

FINAL REPORT ON THE ACCIDENT TO THE SAILPLANE EIRIAVION PIK 20D REGISTERED OO-YEB IN WEELDE ON JUNE 12, 2010

Ref. AAIU-2010-27
Issue date: 7 January 2011
Status: FINAL

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FOREWORD

This report is a technical document that reflects the views of the investigation team on the circumstances that led to the accident,

In accordance with Annex 13 of the Convention on International Civil Aviation, it is not the purpose of aircraft accident investigation to apportion blame or liability. The sole objective of the investigation and the Final Report is the determination of the causes, and define recommendations in order to prevent future accidents and incidents.

In particular, Article 13 of the Royal Decree of 9 December 1998 stipulates that the safety recommendations made in this report do not constitute any suspicion of guilt or responsibility in the accident.

Unless otherwise indicated, recommendations in this report are addressed to the Regulatory Authorities of the State having responsibility for the matters with which the recommendation is concerned. It is for those Authorities to decide what action is taken.

The investigation was conducted by L. Blendeman, Chief Investigator.

NOTE:

For the purpose of this report, time will be indicated in UTC, unless otherwise specified.

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Synopsis

Date and hour of the accident

June 12, 2010 – 12:15 UTC (14:15 LT)

Aircraft

Eiriavion PIK 20D, registered OO-YEB

Accident location

On Weelde airfield

Aircraft owner

The sailplane was privately owned by the pilot

Type of flight

Private

Abstract

On Saturday 12 June, the pilot arrived on the EBWE airfield with his own sailplane, a PIK-20D, registered OO-YEB, stored in a trailer.

He assembled his sailplane.

The flight preparation procedure occurred normally.

He took off at 12:15, launched by the winch, located 1430m further on the Runway 25 of EBWE.

As witnessed by the flight instructor, the initial climb occurred normally; there was no lateral drift, and no sign of abnormal speed build-up.

The winch man saw the sailplane coming, and when it reached the separation point, the winch man cut the power of the winch. The winch man noticed that the tow cable did not detach from the sailplane. When the sailplane came vertical above him, the winch man activated the emergency cable cut-off. The system worked, and the cable was cut; the remaining length was 525m.

Witnesses showed the sailplane in a steady dive, nose down, without any lateral movement of the sailplane.

The sailplane crashed 310m away from the winch in a very steep dive.

The pilot was fatally injured by impact.

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1. Factual information.

1.1 History of flight.

Runway 25 was in use that day.

The morning briefing was given by the instructor around 11:15. The pilot of the OO-YEB had not yet arrived and did not attend the briefing.

The first flight of the day took off at 11.34.

The pilot arrived after 12.00 with the sailplane in a trailer, and started to assemble the sailplane and prepare it for the flight. He proceeded with the pre-flight check. Nobody recalls he asked for help.

He was seen pushing the sailplane towards the start position. There were a few sailplanes in front of him waiting in line for the start.

There were 13 winch starts and 2 aerotow starts performed before OO-YEB.

When OO-YEB's turn came to take-off, the pilot decided to wait somewhat, because returning pilots reported the thermal conditions were not optimum. He sat in the cockpit, waiting, with canopy open. He intended to perform a small navigation flight.

When the pilot decided to take off, he waved to the ground team that connected the winch cable to the sailplane cable.

The wing was raised to the horizontal position by the "wing tip-runner". The type of sailplane was radioed by the start leader to the winch man, with the request to tauten the cable. This was confirmed by the winch man.

The sailplane moved forward a few meters, due to the tautening of the cable, before the actual start.

As witnessed by the flight instructor, the initial climb occurred normally; there was no lateral drift, and no sign of abnormal speed build-up.

The winch man saw the sailplane coming, and when it reached the release point, the winch man cut the power of the winch. The winch man noticed that the tow cable did not detach from the sailplane. When the sailplane came vertical above him, the winch man activated the emergency cable cut-off. The system worked, and the cable was cut; the remaining length was 525m.

Witnesses showed the sailplane in a steady dive, nose down, without any lateral movement of the sailplane.

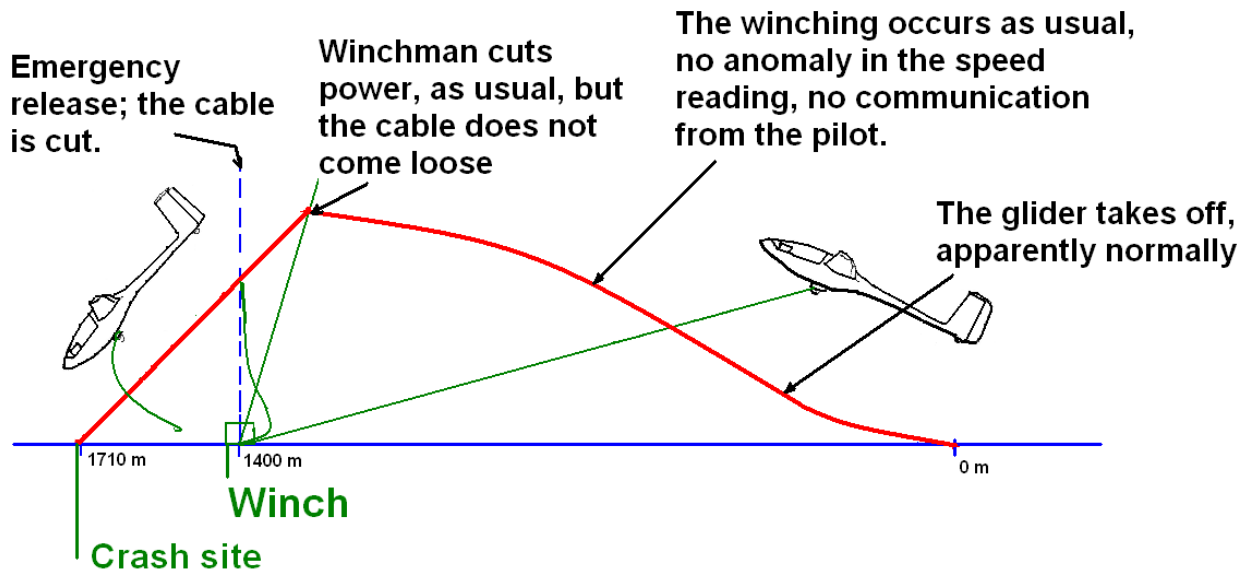
The sailplane crashed 310m away from the winch in a very steep dive.

During the flight, the pilot noticed there was something wrong, as he un-strapped himself and tried to open the canopy; his hat was found at mid distance between the winch and the crash area. The hat itself does not show biological traces of blood.

The pilot was fatally injured on impact.



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1.2 Injuries to persons.

Injuries	Pilot	Passenger	Others	Total
Fatal	1	0	0	1
Serious	0	0	0	0
Minor	0	0	0	0
None	0	0	0	0
Total	1	0	0	1

1.3 Damage to aircraft.

The sailplane was totally destroyed upon impact.



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1.4 Other damage.

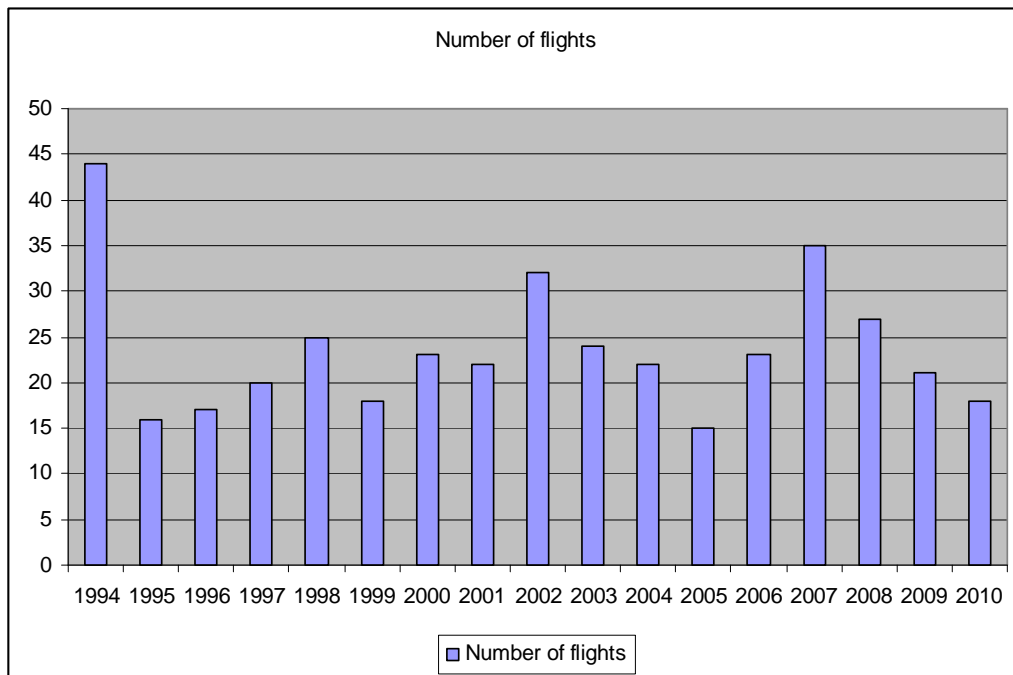
None.

1.5 Personnel information.

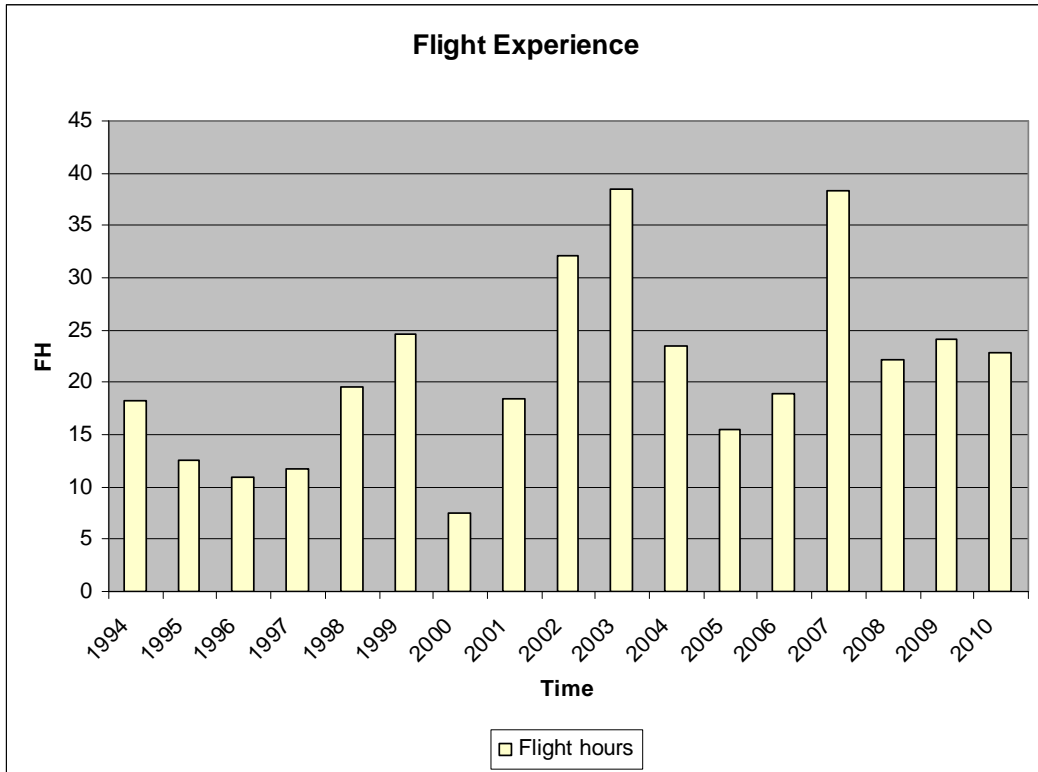
Sex: Male
 Age: 38
 Nationality: Belgian
 Licence: Sailplane pilot licence, first issued on 10 November 1998 by the Royal Belgian Aero Club, valid until 06 May 2012.
 Ratings: Winch and aerotow-start.
 Authorization to carry passengers, issued 09 Dec 1998
 Medical: Medical certificate, class 2 last issued on 07 May 2010, valid until 6 May 2012.

The Pilot-in-command has a total flight experience of over 400 flights and 360 FH, from which 59 flights with the PIK20D (since 2007) for a total of 87 FH. Assuming the sailplane was disassembled at the end of a flight day, the pilot assembled the OO-YEB 54 times since March 2007.

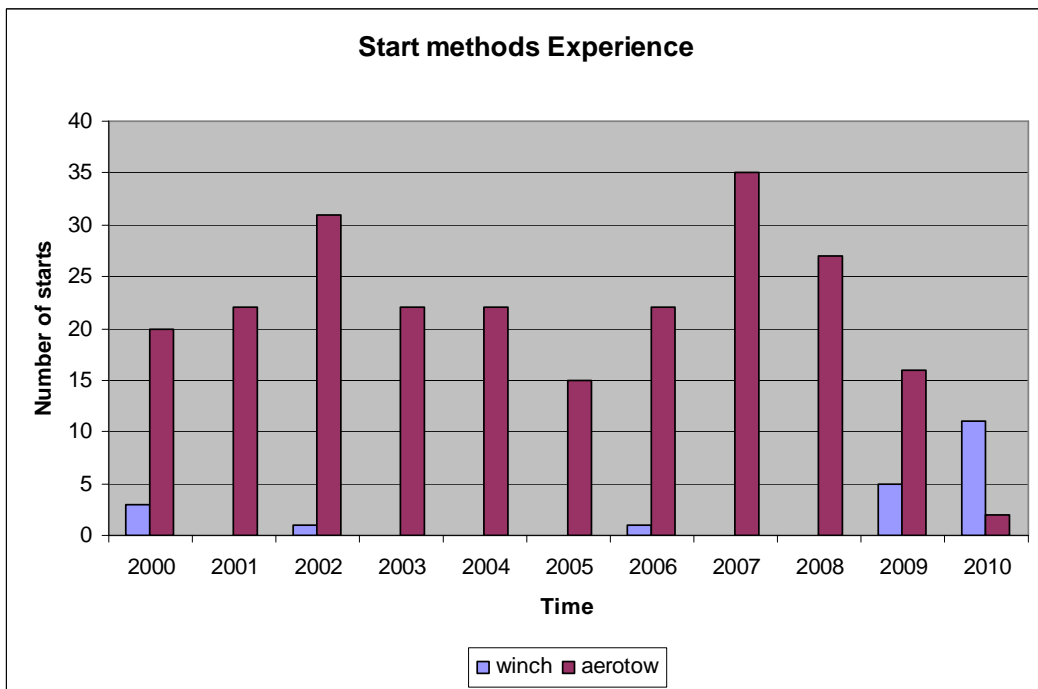
The pilot flew on average 22 flights per year.



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The take-off method used by the pilot was mostly the aerotow, but since the acquisition of the winch by the gliding club, he used this system for 16 flights (5 in 2009, 11 in 2010).



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1.6 Aircraft information.

The PIK-20 is designed according to the OSTIV – Airworthiness Requirements for Sailplanes 1971, single seat unlimited 15m class Utility Category, at the Helsinki University of Technology by Pekka Tammi, with advice from Ilkka Rantasalo and Raimo Nurminen. The prototype first flew in October 1973. It was produced initially by Molino O/Y who were taken over by Eiri-Avion O/Y between 1974 and 1980.

The whole sailplane is made of epoxy resin laminates. The shoulder configuration wing and the control surfaces are of rigid sandwich structure, PVC-foam between epoxy laminates. The wing spars are made of carbon fiber.

The fuselage is made of epoxy laminates stiffened with eight ribs and by the cockpit with a double bottom and with two carbon fiber beams.

Plain ailerons and interconnected trailing edge flaps.
There is a provision for 140 liters of water ballast.

The sailplane was first certified by the Finnish CAA.
EASA has issued a Specific Airworthiness Specification for PIK-20D, under the reference EASA.SAS.A.024, issue 01, dated 22/08/2007.

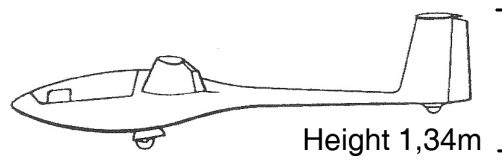
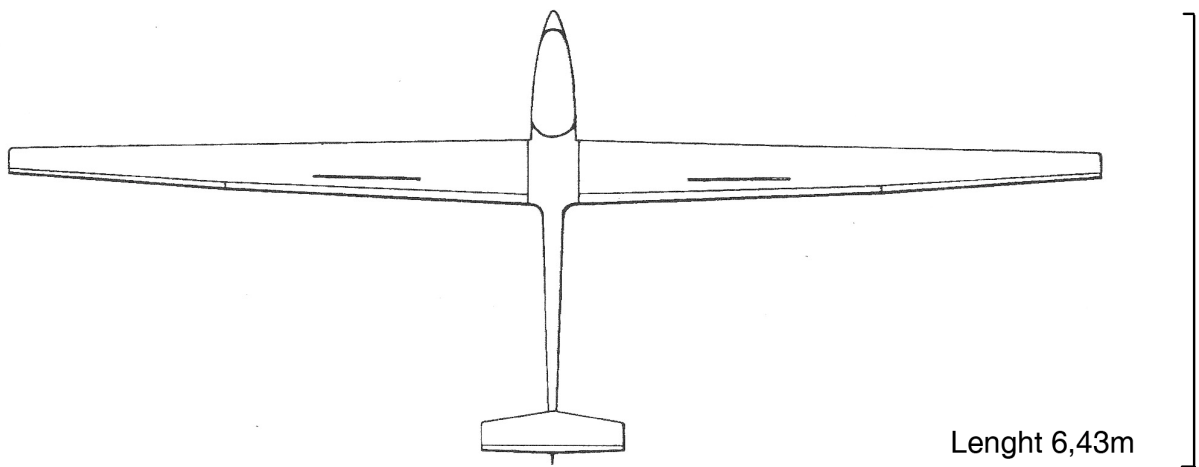
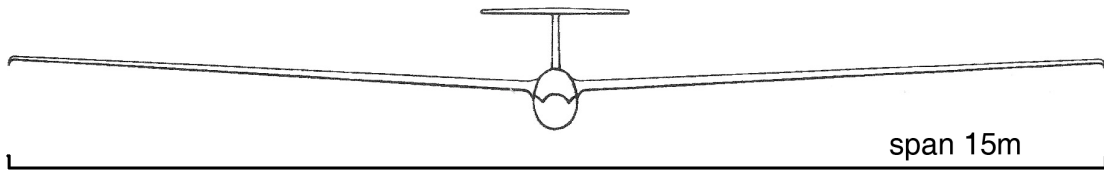
General characteristics

- **Crew:** One pilot
- **Capacity:** 140 kg (310 lb) water ballast
- **Length:** 6.43 m (21 ft 1 in)
- **Wingspan:** 15.00 m (49 ft 3 in)
- **Height:** 1.34 m (4 ft 5 in)
- **Wing area:** 10.0 m² (108 ft²)
- **Aspect ratio:** 22.5
- **Empty weight:** 235 kg (517 lb)
- **Gross weight:** 450 kg (990 lb)

Performance

- **Never Exceed speed:** 292 km/h (158kts)
- **Manoeuvring speed:** 190 km/h (103kts)
- **Maximum Winch tow speed:** 125 km/h (67kts)
- **Maximum glide ratio:** 42
- **Rate of sink:** 0.66 m/s (2.16 ft/min)

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Airframe

Manufacturer: Eiriavion OY.

Type: PIK 20D

Serial Number: 20557

Built year: 1977

Registration: OO-YEB

Total Time: 1500 FH

Certificate of Registration: Nr 5313, first issued by the BCAA on 12 June 2003; last issued on 6 February 2007.

Certificate of Airworthiness: Issued by the BCAA on 27 April 2008

Airworthiness Review Certificate: Last issued on 03 February 2010, valid until 02 May 2011.

Aircraft Manual.

Instructions pertaining to the operation of the sailplane are defined in a document called "Flight Manual for Sailplane PIK-20D".

The Table of Contents of this manual shows three sections:

- I. Flight Manual
- II. Service Manual
- III. Repair Manual

The manual is approved in its entirety; the approval sheet is signed by the National Board of Aviation (Finnish CAA).

The header of the pages of each section bears the reference to the section (Flight Manual, Service Manual, Repair Manual).

The performance of pre-flight inspections is covered by both Section I : Flight Manual (Normal Procedure; chapter 5 pre-flight inspection) and Section II : Service Manual (Chapter 2. Pre-flight check).

Maintenance.

The maintenance of the OO-YEB is performed in accordance with the Maintenance Program, as approved by the Belgian CAA under the reference AMP/OO-YEB/Rev O dated 07/09/2009.

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The Tail section

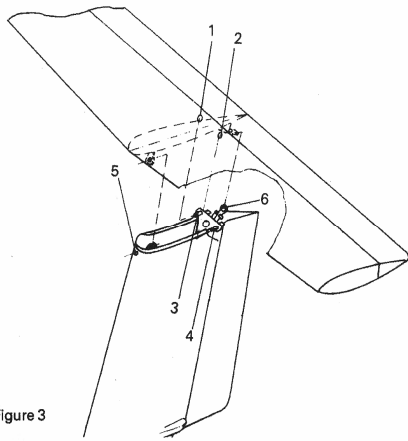
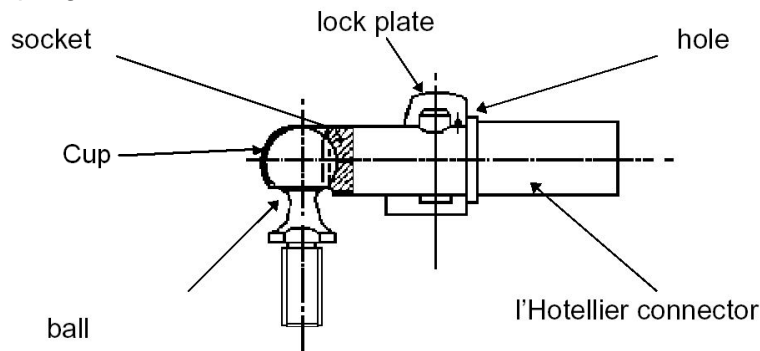


Figure 3



The tail unit is a cantilever T-tail. Fixed incidence tailplane with one-piece elevator articulated on 4 hinges, and activated by a rod connected by a quick release l'Hottellier Coupling.



A l'Hottellier coupling is a quick-release connector, consisting of a ball fitting in a spring loaded socket. The coupling is secured by a lock plate.



Diagram of the socket of a l'Hottellier coupling showing the cam plate and inspection hole

To connect the l'Hottellier coupling, the cam plate is depressed from its open position so that the narrower side is flush with the body of the cup. The cup is slipped over the ball on the other part of the coupling and the cam plate is released. If the ball is correctly located, the cam plate will spring back to the 'closed and locked' position in which the inspection hole will be completely visible as shown above.

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It should not be possible to disengage the coupling even with the application of very considerable force or a sharp jerk.

Nevertheless, these connectors have been the subject of airworthiness directives - the LBA directives are 1993-001/3 and 1994-001/2, after it was found that L'Hotellier couplings, even when in good condition and correctly connected may come open under normal stresses of flight. A minimum mandatory safety requirement was introduced; the locking cams need to be secured with a safety pin

Findings

On the wreckage, the l'Hotellier couplings of the flight controls of OO-YEB were found connected at the exception of the elevator which was found separated. The safety pin of this connector was not engaged as well.



The elements of this coupling were inspected and measured, as per Instruction for the maintenance L'Hotellier Ball and swivel joints, N°10.01 Rev.E, dated 03/94. LBA AD 1993-001/3 mandates this inspection to be performed every 500 FH, or annually, whichever is the soonest.

This inspection was performed every year; the last inspection was performed on January 10, 2010.

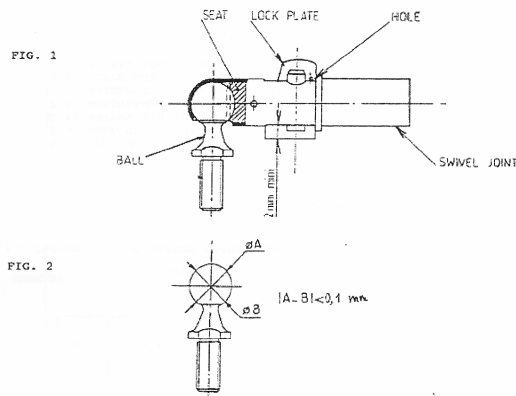
The PIK 20D Service Manual is amended with the addition of the following text in the "Assembly and disassembly" section:

" The l'Hotellier ball and socket connector must be secured".

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Details of the inspection on the l'Hotellier connection:

- Free movement of the ball into the housing.
 - * The ball movement is free of friction points.
 - * The angular displacement is normal.
 - * There were no crack detected at the base of the ball (visual inspection with magnifying glass 10x).
- Ball sphericity measurement.
The IA-BI measurement is < 0.01 mm, 10x better than the requirement.



- Ball thread check.
Not verified; the ball assembly is fixed into a fixture, and glued into position. The assembly is intact, with no sign of rotation.
- Swivel Visual check
There is no deformation or penning visible in the ball location or in the locking device seat.
- Measurement of the locker part projection after assembly of the swivel on the ball
The measure of the projection is 3 mm (required: 2mm)
- Check of the link between drive rod and swivel.
The swivel is secured onto the drive rod.
- Swivel assy operation check.
There was no clamping felt during operation of the seat or the locker.
- The safety pin is of the type prescribed by the AD, and its diameter is 1.2 mm

All elements were in good shape, and did not show abnormal sign of rupture. The metallic surface of the ball and inner side of the socket show no discontinuity (shiny side) as would be expected in a case of a brutal opening of the assembly.

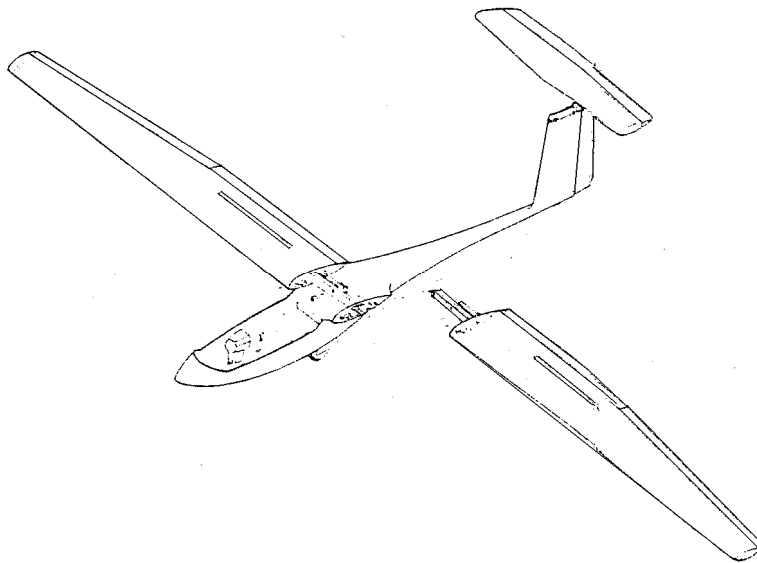
The replacement of l'Hotellier couplings is recommended after 10 years in service. The time in service of the l'Hotellier coupling of OO-YEB was not found in the sailplane's maintenance records.

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The assembly of the sailplane.

A sailplane is generally stored in a dedicated trailer, after disassembly. Before the first flight of the day, the pilot must assemble his sailplane, with or without the help of other people.

The physical assembly of the wings, and movement of the fuselage is generally done by two or three people, then the pilot proceed with the internal connections of the various controls. The assembly occurs as prescribed in the Service Manual.



The inspection after assembly is done as prescribed under the chapter 2. Preflight check of the service manual.

The preflight check must occur after the sailplane has been rigged, and before the first flight of the day.

With respect to the elevator, the following instructions are to be followed:

- ...
- 3. Horizontal stabilizer attachment pins correct and locking pins all the way in and secured. Quick release for elevator control rod secured.
- ...
- 5. Flaps, ailerons, airbrakes, elevator and rudder correct, free and full travel and without slackness

For OO-YEB, witnesses state that the pilot was seen assembling his airplane and the controls alone. No one recalls the pilot asking for support.

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Trim.

The elevator trim is controlled by a green knob located on the left side console. It is connected to the elevator control system by a spring. This implies that the elevator trim is inoperative when the elevator control is disconnected.

The trim is also connected to the flap deflection, so that it can be set for the weight of the pilot to fly with 0flaps at a given speed.

Normal Procedures

The flight Manual Chapter 5 Normal Procedures indicates the following:

5.1. Preflight inspection

- Tail dolly removed
- Barograph on (if installed)
- Loading and ballast checked
- Parachute secured
- Seat and rudder pedal adjusted
- Safety belts secured
- Canopy locked
- Altimeter set
- Electrical instruments on
- Flaps in take-off position
- Airbrakes closed and locked
- Trim set for take-off
- Tow rope coupled on
- Controls free.

5.2. Take-off on winch launch

- Trim 1/3 from the foremost position with mean CG.
- Flaps 0° with 300kg (661lbs) and 4° down with 450kg (990lbs) weight.
- Recommended airspeed
110...125km/h (59...67kts)
- Maximum airspeed 125 km/h (67kts)
- During climb after 100m altitude flaps-airbrakes can be taken
12°down with 300kg – 16° down with 450kg weight.

Note: if the flaps are deflected more than 4° down the sailplane takes off too rapidly and control becomes difficult.

The speed selected on the winch was adequate for the PIK-20D.

On the wreckage, the flaps position seems to be 0°, although the impact damage may have disrupted their position.

The trim selector was destroyed beyond recognition.

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1.7 Meteorological conditions.

Meteorological observations made at 12:20

1. Antwerp - EBAW:
Wind: 320 degrees – 13 kts
Temperature: 18 °C
QNH: 1013 hPa

1. Brussels – EBBR
Wind: 320 degrees – 9kts
Temperature: 18 °C
QNH: 1013 hPa

2. Liege – EBLG
Wind: 330 degrees – 3 kts
Temperature: 14 °C
QNH: 1012 hPa

1.8 Aids to navigation.

OO-YEB was equipped with a Filser LX5000 GPS and Flight Data system.

1.9 Communication.

The sailplane was equipped with a radio: DITEL FSG 40.

The winch and the start leader do also have a radio.

The pilot did not notify any problem on the radio during the start.

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1.10 Aerodrome information.

The Weelde airfield – EBWE – is a military airfield operated by civilian clubs outside military activity.

The military airfield is equipped with a 2 980 m long x 45 m wide concrete runway, oriented 070°/250°.

For civilian use, the runway is reduced to 799 m long and 18m wide.

Threshold 07: N051°23' 42" – E004°57' 37"

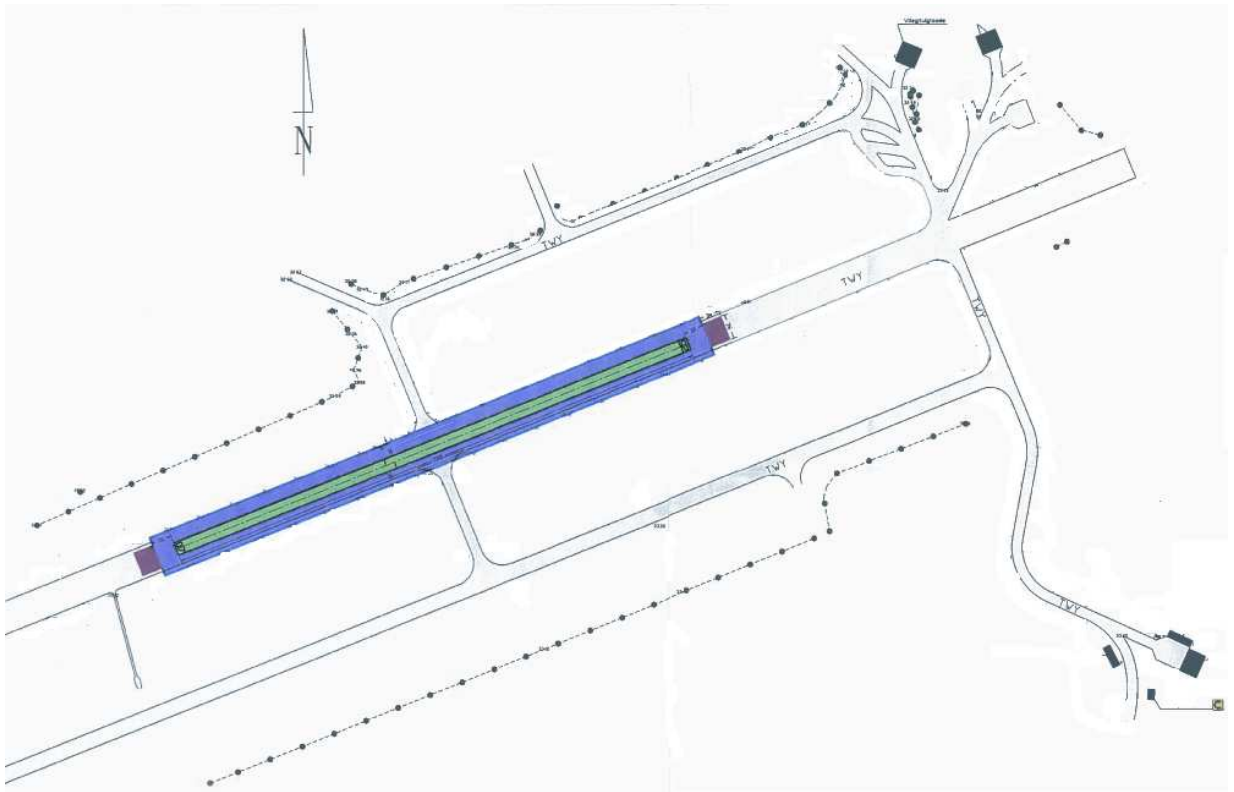
Threshold 25: N051°23' 51" – E004°58' 15"

Elevation is 33 m above sea level

The airfield is operated during daytime hours.

Flight Information Services are given by radio: "Weelde Radio" - 119.600 MHz - Information only, no ATC.

The use of the AD is subject to prior permission from the operator



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1.11 Flight recorders.

Not applicable.

1.12 Wreckage and impact information.

The wreckage lies inverted, at 0.50m of the impact traces. The tail section, and aft fuselage are separated.

The cockpit section is smashed.



The deformation of the wing show a near-frontal impact with the ground.

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1.13 Medical and pathological information.

Not applicable.

1.14 Fire.

There was no fire

1.15 Survival aspects.

The impact of the sailplane with the ground was not survivable if the pilot stayed on board. The sailplane hit the ground with a speed exceeding 200 km/h at a very steep angle.

The pilot was equipped with a parachute (RFS I-11). The safety harness (Autoflug FAG 7 F – 0) was overhauled in 1997, and inspected for condition every year, as per maintenance program.

The canopy is hinged to the right side of the cockpit and can be opened by pulling the red knob on the left side of the cockpit. Jettisoning in an emergency occurs by pulling the above-mentioned knob together with the red jettisoning knob on the right side of the cockpit and lifting the canopy.

The pilot trained for emergency situations during winching on 8 January 2009, by simulation of a winch cable rupture.

The body of the pilot was found un-strapped.

The sailplane itself is equipped with safety devices, primarily aimed at releasing the sailplane from the winch cable.

- The cable release mechanism on the sailplane. (TOST sicherheitskupplung Europa G72 – SN 42131). The release mechanism was tested and showed no anomaly.
- The weak link installed in the trace, designed to break upon over-stress.

The cable was not released from the airplane; the cable was still attached to the wreckage. The cable length was 525m.

The winch is equipped with an emergency cable release; a cutter. The release was activated by the winch man. This activation implies the cable stayed attached to the sailplane.

1.16 Tests and research.

Not Applicable

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1.17 Organizational and management information.

Assembling the wings of the PIK-20D sailplane could be qualified as a critical safety task; indeed, if not properly done, it may lead to an accident (as in this case).

We searched the text of the Regulation to determine whether the performance of such tasks would be subjected to particular precautions.

Regulatory considerations.

European Regulation (EC) No 2042/2003 of 20 November 2003 on the continuing airworthiness of aircraft and aeronautical products, parts and appliances, and on the approval of organisations and personnel involved in these tasks defines requirements with respect to the performance of maintenance tasks on aircraft.

The Regulation prescribes, among others (MA.402(a)) that all maintenance shall be performed by qualified personnel (...). Furthermore, an independent inspection shall be carried out after any flight safety sensitive maintenance task (...)

The pilot-owner may perform limited maintenance tasks, as defined in Appendix VIII of the Part-M of the Regulation.

The pilot of OO-YEB was identified as pilot-owner in the approved maintenance program (reference AMP/OO-YEB/Rev O dated 07/09/2009), and was authorized to perform limited maintenance tasks.

The Appendix VIII of the part-M states the following:

Maintenance tasks shall not be carried out by the Pilot-owner when the task:

- a. is critically safety related, whose incorrect performance will drastically affect the airworthiness of the aircraft or is a flight safety sensitive maintenance task as specified in point M.A.402(a) (...).*

And further:

Any task described in the aircraft flight manual as preparing the aircraft for flight (Example: assembling the sailplane wings or pre-flight), is considered to be a pilot task and is not considered a Pilot-owner maintenance task and therefore does not require a Certificate of Release to Service.

All the precautions regarding the performance of critically safety related maintenance tasks are not applicable in this case, because the assembly of the wing of a sailplane is not considered a maintenance task.

2. Analysis.

Findings.

On the wreckage, the l'Hotellier coupling of the elevator was found not connected; as the safety pin does not show any sign of damage, it is obvious that the safety pin was not installed upon sailplane assembly.

The l'Hotellier coupling itself does not show obvious sign of damage, or deformation that would be subsequent to a brutal opening at impact.

The pilot's hat was found on the ground, at a distance of the wreckage, without biological traces, and the latches of the pilot's safety belt were open. This indicates that the pilot decided to evacuate the sailplane, and succeeded, at least partially, to open the canopy. The canopy itself was found in the wreckage.

The decision to evacuate the airplane must have come after deduction that the sailplane was no longer controllable.

During the first phase of the flight, the sailplane attitude is essentially determined by the direction and intensity of the pulling force developed by the winch. The sailplane is forced into a nose high attitude.

This effect is gradually reduced, as the sailplane reaches its take-off speed. The effectiveness of the elevator increases with the square of the airspeed.

The pilot will actually "feel" the effect of the elevator control after being airborne.

When the pulling force of the winch is removed, the sailplane reverts to his normal attitude, depending from the actual position of the Center of Gravity with respect to the Center of Lift.

In this case, witnesses showed the sailplane in a steady nose down position.

During the dive, the winch cable was still attached to the sailplane, and the pilot tried to open the canopy; the two elements may have had also an impact on the nose down sailplane's attitude.

From the above, we can reasonably deduct that the l'Hotellier coupling of the elevator, during sailplane assembly, was inadequately connected and not secured.

Similar cases.

A quick search on the NTSB and BEA-France website revealed 7 similar cases, involving a disconnected elevator.

- the 7 cases involve 3 deaths, 2 seriously injuries, and 3 minor injuries.
- all 7 cases involve Schleicher ASW-20 type sailplane equipped with l'Hotellier couplings.
- all 7 cases indicate that the pilot omitted to connect the elevator during assembly of the sailplane.

The NTSB database revealed also an accident with a PIK-20D, where the canopy opened in flight, and caused the sailplane to descend to ground impact in a nose low attitude.

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In Belgium, the Flemish League of Soaring Clubs is keeping a database of incidents since 1987, and 3 cases similar to this accident were identified.

Two cases occurred during aerotow; the concerned pilots identified very rapidly the problem and released the cable. Both sailplane landed safely.

The third case occurred during winch start. The pilot identified the problem shortly after start, prepared himself for evacuation, and successfully jumped out of the sailplane. The sailplane itself was totally destroyed.

Assembling the sailplane.

The pilot assembled his sailplane alone, including the check of the proper installation of the flight controls. He did this 50 times before on this sailplane.

A safe assembly is usually concluded with a “positive check”, involving two individuals; one to hold the control surface stationary, while the other individual attempts to move the control stick. The movement of the control stick must be done in both directions – up and down.

A pilot alone cannot determine by moving the control stick whether the elevator is properly connected or not;

- Pushing the stick forward would move the elevator down; it is essential that someone be holding the elevator to detect a possible disconnection, as the elevator would naturally move down by gravity.

and

- pulling the stick (nose up) would move the elevator up, even with a disconnected coupling; the ball of the l’Hotellier coupling will push the elevator upward.

Assembling the flight controls of the sailplane is a pilot’s responsibility, and is not a maintenance task. Therefore it does not require the performance of an independent inspection, or any other precautions (such as the above-mentioned “positive check”), although connecting the elevator controls qualifies as “flight safety sensitive” or “whose incorrect performance will drastically affect the airworthiness of the aircraft”.

Survival Aspects.

Sailplane pilots are trained to cope with emergency situations, but, as in the case of the pilot, this is usually limited to “tow cable rupture” situations.

The pilot was equipped with a parachute.

Evacuating a sailplane in flight might prove more difficult than most pilots might imagine.

Evacuating the sailplane might involve un-strapping, jettisoning the canopy, climbing out of the cockpit, jumping, avoiding hitting the wing, or the tail, opening the parachute and eventually landing.

In addition, in the PIK-20D, and most sailplanes, the pilot lies on his back relatively deep inside the fuselage, and to exit the cockpit, he must raise his body at the strength of his arm.

When the decision has to be taken during winch start, time becomes crucial.

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3. Conclusions.

3.1 Findings.

- The sailplane pilot was duly qualified.
- The elevator control surface was found disconnected from the control rod and system.
- At the exception of the above, the sailplane was in an airworthy condition.
- The pilot tried to evacuate the sailplane in flight.

3.2 Causes.

The cause of the accident is the pilot's failure to adequately connect and secure the elevator control during assembly and failure to perform an adequate pre-flight check.

4. Safety recommendations.

4.1. Recommendation 2010-S-2

AAIU(be) recommends the Belgian Gliding Federation to issue a recommendation to all pilots, clubs and instructors to support the performance of a "positive check" after assembly of a sailplane in particular for those sailplanes equipped with l'Hotellier couplings or other non-fully automatic connections.

After the accident, the Liga van Vlaamse Zweefvliegclubs (LZVC) issued a safety note (Vliegveiligheid ref. LVZC/Rvl/2010-6) to remind sailplane pilots to perform a positive check after assembly of the sailplane.

4.2. Recommendation 2010-S-3

AAIU(be) recommends the Belgian Gliding Federation to develop a training guidance for pilots on the emergency evacuation of the sailplane.

4.3. Recommendation 2010-S-4

AAIU(be) recommends EASA to incorporate a requirement for a "positive check" after assembly of sailplanes equipped with l'Hotellier couplings, such as the ones used on OO-YEB. This requirement could be incorporated in the existing Airworthiness Directives, or in another adequate document.