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Mobility and Transport**  
*Air Accident Investigation Unit*

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*CCN*

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## **Safety Investigation Report**

# **TELEDYNE CONTINENTAL MOTOR IO-520-F ENGINE FAILURE ON 09 MAY 2011**

**Ref. AAIU-2011-23-FZEN-OO-A\*\***

**Issue date: 29 June 2012**

**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 and EU Regulation 996/2010, 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 17-3 of the EU regulation EU 996/2010 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 H. Metillon

The report was compiled by H. Metillon and was published under the authority of the Chief Investigator.

## **NOTES:**

1. For the purpose of this report, time will be indicated in UTC, unless otherwise specified.
2. ICAO document 9859 "Safety Management Manual" was used to identify the hazard and the consequences related to the accident.

## SYNOPSIS

<b>Date and hour of the accident:</b>	9 May 2011, around 9:00UTC
<b>Aircraft:</b>	Cessna U206G
<b>Accident location:</b>	FZEN Bansankusu airfield (Democratic Republic of Congo)
<b>Aircraft owner:</b>	Aviation Sans Frontières Belgique ASBL
<b>Type of flight:</b>	Private
<b>Persons on board:</b>	5

### Abstract:

The engine of OO-A\*\* failed when the airplane entered the circuit to land on runway 24 of FZEN.

The propeller completely stopped turning around 6 seconds later.

The pilot focused flying the airplane and took the decision to manage a steep descent in order to land on 06 runway instead of runway 24.

The pilot landed the airplane successfully and succeeded to stop the airplane at the end of R/W 06 without damage.

The first investigation, made on the incident site, showed that the engine crankshaft was fractured at cheek number 3.

### Cause

The probable root cause of the crankshaft fracture is the installation, during the last engine overhaul, of an unapproved sealant on the parting surfaces of the crankcase halves.

### Category of hazard identified during the investigation <sup>1</sup>

Non adherence to approved data during maintenance.

### Consequence <sup>2</sup>

Engine failure (SCF-PP).

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<sup>1</sup> Hazard – Condition or object with the potential of causing injuries to personnel, damage to equipment or structures, loss of material, or reduction of ability to perform a prescribed function.

<sup>2</sup> Consequence – Potential outcome(s) of the hazard

## 1 FACTUAL INFORMATION

### 1.1 History of flight

The airplane OO-A\*\* was operated by “Aviation Sans Frontières” for logistical support of Non Governmental Organizations.

On Monday 09 May 2011, a flight with 4 passengers was scheduled from Mbandaka to Basankusu airfield in the Democratic Republic of Congo.

After the refuelling, the pilot performed a normal pre-flight inspection, checked the W&B and put the passengers onboard. The airplane took off at 07:45Z.

After take off and climb, the airplane was levelled off at flight level 075 and flew without problem in direction of Basankusu airfield. (Distance between both airfields is around 118 Nm).

At 30 Nm from Basankusu airfield, the descent was initiated down to 2000 feet altitude and then the airplane proceeded to enter right downwind of runway 24.

At 1000 feet AGL all the engine parameters were normal (2400RPM, 21Hg, 100kts and 10° flaps) when suddenly the engine completely lost power and the propeller stopped turning, within 4 to 10 seconds.

After a quick review of the engine parameters and of the fuel selector position, the pilot focused flying the airplane and took the decision to manage a steep descent in order to land on the 06 runway.

The pilot landed successfully, as the airplane touched down between 500m and 1000m from the threshold and the pilot succeeded to stop at the end of runway 06 without damage.

The first examination of the engine on site by the supporting maintenance organization confirmed the engine failure was due to the rupture of the crankshaft.

“Aviation Sans Frontières” sent the engine back to Belgium for investigation. It arrived at AAIU(Be) at the end of November 2011.

## 1.2 Injuries persons

Injuries	Pilot	Passenger	Others	Total
Fatal	0	0	0	0
Serious	0	0	0	0
Minor	0	0	0	0
None	1	4	0	5
Total	1	4	0	5

## 1.3 Damage to aircraft

The airplane was not damaged.

The on-site examination of the engine by the pilot immediately revealed a hole at the top of the right hand crankcase, above cylinders number 1 and 3.



A few weeks later, a licensed engineer of the supporting maintenance organization was sent to the site for the engine replacement and also for the first investigation of the broken engine.

The engineer removed, with some difficulties, the cylinder 1 and could see that the crankshaft was broken at cheek number 3. Important damage was also noticed to the neighbouring parts inside the crankcase.

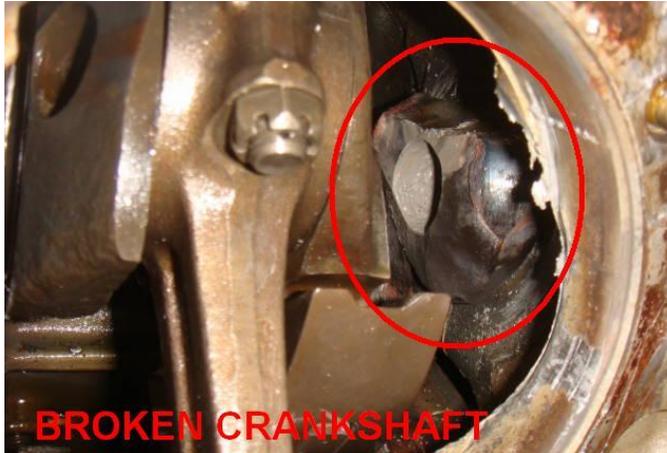


Figure 1: rupture of the crankshaft as seen after removal of one cylinder

#### 1.4 Other damage

No other damage.

#### 1.5 Personnel information

**Pilot:**

Sex: Male  
Age: 57 years old  
Nationality: Belgian  
License: Commercial pilot Aeroplane License SEP (land).  
License valid until 1 July 2014.  
Rating SEP (land) valid until 31 July 2011.  
Medical certificate: Class 1, valid until 11 March 2012.  
Experience: Total Flight experience: over 4450FH.  
Large experience as military pilot on Marchetti 260, Fouga Magister, Lockheed T33, Alpha Jet, Mirage V, F16 and Northrop T-38.

#### 1.6 Aircraft and engine information

**Airframe:**

Manufacturer: Cessna Aircraft Company  
Type: U206G  
Serial number: U20603690  
Built year: 1977  
Airplane total time: 5169:13 Flight Hours

**Engine:**

Manufacturer: Teledyne Continental Motors  
Type: IO-520-F (9)  
Serial number: 286023-R  
Total flight hours: 1425 FH since the last overhaul, performed on February 2005. (3110 FH since the last “rebuilding” by TCM on January 1991)

**Certificate of Registration:**

Certificate of registration number 10093, delivered by BCAA on 15 December 2006.

**Certificate of airworthiness:**

EASA Form 25 delivered by BCAA on 24 January 2007.

**Airworthiness Review Certificate:**

EASA Form 15a renewed on 19 January 2011, valid until 24 January 2012.

**History of the engine:**

The engine Teledyne Continental Motors IO-520-F (9) SN: 286023-R was factory rebuilt on 8 April 1991 and was installed in the airplane at 2011FH (ACTT).

The engine almost flew the recommended time between overhaul (1685 FH instead of 1700FH) before being removed from service.

In February 2005, the engine had been overhauled and reinstalled on the airplane by the company “Air service International” (EASA Part 145 Approved facility number DK.145.0007). A copy of the delivered Certificate of Release to Service is enclosed at the end of this report.

This engine overhaul was performed when the airplane total time was 3695h and the engine time since the previous “Rebuilding” was 1685h. As the crankshaft serial number denotes a manufacture date 31 January 1991, the crankshaft total time since manufacture was around 3110h when the rupture occurred.

There is no known record of propeller strike during the first 147 flight hours since engine overhaul (when the A/C was operated by previous owner) and it was demonstrated that no propeller strike occurred since the airplane was OO-A\*\* registered.

The cylinders number 1 and 2 were replaced on 9 July 2009 at 729h since O/H and the cylinder number 3 was replaced on 3 February 2010 at 949h since O/H. All cylinders were replaced due to exhaust valve leakage.

An Airworthiness Directives compliance record dated 06 November 2006 originating from previous owner is given in appendix.

### **Maintenance**

The maintenance was regularly performed by a BCAA approved Part M subpart F maintenance organization.

The last maintenance, a 200h inspection, was performed on 11 April 2011 at 5151 FH (ACTT), 18 FH before the engine failure.

Reportedly, the oil filter was cut for contamination examination and no anomaly was found.

## 2 ANALYSIS

### 2.1 First findings after stripping of the engine

It took a long time to send the engine back to Belgium and finally the engine was dismantled on 24 November 2011.

The engine accessories were removed and, after opening the crankcase, it was confirmed that the crankshaft was broken at cheek number 3, between main and rod journal number 2.



Figure 2: view after crankcases splitting



The following identification numbers and markings were found on the crankshaft:

- On the propeller flange: A319111N and "V/U"
- On the cheek number 4: 649130 (Note: two last digits are not certain)
- "VAR" and DU" on the cheek number 6

## 2.2 Damage description

A thorough visual inspection of the engine was performed during and after the engine disassembly, taking a particular attention to the engine damage inside the crankcase.

The following damage and/or findings were visible:

- The crankshaft was broken at cheek number 3 located between the rod journal number 2 and the main journal number 2.
- The inspection focused to distinguish the damage which was already present before the crankshaft rupture from those which were caused by the crankshaft rupture.
- Obviously, some damage located in the area of the crankshaft main journal number 2 and number 3 were present before the crankshaft failure.

In particular, the main journal bearings number 2 and 3 had turned inside the crankcase. The crankshaft MJ number 2 housing was extremely worn due to the rotation of the bearings and the bearings were extremely worn and destroyed. This damage could not have been produced during the 4 to 10 seconds necessary to fully stop the engine after the power loss.

- The main journal bearings number 3 showed also evidence that they had turned inside the crankcase, but they were less damaged than bearings number 2.
- The bearings of connecting rod number 2 were extremely worn and damaged and showed traces of overheating. Additionally, one bolt of the connecting rod was broken, probably as a consequence of the crankshaft rupture.
- The crankcase halves showed evidence of fretting on the parting faces located around the thru bolts, in the area of the main journal bearing housings.



Figure 3: Rear side of the crankshaft



Figure 4: Propeller side of the crankshaft



Figure 5: Main journal number 1



Figure 6: Main bearings number 1



Figure 7: Main Journal number 2



Figure 8: Main bearings number 2

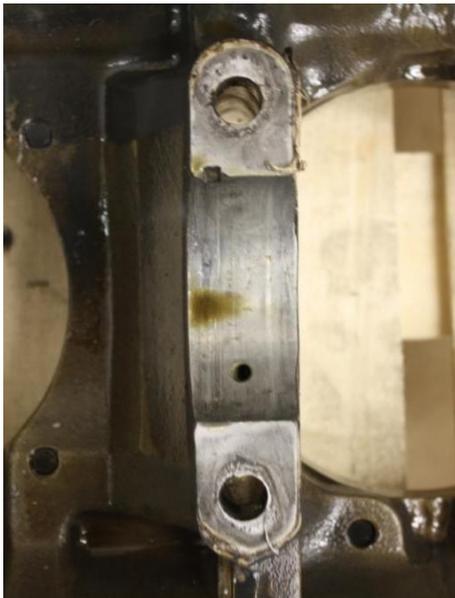


Figure 9: Main journal number 3

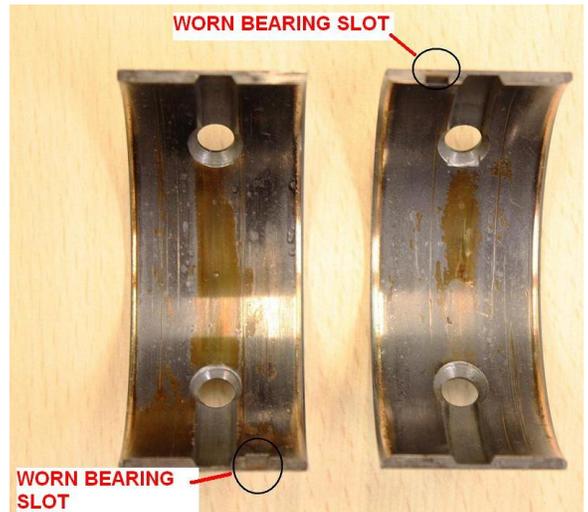


Figure 10: Main bearings number 3



Figure 11: connecting rod number 2

### 2.3 Airworthiness Directives considerations

The Airworthiness Directives compliance record dated 06 November 2006 from previous owner is given in appendix.

This listing originates from “Air service International” and was delivered to the new owner “Aviation sans Frontières Belgique ASBL” when the airplane was sold.

No new Airworthiness Directive regarding the crankshaft were published since this listing had been written.

Out of the AD listing, 4 are dealing specifically with the engine crankshaft.

<u>AD Reference</u>	<u>Effective date (mmddyy)</u>	<u>Subject</u>	<u>Compliance</u>
77-05-04	03/11/1977	Crankshaft – Check propeller operation and oil filter.	Recurrent every 10h up to 100h. Not applicable
97-26-17	01/23/1998	Non VAR crankshaft replacement.  VAR Crankshaft ultrasonic inspection.	VAR crankshaft installed. Recurrent each removal crankshaft. C/W during last O/H dated 09/02/2005

99-19-01	09/30/1999	No. 2 and No. 5 Crankshaft cheek Inspections (Crankshaft mfg or rebuilt between January 1, 1998 and December 31, 1998).	One time NA by date of crankshaft manufacture
2000-23-21	12/12/2000	Crankshaft connecting rod journal failure Crankshaft material inspection. (Applicable to Crankshaft mfg from April 1, 1998 and March 31, 2000).	One time. NA by date of crankshaft mfg 31 January 1991

As seen on the above table, all the airworthiness directives concerning the crankshaft were properly performed.

#### 2.4 Additional findings

After the splitting of the crankcase, we noticed that the parting surfaces of the crankcase halves had been reassembled using a white silicone appearance sealant.

This sealant was clearly present and was in (relative) good condition at the top parting surfaces of the crankcase halves and also at the aft portion of the mating surfaces at the accessory section.

By contrast, the white sealant had completely worn out and was no more visible on the mating surface around the through bolts while a lot of remains of white sealant were present along their borders.

The bearing slot of bearings number 3 were completely worn out and evidence of turning were visible on the outer surface of the bearings (bright appearance).



Figure 12: Examples of elongated bearing tang lock slot

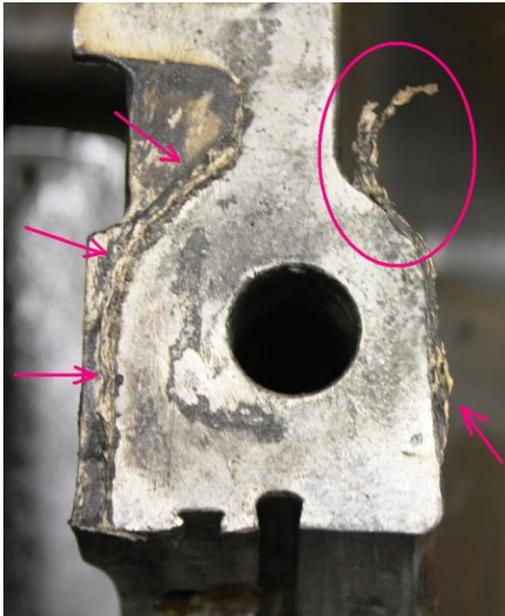


Figure 13: Examples of white sealant remains around the through bolts mating surfaces

## 2.5 Probable cause of the crankcase fretting and of the turning of the bearings

Normally the reassembly of crankcase halves must be performed using “Permatex Aviation Grade 3” and a silk thread as mentioned in “Section XIII Final Assembly and test” of *Overhaul Manual reference X30039*.

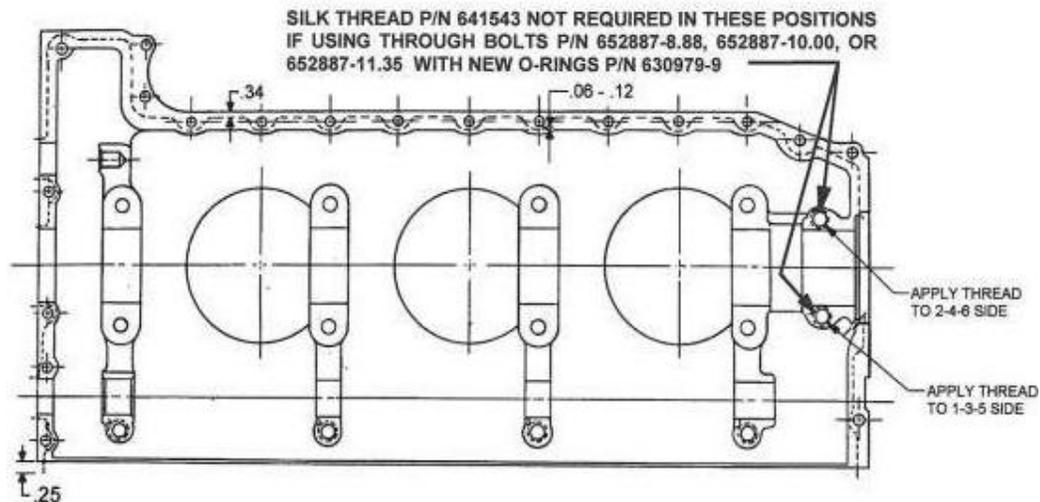
Among other chapter 8-6 (g) of the O/H Manual mentions the following:

*Spread a thin film of No.3 Aviation Permatex on the left crankcase parting flange. Lay lengths of No.50 silk thread on parting flange. Thread should be inside the bolt holes but never on the edge.*

Furthermore, the Service Information Letter SIL99-2B concerning the “Current Listing of Sealants, Lubricants, & Adhesives authorized by TCM” gives a detailed guideline about the “Engine Crankcase Threading Diagram”.

Both manufacturer O/H Manual and SIL refer clearly to Permatex and Silk Thread method to ensure the different parts of the crankcase are oil-tight.

Moreover, SIL99-2B provides on page 15 a drawing showing precisely where the silk thread must be installed. (A copy of this page is enclosed at the end of this report).



**FIGURE 6. 0470, I0470, L/I0520, L/TSI0520, I0550 SANDCAST  
ENGINE CRANKCASE THREADING DIAGRAM**

Figure 14: Drawing of SIL99-2B page 15.

SIL99-2B warns also the engine installer in order to apply thread and Permatex only as illustrated.



Figure 15: Warning of SIL99-2B page 15.

Obviously, a white sealant was used when putting the crankcase halves together instead of Permatex and silk thread.

Moreover, this white sealant was also installed on the parting surfaces located around the through bolts, which is not recommended by SIL99-2B.

After consultation with a TCM specialist it was confirmed that no additional means to ensure oil-tight in the area of the through bolt was necessary when the new style through bolts incorporating 2 O-rings were installed.

Finally, we can say that the installation of a sealant around the through bolts was both unapproved and unnecessary.

By using anything else than Permatex and Silk thread it will not be possible to obtain the proper torque/clamping force required to keep the crankcase halves together.

SIL99-2B warns also the engine installer in order to apply thread and Permatex only as illustrated.

If anything else other than Permatex and Silk string is used, the crankcase halves will move over time and wear out any type of sealant/silicon material that may have been applied.

Once this occurs the main bearings begin to rotate causing the bearing slots to impact the opposite crankcase halve causing an impression to begin.

It will also be noticed that the bearing begins “shifting” forward and aft also elongating the bearing tang lock slot.

Once the elongation begins, it is only a matter of time, before the bearing shifts forward and aft enough to impact the rotating crankshaft on or near the main bearing journals forward and aft radius's. This impact causes a nick in the outer nitriding layer and allows heat to build up in that particular area.

Finally, the different parts became more and more damaged, probably showing an exponential evolution, and the combination of the following factors led inexorably to the crankshaft separation:

- When rotating, the main journal bearings limited drastically the oil pressure necessary to properly lubricate the connecting rod number 2 the consequence being that extreme friction occurs at the connecting rod bearings.
- The extreme wear at the main journal housing did not allow the crankshaft to be adequately supported during rotation => vibration and deformation of the crankshaft.
- The friction of MJ bearings number 2 against the crankshaft main journal radius caused damage in the outer nitriding layer rendering the crankshaft brittle in this area.

### 3 CONCLUSIONS

#### 3.1 Findings

- The engine stopped operating when the airplane was entering the circuit in order to land.
- There was no visible indication during the pre flight inspection and during the last flight showing that the engine's condition was degrading rapidly.
- First investigation on site showed that the engine suffered extensive damage; in particular the crankshaft was broken.

#### 3.2 Causes

The probable root cause of the crankshaft fracture is the installation, during the last engine overhaul, of an unapproved sealant on the parting surfaces of the crankcase halves.

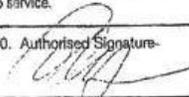
In particular, using anything else other than Permatex and Silk string around the through bolts mating surface will cause over time chafing of the crankcase halves, bearing looseness and finally crankshaft rupture.

### 4 SAFETY RECOMMENDATION

#### Recommendation 2012-P-11 to CAA-DK

AAIU(be) recommends the Danish Civil aviation Authority to investigate the maintenance organization in order to determine if the installation of an unapproved sealant on the parting surfaces of the crankcase halves was limited, or not, to the particular OO-A\*\* engine and to recall eventual other concerned engines.

**ENCLOSURE N°1: Certificate of Release to Service engine TCM IO-520-F (9) SN: 286023-R**

1. APPROVING NATIONAL AVIATION AUTHORITY / COUNTRY <b>CAA / Denmark</b>		2.  <b>EASA FORM 1 AUTHORISED RELEASE CERTIFICATE</b>			3. FORM TRACKING NUMBER <b>No. 01225</b>	
4. APPROVED ORGANISATION NAME AND ADDRESS <b>AIR SERVICE INTERNATIONAL A/S</b> TØNDERVEJ 59      PHONE 45 - 74 67 67 66 DK-6330 PADBORG      FAX 45 - 74 67 68 28				5. WORK ORDER/CONTRACT/INVOICE <b>04693</b>		
6. ITEM	7. DESCRIPTION	8. PART NO.	9. ELIGIBILITY(*)	10. QTY	11. SERIAL / BATCH No.	12. STATUS / WORK
1	ENGINE	10-520-12	VAR	1	286023	OVERHAUL
2	MAGNETO	10-349350-5	VAR	1	646957	OVERHAUL
3	MAGNETO	10-349350-4	VAR	1	646958	OVERHAUL
13. REMARKS <i>ENGINE OVERHAUL IAW TCM O/H MANUAL X 30039H MAGNETO OVERHAUL IAW TCM O/H MANUAL X 42001-1</i>						
14. Certifies that the items identified above were manufactured in conformity to: <input type="checkbox"/> Approved design data and are in condition for safe operation <input type="checkbox"/> Non-approved design data specified in block 13			19. <input checked="" type="checkbox"/> Part-145.50 Release to Service <input type="checkbox"/> Other regulation specified in block 13 <small>Certifies that unless otherwise specified in block 13, the work identified in block 12 and described in block 13, was accomplished in accordance with PART 145 and in respect to that work the items are considered ready for release to service.</small>			
15. Authorised Signature		16. Approval / Authorisation Number <b>DK.145.0007</b>	20. Authorised Signature 		21. Certificate / Approval Ref. No. <b>DK.145.0007</b>	
17. Name		18. Date (D/M/Y)	22. Name <i>OLE SPANGBERG</i>		23. Date (D/M/Y) <i>4/10/05</i>	

**ENCLOSURE N°2: Airworthiness Directives records engine TCM IO-520-F (9) SN: 286023-R**

Direktive. Referenz	Beschreibung Betroffenes Bauteil	Bemerkungen	Ein	Per	Fristen ( Einm. / Per. )	Datum Flugzeit	Anmerkung Insp.
LTA CONTINEN D-1977-099 Ref.: AD 77-05-04, SB M77-6	CRANKSHAFT FAILURE	CHECK FIRST 100 H. SEE SB FOR COMPLIANCE IFF NO PROBLEMS FOUND NO MORE ACTION. SEE AD NOTE FOR INSTRUCTION.	X	X	04.05.1977 + 10 H / FREQ = 10 H	06.07.2001 3.246 AC TT	NA (TIME INST.) KHP
LTA CONTINEN D-1977-256/2 Ref.: AD 77-13-22R1, SB M90-17	CRANKCASE CRACKS	SEE CASTING NO. FOR AFFECTED CRANKCASE. ALL CRANKCASE WITH CONTI. LOGO NOT AFFECTED	X	X	20.08.1977 + 50 H / FREQ = 100 H	10.08.2004 3.682 AC TT	NA KHP
LTA CONTINEN D-1977-304 Ref.: SB T-353	CYLINDER VALVE CRANKSHAFT	SB AUFGEHOHEN. !!!!!!!!!!!!!!!!!!!!!!! AFF ENG. ALL O/H FROM CONTINENTAL OR ROLLS ROYCE.	X		21.11.1977 + 25 H	06.07.2001 3.246 AC TT	NA (TIME INST.) KHP
LTA CONTINEN D-1979-210/2 Ref.: AD 79-05-09, SB M79-2R1	LOSS OF OIL PRESSURE INDICATION	FOR AFF SN.SEE AD NOTE. PUMP ASSY OR OIL PRESS.RELIF VALVE CHANGED IN SERVICE FROM 1.4.78 - 5.1.79	X		25.08.1981 + 50 H	06.07.2001 3.246 AC TT	NA (TIME INST.) KHP
LTA CONTINEN D-1980-052 Ref.: AD 39-3647	FAILURE OF CYLINGER FLANGE	ONLY CYL. O/H FROM AIRMOTIVE ENGINEERING CORP.P/N AE-C639272 TT, AE-C-639274 TT, AE-C-631397 TT.	X		21.02.1980 + 50 H	06.07.2001 3.246 AC TT	NA KHP
LTA CONTINEN D-1982-013 Ref.: AD 81-24-06, SB M80-26R1	FUEL PUMP FUEL LEAKAGE	CHECK PUMP FOR LEAKS BETWEEN SEGMENT. ENG. FROM 1. SEP. 1978 TO 31. JULY 1980 RECURING INSPECTION UNTILL PART B. OF AD NOTE IS PERFORMED.	X	X	23.11.1981 + 10 H, OR 50 H, WHAT OCCURS FIRST / FREQ = 10 H	06.07.2001 3.246 AC TT	NA (TIME INST.) KHP
LTA CONTINEN D-1983-057 Ref.: AD 82-27-03, SL ROTO MASTER 27	TURBIN HOUSING CRACK INSPECTION	AFFECTED MODEL:325E10 AND 3AT6EE10J2. FOR AFFECTED P/N SEE AD NOTE.	X	X	22.03.1983 + 50 H / FREQ = 200 H	06.07.2001 3.246 AC TT	NOT INSTALLED KHP
LTA CONTINEN D-1986-053/5 Ref.: AD 86-13-04 R3, SB M87-19, M86-7,M91-6	SEE SB FOR AFFECTED CYL. P/N	INSP. CYL. BARREL FOR CRACKS. CYL. MANUFACTURED BY TELDYNE CONTI. ON OR AFTER 01.01.1981. SEE SB. FOR AFF. ENGINE SN.	X	X	17.12.1987 + 35 H / FREQ = 35 H	06.07.2001 3.246 AC TT	NA (TIME INST.) KHP

Reg. D-EHKN  
Model U206G  
S/N U20603690  
Date 06.11.2006  
AC TT 3.838  
AC TC  
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Directive list



## Directive list

Reg. D-EHKN  
Model U206G  
S/N U20603690  
Date 06.11.2006  
AC TT 3.838  
AC TC  
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Direktive, Referenz	Beschreibung Betroffenes Bauteil	Bemerkungen	Ein	Per	Fristen ( Einm. / Per. )	Datum Flugzeit	Anmerkung Insp.
LTA CONTINEN D-1993-123 Ref.: AD 93-10-02, SB 93-12	VALVE RETAINER KEY INSTALLATION INSPECT.	ALL NEW MANUF. / O/H FROM CONTI IN 1993. INSP. FOR PROPER INST. OF INT/EXT. VALVE RETAINER KEY	X		22.07.1993 + 1 D	06.07.2001 3.246 AC TT	NA (TIME INST.) KHP
LTA CONTINEN D-1994-191 Ref.: AD 91-19-03, SB M90-14	OIL FILTER FROM MANUF. CHAMPION	INSP. CHAMPION OIL FILTER FOR MANUF. DATE	X		18.08.1994 + 1 D, OR 5 H, WHAT OCCURS FIRST	06.07.2001 3.246 AC TT	NA (TIME INST.) KHP
LTA CONTINEN D-1994-201/2 Ref.: AD 93-08-17, SB M91-10 R1	OIL PICK-UP TUBE INST. IN OIL SUMP	S/N: ALLE. SIEHE SB. CHECK NEW AND O/H ENG. FOR CORRECT OIL PICK-UP TUBE INST.	X		27.10.1994 + 25 H	09.02.2005 3.695 AC TT	DURCHGEF5HRT KHP
LTA CONTINEN D-1995-278 Ref.: SB 94-11	OIL PUMP GASKET	S/N: SEE SB/DIR. FOR AFF. GASKET P/N SEE LTA.	X		31.08.1995 + 10 H	06.07.2001 3.246 AC TT	NA (TIME INST.) KHP
LTA CONTINEN D-1996-233/3 Ref.: AD 96-12-06, SB 94-8A	MAGNET TIMING	ONE OR MORE CYL PN 641917 AND BELOWBOTH MAGNETOS 24 +1-1. ALL CYL PN 641917AND HIGHER BOTH MAGNETOS 28 + -1	X		15.08.1995 + 50 H	10.08.2004 3.682 AC TT	NA KHP
LTA CONTINEN D-1996-283 Ref.: AD 96-12-22	OIL FILTER ADDAPTER FROM CESSNA	ALL ENGINES FROM CESSNA AIRCRAFT COMPANY. ADAPTER PN SEE LTA. N O T CONTINENTAL ADAPTERS	X	X	10.10.1996 + 100 H / FREQ = 100 H	23.08.2001 3.251 AC TT	NA WK
LTA CONTINEN D-1998-054 Ref.: AD 98-01-08	EXHAUST VALVE ROCKER ARM.	ONLY ENG. MODIF WITH SE8594SW. ONLY ROCKER ARMS FROM PERFORMANCE INGENEERING. RELACE AFFECTED ROCKER ARMS WITHIN 25 H	X		29.01.1998 + 1 D, OR 5 H, WHAT OCCURS FIRST	06.07.2001 3.246 AC TT	NA KHP
LTA CONTINEN D-1998-062 Ref.: AD 97-26-17, SB 96-10/CSB 96-8	CRANCSHAFT CRAKS.(SIX CYLINDER ENGINES)	PERFORM INSPECTION AT EACH OVERHAUL OR WHENEVER CRANKSHAFT IS REMOVED.!!!!!! TBO-VERLZNGERUNG NUR WENN LTA DURCHGEF5HRT.!!!!!!	X		29.01.1998 + 1 D	09.02.2005 3.695 AC TT	DURCHGEF5HRT KHP

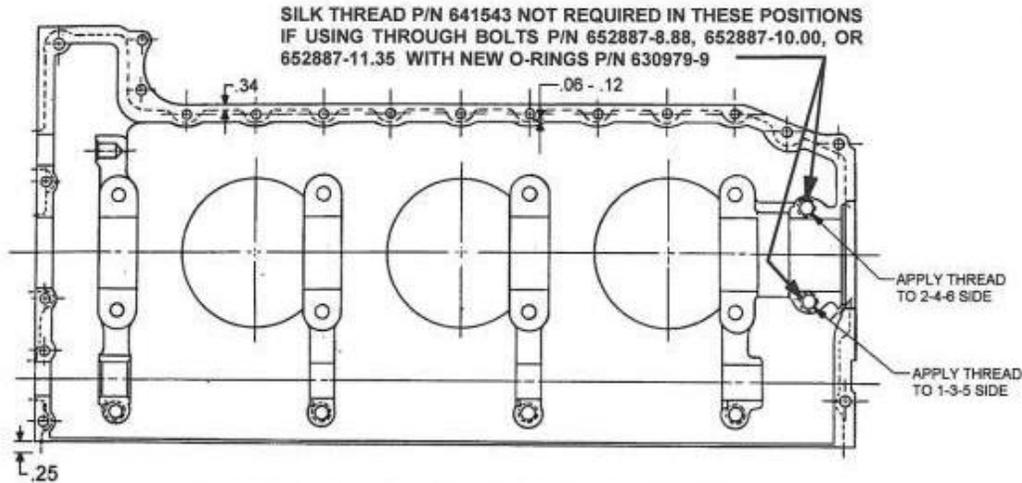


## Directive list

Reg. D-EHKN  
Model U206G  
S/N U20603690  
Date 06.11.2006  
AC TT 3.838  
AC TC  
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Direktive. Referenz	Beschreibung Betroffenes Bauteil	Bemerkungen	Ein	Per	Fristen ( Einm. / Per. )	Datum Flugzeit	Anmerkung Insp.
LTA CONTINEN D-1998-393 Ref.: AD 98-17-11	CRANKSHAFT INSPECTION.	CRANKSHAFT FROM NELSEN BALANCING SERVICE FAA NO. NB7R820J. CRANKSHAFT INSTALLED 01.02.95 AND UP.	X		08.10.1998 + 10 H	06.07.2001 3.246 AC TT	NA (TIME INST.) KHP
LTA CONTINEN D-1999-174/2 Ref.: AD 99-19-01, SB 99-3C, 99-6A	CRANKSHAFT CRACK INSPECTION.	AFFECTED CRANKSHAFTS: ALL ENGINES (NEW AND OVERHAULED FROM 01.01.1998 TO 31.12.1998. AFFECTED SN SEE SB 99-3	X		20.05.1999 + 1 D OR 10 H	27.07.2000	NA KHP
LTA CONTINEN D-2000-175/2 Ref.: AD 2000-23-21, SB 00-5D	CRANKSHAFT INSPECTION.	ALL ENGINE OVERHAULED OR REPAIRED AFTER 01.04.1998 TO 31.03.2000	X		01.06.2000 + 10 H	06.07.2001 3.246 AC TT	NA (TIME INST.) KHP
LTA CONTINEN D-2001-150 Ref.: AD CN 2001-139A	FEHLERHAFT DURCHGEFÜHRTE ARBEITEN.	ALLE MOTOREN UND KOMPONENTEN DIE BEI DER FA. PROVENCE AERO MAINTENANCE ÜBERHOLTODER REPARIERT WURDEN.	X		31.05.2001 + 1 D	06.07.2001 3.246 AC TT	NA KHP
LTA CONTINEN D-2004-202 Ref.: AD 2004-08-10, SB 04-1R1	RAM ENGINES OR CYLINDERS	AFFECTED ECI CYLINDER P/N AEC631397 FOR AFFECTED CYLINDER P/N SEE SB.	X		27.04.2004 + 50 H	10.08.2004 3.682 AC TT	NA KHP
LTA CONTINEN D-2006-032 Ref.: AD CF-2005-40	NON CONFORMANTS OF MAINTENANCE	ENGINES FROM B.C. AERO ENGINES.	X		20.01.2006 + 30 D OR 50 H	21.08.2006 3.753 AC TT	NA KHP
LTA BEND-IGN Ref.: AD 2005-04-12, SB 643B	LH MAINTENANCE INTERVALS FOR MAGNETOS	500H INSPECTION ALL TCM/BENDIX MAGNETOS	X	X	06.04.2005 / FREQ = 4 Y OR 500 H	09.02.2005 3.695 AC TT	DURCHGEFÜHRT KHP
LTA BEND-IGN Ref.: AD 2005-04-12, SB 643B	RH MAINTENANCE INTERVALS FOR MAGNETOS	500H INSPECTION ALL TCM/BENDIX MAGNETOS	X	X	06.04.2005 / FREQ = 4 Y OR 500 H	09.02.2005 3.695 AC TT	DURCHGEFÜHRT KHP

**ENCLOSURE N°3: Selected extract of SIL 99-2B**



**FIGURE 6. 0470, I0470, L/I0520, L/TSI0520, I0550 SANDCAST ENGINE CRANKCASE THREADING DIAGRAM**

**CRANKCASE SEALANT AND THREADING PROCEDURE**

1. Use full strength non-thinned Permatex aviation grade 3D. Shake or mix well before using.

**WARNING**

**Apply thread and permatex only as illustrated.**

2. Apply Permatex Number 3D to the 2-4-6 case half. Apply Permatex only in areas where thread is shown. When applying, use short light brush strokes until an even thin coat is obtained. The Permatex should be viscous enough that most of the brush marks disappear; if not, use a new can of Aviation Permatex. Allow the Permatex to air dry to a tacky condition before threading.

**NOTE...**

Do not apply Permatex to crankshaft nose seal area.

3. Apply a thin translucent coat of TCM Gasket Maker P/N 646942 not to exceed .010 inch thick to 1-3-5 case half. Apply Gasket Maker in all areas that will mate with areas where Permatex was applied on 2-4-6 case half.
4. Apply and position grade D silk thread P/N 641543 on case halves as specified in Figure 6.

Be sure free ends of thread are covered by gaskets except at the nose oil seal.

5. Clean crankcase crankshaft front oil seal land with Locquic Primer "N" and apply an even coat of gasket maker.
6. Assemble crankcase halves, install and torque all crankcase hardware in proper sequence in accordance with the applicable overhaul manual as soon as possible.

**NOTE...**

Take care to prevent displacement or damage to the crankshaft oil seal and silk thread. Insure thrust washer halves and bearing halves remain in place.

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MO	DAY	YEAR	MO	DAY	YEAR		15 of 28 SIL99-2	B
03	29	99	10	17	2005			