

PRELIMINARY REPORT

ACCIDENT
aircraft Enstrom 480B registration marks N-480W,
Fundres (BZ),
10th of May 2017

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ANSV safety investigations are conducted in accordance with Annex 13 to the Convention on International Civil Aviation and EU Regulation No 996/2010. The sole objective of the safety investigation of an accident or incident under these Regulations is the prevention of future accidents and incidents. It is not the purpose of such an investigation to apportion blame or liability. Accordingly, it is inappropriate that ANSV reports should be used to assign fault or blame or determine liability, since neither the investigation nor the reporting process has been undertaken for that purpose.

This Preliminary Report is published to provide details of the initial facts. It contains facts which have been determined up to the time of issue and contains neither conclusions nor safety recommendations. It is published to inform the aviation industry and the public of the general circumstances of the accident and should be regarded as tentative and subject to alteration or correction if additional evidence becomes available. The investigation is continuing and a final report will be published in due course.

Aircraft Type and Registration	Enstrom 480B N-480W.
Date & Time (UTC)¹	10th of May 2017, 11.43'.
Location	Fundres (BZ).
Description of Occurrence	In-flight break up.
Type of Flight	General Aviation. Cross-country.
Persons on Board	Crew (1).
Injuries	Crew: fatal (1).
Nature of Damage	Aircraft: destroyed.
Pilot in Command	Age 75 years, male. Commercial Pilot License (Helicopter/Airplane). Experience: the pilot reported civil flight experience that included 3425 total and 35 hours in last six months as of his medical exam dated 05/27/2016. Verifications are ongoing in coordination with Austrian Accident Safety Investigation Authority (pilot's citizenship) and the NTSB ² (pilot's license issued by FAA ³).
Aircraft Information	Enstrom 480B, year built 2007, serial number 5110, MTOM ⁴ 1.361 kg.
Location	Fundres (BZ), elevation 4022 feet. 465354N0114154E.

¹ UTC: Universal Time Coordinated. Local time, at the time of accident, was UTC+2 hours.

² NTSB: National Transportation Safety Board, Autorità investigativa statunitense per la sicurezza dei trasporti.

³ FAA: Federal Aviation Administration, Autorità dell'aviazione civile statunitense.

⁴ MTOM: Maximum Take Off Mass.

Weather Conditions

VMC⁵. Daylight.

Narrative

During a VFR⁶ flight from Bolzano Airport (LIPB) to Linz airport (LOWL), helicopter suffered an in-flight break-up with one main rotor blade separation followed by the separation of the main rotor hub and the remaining two blades. The helicopter exploded/took fire in flight and impacted the ground with a second explosion.

The sequence of events has been determined throughout a site survey, conducted the day after the accident by ANSV personnel, which included:

- eyewitnesses interviews;
- analysis of distribution of wreckage;
- examination of airframe debris and main rotor parts.

Interviews confirmed the time of event and the loss of helicopter parts during flight before initiating heavy oscillations and exploding/catching fire, impacting the ground in a close to vertical parabolic trajectory.

Debris were found in an area of approximately 200 meter wide 500 meter long, with one of the main rotor blades at the farthest point from main wreckage. The two other blades and the main rotor head were laying at approximately 200 meters from main wreckage. One of the remaining blades was separated from main rotor hub, while the other was still attached.

Main rotor hub assembly was showing the failure of the tension/torsion straps (T/T straps) of the two blades which separated from the main rotor. The lug of the main rotor blade in close proximity of the rotor hub was lying close to its blade, while one of the dumpers was missing.

At the main wreckage site it was possible to observe the almost vertical path of impact trajectory, confirmed by a reduced impact area and the damage to a power line in the close vicinity which interfered with the tail-cone assembly and tail rotor. Signs of power cables interference have been detected on tail rotor shaft assembly, suggesting an inverted position of the helicopter just before the ground impact.

The main wreckage rolled into a river bed, while main rotor transmission assembly was projected approximately 10 meters over the impact point.

Upper pulley assembly was found separated by main airframe, lying together with the main wreckage.

The portion of interest of each main rotor blade, the main rotor hub and the main gearbox were transported to the ANSV labs for further analysis, conducted with the NTSB technical advisor

⁵ VMC: Visual Meteorological Conditions, condizioni meteorologiche di volo a vista.

⁶ VFR: Visual Flight Rules, regole del volo a vista.

from Enstrom Helicopter.

Parts were dismantled, observed and analyzed by mean of the optical microscope, resulting in following findings.

1) *T-T strap #1.*

The general geometry of the wires suggests a failure driven mainly by tension solicitation. No visible sign of torsion. Optical microscopy highlights on a large part of wires fracture surfaces characterized by 45° planes.

2) *T-T strap #2.*

The general geometry of the wires a failure driven by a combination of torsion and tension solicitation. Optical microscopy highlights on a large part of wires fracture surfaces characterized by 45°.

3) *T-T strap #3.*

It was not possible to analyze the T/T strap since the damage on the main rotor blade was so severe that the dismantling was not practical.

No further analysis is deemed necessary at this stage of the investigation process.

4) *Dumper #3.*

The dumper relevant to the main rotor blade which remained attached to the main rotor hub was not found at the accident site. The attachment bolt was found fractured. The morphology of the fracture surface is totally flat, very fine bright grains. The fracture surface was observed by optical microscopy and it appeared to be highly hammered. A small amount of corrosion was found on it (presumably subsequent to the fracture). The length of the remaining fragment of the bolt was not flush with the assembly.

The lug of missing dumper was also found fractured. The morphology of the fracture surface is totally flat with a heavy grade of corrosion. A small part of fracture surface was on a different (higher) plane, not corroded and heavily hammered.

5) *Gearbox.*

The mast was heavily deformed therefore it was not possible to verify the free rotation. However the gearbox case was broken and it was possible to observe the internal gearing. This, beside the generalized light corrosion (most likely post-crash), did not show any particular sign of damage. Teeth were apparently in good condition. On the mast signs of rotation were found.

No further analysis is deemed necessary at this stage of the investigation process.

From the evidence acquired at this stage of the investigation, it has been determined that one of the main rotor blades separated in flight due to a T/T strap failure. The consequent increase of vibrations possibly led to the complete separation of main rotor

hub with the remaining two blades. The second blade separated from the main rotor blade at impact due to the failure of its T/T strap.

For the above reason, the T-T straps and manufacturing records from the same lot number as the suspect T-T strap, as well as the straps from the previous and next lot number have been quarantined by the T/T strap manufacturer.

A stress test has been carried out on a brand new T/T strap with satisfactory results.

Further Investigation

The ANSV safety investigation continues as follows:

- further metallurgical analysis have been planned on the following items in order to ascertain their the fracture mechanism and the relevant cause:
 - TT strap #1 and #2;
 - dumper bolt;
 - dumper lug.
- further stress tests on T/T straps belonging to the same lot of accident have been coordinated with NTSB and manufacturer;
- further analysis of helicopter maintenance records.



Photo 1: main wreckage at the accident site.

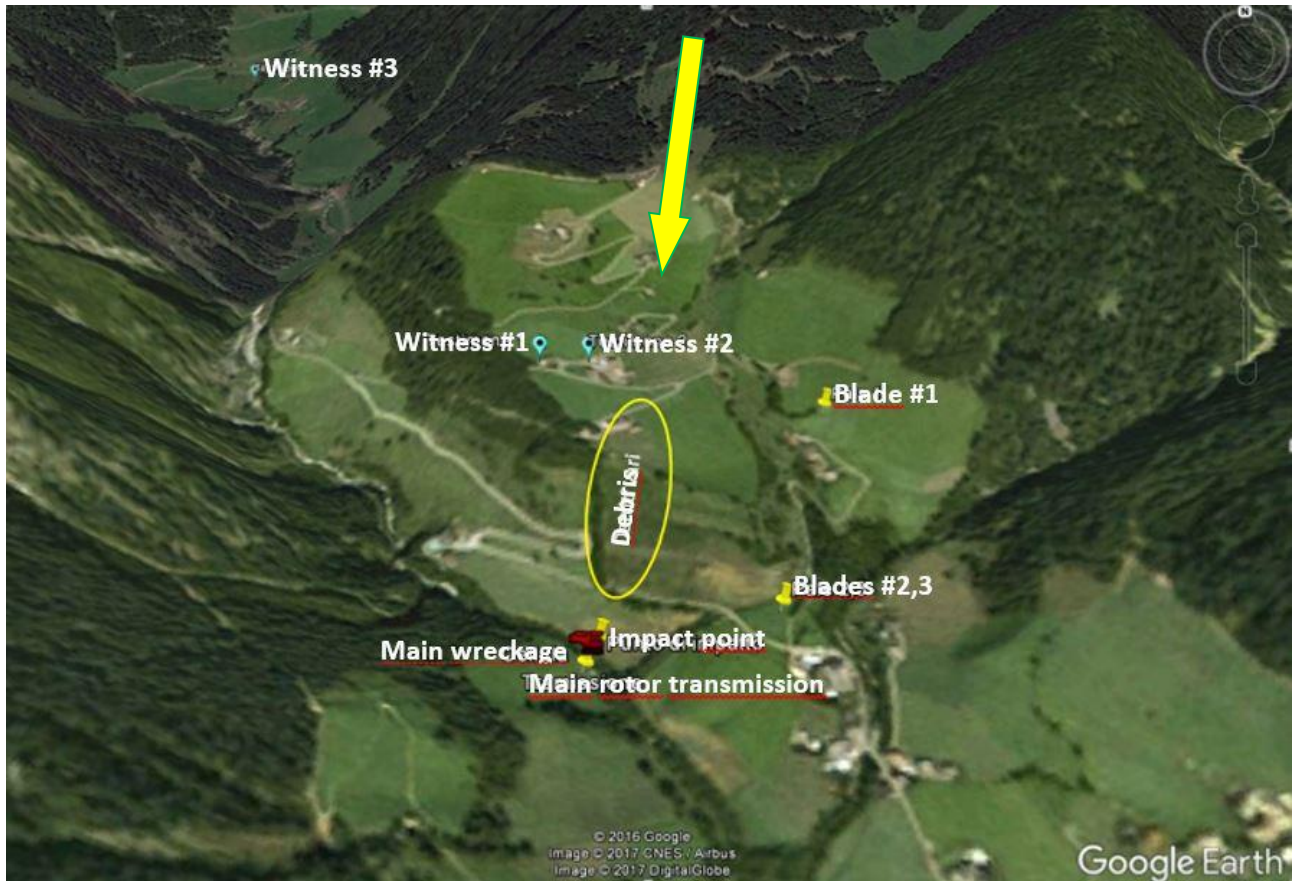


Figure 1: debris distribution and eyewitnesses' position.

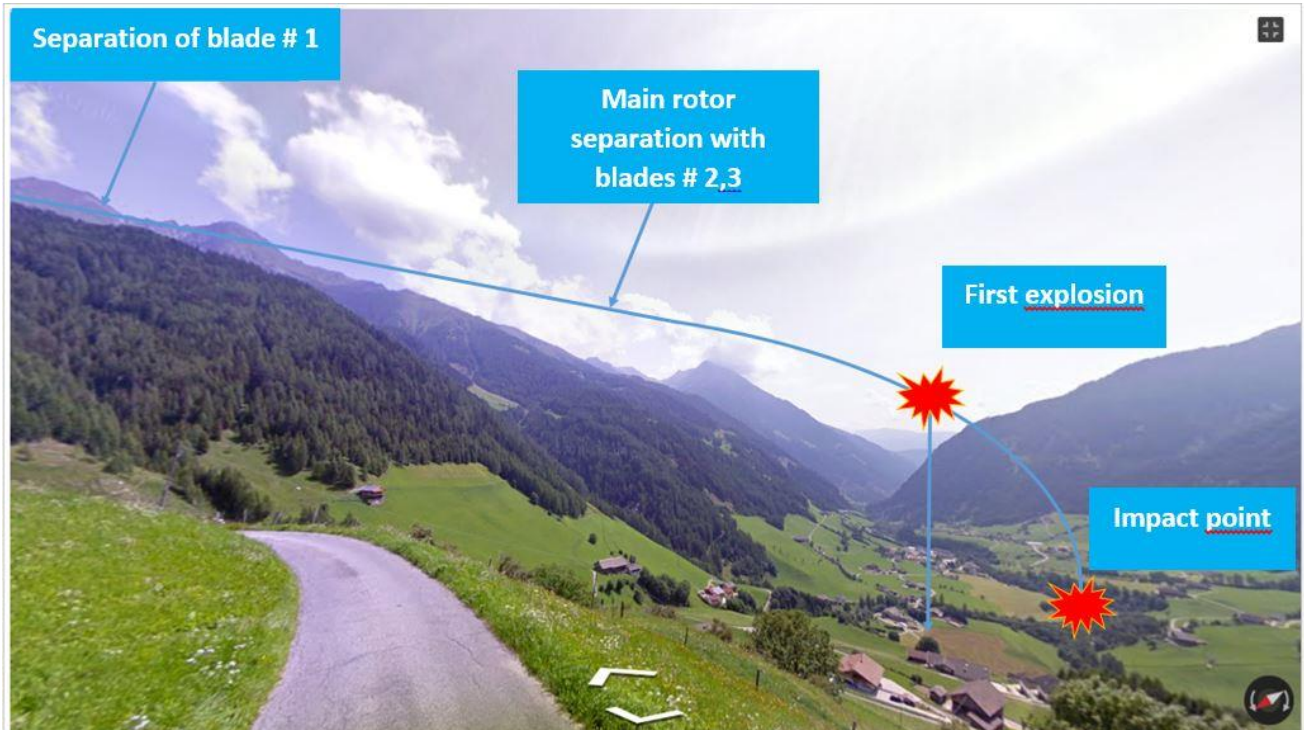


Figure 2: probable reconstruction of the sequence of events.



Photo 2: main rotor hub and failed T/T strap.



Photo 3: main rotor transmission assembly.



Photo 4: T/T strap #1.



Photo 5: T/T strap #2.

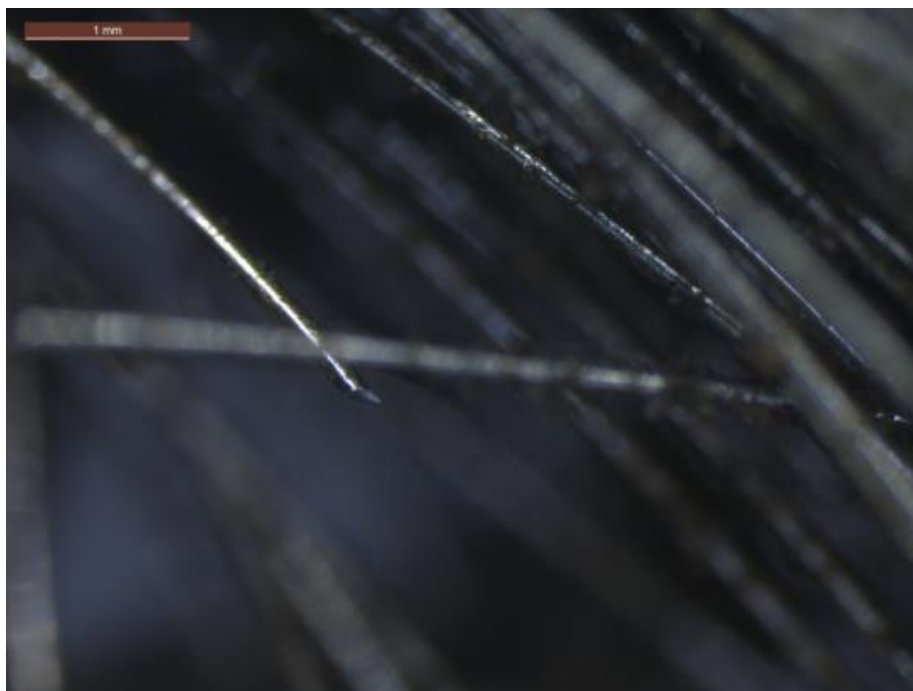


Photo 6: 45° planes on T/T strap #1.



Photo 7: dumper bolt.



Photo 8: dumper lug.



Photo 9: transmission gear box.



Photo 10: main rotor transmission mast.