MINISTRY OF INFRASTRUCTURE
STATE COMMISSION ON AIRCRAFT ACCIDENT INVESTIGATION

FINAL REPORT

Serious Incident

Occurrence No: 619/10

Aircraft: F-100, D-AGPH

1 July 2010

Warszawa-Okęcie (EPWA)

This report is a document presenting the position of the State Commission on Aircraft Accident Investigation concerning circumstances of the air occurrence, its causes and safety recommendations.

The report is the result of the investigation carried out in accordance with the applicable domestic and international legal provisions for prevention purposes only. The investigation was conducted without the need of application of legal evidential procedure.

In connection with the Article 134 of the "Aviation Law" Act (Journal of Laws 2006, No. 100, item. 696 with amendments), the wording used in this report may not be considered as an indication of the person guilty or responsible for the occurrence.

The Commission makes no judgments about fault and responsibility.

In connection with the above, any form of use of this report for any purpose other than air accidents and serious incidents prevention, can lead to wrong conclusions and interpretations.

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

Warsaw 2011

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Terms and acronyms

AFE	Above Field Elevation;
AMSL	Above Mean Sea Level;
APP	Approach Control Service;
ATC	Air Traffic Control;
CAS	Calibrated Air Speed;
CPT	Captain;
CVR	Cockpit Voice Recorder;
CTR	Control Zone;
DH	Descent Height;
DFDR	Digital Flight Data Recorder;
FCOM	Flight Crew Operation Manual;
Feet-(ft)	Altitude measurement unit - 0.3048 m;
FL	Flight Level;
F/O	First Officer;
ILS	Instrument Landing System;
IR CAT III	Instrument Rate CAT III;
LC	Line Check;
LSZH	Zürich Airport;
LMT	Local Mean Time;
MDA	Minimum Descent Altitude**;**
METAR	METeorological Aerodrome Report;
NM	Nautical Mile – 1852 m;
OPC	Operator Proficency Check;
PIC	Pilot In Command;
PF	Pilot Flying;
PM	Pilot Monitoring;
RWY	Runway;
TWR	Aerodrome Control Tower;
QNH	Barometric pressure adjusted to sea level – an altimeter set on QNH will read altitude above mean sea level;
UTC	Co-ordinated Universal Time;
EPWA	Warsaw Airport.

General Information

Occurrence:	**Serious incident**
Type and model of aircraft :	**F - 100**
Aircraft registration marks:	**D-AGPH**
Aircraft commander :	**ATPL(A) Licence**
Flight organizer :	**Swiss International Air Lines**
Aircraft user :	**Contact Air Flugdienst GmbH +Co**
Aircraft owner :	**AeroCentury Corporation**
Place of the incident :	**EPWA**
Date and time of the incident :	**1 July 2010, 08:27 hrs UTC**
Damage to the aircraft :	**Minor damage**
Injuries to persons :	**No injuries**

SYNOPSIS

Note: all times in the Report are expressed in UTC (UTC = local time (LMT) - 2 hours)

On 1 July, 2010 the flight crew of F - 100 airplane, flight No SWR343T, during „Soxer 1G" departure from EPWA approximately at FL 70 could hear an impact sound from the nose bottom part of the fuselage. The flight crew stoppede climbing, reduced the flight speed to approximately 200 kt, and decided to return to the take off aerodrome. The landing took place at 08:44.

Investigation of the incident was conducted by the SCAAI Investigating Team in the following composition:

MSc Waldemar Targalski – Investigator-in-Charge - Member of SCAAI;
Pch D. Stanisław Żurkowski - Member of SCAAI;
MSc Jerzy Kędzierski - Member of SCAAI.

During the investigation SCAAI determined that the probable cause of the serious incident could be:

Reduced strength of the radome sandwich structure caused by gradual (over time) degradation of the material in fiberglass epoxy composite structures and their bonds.

Probable factor contributing to the incident could be:

- several bird strikes against the radome, which occurred earlier and could cause a progressive weakening of its structure. Maitanance of the radome and minor repairs made by the airplane user did not reveal weakening of the construction and did not maintain properly the composite structure and protect it from environmental factors despite they were carried out according to the procedures given in the aircraft maintenance manual.

After conclusion of the investigation SCAAI has made five safety recommendations.

FACTUAL INFORMATION

1.1. History of the flight

On 1 July, 2010 the flight crew carried out a commercial flight from EPWA (Warszawa-Okęcie) to LSZH (Zürich). The flight was carried out according to IFR for Swiss International Air Lines – callsign SWR343T. There were 84 passengers and 4 crew members on the board. The flight crew carried out „Soxer 1G" departure from Runway 29 and in accordance with the received clearance were climbing to FL 240. During the climb the flight crew could hear an impact sound from the nose bottom part of the fuselage and at the same time they noticed a malfunction of the Captain's (CPT) air speed indicator (speed fluctuations +/-20 kt). Flight crew stopped climbing and reported their intention to return to the take off aerodrome because of probable bird strike.

The aircraft was vectored by Approach to land on Runway 33. During final approach the windshear warning was triggered. The flight crew performed a Go Around procedure followed by landing. The landing was made with the assistance of Warsaw Airport duty services.

1.2. Injuries to persons

Not found.

1.3. Damage to aircraft

The radome in its central part was damaged and moved in the down left direction.

The following damages were reported to SCAAI after detailed inspection of the aircraft conducted by Contact Air personnel:

- *(…) no other structural damages except to the Radome, which was deformed and perforated;*
- *the inner layer of the material is delaminated of an area from 66-70% of the Radome;*
- *there are no signs of bird strike or other kind of impact traces;*
- *the mentioned IAS problems on L/H EFIS could not be reproduced on ground and were related to the turbulence caused by the damaged Radome;*
- *the WX antenna had slight chafing marks on the plate and three cables (...).*

REPORT

The first Information's about the incident were as follows:

- Unknown impact at nose radom area in approx 6000-7000ft.
- After impact L/H EFIS Airspeed indications, wrong compared to the other A/C systems
- Landing in WAW performed with use of navigation aids.

As the A/C was landed we received photos taken from the damaged Radom.

- MOC organized two technician's (B1 , B2) for the inspection and repair in WAW.
- LOG organized the Transport of a new Radom from STR to WAW.

The inspection and repair of the PH was covered in the Techlog Entry's 49406, 49408, 49410.

- The inspections showed no other structural damages, except of the Radom. The Radom showed heavy signs of deformation and perforation.
- The inner layer of the material is delaminated of an area from 66-70% of the Radom.
- There are no signs of bird strike or other kind of impact traces
- The mentioned IAS problems on the L/H EFIS could not be reproduced on gnd and were related to the turbulence caused by the damaged Radom.
- The WX Antenna had slight chafing marks on the plate and three cables. The cables isolation was fixed. The system worked still without problems. For a final repair the WX Antenna will be replaced asap.
- Finally the Radom was replaced by a new serviceable part before the next flight of the A/C.

After the first flight the crew also reported no more problems with Radar or Airspeed indications.

Copy of the Damage Report drawn up by te user and sent to SCAAI

The described damages are shown on the following photos made by the Commission members after their arrival at Warszawa - Okęcie aerodrome.


Warsaw


PH

In order to make the detailed assessment of the aircraft technical condition and to restore its airworthiness, Contact Air transferred do Warsaw their specialists. Their work is confirmed by the following documents and the Damage Report reproduced on page 7.

Contact Air

AC-Registration	Station	Date	Work Order No.
D-AGPH	WAW	01.Jul.2010	49406

Aircraft Type	ATA	Journey L. No./Leg No.	DC/DT	WO-Type	MEL Reference	CAT-Status
F100	51-00-00-F	/	/	P☒ M☐ S☐	/ /	A☐ B☐ C☐ D☐

F.B. Request	HIL	Technical Incidents	P-Code	Defect Class	Warranty	Cannib.	Project No.
Brief. Card ☐	Yes ☒	AT☐ DV☐ RR☐ SD☐ TB☐	ROC	H☒ I☐ M☐	☐	☐	

RVSM INOP ☐ ACARS INOP ☒ APU INOP ☐

DETAILED DEFECT DESCRIPTION AND INDICATIONS

NOSE RADOME DEFORMED + PERFORED DUR POSIBLE BIRD STRIKE + SPEED
INDICATION ABNORMALIES CM1 SIDE

WO Reference (W ork Order, T askcard, O ther)		Reason for Transfer G-Ground Time / S-Lack of Spares / T-Tools / M-Manpower /D-Doc Failure					
		Transferred				P-Code	Sign
		Reason	Due Date	TAH	TAC		
W	49408						
W	49410						

DETAILED DESCRIPTION OF ACTION AND REFERENCE TO DOCUMENT SOURCE — P-Code Sign

REPLACED NOSE RADOME IAW TASK 53-64-00-000/400-814A REV JUN 01/10 AND
PERFORMED BIRDSTRIKE INSPECTION IAW TASK 05-51-06-200-816A REV JUN 01/10
NO MORE DAMAGES FOUND

Parts Request

	Description	Part Number	IPC-Reference	Mod.-Sts.	Qty.
1					
2					
3					
4					
6					

Parts Installation / Removal

	Description	Part Number	Serial Number	Label Numbers	Pos.
ON					
OFF					
ON					
OFF					

Planing Information

Est.Gnd. Time	00:00	Used MHrs.	P-Code
Qualif.	Est. MHrs.	00:19	PRZ
		19:00	PRZ
		19:00	SEU

Oil Refill (in Qts.)

	LH	RH		
ENG			APU	
IDG			HYD 1	HYD 2

Double Inspection

P-Code	Sign	Stamp

Work Order Closed / Release to Service

Station	Date	Time UTC	TAH	TAC	P-Code	Sign	Stamp	Organisation
WAW	02.Jul.2010	10:30	39313	37510	SEU			DE145.0102

CERTIFIES THAT THE WORK SPECIFIED WAS CARRIED OUT IN ACCORDANCE WITH PART 145 AND IN RESPECT TO THAT WORK THE AIRCRAFT IS CONSIDERED READY FOR RELEASE TO SERVICE

CA-Form-034 Rev.3/11.12.07

COPY printed by HAM on Tue. 6.July 2010 at 13:43 out of database prod hosted on 57.56.178.141 produced by AMOS www.swiss-as.com

Contact Air

AC-Registration	Station	Date	Work Order No.
D-AGPH	WAW	02.Jul.2010	49408

WO0049408

Aircraft Type	ATA	Journey L. No./Leg No.	DC/DT	WO-Type	MEL Reference	A B C D	CAT-Status
F100	34-12-00-F	/	/	P☐ M☒ S☐	/ /	☐ ☐ ☐ ☐	

F.B. Request / Brief. Card	HIL	Technical Incidents AT DV RR SD TB	P-Code	Defect Class H I M	Warranty	Cannib.	Project No.
☐ / ☐	Yes ☐	☐ ☐ ☐ ☐ ☐	PRZ	☐ ☒ ☐	☐	☐	

RVSM INOP ☐ | ACARS INOP ☒ | APU INOP ☐

DETAILED DEFECT DESCRIPTION AND INDICATIONS

WRONG SPEED INDICATION AFTER RADOM DEFORMATION, ON CA #1 SIDE

WO Reference (W ork Order, T askcard, O ther)		Reason for Transfer G-Ground Time / S-Lack of Spares / T-Tools / M-Manpower /D-Doc Failure: Transferred Reason	Due Date	TAH	TAC	P-Code	Sign
W	49406						
W	49410						

DETAILED DESCRIPTION OF ACTION AND REFERENCE TO DOCUMENT SOURCE — P-Code Sign

PERFORMED FUNCTIONAL TEST OF AIR DATA COMPUTER SYSTEM #1 AND LEAKCHECK, IAW 34-12-00-720-825A AND 34-11-00-790-815C, FOUND SYSTEM IN SERVICEABLE CONDITION.

Parts Request

	Description	Part Number	IPC-Reference	Mod.-Sts.	Qty.
1					
2					
3					
4					
5					

Parts Installation / Removal

	Description	Part Number	Serial Number	Label Numbers	Pos.
ON					
OFF					
ON					
OFF					

Planing Information

Est.Gnd. Time	00:00	Used MHrs.	P-Code
Qualif.	Est. MHrs.		

Oil Refill (in Qts.)

	LH	RH		
ENG			APU	
IDG			HYD 1	HYD 2

Double Inspection

P-Code	Sign	Stamp

Work Order Closed / Release to Service

Station	Date	Time UTC	TAH	TAC	P-Code	Sign	Stamp	Organisation
WAW	02.Jul.2010	11:00	39313	37510	PRZ			

CERTIFIES THAT THE WORK SPECIFIED WAS CARRIED OUT IN ACCORDANCE WITH PART 145 AND IN RESPECT TO THAT WORK THE AIRCRAFT IS CONSIDERED READY FOR RELEASE TO SERVICE

CA-Form-034 Rev.3/11.12.07

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Contact Air

AC-Registration	Station	Date	Work Order No.
D-AGPH	WAW	02.Jul.2010	49410

Aircraft Type	ATA	Journey L. No./Leg No.	DC/DT	WO-Type	MEL Reference	A B C D	CAT-Status
F100	34-41-00-F	/	/	P☐ M☒ S☐	/ /	☐ ☐ ☐ ☐	

F.B. Request / Brief. Card	HIL	Technical Incidents AT DV RR SD TB	P-Code	Defect Class H I M	Warranty	Cannib.	Project No.
☐ / ☐	Yes ☐	☐ ☐ ☐ ☐ ☐	PRZ	☐ ☒ ☐	☐	☐	

RVSM INOP ☐ | ACARS INOP ☒ | APU INOP ☐

DETAILED DEFECT DESCRIPTION AND INDICATIONS

DURING BIRDSTRIKE INSPECTION ON RADOM FOUND SMAL CHAVING MARK ON BACK SIDE OF ANTENNA BLADE AND ON 3 WIRES TILT MOTOR

WO Reference (W ork Order / T askcard / O ther)		Reason for Transfer G-Ground Time / S-Lack of Spares / T-Tools / M-Manpower /D-Doc Failure					
		Transferred				P-Code	Sign
		Reason	Due Date	TAH	TAC		
W	49406						
W	49408						

DETAILED DESCRIPTION OF ACTION AND REFERENCE TO DOCUMENT SOURCE — P-Code Sign

PERFORMED TEMP REPAIR OF WIRE ISOLATION IAW WDM 20, REV 06/10
PERFORMED FUNCTIONAL TEST IAW
34-41-03-400-814A, WX - RADAR STILL SERVICEABLE

Parts Request

	Description	Part Number	IPC-Reference	Mod.-Sts.	Qty.
1					
2					
3					
4					
5					

Parts Installation / Removal

	Description	Part Number	Serial Number	Label Numbers	Pos.
ON					
OFF					
ON					
OFF					

Planing Information

Est.Gnd. Time	00:00	Used MHrs.	P-Code
Qualif.	Est. MHrs.		

Oil Refill (in Qts.)

	LH	RH		
ENG			APU	
IDG			HYD 1	HYD 2

Double Inspection

P-Code	Sign	Stamp

Work Order Closed / Release to Service

Station	Date	Time UTC	TAH	TAC	P-Code	Sign	Stamp	Organisation
WAW	02.Jul.2010	11:30	39313	37510	PRZ			

CERTIFIES THAT THE WORK SPECIFIED WAS CARRIED OUT IN ACCORDANCE WITH PART 145 AND IN RESPECT TO THAT WORK THE AIRCRAFT IS CONSIDERED READY FOR RELEASE TO SERVICE

CA-Form-034 Rev 3/11.12.07

COPY printed by HAM on Tue. 6.July 2010 at 13:45 out of database prod hosted on 57.56.178.141

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FLUGUNTÜCHTIGKEITSMELDUNG

Tailnumber **D-** AGPH

A/C STATUS

☒ **AOG**
☐ **Handicapped**
☐ **Downgrade CAT 1☐ CAT 2☐**

Reason: Impact on Radom at 6000 - 7000ft.

FL – Number: 1334 Location: WAW UTC: 08:08

Date: 01.07.10 Name: Erler Dept. MOC

Estimated ☐ **Next Scheduled Flight** _____
☐ **Next Info from Technik** _____

Action/ Additional Info

Tech Log/WO: 49406

AOG Team send: Send B1 and B2 to WAW for repair

Parts: Send new Radom to WAW by Kurier

Other Infos/ Action: Replaced defect Radom, peformed Detail Inspection of A/C structure around Radome. No defekt. Perfomen Inspection of Pitot System. No defekt. Performed FC of Pitot Static System, Weather Radar and Loc antenna. Found Ok

Aircraft ☒ **Ready to Service**
☐ **Upgraded to CAT 2 ☐ CAT 3 ☐**

Date 02.07.10 **UTC** 12:00 **Name** _____ **Dept:** MOC

MOC Form 20 REV.6/ 18.10.08

After completing the work listed in the above documents, the aircraft airworthiness was restored.

The described damages are typical of implosion.

1.4. Other damages

Damaged insulation of the weather radar motor cables. On 5 July 2010, in accordance with the Work Order reproduced below, the drive of weather radar antenna was replaced.

Contact Air

AC-Registration	Station	Date	Work Order No.
D-AGPH	STR	05.Jul.2010	50172

Aircraft Type	ATA	Journey L. No./Leg No.	DC/DT	WO-Type	MEL Reference	CAT-Status
F100	34-41-03-F	/	/	P☐ M☒ S☐	/ /	A☐ B☐ C☐ D☐

F.B. Request / Brief. Card	HIL	Technical Incidents AT DV RR SD TB	P-Code	Defect Class H I M	Warranty	Cannib.	Project No.
☐ / ☐	Yes ☐	☐ ☐ ☐ ☐ ☐	PAR	☐ ☐ ☒	☐	☐	

RVSM INOP ☐ ACARS INOP ☒ APU INOP ☐

DETAILED DEFECT DESCRIPTION AND INDICATIONS

REFER WO 49419 TEMP REPAIR ON RADAR MOTOR

REPLACE DRIVE WEATHER RADAR ANTENNA

WO Reference (Work Order / Taskcard / Other)		Reason for Transfer G-Ground Time / S-Lack of Spares / T-Tools / M-Manpower /D-Doc Failure: Transferred Reason	Due Date	TAH	TAC	P-Code	Sign
TL	049410						

DETAILED DESCRIPTION OF ACTION AND REFERENCE TO DOCUMENT SOURCE — P-Code Sign

DRIVE WEATHER RADAR REPLACED
IAW TSK 344103 000/400 814A AMM 01.06.10
TEST OK

Parts Request

	Description	Part Number	IPC-Reference	Mod.-Sts.	Qty.
1					
2					
3					
4					
5					

Parts Installation / Removal

	Description	Part Number	Serial Number	Label Numbers	Pos.
ON	DRIVE WEATHER RADAR AN	622-5135-001	1138	60739	
OFF	DRIVE WEATHER RADAR AN	622-5135-201	1072	60739	
ON					
OFF					

Planing Information

Est.Gnd. Time	00:00	Used MHrs.	P-Code
Qualif.	Est. MHrs.		

Oil Refill (in Qts.)

	LH	RH		
ENG			APU	
IDG			HYD 1	HYD 2

Double Inspection: P-Code | Sign | Stamp

Work Order Closed / Release to Service

Station	Date	Time UTC	TAH	TAC	P-Code	Sign	Stamp	Organisation
STR	06.Jul.2010	01:00	39340	37534	PAR			DE145.0102

CERTIFIES THAT THE WORK SPECIFIED WAS CARRIED OUT IN ACCORDANCE WITH PART 145 AND IN RESPECT TO THAT WORK THE AIRCRAFT IS CONSIDERED READY FOR RELEASE TO SERVICE

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1.5. Personnel information (Crew data)

Captain (CPT)

Male, aged 45, ATPL(A) Licence, issued by Luftfahrt-Bundesamt on 25 march 1998, valid until 11 September 2014. Ratings entered into Licence:

F70/100:

- PIC - valid until 31 December 2010;
- IR CAT III - valid until 31 December 2010.

ATR42/72

- PIC - valid until 9 April 2010;
- IR CAT II - valid until 9 April 2010.

Captain was certified to maintain radiotelephony communication from the aircraft in English and German. He had Class 1 Medical Certificate valid until 9 September 2010 and Class 2 Certificate valid until 9 September 2011. OPC (Operator Proficiency Check) dated 20 April 2010, (LC – Line Check) dated 8 March 2010.
The pilot was rated for CAT IIIA approach.

Total flight time:	5918 hrs;
Flight time as a Commander:	1300 hrs;
Flight time as a Commander on F-100:	259 hrs;
Flight time over the last 90 days:	131 hrs 49 min;
Flight time over the last 30 days:	39 hrs 26 min;
Flight time over the last 24 hrs:	6 hrs 3 min.

The last flight prior to the occurrence date - on the same day, flight to Warsaw.

First Officer (F/O)

Male, aged 33, ATPL(A) Licence, issued by Luftfahrt-Bundesamt on 26 November 2002, valid until 22 July 2014. Ratings entered into Licence:
F70/100:

- COP - valid until 31 December 2010;
- IR CAT III - valid until 31 December 2010.

(F/O) was certified to maintain radiotelephony communication from the aircraft in English and German. He had Class 1 Medical Certificate valid until 1 August 2010 and

Class 2 Certificate valid until 1 August 2014. OPC (Operator Proficiency Check) dated on 06 May 2010, (LC – Line Check) dated 20 December 2009.

The pilot was rated for CAT IIIA approach.

Total flight time: 2592 hrs;

Flight time on F-100: 915 hrs;

Flight time over the last 90 days: 107 hrs 50 min;

Flight time over the last 30 days: 30 hrs 40 min;

Flight time over the last 24 hrs: 6 hrs 3 min.

The last flight prior to the occurrence date - on the same day, flight to Warsaw.

1.6. Aircraft information

Manufacturer marking: Fokker 100.

Year of manufacture	Manufacturer	Serial No	Registration marks	State Register Number	Register date
1990	Fokker	11308	D-AGPH	28853	07.07.2008

Airworthiness Certificate valid until: 09 December 2010.
Noise Certificate issued on: 28 May 2003.
Airframe total flight time since new: 39 313 hrs 13 min.
Airframe Total Cycles: 37 510.
Operational limitations:

- MTOW (Maximum Take-Off Weight) - 44 450 Kg;
- MLW (Maximum Landing Weight) - 39 915 Kg;
- MZFW (Maximum Zero Fuel Weight) - 36 740 Kg;
- Maximum Operating Altitude - 35 000 ft.

Prior to the incident the airplane was airworthy.
Contact Air Company received the airplane in 2008 with the radome already installed, but did not receive any documentation related to limitations of the radome working time.

1.7. Meteorological information.

Data based on:
(http://www.wunderground.com/history/airport/EPWA/2010/7/1/DailyHistory.html?req_city=NA&req_state=NA&req_statename=NA)

METAR EPWA 010800Z 01006KT 340V060 CAVOK 22/15 Q1017 NOSIG

METAR EPWA 010830Z 03005KT 330V090 9999 FEW026 22/15 Q1017 NOSIG

METAR EPWA 010900Z 36006KT 320V030 9999 FEW030 23/15 Q1017 NOSIG

The weather conditions during take off, departure and landing were very good. No reports related to windshear on approach to Runway 33. According to the above data there were no weather phenomena (rain, hail) which could cause overload of the radome.

The crew was fully informed about the current weather conditions.

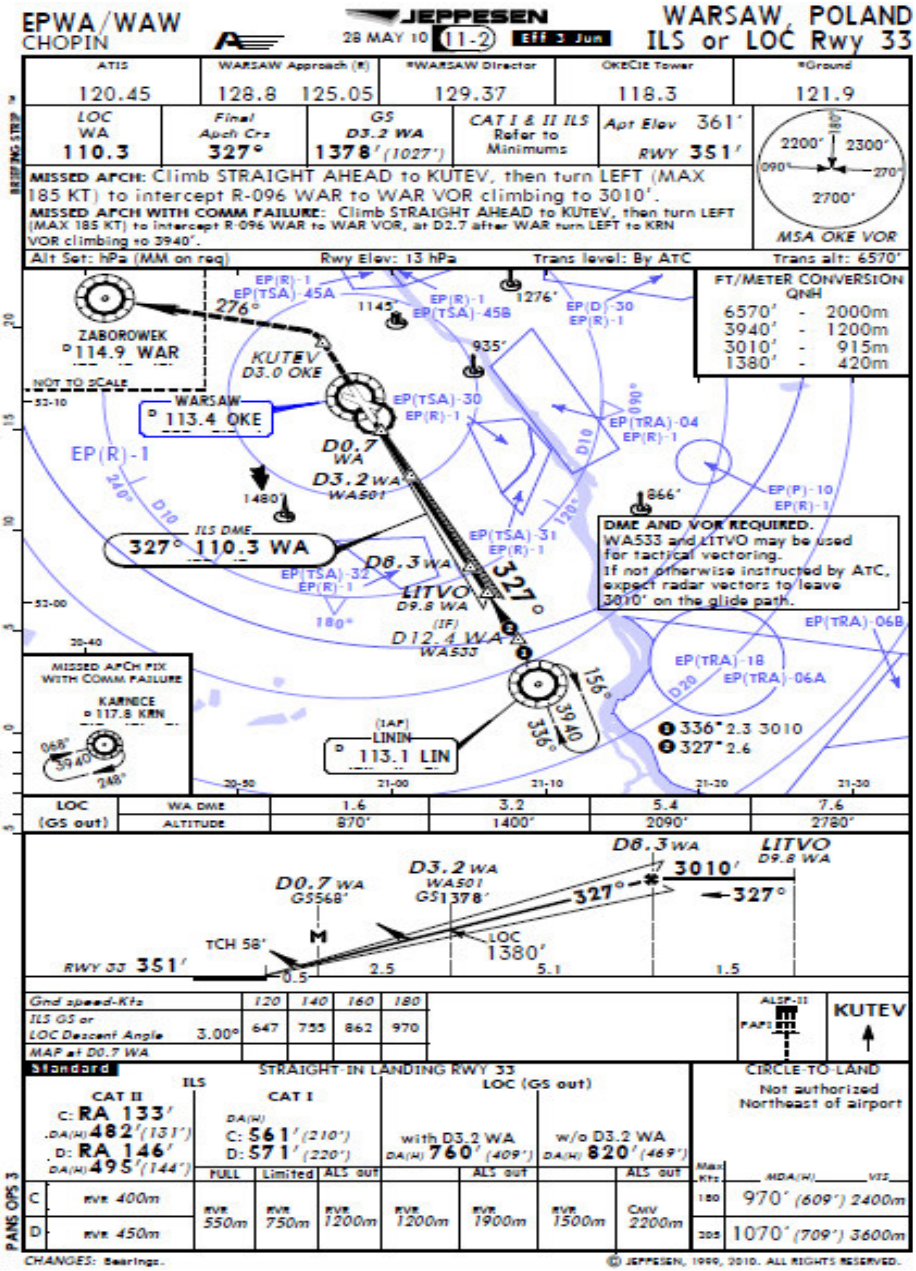
The landing took place at 08:44 hrs, during the day, in a very good weather conditions.

1.8. Aids to navigation.

Aids to navigation were in the working order and available during the incident. They are listed on a copy of the approach chart reproduced on the next page.

1.8.1. Aids to landing.

The landing took place on Runway 33, which is equipped with CAT I and CAT II ILS. A copy of the approach chart reproduced on the next page.



1.9. Communications

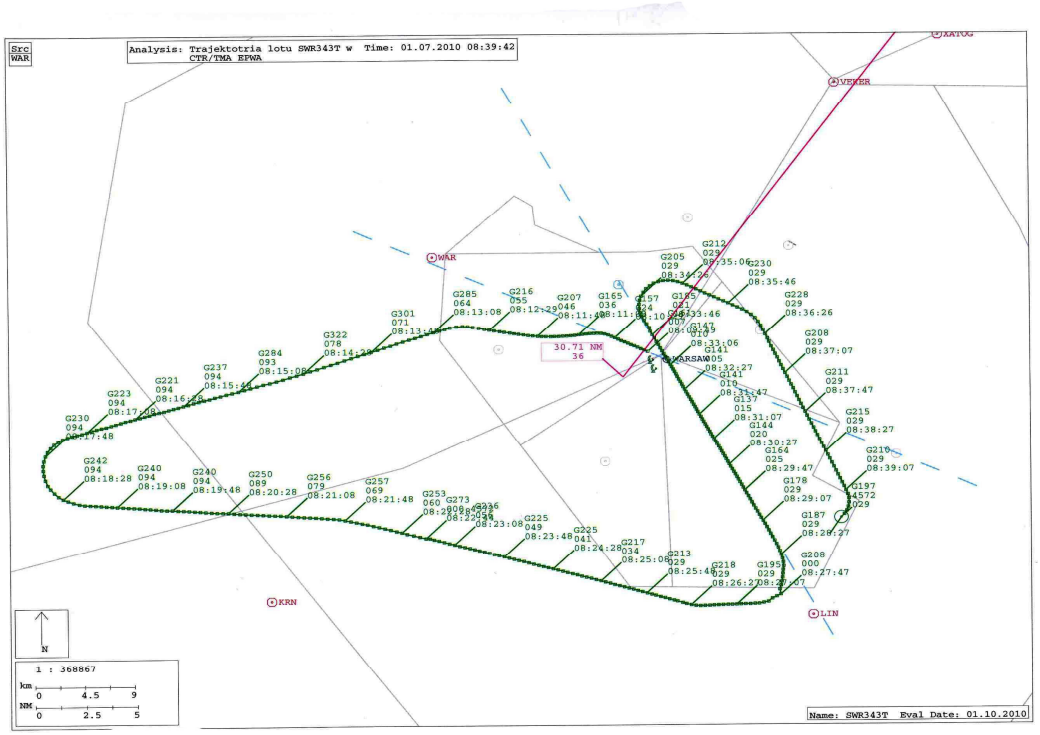
During the whole flight the crew maintained a two-way radio communication with ATC controllers, and the airplane was visible on radar displays. Approach for landing was executed under radar vectoring and monitoring by Warszawa-Okęcie approach radar.

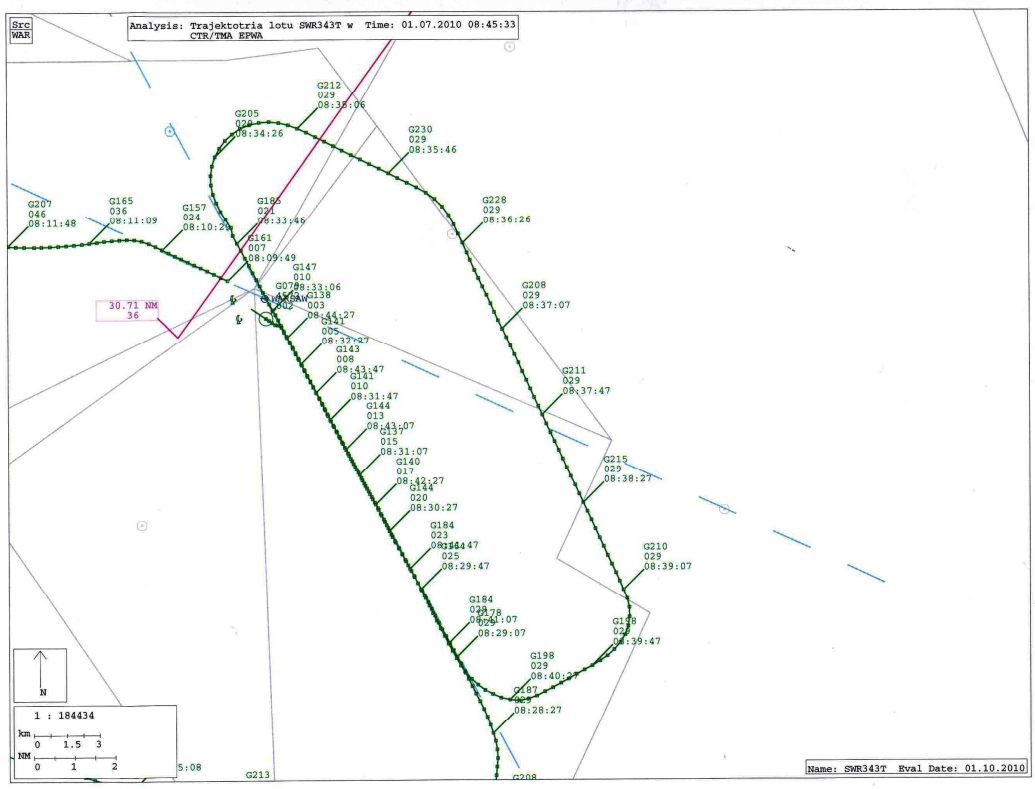
1.10. Place of occurrence information

The occurrence took place while executing „Soxer 1G" departure during the climb to FL 240 within Warszawa – Okęcie TMA.

Below reproduced the real flight route of the airplane - based on radar picture recorded by the means of the Polish Air Navigation Services Agency.

The first picture presents the complete flight while the second one illustrates the route after go around procedure, which resulted from windshear warning.




Src
WAR
Analysis: Trajektotria lotu SWR343T w Time: 01.07.2010 08:45:33
CTR/TMA EPWA
G212
029
08:35:06
G205
029
08:34:26
G230
029
08:35:46
G207
046
08:11:48
G165
036
08:11:09
G157
024
08:10:29
G165
021
08:33:46
G161
007
08:09:49
G147
010
G070
08:33:06
G138
003
08:44:27
G141
005
08:32:27
G143
008
08:43:47
G141
010
08:31:47
G144
013
08:43:07
G137
015
08:31:07
G140
017
08:42:27
G134
020
08:30:27
G184
023
G184
025
08:29:47
G184
029
08:29:07
G228
029
08:36:26
G208
029
08:37:07
G211
029
08:37:47
G215
029
08:38:27
G210
029
08:39:07
G198
029
08:40:27
G187
029
08:28:27
30.71 NM
36
N
1 : 184434
km
0 1.5 3
NM
0 1 2
5:08
G213
G208
Name: SWR343T Eval Date: 01.10.2010

1.11. Flight recorders

The airplane was equipped with: L3 solid state FDR No P/N 100-4043-00 and S/N 01938. The data was retrieved by „Contact Air Maintenance avionics department".

FODA ANALYSIS

Flight:	1. July 2010, AGPH, WAW-WAW
Incident:	Inflight-Return due to damage of Aircraft-Nose
Date:	8. July 2010
FODA_Flightrec.:	1167164

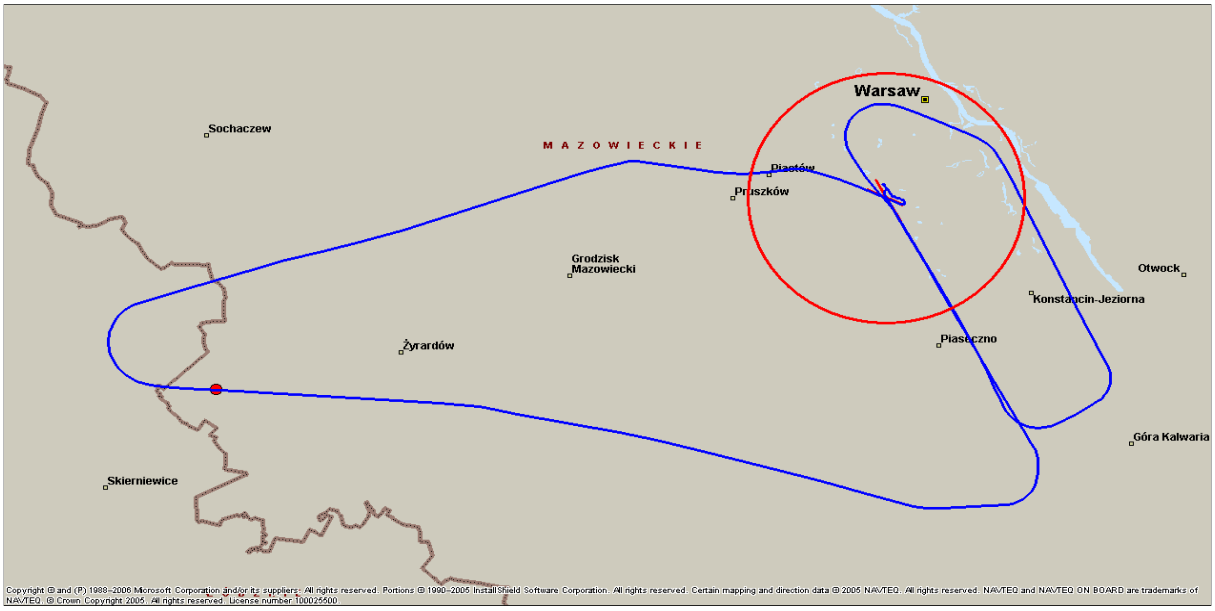
Weather conditions:

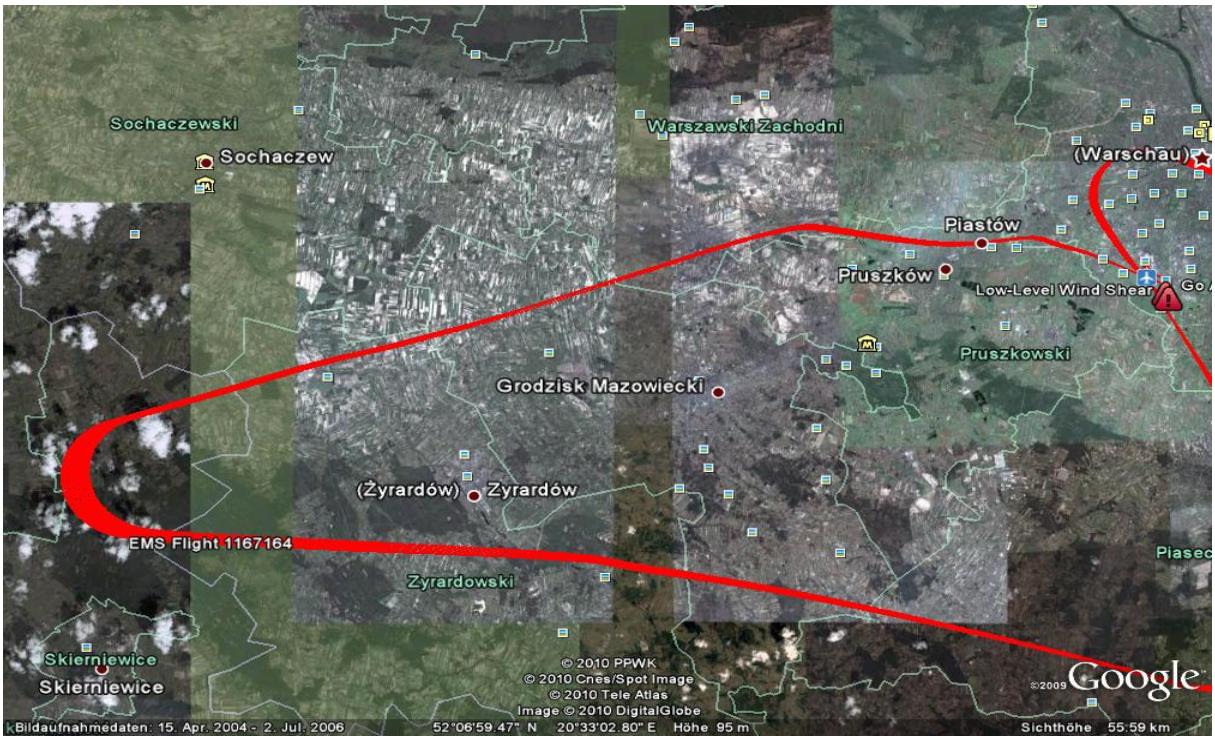
8 min before take off: 010/6 CAVOK 22/15 1017 NOSIG

14 min before landing: 030/5 FEW 026 22/15 1017 NOSIG

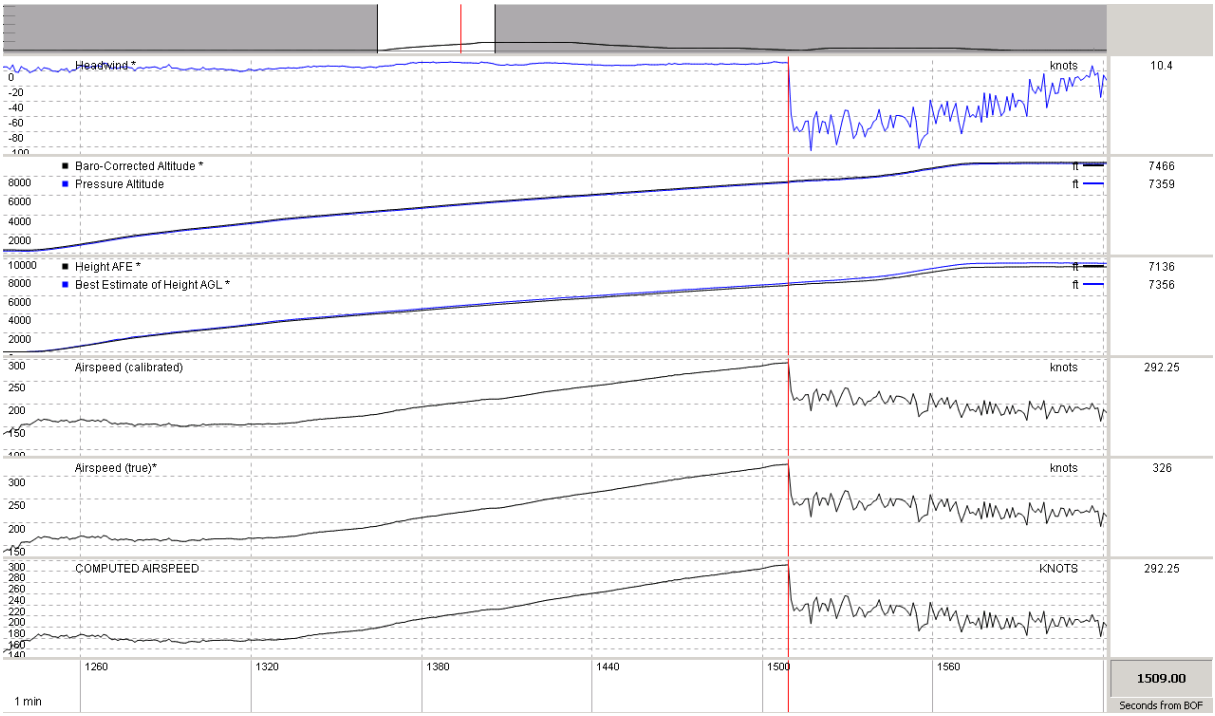
Flight route (map view):

Take off from RWY 29 of EPWA. Landing on RWY 33.

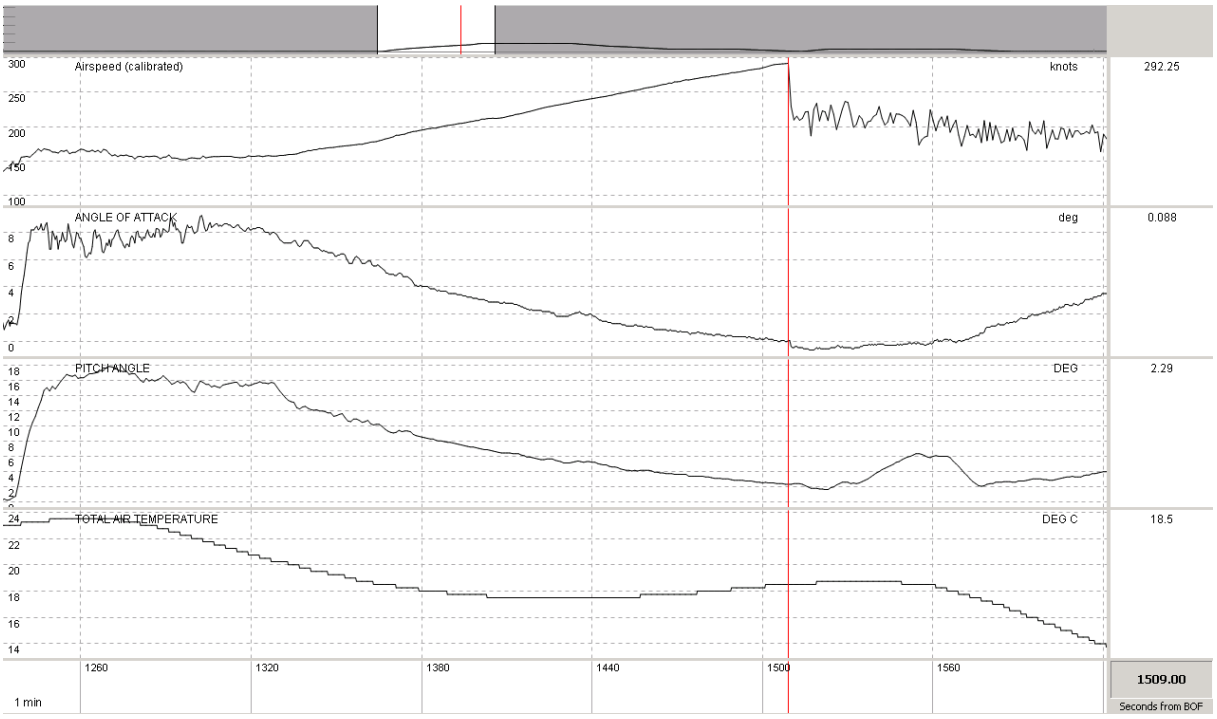




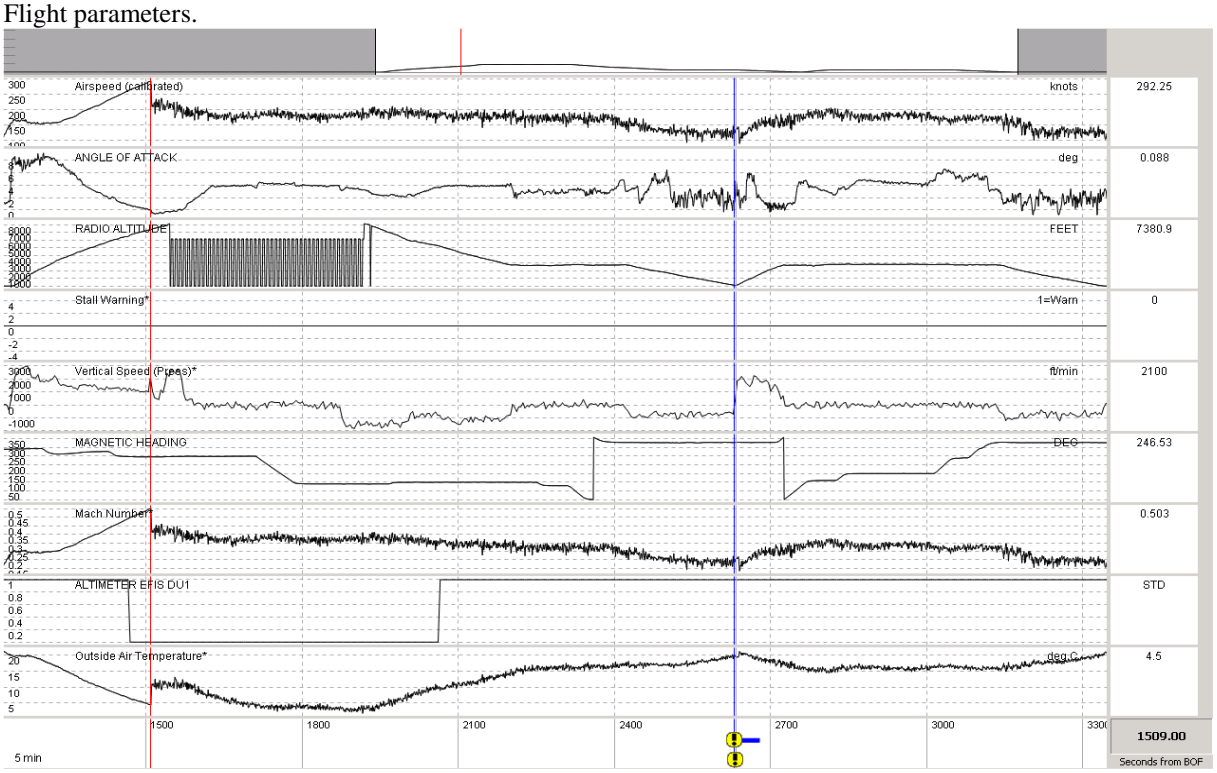
"Low Level Windshear" and "Go Around Event" belong to Flight 1167164.



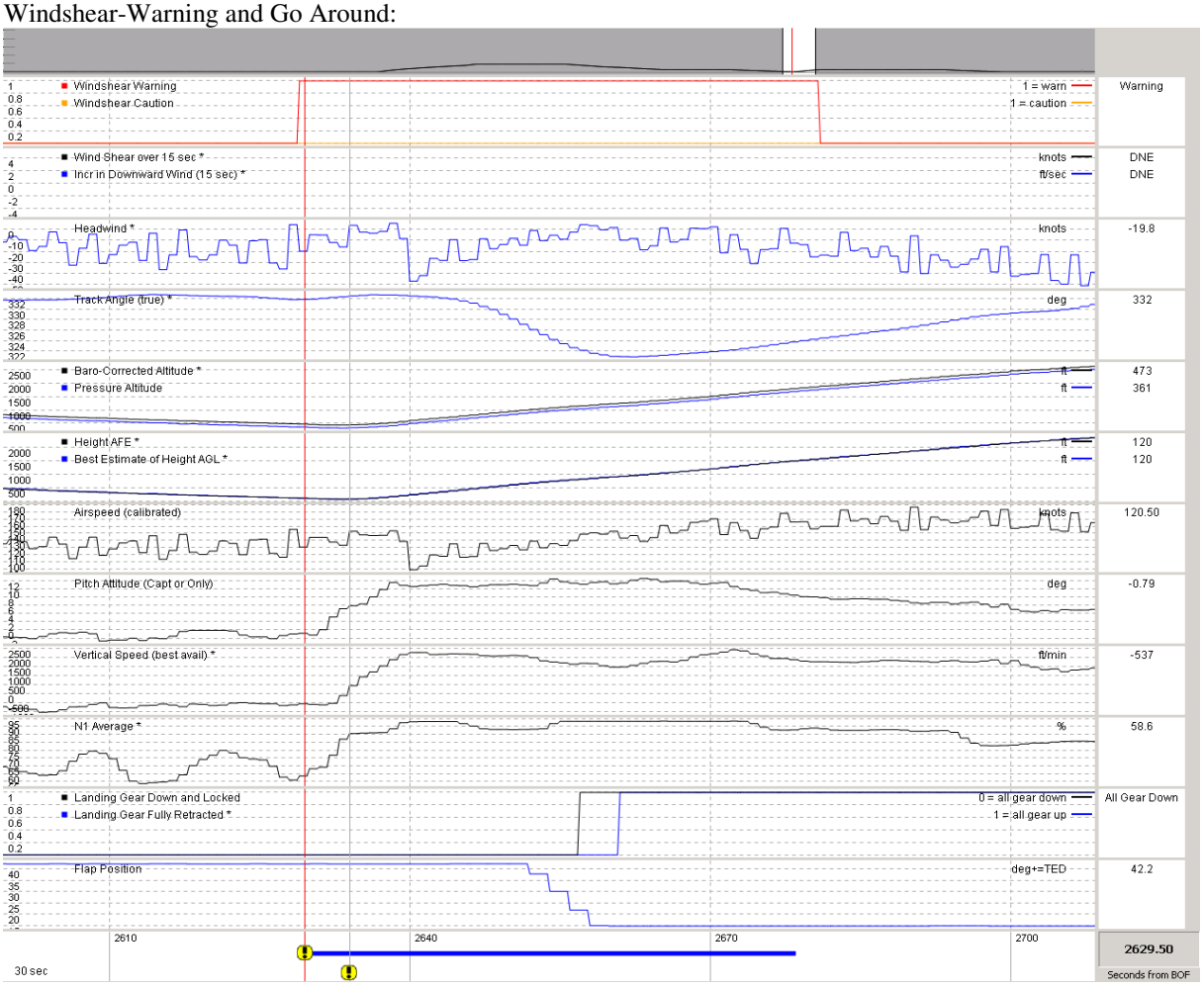
Flight parameters.



Flight parameters.



Windshear-Warning and Go Around:



Conclusions

Based on analysis of the recorded aircraft flight parameters, the Commission determined, that the radome damages occurred within the operational limits.

During the whole flight no exceedings of the aircraft operational parameters were found.

1.12. Wreckage and impact information

Visual inspection of the radome proved that its damage was not caused by a foreign object impact. As a result of the damage no significat parts of the radome were separated from its structure.

1.13. Medical and pathological information

Not applicable.

1.14. Fire

Not applicable.

1.15. Survival aspects

Not applicable.

1.16. Tests and research

The following evidence was gathered:

- Pilots statements;
- Photos of the damaged aircraft;
- Report of EPWA TWR controller;
- Radar pictures of SWR343T flight;
- DFDR (Digital Flight Data Recorder) data;
- On the request of Contact Air, Fokker Services B.V. carried out a detailed visual inspection of the damaged radome, and its results are in the Report No TE-1637 (below a copy of the Report).

Fokker Services B.V. Company permitted to use their Report for investigation of the incident and to include it into Final Report of SCAAI.

Company / dept.	*: FS/TOSN*	*Report no.*	*: **TE-1637***
Order no.	*: A10C39*	*Issue*	*: 1*
Original release date	*: 8-12-2010*	*Release date*	*: 8-12-2010*
Security class	*: RESTRICTED*	*Status*	*: Released*
		ATA	*: 53-61*
		ECR	*:*

Engineering Report

Investigation Report

Inspection Results of a Collapsed Radome on a Fokker 100 of Contact Air

Prepared	*Function / Note*	*Date* *2-12-2010*
Checked	*Checker TOSN*	*3-12-2010*
Approved	*CVE Composites*	*8-12-2010*
Released	*Project leader*	*8-12-2010*

EASA approved procedure for electronic sign-off *template nr. 0863 12-06*

TE-1637

1 General

1.1 List of Effective Pages

Page	*Issue Date*	*Issue*	*Prepared*	*Checked*	*Approved*	*Released*
All	*See front page*	*1*				

1.2 List of Revisions

Issue	*Issue Date*	*Description*
1	*See front page*	*First release*

status	*issue*
Released	*1*
security class	*report no.*
RESTRICTED	*TE-1637*

2 Table of Contents

3 Applicable Documents / References

Document	Description
D97009	Fokker Services - Drawing - Assy Radome (R.F.) - Issue C
ER8-41	The NORDAM Group - Engineering Report - rev IP - Dec 21/05
MNPR-02 CHP 12	M&N Aerospace - Process Specification - May 15/92

4 Description

On request of Contact Air Fokker Services has made a visual inspection for the root cause of the collapsed radome.
The collapsed radome was installed on aircraft S/N 11308 (D-AGPH) and imploded during climb out on a flight from WAW (Warsaw) to ZRH (Zurich) on July 01, 2010.

5 Inspection Results

Fokker Services has made a visual inspection of the collapsed radome and came to the following conclusions:

1. *The radome has been identified by two different part numbers. One part number is located on a Fokker B.V. identification plate riveted on the radome frame and indicates D97009-401 and serial number 172. The other part number is applied by ink and indicates D97009-401P and serial number 1038AL repaired by NORDAM Texas on October 16, 2000.*
   Refer to picures 3 and 4.
   This part number is unkown to Fokker Services. A brief investigation of the repair data of the radome revealed that the radome was released after repair under part number D97009-401P (refer to chapter 6).
2. *No signs of impact damage have been found (like e.g. birdstrike damage).*
3. *It appears that the core material (honeycomb) was still intact on the places where the glassfabric layers were attached found loose from to the honeycomb, hardly leaving showing any traces of bonding resin. Usually traces of bonding resin are an indication of good adhesion. So Fokker Services expected to see more traces or marks of the honeycomb in the resin attached to the disbonded glassfabric layers. Refer to pictures 5 and 6.*
   3.1. On the places on the outside of the radome were the paint had chipped under the violence of the collapse the outer glassfabric layers appeared very dry. Dry glassfabric layers usually occur when too little resin is used or if not enough vacuum force is applied during curing.
   3.2. The same view has been seen at some delaminated areas in the glassfabric faces, again an indication of rather dry glassfabric layers. Refer to figures 7 and 8.
   3.3. Deviating (non-flush) lightning strike diverter strips are installed with a deviating grounding/bonding at the radome frame. Refer to pictures 9 and 10.

6 Retrieved Data

Two similar cases (in 2005) of collapsed radomes have been reported and investigated by Fokker Services.
In both cases it concerned radomes repaired in the same time frame in 2000 by NORDAM Texas according NORDAM Process Specification MNPR-02 Chapter 12 - Fokker 100 Nose radome Repair - Category D.
With this "repair" the composite sandwich shell is re-manufactured with the solid edge as starting plane under STC/PMA per M&N drawing 100F104-1 per spec MNPR1-110. New lightning strike diverter strips are installed per M&N drawing 100F102.
Both radomes have been sent to The NORDAM Group Inc.
The conclusion of their investigation is as follows (refer to Engineering Report ER8-41_IR):

- *For both radomes the conclusion was that the inner skin showed visual signs of a reduced cure pressure during the re-manufacturing process, but that does not necessarily indicates that there was a reduced bond strength.*
- *Since the radome structure survived approximately 5 years in-service, it would indicate that the bond strength was adequate initially, but reduced over time.*

status	*issue*
Released	*1*
security class	*report no.*
RESTRICTED	*TE-1637*

7 Conclusion

Fokker Services has evaluated the radome collapse and resulting damage. The damage is found to be very similar to the earlier experienced collapses.

The radome collapse may affect the ILS systems (the glideslope and localizer antennea are installed on the forward pressure bulkhead) and the weather radar. Since these items are non-essential items it can be concluded that the collapse of a radome will not be treated as an airworthiness issue, because the affected item and the items damaged by this collapse are non-essential items.

In addition Fokker Services is of opinion that it the responsibility of the NORDAM company to take appropriate steps for preventing similar damages in the future (Fokker Services was not involved in the design and approval of the repair/modification). NORDAM has been informed by Fokker Services about this incident.

The Fokker IPC(Illustrated Parts Catalog), the SRM (Sustainment, Restoration and Maintenance) repair limits and CDL (Configuration Deviation List) item 53-20 limits are not applicable to radomes repaired/modified by NORDAM.

Fokker Services will issue a Service Experience Digest (SED) to inform operators of the known collapses.

For any questions or suggestions reference will be made to the NORDAM company.

status	*issue*
Released	*1*
security class	*report no.*
RESTRICTED	*TE-1637*

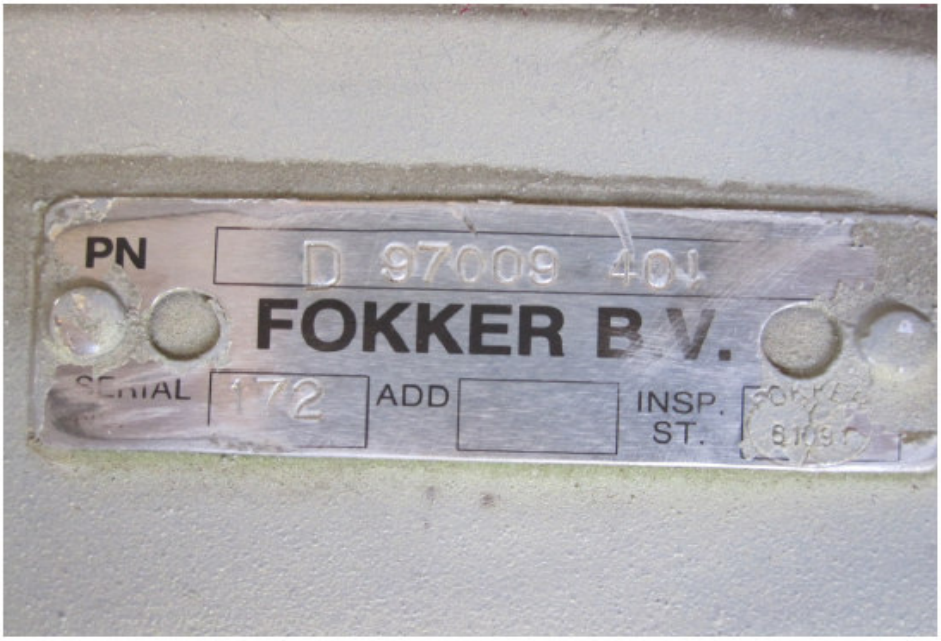
Appendix A (Pictures of the Collapsed Radome)

General view of the collapsed radome
Picture 1

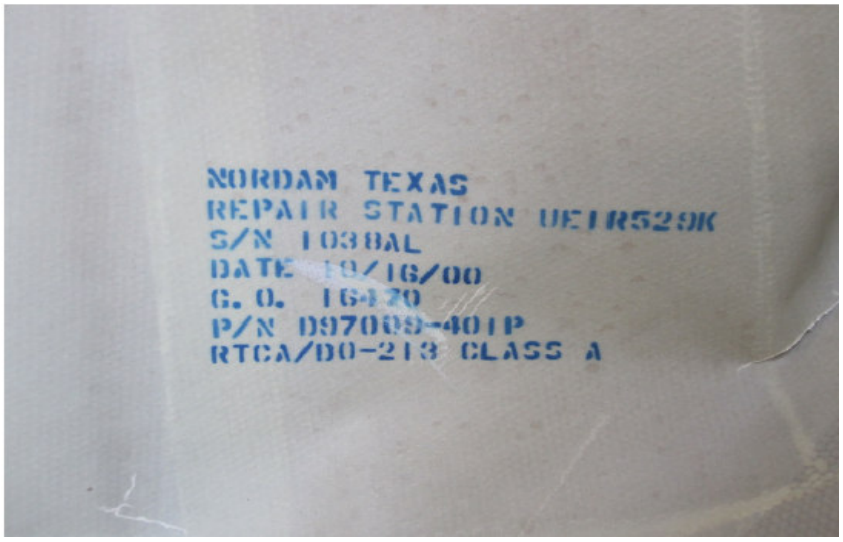
General view of the collapsed radome
Picture 2

status	issue
Released	1
security class	report no.
RESTRICTED	TE-1637

Appendix A *(Continued)*



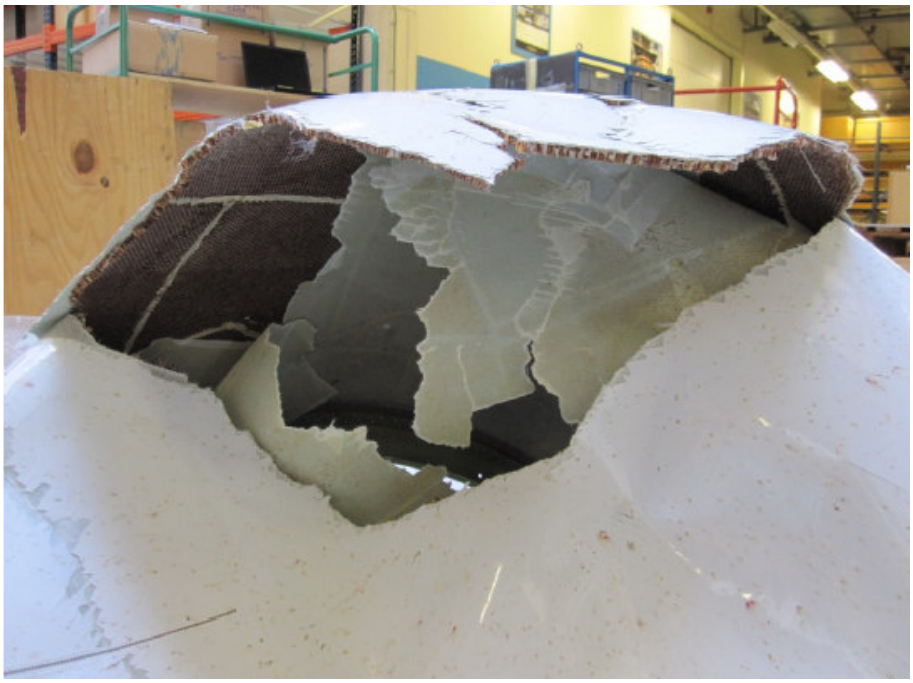
Fokker Identification Plate
Picture 3



Nordam Identification Marking
Picture 4

status	*issue*
Released	*1*
security class	*report no.*
RESTRICTED	*TE-1637*

Appendix A (Continued)



Details honeycomb core and inner skin plies
Picture 5

Details honeycomb core and inner skin plies
Picture 6

status *Released*	*issue* *1*
security class *RESTRICTED*	*report no.* *TE-1637*

Appendix A *(Continued)*

Delaminated inner plies
Picture 8 (picture number according to the original)

Delaminated inner plies
Picture 7 (picture number according to the original)

status	*issue*
Released	*1*
security class	*report no.*
RESTRICTED	*TE-1637*

Appendix A (Continued)

Deviating lightning diverter strip
Picture 9

Deviating lightning diverter strip grounding/bonding
Picture 10

status *Released*	*issue* *1*
security class *RESTRICTED*	*report no.* *TE-1637*

In connection with the findings contained in the Fokker Services B.V. Report, the SCAAI Investigating Team asked NTSB to supervise examination of the radome by NORDAM, which, according to the available documentation, was the last organization servicing the radome. The results of the examination are contained in **ER 8-53 IR** Report, which was made available to the Investigating Team for investigation purposes only, with reservation of the proprietary rights for NORDAM. Due to the findings of the Report and their meaning for the investigation, the Commission quotes below its most important parts.

The following material is part of ER 8-53 IR Report, developed entirely by NORDAM, which also holds the proprietary rights.

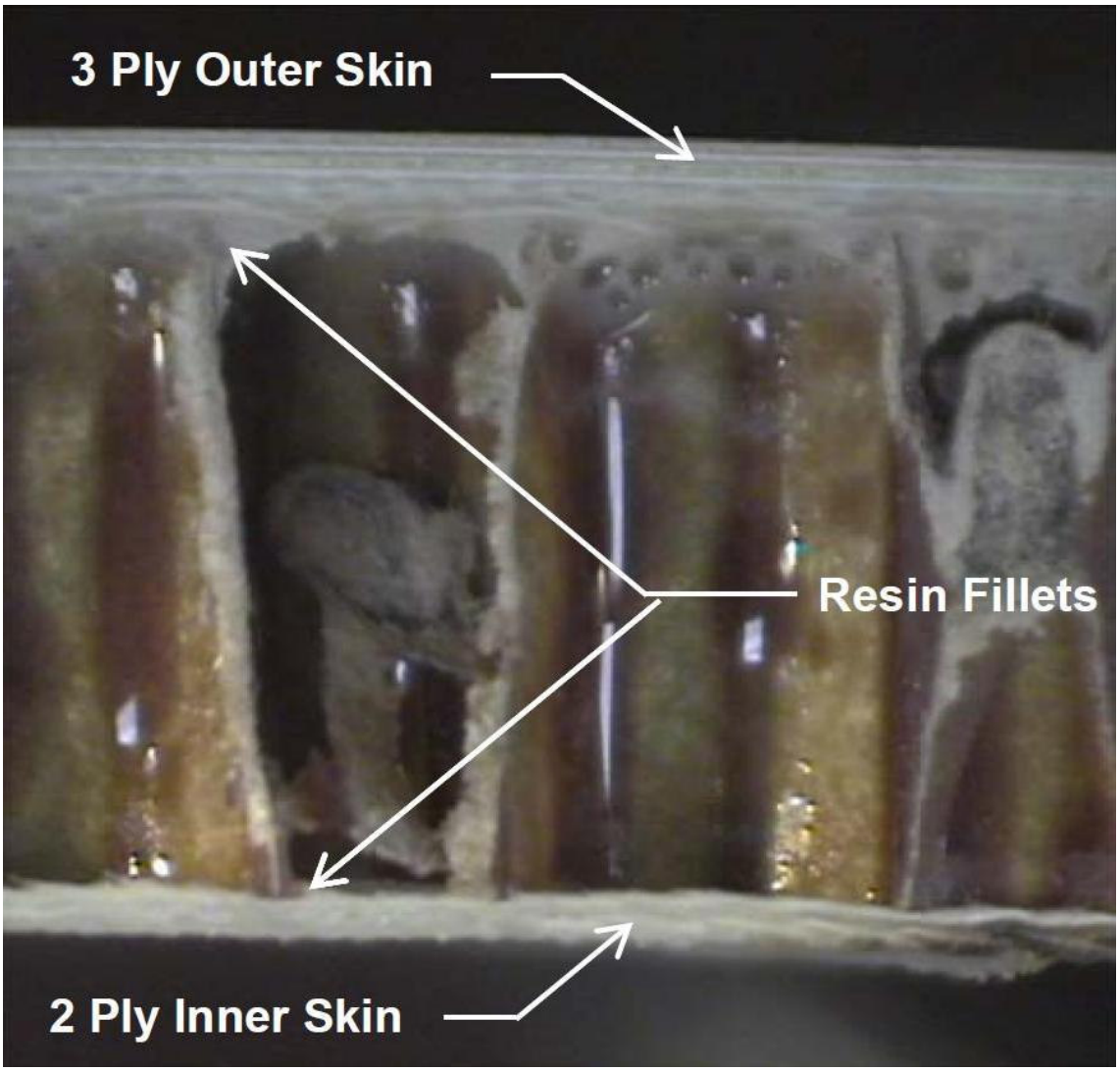
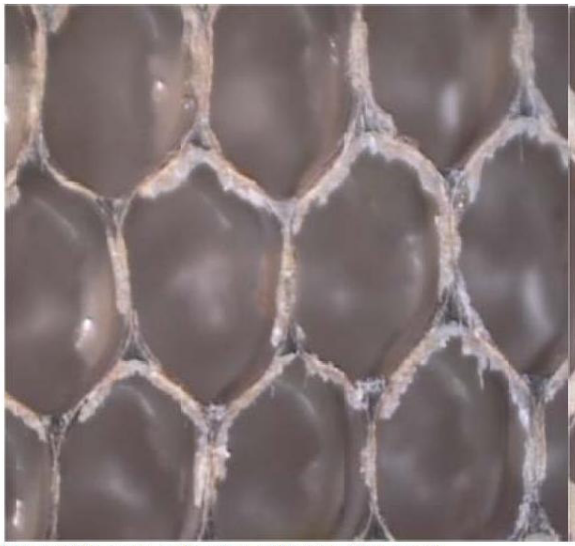


Figure 4
Contact Air Sample #2 Skin Resin Fillets to Core

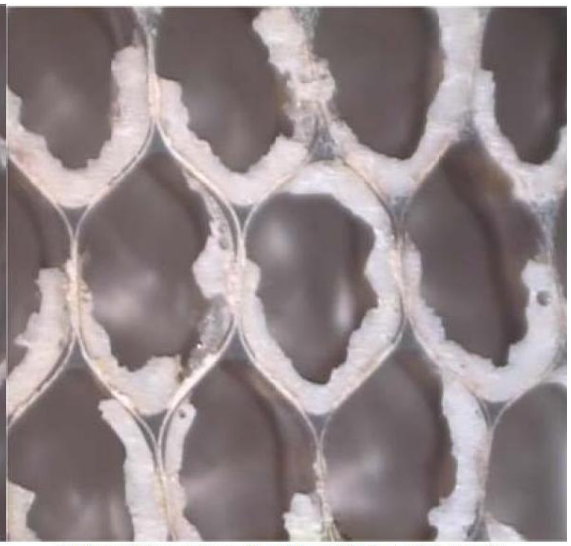
Micro photographs were taken of the cross section from the Contact Air SN 172 Radome. This cross section shows the outer skin to core interface, inner skin to core interface and

the degree of resin fillets for both inner and outer skins. The image illustrates that bond pressure and resin fillets were adequate. The illustration does show that filleting was less on the inner skin than the outer skin however, the fillet size is typical for for a bonded structure of this type. Resin content is directly proportional to the number of plies in a composite layup. In this case the outer skin (in the area examined) contained three plies and the inner skin was constructed of two plies.



Inner Skin core cell edge with bonding resin

Figure 5



Outer Skin core cell edge with bonding resin

Figure 6

Contact Air Sample #3 Core with Resin on Cell Edges,
Lower Aft Area at 6:00, Honeycomb with Resin

Figure 5 and 6 above show the resin residue remaining on the core cell edges. The residue is directly related to the resin fillets/prepreg plies present during the cure cycle of a bonded structure. The darker material in the classic honeycomb shape represents honeycomb core, the lighter material represents resin from the fiberglass/epoxy prepreg skin of the radome. The amount of resin deposited on both surfaces of the honeycomb cell edges are typical of what is expected with a sufficiently bonded honeycomb core to fiberglass/epoxy prepreg skin bond.

During examination of Radome S/N 172 and prior to removing the samples the radome was checked for moisture using equipment manufactured by Moisture Register Products, Mod.: A8-AF, SN: 5D0387 (see Figures 7 and 8). Several areas were found with extensive moisture (H_2O) ingression. Evidence of water was also observed in and around the area of failure. This can be seen by the staining of the inner skin (see Figures 9 through 12).

Figure 7

Figure 8

Moisture Meter used to determine location of moisture in Radome

Close up of face of moisture meter with moisture reading ranges

Figure 9
Contact Air Sample # 1, View Looking In
Nose Section (Failure Area)
Pattern Left by Honeycomb Material

The stained areas of the inner skin illustrated in Figure 9 shows evidence of moisture being present in the core cells. This is typical of most of the areas examined in the delaminated areas.

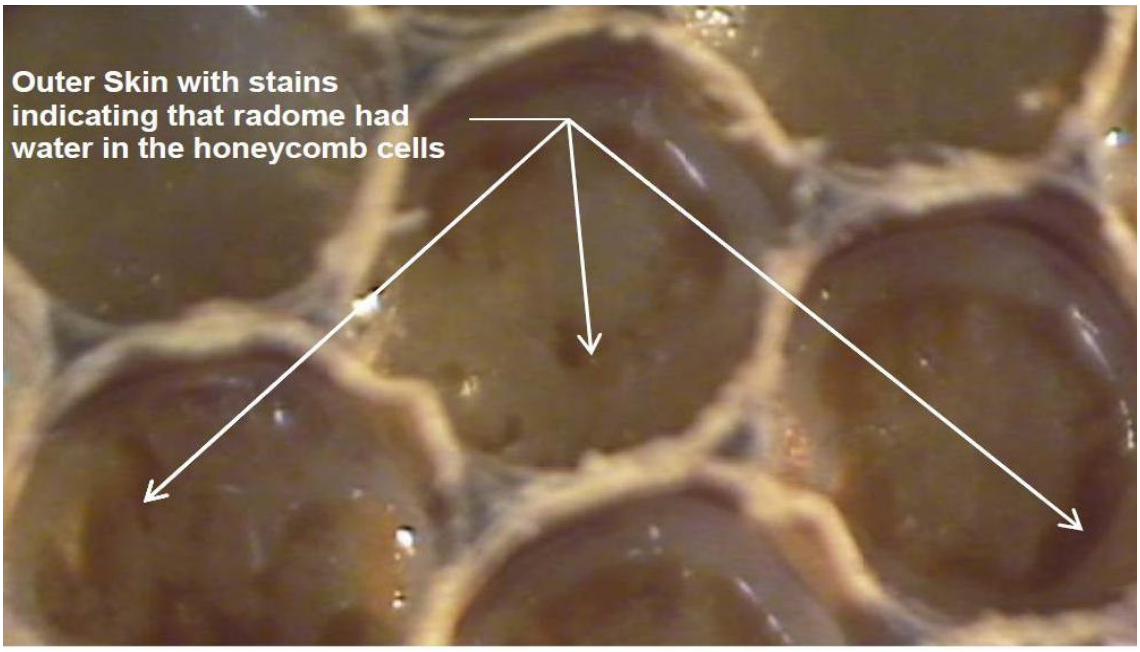


Figure 10
Contact Air Sample #3, View Looking out
Nose Section (Failure Area)
Stains Left by Moisture in the Radome

An area of the radome which appeared to be still bonded aftrer the incident was removed for analysis. When the inner skin was removed from this sample water poured out of the honeycomb cells.

The initial failure area (Figure 11) shows the inner surface of the radome with the failed inner skin pulled back to reveal the honeycomb core. The inner skin exhibited residue that was left behind from prapped moisture. This evidence can be seen in three of the four quadrants as a light brown staining. The color of the staining is due to moisture washing off phenolic resin dust from the Nomex® honeycomb cell walls. Figure 12 is a closer view of the inner skin surface showing the light brown stain over a large area of the inner radome skin. The failure modes observed range from resin to skin; resin to core failure and in some cases core failure at the inner skin to honeycomb interface. These failures were lokely caused by thermal cycling freeze/thaw of entrapped moisture inside the cells of the radome core causing the bonded structure to delaminate or become disbonded.

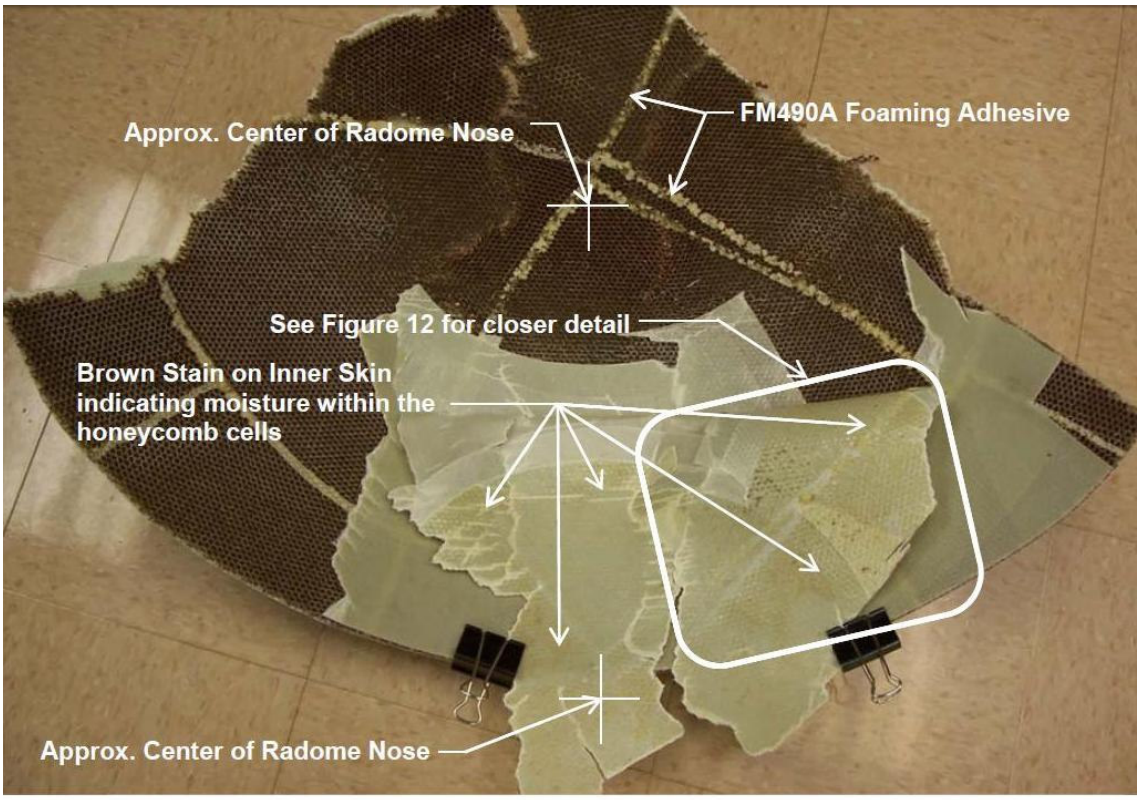


Figure 11
Contact Air Sample #1, View Looking Fwd
Nose Section (Failure Area)
Stains Left by Moisture in the Radome

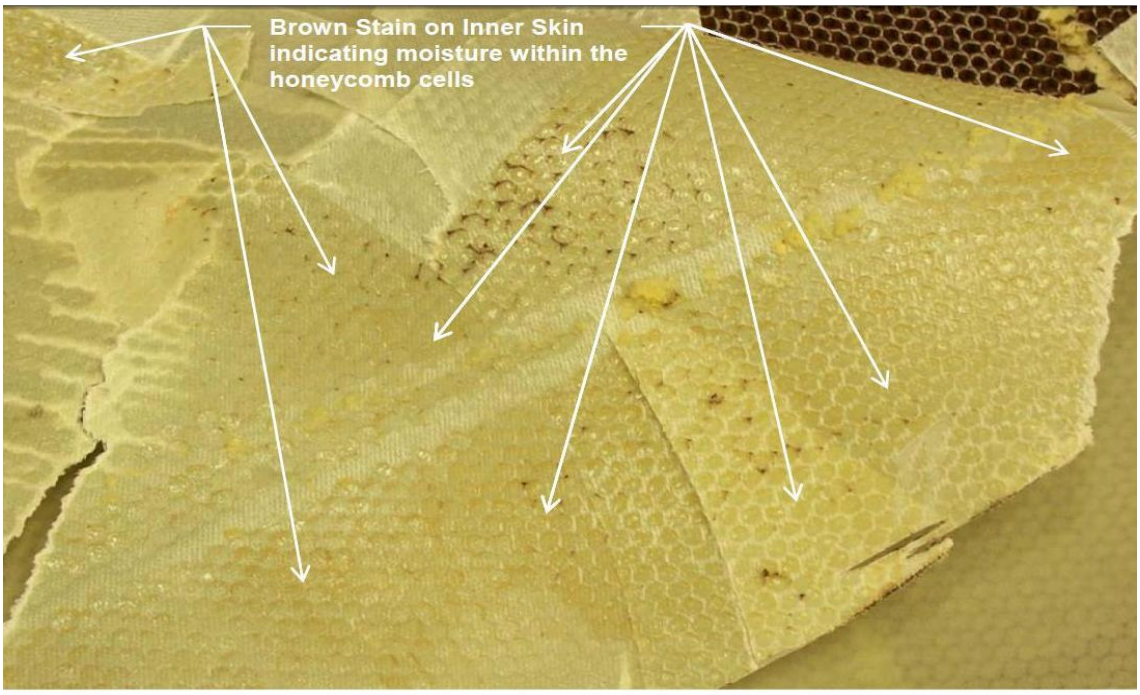


Figure 12
Contact Air Sample #1, View Looking Fwd
Nose Section (Failure Area)
Stains Left by Moisture in the Radome

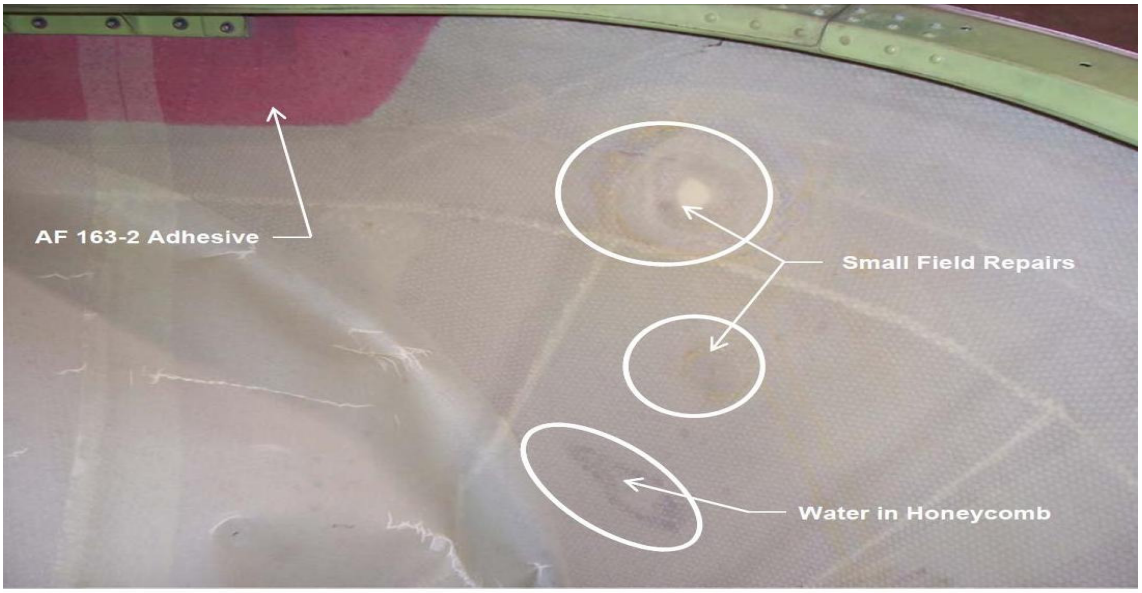


Figure 13
Contact Air Photo of Moisture
Visible through the Inner Skin

Figure 13 shows subsequent repairs post the NORDAM (Texas)repair in 2000. Also there is a third area of concern that shows water in the honeycomb which can be seen through the inner skin. The white area in the middle of the water has delaminated within the skin plies but the area that was wet was still bonded. This section was removed from the radome. During the removal of the inner skin from this area water ran out of the honeycomb cells on to the work surface.

Outer Surface Observations

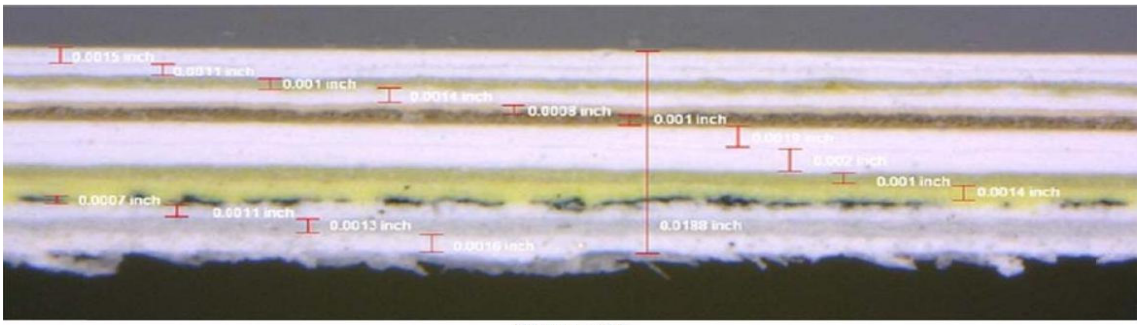


Figure 14

Contact Air Paint Sample
Cross Section of Painted Surface

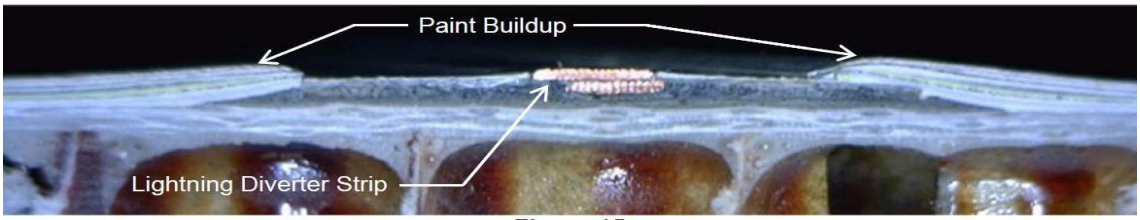


Figure 15
Contact Air Paint Sample

Coatings over the surface of the Radome appeared to be in good shape; however, we observed multiple layers of what appears to be paint and fillers on this radome. No attempt was made to identify each layer, however, the overall thickness measured about 0,019 inch.

Conclusions

The findings of this report are limited to the testing and analysis of the physical aspects of the failed radome. From the initial findings to the final analysis, there are clear indications of water within the honeycomb cells at the nose of the radome where failure was observed. In addition, other areas were found to still contain significant amounts of water.

The repair in question structurally performed for 10 years of in-service life, indicating that the materials, processes, and repair philosophy used were structurally adequate for this type of component. Over time, material degradation does occur in fiberglass epoxy composite structures and the degree of degradation has a direct correlation to how well the composite structure is inspected and maintained to protect it from evironmental elements. The Contact Air Radome Part Number D97009-401 SN 172, showed evidence of significant moisture ingression over a large area, inclusive of the failure area. This entrapped moisture over time degraded the structural characteristics of the bonded components and thus resulted in the implosion of the radome. The repair accomplished by NORDAM (Texas) on October 16, 2000 was structurally adequate and acceptable.

1.17. Organizational and management information

SCAAI received the event notification via telephone from Duty Officer of Warszawa-Okęcie Airport on the day of the occurrence directly after the airplane landing.

After notification, the designated Commission Members arrived at the aerodrome just after the airplane landing. General inspection of the aircraft was carried out to assess its technical condition and several photographs were taken as the evidence. The airplane crew was interviewed.

At the same time Warszawa-Okęcie Airport notified the Commission about an occurrence, which was qualified as „Serious Incident" No 619/10 (SCAAI Reference Number). On July 2, 2010 the Commission received notification about the occurrence from the Polish Air Navigation Services Agency.

SCAAI notified about the occurrence International Civil Aviation Organization (ICAO), Aircraft Accident Investigation Bureau (Switzerland), Federal Bureau of Aircraft Accident Investigation (Germany) and National Safety Transportation Board (USA), in accordance with the recommendations of Annex 13 (Aircraft Accident and Incident Investigations) to the Convention on International Civil Aviation. The Draft of Final Report was sent to AAIB (Switzerland), BFU (Germany), NTSB (USA) and Dutch Safety Board (Netherlands). Dutch Safety Board did not sent response and above mentioned Commisionns had no remarks to the Draft. SCAAI accepted Contact Air's remarks .

Worth noting is the operator commitment to clarification of all aspects of te occurrence objectively and quickly. The Commission had unrestricted access to all information held by the Operator, which was necessary for investigation into the incident. The Investigator-in-Charge also maintained contact with Fokker Services B.V. and the NTSB.

1.18. Additional information

The interested parties were acquainted with the Draft Final Report.

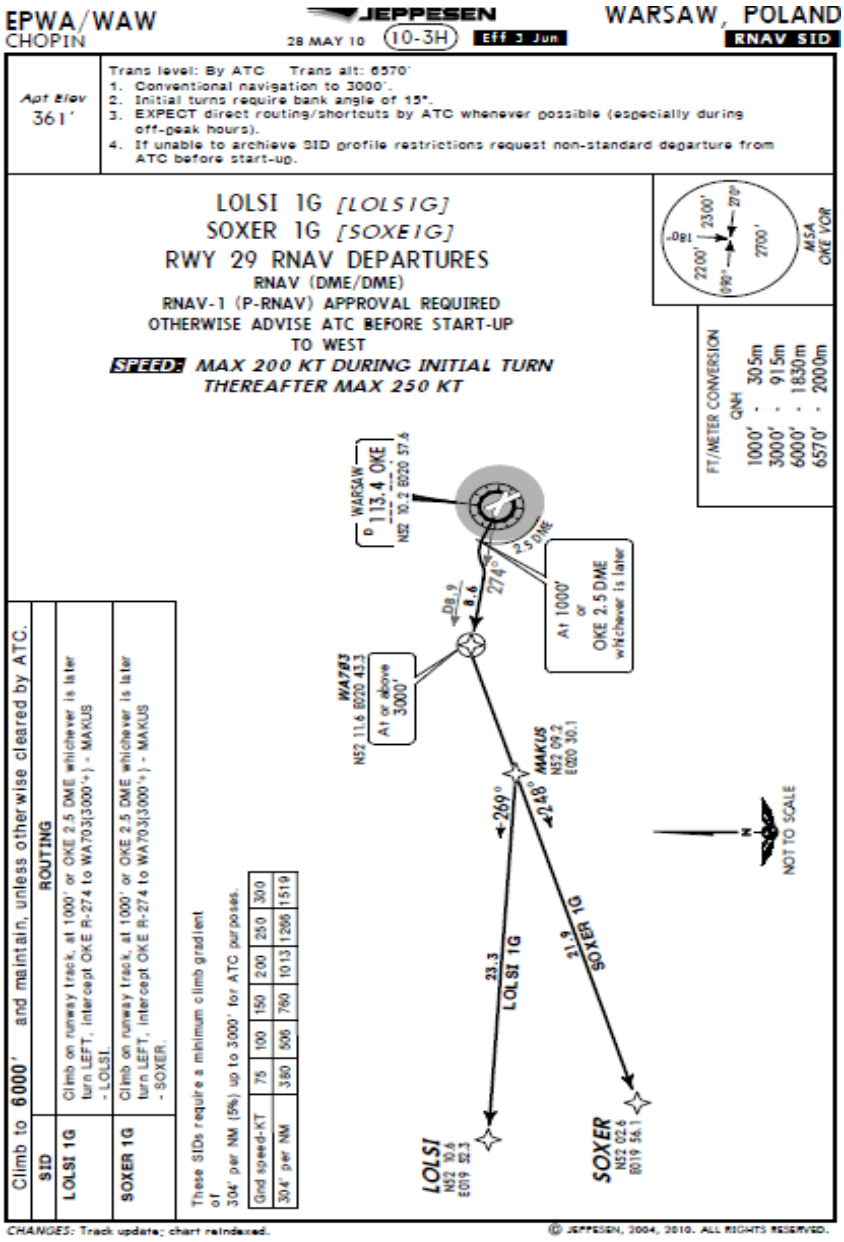
1.19. Useful or effective investigation techniques

Not applied.

2. ANALYSIS

2.1. Course of occurrence

On 1 July, 2010 at 08:09 hrs F-100 airplane, flight SWR343T took off from EPWA (Warszawa-Okęcie). The Pilot Flying (PF) was F/O and the Pilot Monitoring (PM) was Captain (CPT). The flight crew was cleared for the flight to LSZH according to the Filed Flight Plan (*SWR343T-IS F100/M-SDJPRWY/S EPWA0745 N0428F340 SOXER UN869 TGO T724 RILAX LSZH*). Due to the fact that on that day Runway 29 was designated for take off (for landing Runway 33) the flight crew was cleared for SOXER1G departure route, with the initial climb to FL 240 without speed limitations.



During the climb at 7135 feet AFE (Above Field Elevation) the crew could hear an impact sound from the nose bottom part of the fuselage (based on pilots statements). The

crew interpreted this sound as a probable bird strike. A moment later the pilots noticed a malfunction of the Captain's (CPT) IAS (speed fluctuations +/-20 kt). F/O continued as a PF because indications of his instruments were compatible with indications of the standby instruments.

Warnings: **compare speed alert**, **no autoland** and **ruder limiter alert** appeared on Multi-function Display. The system of aircraft malfunctions detecting and alerting was activated – „Master Caution" light was switched on and sound warning was generated.

2.2. Crew actions

Based on the above information the crew abandoned climbing, reduced speed to 200 kt (to avoid further possible damage of the aircraft) and checked operation of the cabin pressurization system. Then the flight crew decided to abandon the flight and return to the take off aerodrome. They reported this intention to the APP service and informed that the cause of such a decision was malfunction of some aircraft systems resulting from probable bird strike. CPT as a PM performed actions for abnormal situations according to the applicable check lists contained in QRH (Quick Reference Handbook).

GPWS FAULT

GPWS ..... OFF

MFDU INOPERATIVE

STBY ENG IND ..... ON

- For alert procedure display, secondary engine parameters and aircraft status, use the transfer function at the MFDS control panel.

MFDS CONTROL PANEL FAULT

MFDS CONTROL PANEL FAULT EFFECTS ..... CHECK

MFDS CONTROL PANEL FAULT EFFECTS

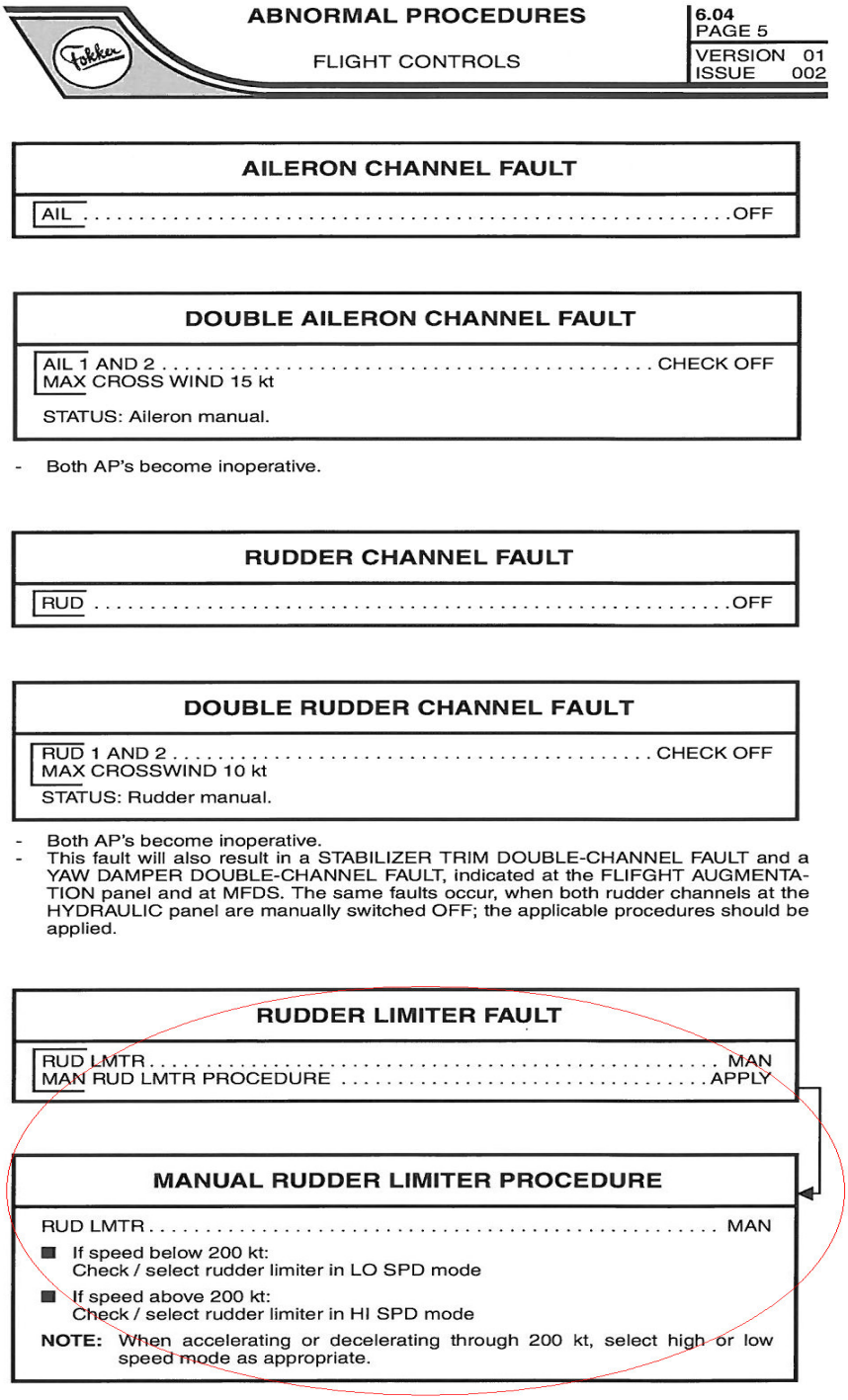
- TRP DEFAULTS TO TOGA
- LH MFDU DEFAULTS TO PRIMARY ENGINE / ALERT DISPLAY PAGE
- RH MFDU DEFAULTS TO SECONDARY ENGINE / STATUS DISPLAY PAGE
- ONLY FIRST COMING ALERT PROCEDURE IS DISPLAYED
- FOR SUBSEQUENT PROCEDURES SEE PAPER CHECKLIST.

COMPARE ATTITUDE (HEADING) (SPEED) ALERT

STBY INTRUMENTS ..... USE
EFIS INDICATIONS ..... COMPARE WITH STBY INSTR
■ If required:
AFFECTED SOURCE ..... SELECT ALTN SYS

COMPARE ILS (RADIO ALT) ALERT

EFIS INDICATIONS ..... CROSSCHECK
■ If required:
AFFECTED SOURCE ..... SELECT ALTN SYS



ABNORMAL PROCEDURES
FLIGHT CONTROLS
6.04 PAGE 5
VERSION 01 ISSUE 002

AILERON CHANNEL FAULT

AIL ..... OFF

DOUBLE AILERON CHANNEL FAULT

AIL 1 AND 2 ..... CHECK OFF
MAX CROSS WIND 15 kt

STATUS: Aileron manual.

- Both AP's become inoperative.

RUDDER CHANNEL FAULT

RUD ..... OFF

DOUBLE RUDDER CHANNEL FAULT

RUD 1 AND 2 ..... CHECK OFF
MAX CROSSWIND 10 kt

STATUS: Rudder manual.

- Both AP's become inoperative.
- This fault will also result in a STABILIZER TRIM DOUBLE-CHANNEL FAULT and a YAW DAMPER DOUBLE-CHANNEL FAULT, indicated at the FLIFGHT AUGMENTATION panel and at MFDS. The same faults occur, when both rudder channels at the HYDRAULIC panel are manually switched OFF; the applicable procedures should be applied.

RUDDER LIMITER FAULT

RUD LMTR ..... MAN
MAN RUD LMTR PROCEDURE ..... APPLY

MANUAL RUDDER LIMITER PROCEDURE

RUD LMTR ..... MAN

- If speed below 200 kt:
  Check / select rudder limiter in LO SPD mode
- If speed above 200 kt:
  Check / select rudder limiter in HI SPD mode

NOTE: When accelerating or decelerating through 200 kt, select high or low speed mode as appropriate.

QRH FOKKER 70 / QRH FOKKER 100

The cabin crew and passengers were informed by CPT about situation on the aircraft board and about decision to return to Warsaw. The aircraft was vectoredt by APP Controller to land on Runway 33. The approach for landing was carried out with engaged autothrottle and autopilot of PF. The autothrottle operated, moving power levers into forward and aft position in spite of a slight speed fluctuations on other instruments.

During final approach at the altitude approximately 120 ft, the windshear warning was triggered. The flight crew performed a go around procedure. After reaching the altitude of 3000 ft (according to the missed approach procedure for Runway 33) the autothrottle system caused that the airplane accelerated and did not maintain the required speed. Because of this, PF disengaged autothrottle. The flight crew did not complete the published procedure of missed approach for this runway because they were instructed earlier to turn right and land with the right turn. In the course of the second approach the flight crew was informed by a controller about deformed radome. The controller received this information from Duty Officer, who was close to the threshold of Runway 33 (based on *„Report of the 1st Shift TWR EPWA").* The pilots discussed information received from the controller and came to the conclusion that the windshear warning was caused by the disturbed airflow acting on the Pitot tube, which was related to the damaged radome and also caused the air speed fluctuation on the CPT IAS. The flight crew asked the controller about reported windshear and the answer was negative. Based on this information, the pilots decided to ignore the next possible windshear warning. The second approach was performed with the autothrottle disengaged. The landing was performed with the assistance of Warsaw Airport duty services even though an emergency situation was not declared. The landing took place at 08:44 hrs.

The Commision found that the crew actions were correct.

2.3. Analysis of reports findings and available history of radome maintenance and repairs

During a visual inspection of the radome damage the Commission Members did not notice any signs that might indicate unambiguously that the damages were caused by a bird strike. No traces of blood, feathers, or the presence of any traces of organic tissues were found on the surfaces of the damaged radome and the aircraft. Only traces of insects were found.

Contact Air Company sent to SCAAI the available history of the radome related to bird strikes. The history is contained in the documents presented below.

Contact Air

WO-Summary

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Workorders of

Current filtersettings:
Aircraft: AC-Reg = 'AGPH'
Text: BIRD

No	W/O	A/C	State	Issue-Date	Due-/C.-Date	ATA	Type	Parts	Ref.	Mel	Hil	Iss	Workorder-description and/or complaint
1	49406	AGPH	Closed	01.Jul.2010	02.Jul.2010	51-00-	P				Hil	ROC	NOSE RADOME DEFORMED + PERFORED DUR POSIBLE BIRD STRIKE + SPEED INDICATION ABNORMALIES CM1 SIDE ACTION-TEXT: REPLACED NOSE RADOME IAW TASK 53-64-00-000/400-814A REV JUN 01/10 AND PERFORMED BIRDSTRIKE INSPECTION IAW TASK 05-51-06-200-816A REV JUN 01/10 NO MORE DAMAGES FOUND
2	49410	AGPH	Closed	02.Jul.2010	02.Jul.2010	34-41-	M					PRZ	DURING BIRDSTRIKE INSPECTION ON RADOM FOUND SMAL CHAVING MARK ON BACK SIDE OF ANTENNA BLADE AND ON 3 WIRES TILT MOTOR ACTION-TEXT: PERFORMED TEMP REPAIR OF WIRE ISOLATION IAW WDM 20, REV 06/10 PERFORMED FUNCTIONAL TEST IAW 34-41-03-400-814A, WX - RADAR STILL SERVICEABLE
3	45575	AGPH	Closed	23.Nov.2009	23.Nov.2009	05-51-	P				Hil	KLI	BIRDSTRIKE ABOBE WINDSHIELD. INSPECTION PERFORMED IAW ARBEITSANWEISUNG "BIRDSTRIKE INSPECTION FOR FLIGHTCREWS" AND VA LM007. NO DAMAGE FOUND. A/C RELEASED FOR 5 FURTHER FLIGHTS ACTION-TEXT: PERFORMED INSPECTION AFTER BIRD STRIKE IAW AMM 05-51-06-200-816-A, NO DAMAGE FOUND

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Contact Air

WO-Summary

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No	W/O	A/C	State	Issue-Date	Due-/C.-Date	ATA	Type	Parts	Ref.	Mel	Hil	Iss	Workorder-description and/or complaint
4	42103	AGPH	Closed	18.Jul.2009	18.Jul.2009	05-51-	P					SRTECH1	CREW REPORTED BIRD STRIKE ACTION-TEXT: BIRD STRIKE CHECK PERFORMED ACC AMM 05-51-06-200-816-A REV 01.06.09 FOUND IMPACT BELOW F/H WINDSHIELD. CKEANED AND CHECKED, NO DAMAGE FOUN
5	42691	AGPH	Closed	12.Jul.2009	12.Jul.2009	05	P					CHR	BIRDSTRIKE AT RADOM ACTION-TEXT: BIRED STRIKE INSPECTION ACC AMM 05-51-06-200-816-A JUN 01/09 AND AMM 05-52-05-200-816-A JUN 01/09 INPACT AT RADOM NO FINDINGS. DEBRIS CLEANED
6	42689	AGPH	Closed	11.Jul.2009	11.Jul.2009	05-51-	P					HIR	BIRDSTRIKE AT NOSE SECTION ACTION-TEXT: BIRDSTRIKE INSP ACC AMM 05-51-06 PERF. FOUND IMPACT SPOTS AT L/H PITOT TUBE AND L/H MAIN GEAR STRUT AREA. CLEANED. NO FURTHER DAMAGE OBSERVED. ENGS CKD, ALL OK. AMM REV JUN 01/09
7	41140	AGPH	Closed	15.Jun.2009	15.Jun.2009	05	P					KPP	BIRDSTRIKE AT ROTATION/ SMALL BIRD HIT CM2 FRONT WINDOW ACTION-TEXT: PERFORMED INSPECTION AFTER BIRD STRIKE I.A.W 05-51-06-200-816-A. NO DEFECTS FOUND. AMM 01.03.09
8	41293	AGPH	Closed	14.May.2009	14.May.2009	05-51-	P					SRTECH1	HIT BIRD SHORT AFTER LIFT OF AT WAW ACTION-TEXT: BIRD STRIKE INSPECTION COUT IAW AMM 05-51-06-200-816A - NO DAMAGE FOUND- OK REV MAR 01/09
9	37771	AGPH	Closed	17.Mar.2009	17.Mar.2009	05	P					SDT	BIRED STRIKE IN NOSE SECTION AREA ACTION-TEXT: BIRDSTRIKE INSPECTION PERFORMED FROM FLIGHT CREW PERFORMED. NO FINDINGS REF AMM CPT 04 VA LM 007 TASK 05-51-06-200-816-A

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Contact Air

WO-Summary

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No	W/O	A/C	State	Issue-Date	Due-/C.-Date	ATA	Type	Parts	Ref.	Mel	Hil	Iss	Workorder-description and/or complaint
10	37772	AGPH	Closed	17.Mar.2009	17.Mar.2009	05	P				Hil	SDT	PERFORM RE.INSPECTION OF BIRDSTRIKE INSPECTION IN NOSE AREA AFTER 5 FLIGHT LEGS ACTION-TEXT: INSPECTION AFTER BIRDSTRIKE I.A.W AMM 05-51-06 REV MAR 01/09 PERFORMED W/C REMARKS
11	37981	AGPH	Closed	05.Oct.2008	05.Oct.2008	05-50	P					SRTECH1	BIRDSTRIKE CHECK REQUIRED ACTION-TEXT: BIRDSTRIKE CHECK PERFORMED ACC AMM 05-51-06 REV SEP01/08, REMAINS CLEANED OFF
12	35195	AGPH	Closed	26.Aug.2008	26.Aug.2008	05-51-	P					HEI	BIRD STRIKE AFTER TAKEOFF AT WAW ACTION-TEXT: PERFORMED INSPECTION AFTER BIRD STRIKE. IMPACT AREA ABOVE COPILOT WINDSHIELD CLEANED
13	35924	AGPH	Closed	08.Jul.2008	08.Jul.2008	05-51-	P					GAS	BIRD STRIKE DURING TAKE-OFF AT ZRH ACTION-TEXT: PERFORMED INSPECTION AFTER BIRD STRIKE ACC. TASK ALL 05-51-01, NO DAMAGE FOUND. A/C RELEASED FOR 5 FURTHER FLIGHTS
14	35925	AGPH	Closed	08.Jul.2008	08.Jul.2008	05-51-	P				Hil	GAS	PERFORM INSPECTION AFTER BIRD STRIKE IAW AMM ACTION-TEXT: PERFORMED BIRD STRIKE INSPECTION I.A.W AMM 01.06.08 AND TASK 05-51-01 NO DAMAGE FOUND CLEAR HIL PAGE 3 ITEM 3+4
15	34701	AGPH	Closed	22.Apr.2008	22.Apr.2008	05-50-	P				Hil	GAS	BIRDSTRIKE DURING LANDING AT RADOME ACTION-TEXT: INSPECTION PERFORMED ACCORDING TASK CARD 05-51-01, NO VISIBLE DAMAGE
16	34702	AGPH	Closed	22.Apr.2008	22.Apr.2008	05-51-	P				Hil	GAS	REFER TO TECH LOG 34701 PERFORM BIRDSTRIKE INSPECTION AFTER MAX 5 FLIGHTS ACTION-TEXT: CARRIED OUT BIRDSTRIKE INSPECTION IAW AMM 05-51-06, SATIS- NO FINDINGS. OK. REV DEC01/07

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Due to lack of visible traces indicating a bird strike, this hypothesis was rejected.

The Investgating Team verified the next hypothesis, which assumed the possibility of aircraft collision with another foreign object such as a meteorological sonde (balloon). It should be noted that the radome damage also did not indicate such an eventuality. In order to exclude this possibility, on the same day, i.e. 1 July 2010, a query was sent to the Aerology Centre (responsible for radiosonde research) of the Institute of Meteorology and Water Management in Legionowo to provide information on the following questions:

1. *Were any research related to use of meteorological sondes carried out on 1 July 2010 from 8:00 am to 8:30 am UTC?*
2. *If so, was it possible to find such a sonde within the above time limit and within the range of approximately 30 NM southwest of Warsaw, at an altitude of about 6 000 to 7000 ft?*

On 7 July, 2010 the above questions were answered by the Deputy Director of Hydrological and Meteorological Services of the Institute in the following way:

"... Kindly inform you that IMGW (Institute of Meteorology and Water Management) does not perform radiosonde measurements except 00 (hrs) and 12 (hrs) UT, and additionally on 1 July, 2010 in the morning there was no accidental release of any free balloon into the atmosphere."

The response presented by the Institute of Meteorology and Water Management **excluded the possibility of the airplane collision with a meteorological sonde**.

The conclusions of reports presented in paragraph 1.16 (TE-1637 - pages 29-36) and (ER 8-53 IR - pages 38-45) also excluded cause of the radome damage as a result of a collision with a bird or other object.

After examination of all available materials and information, the Investigating Team determined that damage to the radome could be caused only by the dynamic pressure of air during the flight.

The damaged area of the radome for a long time worked under conditions that allowed the moisture ingression into the composite structures. Physical phenomena (freezing and thawing) occurring over time inside the radome structure, associated with the entrapped moisture (as well as water), were likely to cause degradation the structural characteristics of the bonded components.

This gradual degradation of the material in fiberglass epoxy composite structures and their bonds could be direct cause of the implosion. It should also be noted that during operation of the radome some bird strikes were recorded, which could be associated with development of local areas of weakness and formation of microcracks in the laminate structures.

Microcracks could be direct cause of moisture ingression into the internal laminate structures, especially honeycomb core. The radome maintanance and minor repairs by the airplane user did not reveal weakening of the construction and did not allow to maintain (properly) the composite structure and protect it from environmental elements.

After a bird strike, AMM (Airplane Maintanance Manual) requires an inspection of internal and external surfaces of the radome (according to TASK 05-51-06-200-816-A Inspection After Birdstrike) for cracks, delamination and traces of the core damage.

TASK 05-51-06-200-816-A Inspection After Birdstrike

1. ***Examine the honeycomb panels for:***
    - ***Craks***
    - ***Crazing***
    - ***Delamination***
    - ***Signs of core damage.***
2. ***Examine the radome on the inside and outside for:***
    - ***Craks***
    - ***Crazing***
    - ***Delamination***
    - ***Signs of core damage.***

Fokker does not require the use of any kind of moisture meter to perform above mentioned inspection. During normal operation, inspections of internal and external structures of the radome are carried out every 8000 flight hours.

3. FINAL CONCLUSIONS

3.1. Commission findings

1. Contact Air Company received the airplane in 2008 with the radom already installed. but did not receive any documentation related to limitations the radom working time.
2. Contact Air did not receive any documentation related to limitations of the radom working time.

3. Prior to the flight the radome did not show any visual signs of damage.
4. The flight crew was cleared for departure without speed limitations below FL 100 (IAS ≤250 kt);
5. The radome damage occurred at 7135 ft (AFE) and the speed of 292 kt (CAS) during climbing and acceleration of the aircraft while executing the „SOXER1G" departure.
6. The damage was accompanied by the sound similar to the sound of collision with a foreign object.
7. The radome damage occurred within the operational limits of the aircraft.
8. During the flight there were no weather phenomena, which could cause overload of the radom.
9. The radome implosion disturbed the airflow mainly aroud the Pitot tube situated on the left side and affected the proper operation of several subsystems of the airplane, which resulted in:
    - speed fluctuations +/-20 kt) on the left (CPT) IAS;
    - several warnings displayed on Multi-function Display: „**Compare speed alert"**, „**No autoland"** and „**Ruder limiter alert**";
    - the above warnings were accompanied by activation of **„Master Caution"** light and sound signal (single chime);
    - slight speed fluctuations on other instruments;
    - moving power lever into forward and aft position with autothrottle engaged;
    - triggering the windshear warning on final approach, which resulted in go around procedure.
10. The crew informed passengers about situation on board and about decision to return to the take off airport.
11. The crew did not declare an emergency situation.
12. Warsaw Airport ensured the landing aircraft full assistance even though an emergency situation was not declared.

13. No traces of the radome damage were found related to collision with a foreign object, particularly to bird strike.
14. The last service of the Radome was performed in 2000 by NORDAM.
15. Delamination of the composite structure was found in the radome material.
16. Analysis of the airplane documentation showed several earlier bird strikes against the radome.
17. After a bird strike inspection AMM (Airplane Maintanance Manual) does not require the use of any kind of moisture meter to inspect the inside and outside of the radome

3.2. Causes of the air incident

During the investigation SCAAI determined that the probable cause of the serious incident could be:

Reduced strength of the radome sandwich structure caused by gradual (over time) degradation of the material in fiberglass epoxy composite structures and their bonds.

Probable factor contributing to the incident could be:

- several bird strikes against the radome, which occurred earlier and could cause a progressive weakening of its structure. Maitenance of the radome and minor repairs made by the airplane user did not reveal weakening of the construction and did not maintain properly the composite structure and protect it from environmental factors despite they were carried out according to the procedures given in the aircraft maintenance manual.

4. SAFETY RECOMMENDATIONS

Contact Air:

- **During future simulator sessions for the flight crews conduct a training with scenario involving abnormal situations similar to that, which occurred during flight SWR343T;**
- **Inform all airline flight crew personnel about the occurreence;**
- **Verify the internal procedures for inspections of the laminate surfaces of the aircraft after bird strikes.**

Manufacturer/aircraft type certificate owner:

- **To review the radome inspections procedure in case of bird strike.**

EASA:

- **Notify all F70/100 users about the occurrence.**

5. ANNEXES

None.

THE END

Investigator-in-Charge

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