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COMMENTS

on the AIR Inc. accident investigation report Martinair MP495 accident 21 Dec. 1992, AIR File #7355, 23 July 2013

References

A - ACCIDENT INVESTIGATION & RESEARCH 'S INDEPENDENT INVESTIGATION INTO THE MARTINAIR DC-10, PH-MBN ACCIDENT AT FARO, PORTUGAL, 21 DECEMBER 1992. AIR File #7355, 23 July 2013, attached.

B - Analyse ongeval Martinair DC-10-30F, MP495 Faro 21 dec. 1992 (or its translation), downloadable from website www.avioconsult.com.

Introduction

This report presents a limited number of comments on the report of the 'independent' investigation & research into the Martinair DC-10 accident at Faro Portugal by AIR Inc. (ref. A). The full AIR Inc. report, including tables, figures and comments in text boxes, is included in the Attachment.
The analysis of the accident by Avio*Consult* (ref. B) is downloadable in the Dutch language from website www.avioconsult.com. A translation in the English language was obviously made available to AIR Inc., and might become available for download soon.

In this cover letter, only the first chapter of ref. A is discussed. Comments on the remaining chapters are included in the many textboxes in the Attachment. In addition, the conclusions by AIR Inc. (with comments following a ●) are included below as well as the conclusions and recommendations by Avio*Consult*.

1. AIR Inc. Report, Chapter 1. Introduction.

1.1. This chapter concludes with the following paragraph:

The Horlings' Report attempts to blame the crew for causing, or allowing the aircraft to develop, sufficiently adverse aircraft performance (i.e. adverse flight parameters) to cause the accident. This AIR Report assesses Horlings' key claims. It is clear to AIR that Horlings' opinions and conclusions are not based upon his completing a detailed and independent scientific analysis of the available recorded data. Horlings did not even attempt to scientifically determine the se-

quence of events leading to the accident. He simply came to a series of what he considers to be significant conclusions without completing a proper scientific analysis to support each conclusion. AIR studied Horlings' "conclusions" and, after comprehensive review, considers them to be totally erroneous. Specifically, Appendix "A" to this AIR Report addresses a number of Horlings' erroneous and unsupported conclusions.

This paragraph is considered an invitation to present a more thorough description of Horlings' education and experience:

- Horlings is a graduate of the USAF Test Pilot School (TPS), Edwards Air Force Base, CA, Class (19)85A, the highest level flight and flight-test training available in aviation worldwide, and was qualified to prepare, lead, conduct and report on experimental flight-tests with all types of fixed wing airplanes, even during their maiden flight. The entry level was an MSc or a BSc degree in engineering plus an entry exam, besides at least 1,000 flight hours. During the one year long course, the students are taught to test and evaluate the performance (including glide path performance and stability), flying qualities and onboard systems, like Control Wheel Steering (CWS) and Auto Throttle System (ATS) of fixed-wing airplanes. During the TPS course, Horlings even logged 10 hours on a KC-10 airplane (DC-10 derivative) besides 120 hours on 22 other different types of airplanes and helicopters. During most (experimental test) flights at TPS, data had to be acquired and stored on tapes of on-board data acquisition systems just like the Digital Flight Data Recorder (DFDR or black box) in MP495. Following the test-flights, the data on the tapes had to be reduced and evaluated, and used for making graphs that had to be included in written reports, totaling up to 32 graded reports in addition to 32 graded exams total in that one year.
  Horlings subsequently had a flight-test assignment for 15 years, the last 5 years as chief experimental flight-test of the Royal Netherlands Air Force (RNLAF) during which many reports had to be reviewed of test pilots, flight test engineers and of scientific institutions (like the National Aerospace Laboratories (NLR) in Amsterdam), and of manufacturers, including McDonnell-Douglas Corporation. Horlings contributed to the design of the modifications for the conversion of two Martinair DC-10 airplanes into KDC-10 aerial refueling and transport airplanes, and was in charge of the experimental flight-test program conducted by McDonnell-Douglas test pilots, following the modifications at the KLM engineering facilities at Schiphol Airport.
  Horlings understands airplanes, can read and understand data in graphs and is capable of reconstructing airplane motions and flight path using these data, knowing and understanding the requirements for performance and flying qualities in Federal Aviation Administration (FAA) and European Aviation Safety Agency (EASA) Airworthiness Regulations, Specifications and Flight Test Guides.
  Horlings' education and knowledge of performance and flying qualities by far exceeds the expertise of accident investigators, on the subject of analyzing airplane behavior in-flight.

1.2. Because AIR Inc. became quite offensive in their comments, these are also regarded an invitation to review the expertise of the AIR Inc. team for conducting the investigation. The AIR Inc. website listed the following team members as of Nov. 14, 2014:

- *Terry Heaslip, M.A.Sc., P.Eng. Mr. Heaslip has a Degree in Metallurgical Engineering (1963) with a Master's in Materials Science (1967) and a Diploma in Aeronautical Engineering (1964).*
  So, Mr. Heaslip does not seem to have completed any education in airplane operations and hence is not qualified to operate airplanes or investigate accidents.

- *Robin McLeod, B.Sc., P.Eng. Mr. McLeod is a materials and mechanical engineer. He is a senior partner and vice-president of computing graphics at AIR. No education in airplane operations, but may be responsible of the graphs in the AIR report (ref. A).*
  Mr. McLeod seems not to have experience in airplane operations either.

- *Steven Roberts, P.Phys. A Professional Physicist with degrees in both physics and geophysics. Steve was (IPTL) and Director of Engineering for Flight Data Monitoring (FDM)*

and Simulation at Teledyne Controls.
This gentleman has experience in material-failure analyses and materials characterizations, computer aided accident reconstructions, and sophisticated radar, flight data recorder and cockpit voice recorder data analyses, but his CV does not show any flight experience which he could use to translate the FDR data into actual flight performance and flying qualities of MP495. If he contributed, he did a bad job.

- *Larry Vance – Senior Consultant – Accident Investigation. Mr. Vance has over forty-years of experience as a professional pilot, and more than twenty-five years as an accident investigator. He completed over two hundred investigations as an Investigator-In-Charge for the Canadian Aviation Safety Board (CASB) and the Transportation Safety Board of Canada (TSB).*
  Mr. Vance should be capable of reconstructing the flight path of MP495 on final approach, but if he did, it doesn't impress much.

- *Bryon Mask – Senior Consultant – Accident Investigation. Captain Mask has more than thirty-five years of flying experience in both fixed wing aircraft and rotary wing aircraft including more than twenty-five years as an airline pilot in both domestic and international operations. Mr. Mask has been active in the accident investigation field, including a two-year secondment to the Transportation Safety Board of Canada as an analyst and field investigator.*
  Mr. Mask should also be capable of reconstructing the flight path of MP495 on final approach, but if he did, it doesn't impress much either.

- *Michael L. Marx – Senior Consultant – Metallurgy and Failure Analysis. Mr. Marx joins AIR with over forty years' experience in aircraft accident investigation. He spent 29 years working for the United States National Transportation Safety Board (NTSB), and for the most part was the Chief of the Materials Laboratory Division. In his final years there, he became the Board's sole Chief Technical Advisor for Metallurgy and Failure Analysis.*
  Mr. Marx seems to have no flight experience at all.

- *Michael Renton – Senior Consultant – Flight Recorders. Mr. Renton joins AIR with more than thirty years of experience analyzing Flight Data Recorders (FDR) and Cockpit Voice Recorders (CVR), first with the National Research Council of Canada (NRC) and then as a consultant for companies requiring specialized services in data extraction, testing and analysis.*
  Mr. Renton seems to have no flight experience either. If he analyzed the MP495 DFDR data, rather than only crunch, filter and reduce the data, he made terrible mistakes.

1.3. AIR Inc. obviously had two experienced investigators, but if they contributed to the investigation of the MP495 accident and in writing the AIR Inc. report (ref. A), they might not be very knowledgeable on the subjects of performance and flying qualities.

1.3.1. A very experienced pilot or investigator does not necessarily have the knowledge and experience to analyze accidents and reconstruct the flight path using the available FDR data. After all, a science degree is not required to become a pilot or an accident investigator. Pilots and accident investigators, like most people, **only see what they look for, and only look for what they know**. Graduate test pilots and flight test engineers of a Test Pilot School know a lot more about airplanes.

1.3.2. Nevertheless, an investigator has pride in his/her job too, and is assumed not to intentionally write a false or inappropriate report to which his or her name is attached. Therefore, it might be that the AIR report was written by Martinair but issued by AIR Inc. without any further and thorough investigation/ reconstruction by knowledgeable people. This would be a very questionable practice for a company that – as the first line on its website homepage – says to be "one of the world's most respected aviation consulting companies specializing in accident investigation and reconstruction".

Having a Test Pilot School background and 15 years of flight-test experience, the respect for this company is now at max questionable, as will become clear below.

2. AIR Investigation Report

Please refer to the attachment for comments on the remaining chapters of the AIR Inc. report.

3. Conclusions (AIR Inc.)

3.1. The integration of the available hard data (Initial impact point, Radar/DFDR/AIDS, etc.), clearly shows that the aircraft, while approaching the Runway 11 threshold, flew into significant horizontal windshear, and subsequently into catastrophic vertical windshear which caused the aircraft to plummet to the runway surface. The Air Traffic Controller did not inform the pilots of the significant changes in the winds on the approach to Runway 11, even though the wind speeds and directions would have been readily apparent on his wind-monitoring instruments.

- Windshear not confirmed by available DFDR data, not confirmed by the accredited NTSB and not by Portuguese investigators either. Wishful thinking. Not a scientific conclusion.
- There was no reason for the Air Traffic Controller; no significant change. The Captain in the cockpit did read and notice the increasing wind himself at least two times, but did nothing with it. This wind should have been used, i.a.w. Martinair procedures.

3.2. The dramatic weather phenomena that affected the aircraft in the last seconds before runway impact (starting at an altitude of approximately 50 feet), and in particular the sudden downflow in the final 5 to 6 seconds of flight, caused the aircraft to descend at a rate from which it was not possible to recover before runway impact. The presence of this downflow is confirmed by the change from the normal G load on the aircraft (+1G) to a condition where there was less than 1G (the downflow was powerful enough to force the aircraft towards negative G). The dramatic downflow prevented the pilots from taking normal pilot actions to arrest the descent rate and flare the aircraft for a normal touchdown.

- The wind data as reported by the Air Traffic Controller meant there was a crosswind component that exceeded the limits of a DC-10 aircraft for a wet and for a flooded runway (Portuguese report). The requirement for windscreen wipers, 9 seconds prior to touchdown, should have convinced the pilots that the runway was flooded, at least very wet, making a safe landing impossible. The crew used old wind data for planning the landing.
- During the whole approach, light turbulence was experienced. No dramatic change during the last seconds of flight, as DFDR data proves.

3.3. When they encountered the dramatic downflow, the crew reacted immediately and dramatically to counter the sudden extreme descent rate, but the rate of descent was beyond the performance capability of the aircraft, making it impossible for the pilots to recover before impact with the runway.

- If indeed the descent rate was extreme, the aircraft would have touched down earlier. The rate of descent might have been caused by the reduced airspeed, i.e. reduced wing lift (which is $\equiv V^2$) and the delay of thrust increase because the auto throttle system was overruled by the pilot flying, who closed the throttles already at 150 ft.

3.4. The aircraft struck the runway at such a high descent rate, and at such an abnormal attitude, that massive loads were created; loads that were beyond the design capabilities of the landing gear. When the right landing gear failed, it led to a series of additional structural failures that caused the aircraft breakup.

- The descent rate was not very high, as the DFDR data shows.
- The aircraft landed with an 11° crab angle, which McDonnell-Douglas does not allow. The crew desperately tried to reach the runway from the side, reason why decrabbing was not completed.

3.5. The sudden loss of control of the aircraft was caused entirely by environmental factors; it was not the result of any actions or mishandling by the pilots. Even with the windshear conditions, the aircraft was at all times well above the aerodynamic stall speed of 107 knots – this confirms that there was no contribution to the dramatic descent rate from an aerodynamic stall condition.

- No, control was not lost while still in-flight. No environmental factors other than a too large a crosswind contributed. The accident was caused by pilots who were not operating in accordance with the standardized approach procedures prescribed in Martinair Manuals. The whole approach was not stable as defined in the manuals. The airspeed was allowed to decrease far below the prescribed approach and threshold speeds. Three to four seconds prior to touching down, the Captain initiated a go-around, but could not reverse the descent into a climb in-time, because the engine rpm was forcefully reduced to idle by the co-pilot, which should never be done with big turbofan engines, because it takes 7 to 8 seconds for the engines to spool up and develop maximum thrust after moving the throttles forward. A well trained pilot knows this; an Auto Throttle System is even programmed accordingly. The engine rpm was too low for the engines to develop go-around power in-time. The Captain took control, but way too late. These definitely are pilot failures because the pilots were not using the standardized procedures prescribed in Martinair Manuals.
- By mentioning the stall speed, the writer must have realized that a decrease of airspeed reduces the wing lift ($\equiv V^2$). To compensate for this loss and prevent an increase in the rate of descent, the angle of attack needs to be increased and thrust is required to compensate for the increased drag. The pitch angle was increased, but thrust was not readily available, because the pilot held the throttles closed. The go-around, initiated during the last seconds of flight, failed because the throttles were kept in idle by the pilot flying.
  The continuation of the approach while the reported wind was exceeding the aircraft limits for a wet and flooded runway, the approach not being stable i.a.w. the requirements in Martinair manuals, the large deviation from the required approach path, the closing of the throttles, the decreasing approach airspeed, and not being able to decrab the aircraft in time are all evidence of mishandling by the pilots.
- There were no windshear conditions, not a dramatic descent rate, no contribution from a stall condition, but only a light turbulence and a crosswind, including gusts and a runway condition that exceeded the airplane (and the pilot) limits. The pilot flying obviously was not capable of conducting a stable approach in accordance with the Martinair procedures under the prevailing conditions, and not capable of landing under high crosswind conditions either. Approach procedures were in place because in the past, many similar catastrophic accidents happened. If pilots are not following procedures then the airline company and the pilots are to be blamed, not the weather.

4. Conclusions by Avio*Consult* on the AIR report.

4.1. The AIR Inc. report considers the airplane having followed exactly the prescribed approach path, and starts with the touchdown point as anchor point working backwards in the air while integrating data from several sources. This is like writing the conclusions that you need or like, and then come up with an analysis that fits these conclusions. This is weird, misleading, not scientific at all.

4.2. Because the report determined that the airplane followed the prescribed approach path, it calculates what the winds and heading must have been. It therewith ignores the objective data recorded by the DFDR. For instance, the used winds were of 8 minutes after the landing. The winds in Annex 5 pages 116 and 117 in the Portuguese Accident Investigation report however, were labeled as "valores calculados". The meaning will be clear.

4.3. Much of the data used were not objective data from DFDR or other reliable sources in the Portuguese accident investigation report, but seem to have been ‘fabricated’ to make believe that the approach was normal and stable while, in fact, it definitely was not. The writers

worked around DFDR and Airborne Integrated Data System (AIDS) data to formulate their desired though fictitious outcome and conclusions.

4.4. The AIR Inc. report is therefore not written by knowledgeable aircraft accident investigators and is to be classified as fiction. Many efforts are made to mislead the reader. The report is definitely not a scientific but rather a fictitious report, meaning it is an unreal, purposefully deceptive report.

4.5. The intention of the AIR Inc. report seems to only fulfil the wish of client Martinair to prove that the airplane encountered windshear. Most of the data presented in the AIR Inc. report however, are not properly analyzed. Non-existing or inappropriately assessed data are used, or existing objective data are not explained as they should be, most probably because the author(s) do not understand the performance and flying qualities of airplanes (as taught at Test Pilot Schools), especially as applicable during approach and landing, at a sufficiently high academic level.

4.6. This AIR Inc. report addresses a number of erroneous and unsupported conclusions, not the analysis by Avio*Consult*.

5. Recommendations by Avio*Consult*

5.1. It is strongly recommended to not allow the use of this disappointing, inappropriate and deceiving AIR Inc. report (ref. A) any further.

5.2. AIR Inc. and Martinair are recommended to withdraw the AIR Inc. report, because both Martinair and AIR Inc. might be called to appear in a higher court, and should therefore realize beforehand what poet Walter Scott already wrote in 1808:

"Oh! What a tangled web we weave,
when first we practice to deceive."

Harry Horlings
Lt-Col RNLAF ret'd,
Graduate USAF Test Pilot School
Owner Avio*Consult*

ATTACHMENT:

AIR Inc. accident investigation report Martinair MP495 accident 21 Dec. 1992,
AIR File #7355, 23 July 2013, (Ref. A), supplemented with many comments in text boxes.