.**
- 2. Honeywell was unable to read the (U16) memory chip of the CVR in view that it does not have the technical capability and recommended that such reading can be carried out by the manufacturer of the said chip (AMD/SPANSION) in California. Honeywell confirmed that the chip still had stored data. The U16 memory chip was handed over to the NTSB representative for follow up with the manufacturer (AMD/SPANSION) and arrange for read-out of the chip memory. However, the NTSB subsequently declined to support this task.**
- 3. No alternative arrangements have been made to read U16 memory chip to date. The Draft Report overlooks this unaccomplished important task of the IC. The IC should arrange for download and analysis to be completed prior to the issue of the Final Report.**
- 4. The blanks in the CVR Transcription attached to the Draft Report(especially in the last vital thirty seconds before the impact) could be**
- 5. The blanks in the last approximately forty seconds regarding the Pilot/Co-Pilot conversations in the CVR Transcript attached to the Draft Report would appear to claim in the Analysis section, that the crew may be incapacitated. Contrary to that the pilot/co-pilot was audible to the last moment of the impact, which**

clearly indicates that the flight crew were active all through the flight to the moment of impact.

6. Differences were observed between channels 1 and 2 and channel 4 of the CVR; and between recorded events are not equal from channel to channel. This needs a thorough specialised analysis. Also unintelligible sounds in the CVR should be diagnosed by specialist laboratories.
7. The CVR transcript attached to the Draft Report was prepared without the knowledge or participation of the YIG. It is noted that this transcript has omitted certain dialogues and sounds highlighted during review of the YIG. These differences between the transcripts should be reviewed by all accredited members of the IC for comment prior to issue of the Final Report.

Note: In press release to the AFP in February 2010, the BEA stated "that two memory chips of the CVR were not read by the BEA, but they have no importance to know what happened to the Aircraft". However, bearing in mind that the remaining unread chip holds at least some data concerning the critical stages of the flight, the YIG consider it essential that attempts are made to download the data from U16 chip. It is noted that the Honeywell had contacted the chip manufacturer, AMD, who had confirmed that download of the volatile memory was indeed feasible. The YIG therefore require that this download be undertaken and analysis of the data be completed before the issuing of the Final Report.

Conclusions:

- 1. As agreed with the IC the Memory Chip U16 of the CVR is not read up to date, which makes the read-out and analysis and/or conclusions drawn from the CVR incomplete. Arrangements should be made for readout of the chip to be completed at the chip manufacturer, AMD/SPANSION, as soon as possible and to allow members of the IC to review the data before the issue of the Draft Report.**
- 2. The CVR Transcript attached to the Draft Report is considered incomplete and should be fully analysed by the IC as soon as U16 memory Chip is read.**
- 3. Differences were observed between channels 1 and 2 and channel 4 of the CVR; and between recorded events are not equal from channel to channel. This needs a thorough specialised analysis. Also unintelligible sounds in the CVR should be diagnosed by specialist laboratories.**

2. Visual Manoeuvring Procedure (MVI):

- 1. As the title "Visual Manoeuvring Procedure" (MVI) for Runway 20 indicates, it is a visual procedure to be effected under visual conditions.**
- 2. The MVI as depicted in the Comorian AIP and Jeppesen Chart (19-10) titled "CIRCLE-TO-LAND WITH PRESCRIBED TRACKS" is also conditioned for night landing for Runway 20 by the functioning of the two flashing lights at Ntsaoeni and Domoni (both of them were off at the Accident time). A warning depicted in the above mentioned Jeppesen Chart (19-10) states the following:**

"During the last turn flashing lights must always remain left of aircraft".

In the absence of these lights (whether as a result of un-serviceability or the airport's failure to illuminate the same), the MVI procedure becomes invalid.

3. The flight crew of IY626 (MSN) were properly trained and qualified for the circle to land procedure for Runway 20 as depicted in the Jeppesen Chart (19-10). The Pilot-in-Command made 25 flights to Prince Said Ibrahim International Airport in the 18 months prior to the Accident. The First Officer had also made 13 flights to the Airport in the same period. The same demonstrates that both the Pilot-in-Command and the First Officer were familiar with the MVI procedure. This is also evidenced by the Pilot/ATC conversation in the ATC transcript.

4. The aircraft high ground speed from the appreciable downwind significantly hurried events during the MVI procedure.

CONCLUSIONS:

1. The MVI approach became INVALID because of the un-serviceability of the two flashing lights at Ntsaoueni and Domoni.
2. The flight crew of IY626 (MSN535) were aware of the MVI procedure at Prince Said Ibrahim International Airport. As a result of the conditions faced and communicated to them by ATC during the approach the Pilot in Command continued on downwind track without commencing the Right Turn and selected 8000 ft (as depicted in the 1st read-out of the FDR) in order to execute ago around and abandon the landing on Runway 20.
3. In light of the un-serviceability of all the Visual Navigation Aids (Lights at Ntsaoueni and Domoni), the Threshold Lights and the unavailability of an Approach Lighting System; and the existence of frequent changing strong winds in the vicinity of Runway, the Comorian Civil Aviation Authorities should have closed Runway 20 for night landings.
4. The crew learned that neither the flashing lights were not operating at the Circle to Land .

Note: On 8 April 2010, following the Accident, the Comorian Civil Aviation Authorities issued an amended AIP (page 1601 E-6) for Prince Said Ibrahim International Airport by deleting any reference to the Flashing lights including the warning which read as:

"During the last turn flashing lights must always remain left of the aircraft"

The Jeppesen Chart (19-10) was also amended to reflect the amended AIP.

4. Crew:

- 1. The flight crew members of Yemenia flight IY626 (MSN535) were properly trained and complied by the Yemeni Civil Aviation Regulations – YCARs route and aerodromes.**
- 2. The flight crew members possessed the Licenses and ratings required to undertake IY626 scheduled for 29th June 2009 for route Sana'a / Moroni / Sana'a.**
- 3. The Pilot-in-Command of flight IY626 had conducted 25 flights to Prince Said Ibrahim International Airport in the last 18 months prior to the Accident.**
- 4. The First Officer of flight IY626 had conducted 13 flights to Prince Said Ibrahim International Airport in the last 18 months prior to the Accident.**

CONCLUSIONS:

- 1. The flight crew of IY626 was properly trained, experienced with Prince Said International Airport and possess the required Licenses and ratings in accordance with Yemen Civil Aviation Regulations (YCARs).**
- 2. The Pilot in Command of IY626 had undergone special airport familiarization flight into Moroni International Airport as per Yemenia Flight Operations Policy Manual on 9th January 2006 and remained current.**

The sole conclusion arrived at the end of the incomplete Draft Report regarding the flight crew is unsubstantiated and without supportive evidences supporting evidences , including the applicable Yemenia operations manual requirements for training and qualification requirements, supporting flight crew certificates confirming the flight crew were appropriately qualified and experienced to undertake the flight to Moroni. The conditions at the time of the Accident and unsuitability of Runway 20 for night landings, due to degraded/inoperative airport lighting, should have led to runway 20's closure by the Moroni Airport Authorities.

5. AIRCRAFT:

1. The aircraft possessed a valid certificate of Airworthiness and has been maintained in accordance with the YCAR regulations.
2. The aircraft's weight and balance were within operational limits.
3. The aircraft has taken off from Sana'a International Airport without any known technical problems, except for the APU low duct pressure ,which was covered by the MEL and did not have any operational consequences for the aircraft during flight
4. No uncertainty, alert, distress or aircraft fault messages were reported by the flight crew or received by the Control Centers in Dar Essalam, Antananarivo, Moroni Air Traffic Control or to other Airplanes in the area.

CONCLUSIONS:

- 1. The Aircraft was airworthy, possessed a valid Airworthiness Certificate and had been maintained in accordance with the appropriate YCAR Regulations.**
- 2. No malfunctions regarding the aircraft were reported by crew during their entire flight as well as no uncertainty, alert or distress messages were received by the Air Traffic Control Centers in Dar Essalam, Antananarivo and Moroni.**

6. WEATHER:

- 1. The reported visibility by the Moroni Air Traffic Controller to flight IY626 on 30th June 2009 was 10km. However, there was no moon light and the vicinity of the Airport was very dark, with the exception of the Airport lighting.**
- 2. Statements by the Air Traffic Controller and the eye witnesses stated that the night was dark with no moon to provide any natural light.**
- 3. Contrary to the reported surface winds notified by Moroni ATC to flight IY626 as 25 kts gusting to 35 kts, the first read-out of the FDR carried out by the BEA revealed that flight IY626 encountered upper winds gusting from 25 kts at**

approximately 22 hr 53 min, to more than 60 kts at approximately 22 hr 54 min. During this period the wind direction changed from 160 to 240 degrees (which indicates that the aircraft could have encountered a wind shear). A dangerous weather condition that has not been considered in the Draft Report.

CONCLUSIONS:

1. During the time period from approximately 22 hr 53 min to 22 hr 54 min IY626 encountered upper winds gusting from 25 kts to more than 60 kts. During that period the wind direction changed repeatedly from 160 to 240 degrees. This condition indicates the possible presence of wind shear.
2. In addition, the un-serviceability of the Visual Navigation Aids (Flashing Lights at Ntsaoueni and Domoni), the un-serviceability of the Threshold flashing lights and the lack of an Approach Lighting for Runway 20, the Flight Crew of IY626 was confronted with total blackout.

7. AIRPORT FACILITIES:

RUNWAY 20:

1. White threshold lights for Runway 20 were unserviceable.
2. There are two flashing lights installed north of Runway 20 as depicted on Comores Union AIP chart for circle to land Runway 20 and on Jeppesen 19-10 chart. The northern flashing light (white) is located at Ntsaoueni and was unserviceable with no NOTAM issued and the other one is green located at Domoni and at the time of the accident was put off with no NOTAM issued.
3. No Approach Lighting System ALS installed for Runway 20.
4. For the arrival procedures in the Republic of Comores AIP and in Jeppesen Chart (19-10) titled "CIRCLE TO LAND WITH PRESCRIBED TRACKS", the following warning was depicted:-

"DURING LAST TURN FLASHING LIGHTS (referring to the two flashing lights at Ntsaoueni and Domoni) MUST ALWAYS REMAIN LEFT OF THE AIRCRAFT".

In the case of Yemenia IY626 on 30th June 2009, one flashing light was unserviceable the other one was off without issued NOTAMs.

CONCLUSION:

Given all the above mentioned critical lighting discrepancies for Runway 20, the Comorian Civil Aviation Authority should have declared Runway 20 closed for night landings.

8 – AIR TRAFFIC CONTROL:

- 1. The Air Traffic Controller announced suddenly and lately Runway 20 in use without consideration to the lack of approach lighting system for Runway 20, the dark night conditions, the several unserviceable visual aids (two flashing lights installed north of Runway 20 – one located at Ntsaoueni and the other at Domoni as depicted on the Comorian AIP and Jeppesen chart (19-10), the unserviceable flashing threshold lights for Runways and the high mountain obstacles surrounding Moroni Island (highest obstacle is situated South-East of the Airport with elevation of 3566 ft).**
- 2. Radio Telephony (RTF) transmission of the ATC to the aircraft was rather weak (the words "say again") was repeated several times by the flight crew.**
- 3. The ATC should have made continuous calling from the loss of contact with the aircraft that could remind the flight crew to report any abnormal situation, but**

rather than that the ATC and started communicating with other traffic by non-standard languages unknown to Yemeni flight crew.

CONCLUSIONS:

The Air Traffic Controller announced suddenly and lately runway 20 in use without consideration to the unavailability of an approach lighting system for runway 20, the dark night conditions, the several unserviceable landing visual aids (the two flashing lights at Ntsaouini and at Domoni, the high obstacles terrain in the vicinity of the Airport. Such conditions should have led to the closure of runway 20 by the Comorian Civil Aviation Authorities.

9 . EYE WITNESSES:

1. Most of the eye witnesses interviewed by the Human Factor Group reported that they had seen fire and flames on the Aircraft – also Bahia Bakari, the only survivor of the accident, stated that she felt her body burning (for details of the eye witnesses' statements refer to Part (3) Appendix (B).
2. Medical reports on Bahia were not revealed to YIG despite the many requests.
3. Copies of the Autopsy Report referred to at page (51) in the Medical and Pathological Information Section of the Draft Report was not given to the YIG.

despite repeated requests. The YIG is therefore unable to comment on the finding herein below:

"In one case the existence of burn is observed, without being able to conclude on origin of these burns."

Note: Signs of black pigmentation was also seen on the part fan blades retrieved from the sea, but no laboratory testing on such item was carried out by the IIC up-to-date.

CONCLUSIONS:

1. From the beginning of the Investigation process into IY626 (MSN535) Accident, no fire or explosions investigation was carried out by the IC
2. It is important that the investigation into the occurrence of fire and/or explosions be carried out fully and properly and in depth by the IC as it was ignored and dismissed in the Draft Report.
3. The Witness Interviews Report prepared by the Human Factors Group formed and approved by the IC was ignored, probably for the reasons most of the witnesses reported seeing fire and flames on the aircraft (refer to PR part 4 Appendix B).

10. Impact Information:

The Draft Report ignored the study of the exact altitude at which the aircraft was disintegrated and the reasons for the large dispersion of the aircraft wreckage.

11. Fire:

1. The statement made in paragraph 1.10 (FIRE) of the Draft Report contradicts with paragraph 1.9 of the said Report where it was stated that in the Autopsy Report; quote: "one individual was found to have burns" unquote.
2. Furthermore, the statements made by the Eye Witnesses that "they have seen fire and flames on the aircraft" and the observations made by thee IC in the Wreckage Report regarding the presence of black pigmentation on the retrieved fan blade were also ignored in the Draft Final Report.

APPENDIX TO PART 3

FURTHER COMMENTS ON THE COMORIAN DRAFT REPORT

As noted from the aforementioned Comments, the Republic of Yemen strongly considers that the investigation has not been completed and that further investigation might well reveal evidence that alters the content and findings of the Draft Report. However, it is believed that the IIC/Government of the Union of Comoros plan to publish the Final Report, and therefore have no choice but to make the following further comments on the Draft Report, although we do not agree with all of its content. With this proviso throughout, the following representations are made.

1.1 Introduction

The following changes and additions requested are for insertion in the text of the Draft Report. As the Draft Report is not line numbered, the location of each item is in general referenced (for the English Translation of the Draft Report – as appended to this Appendix) to: the Page No (and decimal indication of position on the page) - the Section No - and the paragraph No of the Section. Thus the reference for each submission consists of: Page No.position - Section No - Paragraph No, *eg* Page 12.7 - Section 1.2.4 - Para 3.

The new text requested is in black font, with adjacent parts of the original text of Ref 1 in blue font to assist with location. The Proposed content is within quote marks: "..."

Note: Font colours, in text below:

Blue - Draft Report text

Some of the suggested changes possibly relate to the terms used in the translation of the Draft Report into English.

1 Changes Requested

1.2 Warning

Page 5.1 – WARNING – Para 3:

It is requested, for clarity:

"It should be noted that the times indicated in this report are Universal Coordinated Time (UTC); local time in the Comoros was UTC+3 hours".

1.3 Summary

Page 9.6 – SYNOPSIS – Para 3:

As currently presented, the Synopsis provides a summary only of the basic circumstances of the accident and the initial phases of the Search and Rescue operations. We consider that to be a true Synopsis, *ie* a summary of the investigation, the principal known relevant features of the accident circumstances and its background, and of the analysis, findings and conclusions of the investigation should also be included. I therefore request the following addition:

"... which instigated the first search and rescue operations. These located and rescued a single survivor on the following morning.

The evidence showed that the pilots were forced to abandon a routine precision Instrument Landing System (ILS) approach and landing on the northerly runway at Moroni when information from the Moroni Air Traffic Control (ATC) controller late and suddenly in the joining procedure made it apparent that the tailwind would be excessive.

They decided to use the southerly runway instead, following an approved non-precision procedure employing radio beacon signals and two on-shore flashing lights beacons for position information, as this runway was not equipped with an ILS. The runway had a minimal lighting system and no approach light pattern. Late in the approach, after misunderstandings in RT exchanges with the ATC controller, the crew learned that neither on-shore flashing lights was operating, although the Comoran authority responsible had not previously notified either as inoperative.

The aircraft experienced appreciable turbulence during the procedure, as the wind was gusty and changing direction, and the substantial tailwind component had the effect of appreciably hurrying events.

The aircraft design did not include stall recovery facilities that would operate while slats and flaps were up. 70-ADJ descended in a stalled condition and impacted the sea.

Both pilots were correctly qualified, current and checked, and both had considerable experience and had previously conducted multiple night flights to Moroni.

The evidence indicated that the operator's systems for training, qualifying and checking pilots were sound and that the Yemeni regulator had applied appropriate systems for monitoring the operator. Both systems appeared consistent with normal industry standards."

1.4 1.1.1 Execution of the flight

Page 10.4 – Section 1.1.1 – Para 1:

It is requested, for completeness:

"Note: the times used in this report correspond to the time of the FDR and CVR. The times of communications of air traffic control of Moroni are 26 seconds ahead in relation to that of the FDR and CVR."

Page 10.9 – Section 1.1.1 – Para 8:

It is requested, for accuracy, and to correspond with the wording in Appendix 4 of the Draft Report, *Transcript of radio communications with the Moroni control tower*, and Appendix 6, *CVR Transcript*:

"It asked for confirmation that the flashing light is on for runway 20."

1.5 Section 1.3.1 Captain

Page 12.9 – Section 1.3.1 – Para 2:

It is requested, for accuracy, and to correspond with the wording on the Medical Certificates:

"Last medical examination (FAA Class 1 and YCAMA Class 1): 24 March 2009 with the restriction "must possess corrective glasses for near vision."

Page 13.2 – Section 1.3.1 – Para 2:

It is requested, based on information from Yemenia:

Experience in Moroni: 61 flights since January 2006, of which approximately 39 flights involved landing at Moroni at night. Four of the night landings at Moroni were during 2009.

1.3.1.3 Captain's Background

The captain underwent A310 Transition Training in 2005. Instructors marked his performance in all of the multiple topics in each training session as 'Good' or 'Very Good', and he required no remedial training sessions.

He scored highly in the Final Quiz Examination, and passed the training with a final assessment by the training organisation of 'A – Above Average', and a comment of 'good performance'. He was released on line as an A310-300 captain on 23 October 2005.

The training undertaken by 7O-ADJ's captain included simulator practice in MVI approaches. These were based on the procedure recommended by Airbus, and coincided with the published Jeppesen approach chart for Runway 20 at Moroni used by the operator.

The captain received the operator's Special Airport qualification for Moroni (Section 1.13.1.3) in 2005, and the frequency of his subsequent flights there had fulfilled the conditions for this to remain continuously valid. As the approach and runway used for each landing are not routinely recorded, complete data on the total number of approaches that the captain had made using the MVI procedure for Runway 20 at Moroni were not available. However, a number of the operator's First Officers recalled having acted as co-pilot when 7O-ADJ's captain had conducted this approach. In two cases the First Officers' flying logbook entries provided confirmation, for 8 June 2008 and 21 August 2008 respectively.

In December 2008 the DGAC of France, after having examined and assessed the operator's training and checking arrangements, validated the captain's Licence, in relation to the dry lease by the operator of two French registered A310 aircraft.

During his subsequent line flying he had not been associated with any safety reports or disciplinary action. The operator's FDM analysis had not indicated that his performance was deficient in any way. "

1.6 Section 1.3.2 Co-pilot

Page 13.5 – Section 1.3.2 – Para 2:

It is requested, for accuracy:

"Last medical examination (FAA Class 1 and YCAMA Class 1): 26 May 2009 with the restriction "must wear corrective glasses for near vision."

Page 13.7 – Section 1.3.2 – Para 2:

It is requested, based on information from Yemenia:

“ Experience in Moroni: 36 flights since January 2006, of which approximately 18 flights involved landing at Moroni at night. Two of the night landings at Moroni were during 2009.

1.3.2.3 Co-Pilot's Background

The co-pilot underwent A310 Transition Training in 2003. Instructors generally marked his performance as 'Acceptable' or 'Good'. At times he required additional training in some areas, which was attributed to his lack of any previous experience with turbo-jet aircraft and was not considered unusual for a trainee with the co-pilot's type of background.

The additional training generally related to aspects of aircraft handling. He was variously marked in relation to both *Crew Coordination* and *Support of PF* (Pilot Flying) as 'Good'; and in relation to *Task Sharing - Crew Coordination* as 'Good' or 'Very Good'. He passed the training with a final assessment by the training organisation of 'Satisfactory' and was released to line flying as a co-pilot on 13 December 2004.

As for the captain, he had retained the operator's Special Airport qualification for Moroni continuously since 2005.

In December 2008 the DGAC of France validated his Licence, as for the captain.

A Proficiency/Qualification Check by Yemenia on 22 May 2009 marked the co-pilot as 'B - Average' and he was further rated as 'Satisfactory' on the CAMA Proficiency/Qualification Report.

During his subsequent line flying, as for the captain, he had not been associated with any safety reports or disciplinary action, and nor had the operator's FDM analysis indicated any deficiencies in his performance. “

Page 17.3 – Section 1.4.7 – Paras 2 & 3:

It is requested, for clarity:

“ The fuel temperature indicator on the left ECAM had not worked since 21 June 2009. Flying however remained approved for ten days in compliance with both the operator's approved MEL and the Airbus Master Minimum Equipment List (MMEL).

Upon departure of the aeroplane, the air pressure generated by the APU was low and did not provide sufficient power to start up the engines of the aeroplane. The pilot then asked for the help of a ground power unit. The APU was intended to supply utility services for ground operations and was not required to be operable for flight, under the operator's approved MEL and the Airbus MMEL. “

1.7 1.4.8.4 Adjustment of the Trimmable Horizontal Stabiliser (FCOM 1.09.12)

Page 24.5 – Section 1.4.8.4 – Paras 2 & 3:

It is requested, for clarity:

“ . . . orders an aircraft nose-down order in order to avoid reaching an excessive angle of attack. Although available at low speed, this function is designed for a high number of mach. The modification to the aircraft nose-down adjustment is thus limited to 0.7° at a maximum rate of 0.8°/s. This function is available when the automatic pilot is disconnected (or in CWS mode), in clean configuration, airbrake command in “retracted” position. It is activated when the angle of attack exceeds 11° (for low numbers of Mach).

At low speed, the “Stall Trim” and “Theta Trim” functions of the FAC can generate an aircraft nose-down order on the THS. The”

1.8 1.6 NAVIGATION AIDS

Page 27.1 – Section 1.6 – Para 5:

The evidence makes it clear that full information on the Obstruction Flashing Lights is relevant. It is requested:

“ Two obstruction flashing lights were installed on land to the north of the aerodrome to help crews with landing (see Appendix 3). The light furthest to the north (Ntsaoueni) is white. It was not working.

That located to the south of the first (Domoni) is green. It was in working order but was not switched on. The controller cannot switch it on from the control console of the tower. A technician must go on site before the arrival of the aeroplane to switch it on and ensure the electrical backup (batteries).

The purpose of these lights was to provide visual references for pilots landing at night using the MVI procedure for Runway 20. These lights were intended to prevent aircraft from straying towards the mountains close to the east side of the specified pattern, by providing visual guidance for pilots during the turn from the downwind leg onto the final for Runway 20.

The flashing lights formed essential visual aids for the procedure, as specified on the Jeppesen MVI Runway 20 maps (see Appendix 3). Notification that the Ntsaoueni flashing light was inoperative had not been made and was therefore not indicated in any NOTAM. “

Page 27.3 – Section 1.6 – Para 7:

It is requested, for clarity:

“ The other landing aids for Runway 20 consisted of lights marking the threshold and PAPI lights. The lights marking the threshold were not working (NOTAM A0478/09). “

1.9 1.7.1 Information on the aerodrome

Page 29.3 – Section 1.7.1 – Para 2:

It is requested, for accuracy:

“ intensity. The runway end lights are one-directional. There is no centreline lighting. The wheel touch-down zone also has no light beaconing. Runway 20 has no approach lights. The lights marking the threshold of Runway 20 were installed, but these had been notified as inoperative almost 4 weeks before the accident (See paragraph 1.6 Navigation Aids). “

Page 29.8 – Section 1.7.1 – Para 6:

For completeness it is requested that the issue dates of the NOTAMs be added:

“ The flight preparation log contains, among others, the following NOTAMS:

NOTAM A00478/09: SEQUENCED FLG LGT RWY 02 AND RWY 20 OUT OF SERVICE
– issued 2 June 2009
NOTAM A00309/09: LOCATOR ‘HA’ 316.5KHZ OPERATING ON A SINGLE SET –
issued 26 June 2009
NOTAM A00502/09: LOCALIZER HAI 110.3 MHZ OPERATING ON A SINGLE SET –
issued 24 June 2009"

Page 29.9 – Section 1.7.1 – Para 6:

It is requested that the last sentence of the paragraph be modified to provide the information in a neutral way that is appropriate to the Factual Part 1 of the Report. It is further requested that this include the same wording as on the charts and same font weight (plain) :

"Prior to 7O-ADJ's accident, no NOTAM had been issued specifying that the Ntsaoueni light was not working. NOTAM A0550/09 informing that the light was unserviceable covered the period from 8 July 2009 to 8 October 2009 and was therefore not in force prior to the accident. The AIP and the Jeppesen charts each had a note: "NIGHT LANDING: Confirmation from Tower required that Flashing lights are operative".

1.10 Flight Recorders

Page 31.2 – Section 1.7.2.1 – Para 17:

" With regard to U16, the attempts were fruitless. However, proposals were put forward for the extraction of the data in the American universities or by the manufacturer AMD/Spansion. The Inquiry Committee intends to investigate these proposals and, if possible, use these facilities to obtain the missing data. " This has not been done.

Page 51.8 – Section 1.9:

Inclusion of a factual summary of the pathological and toxicological findings of the autopsies on all recovered remains is requested. In the known circumstances of the accident this must be considered an essential part of the Investigation Report.

Page 56.1 Para 0:

The addition of the following sections at the beginning of Section 1.13 of the Draft Report is therefore requested:

"1.13 Information on the organisations and the management

1.13.1 Operator

Yemen Airways (Yemenia) conducted commercial air transport operations under the authorisation of an Air Operator Certificate (AOC) issued by YCAMA, Republic of Yemen, first issued in 1996. A condition of the AOC was the maintenance of comprehensive systems aimed at ensuring safe operation.

1.13.1.1 *Yemenia's Operations Systems*

YCAMA approved Yemenia's Operations Manual, Part A of which defined the systems for managing and controlling the operations and specified the accountable managers. 1.13.1.2

Pilot Training

The following outlines the operator's systems and processes applicable to 70-ADJ's flight crew members.

1.13.1.2.1 Pilot Selection

The operator's process for selecting new pilots was through a Pilot Selection Board. It involved thorough assessment of piloting qualification, technical skills, experience, together with their personality and attitude, including psychometric assessment. The assessment was completed by individual personal interviews with the Pilot Selection Board (Ref: Yemenia Operations Manual 'D', Section 2.2).

1.13.1.2.4 Pilot Type Rating Training and Qualification

To gain a Type Rating the operator required a pilot to undertake an Aircraft Systems Course of ground training and a programme of Simulator Training, and to achieve satisfactory results in a series of associated exams and assessments. A trainee who passed the course then followed this with Initial Operating Experience, Line Training flights and a Release Check flight in order to qualify and obtain a Release to Line Flying qualification as First Officer (Ref: Operations Manual 'D' - 3.5.1).

1.13.1.2.5 Pilot Promotion to Command

In order to be considered for a command position, the operator required a pilot to complete 3000 flight hours as First Officer, and to have achieved satisfactory results in their last two proficiency Checks and last two Line Checks. If the Pilot Review Board assessed the pilot as suitable for command, he would receive additional Ground School training and Upgrade Training, in addition to training for the relevant Type Rating if he did not already hold this. This would be followed by Initial Operating Experience flights, Line Training flights under supervision over 8 flight sectors, and two Release Check flights. If the assessments in the course of the training and checks were satisfactory, the pilot could receive their Release to Line Flying qualification as captain.

The operator's Safety Management Systems in the period leading up to 70-ADJ's accident included three processes, as described in the Safety and Quality Assurance Manual, Chapter 2.

1.13.1.3.1 Reactive Processes

The operator investigated any anomaly encountered in their operations and provided, as appropriate:

- An Investigation Report
- A Mandatory Occurrence Report
- An Air Safety Report
- A Safety Audit Report

In addition, the operation was subject to a Quality Audit every 24 months, with a Quality Audit Report produced.

1.13.1.3.2 Pro-active Processes

The operator had processes in place to encourage a pro-active approach to safety, including:

- Voluntary reports
- Confidential reports
- Hazards reports

1.13.1.3.3 Predictive Processes

The operator had systems in place aimed at monitoring its operations for anomalies, and taking steps to correct any that were revealed:

- Flight Data Monitoring (see Section 1.13.1.3.4)
- Line Operations Safety Audits
- Regular Safety Performance Indicators
- Regular Safety Committee Review, every 6 months

1.13.1.3.4 Operations Performance Monitoring

The operator's Safety & Quality Assurance Manual, Chapter 1.4.7 provided information on the systems for regular monitoring of operational performance:

Flight Data Monitoring (FDM), using the Airbus AirFASE FDM Tool had been implemented and was in progress for all the operator's aircraft, including the A310 fleet. The system provided automatic analysis of flight data, and reports of operational exceedances or abnormalities in various phases of flight. The analysis included the descent and approach phases for the A310 fleet. The intent was to identify aberrant crew performance, deviating from the operator's requirements and specified standards, during routine line flying.

1.13.1.3.5 Safety Audits of the Operator

Recent external audits of the operator were as follows:

2009 External Audit:

- | | |
|----------------------|------------------------|
| Audit Date | - 29 to 31 August 2009 |
| Auditor: | - Quali-audit |
| Audit Report No | - IYE-AUG09 |
| Adverse Findings: | - Zero |
| Yemenia action taken | - No action required |

External Audits under IOSA (IATA Operational Safety Audit)

Yemenia has undergone four ISOA Audits in years 2006, 2008, 2010 and 2012.

During the period 1997 – 2009, the operator operated two French-registered A310-300 aircraft. In this period the DGAC undertook the regular monitoring and auditing of the operator's maintenance facilities and Flight Training Centre.

1.13.1.3.6 Other - Component Repair and Overhaul

The operator used the original equipment manufacturer (OEM) to repair and overhaul its engines, at the OEM's Overhaul Centre, with the aim of ensuring high quality. This applied to engines manufactured by Rolls Royce, Pratt & Whitney and International Aero Engines.

Similarly, the operator's landing gears were overhauled by the OEM, Messier-Bugatti-Dowty, France.

For other components, the operator generally used major aircraft maintenance organisations, such as Lufthansa Technik and Air France.

1.13.1.3.7 Policy Related to Go-Around

Yemenia's Operations Manual, Part A, noted that "*No disciplinary action whatsoever will be taken against any crew that elect to Go-Around for the above reasons*". 1.13.1.3.8
Policy Related to Diversion

Yemenia's Operations Manual, Part A, noted that "*If a flight cannot be operated to the planned destination for any reason, a diversion shall be made to the most suitable alternate airport. Flights may be diverted due to:*

- i. Operational or weather conditions which prevent the completion of the planned operation.*
- iv. Any other circumstances that the Commander or OCC considers warrants a diversion."*

1.13.1.3.9 Pilot Qualification for Operation to Moroni

The operator had designated a number of destinations to which their flights operated which might in some circumstances have more challenging features as Category C 'Special Airports' (Section 1.13.1.3). The operator's Flight Operations Policy Manual (FOPM) (Ref 2, Pages 3.01.24 & 3.01.25, valid from early 2006) designated Moroni in this category.

The operator required pilots to be specifically prepared for a Special Airport, and expressly qualified by)Operations department , before operating to it. The preparation included special briefing, or performing a takeoff or landing with restricted weather minima, or taking off and landing under the supervision of a captain currently qualified for the airport.

The FOPM specified that, once a pilot gained the qualification, he would refresh it by operating to the Special Airport, but that the qualification would otherwise lapse after 12 months."

1.11 2 ANALYSIS

Page 65.1 – Section 2.1.1 – Para 7:

For clarity, the following is requested:

" runway 20 beacon. The controller confirmed that they were not in use. The controller was referring to the threshold lights for runway 20, while the crew, on the other hand, were almost certainly referring to the obstruction flashing lights at Ntsaoueni and Domoni used in order to mark out the last turn of the MVI.

Indeed, the crew had already been informed by the NOTAM that the threshold lights for Runway 20 was not working; on the other hand the instructions on the approach chart used by the operator state that the crew must make sure that the obstruction flashing lights at Ntsaoueni and Domoni are turned on. There was therefore probably a misunderstanding between the controller and the crew as to which lights were being referred to. (Note: recently

the reference to flashing lights and the note to confirm the operational status of the flashing lights has been removed from the approach chart)".

Page 65.3 – Section 2.1.1 – Para 8:

The pilots request for the controller to adjust the lights to maximum intensity would probably be fairly typical in the circumstances, where it was necessary for the crew to maintain visual contact with the runway throughout the approach procedure in order to continue with the approach. A crew might well ask for runway lights to be at maximum brightness in order to maximise the probability of maintaining contact. It is therefore requested:

" At the end of this conversation, taking into account the certainty expressed by the controller, the crew probably believed that the lights in Domoni and Ntsaoueni were switched off. They requested the runway lighting to be at its maximum intensity, probably with the aim of maximising the likelihood of maintaining visual contact with the runway throughout the approach procedure. "

Page 65.3 – Section 2.1.1 – Para 9, 10 & 11:

It is considered that pre warning to the pilots that there might be problems with the illumination of either or both obstruction flashing lights would have significantly increased the probability that they would have planned in advance the action that would be appropriate if one or both were not illuminated on their arrival. It is therefore requested:

" At the end of this conversation, taking into account the certainty expressed by the controller, the crew probably believed that the lights in Domoni and Ntsaoueni were switched off. ~~They then enquired about the maximum intensity of the runway lighting; they had difficulty locating the runway even though visibility was 10 km. [see request above]~~

A pre warning to the crew by NOTAM that one of the flashing lights was not working would have greatly increased the probability that they would have planned in advance the action that would be appropriate if one or both were not illuminated on their arrival. It is much more likely that their decision would have been to refuse the Runway 20 approach, had the decision been made at leisure and not late in the approach, in very busy circumstances and under extreme time pressure."

Page 65.8 – Section 2.1.2 – Para 2:

It appears that the appreciable groundspeed, while not unexpected, might well have been a significant factor. I therefore request:

" During the descent, the aircraft's configuration (slat at 15°, flaps retracted) had the consequence of limiting the indicated reduction of speed: this remained close to 180 kt despite a selected speed of 170 kt. Given the 30 kt tailwind, the groundspeed would have been comparatively high, at around 210 kt. The resultant hastened speed of events would have tended to act as a stressor on the crew and reduced their opportunity to consider their decisions and actions, and was probably a significant factor. "

Page 66.3 – Section 2.1.2 – Para 4:

The following is requested:

"... engaged for descent, the crew's intervention was vital in order to stop the descent. The fact that a vertical descent speed was maintained probably indicates that the crew wished to continue the descent towards the MDA.

It is also possible, given the gusty wind, that an appreciable level of turbulence during the procedure might have led to some of the inappropriate selections described above, and the ones that occurred subsequently. "

1.11.1 2.1.4 Crew Qualification, Training and Assessment

Page 70.7 – after Section 2.1.3:

Each of 7O-ADJ's pilots was fully qualified to conduct the flight. No evidence was found to suggest deficiencies in Yemenia's training or safety management systems; the evidence indicated that they were in accordance with normal industry standards, and had been approved by the Yemeni regulator. YCAMA used systems for monitoring operators under their control that were similar to those used by other regulators, and no evidence was found to suggest that they had not been correctly applied or that YCAMA's monitoring had been deficient.

The evidence indicated that the qualifications of each of 7O-ADJ's pilots had followed training, assessments, certification and recurrent checking that had been in accordance with requirements. No evidence was found to suggest that deficiencies in their performance on the accident flight had resulted from defects in the qualification or checking processes or practices. Each pilot was highly experienced, highly familiar with the aircraft and the AFCS, and had previously successfully conducted many hundreds, and quite possibly thousands of flights, without any evidence from these, their checks or FDM analysis to suggest faults in their performance.

Training naturally involves a large element of preparing a pilot to deal with unexpected and emergency situations, together with frequent checks test their ability in this regard, as far as possible. Although much effort is applied to developing and practicing these piloting skills, it is self-evidently not possible to create fully realistic emergency situations in training. Thus the first true test of a pilot's ability to deal appropriately with an emergency will occur when they experience a particular emergency situation in actuality. No ways can be envisaged in which testing of reactions to emergency situations could be definitive."

CAMA OVERSIGHT

CAMA used systems for monitoring operators under their control that were similar to those used by other regulators, and no evidence was found to suggest that they had not been correctly applied or that CAMA's monitoring had been deficient"