



Havarikommissionen
Accident Investigation Board Denmark

FINAL REPORT

Accident

4-9-2014

involving

AVIONS ROBIN (DR 300/180R)

D-EJBB



Certain report data are generated via the EC common aviation database

FOREWORD

This report reflects the opinion of the Danish Accident Investigation Board regarding the circumstances of the occurrence and its causes and consequences.

In accordance with the provisions of the Danish Air Navigation Act and pursuant to Annex 13 of the International Civil Aviation Convention, the investigation is of an exclusively technical and operational nature, and its objective is not the assignment of blame or liability.

The investigation was carried out without having necessarily used legal evidence procedures and with no other basic aim than preventing future accidents and serious incidents.

Consequently, any use of this report for purposes other than preventing future accidents and serious incidents may lead to erroneous or misleading interpretations.

A reprint with source reference may be published without separate permit.

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FINAL REPORT

General

File number: HCLJ510-2014-274
UTC date: 4-9-2014
UTC time: 11:19
Occurrence class: Accident
Location: 2 nautical miles (nm) west of Kerteminde on the island of Funen
GPS position: N55 27 17 E010 36 05
Injury level: Fatal

Aircraft

Aircraft registration: D-EJBB
Aircraft make/model: AVIONS ROBIN (DR 300/180R)
Current flight rules: Visual Flight Rules (VFR)
Operation type: General Aviation Pleasure Cross-country
Flight phase: Approach
Aircraft category: Fixed wing Airplane
Last departure point: Denmark EKEL: Endelave (private airstrip)
Planned destination: Denmark (Kerteminde/Rosengaarden) (private airstrip)
Aircraft damage: Destroyed
Engine make/model: LYCOMING 360 FAMILY (O-360-A3A)

SYNOPSIS

Notification

All times in this report are UTC.

The Aviation Unit of the Danish Accident Investigation Board (AIB) was notified of the accident by the Funen local police on 4-9-2014 at 12:00 hrs.

The Danish Transport Authority (DTA), the German Bundesstelle für Flugunfalluntersuchung (BFU), the French Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile (BEA), the European Aviation Safety Agency (EASA), the Directorate-General for Mobility and Transport (DG MOVE) were notified on 4-9-2014.

The German BFU and the French BEA appointed accredited non-travelling representatives to the investigation.

Summary

During a low altitude steep turn manoeuvre, the aircraft was exposed to a loss of control in flight.

Low altitude made it impossible to recover before impacting the water.

The pilot and the passenger suffered fatal injuries.

The aircraft was destroyed.

The accident occurred in daylight and under visual meteorological conditions (VMC).

The safety investigation did not result in recommendations being made.

1 FACTUAL INFORMATION

1.1 History of the flight

The accident occurred during a private VFR flight from a private grass airstrip on the island of Endelave to a private grass airstrip near Kerteminde on the island of Funen.

The aircraft made an approach to runway 21 at Kerteminde/Rosengaarden private airstrip.

Witnesses at close positions to the north and east of the airstrip observed the aircraft approaching runway 21 at a low altitude with a low airspeed.

When the aircraft was just above the airstrip, the sound picture to the witnesses was a reduction of engine power followed by an adding of full engine power.

The witnesses observed that the aircraft made an immediate left turn at a low altitude and continued the left turn at an altitude of approximately 20-35 meters above ground level. In a left banking turn, the aircraft flew between two birch trees (approximately 170 meters east of the threshold to runway 21) with the left wing of the aircraft below the treetop of the western birch tree.

The aircraft bank angle to the left increased more and more.

The aircraft lost altitude, and the left wing hit the water.

The aircraft crashed into shallow waters of the fjord of Kerteminde.

1.2 Injuries to persons

<i>Injuries</i>	<i>Crew</i>	<i>Passengers</i>	<i>Others</i>
Fatal	1	1	
Serious			
Minor / None			

1.3 Damage to aircraft

The aircraft was destroyed.

1.4 Other damage

There were no other damages.

1.5 Personnel information

1.5.1 License and medical certificate

On the accident site, the AIB did not find or salvage any pilot information.

Via the German BFU, the AIB received the following pilot information:

The pilot (76 years) was the holder of a Light Aircraft Pilot License (LAPL (A)), initially issued on 7-10-1965.

The Medical Certificate was a class two certificate. The expiry date of the Medical Certificate was 25-8-2015. Limitation of the Medical Certificate: *Shall wear multifocal lenses and carry a spare set of spectacles (VML).*

1.5.2 Flying experience

The pilot's flying experience until 13-7-2013 was 2226:21 hours and 6277 flights.

The flight experience between 4-9-2012 and 13-7-2013 (24 to 14 months before the accident) was 28:19 hours and 47 flights, including 27 flights off-shore to the islands Helgoland, Baltrum, Borkum and Wangerooge.

1.5.3 Pilot experience with the Kerteminde/Rosengarden airstrip

The pilot was familiar with the area and had experience of operating on the airstrip.

1.6 Aircraft information

1.6.1 General

Aircraft manufacturer:	Avions Pierre Robin
Manufacturer's designation:	DR 300/180R
Aircraft serial number:	590
Engine:	Textron Lycoming 360 O-360-A3A
Propeller:	Sensenich fixed pitch propeller
Aircraft approval:	VFR flight operations
Airworthiness certificate:	Valid until 25-8-2015
Empty mass:	583 kilograms (kg) - see appendix 5.1
Maximum take-off mass:	1 000 kg
Maximum landing mass:	950 kg
Crosswind limitation:	22 knots

1.6.2 Maintenance records

Aircraft flight hours:	2243:00 hours (20-7-2014)
Aircraft landings:	4859 (20-7-2014)
Engine inspection:	Performed on 8-6-2014 without remarks. The total engine time at the time of the engine inspection was 730:00 hours
Latest inspection (100 hours):	8-6-2014 (2243:00 aircraft flight hours)
Next inspection (50 hours):	2293:00 aircraft flight hours

1.6.3 Photo of D-EJBB

Below is a picture of the aircraft before departing the island of Endelave.



1.6.4 Mass and balance

1.6.4.1 General

At impact, the aircraft broke up. Due to the muddy fjord floor (depth of mud approximately 20-30 centimeters) and the current of the fjord, the AIB believes that not all on board baggage and flight documentation were salvaged.

For that reason, the AIB has not been able to reconstruct the actual mass and balance of the aircraft at the time of the accident.

1.6.4.2 Theoretical reconstruction of the aircraft mass and balance

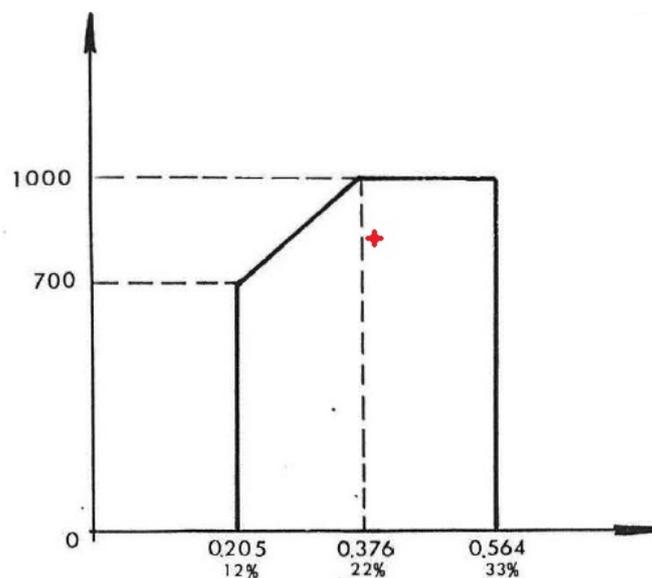
The AIB has made a theoretical reconstruction of the aircraft mass and balance at the time of the accident.

Premises for the theoretical reconstruction were:

- The total fuel on board before departure from Walsrode-Luisenhöhe on 3-9-2014 was 110 liters (including five liters of unusable fuel)
- According to German military radar data, the flight from Walsrode-Luisenhöhe on 3-9-2014 led directly to the island of Endelave (the radar track ended 18 nautical miles south of the island of Endelave)
- The total estimated flight time from Walsrode-Luisenhöhe to the island of Endelave was 1:38 hours
- The average fuel flow was 30 liters per hour
- The total estimated flight time from the island of Endelave to Kerteminde/Rosengaarden was 0:15 hours

Subject	Mass (kg)	Arm (meter (m))	Moment (m/kg)
Empty mass:	583	0.262	152.828
Pilot (male - standard mass):	85	0.410	34.85
Passenger (female - standard mass):	75	0.410	30.75
Baggage on passenger seats (estimated):	50	1.190	59,5
Zero fuel mass:	793	0.35	277.928
Fuel on board:	35	1.120	39.2
Mass at the time of the accident:	828	0.38	317.128

1.6.4.3 Mass and balance envelope



1.7 Meteorological information

1.7.1 Aftercast (Endelave - Kerteminde)

Overview:	High pressure weather with an easterly/southeasterly current of an instable air mass
Weather:	No significant
Clouds:	Few cumulus at 2000 feet
Zero degree isotherm:	12000 feet
Icing:	None
Risk of carburettor icing:	At the surface: Moderate icing at cruise power Serious icing at decent power Above 1000 feet: Serious icing any power
Turbulence:	Light thermal, mainly above land
Surface wind:	120-140 degrees and 8-13 knots
Altitude wind (1 500 feet):	130 degrees and 15 knots
Windshear:	None of significance

1.7.2 Overview - Denmark

Valid on 4-9-2014 between 07:00 and 13:00 hours.

Weather overview:	A ridge of high pressure covered the southern part of Scandinavia
Visibility:	Visibility below five kilometers or cloud base below 1000 feet It is expected at the beginning of the period in the whole area
Turbulence:	Is not expected during the forecasted period
Icing:	Is not expected during the forecasted period

1.7.3 Overview - the accident site and the islands

Valid on 4-9-2014 between 07:00 and 13:00 hours.

Turbulence:	Is not expected during the forecasted period
Icing:	Is not expected during the forecasted period
Visibility/weather/clouds:	In the beginning of the period, a visibility above eight kilometers Cloudbase at 2000 - 4000 feet, locally at 1500 - 2000 feet Cloud top at 2000 feet In the middle and at the end of the period, a visibility above eight kilometers Cloudbase above 4000 feet, locally at 1500 - 2000 feet Cloud top: No forecast

Zero degree isotherm:	The whole area; zero degree at flight level 120
Surface wind:	Easterly and 10 knots
Wind and temperature (2000 feet):	The whole area: 130 degrees and 15 knots / + 11 degrees (Later) 120 degrees and 15 knots / + 11 degrees
Lowest QNH:	1024 hPa
Additional information:	Occurrence of towering cumulus or cumulus nimbus always implies risk of moderate/severe icing and turbulence even though not stated explicitly in the forecast

1.7.4 Significant weather chart

[See appendix 5.2](#)

1.7.5 Hans Christian Andersen Airport (EKOD)

1.7.5.1 Terminal Aerodrome Forecast (TAF)

040700 TAF-FC AMD ekod 040725z 0407/0416 08008kt 9999 few025 tempo 0407/0409
bkn012=

1.7.5.2 Meteorological Terminal Aviation Routine Weather Report (METAR)

041050 METAR ekod 041050z 11010kt 060v140 9999 sct028 20/15 q1026=

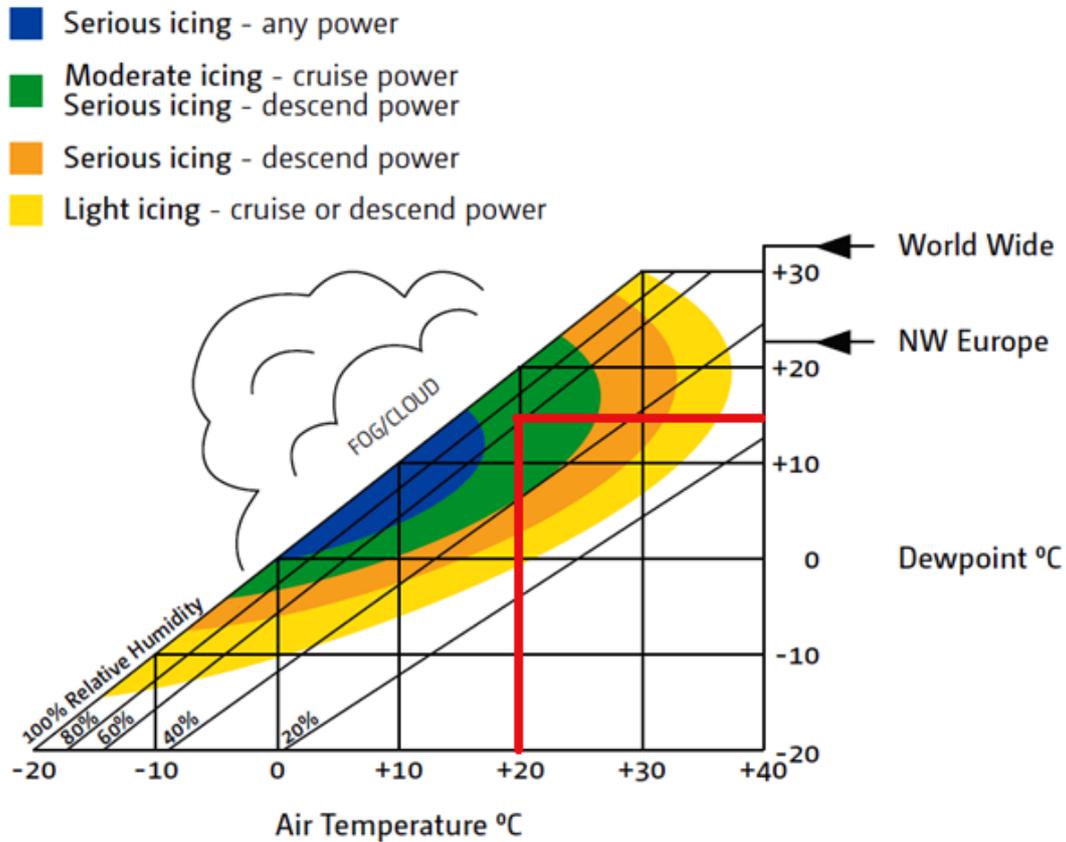
041150 METAR ekod 041150z 09010kt 060v140 9999 sct028 19/14 q1025=

1.7.6 Local weather observations

The locally observed weather conditions at the time of the accident were few scattered clouds, a visibility of more than ten kilometres and a gentle to moderate breeze from the east/southeast.

1.7.7 Risk of carburettor icing

The temperature and dewpoint lines in red refer to a weather observation (METAR) in EKOD at 10:50 hours.



1.8 Aids to navigation

Not relevant.

1.9 Communication and radar

1.9.1 Communication

During the flight (airspace class G), the aircraft was not in radio contact with any Air Traffic Services (ATS).

For the actual VFR flight, there were no requirements for continuous two-way air-ground voice communication.

1.9.2 Radar

At the time of the accident, the aircraft transponder was in the “OFF” position. ATS units had no radar presentation of the accident flight.

1.10 Aerodrome information

1.10.1 Kerteminde/Rosengaarden

Kerteminde/Rosengaarden was a private grass airstrip near Kerteminde on the island of Funen.

Extract from the Airfield Manual Denmark:

Location:	2.2 nm west of the city of Kerteminde
GPS position:	N55 27 2 E010 35 8
Elevation:	10 feet
Runway directions:	03/21
Dimensions - surface:	500 x 15 meters - grass

1.10.2 AIB observations and measurements

Runway 21 direction:	206° magnetic
Dimensions - surface:	428 x 4 meters - cut grass (trail). Outside the cut grass area, the length of the grass was approximately 7-10 centimetres
Runway slope:	Upslope (runway 21)
Runway conditions:	The following two pictures are taken in the direction from south towards north.





Windsock:

Placed next to and at the southern end of the airstrip



1.11 Flight recorders

Neither flight recorders were installed nor required.

1.12 Wreckage and impact information

1.12.1 General

The left wing hit the water, separated from the fuselage and broke apart.

The engine separated from the fuselage and ended up on the floor of the fjord at a position approximately 50 meters northeast of the partly floating main fuselage.

Approximately 155 meters east of the threshold to runway 21 and 60 meters from the shoreline, the main fuselage ended up in an upside down position partly floating on the water.

[See appendix 5.3](#)

The GPS position of the partly floating main fuselage was N55 27 17 E010 36 05.



The depth of water was approximately one and a half meters.

1.12.2 Technical investigation

1.12.2.1 General findings

- The ignition key was in the “BOTH” position
- The fuel selector was in the “OPEN” position with a free movement to the “CLOSED” position
- The flap handle was in the 60° detent position (*Stellung 2 - Landung*)
- The flap position angle of the right wing was measured to be 60° ($\pm 5^\circ$)
- Consistency existed between the flap handle and the wing flap angle position
- The aircraft artificial horizon was locked in a 45-50° bank angle to the left
- The transponder selector switch was in the “OFF” position
- The transponder code setting was 7000
- The VHF radio frequency was set to 119.550 MHz
- The throttle lever was in the “FULL POWER” position
- The carburettor heating lever was in the “COLD” position
- It was not possible to reveal the position of the “MIXTURE” lever
- The fuel pressure warning light did not illuminate at the time of the accident
- The oil pressure warning light did not illuminate at the time of the accident. However, the filament was broken indicating that the light bulb might have been defect before impact, or the filament broke at impact
- The fuel tank broke up at impact. It was not possible for the AIB to do a laboratory fuel analysis

1.12.2.2 Flight controls

An examination of the aircraft’s tail section including examination of the control cables, the fittings, and the control pulleys concluded rupture as a consequence of overload stress.

An examination of the aircraft’s center wing box including examination of the control cables, the push pull rods and the control pulleys concluded rupture as a consequence of overload stress.

An examination of the cockpit control sticks revealed free movement at any position with no signs of blockage before the time of the accident.

1.12.2.3 Engine and propeller examination

- A visual external inspection of the engine revealed no other damages than impact damages
- An engine crankshaft rotation did not reveal any mechanical failures - no unexpected resistance
- A boroscope inspection of the engine cylinders did not reveal discrepancies

- An examination of engine oil, filters, magnetos, carburettor, valves, spark plugs and high tension leads did not give rise to remarks
- The propeller was in a good condition. One of the propeller blades bended slightly forwards
- The propeller spinner was compressed by a vertical force and had marks of rotation
- Wear marks from the alternator belt shifter on the air baffle at cylinder number one indicated alternator rotation at impact.

1.12.3 Operational investigation

Since no objective and exact data for airspeed, altitude and bank angle during the low altitude steep turn manoeuvre were available, the AIB decided to do a theoretical calculation of stall speeds during the observed turn.

[Se appendix 5.4](#)

1.13 Medical and pathological information

After the accident, the occupants were found in the following positions:

Pilot: Outside the cockpit near the wreckage

Passenger: Cockpit front right

The bodies of the pilot and passenger underwent an autopsy. A pathologist produced a report for the AIB.

The report concluded:

- In the case of the pilot, no diseases could have caused or contributed to the accident
- In the case of the passenger, no diseases could have caused or contributed to the accident
- The toxicological examination of the pilot and passenger was negative for carbon monoxide and alcohol
- The pilot and the passenger used hip and shoulder harnesses

1.14 Fire

There was no fire.

1.15 Survival aspects

1.15.1 General

The pilot and the passenger used hip and shoulder harnesses.

Due to the impact forces, the accident was not survivable.

1.15.2 Fire and rescue services

At 11:19 hours, witnesses, who observed the sequence of events, alerted the local fire and rescue services.

Witnesses initiated a rescue mission.

1.16 Tests and research

None.

1.17 Organization and management information

Not relevant.

1.18 Additional information

1.18.1 Aeronautical Information Publication (AIP) Denmark - extract

ENR 1.6 radar services and procedures

c. Pilots, who have not received specific instructions from ATS concerning the setting of the transponder, shall operate the transponder as stated in the following:

- *VFR flights within København FIR: Mode-A, Code 7000*

d. When the aircraft carries serviceable Mode C equipment, the pilot shall continuously operate this mode, unless otherwise directed by ATS.

1.18.2 Operation of flaps during a go-around

The Pilot Operating handbook (POH) stated the following go-around procedure:

Verfehlte Landung (Durchstarten):

- *In jedem Fall kann man wieder Gas geben.*
- *Vergasservorwärmung "aus" (drücken)*
- *Klappen so bald wie möglich auf Stellung "start" (1.Raste)*

With reference to the abovementioned go-around procedure, the AIB forwarded three questions to the aircraft manufacturer:

1. The manufacturer's interpretation of *so bald wie möglich*?
2. From a performance point of view, what are the consequences during a go-around of not retracting the flaps to *Stellung 1 - Start*?
3. If there are no consequences, does the manufacturer regard operation of a flap setting of 60 degrees during a go-around safe?

The aircraft manufacturer replied:

1. *This mean when the pilot judges the situation good enough and is ready to safely raise the flap to the first notch (horizontal wing and speed adapted, refer to chapter 2 -stall speed)*
2. *The only consequence is lower climb performance (due to drag), to obtain the take off/climb performance indicated in the AFM you must be in take off configuration*
3. *There is no handling problem/consequence but the climb performance is impacted. That's why you have to be in take off configuration for climb performance*

Just for information, for the DR400 (same aerodynamic characteristic), the procedure for going around is the following:

Going around procedure

Carburettor heat off check
Throttle full power (push)
Speed (65 kt) 120 km/h
Flaps progressively raise flaps to the take-off position (1st notch)
Normal climb speed (75 kt) 140 km/h

1.19 Useful investigation techniques

None.

2 ANALYSIS

2.1 General

Due to the impact in water and the breakup of the aircraft, some operational and technical documentation were lost, which to some point hampered the AIB investigation.

However, the license, the qualifications and the medical status held by the pilot, the technical status of the aircraft, and the aircraft mass and balance had, in the AIB's opinion, no influence on the sequence of events.

The transponder switch was in the "OFF" position, and ATS units had no radar presentation of the accident flight. The pilot decision of not activating the transponder during the flight from the island of Endelave to Kerteminde/Rosengaarden on the island of Funen was inconsistent with the requirements of the AIP Denmark.

From a flight safety point of view, the AIB strongly encourages pilots to activate an on board transponder during all flights.

2.2 Weather conditions

The weather conditions were good and did not give rise to any flight operational limitations.

Generally seen, the observed weather conditions in the area of Kerteminde were equivalent to the forecasted weather conditions.

The AIB does not know when, how and/or if - during the descent and the final approach to Kerteminde/Rosengaarden - the pilot made use of carburettor heating.

But the risk of moderate carburettor icing at cruise power and serious carburettor icing at decent power was present.

However taking into consideration the observations of sound picture by witnesses combined with the AIB technical investigation, the AIB finds the presence of carburettor icing leading to a partial to full loss of engine power unlikely.

2.3 The airstrip

The pilot had experience and was familiar with the area and the airstrip.

However, the airstrip was shorter and narrower than presented in the Airfield Manual Denmark.

Furthermore, no airstrip wind information was available (worn windsock).

The AIB has no objective explanation for the pilot decision on aborting the landing attempt.

One possible scenario might be that changed conditions modified the pilot's perception of the environment relative to the pilot's expectations.

2.4 Low altitude manoeuvre

2.4.1 Decision making

The pilot decided to abort the landing attempt and do a low altitude steep left turn manoeuvre.

The AIB has no objective explanation for the pilot decision on doing the low altitude manoeuvre. In view of flight safety, neither technical nor physiological causes appeared to justify deviations from optimum flight manoeuvres.

The AIB finds that combined conditions like low altitude during the entire turn (maximum 35 meters above ground level) and a high bank angle during the entire turn (calculated $45^\circ - 59^\circ$) eliminated appropriate flight safety margins, which had a direct influence on the sequence of events.

2.4.2 Stall

Comparing the actual turning radius (85 meters) and the optimum turning radius (249 meters) in sector three, the turning radius was reduced with approximately 66 %, requiring the pilot to increase the bank angle more and more in order to be established on final to runway 21.

The pilot might unintentionally have reduced the attention on the relationship between airspeed and bank angle, while keeping external focus on being established on a new approach to runway 21.

At a bank angle of approximately 59° to the left and at an airspeed of approximately 120 kilometres per hour (flap setting 60°), the left wingtip stalled, while the right wingtip flew at a lower angle of attack leading to an incipient spin (asymmetric stall).

The AIB is aware that the pilot's actual handling of airspeed and bank angle during the left turn might have differed from the AIB's theoretical calculation.

Low altitude made it impossible for the pilot to stop the rotation and recover from the stall before impacting the water.

2.4.3 Scenario

The aircraft was exposed to an asymmetric stall leading to an incipient spin causing a loss of control in flight.

A potential scenario contributing to the loss of control in flight might be an intentional low altitude steep left turn manoeuvre.

3 CONCLUSIONS

3.1 Findings

1. The license, the qualifications and the medical status held by the pilot, the technical status of the aircraft, and the aircraft mass and balance had no influence on the sequence of events
2. The toxicological examination of the pilot and passenger was negative for carbon monoxide and alcohol
3. The pilot and the passenger used hip and shoulder harnesses
4. The pilot decision of not activating the transponder during the flight was inconsistent with the requirements of the AIP Denmark
5. The weather conditions were good and did not give rise to any flight operational limitations
6. The observed weather conditions in the area of Kerteminde were equivalent to the forecasted weather conditions
7. The risk of moderate carburettor icing at cruise power and serious carburettor icing at decent power was present
8. The pilot had experience and was familiar with the area and the airstrip
9. The airstrip was shorter and narrower than presented in the Airfield Manual Denmark
10. No airstrip wind information was available
11. The pilot decided to abort the landing attempt and do a low altitude steep left turn manoeuvre.
12. Combined conditions like low altitude and a high bank angle eliminated appropriate flight safety margins
13. The aircraft was exposed to an asymmetric stall leading to an incipient spin causing a loss of control in flight
14. Low altitude made it impossible for the pilot to stop the rotation and recover from the stall before impacting the water
15. The accident was not survivable

3.2 Factors

1. The aircraft was exposed to an asymmetric stall leading to an incipient spin causing a loss of control in flight
2. Low altitude made it impossible for the pilot to stop the rotation and recover from the stall before impact with the water

3.3 Summary

During a low altitude steep turn manoeuvre, the aircraft was exposed to a loss of control in flight.

Low altitude made it impossible to recover before impacting the water.

The pilot and the passenger suffered fatal injuries.

The aircraft was destroyed.

The accident occurred in daylight and under visual meteorological conditions (VMC).

4 SAFETY RECOMMENDATIONS

The safety investigation has not resulted in recommendations being made.

5 APPENDICES

- 5.1 Gewichtsübersicht
- 5.2 Significant weather chart
- 5.3 Wreckage site
- 5.4 A theoretical calculation of stall speeds during the observed turn

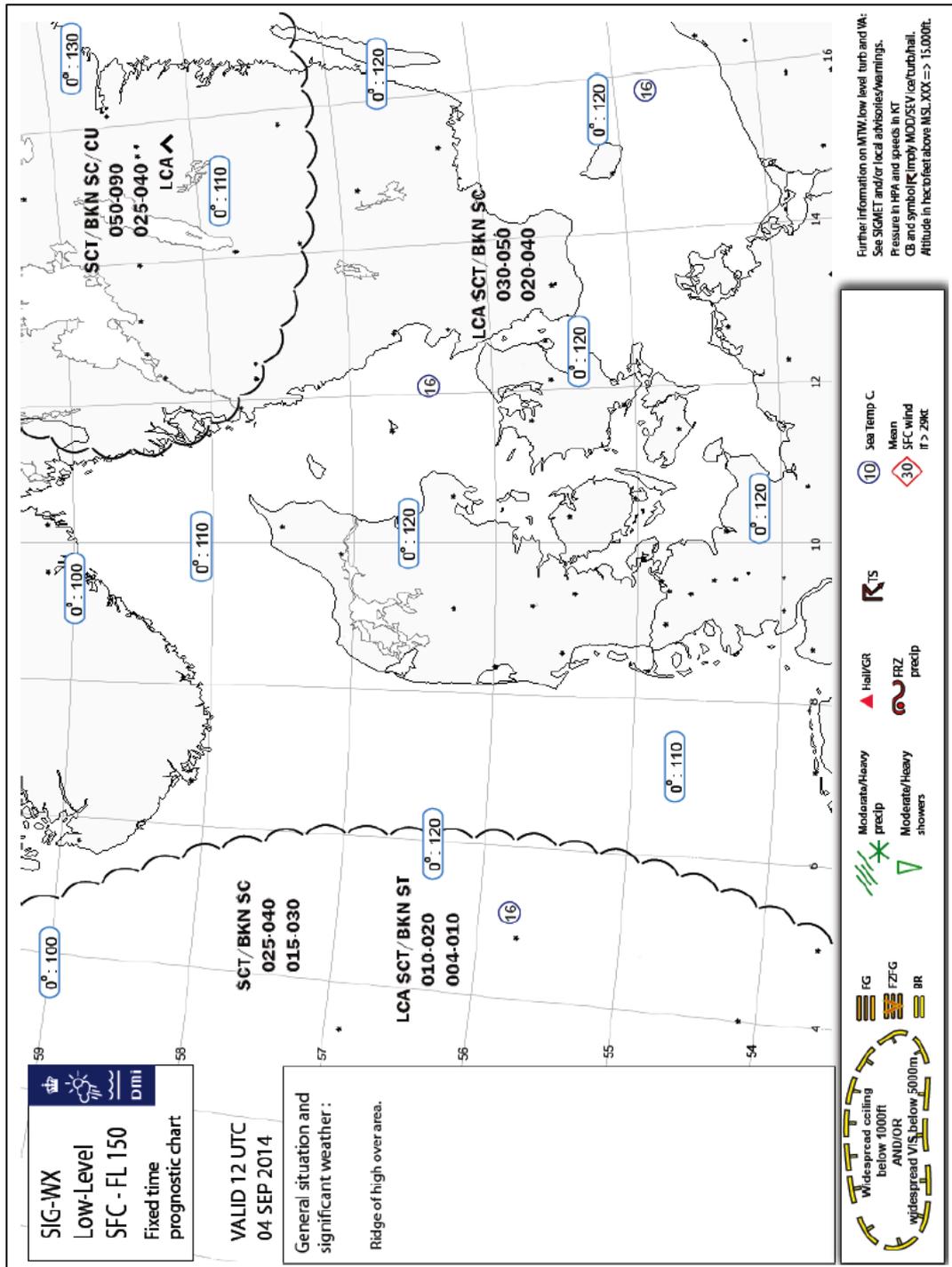
5.1 Gewichtsübersicht

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		Wägebericht und Massenübersicht für Flugzeuge				
		Diesem Wägebericht/Massenübersicht liegt das Ausrüstungsverzeichnis Vom 01.05.1989 zugrunde.				
Muster: DR 300/180R	Werk-Nr.:	D-EJBB				
A. Technische Daten nach Kennblatt (Spezifikation):						
1. Bezugspunkt (BP):						
2. Bezugsebene (BE):	Flügelvorderkante im rechteckig. Bereich					
3. Bezugslinie horiz. (BL):	Oberer Rumpflängsgurt waagrecht bei Referenzsation 1,71 m					
4. Leermasse:	$G_L = 583$ [kg]					
5. Leermassen-Schwerpunkt:	$x_G = 0,262$ [m] von BE					
6. Lufttüchtig.-Gruppe	Zuladung [kg]	Höchstzul. Flugmasse [kg]				
Normalflugzeug (N)	417	1000, Ldg. 950				
Nutzflugzeug						
7. Zulässige Flugmassen-Schwerpunktlagen:						
Lufttüchtig.-Gruppe	Abstand von BE		bei Flugmasse			
	x_{vorn} [m]	x_{hinten} [m]	[kg]			
Normalflugzeug (N)	0,367	0,564	1000			
	0,205	0,564	700			
B. Wägung und Leermassenschwerpunktlage						
	Auflage	Brutto-Masse [kg]	Tara-Masse [kg]	Netto-Masse [kg]	Hebelarm [m]	Massenmoment [kgm]
Wägung	links G_{1l}			235	$x_1 = 0,825$	193,875
	rechts G_{1r}			239	$x_1 = 0,825$	197,175
	vorn/hinten G_2			185	$x_2 = -0,830$	-153,550
Summe A	Gesamt-Masse:			659		237,500
Abzüge	Ausfliegbarer Kraftstoff: (0,72 [kg/l])					
	Rumpfbehälter 1 : 105 l			76	1,120	84,672
	Rumpfbehälter 2 :					
	Flügelbehälter 1 :					
	Flügelbehälter 2 :					
	Ausfliegbarer Schmierstoff: (0,89 [kg/l])					
Summe B	Behälter :					
	Gesamt-Masse:					
Wägung (Summe A)				659		237,500
Abzüge (Summe B)				76		84,672
Leermasse G_L und Leermassenschwerpunkt x_G				$G_L = 583$	$x_G = 0,262$	152,828
In der Leermasse sind enthalten: Schmierstoff, Hydraulik- und Enteisungsflüssigkeit bei jeweils maximal zulässiger Füllung						

5.2 Significant weather chart

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5.3 Wreckage site

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5.4 A theoretical calculation of stall speeds during the observed turn

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Calculation premises:

- The after casted wind conditions: 130 degrees and 10 knots
- True Air speed (TAS) = Indicated Air speed (IAS)
- IAS = 120 kilometres per hour \approx 65 knots (according to the manufacturer's DR400 going around procedure)
- A coordinated turn
- Witnesses observed the aircraft flying at a low altitude between two birch trees standing perpendicularly and approximately 170 meters east of the threshold to runway 21 (a turning radius of 85 meters)
- Stall speed for wings level and with a flap setting of 60° (*Angezeigte Mindestgeschwindigkeiten/ Horizontalflug Stellung 2 (60°)*): 91 kilometres per hour \approx 49 knots

Calculation formulas:

$$r = \frac{V_k^2}{37 \cdot \tan \Phi}$$

r = turn radius of the airplane (m)

V_k = speed of the airplane (kt)

Φ = bank angle of the airplane (degrees)

$$\tan \Phi = \frac{V_k^2}{37 \cdot r}$$

r = turn radius of the airplane (m)

V_k = speed of the airplane (kt)

Φ = bank angle of the airplane (degrees)

$$G = \frac{1}{\cos \Phi}$$

G = average G load the airplane experienced during the turn

Φ = the airplane's average bank angle during the turn in degrees

$$Vs_2 = Vs_1 \cdot \sqrt{G}$$

Vs_2 = the stall speed at the new G load

Vs_1 = the stall speed obtained from the Flight Manual

G = average G load the airplane experienced during the turn

SECTOR ONE

Calculation premises:

- The average flown magnetic course for the calculation of Ground Speed (GS): 161°

Stall speed calculation:

$$r = \frac{65^2}{37 \cdot \tan 30} \approx 198 \text{ meters (TAS = 65 knots (calm wind conditions) and a bank angle of } 30^\circ)$$

$$r = \frac{56^2}{37 \cdot \tan 30} \approx 147 \text{ meters (GS = 56 knots and a bank angle of } 30^\circ)$$

$$\Phi = \arctan\left(\frac{56^2}{37 \cdot 85}\right) \approx 45^\circ \text{ (GS = 56 knob and the turning radius during the final left turn was 85 meters)}$$

$$G = \frac{1}{\cos 45} = 1,414$$

$$Vs_2 = 49 \text{ kt} \cdot \sqrt{1,414} \approx 58 \text{ knots}$$

SECTOR TWO

Calculation premises:

- The average flown magnetic course for the calculation of GS: 071°

Stall speed calculation:

$$r = \frac{65^2}{37 \cdot \tan 30} \approx 198 \text{ meters (TAS = 65 knots (calm wind conditions) and a bank angle of } 30^\circ)$$

$$r = \frac{59^2}{37 \cdot \tan 30} \approx 162 \text{ meters (GS = 59 knots and a bank angle of } 30^\circ)$$

$$\Phi = \arctan \left(\frac{59^2}{37 \cdot 85} \right) \approx 48^\circ \text{ (GS = 59 knob and the turning radius during the final left turn was 85 meters)}$$

$$G = \frac{1}{\cos 48} = 1,494$$

$$V_{s_2} = 49 \text{ kt} \cdot \sqrt{1,494} \approx 60 \text{ knots}$$

SECTOR THREE

Calculation premises:

- The average flown magnetic course for the calculation of GS: 341°

Stall speed calculation:

$$r = \frac{65^2}{37 \cdot \tan 30} \approx 198 \text{ meters (TAS = 65 knots (calm wind conditions) and a bank angle of } 30^\circ)$$

$$r = \frac{73^2}{37 \cdot \tan 30} \approx 249 \text{ meters (GS = 73 knots and a bank angle of } 30^\circ)$$

$$\Phi = \arctan\left(\frac{73^2}{37 \cdot 85}\right) \approx 59^\circ \text{ (GS = 73 knob and the turning radius during the final left turn was 85 meters)}$$

$$G = \frac{1}{\cos 59} = 1,941$$

$$V_{S_2} = 49 \text{ kt} \cdot \sqrt{1,941} \approx 68 \text{ knots}$$

SECTORS

