

Investigation Report

Identification

Type of Occurrence:	Accident
Date:	30 November 2013
Location:	Beesten
Aircraft:	Ultralight aircraft
Manufacturer / Model:	Evektor-Aerotechnik a.s. / EV 97 Eurostar 2000 R
Injuries to Persons:	Pilot fatally injured
Damage:	Aircraft destroyed
Other Damage:	Crop damage
State File Number:	BFU 3X137-13

Factual Information

History of the Flight

Witnesses observed that the pilot of an ultralight entered Rheine-Eschendorf Airfield at about 1300 hrs¹ and then refuelled the ultralight. After outside start-up aid he taxied to the take-off point. He had said he wanted to conduct a sightseeing flight towards the north. At 1333 hrs take-off occurred. At 1335 hrs witnesses saw that the ultralight overflew the airfield from south to north.

¹ All times local, unless otherwise stated.

According to the radar data the ultralight left the traffic circuit toward north-north-east and climbed to 1,700 ft (pressure altitude 1,013 mb). At 1340 hrs the direction was changed to north-north-west. The aircraft descended to an indicated altitude of 1,000 ft. At 1343:30 hrs radar contact ended.

At 1343 hrs witnesses in the area of the accident site saw that the ultralight crashed down at almost right angle.

The ultralight impacted a harvested corn field. The pilot suffered fatal injuries.

Personnel Information

Since 1998, the 56-year-old pilot had held a pilot licence for aerial sports equipment for aerodynamically controlled ultralight aircraft with the rating for passenger flights. The licence was valid until 7 May 2018. He had also held a pilot licence for gliders (GPL), initially issued on 29 June 1998 with the type ratings for gliders and Touring Motor Gliders (TMG). His class 2 medical certificate was valid to August 2014. He had a total flying experience of 354 hours. He had a flying experience on ultralight aircraft of about 70 hours; 27 hours of which were on type.

Aircraft Information

The EV 97 Eurostar is a twin seat aerodynamically controlled ultralight aircraft in metal construction.

Manufacturer:	Evektor-Aerotechnik a. s.
Type:	EV 97 Eurostar 2000 R
Manufacturer's Serial Number (MSN):	2008-3305
Year of manufacture:	2008
MTOM:	472.5 kg
Engine:	Rotax 912 ULS
Total airframe hours:	1,188 hours
Propeller:	Woodcomp Varia 170/2/R

The ultralight was owned by a club and had a German certificate of registration. According to the weighing report of 30 April 2012 the empty mass was 302.6 kg. Prior to take-off in Rheine the pilot had refuelled with 33 l fuel. The objects on board

had a mass of approximately 10 kg. According to witnesses the pilot weighed 80 kg. Mass and centre of gravity of the ultralight were within the prescribed limits.

The last 50-hour inspection was conducted on 13 August 2013; at about 1,150:31 operating hours. On 16 April 2013 the last annual inspection took place and since then the ultralight had been operated for 101:54 hours.

Club members conducted the maintenance of the aircraft.

The scope of work pertaining to the Technische Mitteilung (technical report) M-EV97-01/2009 and the Lufttüchtigkeitsanweisung (Airworthiness Directive) of the DAeC Luftsportgeräte-Büro LSG 09-004 (possible deviation from the required material quality) was conducted on 18 December 2009 by the manufacturer. Compliance with material thickness and characteristics was certified.

On 24 April 2012 the manufacturer conducted the 150-hour inspection required in the safety report for the Varia-160/170-Propeller, No. DAeC 2012-003/LAA Czech Republic Mandatory Bulletin 2010 Sep/01/Woodcomp Service Bulletin No.02/2012 EN. The inspection of the propeller was postponed because the ultralight had been at the manufacturer's in the Czech Republic for repairs. On 19 May 2012 at a total operating time of 929 hours of the ultralight the propeller was installed. The next maintenance interval for the propeller was listed in the aircraft log book as 1,230 hours. The propeller had been in operation for the next 266 hours without any periodic maintenance by the manufacturer.

Meteorological Information

According to the Deutscher Wetterdienst (German meteorological service provider, DWD) the north-west of Germany was at the back of a cold front which had moved south. With the north-west ground current low-lying relatively humid and firmly layered cold air moved in. The General Aviation Forecast (GAFOR) for the relevant area at the day of the accident read:

GAFOR-Areas 05-10 and 31-36:

1500 FT AMSL 350/ 10 KT, 04 Degrees C

2000 FT AMSL 360/ 15 KT, 03 Degrees C

3000 FT AMSL 350/ 20 KT, 01 Degrees C

5000 FT AMSL 350/ 25 KT, M04 Degrees C

FL100 010/ 20 KT, M09 Degrees C

This means:

O - OSCAR - open - ground visibility at least 8 km and cloud base at least 2,000 ft above reference area.

M - MIKE - marginal - ground visibility at least 1.5 km and/or cloud base at least above 500 ft above reference area.*

According to the aviation routine weather report (METAR) of Rheine-Bentlage Airport (ETHE) of 1320 hrs the following weather conditions prevailed:

Wind:	340° / 5 kt
Visibility:	5,000 m
Temperature:	08°C
Dewpoint:	05°C
QNH:	1,020 hPa

According to the Flugleiter (A person required by German regulation at uncontrolled aerodromes to provide aerodrome information service to pilots) visual meteorological conditions prevailed.

According to witnesses at the accident site it was very cloudy with slight rain. The wind was barely noticeable and the temperature 8°C.

Radio Communications

There were radio transmissions between the Aviation Supervision Office and the ultralight. The radio communications were not recorded.

Aerodrome Information

Rheine-Eschendorf Airfield (EDXE) is located east of Rheine-Eschendorf in the control zone of Rheine-Bentlage Airport (ETHE). Airport elevation is 131 ft AMSL. It has one grass runway oriented 105°/285° which is 920 m long and 30 m wide.

Flight Recorders

The air traffic service provider radar data recording was available to the BFU for evaluation purposes.



Accident site

Photo: BFU

In the engine area a severed propeller blade was found in the ground. The second propeller blade (Varia propeller) could not be found. Slivers of the glass canopy were found in a radius of 15 m around the wreckage.

Several pieces from the cockpit were strewn across a distance of approximately 500 m in north-west direction to the wreckage. Starting approximately 500 m before the accident site several aeronautical charts were found strewn across a distance of 300 m. The aircraft log book was found about 80 m south-east and a jacket of the pilot about 70 m south-east of the wreckage.

Fuel had leaked from the fractured fuel tank.

The wreckage was complete as was the control system.

The rescue system had not deployed. A member of the Bomb Squad of the Landeskriminalamt Niedersachsen (state office of criminal investigation) disarmed the rocket prior to the salvage operation.



Propeller hub

Photo: BFU

The BFU examined the propeller flange and blade. The fractured blade correlated with the fracture surface on the propeller hub.

Fire

There was no fire.

Additional Information

Propeller

According to the maintenance documentation the propeller had been sent to the manufacturer for repairs and inspection. The manufacturer certified on 27 April 2012 repairs and inspection of the propeller VARIA 170/2/R-PA 07095661703NN.

Part of the inspection was the completion of the Service Bulletin LAA CR 1.9.2010 / Sicherheitsmitteilung des Deutschen Aero Club e.V., Luftsportgerätebüro DAEC 2012-003. Different propellers of the manufacturer had caused problems during operation which were the reasons for the safety report. Vibrations and unbalance

during operation may cause damages to the mountings of the propeller blades on the propeller flange. In order to ensure safe operation, every 150 operating hours the affected propellers have to be sent to the manufacturer for inspection (refer to appendix Sicherheitsmitteilung Nr. DAeC 2012-003). The aircraft manufacturer stated that a propeller blade torn out in flight could cause strong vibrations. These vibrations could be transmitted to the fuselage which in turn may cause the opening of the cockpit cover.

In their certificate (refer to appendix) dated 24 April 2012 the manufacturer referred to the next maintenance interval of the propeller:

Complete repair and inspection of propeller type VARIA 170/2/R – PA 070956617013NN (immensity 300 hours)

The manufacturer of the propeller stated that the certificate contained the reference that a periodic inspection after 300 operating hours has to occur (immensity 300 hours). This does not mean, however, that the next inspection has to occur after another 300 operating hours. Because this had been the first of the periodic 150-operating-hours inspections the next would have to be conducted at 300 operating hours.

The manufacturer's Instructions for Use Chapter Maintenance and Periodic Inspections for adjustable Woodcamp-VARIA propellers states the maintenance intervals:

Required inspections (TBO) at the manufacturer (dealer):

- 1) after 50 operating hours (incl. engine check),*
 - 2) after 150 operating hours (if the manufacturer does not set an earlier date),*
 - 3) after 300 operating hours (if the manufacturer does not set an earlier date),*
- further examinations each after another 150 operating hours.*

The technician of the club stated that he had understood the certificate of the manufacturer (refer to Appendix) to mean that the propeller could be operated for another 300 hours until the next inspection.

Definitions

A Maintenance Resource Management (MRM) was introduced in aviation to strengthen the human factors area. Among other things, a resulting requirement is standardised language and concept.

The Dictionary of Aeronautical Terms does not list the term “immensity”. The Cambridge Dictionary states: „*the extremely large size of something*“ and the Oxford Dictionaries: “the extremely large size, scale, or extent of something”.

Analysis

General

The pilot held a valid licence and ratings to conduct the flight. Loading and centre of gravity were within the prescribed limits. The meteorological conditions were sufficient for the sightseeing flight. There were no limitations except for scattered slight rain.

Due to loss of one propeller blade strong vibrations occurred which resulted in the opening of the cockpit cover. The resulting turbulence impaired the controllability of the ultralight. According to the stipulations of the manufacturer the engine would have had to be shut off immediately once vibrations occurred. The relatively low flight altitude of 1,000 ft limited the time the pilot had available to trigger the rescue system.

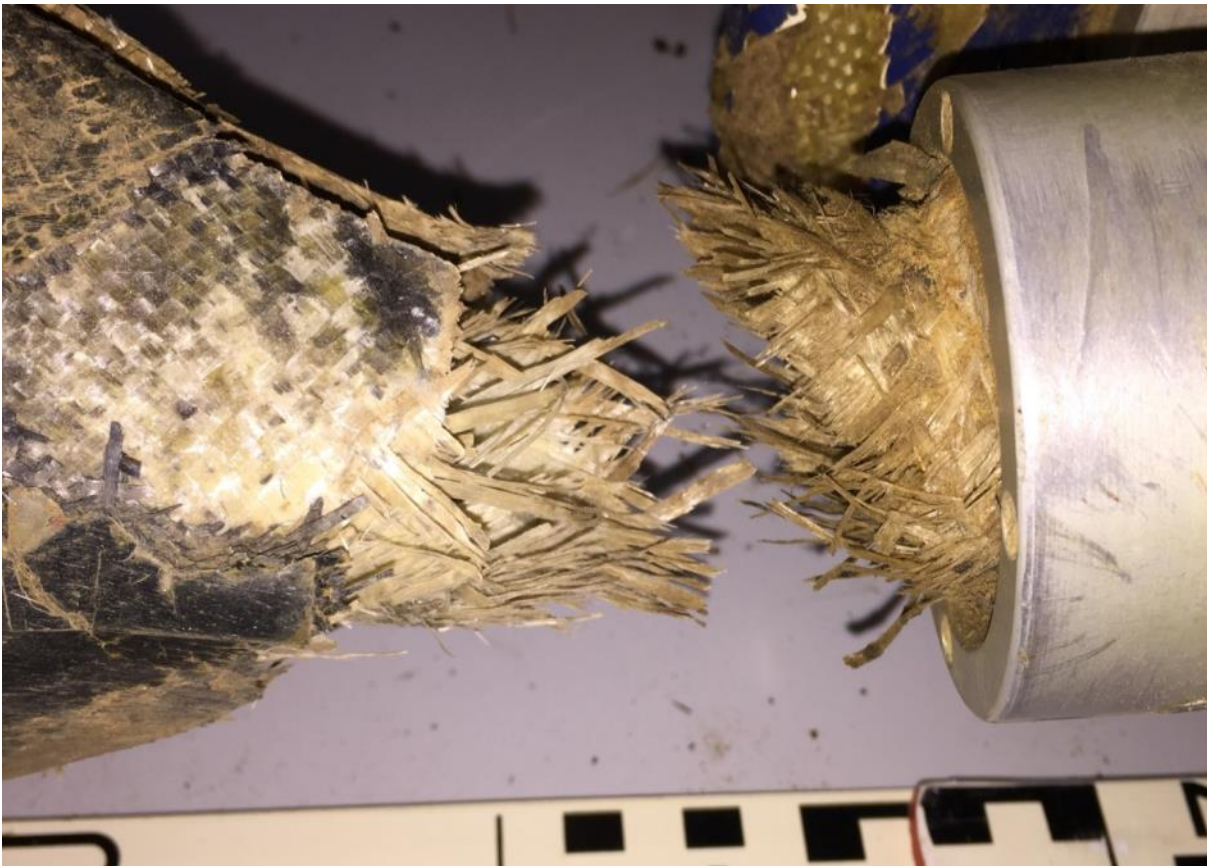
The abruptly ending radar recording and the almost vertical impact in a cornfield indicates that the pilot had lost control.

Technical Examination

The ultralight had a German certificate of registration. On 18 December 2009 the manufacturer conducted a material examination due to their technical report M-EV97-01/2009. The threshold value for airworthiness of 375 MPa was exceeded. There was no indication of material fatigue. The maintenance had been documented and club members conducted it regularly.

The propeller had a maintenance interval of 150 operating hours. The propeller had been operated for 266 hours after the last periodic maintenance by the manufacturer and was therefore operated outside the requirements of the manufacturer.

Parts of the aircraft’s interior were strewn across an almost straight line of 500 m. The distribution of the parts was not influenced very much because the prevailing wind was very slight. The BFU is of the opinion that in cruise flight a propeller blade had separated, which caused the cockpit cover to open.



Fracture propeller blade

Photo: BFU

The fracture surface of the propeller blade found at the accident site showed that the blade had been bent backward toward the fuselage. The opposite fracture surface indicated that the blade had been pulled out of the propeller hub. It is highly likely that one propeller blade had been torn out of the hub during cruise flight and the other remained in the propeller flange until the impact and therefore caused unbalance and heavy vibrations. The vibrations resulted in the opening of the cockpit cover. Because of the open cockpit cover objects from inside the aircraft were flung out and later found on the way to the wreckage.

The BFU has received several reports of damages on the mountings of this propeller type, which cause the loss of propeller blades. The investigation revealed significant exceedance of the maintenance interval and non-adherence to the requirements of the manufacturer. The BFU is of the opinion that adherence to the recommendation of the Service Bulletin LAA CR 1.9.2010 / Sicherheitsmitteilung Deutscher Aero Club e.V., Luftsportgerätebüro DAEC 2012-003 may have indicated material changes of the mountings of the propellers.

Individual Actions

For several years the technician had conducted the maintenance of the ultralight. He knew that the ultralight's propeller was subject to a safety report and maintenance action was required after 150 operating hours. The propeller had been sent to the manufacturer for inspection within the 150 hour interval but would have had to be sent again for the next periodic maintenance action. The manufacturer's "confirmation form" dated 24 April 2012 contained the note "*immensity 300 hours*", which the technician took to mean that the propeller may be operated for another 300 hours. The term means: Operation of the propeller until total operating time of 300 hours.

In his statement regarding the "confirmation form" the manufacturer said that because the propeller of the accident ultralight had been sent in prior to reaching 150 hours, they had set or extended the next maintenance interval to 300 hours (*immensity 300 hours*).

Deficiency of the foreign-language communication

The manufacturer had designed the certificate and it did not meet any other form common in aviation. The diction did not meet any of the usual choice of wording and language use common in aviation (e.g. release certificate EASA form 1). The manufacturer stated that for ultralight aircraft there are no maintenance requirements and standards.

In regard to standard phraseology and specification there was no common language basis between manufacturer and technician. The BFU is of the opinion that the design of the certificate chosen by the manufacturer and the choice of wording resulted in misinterpretation and therefore in exceedance of the maintenance interval. Had the technician asked the manufacturer about the chosen wording (*immensity 300 hours*) misinterpretation could have been avoided.

Conclusions

The air accident was caused by the loss of a propeller blade during cruise flight. Because of the propeller unbalance vibrations occurred which resulted in the opening of the cockpit cover. The ultralight became uncontrollable and impacted the ground.


The significant exceedance of the propeller's maintenance interval contributed to the accident. Due to the communication between manufacturer and technician with not

standardised wording in the “confirmation form” misinterpretation by the technician of the maintenance interval occurred. The not activated rescue system aided the severity of the accident.


Investigator in charge: Knoll
Field investigation: Brandes

Braunschweig: 25.09.2017

Appendix

 DEUTSCHER AERO CLUB e.V. LUFTSPORTGERÄTE-BÜRO	
Sicherheitsmitteilung Nr. DAeC 2012-003	Datum: 07.11.2012
An alle Halter und Piloten von Ultraleichtflugzeugen mit Verstell-Propeller: WOODCOMP Varia 160/170 in-flight adjustable	LAA-Czech Republik Bulletin Mandatory Nr.: September 1 st , 10 Sept/01
<p>Das Luftsportgeräte-Büro informiert die Halter von Ultraleichtflugzeugen über die Kontrolle / Austausch von Propellerteilen. Für die Propeller WOODCOMP VARIA 160/170 hat die LAA-CZ das Mandatory Bulletin 2010 Sept/01 herausgegeben:</p> <p>Um den sicheren Betrieb der Propeller zu gewährleisten, sind folgende Aktionen nötig: (To ensure the necessary safety of propellers, I hereby order the following measures:)</p> <ol style="list-style-type: none"> 1. Jeder Propeller dieses Typs muss innerhalb 150 Betriebsstunden zum Hersteller WOODCOMP zur Inspektion/Reparatur (1. Each propeller of this type must be submitted for inspection/repair to be performed the manufacturer - WOODCOMP - no later than after 150 hours of operation) 2. Bei der Inspektion/Reparatur werden die Blattanschlüsse aus Aluminium gegen stärkeres Material mit vergrößertem Übergangsradius ausgetauscht. (2. During inspection/repair, duralumin attachments of blade roots will be replaced with new parts made of stronger material, and with increased radius of transition from cylindrical section to support ring.) 3. Modifizierte Propeller werden entsprechend gekennzeichnet. (3. Propellers with this modification will be marked correspondingly.) 4. Wenn ungewöhnliche Vibrationen während des Betriebs bemerkt werden, ist die Benutzung schnellst möglich einzustellen und der Propeller an WOODCOMP zur Inspektion/Reparatur senden. (4. If you notice unusual vibrations during operation, stop using the propeller immediately and submit it to WOODCOMP for inspection/repair.) 5. Hinweis: Wenn sich Spinner-Befestigungsplatten oder andere Teile zwischen Propeller und Propellerflansch befinden, ist der Planlauf aller Teile zu prüfen. (5. Note: when propeller hub cover attachment plates or other parts between propeller shaft and propeller hub are used, it is necessary to check the plane of propeller rotation.) <p>September 1st, 2010, Ing. Václav Chvála, LAA ČR Chief Technician</p> <p>Das Luftsportgeräte-Büro weist dringend auf die Beachtung der Herstelleranweisung hin. Maßgebend ist das englische Original: http://www.woodcomp.cz/download/varia-bulletin-en.pdf</p>	
F. Einführer Leiter Luftsportgeräte-Büro	M. Bätz Technik Luftsportgeräte-Büro

Sicherheitsmitteilung Nr. DAeC 2012-003


WOODCOMP
CZECH REPUBLIC

Odolena Voda 24.4.2012


Confirmation form :


Complete repair and inspection of propeller type VARIA 170/2/R - PA 070956617013NN
(Immensity 300 hours)

- Inspection of propeller hub – materiology test
- Installation of new axial ball bearings
- Inspection of control mechanism – cam mechanism (pitch adj.mechanism)
- Installation of new teflon stones
- Installation of new propeller blades roots (Bulletin LAA CR 1.9.2010)
- Assembly of propeller + torque application
- Balancing inspection
- Running test on an engine stand – 10min

+ Bulletin LAA CR 1.9.2010

Jiri Holoubek – WOODCOMP




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Certificate of the propeller manufacturer

The statement of Accident Investigation Institute of Czech Republic (UZPLN) was added onto the investigation report.

Re: Statement re air accident of EV97 Euroctar in Germany on 30 November 2013 (VARIA 170/2/R propeller – serial No. PA070956617013)

Woodcomp Propellers hereby express their deep regret concerning the above stated unfortunate air accident that took place while operating the Varia 170/2/R propeller.

First and foremost, it is necessary to emphasise that in 2009 the Varia propellers were manufactured by Woodcomp s.r.o. which currently operates under the trademark PropTest s.r.o. with its registered office at Osadní 869/32, Holešovice, 170 00 Prague 7 (Business ID No. 26417693).

The successor of Woodcomp s.r.o. (the current PropTest s.r.o.) is the company under the name Woodcomp Propellers s.r.o. This company has been providing the servicing, maintenance and repairs of the stated propeller type since 2013, and it also continues in manufacturing of the same type of propeller. Woodcomp Propellers is also currently the holder of the type certification for the Varia series propellers. The company is a design organisation and is a holder of EASA DOA, POA and MOA. Given the above stated facts, Woodcomp Propellers is of the opinion that it is authorised to bring its preliminary opinion concerning the above mentioned air accident.

Primarily, it is essential to state that the current holder of the type certificate of the subject propeller deems it non-feasible to express any opinion on the propeller accident responsibly as the damaged propeller has not been submitted to it upon the accident for an expert inspection, qualified disassembly and thorough investigation of the causes of its destruction. Likewise, no documents, such as the propeller manual – User Manual, documents on performed installation of the said propeller into the aircraft, documents regarding the aircraft testing performed with the installed subject propeller prior to the aircraft release into the air operation, etc. have been submitted.

Furthermore, no written records on the propeller operation and its inspections and maintenance which are prescribed by the manufacturer as well as by the rules of the air have been submitted either. In the instructions for use provided to each and every buyer of the propeller the manufacturer prescribes keeping a log and mandatory inspections, maintenance and, if needed, the replacement of individual components of the propeller.

The prescribed revisions and inspections at the manufacturer or at the servicing organisation authorised by the manufacturer are the most important measures ensuring a safe operation of the aircraft as well as of its parts throughout its lifespan.

The subject propeller basic data

VARIA 170/2/R propeller – serial No. PA070956617013.

Date of manufacture: 18 August 2009

The subject propeller sold to: Flugsportzentrum Bautzen – Dr.Peter Kuhn (Evektor – the dealer in Germany)

On 1 September 2010, revision was performed, and on 24 April 2012, the LAA service bulletin was issued for Karl Henrik

No further revisions until the time of the accident on 30 November 2013 (280 hours from the last performed revision) were performed.

General

An aircraft propeller is a very complex and complicated product exposed to extreme strains, thus the manufacturer pays a very careful attention when manufacturing it in accordance with the required prescribed technology procedures and processes and from materials prescribed in relation to the certification tests. The Varia range propellers have been designed and engineered with the maximum regard to safety. Each of the

manufactured propeller types undergoes approval procedure by the relevant air authority which in the case of the Czech Republic is the LAA (Light Aircraft Association). During the said approval procedure the design of the propeller as well as its prototype were subjected to a complex testing process the result of which was the issuance of the type certificate for the given propeller type. It is exactly those performed tests forming part of the certification procedure on which both, the propeller lifespan and the extent of the periodical inspections, are based. The manufacturer is obliged, based on the performed tests, to determine the maintenance procedure schedule in order to ensure sufficient inspecting of the stated aviation product throughout the time of its operation and further also the replacement and repair of the extremely strained or damaged parts of the propeller. Each of the propeller operators is then obliged to abide by the ordered maintenance procedure. It is the maximum the manufacturer can do in order to ensure the safe operation of its product.

Based on the submitted information it is especially necessary to state that 650 pieces of the Varia propeller were manufactured and built in different types of aircraft and that they have been used by pilots all over the globe without any reported trouble or difficulty. The users have not noticed any problems with this propeller, which would be related to the manufacturing defect.

Based on the experience from the sustained 16-year-long operation it may be stated that the most common cause of propeller destruction is its damage in the previous operation caused e.g. by the collision of a foreign object with the propeller blade (a bird, a foreign object debris detached from the aircraft, a foreign object ingested by the propeller from the ground, collision with the propeller while handling e.g. another aircraft or a car, etc.). Significant initial damage may also occur upon fierce pushing or dragging of the aircraft propeller. Pilots often underestimate these events without recording them and namely fail to fulfil their obligation to have the propeller subjected to professional revision. As regards a bird strike or a collision with another foreign object, it happens quite often that the pilot does not even know of such an event. Nevertheless, no propeller may be designed so as not to be damaged e.g. by a bird strike, although the damage may not be visible and the propeller may be damaged due to this event even with a considerable delay. We need to realise that the propeller is the most vulnerable part of the aircraft whose even seemingly minor damage may have ultimately fatal consequences. Namely for such cases, it is necessary that users comply with the prescribed propeller reviews specified in the User Manual. Preventive maintenance inspections are aimed at detecting possible hidden damage to the propeller, ensuring compulsory replacement of prescribed components and thus preventing possible future problems of the operated propeller. Insufficient maintenance may thus be a major related cause of destruction of the propeller. The chapter Prescribed Inspections in the propeller User Manual clearly stipulates routine inspections after 50, 150 and 300 hours of operation. Inspections shall be performed by an authorised mechanic, authorised service organisation or the parent production company.

Unfortunately, we need to say that propeller users repeatedly and consistently grossly violate the duty of inspections prescribed by the manufacturer, breaching thus the manufacturer's regulations and threatening their own safety and the safety of their surroundings with their aircraft operation.

To illustrate this point I state that approx. 650 Varia propellers operated in configuration with a variety of aircraft have been manufactured since 2001 until now. We may certainly assume that some propellers will have flown for hundreds or thousands of flight hours over the period of 16 years of operation. The company records show that only 320 out of the total number of propellers have been sent to the manufacturing plant for servicing so far. However, out of this number nearly a half of the propellers were damaged in operation. Those propellers were thus not sent for routine servicing, but for repair. Out of the total number of 650 pieces, only 160 pieces were sent for compulsory inspection and many propellers arrived at the point when their recorded hours flown were e.g. 600 hours, i.e. those propellers have been overused considerably. We may thus say that almost 70% of the propellers of the said type are not serviced in compliance with the manufacturer's regulations and we may insist with a good degree of certainty that over time controllable pitch propellers are subject to a number of destructions as no such a heavily stressed component of the aircraft as a propeller can last for an indefinite number of operating hours.

CONCLUSION

Due to the aforementioned reasons, Woodcomp Propellers s.r.o. strongly disagrees with the proposed conclusions which we consider irrelevant, calculated and drawn in absence of the manufacturer. We reject the conclusions of the investigation commission and remind you that we are able to prove through demonstrative tests and analyses that all the approved procedures and technologies have been and are being complied with.

Best regards,

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Aleš Křemen
CEO

This investigation was conducted in accordance with the regulation (EU) No. 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation and the Federal German Law relating to the investigation of accidents and incidents associated with the operation of civil aircraft (*Flugunfall-Untersuchungs-Gesetz - FIUUG*) of 26 August 1998.

The sole objective of the investigation is to prevent future accidents and incidents. The investigation does not seek to ascertain blame or apportion legal liability for any claims that may arise.

This document is a translation of the German Investigation Report. Although every effort was made for the translation to be accurate, in the event of any discrepancies the original German document is the authentic version.

Published by:

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