Jean-Louis FRANÇON
Expert près la Cour d'Appel de Paris
"Aéronautique et Espace"

Laurent BLONCOURT
Expert près la Cour d'Appel de Paris
"Aéronautique et Espace"

Dr. Dirk KÜGLER
c/o WiTech Engineering GmbH

c/o - care of ???
Kügler not listed on website this company

FINAL REPORT

With comments and remarks by experts of claimants

requested by judgment of the 8th of July 2015
issued by the HAGUE DISTRICT COURT
(Chamber of Commercial Affairs)

CASE NUMBER C/09/434236/HA ZA 13-17
and
CASE NUMBER C/09/441930/HA ZA 13-476

Accident occurring in FARO Airport – Portugal
21st of December 1992

TABLE OF CONTENT

Same numbers, an

ABBREVIATIONS

Acronym	Synonym	Translation
AIDS		Airborne Integrated Data System
AOM	AFM – FCOM are not synonyms	Airplane Operations Manual DC-10
ANA		Aeroportos e NavegaçAo Aerea, E.P.
ATC		Air Traffic Control
ATCO		Air Traffic Control Officer
ATS	AT/SC	Auto-Throttle System or Auto-Throttle / Speed Computer
A/P	P/A	Automatic pilot
BIM	FCOM is not a synonym, not the sa	Basic Instructions Manual – Flight Crew Operating Manual
CCRL		Centro de Controle Regional de Lisboa
CMD		Command Mode (Auto-pilot function mode)
CTA	ATCO	Controlador de Triego Aereo (Air Traffic Control Officer)
CVR		Cockpit Voice Recorder
CWS		Control Wheel Steering
DFDR		Digital Flight Data Recorder
FAA		Federal Aviation Administration
F.E.	F/E	Flight Engineer
FL		Flight Level
F.O.	F/O	First Officer
ft		feet
fps		feet per second
ICAO		International Civil Aviation Organization
INMG	INM	Instituto Nacional de Meteorologia e Geofisica
IST		Instituto Superior Tecnico
kt.	kn	knots
ICAO		International Civil Aviation Organization
KNMI		Koninklijk Nederlands Meteorologisch Instituut or Royal Netherlands Meteorological Institut
MDC		McDonnell Douglas Corporation
mn	min	Minute
MP495	MPH495	Martinair Flight involved in the accident (call sign)
NASB	NAIB Dutch Aviation Safety Board OvV RLD, RvDL, DSB	Netherlands Aviation Safety Board Netherlands Accident Investigation Bureau Raad voor de Luchtvaart Onderzoeksraad Voor Veiligheid (Dutch Safety Board)
NLR		Nationaal Lucht- en Ruimtevaartlaboratorium National Aerospace Laboratory the Netherlands
nm	NM	Nautical mile [1852 m]
OvV		Onderzoeksraad Voor Veiligheid (Dutch Safety Board)
PF	PA	Pilot Flying or Pilot acting
PNF	PM	Pilot Not Flying or Pilot monitoring
PSU		Passenger Service Unit
RA		Radio Altitude
RoA	RvO	Official report issued by the Portuguese Commission of Investigation, Report of Accident
RvO		Report van Ongevol
SIO		Sistema Integrado de Observâo Meteorologica
UTC		Universal Time Coordinated

It seems that the Experts didn't quite

0. PREAMBLE

0.1. GENERAL

In this final report, the word "Experts" refers exclusively to the three Experts appointed by the Court by the decision raised the 8th July 2015.

Any additional experts will be referred to clearly by their names, and their credentials will be ind

Were there any?

diately following the first mentioning of their name

The expression "Claimants advisors' team" shall be used to designate the authors of the "Review of interim report V17 with Remarks and Questions of Claimants " of 27 September 2016.

§§ 0.1.x are new f

0.1.1. EXPERTS' COMPETENCIES.

No expert can claim that he has universal knowledge on all topics. Should it be necessary, he will refer to the best available competency provided by the appropriate specialist.
Moreover, this behavior is the foundation of a proper and well-conducted expertise.

The Experts want to underline that the Claimants advisors' team uses, exclusively and obviously without any contextual dimension, only the available textual information. These textual

Textual? Textual is not objective. Claimants used only objective data: DFDR, AIDS, BIM, AOM, AFM

action or effects due to the

Assuming that the Claimants advisors' team came to the exact conclusions from the available textual information, it is obvious that they do not consider the Human Factors[1] dimension of the events.

Because they have a better understanding of Human Factors.

only (Experts could not read DFDR and A

The Experts, in the analysis they carried out, took this dimension into account and considered that the DASB (RvDL at the time of accident) (being part of the Commission of Investigation) did the same when it sent its comments to this Commission.

To be able to consider the importance of the Human Factors in a cockpit, it is necessary to have demonstrable operational experience and competencies in this field.

Is this so? Don't you mean human performance? Human Factors is something else in the academic

[1] *Human Factors in its widest definition describes all the aspects of human performance when interacting with the (aviation) environment to influence the outcome of events*

Is not the correct definition of HF. Human Factors (plural, capital initials) is the science of ergonomi

The Experts underline the fact that the Judge in charge decided to choose and appoint them on the basis of their individual CVs :

- An engineer and professor, internationally well-known in the field of Air Traffic Management (ATM), with a strong industry background, educating at leading universities including Human Factor concepts.
- Two airline pilots, both with more than 15000 hours of flight as captain, instructor and examiner, in charge during years to provide advices to their own national civil authority about flight safety.

  These two pilots have taught instructors and pilots on the "Human Factors" concepts since the beginning of their implementation in the captains' and first officers' training then for all personnel involved in airlines operations.

  One of these captains being first officer, captain, instructor and examiner on DC10-30 KSSU during more than 4500 hours of flight.

You mean CF

Have these 'experts' ever reviewed and analyzed DFDR data? Ever analyzed an accident using objective data?

0.1.2. ANSWERS TO "REVIEW AND REMARKS AND QUESTIONS"

The Experts have studied carefully the "Review and Remarks & Question of Claimants of Interim Report V17" of 27th September 2016.

The large amount of non-relevant remarks within this report has lead to a huge confusion.

There were no non-relevant remarks. 'Experts' did obviously not understand. These 'exp

Consequently and in accordance with the Court's requirements, "Review and Remarks and Questions" (as provided by the Claimants advisors' team) will only be considered if they concern the actual content of the Experts' interim report V17; they should not [illegible] received an answer [illegible]

Remarks and Questions were only on V17, what if answers wrong?

The Experts want to underline that their mission is not to issue an opinion on the work of the Commission of Investigation.

Yes, if required to answer the questions of the court.

It is obvious that the accident wouldn't have happened if the captain decided to go around at one moment during the approach to FARO, and, a fortiori, if he decided not to take off from Amsterdam.

But his job was to move the passengers from Amsterdam to Faro. This is probably an important human aspect in this file.

To simplify and clarify, the debatable flight can be divided the in two parts:

- The first one above 500 [ft][2] elevation, which was handled by the crew with a correct airmanship, aside from an inappropriate correction of the wind during the interception and the final phase, flying so laterally displaced at the left of the radial 111°. During this phase, the immediate safety of the aircraft was never affected by the captain's decisions.

  Heard of ALAR? Stabilized approach?

There was no

- and the one below 500 [ft] where the loss of control happened. The non-decision of go around under 500 [ft] is one of the major cause of the accident.

Many points and questions [illegible] facts without any relation wit[illegible]

go-around started at 3 sec. before landing, and failed. Should have begun earl

2 *Stabilization height mentioned in BIM MARTINAIR §3.4 APPROACH AND LANDING –Index 06*

So, the Experts believe that providing answers to the questions of the Claimants advisors' team, referring to the part of the flight above 500 [ft] is not directly relevant.

Yes it is because of the errors made during the approach while above 500 ft. Why did experts spent so many words

0.1.3. DASB UNTIL 1994.

0.1.3.1. ROLE AND POSITION

The Experts must recall that the DASB was acting as a member of the Commission of Investigation and had consequently to respect the recommendations of the ICAO Annex 13 ("Aircraft Accident and Incident Investigation").
It is clearly indicated that the work of a Commission of Investigation is not to define liability but only to determine causes and/or contributing factors to avoid other accidents due to similar causes in the future. [3]

Consequently, the Experts' understanding of "*the work in due care*" of the DASB excludes all what concerns the determination of liability.

But the questions of the court are liability related.

0.1.3.2. COMMUNICATION TO THE CLAIMANTS

The following text is a part of the preliminary introduction of the meeting of the 1st December 1994

« INFORMATION MEETING OF THE CIVIL AVIATION BOARD FOR THE VICTIMS AND THE FAMILIES OF THE FARO AVIATION DISASTER »

« The purpose of this meeting is to give information, information about the report, information about the role of the Civil Aviation Board, and in particular, this is what this afternoon is about, to give you the opportunity to ask the experts on this side of the table questions, factual questions.
What this meeting is not about - and I repeat - what this meeting is not about is answering questions about culpability, liability and financial issues. These questions will not be addressed because they do not fall under the remit of the Board. This is not the purpose of this meeting and the Board cannot answer such questions, so there's no point in asking them. »

Investigation was finished by 15 Nov. 1994

The DASB representatives [...] communicate with any party as long as the investigation was ongoing.
That is why Annex 13 specifies the conditions for the independence of these bodies.

Then, during the first meeting (11th August 1993) with the victims or the families, and before the issuance of the fir[...] DASB was bound by the obligation of non-disclo[...] of Investigation.

During the second meeting [...]lication of the final report (15th November 1994), [...]t of the report itself,

Was not a meeting. On Aug 11, questions were asked

3 ICAO Annex 13 : « Objective of th[...]vestigation of an accident or incident shall be the prevention[...] of this activity to apportion blame or liability »

unique official document. The Dutch authorities had the possibility to appoint experts to define liability and, in such context, never DASB could be part of these experts because of a possible conflict of interest.

The State (a minister) appointed DASB to inform the pax, to answer que

The assessment of the DASB's work and/or behavior during the Investigation and after, during the meetings with the victims and families, will consequently follow strictly these considerations.

This was not asked by the Judge. You gave your own interpretation.

0.1.4. THE LIMITS OF THE MISSION OF THE EXPERTS

Based on the judgement of 8th July 2015 ref:C/09/434236 / HA ZA 13-17 en C/09/441930 / HA ZA 13-476, the mission of the expert has been limited to the general question in accordance with the following text inside quotes.

« The court has not yet formulated an opinion on the main argument referred to in 2.5, as it needs the advice of experts to be able to form such an opinion. The general question for the experts therefore is: ***did the then Civil Aviation Board handle the information available at the time regarding the aforementioned themes with due care?*** *The court maintains this general question, which comprises all relevant aspects (and limitations to be taken into account), even after learning the responses of the Parties to the provisional and general opinion of the court on the questions given in the interlocutory decision. The experts need not conduct own investigations into the cause of the air crash, but rather provide an answer, based on their expertise, to the question* ***whether or not the Board, in its then capacity, adequately processed the then known and available information. »***

and
« (1) Did the Civil Aviation Board handle the information it had at the time regarding the aspects stated in 2.5 of this judgment with due care?
(2) Do you have other comments that may be relevant to the assessment of this case?"

The mission of the Experts is constricted on the actions in 1994 of "*the then civil aviation Board*", in its "*then capacity adequately processed the then known and available information*".

The mission of the Experts is not to evaluate the answers made by the DASB to the Horling's report in 2015, even though the study of all these questions is useful for a better analysis.

As already said, in accordance with the Court's requirements, "Review and Remarks and Questions" (as provided by the Claimants' advisors) will only be considered if they concern the actual content of the interim report V17; they should not be considered when the "Remarks and Questions" have already received an answer in that report.

What if this answer was wrong?

No further answer[4] to "Review and Remarks and Questions" will be provided if they do not meet these criteria.

---

[4] *At the begining of the analysis of the « Review and Remarks and Questions of Claimants of interim report V17 », the Experts will define precisely the use of the term « No comment » or « not relevant »*

However, if it would turn out that a new point having a direct relation to the Experts' mission defined by the Court is raised by the Claimants' advisors, the Experts could provide a comment or answer, unless if this point is of no consequence on the Experts' conclusions.

0.2. THE "RAAD VOOR DE LUCHTVAART"

Why this included?Changed followin

The Raad voor de Luchtvaart [Netherlands Aviation Safety Board] was established on 1st January 1937 further to the Luchtvaartrampenwet [Air Disaster Act], since repealed. At the time of the air accident, the Board did not have its own legal personality and was structured under the then Minister of Transport, Public Works and Water Management.

In 1993 the Luchtvaartrampenwet [Air Disaster Act] was replaced by the Luchtvaartongevallenwet [Air Accident Act] since repealed.

Further to the Wet Raad voor de Transportveiligheid [Transport Safety Board Act], since repealed, the tasks and activities of the Raad voor de Luchtvaart [Netherlands Aviation Safety Board] were transferred to the Raad voor de Transportveiligheid [Transport Safety Board] (see also sections 91 and 102 of this act for transitional provisions).

Subsequently, on 1st February 2005 the Raad voor de Transportveiligheid [Transport Safety Board] was transformed into the Onderzoeksraad voor veiligheid [Dutch Safety Board] see sections 87-90 of the Rijkswet Onderzoeksraad voor veiligheid [Dutch Safety Board Act].

0.3. WRITING CONVENTION

All samples from official documents are italicized and their sources indicated either in the text itself or in footnotes.

0.4. TIME REFERENCES

??

This question seems to be considered as an important issue in order to understand the last part of the flight MP495.

But the real question is, whatever the used time reference, whether this reference should be considered as a contributing factor to this accident.
The answer is obviously clear ... y the Experts decided to close this question at

Nevertheless, the Experts tried ... f Investigation considered this question during t

not to the accident, of course, but a factor during the inve

As it is not a crucial element to answer the questions raised by the Court of Justice, nd in annex 8.1 of the present report.

page 51

ng their report, the Experts will use the DFDR time as the main e it is th

?? for occurrence of a wind 220/3

A DFDR does not record time of day data, but only elapsed time, the time since start-up or

5 ~~The DFDR time reference is the time provided by the Captain's clock in the cockpit.~~

1. GENERAL CONSIDERATIONS – THE MISSION

1.1. THE DECISION RAISED THE 8TH JULY 2015 :

“ *The court:*
in both cases

a) *orders an investigation to be conducted by three experts;*
b) *appoints as experts the aforementioned Mr L. Bloncourt, Mr J-L. Françon and Mr D. Kügler, in order to conduct an investigation and give a* ***written*** *and* ***substantiated*** *answer to the following questions:*
   1) *Did the Civil Aviation Board handle the information it had at the time regarding the aspects stated in 2.5 of this judgment with due care?*
   2) *Do you have other comments that may be relevant to the assessment of this case?*”

comments! Not useless and inappropria

1.2. THE MISSION

The Experts will only have to answer these two questions raised by the Court by establishing an in-depth comparison between the set of actions, performed by the Dutch Aviation Safety Board, that should have been taken, and those actions that have actually been taken.

To be sure, the Experts acting as described above will, at all time, keep in mind that the goal of the Commission of Investigation[6] is not to lay blame and establish legal liability, but to establish facts to improve flight safety.

Is not the question. Neither DASB nor the Exper

To avoid any misunderstanding, the Experts act to be
and simplify their considerations and explanations. F
erase all the false or unnecessary considerations that
of e

?? Did they? Do they have system engineering

[6] *As defined in chapter 3.2 of the present report*

2. THE ACCIDENT – REMINDS

2.1. THE FACTS[7]

Not quoted exactly from the Summary in

« On 21 December 1992, a DC-10-30F aircraft, registered in Netherland under the designation PH-MBN, with 327 Passengers and 13 crew members on board, was performing an approach to the runway 11 at Faro Airport, for a landing.
An active thunderstorm formation was approaching the airport.
The aircraft made a hard landing on the left-hand side of the runway 11.
The right landing gear fractured, followed by the separation of the right wing from the fuselage, starting a rotation of the aircraft along its longitudinal axis.
The aircraft slide to the right and off the runway, broke into two main sections and caught fire.
Several passengers and crewmembers were killed. »

2.2. THE AIRCRAFT

The aircraft involved was a DC-10-30CF, registered PH-MBN, serial number 46924, fuselage number 218, equipped with three CF6-50C engines and was delivered by McDonnell Douglass company in November 1975.

It is known as part of the fleet of the KSSU[8] consortium.

The DC-10-30CF was a convertible cargo/passenger version of the DC-10-30.

C = convertible F = freight

[7] *Extract from the non-official translation of the official Portuguese report, issued in November 1994.*
[8] *KSSU was a consortium made for maintenance purposes, by KLM, the former Swissair, SAS and the former UTA French Airlines.*

Why do Experts discuss this? Filli

3. THE CONVENTION OF CHICAGO[9], THE ASSOCIATED DOCUMENTS AND THE COMMISSION OF INVESTIGATION

3.1. GENERAL CONSIDERATIONS AND THE ASSOCIATED DOCUMENTS

Within this chapter, the Experts want to point out the legal context of the international relationships between the member States of the ICAO[10], which ratified the Convention of Chicago and, more precisely, the relationships between the member States involved in an investigation following an accident in aviation.

Please, refer to Annex 8.2 of the present report for a full analysis.

The Convention of Chicago issued 19 annexes[11], among them the annex 13 related to the Aircraft Accident Investigation.

3.2. THE ANNEX 13 AND THE COMMISSION OF INVESTIGATION

3.2.1. ACCORDING TO THE ICAO

In case of aviation accident or incident, under the direction of a main investigator designated by the country where the event took place, the accredited representatives of the following countries have the right to participate to the commission of investigation:

- The State of aircraft registration;
- The State of operator;
- The State of aircraft design;
- The State of aircraft manufacturer.

---

[9] *International convention related to civil international aviation signed the December 7th 1947, in Chicago*
[10] *International Civil Aviation Organization created by the Convention of Chicago*
[11] *Annex 1: Personnel licensing*
Annex 2: Rules of the Air
Annex 3: Meteorological Services for International Air Navigation
Annex 4: Aeronautical Charts
Annex 5: Units of Measurement to be Used in Air and Ground Operations
Annex 6: Operation of Aircraft
Annex 7: Aircraft Nationality and Registration Marks
Annex 8: Airworthiness of an Aircraft
Annex 9: Facilitation
Annex 10: Aeronautical telecommunications
Annex 11: Air Traffic Services
Annex 12: Search & Rescue
Annex 13: Aircraft Accident Investigation
Annex 14: Aerodromes
Annex 15: Aeronautical Information Services
Annex 16: Environmental Protection
Annex 17: Security – Safeguarding International Civil Aviation against acts of Unlawful Interference
Annex 18: Safe Transportation of Dangerous Goods by Air
Annex 19: Safety Management (SMS)

It is advised that the State of aircraft registration or the State of operator designate one or several advisors that they may suggest directly to the Commission of Investigation to assist the members of the Commission and the accredited representative.

Similarly, both States of aircraft design and of aircraft manufacturer will be able to designate one or several advisors that they may suggest to the Commission of Investigation to assist the members of the Commission and the accredited representative[12].

Moreover, a third state may request to get involved in the investigation process if one of its citizens died in the accident. In this case, the State in charge of the investigation might give this third State the permission to designate its own expert; however, the expert will not be accredited and will only enjoy a certain set of prerogatives as clearly defined by the State charged with the investigation.

In this context, the composition of the Commission of Investigation officially designated to investigate the accident of the Martinair DC10 – Flight number MP495 – in FARO-Portugal conforms strictly to the ICAO's recommendations.

Under the appointed Portuguese Chief of the Commission of Investigation[13], this Commission was composed, among others, of:

- An accredited representative of the State of registration, which is, in this case, the same as the State issuing the airline operator certificate[14]:
  - One or several officials appointed by the Dutch Aviation Safety Board;
- An accredited representative of the State of design, which is in this case, the same as the state of manufacturer:
  - One or several officials from the National Transportation Safety Board (NTSB) appointed by the Federal Aviation Administration of the USA.

Both these representatives had the status of "*accredited representatives*" as defined in the ICAO Annex 13 as followed:

5.25 Participation in the investigation shall confer entitlement to participate in all aspects of the investigation, under the control of the investigator-in-change, in particular to:

- *visit the scene of the accident;*
- *examine the wreckage;*
- *obtain witness information and suggest areas of questioning;*
- *have full access to all relevant evidence as soon as possible;*
- *receive copies of all pertinent documents;*
- *participate in read-outs of recorded media;*
- *participate in off-scene investigative activities such as component examinations, technical briefings, tests and simulations;*

12 Refer to next page for the definition of a « accredited representative »
13 Refer to Article 26 of the Chicago Convention - § 8.2 of this report.
14 This document is a mandatory document issued by the State involved, and required to be allowed to transport by air, passengers and goods.

- *participate in investigation progress meetings i*
  analysis, findings, causes and safety recomme
- *make submissions in respect of the various ele*

Only one accredited representative, Mr. J. Biemond

To conclude, it conformed accurately to Annex 13:

- that the Commission of Investigation was place
  of a Portuguese Official;
- that the State of aircraft registration (which als
  was being represented by one or several accredited representatives from the Dutch Aviation Safety Board;
- that the State of design (which is also the State of the manufacturer) was being represented by one or several accredited representatives from the NTSB;
- that the Commission of Investigation decided to use the services of the organizations acting as advisors and suggested by the accredited representatives; these organizations had to directly and precisely answer to the questions raised by the Commission of Investigation.

3.2.2. INITIAL ACTIONS OF THE PORTUGUESE AUTHORITIES

These are explained in detail in the official report of 1994[15].

3.2.2.1. NOTIFICATION

Notification of the accident was carried out as it was supposed to, as defined by Annex 13; the following actors were notified of the accident on the day of its occurrence:

- The Dutch Aviation Safety Board, which acts on behalf of both the State of aircraft, and the State of the operator;
- The Federal Aviation Administration (FAA – USA), which was the administration that had certified the type of aircraft relevant to the case;
- The National Transportation Safety Board (NTSB – USA), which was the US specialist of investigations in case of accident;
- McDonnell Douglas Company – USA, which design then built the aircraft;
- The ICAO.

3.2.2.2. CONSTITUTION OF THE COMMISSION OF INVESTIGATION

Following the decision of the Director General of Civil Aviation of Portugal, this commission was put under the presidency of the Director of Aeronautic Personnel[16] who was assisted by five more people.

[15] *The RvA/RvO : Official report issued by the Portuguese authorities after the comments of the NTSB and the Dutch Aviation Safety Board*

[16] *Mr Luis Alberto Figueira Lima Da Silva,*

Following the suggestion of the President of the Commission of Investigation, the following were assembled to work together:

- A specialist in navigation aids;
- A specialist in medical and pathological issues;
- A specialist in air operations;
- A specialist in meteorology and navigation;
- A specialist in communications;
- The accredited representatives as indicated above.

flight

Finally, the Commission of Investigation called on to the following experts or specialists to investigate:

- McDonnell Douglas [designer and manufacturer of the aircraft] to answer questions regarding the functioning of aircraft specific components;
- General Electric [designer and manufacturer of the engines] to answer questions regarding the functioning of the engines and associated parts;
- Rockwell International [designer of some parts of the aircraft's equipment, related to the navigation capability of the aircraft];
- Netherlands National Aerospace Laboratories (NLR) for some specific studies;
- Martinair (or its mother company KLM), for the transcription and translation of the content of the C [illegible]
- The "Instituto Supé [illegible]
- The "Instituto Nacio [illegible];

Only since 31 Dec. 2008 is Martinair part of KLM group.

The "Nationaal Lucht- en Ruimtevaartlaboratorium" (NLR) is the national Netherlands Aerospace Laboratory.

As an independent non-profit organization, the NLR is the aerospace-knowledge enterprise in the Netherlands and provides high-quality technical support to various areas of the aerospace sector.

This organization was in charge to analyze the meteorological context of the accident, and more precisely the potential occurrence of windshears and of microbursts, if any, at and around the airport.

The "Instituto Superior Tecnico" (IST) is one of the most prestigious engineering schools of Lisbon, and it was put in charge of analyzing the landing gear components of the DC10 wreckage.

The representatives of the Martinair as well as the representatives of its mother company, KLM, were entrusted with the transcription and the translation of the Cockpit Voice Recorder contents, and to provide the Commission of Investigation, with all relevant technical and operational documents deemed necessary.

4. ANALYSIS OF THE FLIGHT BY THE EXPERTS

The first question[17] raised in the mission entrusted to the Experts by the decision of the 8th of July 2015 does not cover the analysis of the flight itself but only, the action of the Dutch Aviation Safety Board during the investigation.

However, to answer the second question of the mission[18], the Experts have found it necessary to conduct this anal[illegible] ccident and consequently, of the behavior of [illegible]

§ 1.1

To make easier the reading of [illegible] o group this analysis in the Annex 8.6 to this [illegible]

paragraph

17 *Decision of 8th of July 2015 : « Did the Civil Aviation Board handle the information it had at the time regarding the aspects stated in 2.5 of this judgment with due care? »*

18 *Decision of 8th of July 2015 : « Do you have other comments that may be relevant to the assessment of this case? »*

5. THE OFFICIEL REPORT (RVO) OF THE COMMISSION OF INVESTIGATION

5.1. GENERAL CONSIDERATIONS

This report corresponds exactly to what was requested by the ICAO in chapter IV-4-4 of the document n°6920[19].

According to this document, the report must be divided into five main sections[20] :
1) factual information;
2) analysis;
3) conclusions;
4) safety recommendations;
5) annexes and appendices.

According to the ICAO Document n°6920, before the publication of the final report, it is recommended[21] that the Commission of Investigation consults with both authorities of registration and of construction of the aircraft since both have designated their own accredited representatives.

This recommended procedure is strictly the one implemented by the Portuguese Commission of Investigation when the comments of the Dutch Aviation Safety Board and the NTSB were requested.

5.2. THE CONTENT IN DETAIL

5.2.1. THE CAUSES OF THE ACCIDENT

5.2.1.1. ACCORDING TO THE OFFICIAL REPORT[22]

« The commission of Investigation determined that the probable causes for the accident were:
- *The high rate of descent in the final phase of the approach and the landing made on the right landing gear, which exceeded the structural limitations of the aircraft.*
- *The crosswind, which exceeded the aircraft limits and which occurred in the final phase of the approach and during landing.*
- *The combination of both factors determined stresses, which exceeded the structural limitations of the aircraft.*

Contributing factors to the accident were:
- *The instability of the approach.*

[19] *Refer to annex 8.2.3 of the present report.*
[20] *Refer to annex 8.2.5 of the present report.*
[21] *ICAO cannot issued rules but only « Standards and recommended practices »*
[22] *Non official translation of the Report of the Commission of Investigation – page 129*

- *The premature power reduction, and the sustaining of this condition, probably due to crew action.*
- *The incorrect wind information delivered by Approach Control.*
- *The absence of an approach light system.*
- *The incorrect evaluation by the crew of the runway conditions.*
- *CWS mode being switched off at approx. 80 ft RA, causing the aircraft to be in manual control in a critical phase of the landing.*
- *The delayed action of the crew in increasing power.*
- *The degradation of the lift coefficient due to the heavy showers. »*

5.2.1.2. A PROB

After reading the cause and contributing factors, the conclusion is that the Experts do no

From a purely technical poi[nt] of view, and considering that both the analysis and the conclusion of the Commission of Investigation are true, the causes of the accident should have been presented as follow:

The cause:

Which conditions? The cause is that the pilots didn't apply procedures during the whole flight - lack of decision

Own analys

The accident is a sum of conditions leading to a hard touchdown for which the aircraft was not designed, and therefore "not certified" (i.e. outside the certification limits). As a result, the right landing gear collapses and the right wing broke

How do you know? The aircraft was not certified for a crabbed landing - pilot error.The landing gear was c

The contributing factors:

- An approach becoming unstable on short final[23], just before the landing, ... nge of the meteorological conditions and a high ... of thrust which aggravated the previous contributing factor;

not unstable at all, fully controllable. But not in the right position.

ROD not exceptionally high: you mention 850 fpm

- On very short final, a lack of decision to initiate a missed approach procedure[24];

A go-around was initiated,

- An incorrect meteorological information[25];
- ... the flight management mode[26] on very short final that might ... re

re were no ot

no call "my controls" by captain. The pilots will

not flight management mode, but AP mode (CWS

5.2.1.3. COMMENTS BY THE EXPERTS

?? No is not. Irrelevant here

Whatever the cause of an accident might be, it is always the result of several factors, each of them having a various level of importance and impact.

what do you mean confusing. In the airplane, the throttles were pushed forward, captain said "th

23 *For the Experts, the short final part c*

24 *At this moment, the situation was quite confusing :*
   - *In his statement from 29.12.1992, the Captain said « I cannot remember that I have called to open the throttles ».*
   - *Refer also the F/E statement from 29.12.1992 « The Captain said "Go Aorund" and slammed the throttles open. »*

25 *The ATC controller uses the runway 29 meterological information instead of the ones for runway 11.*

26 *Disengagement of the CWS mode.*

This was never proven to be true (cour

lateral!These quotes were not used in the

A violation.Overrun of which limita

T ortuguese Commission of Investigatio when it mentioned "*a non-standard trajectory*" and "*a variation c conditions*"; because both these factors have supposedly provoked an overrun of the aircraft's limitations.

lateral, was it?

Ook Lat nav error - radar - traversing landing - LG failure

In general, the main he Faro a way and with a traj did no flight path established by the applicable procedures.
It means, that one of the recommendations to improve the flight safety and issued by the Commission of Investigation as required by the Annex 13, should be to teach the pilots to initiate a missed approach in case of a non-stabilized approach and under a fixed height.

not under a fixed height. At any time during the approach, (BIM 2.3.6) and flare (AOM 3.3.5 - 15)

After the issuance of the draft accident report, published after the accident by the Commission of Investigation, the Dutch Aviation Safety Board proposed modifications to the content of this report to adjust the wording, but accepted the conclusions of the final report.

No, they did not at all. DASB wanted windshear as cause, the Portuguese not, and did

The Expert's mission is not to scrutinize the causes as indicated in the official report published by the Portuguese Commission of Investigation.

know meaning of scrutinize? Should have done j

The Experts are specifically requested to consider the action of the Dutch Aviation Safety Board and to verify if "*the Civil Aviation Board handle the information it had at the time regarding the aspects stated in 2.5 of this judgment with due care*".

During the analysis of the documents provided, the Experts have forced themselves to stay away from the notions of "technical cause" and "responsibility" in the judicial sense.

But this was the intention. You wrote about technical aspects, like landing gear failure, and about prof

This is also how the Experts evaluated the Dutch Aviation Safety Board's actions as well as answered the questions asked by the court.

To determine whether the DASB handled the information they had with due care, Experts should have used the Blue Report that was

5.2.2. THE DUTCH AVIATION SAFETY BOARD'S COMMENTS TO THE PORTUGUESE OFFICIAL REPORT

5.2.2.1. GENERAL COMMENTS

The first two paragraphs of the comments made on behalf of the Kingdom of the Netherlands by the Dutch Aviation Safety Board, are quite important.

It is important to clearly understand the meaning of these sentences to answer the question raised by the Court.

> "*The Aviation Safety Board is of the opinion that the Portuguese report, in general, correctly reflects the course of events leading to the accident.*

> *The Board agrees with the factual information and generally agrees with the analysis and the conclusions drawn from it*."[27]

There seems to be a general agreement from the Dutch Aviation Safety Board with the Portuguese official report; however, som Appendix in RvO? Not in Blue rep hen addressing certain details.

That means that the Dutch Aviation Safety Board agrees in general with the description of the events by the Commission of Investigation – based on the factual information – and more important, with the analysis and the conclusions made by this Commission.

As already mentioned in chapter 5.2.1.1, the Commission of Investigation determined that the probable causes[28] for the accident were:

- *The high rate of descent in the final phase of the approach and the landing made on the* But was there a hight rate of descent? 850, could handle 1014 fpm at max LW (Fedex report) *the aircraft.*
- *The crosswind, which exceeded the aircraft limits and which occurred in the final phase of the approach and during landing.* No, heading was 125 all the t

was struct. integrity impe *The combination of both factors determined stresses, which exceeded the structural limitations of the aircraft.* crosswind responsible? Crosswind - traverse landing - No, max demo

It is important to note that the official Report of Accident (RoA) issued 31. October 1994 by the Commission of Investigation never uses the word "*windshear*" as the **cause** of the accident.

As already mentioned in chapter 5.2.1.1, the Commission of Investigation determined contributing factors[29] to the accident as:

- *The instability of the approach.*
- *The premature power reduction, and the sustaining of this condition, probably due to crew action.*
- *The incorrect wind information delivered by Approach Control.*
- *The absence of an approach light system.*
- *The incorrect evaluation by the crew of the runway conditions.*
- *CWS mode being switched off at approx. 80 ft RA, causing the aircraft to be in manual control in a critical phase of the landing.*
- *The delayed action of the crew in increasing power.*
- *The degradation of the lift coefficient due to the heavy showers. »*

Again, the Official Report of Accident (RoA) issued 31. October 1994 issued by the Commission of Investigation never uses the word "*windshear*" as a **contributing factor** of the accident.

---

27 *Comments of the Kingdom of the Netherlands by the Aviation Safety Board, page 1, issued on September 6th, 1994*
28 *Official report of the Commission of Investigation*
29 *Official report of the Commission of Investigation*

The third paragraph of the Dutch comments confirms the content of the first paragraph and gives the actual opinion of the Dutch Aviation Safety Board: "*the analysis … should be expanded* "[30]

And why?

> "*To accurately determine the probable causes of the accident and the contributing factors*"[31]

We're not kids

But what is the final purpose of this analysis?

> "*For the purpose of learning the lessons and taking accident prevention measures*" [32]

No, not a sharper analysis. They wanted windshear to be li

The Dutch Aviation [illegible] onclusions in general, but they request a sharper analysis on the causes and contributing factors of the accident.

That being said, within the Portuguese Commission of Investigation they are not in charge to build up the analysis and issue the final report

Well, they had all of the data and could do a 'sharper' a

Ultimately, the Portuguese Commission of Investigation is the one making the conclusions and it is its choice to accept or refuse the remarks of the Dutch Aviation Safety Board.

Was this asked? Did DASB handle with due care? You are toning down the role of DASB.

5.2.2.2. THE WEATHER ASPECTS ACCORDING TO DUTCH AVIATION SAFETY BOARD

Indications from the Dutch Aviation Safety Board that "*the crew … has been fully aware about the prevailing weather at Faro airport*"[33] are considered to be true.

The Experts have no evidence to confirm that the crew was not aware "*of the extreme conditions at the time of the accident*", as the Dutch Aviation Safety Board seems to suggest in the same sentence[34].

As it happened, the crew indicated several times that the weather conditions were expected to be difficult and the Captain clearly spoke about a possible diversion towards Lisbon[35].

[30] *Comments of the Kingdom of the Netherlands by the Aviation Safety Board, page 1, issued on September 6th, 1994*
[31] *As indicated in the comments of the Kingdom of the Netherlands by the Aviation Safety Board*
[32] *As indicated in the comments of the Kingdom of the Netherlands by the Aviation Safety Board*
[33] *Comments of the Kingdom of the Netherlands by the Aviation Safety Board, page 1, issued on September 6th, 1994*
[34] *Comments of the Kingdom of the Netherlands by the Aviation Safety Board, page 1, issued on September 6th, 1994*
[35] *Refer to CVR transcription*

The Dutch Aviation Safety Board indicates that the crew was not informed of the existence of windshear, and, in the Expert's opinion, this is correct. At this time, there was no instrumentation related to windshear conditions available on-board, and the crew was only able to suppose that this kind of conditions could be effective because of the prevailing thunderstorms.

It must be noted that the SIO[36] in principle possessed the means to analyze and to raise warnings in case of windshear, but it was solely based on the different variations of the wind at a given spot, and not based on a thorough comparison of winds measured by several sensors, themselves spread out around the airport[37].

The Dutch Aviation Safety Board noticed correctly that information regarding weather conditions obtained during the flight, were similar to those prior to take-off (during flight preparation), with a rather constant wind of 15 to 20 knots coming from the south-east (150°).
The Experts agree with this observation.

ATC reported "current thunderstorms

The crew was aware of the presence of thunderstorms, even of the one that

ch, because it was located only 8 to 12 nautical miles

Nothing on CVR!

d confirms the analysis of the thunderstorms' effects,
and heavy showers.

TAF and METAR showed steady wind.Howev

Flight Engineer (F/E)[38] show that the flight goes
enced turbulences that could be
8 nautical miles during the right-
the right axis for final approach.

F/E statement also contained othe

ates a major flight path correction

?? Source? F/E statement? Fuel p

n the event
ndshear? Or t
at F
ce this type
f the compa
ny crew m
e the prese
approach.

flight path correction? How do you

hears are frequent.

located in the fuel tanks. It was recurrent that,
the tanks would be accumulating at the rear of
de is due to three simultaneous elements: the
need for the
e turbulence

not in DFDR data. Irrelevant to revie

ATC reported a thunderstorm 30 min before landing (ACC) + own radar obdervation + report TP120 (CVR)

viation Safety na"[41]— is not

ed on the fact mena".
blish this kind

The reason is simple: the position of thunderstorms overhead the airport was not accurately predictable at the time of accident.
It was possible to predict a general unstable condition with a possible occurrence of thunderstorms, but predicting the occurrence of a thunderstorm at a precise location was impossible at the time of the accident.

See TAF: Inter moderate thunderstorms; this is not j

The Dutch Aviation Safety Board, later, commented on the choices made by the crew regarding both landing configuration and breaking distance[43].
The Dutch Aviation Safety Board seems to agree with the crew's decision; and the Experts agree as well.

What do you mean, motivate your answer.

No information regarding the intensity of the showers was transmitted to the crew. The presence of thunderstorms makes the occurrence of strong showers more likely, but no communication speaks of it.

is not required. ATC reported "flooded". Pilots asked for windshield anti icing. Th

Visibility did not seem to be an issue during this approach; even though the F/O ual references at one point[44], putting the windshield wipers on y solving the problem of visibility.

experienced intense shower at 250 ft, would be reaso

, that the Dutch Aviation Safety Board is right not to highlight

As previous note shows the importance of this point, why did experts not consider that DASB is wrong not to highlight this point

No indication thereafter that he saw

formation provided on board by the computers[45], we will see in aircraft's equipment[46] that this information was important and ubstantial help.

In 8.6.3.5 not found that this info w

[41] *Comments of the Kingdom of the Netherlands by the Aviation Safety Board, page 2, issued on September 6th, 1994*
[42] *Faro's Airport Information Publications*
[43] *Comments of the Kingdom of the Netherlands by the Aviation Safety Board, page 2, issued on September 6th, 1994*
[44] *Refer to CVR transcription*
[45] *Calculated by the R NAV system and provided on the performance page of the Computer Display Unit (CDU)*
[46] *Refer to chapter 8.6.3.5 of this report*

In windshear procedures, it is

The Dutch Aviation Safety Boar
computed wind was "*not required*" in the Martinair's standard flight procedures.
However, not requiring it did not mean that it was forbidden.
What is forbidden is always clearly defined in the operational documentation.

The arrival at Faro on this day cannot be qualified as abnormal approach due to extreme weather conditions.
That being said, it is true that this approach was a difficult one, and all that could help the crew has to be positively considered.

?? It ended up being difficult because procedu

For this crew (as for any crew), immediate information regarding the actual wind is always useful[49].
And the CVR shows us that the Captain did not hesitate to use this computed wind information.

See letter Collins, Mr Biemond had it.

The assertion made by the Dutch Aviation Safety Board is true: the computed value of the wind (direction and intensity) should be wrong as soon as the aircraft does not fly symmetrically[50].
Moreover, only the official indication provided by the ATC is considered as valid.

for planning purposes, is minutes old wind data. The actual wind might be different, reason for c

A major change of meteorological conditions actually occurred during the very last part of the approach, inducing an instability of the flight.
The Expert's investigation shows that this instability has started at around 800 feet height.[51]

There was no instability, variations were caused by PF who did not fly the procedure according to the AOM,

The Dutch Aviation Safety Board considers this change of meteorological conditions to be a major contributing factor to the accident.
It relies on the studies conducted by the NLR to affirm that "*the microburst, according to the calculations made by NLR, caused headwind to tailwind changes of a magnitude which would have triggered a windshear alert, if such a system had been installed in the aircraft*."[52]

The Experts prefer to be more cautious here. They estimate that the existence of windshear is possible, as the analysis by the NLR shows, but they do not feel confident enough to affirm that the intensity of this windshear was sufficient to be a contributing factor to the accident.

At the instant of reading the wind, sideslip was zero. The actual wind v

---

47 *Comments of the Kingdom o… …ed on September 6th, 1994*
48 *Navigation system of the KSS…*
49 *Nowadays, these informatio… …ndicate both the direction and the strength o… …cedure are even given if the computer estima… …this did not exist at the time of the accident.*
50 *Meanning wihout any slip angle.*
51 *Refer to chapter 8.6.5.3.1 – The vertical acceleration, in this report.*
52 *Comments of the Kingdom of the Netherlands by the Aviation Safety Board, page 4, issued on September 6th, 1994*

Refer to ICAO PANS-RAC Doc. 4444 Chapter IX and X. JAR-OPS only adopted in 1995. ICAO PANS-RAC (flooded) in 1985.

igation

ulations. J

At the time of the accident, the reference were the national rules. But it can be considered the JAR OPS1 as the reference to be applied because of the evolution of the European regulations and then the national ones.

The Dutch Aviation Safety Board used the expression "*contaminated runway*", and detailed the conditions associated with the term.

No, investigator Frans Erhart was informed about the use of F

The Martinair documentations (or the KLM one) do not clearly define this term: they use the expression "*standing water*" as indicated in JAR-OPS 1.

KLM confirmed being delayed amending the m

As indicated by the Dutch Aviation Safety Board, the term "flooded" is used in the ICAO document n°4444[55].

One must note that this document does not constitute a reference for pilots, and that it is more destined to be used by air traffic controllers (ATCO).

??? Pilots must be trained to understand ATCO

Here is the content of the ICAO Document n°4444 - chapter 11.4.3.4 – Messages containing information on aerodrome conditions:

In 1992:PANS-RAC, § 4

11.4.3.4.1 Whenever information is provided on aerodrome conditions, this shall be done in a clear and concise manner so as to facilitate appreciation by the pilot of the situation described. It shall be issued whenever deemed necessary by the controller on duty in the interest of safety, or when requested by an aircraft. If the information is provided on the initiative of the controller, it shall be transmitted to each aircraft

---

53 *Refer to chapter 8.6.4.4.2 of this report*

54 *Refer to the Annexes to understand why the Experts used the JAR OPS as a reference.*

55 *ICAO Doc n°4444 : PANS ATM - Air Traffic Management - Procedures for Air Navigation Services*
The Procedures for Air Navigation Services - Air Traffic Management (PANS-ATM) are the result of the progressive evolution of the Procedures for Air Navigation Services - Air Traffic Control (PANS-ATC) prepared by the Air Traffic Control Committee of the International Conference on North Atlantic Route Service Organization (Dublin, March 1946).
Originally applicable on a regional basis, the PANS-ATC became applicable on a worldwide basis on 1 February 1950.
The last edition of 2007 – the fifteenth – re-titled Procedures for Air Navigation Services — Air Traffic Management (PANS-ATM), provides for a comprehensive update of the procedures as well as a major reorganization of the contents. The new title reflects that provisions and procedures relating to safety management of air traffic services and to air traffic flow management are included.

concerned in sufficient time to enable the pilot to make proper use of the information.

11.4.3.4.2 *Information that water is present on a runway shall be transmitted to each aircraft concerned, on the initiative of the controller, using the following terms:*

- *DAMP: the surface shows a change of color due to moisture.*
- *WET: the surface is soaked but there is no standing water.*
- *WATER PATCHES: patches of standing water are visible.*
- *FLOODED: extensive standing water is visible.*

It appears that this information corresponds to what the controller can see from the tower.

reported to the aircrews

Yes, the crew understood, otherwise they would have asked: Say again, or asked details. The captain answered after 8 sec.: "Roger

Actu[illegible]
unde[illegible]
statu[illegible]

Based on his training, he transmits the information to the crew to improve the flight safety: he should therefore ensure that he is well understood.

Don't blame him. The capt said Roger.

Such an issue today is always in-depth analyzed by specialists[56]: This type of issue is part of the investigation on verbal and non-verbal communication (in the larger meaning of the term[57]).

Therefore, standardized terminology was u

Such an analysis was not carried out at the time of the accident, except if a specific element calls for it, which was not evident in that instance.

No reason, capt said Roger.

The "flooded" information was transmitted at 07:28:17 UTC[58], which was a relatively critical moment:

- The aircraft was in the middle of the final turn procedure towards the final descent path for landing;

  on autopilot, capt did radio

- The flight went through an active storm area, provoking turbulences "*stronger than moderate*" as said by the F/E;

  ??? Did you verify with DFDR data

- An important correction of the flight path just occurred, which resulted in the flashing of the fuel cue light[59]

  ?? A normal appr. procedure turn. Where from? Objective DFDR dat

Moreover, this information is transmitted about 5 minutes before landing. It is a long time taking in account the workload of the crew, which is performing the final approach using a VOR-DME procedure, next to an active stormy area.

Was during final turn, on autipilot. No high workload. CVR recording doesn't support this.

Usually, an update on the prevailing weather conditions will be given by the ATCO to the landing aircraft when issuing the respective landing clearance.

---

56 *This is a huge chapter of the nowadays analysis of the Human Factors.*
57 *Human interactive communication*
58 *This information was also transmitted to the MP461, several minutes ago.*
59 *The "fuel cue light" is an alert indicating that something wrong happens regarding the fuel systems. The pilots must then check the local panel to know precisely what is going on.*

The landing clearance to MP495 was given at 07:31:44 UTC: “*cleared to land runway one one, the wind one five zero, one five knots, maximum two zero*”[60].

The previous description demonstrates that the crew members are mentally busy in the cockpit and that ensuring proper communication with the ATC is not their top priority at this particular moment.

Not supported by CVR recording

The time gap[61] between the transmission of the “flooded” information and the Captain’s answer is a huge element proving this assertion.

No, he was selecting and reading the wind data fro

It is possible then that the Captain did not immediately understand the word “flooded”.

Looking for excuses to protect the pilots? He responded "Roger", meaning I understood, isn't it Experts?

Even though he did not understand it right away, he at least heard it.
This is what his answer “ROGER” suggests; “ROGER” is a general expression that means “I ~~got~~ it”, and we cannot neglect it.

The Captain, in his statement, indicates what the term “flooded” might mean for him[62] : *”if the runway is actually flooded that means “standing water” to me. In that case, the breaking action in “poor” and the crosswind limit is reduced to 5 kt. In my mind this condition did not exist during our approach”.*
The term “flooded” should then have resulted in a request for further information.
But there was no further commu[...]hich means that the Captain did not fully gras[...] word.

Why? He understood, didn't he? He said "roger"

It is this last factor that enables the Experts, to agree with the Dutch Aviation Safety Board on this point.

The Experts consider that the Dutch Aviation Safety Board’s position is valid since the information received by the pilots regarding the runway status did not strike them as important enough to make it a top priority in their assessment of the situation, and in the list of problems to solve.

Were there problems?

r Erhart. "According to regulations (attached) flooded can be used by an ATS unit in RT (and in ATIS tran

THE APPROACH AND LANDING

REF?In 1992 called Vthreshold.

Regarding the speed to be inserted if the ATS speed window[63], and regarding the KLM flight crew operating manual, the REF speed[64] was 139 knots.

The Experts think

Experts think... Have you reviewed the AOM 3.3.5-03? The minimum wind correction factor is 5 kt! Va

- either the Captain considered steady wind conditions and in this case, the right command airspeed to be inserted was 144 knots (139 + 5 knots);

See 8.6.4.2.2. p102

[60] *Here, the Approach controller (ATCO) even transmitted to the aircraft the instantaneous wind from runway 29 instead of runway 11*
[61] *9 seconds (refer to CVR transcription)*
[62] *Lijst 4-map-1-on-4 p.34 of the pdf document*
[63] *On the Multifunction control panel*
[64] *REF speed is the speed to manage during the approach, depending on the aircraft landing configuration. This speed is then modified according to the wind conditions.*

Experts did not notice error in FCOM 03-50-04

Approach speed must always at least 5 kt higher than threshold s

- or, the Captain considered a gusting wind c command airspeed to be inserted was 139 Knots[65], having in mind that the ATS system will add automatically a 5 knots correction in case of gusts[66].

ending up at the same speed, while during gusts the speed should be 5 kt higher than 144 kt! Bad Human Factors interpretation

No. Wrong

In both cases, the value of the ~~resulting~~ indicated airspeed to be ~~monitored~~ during the final approach is 144 knots.[67]

to set in the ATS

And regarding the weather conditions prevailing at the landing time, the likely Captain's decision considering a gusting wind conditions is considered by the Experts as appropriate, leading to put 139 knots in the ATS window.

Experts don't interpret the manual correctly, don't understand the approach speed criteria and the required wind correction.

This difference of 5 knots between the selected speed in the ATS window and the speed to be monitored is not a cause of the accident.

Well, the setting of a too low approach speed led to a too low threshold speed, loss of lift, and increased ROD.

The Dutch Aviation Safety Board is on the same position as the Commission of Investigation about the beginning of instability, calling it, « *oscillations in pitch, airspeed and engine power* »[68].

But what is your opinion?

variations

The Dutch Aviation Safety Board regards the beginning of instability as being likely due to the first downburst[69] the aircraft had to go through.

The Dutch Aviation Safety Board believes that oscillations might have increased following the second and third microburst[70] that occurred during final approach, and also following interactions coming from the ATS and the pilot's control inputs.[71]

Were there any

There was no instability in the sense of aircraft instability, and no loss of control either. How determined? Experts don't know what they are t

The Experts confirm that instability increased until the loss of control. However, the Experts do not confirm the interactions of the ATS and the pilot's control inputs because neither the Dutch Aviation Safety Board nor the Commission of Investigation substantiated this theory.

But what is your opinion? You cannot read DFDR graphs, can y

The Experts agree and side with the Dutch Aviation Safety Board when it indicates that the instability did not force the aircraft to go beyond its operational limitations.

The Dutch Aviation Safety Board remains cautious regarding the vertical speed values as it seems that these values are merely computed, and not recorded by sensors.

FCOM not provided by the court. They provided Martinair AOM

65 *KLM FCOM § 3.3.5-03 : « During gusting wind conditions, the ATS will add up to a maximum of 5 knots to the ATS reference speed. »*

66 *KLM FCOM § AOM 3.3.5-03 - Wind Correction Factor indirectly confirmed by Douglas in its response of February 12th, 1993 by Steven R. Lund. The target speed to manage was 144 knots meaning that the speed to put in the ATS window was 139 knots.*

67 *Refer to the Captain's statement and to the Doug*

68 *Comments of the Kingdom of the Netherlands b on September 6th, 1994*

69 *As defined by the NLR in its report CR94238C*

70 *As defined by the NLR in its report CR94238C*

71 *Comments of the Kingdom of the Netherlands b on September 6th, 1994*

Definitely wrong. The approach speed had to

The Experts agree here that such caution is appropriate.

The Dutch Aviation Safety Board's comments seem to indicate that what they identify as "*problems*"[72] started at approximately 150 feet.

The Experts do not validate this statement because this phase of the trajectory is merely the continuation of the previous trajectory during which an uncontrolled, or mishandled, instability settled. Nevertheless, the Experts consider that severe problems started at 150 feet height.

why? because of what? Noticed copilot c

to

Moreover, the Dutch Aviation Safety Board indicates that the thrust increase at around 102% at 07:32:40 UTC — 10 seconds before impact — is the result of the ATS's actions.[73]/[74]

20. At 10 sec, the decrease!

The Experts disagree with this assertion.

Seen DFDR data?

It seems that the specialists originally designated to lead this investigation preferred to remain cautious by avoiding declaring which one, between the ATS and the pilot, caused this thrust variation.
The thrust increase could also have be initiated by the pilots: this is at least the content of the statements made by the Captain and the F/E.

Yes, 2.5 sec before touchdown, r

The Dutch Aviation Safety Board estimates that the Portuguese report is correct regarding the thrust decrease probably initiated by the ATS and confirmed by one of the pilots.

!

A lack of certainty about the thrust variation is the reason for the Experts to be cautious.

If Experts would have been familiar with ATS operation, they won't have lack of uncertaincy.

The Dutch Aviation Safety Board holds the F/O's actions on the controls[75] responsible for the inclination leftward.[76]

The flight analysis conducted by the Experts tends to agree with this statement.[77]

The bank angle gradient to the left, surprises both pilots who react at the same time to control and revers ... strong.

?? Wrong word. Bank increased to left over 6 s because of 90% rudder to left, no surprise. No timely co

No! bank to z

??

It is technically possible that this probably strong action by the pilots provoked the automatic pilot to disengage the CWS mode.

No, because of opposite control inputs of capt and co

---

72 *Comments of the Kingdom of the Netherlands by the Aviation Safety Board, page 6, issued on September 6th, 1994*
73 *Comments of the Kingdom of the Netherlands by the Aviation Safety Board, page 6, issued on September 6th, 1994*
74 *Refer to Captain's statement and F/E's statement.*
75 *The Dutch Aviation Safety Board indicates that this action is on the rudder (23° to the left)*
76 *Comments of the Kingdom of the Netherlands by the Aviation Safety Board, page 6, issued on September 6th, 1994*
77 *Refer to chapter 8.6.5.3.2 of this report.*

This is validated by the Dutch Aviation Safety Board.

Is this so?

However, a double-click[78], which was signaled and recorded by the CVR seems to prove that this disengagement was voluntary.

autonomously? accidentally? Becau

Not seen AIDS data?

In case of automatic disengagement, only one click would have been recorded, and heard.

The Dutch Aviation Safety Board explains that both pilots might not have noticed since both were looking outside, and since the disengagement of the CWS mode is signaled only visually on the instrument panels.

Did this matter? The capt took control.

It is possible that the signal was simply not seen by both pilots, but could have been seen by the F/E.
In such a case, it means that the double-click should be effective and it is the one which caused the Autopilot disengagement.

the double click didn't cause, but opposite control inputs.

The statement according to which the disengagement of the autopilot (switching from CWS to MAN) occurred spontaneously is therefore not validated by the Experts.

?? Caused by opposite roll control inputs capt and copilot. Not spontaneously. Capt did not call 'my controls'. U

The aircraft touchdown at 07:32:50 UTC and the NTSB indicates in its factual report of February 12th, 19 moment, the flight data are as follows:

?? No wrong time reference.

- CAS: 126 knots
- Magnetic hea 116,72 °
- Pitch attitude + 8,79 °
- Roll angle: + 5,62 ° (Right wing down)
- G forces: 1,9553

Note that for 162 tons[79], the stall speed with Flaps 50° and slats extended to the land position, is 112 knots. At 126 knots, the aircraft is technically still able to fly.

So, no loss of control? As stated in 5.2.2.4?

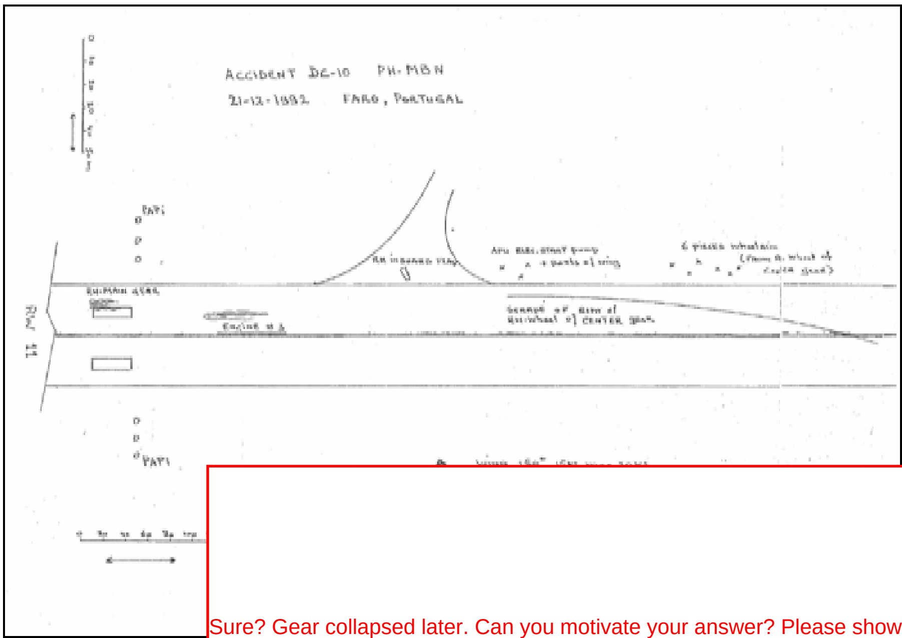
The heading at touchdown is 117°, which a runway axis of 106°, meaning a crab angle of 11°.

Op pag. 33: Crab angle = contributing factor.

Why don't you say here that the DC-10 is not approved for landing with crab angle. AOM 3.3.5-15:Landing on a wet

Why not mention that go-around was impossible because thrust was at flight idle, and that, after touchdown, the sp

[78] *At 07 :32 :44 UTC and 80 ft according to the CVR transcription*
[79] *Estimated landing weight of the aircraft*



Why this figure, and not the off

Docu

Sure? Gear collapsed later. Can you motivate your answer? Please show calculations, etc.

The Experts' c
to the collapse of the gear.

and what is your opinion? We did read the report as well.

1,9553.

According to the official report, the high impact on landing (load factor -1,9555 G - and high vertical speed) are not only contributing factor
the gear.[80]

deleted "without any doubt"

Just prior to touchdown, vert. g was 1.2 g, meaning tha

The certification of the landing gear of the DC10 follows the FAA Part 25.473 « *Landing load conditions and assumptions* ».

page 54?

How do you know? But was the landing gear built to this cert. limit, or was it made stronger?

With

got :With

he selected limit vertical inertia load factors at the c.g. of the airplane may not be less than the values that would be

But also above the real DC-10 limits? That's the question here + We

See p 53 with qoutes out of the NTSB report DCA97MA05

80 *The reference is the RvO 1.16.1 which, itself, refers to the fracture study presented in annex 10 of the official report.*

81 *Refer to chapter 8.6.4.6 of this report*

The vertical (normal) acceleration just before touchdown, as recorded by the DFDR, was 1.2 g, meaning that the aircraft landing weight was not

5.2.3. THE DUTCH AVIATION SAFETY BOARD'S BEHAVIOR DURING THE INVESTIGATION

This is the main concern for the Experts because this question constitutes the core of the mission as defined by the Court.

The analysis and study of the archived documents put at the Experts' disposal shows an important involvement by the collaborators of the "*Netherlands Accident Investigation Bureau*" as called in the official report of the Portuguese Commission of Investigation.

We must bear in mind that the intervention by the Dutch Aviation Safety Board follows the ICAO Annex 13. It will be considered and will be able to take actions as an accredited representative who will be put directly under the responsibility of the President of the Commission of Investigation.

The problem that will arise for the collaborators of the Dutch Aviation Safety Board will be to remain independent from both the Dutch Authorities and the airlines involved.

5.2.3.1. KLM/MARTINAIR AND THE TRANSCRIPTION OF THE CVR

It is normal that most of the conversations in the cockpit going on are in Dutch language since the crew members are themselves Dutch natives (at least the pilots).

F/E was Canadian...

It is only in 2003 that a certain number of standards and recommended practices were published by the ICAO about the question of language to be used in a cockpit; these clarifications did not address general communication in the cockpit but only communications with ATC centers.

In our case, the use of the English language by the airline in its document concerning general operations makes us believe that English was the language to use.

Let us begin with the operational documents.

The document called "Basic Instructions Martinair" is written in English for the most part.
That being said, some paragraphs or chapters are in Dutch.
For instance, the rule addressing working hours and rest (chapter 1.1.2 of the BIM) is written in both Dutch and English.

This document establishes rules that ought to be always implemented regardless of the type of aircraft.
It also comes with annex documents edited by Martinair's mother company (KLM), which describe all technical characteristics and performances of the DC10.

It is worth noting that general rules do not address the use of various languages in the cockpit.

However, it is normal that crew members spontaneously use their native languages during non-technical conversations.

It appears that the crew was speaking English for all technical conversations and Dutch for general ones.

This therefore calls for a transcription of the CVR by people who are knowledgeable about Martinair's procedures (of the time) and who are completely fluent in Dutch.

The decision made by the Official Commission of Investigation to charge the Dutch Aviation Safety Board, acting also as accredited representative, to solve this question for a transcription of the CVR, is then logical.

Was not asked by the Court.

5.2.3.2. NTSB AND THE DFDR ANALYSIS

In this case, the transcription and the interpretation of the flight data was assigned to specialists of the National Transportation Safety Board, also accredited representative of the USA/FAA.
This is logical because the designer of the system was an US company, and that the equipment the NTSB possesses is probably one of the best in the world.

5.2.3.3. THE OTHER SPECIFIC ANALYSIS

5.2.3.3.1. THE LANDING GEAR COLLAPSE

The investigation commission assigned the metallurgical analysis of the main gear's fracture to a Portuguese laboratory[82].

The conclusions appear in annex 10 of the Portuguese official report:

> « *The material of the various components of the landing gear had mechanical characteristics that meet the specifications provided by the manufacturer. All microscopic observations deeply documented in this report did not detect manufacturing defects, both internal and superficial or lack of homogeneity of the material. The material found was thus free from defects, homogeneous and the mechanical characteristics adjusted to the set of landing gear parts.*
>
> *The macro and microscopic observations made in all critical parts and in selected areas of beginning of rupture clearly demonstrated that the rupture of gear parts, attachments and retraction mechanism was a static rupture, suddenly caused by an intense overload induced by the hard landing on the runway. The various localizations of sudden ruptures were detected and documented as well as a microscopic characterization of the mechanisms acting in breakage of parts, was conducted, which confirmed the above.*

Why did they write this. Were they not informed about the large crab angle that c

[82] *The "Instituto Supérior Tecnico";*

Any fatigue pre-crack nor nucleation localization and fatigue cracking were detected. Therefore, the parts of the gear and associated motion mechanisms were, in the time of the accident, without fatigue or other defects and without internal fatigue damage. The rupture was due exclusively to the so strong impact on the gear during the hard landing that caused the overload that induced in the parts and in critical areas, instantaneous stress levels that exceeded the static ultimate strength of the material. Gear failed not at touchdown, but further down the runway.

The approximate calculation of torsional moments created in the gear retraction mechanism at the instant of rupture has led to rather high values within the zone of plastic deformation of the material. This result confirms the conclusion mentioned above since the values obtained by bending moments could only be achieved in a violent overload stress caused by an impact applied suddenly. »

Why was the replacement of the right landing gear postponed three times?

5.2.3.3.2. THE WEATHER CONDITIONS

The analysis of the meteorological situation was partially assigned to the KNMI (Koninklijk Nederlands Meteorologisch Instituut or Royal Netherlands Meteorological Institut)

This is a first analysis of the general meteorological situation.

A weather analysis was issued the 21st of January 1993 by the « Instituto Nacional de Meteorologia e Geofisica (Decision n° 29/92 issued on December 21st 1992).
This analysis was also a general situation analysis showing a low-pressure area South-West of Portugal with heavy thunderstorms.

But the maps do not show an exceptional situation, that would alert pilots who face such instability in different regions of the world.
That being said, the general meteorological situation does seem to be unusual in the middle of December in Southern Europe.

Were there windshears during the final approach of the MP495?

This analysis was assigned to the NLR (Nationaal Lucht- en Ruimtevaartlaboratorium or Netherlands Aerospace Laboratory) as stated in a first contract requested by the "Netherlands Accident Investigation Bureau" (Initial report of NLR CR 93080 C as of 05 March 1993).
A second contract was initiated in order to complete the conclusions of the first report (NLR report CR94238C as of 06 July 1994).

Was NLR right? Were the up and downdrafts not the consequence o

The only thing we may add though is that the NLR has evaluated the wind during the final approach, and based their evaluation on an analysis of both vertical and horizontal accelerations.[83]

And was this correct? Reliable?

The NLR has identified three situations of downbursts and areas of turbulence with microbursts; as it happened, it seems to be the third one that could really be of interest since the two previous ones were passed successfully, even though it caused instability of the aircraft on its trajectory.

Please explain what instability, using DFDR

For this last situation of downbursts and areas of turbulence with microbursts, it corresponds to a wind
and a speed of 27-28

Do you agree with downbursts after reviewing DFDR data?And how did you derive these winds? How

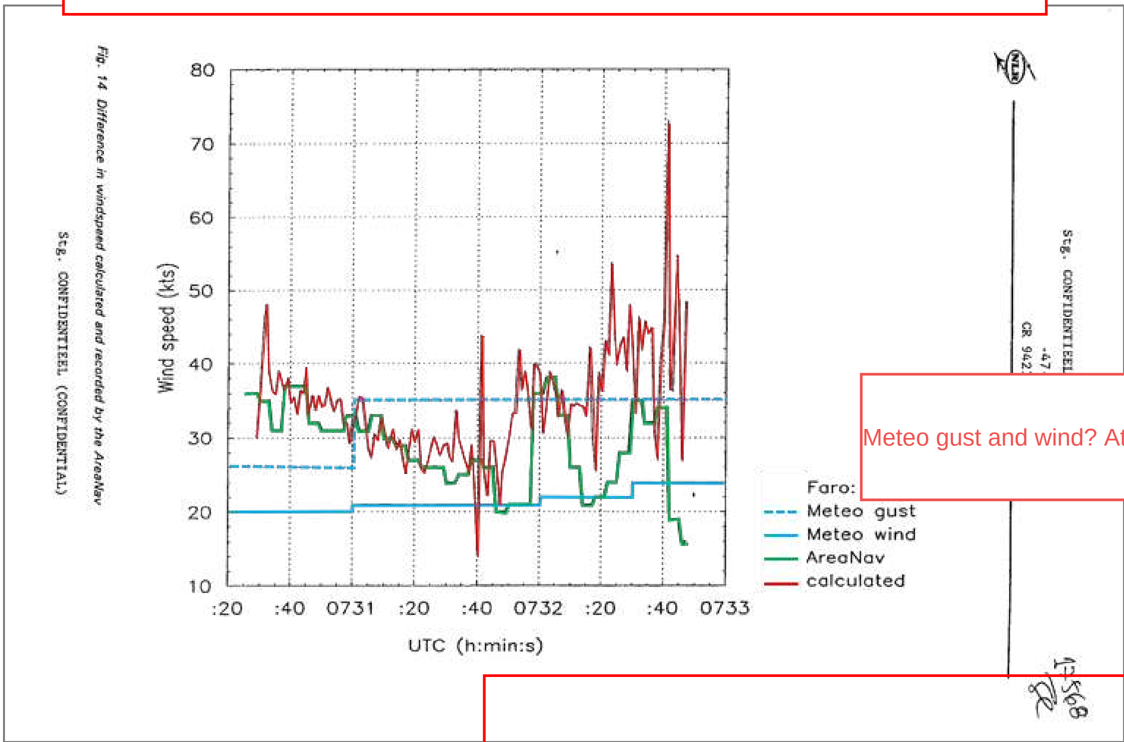
This could very well explain the leaning leftward, but not necessarily, the brutal variation of bank angle.

Was a rudder control input, not seen AIDS data?

??

These variations of wind, whatever its effects, are significant.

Were they? The heading was constant 125 deg. except during rudder input. This cannot be called signifi

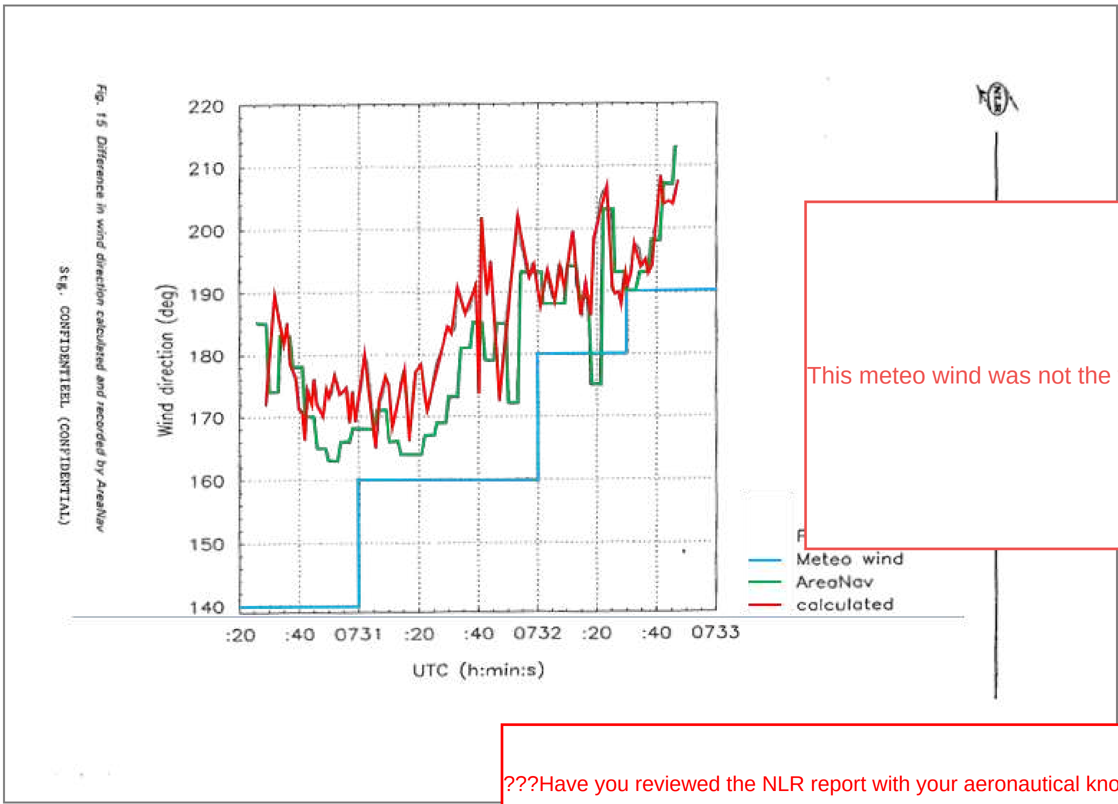


Meteo gust and wind? At the airport, o

Where is the AeraNav data from?And what does calculated mean? Ho

[83] *The wind is not a recorded data as it is the result of a computing process. The only way to have an approximate value of the wind is to compare the route and speed of the aircraft by reference to the ground, to the heading and speed of the aircraft by reference to the air.*

Did you not do a heading/ speed analysis? A heading of 125° on a said appr



This meteo wind was not the wind r

???Have you reviewed the NLR report with your aeronautical knowledge? Are the

The fact that the Dutch Aviation Safety Board proposed to hire the services of an outside laboratory (here NLR) perfectly follows the ICAO Annex 13.

As a last resort, the commission itself will pick and choose the experts or specialists it wants to provide help in the investigation. ??? Why are you saying this?

The Commission of Investigation does not have any apparent reason that would force it to refuse the proposition of the Dutch Aviation Safety Board regarding the usage of the NLR's services — the latter having an already well established reputation.

As a consequence, the commission has no reason to reject the NLR's conclusions.

But you? You say you are experts, do you accept or reject? Why would we accept your conclusions?

5.2.3.3.3. THE FUNCTIONING OF SOME AIRCRAFT EQUIPMENT.

It is rather usual to see a Commission of Investigation requesting the expertise and the assistance of an aircraft's manufacturer, or of an industrial company that designed and/or built a given system or a certain part of equipment.

Annex 13 requires these to be invited, isn't it?

It is also important to note that it is really not in the interest of the manufacturers to hide a weakness of their production. Such an action would not only make them responsible for any future problem ... eir reputation.

is this so? They will be sued by others in case of

5.2.4. THE LETTER OF THE GENERAL MANAGER OF THE AVIATION AND MARITIME AFFAIRS AND THE ANSWER OF THE DUTCH AVIATION SAFETY BOARD

The General Director of Civil Aviation followed up with the Minister of Aerial and Maritime Affairs' instructions through this letter, dated on June 28th, 2011.

> « *In my letter of 17 May 2011, reference IENM/BSK-2011 /60723, I informed you that the analysis by AvioConsult of the air disaster at Faro in 1992 would be submitted to the Dutch Safety Board.*
> *By now, Minister Schultz van Haegen has received the findings of the Board.*
> *In the accompanying letter addressed to the Minister the chair of the Dutch Safety Board, T. Joustra, included the following assessment:*
> *"It is the opinion of the Dutch Safety Board that this report does not present any new facts or insights in relation to the Faro disaster and that further investigations will not lead to further clarity or discovery of the tru* [illegible]
> *I appreciate that this letter cannot remedy sufferin* [illegible] *e that the relatives can obtain a degree of comfort from it* [illegible] *arlier, the Director Aviation of my service, Mrs. Ellen Bien, is* [illegible] *l meeting with Mr. and Mrs. Vroombout.*
> *Please find enclosed the analysis of Dutch S* [illegible] *report by AvioConsult.*
> *I hope you will find this information useful.* »

Only referring to the Summary; did

Why this quote?

This letter is important in the context of the questions asked to the Experts; this is why the answers provided by the Dutch Aviation Safety Board ought to be evaluated.

??

Several points have been addressed throughout this report.
The Experts provide answers to some questions regarding the use of the engines, the thrust management, and landing with locked wheels.[84]

Other answers are more implicitly given about the objectivity of the Dutch Bureau of Investigation and Security. OVV??

You mean to the Draft Portuguese repor

The Dutch Aviation Safety Board proposed several modifications of the ~~interim report V17~~, to the Commission of Investigation through different comments and remarks: the Commission did take or did not take them into account to issue the final report, showing a real independence.

One must not get confused between the nature of these two entities; in reality, one has full responsibility for the investigation (here: the Commission of Investigation) whereas the other one is just there to confirm, contradict and sometime help if necessary in order to shed mor [illegible] ere: the Dutch Aviation Safety Board).

just there? On page 15 you wrote The comn

[84] *Refer to chapter 8 of this report.*

The experts have thoroughly analyzed the Dutch Aviation Safety Board's propositions and have at time corroborated, and at other time contradicted some of them.

And, where are your comments? Did you indeed review the blue report (RVDL3) or only the a

One only needs to take a look at the draft accident report submitted by the Commission of Investigation to the Dutch Aviation Safety Board in which we can notice several potential errors that were later on corrected through the Dutch Aviation Safety Board's proposals.

But many proposals (in RVDL3) were rejected by the Commission. What about the proposals th

6. ANSWERS TO THE COURT

This chapter is dedicated to the eleven points raised in the §2.5 of the judgment of the 8th of July 2015:

6.1. THE MICROBURST AND WINDSHEAR, THE CROSSWIND AND TAIL WIND COMPONENT ACCORDING TO THE REPORT OF ACCIDENT

It is undeniable that the aircraft has encountered destabilizing meteorological conditions during the last phase of its final approach. Why? Heading near constant, no large alt. deviations.

The copilot mishandled the controls and caused the variations.

The NLR has conducted two studies[85] that both confirmed that the aircraft went through three windshears below 1000 feet/ground, after07:30:30 UTC.

No, in clonclusions NLR: no windshear. You said no windshear (page 26, 22), Portuguese said no windshear, so was NLR right?

The third windshear — through which the aircraft went at a very low altitude —has caused an important flight path deviation followed by a loss of control; the latter led to a descent rate way above the value that the landing gear could support.

The Experts estimate that these variations of speed and direction of the calculated wind must be considered, and as a result, they induced accelerations[86] and turbulences[87] There were no wind variations, only a copilot who used his controls inapproriately and caused variations.

It seems likely that certain Which ones? Please specify. ease of the rate of descent, whi

All that being said, it is not in the Dutch Aviation Safety Board competencies to requalify the NLR's conclusions. This makes no sense since the Dutch Aviation Safety Board has neither the expertise not the responsibility to do it.

Wrong, they should have commented. NLR was not aware of a VOR-DME approach. The research engineers w

6.2. THE (ALLEGED) OCCURRENCE OF A LATERAL MOVEMENT

All the elements analyzed by the Experts (the wind effects or the pilot's actions on the flight controls) lead to the same conclusion that there is a lateral movement towards the left of the runway. Did you really analyze the control inputs by the pilots?

Yes, but not from the (extended) runway centerline, but from the left side, from far left of the centerline.

It is a coherent conclusion with:

- The statement made by the pilots during their interviews, according to which the aircraft was on the r 200 feet height;
- The impact that occurre unway as proven by the markings on the ground Do you believe statements taken two months

---

85 *Refer to NLR report CR 93080C pages 79 & 80 or NLR report CR94238C*

86 *Although lower than the limit established by the ICAO in a published document that has been abrogated by the time of this report.*

87 *Refer to passengers' or crew members' statements,*

6.3. THE RATE OF DESCENT

calculated? Or read from DFDR data? N

The value of the descent rate was calculated by both the NLR and the NTSB in its analysis of recorded parameters on the DFDR.
Both have similar conclusions.
The Experts also obtained similar results.

How calculated? Sure? Number? 850 fp

Moreover, the analysis of the mechanical collapse of the right main landing gear illustrates the problem generated by an excessive vertical speed.[88]

Was it excessive for a DC

The Experts' mission is not to find out the origin of this vertical speed. Moreover, it is a normal job for an expert of a Commission of Investigation from which DASB is a part, to require the answer from the best specialist available for the related topic.[89]
It is obviously not possible to deny the existence of a high vertical speed[90] at the time of the accident.

Why neglect the NTSB report that experts of claimants mentioned? ROD was 850 fpm, th

6.4. THE (ALLEGED) OCCURRENCE OF AN INTENTIONAL NAVIGATIONAL ERROR

On page 7 you mention an inappropriate correction of the wind during the interception and the final phase. On page 102 same thing. O

If this question calls for the Expert to evaluate the decision of the crew to engage the last turn at 8 nautical miles, then the answer resides in the relevant Portuguese procedure published at the time.

No, it is about not returning to the 111 approach radial

The Experts' analysis as shown in paragraph 8.6.4.1 of this report, shows that the crew respected the published approach procedure, at least during initial and intermediate approach paths.

Do you really mean this? This question is about the final approach, from 6 nm

In addition, this flight path clearly avoided a very active stormy area, west of the airport for more or less 10 nautical miles.

Irrelevant, Is this sure? Not on CVR.

On page 7, experts state about the approach above 500 ft: "aside from an inappropriate correction of the wind during

6.5. THE (ALLEGED) MISSING OF CALLS BY THE CREW

If this question calls for the Experts to evaluate the fact that the crew forgot the "500 feet" call out, the Experts confirm that the crew forgot it even if it was partially corrected by the F/E' call out.

The instructions published by Martinair in its BIM indicate that, if the aircraft is not stabilized at this altitude, a missed approach procedure must be engaged.
This specific instruction is customary in most airlines.

The pilots call this window the "stabilization floor".

not an AOM term.

---

[88] *Referring to the conclusion of the "Instituto Supérior Tecnico" which was in charge to perform the metallurgic analysis;*
[89] *Refer to the Preamble of this final report.*
[90] *Vertical speed calculated and as recorded on the Aircraft condition monitoring system – NLR report CR 94238C page 50*

Experts forget to mention the other missed calls: 'A

ıtion floor[91] may vary from one company to another, se.

Irrelevant, what is this in the Martinair manuals?

h this window in a specific configuration, but to do it efined by the actual procedure. ifferent whether the pilots carry-out a visual or an

neans that all destabilization below this level should sed approach procedure.

ve initiated a missed approach procedure since the n at a very low altitude.

ion, the fact that the pilots forgot to make the considered as a contributing factor to the accident: the announcement constitutes a verbal reminder of the procedure to follow, and it was not done.

On page 84 you wrote: "Why did one of the pilots seem to override the functioning of the A

6.6. KEEPING THE THROTTLE (TOO) CLOSED

You don't discuss closing the throttles at 150 ft. 15 sec

There are two points to address regarding this question:

- First, the records show a strong thrust increase that reached a value comparable with a missed approach procedure;
- Then next, a decrease down to flight idle thrust.

When exactly?

and 3 sec prior to touchdown an increase again

Several scenarios have been mentioned but, for the Experts, it clearly appears that the increases in thrust were consequential to the destabilization, not a cause of it.

DFDR and AIDS show the copilot interfering. Not noticed, experts?

However, even though the thrust increase showed the pilot's intentions to go around, n but the variations of bank angle,

Which thrust increase do you mean? At 15 sec. before landing? Thereafter th

??? What do you mean. There was only one peak (14° left).

6.7. THE LANDING GEAR BREAKING OFF

There is no doubt whatsoever regarding this element; the Portuguese experts conducted analyses that are irrefutable:

- The material did not have any defect that could have weakened the gear's resistance;
- The maintenance of the system conformed with the constructor's instructions;
- pressure on the landing gear that /.

How do you know? Seen the maintenance log? Replacement was postpon

Are you sure? No additional effect of the crab angle, ear

[91] *Make the differene in between the stabilization floor which is a reference for the handling of the plane and the MDA which is a reference for specific IMC approaches.*

6.8. THE CREW'S INTERPRETATION – OR LACK THEREOF – OF THE TERM "FLOODED"

As explained before, the Experts estimate that analyzing the understanding of this word can be done using the largest sense of the term and cannot be dissociated from the "Human Factor" principles, which ought to be considered as a cause or a contributing factor of the accident.

The real science of HF is much older.

This type of "Human Factor" analysis was at its early stage at the time of the accident, and no specific publication defined it clearly even though some airlines started to consider it in the flight safety policies.

The "flooded" information was transmitted to the crew around 5 minutes before expected landing.

?? Not in § 8.4.1

It came at a moment when the pilots' w

Also on page 28

- In the middle of the final turn;
- Crossing of a storm west of the airport; Crossing ??
- With important variations of the flight parameters
- And with important thrust variations and the flick indicating that the aircraft took at this precise moment, a substantial pitch attitude but within the AFM[92] limits.

"the fuel pressure warning light briefly illuminated"

Substantial? How do you know? Objective data? Where from? FE

pitch attitude limits in AFM?

The Experts note the delay, quite long (9 seconds), between the transmission of the "flooded" information by the ATCO and the answer from the crew, showing also that the crew was highly busy at this time. How do you know? Flew on autopilot! No evidence on CVR.

From a "Human Factor" standpoint, it is then conceivable that the information "flooded"[93] was not fully perceived and understood, or actually even heard.

Capt said Roger, and stated the exact meaning of flooded in his statement to the Portuguese police.

It is credible that the captain's answer was more of a reflex, which means that the information was not well understood.

a reflex after 9 seconds?

On the other hand, one could suppose that the information was well heard and understood. If not sure, why talk about this?

The Experts estimate that this information alone might not be sufficient to cancel the approach at this moment.
~~The final decision is what is called "a Captain's decision".~~

On this chapter regarding the meaning of "flooded", the Experts remind that the fact that the runway was or was not flooded is neither a direct cause nor a direct contributing factor of this accident.

The ATCO reported the runway was flooded, so it was (for the pilots to use, not to doubt). You don't know

---

[92] *Aircraft Flight Manual issued by the manufacturer.*
[93] *Refer to Captain's statement : « In my mind, this condition did not exist during our approach »*

The captain made the interpretation that the runway was wet. "I took it to mean that the runway was wet". In that concext see the earlier remark "flooded m

??

On page 58 § 8.4.1 no ref. to high workload, not on CVR either.

this means he processed the info an

993: the result of this

meeting? Questions asked beginning o

official report on the
d in November 18th,

after issuance of the final report

94 *31st October 1994*

95 *Judgement of the 26th of February 2014 § 3.10*

Consequently, the Experts consider as normal that the airline and the Dutch Aviation Safety Board, itself linked by an obligation of secrecy (to protect its independence because of its involvement as accredited representative in the Commission of Investigation), answer the questions after the issuance of the official report.

The Experts underline that the most part of these questions were not appropriate to the investigation itself but are related to liability and/or responsibility of the different actors, which is not the main purpose of such an investigation. No, but in this case it is.

But were the answers right?Was this handled by DASB with due c

6.10.2. MEETING OF 1994

Another meeting took place on December 1st 1994[96], after the issuance of the final report of the Commission of Investigation.
The purpose of this new meeting was to explain the content of this report, to provide information about the role of the Dutch Aviation Safety Board and to give opportunity to ask factual questions.

were they?

The Experts want to underline that the DASB o [illegible] d by the conclusions of the Commission of Investigation.

No was not the most important.

The most important remarks raised by the families and victims were that the witnesses' statements were not considered by the Commission of Investigation.

The Experts have been provided with a document Dossier NA 2617 and Dossier NA 2622, merging the visual witnesses' statements.

The answers provided during the meeting to the families and victims were considered as not appropriate by the families and victims. But what is your opinion?

?? The Experts note that in some cases, the answers were not enough substantiated, mainly in the way an accident investigation is organized or conducted according to ICAO Annex 13.

They note the existence of contradictions in between the witnesses' statements but also contradictions between the statements and the objective recorded flight data.

You do not answer the question of the court. What's your conclusion on the

6.11. THE LOCATION WHERE THE AIRCRAFT CRASHED.

The Experts assume that this question refers to the fact that the region of Faro could have been a cause, or a contributing factor of the accident.

No, the location on the runway, half outside of the runway left side and in the d

[96] *Judgement of the 26th of February 2014 § 3.11*

General instructions regarding Faro airport do not provide any alert on this specific topic.
The Faro region was comparable, meteorologically speaking, to Lisbon or to other places on the other side of the Gibraltar strait, which are not well-known for their dangerous conditions.

Faro is still not on the list of airports where windshear ever occurred.

This affirmation does not include stormy situations in which meteorological phenomenon such as windshear, microburst, or downburst can occur.

7. CONCLUSION

not during the investigation, du

Let's remember that the question asked to the Experts was to
not, the action of the Dutch Aviation Safety Board during the investigation that followed the accident of the 21st of December 1992 was in accordance with national and international regulations applicable at the time, and beyond mere regulation, if the investigation was well conducted, "*with due care*".

The Experts' mission is not to determine what or who was/were responsible or liable for the accident.

As demonstrated in several documents provided to the Experts, the Dutch Aviation Safety Board's behavior could have been improved, but was in accordance with standard investigation regulations.

Was not the question. Also in answering the questions?

Seen/ used the Blue report RVDL3 (Lijst 4 tab 23)?

In accordance with ICAO, the Dutch Aviation Safety Board did not lead the investigation but participated in the investigation under the authority of the appointed Portuguese Chief of the Commission of Investigation.

This is a crucial point:

- Any remark, any request for additional investigation, any analysis had to be approved by the official Commission of Investigation;
- Any other conclusion would be illegitimate if we consider the aim of an investigation as defined by international treaties and conventions.

Not after finishing the investigation. The case in court is not about the investigation, but about thuth finding.

Another important and interesting factor not to forget is that the Dutch Aviation Safety Board and its accredited representatives are subject to the same limitations and constraints as the Commission itself.

During the investigation, but not thereafter, not in this court case.

These limitations are established by the ICAO Annex 13.

It absolutely does not authorize to establish legal liability.

It only allows to establish causal chains or contributing factors as to anticipate other future potential issues and therefore improve the global flight safety.

The Dutch Aviation Safety Board proposed the involvement of third parties to bring a best-in-class professional expertise and answer questions raised by the Commission
havior was in accordance with
entions.

tc. Was not true, didn't you notice?

and, was it best in class? Did you review? No, you didn't, did you? Refer to the repo

e NLR or the expertise of the
ations.

There is no reason to objectively doubt the conclusions of these laboratories or organizations. Did you really review the the NLR report? Do you have the required expertise? NO.

Nothing forced the Commission of Investigation to take into account these conclusions or even ask for different opinions if they started doubting the correctness of the answers given. Not a subject of this case. What is your expert opinion?

The proposals of modifications of the final official report were evaluated in detail by the Experts. You mean also the Blue report?

Some appeared to be adequate, and some other are not. And? Not adequate? Or trying to mislead th

But only the official Commission of Investigation had the power to accept such proposals of modifications or reject them.

They fortunately did, but in NL DASB continued to promote their own opinion which did not agree with the final report.

To conclude, the Experts consider that the Dutch Aviation Safety Board — through its actions, comments, and involvement into the investigation as an accredited representative of the Commission of Investigation — did not deviate from its responsibilities and fulfilled its obligations in due care as defined at the time of the accident in the ICAO Annex 13.

But this was not the question of the court, was it? Did DASB handle the info with due ca

22th of April 2017

Experts do not answer the questions of the court. DASB is not an accredited rep. now anymore.

Laurent BLONCOURT

Dirk KÜGLER

Jean-Louis FRANÇON

8. ANNEXES

Experts should have read § 2.2 in Horlings report.

8.1. TIME REFERENCE

DFDR does not record time of day, only e

According to the transcription of the ed at 07:32:50 UTC, which seems to correspond to the DFDR recorded data as provided by the NTSB.

According to the official report, touchdown occurred at 07:33:20 UTC[97] , which shows a difference of 30 second

On page 21

In Annex #5 of the official report, named "TIME UTC", we note three references: Radar, Padrao (standard), and CVR.

The accident occurred at 07:32:49 on both "RADAR" and "CVR", but at 07:33:20 on "STANDARD".

Moreover, even though the gap between "RADAR" and "STANDARD" is constant, the gap between "RADAR" and "CVR" is not.

because the vinyl tape in the CVR mig

We can consequently read:

RADAR	STANDARD	CVR	Delta between "RADAR" and "STANDARD" +		Delta between "RADAR" and "CVR"	
06:51:29	06:52:00	06:49:49	MINUS	00:00:31	PLUS	00:01:40
06:55:09	06:55:40	06:53:38	MINUS	00:00:31	PLUS	00:01:31
06:57:37	06:58:05	06:56:09	MINUS	00:00:28	PLUS	00:01:28
07:00:09	07:00:40	06:58:51	MINUS	00:00:31	PLUS	00:01:18
07:03:39	07:04:10	07:02:29	MINUS	00:00:31	PLUS	00:01:10
07:05:14	07:05:45	07:04:08	MINUS	00:00:31	PLUS	00:01:06
07:09:14	07:09:45	07:08:18	MINUS	00:00:31	PLUS	00:00:56
07:19:39	07:20:10	07:19:09	MINUS	00:00:31	PLUS	00:00:30
07:23:34	07:24:05	07:23:14	MINUS	00:00:31	PLUS	00:00:20
07:27:49	07:28:20	07:27:40	MINUS	00:00:31	PLUS	00:00:09
07:32:49	07:33:20	07:32:49	MINUS	00:00:31	MINUS	00:00:00

Not a good comparis

reliable is not the point, th

We have to bear in mind that the equipment used for the CVR was not so reliable ~~as it is now~~: this type of support was sensitive to heat and can easily become distended.

It is thus mandatory to adjust the CVR time reference with the standard UTC time. time, such a synchronization is not obviously required. e Commission of Investigation has decided to use the

in the end, all along, which was the right choice, UTC.

? or it was necessary. Did the Experts do this again

e use of multiple time references used in the report had k of analysis done by the Commission of Investigation.

xperts use a crosswind of 220°/35 kt, but

What ref do experts use?

97 *Portuguese Official report page 21*

8.2. THE CHICAGO CONVENTION AND ASSOCIATED DOCUMENTS

Why included?Was asked by the Court to dis

8.2.1. GENERAL CONSIDERATIONS

Two states have been involved in this accident:

- Portugal as the accident occurred on its territory; and
- The Kingdom of Netherlands because the operator's certification, its main base and the aircraft registration are under its responsibility.

The international aviation relations between States are governed by an Agreement signed in December 1944 and known as the « Chicago Convention ».

Portugal ratified this convention on 27th of February 1947 and the Kingdom of Netherlands, the 26th of March 1947.

The Chicago Convention founded the "International Civil Aviation Organization" (ICAO) and published 19 annexes dealing with all technical or non-technical issues related to the transport of passengers or cargo, first to ensure efficiency in international air services, but also to help to the development of this industry and the safety of its operations.

The ICAO has no power to establish regulations, but only to issue "standards and recommended practices", the so called SARP's.

Each member State commits – through the ratification of the Convention – to transpose these standards and recommended practices in its own legal and regulatory corpus.
These texts then become the applicable regulations for the operators certified by the respective member State.

In case of difference between the ICAO standards and recommended practices and the national implementation, the involved member State should inform the ICAO on the nature of these differences so that the other member states become aware of the resultant situation.

As it happened, neither Portugal nor the Kingdom of Netherlands changed their respective regulatory corpuses, which means that the ICAO standards remained fully applicable.

8.2.2. THE CHICAGO CONVENTION AND THE AIRCRAFT ACCIDENTS OR INCIDENTS

Here, it is most specifically the Article 26 of the Chicago convention that is relevant to us.

Article 26 - Investigation of accidents

In the event of an accident to an aircraft of a contracting State occurring in the territory of another contracting State, and involving death or serious injury, or indicating serious technical defect in the aircraft or air navigation facilities, the State in which the accident occurs will institute an Investigation into the circumstances of the accident, in accordance, so far as its laws permit, with the procedure which may be recommended by the International Civil Aviation Organization.

The State in which the aircraft is registered shall be given the opportunity to appoint observers to be present at the Investigation and the State holding the Investigation shall communicate the report and findings in the matter to that State.

The article is very clear: those responsible for the investigation are the authorities of the country where the accident occurs.

So in this case it is Portugal.

Furthermore, following Article 26 of the Chicago convention, both the work of investigation and the report are Portugal's sole responsibilities.

8.2.3. ASSOCIATED DOCUMENTS

It may turn out to be necessary for the ICAO to help its members fully understand the content of these annexes, but also understand how to successfully implement the standards and recommended practices it publishes.
The ICAO uses to this effect a set of documents comprising technical guidelines that are supposed to provide the help required to the good understanding of its norms and practices.

As it happens, in 2000 ICAO starts to publish a specific document (Doc n°9756), entitled "Manual of Aircraft Accident and Incident Investigation."
This document, divided in four volumes, explains precisely the procedure to follow to investigate in case of an accident.

The document n°9756 is a successor of an older document — Doc n°6920 — that was in force at the moment of the accident.

It is therefore the document n°6920 that will be used as the point of reference to evaluate the work the Commission of investigation — of which the Kingdom of the Netherlands is an accredited member; and it will be this same document that will be used to assess the potential comments and requests, fulfilled or not, from the Dutch Aviation Safety Board.

« The purpose of this manual is to encourage the uniform application of the Standards and Recommended Practices contained in Annex 13 and to provide information and guidance to States on the procedures, practices and techniques that can be used in aircraft accident investigations. Since accident investigations vary in complexity, a document of this kind cannot cover all eventualities. The more common techniques and processes, however, have been included.

Although this manual will be of use to experienced and inexperienced investigators alike, it is not a substitute for investigation training and experience.
This manual is issued in four separate parts as follows:
Part I — Organization and Planning;
Part II — Procedures and Checklists;
Part III — Investigation; and
Part IV — Reporting.
Because this manual deals with both accident and incident investigations and, for reasons of brevity, the term "accident investigation", as used herein, applies equally to "incident investigation".
The following ICAO documents provide additional information and guidance material on related subjects:

- *Annex 13 — Aircraft Accident and Incident Investigation;*
- *Annex 9 — Facilitation*
- *Manual on Accident and Incident Investigation Policies and Procedures (Doc 9962);*
- *Manual on Regional Accident and Incident Investigation Organization (Doc 9946);*
- *Human Factors Training Manual (Doc 9683);*
- *Manual of Civil Aviation Medicine (Doc 8984);*
- *Hazards at Aircraft Accident Sites (Circular 315);*
- *Training Guidelines for Aircraft Accident Investigators (Circular 298); and*
- *Human Factors Digest No. 7 — Investigation of Human Factors in Accidents and Incidents (Circular 240).*

This manual, which supersedes the Manual of Aircraft Accident Investigation (Doc 6920).[98] in its entirety, will be amended periodically as new investigation techniques are developed and new information becomes available. »

8.2.4. THE INVESTIGATION'S OBJECTIVE IN CASE OF AN ACCIDENT

The ICAO Annex 13 defines clearly the objective of the investigation in case of accident:

GENERAL

1.1.1 The sole objective of an investigation into an aircraft accident or incident conducted under the provisions of Annex 13 shall be the prevention of accidents and incidents. Annex 13 also states that it is not the purpose of an investigation to apportion blame or liability. Any judicial or administrative proceedings to apportion blame or liability shall be separate from any investigation conducted under the provisions of Annex 13.

1.1.2 An aircraft accident or incident provides evidence of hazards or deficiencies within the aviation system. A well-conducted investigation should identify all immediate and underlying systemic causes and/or contributing factors of the accident or incident. The investigation may also reveal other hazards or deficiencies within the aviation system not directly connected with the causes of

[98] *These preliminary considerations are the same on both documents N°6920 and N°9756*

the accident. The emphasis of an aircraft accident or incident investigation shall be on determining why the accident or incident happened and on recommending appropriate safety actions aimed at avoiding the hazards or eliminating the deficiencies. A properly conducted accident investigation is an important method of accident prevention.

1.1.3 An investigation shall also determine the facts, conditions and circumstances pertaining to the survival or non-survival of the occupants of the aircraft. Recommendations for improvements to the crashworthiness of the aircraft are aimed at preventing or minimizing injuries to aircraft occupants in future accidents.

1.1.4 The Final Report, which is produced at the completion of an investigation, constitutes the official conclusions and record of the accident or incident.

As stated, the only objective is the accident prevention.

Annex 13 stipulates even more distinctly that the aim of the investigation is not to lay blame or to establish legal liability, be it civil or criminal. The court didn't ask the Experts this.

As a consequence, all judicial or administrative procedure aiming at laying blame or establishing legal liability must be considered independent from any investigation that would follow indications as stated in Annex 13.

This means, without any doubt, that the investigation led by the Portuguese Commission of Investigation, to which the Dutch Aviation Safety Board has been appointed, had for sole objective to bring to light the technical or human causes of the accident; and once again, not to establish who is legally liable.

8.2.5. DETAILS ABOUT THE STRUCTURE OF AN OFFICIAL REPORT ACCORDING TO THE ICAO DOCUMENT N°6920.

Why included? Writing hours, maki

According to this document, the report should encompass five major sections/chapters:

1) *Known Facts;*
   a) *Flight History (what happened during the flight))*
      We must bear in mind that only important events are to be written down in this section;
      Recordings of the audio or of parameters constitute the main source of these chronological events. Other events will only be reported if they are considered an added value to the report.
   b) *Injuries*
   c) *Damages to the aircraft*
   d) *Damages to the aircraft*
   e) *Information regarding the staff involved in the accident, especially the crew members*

   - f) *Relevant technical information about the aircraft and relating to the loading of the aircraft*
   - g) *Weather information*
   - h) *Navigation assistance*
   - i) *Communication*
   - j) *Airdrome information (if applicable)*
   - k) *Flight recorders*
   - l) *Information pertaining to the wreck of the aircraft, and to markings on the wreck caused by hitting the ground*
   - m) *Medical and pathological information*
   - n) *Occurring of a fire and its consequences*
   - o) *Survivability*
   - p) *tests and searches conducted by the investigation commission*
   - q) *Usage of new techniques/procedures (if applicable)*
2) *Analysis*
3) *Conclusion*
   - a) *Evidences*
   - b) *Causes that must not be a mere description of circumstances*
4) *Security recommendations*
5) *Annexes and appendices*

8.3. LANDING LOAD CONDITIONS AND ASSUMPTIONS

Why included? The airplane

Did this FAR 25 apply in 1992?The first line was different in DCA97MA055 (appe

FAR Part 25.473 - Landing load conditions and assumptions.

(a) For the landing conditions specified in Part 25.479 to Part 25.485 the airplane is assumed to contact the ground—
- *(1) In the attitudes defined in Part 25.479 and Part 25.481;*
- *(2) With a limit descent velocity of 10 fps at the design landing weight (the maximum weight for landing conditions at maximum descent velocity); and*
- *(3) With a limit descent velocity of 6 fps at the design take-off weight (the maximum weight for landing conditions at a reduced descent velocity).*
- *(4) The prescribed descent velocities may be modified if it is shown that the airplane has design features that make it impossible to develop these velocities.*

In § 5.2.2.4 or

(b) Airplane lift, not exceeding airplane weight, may be assumed unless the presence of systems or procedures significantly affects the lift.

(c) The method of analysis of airplane and landing gear loads must take into account at least the following elements:
- *(1) Landing gear dynamic characteristics.*
- *(2) Spin-up and spring back.*
- *(3) Rigid body response.*
- *(4) Structural dynamic response of the airframe, if significant.*

(d) The limit inertia load factors corresponding to the required limit descent velocities must be validated by tests as defined in Part 25.723(a).

(e) The coefficient of friction between the tires and the ground may be established by considering the effects of skidding velocity and tire pressure. However, this coefficient of friction need not be more than 0.8.

FAR Part 25.485 - Side load conditions.

In addition to Part 25.479(d)(2) the following conditions must be considered:

(a) For the side load condition, the airplane is assumed to be in the level attitude with only the main wheels contacting the ground, in accordance with figure 5 of appendix A.

(b) Side loads of 0.8 of the vertical reaction (on one side) acting inward and 0.6 of the vertical reaction (on the other side) acting outward must be combined with one-half of the maximum vertical ground reactions obtained in the level landing conditions.

These loads are assumed to be applied at the ground contact point and to be resisted by the inertia of the airplane.

The drag loads may be assumed to be zero. Can Experts explain what this means?

There is more: The accident investigation report of the NTSB (DCA97MA055) of a crash during landing with an MD-11 in Newark, 31 July 1997, include

These are the established facts out of the Appendix of the Port. Re

8.4. COMMENTS REGARDING THE PROPOSITIO… TO THE COMMISSION OF INVESTIGATION[99]

These are not the proposition of changes out of the "Blue Report" (RVDL3), but the 'weakened' established facts out of the Appendi

	Dutch Aviation Safety Board's proposals or comments	Com…

8.4.1. ESTABL…

No comment Experts, on the workload here? Like in § 6.9 page 45?

Indent 7, Re…

chapter 3.1 indent 3 *page 8*	*There were n… or its systems… degradation c… the workload on the crew during the final phase of the flight.*	…ch Aviation Safety Board about these two assertions. Even if the landing distance is not a contributing factor to the accident, the Experts evaluation is … the reverser n°2 is a concern that the crew should have considered, …er conditions. Rwy too short if flooded Why? Landing performance is calculated without th
chapter 3.1 indent 4 *page 8*	*The inoperative items at departure from Amsterdam, did not affect the aircraft operation.*	
Chapter 3.1 indent 12 *page 9*	*The aircraft in the final phase of the approach passed a turbulence area associated with windshear and downburst phenomena, that initiated a longitudinal instability of the aircraft.*	Don't estimate, use facts or say nothing. There is no proposa… …fety Board about this assertion. The Experts estimate that instability is not the sole result of the meteorological conditions (thunderstorms) which included possible windshear and/or downburst.
chapter 3.1 indent 13 *page 9*	*The crew was less aware of the turbulence and its consequences on the aircraft stability, due to the influence of the operation of the automatic flight control systems (ATS and CWS)*	This is a suggestion of wording made by the Dutch Aviation Safety Board. The final positio… « *The use of the* … *the crew's perception of the* … Not a suggesting in wording, but DASB tried to delete the original line from the draft of t… The Experts co… …ecause the crew was aware…

Valid? DASB changed its line following non-acceptance of the d…

99 *Issued in the Comments of the Kingdom of the Netherlands by the Aviation Safety Board to the Report of Accident (RoA) – page 8 and followings, in September 1994.*

was

chapter 3.1 indent 14 *page 10*	*The aircraft was informed by Approach Control that the runway was flooded and the crew did not consider this information when determining braking action.* This was in the draft: "crew did not consider this informatio	The Dutch Aviation Safety Board suggestion is to change the last part of the sentence using the following wording : « *when determining braking action* ». also to delete: for braking action POOR. The final position of the Commission was to change the whole sentence: « *The aircraft was informed by Approach Control that the runway was flooded. The crew did not associate the term flooded with bad braking conditions (Poor), due to a lack of update of the ICAO phraseology in the Aircraft Operating Manual and Crew Training Manual.* » Hence, Martinair / KLM error The Experts' evaluation is that these two sentence should have been substantiated: • the time gap between the issuance of information and the actual landing time is too important; what do you mean • the ICAO document 4444 was not issued to be used by crewmembers, but to be used by ATCO. ??? Wrong, is for pilots/manual writers too. Pilots need to be able to understand ATCO's, isn't it? Was called ther
chapter 3.1 indent 15 *page 10*	*At 07.32:15 UTC Approach Control transmitted the last wind information. Wind 150° - 15 kt, max. 20 kt.*	The Experts want to underline that this information is false because of the following remark. False?
chapter 3.1 indent 16 *page 10*	Approach Control transmitted to the aircraft the instantaneous wind from runway 29 instead of runway 11. Good for this case. Instantaneous wind shows no adve This is not sure. Court in Evora determined c	In the final version of the conclusions (chapter 3.1), the Commission added a sentence: « *Faro Approach Control transmitted to the aircraft the instantaneous wind instead of the 2-minutes average wind and the wind from runway 29 instead of runway 11.* » The Experts consider the ICAO Doc 4444 as the reference for ATC controllers. There is no contradiction given that the text allows the ATC ficant variations. But the Experts consider that transmitting the ru a professional mistake by the ATC controller. Not a good consideration. Certain

This text added in Attachment, is

Never proven to be true by the court of Evora.

Chang

chapter 3.1 indent 16 *page 10*	*In view of the fast changing weather, in the last phase of the approach, the Board considers that this omission had no bearing on the accident, since, even if the correct selection for runway 11 had been made, the warning of the ATC controller would to all probability have come too late to be effective*	Even if this Dutch Aviation onsider that such a mistake made by an ATC controller is definitely not acceptable. Who knows the actual wind at the same time on runway 11 threshold and who can say that, with a right indication, the crew would decide or not to go around ? ?? The very large wind correction angle on a The Experts should have conducted a more thorough Ti
chapter 3.1 indent 17 *page 10*	*At 07:33:20 UTC, the accident occurred*	The Experts note that the time reference does not match neither with CVR reference nor with DFDR one. = 32 kt crosswind component. This is much higher than "the crosswind limit of the DC-10" for both the runw
chapter 3.1 indent 19 *page 10*	*Approach Control did not transmit to the aircraft the wind information on runway 11 that reached 220° with 35 kt between 07.32:40 and 07.33:30 UTC.*	The Dutch Aviation Safety Board did not issue any comment on this sentence. This is the exact feeling of the Experts: 220° at 35 kt is the crosswind limit for the DC10. With a runway wet as indicated by the Captain and flooded as indicated by the ATC controller, a go-around decision would have been a highly probable consequence. ! Would have been? Was the only option ev
chapter 3.1 indent 21 *page 11*	*The instability and the momentary visibility degradation in the final approach were not of such a magnitude that the crew should have made the decision to discontinue the approach.*	The Dutch Aviation Safety Board asked to add or to modify part of this sentence: « *were not of such a magnitude that the crew should have made* » The Experts validate this Dutch Aviation Safety Board's proposal for the first part of the approach (above 200 ft AGL) The Commission changed the sentence, but in an opposite direction to that expected by the Dutch Aviation Safety Board: « *The crew did not integrate information concerning the instability and the momentarily visibility degradation in the final phase of the approach, and having wrongly interpreted the communication of the runway condition (Flooded), did not take the decision to abandon the approach.* » This final sentence makes clear that if the crew had understood the information about the runway conditions (« flooded »), it should have « *take the decision to abandon the approach* » Furthermore, this sentence, finally issued in the official report, is very important, given that the underlying philosophy allows the Commission to consider this lack of Captain's decision to go around as a contributing factor of the accident.

chapter 3.1	*At 150 ft, the power was reduced to flight idle. In*	The Commission modified the sentence as follow: « *At 150 ft (RA) power has been reduced to*

indent 22 *page 11*	*all probability, this power reduction was initiated by the ATS with a follow through by the F/O. Also the sustained flight idle thrust condition was most probably a result of action of the F/O. Normally, the ATS retard mode starts at 50 feet RA.*	*flight idle through ATS and kept at flight idle, probably by copilots' action. Under normal conditions the ATS retard mode starts at 50ft (RA).* ?? Was clear from moment AIDS data w Although it has been impossible to define the source of the reduction of thrust, the Experts validate the Dutch Aviation Safety Board suggestion but, in their opinion, the remaining doubt should have been underlined. No errors were found in the ATS system, so the throttle retardation was manual!
chapter 3.1 indent 23 *page 11*	*The autopilot CWS mode disengaged at 80 ft, apparently non-intentional. There is no evidence that the crew noticed the resulting "autopilot red light" flashing signal.*	The Dutch Aviation Safety Board, writing such a sentence or modifying it, did not really consider the CVR transcription, indicating a double click at 07:32:44 UTC and 80 feet. The Commission modified the sentence as follow: « *At 80 ft RA the autopilot disengaged the CWS mode, apparently not intentionally. There are no clear indications that the crew became aware that the warning light for this condition was lit.* » The Experts do not validate neither the sentence suggested by the Dutch Aviation Safety Board nor the final one issued by the Commission. Both considered that the disengagement was not intentional but it is only an assumption. The Experts again refer to the CVR transcription. No, not assumption. The CWS is designed to disengag
chapter 3.1 indent 24 *page 11*	*The sudden wind variation in direction and intensity during the last phase of the final approach created a cross-wind component which exceeded the aircraft limits in the AOM*	The suggestion requested by the Dutch Aviation Safety Board ["*during the last phase of the final approach*"] is correct.

chapter 3.1 indent 25 page 11	*Due to a premature, large and sustained power reduction and the sudden wind shift (tailwind component) in the final approach phase, the aircraft attained a rate of descent of 1000 ft/mn.* Where recorded? No, not a strong nose down action, the ??	The final version of the senter « *The premature power redu* *eased the rate of descent, which reached value* *According to the values regis* *variation of wind speed and direction in the las* First, the thrust reduction did *on and the speed* remained at all times above th The wind variation did not incr Did you check the AIDS data on control force? At the opposite, it is possible that the pilot created himself the increase of vertical speed, acting on the controls to make a « positive touchdown » as required by the Captain during the briefing. The value of the left inboard elevator is obvious: One [1] second before the touchdown, a strong nose down action is recorded. As a consequence, the Experts do not validate any version, neither the one proposed by the Dutch Aviation Safety Board nor the one finally validated by the Commission. Didn't you read DFDR data? Why don't you make the right conclusion here?
chapter 3.1 indent 26 page 11	*The crew intervention for power increase of the engines was too late to stop the high rate of descent.* No not quite correct. What do you mean by out of stall conditions	No comment from the Dutch Aviation Safety Board. The Experts cannot validate this sentence. Out of stall conditions and, also, in specific conditions, the rate of descent is directly linked to the elevator. The thrust then allows the control of the speed. This sentence has been deleted in the final version and changed for the following: « *The captain's intervention during the whole approach seems to have been too passive, and concerning the last power increase, it came too late.* » The Experts do not validate this assertion of the Commission. ?? The captain's interv y professional, given that he was monitoring ease. g to do with airmanship).
chapter 3.1 indent 27 page 11	*The fracture of the right landing gear was caused by the combination of the touchdown on the right hand aft wheel, the crab angle and the high rate of descent.* DASB wanted to delete "and the significar	The final version of : « *The fracture of th* *f ~~the touchdown~~* *on the right hand a* » Is always on aft wheels and in righ You due to a go-around that close to the gro at the moment of contact with the runway

8.4.2. CAUSES

Chapter 3.2 *page 13*	*The commission of Investigation determined that the accident was initiated by:* *- a sudden and unexpected wind variation in direction and speed (windshear) in the final stage of approach.* *Subsequently a high rate of descent and an extreme lateral displacement developed, causing a hard landing on the right hand main gear, which in combination with a considerable crab angle exceeded the aircraft structural limitations.* DASB wanted a whole new CAUS But the crab angle has. Is what you said before, on page 32:	The Dutch Aviation Safety Board's suggestion is to insert the word "windshear", following the NLR's conclusions. The final version of the text is: « *The Commission of Investigation determined that the probable causes for the accident were:* - *The high rate of descent in the final phase of the approach and the landing made on the right landing gear, which exceeded the structural limitations of the aircraft.* - *The crosswind, which exceeded the aircrafts limits and which occurred in the final phase of the approach and during landing.* *The combination of both factors determined stresses which exceeded the structural limitations of the aircraft*. » The Experts do not validate this wording. because the pilot failed to line-up the airplar As previously indicated in 5.2.1.2, the cause of t ground in a manner not intended by the aircraft manufacturer and therefore "not certified". Indeed, if the Captain had initiated a go around procedure, there would probably have been no accident. The captain did initiate a go-around, but didn't notice the near idling engines. He was too late. See 5.2.2.4 p The strength of the crosswind has nothing to do with ground contact. Subsequently, it would likely have made the lateral control difficult during the deceleration but in any case, at the time of touchdown. as certainly destabilized the approach. because of pilot shortfalls It was also tion on duced a vertical speed exceeding t limits. . The pitch angle increased, re Difficult? Never max aileron contr certainly destabilized? The pilot c

Experts did not include all of the fa

8.4.3 CTORS

Where? Experts should have used the AOM that was mailed to them.

chapter 3.2 *page 13*	*From the forecast and the prevailing weather, the crew of MP495 did not expect the existence of windshear phenomena.*	The Exp From the ndshear or, at le FCOM obviously The Commission did not accept this suggestion of the Dutch Aviation Safety Board.
chapter 3.2 *page 13*	« *The premature large power reduction and sustained flight idle thrust, most probable due to crew action* »	The Commission changes its sentence for the following: « *The premature large power reduction, and the sustaining of this condition, probably due to crew action* » The Dutch Aviation Safety Board, making this suggestion, does not exactly follow the NLR conclusions with indicates (Summary of the Doc 93080C from the NLR's report) that the "*analysis concludes that at the end of the approach, the pi ride the throttles to close them, possibly induced by an initial* The final wording is not adequate because it has r due to pilot's action.
chapter 3.2 *pa*	*CWS mode being disengaged at 80 ft RA causing the aircraft to be in manual control at a*	The Experts cannot validate this wording becau ation to disengage the CWS mode. It is only an advice to let lown. the Commission validated the D tion

?? No errors found in ATS. Copilot received additional training to unlearn closing the throttles of b

This is not the final report that was included as

ich?

AOM 3.3.5 - 08: "The minimum height to change from CMD to OFF is 150 ft HAT". 150 ft. Does this not

OVV wrote this document, and used only the items out of the summary of the AvioConsult report, did obviously not review the complete report..

8.5. THE QUESTIONS RAISED BY AVIOCONSULT, THE OFFICIEL ANSWERS AND THE EXPERTS' COMMENTS ABOUT THESE ANSWERS[100]

Avioconsult report		**Dutch Safety Board's answer (OvV response)**	**Experts' comments**
Item 1	Introduction. After the catastrophic accident of Martinair DC-10-30F at Faro airport, Portugal on 21 December 1992, investigations were undertaken by Portuguese investigators with the support of, among others, Dutch and American investigators. The activities of the Dutch investigators included reading out the Cockpit Voice Recorder (CVR), the American National Transportation Safety Board (NTSB) read out and reported on the flight data recorded by the Digital Flight Data Recorder (DFDR - the "black box").	No answer	The Avioconsult's assertion should be supplemented by the following: the Dutch Aviation Safety Board is not only the provider of the CVR transcription but it is first an accredited representative of the Dutch No, not DASB was an accredited rep., but Mr. J. Biemond was, a
Item 2	The interim Accident Report (RvO, 21 July 1993) was trans was NTS Aviat comm was Where is that suggestion?	Here it is suggested that the Portuguese report was the Portuguese and then submitted for hat is not correct. The Portuguese report d in the Portuguese language to both the he Raad voor de Luchtvaart (Dutch ty Board). In order to comment on it the en translated into English by the Dutch ty Board (it is likely that the NTSB also hemselve). Hence the translated report e translation was done at the request of ation Safety Board and each page of this age report states that it is an unofficial nd that the text of the Portuguese is final report was published on 31 October 1994 in the Portuguese language.	The Experts performed their analysis, using the non-official translation but also the official version issued in Portugue Where do you have that from? Th

[100] *Attachment to the letter with reference IENM/BSK-2011/BB196. of 1st June 2011*

Avioconsult report Dutch Safety Board's answer (OvV response) Experts' comments

Item 3	At the request of some victims a new supplementary analysis was made of the cause of the accident, using the RvO of the Portuguese investigators and the letters from the NTSB included in the appendices to this report and flight data recorded by the DFDR, transcripts of the CVR, a report by the Netherlands National Aerospace Laboratory [Lucht- en Ruimtevaart Laboratorium] (NLR) and the comments by the Dutch Aviation Safety Board.		No comment
Item 4	Conclusions of the Committee of Investigation. The main conclusions in the Accident Report can be summarized as follows. An (*) means that the conclusion is disagreed with. (1) During approach the aircraft passed a turbulent zone associated with microburst and downburst phenomena which caused longitudinal instability of the aircraft (*);	Hence (*) means that AvioConsult disagreed with the conclusion. Portuguese report: *The aircraft in the final phase of the approach crossed a turbulence area associated with microburst and downburst phenomena, that initiated a longitudinal instability of the aircraft.* *(A aeronave atravessou na fase de aproximação* *AvioConsult concl* *data, that there wa* *The analysis in the* *that the approac* *windshear warning* *had not reported*	No commen The Experts sed » in the Aviocons other word « initiated » i In the final report ICAO ram » should *triggered longitudinal* sion with the causes of official report. estion of the presence

AvioConsult didn't make the remarks in th

Portuguese report.

did this indeed trigger...?

But they should have asked questions after reading the NLR report. They must have seen th

This does not imply that th

There was no longitudinal instability (triggering)

Which question? Was this report r

Avioconsult report	Dutch Safety Board's answer	(OvV response) Experts' comments
	also described that given the weather conditions ... *ions. This assessment* ... *ble FDR data together* ... *of the aircraft. This study included the conclusion that there were indications of a 'microburst'. The conclusion of the NLR report was included in the Portuguese final report, but the final conclusion of the final report by the Portuguese authorities does not refer to windshear hence there is no difference in interpretation of the flight data as claimed by AvioConsult.*	... nstability generated a flight path ... utch Aviation Safety Board's responsibility to validate the way the NLR issued its ...
	In the AvioConsult conclusion, it was stated that the pilots caused the instability themselves by using rudder movements and CWS mode. *The Portuguese final report makes a link between the longitudinal instability (pitch angle stability), the CWS mode and the wind conditions at the time. It was also stated that the use of the automatic systems may have had an adverse effect on the perception by the crew of the turbulence and instability.* *The use of the rudder and any movement thereof is not directly linked to the nose position (pitch) of the aircraft as stated by AvioConsult.* *The explanation given in the Portuguese report is much more likely.*	The weather conditions are a contributing factor for the flight path instability and obviously the CWS, linked to the flight controls, also. The Experts are not really sure that Avioconsult made a linked between th ... nt of the rudder.
	AvioConsult concluded that there was light turbulence	

The Experts do obviously not know what flight path instability is. Please look at the DFDR altitude graphs. Where is the instability? There is only little variati

The pilots themselves also have a resposibility (and procedures).

The researcher regrettably was not aware of the way a non-precisio

Yes it is, they should have reviewed the report with due care, b

Please motivate.Is CWS a contr. factor? Sure?Not the pilot wh

then why mention it. Facts please.

	Avioconsult report	Dutch Safety Board's answer	(OvV response) Experts' comments
		during the approach *This conclusion agrees with the final report where the final conclusion is drawn that turbulence associated with microburst and downburst phenomena caused longitudinal instability of the aircraft.* *It is noted that although AvioConsult stated that there was only light turbulence, this turbulence was assessed differently in other parts of the AvioConsult report.* *For example, it was stated that the observations by the crew themselves and the turbulence occurring were reasons for a go-around.*	Not exactly. AvioConsult's assertion is that the flight only suffered light turbule ear nor downburst. and your? The Experts validate the OvV remarks about the inconsistency of some AvioConsult's statements. is somerning different, not because of turbu
	(2) The aircraft was informed by approach control that the runway was flooded, but the crew did not associate the term 'flooded' with poor braking conditions. Despite the available information about the instability and temporary worsening of visibility in the final stage of the approach and because of the incorrect interpretation of the information provided to them about the state of the runway (flooded) the crew did not decide to abort the approach;	Portuguese report: *The aircraft was informed by Approach Control that the runway was flooded. The crew did not associate the term « flooded » with bad braking conditions (POOR), due to a lack of update of the ICAO phraseology in the Aircraft Operating Manual and Crew Training Manual.* *The crew did not integrate information concerning the instability and the momentarily visibility degradation in the final phase of the approach, and having wrongly interpreted the communication of the runway condition (flooded), did not take the decision to abandon the approach.*	As indicated previously by the Experts, the used of the word « flooded » is only done in the ICAO Doc 4444 which is oriented for the ATC controllers. The Experts also developed this question and confirmed that the crew did not give to the word « Flooded » the ATC meaning, as this word was never used by the operator's documents.
		OvV response: *The Portuguese report clearly stated that the crew did not interpret the term flooded correctly. AvioConsult did not state anything new. However, the AvioConsult report left out the text from the Portuguese report about not communicating wind information (220°, 35 knots; tailwind and an exceedance of the crosswind limit of the aircraft).*	The Experts validate the OvV remark. No, capt understood.???
	(3) At an altitude of 150 ft power was reduced to	Portuguese report:	Because this wind did not occur during flight: no evidence on DFDR data, clock time analysis proves

No, an ATS is not programmed to reduce the thrust to a level belo

	Avioconsult report	Dutch Safety Board's answer	(OvV response) Experts' comments
	"flight idle", probably because of an action by the copilot. Under normal conditions the Auto Throttle System (ATS) starts the reduction at 50 ft. A premature reduction in power probably worsened the descent rate which reached values exceeding the operational limits of the aircraft (*). There was no significant change in the wind speed and wind direction in the final 20 seconds, according to the values recorded by the meteorological service;	*At 150 ft (RA) power has been reduced to flight idle through ATS and kept at flight idle, probably by the copilot action.* *Under no* *starts at 5* No, look at DFDR N1 data: 4x by ATS, then a high	As already said, the Experts do not validate the official assertion related to the reduction of thrust. The rate of thrust variation is the same as if done by he ATS. It is then impossible to define definitely who nitiate the thrust reduction. Precisely, the design of the system is to move back he thrust levers with 2°/sec then 3°/sec below 15ft and 6°/sec at touchdown. Nothing is proved but, NLR and NTSB indicate a manual reduction.
		The premature power reduction and the sudden wind variation probably increased the rate of descent, which reached values exceeding the operational limits of the aircraft.	Yes, but also a po Yes! Look at retard rate DFDR N1 data and rev
		According to the values registered in the SIO, there has not been a significant variation of wind speed and direction in the last 20 seconds.	Yes. But the NLR expertise indicates such a wind variation. Is the NLR right?
		OvV response: *AvioConsult did not agree with the fact that the descent rate exceeded the operational limit of the aircraft. In Section 2.2.3 Approach, the Portuguese investigation report stated that the actual descent rate of 1000 ft/minute exceeded the operational limit of 600 ft/min - specified in the Aircraft Operating Manual.*	Did they mention certification limits? No. The NSTB and indicating that the greater than the certification limits. The metallurgic expertise indicates also that the collapse of the of descent. Did the Portuguese metallurgic report m
		AvioConsult stated that the high descent rate was doubted. It was claimed that it was not indicated by the DFDR.	The Vertical speed is not recorded on the DFDR. But radalt + time = delta h/sec
		It was also stated that it may be assumed that the descent rate was not abnormally high. According to AvioConsult the operational limit said to be specified in the Flight Crew Operational Manual was not exceeded.	The limits are not only an operational limit for the DC10 but a certification one: 600 ft/mn with the Maximum structural landing weight and 300 ft/mn with the maximum structural takeoff weight.
		AvioConsult did not address the limit said to be specified in the Aircraft Operational Manual, nor	T D But what were the design limits used by the manufacturer? NT

		the observed difference between the 2 manuals. *The SIO provides weather and wind information gathered by various sensors and is supplemented by observations by meteorologists. Every 30 seconds the average wind speed and wind direction during the preceding 2 minutes are stored. Sudden gusts or rapid changes in wind direction are not stored. Both the instantaneous and the average wind information are available in the traffic control tower.* *In this case, during the approach, the average wind was communicated to the crew but not the sudden change in wind. This was not stated by AvioConsult.* *It was also found that the wind measurements for runway 29 were used and communicated while runway 11 was used for the landing.*	mistake (using RWY 29 information instead of RWY 11 nce. Not proven (Evora court) static forces, so not dynamic forces of a touchdown? The gear fa
	(4) The collapse of the right-hand landing gear was due to a combination of the high descent rate with the correction for alignment at the time of contact with the runway (*).	Portuguese report: *The fracture of the right main landing gear was due to the combination of the high rate of descent and the drift correction taking place at the moment of contact with the runway.* *[This may be a translation issue: drift correction vs alignment correction]* *[translator's note: here and elsewhere we have used "alignment" and "line-up" as synony* ?? Important?Decrabbing means alignii *The rupture happened exclusively due to impact on landing which produced the over*	Th the gear is due to excessive static forces, meaning that the main reason is the rate of descent. The translation of the expression « drift correction » should have been: « correction of the crab angle » No, the failure to not correct the drift angle just prior to touchdown result

	but the fracture did	*which induced in the components and critical zones instantaneous levels of tension which exceeded the material static limit resistance.* OvV response: *In their analysis AvioConsult stated that it is suspected that the landing was made with braked wheels and that specifically that was the cause of the collapse of the landing gear.* *The report stated that the aircraft landed on the right-hand main landing gear with a nose position of 8.790° pitch up and a roll angle of 5.62° to the right, and wind correction angle between 7° and 9° to the right, relative to the center of the runway. (i.e. the aircraft was not correctly aligned). The aircraft hit the runway at a vertical speed of more than 900 ft/minute which resulted in an acceleration of 1.9533 G.* *The damage to the wheels and tyres, as described in the Portuguese report, did not give any suggestions of blocked wheels during the touchdown.* *According to the AIDS data (which stopped at 47 ft) the right-hand brake pedal was occasionall depressed during the approach. The same data shows that despite depressing the brake pedal th brake pressure remains 0.* *Information from the manufacturer indicated that landing with blocked possible given the system design. main landing gear of the aircraft is on the ground and the wheels are turning made the brake pressure available. Hence the aircraft cannot land with blocked wheels.* *The suspicion of AvioConsult is not correct.*	Landing with braked wheels (*aft wheels of the two wing gears*) is not possible as soon as the anti-skid system What wheels were provided with a ?? Seen AIDS data? The Experts validate this OvV assertion not occasional, but continuously. The pilots feet were not in the ri Show this information please. But when padals pressed, brake pressure is released as soon
Item 5	Conclusions of the Dutch Aviation Safety Board .		

	The sudden variation in wind direction and speed during the final approach caused a crosswind component which exceeded the aircraft limits in the Airplane Operating Manual (*)	OvV response: *AvioConsult disputes this conclusion, but the conclusion (where it concerns the sudden variation) was not adopted in the Portuguese investigation report and is therefore not relevant to the assessment of the report.* *Incidentally, AvioConsult did not use the wind information at the time (220° at 35 knots) communicated by traffic control. The wind from this direction results, relative to the runway (106°) in a crosswind of 32 knots and 14 knots tailwind. The ACH specifies a maximum crosswind component of 30 knots. Hence the crosswind limit for a dry runway was also exceeded.* Due to the premature major and sustained power reduction and the tailwind component during the final stage of the landing the descent rate of the aircraft reached approximately 1000 ft/min (*). OvV response: *The effect of the power reduction on the descent rate was discussed earlier.* *The tailwind component increased the groundspeed. If the aircraft followed the same vertical path to the runway this would result in a higher descent rate.* The collapse of the right-hand landing gear was caused by the combination of landing on the right hand aft wheel, the crab angle and the high rate of descent (*) OvV response: *Already discussed above.*	No comment Why not?When did the wind change to 22 Already discussed True Landing in crosswind from the right is always Refer to item 4 for the Ex Only some data of AIDS is used as inp
Item 6	1 Conclusions of this supplementary analysis. Despite the fact that significant data had been left out of or deleted from the RvO, based on both the information about the final stage of the flight presented in words, numbers and graphs by NTSB	OvV response: *This comment, which also contains an accusation, is not based on facts and therefore speculative. The report indicated that 2 different flight recorders were used (the DFDR and the AIDS) for analysis*	The Experts validate the Moreover, the DFDR is fed by data coming from the AIDS. Assuming that NTSB or a Commission of Investigation

Not relevant here.

	in their DFDR Factual Report, and the factual information in the RvO it could be concluded, provisionally and objectively that:	*and that one of these recorders, the AIDS (which is not crash-resistant) did not contain any data from an altitude of 47 ft due to damage to the tape. There is absolutely no indication that (the NTSB) erased anything.*	can disregard data is a huge a At the time the analysis was written, only graphs out of RvO were
	(1) the crew were informed at least four minutes before the landing that the runway was 'flooded' (covered in water), which would result in 'braking action poor'. The runway length required under these conditions would, according to the Landing Data Card calculated and drawn up by the crew themselves, be approximately 600 m (!) longer than the actual length of the runway. If the aircraft had landed correctly, then the aircraft would not have come to a halt in time on the flooded runway;	OvV response: *The crew did indeed hear in time that the runway was 'flooded', however the crew did not make the línk to the 'poor' braking action. The Portuguese report attributes this to the fact that the Martinair Aircraft Operating Manual and the Martinair Crew Training Manual did not include the most recent ICAO terminology.* *The crew had indeed calculated the required landing distance for all braking conditions, but they did not realize the fact that given flooded they should have assumed 'poor'.* *Whether or not the aircraft after landing would have come to a halt before the end of the runway cannot be stated with such certainty, but according to the calculation method used there was insufficient runway length available.*	This statement is developed in 5.2.2.3 So, were the manuals OK? No! (PANS-RA Refer Experts' comments to the item 4 paragraph (2). ?? Capt mentioned 5 kt max. crosswin The Experts' opinion is that this question is of no importance because it is neither a direct cause nor a contributing factor to the accident itself. The aircraft would have vacated the runway due to the we
	(2) that the crosswind limit for the condition of the runway at the time ('flooded') was exceeded;	OvV response: *The crosswind limit (30 knots) was also exceeded for a dry runway if the current wind at the time, not communicated to the crew, had been used.* *Note: for braking conditions 'poor' a maximum crosswind of 5 knots was permitted.*	Referring to the NLR analysis, the OvV's statement is true. But the Experts underline that the crew was not informed of such a crosswind limit exceedance. The capt did read the wind on board several ti
	(3) that the approach at an altitude of 500 ft was not stable in terms of altitude, approach angle, speed and engine power, as specified in the Flight Crew Operating Manual (FCOM);	OvV response: *In section 2.2.3. Approach, the Portuguese report indicated that the approach was not stable and referred to the Operations Manual;* *The company operations manual (BIM) strongly*	According to the BIM, the flight should be stabilized at 500 ft **and below**, meaning that in case of destabilization occurring below 500 ft, the crewmember should have to perform a missed

		recommends that in cases when an approach is not stabilized at 500 ft or below that level, the approach should be abandoned (a missed approach should be executed). *The Portuguese final report also stated:* *The BIM does not contain any objective parameters when an approach is not stabilized, in particular during non-precision approaches.* *AvioConsult stated that the FCOM does include objective parameters relating to the stabilized approach, but does not address the potential difference between the BIM and the FCOM.*	approach procedure. If the flight crew in a Non-Precision Approach has no visual reference to the runway at the Minimum Descent Altitude (MDA) – here 400ft. – a descent below must not be made (ICAO Annex 6). Changed from V17!
	(4) the difference in the angle between the approach path followed by the aircraft and the prescribed approach radial in the horizontal plane was too large. No attempt was made to correct this, although time for this was available. The aircraft approached the runway at an excessive angle, not steering enough into the crosswind, and therefore did not reach the extension of the centre line of the runway;	OvV response: *The approach procedure for runway 11 states that VOR radial 291° should be followed inbound (heading 111°). The specified approach has an angle of 5° to the runway heading (106°).* *The Portuguese Report stated that the 291° radial was passed while lining up before the approach. The aircraft flew north of this radial for some time. At a distance of 6 km of the runway threshold the aircraft passed this radial from north to south and then flew towards the extension of the center line of the runway.* *The figure shown below indicates that the deviations were limited and not such that they warrant AvioConsult's conclusion.*	According to Captain's statement, the flight was established on the extend 11 at 200 ft. This seems confirmed by Seems? Not confirmed This statement matches The Experts validate this Experts should use objective data, not But why do DFDR data not show a crosswin
	(5) that the throttles of the three engines were pulled back or held back prematurely as a result of which the engine speed and airspeed reduced too early and much t of the approach and Type error! In RvO op pag 127 staa	OvV response: *The Portuguese report stated that:* *50 ft (RA) power has been reduced to flight idle rough TAS and kept at flight idle, probably by pilo ion. Under normal conditions the ATS* ATS	The Experts do not validate the official statement as the thrust reduction, whatever the reason, has begun earlier. DFDR data proves that at 50 ft, power was as low

	the captain at the very last moment before the landing failed.	*retard mode starts at 50 ft (RA).* *The captain's intervention during the whole approach seems to have been too passive, and concerning the last power increase, it became too late.* *[Translator's note: the following sentence was in italics and in Dutch: presumably it is the OVV response, rather than part of the Portuguese report.] The speed reduction, which was too early and to large, was not the cause of the failed go-around, it was the late intervention which was the problem.*	For the Experts, this statement is not true. The flight path monitoring was correct according to the airmanship. What do you mean? Evidence? Seen DFDR data? Even if this sentence was not adopted by the Commission of Investigation, the Experts validate this statement. The cause of the high rate of descent was not the too early or too large thrust reduction, but the too late intervention of the captain. ?? And the crew members could have been able to initiate a missed approach procedure – obviously before the gear collapsed – thanks to the flight idle system. could have? Heard of and noticed the spool-up time from fli
	(6) that the standard manoeuvre to align the longitudinal axis of the aircraft up with the runway heading, to prevent a traversing landing, was initiated with significant hesitation too high and too early and the roll angle required for alignment with the runway was not adopted and maintained, as a result of which the aircraft was not aligned with the runway and landed with a drift angle.	OvV response: *The Portuguese report did state that the aircraft landed with a drift angle. The report did not cover all the actions or failures to act by the pilot flying.* The heading was near constant 125 deg iaw DFDR data, exce The airplane was never on the extended runw	Neither the Commission of Investigation, nor the Dutch Aviation Safety Board indicate that the actions on the rudder have been initiated to de-crab the aircraft. The Experts consider that what is called « hesitation » is the evidence indicating that, when the pilot has begun his actions on the rudder, his probable intentions were not to de-crab the aircraft but, most probably, to improve, from his point of view, the control of the flight. Also, during such a landing with cross wind, the pilot's actions performed to maintain the runway centerline cannot, of course, remain constant because a gusting wind is not a steady wind!
	(7) that the aircraft landed half next to the runway and far beyond the touchdown zone and almost certainly with braked wheels as a result of which the forces on the landing gear increased enormously and resulted in its collapse.	OvV response: *The Portuguese report stated that: the aircraft landed with the right-hand main landing gear on the left-hand side of the runway and that the marks made by the landing started in the touchdown zone, approximately 300 m beyond the runway threshold, i.e. not far beyond this zone. The AID*	On the AvioConsult's comment, we have three considerations: • Landing on the left part of the runway: The Experts validate this assertion but this is one of the factor allowing to explain the occurrence of

A strong crosswind does not displace an airplane, but only increa

		indicated that the right-hand brake pedal was pressed down during the approach. The data of the AIDS recorder stopped at 47 feet. AvioConsult assumed that what was observed during the approach also occurred later during the landing. It also appears that they were not aware of the issue discussed under item 4 (4). *Hence, this is a speculative remark.* Do you think that you can replace your fe Did you consider several airplane types, for instance a s	When we observe the rubber deposits left by the landings on a runway, they are not all concentrated in the same area or symmetrically on either side of the axis. It is not for nothing that a runway is 45 meters wide. ?? • Landing far beyond the touchdown zone: This assertion is wrong. The early first marks of touchdown are at around 300 meters from the threshold. First, a normal landing begins when the aircraft overflies the threshold of a runway at 50 feet. Considering a standard 5% slope approach, that means that the touchdown would occur at 300 meters beyond the threshold. According the ICAO Annex 14 which defines the standard marks on a runway, for an available landing distance of 2400 meters and more, the aiming point of touchdown should begin at 400 meters from the threshold and its length should be between 45 and 60 meters. ~~The lateral spacing between inner sides of stripes may be varied between 18 and 22,5 meters to minimize the contamination of the marking by rubber deposits.~~ • Landing with brake pedals depressed: This assertion is wrong. refer to RvO annex 9 - factual data - facts
	(8) that the graphs of the DFDR data and discussions recorded on the CVR did not provide any indication that during the approach the aircraft passed through a windshear area. It was also found that the descent rate was normal and that the landing was not hard, but it was traversing. According to the ICAO definition the turbulence experienced was only light;	Portuguese report: *According to the FDR data the aircraft landed with an acceleration of almost 2G and a vertical speed of more than 900 ft/minute.* *Both the crew and several others on board mentioned strong turbulence.*	The Experts validate all the statements, either from the Commission of Investigation or from the Dutch Aviation Safety Board. They do not follow the AvioConsult assertion. Why not? Please motivate your answer. Please provid

		OvV response: *Here AvioConsult does not agree with the Portuguese authorities who stated in their report why they think that the weather can be described as turbulent with elements of windshear.* *However, a windshear warning was recorded shortly after the accident.* How do you know?Did you verify the statemen	How was the lateral acceleration? W The rec[...] could be classified [...] obsolete ICAO gri[...] But we r[...]e vertical and lateral acceleration to have a good idea of actual turbulence experienced during the approach. The crewmembers' statements are in concordance with the passengers' ones. As indicated previously in this report, even if these turbulences would not be classified as moderate or severe, the problem is that they induced instability and this instability is obvious on the recorded data. ??
	(9) that the crew did not act in accordance with the instructions for flying during or recovering from experienced windshear, and hence neither expected nor experienced windshear.	OvV response: *Not acting in accordance with certain instructions cannot lead to the conclusion that the conditions under which these instructions apply did not occur.* DFDR data do not show the variations that woul	Did turbulence cause instability? Or just some normal variatio For experts, it is surprising to read in the same sentence that the pilots did not respect the procedures You did not read the sentence very well. The crew did not take the
	(10) that from an altitude of 500 ft there were several reasons, based on the instructions, to make a go-around, which was not done.	OvV response: *This conclusion by AvioConsult is correct. The Portuguese investigators also mentioned this in their report.*	This comment is correct.
	(11) that the throttles were operated incorrectly and not in accordance with the instructions and the autopilot was used inappropriately.	OvV response: *The Portuguese report addressed the way in which the autopilot and throttles were used.* *However, the report did not qualify this with a value judgment such as 'inappropriately'.*	The 'instability' was caused by the copilot who could not operate instability. Qualifying then the use of these automatisms as done is not on the line defined by the ICAO Annex13.
	(12) that the crew did not make the approach in accordance with the prescribed Martinair	OvV response: *This is not indicated by the information in the*	The flight [...] with the This court case is not an Annex 13 ca

	procedures and also not in accordance with the approach procedure and route prescribed by the Portuguese authorities. 13. Calculation approach speed in Martina	*Portuguese investigation report.* *The crew made a VOR approach. This is an approach which, under certain weather conditions, brings the aircraft in a position w~~here a visual approach can be made~~. In this case, the crew could see the runway at approximately 4 nm from the airport. This procedure requires them to intercept the approach radial. ~~This may be departed from once the runway is visible~~. Such procedures are designed with margins which allow for not immediately intercepting the approach radial. The wind and airspeed can always result in a tighter or wider curve during interception. During the approach it is permitted to descend to the minimum descent altitude (MOA) until other restrictions are specified. The glide path mentioned by AvioConsult is a glide path indicated by lamps next to the runway (PAPI). When following this glide path one is flying towards the runway at a 3° glide path.* *Given the above it cannot be concluded that the* Why left out, not commented?FCOM page 03-50-04. No error in AOM..	official procedures. No definitely not. Why needed a headin
Item 7	Causes according to the Committee of Investigation. The most likely causes of the accident were: (1) the high descent rate during the final stage of the approach made and the landing on the right-hand landing gear, further to which structural limits of the aircraft were exceeded (*);	OvV response: *The Portuguese report did state this. This was discussed above.*	Already discussed
	(2) the crosswind, which exceeded aircraft limits, experienced during the final stage of the approach and landing,	OvV response: *The Portuguese report did state this. This was discussed above.*	Already discussed
	(3) Due to the combination of these two factors the structural limits of the aircraft were exceeded (*).	OvV response: *AvioConsult stated that landing with braked wheels was considered to be a significant factor. Earlier it was stated that the suspicion that the landing was made with braked wheels is incorrect.*	Already discussed

	(4) Contributory factors to the accident: The unstable appr[illegible] and main[illegible] crew actio[illegible] wind from[illegible]sment of th[illegible]tempt whic[illegible]uction in wi[illegible] In NL: instabiliteit	OvV response: *The report did not mention a go-around attempt which was undertaken too late, but:* • *The delayed action of the crew in increasing power.* *The Portuguese report also stated:* • *The absence of an approach light system, and* • *CWS mode being switched off at approx. 80 ft RA, causing the aircraft to be in manual control during a critical phase of the landing.* *Here, AvioConsult left out some issues which were included in the report.*	Already discussed The Experts validate the OvV response. Irrelevant. PAPI available, Therefore calle Yes it was, in § 4.1.2
Item 8	Causes according to the Dutch Aviation Safety Board: A sudden and unexpected change in wind direction and speed (windshear) during the final stage of the approach (*). This was followed by a high descent rate and extreme lateral movement, which caused a hard landing on the right-hand main landing gear, which together with the significant crab angle exceeded the structural limits of the aircraft (*).	OvV response: *This was not adopted in the Portuguese final report.* OvV response: *This was not adopted in the Portuguese final report.*	The OvV answers are right. The title of Item 8 was: Causes according to D
Item 9	Causes according to this supplementary analysis. The accident was caused because the crew: (1) ignored the current wind data communicated to them and read out on aircraft and ignored the condition of the runway and did not respond to these by making a timely go-around as prescribed (implicitly) and diverting to an alternative airport. The crosswind limit was exceeded.	OvV response: *According to Martinair procedures the wind information in the aircraft must be used if the crew is expecting windshear. The facts do not indicate that the crew expected windshear. Additionally, AvioConsult tried to demonstrate that there was no w*[illegible] The commission and the NTSB co	The Experts do not validate the OvV response nor the AvioConsult assertions. The use of the official wind is obviously mandatory because it is the only information available about the wind conditions near the threshold (refer to the position of the windsock near the threshold of a

But the actual wind is available for read-out on-board. The capt

	If experts had done a proper job on the time references, they would c	Is a heading of 125° to a runway 106° not ala *d that the* *ded' with* *ot use the* *ted) wind* *wind limit* *Based on the wind data available to the crew, no limits were exceeded for them.* *Here, the incorrect interpretation of the term 'Flooded' is essential.*	Refer to AOM. Symmetrical not mentioned. U Th annot be a re symmetrical conditions of flight are unknown. But the airmanship recommends the use of all available information to manage safely of an aircraft, then this use may be done with precautions. The existence of windshear is at all time possible when suffering a thunderstorm. But it was not obvious at this time to detect a windshear occurrence only using the flight instruments. Irrelevant. This is true E « Human Factors » r munications technics, t rtunately at a bad time r ckpit. No, wrong. The captain stated wh ngaged.
	(2) during the final approach, deviated too much from the approach chart prescribed by the Portuguese authorities and were still not flying stably on the approach path at the altitude defined in the FCOM and, despite this, continued the approach and did not make the prescribed go-around.	OvV response: In the chart in RvO Annex 12, and in the A *It is not indicated anywhere that the aircraft deviated 'too much' from the specified approach path. The last part of the approach was flown visually.* *The fact that the crew did not make a go-around was also described in the Portuguese report.*	Already discussed above. The Experts validate the OvV response regarding the fact that the last part of the approach was flown visually. The last part had to be flown visually, laterally and ve
	(3) pulled the engine throttles back too early or held them back, as a result of which the go-around initiated at a low altitude failed.	OvV response: *The link created here between pulling the throttles back too early and holding them back and the failure of the initiated go-around is unclear.* *In relation to this the report stated that the actions by the captain were too passive and that power was increased too late.*	The Experts do not validate the AvioConsult assertion to initiate a « missed is called an « aborted sers be extended). The go-around at 3 sec. before lan
	(4) made serious, even fatal operating errors, both	OvV response:	

	during the final approach and during landing, as a result of which the aircraft touched down partly to the side of the runway and with braked wheels, due to which structural limits were exceeded. Approach and Landing Accident Reduction (ALAR) WG's already en	*The Portuguese report addressed the actions or failures to act. This was done in the spirit of ICAO annex 13.* *The sole objective of the investigation of an accident, or incident shall be the prevention of accidents and incidents. It is not the purpose of this activity to apportion blame or liability.* *Using terms such as 'serious' and 'fatal errors' is incompatible with this.* *As stated in 4.4, landing with blocked wheels is impossible for technical reasons. Depressing the brake pedals during the approach and landing is therefore not an operating error. The brake pedal is fitted to the rudder pedals. It is not unusual for the brake pedal to be depressed when operating the rudder pedals. This is especially relevant under conditions when many steering inputs are made using the rudder pedals. This happens during variable wind and turbulence.* But it should not by positioning the feet properly.	The Experts validate the OvV response. They underline that the « serious, even fatal errors » are not precisely described in the AvioConsult report and that these expressions do not match with the aim of the ICAO Annex 13. Did you read the whole report?This, aga The example of the « landing with the wheels braked » should be emphasized to sustain the Experts' opinion as the system itself is designed to precisely avoid this occurrence. No, AOM allows brake pedals to be applied only after nos
	(5) handled the autopilot, autothrottle system and crosswind landing incompetently.	OvV response: *This repeats of what was discussed under the previous item.*	Same remark.

Where? FDR and AIDS data show this, NTSB als

8.6. ANALYSIS OF THE FLIGHT B

Expert? In 600 hrs? In what? Human Factors??? In a specific aircra

8.6.1. THE CREWMEMBERS

Why included? Was not asked by the court.

The three crew members are experience
in this accident.
Generally speaking, a pilot who spends
is subsequently considered as an expert, in regard to the "Human Factor" principles.
In other words, the crew members have the capacity to react swiftly and naturally in case an unexpected event occurs during routine procedures.

But in this case, they didn't

Here is the individual experience of each crew member separately:

- For the Captain since March 1988:
  - A total of 1250 hours on DC10 in almost 5 years, which accounts for approximately 250 hours per year[101]—a relatively small number. The Captain was Flight Instructor and involved in the DC10 department management.

- For the First Officer (F/O) since August 1989:
  - A total of 1800 hours on DC10 in which accounts for approximately 520 hours per year; and that is without counting the hours spent on flight simulator. This is a rather "normal" amount.

Recent overview from I&M 1 - 4 Fax Martinair. "Cross wind

- For the Flight Engineer (F/E) active since early 1992:
  - Even though he recently joined Martinair, he is rather experienced on DC10 since he spent 1700 hours flying, among which he spent 1250 hours operating the aircraft as Flight Engineer.

Experts should have used the AOM that was maile

Some extracts from the Flight Crew Training Manual used by Martinair (or KLM)[102] explains the dangers and characteristics of windshears.
However, the documents provided to the experts does not indicate how the crew members were trained regarding this phenomenon, and therefore how knowledgeable the crew members were about windshears at the moment of the accident.

Seen the appendix of NTSB in Portuguese Report?

8.6.2. THE HUMAN FACTORS

An investigation that would be carried out according to nowadays' norms would address what is called "the Human Factors", which is inevitably an essential aspect of such cases.

---

[101] *Usually a crew member flies 600 to 700 hours a year. This small amount of flight hours is due to his position as instructor, which means a lot of flight simulator sessions and administrative work.*

[102] *Flight Crew Reference Guide Chapter 5.1 Paragraph 5.5.1 - Gust and Paragraph 5.1.2 - Low level wind shear.*

For this Faro accident, the investigation report is quite weak in this regard, which ultimately adds-up to the challenge posed to the Experts.

No, human/ pilot errors

As a matter of fact, some of the documents p[illegible]d to the conclusion that it was indeed the Human Factor — more precisely the reaction of the crew members — that is to be held in majority responsible for the accident. ??

Since 1970, ICAO published, in chapter 9 of its document n°6920, a recommendation as to take the Human Factor into account in case of an investigation.

Here is the text: Why all this? 6920 is an old doc.

> *This chapter of the Manual of Aircraft Accident Investigation is intended as a general guide to an aircraft accident investigator on the contribution medical, pathological and human engineering specialists, in short the various « Human Factors » experts, may be able to make to an accident investigation and the nature of the work involved in their contribution. More detailed material is provided for the medical specialists themselves in the ICA0 medical manual and in other technical publications which, whilst technical in content, could be of value to aircraft accident investigators interested in this particular field.*
>
> *The prime object of the Human Factors investigation is to obtain evidence as to the cause, sequence and effect of the accident through an examination of the operating crew, the cabin attendants and the passengers. Co-incidentally with the investigation, evidence as to identification will automatically emerge particularly if each examination is enhanced by the coordinated efforts of the Human Factors Group pathologist, police, odontologists, radiologists, etc.*
> *Identification of the victims must not be regarded as an end in itself.*
> *Identification is an essential part of the over-all aircraft accident investigation and it is expedient to integrate the identification of bodies with the post-mortem and autopsy examinations. It is for this reason that the subject of identification is dealt within some detail in this chapter.*
> *The importance of the Human Factors investigation has been inadequately appreciated in the past; the evidence derived from the human beings concerned in an aircraft accident - be they crew or passengers, survivors or non-survivors - represents an integral part of the investigation as a whole. The purpose of this introduction and Section 9.2 is to outline the value of the medical investigation to aircraft accident investigators and to civil aviation administrations.*

Conclusion

Experts did not understand this ICAO document. It is not about human err

As we can see, the emphasis here is put on the pathological aspect, rather than on the psychological aspect, as a potential cause for an accident.
We therefore cannot hold the Commission of Investigation, and among it the Dutch Aviation Safety Board, responsible for not analyzing this specific issue. Not asked.

We will need to wait for a few years[103] before the psychological aspect of crew members can be effectively taken into account in the analysis of accidents that involve such complex systems, but also that touch upon other specialties.

??? Any relevance?

Doc 6920 4th edition was of 1970.

[103] *The first documents about what we call now the « Human Factors » were issued by ICAO, in 1994.*

How do you know? Are you Ps

Admittedly, this accident comprises a good number of fascinating ... the crew's psychology.

u noticed. Why not discussed this

which is to determine whether DASB was right - Is also ques

Let us ask a few questions without answering them (since it is not ou

Then why are you asking these questions? To make money?

Why these po

- Why did one of the pilots seem to override the functionin... decrea... the spe...
- Why di... an altit... ATS increased the thrust 15 sec before landing, the copilot then closed the throttles, because he might have realized th
- Why d... stoppe...

These q... accident. It was not stopped, it ended because of touchdown - was initiated too low, at too low engine RPM. Experts did obviously not r
Answers ... illustrated...

No, by use of objective DFDR data

...ly" is not appropriate in such serious investigation work or in any ...even 20 years after the facts. Neither is the use of "estimate" by the experts.

8.6.3. THE AIRCRAFT

two AP systems

Irrelevant here, not to be used at Faro.

The DC10 was equipped with an autopilot ...

- under certain conditions, the system could land by itself and perform the ~~taxing~~ phase immediately after landing;
- the system could also fly "in transparency" through the ~~option~~ called "control wheel steering"; ?? Is an official AP Mode! Not transparent at all.
- it was equipped with an up-to-date[104] navigation system, especially according to KSSU standard, to which t... actually equipped with the fir... time, which later on ~~and to th~~... commercial aircraft. No, it was old. The RNLAF purchased the airplane and had already decide

Irrelevant

8.6.3.1. THE CONTROL WHEEL STEERING OR CWS

The Portuguese report speaks of the aircraft's navigability without further elaboration whereas the question related to the handling of the CWS system was later deemed important in the origins of the accident. Was it?

~~This system was the ancestor of modern flight controls systems.~~

[104] *When the DC10 performed its maiden flight in 1973, this equipment was really the best available in this industry. Even in 1992, it remains one of the well-equipped aircraft among the long range airliners.*

[105] *First stand-alone navigation system based on flight management computer systems and highly efficient flight directors and autopilots.*

It allowed great accuracy but also provided great flight stability by watering-down excessive orders given to the flight control systems.

?? excessive control inputs from pilots? Refer to AID

How did it work?

maintain attitude in pitch

- CWS was a specific mode of the autopilot design to maintain ~~two elements of the flight~~: the pitch and the roll of the aircraft.

the attitude in two body axes of the airplane

- When switching-on the CWS, and without even needing to use the control column, the autopilot would maintain these two elements until it was given the signal to do otherwise. How?
- Variations in trajectory would from that point, ~~only depend~~ on outside meteorological disturbances.

No, CWS would correct for disturbances to maintain the commanded pitch and

How did the pilot give his orders to the autopilot?

both capt and copilot control columns and wheels

- A component placed in ~~the control column~~ allowed to measure the pressure applied by the pilot on the column, ~~either to pitch or to roll~~, and it transmitted these signals to the autopilot computer.

and on the control wheel

- The computer then took the measures necessary to activate the adequate control surfaces (ailerons and/or elevators), and as a reverse effect, physically moved back the control column.

not reverse, but tactile feedback of the control surface motions to the controls

- The control column was then moving independently from the pilots, as it was in fact following the activation of certain flight control surfaces by the autopilot.
- When switch-on, this process functioned continuously which enabled flying the aircraft through the autopilot “in transparency”.
- As we can understand through the explanation above, the position of the control column was consistently being synchronized with the position of the control surfaces as both were linked by cables.
- It existed of course a certain flexibility in the system, which was ensured by shock absorbers and springs that prevented backlashes from activation or deactivation of the CWS. ?? actuators?
- Nevertheless, pilot instructions indicated specifically not to exert any type of pressure on the control column at the moment of activation, or deactivation, of the CWS in order to avoid any bump.
- It does not mean that the plane could become uncontrollable or could have brutal reactions. If it ever was the case, how could we imagine such a system being approved and certified?

No, at 570 ft from CMD to CWS

How did the pilots activate or deactivate the CWS system?

- The activation was done by moving the autopilot control lever from the MAN position to the CWS position; this was done by the pilot himself of course.
- The transition from CMD (autopilot engaged) to CWS can only be done manually by the pilot.
- Any action on the disengagement “reflex” push button on the control column, will cause a full disengagement of the autopilot (lever on MAN) and the appropriate visual alarm of disengagement (A/P red) would turn themselves on. A second action on this “reflex” push-button will extinguish the warning lights. A rapid double click on this push button will disengage the autopilot directly to MAN mode without any warning light illumination.

No mention of disengagement of CWS by the system itself, in case of conflicting control inputs by cap

On DC10, there was no comparison on the forces applied by one pilot by reference to the other what is called a ~~This notion was brought~~ ~~ot~~ ~~mechanically synchronized.~~

Wrong, both inputs were continuously compared, which caused CWS to sw

On the DC10, it is not the case because the control columns are mechanically linked to each other, and all actions that a pilot might take on his own column is felt by the other pilot in his own column.

Wrong, force transducers for all 4 pitch and roll control forces.

There is no double-input on DC10.

Yes, there is to the AP, via the force transducers, which was why CWS sw

That being said, there still was the possibility to disengage the autopilot, functioning in CMD or CWS mode, by a violent manipulation of the column.
For instance, in the case that the autopilot induced a spurious order because of a parasite signal and, as a consequence, engaged in a non-coherent maneuver, the pilots had the possibility to override the autopilot by an adequate manipulation of the control column which would provoke an automatic disengagement of the autopilot—associated with the visual alarms we mentioned earlier.

??

CWS is commanded by pilots through the control column and wheel. Pilot is in the loop all the time.

Usually, the DC10 was managed during the flight when the autopilot was not

controlled. How do you know "was"? You mean usually is...

Once in final approach, the minimum altitude at which the CMD mode must be disengaged is 500 ft[107] ~~, at the latest~~. It was then possible to fly the aircraft either in CWS or in MAN mode.

No, Martinair allowed/required landing with CW

In case of full manual landing, it was appropriate to deactivate the CWS mode at a minimum of 150 ft.
This does not mean that the pilots absolutely had to deactivate the CWS mode at this altitude. This means that if the pilot wanted to proceed to a full manual landing, he was recommended to deactivate the CWS at this altitude.
Once again, he could however remain in CWS mode and proceed to landing as such.

The technique of landing in CWS mode was simpler than landing manually.

Landing in CWS is also manually (is not automatically)

During a full manual landing procedure, the pilot must begin to "flare" the aircraft at around 50 ft by slightly raising the nose of the aircraft to decrease the vertical speed as to remain within the limits of structural resistance of the landing gear and of the fuselage.

?? You were r

At this precise moment, the power of the engines must be reduced to "flight-idle"; the speed will normally decrease which will have for consequence to harden the downslope. The pilot will have to constantly adjust the nose

??

constantly increase the pitch angle??? Hope not.

---

[106] *According to Airbus philosophy, pilots can, on their own side and at the same time, act on the joystick, the resulting signal finally sent to the autopilot computers being the algebraic sum up of both signals. In case of dual and opposite inputs, the resulting signal will be zero and no signal would be sent to the computers, so the flight path will be not modified. In such conditions, giving the information of a dual input becomes a tremendous safety issue.*

[107] *Except in the case of an automatic approach.* irrelevant here

control column (making sure that it is slightly raised) as long as a contact with the ground will not have been established.

When using the CWS mode, the pilot will only have to initiate the “flare” procedure and take the appropriate attitude for the landing. This attitude will be then maintained by the CWS whatever the thrust and speed.

The conclusion is that the use of the CWS, the day of the accident, was strictly in accordance with the Martinair and KLM standard operationa
The Experts will later analyze the disengagement of the C
before the accident itself.

Was this asked by the Court?

No, it was not. The copilot did not use CMD ar

8.6.3.2. THE HANDLING OF THE ENGINES

In the Portuguese report, there is virtually no question about the use of the engines because in some way, they are not involved in the accident.

But the Experts, taking into account some comments from the claimants, chose to develop this topic to avoid again any misunderstanding or inappropriate consideration.

compressor/ fan

The main parameter used to manage these engines was the
rotation speed, also called N1.

Manage? N1 is a consequence of throttle setting, controlled by the pilot

When at idle during a flight, the N1 was

would be (only manual idle, not ATS idle which was 60%).

At full thrust, it was customary to have an N1 at around 105% with a maximum speed limit at 118,5% for the CF6-50C; the used value would basically depend on the conditions of the

Not on DFDR this flight

These engines had great momentum inertia due to their mass but also due to their quite high rotation speed. As a consequence, th with a significant anticipation to obtain the required thrust

engine mass, or compressor/ fan mas

if he had reduced thrust to flight idle himself, not otherwise or while on ATS

The certification rules have taken into account th ined the response time that had to be respected by an

Why didn't you use this for analysis of the

Here are the applicable rules issued by the FAA:

Why all this?A

FAR § 33.73 Power or thrust response.

The design and construction of the engine must enable an increase—

(a) From minimum to rated takeoff power or thrust with the maximum bleed air and power extraction to be permitted in an aircraft, without over temperature, surge, stall, or other detrimental factors occurring to the engine whenever the power control lever is moved from the minimum to the maximum position in not more than 1 second, except

that the Administrator may allow additional time increments for different regimes of control operation requiring control scheduling; and

(b) From the fixed minimum flight idle power lever position when provided, or if not provided, from not more than 15 percent of the rated takeoff power or thrust available to 95 percent rated takeoff power or thrust in not over 5 seconds. The 5-second power or thrust response must occur from a stabilized static condition using only the bleed air and accessories loads necessary to run the engine. This takeoff rating is specified by the applicant and need not include thrust augmentation.

Which?

Did you check DFDR data for the engine acceleration ju

This is why the manufacturers set a minimum as to t
flight that they called "flight-idle".
It allowed to go from flight-idle to full thrust in less than 5 seconds, which wa enough to avoid a speed decrease o-around maneuver,

ATS responds to elevator input.

not necessarily a speed dec

Just to know, the value of ground-idle was around 25-30%, and the value of flight-idle around 40-45% depending on the outside temperature and on the indicated airspeed.

ground sensing

The engines automatically switch from flight-idle to ground-idle through a ground-flight signal transmitted by a sensor located — depending on the aircraft — in the shock absorber of the nose gear when it is compressed, so when the aircraft is on the ground (as for the DC10 and many other aircrafts) or when a de-tilt of the wing gear at touchdown occurs (as for the B747).

No

Present facts DC-10 please, not a 'story'

An aborted landing[108] is at all time possible even after the touchdown, but it must be
nded.
ots are instructed not to attempt an
d.

All irrelevant for this case!

ric (via Boeing) for the different values
oves this is not rig perature

To whom?Which engine type?

The Martinair DC-10 AOM does not use the term "ab

The point is that the pilot closed the throttles below fligh

No, nor in accordance with Mar

[108] *Note the difference of wording: a missed approach procedure is initiated before the touchdown and an aborted landing is initiated after the touchdown but before the reversers extension.*

2.F. GROUND IDLE TRIM TABLE (TEST NO. 3)
(ALLOW TO STABILIZE 3 MINUTES WITH NO AIRBLEEDS OR GENERATOR LOADS)

Why present this table? Ground idle...V

PARAMETER LIMITS	OAT	OAT	N2RPM +1.3% -1.2%	N1RPM (MAX)		OAT	OAT	N2RPM +1.3% -1.2%	N1RPM (MAX)
UNITS	°F	°C	%N2	%N1		°F	°C	%N2	%N1
	-40	-40	57.8	24.1		+ 43	6	63.4	26.1
	-38	-39	57.9	24.1		45	7	63.5	26.2
	-36	-38	58.0	24.1		46	8	63.6	26.2
	-35	-37	58.2	24.2		48	9	63.7	26.3
	-33	-36	58.3	24.3		50	10	63.8	26.3
	-29	-34	58.5	24.4		52	11	63.9	26.4
	-27	-33	58.6	24.4		54	12	64.0	26.4
	-26	-32	58.8	24.4		55	13	64.2	26.4
	-24	-31	58.9	24.5		57	14	64.3	26.5
	-22	-30	59.0	24.5		59	15	64.4	26.5
	-20	-29	59.2	24.6		61	16	64.5	26.6
	-18	-28	59.3	24.6		63	17	64.6	26.6
	-17	-27	59.4	24.7		64	18	64.7	26.6
	-15	-26	59.5	24.7		66	19	64.9	26.7
	-11	-24	59.8	24.8		68	20	65.0	26.7
	- 9	-23	59.9	24.9		70	21	65.1	26.8
	- 8	-22	60.0	24.9		72	22	65.2	26.8
	- 6	-21	60.2	24.9		73	23	65.3	26.9
	- 4	-20	60.3	25.0		75	24	65.4	26.9
	- 2	-19	60.4	25.0		79	26	65.6	27.0
	0	-18	60.5	25.1		81	27	65.8	27.0
	+ 1	-17	60.7	25.1		82	28	65.9	27.1
	3	-16	60.8	25.2		84	29	66.0	27.1
	7	-14	61.0	25.2		86	30	66.1	27.1
	9	-13	61.1	25.3		88	31	66.2	27.2
	10	-12	61.2	25.3		90	32	66.3	27.2
	12	-11	61.4	25.4		92	33	66.4	27.3
	14	-10	61.5	25.4		93	34	66.5	27.3
	16	- 9	61.6	25.5		97	36	66.7	27.4
	18	- 8	61.7	25.5		99	37	66.9	27.4
	19	- 7	61.9	25.6		100	38	67.0	27.5
	21	- 6	62.0	25.7		102	39	67.1	27.5
	25	- 4	62.2	25.7		104	40	67.2	27.6
	27	- 3	62.3	25.7		106	41	67.3	27.6
	28	- 2	62.4	25.8		108	42	67.4	27.6
	30	- 1	62.6	25.8		109	43	67.5	27.7
	32	0	62.7	25.9		111	44	67.6	27.7
	34	+ 1	62.8	25.9		115	46	67.8	27.8
	36	2	62.9	26.0		117	47	67.9	27.8
	37	3	63.0	26.1		118	48	68.0	27.8
	39	4	63.1	26.1		120	49	68.2	27.9

2.G. FLIGHT IDLE TRIM TABLE (TEST NO. 3)
(ALLOW TO STABILIZE 3 MINUTES WITH NO AIRBLEEDS OR GENERATOR LOADS)

PARAMETER LIMITS UNITS	OAT °F	OAT °C	N2RPM ±0.7% %N2	N1RPM ±1.6% %N1		OAT °F	OAT °C	N2RPM ±0.7% %N2	N1RPM ±1.6% %N1
	-40	-40	71.2	37.9		+ 43	+ 6	77.3	41.6
	-38	-39	71.3	38.0		45	7	77.5	41.7
	-36	-38	71.4	38.1		46	8	77.6	41.8
	-35	-37	71.6	38.2		48	9	77.8	41.8
	-33	-36	71.7	38.3		50	10	77.9	41.9
	-29	-34	72.0	38.5		52	11	78.1	42.0
	-27	-33	72.1	38.6		54	12	78.2	42.0
	-26	-32	72.2	38.6		55	13	78.4	42.1
	-24	-31	72.4	38.7		57	14	78.5	42.2
	-22	-30	72.5	38.8		59	15	78.6	42.2
	-20	-29	72.7	38.9		61	16	78.8	42.3
	-18	-28	72.8	39.0		63	17	78.9	42.4
	-17	-27	72.9	39.1		64	18	79.1	42.4
	-15	-26	73.1	39.2		66	19	79.2	42.5
	-11	-24	73.3	39.3		68	20	79.3	42.6
	- 9	-23	73.5	39.4		70	21	79.5	42.6
	- 8	-22	73.6	39.5		72	22	79.6	42.7
	- 6	-21	73.7	39.6		73	23	79.8	42.8
	- 4	-20	73.9	39.7		75	24	79.9	42.9
	- 2	-19	74.0	39.7		79	26	80.2	43.0
	0	-18	74.1	39.8		81	27	80.3	43.0
	+ 1	-17	74.3	39.9		82	28	80.4	43.1
	3	-16	74.4	40.0		84	29	80.6	43.2
	7	-14	74.7	40.1		86	30	80.7	43.3
	9	-13	74.8	40.2		88	31	80.8	43.3
	10	-12	74.9	40.3		90	32	81.0	43.4
	12	-11	75.1	40.4		91	33	81.1	43.4
	14	-10	75.2	40.5		93	34	81.2	43.5
	16	- 9	75.3	40.5		97	36	81.5	43.6
	18	- 8	75.5	40.6		99	37	81.6	43.7
	19	- 7	75.6	40.7		100	38	81.8	43.8
	21	- 6	75.7	40.8		102	39	81.9	43.8
	25	- 4	76.0	41.0		104	40	82.0	43.9
	27	- 3	76.1	41.0		106	41	82.2	44.0
	28	- 2	76.3	41.1		108	42	82.3	44.0
	30	- 1	76.4	41.1		109	43	82.5	44.1
	32	0	76.5	41.2		111	44	82.6	44.2
	34	+ 1	76.7	41.3		115	46	82.9	44.3
	36	2	76.8	41.3		117	47	83.0	44.4
	37	3	76.9	41.4		118	48	83.1	44.4
	39	4	77.0	41.5		120	49	83.3	44.5

The Experts' conclusions are:

The Experts obviously did not notice that the throttles were closed to flight idle more than 10 seconds prior to touchdown, while the

8.6.3.3. THE HANDLING OF THE AIRSPEED

The thrust could be adjusted manually or automatically through two auto throttle systems called "Auto-Throttle – Speed Computers" (AT/SC) or shortly "ATS".

all

The standard procedure was to use the two systems for the whole phases of the flight, even when flying the plane manually.

This policy was implemented because of the high reliability of the systems, providing an excellent protection against uncontrolled decreases in speed whatsoever during takeoff, approac [illegible] tions, in turbulent atmosphere with risk of windshear.

ATS adds 5 kt to approach speed dur

Then ATS need to be switched off.

??

The DC10 was equipped with two [illegible] tems which enabled:

selected speed by

What do yo

- a more accurate follow-up depending on the situation, the ~~intended speed of~~ the pilot, or the p [illegible] ding).
- At all times mai [illegible] by the manufact [illegible]

are two systems more accurate than one? Redundancy is the point.

and cruise, approach?

redundant

Role ATS for go-around? (TOGA switch)

Two full different channels provide three functions:

- automatic control of the thrust delivered by the engines via a ~~Thrust Rate Computer *(TRC)* and respective *Fuel Control Unit (FCU)*;~~

FD command and computer

- ~~management and~~ control of the speed;
- protection against stall.

ATS

Each ~~computer~~ provides the following outputs:

- management of the thrust levers;
- fast/slow indicator on each main instrument (A*ttitude* D*irector* I*ndicator or ADI*) and respective appropriate failure signal;
- information to the Flight *D*irector *(FD)* horizontal command bar when on Take-Off or Go-Around (*TO/GA*) modes;
- Stall warning;
- management of the automatic extension of slats (protection against stall).

For the TO/GA modes and for the stall warning, the computers use specific sensors providing the Angle of Attack or AOA.
For the other functions, the computers use signals provided by various components among them the Air Data Computers or ADC (providing the calibrated airspeed, altitude and vertical speed).

Plus other inputs,

controls

Each ATS computer provides information to an electrical motor driving the thrust levers via clutches.
The pilot can manually override these clutches at any time but it will require higher force than usual. If the pilot acts on the levers while the ATS are engaged, as soon

According to the DC-10 schematic diagrams ATA nr. 22-31, ATS re as the pilot stops his actions, the levers will return to the automatic computed position.

In regular conditions, one would pilot the DC10 with the two ATS systems always activated during the flight.

The use of these systems allowed, in case of go-around, to go at full-throttle immediately (less than 5 seconds), just by depressing a push-button located at the front of the engine thrust levers[109].

Did the captain use this TOGA switch? No, he didn't.

The Experts have analyzed the choice of the approach speed and the management of this speed.

and, what was the result?

8.6.3.4. THE LANDING GEAR BRAKING SYSTEM

The DC10 was equipped with a very efficient breaking system that used disks on all wheels of the main landing gears (central and wi

No, not on all aircraft, not all DC- 10 either o

As it has been the case on all aircrafts for decades, the main gear wheels are protected by an anti-skid system not to get stuck; a similar system to the one we see nowadays on cars.
This system allowed to optimize breaking while keeping the wheels in rotation as to always obtain maximum ~~deceleration~~

friction on the (wet or contaminated) runway without skidding

However, it was obviously mandatory not to land with the wheels locked by an unwanted pilot's action on the brake pedals. This protection was the job of a sub-system of the anti-skid system called the "free wheel" protection[110].
This system prevented the hydraulic pressure to be relea
as the conditions were not obtained, that is to say as lon
the wing gears had not ~~reached a certain rotation speed~~.

Is this DC-10 nomenclature? Not found i

spun up.

Clearly said, the pilot could land while applying maximum pressure on the pedals because the breaks would not have started functioning.

d, and that the wheels would
system would have authorized

at spin-up

ot get blocked by the breaking

Wrong. AOM requires ~~nose gear fi~~rmly on runway before application pressure on pedals!

at the runway was wet or

not required anymore...

eaking ~~absolutely impossible~~.

On the DC10, only the rear axletrees of the wing's landing gear were equipped with the "free-wheel" system because it was these wheels which physically[111] touched the

[109] *Under the condition that the flight directors and the AT-SC calculator are both activated.*
[110] *Just to know, the reader will note that this system was constantly tested during maintenance flights that followed the technical inspection.*
[111] *Because of the attitude on the aircraft at this moment.*

Note from where? How do you know? Do you have the ma

No, because the rear bogey wheels moment (

a landing, whereas the front and the centr
little bit later.

As said before, applying brakes is allowed only after nose gear is firmly on the ground.

Not mentioned by the Experts is th

wheels of the main landing gears were being
reaking pedals while flying, is therefore imp
nd free-wheel system was designed

assuming is

that was not mentioned in the final Portug

es it was. Max. LW 192.322 kg, Actual Landing Weight was calculated by the crew to be 161,400 kg. (P

Bad statement for Experts

8.6.3.5. THE NAVIGATION CAPABILITY OF THE

Another important point is the design itself of the KSSU DC10 in terms of navigation follow-up. ??
We must fully understand it as this fact could have represent a factor to the way the accident occurred, not technically speaking but because of the induced workload for the pilot flying.

Moreover, the Experts consider it as important to provide answers on this point because of the comments they read in the provided documents. were there any questions?

The KSSU DC10 was not designed to ~~follow a magnetic radial~~, or in other words, an electromagnetic route[112].

automatically

The consequence is that for a VOR/DME approach of the same kind that was used the day of the accident at Faro, the pilot of a KSSU DC10 cannot automatically follow the approach radial but can only follow ~~the route defined by~~ ... sing the HEADING (HDG) mode of the flight director and the auto

a selected

This does not mean that the flight path monitoring is not accurate, but it means the workload of the crew members will be greater on this aircraft than it would be on another type of aircraft.

The workload during a VOR approach (Faro) is little higher, because following VOR radial needs manual inputs. But is standard procedure.

The adjustments on HDG mode must constantly evolve depending on the variations of the wind, and therefore depending on the drift due to the wind.

Regarding the vertical path, the type of (non-precision) approach performed on the day of the accident does not provide a guidance signal for a descent slope that can

by:

would that be different on any other d

ned to follow horizontal routes by relying on ~~fictional~~ references that are defined in
l coordinates (north/south and east/west) ;
etic radials emanating from at least two ground stations; ??
nanating from one unique station and the distance to it.
calculated in order to join these points one by one so that the autopilot might follow
s what is required by the pilot.

indicate

be a[...]y followed because ~~there is no~~ radio-magnetic navigation signal that would materialize this slope.

airport Faro was not equipped with a...

The pilot can only follow a descent slope by using one of the basic modes of the a[...]

not follow, but only set a fixed rate of descent. There is nothing to follow during the initial part of the descent below 2000 ft.

A third aspect to be analyzed here is the interaction between the aircraft's systems and the pilots.

How much in MP495? Really much? More than during an ILS approach?

Much information is being given to the pilots to help them, and assist them in their work. This is why we refer to these systems as "Flight Guidance."

Among these tips given to the pilots is the constant display of instantaneous 'actual' winds.

Not constant (continuously), only if selected, which the captain did.

It is calculated:

air data

- from ~~aerodynamic data~~ measured by "pitot tubes" type of sensors as well as Angle of Attack sensors (AOA sensors);
- and from data coming from the accelerometers, which compute the movements of the aircraft center of gravity

AOA for wind calculation?? airspeed + altitude + position

No, is calculated within and using the accelerometer and po

It is then possible to calculate by mathematical ~~comparison~~ between these two types of data the actual wind on the aircraft's flight path.

No, would be too simple. Via vector arithmetic.

The calculation can only be correct, whatever the sensors accuracy, if the calculation hypotheses are valid.

??

No

Among the mandatory hypotheses, it is necessary that the aircraft flies on a perfect symmetrical configura[...]

during the

In case of slide slip app[...]ation, the aerodynamic data measured are wrong, and so is the result.

Sideslip is not measured, so AINS doesn't include this in wind calculations. A s

At the very end of the approach[113], or just before the t[...], compensate a cross wind by aligning the aircraft axis with the runway center line, ~~then creating a slide slip angle~~.

which one? Longitudinal.

Displacement from the extended centerline should be prevented b

Without judging of what happened on board of the aircraft at the very end of the final approach on the day of the accident, all experts come to the agreement that the pilots performed a certain set of maneuvers — esp[...] ultimately decisive.

all three?

For what? Describe th

What maneuvers? Control in

As soon as such maneuvers are being performed, the indications given on the wind measures become false; and these maneuvers started rather soon, at 400 feet, if we refer to the flight recordings.

False? or some deviation? and how much? Pos or negative?Do the DFDR airspeed data look fals

113 *During automatic approaches using autopilots, the system is designed to begin the decrab maneuver at 138 ft above the ground. Before this point, the wind calculated by the computer is right.*
When flying the aircraft manually, the align procedure is normally initiated by the pilot between 100 and 50 feet.

Suggested is that the approach was very difficult, but

What is your conclusion? What do DFDR and AIDS data tell you?

8.6.4. THE FLIGHT

8.6.4.1. THE FLIGHT PREPARATION

8.6.4.1.1. THE WEATHER FORECAST

The official report states that the crew visited the weather forecast center prior to departure.
However, this is not clear since passing by the weather forecast center prior to the flight is normally not mandatory, according to the Martinair procedures.

Not right, the procedure still required visiting the meteo office; crew MP461 did. Letters meteo.

It is of course required to gather weather forecast information for the departure, the route itself, the destination airport, as well as potential emergency airports.
This is clearly stated in the Flight Crew Operating Manual of Mart

alternate. Are you pilots?

The information available on this particular day — given in the form of a Meteorological Aerodrome Report (METAR) — indicated the actual conditions for a specific hour, as well as the possible evolution of the weather for the two following hours

specified

ified time period.

The weather forecast is transmitted in the form of a Terminal Aerodrome Forecast (TAF); this information comprises the forecast for an indicated time period of 6, 9, or 12 hours.

On this specific day, the pilots had a METAR that dated from the December 21st at 4:00 UTC.[114]

- Wind: 140°/13 kt
- Visibility: more than 10 km
- Clouds: 2/8 stratocumulus at 2000 ft
  3/8 Altocumulus at 10000 ft
  1/8 cumulonimbus at 2500 ft
- Temperature: 15°C
- Dew point: 14°C
- QNH: 1014 hPa

The wind was far from posing any challenge regarding the aircraft limitations on a wet runway.

Far? Facts please. Cross comp was 7 kt. Limit wet runway was 15 kt cross comp.

At the moment of the accident, "octa" was in use as the valu

unit

ndicate clouds, 8/8 meant that the sky was

always in use.

d the value indicated the height of the clouds' base.

8 octa's means what height? Bad explai

The gap between the temperature and the dew point let one assume that humidity was

large? small?

tween 90 to 95%.

114 *RvO chapter 1.7.7.2.1 – page 35 of the non-official translation of the RvO*

Finally, the atmospheric pressure did not reflect the reality of a depression since it was even higher than the standard pressure of 1013,25 hPa.

This information at hand allowed to predict a final approach that would be a little bumpy because of the presence of 'instability' clouds, but without major issue below 2000 ft.

?? cumulus? cb?

Simultaneously, the TAF of December 21st from 4:00 UTC to 13:00 UTC indicated the following:

- Wind: 150°/15 kt
- Visibility: more than 10 km
- Clouds: 3/8 stratus at 500 ft
  4/8 Cumulus at 1200 ft
  5/8 stratocumulus at 2000 ft
- Tempo Visibility: 8000 m
  Showers
  5/8 Stratus at 400 ft
  5/8 Cumulus at 1200 ft
- Inter Visibility more than 10 km
  Moderate thunderstorms
  2/8 cumulonimbus at 1800 ft

The wind remained in acceptable range, even on a runway that would be wet.
The lowest base of the could cover was below 3/8 and could therefore be ignored.
Visibility never went below the minimum value. less than
Stormy showers were to be expected.

Yes, it did! This was forecast, 7 hrs long. Tempo 5/8! During the approach

For a pilot, such situations are not unusual and are in no case difficult to handle; the atmosphere is bumpy, and moderate rain can occur, which would call for the use of windshield's wipers in fast mode – but nothing more.

Visibility was lost below MDA, reason for go-around.

8.6.4.1.2. THE TECHNICAL STATUS OF THE AIRCRAFT

An important detail to be considered to better understand how the pilots perceived the situation is the mechanical aspect of the thrust reverser of engine N°2.

Why spent 2,5 pages on this subject? To confirm that the pilots didn't follow ru

Did not apply.Is about departure

Landing on a contaminated runway[115] was advised against[116] if one deceleration system was not operational.

Departure with an inoperative reverser from a repair station was against Martinair procedures

[115] *JAR-OPS 1.480 – Terminology :*
Contaminated r *...ed when more than 25% of the runway surface area (wh... ...ngth and width being used is covered by the following :*

Not applicable in 1992. Also defined in AOM.

If the captain was warned before landing that the runway was or could get contaminated, he could have simply not even take-off with a thrust reverser that was not operational (because he would have needed all thrust reversers to be fully operational).

No, reversers are nice to have, saves brakes. Landing distance is not calcula

However, he took the rational decision to depart despite the fact that the thrust reverser N°2 was not operational, which did not jeopardize the safety of the flight at this stage.

The aircraft departed, it seems, with a 40 minutes delay; which was the time needed by the maintenance team to stow the thrust reverser N°2.

The engine N°2 is located right above the fuselage and at the bottom of the vertical fin, which makes its access rather difficult.

Irrelevant, unnecessary words

where? Sure? How do you know of Martinair?

In these conditions, the operators asked their crews to avoid using the thrust reverser N°2, except in case of emergency.
This instruction was to avoid the thrust reverser to get potentially stuck in "not retracted" position, which would have involved a heavy intervention during the stopover.
However, operators asked their pilots to systematically use the ~~thrust reverser N°2~~ during return flights at main base, simply to verify the well-functioning of the reverser.

all reversers

?? How do you know? Was during pre-flight checks, wasn't it?

During the flight prior to our case, a problem with this reverser occurred that required an intervention from maintenance.

No, departure from Schiphol had only one option, repair before takeoff (Martinair procedures)

There are two possible options at this stage:

- Solve the problem by repairing the defect before the next flight;
- Depart with the thrust reverser stowed in position "retracted" because based on the forecast its use was not required.

?? irrelevant, not in procedures.

Aircraft manufacturers have therefore developed a policy allowing to take off with a faulty system, in order to … ssible.
It therefore becomes pos… e or a defect since the flight safety is …

nonsense

However, some system… they are not operational: these cases …

Manufacturers issue tab… e defect and the procedures to implem…

Not a policy, a firm procedure in the MMEL (approved by authorities): C

(i) *Surface water more than 3* … *more than 3 mm (0·125 inches) of water ;*
(ii) *Snow which has been co* … *on and will hold together or break into lumps* …
(iii) *Ice, including wet ice.*
[116] *But not forbidden*

These tables are called "minimum equipment lists" or "MEL", and they are certified as crucial elements of the whole aircraft certification.

?? Called Dispatch Deficiency Guide (DDG), in Ma

must

~~Only~~ the captains are allowed to use these MEL; first, because they are the only ones responsible for the flight and, second, they are the only ones able to assess the impact of any failure regarding the operational egarding other potential issues. ??

No, they are not, they cannot. No engineering

Here is the issued table[117] for the reversers:

★ - Thrust Reversers	One fan thrust reverser may be unserviceable provided: . Aircraft shall not depart a station where repair or replacement can be made. . The unserviceable fan thrust reverser is secured and stowed according to MAI 78-00-01. . When dispatching from a wet or contaminated runway, the thrust used for take-off shall not be less than full A rating. . Asymmetric thrust reverser configuration does not seriously affect directional control due to the runway conditions at destination and/or alternate airports. . Anti-skid system is in <u>Phase IV</u> configuration.

The star[118] at the beginning of this text means that this item is a "consult" item.
The dispatch depends then on the evaluation of the situati operational context on the ~~captain's~~ decision.

Captain must consult with? With the

Departure seems to be impossible from Amsterdam because this airport is the Martinair's main base

seems impossible? Was not approved.

, and a repair station

But the text does not sa
It is stated "*from an airp*
The questions are:

No, not that day. + In preamble FAA MEL "at earliest time"

- Is it possible, that day, to perform the repair in Amsterdam?
- Is the spare part immediately available or should Martinair's maintenance ask a supplier to send this part?

Irrelevant questions, you are bending the rules.

The answer is not so obvious.

No, not yet in 1992.

Martinair, as subsidiary of KLM, must comply with the commercial agreement of its mother company. And the maintenance is managed by an agreement being part of the KSSU Consortium which is in charge with all maintenance topics.

The engines and all its systems (including reversers) are managed by a company based in Paris — REVIMA — itself being a subsidiary of UTA French Airlines[119], member of the KSSU consortium.

Irrelevant information. Why included?

[117] *Refer to KLM Aircraft Operations Manual § 3.1 Dispatch Deficiency Guide – 3.1.7 Power plant*
[118] *Refer to KLM Aircraft Operations Manual § 3.1 Dispatch Deficiency Guide – 3.1.0 General - 0.2 Categories*

How do you know?

That means that the spare part had to be moved from Paris, a be made in Amsterdam.

at that tim

??? MEL / DDG presents operational limitations / procedures for in-flight use as well.

AOG = prio 1

In any event, the meteorolog departure did not make the wel

Irrelevant. Rules were in place and mandatory.

When in flight, it is not allowed to use the MEL in case of failure or defect. The flight crew must use the appropriate 'abnormal' or emergency check-lists

Finally, if the captain made the decision to take-off, it means that he did not plan the fact that the runway might be contaminated at arrival.

Relevant? He knew about the weather!

If conditions at arrival are difficult, the crew is trained to handle it and mitigate risks; for instance, the crew may request more fuel before departure to wait for the conditions to improve at arrival, or divert to an alternate airport.

Was not i.a.w. procedure, Captain made decision outside of his autho

8.6.4.2. DURING THE FLIGHT

The situation is different.

The captain handles the situation as it comes and nothing forbids him to continue the flight with a thrust reverser that is not operational[120], except if the procedure or a checklist indicates otherwise, which was not the case.

?? What and why are you saying this?

From / see

Moreover, the reversers are not taken into account for the landing performances assessment.

Are you serious? Well, there are procedures...

An operator has no possibility whatsoever to impose anything to one of its captains once the flight has started; however, it needs to be noted that the operators advise strongly against landing when the runwa time as one of the systems that contribute

Crosswind limit reduction on wet and flooded don't have to do with deceleration only, also with avoiding runway vacation.

is not an operators advise. It is part of the capabilities of the aircraft and the ce

No, definitely not. If he decides different from the AFM limits and proce

8.6.4.2.1. THE WEATHER SITUATION AT ARRIVAL

It was not obviously easy to manage.

The analysis of the overall weather situation is useless in the context of the mission given to the Experts.

??

---

119 *This airline is a member of the Air France consortium since January 26th, 1990; and the former agreements were still applicable, including the repartition inside the KSSU consortium. In this context, all issues regarding the engines and the landing gears are under the UTA's responsibilities.*

120 *And in flight, except in case of abnormal extension of the reverser, it is not possible to know if whether or not the reverser will be*

It is, like other systems, tested before takeoff, isn

At maximum, one may consider that a rather active depression, associated with an important humidity level, generated a strong instability that has a considerable vertical influence in the area of Algarve.

Is this so? In the flat coastal area, with wind from

The presence of unstable clouds— "cumulonimbus"—all around Faro was confirmed. Stormy cells were also reported in the immediate surroundings of the airport, especially in the south, south-west ~~and south-east~~ of the platform at pretty close distance.
Pilots signaled several storms less than 10 nautical miles out of runway 11, and one very close to the axis of approach.

RoA § 1.7.2.2 page 38

According to official reports, showers measurements recorded between 07:27 UTC and 07:37 UTC reach the value of 60 to 65 millimeters of water per hour.
According to meteorology criterion, such a quantity is considered as exceptional. It represents 1 liter of water by m^2 per minute.

The runway was reported flooded.

Such quantities of water correspond — according to standards classification — to an exceptionally strong storm, and therefore to the presence of storm cells that, first, have a great potential for [illegible] so have a powerful vertical influence.

storm? Or just showers.

There are three important consequences to such a situation:

possible

- It can strongly disturb the adherence of the lateral trajectories as the pilots avoid active/shaky zones;
- It can induce vertical disturbances with the appearance of downbursts or ascending wind bursts, even more violent and unpredictable when the cells are highly active;
- It might under certain conditions generate windshear, and even microbursts[121], which are considered as an important danger in aeronautic.

Facts of this flight, please.

The Portuguese weather forecast services predicted the presence of storms and rain that could be strong, however, it was impossible to predict the following:

?? bla, bla

- The localization of stormy cells with a small diameter on a macroscopic scale;
- The maps — called TEMSI or SIGWX — cannot indicate these isolated cells whose evolution cannot be accurately located and that often move pretty fast;
- They limit themselves to merely indicate the likelihood of stormy zones in given geographical areas;
- the localization of vertical phenomenon such as windshears or downbursts.

The Official Report states the following in its pages 15 and 16 of the non-official translation:

« *According to the crew statements:*

[121] *The dangers of the windshears, downburst and microburst have been investigated since*

During descent and approach, the Captain detects on the weather radar, several returns[122], corresponding to rain showers located West and South of field. This last one at a distance of more than 50 miles.

During the outbound leg of the procedure, he detected a CB, west of the field between 7 and 12 DME.

did they? (No action)

During descent, the F/E notic... estimated distance of 10 miles. The crew realizes from the communication between Faro Approach and the flight TP120 that ... what they identified as rain showers was a thunderstorm cloud.

just South of Faro there was

, but according to the crew of TP120 it

This is not in the origial Portuguese report.

...ng final about 8 miles DME, turbulence of a degree ...uld have been found and if so, it would be related to the ...weather radar, west of the field.

During final approach, light to moderate turbulence was encountered.

below 900 ft

The aircraft was flying in and out of clouds and the forward visibility was not good. Continuous rain was experienced in some occasions, namely near the threshold, where due to the rain, the visibility wa...

visibility was lost at 250 ft, reason for go-around

Nevertheless, immediately before the threshold, ...

All together, these statem... d by METARs, and there is no ... t the approach was rather shaky and that following the trajectories as indicated on the maps must have been difficult.

light to moderate turbulence, as DFDR data prove.

Difficult?? No, the autopilot made a perfect final turn, despite wind. The pilot did not steer back to the approach radial!

According to the Jeppesen VOR/DME approach chart[123], the place to begin the final turn was at 8 nautical miles (Faro DME) and to begin the final descent at 7 nautical miles (Faro DME).

Active thunderstorm center of activity, between 7 and 12 nautical miles west of the airport, were attested by the F/E indicating a strong reaction of the autopilot to maintain altitude.[124]

Nothing on CVR. Nor in DFDR data.

According to the procedure, the height of the last level before final descent was set at 2000 ft QNH with the start of the final descent set at 7 NM DME.

Turning at 8 NM DME allows then to avoid the stormy zone while respecting, first, the trajectory as defined by the approach map ... point as established by the procedure.

Descent point was not respected with finishing t

Was this the case? Nothing on CVR.Turning

[122] *Technically speaking, we can also use the words « echoes »*
[123] *Refer to annex 8.6.4.5.1*
[124] *Lijst 4 Map-1-sur-4 – F/E ...*

?? Not found.

No, heading select was manual. Capt said I'll gi

Stabilize? Excellent decision? The final approach path was n

e choice by the pilot flying to stabilize the flight path for a few seconds to heading 080°[125] was an excellent decision, allowing both a clear final approach path interception without going above the final descent path.

The only critique we could make towards the crew is not to have sufficiently anticipated the beginning of interception because of an unfavorable wind that pushed the aircraft outside of the planned trajectory.

and not returning to the approach radial for meeting the AOM required stabilized approach criteria.

Moreover, the turn toward the final approach radial was performed with only a 25° bank angle because it was performed through the autopilot, which induced a d

No, don't blame the autopilot. Look at the trajectory in RoA Annex 12. The c

slight? 6°, is more than 1 km!

DFDR data shows: max

8.6.4.2.2. THE CHOICE OF THE APPROACH SPEED

On the day of the accident, the landing weight of the aircraft was around 161/162 tons.

Was exactly known. See landing data card in RoA

According to this weight, the correct reference speed (REF) should be set at 139 knots without wind corrections.

threshold speed Vthr. Vref was not u

to be

The approach speed is always at lea

The ~~FC~~OM indicates tha

and weight

nd air speed bug is set as requi the actual configuration and, if applicable, the wind correction factor.

To compensate the effect of the w

AOM (Martinair)

e ground[126], this speed has to be amended as indicated by FCO correction factor (WCF).

Plus to be prepared for a go-around at a speed higher than Vthr.

The amended approach speed sh following[127]:

This is in the NOTE below the table.

Table out of AC

Wind	Autoland	Manual l
		Greater of:
Steady state	5 kt	½ of the above 20
Gust	5 kt	All of the above 5 k

accident day

Regarding the ~~to-day~~ conditions:

- The wind issued by ATC was:
- the Captain considered a gust
- According to the crew's stater as the difference between the one. In our case, the gust is 5

You mean ground effect? Boundary layer has nothing to do with wind grad

?? He heard about gusts only one minute before landing.

So the total of 5 kt applied.

threshold speed

Consequently, the ~~landing bug~~ (whit

Wrong! At 144 kt

Look in the table, Experts. Min. steady state additive is 5 kt; gust (5 kt) additive = 0: ATS window should have been set at an approach speed 139+5+0 = 144 k

8.6.4.3. WINDSHEAR OR NOT WINDSHEAR

Copied from AOM?

8.6.4.3.1. FIRST, WHAT IS A WINDSHEAR?

The FAA definition tells us that a windshear is a change in wind speed and/or direction over a short distance. It can occur either horizontally or vertically and is most often associated with strong temperature inversions or density gradients.
Windshear can occur at high or low altitude.

Airbus, in a document issued in 2007, gives us another definition for the windshear:

> *Windshear is defined as a sudden change of wind velocity and/or direction.*
> *Windshear occurs in all directions, but for convenience, it is measured along vertical and horizontal axis, thus becoming vertical and horizontal windshear:*
>
> *Vertical windshear:*
> - *Variations of the horizontal wind component along the vertical axis, resulting in turbulence that may affect the aircraft airspeed when climbing or descending through the windshear layer*
> - *Variations of the wind component of 20 kt per 1000 ft to 30 kt per 1000 ft are typical values, but a vertical windshear may reach up to 10 kt per 100 ft.*
>
> *Horizontal windshear:*
> - *Variations of the wind component along the horizontal axis (e.g., decreasing headwind or increasing tailwind, or a shift from a headwind to a tailwind)*
> - *Variations of wind component may reach up to 100 kt per nautical mile.*
>
> *Wind shear conditions usually are associated with the following weather situations:*
> - *Jet streams*
> - *Mountain waves*
> - *Frontal surfaces*
> - *Thunderstorms and convective clouds*
> - *Microbursts.*

Neither the FAA nor Airbus give us any precise value to define the beginning of a windshear.

If we cannot use a threshold value to know if, whether or not, windshear occurred during this approach, we might use the evolution of the flight path, taking into account the pilots' actions.

Still according to Airbus, here is how it is possible for a pilot to recognize the presence of windshear:

[128] *The yellow bug will be the reference for AT/SC computer.*

Timely recognition of a windshear condition is vital for the successful implementation of the windshear recovery/escape procedure.
The following deviations should be considered as indications of a possible windshear condition:

Indicated airspeed variations in excess of 15 kt;
Ground speed variations;
Analog wind indication variations: Direction and velocity;
Vertical speed excursions of 500 ft/mn;
Pitch attitude excursions of 5 degrees;
Glide slope deviation of 1 dot;
Heading variations of 10 degrees;
Unusual autothrust activity or throttle levers position.

What are the various configurations and the interferences with the aircraft flight path?

Windshear in front of the aircraft:

The aircraft speed increases significantly
The crews do not always perceive this increase of the headwind as a risk.
But such a headwind gust de-stabilizes the approach of the aircraft, which will tend to fly above path and/or accelerate, if the pilot does not react adequately.
If the headwind shear occurs at takeoff, the resulting aircraft performance will increase. Once out of the shear, the indicated airspeed decreases thus leading to an AOA increase which might trigger the alpha-floor protection and/or stick shaker activation.

The aircraft crosses the windshear area:

Vertical downinterims are usually preceded by an increase of the headwind component. If the pilot does not fully appreciate the situation, he/she will react to the headwind gust effects to regain the intended path by reducing the power and by pushing on the stick. At that point, a vertical downinterim will increase the aircraft sink rate, which will bring the aircraft below the intended path.

Windshear behind the aircraft:

In case of a sudden increase of the tailwind, the aircraft airspeed decreases instantaneously. The lift decreases and the aircraft tends to fly below the intended approach path.
If the pilots pulls on the stick to recapture the path without adding sufficient thrust, the AOA will increase significantly and the aircraft will sink down.
If sufficient thrust is set to regain the intended path, but the pilot's reaction is then slow to reduce the thrust once back on the path, the aircraft will fly above the path and/or will accelerate.

All combinations between these three scenarios are possible, with various intensities, and depending on where windshears appear.

8.6.4.3.2. THE NLR ANALYSIS AND ASSOCIATED DOCUMENT

In the documents sent by the Court, two reports are issued under the NLR responsibility:

- The first one the 13/02/1993 named "Windshear analysis using flight data from the DC10 crash at Faro airport" (NLR CR93080C);
- The second one the 20/06/1994 named "Analysis of additional flight data of the DC10 accident at Faro Airport" (NLR CR94238C);[129]

Was also pilot at Martinair

Accordin... *the additional NLR windshear study"*[130] by M. H. Tigchela... ...st pilot RLD (Airworthiness department), for the first report, "*certain data were not available to NLR*".

Then why used this report?

In the second report, "*Additional data was requested and received from MDC and part of the analysis was recalculated*".

In this document, the two analyses performed by the NLR are merged and the main conclusions are:

- The change-over from CMD to CWS later than indicated in the first report; but was in-time
- The data shows that the instability begins before the disengagement of the autopilot (VRT SPD mode); What data? Where do you have these from?
- The functioning of ATS was normal. The pilot probably overrides the throttles to close them even if this reduction was possibly initiated by the ATS;
- The wind at touchdown was beyond the aircraft limits; Was this so? The pilots continued the ap
- The reversion from CWS to MAN is a contributing factor to the heavy touchdown;
- The reversion was caused by an opposite action[131] of the two pilots;
- The slide slip calculations are confirmed. That means that the calculations about wind, windshear, downbursts and turbulence was good;
- The instability was not induced by the pilot (not a Pilot Induced Oscillation).

Did experts really confirm? Where discussed/ motivated? NLR didn't conclude windshear.

Other considerations are issued:

- Difference between landing technics with or without use of CWS;
- Incidents involving the use of CWS and/or AT/SC;
- The possible consequence of aircraft instability on the pilots' decision de reduce the thrust;
- The CWS can stabilize the aircraft "*when no stick force inputs are make on the control column*";
- The combination CWS/ATS may "*have contributed to the observed longitudinal instal*...

No, CWS and ATS are well designed systems. Thrust variations were caused by unnecessary pitch and y

Based on the NLR's analysis, the conclusion of this document is that the collapse of the gear is due to two reasons:

The NLR reports were not on the collapse of the gear

...mits because of thrust reduction itself induced by

...ure? No long. instab. to be observed in DFDR data. Do you know what this is? Pilot induced!

...e aircraft limits, whose crew was unaware.

...t have been aware. Why else would they need a heading of 125° during the app

...ur-4, sent to the Experts by the Court at the beginning of January

...ed by a rapid action to the right.

No, an opposite control input from cap

Not an official report

The conclusions of the document NLR CR93080C and confirmed by the document NLR CR94238C, both documents issued by the NLR under contracts established with the Dutch Aviation Safety Board, are:

- The weather was turbulent because of crosswind hence with turbulence, gust …;
- The aircraft crossed a first downburst area from which the flight emerged at about 700 ft;
- The aircraft then cross
 at about 1 nautical mile
- "*The last microburst c*
 could have triggered a

These conclusions indicate t
altitude of about 50 meters."
But at the same time, the NLF
of the rapidly varying wind it is
turbulence."

Despite these comments, the
near or exceeding the crossw
 value of 4

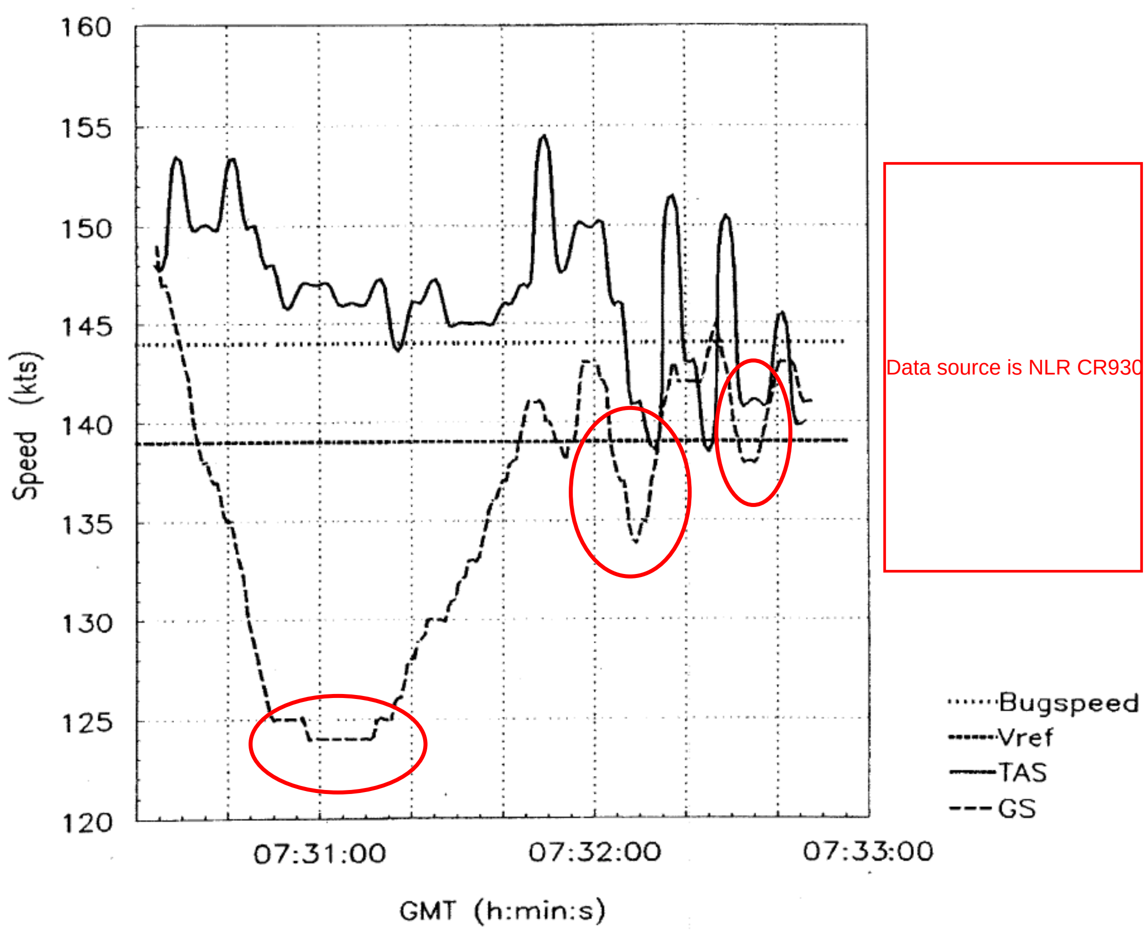
eport was written and reviewed by engineers who had no flying experience; the

Which is a pilot erro

Have you conducted a heading

Experts copied NLR text, and obviously did not analyze or verify the data thems

Fig. 4 Groundspeed and True Airspeed time history



One of the most obvious reasons for the NLR to conclude to the presence of three windshear situations is the change in ground speed as indicated in the diagram above[132].

Where is the ground speed data from? How calculated? Reliable data? Have you noticed the changes required by DASB?

8.6.4.3.3. THE EXPERT'S OPINION

Given the meteorological condition around Faro's airport on the day of the accident, that constituted a hostile environment with active stormy cells, the probability to come across vertical winds going up or down was high.

So, why not diverted? Were there really vertical winds?

At this time, systems on board were not very useful to detect vertical winds or anticipate horizontal variations.

If they had systems, they would not have had any use. Please refer to the normal g

Generally speaking, the potential for anticipation was very low; and even though there has been progress, it is still true today.

??

132 *Document NLR C93080C page 53*

Preventing from the effects of windshear relied therefore solely on the observation that could be made of different parameters during the flight.

And in this context, the pilots had a strong advantage on the readings of 'immediate' actual wind computed by the RNAV system and that would give them some useful information, even though it would always be delayed. ?? No, AINS calculates very fast!

The automatic system responsible for maintaining speed was also quite helpful to handle quick variations of the indicated speed.

Finally, airport operators set up ground systems around the airport that enabled the measuring of the wind to detect potential windshear; these ground systems were set up to mitigate the risks associated with brutal wind variations.
Such systems have been designed and used for quite a while already due to fatal accidents occurring especially in the United States.

At the moment of the accident, the airport of Faro was equipped with a system that would record meteorological data, analyze these information, and finally broadcast it; however, it was not equipped with a global system of alert since the local and usual meteorological conditions did not require it.

The system called "*Sistema Integrado de Observâo Meteorologica"* or SIO, is precisely described in the paragraph 1.7.4.3 of the official Portuguese report:

"analyze" is not mentioned!

analyze information coming from sensors perimeter, close to the runway thresholds 11 and 29.

- Data are recorded every 30 seconds and displayed on a special screen meant ...hat; the screen is located in the airport control tower.
- ...0 minutes following each hour, a report is printed and displayed in ...ge of this special screen.
- ...n's time reference is independent and must be adjusted by the ...
- ...ler may display for one or the other runway threshold (11 or 29), an ...ous wind, or a wind with an average of 2 or 10 minutes.
- ...ata (aver... ...seconds) is displayed every second ...cial scree...
- ...n has th... ...vectorial ...between t... ...are over

No, the report says on page 41: T

...of inves... ...n in its ...the fact ...two last ...his value... ...rage.

average

No. The report says on page 44: the display sho

...esented ... rotation ...l as an i... ...7:33:00

Please check again w

Why not UTC? Difference SIO - U

...ge 49 §1.7.4.4 Std time 07:32:15 (is 1

SIO Time			...st	Runway 29		
				Direction	Intensity	Gust
07 :30 :~~30~~				150	19	25
07 :30 :30				150	19	25
07 :31 :00	140	20	26	150	18	25
07 :31 :30	160	21	35	160	18	25
07 :32 :00	180	22	35	170	20	25
07 :32 :30	190	24	35	180	22	29
07 :33 :00	190	27	35	200	24	32
07 :33 :30	180	26	35	200	27	34
07 :34 :00	170	25	35	200	29	34

Accident

The data, by themselves, allow for only one thing: to notice that a rotation of the wind occurred, co... However, th... ...n airport.

after the accident! This would have led to a heading increase which was not recorded on the D

According to this records, the wind changes from 140° to 190° (with a runway oriented at 106°) between 07:31:00 and 07:33:00 SIO time.
So, at 07:31:30 SIO time, with a recorded wind coming from the 140° for 20 knots, we have an additional headwind component of about 17 knots with about 12kt crosswind.
With a wind at 190° for 27 knots, we have about 3 knots headwind and about 27 knots crosswind.

To this variation, we must add the brutal increase by 8 knots of the gust wind meaning a 35 knots crosswind under gust.

?? Please explain. What would be the effect on the airplane that

A slight variation of the direction of the crosswinds can represent a danger well known for the pilots because these variations can generate the wind to change from headwind to tailwind very rapidly.
These variations increase the risks of destabilization of the trajectory, which would call for action on the engine thrust to correct the speed, but also on the stick in order to adjust the flight path.

Was there any control input required? No.

As long as the aircraft is under automatic control and it is not strongly destabilized neither for the speed nor for the attitude because the autopilot will maintain the pitch and roll and the ATS will maintain the speed.

or vary?

But the flight path in itself, can be destabilized because, in our case, the flight path monitoring is not coupled with ground signals (localizer and/or glide slope) and the reaction of the autopilot can be slower than the human one.

?? No

After automatism disengagement, the corrections implemented by the pilot should be done more rapidly and with a greater efficiency.
The closer the aircraft gets to the ground, the more difficult it becomes to gauge the corrections needed; the pilot could easily over-correct by reflex.

Ultimately, the flight path's instability in itself is an objective and strong indicator for the presence of wind variations. And strong wind variations can become windshears.

That being said, any approach occurring under turbulent conditions with strong crosswinds that brutally vary in both direction and intensity can be destabilized—without the occurrence of windshears.

Were there brutal variations? Do DFDR data prove that?

The Experts consider that the only thing that they can objectively deduce from this analysis is that the flight path was destabilized because of whatever their nature.

But did you analyze the DFDR data to confirm this? N

Where is your objective deduction?

Faro airport is still not listed as airport where windshear occurs.

8.6.4.4. THE RUNWAY CONDITIONS AND THE ASSOCIATED PERFORMANCES AS EVALUATED BY THE CREWMEMBERS

8.6.4.4.1. COULD WE CONSIDER THE RUNWAY CONDITIONS AS A CAUSAL OR A CONTRIBUTING FACTOR TO THE ACCIDENT?

This is a quite important question.

The runway surface conditions ar
for this accident.
The accident occurred at the mo
later on.

?? The crew continued the approach while they were made aware and understood that th

The airplane would have vacated the runway due to the too strong crosswind and the runway condition.

The runway surface condition — flooded, wet, short, long, etc. — had no impact on the accident whatsoever, and is therefore irrelevant.

I beg your pardon? Unbelievable that expert

Despite the captain confirming to know about the runway condition and exc

8.6.4.4.2. WHAT ABOUT THE APPLICABLE RULES AT THE TIME OF THE ACCIDENT? (THE EUROPEAN JAR-OPS)

JAR-OPS 1 adopted in 1985, not prior to the accident

First of all, to discuss the expression "flooded", and how it has to be taken into consideration both in regards to crosswind limitations and to the decision to continue the approach made by the captain, we must refer to the rules in force at the time of accident.

No, ICAO Doc. PAN RAC (now 444

For an European operator, the rules to follow were those of the JAR-OPS, as soon as they were adopted nationally[133].

For a pilot, he has to follow the rules in the formal, RLD approved manuals.

The Claimants' advisors team is right when he indicates that the final JAR-OPS was issued in May 1995.
At the time of accident, the applicable rules were the national rules.

This JAR stuff is totally irrelevant. The ATC controller reported a flooded runway. The pilots simply have to listen

[133] *In reality, these rules were not made mandatory until they were adopted on a national scale. And JAR OPS 1 was adopted the Netherlands at the time of the accident.*

No, JAR OPS did not yet exist in 1992. Same for ICAO

But to ensure a smooth harmonization between the national rules and the rules based on JAR OPS recommendations, all countries in Europe began to change their own regulations 4 or 5 years before the introduction date of 1995.

For a pilot, he has to follow the rules in the formal, RLD approved airplane and operations manuals.

This is why the Experts use the JAR OPS as reference for their assessment although it was not the applicable reference. You should have used the rules applicable and used in the Netherlands.

Moreover, these considerations are of no consequence on this accident itself. Then why spent ti

But the non-decision of go around had a consequence. So they should have gone- around?

JAR-OPS 1.480 – Terminology

(2) Contaminated runway.

This JAR stuff is totall

A runway is considered to be contaminated when more than 25% of the runway surface area (whether in isolated areas or not) within the required length and width being used is covered by the following:

- *(i) Surface water more than 3 mm (0.125 in) deep, or by slush, or loose snow, equivalent to more than 3 mm (0.125 in) of water;*
- *(ii) Snow which has been compressed into a solid mass which resists further compression and will hold together or break into lumps if picked up (compacted snow); or*
- *(iii) Ice, including wet ice.*

…

(10) Wet runway.

A runway is considered wet when the runway surface is covered with water, or equivalent, less than specified in subparagraph (a)(2) above or when there is sufficient moisture on the runway surface to cause it to appear reflective, but without significant areas of standing water.

The JAR's did not encompass the notion of "flooded runway", but simply of "contaminated runway".

Before figuring out how the captain interpreted this term, and if we assume that the expression "flooded" was used in the sense of "contaminated", then the question we ought to ask is how did airport services determine that the runway could be "contaminated"?

JAR-OPS 1.485 – General

The AOM § 6.4.2

(a) An operator shall ensure that, for determining compliance with the requirements of this Subpart, the approved performance data in the Aeroplane Flight Manual is supplemented as necessary with other data acceptable to the Authority if the approved performance Data in the Aeroplane Flight Manual is insufficient in respect of items such as:

(1) Accounting for reasonably expected adverse operating conditions such as take-off and landing on contaminated runways; and

(2) Consideration of engine failure in all flight phases.

(b) An operator shall ensure that, for the wet and contaminated runway case, performance data determined in accordance with JAR 25X1591 or equivalent acceptable to the Authority is used. (see IEM OPS 1.485(b).)

What are the obligations that an operator must comply with when using runways?

JAR–OPS 1.515 Landing – Dry Runways

(See Acceptable Means of Compliance to the OPS 1.510 and to the 1.515)

Are you doubt

(a) An operator shall ensure that the landing mass of the aeroplane determined in accordance with JAR–OPS 1.475(a) for the estimated time of landing at the destination aerodrome and at any alternate aerodrome allows a full stop landing from 50 ft above the threshold:
- *(1) For turbo-jet powered aeroplanes, within 60% of the landing distance available; or*
- *(2) Not applicable*
- *(3) Not applicable*
- *(4) Not applicable*

(b) When showing compliance with subparagraph (a) above, an operator must take account of the following:
- *(1) The altitude at the aerodrome;*
- *(2) Not more than 50% of the head-wind component or not less than 150% of the tailwind component; and*
- *(3) The runway slope in the direction of landing if greater than +/-2%.*

(c) When showing compliance with subparagraph (a) above, it must be assumed that:
- *(1) The aeroplane will land on the most favorable runway, in still air; and*
- *(2) The aeroplane will land on the runway most likely to be assigned considering the probable wind speed and direction and the ground handling characteristics of the aeroplane, and considering other conditions such as landing aids and terrain. (see IEM OPS 1.515(c).)*

(d) If an operator is unable to comply with subparagraph (c)(1) above for a destination aerodrome having a single runway where a landing depends upon a specified wind component, an aeroplane may be dispatched if 2 alternate aerodromes are designated which permit full compliance with subparagraphs (a), (b) and (c). Before commencing an approach to land at the destination aerodrome the commander must satisfy himself that a landing can be made in full compliance with JAR–OPS 1.510 and sub-paragraphs (a) and (b) above.

(e) If an operator is unable to comply with subparagraph (c)(2) above for the destination aerodrome, the aeroplane may be dispatched if an alternate aerodrome is designated which permits full compliance with sub-paragraphs (a), (b) and (c).

JAR–OPS 1.520 Landing – Wet and contaminated runways

(a) An operator shall ensure that when the appropriate weather reports or forecasts, or a combination thereof, indicate that the runway at the estimated time of arrival may be wet, the landing distance available is at least 115% of the required landing distance, determined in accordance with JAR–OPS 1.515.

(b) An operator shall ensure that when the appropriate weather reports or forecasts, or a combination thereof, indicate that the runway at the estimated time of arrival may be contaminated, the landing distance available must be at least the landing distance determined in accordance with subparagraph (a) above, or at least 115% of the landing distance determined in accordance with approved contaminated landing distance data or equivalent, accepted by the Authority, whichever is greater.

(c) A landing distance on a wet runway shorter than that required by sub-paragraph (a) above, but not less than that required by JAR–OPS 1.515(a), may be used if the Aeroplane Flight Manual includes specific additional information about landing distances on wet runways.

(d) A landing distance on a specially prepared contaminated runway shorter than that required by sub-paragraph (b) above, but not less than that required by JAR–OPS 1.515(a), may be used if the Aeroplane Flight Manual includes specific additional information about landing distances on contaminated runways.

(e) When showing compliance with subparagraphs (b), (c) and (d) above, the criteria of JAR–OPS 1.515 shall be applied accordingly except that JAR–OPS 1.515(a)(1) and (2) shall not be applied to sub-paragraph (b) above.

We therefore conclude that to schedule the use of a specific runway, the aircraft must be fully stopped:

- On a distance equivalent to 60% of the landing distance available for a runway dry; and
- if a wet or contaminated runway is expected at landing, the runway length must be increased by 15 % to compute the final landing distance.

8.6.4.4.3. THE FLIGHT CREW OPERATION MANUAL

We first notice that the expression "flooded" has not even been defined in Martinair's FCOM, nor has it been defined in KLM's FCOM.

But "standing water" is. See next page."Flooded" was in

We find the following in Martinair's BIM:

08 Description of braking action and runway condition

Braking Action	Motne Code	Friction Coëff. (μ)	Typical Runway Condition
GOOD	5	0.40 and above	. Dry runway. . Wet runway with good surface condition.
MEDIUM to GOOD	4	0.39 to 0.36	
MEDIUM	3	0.35 to 0.30	. Moderate to heavy rain on clear runway. . Snow/Ice covered but sanded runway.
MEDIUM to POOR	2	0.29 to 0.26	
POOR	1	0.25 and below	. Slush or snow covered runway. . Ice covered runway. . Freezing rain. . Drizzle on dusty runway. . Standing water.

Interpolation between given values is permitted.

The reading of this table enables us to confirm that the Captain was supposed to consider, depending on meteorological information that was a Was supposed to..., but he knew e breaking action should be rather considered as "medium".[134]

This is also what can be induced from the "approach briefing" made by the F/O before beginning the descent, and amended by the Captain when he asked for a "positive touchdown," as it is advised in the paragraph 3.3.5—15 of the FCOM. Use AOM

For a wet runway, yes. They had not yet heard that the runway was flooded.

The landing performances are defined in KLM's FCOM, in the chapter 6.4 "Landing performance."

Use AOM

The reader will note an important point of these few pages:

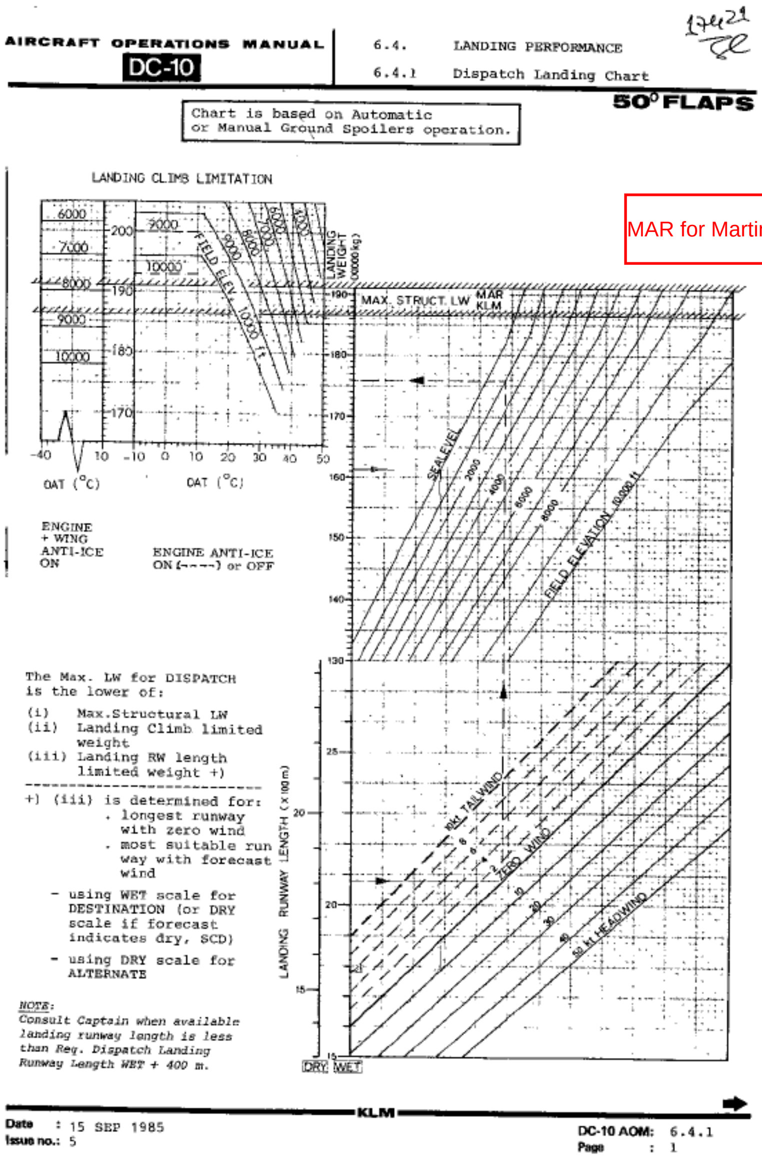
Not relevant this case.

- The difference between the runway length required to schedule a specific runway during the flight preparation;
- and the actual landing distance depending on daily conditions.

We can find at paragraph 6.4.1 the "dispatch landing chart":

- in page 1, it indicates the procedure and the performance to be considered when the flaps are set at 50° ("flaps 50° setting"), and
- in page 2, it indicates the procedure and the performance to be considered when the flaps are set at 35° ("flaps 35° setting").

[134] *Refer to Lijst 4 nr 9 vesrlag 1 : Document sent to the RvDL. Meeting minutes. 28 january 1993 8. Braking action*



MAR for Martinair DC-10,KLM fo

We note that it was possible to plan landing at “maximum structural landing weight”, which corresponds to 186,4 tons for both dry and wet runways (as defined by the JAR OPS 1.480—Terminolog

Wrong: for Martinair (MAR): Max LW = 192.322

The table showing at paragraph 6.4.2 allows to plan, when in flight and during the approach briefing, the distance required for landing:

KLM aircraft operations manual **DC10**

6.4 LANDING PERFORMANCE
6.4.2 Actual Landing Distance

17422

The Actual Landing Distances on this page are based on the following **Reference Conditions:**

. Flaps 35.
. Landing Weight: 160.000 kg
. Standard flight techniques as per AOM 3.3.
. Touchdown point at: 620 m for Flaps 35.
560 m for Flaps 50.
. Braking technique: Full brakes at nose gear touchdown *.
. Standard temperature.
. Zero slope.

Landing not allowed

* For the purpose of calculating Actual Landing Distances only 50% of the maximum available retardation force of the brakes has been taken into account. This is based on studies on the braking effectivity in airline operation.

REFERENCE ACTUAL LANDING DISTANCES (m)

Braking Action	GOOD	MEDIUM	POOR
Tailwind 10 kt	1910	2460	3150
Component 5 kt	1840	2360	3040
Zero wind	1760	2250	2890
Headwind 10 kt	1630	2070	2630
20 kt	1500	1890	2370
Component 30 kt	1370	1710	2110

Corrections (m) for deviating conditions:

WEIGHT	Per 10.000 kg $\frac{\text{ABOVE}}{\text{BELOW}}$ 160.000 kg	+70 -60	+110 -100	+160 -150
FAS	Per 1 kt ABOVE V_{TH} + 5 kt	+20	+30	+40
CROSSWIND	Per 1 kt	+10	+10	+10
TEMPERATURE	Per 1°C $\frac{\text{ABOVE}}{\text{BELOW}}$ Std	+6 -6	+8 -8	+10 -10
FIELD ELEVATION	Per 1000 ft ABOVE Sea Level	+60	+80	+100
SLOPE	Per 0.1% $\frac{\text{DOWN}}{\text{UP}}$ Slope	+20 -15	+25 -20	+40 -30
REVERSE THRUST	No reverse eng 1 or eng 3	+30	+360	+770
	No reverse eng 2	+30	+100	+190
	No reverse	+110	+360	+770
FLAPS	Flaps 50	-100	-150	-200

Maintain a margin of 200 m over the Actual Landing Distance.

-oOo-

Date : 1 DEC 1992
Issue No: 11

REVERSE SIDE
INTENTIONALLY BLANK

DC-10 AOM: 6.4.2
Page : 1

It is important to underline that the results are established with only 50% of the maximum braking action capability and that the touchdown point is at 560 m (with the flaps 50° configuration) from the threshold.

Based on a braking action classified as « Medium », the reference landing distance is:

Wind: 150° / 20 kt equivalent to 15 kt headwind

The planning wind at top of descent was

➔ Reference landing distance: 1980 m

The corrections for the deviating conditions from the reference evaluation are:

Outside temperature:	15°	No correction
Cross wind:	12 kt	+ 120 m
Airport pressure altitude:	≈ 50 ft	No correction
Aircraft landing weight:	161 T	+ 110 m
Runway slope:	≈ 15 ft/2500 m	No correction
Reversers:	1 & 3 only	+ 100 m
Flaps:	50 °	- 150 m

You forget: Weight, Final airspeed, crosswind and the 200 m margin. (+80+10+150+200 = 440 m)

The resulting corrections are: +180 m. +440 m = 620 m

➔ That means a landing distance of ~~2160 m~~. 2600 m for a wet runway!244 For a flooded runway: far

One has to keep in mind that we must consider this value as established for a touchdown at 560 m from the threshold, while the normal technique, as described in paragraph 3.3.5 of the FCOM (vol II), should enable a touchdown in the 300 m envelope. ?? or KLM / Martinair?

The landing performance analysis as provided by McDonnell Douglas concluded that a landing distance below 2000 meters was necessary according to the actual conditions. Where is this analysis?

One of the questions that remain unanswered is, once more, the way the pilots interpreted the expression "flooded."

No crew member did, at any moment, express any doubt regarding this term; each crew member — the captain, the first-officer, and the flight-engineer — understood it the same way.

?? What understood? How do you know? From statements month after the accident? Only the captain stated to the

And as the Ex

the paragraph

They all consid

Very poor is that the Experts do not mention the crosswind c

135 *Meeting minutes N° BVO/92-12/12 – Extension 63291 – 28th january 1993 – Subjects : 2nd coordination meeting §8 : Braking action and the term « Flooded »*
« Traffic control mentioned « Runway flooded » to both the B-767 and the Dc10.
This was confirmed by the NB-767 and apprently interpreted as « wet runway » with b/A medium
Apparently, after the landing, the B-767 did not see any need to comment about this, neither to the TWR nor to the DC-10. A B767 has other (crosswind) limits than a DC-10. It may also land with the wind correction angle maintained (crabbed).
Given their own statements, the DC-10 apparently made the same assumption.
It will be checked with/ ?? Yes, months later. The captain stated *of this non standard expression. »* Definitely not non-standard. Refer

error in numbering

8.6.4.1. THE HORIZONTAL FLIGHT MANAGEMENT DURING THE APPROACH

8.6.4.1.1. THE USE OF THE CHART

As one can see it on the Jeppesen chart, there are two different approach flight paths:

1) First, the one coming from a point at 14 DME on the 291° radial of the VFA VOR.

   This flight path must cross the 6 DME VFA VOR initial approach fix at, or, above 3000 ft, then, via a right turn to a 291° ~~route~~, descent to 2000 ft to again turn right at 10 DME, and finally come back to the 111° radial for the final approach path.

   ?? Irrelevan

   The minimum safety altitude (MSA) on this sector is 3000 feet and it is the reason why descending under this altitude is only allowed in the holding pattern;

   No, also from the VOR west bound, a

   The final descent should begin at 7 DME VFA.

2) The second one, designed as "Alternative procedure", via overhead the VFA VOR at, or, above 4000 ft.

   Not in Annexo 12 RoA! Not in 1992?

   The route to follow then is outbound via:
   - the 281° radial for CAT A & B aircraft, or
   - the 269° radial for CAT C & D aircraft

   until crossing 8 DME then turn right to be established on the final 111° radial.

   This difference of radial (269° instead of 281° radial) is due to the speed used to establish the last final turn which radius will be different.

The DC10 is classified as a CAT D aircraft, which means an approach speed between 141 knots and 166 knots.

The CAT C/D speeds are greater than the CAT A/B speed, consequently, the outbound radial should provide a greater radius of final turn. This is the case with the outbound radial of 269° as indicated on the Jeppesen chart.

standard

The real flight path of the MP495 was performed according to the alternative procedure for CAT C & D aircraft[136]. ?? 1992 appoach plate (RvO annexo 12) doesn't show an alternate procedure.

The path assigned by ATC. Did the "alternative" procedure exist in 1992?

The final turn is performed with the autopilot engaged and acting in Heading Select (HDG SEL) mode.

max.

In this configuration, the bank angle is ~~set at~~ 25°, matching with the value used to define this turn. ?? DFDR data shows max 17° during this turn.

136 *Captain's statement page 4*

Which statement? Did the captain mention "alternative procedure" ?

No, not 'obviously'; only if pilot is too

But, with a wind coming from the south/south-east, the path on ground will obviously "overshoot" the approach radial and a correction should be performed to come back as soon as possible on the centerline or on the scheduled radial (here VOR-VFA radial 111°).

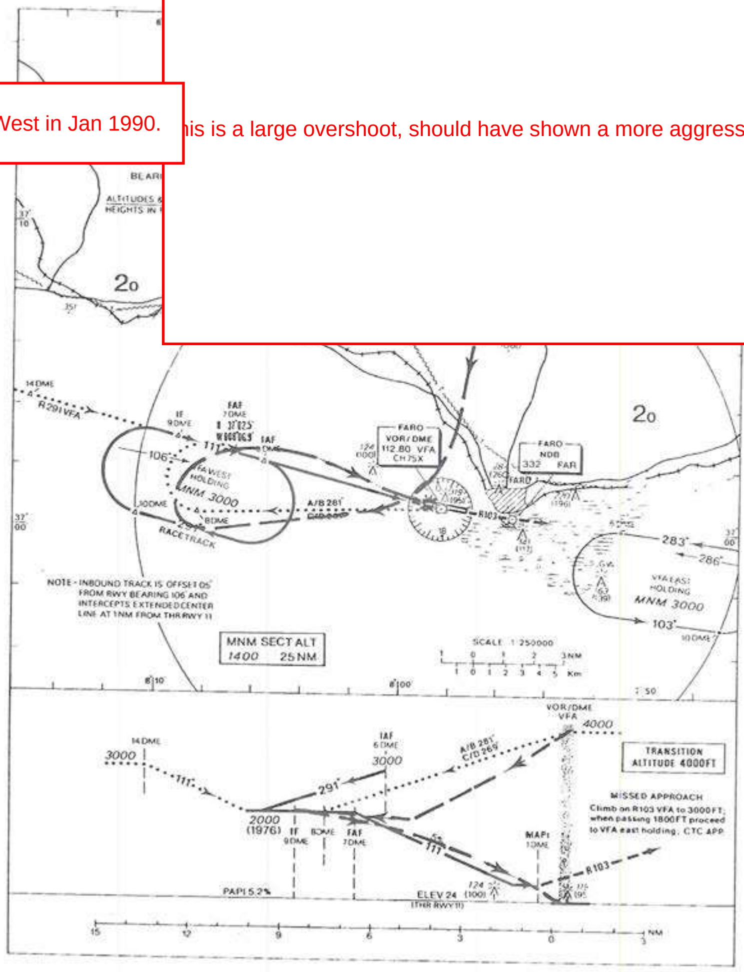
...which did not happen.

Where is your analysis? Did you write it down?

According to the radar data analysed by the experts and the chart issued in the official report Annex 12: "Plotting Radar da trajectoria da aeronave", the position of the aircraft at the end of the final turn was (at a maximum of) about 0,6 [nm] left of track and reduced gradually towards the intersection with the extended centre line of runway 11 at around 1 [nm]

Magnetic variation 6° West in Jan 1990.

is is a large overshoot, should have shown a more aggressive return to the correct approach rad



In the draft of this report, experts

AEROPORTO DE FARO

TRAJECTÓRIA RADAR DO VOO MP 495

Was this Annex correct? Did you analyze the control inputs and aircra

137 *Source: Annex 12 of the Final Report of Accident by DGAC Portugal ("RELATIORIO FINAL DO ACIDENTE OCORRIDO NO AEROPORTO DE FARO – PORTUGAL EM DE DEZEMBRO DE 1992", Relatorio No. 22/ACCID/GPI/92).*

Why 125? Did you calculate the wind? The crosswind component? Consequence wet/ flooded runw

…usly:

…eading of 150° and
…125° to balance the
wind and to establish the mandatory drift angle;

- The handling of the early stage of the final descent.

No, the data doesn't prove this happened. Headi

These two actions were performed in accordance with the BIM

were not. As radar plot shows. MP495 never established on 111°. See remark previous page.

Moreover, a correction of this magnitude is not a problem of concern, since the navigation aids are available (as it was the case) and as soon as the visual references are effective (according to the Captain's statement, it was true when crossing more or less 1.200 [ft] above the ground[138])

What about objective data?

According to the Captain's statement, the flight was on the extended centerline of the runway at 200 [ft][139].3

So when the captain says it, it is true? Experts, what do the data tell you? Did you analyze the data

The Commission of Investigation issued the chart in the official report Annex 12: "Plotting Radar da trajectoria da aeronave".
The Claimants' advisors team used also this chart to support their comments.

Following the remark referenced under 4.2.5.11 on the "Review and Remarks and Questions of the Claimants after the issuance of the interim report V17", the Experts decided to clarify and to reformulate the note of the page 105 of this interim report V17 and to answer the above remarks.

The main challenge is to try to determine precisely the position of the aircraft related to the perfect fl… …pproach.

not the perfect, but the required flight path

Three main points are to be considered:

a) the Air Traffic Control (ATC) surveillance radar used by NAV Portugal (Air Navigation Service Provider ANSP in Portugal) is a tool to separate aircrafts relative to and between each other;
   ATC takes any position error of the surveillance radar into account when defining separation standards.
b) the ATC radar data used by NAV Portugal has also been used by the Commission of Investigation to determine the position of aircraft relatively to the ground;
   The absolute position of an aircraft derived from ATC surveillance radar is not necessarily fully aligned to the corresponding geography. The resulting track of an aircraft derived by means of ATC radar compared with a ground based reference track (like 111° radial of a VOR) definitely has an error which is not known in this specific case.
c) the positioning and navigation accuracy of the aircraft itself using INS, VOR/DME, etc.:

[138] *Captain's statement – page 5*
[139] *Captain's statement – page 6*

irrelevant here

During cruise, the usual procedure (VOR/DME on "Autotune")[140] for the best combined resulting navigation accuracy is, as much as possible, a dual DME updating.
At the very last part of the flight and according to the approach procedure to be performed (VOR/DME runway 11), the FARO VOR/DME was manually selected on both receivers. In this case, the resulting navigation accuracy become the one of the VOR/DME.

What?

That demonstrates that the use of the recorded data ("mixed of inertial platform data such as the Euler angles (roll, pitch and yaw), ground track, drift angle, magnetic heading a [illegible] gether with inertial acceleration measured i [illegible] [141] to derive the flight path is the best solutio [illegible] position of the aircraft.

were these recorded? Euler angles? Do you hav

To further analyse the lateral and vertical alignment of the flight MP495 towards runway 11 at Faro, the Experts have conducted a detailed analysis based on the available radar data positions from the official Annex of the RoA.

8.6.4.1.2. ANALYSIS OF RADAR DATA OF FLIGHT MP495

8.6.4.1.2.1. GENERAL STATEMENTS

This analysis is intended to visualize the track of the flight MP495 on 21. December 1992 based on radar data provided by the court to the experts. The source for this analysis has been in the c [illegible] (RoA) by the Portuguese Commission c [illegible] re in annex 5 of ~~the Annex to~~ the RoA).

What data do you mean? Just the radar trajectory image? Or annex

The documentation provided to the experts by the court does not include any details on the radar sources itself (like geographic position, type of radar primary and/or secondary surveillance, update rate, position errors etc

ls in Accident report § 1.17.5.

Never heard of PRF? Not range?

As the analysis of the final flight is of particular interest, the experts started to use the rad [illegible] e 07:11:29 [hh:mm:ss] until 07:32:59 [hh:mm:ss] as the last dat [illegible]

interval

Th [illegible] provided with a five (5) seconds update until touchdown of the [illegible] :mm:ss] RADAR time.

Did experts analyze, or just copied

Th [illegible] at Faro on 21.12.1992 has been 5.31°W (changing by 0.1 [illegible]

called variation. Is this of relevance?

The radar trajectory chart in RoA Annex 12

---

140 *Automatic selection of the station for the best updating of the INS position*

141 *NLR final report CR 93080C page 79 and the text, chapter 2.2.1 pages 17 and 18.*

Not used by Commission, not formally is

distance

At max. range, a 'target' is painted at least 3x during each a

8.6.4.1.2.2. ACCU F TI

Generally, as a rotating radar delive (h "plots" in polar coordinates representing the range the target (here: aircraft).
The absolute accuracy of the resulting "plots" is accuracy of the radar and the distance to the rad this case).
The ~~induced~~ error (in absolute terms) of this angular accuracy becomes larger the further away the target (here: aircraft) is from the radar origin.

The error associated of the range measurement of the radar stays more less the same over the maximum coverage area of the radar.
~~In other words~~, the further away the target (here: aircraft) is from the radar origin, the larger the bearing error appears in absolute terms. This is why we have a changing lateral position quality of the radar plots during the course of the flight.

A changing lateral position quality? Why changing? The distance to the radar near Lisbon didn't change that much. Nonsense.

It can be assumed, that in 1992 the available radar data has been subject to radar tracking.

?? What do you mean? Don't assume, be sure as experts. Or just position recording? Radar tracking is something else.

A radar tracker is a component of a rotating air surveillance radar system that converts consecutive radar observations ("plots") of the same target (here: aircraft) into tracks.

Or is this the role of the SSR? What was the radar antenna RPM? One rev. per 5 seconds?

The radar tracker is also able to use consecutive plots to estimate the current speed and heading of the aircraft.

Is not applicable here. In annex 5 individual data points. No tracking. On the radar scop

It can also be assumed that in 1992 the data of only one radar at any given time had been used as data source (so called "mono radar ~~tracking~~").
Mono radar tracking refers to the use of surveillance data from single radar only.
This technology has been in place in Portugal at the time of the accident by the air navigation service provider (here NAV Portugal).

How do you know? No SSR? Above you mentioned no de

At 07:20:29 [hh:mm:ss] RADAR time the original radar data set ("magenta radar plots" in figures) started to include a second set of radar data positions in the data set ("cyan radar plots" in figures).

Where from?

From data analysis it appears that this second data set ("cyan") is identical to the original positions in principle but has been subject to a lateral position correction.

According to the legend Annex 5: the second set are adjusted positions, but no further info on what

By whom? Why?

The measured n radar tracks is in 150 [m] and 30

How? By whom?

No quantitative statement on the absolute lateral position accuracy of the radar data can be made.

So, why are you using these data?Is lateral data rele

Sure? No overshoot during the

5.4.1.2.3. LATERAL ANALYSIS OF THE RADAR DATA

ow that the aircraft flew from north to south, crosses the Faro airport midfield and followed the prescribed (alternative) routing towards the non-precision VOR/DME approach to Faro airport (see figure 1).

The radar data are complete and every five (5) seconds a position report is available; no single position report is missing throughout the data set. In figure 1, the areas with orange circles mark areas with large lateral deviations within the radar track (orange circles). what does this mean? Data missing?

These effects cannot be fully explained at this point.
It is assumed that these deviations are caused by radar tracking alignments or possibly by masking or shadowing the aircraft bottom secondary surveillance SSR transponder antenna because of the banking aircraft (which is not for sure) towards the interrogating secondary SSR radar. Is the second data set SSR data? Both data sets show errors, not

In both cases, the strong modification of the aircraft trajectory in such a short time is operationally not possible and has no further relevance to the accident and therefore does not need to be considered any further. Doesn't this say anything about the data quality, accuracy?

An interpolation of these radar position points is acceptable. which points? Why is bad data accep

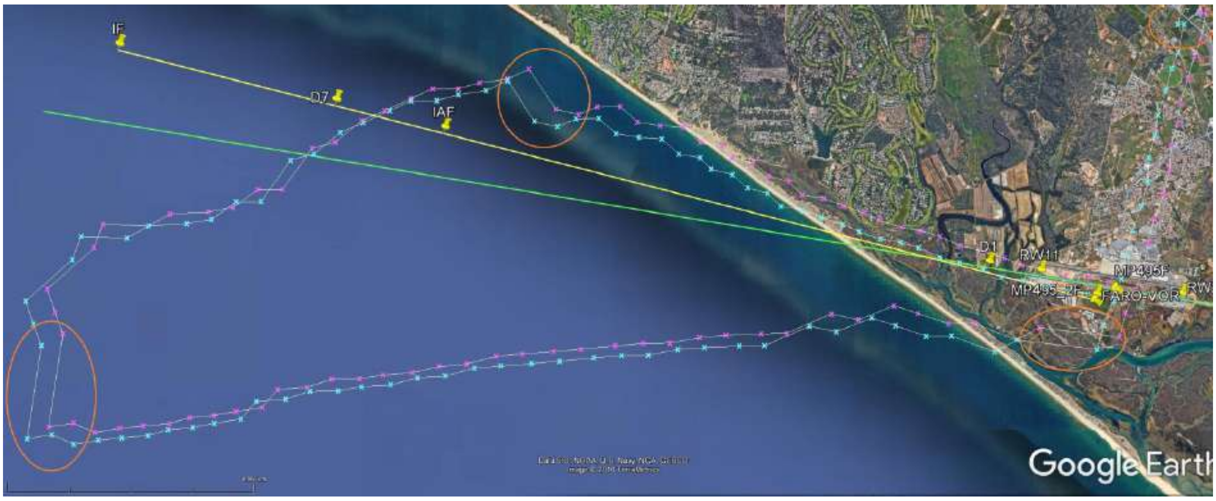


Figure 1: ~~Lateral~~ Flight Profile based on radar data (in Google Earth projection) (Magenta: Original radar track; Cyan: Corrected radar track) What radar data?

Annex 5: "Radar positions" e fi ete unw "adjusted positions" i.a.w. Annex 5 itial Approach Fix (IAF) towards natch the runway 11 around the

Neither of the two precisely 'matches' runwa

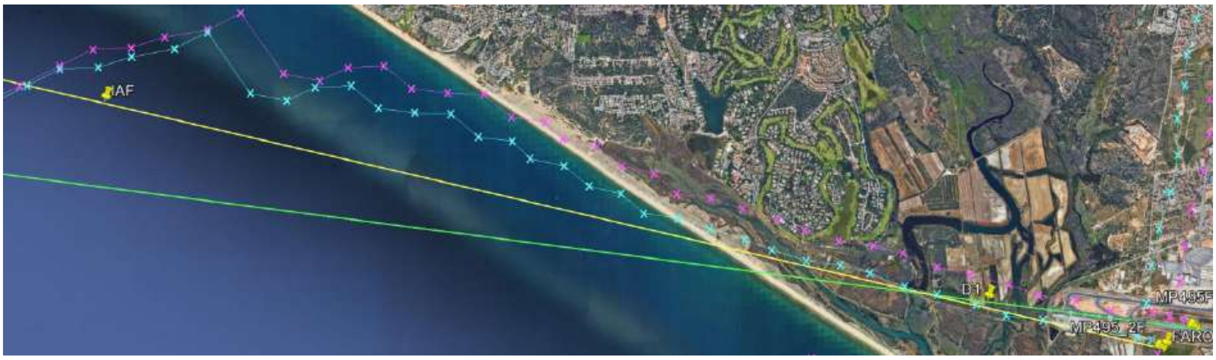


Figure 2: Lateral Flight Profile based on radar data (from IAF to touchdown, zoomed in Google Earth projection) (Magenta: Original radar track; Cyan: Corrected radar track)

Corrected? How, why?

The corrected radar data track (cyan colour) ends up about 150 [m] south of and about 900 [m] from the threshold of runway 11 (see orange circle). The original radar track data (magenta colour) ends up about 90 [m] north of and about 1.200 [m] from the threshold of runway 11 (see orange circle).

"Good data" isn't it? No!

Figure 3: Lateral Flight Profile based on radar data (final segment, zoomed in Google Earth projection) (Magenta: Original radar track; Cyan: Corrected radar track)

As the aircraft has reached the runway 11 (around 350 m to 400 m beyond runway threshold) it can be assumed that the last radar datum should be somewhere around this position. It has therefore been assumed that the corrected ("cyan") radar track (corrected by NAV Portugal) is the most "suitable" radar track; this corrected "cyan" track is identical in principle with the "magenta" track but shifted by a lateral correction factor.

Consequently, the "cyan" track has been shifted to the North to match the runway 11 centre line as best as possible (see shifted "green" track in figure 4).

Is this allowed in an objective analysis

What was the radar horizon? Are the data from below 500 f

Figure 4: Lateral Flight Profile based on radar data (final segment, zoomed in Google Earth projection) (Cyan: Corrected radar track; Green: Shifted corrected radar track)

In a next step the green track has been again shifted to the west end of the runway (to become a "purple" track) so that the last radar datum (see orange circle in figure 5 … n point of flight MP495.

Experts shift data? Objective?

… r data (final segment, zoomed in Google Earth projection) … to touchdown point corrected radar track)

Figure 6: Lateral Flight Profile based on radar data (final segment, zoomed in Google Earth projection) (Purple: Shifted to touchdown point corrected radar track)

Figure 7: Lateral Flight Profile based on radar data (final segment, zoomed in Google Earth projection) (Purple: Shifted to touchdown point corrected radar track)

From this radar data analysis it can be assumed, that the flight MP495 had been laterally aligned with the extended centre ite late) shortly after the intersection of VOR radial 111° and centreline of 106° at around 0,8 [nm] (or 1.500 [m]) from touch ssuming a thre degree glide path of the flight the corre e ground is a 250 [ft].

Look at DFDR radalt data

5.2% as specified

.4.1.2.4. VERTIC ADAR DATA

ation of each radar via the secondary nterrogations of the ai SR-Mode C) of flight ion of the vertical info 100 [ft] increments

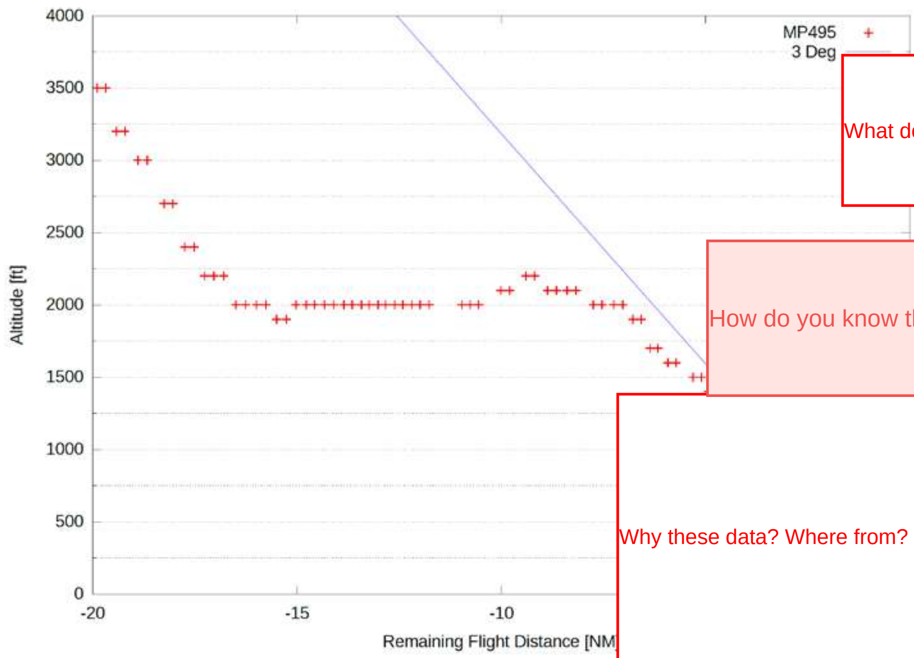
ot used DFDR radalt data?

ed is not sure! So you d

intervals?

Then why landed the airplane

l, that from this analys nt of the aircraft was during the final 5 [with some vertical al stage of the approa



What does this mean? Was specified 5.2 %

How do you know the exact distance? You would r

Why these data? Where from? Not from the court.Most is irrelevant.Ra

Figure 8: Vertical Flight Profile based on radar data

Then why and how did the airpl

8.6.4.1.2.5. CONCLUSION OF THE RADAR DATA ANALYSIS

This analysis of the available radar data supports the assumption, that flight MP495 was laterally
after the inte
at around 0
extended ce
Captain's sta
at 200 [ft].

Did you analyze pilot control inputs and airplane motions from 1 nm using objective DFDR and AIDS data? If on

The Experts are also confident regarding the conclusions of the NLR report about the position of the aircraft which wa
runway below more or less 200

You were not asked to be confident, but to analyze, to be sure. Experts used th

Moreover, this conclusion matches with the Captain's statement[143] indicating that the flight was on the center line of the runway at 200 [ft] and the radar data analysis conducted by the experts.

A statement is not objective. Why did the captain take control 6 sec before touchdown?

Generally, all parties agree on the fact that there was an overshoot of MP495 at the end of the final turn towards the radial 111° at (a maximum of about) 7 [nm] from the FARO VOR/DME.

At 7 nm, the airplane crossed 111, the largest deviation of radial

The Experts have to recall, that the pilots reported to have the runway in sight from 4 NM (or 1.200 [ft]) and confirmed to ATC at 1.100 [ft]), and that this lateral overshoot is not a cause of the accident.

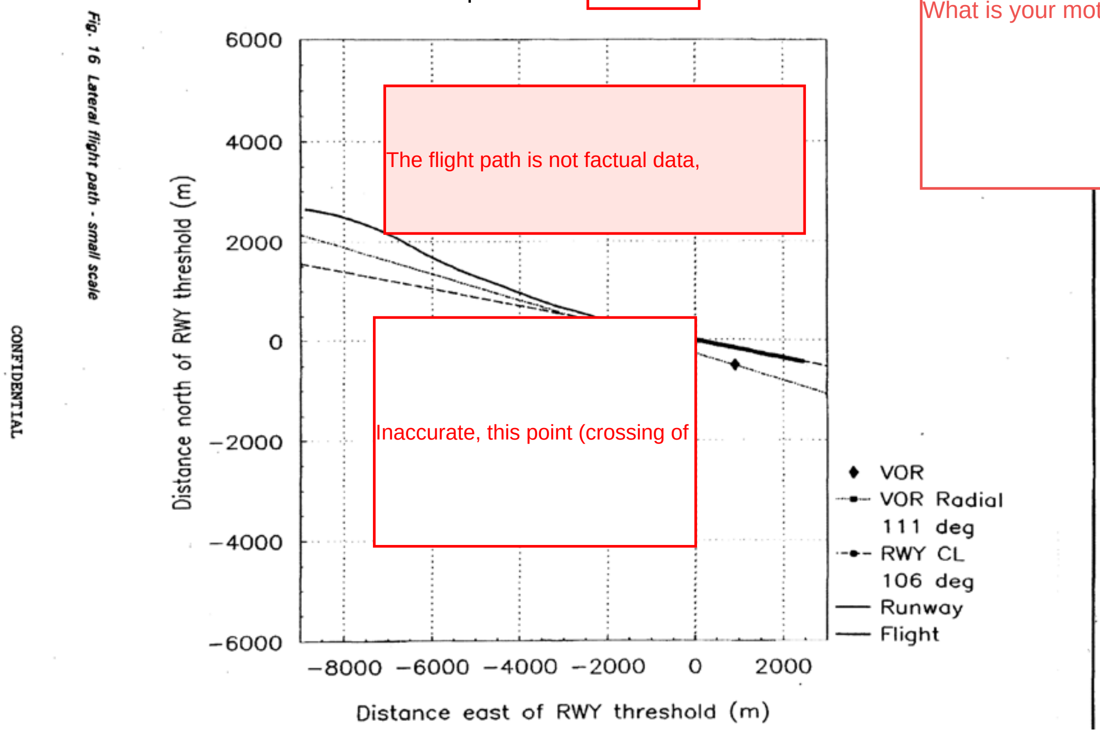
[142] *Captain's statement – page 6 (Lijst 4 map 1on 4 pdf page 19)*
[143] *Captain's statement – page 6 (Lijst 4 map 1on 4 pdf page 19)*

Well it is, indirectly. The approach path was not stabilized (within required lateral bou

The following chart[144] provided by the NLR (see final report CR93080C) confirms the Captain's statement and the radar data analysis of the experts ab the aircraft on short final.

<u>Note</u>: This chart of the final NLR report CR93080C has been used following th team correct indications in the Interim Report V17. ??

What is your motivation to write



This figure is out of an NLR re

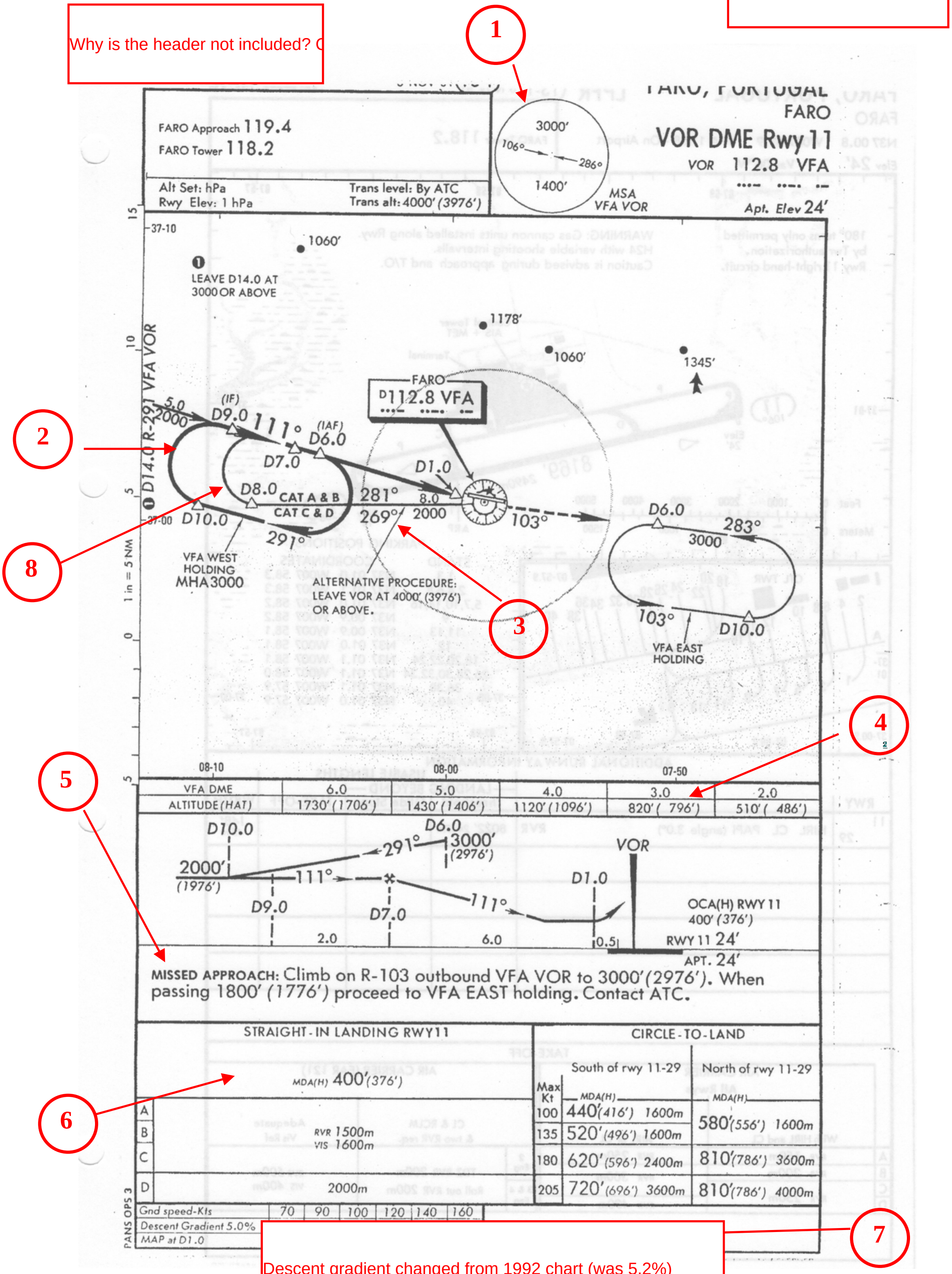
The origin of the flight path data is not made clear. Ex

144 Source: 10039189-List-4-map-4-sur-4.pdf (page 85)

8.6.4.1.3. THE JEPPESEN CHART

This is not the Approach Plat

Why is the header not included? C



Descent gradient changed from 1992 chart (was 5.2%)

Is not relevant to the case, to the questions asked by

1 This circle provides the minimum safety altitude (MSA) according to the position of the aircraft with respect to the VFA VOR:

- North of the radials 106°/286° of VFA, the MSA is 3000 feet (QNH)
- South of the radials 106°/286°, the MSA is 1400 feet (QNH)

The circle is the 25 nm circle around the VFA VOR

This does

2 This path is at the same time the west holding pattern but also the flight path to be used for the traffics coming from the west and landing in Faro on runway 11. These traffics must cross the position 14 nm VFA DME at or above 3000 feet QNH with a minimum of 2000 feet QNH then leave 2000 ft QNH at 7 nm VFA DME on the radial 291°.

3 This path is called “Alternative procedure”.
The traffics must cross overhead VFA VOR at or above 4000 feet then fly either the radial 281° for the aircrafts classified as category A or B or the radial 269° for the aircrafts classified as category C or D.

4 These boxes are the tool used to check the final descent slope.
The final descent begins at 7 nm VFA DME then should cross 6 nm VFA DME at 1730 feet QNH, and so on.
The pilots use the word “window” to refer to the association of a distance (DME) and the respective altitude.

5 This is the description of the flight path to be followed in case of go around procedure.

6 This is the Minimum Descent Altitude at which the visual reference must be in sight to be cleared to continue the approach.

7 This box gives the average rate of descent on a 5% slope for various ground speeds.
For example, for a ground speed around 135 knots (*Approach speed 144 minus wind component of 11 knots = 133 knots*), the average rate of descent should be around 685 feet per minute.

8 The turn in final is computed according to the speed used for the category of aeroplane involved.
These Categories are defined below with a constant bank angle of 25° and no wind effect.

This is the reason why for the aircraft classified in category C or D, the outbound radial is different than the one used for category A or B aeroplanes.

8.6.4.1.4. AIRCRAFT APPROACH CATEGORY (ICAO)

The reference is the document n° 8168: Procedures for Air Navigation Services - Volume I - Flight Procedures:

1.3 CATEGORIES OF AIRCRAFT

- *1.3.1 Aircraft performance has a direct effect on the airspace and visibility required for the various manoeuvres associated with the conduct of instrument approach procedures. The most significant performance factor is aircraft speed.*

- *1.3.2 Accordingly, categories of typical aircraft have been established. These categories provide a standardized basis for relating aircraft maneuverability to specific instrument approach procedures. For precision approach procedures, the dimensions of the aircraft are also a factor for the calculation of the obstacle clearance height (OCH).*
- *For Category DL aircraft, an additional obstacle clearance altitude/height (OCA/H) is provided, when necessary, to take into account the specific dimensions of these aircraft (see Part II, Section 1, Chapter 1, 1.3).*

- *1.3.3 The criterion taken into consideration for the classification of aeroplanes by categories is the indicated airspeed at threshold (Vat), which is equal to the stall speed Vso multiplied by 1.3, or stall speed Vs1g multiplied by 1.23 in the landing configuration at the maximum certificated landing mass. If both Vso and Vs1g are available, the higher resulting Vat shall be applied.*

- *1.3.4 The landing configuration that is to be taken into consideration shall be defined by the operator or by the aeroplane manufacturer.*

- *1.3.5 Aircraft categories will be referred to throughout this document by their letter designations as follows:*

Category A:	*less than 169 km/h (91 kt) indicated airspeed (IAS)*	
Category B:	*169 km/h (91 kt) or more*	*but less than 224 km/h (121 kt) IAS*
Category C:	*224 km/h (121 kt) or more*	*but less than 261 km/h (141 kt) IAS*
Category D:	*261 km/h (141 kt) or more*	*but less than 307 km/h (166 kt) IAS*
Category E:	*307 km/h (166 kt) or more*	*but less than 391 km/h (211 kt) IAS*
Category H:	*see 1.3.10, "Helicopters".*	

For example:

- The Boeing B737 or the Airbus A320 or the Airbus A380 are classified as Category C aeroplanes.
- The Boeing B747 or DC10 are classified as Category D aeroplanes.

The conclusion is that the MP 495 must follow the 269° radial.

The Experts spent time on writing useless data, opinions, rather than analyzing the accident using objective DFDR data. They might not h

8.6.4.2. THE VERTICAL FLIGHT MANAGEMENT DURING THE APPROACH

The descent path management was apparently well performed:

'Apparently' was added compared to V17

- Anticipation of the key points,
- Flight data checks when overflying these key points,
- Evaluation of the position of the aircraft regarding the required flight path,
- Corrections to be initiated.

How do you know all these points?

However, recorded

How do you know for MP49

How do you know, at that time? You know the groundspeed? Is in

- A position a
  DFDR as pr
  07:31:25 UT
  was slightly
  configuration. The adjustment
  compare

?? The autopilot was engaged to

UTC? Timescale in An

A position approximately 50 feet below the flight path at around 07:31:45 UTC with, in this case, a clear increasing indicated air speed combined with a decreasing N1.

The copilot pushed on the control, pitch to 0°, interfering with the autopilot (AIDS data).

This situation is abnormal: it shows incoherence in the trajectory data that can only be explained with outside parameters (as the flight is at this moment managed by the autopilot).

The turbulence had just started. + pilot influence, nothing further from outside

A position below the flight ... ld be logical if N1 was constant or increasing

which was set at a fixed rate of descent

The descent gradient was not really different from usual values (not enough to be noticed); an outside disturbance caused what we obviously see on the reports.

An adjustment was made to get back on the vertical flight path.

How do you know? No AIDS data of that time. Adjustment by? The ROD was constant, by autopilot.

- A position approximately 70 feet below the flight path at around 07:32:00 UTC with ... as a N1 decrease.
  Th... he manual adjustment enables the pilots to ... ht path

Vert spd mode

There was a small speed increase

to intercept the PAPI glide path, for which level flight was required.

- Finally, a position 30 feet below the vertical flight path at 07:32:40 UTC at about 150 feet above ground level, with an obvious speed decrease and a major N1 increase

  At this time N1 was decreasing (DFDR), the speed did not yet decrease.

  This is important because:
  - o This is the only situation flagged (CVR) by the Captain who was monitoring the approach p
  - o it shows the entering in ... e important thrust adjustment, the speed decreased rather strongly.

decrease? Cause of thrust adjustment?

Experts refer to above or below the flight path, but as the ground speed

Portuguese AIP? Do you have that? Wa

[145] *The « perfect descent slope » [or ideal descent slope] is the slope as indicated ... in this case, 5% from a point placed at 50 ft above the threshold. For this slope, refer to the Jeppesen chart establish according the ICAO Annex 14 and PAN OPS 3, indicating the ~~ideal~~ descent gradient of 5%.*

??

5.2 %

From the Experts' point of view, this is what worried the Captain and forced him to comment on the position of the aircraft and flag the position below the vertical flight path, whereas he did not do it before.

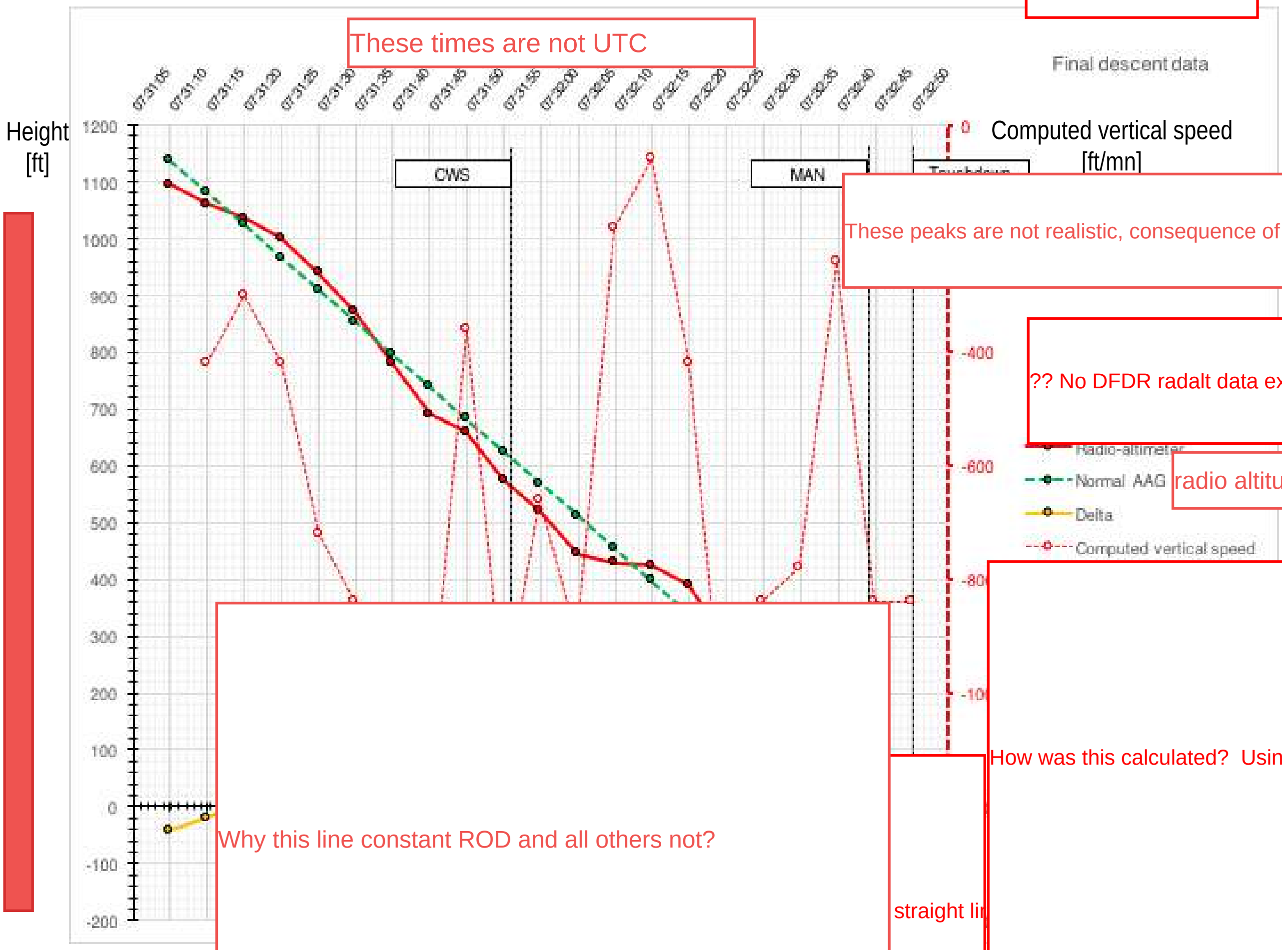
This was not a very good analysis. No reference to DFDR and AIDS data with pilot inputs.

Here after, are the variations of the final descent's characteristics.

Important: The vertical speed values are computed. This is why one must keep it in mind and be cautious when taking these values into consideration.

Good remark! But why i

These times are not UTC



These peaks are not realistic, consequence of inapprop

?? No DFDR radalt data exists ab

radio altitude

How was this calculated? Using discret

Why this line constant ROD and all others not?

straight li

Computed v

The computed vertical speed value at touchdown is around 850 feet per minute.

Not too large, isn't it?

Experts should check the analysis made my experts of claimants The last 80 seconds of flight MP495 (www.aviocons

146 *From the provided NTSB chart (DFDR factual report DCA 93RA-011 February 12th, 1993), the actual height has been put in front of time reference and the vertical speed is then computed each 5 secondes.*

8.6.4.3. THE ACCIDENT IN ITSELF

The Experts will underline only one element regarding this part of the flight as it is not the mission they received from the Court.

The accident is due to the destabilization of the flight at low altitude.

This is a bit short. What exactly was de

8.6.4.4. THE "GO AROUND" PHILOSOPHY AT THE TIME OF THE ACCIDENT

This question is a matter of pilot's and airline's culture.

?? What do you mean? Saving additional cost for go

At the time of the accident, "go around" was being perceived to be equivalent to "unable to manage" the elements, "being pointed ~~out~~" by the commu

You cannot manage the elements, only the airplane.

at

Martinair. Or by Mr. Martin Schröde

The only case for which the "go around" was accepted, was during the low visibility operations, such as fog, because managed under autopilots' inputs.

?? not under AP?

It has been a huge work for the airlines safety departments to change the way "go-around" procedures would be considered by the pilots.

?? Change what? Is this so? Relevant?

Another factor is the decision of the Captain to divert to Lisbon in case of missed approach.

Decision to divert? Only go-around decision was made, or to wait near Faro for water to drain from the runway

From what we call now the "Human Factors" point of view, this situation is considered ons to manage.

Nothing to do with Human Factors. See pag

So, what are you saying? Was the go-around necessary or not?

8.6.5. THE RECORDERS

8.6.5.1. CVR ANALYSIS

The reference used by the Experts is extracted from the files sent to the Experts by the Court[147].

The time reference used below is the one indicated by the transcription and described as UTC reference.

The lessons:

Are you sure? To what standards? French?

1 The crew behavior and coordination are good.
   a. For example, the conversation at 06:59:58 UTC shows a good level of professionalism;
   b. Also, the captain's behavior regarding the crew briefing is good: the Captain let the F/O perform his briefing and clarify some points

[147] *Refer to the document list and to the document provided on the Lijst-2-map-3-sur-3*

important from his point of view, such as the technic for landing or the diversion to Lisbon in case of missed approach;

2 The management of the cockpit is quite good until 800 feet (radio-altimeter)
   a. The crew is aware of the quite bad weather conditions;
   b. The choice of the flaps setting during the briefing is made with respect to a wet runway;
   c. The flight path follows the Jeppesen chart;
   d. The slope management is good not only from the procedure point of view but also from the airmanship point of view.

No, blown away, as said before. Does this belong

3 Psychological aspects
   a. Even if the Experts cannot evaluate it using an audio record, they estimate that the level of stress in the cockpit increased strongly in the last part of the approach;
   b. The captain forgot to check the “500 ft” window and the F/E had to remember him;
   c. The F/O make a confusion between the “windshields” and the “wipers”;
   d. These two points are the demonstration that the cockpit level of stress raised significantly after crossing 800/700 feet radio-altimeter;
   e. Other issues will be analyzed later on, based on pilot’s specific actions recorded on the DFDR.

No sign of on CVR. If looked at control inputs of the copilot, may be, but

Is this all on CVR analysis?Below, analysis

This is not the standard UTC time, but CVR "UTC" (RvO Annex

COCK

This is the arrival crew briefing part of the descent briefing (AOM 3.2.4 - 09), and is not co

Using WET scale is a standard proced

TIME UTC	ALTITUDE	WHO ?		C
06:52:52		F/O	*End of approach br* - *Flaps 50°* - *manual crew coordination procedure* - *wet runway*	➔ The crew anticipates a wet runway ➔ It is not possible to perform another type of approach because with a KSSU DC10, the VOR-DME approach can only be performed manually or using the basic modes (HDG, VRT SPD) of the autopilot.
06:53:22		CPT	*The 461 is standing by for descent*	(inside taking with the crew)
06:53:56		CPT	*We have to look at these things*	Probable comments about echoes on the radar
06:53:59		CPT	*And here are the wipers*	Seems to be a test for the wipers (no limitation) And this shows that the Captain anticipates the need for wipers later on during the approach
06:54:00		F/O	*Roger*	
06:54:08		F/E	*237, 195, 161, 139*	Different airspeeds to manage during the deceleration towards the landing configuration: 237 : VMAN UP/RET 195 : VMAN Flaps 0°/TAKE OFF 161 : VMAN 22°/TO 139 : REF Flaps 50°/LAND
06:54:25		CPT F/O	*set* *set*	V THR (threshold speed)
06:55:54		CPT	*You have to make it a positive touchdown then*	This shows us that the crew was aware of at least a wet runway
06:55:56		F/O	*ja*	
06:56:09		F/O	*That happens sometimes, even if you don't want it*	Seems to be a joke, showing that the crew is NOT stressed
06:56:11		CPT	*ja*	
06:56:51		ATC	"MP 495, proceed direct to Faro"	Usual normal procedure
06:56:55		MP495 (CPT)	"Proceed direct to Faro, 495, thanks"	
06:57:01		F/O	*direct Faro*	
06:57:02		CPT	*ja*	

[148] *Lijst 2-map-3sur-3*

Limited to important matter according to the Experts...

06:59:04		F/O	*There is a PAPI over there*	Seems to be considerations between the CPT and the F/O about some specificities of the approach and the runway : - ~~Localization of~~ the PAPI - No approach lights - Approach with an offset to the left
06:59:05		F/O	*... runway lights, centerline lights but no approach lights*	
06:59:12		F/O	*Some…offset, isn't it, to the left*	Seems to consider the offset radial of approach path
06:59:15		CPT	*Yes, a little bit*	
06:59:16		F/O	*5°*	
06:59:58		CPT	*I'm off this frequency for a while*	The captain contacts the airline operations on ground. This procedure shows a good level of professionalism
07:00:28		CPT	*I'm back again*	
07:00:29		F/O	*Roger*	
07:00:33		F/O	*Discussion about the parking position*	Anticipation for the operation on ground. On DC10, the ground taxiing is performed only from the left side (Captain). The F/O seems to anticipate his duty after the landing.
07:00:55 to 07:01:23		ALL	*F/O Descent check-list* *F/E Descent check-list* *F/E Windshield anti-ice* *CPT Set* ~~*F/E Exterior lights*~~ ~~*CPT Set*~~ *F/E Annunciator lights* *F/O Checked* *CPT Checked here* *F/E Terrain clearance* *CPT Checked* *F/E Approach preparation* *CPT Completed* *F/O Completed* *F/E Descent check-list completed* These steps not in CVR transcript RvO Annexo 5	Descent check-list
07:01:26		CPT	*Just a beacon ..., isn't*	
07:01:29		F/O	*Yes, that one is behind the runway*	
07:01:31		CPT	*... behin[illegible]*	
07:01:56		[illegible]	[illegible]	
07:02:00 to 07:02:19		[illegible]	[illegible] ach, good day" Was message from MP461, not 495	[illegible]nt clearance
07:02:25		[illegible]	[illegible]	

4 messages left out: F/O ..., location of VOR/DME: "think so", sound of sele

Left out: 07:05:52 ATC, MP495 rec

07:02			*I'm listening out what we ...*	ATIS? (for weather info)
07:02			*Communication to MP461 (B767 landing in Faro 5 minutes before* Part of incomplete. + thunderstorms	RWY 11 in use,150°/15 kt, visi 2500m, thunderstorm 3/8 500 7/8 2300 1/8 CB 2500 16 Temp 13 QNH 1013 Transition level ~~050~~ + present weatherRvO Annexo 5,
07:03			*The captain ~~repeats the messa~~* *minimum visibility for a VOR/DME approach RWY 11 : 2000 m*	Minimum Visibility is confirmed and compatible with the visibility issued by ATC
07:04			*If we don't make it, we go immediately to Lisboa*	This gives the CPT's action plan : he does not want to wait but to divert immediately to Lisboa in case of go around
07:04			*But it shouldn't be a problem*	Shows us that the CPT considers the situation as normal
07:05:56		ATC	"495, cleared FL 70"	
07:06:03		FO	*Level 70 set and armed*	
07:06:32		CPT	*I don't see anything on the radar at all*	Either the radar antenna is set at a too low angle or the echoes are quite important (crossing a cloud with heavy rain)
07:06:45		F/O	*Here to the right* + Capt.: Yes 10 km	Seems to turn right may be to avoid la
07:08:32	Also not included: 07:07:58. F/O Let's set QNH then, 1013. This was way too early, because at this time they were descending to flight level 070. Transition level for changing was 050. Luckily, QN			
07:09:13	41 sec later! 2x UH left out			
07:09:24		F/E	*…set …*	The F/E is setting the pressurization
07:09:25		CPT	*ja*	
07:09:54		CPT	*We can go at the end of the runway*	Meaning that the captain plans to exit the runway not using the taxiway C but the taxiway P irrelevant, was this in 1992?
07:09:56		F/O	*ja*	
07:11:41		Public Address	*Ladies and gentlemen, in about … minutes …*	No comment
07:12:05		ATC	MP 461, confirm passing altitude and distance	Showing that the controller is not using a radar but classical separation

Experts, you left out important information about the crew not adhering

07:12:09		MP461	Out of 85 for 4000 feet, present out of 20 nautical miles	MP 461 is inbound Faro VOR at 20 nautical miles
07:12:14		CPT	*… 20 NM …*	
07:12:22		F/O	*What ?*	
07:12:23		CPT	*He is 20 NM in front of us*	This is the distance between the MP461 and the MP 495 meaning more or less 6 to 7 minutes
07:12:25		F/O	*…*	
07:12:28		CPT	*ja*	
07:12:45		F/O	*It's raining cats and dogs over here*	The weather is quite bad and this shows us that the crew was aware of the weather situation
07:12:46		CPT	*ja*	
07:13:07		CPT	*We should have arrived half an hour earlier*	Possible meaning that the weather conditions are worst than 30 minutes ago or also that without the problem with reverser n°2, at this time they should be already on ground
07:13:10		F/O	*Yes, you can say that again*	
07:13:13		CPT	*ja*	
07:13:21		MP461	MP 461, can we proceed approximately 5 miles over left to avoid build up ?	Confirm the fact that a lot of CBs are in the area
07:13:33		ATC	Affirm, confirm your are flying down the INS to 5 miles finals ?	The ATC controller did not understand the request. But this answer shows also that there are probably CBs on the S-S-W of the airport, because the Controller seems to understand that a report direct to a position 5 miles on the extended centerline of the runway using INS is acceptable.
07:13:42		MP461	Negative, proceeding 5 miles left of track to avoid build up	Means finally a track south-east of the normal one
07:13:47		ATC	OK, so report abeam overhead for a VOR-DME procedure	Meaning that the ATC clears the MP461 to pass south of the airport to join directly the outbound radial of the VOR-DME procedure
07:13:54		MP461	We'll proceed overhead when we are clear and we have pr of 60 for level, correction, for 4000 feet and we are ~~out 4 NM~~ 14 miles out	
07:14:07		ATC	Roger, sir, report overhead for starting the VOR-DME procedure outbound radial 125 sorry, 269	
07:14:14		MP461	Roger, outbound 269 call you overhead MP 461	The MP461 is obviously following the "alternative procedure"
07:15:09				A cabin attendant enters the cockpit
07:15:13		Cabin Attendant	*… How is the weather ?*	
07:15:14		CPT	*It's a lousy weather over there*	Confirmation that the crew is aware a In 1992, not called alternative proced
07:15:15		Cabin Attendant	*Lousy weather ?*	
07:15:16		CPT	*ja*	
07:15:16		Cabin attendant	*… I'm going again*	

07:15:25		F/O	*Approach check-list*	According to the DC10 standard procedure, this check-list is performed as soon as the main altimeters are set on QNH,
07:15:29		F/E	*Approach check-list*	
07:15:30		F/E	*No smoking Fasten seat belts*	
07:15:32		CPT	*Auto, on*	The seat belt s sign will automatically turn ON when the landing gear will be extended
07:15:34		F/E	*Exterior lights*	
07:15:35		CPT	*Set*	
07:15:36		F/E	*Thrust ~~rate~~ Computer*	~~Automatic calculation of the thrust available~~
07:15:38		CPT	*Set*	On G/A to prepare a possible missed approach
07:15:44		F/E	*Landing data*	
07:15:46		F/O	*Checked and set*	Speeds for landing
07:15:50		CPT	*Set, ja*	
07:15:52		F/E	*Radio altimeter*	
07:15:55		CPT	*Checked, zero set*	According to the Martinair procedure,; it is a normal setting for a VOR-DME approach
07:16:00		F/O	*Ja checked zero set*	
07:16:03		F/E	*Speed brakes*	
07:16:04		CPT	*Retracted*	Extend the flaps and slats with speed brakes extended was forbidden
07:16:06		F/E	*Navigation systems*	Possibility to insert specific information such as predetermined approach in the navigation computer. It was not the case here
07:16:07		CPT	*set*	
07:16:08		F/O	*set*	
07:16:14		F/E	*Crew briefing*	For landing, allowing if applicable to add some specific elements
07:16:16		F/O	*Completed*	

?? Or the instructor reminding his stude

07:16:17		CPT	*Do you want to start with 269 radial ?*	This is what is called a task interruption. And this the confirmation that the MP495 is using the alternative procedure as MP461 did it a little bit earlie
07:16:24		F/O	*Yes in a moment – that's OK, yes*	The Flight is just overflying the VOR
07:16:32		F/E	*So*	Good demonstration of professionalism. T item which was not answered because of
07:16:33		F/O	*Is*	o, was not yet completed, F/O seems under pre
07:16:36		F/E	*St*	Not already compared
07:16:38		F/O	*Alt*	ever confirmed
07:16:42		F/E	*Ap*	
07:17:10		ATC	MP	

Impossible. See MP461 top next page and 07:17:38

In 1992, not called alternative proc

07:17:14		MP461	Approaching overhead 2,5 miles out, 4000 feet	
07:17:18		ATC	Roger, cleared for a VOR/DME approach runway 11, 269 outbound, report leaving 4000.	
07:17:27		MP 461	Roger call you leaving 4000 and outbound 269	
07:17:35		ATC	MP495 confirm distance to run	
07:17:38	FL 090	MP495	Distance to run is 26 and we are out of 90 for 70	The MP495 just passed flight level 90 (really 9000 ft because altimeter w
07:17:54		MP495	Did you copy, 495	
07:17:56		ATC	Affirm	
07:17:59		TP120	Comms to MP 461 en TP 120 not copied here. 07:18:21 - 07:18:38	Traffic departing from Faro. The ATC organize the separation with both MP461 and MP495 According to the position of the MP495, the departure clearance sent to TAP 120 was to turn right, climb upper than FL 060 and then come back overhead the airport on the way to Lisboa
07:18:42	FL 070	CPT	*ja* ja check	Sound altitude alert and selector knob. Means the aircraft is approaching FL 070
07:18:50 49		ATC	The wind 2, sorry 150 at 24 knots, cleared take off runway 11,right turn to be overhead above 60	Take off clearance for TAP 120 Note the value of the wind speed
07:18:52		CPT	*…*	Unreadable
07:18:54		F/E	*What ?*	F/E, also a pilot, might be alerted by the new wind: 150° at 24 kt.
07:18:55		CPT	*…*	Unreadable
07:18:56		F/E	*OK, I'll check ~~that~~* them	Probably the landing data. Cross component of 150° at 24 kt = 17 kt, too high for a
07:19:09		ATC	MP495, descent 4000 to be below 60 at least at 10 DME	
07:19:15		MP495	495 roger, below 60 10 DME down 4000 feet	
07:19:19		F/O	*4000 feet armed*	
07:19:20		CPT	*OK*	
07:19:26		CPT	*… report out of 60, 10 DME*	
07:20:03		F/O	*Approaching 60*	
07:20:05		CPT	*ja*	
07:20:07	FL 060	MP495	495 is Out of 60	
07:20:11		ATC	495 roger next report passing overhead ~~joining~~ turning outbound radial 269 for further clearance	
07:20:19		MP495	Wilco, MP495	
07:20:37		MP461	MP461 is at 2000 feet to maintain, we approaching 7 miles out and we are turning inbound shortly	
07:20:47		ATC	461, copied, newt report leaving 2000 feet 7 miles inbound	
07:20:48				Sound of altitude alert (approaching probable 4000 feet)
07:20:52		MP461	I will do, 461	
07:21:02		F/O	*Altitude capture*	The flight reaches 4000 feet
07:21:04		CPT	*Check*	

07:21:21	4000	MP495	MP 495 maintaining 4000	
07:21:23		F/O	*Altitude hold*	
07:21:25		ATC	495 confirm distance	
07:21:27		MP495	11	
07:21:29		ATC	Roger next report ov	
07:21:33		MP495	495, wilco Left out 07:22:24 - 07:22:50, MP495 to approach "departing traffic is out of 4000 now", and r	
07:22:50		F/O	*Slats take off*	
07:23:02		CPT	*Slats are take off*	
07:23:25		MP461	MP461 is leaving 2000	
07:23:29		ATC	Confirm runway in sight	
07:23:29		F/O	*Flaps 15* lights	
07:23:32		MP461	Negative, fully IMC	
07:23:35		ATC	Roger, request at minimums or runway lights in sight	This can indicate that the ATC controller would not be surprise if the traffic MP461 must perform a missed approach
07:23:41		MP461	*Call you*	
07:23:44		ATC	MP495, when passing overhead, join outbound radial 269, initially descent to 3000	The ATC controller wants to maintain at least 1000 feet of vertical separation with the MP461
07:23:53		MP495	When overhead at 269 radial and down 3000	
07:24:02		CPT	*Yes over here, you can see the runway*	
07:24:04		F/O	*ja*	
07:24:06		MP461	MP461 runway visual	Meaning that the MP461 got the runway insight at about 1700 feet above ground level
07:24:09		ATC	Cleared to land runway 11, runway surface conditions flooded, wind 150 20 knots	
07:24:16		CPT	*Flaps are on 15*	
07:24:18		MP 461	150 20 MP461	
07:24:36		F/O	*Ik heb VOR geselectoerd*	
07:24:38		CPT	*That's right, me too*	
07:24:50		CPT	*There is the 767*	they can see the MP461, meaning then they are out of the clouds at this moment
07:24:51		F/O	*Ja altitude capture*	They reach 4000
07:24:56		F/O	*3000 feet is armed*	
07:25:00		CPT	*Check*	
07:25:11	4000	MP 495	495 is overhead leaving 4000 for 3000	
07:25:19		ATC	495 roger, confirm VOR:DME procedure runway 11, continue descent to 2000 feet, repor … nd	(Alternative procedure not mentioned)
07:25:26		MP495	Call you turning inl … ceeding to 2000 feet	
07:25:30		F/O	*2000 feet armed* in a	
07:25:35		MP461	MP461 final	

07:25:41		ATC	Cleared to land now 130, 18, 20 maximum	
07:25:46		F/O	*Flaps 22*	
07:25:54		CPT	*Flaps are 22*	
07:25:59		CPT	*You may turn at 8 DME*	According the Jeppesen chart (valid NOV 91), this is the normal procedure. The point at 10 DME is the end of the outbound holding pattern.
07:26:01		F/O	*ja*	
07:26:16		F/O	*Heading select*	
07:26:18		F/O	*2500 QNH set*	
07:26:33		F/O	*Altitude capture*	
07:26:35		CPT	*Check*	
07:26:44		F/O	*Altitude hold*	Missing: 2000 ft set
07:26:45		CPT	*ja*	
07:27:53		CPT	Approaching 8 miles	
07:27:54		F/O	*ja*	
07:27:56		CPT	*I'll give yo* over right	The CPT changes the radial 269 to 111 in the VOR window
07:28:01		F/O	*Overhead*	They are at 8 DME and the F/O calls out his own action to turn right towards interception heading of 080° Capt confirms
07:28:04		CPT	.... zero eight zero	
07:28:11		CPT	495, is turning inbound	
07:28:17		ATC	495 copied, report at minimums or runway insight runway surface conditions are flooded	
07:28:26		CPT	Roger, call you	The dela important Why? Capt checked INS wind. Was 30 kt! See 07:30:13. The capt scratches his head: Flooded...
07:28:42			...Zero, 2 sec. later Capt.: Yes	
07:28:55		CPT	*Seven DME*	The captain reminds that the beginning of the descent is at 7 DME
07:28:57		F/O	*Yes, then the gear may be selected down*	The anticipation is correct. gear too late, 9 nm ~~A few seconds before the~~ beginning of the descent, the gear must be selected dowr No
07:29:00		CPT	*Gear down*	According to the standard procedure, this is the F/O who is supposed to ask for this item but he was busy because he overshot the 111 appr
07:29:17		CPT	*The wind is from the right* meaning: do something, Increase heading	
07:29:22		CPT	*Gear is down*	
07:29:23		F/O	*Yes thank you*	
07:29:25		F/O	*Flaps 35*	
07:29:28		CPT	*Flaps 35*	
07:29:32		CPT	*Flaps are 35*	Vert Spd knob
07:29:36	2000	F/O	*Vertical speed selected*	This action is directly performed by acting on the ~~cursor~~. This is the effective beginning of the final descent
07:29:43		F/O	*Flaps 50*	
07:29:~~50~~ 47		CPT	*Flaps 50*	

07:30:00		CPT	*Six DME seventeen thirty* ?? 116	AOM 3.3.5 - 09, page 11: Intercept a 3° visual glidep The captai … facilitate the monitoring of the slope. The Vz is more or less around 700 ft/mn i.e. 70 ft in 10 seconds. Time to descent from 2000 ft to 1730 ft is 38 seconds. Means that 1730 should be cross at 07:29:55. The path is a little higher than normal (around 40 ft)
07:30:05		CPT	*Check ?* How do you know. From estimates? Acc	The F/O did not answer to the Captain's remark The CPT insists to bring back the F/O into the procedure
07:30:06		F/O	*Yes, check*	
07:30:08		CPT	*Five DME, fourteen fifty*	This is an anticipation Normally, the crossing of the 5 DME window should occur at 07:30:33
07:30:13		CPT	*Wind is coming from the righ … one two three or so*	… light is left … heading to
07:30:22		F/O	*ja*	Source of this wind must have been the AINS. On radial 111, and at airspeed 139, wind would have been 185/30 k
07:30:25		F/E	*OK for the landing check list*	… erform this
07:30:27		F/O	*Ja, landing check-list*	??

07:30:28	≈1450	CPT	*Four DME, eleven twenty*	The check at 5 DME seems to be satisfactory because there is no comment about the position on the slope and the captain anticipates the next check. According to the previous check, the 4 DME window should be crossed at 07:31:05
07:30:32		F/E	*Missed approach altitude*	
07:30:36		CPT	*… three… set*	According to the Jeppesen procedure, the altitude of missed approach is 3000 feet on the east holding pattern
07:30:40		F/E	*Altimeters*	
07:30:41		CPT	*Set three times*	Means that the three altimeters are set on QNH and checked
07:30:44		F/E	*spoilers*	
07:30:45		CPT	*armed*	
07:30:46		F/E	*I'll check them*	Mean that the F/E is not fully satisfied and rearm the spoilers or can also indicates that he tells the captain that he will check the right extension of the speed brakes when on ground
07:30:47		CPT	*Ja*	
07:30:50		F/E	*Flaps Slats*	
07:30:52		CPT	*50, land*	
07:30:55		F/E	*Landing check-list completed*	
07:30:56		CPT	*OK*	

F/ERvO Annexo 5 page 113

Nat. Archive file 2624

VOR approach checks seem not listed/ executed (AOM 3.3.5 - 08)

07:31:01	1180	F/O	*The runway is …*	On some … brackets
07:31:03	1150	CPT	*Four DME, eleven twenty*	The check is correct meaning that the aircraft is on the slope.
07:31:05		ATC	MP495, confirm inbound, how many miles	
07:31:08		MP495	We are 4 miles out	
07:31:14	1100	CPT	*Yes, you can see the runway*	Seems to be the answer to the F/O's question at 07:31:01 meaning that the visibility is around 3 miles (5000 m)
07:31:24		CPT	*Three DME, eight twenty*	Next window is at 3 DME and 820 ft normally at 07:31:41
07:31:29		CPT	*Three DME eight twenty*	The Captain indicates this information a second time because he did not got any answer from the F/O
07:31:33	Missing: :37: MP495 final.			The wipers are on
07:31:40	820	ATC	Confirm you have the runway in sight?	
07:31:43		CPT	Affirm	Classical question asked just before issuing the landing clearance
07:31:44		ATC	Cleared to land RWY 11 Wind 150°, 15 knots maximum 20	
07:31:52		CPT	Cleared to land	

07:31:53	560	F/O	*Autopilot CWS*	Indicates that the switching for CMD to CWS is done voluntarily by the F/O The flight is around 500 ft
07:31:54		CPT	*OK, he, the runway is …*	Flooded
07:31:55		ATC	Confirm the lights are too bright ?	
07:31:58		CPT	No it's fine, keep it	The Captain confirm that the visual contact with the runway is good
07:32:00	500	F/E	*(you missed) five hundred*	The expression is into brackets meaning that the translator is not sure about this. This is the check to decide if the flight path is stabilized or not to continue the approach To be underlined: no answer from the captain. The level of stress seems to be high. Why? Not on approach radial!
07:32:03		CPT	*Cleared*	This means he just (re-)established on glidepath; he was slightly below because vert. speed set in AP was little higher than for
07:32:04		F/O	*ja*	
07:32:04		F/E	*Ja checked*	
07:32:15		F/O	*PAPI, hé*	… e position on the slope. This could mean that that position is acceptable
07:32:16		CPT	*ja*	
07:32:20		CPT	*Speed a bit low, a bit low*	
07:32:24		CPT	*Ja OK, speed is OK*	The F/O makes a correction
07:32:29	400	F/O	*Windshield, windshield anti-ice I don't see ~~nothing~~* anything (Annexo 5)	This sentence is very important: 1/ the F/O makes a mistake: he asks for windshields instead of

He was below MDA and should have initiated

				wipers; 2/ He loses the visual contact with the runway due to the rain; 3/ his level of stress is now very high.
07:32:30		CPT	*ja*	
07:32:32		F/E	*You're at fast*	The wipers was ON since 07:31:33. Either the F/E confirms that he cannot do anything because the wipers are already on Fast or he sets the wipers to Fast position
07:32:34	160	CPT	*A bit low, a bit low, a bit low*	~~This is the case since 07:31:29~~ The Captain urges the F/O to do something because he repeats the information three times. The gap seems to become significant. The level of stress is very high.
07:32:36		F/O	*ja*	
07:32:37		CPT	*OK, OK, OK*	
07:32:39		CPT	*Wind is one ninety with twenty*	The wind is fully from the right But we must consider this information as a wrong information regarding the use of rudder by th
07:32:44	80			This double click sound should mode.
07:32:47	50		*RA audio signal*	Crossing of 50 feet
07:32:48		Capt	Throttles	Increase of thrust. The aircraft is not under control
07:32:49				Touchdown. Meaning that 50 ft w
07:32:50	0			

No, because he doesn't want the wh

F/O corrects, pulls nose up.

+ single click (CWS off, AOM 3.3.3 - 03)

Why not? Please explain.DFDR data does not confirm this.

Checked vert. g?

ider such informa

8.6.5.3. DFDR ANALYSIS

??

The reference used by the Expert is extracted from the binder named "Lijst-2-map-3-sur-3".

The time reference of the NTSB analysis is a DFDR reference.

Consequently, a time coordination must be done to translate the conclusions.

The best coordination point is the touchdown point at 0007:02 DFDR elapsed time and 07:32:50 UTC according to the chart itself or 07

According to the RvO page 21, "At 07:33:

The analysis of the DFDR shows two very different p

OK, but why not use

Is > 80 sec l

- From 07:31:00 to 07:31:32, the flight path is q
  - The CAS around 145 kt
  - The acceleration around 1G and

normal

N1 around 75% v

Is not instability, because the airplane recovers following disturbances. Is variation

40

- After 07:31:32, the instability is obvious:
  - the control forces and the position of the control column; ?? What's wrong?
  - the lower and upper rudder and the roll angle;
  - the aileron between 10° right wing down and 5° left wing down;
  - the acceleration begins to flicker between – 0,8 and + 1,25 to reach 1,95, ~~1 second before~~ at touchdown
  - the CAS between 154
  - the thrust (N1) between 63 and 102 % before be reduced to flight idle at 07:32:~~45~~, 5 seconds before touchdown;
  - the pitch a … e flaps 50° on a 5% slope fluctuating … n;
  - extension c … nly to the right hand side.

14 seconds!

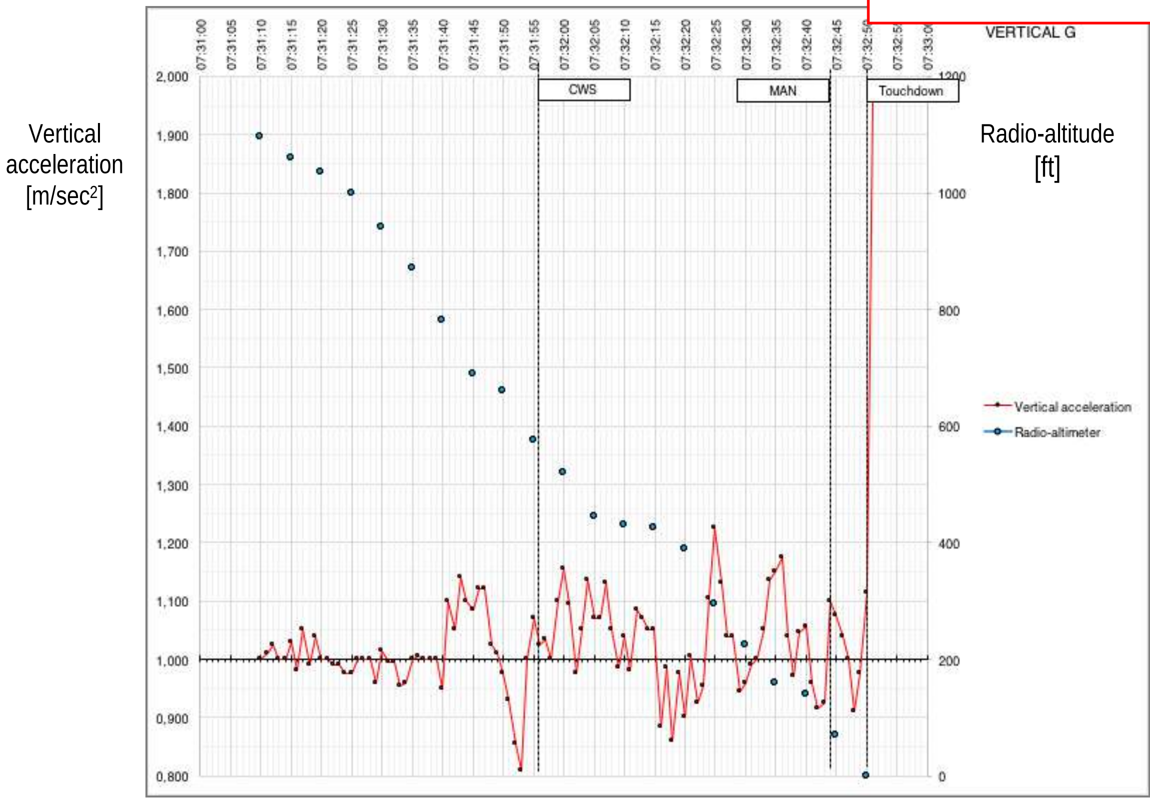
= upwind side

more comments to be made

Did experts not notice control inputs by the

8.6.5.3.1. THE VERTICAL ACCELE

Is not DFDR data out of RvO Annex 15, is it?Why not



There was no

Vertical acceleration

ed

To analyze the actual acceleration, the aircraft, sustain during this final approach, we must take into account the instantaneous bank angle because this angle creates a centrifuga

only if a coordinated turn is made. Not in this c

relevant? This paragraph is irrelevant, rubbish

a centrifugal force if you line up

ank angle of 10°, the G force will be 1.0155 and for a bank angle ill be 2 G meaning your weight will be twice your normal weight.

my weight is still the same...

that, on most cases, the bank angle fluctuates between + or – rrection is small and equivalent to a 1,004 G (400 grams for 100

it? Less than sensor accuracy.

olete ICAO turbulence scale, the classification is the following:

so where is the current? The one valid in 1992?

elow 0,05 G

Yaw and roll oscillations

ICAO Doc 4444 PANS-ATM is not obsolete -

,05 to 0,2 G

bumps and oscillations but without significant changes in altitude or attitude

,2 to 0,5 G

Strong, intermittent uncomfortable jolts with attitude upsets and indicate

- Severe: 0,5 to 1,5 G
  Aircraft han
  dangerous e
- Very severe: above 1,5 G
  Extreme ha
  controls for s

No seperate scales for individual airplane types.

This classification is not any more in
physical characteristics, would have specific responses to the turbulence.

Nevertheless, the Experts should consider that, even light and occasionally moderate as indicated in the crew's and passengers' statements, ~~the turbulence was effective~~ from 07:31:40 UTC to the end of the flight.

there was light turbulence

Did they mention this exact time? What about DFDR data? These

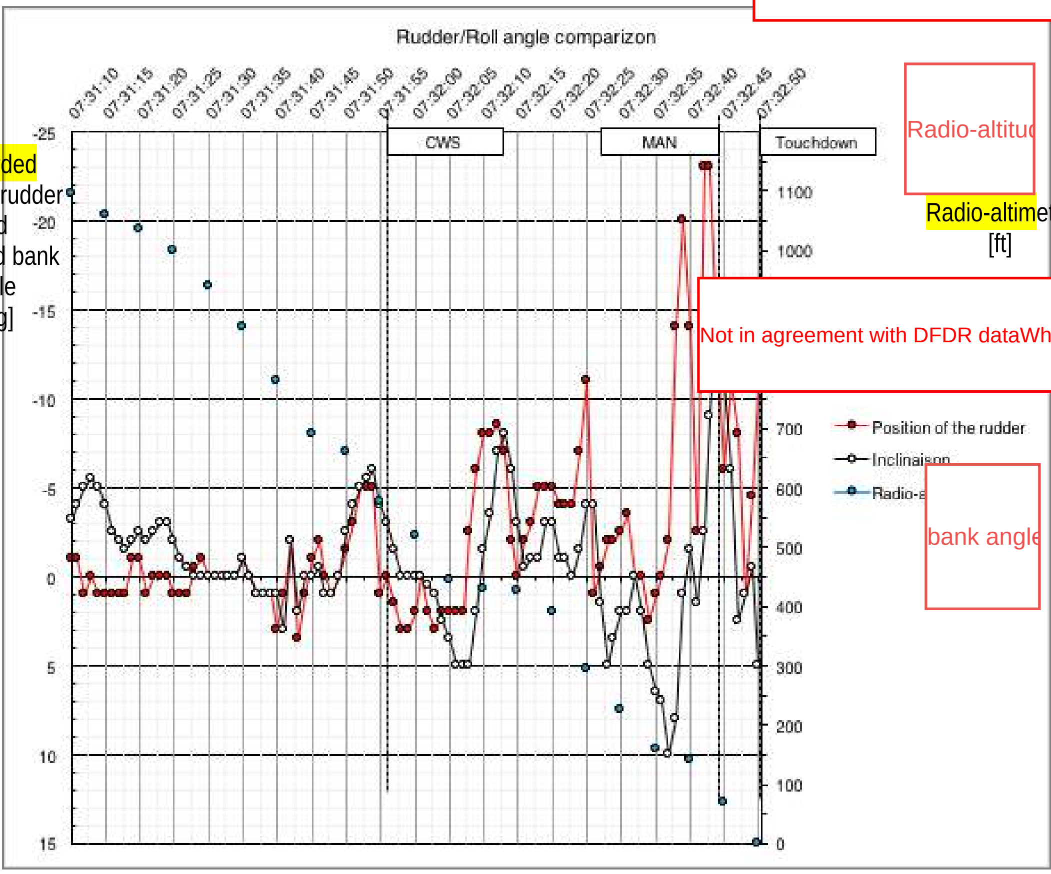
What is your conclusion?

8.6.5.3.2. THE ROLL MANAGEMENT

8.6.5.3.2.1. THE RUDDER[149]

?? Roll management with rudder data?

Recorded angle of rudder and recorded bank angle [deg]



Radio-altitu

Radio-altimeter [ft]

Source? Why no

Not in agreement with DFDR dataWhe

bank angle

Can anybody acc

Position of the rudder

[149] *It is internationally agreed that the "negative" sign is applied to the movements or values towards the left.*

No, not when AP engaged, but always whe

Irrelevant here

der actuators are enslaved to the yaw damper

r on the rudder are yaw damper induced rudder movements <= ±5 deg

On all operating modes, except AUTOLAND[150], the pilot does not feel the rudder movements.

Not UTC! Is radar time. Better: at

That means that until 07:31:56 UTC, the recorded rudder movements are only the consequence of yaw damper orders.

No, to the additional rudder input above 5 deg. ref: AOM 1-3

Not if from yaw

When the autopilot operating mode changes from CMD to CWS at 07:31:56 UTC, the rudder actuators receive the signals both from the pedals and from the yaw damper computer. The movement of the inner rudders are limited to + or – 23°.

upper and lower rudders

This means, that after 07:31:56 UTC, the rudder movements are the consequenc both the pilot's actions and the yaw ~~computer~~. damper

The rudder movements are quite important but it is not possible to qualify them abnormal according the weather conditions (thunderstorm, wind rotation and rain).

You forget the turbu

Already earlier. Below 400 ft

pedal, and the rudder

Below 150 feet (radio-altimeter), the rudder movements are, most of the time, towards the left (add to actions on the same direction with ailerons) inducing a quite

Average roll control forces were to the right

is value being out of the limit for the landing.

se correction to the left would be required, if not on centerline.

Just a peak,

We must take into account the fact that, below 150 ft, the pilot must also « align » the aircraft with the runway and de-crab the flight p

150 ft? He didn't decrab, because rudder pedals returned t

This is the case for the MP495. ??? Was not aligned! La

Technically speaking, the DC10 is designed to perform this task automatically in case of automatic landing, using the autopilot AUTOLAND mode

irrelevant here, no autoland capability at Farc

For this approach, this configuration is not implemented for two reasons:

- The approach is not an ILS approach but a VOR-DME one
- The crosswind is out of the limit for an automatic landing.

One reason: Faro is not eq

??Crosswind limit Autoland was 15 kt (RoA page 96). So you confirm crosswind > 15 kt? Also too high for manual landing wet

In case of landing with crosswind, three technics are available:

- Landing with the drift a ... wn using the flight controls and the
- Sideslip landing: de-c ... center line managing the bank an
- adjusting ... -crab the plane just ... e aileron to maintain the aircraft le

e airplane will start drifting d

??AOM 3.3.5-14 prescribes to apply the normal crosswind techniq

The DC10 « does not like » (... ause it is not

is not approved for DC-10

t, but be ... gers. At the ... e, the Bo ... y problem.

Irreleva

ut decrabl

[150] *After the pre-land test allowing, if ... ontrols.*

irrelevant to this case

Irrelevant

~~The autopilot of the aircraft is design to use the second technic, beginning the de-crab at 138 ft and managing the center line with the aileron (bank angle~~). The feeling for the passengers is not comfortable because the plane fly ~~all along the approach~~ with a bank angle.

only the final approach

~~Generally speaking~~, the pilots land the aircraft using the third technic because during the approach, the flight

but not pilots MP495

own is also more comfortable for the passengers… if the rcraft is good!

The F/O's actions on the rudder could match with the second technic but the question was not raised by the Commission of investigation during the interviews.

Then why do you write about this subject? What is your opinion, that was asked by the court.You should have noticed that son

8.6.5.3.2.2. THE AILERONS

Only if control wheel > certain t

The control wheel is linked ~~at the same time~~ to th nd to the spoilers actuators via a spoiler mixer: the spoilers provide an assistance to the aileron in order to have an efficient control of the bank angle.

why inclination (bank angle ?) in graph

The functioning law is the following:

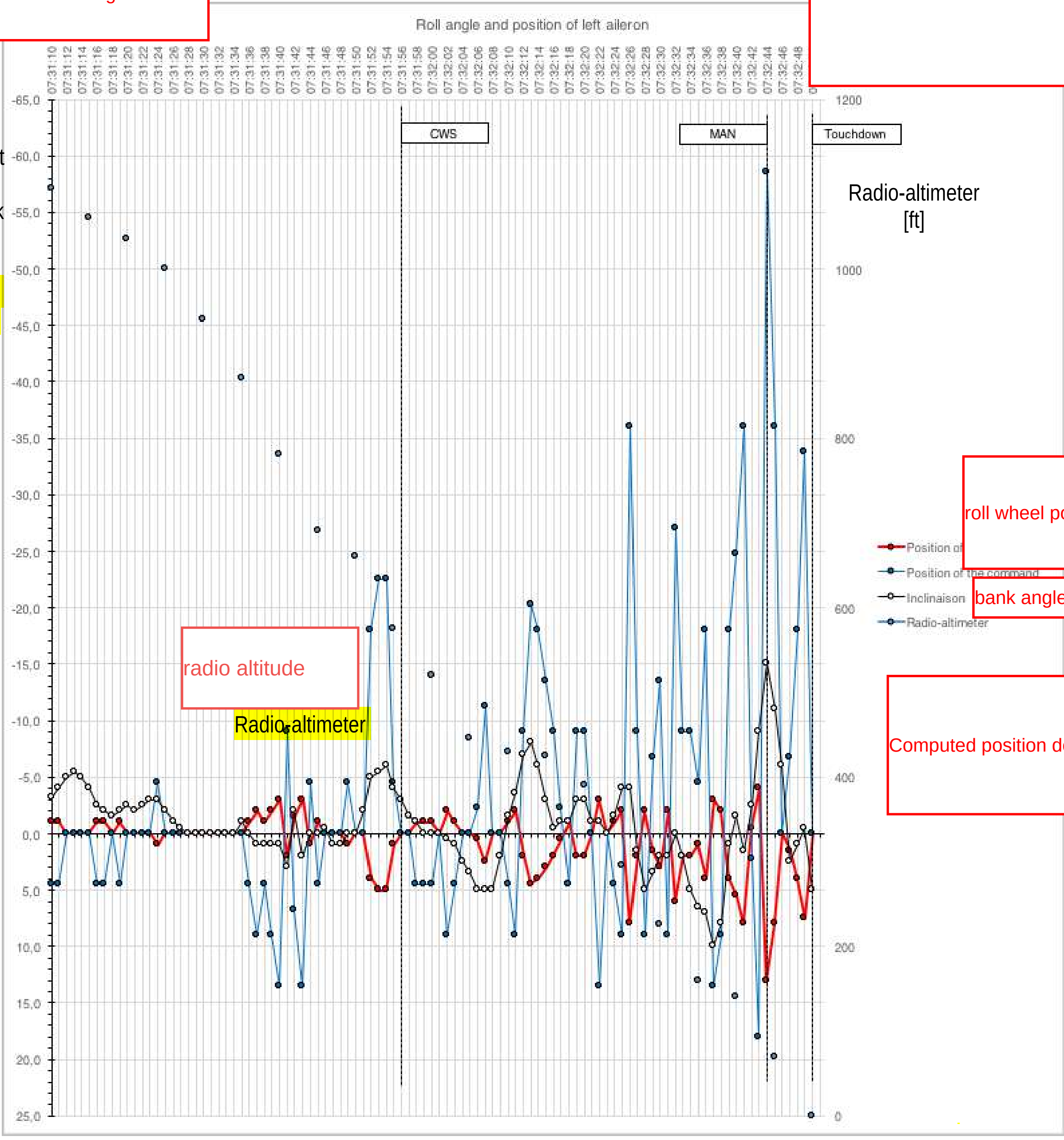
relevant?

- Each aileron surfaces can move between + 20° and – 20° ~~depending~~ of the position of the control wheel;
- control wheel is > certain threshold (5 units)
- The spoilers are activated when the ailerons ~~are at more than 15°~~ and will reach 60° when the control wheel is at 90°;
- For a movement of the ailerons of 5°, the pilot must apply a displacement of the control wheel of 22.5 °.

100 sec before landing

What is the data source?One data point eve

Recorded angle of the left aileron, Recorded bank angle
Calculated position of the control wheel [deg]



radio altitude

roll wheel position or roll

bank angle?

Computed position does not agree

Computes position of the control wheel

Why computed, if AIDS data is a

On a DFDR record, the movement of ailerons is not immediately significant to a casual observer because, as we have seen above, it is highly under-fold relative to the movement of the control wheel.

??

DFDR aileron data is very clear, didn't you verify? As are control data of AIDS.

Are recorded by AIDS. RvO Annex 9/ 1

On the curve above, the movement of the control wheel is reproduced as an indication because the values displayed are not measured but calculated.

How? Why not used

Is movement important, or aileron deflection?

Until 7:31:56 UTC, the autopilot controls the aircraft and more specifically, the ailerons.

also the elevator

70 sec before landing important? Why?

It is important to note the movements of the control wheel around 7:31:40 UTC and around 7:31:53 UTC because these movements are the result of an action of the autopilot.

These actions show that an external and relative instability area is crossed.

light turbulence starte

The Captain in his statement did not underline this instability, showing us that it could be consider as not abnormal.

so w

Command mode of the

After the disengagement of the S mode, after 07:31:56 UTC, the movements of the ailerons are much more important and they are increasing in amplitude. The Experts note that the actions are mostly oriented to the left.

Look once more at DFDR data, the average over the last

At low altitude, the pilot's actions become very strong and very unstable.

He did not use CWS as he

increase

It is also possible to emphasize the concomitance between the actions on the ailerons (almost 60° to the left on the control wheel) – the bank angle reaching at this er in the same direction.

AIDS - max 10%, one peak right 25%. DFDR data shows no larger aileron

Why do you not explain why this was? The pilot was not yet on th

8.6.5.3.2.3. CONCLUSION

Analysis? Just a few remarks.

This analysis suggests:

Are you not sure?

only light turbulence

- That a relatively strong instability is obvious below 400 feet above the ground;
- That the pilot was very active on the controls with relatively large inputs on the rudder;
- That the bank angle in very short final seems to b simultaneous action of the ailer th c

According t th pilot, is th

This is no biliz

Heard of side effect of rudder? Cnb (yawi

So pilot induced, not by some outs

inappropriate and unnecessary...w

?? What do you m

8.7. ANALYSIS OF THE DOCUMENT "LIJST 2 NR. 5 : DE TEKST VAN DE VOORLICHTINGSBIJEENKOMST VAN 1 DECEMBER 1994 (PRODUCTIE 5 VAN DE DAGVAARDING)"

This document is the literal transcript of the information meeting of the Civil Aviation Board for the victims and families of the Faro air disaster.

The different persons and their quality:

Name	Functions
Mr LOEB	Chairman of the meeting
Mr GROEN	Meteorologist
Mr BODEWES	Chairman of the Civil Aviation Board
Mr SNOEK	Pilot - Civil Aviation Board
Mr HOFSTRA	Pilot - Civil Aviation Board
Mr BARENDRECHT	Pilot - Civil Aviation Board
Mrs VAN BEEK	Institute Essenburg
Mr SÖTEMANN	Passengers' families or representatives
Mr WESTERMAN	
Mrs VAN VEEN	
Mr VAN DER ELST	
Mr WINKELMAN	
Mr SCHOTGERRITS	
Mr JASPERS	
Mr SCHOUTEN	
Mr BATENBURG	

The Experts note that the Chairman indicates clearly the limits of this information meeting inside the ICAO annex 13: no culpability, no liability, no financial issues.

It is important to consider that this position is the golden rule of the Dutch Aviation Safety Board's behavior.

?? How do you know? There is another rule: fair and truthful investigation. No lies in answers.

During this meeting, it appears that the Claimants consider that the testimonies of the passengers were not taken into consideration[151] and that the persons in charge to provide explanations have not explained the process of an investigation, which would have probably responded to the questions.

During an investigation, all information is important and no information prevails over another. Specific information opens for questions [...]n of Investigation will keep open or will close, according to the [...]osal.

not even objective (DFDR) data

[151] *Refer to meeting minutes BVO/92/12/75 (lijst 4 nr 9) : « The passengers statement (translated) will be presented to the Portuguese Authorities supplemented by the questionnaires completed on the basis of the statement »*

Thus, some passengers stated to have seen the right engine on fire, before the contact with the ground.
But the flight recorders, either the DFDR or the CVR, show no signal matching with this situation. Indeed, an engine fire shall undoubtedly be recorded and the aural warning in the cockpit as well.
should
Moreover, other statements indicate that there was no fire on this engine.

In the absence of objective confirmation, the Commission of Investigation closed this issue.

It is the same with the altitude loss attested by a passenger which saw the information on the screen providing the position of the aircraft in cabin during the flight. ??
No record confirms the words of the passenger and the Commission of Investigation therefore closed this issue.

Other testimonies cannot be taken into consideration.
For example, the testimony of the passenger indicating that the aircraft gained altitude because "*at some stage, we were above the cloud cover*" cannot be taken into account. Indeed, what the passenger saw is probably true: but his (or her) deductions are false, because a cloud layer is never horizontal or linear, especially in the event of instability.

What another passenger calls for a go-around "*until we were above the cloud cover*" is perhaps the strong correction recorded during the last turn before the final approach. The Experts have no time reference indicating when this passenger felt this increase of thrust. But the description matches to what can be felt when entering a cloud with a downburst: a thrust correction, may be important, is made just to maintain the altitude and then, you get out of this cloud.
???record
The feelings match with a climb but nothing like this has happened or is recorded.
Here we are in a well-known case for the pilots: the sensory illusions. And the first law to avoid the dangerous consequences of it is: "Trust your instruments at all time!"

A little bit later, the questions become more technical but the answers are sometime not appropriate.
?? Is on CWS
The reader will refer usefully to paragraph 8.6.3.1 of this report for more details.

Again a little bit later, no explanation is provided to the fact that the CVR stops functioning at the time of impact.
No, 9 sec after touchdown. RvO annexo 5.
To explain it, it would have been useful to explain the technology used at this time.
The system consisted in a tape-recorder, operating with a continuous tape of 30 minutes, meaning that it was only possible to record the last 30 minutes of a flight.
In case of strong impact, the recording head can
forces, and the record
But there was nothing lost. Do you ur
According to your CVR transcript in § 8.6.5.2 th

The experts did not include the (alleged incorrect) statements of Martinair and the DASB made during the meeting (

8.8. THE 143 QUESTIONS, THE ANSWERS AND THE EXPERTS' COMMENTS

Refer to Judgment of 26th February 2014 § 3.10 for details.

Where is your conclusion? We

Convention to understand the remarks raised by the Experts:

No comment:	means no more comment that the one provided by the Dutch Aviation Safety Board;
Not applicable:	means does not be linked to the case;
Not in our scope:	means out of the questions raised by the Court to the Experts.

You were not asked to answer the fami

Question raised by the families	Answers from the Dutch Aviation Safety Board or by Martinair	Remarks by the Experts if
About the interviews of the passengers by the Aviation Service [Dienst Luchtvaart - part of the National Police Force]		
1. Is the official Portuguese commission of inquiry aware of that fact that all passengers who want this will be interviewed by the team of detectives of the Aviation Service?	In summary, all the passengers were interviewed who wanted to be. Their statements, translated into English, were given to the Portuguese commission of inquiry. The information from the statements had been included in the final report, specifically in the "Survival Factors" section.	Yes. Refer to the meeting minutes BVO/92/12/75 (lijst 4 nr 9) : « *The passengers statement (translated) will be presented to the Portuguese Authorities supplemented by the questionnaires completed on the basis of the statement* »
2. Are the members of the Portuguese Commission of inquiry of the opinion that all reports should be translated into English so that they too will be able to read the contents?		
3. Even if that is not the case, I am of the opinion that Minister Weggen should be asked to instruct the Dutch Preliminary Investigation committee to have all statements by passengers translated into English and made available to the official Portuguese Commission of inquiry.		Not applicable

About the state of maintenance of the Anthony Ruys

4. Is Martinair prepared to provide a list of all faults and all maintenance operations during the past year and a half to the aircraft, stating the repairs made; including special maintenance just before take-off?	Yes, Martinair is prepared to give the competent authorities and bodies access to faults, maintenance and repairs to the aircraft concerned, (in so far as this has not already been done).	The technical story of an aircraft is at all time followed in detail by the specialists. As indicated, the aircraft was "good for fly" except for the reverser n°2 (approved technical deviation)

Delay replacement right main landing g

About the delay of the disaster flight by 35 minutes at Schiphol

5. If not, then can such a list be demanded.	Not applicable	Not applicable
6. What was the true reason for the delay of the disaster flight by 33 minutes at Schiphol?	Repairing a reverse complaint to the tail engine (engine no. 2) .	Not applicable
7. What is Martinair trying to cover up by stating that it only concerned catering and check in problems while the captain informed the passengers that: "The crew are ready to take off, but the technical people had not yet finished"?	Martinair is hiding ~~something~~. It is a normal occurrence that shortly before a take-off many people of different departments, including the engineering department, catering, passenger service [translator's note: "passagedienst " unclear] and apron department are busy in and around the aircraft.	It is rather frequent that the person performing the announcement is not aware of the actual reason of the delay. Of course the Captain knew the actual cause of the delay and there is no reason to hide it to the passengers.
8. Is it permitted that passengers board before all technical problems have been solved?	Yes, that is permitted.	It is a Captain's decision, done in coordination with the ground staff, regarding the technical problem to be solved.

Should be: not in our scope

You were asked whether the a

About the left-hand engine

9. What was the reason that there was an elevating work platform by the left-hand engine, as a number of passengers observed just before we boarded.	There was no elevating work platform at the left-hand engine but there was one by the tail engine.	Nevertheless, it could be a routine operation as the maintenance is not only performed inside a specific shelter but can also be performed as we said it "on line". This is called "Continuous airworthiness"

10. Were there technical problems with the left-hand engine before departure?	No.	Not reported on the maintenance log book if we refer to the Portuguese Official report.
11. If so, why was it not decided to do a "test take-off" [translator's note: or possibly "test start"] before departing?	Not applicable.	These "test take-off" or "test start" are performed after specific maintenance actions. These actions are defined in a maintenance protocol certified by the certification authorities, in this case the FAA and the Dutch ones. No test start or "test take off" was needed in this case.
12. Can it be determined from the black box data or remains of the left-hand engine if this might have suffered problems from take-off?	From the data of the Digital Flight Data Recorder (DFDR) it may be concluded that the left-hand engine, and the centre engine and the right-hand engine operated normally from take-off through to the time of the accident.	Yes, it can. The "Black boxes"

About problems during a flight on 3 January 1992		
13. Was the Martinair aircraft which last year in 3 January, in the morning, left Schiphol with 3 ½ hours' delay after a "test take-off" the Anthony Ruys?	No.	No comment
14. Was the aircraft which on 3 January 1992 at 4 in the afternoon could not depart from Faro but first had to be repaired on site the Anthony Ruys?	Yes.	The aircraft performed a lot of
15. In case both aircraft are the same aircraft (even if it is not the Anthony Ruys) was it now after the fact not clear that a trial take-off was in fact insufficient and that in fact a replacement aircraft should have been chosen as the repaired aircraft should have been subjected to a "test flight" rather than a "test take-off"?	There are strict regulations, imposed by the authorities and supplemented by company regulations, which clearly describe how a complaint should be dealt with and if a test start or test flight is required. In the present case neither a test take-off nor a test flight were required at all.	No comment

About the busy Christmas period		
16. Did a rush to drop our charter flight in Faro in the busy Christmas period lead to not choosing greater certainty through a test take-off or complete certainty by using a different aircraft.	No, there was no rush at all.	

About the weather		
17. Was it responsible to land in the weather conditions at Faro?	It was responsible to land under the weather conditions which the crew were informed of.	Yes it was responsible to continue the approach. Why now responsible to continue the ap
18. Did the crew have sufficient information to judge if a landing with a DC10 was responsible with 100% certainty?	With the weather conditions which the crew were informed of they had enough information to decide whether or not the landing was responsible. The rapidly changing weather conditions during the last stage of the flight were not known to the crew. Hence these conditions could not be included in the decision-making about the landing.	100 % certainty does not exist. The target is to minimize the risk as much as possible.
19. According to several newspapers, at 06.00 hours GMT (7 hours Dutch time) the Portuguese aviation authorities gave a special warning for hazardous weather conditions with heavy thunderstorms and heavy icing. Did the warning from Portugal at 06.00 GMT reach the crew of the Anthony Ruys?	The Portuguese authorities did indeed issue such a warning. The correct text is included in the report. This warning was not communicated to the crew of flight 495.	Yes, according to the Official report, a SIGMET number 1, valid between 06:00 and 12:00 UTC was issued warning for Clear air turbulence conditions
20. Is it true that before the Martinair aircraft, other aircraft diverted to Sevilla?	That morning, before the Martinair aircraft, no aircraft diverted, according to the statement by the Portuguese authorities.	No
21. If so, was that because Faro airport was temporarily closed due to bad weather?		Not applicable
22. If so, what was the observable improvement in the weather as a result of which the Martinair aircraft did get permission to land?		

Change fro

23. If other aircraft did divert, but the airport was not closed, then was the decision to continue flying a personal decision of the crew of these aircraft?		
24. If so, what types of aircraft did this concern?		
25. Could the crews of these aircraft be asked what their reasons were and if these had to do with the weather conditions?		
26. Did the Anthony Ruys crew, during the last contact with the control tower, receive specific information about the weather and what was that?	The Anthony Ruys received the latest weather information from the traffic control tower, one minute before the accident. This was: "The wind 150, 15 knots, maximum 20". Earlier, 'runway is flooded' was	It is an international procedure. The ATC controller (ATCO) giving the landing clearance/ authorization give also the last wind conditions. But in our case, these conditions were the runway 29 conditions and not the runway 11. The crew could not know that the information provided is not correct.
27. Was it stated, as it appeared in some messages in the press, that there was still 1/8 thunder cloud on the horizon?	This was not ~~indicated~~ at the time.	About the meaning of such an information, 1/8 thunder cloud does not mean anything according to the standard phraseology. Let us understand that the question is about "1/8 cumulonimbus". 1/8 is the portion of sky covered by the cloud, meaning that 7/8 are free of clouds …
28. If so, could it have been known to the crew that it is risky to land in that, as downdraughts (microbursts) just above the ground can occur in that?	See the answer to question 27.	No comment.
29. In that case, what made the crew decide to start the landing despite that?	The last weather information received confirmed the picture the crew had formed of the	Not applicable . Comment: The question is not to begin an approach but to … n the
30. Might there have been economic motives at stake, as suggested by spokesperson Gielen of Alltalla suggested		never … safety How do you know? Also for Ma

in Nieuwe Revu [translator's note: Dutch magazine] of 27 January?		

About possible overconfidence by the crew		
31. Are there any statements on the tapes of the Cockpit Voice Recorder which could suggest overconfident or irresponsible action on the side of the crew?	Such statements are not included on the tape (see transcript).	No.
32. Why did the pilot inform the passengers several minutes before the crash that the wind was UNFORTUNATELY from the east during the landing?	With respect to this q Capt. Van Staveren stat he could not remember something like that c Public Address System. * However, had he something like that then i have been with the idea t weather would probabl like that for the first da that as a result our pass would not have the possible holiday weather. Furthermore, this statement would have been made during the standard speech which is always made well over half an hour before arrive and certainly not a few minutes before the landing.	The advised heading by the captain was not ad
33. Why did the pilot tell the passengers, less than one minute before the landing "Ladies and gentlemen, now we are really going to start the landing: We are ready for it."?	The pilot can state with certainty that less than one minute before the landing no statements were made over the Public Address System.	Not applicable. Comment: one minute before the landing, the high workload of Crew does no any announceme

About unsteady approach		
34. Why does Martinair persists that until the time of the downdraught the flight was "completely normal" while almost all passengers testified that the pilot had the greatest possible difficulty controlling the aircraft during the landing procedure?	]t will undoubtedly have been turbulent during the final approach. This is also indicated by the record of the flight recorder. This will have made it more difficult to control the aircraft, but it was not exceptional. The link which you make in your question between the turbulence the passengers experienced and "the pilot had	According to the CVR and to the DFDR, the flight was completely normal till the beginning of instability below 700 feet.

	the greatest possible difficulty controlling the aircraft" is your responsibility and I cannot support it.	
35. Is the commission of inquiry aware of the fact that at least one member of the crew stated never to have had such an unsteady approach in her career?	None of the crew said something like that in their statements.	No comment.
36. Is the commission of inquiry aware of the fact that at least one member of the crew stated that they had been afraid the whole trip?		
37. Is there anything to be found in the interviews of the crew about these statements by the passengers?		

About what happened at 2 minutes before the scheduled landing time. Around 7 minutes before the actual landing.		
38. What happened exactly 2 minutes before the scheduled landing time, around 7 minutes before the crash, when the aircraft was suddenly pulled up from 1170 to 1226 ft with roaring engines?	Answer BVO	The aircraft crossed a turbulent area.

This answer is purposely incorrect. N

About an unusual approach route:		
39. Is it true that the Anthony Ruys flew over Almanville while one would normally fly over Villamoura, 20 km away?		It is the normal work of the ATC-system to provide more direct routes ("Direct to...", Radar vectors, etc.).
40. If so, what was the reason for that diversion?	Answer BVO	Not applicable

About the use of alcohol or drugs		
41. Is there in Portugal, as in the United States, a statutory duty to test drivers on the use of alcohol and drugs in the event of serious traffic accidents?	Answer BVO	Yes It is a ICAO standard and recommended practices.
42. Was the Anthony Ruys crew	Answer BVO	No information.

tested on the use of alcohol and drugs, immediately after the accident?		
43. If so, what was the outcome of these tests?	Answer BVO	Not applicable
44. If tests were not undertaken, would that not amount to serious negligence by the authorities given the seriousness of the accident?	Answer BVO	No comment

About air traffic control		
45. Is it true, as claimed by Diáro de Sul, that the air traffic controller observed flames at the Anthony Ruys at 7.26 km from the airport at an altitude of 400 to 500 meters?	Answer BVO	No
46. If so, why did the air traffic controller not report that to the crew?	Answer BVO	Not applicable

About fire in the right-hand engine before the landing		
47. Did the crew of the Anthony Ruys state to the detectives of the Aviation Service that the right-hand engine was on fire before we touched the ground?	No, the crew stated that the right-hand engine was not on fire.	Not applicable Comment : for a one hand, there is no warning on the records and for the other hand, witnesses' statements are available indicating that there is no fire.
48. Was the crew of the Martinair Boeing which landed slightly earlier also interviewed by the detectives?	Answer BVO	Yes How do you know? Did you read the
49. Did captain Charbon of the Boeing confirm to the detectives that before the landing he heard one of the Anthony Ruys shout "Shit, we are on fire"?	No, definitely not.	No
50. Did Charbon see fire by the right-hand wing before the Anthony Ruys touched the runway?	No.	No

51. Is the commission of inquiry aware of the statements by passengers who saw that the right-hand engine was already on fire before the Anthony Ruys touched the ground?	Answer BVO	The statements have been delivered to the Commission of Investigation.
52. Was a signal received in the cockpit that the right-hand engine was already on fire approximately 1 minute before the aircraft crashed?	Answer BVO	No fire signal recorded neither on the DFDR nor on the CVR
53. If not, then is the aircraft manufacturer not responsible for the lack of such a signal?	Not applicable	Not applicable.

About the true cause of the crash		
54. Given the fact that the right-hand engine was already on fire before the landing and the possibility that the left-hand engine was faulty, was the weather actually an essential factor, or did we simply crash and were we lucky that this happened so close to the ground?	Answer BVO	Not applicable.
55. Is a potential fault of the engines the responsibility of the engine manufacturer or the maintenance company, in this case KLM?	Not applicable	Not applicable.

About the fire brigade		
56. How can it be explained that the fire brigade were immediately present on site and covered passengers, who had left the aircraft within one minute of the crash, with foam?	During every take-off and landing an emergency team is standing by in a truck with the engine running. During the landing of the DC-10 there was no fire engine on the runway. The aircraft crashed on the south side of the runway, almost opposite the fire station and that is the reason why they needed	No comment.

	so little time to reach the aircraft.	
57. Had the fire brigade been warned that an aircraft was experiencing problems or did the fire brigade have reasons based on their own observations (noise, fire) to be ready to get going?	No see answer to question 56	No comment.

About the place where the Anthony Ruys first touched the runway		
58. Why did the aircraft not land in the center of the 120 meter-wide runway but at 10 meters from the edge?	Answer BVO	A runway is 45 meter-wide. Understanding why the aircraft land on the left-hand side of the runway is the beginning of the whole explanation of the accident.

In the length		
59. Is the length of the braking	Yes, the length is more than	Yes

On page 117, experts calculate this but 'forgot' numbers: they required 2600 m

About the safety of the passengers on the aircraft		
60. Which of the following matters are the responsibility of the airline, which of the maintenance company and which are the responsibility of the aircraft manufacturer?	Answers from question 61.	No comment
61. Did seats detach in areas where this should not have happened?	Answer BVO	No comment
62. What forces are the seatbelts of the passengers calculated [designed] for?	The forces are calculated for 9G of forward speed.	No comment
63. In what condition were the seatbelts on the Anthony Ruys?	Answer BVO	It is an item checked before each flight to know if whether or not the seat is serviceable.
64. Were several seatbelts, whether they had come	Answer BVO	No comment

loose or not, in a ragged condition?		
65. How is it possible that installation errors were made, so that at least two seatbelts were installed the wrong way round?	There cannot be installation errors. The hook-in-eye principle means that incorrect installation is impossible.	No comment
66. Why are there only waist seat belts for little kids on laps, without shoulder straps, like on any car seatbelt for babies?	There are no baby seatbelts with shoulder straps as the baby seatbelt is connected to the seatbelt of the passenger who has the baby on their lap.	No comment
67. Could airlines be required to have baby seatbelts with shoulder straps on board?	That could be done, but it is not required internationally.	No comment
68. How effectively should the hand luggage bins close?	The hand luggage bins should close properly. They are regularly inspected.	Item checked before each take off and ea
69. Shouldn't they be centrally locked during the landing procedure?	No. They are checked by the cabin crew. Central locking is not possible.	No comme
70. What forces are the ceiling panels designed for and how flammable are they or the insulation material above them?	The fitting of the ceiling panels and the panels themselves meet the requirements set by the manufacturer and by the Dutch and American aviation authorities. The same applies to the insulation material above them.	Refer to international rules of certification.
71. What are the evacuation slides designed for? (Only for training or also for disasters?)	The slides are designed for use in emergency and precautionary landings (on the ground and on water) where stairs and/or bridges cannot be used.	No comment.
72. How extensively do the passengers have to be informed before the flight?	Thoroughly, in accordance with national and international regulations and rules.	No comment.
73. Would it not be useful to inform passengers of the possibility that it cannot only go wrong in the air and on the water but also on land?	See answer n°72	No comment.

Questions about the aftermath of the disaster. About the support of passengers who wanted to return by train. About the investigation of the cause of the disaster		
74. Should airlines not be required to provide effective medical, psychological and financial support for people who do not dare fly back with an aircraft after a crash?	Airlines will always do everything they can to provide help and support. A factor which should not be neglected is that experts often have to be transported across long distances. Furthermore, after the crash at Faro the runway was blocked as a result of which the experts could not get there quickly enough.	No comment.
75. How in god's name is it possible that European airlines are still permitted to fly with insurance conditions for their passengers which date from 1966?	The regulations are set internationally.	No comment.
76. To what extent is Dutch politics responsible for the fact that since 1966 the road traffic act has increased the mandatory insurance from approximately 250,000 guilders per event to at least 2,000,000 guilders while for aviation it is permitted to fly while the airline has only insured their passengers for non-indexed amounts from 1966 in devalued dollars.	This is outside our competence.	No comment.
77. Does Martinair also have insurance for the aircraft for an amount for which a similar aircraft could be built in 1966?	*The purchase price of aircraft over a period of 27 years, as referred to, and the review of the existing conditions, are two unconnected matters.* *Both have been increased significantly*	No comment.
78. Is Martinair - in so far as they are culpable and not the Faro air traffic control or the manufacturer of the DC10 – prepared to provide compensation to those seriously affected, from their own resources, similar to the regulations which apply, for example, to car insurance?	Not applicable.	No comment.
79. If not, then can Martinair be	Not applicable.	Not applicable.

required to do so?		
80. If not, then can claims be addressed to the Dutch state?	Not applicable.	No applicable.
81. Is the information correct that all passengers who have indicated that they want to be interviewed will be interviewed the coming two weeks.	As far as we are aware, all the passengers who indicated they wanted to be have been interviewed.	The witnesses' statements have been sent to the Commission of Investigation. No comment about the delay.
82. Is the team of detectives of the Aviation Service not permanently understaffed in this period, especially if you realize that the same 6 detectives also have to deal with the aftermath of the Bijlmer disaster?	Answer BVO	No comment.
Questions from the letter about secondary and tertiary witnesses, addressed to lawyer Bunjes, mailed to lawyer Biemond on 15 March 1993		
83. Are four statements about fear responses from outsiders - who are very familiar with aircraft noise - enough to conclude that the passengers were not the only ones who considered the engine noise of the Anthony Ruys worrying?	It is not up to Martinair to judge this.	No comment.
84. Why did the Anthony Ruys fly across the departures building when that is normally never done?	The normal instrument landing procedure at Faro requires flying across the airport, irrespective of the runway being used, before starting the landing. The word "never" as used in question is incorrect.	The arrival the day of the accident was performed using runway 11 because of the prevailing wind.
85. Could it be that the fire brigade, like those waiting in the [departures] building, were alarmed by the thundering noise of the aircraft passing overhead and because of that deployed more quickly than normally?	Answer BVO	No comment.
86. Can the passenger lists of the scheduled return flights from Faro on 21 December be	Answer BVO	No comment.

used to trace witnesses who may have made observations which are relevant to the investigation of the cause of the disaster?		
87. Did Mr. Charbon implicitly indicate in a discussion with a passenger of the 767 that the aircraft was indeed already on fire before the landing?	No	No comment.
88. If the thunderstorm was on the other side of the runway then can there actually have been a microburst on the side where the Anthony Ruys started the landing?	Answer BVO	It is rather impossible to anticipate the position of a microburst. This is exactly why such meteorological phenomena are dangerous Dangerous microbursts were never ever
89. If there was a thunderstorm, even if it was on the other side of the runway, then was it responsible to land at that time?	Answer BVO	No comment.
90. Is it possible to interview witnesses in Portugal in general, who may have made observations which could shine light on the causes of the events?	Answer BVO	~~Witnesses' statements for workers or others are available~~.
91. Do observations about luggage bins popping open during other flights confirm the suspicion that the Anthony Ruys may have operated as a cargo aircraft for some time and then been converted back to a passenger aircraft?	In what configuration the aircraft flew or flies (passengers or cargo) is not relevant. The luggage bins are one separate part during the conversion. In other words, the bins do not consist of separate segments.	~~The aircraft involved was operated as convertible aircraft meaning it was built with passengers' windows and a cargo door.~~ ~~There is no relation between the two assertions.~~
92. Is it correct that a normal DC10 passenger aircraft, in addition to the two outer rows, has a double row of luggage racks in the center of the aircraft?	Martinair has a normal type of DC-10 which is available with and without luggage racks in the center.	It is a matter of commercial policy to fit the cabin with a center row of racks and not to be normal or abnormal.
93. Are/were the luggage racks on the sides of a DC10 adequate for the luggage of 328 passengers?	An aircraft hand luggage can be placed in the luggage bins and under the seats, for which purpose an additional bracket is fitted under the seats.	Again it is a matter of commercial policy.
94. If not, is there culpable behavior on the side of Martinair and/or the State of	No, see the answer to question 93.	Not applicable. No comment

the Netherlands as the owner of the aircraft due to endangering the passengers by allowing more passengers than the aircraft is designed for in terms of hand luggage space?		
95 90. Can airlines be required in future to choose between either providing hand luggage space in accordance with the design of the aircraft for passenger flights, or flying with a limited number of passengers?	No, the aircraft is certified for the number of passengers and the available space for hand luggage in the luggage bins and under the seats.	Not in our scope.
96. Between 9 and 21 December did Martinair have repairs made to the aircraft to fix the "perfectly normal" phenomenon that rubber feet of a video [equipment] bag melted due to the heat at the bottom of an aircraft?	A repair was indeed made to an air duct under the cabin floor, in front of the rear passenger door. A coupling in this air duct leaked and blew hot air against the floor.	No comment.
97. What was the matter on 17 December 1992 - four days before the Faro crash - with the Anthony Ruys that they had to fly circles over Cancun for an hour to use up kerosene before they could land?	There was nothing wrong with the Anthony Ruys on 15 December 1992 (and not 17 December 1992) . Due to a favorable route the landing weight was slightly too high as a result of which the captain decided to fly in circles for around 15 minutes to reduce the landing weight by the lower quantity of fuel on board.	No information. <u>Comment</u>: This is a normal procedure as it is forbidden to dump fuel in such a case (not an emergency situation).
98. And why was the landing at that time so rough?	We have no information about a rough landing.	Not applicable to the case.
99. Was the stopover of an hour and a half in Miami only to bring fresh crew on board or was work done on the aircraft, and if so, what?	At Miami there was only a crew change.	~~Not applicable to the case~~. <u>Comment</u>: A stopover of less than 1 hour and half is not frequent for long range aircraft.
100. What was the reason that during the autumn holidays a mechanic flew to Tenerife?	He was going on holiday.	No comment.
101. Request for a list of all the maintenance on the Anthony Ruys during the past year and a half.	See the answer to question 4.	Already answered. No comment

Questions from the letter about potential criminal matters, addressed to lawyer Toeter, mailed to lawyer Biemond on 25 May 1993.		
102. On 21 December 1992, did the Anthony Ruys leave Schiphol without permission of the technical maintenance department?	No, this aircraft was finished entirely in accordance with the rules and declared as technically airworthy by the Maintenance Department and checked as such by the crew.	Not applicable.
103. How could this happen?	Not applicable.	
104. Why was the aircraft not recalled?	Not applicable.	
105. What is the reporting duty of technical personnel in case of such an incident?	There was no incident. An aircraft will not depart if it has not been released by the Maintenance Department.	
106. Was there actually an incident, or was it a "good" practice which developed over time that the pilots themselves determine whether an aircraft is airworthy or not?	There was neither an incident, nor a "good" practice which developed over time.	The pilots do not determine by themselves if the aircraft is airworthy or not. There are rules and procedures. The only cases for which a pilot can take the decision to take off with a defect are listed in a certified document: the DDG in AOM.
107. Did the pilot by departing in this way, act in accordance with written or unwritten instructions from the Martinair management?	Yes, fully.	
108. Are there standards and regulations for the minimum requirements which an aircraft has to meet after being converted from cargo aircraft back to passenger aircraft?	Yes, there are such regulations.	It is a certified process.
109. Did Martinair comply with these standards?	Yes, fully.	
110. Is there an approvals body (e.g. the RDD) to issue a certificate of airworthiness every time an aircraft is converted to a passenger aircraft?	Martinair has authorised ground engineers who, in accordance with instructions approved by the RLD, declare the aircraft to be airworthy.	
111. Was such a certificate issued for the Anthony Ruys and if so, who is responsible for any shortcomings found later?	The aircraft was signed off in-line with the approved instructions and there were no shortcomings found later.	

No comment because this a a pilot

Where do you have this manual from? Your own? Not provided by the court!

113. Are there standards where it is a requirement to land a D[illegible] th[illegible] co[illegible] st[illegible] The lateral approach guidance of th	Yes, there are such standards. They were not exceeded in Faro.	The flight crew operating manual indicates the [illegible] which landing usi[illegible] autopilot is mandatory [illegible] when it is forbidden to use the autopilot to perform a landing procedure. ~~In our case, without an ILS (*an ILS Cat2 is required to perform automatic landing*), it is not possible to perform an automatic landing.~~
114. Is the conclusion justified that Boeing aircraft are generally easier to control than the DC10; and certainly under extreme weather conditions?	No.	No
115. Is the conclusion justified that the Boeing 767, which landed at Faro just before the Anthony Ruys, is more agile and easier to manoeuvre the around 20 years old Anthony Ruys? A) Because it is a Boeing. B) Because it is a much more modern aircraft.	No.	No Requires verification in B767 manu
116. Is this also reflected in the landing limits for a Boeing 767 compared with a DC10?	No. Yes	The cross-wind limitation is more or less the same on the two types. Wrong DASB answer. Check 767 AOI
117. Is it therefore explicable, on the basis of the above, that the Anthony Ruys crashed while the Boeing 767 did land "safely" with jolts and bumps, although one of those on that	No Yes	Not applicable. Wrong answer

aircraft described the landing as "Sliding down the stairs on your ass."?	[redacted]	
118. Is the report still available on the basis of which the RLD made statements in 1970 about the unreliability of the cabin floor of the DC10 and is that report public?	Tha [redacted] by the Federal Aviation Authority which issued an Airworthiness Directive note, under which all Douglas and Boeing aircraft had to be modified with decompression panels. These panels equalize the pressure above and below the floor.	~~Not applicable.~~ [redacted]
119. Was the floor of the Anthony Ruys ever modified to the standard which the FAA made mandatory after the crash at Paris in 1974.	Yes, the Anthony Ruys was modified to this standard.	Yes [redacted]
120. How can it be explained that the floor section between rows 23 and 29 collapsed during the crash and took around 50 passengers with it, of whom at least 32 died?	Answer BVO [redacted]	No comment. [redacted]
121. Was the collapse of the floor in that area due to decompression?	Answer BVO [redacted]	No
122. If not, then is it not strange that the floor collapsed in exactly the same place as during the Windsor incident of June 1972?	Answer BVO [redacted]	No comment. [redacted]
123. Can the collapse of the floor be attributed to the manufacturers?	Answer BVO [redacted]	No comment. [redacted]
124. Is it not necessary to reinforce the floor such that it simply cannot collapse due to decompression?	Answer BVO [redacted]	Not applicable. [redacted]
125. Would it not be advisable for the RLD to contact the Australian Air Transport Group which, according to our information, imposes and enforces much stricter standards than common in	Answer BVO [redacted]	Not in our scope.

the rest of the world? Apparently, the German RLD also uses much stricter standards than the Dutch ones.		
126. Was there actually any chance of saving the fully loaded (weight 180 tons) Anthony Ruys after it had landed, given: A. The speed of over 260 km per hour; B. The place where it first touched the runway; C. The failure of all electricity, as a result of which it may not have been possible to engage the thrust reversers in the engines; D. The probable fire in the right-hand engine shortly before the landing.	The aircraft did not weigh 180 tons but 161.4 tons. Given the question if there was any chance of saving the fully laden Anthony Ruys after it had landed the answer is unequivocally Yes, with respect to the statements under items A-C. There was no fire in the engine (item D).	A: yes. The brakes are designed for that; B: Yes. The aircraft landed exactly where it has to do it; C: Yes. The reversers are not electrically activated; D: not applicable
127. Can it be concluded from the black box and/or statements by the crew problems that there were problems with the landing gear and that it was attempted to deploy it several times?	Answer BVO	Not applicable.
128. Had the sudden climbing movement, already mentioned in question 34 (Sötemann question 38) from 1170 to 1225 feet approximately 7 minutes before the crash have anything to do with an attempted to get the landing gear "out".	No	Already a
129. Was the statement on 2 July 1993 by Mr. Schotgerrits a reason for the commission of inquiry to minutely examine the right-hand landing gear on any defects which may have been present before the crash?	Answer BVO	No comment. No comment?Not on crabbed landi
130. If not, does the commission of inquiry see any reason for that now?	Answer BVO	The DASB, following the review of the main
131. Or was it found in an earlier stage of the investigation what the cause	Answer BVO	Not applicable.

was of the collapse of the right-hand landing gear?		
132. Was the collapse of the right-hand landing gear the result of a defect which existed earlier, or of an incorrect landing manoeuvre?	Answer BVO	No
133. Could the collapse of the right-hand landing gear be identified as the cause of the inability to control the aircraft during the landing and therefore as one of the main causes of the crash?	Answer BVO	Yes
134. Does the Hold Item list of the Anthony Ruys include any items which were not remedied which may be associated with the cause of the crash?	No, the Hold Item List did not include any items related to this crash.	No
135. Was a trip report made for the delay at Schiphol and if so, was the content of that public?	No, this would normally be written after the flight.	No comment.
136. If no trip report was written, then wouldn't the regulations have been infringed?	No, see the answer to question 135.	No comment.
137. What about the authority and experience of the Anthony Ruys cockpit crew to fly on a DC-10?	All were fully authorized and had more than enough experience to fly on a DC-10.	The crew was fully type rated and experienced to fly the aircraft.
138. Did the flight engineer, given that this was a Canadian agency worker, have adequate authority to stand up to the captain when he decided that the Anthony Ruys could depart from Schiphol?	Given the crew concept, each member of the crew, including the flight engineer, has their own specific competences and authority, irrespective of their nationality.	No comment.
139A. Does the Rijks Luchtvaart Dienst check the quality of hired-in cockpit crew of Dutch airlines?	Yes, the RLD checks each member of the crew.	No information.
139B. Would it not be useful to include the recommendation to the Raad voor de Luchtvaart in your report that the Dutch Aviation Act should state a maximum alcohol content with withdrawal of the licence to fly as a sanction for infringement?	Answer BVO	No comment.

140. At what point would the Anthony Ruys first have touched the runway had there not been a vertical downdraught which suddenly pushed the aircraft 50 meters down?	Answer BVO	At more or less 300 meters from the threshold.
141. Measured from that virtual point, would there have been enough braking distance to bring the aircraft weighing 180 tons at a landing speed of 260 km per hour to a stop before the end of the runway?	The air weighed 161.4 tons, not 180 tons. The answer to this question is unequivocally: YES.	Refer to landing distance analysis.
142. Could the point where the Anthony Ruys first touched the runway be due to a combination of poor visibility and the lack of an ILS Instrument Landing System) at that airport?	Answer BVO	No.
143. Shouldn't there be specific limits for the conditions when landing is still permitted at airports where there is no ILS (Instrument Landing System) .	There are such [limits] . This relates to increased values for visibility and cloud base, which were easily fulfilled in this case.	Yes, the minimum decision altitude is higher and the required horizontal visibility, greater.

Where is your conclusion? Were the answers correct?§ 6.10 page 45 and 46

8.9. THE "REVIEW AND REMARKS AND QUESTIONS - CLAIMANTS OF INTERIM REPORT V17 FARO"

8.9.1. PREAMBLE

The Experts want here to thank again the Claimants advisors' team for the work done to issue the "Review and Remarks and Questions of Interim Report V17 Faro".

Following the analysis of this document, improvements have been made to the interim report to explain or clarify some points.

But not too many...

Nevertheless, the general feelings, when reading these remarks, are that the aim of the Claimants advisors' team is to underline a liability, either from the crew, or the airline, or against the Dutch authority and its represen[illegible] time of the accident).

Did experts read the letter of the court caredully?

Again, the Experts want here to underline once more that the aim of the work of the Commission of Investigation, according to the recommendations of the Annex 13 of the ICAO, is not to define liability but to define causes and/or contributing factors to improve, downstream, the flight safety.
In this context, DASB, as part of the Commission of Investigation, was not allowed to define liability.

This court case is not about Annex 13, but to determine whether the DASB told the truth to the victims

Particularly with respect for the victims and their families, the Experts decided to answer as far as possib[illegible]terim Report V17 Faro", in acc[illegible], and with respect to the limits [illegible]

The victims and their families want to hear the truth, and nothing but the tru

Notes :

- The used of the term "No Comment" will mean "No more comment that the ones already raised in the core of this report or in its annexes"
- The used of the term "Not relevant" will mean "Out of scope"

Why not answered the questions and

8.9.2. EXPERTS' COMMENTS

Answers and comments, if applicable, to the "Review and Remarks and Questions of Claimants of Interim Report V17"

152 *The court has decided that the experts - in their final report - only need to respond to the comments of either party where these comments concern the actual content of the draft-report.*

Reference inside the claimants advisors' team's review	Text by the claimants advisors' team (if appropriate)	Comments by the Experts	Additional remarks
1	Introduction		
1.1	Scope		
1.1.1	Following an independent analysis by AvioConsult, the lawyer subpoenaed the DASB, and therefore the State for: 1. Inappropriate, careless investigation of the cause of the accident, and 2. Misinforming the survivors and the next of kin of the deceased.	This is inappropriate because the DASB was not in charge to investigate the cause of the accident but was only part of the Commission of Investigation according to the ICAO Annex 13.The Portuguese authority was in charge of the investigation and appointed a Portuguese official to lead the Commission of Investigation. DASB was part of this team. The answer to the point n°2 is detailed in 0.1.3.2 of this report	ICAO Annex 13 Is this court case inappropriate? Has nothi No, it is not. DASB had their own opinion on the ca
1.2	Review		
1.2.1		No comment	
1.3	Structure	No comment	
1.3.1		No comment	
1.3.2		It would have been preferable to have chosen a structure already used either in the official report (RvO) or in the interim report of the Experts (V17) to facilitate the analysis. Moreover, it would have been practical to source each remark by its precise reference in one or the other of the existing reports. This structure leads to an additional and useless workload for the Experts to set up a correspondence in between the available documents and this "Review and Remarks …".	V17 doesn't have a structure References were provided, isn't it?E

1.3.3		Particularly with respect ~~due~~ to the victims and their families, the Experts will issue answers or comments in accordance with the indications provided by the Judge.	Note pr... with the "Review... mants of Interim ... Certificate of Airworthiness.AOC is som
2	Fight preparation		
2.1.	Landing gear Experts cannot know this. No details in the RoA. Is assu	The aircraft was "Good for flight" according to the approved procedures (manufacturer and authorities {FAA and Dutch authorities}	RvO §1... *t the date of ... ft airworth...* is airworthiness same as good for flight? + 3rd: thru
2.2	Thrust reverser Experts did not copy the violation of DDG No, permission to depart required co Questions not ans	All the procedures were fully respected before the dispatch. The "reverser" item was a (*) consult item. See 8.6.4.1.2 « The Technical Status of the Aircraft » ?? Why don't you mention the Dispatch Deficiency Guide (DDG) t	The ME... uthority issuing the ~~Air Operating Certificate~~. It is based on the MMEL approved not only by the FAA but also by the certification authority, in our ...se, the Dutch authority. ...s soon as the MEL is respected, it is not ...cessary to organize any contact with the ...thority. At the opposite, a contact will be ...andatory to obtain a dispatch clearance out of the ...EL (technical flight, …)
2.3 Questions not ans	Flight crew experience	No comment Why not? Don't want to blame the pilots? CP experience crosswind landings to 15 kt Earlier experts concluded the pilots being fully qualified § 8.6.1, page 82..	
3	En-route and initial descent		
3.1 Questions not ans	Weather changes en-route and initial descent	No comment No answer to the questions either. In the final report they say it was responsible to continue the ap	
3.2 Questions not ans	Arrival briefing	No comment about the content of the briefing. Remember that all these considerations are of no consequence because the landing distance is definitely neither a cause nor a contributing factor to	Thanks to the Claimants' advisors team for the landing weight correction. Nevertheless, the Experts underline that the exact limitation was 192.3 tons and not 193.2 tons. OK, typo. But experts still wrote 186,4 ton

Landing was not approved for actual runway

		the accident.	
4	Approach		
4.1	Approach Stability Questions not ans	The Claimants' advisors describe here the aerodynamic stability, which is a certification criterion. In this case, the term "Approach stability" refers to an operational meaning related to the flight path and not to the aircraft itself. For an airline pilot, the term "stabilized" or "stabilization" or "stable" is definitely not related to aerodynamics but to the followed flight path. The right term is not "Approach stability" but "Approach Stabilization". Also the Experts want to underline that there are many external and/or internal causes to destabilize an approach.	No, not aerodynamic stability, which is not only for certification
4.2	Outbound radial, inbound turn and establishing on the approach		
4.2.1 to 4.2.2.12		No comment	No further comments? Or don't you want
4.2.2.13	The captain confirmed to see the runway from 4 nm out.	As soon as the Captain said that he had the runway in sight, all the considerations presented previously by the Claimants' advisors are no more to be considered because the approach is not any more a non-precision approach but a visual approach, even if the crew continued to help themselves using the information provided by the electronic devices (DME, R NAV, VOR …).	This is not in accordance with the AOM 3
4.2.2.14		The Experts have no knowledge of the meaning of the term "beaufort" in aviation.	Is between parenthesis in this paragraph only to assist non-a

4.2.3	Comments DASB		
4.2.3.1		No comment	Not on the large deviation from the approach radial either?
4.2.4 to 4.2.4.2.2		No comment	
4.2.4.2.3		The Claimants' advisors do not provide the solution to use the autopilot to intercept the 111° radial: this interception was only possible using the heading mode of the autopilot (and flight director). On the KSSU standard, it was not possible to intercept automatically a VOR radial.	We didn't say that.The pilot could have adjusted the
4.2.4.2.4 to 4.2.4.6.1	Questions not ans	No comment	Why no comments and answers to these 5 questions? Experts obviously don't
4.2.5	Other remarks and Questions		
4.2.5.1 to 4.2.5.5		No comment	Why no comments? Experts obviously don't want to comment on pilot errors.
4.2.5.6	The strong 30 kt wind from the right would be way too high for landing. This should have led to a go-around also at this point, 3.5 min before landing.	No, a strong wind at 1500 feet and higher is not a reason to go-around	Not with a 30 kt crosswind and a runway reported flooded? N
4.2.5.7 to 4.2.5.10.2 Questions not ans		No comment	Why no comments? Experts obviously don't want to comment on pilot errors.
4.2.5.11	Experts question the accuracy and the source of the maps used in the investigation (V17 § 8.6.4.5, page 105) and present three possibilities ... 8 nm are accurately shown. Hence, the plot of the inbound track is accurate as well.	Answering to these two remarks, the interim report V17 has been clarified for ?? Final report see page 120	efer to the comments by claimants in § from p
4.2.5.12	In the same NOTE, the Experts state: "*For the*		-

	DC10 inertial systems, the accuracy is of 1 NM/hour, constantly maintained depending on the useful radio-aids systems. *The best performance happens with a dual-DME updating system and is therefore maintained around 1 NM, meaning an imprecision radius of 2 km*"! This is not true. The drift of an INS is 1 ... but the Commission used ground radar data though, not INS data. Experts are obviously not familiar with the operation of an INS and have no expertise of ground radar and other positioning systems for logging the track of an aircraft. They should not have mentioned this.		
4.2.5.13 4.2.5.14		No comment	Note : As soon as the Captain has the runway in sight, these considerations are not relevant.
4.2.5.15		No comment	
4.3	Approach speed		
4.3.1 to 4.3.5		No comment	Note : according to the AOM 3.3.5 – 03 Wind Correction Factor, the note below the table indicates on its second paragraph, that the ATS will add automatically 5 knots to the selected speed in the ATS window in case of gusting conditions. The Claimants' advisors themselves confirm this automatic increment of 5 knots on airspeed when ATS are ON because of turbulence (Ref § 4.4.4.4.1 of their "Review and Remarks and Questions")
4.4	Alleged windshear during the glide path		
4.4.1 to 4.4.5.8.3		No comment No new evidence	
4.5	Glide path		The use of the term "Glide" is inappropriate for a

Questions not ans
The report was not clarified on this INS subject
Not the correct note here, distance was still 7 nm. Th
on turn radius and not configuring
Questions not ans
Q 39 of 143. Again no comment on pilot errors.
Question not answ
Experts still do not understand, did not read the manual well. The approac
Many questions n
No comment on the letter of the NTSB eit
But was there any windshear, downdraft, updraft etc.? Was the NLR right? Does the DFDR data co
Not from reviewing DFDR and AIDS data out of the RoA annexes 1
The DC-10 AOM procedure on non-precision approach § 3.3.5 - 08 wri

4.5.1 to 4.5.5.3 Questions not ans	The change was: The descent path management	inor correction has been introduced in the report V17 in the final report??	It is not a good engineering practice to calculate from discrete da
4.5.5.4		From the available graph on the provided documents, the actual height has been put in front of time reference and the vertical speed is then computed each 5 seconds.	compute a vertical speed because the result would have been obviously an instantaneous vertical speed, data definitely useless for a pilot because of its high rate of changing. ??
4.5.5.4.1 to 4.5.5.7 Question not answ		No comment Why not answered this question with: we did not analyze approach data.	
4.5.5.8 Question not answ		Some corrections have been implemented in the core of the final report on the related graphs.	But experts did not use formal DFDR and AIDS data instead, only ill
4.6	Flooded runway, definition and awareness	The Experts want again to underline that the status of the runway is definitely not a cause or a contributing factor of the accident. The experts confirm that at the time of this message (07.28:56 of the official report around 10 [nm] from touch down), the captain did not put the safety of the aircraft at risk on continuing the approach. The Experts want to underline that the crew of the MP461 also received the same information, also disregarded it and performed a good landing with a good deceleration.[153] They also want to confirm that the workload was high during the last turn towards the final path. Managing the aircraft, "in-and-out" an active thunderstorm, while preparing a change of configuration, the interception of the final axis, with	If the crew would have used the runway condition data, th

[153] This point leads to some comments indicating that the B767 should be a better aircraft than the DC10 or that the MP465 crew was not so professionnal as the MP461 one. *Both ideas are definitely not appropriate*.

Have you analyzed the B767 landing data. the approved landing techniques and crosswind limits? No you haven't. This footnote is therefore definitely inappropriate, even misleading.

		a flashing fuel cue-light, and the associated change of thrust, is one of the parts of the flight where the workload is the heaviest. The use of the term "*Roger*", nine (9) seconds after the transmission of the "flooded" information is the best evidence proving the level of workload. In these conditions, all the following comments about the understanding of this term by the crew issued the Claimants advisors' team are irrelevant or received detailed explanations in the previous paragraphs of this report. Nevertheless, the Experts will comment some points, as it could be important for the Judge to imagine the context and draw his own idea of the situation.	The flight engineer did not execute the procedure require
4.6.1 to 4.6.2.3		No comment	Again "no comment" on pilot and Martinair/KLM errors.
4.6.2.4		The Claimants advisors' team cannot provide any evidence that the crew of MP 495 heard the transmission to the MP461. The Claimants advisors' team can only say that this transmission is recorded on the CVR. The difference is not only semantic. It is well known that a message that is not at the intention of a crew is not necessarily listened or understood by this crew. To hear a message a crewmember must be ready to hear it. This is a constant of the Human Factors principles about the communication. During an approach on an airport, a lot of messages are issued by ATC and recorded on the CVR of an	There is a reason and a purpose that airplanes tune their r

		aircraft, and the crew hears them unconsciously without paying them specific attention. The individual call sign triggers a caution flag for the crew : as soon as this specific call sign is issued, the attention is focused on the subsequent information. This is the reason why the Experts cannot take into consideration as evidence that the message issued for the MP461 flight was definitely heard by the MP465 crew.	Well, the crew paid attention. The capt. said for instance Protecting the pilots?
4.6.2.5		No more comment than already detailed for paragraph 4.6	That was not an answer to the facts listed in 4.6.2.5.
4.6.2.6		The Experts cannot accept the position of the claimants advisors' team when they suppose, and guess who from their point of view, that a CVR transcription has been modified	Experts left out several pilot errors in their CVR transcrip
4.6.2.7 to 4.6.2.8		In the first statement, the captain says that he knows the meaning of the term flooded, as an answer to a police question. But he said also "in my mind this condition did not exist during our approach". In the second one several months later, he says that he has interpreted in flight the term "runway is flooded" as wet runway conditions. And in addition he makes a remark about the non-standard term flooded.	So he gave it a good thought. Could it not be that he modified the statement under pres

		There is no contradiction here, only a same event commented at different times. The two statements do not prove that in "the second statement the captain claims to have no knowledge of the meaning of the term "flooded" . The Experts consider the two statements a complementary one each other.	Complementry? So experts confirm the capt knew what floo
4.6.3.1		The experts estimate that if the pilots have lost the control of the aircraft under 500 [ft] after a normal final approach, the comment of the DASB about extreme conditions is comprehensible.	There was no loss of control. The airplane responded to pilot
4.6.3.1.1		No comment	No comment on large heading 125° ?
4.6.3.2 & 4.6.3.2.1		No comment	Experts do not quote out of 1st statement of capt. on flooded. Pro
4.6.3.2.2 Question not answ		Refer to 4.6.2.7 It is not a task of the Experts and they are not in position to comment on this kind of potential procedures issues.	It is the subject of the question of the court.
4.6.3.2.3	Question not answ	Refer to 4.6.3.2.2	No comment on this question. DASB withheld 1
4.6.3.2.4 Question not answ		Assuming that the pilot has interpreted the term "flooded" as "standing water", and subsequently that the runway would have been too short, at eight (8) or even four (4) minutes before touch down, the captain is entitled to postpone the go-around decision because at this moment there is no immediate threat for the aircraft.	Wrong, read the manual. AOM 3.3.5 - 15 append

4.6.3.2.5 Question not answ		Refer to 4.6.2.7 For the one hand, DASB as part of the Commission of Investigation was not in charge to define liability. For the other hand, DASB had no reason not to believe the Captain in his statement.	Was not the question
4.6.3.3 & 4.6.3.3.1		No comment	on the mis-information by DASB on 1st capt floode
4.6.3.3.2		It is true that there is no reference to the captain statement on December 1992 regarding his knowledge of the term "flooded". The Experts of course cannot provide any certainty about that. A lot of explanations are possible (non exhaustive list): - Either the DASB representatives during the claimants' meeting had an insufficient knowledge of the file. - Or they found it unnecessary to recall this point, considering that this was not a cause of the accident. - Or they considered that despite the knowledge of the captain about the term "flooded", he took it as that the runway was wet.	?? DASB representatives present knew. Several note
4.6.3.3.3 Question not answ		Not relevant according to the previous comment.	Very relevant, DASB knew, but lied to the victims.
4.6.3.4		Not relevant according to the previous comment.	not relevant under the actual crosswind? Heading 125
4.6.3.4.1 Question not answ		No comment You don't want to answer questions about	

4.6.3.4.2	Question not answ	No comment	In V17, you said yes to land, in the final report you
4.6.3.5		A 100% certainty is never a reachable target.	Very simple answer.
4.6.3.5.1 to 4.6.3.10.1	Questions not ans	No comment	Again, experts refrain from answering questions on the
4.6.3.10.2	Question not answ	On the ATC tower, the SIO wind page was set on runway 29 instead of runway 11 meaning the ATC controller was not aware of this wind.	Never proven, Evora court decision.Question was not
4.6.3.11		DASB is right when he asked to delete this sentence. Because it is true as the captain's statement proves it (see 4.6.2.7).	you refer to the second statement, while not taking the 1st stateme
4.6.3.11.1	Question not answ	The comment of the claimants advisors' team is not appropriate.	This is a question, a very appropriate question to the f
4.6.3.12		No comment	Martinair / KLM confirmed being too late amending the n
4.6.3.13 to 4.6.4.2	Question not answ	Not relevant	Is this really not relevant? Is landing with reduced braking
4.6.4.2.1	Question not answ	?? Can't find. Says "no comment"	Already answered. … 4.2.4.4 : Refer to the … Lijst-4 map-1-sur-4, page … ment : "*It caused the aircraft pitch to increase to maintain altitude. This attitude change caused the auto throttles to increase thrust to approximately 100% N1 for approximately 4 to 5 seconds to maintain selected speed. When the aircraft pitch increased, the fuel pressure warning light briefly illuminated and both Captain and First*	Why nothing on CVR, nothing in first capt statement? F/

		Officer reacted to the "fuel cue light-on" on the forward panels to query the light."	What do you mean? Nothing on CVR
4.6.4.3 & 4.6.4.4		No comment	The captain answered "roger" so he understood,
4.6.4.4.1	Question not answered objectively.	By experience and their high knowledge of Human Factor in theory and practice.	Bull shit, workload was not high, autopilot was engaged to m
4.6.4.5		No comment	Again covering up pilot error.
4.6.4.5.1		Refer to the previous answer at 4.6.4.4.1	
4.6.4.6 to 4.6.4.7.1		No comment	expert and pilot errors
4.6.4.7.2	Question not answ	The Experts do not change anything.	experts did change the statement
4.6.4.8		No comment	The Experts made a mistake : the JAR OPS-1 was issued of 22nd May 1995. But the JAR OPS is the result of a long transition period during which the national rules converged slowly towards the final target; see also 5.2.2.3 and 8.6.4.4.2). Nevertheless, it is true that the term "flooded" was not used in the KLM/ Martinair documentation. No, but the captain knew its exact meaning.
4.6.4.8.2 to 4.6.4.11	Question not answ	No comment JAR-OPS 1 never reached the final target. EASA took over.	
4.5.4.11.1 6		Most important in this case is that the indicated wind on the instrument available to the ATC controller was the actual wind for runway 29.	Not sure, not relevant. Pilots should have ques
4.6.4.11.2 & 4.6.4.12	Question not answ	No comment	Of course not, experts did not analyze time scales, and did r
4.6.4.12.1		But the crew did not understand that the runway was flooded and used the wet conditions. This is	Capt understood, don't you get it? Protecting?T

		confirmed by the CVR (briefing approach)	
4.6.4.12.2		No comment	No comment because that would blame the pilotsNo rule
4.6.4.12.3		No comment	
4.6.5			
4.6.5.1		Already answered	but not right.
4.6.5.2		This question is inappropriate. The captain understood “wet runway”	
4.6.5.2.1		Refer to answer to 4.6.2.7	Inappropriate? Is a question of the court as well. Re
4.6.5.2.2		The captain understood “wet runway”	
4.6.5.2.3	Questions not ans	The Captain understood “wet runway”, and for him there was no reason to request a confirmation.	
4.6.5.2.4		Nearby a stormy area, the weather can change very quickly, this informal remark has no real operational impact.	Good, yes. A runway can even get flooded rapidly
4.6.5.2.5 to 4.6.5.3		No comment	
4.6.5.3.1	Questions not answered.	None. It is the normal job of a pilot to try to land at the destination airport.	Also when the runway is flooded, and the crossw
4.6.5.4 to 4.6.5.5.1		No comment	No comment? Easy question. But affects the opi
4.6.5.5.2	Questions not ans	Already answered	Where?
4.6.5.6 to	Questions not ans	No comment	Q 27 of 143. Was the DASB answer correct? Wh

4.6.5.8.3			
4.7	Conclusion of the Experts on the Approach	No comment	Subject is overshoot of 111 approach radial.with 0.7
4.7.1 to 4.7.3.3		No comment	
4.7.3.4		The pilots reported to have the runway in sight from 4 [Nm] (or 1200 [ft]) and confirmed to ATC at 1100 [ft]), The visual contact with the runway was effective at 1200 [ft].	Subject here is the overshoot following the final turn
4.7.3.4.1	Question not answ	DASB says "according to the crew statement the aircraft was correctly in the slot for landing, down to an altitude of 200 [ft]". It is the exact sentence written in the final Portuguese report (English version) but the exact statement of the captain is "at 200 [ft] we were on the center line in the slot for landing"	Is not about statements, is about evidence, objectiv
4.7.3.5 to 4.7.3.8	Questions not ans		Nothing on the pilot errors?
4.7.3.9		Not true. Although very late, the aircraft reached the runway centerline.	
4.7.3.9.1	Questions not ans	No comment	How do you know? From statements? If so, why then co
4.7.3.9.2		The Experts cannot agree with the term "intentional" used by the Claimants advisors' team.	
4.7.3.10		See § 8.6.4.5 revised (of the final report of the Experts) with a picture of the document CR93080C mentioned in the official final report.	This NLR report was not issued with the RoA. Was an
4.7.3.10.1 and		See 4.7.3.10	Why did experts use an unofficial NLR report? Because the

4.7.3.10.2	Question not answered.		
4.7.3.11		No comment	Why not analyzed DFDR data as asked? If you c
4.7.3.12		Not applicable. The Experts have a transcription of the CVR. However, the exchanges did not show overconfidence but simply a professional crew performing their work professionally.	Why don't you answer the questions?
4.7.3.12.1	Questions not answere	The Experts confirm their initial evaluation	
4.7.3.12.2		No comment	?? PAPI recorded?
5	Final Approach and touchdown		
5.1	Minimum decision altitude		
5.1.1 to 5.1.2.4		No comment	no comments on rules for calls and the facts?
5.1.3		Refer to 4.7.3.4.1	page 191, second statement captain?
5.1.4 to 5.1.5.1		No comment	no comments on rules for calls and the facts? Beca
5.1.5.2		The Captain did not verbally underline the "500 feet" gate neither at 400 ft. But neither the PF nor the Captain called out for a go-around.	This question is about more what they did not. The captain initiated the Go around without sayin
5.1.5.3		When there is some rain, you obviously use wipers to enhance the vision outside. This is not what a pilot call a loss of visibility.	Aren't the rules that pilots initiate a go-around imm
5.1.5.4		Yes, it is true. But the F/E understood perfectly what the F/O was really asking for.	

		This exactly what is called "communication" by the Human Factors principles.	Giving the wrong command (anti-ice rather than wipers) is I
5.1.5.5		No comment	Was pilot error. Not i.a.w. procedures. W
5.1.5.6		The Experts want to remind that the destabilization begun more or less at this altitude. The probable reason of the mistake is the predominant stress.	There was no destabilization, co-pilot was mis-using the
5.1.5.7 to 5.2.4.2	Questions not answered.	No comment	No comments on many questions concerning pilot errors.
5.2.4.2.1	Ah, an answer. But not in accordance	That is true. But the communication is not only verbal and a gesture sometime is often enough to inform everybody about a decision. The increase of thrust could be exactly the evidence of such a gesture.	The copilot obviously not noticed a gesture either and n
5.2.5			
5.2.5.1		Normal job. The crew calculates usually the landing data card when it performs the before descent and approach briefing, then using the last weather forecast issued either by an ATIS or on request. Then it is an airmanship behavior to modify the data if necessary.	Which the crew did not. Hence, no airmansh
5.2.5.2		The Claimants advisors' team cannot say on the same sentence that the wind varied in strength and	The Experts want again to underline that a thunderstorm was quite close the final approach

Did experts carefully read?

		direction and ask the crew to use a wind provided by the tower using a wrong reference more than 5 minutes prior the scheduled landing.	path. Consequently the wind variations are a normal situation in this case. Hence, ATC provided winds could be wrong?
5.2.5.2.1	Question not answered.	Already answered or commented where?	
5.3	Rate of Descent		
5.3.1 to 5.3.2.1		No comment	
5.3.2.2		The Claimants advisors' team uses inappropriately the term "radar altitude".	Inappropriate? RADAR is acronym for Radio Detection a
5.3.2.3		The Experts want to clarify a point. The radio-altimeter indication is not so accurate : the measurement is performed perpendicularly to the plane and not vertically. That means a rapid variation of the bank angle induces an error of indication well known by the pilot performing a visual pattern at a low altitude. During the last turn, rapid changes of bank angles can occur, enough to trigger false GPWS warning. The radio-altimeter indication is then really accurate when the approach is smooth or rather smooth with small bank angle correction. Obviously, this indication is also dependent of the ground profile.	
5.3.2.4 to 5.3.3.1.1		No comment	Why no comment? Not on the ROD that DASB mentioned of 1
5.3.3.2		No. The conclusion of the Claimants advisors' team is not acceptable. The absence of GPWS warning does not show that "the rate of descent was not high" : it shows only	Claimants used the word excessive. Experts calculated ROD

		that the limits which trigger a warning (here GPWS) were not exceeded.	Was GPWS operative at this time?
5.3.3.3		The term “tried to persuade” is not appropriate. Experts did obviously not use the Blue report, the formal Cor This court case is about the behavior of theDASB towards t	The Claimants advisors’ team uses many time this term to reach their aim, that is to persuade the reader that DASB did a wrong job. In this case, as for many cases, the position of DASB is not wrong. And remember that as a member of the Commission of Investigation, the DASB’ job is exactly to make proposition to this Commission, then to discuss the final wording. It is a constant among the Claimants advisors’ team to consider the DASB as separate from the Commission of Investigation: This is a major mistake; the DASB is a part of the Commission of Investigation and must act in accordance with this role clearly defined by ICAO Annex 13.
5.3.3.3.1		The Experts also note that the Claimants Advisors’ team considers that the decreasing of the vertical acceleration could be an evidence of a possible go-around, in contradiction with what they are expressing in some previous paragraphs.	The pilot pitched up the airplane and increased the thru
5.3.3.4		This paragraph is important. During this investigation, the NLR was appointed b the Commission and not by the DASB. Consequently, the DASB was not in a position to	No, by DASB. See the title sheet of the report in RvO Annex 4.W

		allow the NLR to issue any part of an official document without the authorization of the owner of this document, i.e. the Commission of investigation.	
5.3.3.5 to 5.3.4.1		No comment	Why no comment? Was part of a question of the court
5.3.4.1.1		Refer to the core of this report and 4.5.5.4 of chapter 8.9.2 "Experts Comments".	Not found how experts calculated ROD 850 fpm to be beyond
5.3.4.2		No comment	No comment on the NTSB report? Where?This makes
5.3.4.2.1	Question not answered.	Refer to the core of this report	
5.3.5 to 5.3.5.1		No comment	
5.3.5.1.1		If the remark is relevant, the best is to ask the NLR itself. The Experts cannot answer for this laboratory.	No, the question was asked to the experts. You were
5.3.5.2 & 5.3.5.2.1	Question not answered.	No. DASB is not responsible for the NLR report neither the Commission of Investigation. NLR is responsible for its report. DASB is neither responsible for the decision of the Commission of Investigation to appoint the NLR for this study. DASB proposed this laboratory and the Commission appointed it.	Well, DASB required NLR to make changes on critica
5.3.5.3 to 5.3.5.6		No comment	Why no comments. Don't you understand the NTSB
5.3.5.7		The F/O's action plan was to land ! In this case	

		preventing an increase of thrust is a normal behavior because of the risk of increase of landing distance ! Normal? At 150 ft AGL?	Experts of claimants now lost confidence in the experts as air
5.4	Premature thrust reduction		
5.4.1 to 5.4.1.4		No comment	Why not? Pilot made an error, didn't he?
5.4.2.1		Already commented	Yes, but still not adequately. The pilots made an error,
5.4.2.2 to 5.4.5.2	Questions not answered.	No comment	No comment on this pilot error?
5.4.5.3		The ATS has full authority to reduce the thrust to flight idle if necessary and this flight idle is around 45 %	No, not correct. ATS did not reduce the thrust to below 6
5.4.5.4		No comment	Dis experts not read the NTSB letter?Don't you ment
5.4.5.4.1 to 5.4.5.5	Questions not answered.	The Experts never talk about a wrong functioning of autoflight systems	
5.4.5.6		Not relevant Not relevant? No evidence? Did you not check DFDR data? Or cannot you? Checked AOM for procedures?	Assertions not sustained by evidences.
5.4.5.7 to 5.4.5.8.2	Questions not answered.	No comment	No comment on NTSB statement? Pilot errors, isn't it
5.5	Control inputs during final approach		
5.5.1 to 5.5.5.2.4	Questions not answered.	No comment	Why no comments? Pilot errors that you don't want to comm
5.6	Autopilot disengagement		
5.6.1 to 5.6.5	Questions not answered.	No comment	
5.7	Go-around attempt		
5.7.1 to 5.7.4		No comment	

5.7.4.1.1		Please explain	The subject is the go-around attempt, not about the captain being highly professional during th
5.7.4.1.2 to 5.7.5.2.1	Question not answered.	No comment	
5.8	Alleged Lateral Displacement Just Prior To Touchdown		
5.8.1 to 5.8.5.7.1	No comments on 5 pages? Questions (6) not answered	No comment You don't have objective evidence that the airplane was on th Were DASB and Commission right? That is what the court wa Yes, the court asked you to.	It is not possible to deny the lateral displacement during the approach: at 200 ft., the aircraft is on the extended center line of the runway, and the touchdown occurred on the left-hand side on the runway 11. The reasons for this displacement was investigated by the Commission of Investigation which includes the DASB. After discussions and expertises, the Commission concluded that the causes were a huge modification of the aerological conditions. The mission of the Experts is not to evaluate the conclusions of the Commission
5.9.1 to 5.9.5.4.1	Questions not answered.	No comment	Landing with a crab angle is a pilo
5.9.5.4.2	Question not answered.	This comment is not acceptable. A good expert knows that the analysis of a situation does not at all time conduct to a binary result. Technical considerations are not in themselves sufficient and must be merged with variable inputs such as Human Factors or environmental conditions. Wisdom is a fundamental law in this matter. If everything was easy to understand or to clarify, it would not be necessary to use experts'	Experts wrote "could be", while there was objective

		competencies. In this context, the use of the words “should”, “could”, “would” is highly justified.	No, these words show weakness, uncertaincie
5.9.5.5		No comment	Pilot errors, not to be commented on, isn't it exp
5.9.5.5.1	Question not answered.	No comment	
5.9.5.6 to 5.9.5.7.1	Questions not answered.	Not relevant	On page 172, your answer was No. Now our question is not re
5.10	Point of Touchdown on the runway		
	Questions not answered.	The translation of the question could be inappropriate: It should rather be titeled “location where the aircraft crashed ” instead of “point where the touchdown occurred”. Where did the aircraft touchdown? On the far left side Is not the question. All irrelevant.	The touchdown zone of a runway is the best compromise in between the length of the runway and the clearance from obstacles in short final. The best demonstration the Experts can provide for all these questions of touchdown is the following one : 1) At takeoff, the weight of an aircraft is obviously higher than for the landing. 2) The performance at takeoff is calculated to accelerate at least to a specific speed and in case of failure, to decelerate, without exceeding the limit of the runway. When exceeding this specific speed, you must take off, meaning stopping the aircraft in the remaining runway length is not anymore possible. This consideration means that taking off from a runway which length is 2400 m for example will result in accelerating during 1400 m more or less, then, if necessary for example in case of engine failure, in decelerating, at the maximum operational take off weight, using less than 1000 m, i.e. the remaining runway length.

		Irrelevant this case Is what the NLR wrote. Why no answers to the questions?	All these considerations to say that touching down at 1000 m from the threshold will not necessarily result in an accident. This is obviously not recommended and the standard is to land between 300 m (not before because of the obstacles) and 600 m (to avoid a huge use of the brakes). 900 m is already too much. And obviously, you should correct the deceleration capabilities according to technical and operational data (i.e. a brake inoperative or a reverser stowed or a runway wet or contaminated, or tail wind …) Speaking, as the Claimants advisors' team said, of "268 m" as the touchdown point is a non-sense.
5.11	Landing gear failure		
5.11.1 to 5.11.6.21.1	Questions not answered.	No comment Really? Nothing on 8 pages?	Nothing on the NTSB report (Appendix 35)?Nothing on the
6	Cause of the accident by the Experts		
6.1	Conclusions and Recommendations Draft Report changed by DASB		
6.1.1		No comment	No comments on the changes in causes bet
6.1.2	"6.1.2.1 DASB tried to persuade the Commission during a visit and with deletions and additions in the Report RVDL3 (lijst 4 tab 23) to change the causes to: …"	All along this paragraph, the Claimants advisors' team uses the term "*DASB tried to …*". DASB did its job as member of the Commission of Investigation. This is, perhaps, the most important point : As member of the Commission of Investigation, DASB becomes independent of the Netherlands authorities. Simultaneously, as expert appointed to the Commission of Investigation in agreement with the	Don't you agree after reading the referenced Blue rep This court case is not about the job as member of

		ICAO Annex 13, DASB is not independent; it is a part of the Commission of Investigation and must provide the Commission with all its opinions and analysis.	DASB, and not the Commission answered the ques
6.1.3		The Experts used another wording to underline the fact that the accident is due to the contact with the ground. Doing so, the Experts underlined the fact that a decision to go-around will be enough to save the plane and its passengers, exactly what the Claimants advisors' team is trying to say from the beginning of their contributions. But the problem is not here: the accident occurred and we are not in charge to define any liability ; we have to define if whether or not, DASB performed its job in due care.	No, not only. The approach was not i.a.w. the prescribed pr The decision was made, and a go-around was initiated. But d Wrong. Experts were asked to determine whether DASB t
6.1.4 to 6.1.4.5.7	Eight questions not answered.	No comment	
6.2	Conclusion Experts Question not answered.	No comment	Important question not answered. Competence of experts is do
6.3	More Conclusions Experts Questions not answered.	No comment	
7	Other Aspects 12 Questions not answered.	No comment Experts continue to avoid answering the questions. O	The Experts explained why they considered important to performed their own analysis, validating such point or at the opposite, raising such or such question, for example about the Human Factors

		It sure is difficult if you don't have the expertise. Experts should l	considerations. Otherwise, it would be quite difficult to answer the questions raised by the Judge about the quality of the work performed by the DASB during this investigation.