Accident
Boeing MD-11, D-ALCQ,
Jul 27 2010, Riyadh,
Kingdom of Saudi Arabia

Annual meeting between National Civil Aviation Safety Investigation Authorities and EASA

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Accredited Representative Germany

Topics

1. Accident Boeing MD-11 Riyadh

2. Participation of EASA

3. Safety and Airworthiness Discussion

4. Conclusion

Aircraft overview

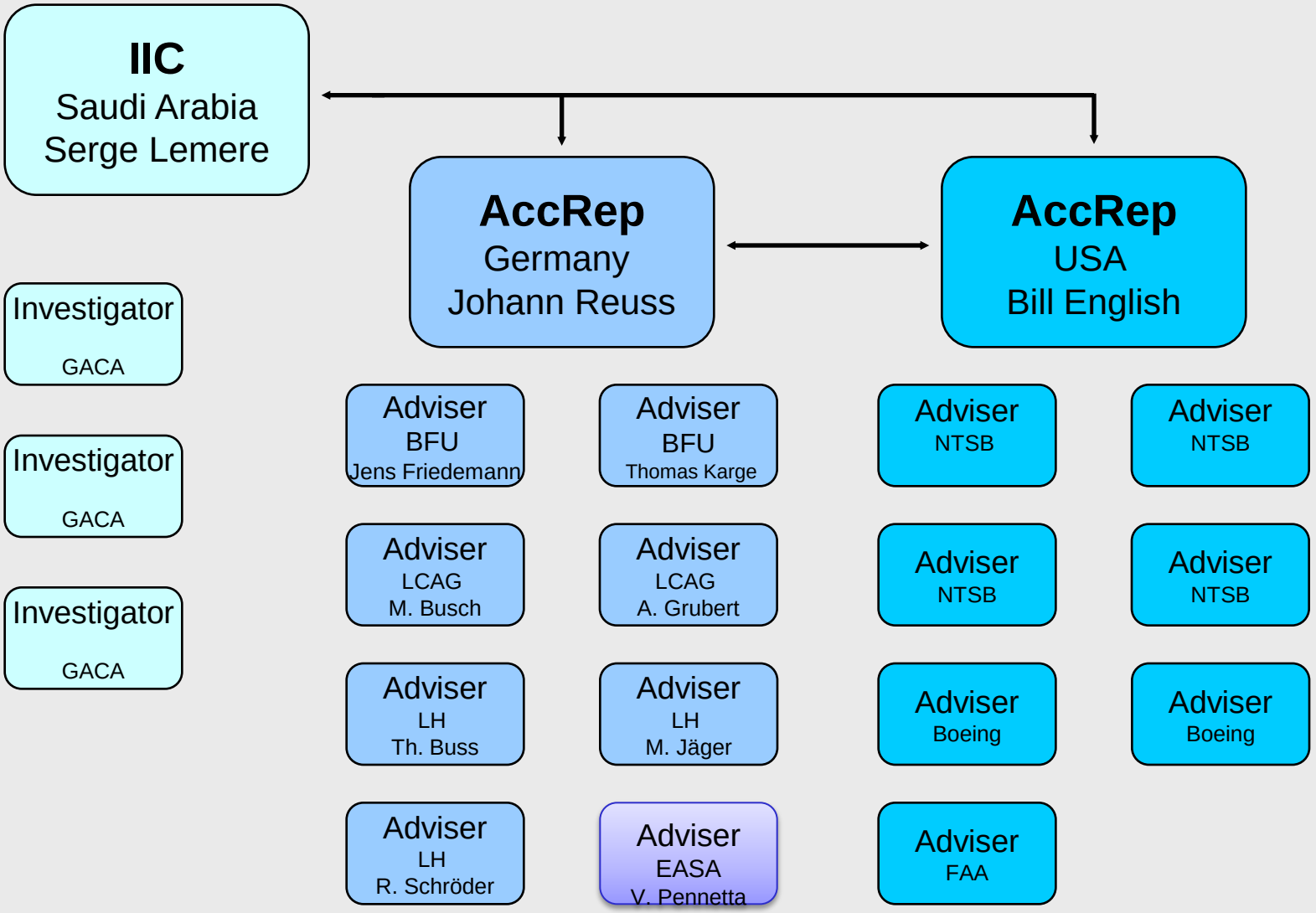
Aircraft overview

Aircraft overview

RWY Traces


KKIA-4095
28/07/2010 09:00

Organisation ICAO Annex 13



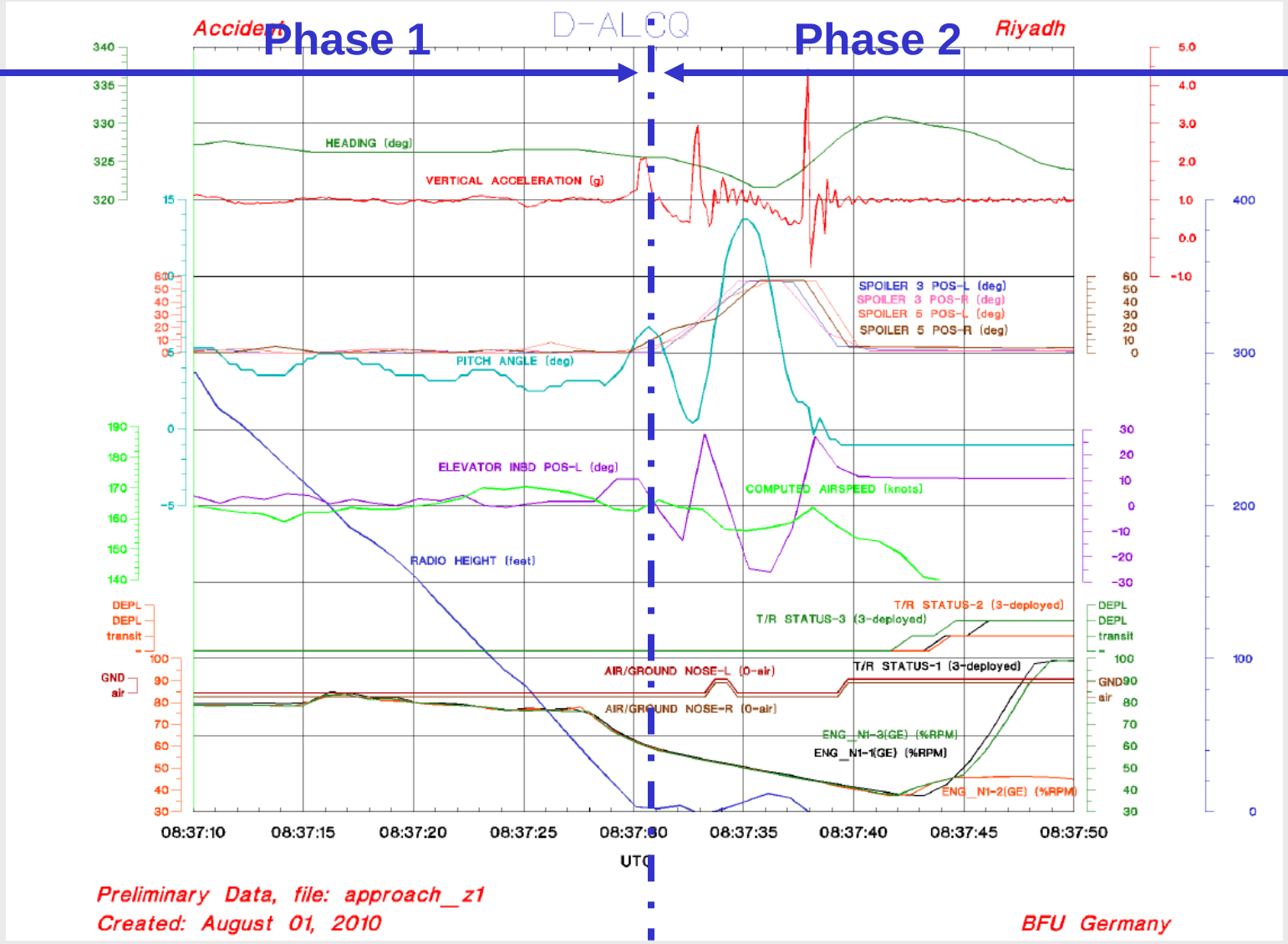
Groups

BFU	NTSB
Data (CFR, FDR, DAR)	Ops
Aircraft	Performance/ Systems

Investigation

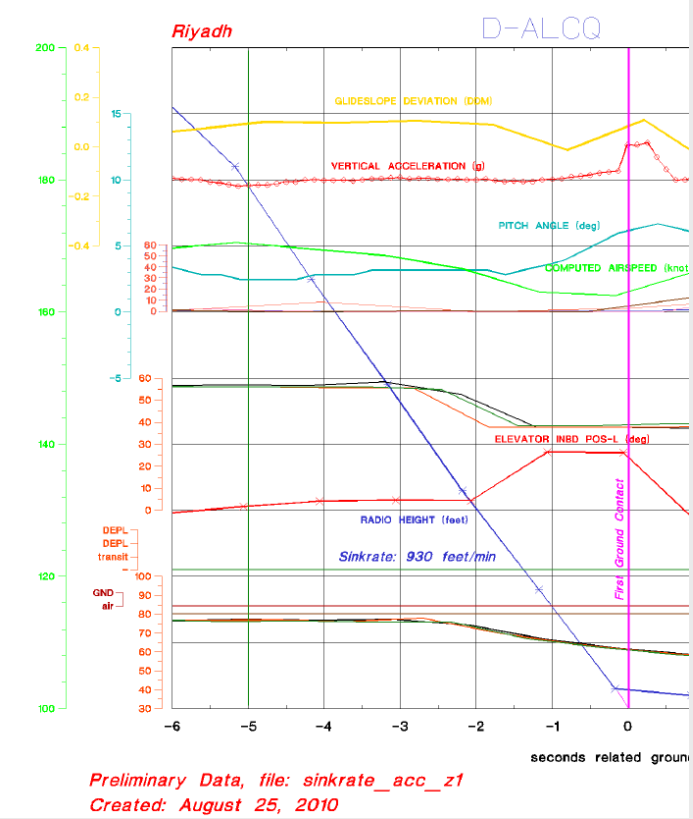
Recorders

FDR: Events


Accident
Phase 1
D-ALCQ
Phase 2
Riyadh
HEADING (deg)
VERTICAL ACCELERATION (g)
SPOILER 3 POS-L (deg)
SPOILER 3 POS-R (deg)
SPOILER 5 POS-L (deg)
SPOILER 5 POS-R (deg)
PITCH ANGLE (deg)
ELEVATOR INBD POS-L (deg)
COMPUTED AIRSPEED (knots)
RADIO HEIGHT (feet)
T/R STATUS-2 (3-deployed)
T/R STATUS-3 (3-deployed)
T/R STATUS-1 (3-deployed)
AIR/GROUND NOSE-L (0-air)
AIR/GROUND NOSE-R (0-air)
ENG_N1-3(GE) (%RPM)
ENG_N1-1(GE) (%RPM)
ENG_N1-2(GE) (%RPM)
DEPL
DEPL
transit
GND
air
08:37:10
08:37:15
08:37:20
08:37:25
08:37:30
08:37:35
08:37:40
08:37:45
08:37:50
UTC
Preliminary Data, file: approach_z1
Created: August 01, 2010
BFU Germany

Phase 1: Analysis

Facts:



Analysis:

- sink rate slightly high
- late flare just before touch down

Why?

- high temperature?
- high landing weight?
- PF low experience on MD11?
- F/Os prior experience (German Wings) did not prepare him for landings with large aircraft on airports like Riyadh?

Safety Defences:

- Captain (pilot monitoring) did not realize the higher sink rate and instruct a G/A

Phase 1: Analysis

- The firm landing was caused by a slightly high sink rate and a misjudged flare.
- The crew did not realize the lift off after first touch down.
- The crew did not see a necessity to perform the “bounced landing recovery procedure”.

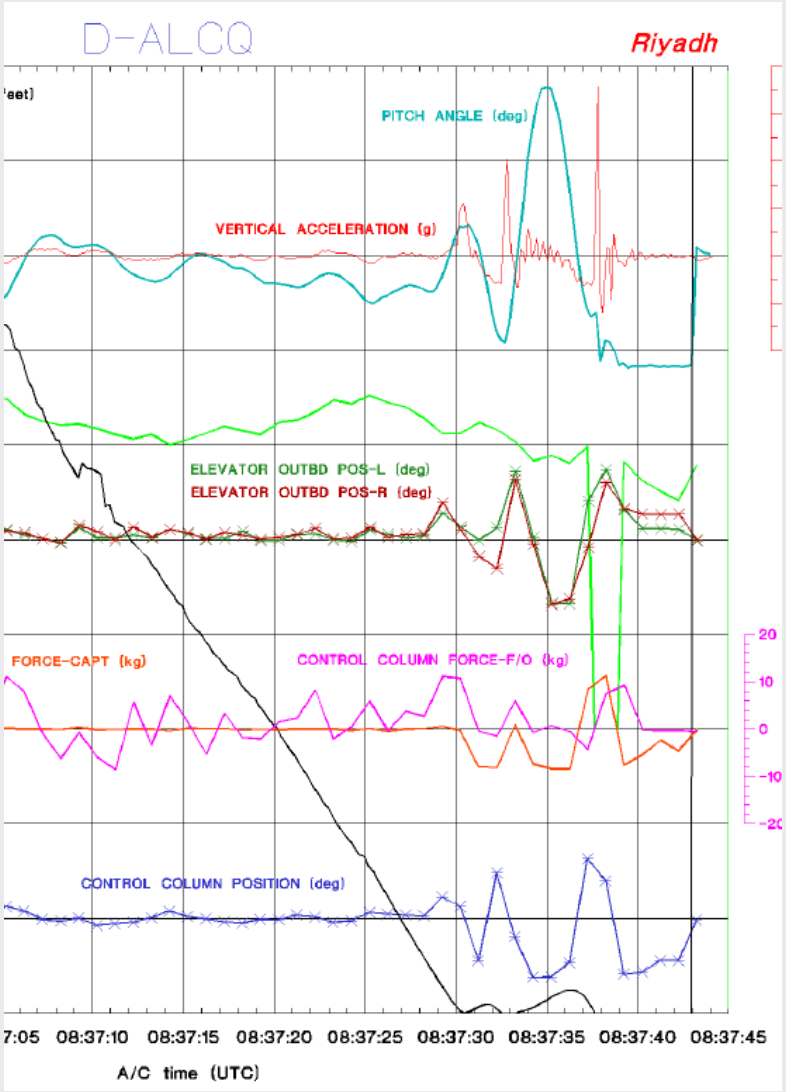
Remark:
Result of the firm landing was a hull loss.

Phase 2: Analysis

Safety Defenses:

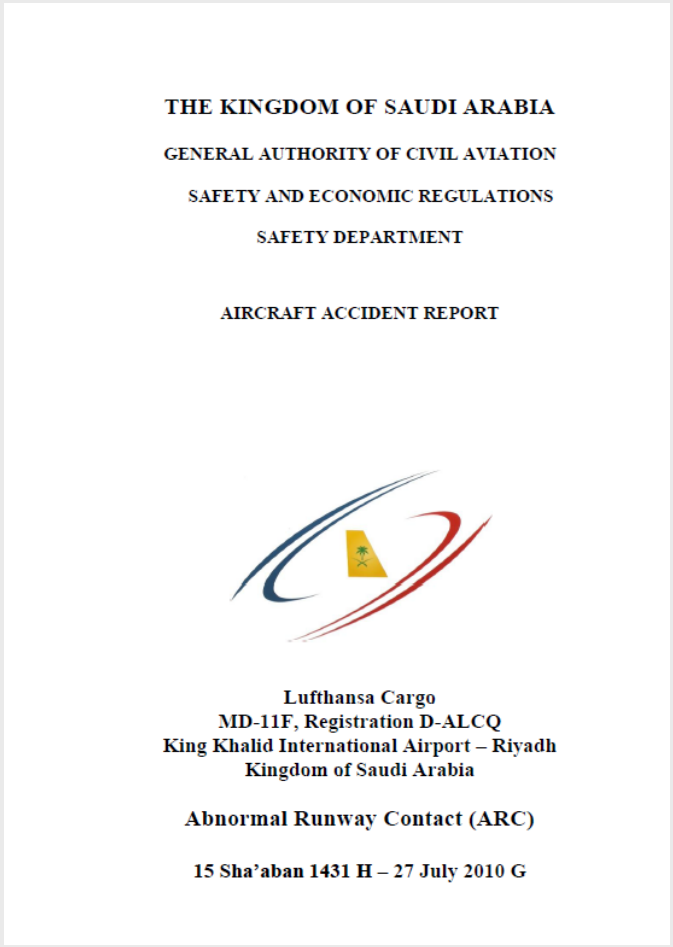
- A safety defense to detect a lift off after first touch down was not available or successful.
- Bounced Landing Recovery Training was not successful.
- Landing Technique: There was no description and instruction what pilots have to do in case of high touch down rates (full elevator deflection might be unsuccessful).

Phase 2: Analysis



- Both pilots didn‘t realize the lift off after first touch down.
- The excessive pitch up (-4° to 14°) after first touch down indicated that the aircraft was out of control.
- Both pilots didn’t realize the situation.
- Both pilots were not aware of the high pitch rate.
- Control column inputs induced by PF were not successful to recover the aircraft.
- Control column inputs seems to be in line with the elevator deflection (short time delay?)
- At high touch down rates, full elevator input might be insufficient to keep the nose wheel from touching down hard.

Final Report



THE KINGDOM OF SAUDI ARABIA

GENERAL AUTHORITY OF CIVIL AVIATION

SAFETY AND ECONOMIC REGULATIONS

SAFETY DEPARTMENT

AIRCRAFT ACCIDENT REPORT

Lufthansa Cargo
MD-11F, Registration D-ALCQ
King Khalid International Airport – Riyadh
Kingdom of Saudi Arabia

Abnormal Runway Contact (ARC)

15 Sha'aban 1431 H – 27 July 2010 G

- Issued by GACA
- In accordance with ICAO Annex 13

Final Report: Findings (1)

3.0 FINDINGS

3.1 Cause Related Findings.

1. The flight crew did not recognize the increasing sink rate on short final.

2. The First officer delayed the flare prior to the initial touchdown, thus resulting in a bounce.

3. The flight crew did not recognize the bounce.

Final Report: Findings (2)

4. The Captain attempted to take control of the aircraft without alerting the First Officer resulting in both flight crews acting simultaneously on the control column.

5. During the first bounce, the Captain made an inappropriate, large nose-down column input that resulted in the second bounce and a hard landing in a flat pitch attitude.

6. The flight crew responded to the bounces by using exaggerated control inputs.

7. The company bounced-landing procedure was not applied by the flight crew.

Final Report: Findings (3)

3.2 Other Findings

1. The flight crew was properly licensed and was qualified on the type of aircraft.

2. The meteorological conditions did not contribute to the accident.

3. The aircraft was properly certificated and had been maintained in accordance with approved procedures.

4. The aircraft had no oral or visual indicator, such as a HUD, to inform the flight crew of a bounced landing.

Safety Recommendation No.1 (9)

1. The FAA should require Boeing to revise its MD-11 Flight Crew Operating Manual to reemphasize high sink rate awareness during landing, the importance of momentarily maintaining landing pitch attitude after touchdown and using proper pitch attitude and power to cushion excess sink rate in the flare, and to go around in the event of a bounced landing (A-11-68).

   Safety Action was taken by Boeing on 15 February 2011. The MD-11 Flight Crew Operating Manual was revised by Boeing in accordance with the stated recommendation A-11-68.

Safety Recommendation No. 2 (9)

2. Once Boeing has completed the revision of its MD-11 Flight Crew Operating Manual as recommended in Safety Recommendation A-11-68, the FAA should require all MD-11operators to incorporate the Boeing-recommended bounce recognition and recovery procedure in their operating manuals and in recurrent simulator training (A-11-69).

3. Lufthansa Cargo should consider installing Head-Up Displays (HUDs) on its MD-11F aircraft.

Participation of EASA

EU996 (Article 8): Participation of EASA

1. *Safety investigation authorities shall, provided that the requirement of no conflict of interest is satisfied, invite EASA and …*

…
(b) as an adviser appointed under this Regulation to assist accredited representative(s) of the Member states in any safety investigation authority is invited to designate an accredited representative in accordance with international standards and recommended practices for aircraft and incident investigation, under the supervision of the accredited representative.

EU996 (Article 8): Participation of EASA

(b) as an adviser appointed under this Regulation to assist accredited representative(s) of the Member States in any safety investigation conducted in a third country to which a safety investigation authority is invited to designate an accredited representative in accordance with international standards and recommended practices for aircraft accident and incident investigation, under the supervision of the accredited representative.

….

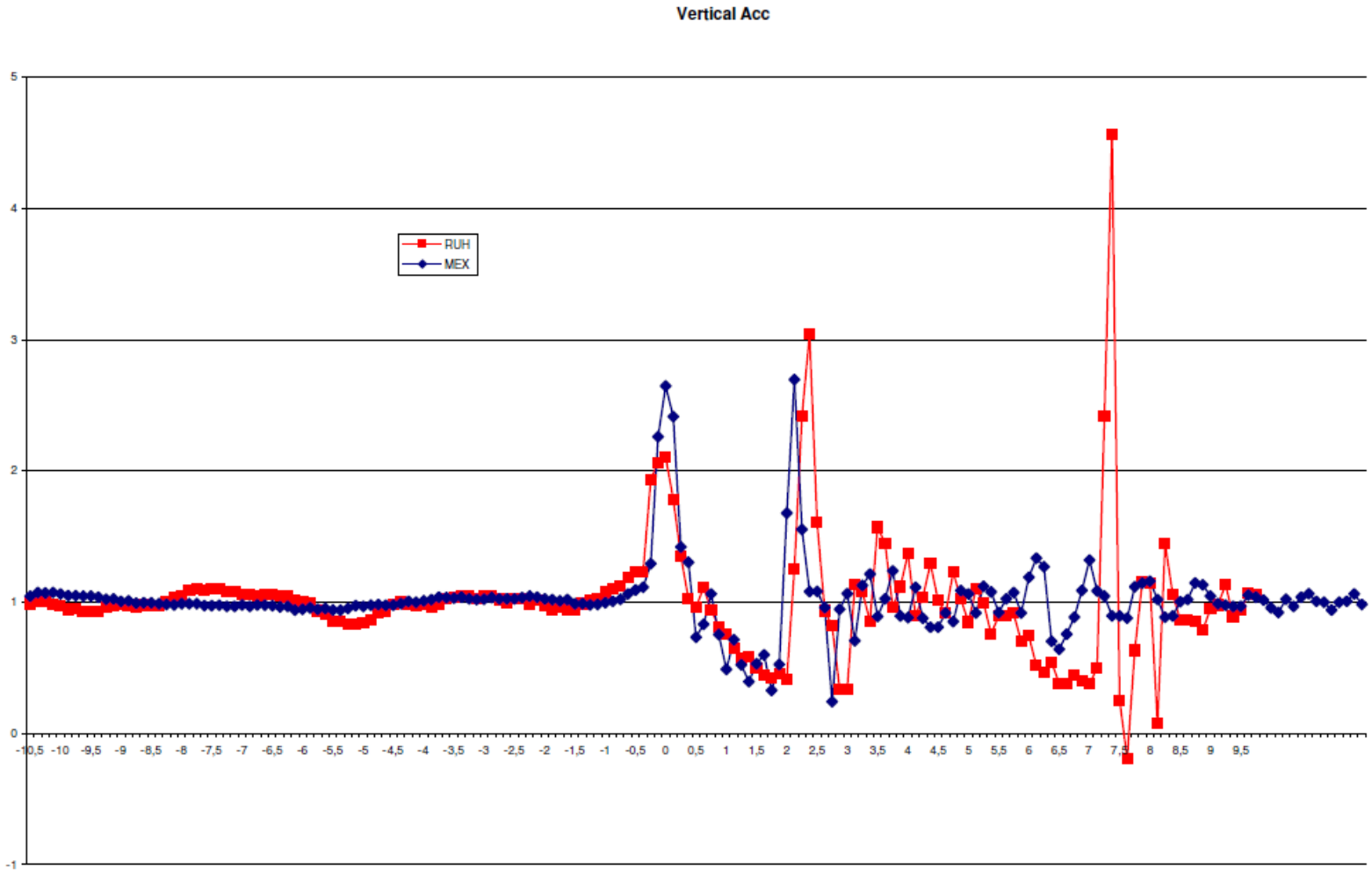
…

(d) Participate in the read-outs of recorded media, except cockpit voice or image recorders

Safety and Airworthiness Discussion

Situation after report publishing

- HUD Safety Recommendation addressed to Lufthansa Cargo
- Safety Recommendation was accepted by Lufthansa Cargo. The implementation was not possible.
- The A/C manufacturer did not accept a change or modification of the MD11.
- Result: No HUD or bounce indication system
- The Riyadh accident was similar to other MD-11 landing accidents (Mexico, Narita, ….


Vertical Acc
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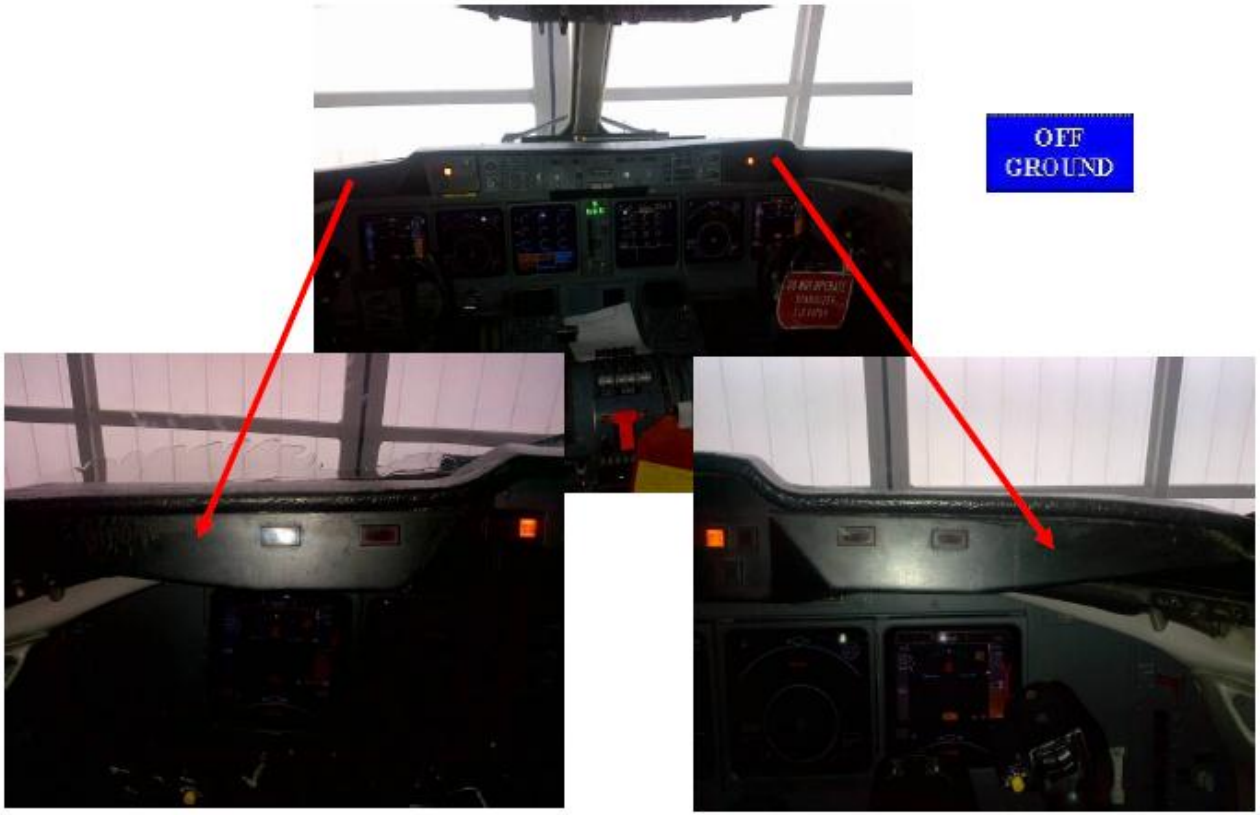
Further Meetings and Workshops

- NTSB MD11 Review Group Briefing to Boeing, FAA, BFU, EASA, FedEx, Lufthansa, and ALPA on MD11 Group's activities (Oct 2012 in Long Beach)
- Additional Meeting of FAA and EASA in Long Beach
- EASA Meeting with European MD-11 operators (March 2013 Cologne)

OFF-GROUND Advisory System (OGAS)

OGAS Location



Conclusions (1)

- If case of an investigation conducted by an non-European country with participation of an European SIA it is imported:
  - To comply with ICAO Annex 13,
  - To accept national rules and regulations,
  - To act as an European team,
  - To share information and know-how

Conclusions (2)

- Experience in the Riyadh investigation:
  - The assistance by EASA was helpful,
  - Communication between EASA and AccRep was open and fruitful,
  - There was a functional interface between the EU 996 investigation and further activities in terms of airworthiness by EASA.

Thank you very much for you attention!