FINAL REPORT

ACCIDENT

Occurrence No.: 466/07

Aircraft: B737-800, EC-HBM

October 28, 2007

EPKT aerodrome

This Report is a document presenting the position of the State Commission on Aircraft Accidents Investigation concerning circumstances of the air occurrence, its causes and safety recommendations. The Report was drawn up on the basis of information available on the date of its completion.

The investigation process can not be considered as finally closed. The investigation may be reopened if new information becomes available or new investigation techniques are applied, which may affect the wording related to the causes, circumstances and safety recommendations contained in the Report.

Investigations into air occurrences are carried out in accordance with the applicable international, European Union and domestic legal provisions for prevention purposes only.

The investigation was carried out without the need of application of the legal evidential procedures, applicable for proceedings of other authorities required to take action in connection with an air occurrence.

The Commission does not apportion blame or liability.

In accordance with Article 5 paragraph 5 of the Regulation (EU) No 996/2010 of the European Parliament and of the Council on the investigation and prevention of accidents and incidents in civil aviation […] and Article 134 of the Act – Aviation Law, the wording used in this Report may not be considered as an indication of the guilty or responsible for the occurrence.

For the above reasons, any use of this Report for any purpose other than air accidents and incidents prevention, can lead to wrong conclusions and interpretations.

This Report was drawn up in the Polish language. Other language versions may be drawn up for information purposes only.

WARSAW 2017

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ABBREVIATIONS

A/T	Autothrottle
ACO	Automatic Call Out
AFDS	Autopilot Flight Director System
AFTN	Aeronautical Fixed Telecommunication Network
AGL	Above Ground Level
AP, A/P	Autopilot
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
ATPL(A)	Airline Transport Pilot Licence (Aeroplane)
CAS	Calibrated Air Speed
cm-1	crew member-1
cm-2	crew member-2
cm-3	crew member-3
CRM	Crew Resource Management
CVR	Cockpit Voice Recorder
DA	Decision Altitude
DH	Decision Height
DME	Distance Measuring Equipment
EPKT/KTW	Katowice Aerodrome
FDR	Flight Data Recorder
FIR	Flight Information Region
FL	Flight Level
FMC	Flight Management Computer
G/S	Glide Slope
G/S ENG	GLIDE SLOPE ENGAGED
GPWS	Ground Proximity Warning System
HAT	Height Above Touchdown
HIALS	High Intensity Approach Lighting System
HIRL	High Intensity Runway (Edge) Lights
IAS	Indicated Airspeed
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
IMGW	Institute of Meteorology and Water Management
KTC	Navigation Point (NDB)

LACC	Lateral Acceleration
LOC	Localizer
LVL CHG	LEVEL CHANGE
LVTO	Low Visibility Take-Off
MAP	Missed Approach Point
MDA	Minimum Descent Altitude
MDH	Minimum Descent Height
NDB	Non-directional Beacon
OM	Outer Marker
PAPI	Precision Approach Path Indicator
PF	Pilot Flying
PIC	Pilot-in-Command
PM	Pilot Monitoring
QFE	Barometric pressure at the aerodrome elevation
QNH	Barometric pressure adjusted to mean sea level
RA (RALT)	Radio Altitude
RVR	Runway Visual Range
RWY27	Runway 27
SFL	Sequenced Flashing Lights
SWC	Significant Weather Chart
TAF	Terminal Aerodrome Forecast
TOD	Top Of Descent
TWR	Tower
UTC	Universal Time Coordinated
V/S	Vertical Speed
VACC	Vertical Acceleration
VMC	Visual Meteorological Conditions
VOR	Very High Frequency Omnidirectional Range

GENERAL INFORMATION

Occurrence reference number:	***466/07***			
Type of occurrence :	***ACCIDENT***			
Date of occurrence:	***October 28, 2007***			
Place of occurrence	***EPKT***			
Type and model of aircraft:	***B737-800 aeroplane***			
Aircraft registration marks:	***EC-HBM***			
Aircraft User/Operator:	***AIR EUROPA LINEAS AEREAS***			
Aircraft Commander:	***ATPL(A)***			
Number of victims/injuries:	***Fatal***	***Serious***	***Minor***	***None***
	-	***-***	***-***	***122***
Investigator-in-Charge:	***Macie Lasek - until June 30, 2012*** ***Edward Łojek - until November 10, 201*** ***Bogusław Trela[1] - since September 1, 2017***			
Investigating authority:	***State Commission on Aircraft Accident Investigation (SCAAI)***			
Composition of the Investigation Team:	***As below***			
Document containing results:	***SCAAI Final Report***			
Recommendations:	***NONE***			
Addressees of the recommendations:	***Not applicable***			
Date of completion of the investigation:	***December 20, 2017***			

SYNOPSIS

On October 28, 2007, at night, Boeing 737-800 chartered aircraft, registration marks EC-HBM, performing ILS landing on EPKT RWY27 in low-visibility conditions, touched down approximately 870 m ahead of the runway threshold in the area of approach lights system. The aircraft sustained damage to the engines, fuselage, flaps and horizontal stabilizer. Most of the aerodrome approach lights were also damaged. After completing landing roll the airplane taxied to a designated stand.

[1] Due to organizational changes in SCAAI since September 1, 2017 drafting of the Final Report has been overtaken by SCAAI Member Bogusław Trela.

The flight crew did not inform about the occurrence the airport traffic control services or any other airport services. No passengers or crew members were injured as a result of the occurrence.

Investigation into the occurrence was conducted by the SCAAI Investigation Team in the following composition:

Maciej LASEK	- Investigator-in-Charge until June 30, 2012
Edward ŁOJEK	- Investigator-in-Charge until November 10, 2016
Bogusław TRELA	- Investigator-in-Charge since September 1, 2017
Tomasz Makowski	- Member of the Team
Ryszard RUTKOWSKI	- Member of the Team
Waldemar TARGALSKI	- Member of the Team until April 30, 2013
Piotr Lipiec	- Member of the Team until November 10, 2016
Jacek MAINKA	- expert
Tomasz SMOLICZ	- expert.

The cause of the accident was the failure to execute a missed approach procedure even if the criteria of a stabilized approach were not met during an attempt to intercept G/S "from above" at excessive descent rate, under meteorological conditions below the minimum for the aerodrome.

Factors contributing to the occurrence

1. Errors in flight crew co-operation (inadequate CRM).
2. The failure to perform the approach in accordance with the published procedure.
3. No response of the crew to the warning signals generated by GPWS.
4. Landing on aerodrome equipped with ILS CAT I with autopilot engaged.

After completion of the investigation SCAAI has not formulated safety recommendations.

1. FACTUAL INFORMATION

1.1. History of the flight[2]

On October 27-28, 2007, a crew of B737-800 airplane, registration marks EC-HBM, performed a charter flight Katowice (EPKT) – Beirut (OLBA) - Katowice (EPKT).

On October 26, 2007 at 21:38 hrs UTC[3] the airplane arrived from Rome to Katowice. Next day, after a rest in a hotel conditions, the flight crew started their flight duty period around 16:30 hrs. Due to the extended flight duty period the crew consisted of three pilots – Captain (cm-1) - on the left seat, FO (cm-2) - on the right seat and an instructor (cm-3) - on a jumpseat in the cockpit.

The take-off for EPKT-OLBA-EPKT flight was planned for 17:00 hrs but actually it occurred at 18:08 hrs.

The airplane landed on OLBA aerodrome at 22:18 hrs.

The take-off for the return flight to EPKT (flight AE 911) took place at 22:40 hrs. During that flight, the Captain was PM, FO was PF and the instructor occupying the jumpseat, according to his statement, was the crew commander (PIC). Until a certain point the flight was uneventful. At 1:42 hrs, when in Bratislava FIR, the crew began to descend from FL360 to FL120. At that time ATC from Bratislava FIR passed to the crew the meteorological conditions on EPKT:

> *wind variable 2 kt, visibility 400 m, visibility for RWY 27: 650m, 550m, 550m, fog, clouds 500ft and 300ft, QNH 1027, dewpoint +8*

The Captain and the instructor agreed that the conditions were suitable to attempt landing, saying: *"it is just enough"*.

At 1:45:04 hrs (20'14" before touchdown[4]) - Captain ordered approach/descent briefing, which lasted about two minutes. During the briefing the capture of ILS G/S signal over OM was discussed.

At 1:47:58 hrs (17'20") - the crew established communication with Warsaw ATC (at 134.925 MHz), and received a clearance to descend to FL100.

[2] Descent, approach and landing of the aircraft was reconstructed from:
a) statements of the three pilots present in the cockpit and statements of EPKT aerodrome employees;
b) CVR recordings translated from Spanish;
c) FDR recordings.

[3] All times throughout the Report are given in UTC;

[4] Two time scales are used in description of course of events during the flight: one is UTC time, and in the other scale zero point was at 02:05:18 hrs UTC, when the first touchdown of the airplane occurred. The time to the first touchdown is given in parentheses.

At 1:55:27 hrs (9'51") - the crew was cleared to descend to FL080, and at 1:57:46 hrs (7'32") received from EPWA ATC weather conditions on EPKK aerodrome:

wind 230, 1kt, visibility 300m, RVR 250m, fog, clouds broken 100ft, second layer 600ft, temp.+8, dewpoint +8, QHH 1027.

At 1:58:57 hrs (6'21") - Katowice TWR instructed the crew to report their position 16 NM ahead of KTC VOR, informed them that EC-HBM was No. 1 for landing and passed to the crew the landing conditions on EPKT:

wind var. 2kt, visibility 300m, fog, clouds broken 100ft, temp.+8, dewpoint +8, QNH 1027, expect approach to RWY 27, trans level 80, RWY wet, braking action medium, and copy RVR from treshold 27, 450m, 450m, 650m.

The weather conditions received were commented by the Captain: *"Well, that is a little bit difficult, isn't it?"*

At 1:59:54 hrs (5'24") – EPKT TWR cleared the airplane to descend to 4000ft according to QNH=1027hPa and requested the crew to report when over KTC. During the descent FO suggested that, due to poor visibility, the approach should be performed according to the published procedure, but the Captain decided to perform a straight-in approach to reduce fuel consumption.

At 2:03:18 hrs (2'00") - at the distance of 6.4 NM from RWY 27 threshold the airplane entered the final leg in the landing configuration (landing gear extended, flaps extended to 41º), which was confirmed by the Captain who reported to EPKT TWR controller: *"... AE 911 is on the localizer runway 27 ..."*. At that time the airplane was above G/S (G/S DEV = 5.62dot), RA = 3097ft, VERT SPEED= -1560ft/min, CAS = 152kt, engines were set to FLIGHT IDLE.

At 2:03:24 hrs (1'54") – EPKT TWR controller cleared the crew for landing and passed the following meteorological conditions:

AE 911 clear to land RWY 27, wind 240 deg., 2kt, RVR from threshold 27 500m, 500m, 900m. "

At 2:03:42 hrs (1'36") - the crew requested full intensity approach lights and five seconds later they received response that the lights had been switched to maximum.

2:04:00 hrs (1'18") – for over a dozen seconds the Captain and FO were exchanging opinions that they were flying too high.

2:04:12 hrs (1'04") - temporary change of A/P mode from LVL CHG to V/S, vertical speed decreased from -1720 [ft/min] to -1432 [ft/min].

2:04:19 hrs (0'59") - change of A/P mode from V/S to LVL CHG, RA = 1610ft, the airplane was above G/S, vertical speed started to increase, Captain urged FO saying: *"go downwards, go downwards ..."*.

2:04:29 hrs (0'49") - the plane approached G/S, RA = 1274ft, VERT SPEED= -1848ft/min; at that time Captain stated passing KTC navigational aid at 2000ft. According to FDR data, at 2:04:29 hrs the plane was at a pressure altitude of about 2200ft according to QNH (according to ILS procedure KTC should be passed at 1790ft.

2:04:36 hrs (0'42") – FO confirmed that KTC was passed about 300ft higher then required.

2:04:51 hrs (0'27") – Captain stated G/S capture saying: *"..OK, entering in slope ... "*.

2:05:00 hrs (0'18") – captain stated: *"...approaching minimum ..."* .

2:05:01 hrs (0'17") – the airplane crossed G/S from above, RA = 388ft, VERT SPEED = -1664ft/min, GPWS generated SINK RATE, a small movement of the control column in aft direction and automatic change of LVL CHG mode to G/S ENG mode were recorded.

2:05:06 hrs (0'12") – ACO voice APPROACHING MINIMUMS and double shouting of the Captain: *"... keep that slope .."*.

2:05:08 hrs (0'10") - GPWS again generated SINK RATE; RA=198ft, VERT SPEED= - 1624ft/min.

2:05:09 hrs (0'09') - GPWS generated PULL UP, RA=163ft, VERT SPEED = -1760ft/ min.

2:05:10 hrs (0'08") – pulling control column, RA = 173ft, VERT SPEED= -1840 ft/min, engines RPMs: N1/1=71.12% and N1/2=70.75%, CAS=146.5kt.

2:05:12 hrs (0'06") - end of PULL UP warning.

2:05:13 hrs (0'05") - Captain spotted approach lights and said: *"In sight"*.

2:05:14 hrs (0'04") - Captain said three times: *"..I have it! .."* and FO said: *"... your controls!"*. At the same time GPWS twice generated SINK RATE, because the vertical speed was -1112ft/min, RA = 50ft.

2:05:15 hrs (0'03") - FDR recorded VACC = 1.309g, HDG = 267deg and a left turn of the control wheel.

2:05:16 hrs (0'02") – FDR recorded change in lateral acceleration LAACC = - 0.083g and CVR recorded the first sound of impact, probably with an approach light post.

2:05:17 hrs (0'01") – left roll of the airplane (ROLL = -10.5deg), RA = 3ft, return of the control wheel to neutral position. Captain said: *"Oh, my God"*.

2:05:18 hrs (0'00") - the first touchdown of the aircraft (according to the recorded AIR/GRND signal), CAS = 144kt, PITCH = 6.0deg and momentary advancing the thrust levers to the take-off setting.

2:05:19 hrs – activation of TAKE-OFF WARNING due to configuration improper for take-off.

2:05:21-22 hrs – STICK SHAKER was activated for one second and the second touchdown occurred, VACC = 1.799g, PITCH = 5.8deg.

2:05:23 hrs – engines RPMs: N1/1 = 87.25% and N1/2 = 82.00%, backward displacement of the thrust levers, third touchdown of the airplane.

2:05:25 hrs - fourth touchdown of the airplane.

2:05:30-31 hrs – deployment of reversers of both engines.

2:05:38 hrs - A/T disconnection;

2:05:45-46 hrs – retraction of the reversers of both engines;

2:06:10 hrs – disengagement of A/P.

2:07:29 hrs – a turnback on RWY27 after completion of the landing roll.

2:09:00 hrs – leaving RWY27.

2:12:00 hrs – engines shutdown on stand 11.

As a result of the off-runway landing, the airplane sustained substantial damage.

Five minutes after the first touchdown, during taxiing, the Captain intended to inform the traffic controller about the occurrence, he said:

2:10:34 hrs - *"We should say something to the tower, because we have lights broken?"*

and:

2:10:42 hrs - *... "it must be a lot of lights broken, and other things"*

the instructor responded:

2:10:44 hrs - *".....wait, wait, wait"*.

As a result, the crew did not inform air traffic services about the occurrence.

Fig.1. EC-HBM approach trajectory

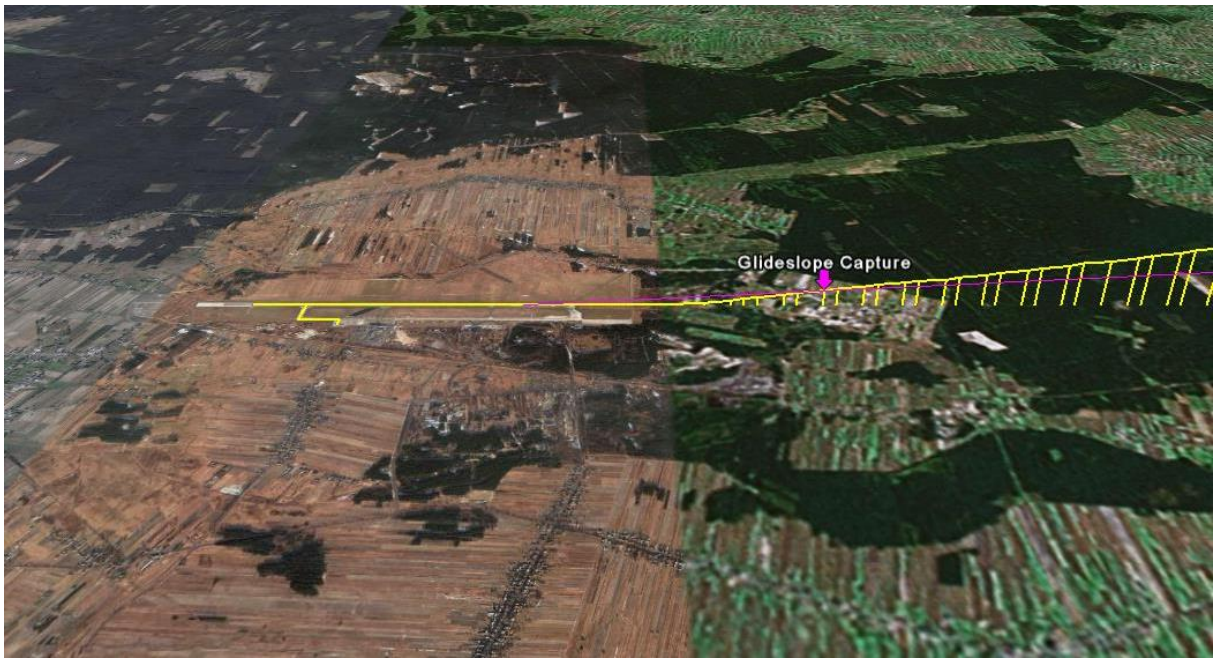


Fig. 2. Final approach reconstruction based on FDR data

1.2. Injuries to persons

Injuries	Crew	Passengers	Others
Fatal	-	-	-
Serious	-	-	-
Minor	-	-	-
None	8	114	-

1.3. Damage to aircraft

As a result of the occurrence the aircraft sustained substantial damage to both wings skin, flaps, engines and the landing gear hydraulic system. Boeing survey report sent to the SCAAI contained 123 items.

Fig. 3-6. Damage to the EC-HBM airplane

1.4. Other damage

Damage to the system of approach lights (66 approach lights, 20 flashing lights and other elements of the lighting system).

Fig. 7-10. Damage to the approach lights on EPKT

1.5. Personnel information (crew data)

Due to the long duty period the crew consisted of three pilots. During the investigated approach they performed the following duties:

1.5.1. Captain (in CVR recording referred to as "cm-1") occupied the left seat - male, aged 59, holder of ATPL(A) with valid ratings for B737 (300-900) and IR(A), and LVTO/CAT II/III, total flight time approximately 15000h, including 5000h on B737. During the approach he was PM and was planned to take over the airplane control after establishing visual contact with the terrain (but not lower than the DH(A)) and then to perform landing as PF.

1.5.2. FO (in CVR recording referred to as "cm-2") occupied the right seat – male, aged 37, holder of ATPL(A) with valid ratings for B737 (300-900) and IR(A), and LVTO/CAT II/III, total flight time approximately 5000h, including 2000h on B737. During the approach he was PF and after takeover by the Captain he was planned to become PM.

1.5.3. Instructor pilot, (in CVR recording referred to as "cm-3") occupied a jumpseat in the cockpit – male, aged 54, holder of ATPL(A) with valid ratings for B737 (300-900), IR(A), TRI(A) and LVTO/CAT II and III, total flight time over 15000 h. He was the crew commander (PIC).

1.6. Aircraft information

Boeing 737-800, passenger, two-engine, turbojet, Maximum Take-Off Mass 73500kg.

Certificate of Airworthiness No 4413 valid until March 14, 2008.

Year of Manufacture	Manufacturer	Airframe Serial No	Registration Marks	Register Number	Register Date
1999	Boeing Commercial Aircraft, USA	28382	EC-HBM	4584	2004

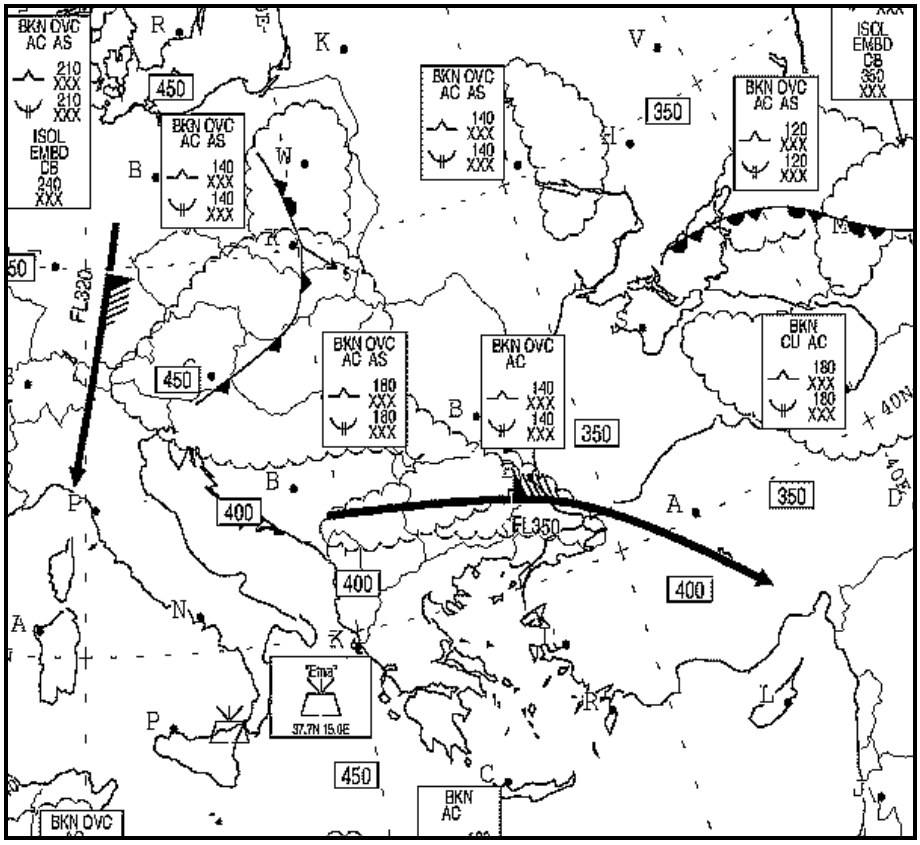
The airplane load was within the prescribed limits. The airplane technical condition had no impact on the occurrence.

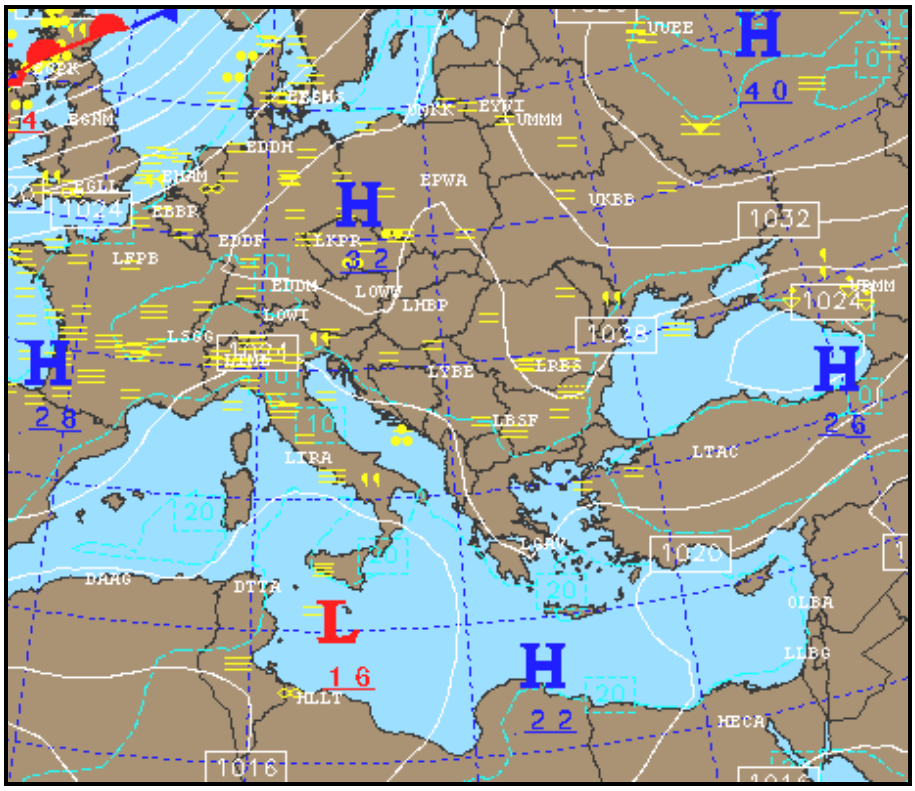
1.7. Meteorological information

Weather conditions during the flight

Immediately after the occurrence METARs for EPKT and neighboring aerodromes - EPKK, EPWR and LKMT – were downloaded from the http://euro.wx.propilots.net website. In addition, archival data (maps) from Wetterzentrale.de server and satellite images from University of Wyoming were obtained.

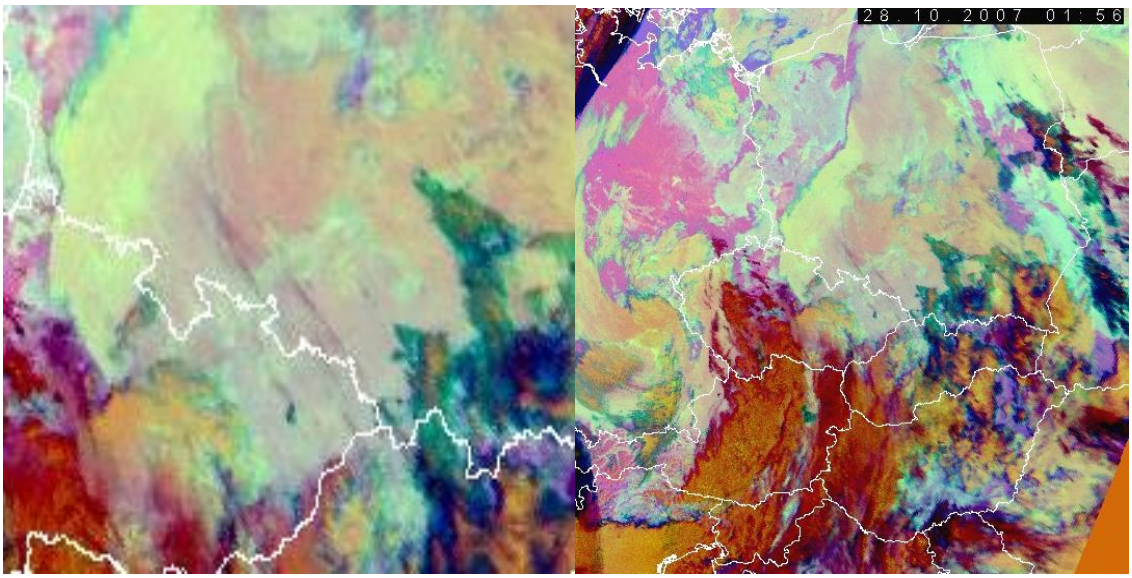
An independent synoptic analysis of the weather situation in southern Poland was conducted. On October 28, 2007, the area was under the influence of a strong high with the 1040 hPa centre over the central European Russia and secondary centers over western Poland, Bay of Biscay and Georgia.

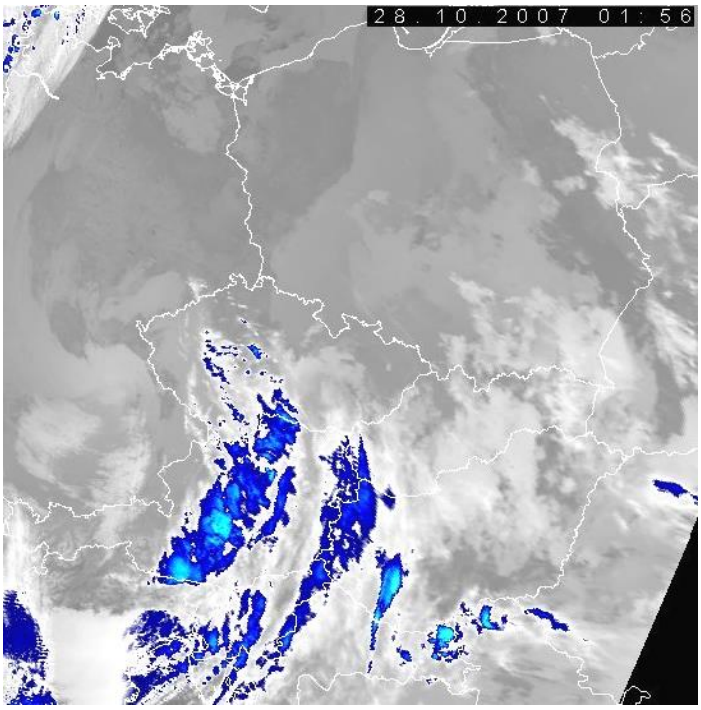




In spite of the high, close to the ground, above the inversion layer weak front zones were moving from England. Western movement was in upper layers, and a jet stream of 95kt was on FL350 over the Balkans and central Turkey. In the frontal area over

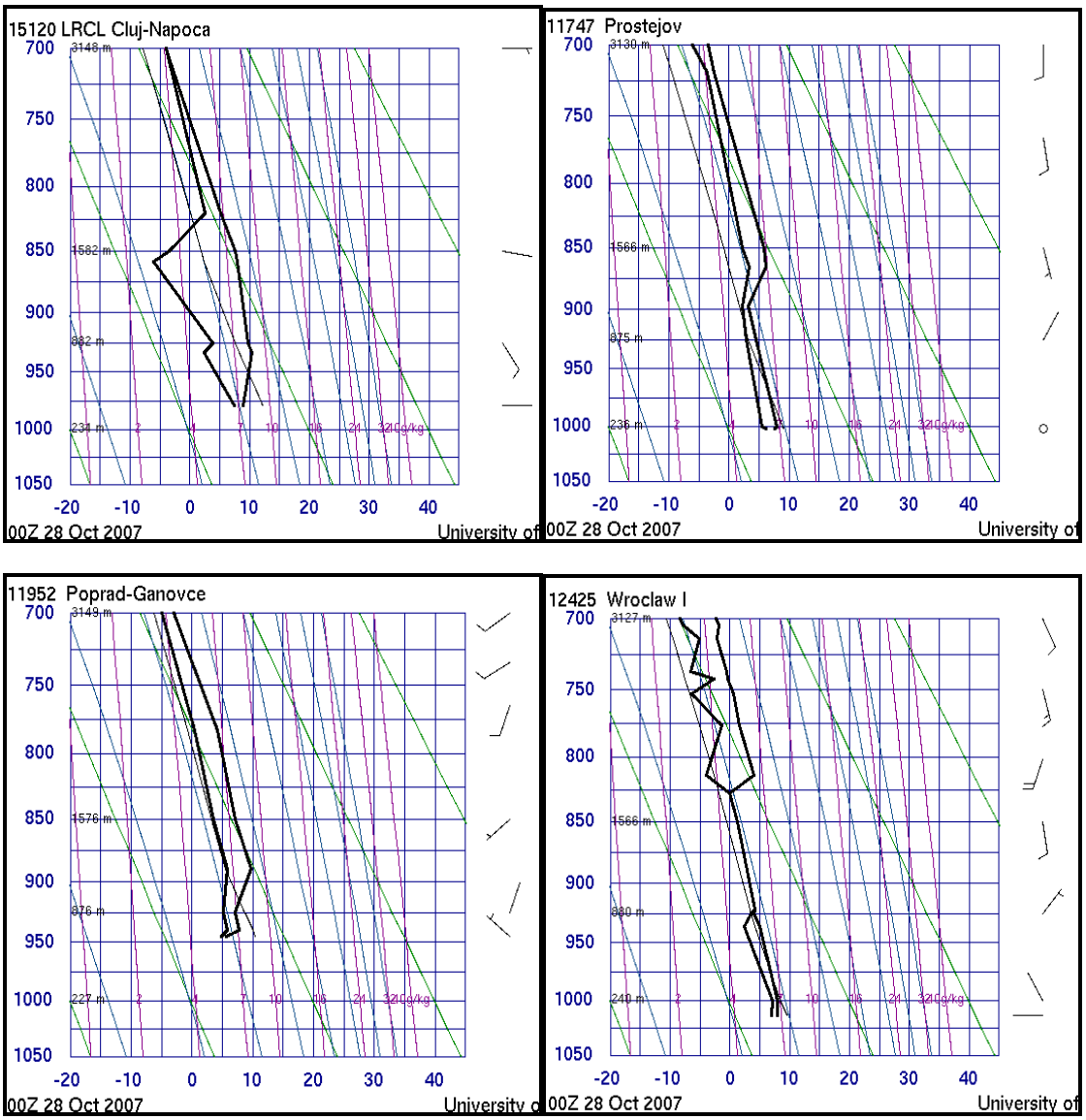
Hungary, Slovakia and southern Poland, full cloud cover with AS medium clouds from FL180 with weak icing and turbulence was forecast. Over central Poland this cloud cover was forecast below FL140.





A weak front zone is visible on the satellite image from the NOAA satellite as of 1:56 hrs (above). Numerous areas of fog and low stratus clouds, shown in yellow and yellow-green colors are seen on a night photo (on the left).

The results of atmospheric sounding from stations located approximately along EC-HBM flight route showed considerable humidity and numerous inversion layers; such a situation is conducive to the formation of fog.



The actual weather conditions on EPKT prior to and during the landing were determined by the meteorological station located on the western edge of the aerodrome. They are given in the table below.

	EPKT 00:30 UTC	***EPKT 01:00 UTC***	***EPKT 01:30 UTC***	***EPKT 02:00 UTC***	***EPKT 02:30 UTC***
Visibility	500 m	500 m	400 m	300 m	300 m
Runway Visual Range	700 m	650 m	700 m	500 m	500 m
Cloud cover - lowest layer	FEW 30 m	SCT 30 m	SCT 150 m	BKN 30 m	BKN 30 m
Cloud cover – main layer	BKN 900 m	BKN 900 m	SCT 900 m	Invisible	Invisible

Weather Phenomena	fog, weak drizzle	fog, weak drizzle	fog	fog	fog
Wind – direction, speed	Western, 2 kt	Variable, 2 kt	Variable, 2 kt	Variable, 2 kt	None
Temperature (^oC)	+08	+08	+08	+08	+08
Dew Point Temperature (^oC)	+08	+08	+08	+08	+08

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  EPKT 280230Z 00000KT 0300 R27/0500 R09/1000 FG BKN001 08/08
Q1027=

  EPKT 280200Z VRB02KT 0300 R27/0500 R09/0600 FG BKN001 08/08
Q1027=

  EPKT 280130Z VRB02KT 0400 R27/0700 R09/0600 FG SCT005 SCT030
08/08 Q1027=

  EPKT 280100Z VRB02KT 0500 R27/0650 R09/0800 -RA FG SCT001
SCT005 BKN030 08/08 Q1027=

  EPKT 280030Z 27002KT 0500 R27/0700 R09/0900 -RA FG FEW001
SCT005 BKN030 08/08 Q1027=
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The airport automated measuring system provided reliable data because it was particularly well calibrated to the visibility ranges and cloud bases which prevailed during the considered period. It should be noted that the Runway Visual Range was 500m while the lowest visibility was 300m. EPKT is known for the significant differences in visibility between the two ends of the RWY due to its location in the industrial area.

The weather conditions on the neighboring aerodromes, which were within the range of EC-HBM (EPKK, EPWR, EPPO, LKMT and EPWA) are given in the tables below.

02:00 hrs UTC

	EPKK 02:00 UTC	***EPWR 02:00 UTC***	***EPPO 02:00 UTC***	***LKMT 02:00 UTC***	***EPWA 02:00 UTC***
Visibility	350 m	4000 m	2000 m	1800 m	7000 m
Runway Visual Range	250 m	- - -	- - -	- - -	- - -
Cloud cover - lowest layer	BKN 30 m	SCT 450 m	- - -	OVC 60 m	- - -
Cloud cover – main layer	BKN 200 m	BKN 630 m	BKN 1290 m	Invisible	NSC
Weather Phenomena	Fog	- - -	- - -	Fog, Drizzle	- - -

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EPWA 280200Z 12005KT 7000 NSC 09/09 Q1028 NOSIG=
LKMT 280200Z 00000KT 1800 DZ BR OVC002 08/08 Q1027 BECMG 1500 BR=
EPPO 280200Z 33001KT 2000 BR BKN043 06/06 Q1028=
EPWR 280200Z 00000KT 4000 BR SCT015 BKN021 08/07 Q1027=
EPKK 280200Z 24001KT 0350 R25/0250N FG BKN001 BKN007 08/08 Q1027=
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02:30 hrs UTC

	EPKK 02:30 UTC	***EPWR 02:30 UTC***	***EPPO 02:30 UTC***	***LKMT 02:30 UTC***	***EPWA 02:30 UTC***
Visibility	350 m	4000 m	1500 m	1800 m	7000 m
Runway Visual Range	600 m	- - -	- - -	- - -	- - -
Cloud cover - lowest layer	BKN 30 m	- - -	- - -	BKN 90 m	- - -
Cloud cover – main layer	Invisible	BKN 450 m	SCT 1290 m	OVC 150 m	BKN 1380 m
Weather Phenomena	Fog	- - -	- - -	Drizzle	- - -

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EPWA 280230Z 11004KT 7000 BKN046 09/09 Q1028 NOSIG=
LKMT 280230Z 04003KT 360V080 2500 DZ BR BKN003 OVC005 08/08 Q1027 NOSIG=
EPPO 280230Z 28002KT 1500 BR SCT043 07/06 Q1028=
EPWR 280230Z 00000KT 4000 BR BKN015 08/07 Q1028=
EPKK 280230Z 00000KT 0350 R25/0600U FG BKN001 08/08 Q1027=
```

As the above data show, the conditions on EPWR, EPPO and EPWA were suitable for landing, and the conditions on LKMT and EPKK were better than on EPKT.

Conclusion:

The weather conditions on EPKT were below the aerodrome minima.

Weather forecasts available to the crew

Materials created by the IMGW and sent to all aerodromes via AFTN system contained a set of TAFs containing forecasts for EPKT and neighboring aerodromes. The following table contains TAFs for EPKT, EPWR and EPWA.

TAFs as of 19:00 hrs UTC, available prior to departure from Beirut

	EPKT 21:00-06:00	***EPWR 21:00-06:00***	***EPWA 21:00-06:00***
Visibility	2000 m Possible fog 600 m	5000 m Possible 1500 m	6000 m Possible fog 600 m
Cloud cover, cloud base	BKN 450m Possible OVC 30m	BKN 600m Possible BKN 150m	Insignificant Possible BKN 90 m
Weather Phenomena	Mist, possible fog	Mist, possible drizzle	Mist, possible fog between 21-03
Wind – direction, speed	Variable, 2 kt	Variable, 3 kt	Variable, 3 kt

TAF EPKT 271900Z 272106 VRB02KT 2000 BR SCT007 BKN015 PROB40
TEMPO 2106 0600 FG OVC001=

TAF EPWR 271900Z 272106 VRB03KT 5000 BR BKN020
PROB30 TEMPO 2106 1500 BR DZ BKN005=

TAF EPWA 271900Z 272106 VRB03KT 6000 NSC TEMPO 2106 1500 BR SCT008
PROB30 TEMPO 2103 0600 FG BKN003=

No significant changes were in the next edition of TAFs for the above aerodromes, issued before 22:00 hrs. Those TAFs were not available to the crew but should have been available to air traffic controllers.

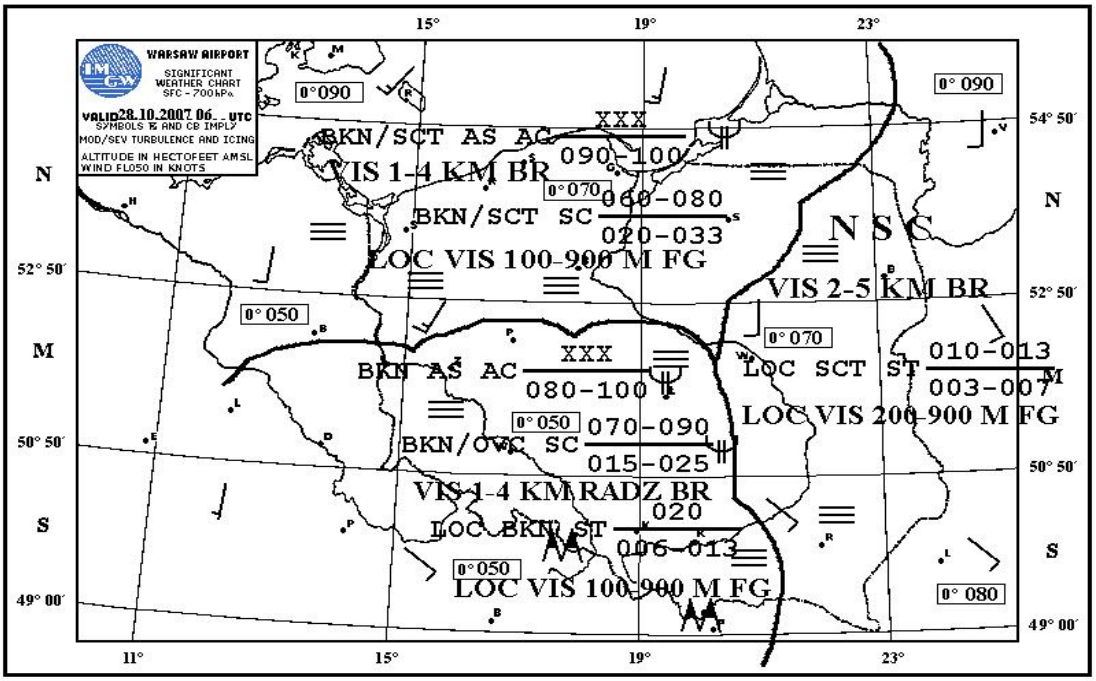
TAF EPKT 272200Z 280009 VRB02KT 2000 BR SCT007 BKN020 TEMPO 0009
1200 DZ SCT005 BKN015 PROB40 TEMPO 0008 0600 FG BKN002=

TAF EPWR 272200Z 280009 VRB03KT 5000 BR BKN023
PROB30 TEMPO 0009 1500 BR DZ BKN005=

TAF EPWA 272200Z 280009 VRB03KT 6000 NSC TEMPO 0007
3000 BR SCT008 PROB30 TEMPO 0006 0600 FG BKN004=

Note:
TAFs developed before 19:00 hrs UTC indicated the deterioration of weather conditions at night, the worst forecasts were for EPKT.

The TAFs of EPWA, EPKK and EPWR forecast possible fog.



SWC up to FL100 contained the forecast of poor weather conditions in the south of Poland. Those charts were not distributed for international exchange.

1.8. Aids to navigation

EPKT RWY 09/27 was 9186 ft (2800 m) long and 196 ft (60 m) wide, located in magnetic direction of 270/090 and on the occurrence day it was equipped with the following navigation aids:

Visual aids:

RWY 27: HIRL, HIALS, SFL

RWY 09: HIRL, HISLS, PAPI-L (angle 3.0 deg)

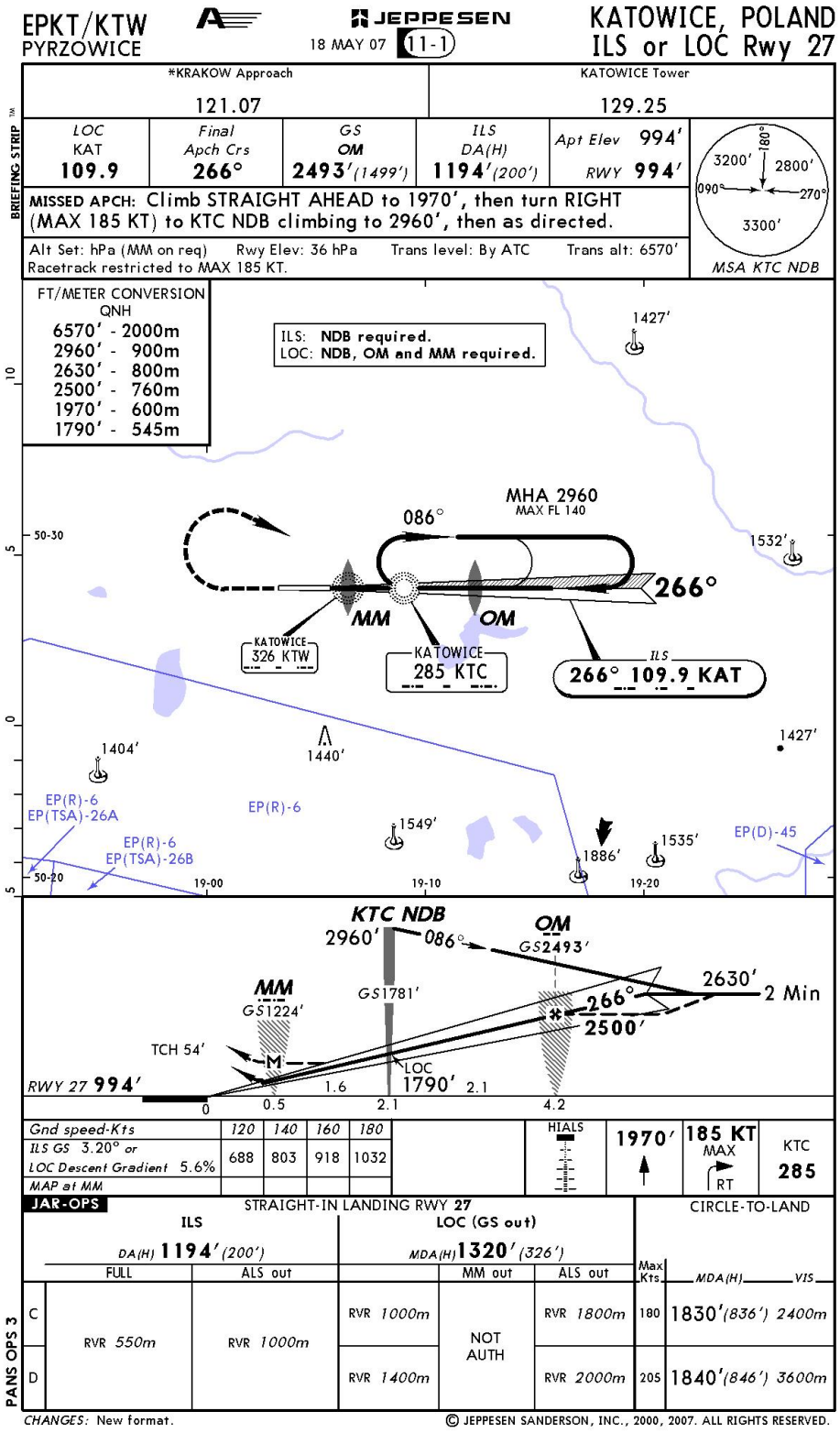
Electronic aids are presented in the table below.

URZĄDZENIA RADIONAWIGACYJNE
19. RADIO NAVIGATION, AND LANDING AIDS

Rodzaj pomocy, kat. ILS/MLS deklinacja dla VOR/ILS/MLS Type of aid, CAT of ILS/MLS (for VOR/ILS/ MLS give VAR)	Znak rozpoznawczy ID	Częstotliwość Frequency	Godziny pracy Hours of operation	Współrzędne posadowienia anteny nadawczej (WGS-84) Site of transmitting antenna coordinates (WGS-84)	Uwagi/Remarks
NDB	KTC	285 kHz	H24	50°28'26.67"N 019°09'01.21"E	086°, 3.99 km FM THR 27.
L	KTW	326 kHz	H24	50°28'27.08"N 019°06'27.19"E	086°, 0.96 km FM THR 27.
ILS LLZ	KAT	109.900 MHz	H24	50°28'27.53"N 019°02'56.43"E	CAT I RWY 27. 266°, 0.42 km FM THR 09.
ILS GP	-	333.800 MHz	H24	50°28'32.08"N 019°05'20.93"E	GP 3.2°, 0.15 km N FM RCL 0.35 km W FM THR 27 along RCL, RDH = 16.7 m.
OM	kreska kreska/ dash dash	75.000 MHz	H24	50°28'26.25"N 019°12'16.15"E	086°, 7.84 km FM THR 27.
MM	kropka kreska/ dot dash	75.000 MHz	H24	50°28'26.93"N 019°06'26.80"E	086°, 0.95 km FM THR 27.

On the occurrence day EPKT aerodrome was equipped with 109,9 MHz ILS CAT I (angle 3.2deg) – the last calibration prior to the occurrence day was carried out on May 28, 29 and 30, 2007, the first one after the occurrence day – on October 2008. Both calibrations did not show any errors in the system operation.

The holding and approach procedures and location of the individual navigation aids on EPKT aerodrome are shown in the approach chart below.



1.9. Communications

No impact on the occurrence – no comments on the quality and understanding of communication were reported.

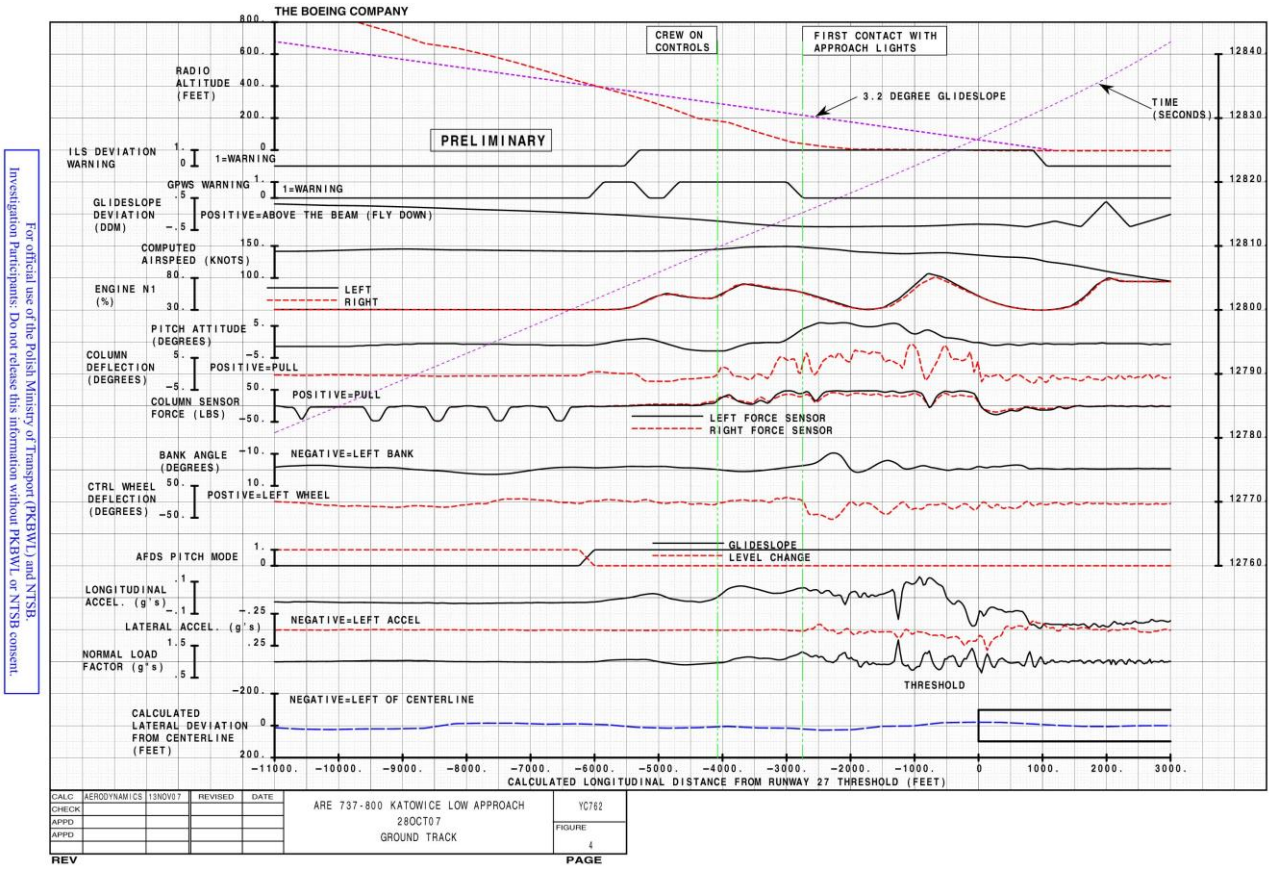
1.10. Place of occurrence information

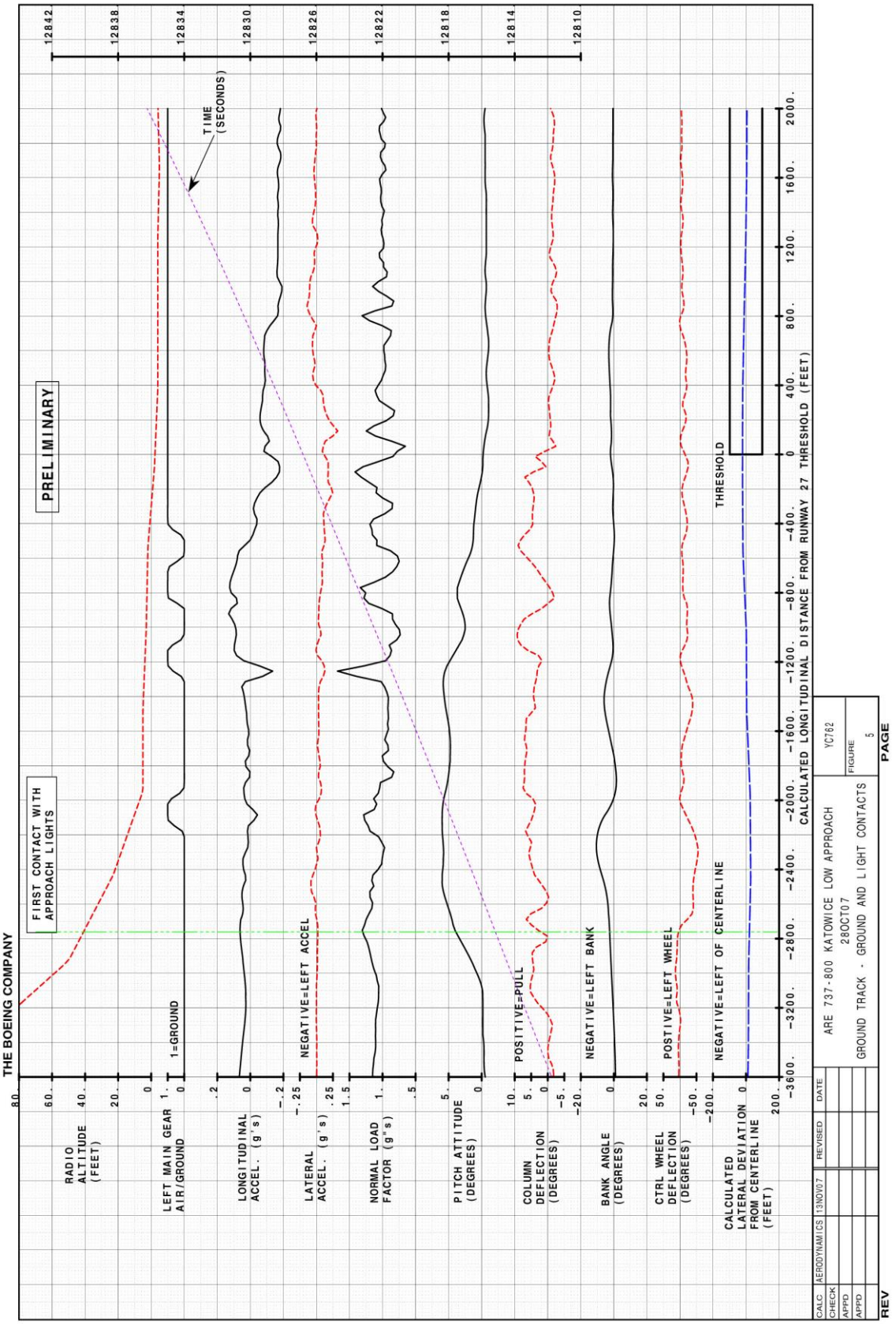
The airplane touchdown occurred approximately 870 m ahead of RWY 27 threshold in the area of approach lights.

1.11. Flight recorders

The airplane was equipped with Allied Signal FDR, P/N: 980-4700-042, S/N: 412. The FDR recording (25 flight hours) was read out and analyzed by SCAAI and Boeing.

The recording of CVR from EC-HBM was also read out. The CVR allowed for 2 hours of recording time and covered the period until the airplane electrical power was disconnected on the parking stand.





1.12. Wreckage and impact information

During the collision with the masts of the approach lights the wings, flaps, engines, fuselage and horizontal stabilizer were damaged. The wreckage of flaps and the left engine fairing were distributed along the approach route behind the place of the first collision with the approach lights.

1.13. Medical and pathological information

Not applicable. Nobody was injured as a result of the accident.

1.14. Fire

Fire did not occur.

1.15. Survival aspects

Damage to the hydraulic system caused release of the hydraulic fluid in the form of aerosol around the aircraft. The aerosol had properties irritating eyes and respiratory system, which required the use of protective equipment by the airport fire brigade.

1.16. Tests and research

In the scope of the investigation the photographic documentation and the documentation of the crew and the carrier were analyzed. An expert opinion on the weather conditions and forecasts available to the crew was obtained. The operation of EPKT navigation aids was checked. Recordings of FDR and CVR were analyzed.

1.17. Organizational and management information

Actions of Airport Duty Officer, Airport Ground Traffic Coordinator and Airport Fire Brigade are described in the documents available to the Commission. Those actions had no impact on the occurrence course.

The draft Final Report was sent to the State of Manufacturer, the State of the Operator and the Katowice airport management. The State of Manufacturer and the airport management did not make any comments. The Operator submitted comments which were attached to the Final Report as Annex 2.

1.18. Additional information.

After leaving the aircraft, the crew went immediately to the hotel without informing anyone of the possibility of damage to the approach lights.

1.19. Useful or effective investigation techniques

Standard techniques were used in the course of the investigation.

2. ANALYSIS

2.1. Course of the occurrence

About one hour before landing, while still in Bratislava FIR, the crew discussed layout of EPKT aerodrome, including location of KTC navigational aid in relation to RWY27 threshold, and then weather conditions in EPKT given by Bratislava at 1:42:19 hrs *(wind var. 2kt, vis. 400m, RVR RWY27 650m, 550m, 550m, fog, clouds 500ft, and 300ft, QNH 1027, temp. + 8^o C, Dewpoint +8^{o}C).*

Both Captains (cm-1 and cm-3) accepted the conditions, stating: *it is just enough*.

About 20 minutes before the first touchdown of the airplane PM ordered a briefing during which FO discussed procedures for landing and missed approach published in Jeppesen. At that time the principles of crew cooperation was also agreed (as described in section 1.5.).

According to the agreed principles the takeover of airplane control by cm-1 was to take place at the moment of establishing visual contact with approach lights, but not lower than the Decision Height (DH). In the case of cm-1's failure to takeover the control, cm-2 should have performed a missed approach. The straight-in approach (which was actually executed) had not been discussed during the briefing.

The role of the formal commander (cm-3) during the briefing was rather passive and accepting the arrangements between cm-1 and cm-2.

The landing checklist was not done.

After establishing radio communication with EPKT, at 1:58:44 hrs (6'34 ") the crew was instructed to report 16 miles ahead of KTC. It was not done.

The weather conditions on EPKT (received from Warsaw at 1:58:57 hrs) were the following: RWY27 RVR 450m, 450m, 650m. They were commented by cm-1: *Well, that is a little bit difficult, isn't it?* (The conditions required in CAT I for RWY 27 with ILS were: DH = 200 ft, RVR = 550 m).

At 1:59:50 hrs UTC (5'28 ") the crew reported FL80 and was cleared to descend to 4000ft and was instructed to report KTC crossing.

During a brief discussion (2:00:01 - 2:00:45 hrs) cm-2 opted for an approach according to the published procedure, but cm-1 decided to conduct straight-in approach having mentioned excessive fuel consumption.

About 4'30 " before the first contact with the ground cm-1 started straight-in approach, but EPKT traffic control was not informed about that. Only the crew's report on LOC/ILS capture two minutes before touchdown was an indirect information to the controller about the crew intentions.

The weather conditions on EPKT received by the crew at 2:03:24 hrs (1'54'') were the following: *RVR RWY27 500m, 500m and 900m*, i.e. the conditions were below the minima, allowing the crew to divert to alternate aerodrome with better weather conditions.

The above information did not cause the crew to change the destination aerodrome.

That decision of cm-1 probably resulted from his concerns about excessive fuel consumption, which he had expressed earlier. After the accident the fuel quantity in the airplane tanks was over 4000 litres, so both EPWR and EPWA, good weather aerodromes, were available for landing.

Both pilots at the controls were aware that they were too high for straight-in approach (G/S was below the airplane), hence it required a greater descent rate (1600-2000 ft/min - more than twice the normal descent rate on G/S) and interception of G/S from above. It caused that 17 seconds before the first contact with the ground the airplane crossed G/S and continued the flight below G/S.

Increase in the aircraft pitch (from -3 deg to +6 deg) to intercept G/S (this time from below) occurred just above the ground, causing that the airplane was close to touchdown attitude. Therefore, the damage to the airplane resulted from the collision with the approach lights rather, and not from the touchdown.

2.2. Recommended procedures (based on *737 Flight Crew Training Manual*)

2.2.1. Descent planning

Flight crew workload typically increases as the airplane descends into the aerodrome area. Distractions must be minimized, essential duties related to descent and approach planning must be completed earlier so more time is available during the critical approach and landing phases.

Operational factors and/or terminal area traffic requirements may not allow following the optimum descent schedule. ATC, weather, icing and other traffic may require adjustments to the planned descent schedule.

Proper descent planning is necessary to arrive at the desired altitude at the proper speed and configuration. The distance required for the descent is approximately 3 NM/1000 feet altitude loss. It is recommended to plan that in case of straight-in approach approximately 12 miles from the runway the airplane should be at required altitude at clean configuration speed. A good crosscheck for this plan is to be at 10 000 feet AGL, 30 miles from the airport, at 250 knots.

In the investigated case the above recommendations were not executed properly. Based on CVR recording, it was not possible to infer to what point the crew was navigating (whether it was EPKT, OM, or KTC, or another one).

2.2.2. Descent procedure

All safe instrument approaches have some basic factors in common. These include good descent planning, careful review of the approach procedure and weather conditions, accurate flying, and good crew coordination. Thorough planning is the key to a safe approach.

Before the start of an instrument approach, the PF should brief the PM of his intentions in conducting the approach. Both pilots should review the approach procedure. All pertinent approach information, including minimums and missed approach procedures, should be reviewed and alternate courses of action considered, e.g. diversion to an alternate aerodrome.

As a guide, the approach briefing should include at least the following:

- weather and NOTAMs at destination and alternate aerodromes;
- type of approach and the validity of the charts to be used;
- navigation and communication frequencies to be used;
- minimum safe sector altitudes for the airport;
- approach procedure including courses and heading;
- vertical profile including all minimum altitudes, crossing altitudes and approach minimums;
- determination of the Missed Approach Point (MAP) and the missed approach procedure;
- other necessary crew actions such as setting proper frequencies of navigation aids (ILS, VOR, NDB), setting frequencies for communication and ATIS, setting courses and other requirements as applicable;
- taxi routing to parking including possible exits from runway;
- any other information related to non-standard procedures;
- management of AFDS.

2.2.3. Approach

Stabilized Approach Recommendations

Maintaining a stable speed, descent rate, and vertical/lateral flight path in landing configuration is commonly referred to as the stabilized approach concept.

Any significant deviation from planned flight path, airspeed, or descent rate should be announced (by PM). The decision to execute a go-around is no indication of poor performance.

Note: Do not attempt to land from an unstable approach.

Recommended Elements of a Stabilized Approach

An approach is considered stabilized when all of the following criteria are met:

- the airplane is on the correct flight path;
- only small changes in heading and pitch are required to maintain the correct flight path;
- the airplane speed is not more than Vref +20 knots indicated airspeed and not less than Vref;
- the airplane is in the correct landing configuration;
- sink rate is no greater than 1,000 fpm; if an approach requires a sink rate greater than 1,000 fpm, a special briefing should be conducted;
- thrust setting is appropriate for the airplane configuration;
- all briefings and checklists have been conducted;
- ILS approaches should be flown within one dot of the glide slope and localizer;
- during a circling approach, wings should be level on final by 300 ft AFE.

Unique approach procedures or abnormal conditions requiring a deviation from the above elements of a stabilized approach require a special briefing.

Note: An approach that becomes unstabilized below 1,000 ft AFE in IMC or below 500 ft AFE in VMC requires an immediate go-around.

2.3. Analysis of EC-HBM FDR recording

The data from FDR recording allowed to reconstruct the flight from the engines start to their shutdown.

The take-off from BEY aerodrome, climb and cruise on FL360, proceeded uneventfully without any deviation from standard flights. The flight was conducted at the speed of 0.79 Mach, autothrottle and autopilot B were active.

After about 3-hour flight, over Slovakia territory, at the distance of 134 NM from EPKT aerodrome, the crew started a descent. The airplane maintained a constant heading of 324 deg. At the beginning the vertical speed was up to -2600 ft/min, but from FL320 it was set to -1008ft/min and maintained at this value up to FL270.

After crossing the border of Poland at the distance of 76 NM from EPKT the airplane continued descent, leaving FL270, V/S mode was changed to VNAV mode and vertical speed increased to -2200 ft/min. At the distance of 25 NM from EPKT the aircraft stopped descending and was on FL100 for about 30 seconds and then again started descending at the rate of -1408 ft/min.

At the distance of 13NM from EPKT at PRALT = 7500ft, the aircraft according to the entered route in the LNAV mode started the left turn to the heading of 313 deg. At that moment the crew changed A/P mode to HDG SEL and set a new heading of 001 deg. The aircraft made a right turn and continued flight with the heading of 001 [deg] perpendicular to RWY27.

At PRALT = 6045 ft A/P mode was changed to LVL CHG with the set altitude of 4000ft. The flaps are extended to position 5 deg, and a moment later landing gear is extended. At the distance of 2.9NM to RWY27 extended centre line and PRALT=5613ft, the crew started a turn towards the aerodrome setting a new course of 303 deg on A/P panel.

When the airplane started the left turn, VOR/LOC mode was set on A/P panel and course in HDG SEL mode was changed to 295 deg. The flaps extending was continued up to the position of 40 deg. The speed of final approach was set at 142 kt.

At PRALT = 4416ft the altitude setting on A/P panel was changed to 2496ft. At a distance of 6.9NM, the A/P modes were automatically changed, the VOR/LOC mode was armed, the HDG SEL mode was disengaged, the aircraft started a turn and stabilization in the direction of RWY27. The crew selected APP mode and set the course of 266 deg.

At the distance of 5.9NM from RWY27 the airplane was aligned with the ILS LOC path at RALT = 3097ft, on the RWY27 course, but still remained 5.6 dot above ILS G/S. The plane descended at rates from -1560 ft/min to -1720 ft/min.

At PRALT = 2359ft, due to reaching the set altitude, A/P automatically disengaged LVL CHG mode and remained in V/S mode at the descent rate of -1600 ft/min. The crew entered the new height of 0ft and re-entered LVL CHG mode. Temporary descent rate was -1856 ft/min. The descent began in order to intercept G/S from above.

At RALT = 1030 [ft], the aircraft maintained CAS = 141.25 [kts], was on RWY27 course, 3.78 [dot] above G/S and descended at the rate of -1768 ft.

At RALT = 388ft, descending at the rate of -1664 ft/min, the airplane crossed G/S, the autopilot in APP mode armed GS ENG sub-mode, LVL CHG was disengaged. Flight Director in PITCH mode did not change indications, PITCH= -1.1 deg. A high descent rate caused GPWS to generate SINK RATE message.

The crew slightly pulled the control column and increased the engines thrust from IDLE to 56 [%], which caused temporary increase in pitch to 1.1 deg and decrease in the descent rate to -1392 ft/min. At RALT = 198ft, GPWS generated SINK RATE and PULL UP messages.

At that moment the plane was 2 dot below G/S. The crew again pulled the control column and reduced the descent rate to -1112 ft/min. However, GPWS generated SINK RATE again.

The thrust levers were set to IDLE, the aircraft pitch was 5.6 deg. At this point, at RALT=20ft, an abrupt twist of the control wheel to the left occurred, causing the aircraft to roll at 10.5 deg and the momentary change of its course. During a short turn, rapid changes in lateral acceleration were recorded, which indicated that the left part of the aircraft collided with an obstacle.

When leaving the turn and the airplane was still in the left roll, a short-lasting touchdown of the left main landing gear was recorded. The crew increased the engines thrust by pushing the thrust levers beyond the take-off position and again corrected the direction of flight by making a turn to the left with a roll of 6 deg. The system generated TAKE-OFF WARNING message of improper configuration due to the thrust levers setting. At that moment both STICK SHAKERs were activated (warning about approaching to stall). The lateral acceleration recording showed further collisions with obstacles. The airplane with the pitch of 5.8 deg and roll of 2.1 deg the second time briefly touched the ground with the left main landing gear. At that time the crew pulled the control wheel more firmly, and the engines reached the take-off thrust.

When the thrust levers were set in the aft position, the third short-time touchdown of the left main landing gear was recorded. Then the airplane without roll and with pitch angle of 1.2 deg the fourth time contacted the ground with the left main landing gear. The touchdown of the front and right landing gears was not recorded.

Prior to the nose landing gear touchdown (pitch angle of 0.4 deg an abrupt change in acceleration in all three directions was recorded, which indicated that the aircraft crossed RWY27 threshold.

After entering RWY27 GROUND SPOILERS were released automatically, and the crew activated both engines reversers with their settings on 80%. At CAS=84.5kt the reversers started closing and GROUND SPOILERS closed.

During the landing roll STICK SHAKER was activated again. When the landing roll was completed, the crew disengaged A/P, which was active throughout the approach and was automatically setting the trimmer. After deceleration to a safe speed the airplane vacated RWY27. When taxiing to the stand was completed, the engines of the aircraft were shutdown.

2.3.1. Conclusions from FDR recording analysis

The crew of EC-HBM airplane performed an unstabilized approach, contrary to Boeing recommendations contained in the *B737 Flight Crew Training Manual (FCTM).*

As a result of unstabilized approach, where G/S was intercepted from above at a great descent rate, premature multiple touchdowns of the aircraft and collisions with the ground obstacles occured. Approach to landing and landing were performed with B autopilot engaged, which the crew disengaged only after the landing roll.

According to information received from Boeing, B737-800 AP has a BEAM ANOMALY DETECTOR function that monitors the quality and status of the G/S signal. This function allows AP to maintain the proper glide path and prevent unnecessary maneuvers due to short interruptions or interference of the G/S signal.

This function also monitors the rate of deviation from G/S and maintains the previous descent rate if the deviations are too rapid or the signal has been lost only temporarily.

Based on the FDR recording, the Boeing Company made the following comments on EC-HBM approach and landing on EPKT:

- LOC signal was intercepted approximately 5.9NM (10.9km) from RWY27 threshold, but the aircraft was at RALT=3800ft, which was approximately 1700ft above G/S.
- The aircraft was continuing the approach with a great descent rate, momentarily exceeding 2000 ft/min.
- At RALT=400ft and at descent rate of -1650 ft/min, the aircraft crossed G/S and AP changed its mode from LEVEL CHANGE (G/S ARM) to GLIDESLOPE ENGAGE. Increase in the pitch angle was an initial reaction of AP on G/S capture. However, due to the high descent rate and a short distance from G/S transmitter, the change rate of G/S signal was high and BEAM ANOMALY DETECTION function was triggered. As a result, AP attempted to restore the previous fight path with the descent rate of -1650 ft/min.
- At RALT=220ft the crew overrode AP by pulling the control column to stop sinking. AP was not disengaged.
- Approximately 2800ft from RWY27 threshold the airplane started colliding with the approach lights, which was recorded as changes in acceleration. Then the plane was flying at RALT=5ft or less, hitting the approach lights and the ground. The plane reached the runway and braked normally.

Boeing company concluded that AP attempted to capture G/S, but an excessive descent rate caused fast crossing of G/S and triggered BEAM ANOMALY DETECTION.

FDR recording also showed that the aircraft maintained RWY27 course starting from the distance of 6NM, but crossings of OM and MM were not recorded. On previous days crossings of MM were recorded but crossings of OM were not recorded.

2.4. Flight crew actions

2.4.1. The crew did not conduct LANDING CHECKLIST.

2.4.2. G/S capturing from above with a high descent rate and G/S crossing at a distance of 1.5NM from the runway threshold in the absence of visual reference to the ground is a HIGHLY DANGEROUS maneuver which led to the accident.

2.4.3. In the existing weather conditions, it was necessary to divert to an alternate aerodrome having better conditions, e.g. EPWR or EPWA.

2.4.4. When attempting to land on EPKT, it was necessary to perform the published approach procedure instead of straight-in approach, which forced the crew to fly at a high vertical speed in the absence of visual reference to the ground.

2.4.5. The briefing prior to the descent was incomplete, omitting STRAIGHT-IN approach, which was actually performed.

2.4.6. The crew did not respond to the SINK RATE and PULL UP messages generated by GPWS over a dozen seconds before the first contact of the airplane with the ground.

2.4.7. PIC, as a commander and also as an instructor should have supervised the correctness of the crew's decisions and their correct implementation. In the Commission's opinion, PIC should have seated "at controls" during take-off, initial climb, approach and landing, especially if those flight phases have taken place in weather conditions close to minima.

2.4.8. Landing with AP engaged led to G/S crossing and the airplane passing below G/S, which resulted in its premature contact with the ground.

All of the above errors indicate that the crew did not apply the CRM principles.

The crew's failure to inform the airport services about the touchdown short of RWY threshold and damage to the approach lights system had an adverse impact on safety of subsequent landing aircraft. That failure was a violation of the rules of conduct in the area of aviation safety, and was also contrary to the ethics of a professional pilot.

3. CONCLUSIONS

3.1. Commission findings

a) The crew had valid ratings.

b) The technical condition of the aircraft had no impact on the accident.

c) The weather conditions during the landing approach were known to the crew.

d) The weather conditions were below minimum for the selected approach.

e) The crew made the decision to perform a straight-in approach disregarding the published approach procedure.

f) Due to aligning with the RWY 27 centre line at too short distance and too high altitude, an attempt was made to intercept G/S from above with a descent rate significantly higher than that required for the published approach procedure.

g) The crew performed landing on the aerodrome equipped with CAT I ILS with AP engaged.

h) The crew actions were inconsistent with CRM principles.

i) The crew left the airport without informing the aerodrome services of the occurrence and damage to the approach lights.

3.2. Cause of the accident and contributing factors

The cause of the accident was failure to execute a missed approach procedure even if the criteria of a stabilized approach were not met during an attempt to intercept G/S "from above" at excessive descent rate, under meteorological conditions below the minimum for the aerodrome.

Factors contributing to the occurrence

1. Errors in flight crew co-operation (inadequate CRM).
2. The failure of the crew to perform the approach in accordance with the published procedure.
3. No response of the crew to the warning signals generated by GPWS.
4. Landing on aerodrome equipped with ILS CAT I with autopilot engaged.

4. SAFETY RECOMMENDATIONS

After completion of the investigation SCAAI has not formulated any safety recommendations.

As part of its comments to the draft Final Report, the Operator has sent to the SCAAI, among others, a description of the corrective actions taken after the accident. The comments have been attached to the Final Report as Annex 2.

5. ANNEXES

Annex 1. Album of Illustrations

Annex 2. Operator's comments to the draft Final Report

THE END

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ANNEX 1
TO FINAL REPORT
ACCIDENT TO BOEING 737-800; EC-HBM
OCCURRENCE 466/07

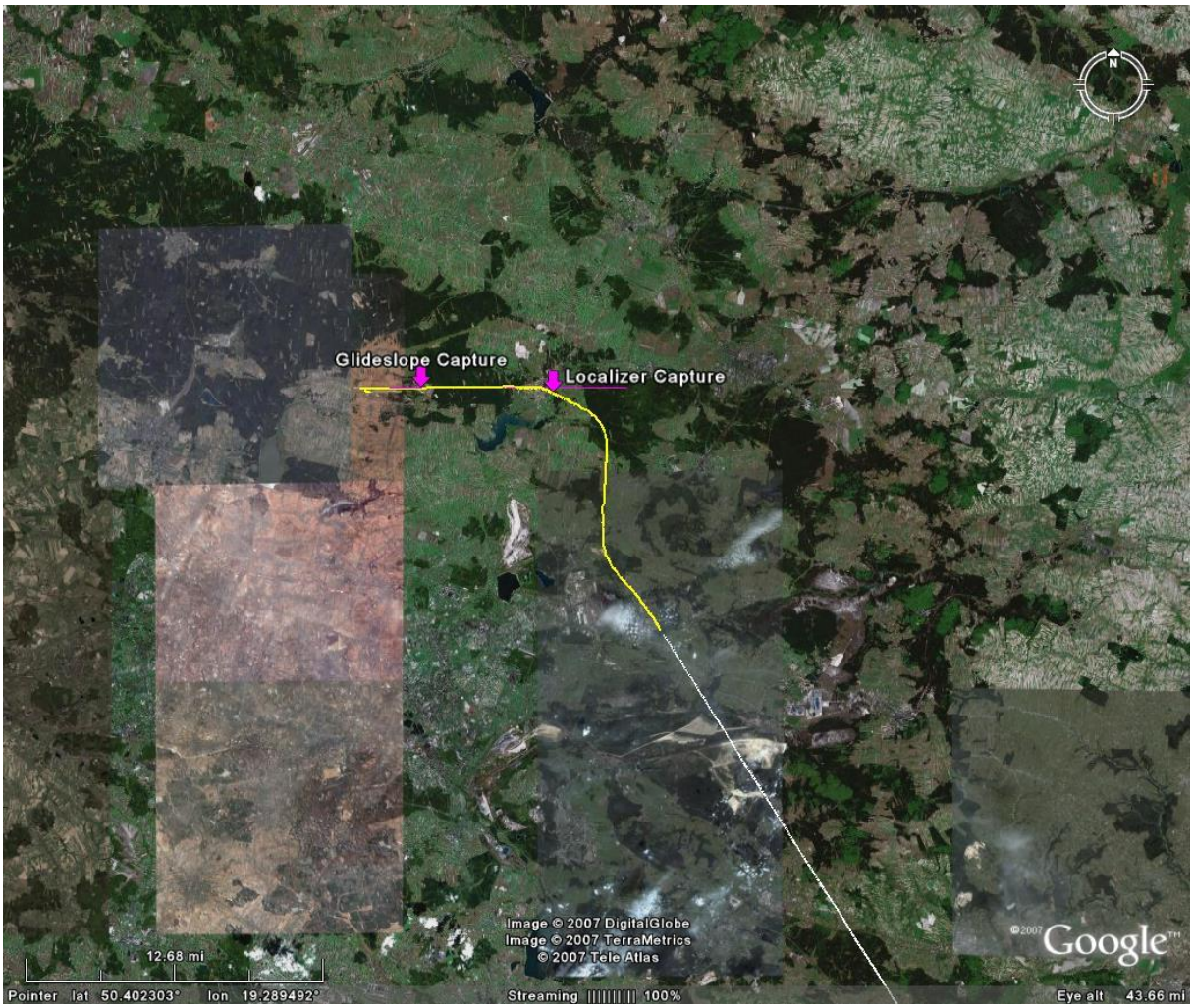
ALBUM OF ILLUSTRATIONS

accident to Boeing 737-800; EC-HBM

October 28, 2007, EPKT

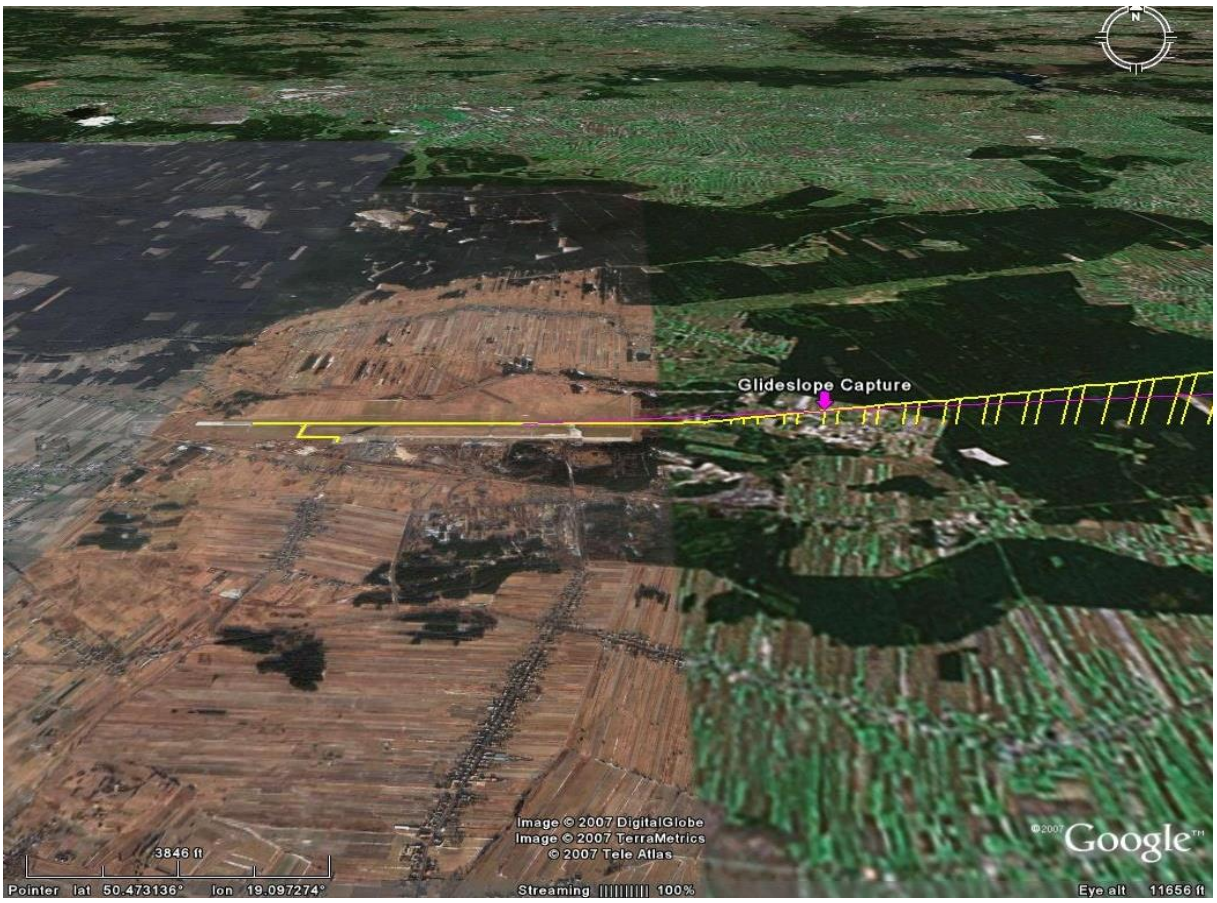
Photos and illustrations: SCAAI [unless otherwise indicated]

1 – Boeing 737-800 EC-HBM prior to the accident [photo: internet site publicly available]



2 – End phase of the flight – approach to EPKT [M. Smith, NTSB]

3 – End phase of the flight – G/S capture [M. Smith, NTSB]



4 – End phase of the flight – final approach and touchdown [M. Smith, NTSB]

5 – Traces of landing ahead of EPKT RWY27 [geoportal, 2007]

6, 7, 8 – Approach lights situated ahead of EPKT RWY27 – condition prior to the accident [photo: internet site publicly available]

9 – Beginning of the approach lights system ahead of EPKT RWY27 threshold after the accident

10 – Damage to the approach lights system ahead of EPKT RWY27 threshold after the accident

11 – Damage to the approach lights system ahead of EPKT RWY27 threshold after the accident

12 – Damage to the approach lights system ahead of EPKT RWY27 threshold after the accident

13 – Trailing part of the left outboard flap separated from the airplane

14 – Trailing part of the right outboard flap separated from the airplane

15 – Part of the right Krüger flap

16 – Damage to the approach lights system ahead of EPKT RWY27 threshold after the accident

17 – Separated part of a flap track fairing from the left wing

18 – Pieces of damaged lights and small pieces of the airplane skin

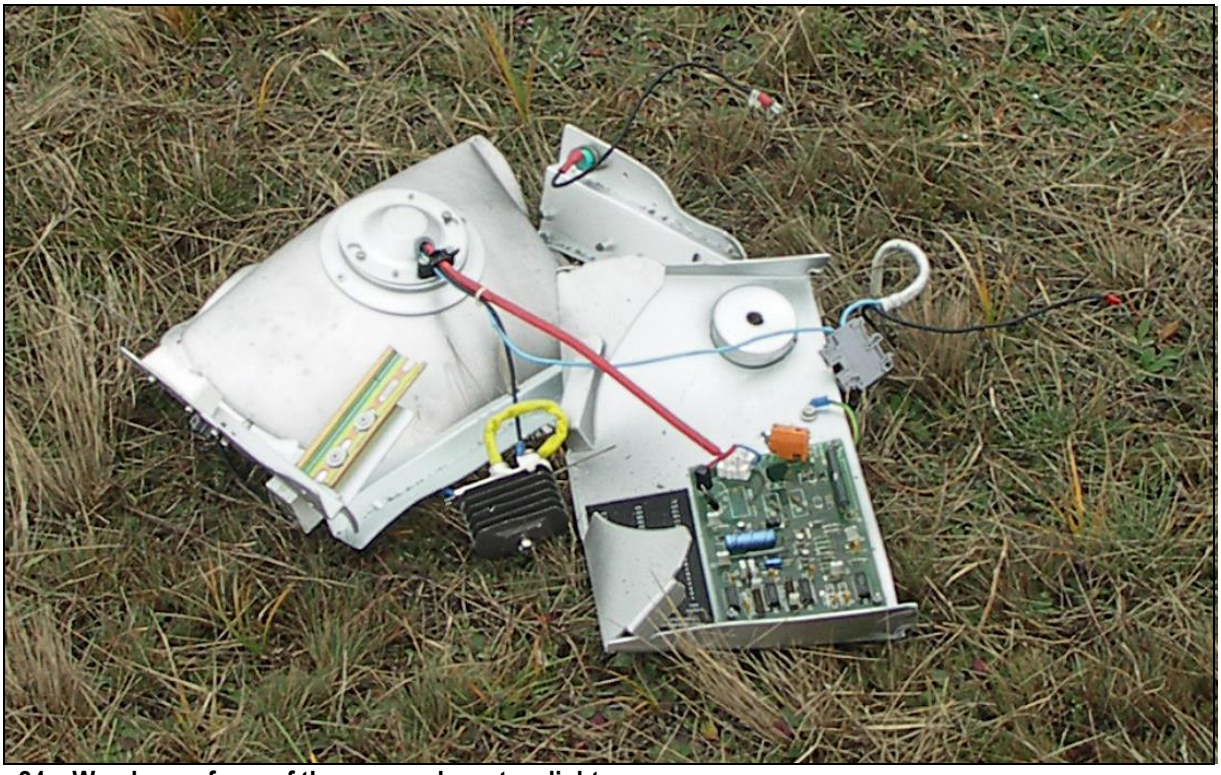
19 – Damage to the approach lights system ahead of EPKT RWY27 threshold after the accident

20 – Pieces of damaged lights and small pieces of the airplane skin

21 – Tracks of the left main landing gear wheels near transversal taxiway ahead of EPKT RWY27 threshold

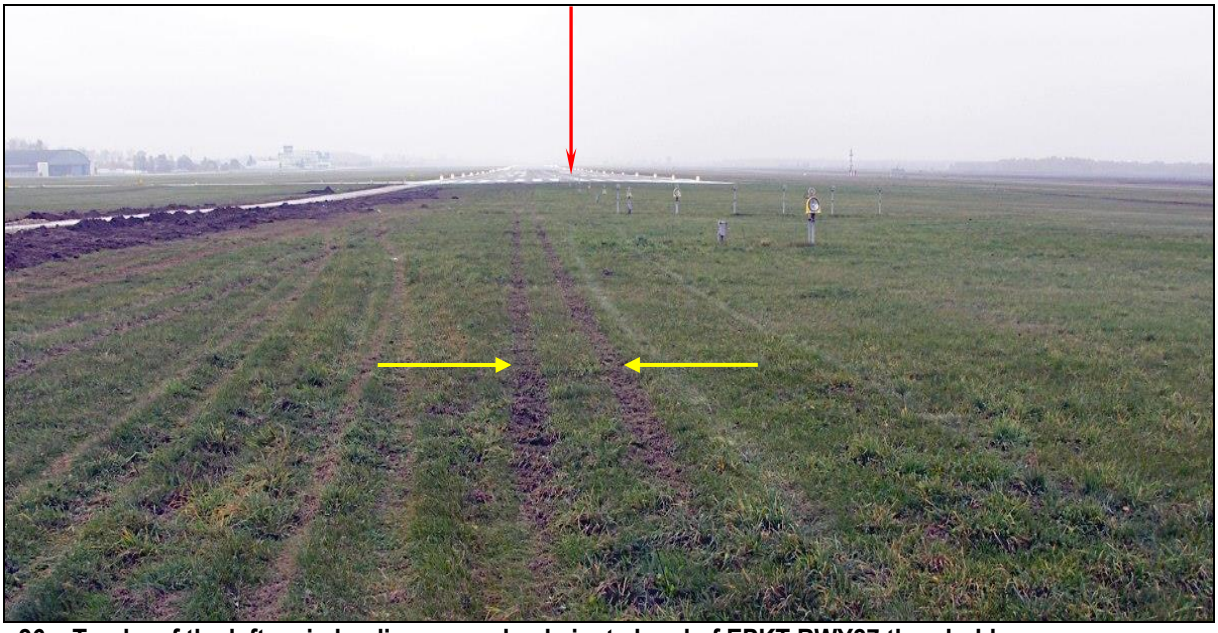
22 – Damage to the approach lights system ahead of EPKT RWY27 threshold after the accident. Visible RWY27 threshold

23 – Damage to the approach lights system and small pieces of the airplane skin. Visible RWY27 threshold



24 – Wreckage of one of the approach system lights

25 – Damage to the approach lights system and small pieces of the airplane skin. Visible RWY27 threshold



26 – Tracks of the left main landing gear wheels just ahead of EPKT RWY27 threshold

27 – Crossing point of the RWY27 threshold by the airplane left main landing gear wheels

28 – Crossing point of the RWY27 threshold by the airplane right main landing gear wheels

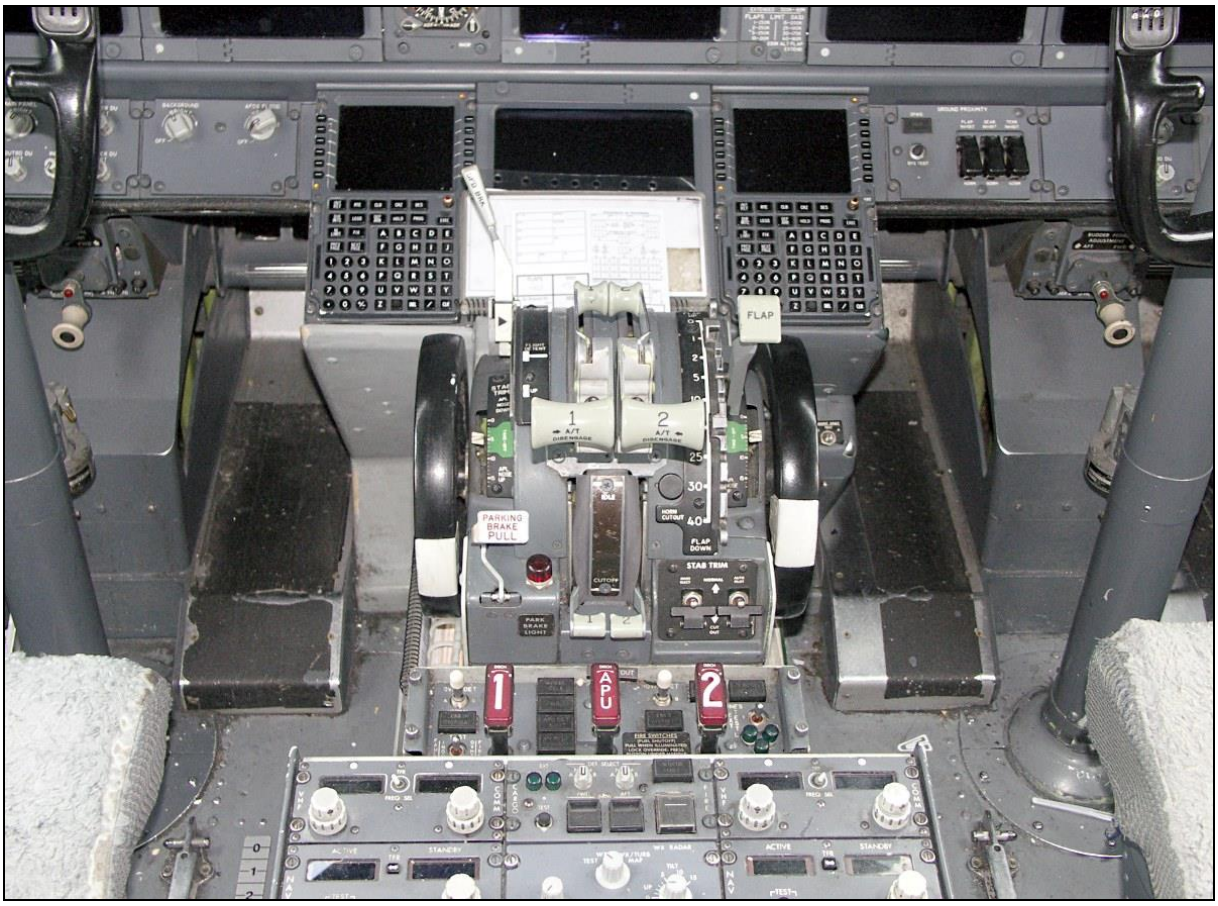
29 – The airplane on a stand next day after the accident

30 – The airplane on a stand next day after the accident

31 – Aft overhead cockpit panel

32 – Forward overhead cockpit panel

33 – Instrument board



34 – Powerplant control panel – close-up

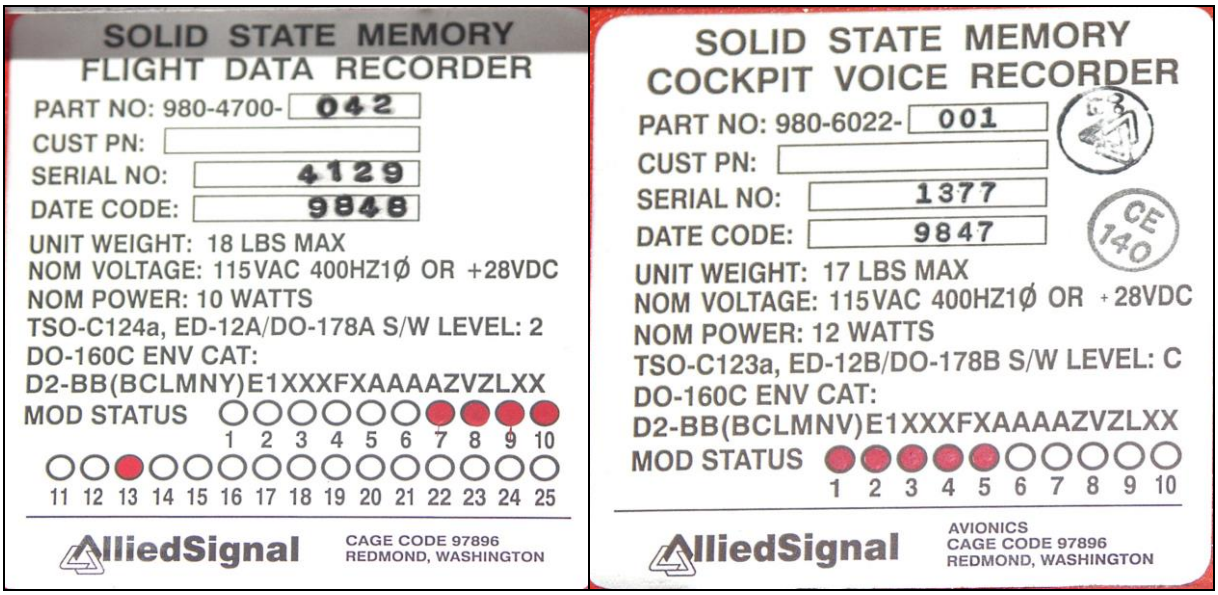
35 – Aft center panel – close-up

36 – Left side of the cockpit. Visible jump-seat of the third member of the flight crew

37 – Right side of the cockpit

38 – Flight Data Recorder prior to removal from the airplane

39 – Cockpit Voice Recorder prior to removal from the airplane



40, 41 – FDR and CVR rating plates

42 – Cabin interior

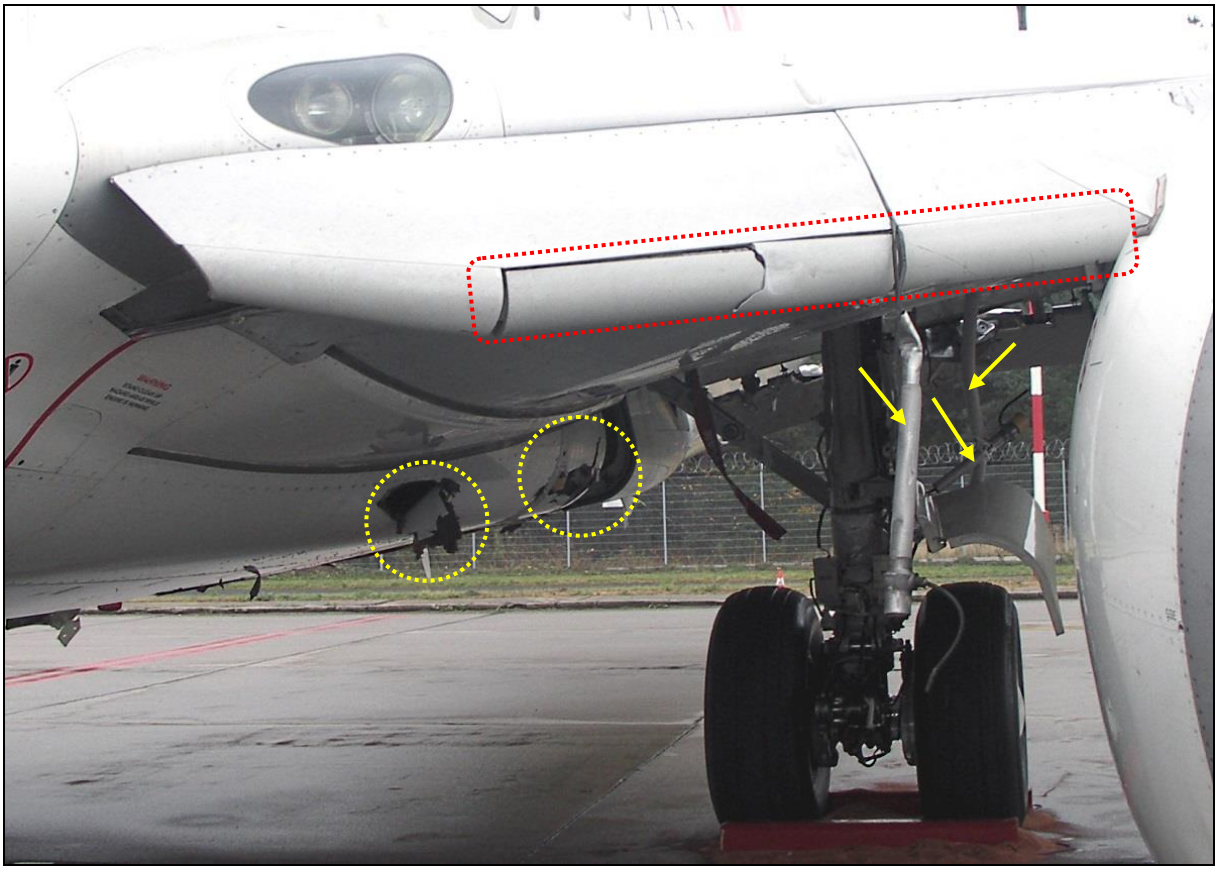
43 – Cabin interior

44 – Left wing – general front view

45 – Left wing front view – inboard and middle parts

46 – Front view of the left wing tip

47 – Front view of the left wing tip – close-up



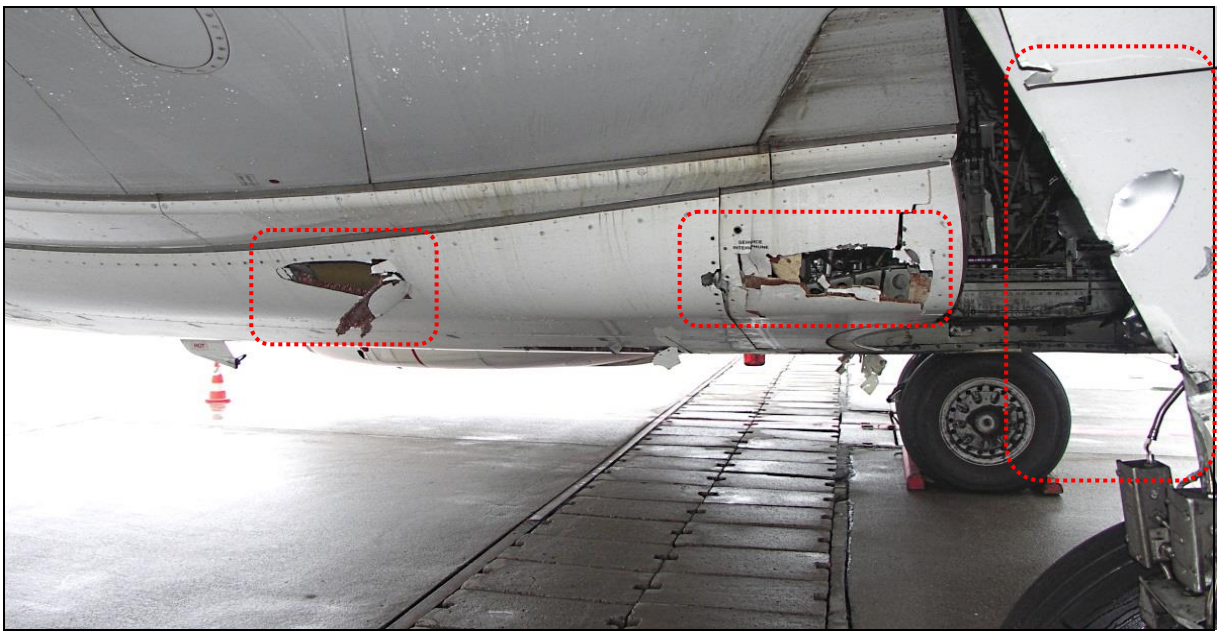
48 – Left wing front view – inboard section, damage marked. Arrows show the lights pieces stuck in the airplane structure

49 – Left engine inlet – visible damage

50 – Damage to the left engine fan – close-up

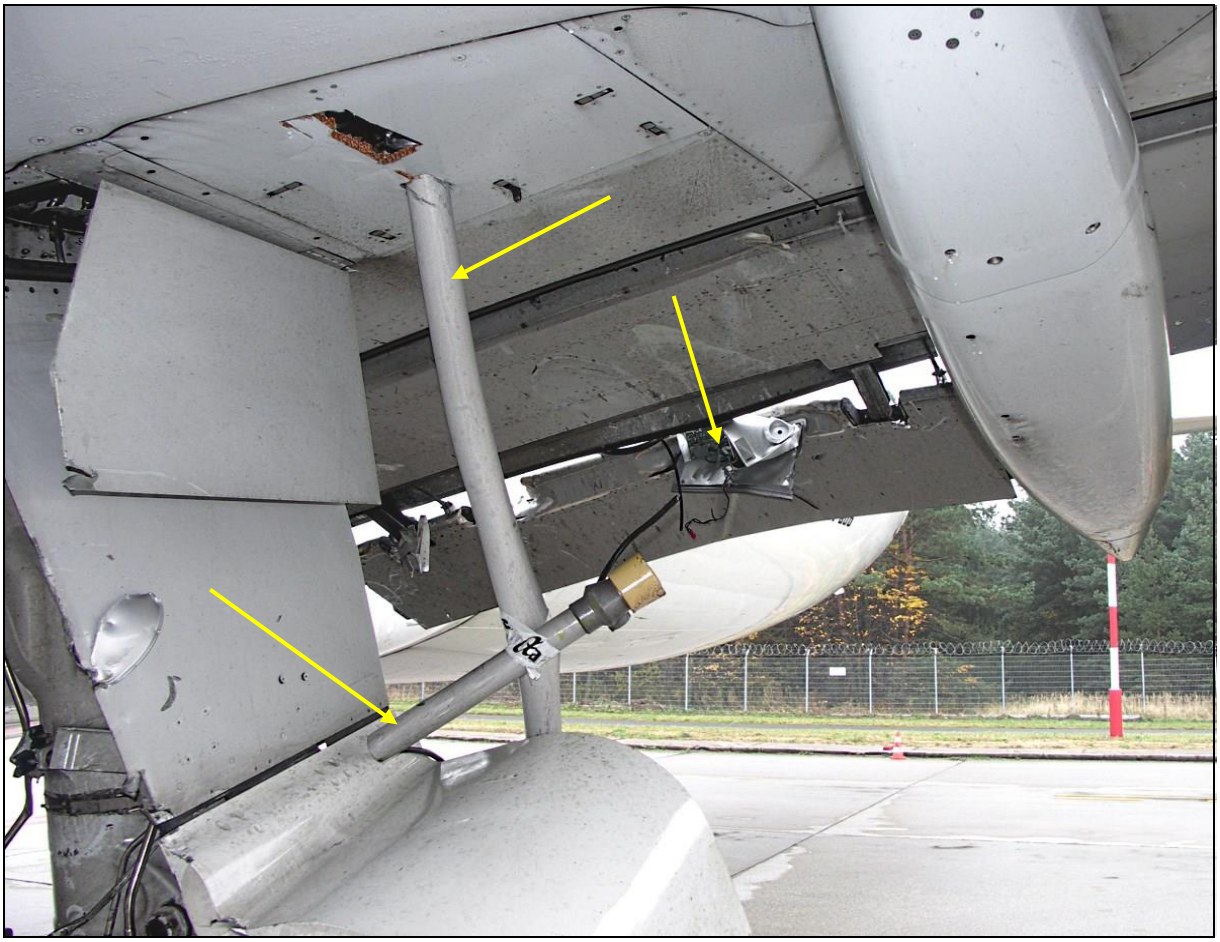
51 – Damage to the left side of the left engine nacelle

52 – Damage to the left side of the left engine nacelle – close-up



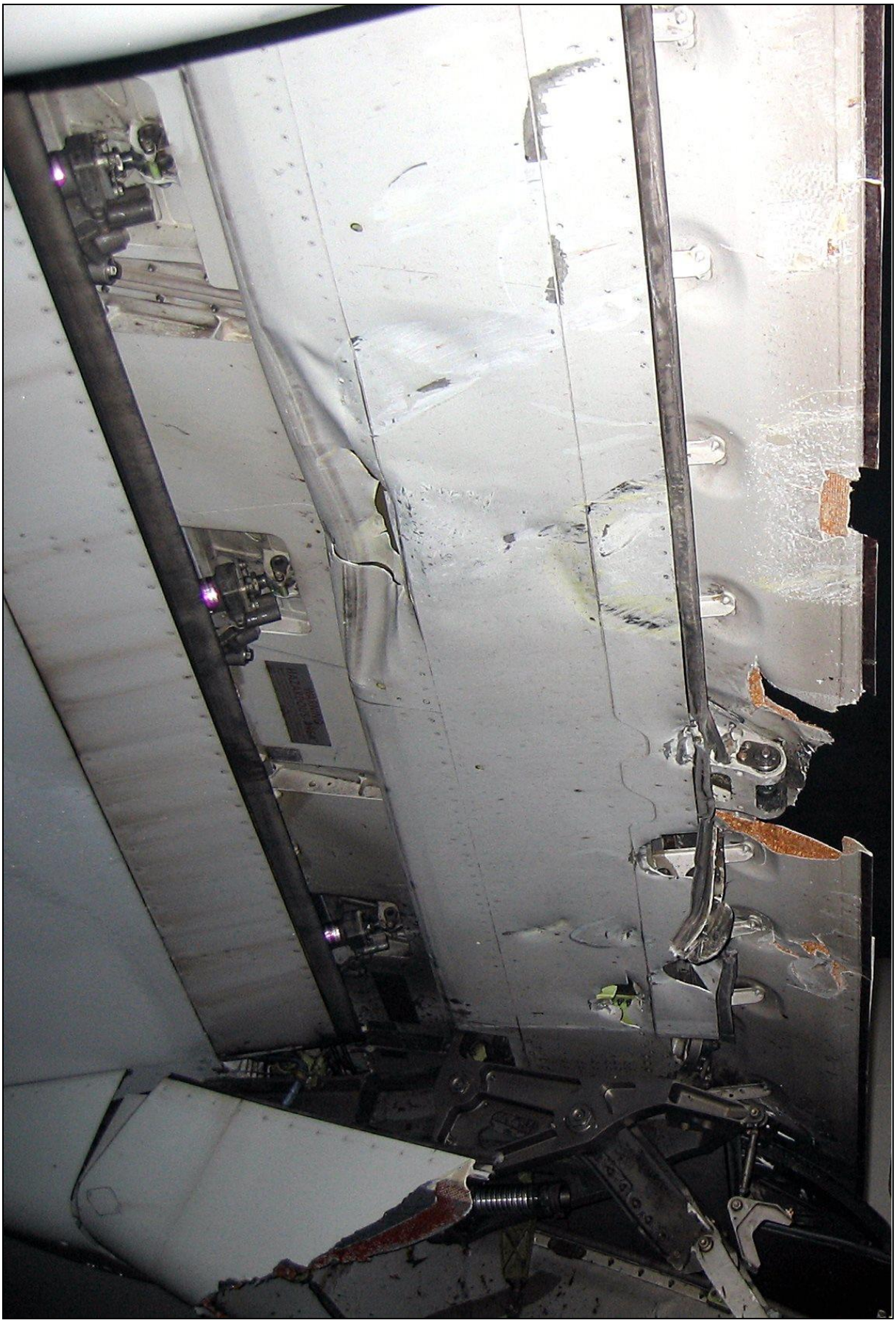
53 – Damage to the left side of belly fairing and the left main landing gear door

54 – Damage to the flap and flap track fairing of the left wing



55 – Damage to the bottom of the left inboard flap. Arrows show the lights pieces stuck in the airplane structure

56 – Damage to the door of the left main landing gear and the bottom of the left inboard flap. Arrows show the lights pieces stuck in the airplane structure



57 – Damage to the bottom of the left outboard flap – close-up [photo: airplane crew]

58 – Damage to the rear section of the left main landing gear door. Arrows show the lights pieces stuck in the airplane structure [photo: airplane crew]

59 – Damage to the left main landing gear door and the left inboard flap. Arrows show the lights pieces stuck in the airplane structure [photo: airplane crew]

60 – Damage to the rear section of the left inboard flap – close-up. Arrows show the lights pieces stuck in the airplane structure [photo: airplane crew]

61 – Damage to the rear section of the left outboard flap and the flap track fairing – close-up

62 – Damage to the track fairing of the left outboard flap; visible damage to the flap [photo: airplane crew]

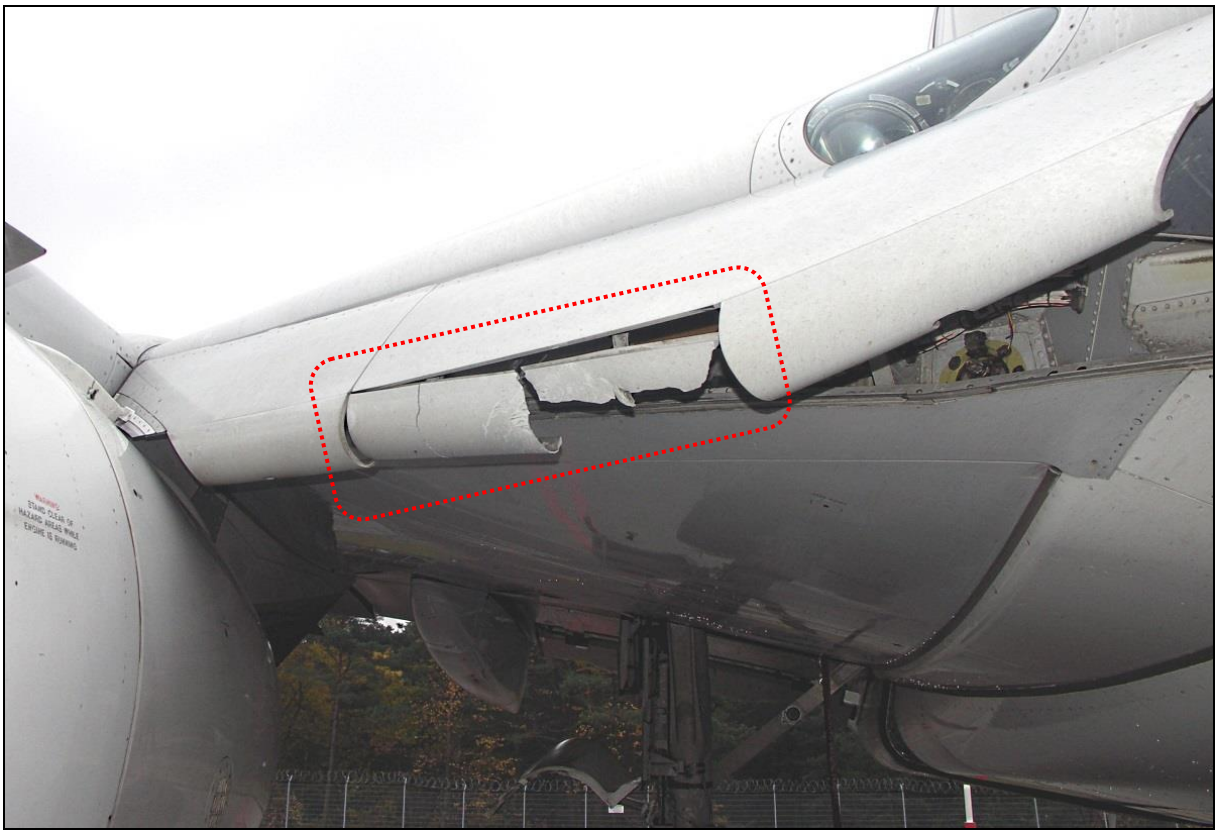
63 – Damage to the track fairing of the left outboard flap; visible damage to the flap [photo: airplane crew]

64 – Top view on the damaged left outboard flap. Visible part of the damaged track fairing

65 – Right wing – general front view

66 – Root area of the right wing – visible damage to the Krüger flap and fuselage puncture

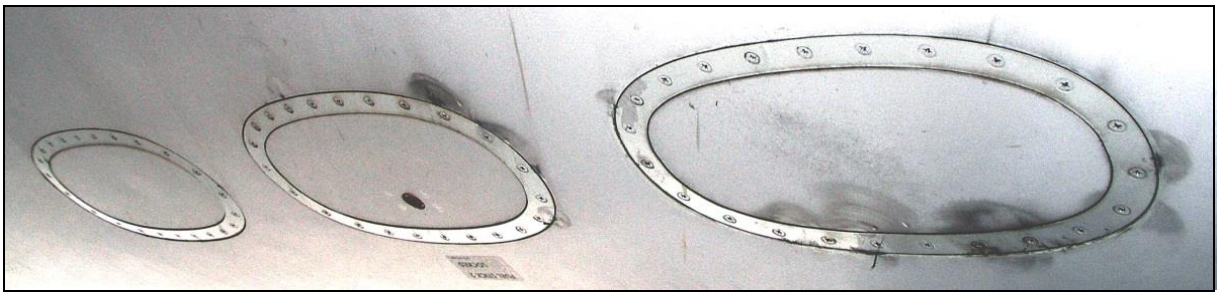
67 – Puncture and scratch of the fuselage – close-up [photo: airplane crew]



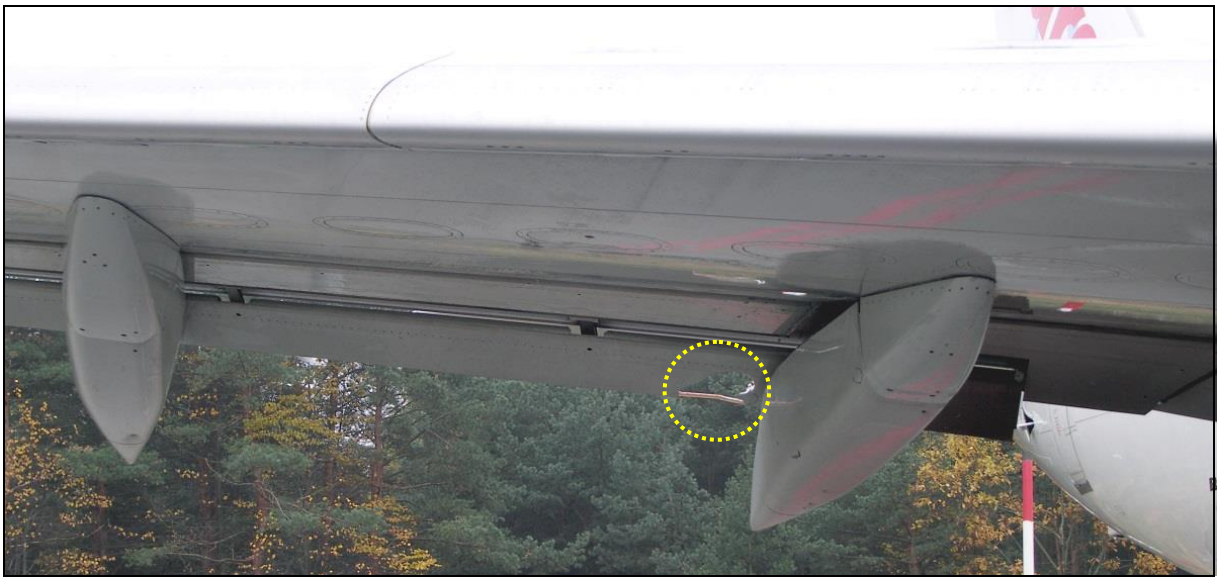
68 – Damage to the right Krüger flap

69 – Damage to the left side of the right engine nacelle. Marked damage resulting from a collision with a light and damage to the Krüger flap

70 – Damage to the right engine inlet

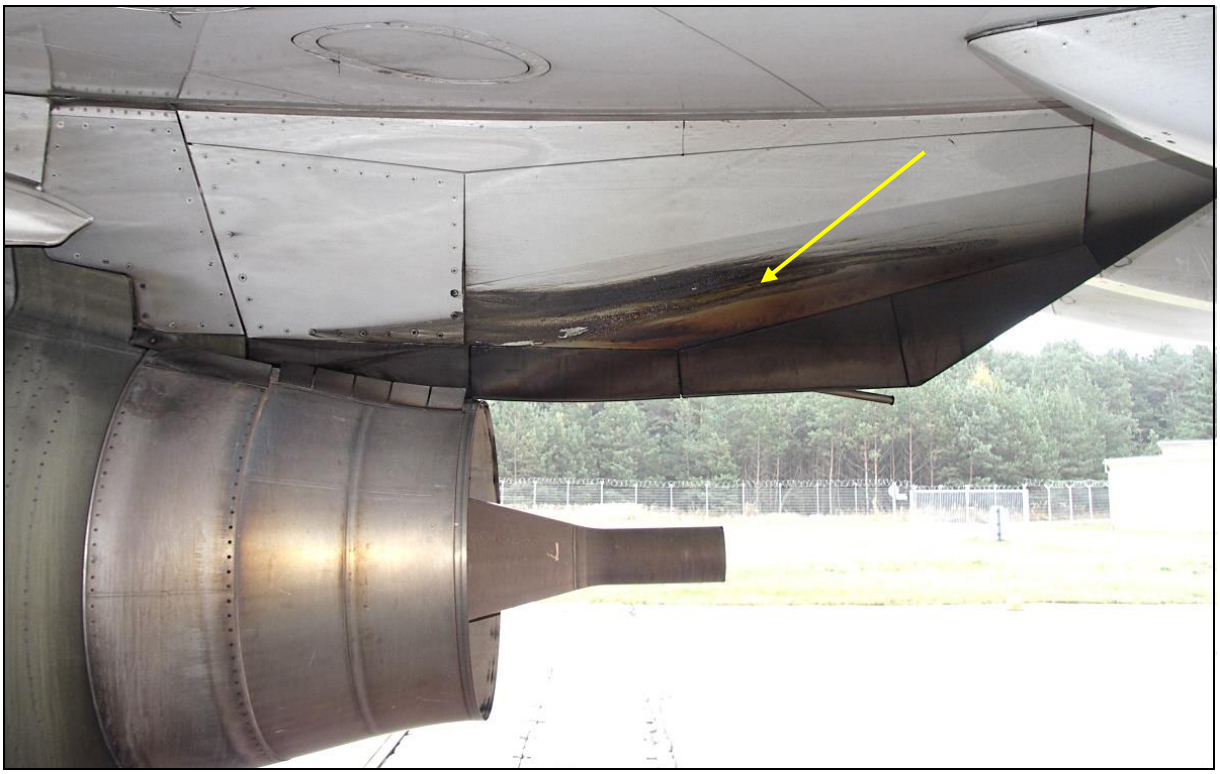


71 – Signs of unsealing of the integral tank in the area of the right wing root



72 – Damage to the right outboard flap, bottom view

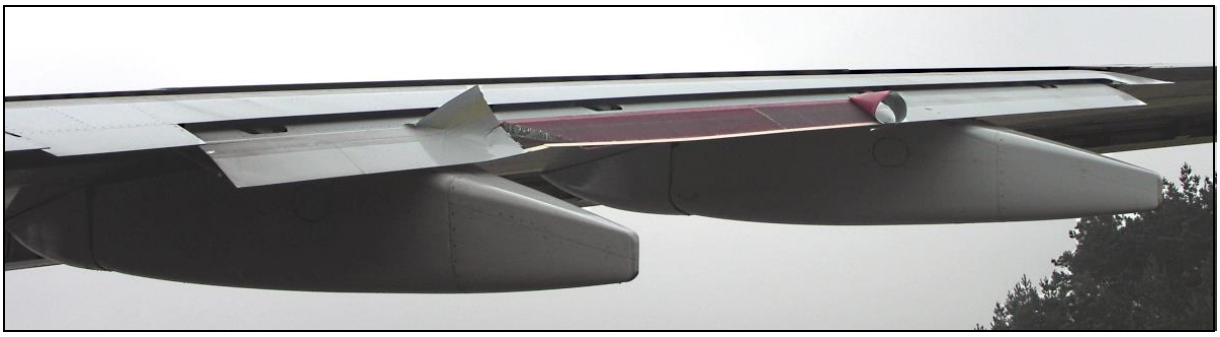
73 – Damage to the left inboard flap, rear view



74 – Abnormal signs on the right engine pylon

75 – Abnormal signs on the right engine pylon

76 – Lights pieces, which went through the outer flow of the engine [photo: airplane crew]



77 – Damage to the right outboard flap – rear view

78 – Damage to the right outboard flap – top view

79 – Damage to the right inboard flap – bottom view

80 – Damage to the right inboard flap – bottom view

81 – Scratches and abrasions of the left rear part of the fuselage skin

82 – Scratches and abrasions of the left rear part of the fuselage skin – close-up

83 – Damage to the left main landing gear door and belly fairing. Arrow shows a light piece stuck in the airplane structure [photo: airplane crew]

84 – Damage to the belly fairing – close-up [photo: airplane crew]

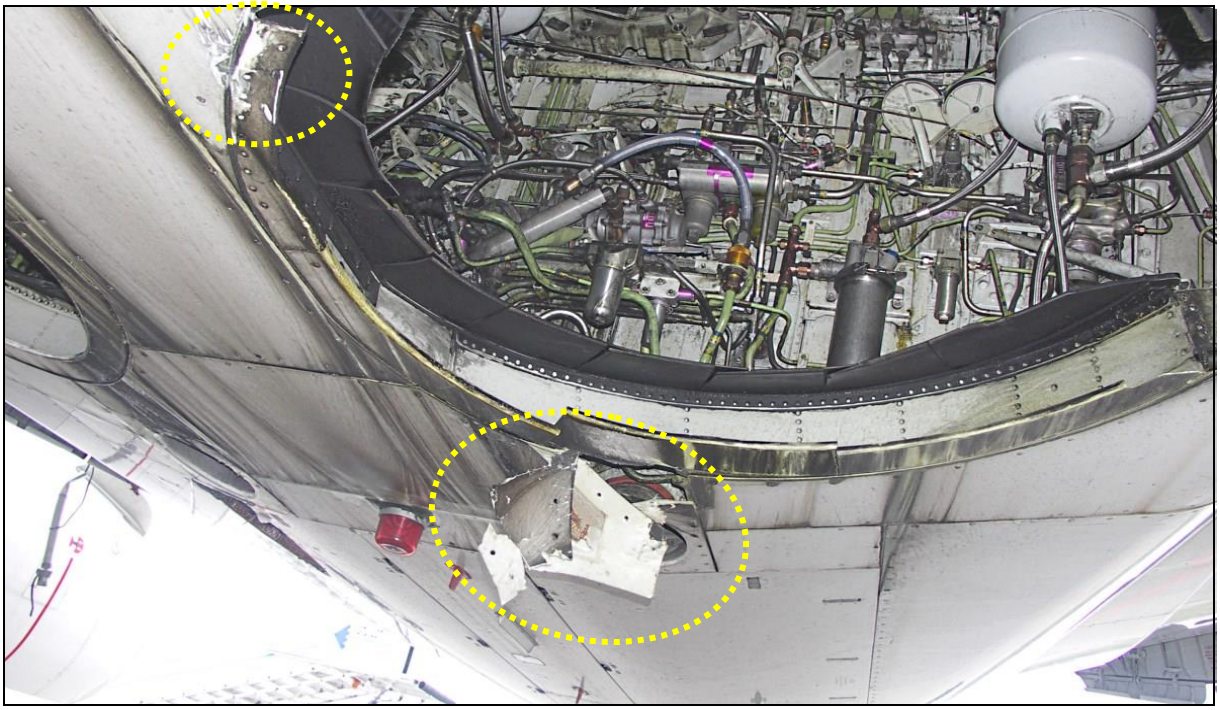
85 – Damage to the belly fairing – close-up [photo: airplane crew]

86 – Damage to the belly fairing – close-up

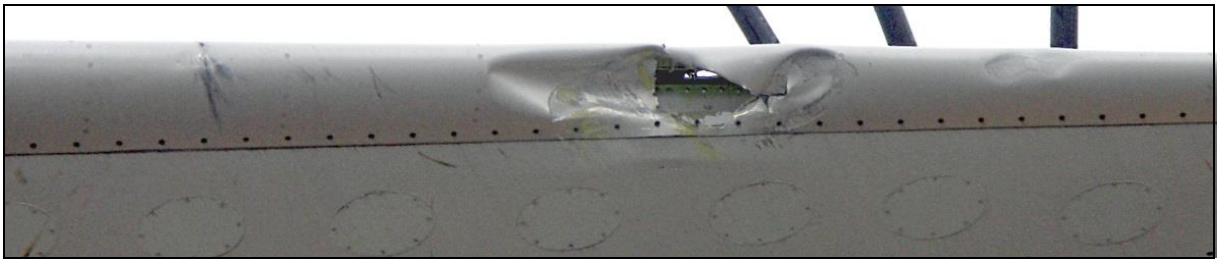
87 – Damage to the belly fairing – close-up

88 – Damage to the belly fairing – close-up [photo: airplane crew]

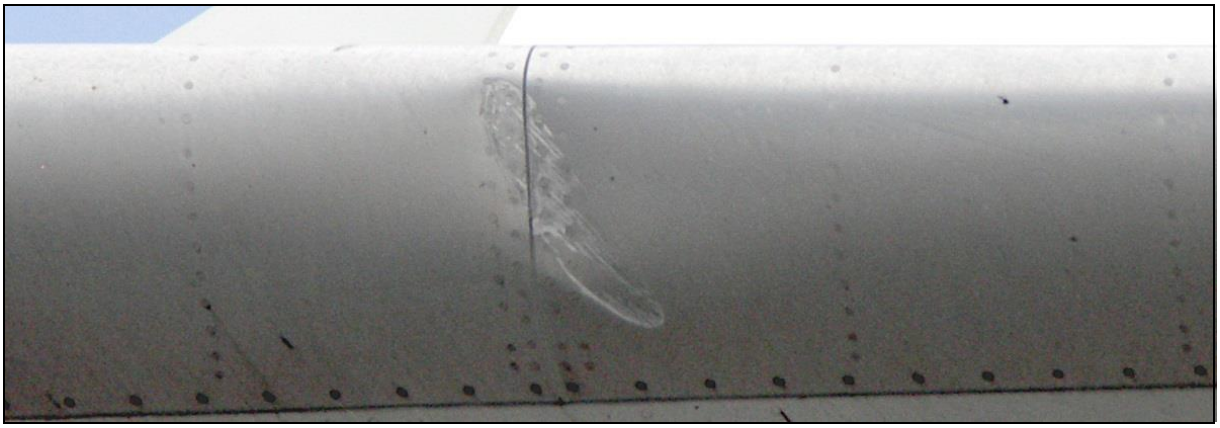
89 – Damage to the bottom part of the fuselage skin – close-up [photo: airplane crew]



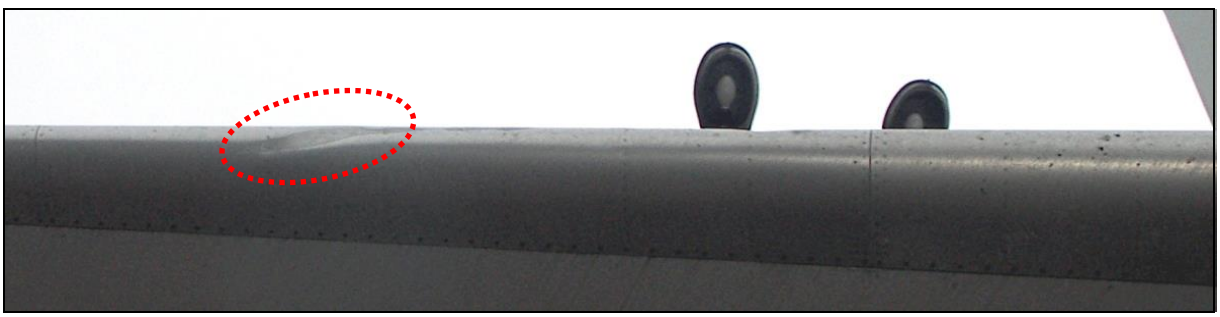
90 – Damage to the belly fairing in the area of the right main landing gear well – close-up



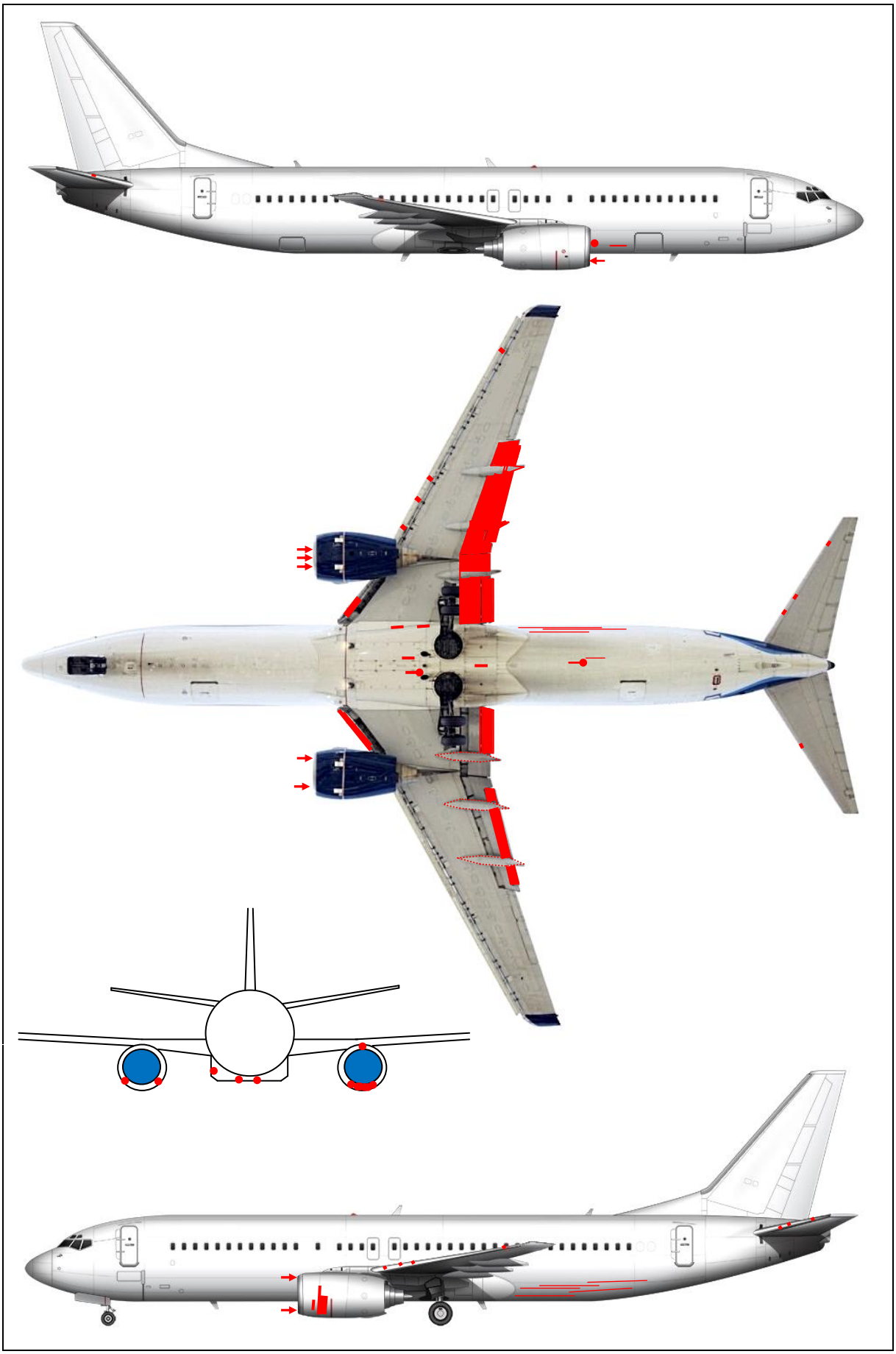
91 – Damage to the left horizontal stabilizer leading edge – close-up



92 – Damage to the left horizontal stabilizer leading edge – close-up



93 – Damage to the right horizontal stabilizer leading edge – close-up



94 – Damage to the airplane parts marked in red

THE END

ANNEX 2
TO FINAL REPORT
ACCIDENT TO BOEING 737-800; EC-HBM
OCCURRENCE 466/07

COMMENTS OF THE OPERATOR

accident to Boeing 737-800; EC-HBM

October 28, 2007, EPKT

ALLEGATIONS TO REPORT

EC-HBM

LANDING SHORT OF THE RUNWAY

Prepared by: Felipe Urien

DATE 08/11/2017

AirEuropa	ALLEGATIONS TO REPORT
	UX-991
LANDING SHORT OF THE RUNWAY	

SYNOPSIS

On October 28 th, 2007, at night, a Boeing 737-800 chartered aircraft, and with registration marks EC-HBM, performing ILS landing on EPKT RWY 27 in low visibility conditions, touched down approximately 870 meters ahead of the runway threshold in the area of the approach light system. The aircraft sustained damage to the engines, fuselage, flaps, and horizontal stabilizer. Most of the aerodrome approach lights were also damaged.

After completing landing roll, the aircraft taxied to a designated stand.

CAUSES

¨Failure to execute a missed approach procedure even if the criteria of a stabilized approach were not met during an attempt to intercept G/S from above at excessive descent rate, under meteorological conditions below the minimum for the aerodrome¨.

Comments: Air Europa agrees with the report and assumes that those were the main causes of the accident.

FACTORS CONTRIBUTING TO THE OCCURRENCE

1. **Errors in CRM: Air Europa agrees with the report. In allegation, since 10 years have elapsed, Air Europa has implemented during this period a fully documented training program in human factors and CRM (OM D 2.1.2 and 3.4.4.1). In addition, NOTECHS assesments are carried out during line checks and simulator OPC checks according to AMC1 ORO.FC.115.**

2. **Failure of the crew to perform the approach in accordance with the published procedure: Air Europa agrees with the report. In allegation, Air Europa has an implemented and documented procedure (OM A 8.3.2.1.6 and 8.3.5.2) to review the approach procedure loaded in the FMC against the approach plate. This procedure should be performed during the approach briefing.**

3. **No response to the EGPWS alerts. Air Europa agrees with the report. In allegation, Air Europa has an implemented policy regarding the use, training, compliance with TAWS alerts (OM A 8.3.2.1.17 and OM D 2.1.7.1.6).**

4. **Landing on an aerodrome equipped with ILS CAT I with autopilot engaged: In allegation, it´s a fact that the autopilot was engaged at the time of the event, however, the startle effect, the lack of height awareness and the rush to intercept a Fly-up glide slope, caused the flight crew to react instinctively trying to override the autopilot using manual force instead of the quick disconnect button. Therefore, as insufficient force was applied, the crew failed to disconnect the autopilot.**

5. RECOMMENDATIONS AND ACTIONS TAKEN

1. **Recommendations regarding descent planning: Air Europa accepts this recommendation, and furthermore, procedures described in the OM B (2.2.1-2.3.2.3-2.3.8.10) reinforce the importance of filling out all fields in the FMC in order to achieve an accurate descent planning.**

   ¨when the descent is being planned, the crew must modify the FMC route in order to account for any possible shortcuts, vectors, holdings, etc.. allowing the FMC to calculate the most efficient profile. Due to this, the FMC route may not coincide with the published route, demanding extra awareness of the flight route being flown¨.

   In this particular case, the CM1 ordered the F/O to skip the procedure hold published in the chart and depicted on the navigation display in order to minimize the fuel consumption as it was being higher than planned initially. This caused the airplane to be high on the profile.

2. **Stabilized approach recommendations: Air Europa accepts this recommendation. This has been implemented in the OM A 8.3.2.1.17 and all crews are continuously encouraged during the recurrent training in Operational Safety to discontinue the approach if it becomes unstabilized below 1000 feet.**
   A stabilization policy with a single gate at 1000 feet has been defined for ALL approaches.
   Beside this, Air Europa has an implemented SMS system and an effective FDM program in accordance with AMC1.ORO.AOC.130. Compliance monitoring inspections are periodically carried in accordance with ORO.GEN.200

3. **Regarding weather minima, Air Europa, according to AirOps AMC1.CAT.OP.MPA 305e, has published in the OM A 8.3.2.1.13 the visual requirements to commence and continue the approach below 1000 feet in those approaches with DH lower than 1000 feet. Since then, it has never happened again that any airplane operated by Air Europa has violated the approach ban.**

4. **The crew left the airport without reporting the damage caused to the approach lights: Air Europa agrees with the report. In allegation, the crew suffered a big emotional impact when they realized about the damage caused to the aircraft. There was no intention to hide the effects of the accident as they were obvious.**

5. **Regarding the increased fuel consumption, all flight dispatches have changed and enhanced with the implementation of the LIDO Briefing Package which uses an improved weather prognosis for the selection of alternate aerodromes.**
   The LIDO package discards automatically any alternate airport not meeting required planning minima.

Air Europa has introduced in the OM A 8.1.10 instructions to provide a new operational flight plan anytime the ATOM exceeds the TOM used in the initial flight plan by more than 2000kg. Fuel penalty information for weight variations up to 2000kg are provided in the Operational Flight Plan.
In order to achieve accurate trip fuel calculations, performance degradation values are determined according to the internal procedure ref. AEA-PE3-099.

6. **All Boeing 737´s in Air Europa have been equipped with ACARS system, allowing flight crews to obtain actual weather reports in a fast and easy way, helping them in the process to analyze options and take decisions.**

7. **Air Europa has implemented a conservative fuel policy described in the OM B 2.3.8, based on a correct fuel management, taking into account that safety is the main pillar of the operation.**

8. **Air Europa has made modifications in the OM A 4.2.2 to clearly define the designation of the captain in case of special crewing. A special crewing is understood as any other than the standard commander and co-pilot.**

   ¨In case of a crew composed by more than one pilot qualified as a commander, one of them will be designated as the pilot-in-command, and the rest as co-pilots. The crew member designated as the pilot-in-command will occupy the left-hand seat¨.

9. **After the accident, air Europa carried out an internal investigation and its final report was shared with the Spanish CIAIAC.**

10. **The involved crew received extra-training in simulator, and were scheduled to fly under supervision during line operation until they were considered ready to fly again without an instructor. The captain, participated in several conferences to mind the rest of the pilots about the importance of CRM and adherence to the SOP´s, expressing lessons learnt.**