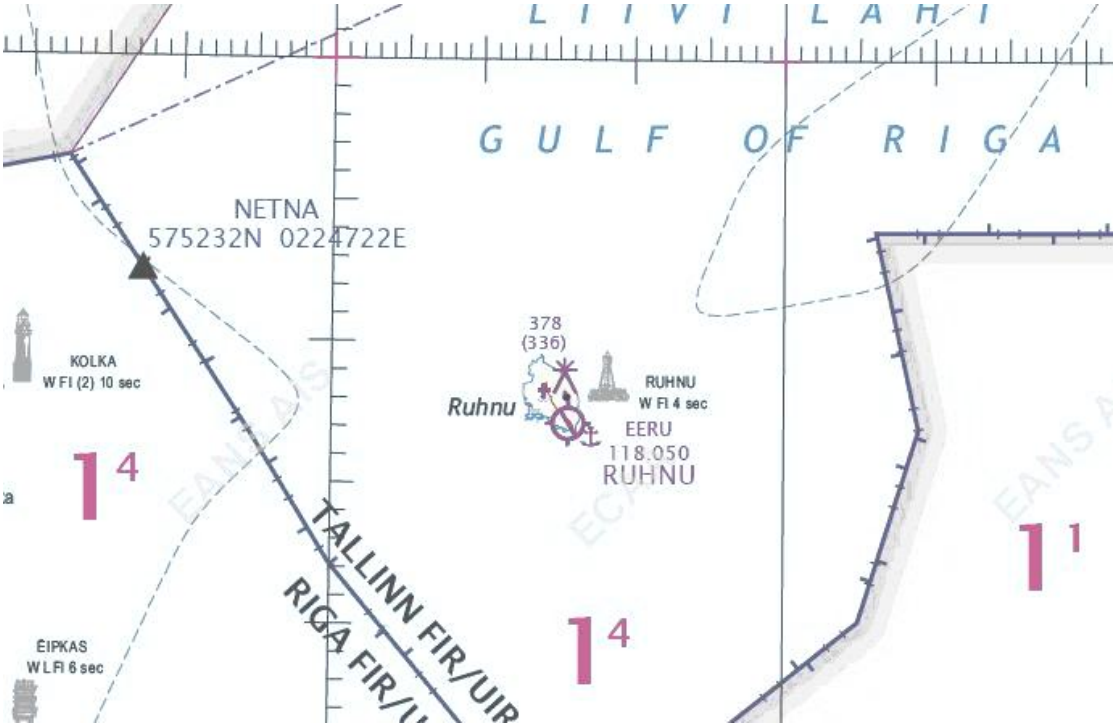
FINAL REPORT OF AIRCRAFT ACCIDENT INVESTIGATION

Britten Norman BN-2B-26, D-ILFB

Ruhnu, Estonia, March 3rd, 2007



Tallinn 2011

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SYNOPSIS

On March 3, 2007, at 14:08[1], a twin engine aircraft Britten Norman BN-2B-26, *Islander*, operated by *Luftverkehr Friesland Brunzema und Partner KG* took off from Pärnu airport to make a scheduled VFR flight to the island of Ruhnu. A certificated pilot, two passengers and 520 kg of cargo were on board of the aircraft. Approaching the island from the east, the pilot decided to land on runway 32. Due to the low visibility on the island, the pilot could not establish visual contact with the aerodrome during approach and was unable to maintain safe altitude. The aircraft impacted the ground in a forested area 0.24 Nm northeast from the runway 32 threshold.

Neither the pilot nor the passengers were injured; however the aircraft was damaged beyond repair. At the time of the accident, poor visibility with low cloud base predominated on the Ruhnu Island.

The Investigation of the accident was carried out by the Emergency Management Department of the Ministry of Economic Affairs and Communications. Investigator-in charge was Jens Haug.

Formal notification was forwarded to authorities responsible for the investigation of aviation accidents: to the Federal Republic of Germany (the State of Registry of the aircraft) and to the United Kingdom (the State of Manufacture of the aircraft). Accredited Representative was appointed by the BFU Germany.

The investigation determined as a cause of the accident the pilots' failure to maintain safe flight altitude while continuing visual flight in the IMC and descending in unsuitable meteorological conditions. It was established that inadequate exchange of information between ground services of Ruhnu aerodrome and the aircraft was a contributing factor to the accident.

[1] UTC. Local time in Estonia is UTC+2h

1. FACTUAL INFORMATION

1.1. History of the flight

Luftverkehr Friesland Brunzema und Partner KG, registered in Germany and holding the Air Operator Certificate issued by the Federal Republic of Germany in 1983, has been operating scheduled flights between Pärnu (EEPU) and Ruhnu (EERU) since 2006. The flight, initially planned for 26th February 2007, was postponed several times due to adverse meteorological conditions, causing problems with provision supply on the island. On Friday, 3rd March, pilot checked the weather at 13:00 and at 14:00. Based on the received information the pilot decided to depart for Ruhnu at 14:00.

At 14:08, the aircraft took off from Pärnu airport to make a scheduled VFR flight to the island of Ruhnu. Flight was carried out in the uncontrolled airspace. Pilot, two passengers and 520 kg of cargo were on board the aircraft. According to the weather briefing received by the pilot via telephone from Kuressaare, at 14:00 the cloud height in Kuressaare (EEKE, 36 Nm northwest of Ruhnu) was 600 ft. and 180 m (approximately 540 ft.) in Ruhnu. During the uneventful flight on the altitude 1500 ft., the coast and the ice border were clearly visible. The aircraft stayed clear from the clouds and no signs of icing were noticed by persons on board. Approaching the island from the northeast it was intended by the pilot to use RWY 32 for landing. The pilot decided to fly low from east to west across the runway to check the windsock and runway condition. While approaching the island, the pilot descended at the rate of 150 ft/min with low power settings and flaps extended by 1 notch. During descent the horizontal and vertical visibility deteriorated and the flight was continued in IMC[2]. The descent was continued in clouds; therefore the pilot had no visual contact with the ground and horizon. The aircraft broke off the clouds over the coast on a very low altitude (100-120 ft. by pilot's statement). Trying to maintain safe altitude and speed pilot added power, at the same time stall warning signal activated and seconds later the lower part of aircraft's fuselage touched the treetops and collided with the terrain at 14:36. The engines continued producing power until collision with trees whichafter those were set to the iddle by pilot.

The passengers and pilot escaped the aircraft without assistance and with no injuries.

The accident site is situated 0.24 Nm northeast off the runway 32 threshold. Ground surface is uneven and forested with young pinewoods.

[2] IMC-Instrument Meteorological Condition. Weather condition, which requires the aircraft to be operated under Instrument Flight Rules, flying primarily by reference of flight instruments.

1.2. Injuries to persons

The injuries to the persons were limited to minor scratches. Neither pilot nor the passengers required medical assistance and were able to abandon the aircraft on their own.

1.3. Damage to aircraft

As the result of the impact with trees and the ground, the aircraft was substantially damaged. Horizontal stabilizer and tip of the left wing were torn off. Left propeller was also damaged as well as the belly of the fuselage.

1.4. Other damage

There was no other damage.

1.5. Personnel information

Pilot:

Male, age 54

Flight time	On aircraft	On aircraft type
In last 90 days	63	29
Total	16 079	N/A

The pilot held a valid CPL (A) license PIC, IR, CRI ratings for single engine and multiengine aircraft, also FI ratings for PPL and CPL. The class 1 medical certificate was valid.

The pilot is described as a very experienced and disciplined airman; there are no negative records on pilot with German CAA by the time of the investigation.

The nature of the operations of the *Luftverkehr Friesland Brunzema und Partner KG* requires large number of relatively short flights into and from short runways, giving pilot extensive experiences in aircraft handling in difficult weather conditions.

The pilot was well familiar with the Ruhnu airfield and surrounding terrain.

1.6. Aircraft information

Type of aircraft:	Britten Norman BN-2B-26, *Islander*
Serial number:	C 2271
Year of manufacture:	1994
Total hours	2811:37
Total landings	27857
Airworthiness Certificate:	L 20247, issued by the Aviation Authority of the Federal Republic of Germany
Valid until:	March 2007
Maintenance:	according to EASA Part M requirements

Britten Norman BN-2B is a high-wing cantilever monoplane with a rectangular fuselage and two wing-mounted piston engines. The maximum certificated take-off mass is 2 998 kg. It is certified for single pilot operations and will usually accommodate up to nine passengers. The aircraft is not equipped with autopilot nor is it fitted with anti-icing equipment. It is not equipped with radio altimeter.

The aircraft was last fuelled in Pärnu Airport.

1.7. Meteorological information

Ruhnu aerodrome is not equipped with Automatic Terminal Information Service (ATIS). Weather information is transmitted by phone by an aerodrome employee who receives the information from the display connected with the local meteorological observatory, by using equipment for measuring vertical visibility and by visual observation of objects situated in about 1 km distance.

The aerodrome employee does not hold The Radio Telephony Operator's License and she does not speak any language except Estonian.

On the day of the accident the representative of the operator called several times to the employee of the Ruhnu aerodrome to receive weather information. Usually Pärnu FIS calls to the Ruhnu aerodrome, but since Pärnu tower did not work on the day of the accident, the call was made by the local representative of the operator. It was at 13:35 when the employee of Ruhnu aerodrome reported the weather information last time prior to the accident. According to the latest information, vertical visibility was 145-160 m and horizontal visibility over 3 000 m. According to the employee, the trees situating about 1 km from the airport building at the northern end of the runway 32 were also visible.

The investigation has no alternative sources to obtain factual weather information. The adequacy of the reported meteorological condition cannot be evaluated.

Horizontal visibility measured after the accident was 2 600 m and vertical visibility approximately 140 m.

At the time of the accident, air- and dew point temperature in Ruhnu were +1 ºC. The wind blew at speed 2 knots from the north, QNH was 1003 hPa.

1.8. Aids to navigation

Ruhnu aerodrome is not equipped with radio navigation aids or runway lights. During the flight the pilot had switched on GPS *Direct To* mode with the destination of the threshold of runway 32. GPS was operational and indicated the location of the aircraft when switched on during the examination of the aircraft wreckage. The pilot did not use GPS for vertical navigation.

1.9. Communications

No radio communication was held after leaving Pärnu AFIS. Kuressaare Tower was informed about departure of the flight by the Operators representative by telephone.

The Air Traffic Service of Ruhnu aerodrome is carried out on the of Kuressaare TWR frequency 118.05 MHz. Only flight information service is provided.

Three minutes before ETA to Ruhnu the pilot informed his approach in English on the frequency of Kuressaare tower. The employee of Ruhnu aerodrome replied „OK“, which had been agreed to mean that the runway was clear and that there were no unforeseen circumstances.

The local person responsible for operating the airport spoke no English or German and held no radiotelephony license to operate the equipment on aviation frequencies.

1.10. Aerodrome information

ICAO designator:	EERU
Runway:	14/32
Runway dimensions:	600X60 m
Runway cover:	lawn
Altitude:	10 feet

Ruhnu aerodrome is situated in the southern part of the island in the vicinity of port, so that approach to the runway 32 is performed over the sea and approach to the runway 14 over the forest.

A local resident is employed at the aerodrome, who communicates information on the runway conditions and weather on phone. Device ИВО-1М is used for measuring cloud base.

The aerodrome employee has no qualification in the field of aviation.

1.11. Flight recorders

The aircraft was not equipped with flight recorders and it was outside ATS radar covering area prior to the accident.

1.12. Wreckage and impact information

Due to impact with trees and ground, the aircraft was damaged beyond repair. A wing, especially the leading edge and the wingtips were substantially damaged. Horizontal stabilizer and left horizontal stabilizer were separated and indented.

D-IILFB wreckage on impact site

Damage to aircraft fuselage was moderate and limited mainly to damages to its lower part.

By the time of the wreckage examination, goods had been unloaded from the cabin of the aircraft and the switches of electronic instruments had been set to safe position. The position of controls was found normal, the continuity of the control cables could be positively determined. All electrical fuses were intact.

QNH on both altimeters was set to 1002 hPa.

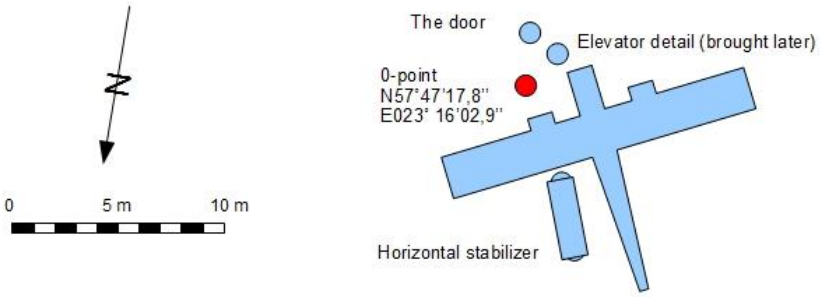
Aircraft's fuel valves were open, fuel was supplied to both engines from the tank in a respective wing.

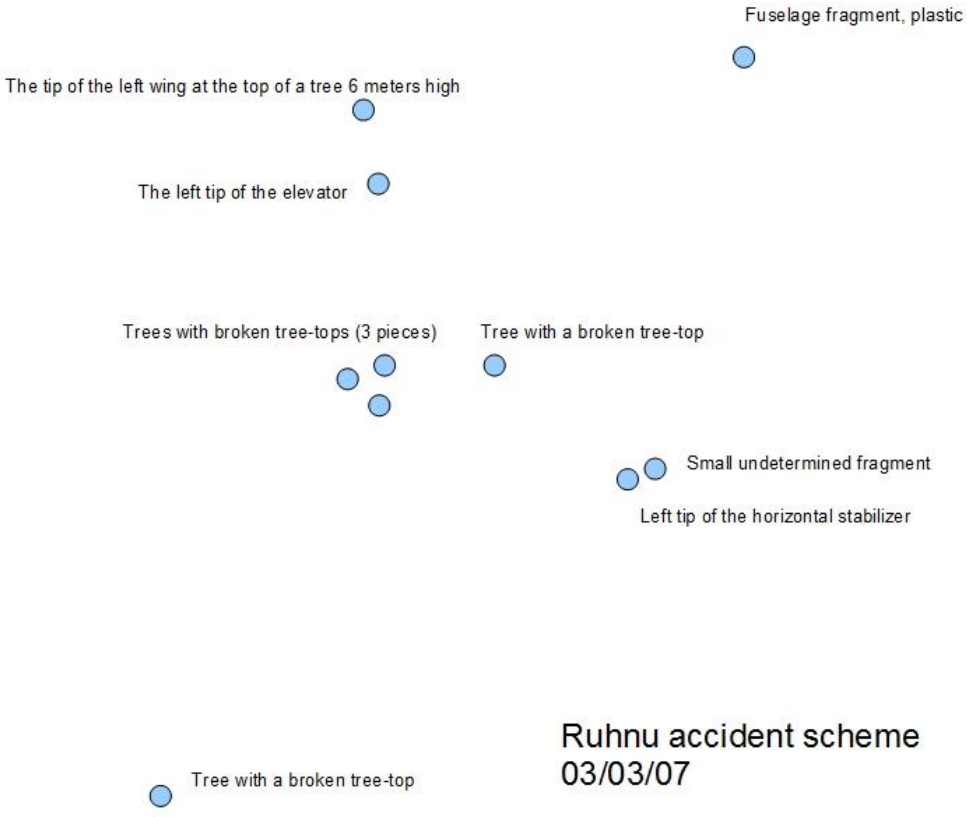
The first impact of the aircraft with trees had taken place at the altitude of 10 m 67 m from the location of the wreckage (indicated by indentations on the trees). The left wingtip collided with a tree 6 m above the ground and at 29 m distance from the wreckage. Damages to the fuselage of the aircraft indicated that when impacting the terrain the aircraft was in 5-10˚ nose down position with wings horizontal.

Circular marks are clearly visible on the blades of both propellers. Stress marks were visible across the propeller blades of the aircraft. Tips of right propeller blades were bent back, the blades of left propeller were undamaged, two blades were in feathered position.

According to witnesses' statements, there was a fuel leakage from the wing tank after the accident. The fuel was collected in a canister to prevent environmental pollution.

According to the pilot's and passengers statements, there was no evidence of icing on wings or propellers neither before nor after the accident.


N
0
5 m
10 m
The door
Elevator detail (brought later)
0-point
N57°47'17,8"
E023° 16'02,9"
Horizontal stabilizer


Fuselage fragment, plastic
The tip of the left wing at the top of a tree 6 meters high
The left tip of the elevator
Trees with broken tree-tops (3 pieces)
Tree with a broken tree-top
Small undetermined fragment
Left tip of the horizontal stabilizer
Tree with a broken tree-top
Ruhnu accident scheme
03/03/07

1.13. Medical and pathological information

The pilot was tested for alcohol with the negative result.

1.14. Fire

There was no fire.

1.15. Survival aspects

Nobody was injured in the accident. Both passengers and the pilot had seat belts attached. The cargo from the aft of the cabin was thrown forth as the result of the impact without inflicting any injuries to the persons.

1.16. Tests and research

No tests were carried out during investigation.

1.17. Organizational and management information

1.17.1 Operation of the flight

Operator LFB held a valid Air Operator Certificate (AOC) No D-338 AOC, which was issued by Aviation Authority of the Federal Republic of Germany with the expiry date November 30 2007. The company has a local representative providing assistance with local knowledge and language.

The operator company has hold AOC since 1983. The company has not been involved in serious incidents and accidents before.

1.17.2 Communication of meteorological information on Ruhnu aerodrome

Information on the weather conditions in Ruhnu is provided by air traffic controller of Kuressaare airport or air traffic controller of Pärnu airport, who receive the information from the employee of Ruhnu aerodrome. To establish cloud base in the area of Ruhnu aerodrome a ИВО-1М device (equipment) is used. The accuracy of ИВО-1М is considered unreliable by pilots familiar with the equipment. The investigation could not determine any accuracy figures in technical documentation of the mentioned device.

Employee of the Ruhnu aerodrome receives the wind information from automatic equipment „Milos 520“.

The employee of Ruhnu aerodrome holds no license for radio communication with aircraft. Communication with foreign crew members is also problematic, since the employee does not speak foreign languages.

2. ANALYSIS

2.1. General

Taking into account statements by the pilot and passengers and the results of the post-accident examination of the wreckage, the technical failure of the aircraft controls, engines or systems as a cause of the accident can be ruled out. The investigation found no evidences indicating on any kind of failure or malfunction.

All structural elements of the aircraft were on the accident site and inflight breakdown of the aircraft did not take place. There were no indications of pre-accident damages on the fuselage, wing or stabilizers of the aircraft.

The engines of the aircraft functioned properly until the contact with the trees. This was claimed by the pilot, by the passengers and the employee of the aerodrome who heard the accident. According to the pilot he added power, when stall warning signal activated. The changes in power setting were also heard on the ground. The pilot closed the engine throttles shortly before the aircraft hit the trees.

The stable operation of engines, their response to power changes as well as the fact that there was fuel in tanks after the accident rules out possible problems with fuel and engine controls as a cause of the accident.

Icing

Weather conditions in clouds over Ruhnu were clearly supporting ice formation. Most of the flight took place clear of clouds, no icing formation was noticed. Icing conditions were present on final descent and approach phase of the flight, when aircraft entered the clouds. The following findings rule out the possibility of aircraft loosing lift due to the icing.

The aircraft flew in the icing conditions only for a short period of time. This does not exclude the theoretical possibility of substantial ice formation on wing, stabilizers and propeller blades. However, severe icing could not have been left unnoticed by the captain. The pilot claimed that there was no icing.

Propellers on this type of aircraft are situated in line with the first row of seats. Heavy icing and the ice separating from propeller causes ice particles impacting the fuselage of the aircraft producing banging sound. However, neither of the passengers noticed it.

The icing of *Pitot*' tubes and/or static pressure ports would have been noticeable on decent and decreasing speed. However, sudden encounter with IMC conditions may be confusing and such changes can remain unnoticed. At the time of wreckage examination, the electric switch of *Pitot'* tube and stall warning sensor heating was

found in the OFF position. The stall warning system was operational till the end of the flight.

Thus, one may conclude that there was no icing and that icing cannot be considered as cause of the accident.

Stalling

There is no objective information on the speed of the aircraft shortly before the impact. According to the aircraft manual, the stall signal shall activate at the speed that is 5-10 knots above stalling speed. With flaps extended in position 1, the stalling speed of the aircraft is 42 knots. Consequently, the speed of the aircraft fell below 52 knots.

Relatively integral state of the wreckage and damages to the trees confirm that the speed of the aircraft was low at the moment it impacted the ground. High energy impact would cause much more extensive damages to the persons on board, to the aircraft and surrounding terrain.

Pilot claimed that he descended with the speed 80-90 knots, which is considerably higher than stalling speed and contradicts to the fact of stall warning activation.

Considering the location of the site of the accident (375 m from the coastline) and statements by the passengers, who claimed that the aircraft got off the clouds approximately above the coastline, and taking into account the estimated track of the aircraft (rate of descent and horizontal speed), it may be concluded that the pilot continued descent in the clouds up to the altitude 100 ft or approximately 30 m from sea level.

2.2. Adherence to the rules of the air and FOM[3] requirements

The flight was performed under visual flight rules (VFR). Neither Ruhnu aerodrome nor was the aircraft certified for instrument flight, which enables safe operation in the conditions of limited visibility.

According to the statements by passengers and the pilot, visual contact with the ground and see surface was present at the beginning of the flight, when Manilaid and the coast of the island of Kihnu could be seen. One could also see the borders of ice and birds on the sea. The visibility deteriorated rapidly when approaching Ruhnu Island and during descent, when the aircraft entered clouds. According to the pilot, the upper margin of the clouds was on 600 ft.

[3] FOM- Flight Operation Manual - the manual of the company that operates aircraft

The clouds did not allow the pilot to establish visual contact with the island and aerodrome when approaching Ruhnu.

In accordance with visual flight rules (VFR) (Under the rules of the air), the pilot was not to continue descent below the safe altitude 500 ft before reaching the runway 32 final and establishing clear and stable visual contact with the aerodrome.

The minimum required visibility for airspace class G in the FOM of the Operator is 5 km.

Upon unexpected deterioration of visibility and ceiling, the pilot should have immediately abort (suspended) the descent and depart the IMC.

2.3. Weather information and its adequacy

In spite of the fact that information on the meteorological conditions in Ruhnu was not directly accessible for the pilot through ATIS or direct communication with the employee of the Ruhnu aerodrome, the information received by the pilot is considered to be sufficient and the arrangement of the communication of meteorological information in Ruhnu aerodrome adequate.

The building shortage of the provision on the island can be considered as a source of motivation or pressure to report the weather more suitable for the flight.

3. CONCLUSIONS

3.1. Findings

The pilot held all licenses the ratings necessary to perform the flight.

The investigation did not establish any malfunction of engines or aircraft systems that could have caused the accident.

The cloud base and visibility on Ruhnu aerodrome and in the vicinity was significantly lower than the permitted minimum for VFR flights.

3.2. Causes of the accident

Causes of the accident

The investigation established the following causes of the accident:

1. **The pilot could not maintain safe flight altitude when approaching Ruhnu aerodrome**.
2. **The pilot continued the descent in spite of IMC**.

Contributing factors to the accident

The investigation established the following factors contributing to the accident:

1. High motivation to perform the flight.
2. Inadequate weather information from ground services of Ruhnu aerodrome.
3. Inadequate aeronautical oversight in the destination airport.

4. SAFETY RECOMMENDATIONS

To the Estonian Civil Aviation Administration:

1. Civil Aviation Administration should find possibilities to ensure more efficient control over scheduled flights performed to and from the aerodromes with no qualified personnel on site.
2. Civil Aviation Administration should consider reviewing the minimum requirements for the small airfields serving regular commercial flights. This should take into account both personnel training and meteorological equipment.

Jens Haug