



ACCIDENT INVESTIGATION REPORT BRIEF

(REF. BEA09072018-01)

ATR 72-600/CN-COH (RAM EXPRESS)

AL HOCEIMA (GMTA) / MOROCCO

OUTLINE

- I. Organization of the investigation
 - II. Factual information
 - III. Analysis
 - IV. Conclusion
 - 4.1. Findings;
 - 4.2. Causes
 - v. Safety Recommendations
- 
- A decorative graphic consisting of several parallel white lines of varying lengths, slanted upwards from left to right, located in the bottom right corner of the slide.

I- ORGANIZATION OF THE INVESTIGATION

Accident time: July 09th, 2018

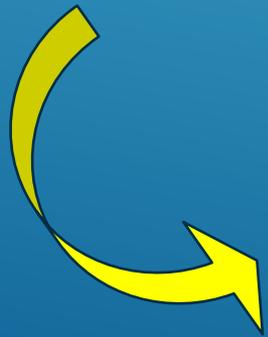
1st notification : July 11th, 2018, Category : Bird strike

- ❑ Rerouting to Nador
- ❑ Removal of the Flight recorder (CVR&DFDR)

2nd notification : July 17th, 2018, Category : Impact with the sea water

▶ **Preliminary Classification: « IMPACT WITH THE SEA WITHOUT LOSS OF CONTROL IN FLIGHT « CFIT » BARELY AVOIDED »;**

- Departure of a Go-Team to NADOR
- Investigator in charge Designation and the technical staff Team
- Forward the Notification to the relevant States and stakeholders
- Flight Recorders read-out (CVR, FDR);
- Technical crew interview....
- Press release preparation;
- BEA France assistance (CVR:DFDR Read-out);
- GPWS expertise of by the manufacturer (ACSS)...



II- FACTUAL INFORMATION

AIRPORT NAV (JULY 09TH)

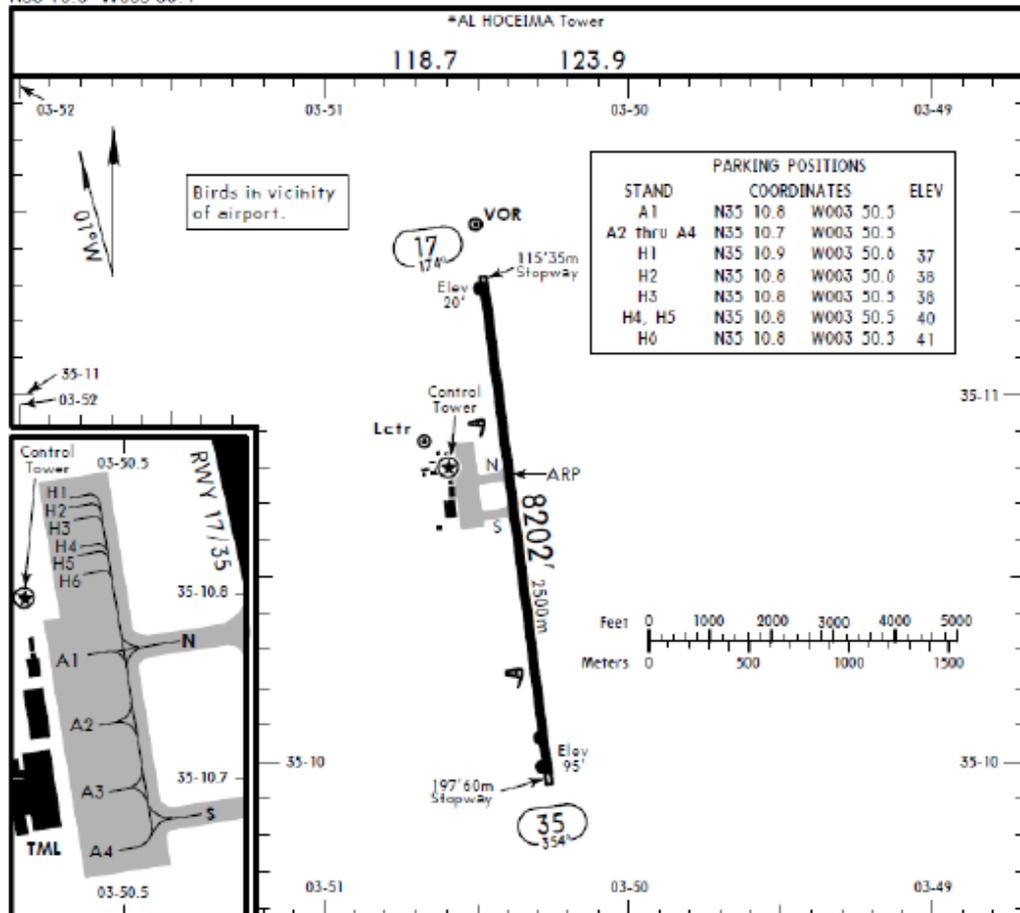
Nav, aids available and operational:

ILS,
MLS,
NDB,
PAR,
VOR,
visual ground aids, etc.,

- VOR - Minimums:
760 Ft, Visibility 3200 m

GMTA/AHU
Apt Elev 95'
N35 10.8 W003 50.4

JEPPESEN AL HOCEIMA, MOROCCO
20 JUL 18 (10-9)
CHERIF EL IDRISSE INTL



ADDITIONAL RUNWAY INFORMATION

RWY	HIRL (60m) PAPI (angle 3.0°)	USABLE LENGTHS		TAKE-OFF	WIDTH
		Threshold	Glide Slope		
17	HIRL (60m) PAPI (angle 3.0°)				148'
35	HIRL (60m)				45m

GMTA 091800Z 36004KT 4000 BR OVC006 23/23 Q1016 NOSIG=

- Airport : Charif Al Idrissi-Côte du Rif, Morocco (GMTA/AHU)
- Report time : Issued on the 9th of the month, at 18:00 UTC
- Winds : from 360°(north) at 4 knots
- Visibility : 4.000 m
- Precipitation : Mist
- Clouds : Overcast at 600 feet
- Temperatures : Temperature 23°C, dew point 23°C
- Pressure : QNH 1016 hPa
- Expectations : No significant changes expected

GMTA 091900Z 02002KT 4000 BR OVC006 23/23 Q1016 NOSIG=

- Airport : Charif Al Idrissi-Côte du Rif, Morocco (GMTA/AHU)
- Report time : Issued on the 9th of the month, at 19:00 UTC
- Winds : Wind from 20°(north) at 2 knots
- Visibility : Visibility is 4,000 m
- Precipitation : Mist
- Clouds : Overcast at 600 feet
- Temperatures : Temperature 23°C , dew point 23°C
- Pressure : QNH 1016 hPa
- Expectations : No significant changes expected

GMTA 092000Z 08002KT 4000 BR OVC006 23/23 Q1017 NOSIG=

- Airport : Charif Al Idrissi-Côte du Rif, Morocco (GMTA)
- Report time : Issued on the 9th of the month, at 20:00 UTC
- Winds : Wind from 80°(east) at 2 knots
- Visibility : Visibility is 4,000 m
- Precipitation : Mist
- Clouds : Overcast at 600 feet
- Temperatures : Temperature 23°C, dew point 23°C
- Pressure : QNH 1017 hPa
- Expectations : No significant changes expected

09TH)

METE

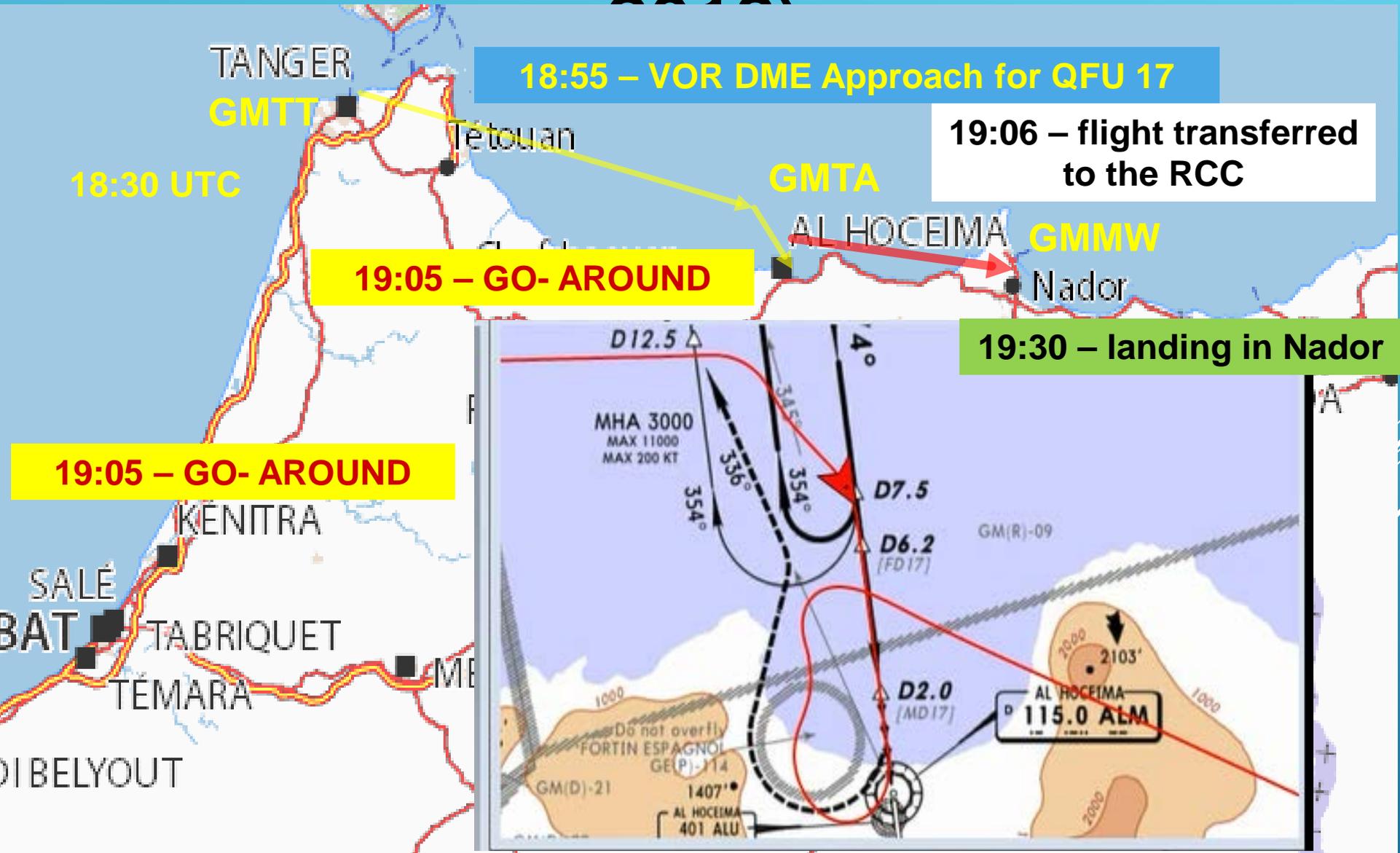
II- FACTUAL INFORMATION

HISTORY OF THE FLIGHT (JULY 9, 2010)



II- FACTUAL INFORMATION

HISTORY OF THE FLIGHT (JULY 9, 2010)



II- FACTUAL INFORMATION

HISTORY OF THE FLIGHT (NARRATIVE)

- **09th of July 2018**: from Tangier to Al Hoceima (54 PAX, 04 crew + 01 observer).
- **During the approach**, the plane **hit the sea water** at about 2540 m before the runway of Al Hoceima Airport and climbed up to reroute to Nador Airport.
 - ❖ The aircraft suffered **significant damage**;
 - ❖ Immobilization of **10 weeks** ;
 - ❖ **No injuries** were reported.

II- FACTUAL INFORMATION

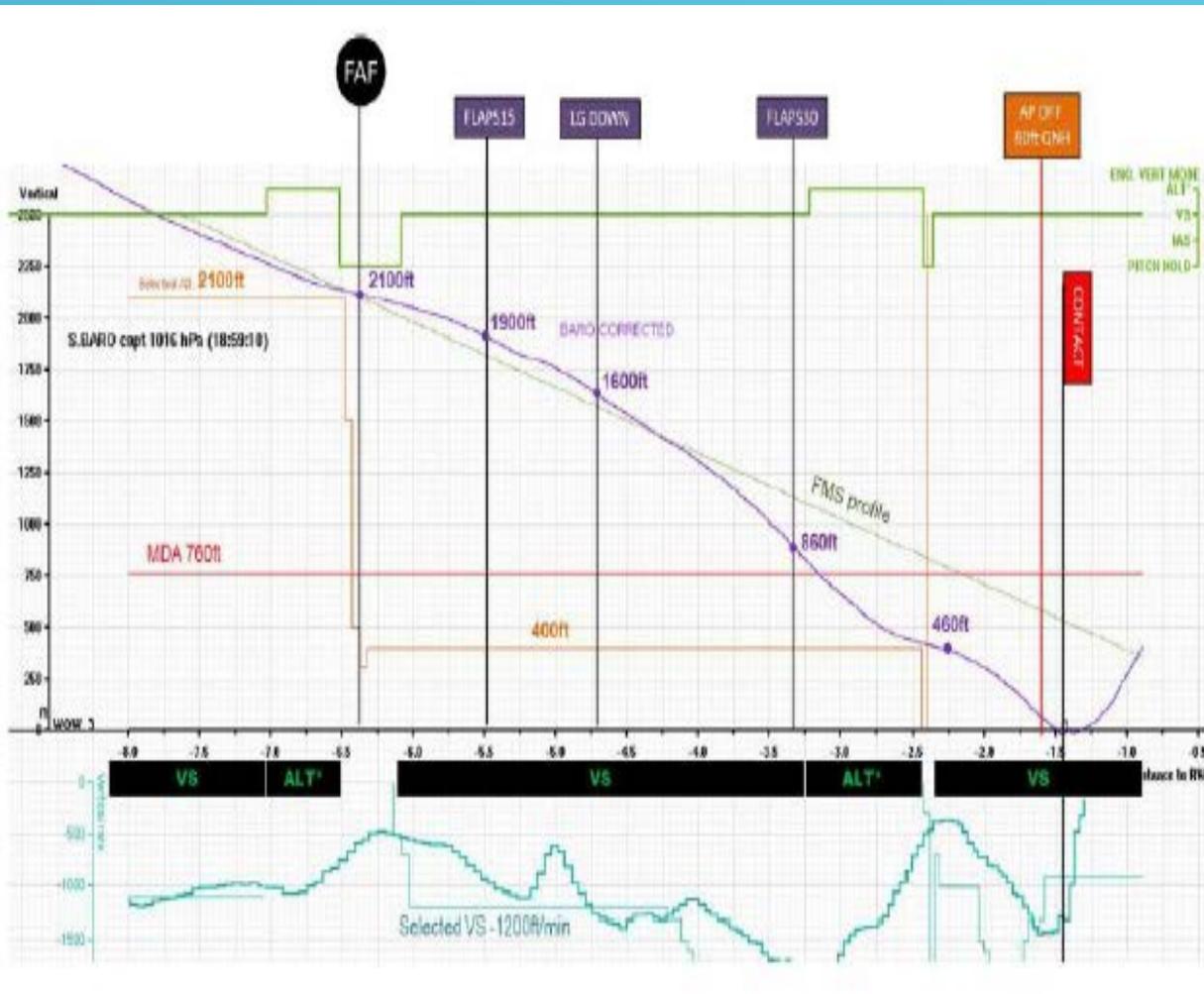
3RD APPROACH'S PROFILE TO AL HOCEIMA

One short Briefing at Tangier Airport
for both **departure** and the **approach** to Al Hoceima

- VOR/DME approach, with a minimum of **760 ft**;
- If the runway is not in sight at the minima, will descend to **400 ft** and maintain this altitude;
- If the runway is still not in sight **at 2NM** from the VOR, will have to abort the approach and go-around.
- CDB accepts, after consulting the DDM, the co-pilot's suggestion to **stop the GPWS** to avoid alarms during the descent and the approach.

II- FACTUAL INFORMATION

3RD APPROACH'S PROFILE TO AL HOCEIMA



- ❖ LNAV mode was active;
- ❖ V/S engaged (AP):
 - - 1500 ft/mn,
 - - 1600 ft/mn,
 - -1800 ft/mn.
- ❖ IAS: 230 kt.

When the Approach becomes unstable **below 1000 ft AGL**, the crew must immediately engage a **go-around**

II- FACTUAL INFORMATION

WRECKAGE AND IMPACT INFORMATION

Point d'impact du CN-COH du 09/07/2018

Rédigez une description pour votre carte.

Point impact Point d'impact

Légende

- Début de piste de l'aéroport GMTA
- 📍 Point d'impact

Règle

Ligne Trajet Polygone Cerde Trajet 3D Polygone 3D

Mesurez la distance entre deux points au niveau du sol.

Longueur de la carte : 2 644,05 Mètres

Longueur au sol : 2 644,04

Direction : 172,41 degrés

Navigation à la souris

Enregistrer

Effacer

Google Earth

Image ©2016 TerraMetrics
Image ©2018 DigitalGlobe
©2018 Google

1 km



II- FACTUAL INFORMATION

FLIGHT RECORDERS

1.11.1. Cockpit Voice Recorder (CVR)



Manufacture: L3Com
Model: FA2100
P/N: 2100-1225-22
S/N: 001202949
Medium: Solid State
State of the recorder: No damage (visual inspection)
Read-out equipment: L3Com Recorders Portable Ground Support Equipment (RPGSE)
Analysis system: ROSE
Recording configuration: 2heures, 4 channels
Recording quality: Good and clear
Contents: 2 hours
Channel1: CM1/Channel2: CM2 /Channel 3:CM3/Channel4: AREA

1.11.2. Flight Data Recorder (FDR)



Manufacture: L3COM
Model: FA2100
P/N: 2100-4245-00
S/N: 000820548
Medium: Solid State
State of the recorder: No damage (visual inspection)
Read-out equipment: L3Com Recorders Portable Ground Support Equipment (RPGSE)
Analysis Equipment: ROSE
Recording Length: Approximately 50 hours flight data
Recording quality: Good

II- FACTUAL INFORMATION

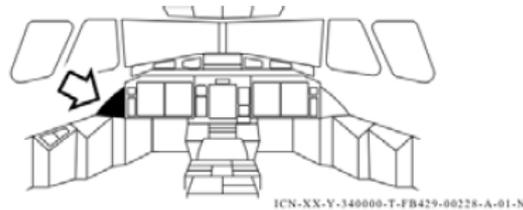
INFORMATION ABOUT GPWS (GROUND PROXIMITY WARNING SYSTEM)

THREATENING TERRAIN OR RELIEF ALERTS DISPLAY

Alert level	Aural Warning	Navigation display	Visual warning
Warning	<i>OBSTACLE AHEAD, PULL UP</i>	- Automatic - 10Nm display - solid red area	<i>On each flight crew's glareshield,</i> OBSTACLE pb light comes on RED PULL UP,
	<i>TERRAIN AHEAD PULL UP</i>		
Caution	<i>TERRAIN AHEAD</i>	- Automatic - 10 Nm display	<i>On each flight crew's glareshield,</i> OBSTACLE pb light comes on
	<i>OBSTACLE AHEAD</i>	- Solid yellow area	AMBER "GPWS"

II- FACTUAL INFORMATION

INFORMATION ABOUT (GPWS)



All modes are inhibited by stall warning:

- Mode 5 is active if the PF side ILS is tuned on the correct frequency and if the gear is Down;
- GPWS or TERR FAULT lighting indicates that some or all reactive or predictive warnings are lost.

In that case, the remaining alerts must be considered as valid and taken into account.

1.18.2.1 APPROCHES DE NON PRÉCISION

- La case "LNAV" sur les cartes est associée à cette approche. Puisqu'il s'agit d'une approche de non précision,
- Il est défini un FAF (Final Approach Fix, début de l'approche finale), une MDA (Minimum Descent Altitude) et un MAP (Missed Approach Point).
- La MDH (Minimum Descent Height) ne peut pas être inférieure à 300 pieds.

immediately initiate a CLIMB AND A TURN, based on any available information but preferably external visual reference. Continue to maneuver until warning stops.

II- FACTUAL INFORMATION

TESTS AND RESEARCH (GPWS BY ACSS)

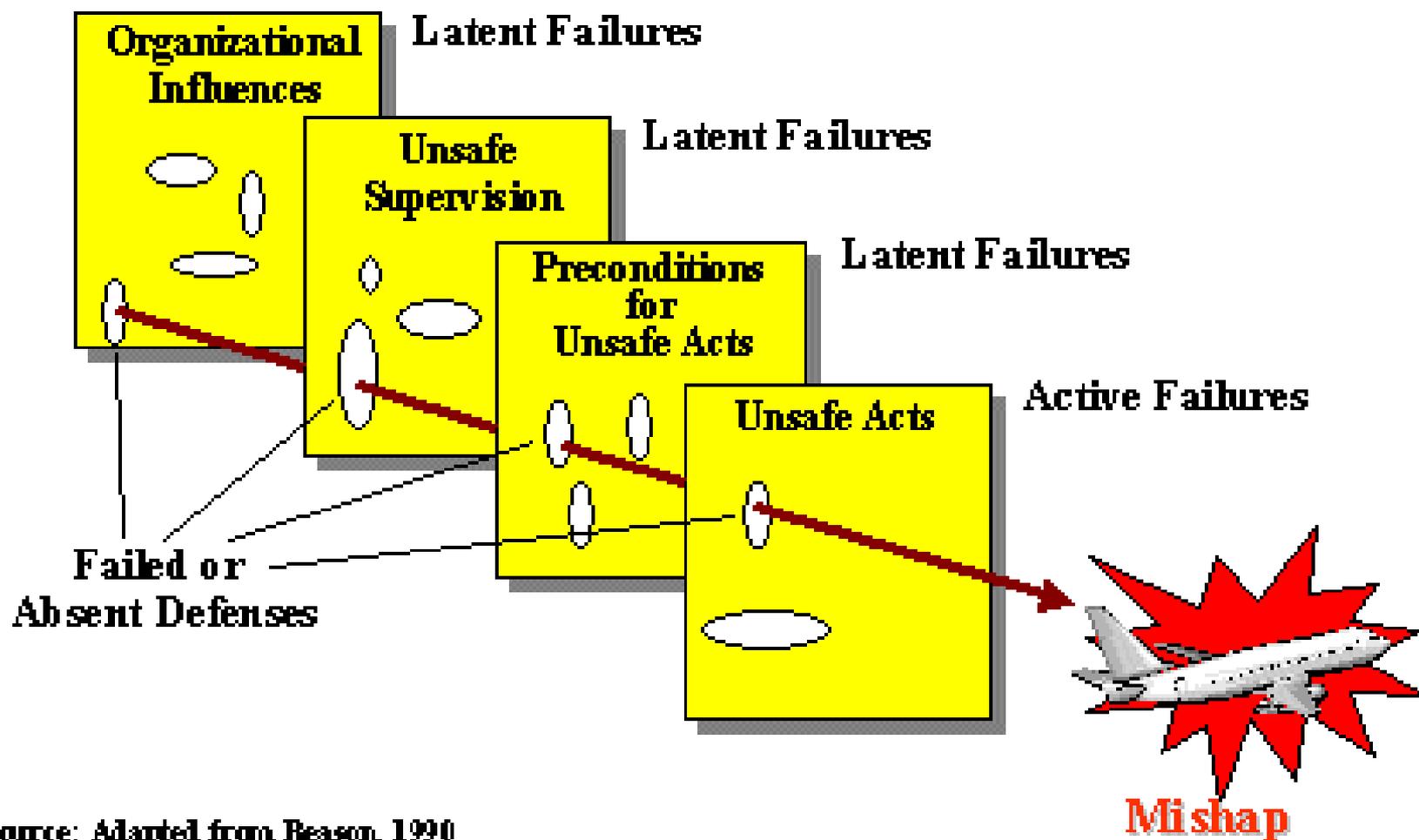
1ST LEG (CMN- GMTA)

Conditions d'Alerte lors de l'approche de la première étape sur AHU

Time	7/9/18 4:10 PM
Flight Phase	Cruise Approach
Latitude	35.203136 degrees
Longitude	-3.843681 degrees
Altitude	83.5 feet
CPA Altitude	75.5 feet
Terrain Altitude	6.6 feet
Radio Altitude	70.0 feet
Total Minimum Terrain Clearance Distance (MTCDD)	38.9 feet
Vertical Speed	-928.4 ft/min
Terrain Closure Rate	860.2 ft/min
Airspeed	115.8 knots
Ground Speed	122.4 knots
True Track	172.5 degrees
Nearest RWY Dist	1932.7 meters (6340.9 ft)
Landing Gear	Down and Valid
Landing Flaps	Down and Valid
Pilot Terrain Inhibit	No Inhibit

- ❖ Was tested and inspected with the presence of MAIG air investigators;
- ❖ No Failure detected;
- ❖ No defects in the TAWS and TCAS Logs;
- ❖ All functional tests were successful.

The Reason Model and Accident Causal Chain

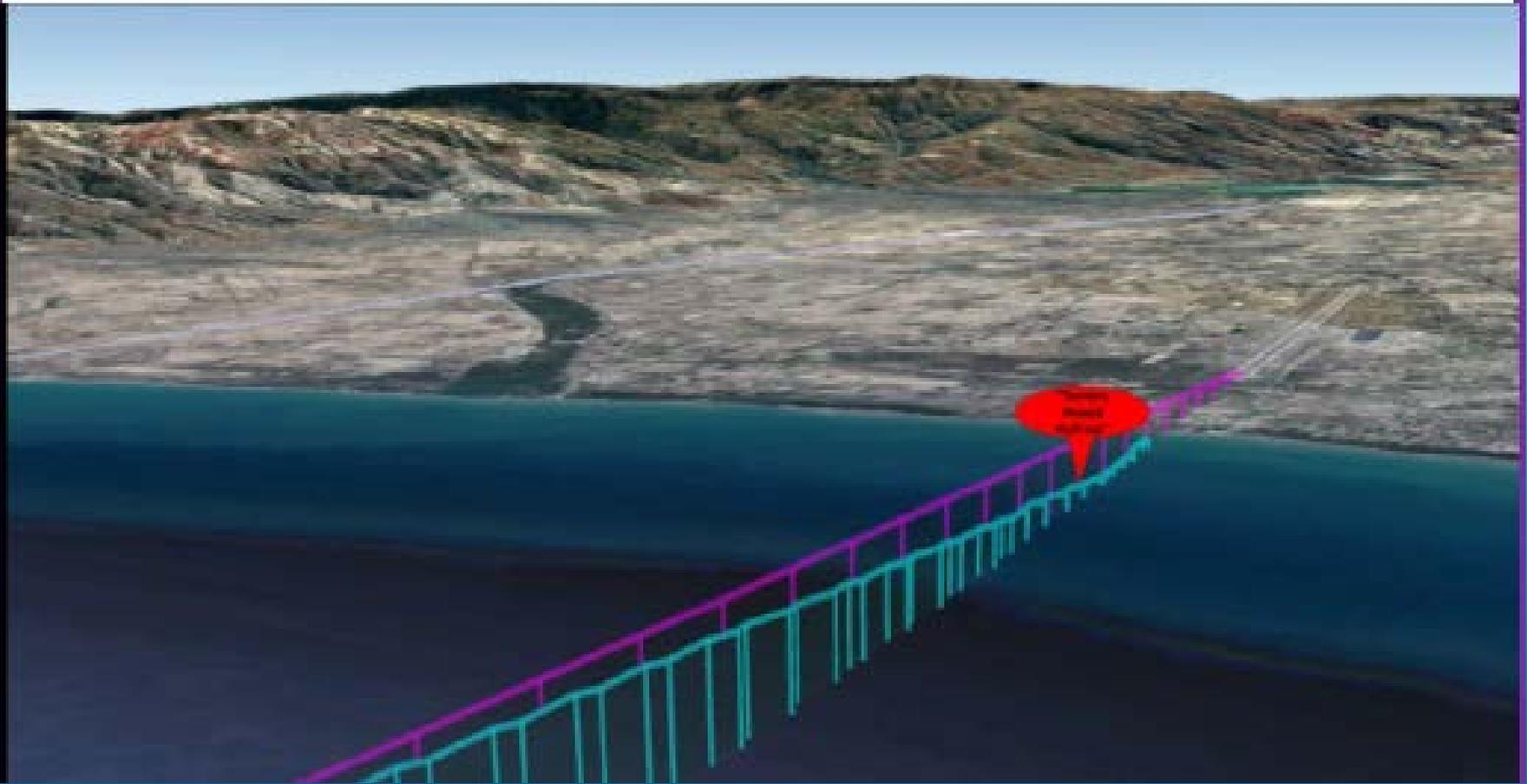


Source: Adapted from Reason, 1990

III- ANALYSIS

1ST APPROACH TO AL HOCEIMA

Figure Essai/Rech1 : profile du plan nominal (3°) / profile suivi par avion



III- ANALYSIS

1ST VERTICAL PATH ON THE APPROACH TO AL HOCEIMA

Trajectory in Magenta shows the descent plan at 3 degrees

Trajectory in blue shows the path of the aircraft

Trajectory in green shows the lower limit of the landing cone defined by TAWS



(Source : ACSS)

III- ANALYSIS

WATER TOUCH AND RISE:

- ❖ 19:03:47: the FP says, "**this is not normal**" and then announces in native language which means "now take it manual";
- ❖ 19:03:49: height **80 feet and speed 130 kt**, the OPL disengages the AP. For 9 seconds, the PF applies nose up forces on the stick while the PM applies nose down forces. The maximum opposing force on the two control columns reached 3 times 68 DaN;
- ❖ 19:03:51: PF **advanced the throttles to 74° position (in 4 s)**;
- ❖ 19:03:5: the **landing gear were compressed**; the **aircraft struck the surface of the water twice**;
- ❖ At the time of the second impact, the aircraft has a **-3° nose-down attitude** and underwent a **vertical acceleration of 3.92G** and a deceleration of 0.42G.

III- ANALYSIS

Aspects linked to this occurrence

Al Hoceima airport classified (requiring special precautions / training and experience of flight crews);

WEATHER marginal to facilities (ceiling lower than minimums);

GPWS ground impact warning equipment (H/S) switched off by crew;

Classic approach procedures requiring a high level of crew coordination;

Low experience on the type of CDB and co-pilot.

IV- CONCLUSION

FINDINGS

Operating fundamentals:

The company holds a valid Technical Operating Certificate;

The Aircraft's Certificate of Airworthiness is valid;

The crew members hold valid licenses and qualifications;

Crew scheduling is done in accordance with the regulations in force and crews have had sufficient rest before undertaking the mission.

III- CONCLUSION

FINDINGS

Meteorology and airport :

Al Hoceima airport has conventional "no vertical guidance" approaches and a PAPI for the runway facing QFU 17;

No published procedure for QFU 35;

Presence of fog at Al Hoceima airport known by the crew during the flight preparation.

IV- CONCLUSION

FINDINGS

GPWS SYSTEM:

Illumination of the light "FAULT" of the GPWS, during approximately six minutes, at the end of the cruise of the **first Leg** on Al Hoceima (due to a degradation of the GPS signal in the zone where the plane was);

The CDB stopped the GPWS in flight, before starting the approach of the **second Leg** at the airport of Al Hoceima.

IV- CONCLUSION

FINDINGS

Crew Resource Management (CRM):

The approach to Al Hoceima is characterized by a **lack of preparation and anticipation;**

The verbal communication is limited to the instructions of the CDB followed **without challenge by the copilot** (OPL);

The **announcements** are non-existent, and the **cross-checks** are rare and ambiguous.

IV- CONCLUSION

FINDINGS

Work and behavior of the flight crew:

- ❖ Violations of operational rules,
- ❖ Hazardous operational decisions with a relentless pursuit of the approach

IV- CONCLUSION

FINDINGS

Lack of required conditions and beyond limits:

Decision to descend to 400 feet, which is below applicable airport minimums;

Disabling the system (GPWS) during flight;

Continued the approach with a ceiling of 600 feet, while the minima were 760 feet.

Approach with uncontrolled indicated airspeed, variable plan and excessive rate of descent.

The approach was unstable;

Failure to overshoot below the recommended limit;

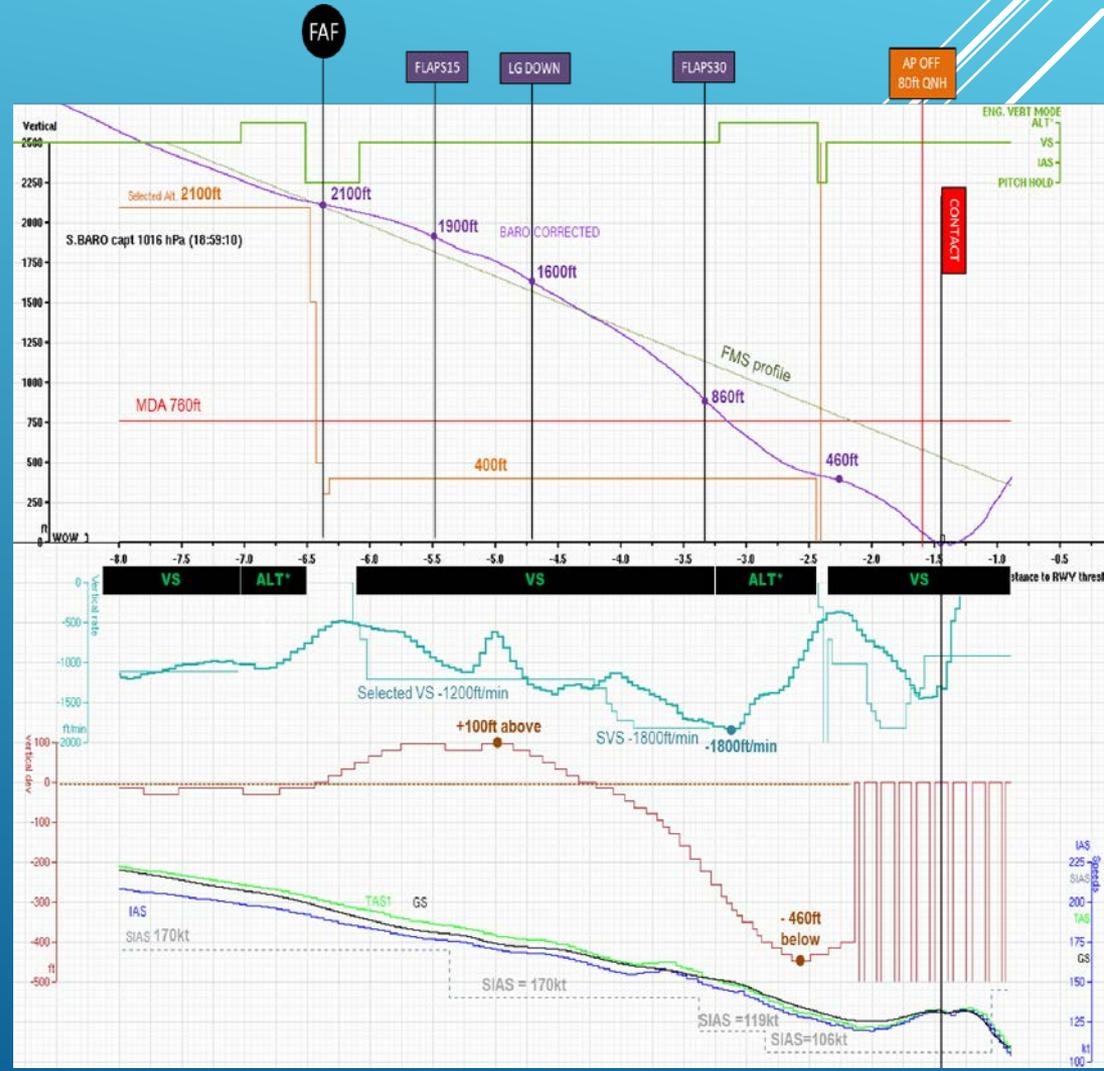
Descent below the Minimum Descent Altitude (MDA) without visual reference.

IV- CONCLUSION

FINDINGS

Lack of required conditions and beyond limits (Facts):

1. GPWS switched OFF at 6000ft
2. Selected Altitude below MDA
3. Vertical path below FMS profile from 1400ft till impact
4. AP OFF 80ft
5. Go Around 30ft
6. Contact with sea approx 1.4Nm from Runway Threshold



IV- CONCLUSION

CAUSES

A. Non-compliance with operational procedures:

NB:

It is to be underlined that the reaction of the OPL, even if late, allowed to limit the final situation to the only material damages suffered by the aircraft.

B. CRM:

The lack of communication and coordination ;

The lack of an appropriate mix between the CDB's authority gradient and the OPL's level of assertiveness, cause the OPL to be slow to react against CDB directives,

Inconsistent with the limits of the stabilization floor and approach minima.

V- SAFETY RECOMMENDATIONS

N°01/19 : Integration process of the pilots in the company

The analysis revealed dysfunctions within a flight crew made up of two recently recruited pilots, with large differences in profiles, both in terms of their professional backgrounds, their ages and experiences. It would therefore be recommended to reinforce the pilot integration process with adapted CRM modules, to ensure fluidity of interactions and coherence of communications between pilots and therefore enhance decision making.

N°02/19 : Approaches

The operator is developing the domestic destinations where approach procedures don't allow vertical guidance. Considering the specificities of non-precision approaches (Classic Approaches), it would be recommended :

- Emphasize, during awareness and training sessions, the Constant Angle Approach (CANPA) when vertical guidance is not available;
- Integrate aircraft equipment and associated procedures that allow programming and tracking of vertical approach profiles.

V- SAFETY RECOMMENDATIONS

N°03/19: Reaction to the GPWS alarms/alerts:

The fact that the flight crew, obsessed by precipitated approaches, did not reserve adequate responses to GPWS alarms, instabilities and lack of visual references at minimums, shows that these actions are not systematic. It would therefore be recommended to insist, during training and proficiency testing of flight crews, on :

- the criteria for undertaking and continuing an approach in terms of stabilization and minima;
- The GPWS system, the meanings of its messages and the actions they imply.

N°04/19: MEL /GPWS

The review of the Minimum Equipment List (MEL), in effect at the time of the event covered by this report, identified inconsistencies in the Operational (O) and Maintenance (M) procedures related to the GPWS items of the MEL.

It is recommended that these inconsistencies be corrected immediately and that the document be reviewed to identify and correct them

Moroccan Air Investigation Bureau



Thank you for your attention

Back-up slides

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1.19 Useful or effective investigation techniques.

Renseignement sur les systèmes embarqués (GPWS)

❖ Modes d'opérations de base :

- Mode 1 - EXCESSIVE DESCENT RATE
- Mode 2 - EXCESSIVE TERRAIN CLOSURE RATE
- Mode 3 - Altitude Loss After Takeoff
- Mode 4 - DANGEROUS TERRAIN CLEARANCE
- Mode 5 - BELOW GLIDE SLOPE
- Mode 6 - ALTITUDE CALLOUTS.

❖ Modes augmentés Amélioré :

- TERRAIN CLEARANCE FLOOR (TCF)
- TERRAIN AWARENESS DISPLAY (TAD).

II- FACTUAL INFORMATION

NON PRECISION APPROACH

