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Aircraft Accident Investigation Bureau AAIB

# **Final Report No. 2004 by the Aircraft Accident Investigation Bureau**

concerning the accident

to the Ecolight, Eurostar EV 97 aircraft, registration HB-WAV

on 29 July 2006

on Lake Neuchâtel 900 m off the port,

in the municipality of Auvernier/NE,

5 km south-west of Neuchâtel

## Ursachen

Der Unfall ist auf eine Kollision des Flugzeugs mit einer Wasserfläche infolge Kontrollverlust durch den Piloten zurückzuführen.

Folgende Faktoren haben zum Unfall während der Startphase beigetragen:

- Das Öffnen der unverriegelten Plexiglashaube;
- Die Trimstellung auf *"nose up"*.

## General remarks concerning this report

This report contains the AAIB's conclusions on the circumstances and causes of the accident which is the subject of the investigation.

In accordance with Annex 13 of the Convention on International Civil Aviation of 7 December 1944 and article 24 of the Federal Air Navigation Law, the sole purpose of the investigation of an aircraft accident or serious incident is to prevent future accidents or serious incidents. It is therefore not the purpose of this investigation to determine blame or clarify questions of liability. The legal assessment of accident/incident causes and circumstances is no concern of the incident investigation (art. 24 of the Air Navigation Law).

If this report is used for purposes other than accident prevention, due consideration shall be given to this circumstance.

The definitive version of this report is the original in the French language.

All times in this report unless otherwise indicated, are indicated in the standard time applicable to the area of Switzerland (local time – LT), corresponding at the time of the accident to Central European Summer Time (CEST). The relationship between LT, CEST and co-ordinated universal time (UTC) is:  $LT = CEST = UTC + 2 \text{ h}$ .

For reasons of protection of privacy, the masculine form is used in this report for all natural persons, regardless of their gender.

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## Final Report

Owner	AVIAECO, Aerodrome, 2013 Colombier, Switzerland
Operator	AVIAECO, Aerodrome, 2013 Colombier, Switzerland
Aircraft type	Eurostar EV 97 model 2000 version R
Country of registration	Switzerland
Registration	HB-WAV
Location	Lake Neuchâtel, approximately 900 m off the port of the municipality of Auvernier/NE
Date and time	29 July 2006 at 17:25 LT

### Synopsis

#### Summary

On 29 July 2006, the pilot, flying solo, took off in the Ecolight aircraft registration HB-WAV from concrete runway 05 at Neuchâtel aerodrome. Shortly after take-off, the pilot experienced a strong resistance in the elevator controls and attempted to stabilise the aircraft. The aircraft hit the surface of Lake Neuchâtel and quickly sank. The pilot, seriously injured, vacated the wreck using his own resources and was quickly assisted by a couple of leisure yachtsmen sailing close to the port of Auvernier.

A submarine equipped with a camera was deployed to find the wreck, which was located at a depth of approximately 80 m. Owing to unfavourable weather conditions, the wreck was not found until 5 August 2006 and an attempt to raise it two days later failed. On 12 August 2006, the wreck was winched onto a lake police boat, brought to the port of Auvernier and then conveyed by helicopter to Neuchâtel aerodrome.

#### Investigation

The accident occurred on 29 July 2006 at 17:25 LT. It was notified at about 17:30 LT by the Swiss Air Rescue Service (REGA) to the federal Aircraft Accident Investigation Bureau (AAIB). The investigation was opened on the same day at about 18:00 LT at the location of the accident and was conducted in collaboration with the Neuchâtel cantonal police.

The accident is due to the aircraft colliding with the water following a loss of control by the pilot.

Factors which played a part in the accident during the take-off phase:

- opening of the unlocked canopy;
- elevator trim in the "nose up" position.

## 1 Factual information

### 1.1 History of the flight

#### 1.1.1 Flight preparation

On Saturday 29 July 2006 at about 17:00 LT, the pilot went to Neuchâtel aerodrome with the intention to carry out a local flight in the Ecolight Eurostar EV 97 HB-WAV. He then went to the room reserved for pilots to prepare his flight and completed the usual formalities. According to his statement, he made his pre-flight inspection in the hangar. After starting the Ecolight, he performed an engine check in the location provided for this purpose.

#### 1.1.2 Accident flight

At about 17:20 LT, the pilot of aircraft HB-WAV, flying solo, joined runway 05 of Neuchâtel aerodrome and took off just before 17:25 LT. After flying over the row of trees located on the extended centerline of the runway, the pilot encountered strong resistance in the elevator controls. In his statement of 25 August 2006, the pilot stated: *"...J'étais à 5200 tours, j'ai ensuite arrêté la booster pump, mis les flaps sur zéro, réduit la puissance sur 4800 tours comme le prescrit l'AFM et vérifié la vitesse qui se trouvait sur 110 km/h... Après avoir baissé le nez, quelques temps après, j'ai remarqué que l'avion avait tendance à fortement piqué du nez. J'ai alors dû tirer fortement sur le manche, j'ai remis pleine puissance, l'avion est revenu un peu dans une assiette normale, tout en devant maintenir une forte pression sur le manche. J'ai alors essayé de trimmer l'avion, mais je n'ai pas trouvé tout de suite le levier de trim. J'ai tenté de regarder où il était, en vain. Puis j'ai regardé à nouveau dehors pour voir que l'avion piquait à nouveau, j'ai alors tiré à nouveau sur le manche et l'avion a touché l'eau... Le moteur fonctionnait parfaitement. Aucune vibration à signaler. Pas de changement de bruit particulier."* Translation: "...I was at 5200 rpm, then I switched off the booster pump, set the flaps to zero, reduced power to 4800 rpm as specified in the AFM and checked the speed, which was about 110 km/h... After lowering the nose, some time afterwards, I noticed that the aircraft nose was tending to drop considerably. I then had to pull hard on the stick, I applied full power, the aircraft resumed a more or less normal attitude, but I still had to maintain strong pressure on the stick. I then tried to trim the aircraft, but I didn't find the trim lever immediately. I tried to locate it, but in vain. Then I looked out again to see the aircraft dropping its nose again; I then pulled on the stick again and the aircraft touched the water... The engine was running perfectly. No notable vibration. No significant change in noise."

The pilot, seriously injured, managed to vacate the crashed aircraft by his own efforts. He was quickly assisted by a couple of leisure yachtsmen before the arrival of the emergency services. The couple made the following two statements:

Statement 1 [translated from French]: "...I was sailing my boat towards the port of Auvèner when I heard the engine noise of an aircraft which had caught my attention. Raising my eyes, I saw that it was flying particularly low. I don't know if the aircraft was taking off but the engine speed was slow, as if it was idling. I know a bit about it as I am interested in all kinds of aircraft. I noticed when the aircraft was at 45° elevation in relation to myself that the canopy was open... I was looking at the aircraft from behind, so I did not see the pilot. The engine noise was oscillating... As soon as I saw the aircraft in the water I called the police. I also gave the police the GPS coordinates of the point of impact after I was able to get close to the pilot."

Statement 2 [translated from French]: “We didn’t see the pilot get out. I said to myself, “Where is he, where is he?” I went aft to look for ropes and the lifebelt. That was when I saw that a man was holding on to the aircraft’s tail. The nose was sinking. I immediately asked him if he was on his own. He said he was. ... I remember that he said: “*Comme je suis bête*” [How stupid I am], which made me think he had made a pilot error. I threw the lifebelt to him and told him to slip it over himself. We pulled him towards our boat. When we tried to pull him onto the boat, he said that he could no longer move his legs and couldn’t feel anything. So he stayed in the water inside the lifebelt until the emergency services arrived.”

The pilot, seriously injured, was taken to hospital by helicopter. The aircraft sank to a depth of approximately 80 m (annex 1).

## 1.2 Injuries to persons

Injuries	Crew	Passengers	Total number of persons on board	Others
Fatal	0	0	0	0
Serious	1	0	1	0
Minor	0	0	0	---
None	0	0	0	---
Total	1	0	1	0

## 1.3 Damage to aircraft

The aircraft was destroyed.

## 1.4 Other damage

Minor pollution to the lake due to fuel leakage.

## 1.5 Personnel information

1.5.1	Pilot	
	Person	Swiss citizen, born 1947
	Licence	Private pilot’s licence PPL(A) according to joint aviation requirement (JAR), issued on 30.10.2003 by the Federal Office of Civil Aviation (FOCA)
	Ratings	Single engine piston (SEP), valid till 27.10.2007
	National rating extensions	Night flying extension (NIT), obtained on 30.01.2006
	Medical certificate	Class 2, VDL (must wear spectacles) Validity from 14.01.2006 to 31.01.2007
	Last medical examination	14.01.2006
	Commencement of pilot training	2001



## 1.5.1.1 Flying experience

Note: the pilot's logs were lost during the accident. His flying experience was reconstituted using data provided by the "Groupe de Vol à Moteur du Club Neuchâtelois d'Aviation" where the pilot carried out his training and by the instructor responsible for the Ecolight category.

Single engine piston aircraft (SEP)	Total 137:40 hours actual flying Total in the last 90 days: 5:30 hours
Ecolight	Training on this aircraft commenced on 24 June 2006 and was completed on 7 July 2006. Total flying experience for the Ecolight category: 8:31 hours of which 4:44 hours training and 3:47 hours private flying.

## 1.6 Aircraft information

## 1.6.1 Information on certification of the Ecolight in Switzerland

According to aeronautical information circular (AIC) B 007/06 dated 30 March 2006 on the operation of foreign ultralight aircraft in Swiss airspace, the following information was published [translated from French]:

From 1 July 2005, Ecolight category aircraft may be certificated and allowed to fly in Switzerland.

Note: abroad, the aircraft in the Ecolight category applied in Switzerland are known as microlight, ultralight, ultralight aircraft, ultralight motorised (ULM), etc.

Aircraft in the Ecolight category are meeting, among others, the following requirements:

- Three-axis aircraft with a wing loading equal to or greater than 20 kg/m<sup>2</sup>.
- Certificated in compliance with LTF-UL certification standards.
- Comply with Swiss environmental regulations.
- Are validated by the Swiss Microlight Federation (SMF) certification body, in accordance with the prescriptions of the Federal Office of Civil Aviation (FOCA).

Airworthiness certificate and registration marks:

- Ecolight aircraft entered in the Swiss aircraft register have an airworthiness certificate recognised by the ICAO (special category).
- Ecolight aircraft are entered in the Swiss aircraft register under marks HB-W\_\_.

The Ecolight Eurostar EV 97 model 2000 version R aircraft was certificated in Switzerland by the Swiss Microlight Federation (SMF), in accordance with the FOCA prescriptions, on 24.02.2006.

## 1.6.2 General

Registration	HB-WAV
Aircraft type	Eurostar EV 97 model 2000 version R
Characteristics	Ecolight, single engine, side by side two-seater, low wing, metal construction with nose wheel and fixed tricycle landing gear
Manufacturer	Evektor-Aerotechnik A.S., Kunovice, Czech Republic

Year of manufacture	2006
Serial number	2006-2721
Owner	AVIAECO, Aerodrome, CH-2013 Colombier
Operator	AVIAECO, Aerodrome, CH-2013 Colombier
Airworthiness certificate	The Ecolight HB-WAV was imported new from the Czech Republic into Switzerland on 23.06.2006. The aircraft had a provisional airworthiness certificate issued by the FOCA on 30.06.2006. Valid till 31.12.2006
Area of use	VFR non-commercial
Engine	Manufacturer: Bombardier Rotax GmbH & Co. KG, Gunskirchen, Austria Type: Rotax 912 ULS, 4 horizontally opposed cylinders in "Boxer" configuration Power: maximum (5 minutes) 5800 RPM 100CV / 73.5 KW maximum (sustained) 5500 RPM 95CV / 69.0 KW cruising 4800 RPM 50.6CV / 37.7 KW Serial No.: 2006-2721 Year of manufacture: 2006
Propeller	Manufacturer: Duc Hélices, Lentilly, France Type: SWIRL 174, three-blade, made from sheet carbon, fixed pitch, blades locked on the ground
Equipment	VHF-COM TX/RX Filser ATR-600, transponder TX/RX Filser TRT-800, Garmin GPS MAP 296, EFIS-D10A Dynon Avionics
Rescue system	Parachute Emergency System "Pyrotechnic parachute Magnum 501", "BALLISTIC RECOVERY SYSTEM" (BRS) Serial No.: 181 SP Year of manufacture: 06/2006
Operating hours	29:20 hours of operation since new
Mass and centre of gravity	For the Ecolight Eurostar EV 97 model 2000 version R, maximum take-off mass MTOM is fixed at 472.5 kg according to the regulations in force. At the time of the accident the mass and centre of gravity were within the prescribed limits.
Maintenance	HB-WAV had a provisional airworthiness certificate. The FOCA import inspection had not yet taken place at the time of the accident. The first 25-hour check was carried out by the operator on 18.07.2006 at 23:05 total hours flying time.

Fuel	Euro 95 and 98 fuel types are used; AVGAS may be used only exceptionally. For HB-WAV, the fuel was stored in a jerry can placed in a key-locked cupboard in the hangar.
Fuel capacity	The aircraft tank has a fuel capacity of 65 l of which 2.9 l cannot be used.
Fuel quantity	Before the flight, the pilot added 10 l of fuel. The resulting fuel quantity, approximately 45 l, was sufficient to make the envisaged flight.
Emergency beacon	Not fitted

## 1.7 Meteorological information

### 1.7.1 General

The information contained in sections 1.7.2 and 1.7.3 was supplied by MétéoSuisse.

### 1.7.2 General situation

In the wake of a weakened cold front, air which was still fairly humid was being conveyed towards the Alpine region.

### 1.7.3 Meteorological conditions at the location and time of the accident

The following information on local meteorological conditions at the time of the accident is based on a spatial and temporal interpolation of the observations made by several weather stations.

Cloud	2-3/8 base at 5500 ft AMSL and 4-5/8 base at 10 000 ft AMSL Showers in the vicinity
Visibility	About 20 km
Wind	East 2-4 kt, gusting to 8 kt
Temperature/dew point	26 °C / 17 °C
Atmospheric pressure	LSZH 1012hPa, LSGG 1012 hPa, LSZA 1008 hPa
Position of the sun	azimuth: 258°                      elevation: 36°
Hazards	N/A

## 1.8 Aids to navigation

Onboard the aircraft, the pilot had a GPS (Global Positioning System) and an EFIS (Electronic Flight Information System). It was not possible to recover the data from these devices.

## 1.9 Communications

According to a witness listening on the aerodrome flight information service - AFIS frequency 123.600 MHz, the report made by the pilot before take-off was correct. The same witness, located towards office "C" tried to establish radio contact with the pilot after noticing that the aircraft was deviating from its trajectory. He did not obtain any response. The pilot did not make a distress call.

## 1.10 Aerodrome information

Neuchâtel aerodrome, located on the shore of Lake Neuchâtel, is a private aerodrome. The aerodrome is equipped with a 550 x 30 m grass runway and a 700 x 20 m asphalt runway, orientation 05/23. A distance of 700 m is available for take-off on the asphalt runway 05.

## 1.11 Flight recorders

Not applicable.

## 1.12 Wreckage and impact information

### 1.12.1 Information concerning the wreckage

The following points were ascertained after the wreck was recovered:

- The underside of the front section of the fuselage was badly dented. The nose gear was bent backwards and the fairing of the wheel had pierced the cabin floor. The rudder pedal system was separated and displaced to the rear.
- The canopy was no longer in place, the ball-and-socket fixings and extension damper rods were torn off.
- The left wing was badly damaged and the left landing gear was torn off.
- The right wing had superficial damage. The fuselage was badly deformed. The elevator, rudder and trim tabs and the fixed tail fins suffered only little damage.
- The left-hand safety harness had been used; the ventral part resisted the deceleration forces. However, the retention cable of the dorsal section did not withstand the impact.
- A padlock locked the operating handle of the emergency parachute, the "BALLISTIC RECOVERY SYSTEM" (BRS) and prevented the system from being used immediately (see fig. 3).
- The fuel selector was in the "Open" position.
- The magneto selector switch was in the "Both" position.
- The battery switch and the IC, Socket and Ldg Light switches were in the "ON" position; the fuel pump was in the "OFF" position.
- The COM and Ldg Light circuit breakers were found in the out position.
- The trim control lever was found to be in the rear "nose up" position 8 mm from the stop.
- The landing flap control was in the "RETRACTED" position.
- The parking brake pull handle was in the pulled-out position.

### 1.12.2 Information on the engine and propeller

- The engine cowlings were partially torn off. The fractured propeller blades indicate that the engine was providing power at the time of impact.
- All the engine controls were correctly connected to the carburetors and other systems. The throttle control was positioned at 30 mm from the full throttle position. The maximum travel is 70 mm. The "Choke" control was pushed.

## 1.12.3 Information on the trim control lever and flight controls

- The trim control lever is located between the two seats, close to the flaps lever. Three symbols for the different positions “nose up”, “neutral” and “nose down” are affixed on the slide support of the trim control.
- The trim tabs are positioned by means of two cables fixed to the control, fitted with a knob. The function is effected by means of a horizontal slide.
- The trim control cables are protected by sheaths; they are fixed at the ends by drilled bolts on the control horn in the cabin and on the trim tabs above and below the elevator.
- A visual inspection of the aileron connections, coupling rods, reverse levers, traction cables and tensioners as well as the trim system guide sheaths provided no indication of a pre-existing fault.

## 1.12.4 Information concerning the emergency parachute

The Eurostar EV 97 HB-WAV is equipped with a "Pyrotechnic parachute Magnum 501", "BALLISTIC RECOVERY SYSTEM" (BRS). This optional equipment is installed at the front of the fuselage, between the firewall and the instrument panel. After shutting down the engine, this system can be activated by the pilot by pulling on the handle located on the lower section in the centre of the instrument panel. This control is identified by a plate with the following wording: *"RESCUE SYSTEM IN EMERGENCY PULL TO ACTIVATE"*. According to the manufacturer's documentation, less than 4 seconds are required to open the BRS emergency parachute in a speed range between 100 and 300 km/h. With the parachute open, the rate of descent is 7.33 m/s.

- On the instrument panel cover, two placards indicate the presence of a danger. The pyrotechnic cartridge of the parachute was slightly damaged by the impact.



Fig. 1: Identification of the BRS on the instrument panel cover



Fig. 2: Pyrotechnic cartridge of the BRS parachute system

A padlock fitted on the emergency parachute system activation handle prevented immediate operation of the system. The key to the padlock was fitted on the same key-holder as the magneto selector key. A second key was found in the left side pocket of the aircraft.



Fig. 3: Padlock fitted to the emergency parachute control

1.12.5	Information concerning the site of the accident	
	Site of the accident	Lake Neuchâtel, approximately 1800 m from the threshold of runway 23 Neuchâtel (LSGN)
	Swiss coordinates	557 980 / 202 221
	Latitude (WGS84)	N 46° 58' 11"
	Longitude (WGS84)	E 6° 53' 11"
	Elevation	1410 ft AMSL / 430 m/M
	Position	Approximately 900 m off the port of Auvernier
	Topographical map of Switzerland	Sheet No. 1164, Neuchâtel, scale 1:25 000



Fig. 4: Recovery of the wreck

### 1.13 Medical and pathological information

The pilot suffered serious injuries to the spine.

The pilot's blood and toxicology analyses were negative.

## 1.14 Fire

Fire did not break out.

## 1.15 Survival aspects

The pilot was able to unfasten his safety harness before vacating the wreck. He first gripped the fuselage when the nose of the aircraft was already under water. Before the wreck sank, the pilot was helped by a couple of leisure yachtsmen. He was then taken to hospital by helicopter.

## 1.16 Tests and research

### 1.16.1 Safety belts

The safety belt system consists of two harnesses with four fixing points. A break was found in the left harness' retention cable of the dorsal section. The summary of the analysis of the break in this cable is as follows: *"...Sowohl die makroskopische als auch die mikroskopische Begutachtung ergaben, dass duktile Gewaltbrüche vorliegen. Der Zugversuch am visuell noch intakten Rückhalte kabel (rechts) ergab eine Bruchkraft von 7211 n bei einem Weg von 15 mm."*

Translation: "... Both the macroscopic and microscopic examinations showed that ductile forced ruptures are present. The tensile test of the (right) retention cable which was visually still intact produced a tensile strength of 7211 N for a 15 mm travel."

Interpretation of the results of the analysis concluded that this rupture was due to the sudden onset of an overload during the impact.

### 1.16.2 Characteristics of the canopy locking system

The canopy opens by pivoting forwards. The two pivot axes are located between the firewall and the instrument panel. The canopy is maintained in the open position by two dampers fixed at the level of the instrument panel. The cockpit is accessed by climbing onto the wings.

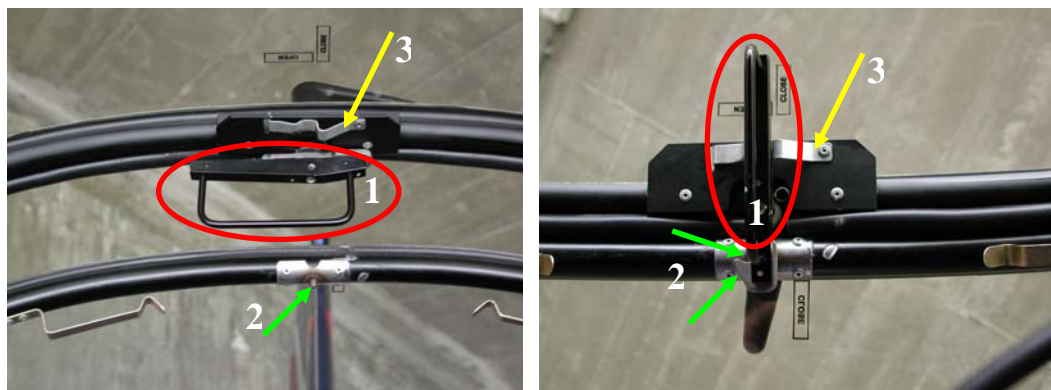


Fig. 5 and 6: 1) Locking handle. 2) Locking tab and hook. 3) Spring blade

The canopy is closed by pulling on the locking handle from the pilot's seat. When it closes, it is positioned with the aid of metal side plates serving as guides on the rear structural frame. If the locking handle is positioned parallel to the frame, it is then in the unlocked position (Fig. 5). On the other hand, if the handle is positioned in the direction of flight, it is in the locked position (fig. 6). In this position, locking is achieved by means of a hook which locks onto the fitted tab (2) on the rear structural frame. A safety system consisting of a spring blade ensures that the handle remains in the locked position (3).



The inspection of the locking system concluded that in the event of violent opening with the correctly locked canopy being torn off, specific traces would be visible on the rear of the tab and on its left side. However, the locking tab exhibited only traces of normal wear.

The analysis report continues [translated from German]:

"We conclude that the locking hook was not enclosing the tab at the time of the impact and when the canopy was torn off; the canopy was therefore not locked...

... Based on traces of deformation on the hinge of the canopy, traces of scratches, abrasion and friction on the engine cowling, deformation of the rod of the left gas pressure damper, damage suffered by the coating in the area situated in front of the left and right openings through which the gas pressure damper rods pass and the shape of the areas of fractures on the two rods, we conclude that the not locked cockpit canopy was fully torn open during the impact of the aircraft and finally torn off forward."

In 2004, flight tests were carried out by the manufacturer with the canopy open in order to check, among other things, the maneuverability and controllability of the Eurostar EV 97. The following can be read in the conclusions:

*"The flight test has demonstrated an acceptable controllability and manoeuvrability of EV-97 aeroplane at flight with opened wide canopy...Wake behind opened canopy causes vibrations of the tail units, the amplitude of horizontal tail unit tips was within +/- 70 mm...In case of unintentional canopy opening during a solo flight an attempt of the pilot to close the canopy would require from him an increased effort and control skills and could reduce safety of flight...."*

#### 1.16.3 Trim system

The left corner plate of the trim control slide system was damaged by buckling (fig. 7).



Fig. 7: Position of the trim control lever

Inspection of this system made it possible to determine the position of the trim control prior to impact. In conclusion, the report states [translated]:



*“... We conclude that the trim lever was originally close to the rear “nose up” stop. When the aircraft impacted, the trim lever was not moved, or was only slightly moved. Thus at the time of the impact the trim lever and therefore the trim tabs were more or less in the positions in which they were found. In our opinion, longitudinal forces resulting from the buckling of the metal cover of the trim lever and flaps control, which would push the cover at a flat angle against the rod of the lever, would be insufficient to cause displacement of the trim control lever...”*

*This means that when the aircraft was deformed when its nose hit the water, there was no resulting traction on the cable linking the rear of the trim lever to the trim tabs. In view of the above, the position of the trim lever and trim tabs at the time of the impact could not have been changed under the effect of the impact.”*

With regard to the buckling of the left corner plate of the support of the trim slide system; the experts' report concludes that the deformation was caused by the impact on contact with the water.

#### 1.16.4 Examination of the instruments

The laboratory analysis of the airspeed indicator and the tachometer (rpm) was not able to accurately determine the parameters of the last values indicated before impact.

The GPS MAP 296 navigation instrument and the EFIS D10A multifunction display were analysed in a specialist laboratory. It was not possible to extract any information from these devices.

#### 1.16.5 Inspection of the engine

The inspection of the engine did not reveal any fault in relation to the accident.

### 1.17 Organisational and management information

Aircraft HB-WAV was operated by the AVIAECO, a non-profit-making association based at Neuchâtel aerodrome. This association was founded in June 2006 with the purpose of promoting economical and ecological aviation. At the time of the accident, this association only operated this aircraft.

### 1.18 Additional information

In his first statement, the pilot explained his view of the facts as follows: *“... décollage 05 avec volets 1er cran et puissance maximale (5200 tours), jusqu'aux arbres avant la rive, tout va bien, arrivé aux arbres j'arrête la booster pump, rentre les volets, réduits à 4800 tours et baisse un peu le nez, contrôle de vitesse, 110 km/h, l'avion est un peu trop cabré, je pousse encore un peu sur le manche qui me paraît dur. Tout à coup l'avion montre une forte tendance à piquer, j'essaie de compenser en tirant fortement sur le manche, puis remet des gaz pour essayer de gagner de l'altitude, avec un succès partiel, la descente est freinée mais le maintien d'altitude approximatif. Je recherche la commande de trim de la main droite pour voir si je peux avec elle soulager la pression sur le manche; dans l'énervement je ne la trouve pas et je la cherche des yeux. Avant de la visualiser je regarde de nouveau dehors et constate que je me suis remis à descendre et que je suis très bas sur l'eau même si l'altitude est difficile à estimer en raison de l'eau calme et de la légère brume. Je tire encore une fois sur le manche dans l'espoir de gagner de l'altitude mais je ne parviens pas à arrondir suffisamment la trajectoire pour éviter le contact avec l'eau qui se fait à grande vitesse et violemment ...”.*

Translation: "...take-off 05 with flaps in 1<sup>st</sup> position and maximum power (5200 rpm), as far as the trees before the shore; everything in order, when I arrived at the trees I switched off the booster pump, retracted the flaps, reduced to 4800 rpm and lowered the nose a little, checked the speed, 110 km/h, the nose was a little too far up, I pushed a little on the stick, which seemed stiff to me. Suddenly the aircraft exhibited a strong tendency to drop its nose, I tried to compensate by pulling hard on the stick, then opened the throttle to try to gain height, with partial success, the descent was stopped but maintaining altitude was approximate. I tried to find the trim control by feeling for it with my right hand to see if I could use it to reduce the pressure on the stick; in my nervous state I could not find it so I searched for it visually. Before locating it I looked outside again and found that I had started to descend again and was very low over the water, though the altitude was difficult to estimate because of the calm water and the light mist. I pulled on the stick again, hoping to gain altitude but I didn't manage to change trajectory sufficiently to avoid contact with the water, which was at high speed and violent...".

The pilot also explained the following facts concerning the history of the flight on the subject of the trim control: *"... Je l'ai mise au neutre (marque de couleur) lors du check "before take-off". Elle se manipule très facilement ..."*.

Translation: "I set it to neutral (coloured mark) during the "before take-off check". It was very easy to operate...".

Regarding the canopy position, he added: *"... j'ai eu une inquiétude à ce sujet lorsque je me suis trouvé dans l'eau car à cet instant elle était absente. En réfléchissant après coup, je me rappelle toutefois avoir effectué le mouvement de fermeture de la verrière, mais était-elle verrouillée? Je ne peux pas l'assurer... Quand j'ai vu la verrière manquante, j'ai tout de suite pensé que j'avais oublié de la verrouiller."*

Translation: "I was worried about this when I found myself in the water as at that time it was not there. Thinking about it after the event, however, I do remember making the movement to close the canopy, but was it locked? I can't be sure ... When I saw that the canopy was missing, I immediately thought that I had forgotten to lock it."

#### **1.19 Useful or effective investigation techniques**

Not applicable.

## 2 Analysis

### 2.1 Technical aspects

#### 2.1.1 General

The Aircraft HB-WAV was almost new and no fault in the airframe or engine propulsion was found.

#### 2.1.2 BRS emergency parachute

The Eurostar EV 97 HB-WAV is equipped with a "Pyrotechnic parachute Magnum 501", "BALLISTIC RECOVERY SYSTEM" (BRS). In the event of a problem, this system could be activated by pulling on a handle identified as "RESCUE SYSTEM IN EMERGENCY PULL TO ACTIVATE".

However, this action was not possible as a padlock was fitted to the emergency parachute system activation handle, preventing rapid use of the system (fig. 3). The fitting of a padlock is not in conformity with the philosophy of the system.

#### 2.1.3 Canopy locking

On this type of aircraft, the accessibility of the canopy closing handle once the pilot is belted is not easy because of its remote position on the rear frame of the canopy.

The analysis of the canopy locking system found that the locking hook was not in the locked position. Since the canopy was not locked, it was initially partially-open in flight and was then torn off during the impact. The experts' report on this system excludes the possibility that the locking hook was turned and opened following the frontal impact of the aircraft (fig. 5 and 6). The pilot probably closed the canopy before take-off but did not lock it.

#### 2.1.4 Trim control lever

The pilot stated that he positioned the trim control lever in the "neutral" position. However, upon the recovery of the aircraft, this control was found in "nose up" position, 8 mm from the rear stop (fig. 7). Technical analysis showed that this control lever could not have moved during the impact. The pilot also stated that he encountered abnormal conditions after retracting the flaps. He then tried to change the position of the trim control lever but could not find it.

### 2.2 Operational and human aspects

#### 2.2.1 Use of the checklist

The expert inspections as well as the visual examination of the wreck show that points on the checklists were not carried out. For example, the padlock preventing immediate use of the emergency parachute system remained in place. The "nose up" position of the trim control was probably not verified. This setting corresponds to the position used in the landing phase.

### 2.2.2 Initial take-off phase

Throughout the ground acceleration phase and up to the change in power setting and configuration, no aerodynamic disturbance affected the behaviour of the aircraft. On one hand, the canopy was still in the closed position, which was corroborated by witnesses, and on the other hand the effect of the inappropriate position of the trim control was undoubtedly compensated by the flap setting on take-off. The canopy probably opened in the phase of the manipulations after take-off. This phenomenon may be explained by the change in vibration and the increase in speed following the retraction of the flaps.

### 2.2.3 Flight phase with loss of control

The flight tests with an open canopy carried out by the manufacturer confirm acceptable manoeuvrability of the aircraft and an increase in the forces on the stick along the pitch axis due to the creation of turbulence affecting the elevator. However, continuation of the flight demanded greater skills. In addition, the action of closing the canopy whilst flying is not easy. The inexperience of the pilot on this type of aircraft prevented him from maintaining control of the Eurostar, whose sudden change in response to the controls probably caused an understandable panic and essentially gave the impression of a technical failure.

The fact that the pilot did not find the trim control in his haste is probably attributable to the fact that its position was not in the range envisaged for take-off but much further back, 8 mm from the stop. This trim position in the rear sector, in conjunction with a half-open canopy, must have considerably altered the aerodynamic behaviour of the aircraft and increased the forces necessary to control it in the pitch axis. The pilot probably did not find it because of his haste, which must have increased his stress level as a result of the very surprising behaviour of the aircraft.

In this kind of situation, it is necessary to imagine that everything is happening very quickly and virtually no time is left for analysis. The priority is stabilisation of the trajectory; the low altitude left only a very narrow margin of manoeuvre in space and therefore in time.

The final attempt to recover the aircraft could not prevent the collision with the surface of the water but certainly enabled the pilot to survive.

### 3 Conclusions

#### 3.1 Findings

- The pilot was in possession of the appropriate licences.
- The pilot had completed his training on HB-WAV approximately 3 weeks before the accident.
- There are no indications that he was affected in his state of health during the flight which is the subject of this report.
- The aircraft had a provisional airworthiness certificate issued by the FOCA on 30.06.2006 and valid until 31.12.2006.
- The aircraft was rated for private VFR flight. The investigation did not find any defect in relation to the accident. The aircraft had flown for 29:20 hours since new.
- The mass and centre of gravity were within the limits specified in the flight manual.
- The fuel quantity onboard was sufficient to make the intended flight.
- The pilot did not make a distress call.
- HB-WAV was equipped with a "pyrotechnic parachute Magnum 501", "BALLISTIC RECOVERY SYSTEM" (BRS). The control handle of the emergency parachute was padlocked.
- The aircraft was not equipped with a distress beacon.
- After the aircraft was recovered, the trim control lever was found positioned in the "nose up" sector.
- The canopy was not locked. It freed itself from its fixings on impact and was not found.
- The inspections of the flight controls and engine provided no indication of a pre-existing fault.
- The fractured propeller blades indicated that the engine was providing power at the time of impact.
- The meteorological conditions did not play any part in this accident.

### 3.2 Causes

The accident is due to the aircraft colliding with the water following a loss of control by the pilot.

Factors which played a part in the accident during the take-off phase:

- opening of the unlocked canopy;
- elevator trim in the "nose up" position.

Berne, 9 October 2008

Aircraft Accident Investigation Bureau

This report contains the AAIB's conclusions on the circumstances and causes of the accident which is the subject of the investigation.

In accordance with Annex 13 of the Convention on International Civil Aviation of 7 December 1944 and article 24 of the Federal Air Navigation Law, the sole purpose of the investigation of an aircraft accident or serious incident is to prevent future accidents or serious incidents. It is therefore not the purpose of this investigation to determine blame or clarify questions of liability. The legal assessment of accident/incident causes and circumstances is no concern of the incident investigation (art. 24 of the Air Navigation Law).

If this report is used for purposes other than accident prevention, due consideration shall be given to this circumstance.