TELEDYNE CONTINENTAL® AIRCRAFT ENGINE

MANDATORY SERVICE BULLETIN

Category 1 **MSB09-1**

The Subject Matter Of This Service Bulletin Is Incorporated In Whole Or In Part In An FAA Issued Airworthiness **Directive**

Technical Portions FAA Approved

SUBJECT: CYLINDER REPLACEMENT

BACKGROUND: As of the date of this Bulletin, Teledyne Continental Motors (TCM) has identified the cause of cracks in 35 cylinders manufactured from November 1, 2007 to January 30, 2009. TCM has determined that the EQ3 cylinder head casting tool used in the manufacturing process created an area of reduced thickness that may result in a crack after prolonged operation. This crack manifests itself in the area between the upper sparkplug bore and the fuel injector/primer nozzle bore. The cracked cylinders returned to date have occurred on engines from high use fleet operations with occurrence times ranging from approximately 430 to 1,300 total hours. Replacement cylinders conforming to proven production history will be provided.

> While there have been no accidents or incidents related to this cylinder head crack, TCM has elected to replace all cylinder assemblies with the EQ3 head casting. TCM will provide warranty assistance for this purpose through December 31, 2009.

PURPOSE:

This Mandatory Service Bulletin (MSB) is issued to require inspection to identify the EQ3 cylinders and to require the further inspection and replacement of those cylinders in order to ensure a timely and orderly retirement of the EQ3 cylinders.

This MSB has been divided into two sections to aid all parties in complying with its requirements.

Section 1 provides the details on cylinder inspection and replacement:

Step 1: Provides instructions to determine if your cylinders have been manufactured with the EQ3 head.

Step 2: Provides cylinder inspection and replacement instructions based on the total hours in service.

Section 2 contains tables listing engines that may have EQ3 heads installed and cylinders shipped by TCM from November 01, 2007 through January 30, 2009 that may have cylinder assemblies with the EQ3 head on them.

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COMPLIANCE: Identify all potentially affected cylinders, within the next twenty (20) flight hours but in no case later than April 30, 2009. If any cylinder has the EQ3 head, notify TCM to schedule a replacement. All EQ3 cylinders must be replaced no later than December 31, 2009.

For cylinders with 400 hours or more total time in operation, Step 2 (Cylinder Inspection Instructions) must also be completed within twenty (20) hours of operation or by April 30, 2009, whichever is earlier, and every fifty (50) hours of operation thereafter until cylinder replacement.

WARNING

IF A CRACK IS PRESENT THE CYLINDER MUST BE REPLACED IMMEDIATELY. TO SUPPORT REPLACEMENT AT AN AUTHORIZED CENTER, A REPOSITIONING FLIGHT OF NOT TO EXCEED FIVE (5) HOURS IS AUTHORIZED IF NO FUEL OR COMBUSTION STAINING IS FOUND AT THE SUBJECT LOCATION. IF SUCH INDICATIONS ARE FOUND, CONTACT TCM BEFORE FURTHER FLIGHT.

MODELS AFFECTED:

O470-G, K, L, R, S, M, U; IO470-C, D, E, F, H, L, M, N, S, U, V, VO; TSIO470-B, C, D; IO520-A, B, BA, BB, C, CB, D, E, F, J, K, L, M, MB; TSIO520-AF, B, BB, C, CE, D, DB, E, EB, G, H, J, JB, K, KB, L, LB, M, N, NB, P, R, T, UB, VB, WB; IO550-A, B, C, D, E, F, L; IOF550-B, C, D, E, F, L engines which may have had a cylinder replaced utilizing a cylinder shipped from TCM between November 1, 2007 and January 30, 2009. The serial numbers of affected cylinders are listed in Table 2 of this MSB.

All New and Rebuilt engines as listed in Table 1 shipped from TCM between November 1, 2007 and January 30, 2009

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SECTION 1

GENERAL

The EQ3 head casting cylinder assemblies are identified by a four (4) fin relief at the bottom lower left hand portion of the cylinder head (as installed on the engine) and a depression cast EQ3 in the cylinder head rocker boss (overhead) area as shown in Figures 1 and 2. These cylinders are to be replaced in accordance with the guidelines set forth in this bulletin and based upon applicable engine model and aircraft manufacturer procedures. All EQ3 cylinders must be replaced no later than December 31, 2009.

STEP 1 - EQ3 CYLINDER HEAD IDENTIFICATION AND REGISTRATION

For all engines and cylinders identified in Tables 1 and 2 of this MSB: confirm affectivity in accordance with the following instructions.

Inspect all potentially affected cylinders, within the next twenty (20) flight hours, but no later than April 30, 2009. Verify affectivity of all engine models and cylinders in accordance with Tables 1, 2, and 3. The engine serial number is located on the engine data plate and the cylinder serial number is located on the crankcase side of the top portion of the cylinder head as installed on the engine (Reference Figure 3).

Note: For affected cylinders with 400 hours or more total time in operation, <u>STEP 2</u> is also required.

- A. For engine models identified in Table 3, use the engine log book to determine if a cylinder replacement has occurred between November 1, 2007 and January 30, 2009. If cylinder replacement(s) are verified to have occurred, proceed to "Cylinders Installed on an Engine" below. If no cylinder replacements have occurred in the specified time period, no further action is required. Make an engine logbook entry recording the results of this inspection and compliance with this MSB.
- B. For those engines and cylinders listed in Tables 1 and 2, or cylinders requiring further inspection in accordance with STEP 1.A above, proceed as follows:

CYLINDERS INSTALLED ON AN ENGINE:

NOTE: All cylinders must be checked for affectivity. Depending on manufacturing date and/or maintenance practices an engine may have any number between zero and six of the affected cylinders.

1. Open or remove the engine cowling in accordance with the airframe manufacturer's instructions to the point necessary to allow visual access to the cylinders on both sides of the engine (Figure 4).

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- 2. Access the area of the cylinder head casting as shown in Figure 5. This area is visible as you look down at the cylinders in their mounted condition from above the engine compartment.
 - a. Look for a 6 digit part number casting mark such as "649166" or similar. In addition to the casting mark number, there may be a letter indicator such as AE, AD or similar. (Reference Figure 5)
 - b. If a number casting mark is present, it indicates the cylinder head assembly is not covered by this MSB and no further action is required. Make an engine logbook entry recording the results of this inspection and compliance with this MSB.
 - c. If a number casting mark **is not** present, then the cylinder may be covered by this MSB. Verify the EQ3 cylinder S/N as shown in Figure 3 is present and listed in Table 2. If so, proceed to completion and registration and **STEP 2**.

CYLINDERS NOT INSTALLED ON AN ENGINE:

- 1. Cylinders with a depression cast EQ3 in the cylinder head rocker boss area as shown in Figure 2 are covered by this MSB and must be exchanged.
- 2. Contact TCM in accordance with the completion and registration section below.

"CAUTION": DO NOT INSTALL EQ3 CYLINDERS ON ANY ENGINE.

COMPLETION AND REGISTRATION

- 1. Upon completion of the required inspection, if no EQ3 cylinders are identified, reinstall or replace all items that have been removed to perform this inspection in accordance with the applicable manufacturer's instructions. Tighten all loosened or removed hardware in accordance with the applicable manufacturer's instructions. Make an appropriate logbook entry stating findings and compliance with this MSB.
- 2. If EQ3 cylinders are identified:
 - a. Complete the Customer Information form located at the end of this bulletin.
 - b. Proceed to **STEP 2**.

STEP 2 – CYLINDER INSPECTION AND REPLACEMENT INSTRUCTIONS

A. For affected cylinders less than 400 hours total time in operation:

1. No detailed inspection is required beyond those provided in the applicable TCM maintenance and overhaul manuals and/or the applicable airframe manufacturer's maintenance manual. Reinstall or replace all items that have been removed to perform this inspection in accordance with the applicable manufacturer's instructions. Tighten all loosened or removed hardware in accordance with the applicable manufacturer's instructions. Make an appropriate logbook entry stating findings and compliance with the MSB. Contact TCM to schedule a replacement cylinder. All EQ3 cylinders must be replaced no later than December 31, 2009.

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B. For affected cylinders with 400 hours or more total time of operation

The following inspection must also be accomplished. Additional inspections are required at each fifty (50) hour interval until the cylinder is replaced.

WARNING

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- 1. Remove the engine cowling and cooling baffles in accordance with the airframe manufacturer's instructions to the point necessary to allow visual access to each affected cylinder's upper spark plug area.
- 2. Remove the ignition lead from the top spark plug. Remove the top spark plug.

NOTE: Visual evidence of a crack in the inspection area between upper spark plug bore and fuel injection nozzle/primer port as indicated in Figure 6 does not require further verification with a dye penetrant inspection.

- 3. Install a protective cap in the top spark plug bore to prevent contamination from entering the cylinder bore area.
- 4. Using a flashlight and a 10x power magnifying glass, perform a detailed visual inspection of the area between the fuel injector nozzle boss and the upper spark plug. (Reference Figures 6 and 7)
- 5. If crack indications are found, proceed to step 12(a) below.
- 6. If no crack indications are noted during the visual inspection or if the mechanic has any questions concerning the presence of cracks in the affected area, proceed to step 7 below.

NOTE: Dye-penetrant inspection must be performed by a properly qualified mechanic in accordance with the manufacturer's instructions. Use "Magnaflux® Portable Spotcheck Kit" or equivalent. These kits can be purchased through most aviation industry distributors.

- 7. Using Dye-penetrant "Cleaner/Remover", thoroughly clean the area between the upper spark plug bore and fuel injection nozzle/primer port as shown in Figure 7.
- 8. Spray the "Penetrant/Dye" onto the clean/dry area indicated in Figure 7. Allow the "Penetrant/Dye" enough time to set in accordance with the manufacturer's instructions.
- 9. Remove and clean the area in which the "Penetrant/Dye" was applied in accordance with the manufacturer's instructions.

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- 10. Spray the "Developer" onto the clean/dry area indicated in Figure 7. Allow the "Developer" enough time to dwell in accordance with the manufacturer's instructions for the determination of the existence of a crack.
 - a. If a crack is present, its appearance and location will be similar to that shown in Figure 8.
 - b. Refer to Step 12, below, for required actions in either a "No Crack Present" or a "Crack Present" case.
- 11. Repeat steps 2 through 7 on all remaining identified EQ3 head casting cylinder assemblies.
- 12. Complete the following based on the results of the inspection.
 - a. Preceding Inspection Reveals No Cracks
 - i. If required, clean the area thoroughly to remove the Developer. Remove the protective cap from the spark plug bore. Prepare the previously removed spark plugs for re-installation in accordance with the spark plug manufacturer's maintenance instructions. Reinstall each spark plug in its previous location. Torque the spark plug to 300 360 in/lbs.
 - ii. Install the ignition lead and torque 5/8" B-nut to 90 95 in/lbs and 3/4" B-nut to 100 120 in/lbs.
 - iii. Reinstall all items that have been removed to perform this inspection. Tighten all loosened or removed hardware in accordance with the applicable manufacturer's instructions.
 - b. Preceding Inspection Reveals Cracks
 - i. If a crack is verified and fuel or combustion staining was noted in the inspection area, contact TCM before further flight.
 - ii. Contact TCM via one of the means listed below and on the Customer Information Form to schedule replacement of the affected cylinder(s).
 - iii. If a crack is verified but no evidence is found of fuel or combustion staining, then the engine may be operated for up to five (5) hours for the purpose of relocating the aircraft to a cylinder replacement location.

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NOTE: Replacement cylinders will be readily identified by both the "NT" indented casting mark located in the cylinder head rocker arm boss region and by the absence of a four (4) fin relief. These replacement cylinders can also be identified by having a serial number sequence of AC09BA001 and higher.

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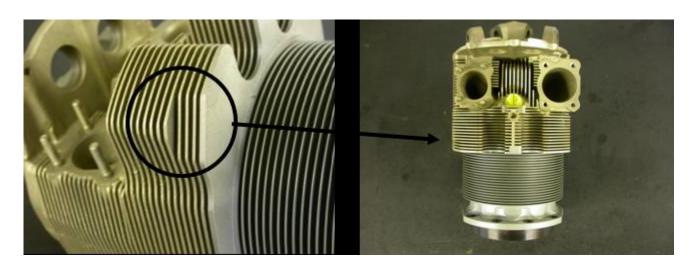


FIGURE 1 Cylinder Head Casting Four (4) Fin relief Location

SECTION 2

TABLE 1
Possible EQ3 Cylinder Equipped Engines Shipped From
The Factory

| | The Factory |
|-------------------|-------------------------|
| Engine Model | Engine Serial Number |
| 0470K (Rebuilt) | 049560 - 049562 |
| 0470L (Rebuilt) | 832925 - 832936 |
| 0470R (New) | 466902 - 466915 |
| 0470R (Rebuilt) | 834219 - 834266 |
| 0470S (New) | 464643 - 464645 |
| 0470S (Rebuilt) | 819195 - 819207 |
| 0470U (New) | 470902 - 470907 |
| 0470U (Rebuilt) | 834458 - 834498 |
| I0470C (Rebuilt) | 295611 - 295615 |
| I0470F (Rebuilt) | 833666 - 833678 |
| I0470L (New) | 468685 - 468689 |
| I0470L (Rebuilt) | 298347 - 298372 |
| I0470N (New) | 458199, 458200 |
| I0470N (Rebuilt) | 096841 - 096844 |
| I0470S (Rebuilt) | 109430 - 109432 |
| I0470V (New) | 455812 |
| I0470V (Rebuilt) | 171360 - 171362 |
| I0520BA (Rebuilt) | 822977 – 823000, 836650 |
| I0520BB (New) | 580226 - 580232 |
| I0520BB (Rebuilt) | 830218 – 830250, |
| | 836900 - 836910 |
| I0520C (Rebuilt) | 831016 - 831048 |
| I0520CB (New) | 576414 - 576424 |
| I0520CB (Rebuilt) | 831830 - 831869 |
| I0520D (New) | 581599 - 581613 |

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| Engine Model | Engine Serial Number |
|---------------------|------------------------------------|
| I0520D (Rebuilt) | 832577 - 832634 |
| I0520E (Rebuilt) | 215988 - 215993 |
| ` ' | |
| I0520F (New) | 579399 - 579413 |
| I0520F (Rebuilt) | 835185 - 835267 |
| I0520J (Rebuilt) | 216546 - 216548 |
| I0520K (Rebuilt) | 224180 |
| 10520L (New) | 577309 - 577319 |
| I0520L (Rebuilt) | 295480 - 295500 |
| | 835900 - 835926 |
| I0520M (Rebuilt) | 826223, 826225, 826230, 826231, |
| | 826234 - 826237 |
| I0520MB (Rebuilt) | 829201 - 829212 |
| I0550A (Rebuilt) | 817109 |
| 10550B (New) | 688601 - 688639 |
| | 690427 - 690451 |
| | 690462 - 690464 |
| | 690472, 690478 - 690481 |
| | 690495 - 690553 |
| | 690563, 690564, 690570 |
| | 690624 - 690635 |
| I0550B (Rebuilt) | 834721 |
| | 834732 - 834790 |
| I0550C (New) | 688375 - 688400 |
| | 690151, 690152 |
| | 690190 |
| | 690198 - 690217 |
| | 690224 - 690231 |
| | 690252 - 690284 |
| | 690318 - 690361 |
| | 692439 |
| I0550C (Rebuilt) | 817108 |
| | 833538 - 833565 |
| | 833570 - 833584 |
| | 833590 - 833600 |
| | 833604 - 833606 |
| | 833609 - 833611 |
| TOTTOD (NI) | 833614, 833615 |
| I0550D (New) | 680099 - 680109 |
| 10550D (D. 1. 11) | 680113 - 680119 |
| I0550D (Rebuilt) | 833226 |
| | 833250, 833253 |
| | 833255 - 833287 |
| | 833290 - 833297 823200 - 823215 |
| | 833300 - 833315 |
| IOSSOE (Norm) | 833319, 833320 |
| I0550E (New) | 681149, 681150 |
| I0550F (New) | 679602 - 679615 |
| I0550F (Rebuilt) | 824211 - 824246 |
| I0550L (New) | 678010 - 678012 |
| I0550L (Rebuilt) | 289227 - 289241 |
| TSI0520AF (New) | 525105 |
| TSI0520AF (Rebuilt) | 245264 |

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| Engine Model | Engine Serial Number |
|-----------------------|---|
| TSI0520B (Rebuilt) | 176861 |
| TSI0520BB (Rebuilt) | 287688 |
| TSI0520BE (New) | 528530 |
| TSI0520BE (Rebuilt) | 273861 - 273865 |
| TSI0520C (New) | 501657 - 501659 |
| TSI0520C (Rebuilt) | 178652 - 178659 |
| TSI0520CE (New) | 530186 - 530191 |
| TSI0520E (Rebuilt) | 826357 - 826359 |
| TSI0520EB (New) | 510851, 510852 |
| TSI0520EB (Rebuilt) | 815210 - 815216 |
| TSI0520H (New) | 506915, 506917 |
| TSI0520H (Rebuilt) | 217497 - 837151 |
| TSI0520J (Rebuilt) | 825255, 825256 |
| TSI0520JB (New) | 533002, 533003 |
| TSI0520K (Rebuilt) | 224611 |
| TSI0520LB (Rebuilt) | 815518 - 815522 |
| TSI0520M (New) | 532378 |
| | 532381 - 532404 |
| | 532406 - 532411 |
| | 532413 - 532416 |
| | 532418 |
| | 532423 - 532427 |
| | 532429 |
| TSI0520M (Rebuilt) | 830756 - 830781 |
| TSI0520N (Rebuilt) | 228649 |
| TSI0520NB (Rebuilt) | 822443 - 822458 |
| TSI0520P (New) | 513959 |
| | 513960 |
| TSI0520P (Rebuilt) | 278946 - 278955 |
| TSI0520R (New) | 522840 - 522856 |
| | 522858 - 522860 |
| | 522862, 522864, 522865, 522867 |
| TECHOSOOD (D. I. 110) | 522869 - 522871 |
| TSI0520R (Rebuilt) | 289626 - 289630 |
| | 289632, 289633, 289635 - 289638 |
| | |
| | 289640 - 289643 289645 - 289649 |
| | 289651, 289653, 289654 |
| TSI0520T (New) | 515445, 515446 |
| TSI0520T (Rebuilt) | 829573 - 829587 |
| 1220201 (Itabulit) | 829589 |
| TSI0520UB (New) | 527615 - 527620 |
| TSI0520UB | 809479 |
| | 809481 - 809484 |
| | 809487 |
| TSI0520VB (New) | 529134 - 529142 |
| TSI0520VB (Rebuilt) | 832103 |
| | 832105 - 836163 |
| | 836165, 836167, 836170, 836171, 836173, |
| | 836175, 836176, 836178 |
| | 836180 - 836183 |

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| Engine Model | Engine Serial Number |
|-----------------|----------------------|
| | 836185, 836186 |
| TSI0520WB (New) | 518961 - 518964 |

TABLE 2 Possible EQ3 Cylinders

| | 1 obsible EQS Cylinders | |
|-----------------------|---|-------------------|
| Cylinder Part | Engine Models | Cylinder Serial |
| 655467A1,A3,A5,A7, | O470-G,K,L,R,S,M IO470C | AC07KA001 through |
| A8 | | AC09AB999 |
| EQ7020, EQ7093 | | |
| 655468 A1, A3, A5,A6, | O470-U | |
| A7, A8, A9 | IO470-D,E,F,H,L,M,N,S,U,V,VO | |
| EQ7027, EQ7094 | TSIO470-B, C, D | |
| 655469A1,A6, A7, A8 | IO520-A,B,BA,BB,C,CB,D,E,F,J,K,L,M,MB | |
| EQ6989, EQ7048 | IO550-A,B,C, IOF550-B, TSIO520-AF,CE,UB | |
| 655470A1,A3, A4 | TSIO520-B,BB,C,D,DB,E,EB,G,H,J,JB,K,KB, | |
| EQ7053 | TSIO520-L,LB,M,N,NB,P,R,T,VB,WB | |
| 655471A1,A3, A4 | IO550-D,E,F,L IOF550-D,E,F,L, | |
| EQ7089 | | |
| 655472A1,A3, A4 | IO550-B,C | |
| EQ7088 | | |
| 655484A1,A4, A5 | IO550-B,C, IOF550-B,C | |
| EQ7350 | | |
| 655485A1,A3, A4 | IO550-D,F,L | |
| EQ7309 | | |

Cylinder Serial Number Explanation

| ID | YEAR | MONTH | SERIAL |
|----|------|-------|--------|
| AC | 07 | K | A001 |

ID = **AC** is the component identification code for cylinder.

Year = 07 represents 2007

Month = K is the month code for November (A = January, etc)

Serial = Begin with A001each month, After A999, will go to B001, etc.

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TABLE 3

Potential Engine Models For Replacement Cylinder Installation

O470-G, K, L, R, S, M, U

IO470-C, D, E, F, H, L, M, N, S, U, V, VO

TSIO470-B,C,D

IO520-A,B, BA, BB, C, CB, D, E, F, J,K, L, M, MB

TSIO520-AF, B, BB, C, CE, D, DB, E, EB, G, H, J, JB, K, KB, L, LB, M, N, NB, P, R, T, UB, VB, WB

IO550-A, B, C, D, E, F, L

IOF550-B, C, D, E, F, L



FIGURE 2 Location of EQ3 Marking in the Cylinder Head Rocker Box Overhead Area

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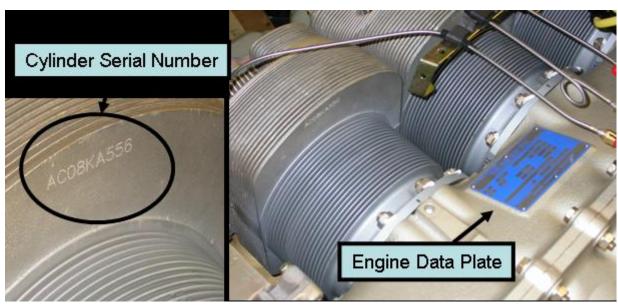


FIGURE 3
Cylinder Serial Number and Engine Data Plate Locations



FIGURE 4
Example of Top Down View with Cowling Removed
Typical Engine Installation

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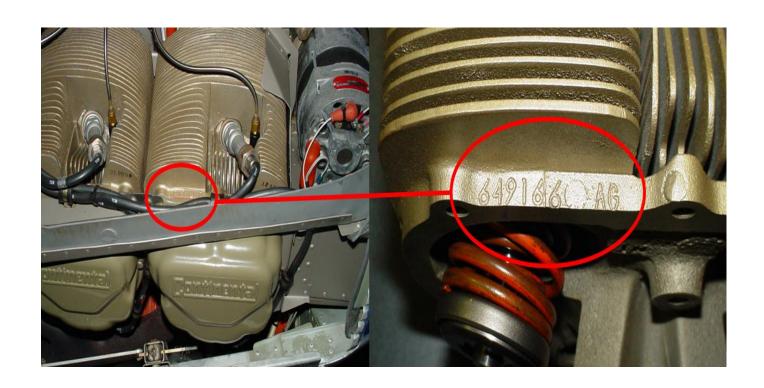


FIGURE 5
Rocker Arm Boss (overhead view of cylinder in mounted condition)

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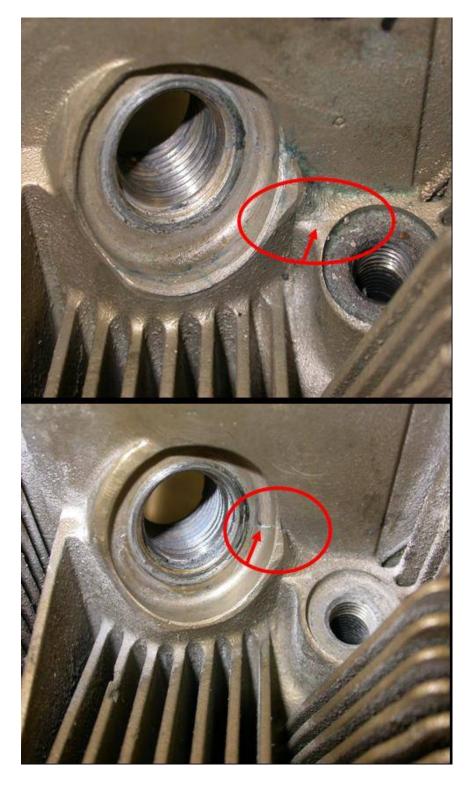


FIGURE 6
Typical Visual Crack Indications

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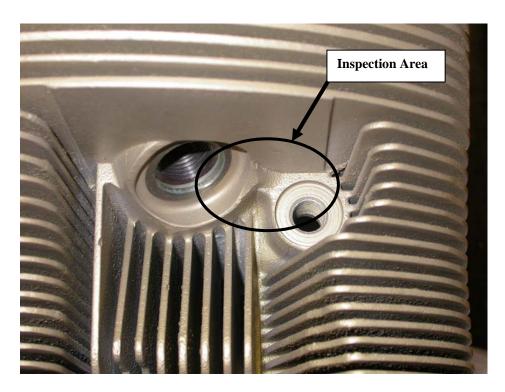


FIGURE 7
Inspection Area Between Upper Spark Plug Bore and Fuel Injection
Nozzle/Primer Port

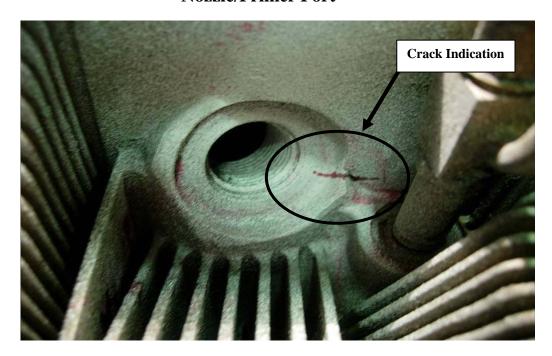


FIGURE 8 Cylinder Head Crack Indication with Dye Penetrant

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Warranty

- 1. Initial Inspection:
 - a. Up to two hours labor at the posted shop rate will be paid to cover the initial inspection performed at 400 hours engine total time.
 - b. The inspection must be performed by a TCM FBO Services member.
 - c. The Compliance Sheet attached to this bulletin or the on-line Compliance Form must be filled out in full and returned to TCM to validate this warranty adjustment.
- 2. Cylinder Replacement:
 - a. Cylinder replacement will be performed at designated TCM Cylinder Replacement Program Centers.
 - b. TCM will pay for parts and labor associated with the cylinder replacements performed at the designated TCM Cylinder Replacement Program Centers provided that the work is completed on or before December 31, 2009.
- 3. For aircraft that cannot be flown to a TCM Cylinder Program Replacement Center, contact TCM Technical Customer Service at 888-826-5465 (251-436-8299) or TCM.CYLINDER@TELEDYNE.COM for assistance.

NOTE: IN ACCORDANCE WITH THE TERMS OF THE APPLICABLE TCM WARRANTY POLICY, FAILURE TO COMPLY WITH THIS MSB ON OR BEFORE DECEMBER 31, 2009, VOIDS ANY AND ALL WARRANTIES COVERING PRODUCTS THAT ARE THE SUBJECT OF THIS MSB.

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MSB09-1 - Customer Information Form

| Date: | | | | Airc | Aircraft Registration Number: | | | |
|------------|----------------|----------------|-------|-----------------|-------------------------------|-------------|-----|---------------|
| Engine Po | sition (Circle | one): Front | Re | ear | Left | Right | | |
| Engine Mo | odel: | | | Engi | ne Ser | ial Number: | | |
| Total Hour | rs: | Total hours o | f ope | eratio | n annu | ally: | | |
| Customer | Business/Co | ntact Name: | | | | | | |
| Address: | | | | | | | | |
| City: | | | | State | : | | Zip | Code: |
| Country: | | | | | | | | |
| Contact Te | elephone: | | | | E-Ma | il Address: | | |
| Maintenan | ce Facility: | | | | | | | |
| Address: | | | | | | | | |
| City: | | | | State: | | | Zip | Code: |
| Country: | | | | | | | | |
| Contact Te | elephone: | | | E-Mail Address: | | | | |
| | Cyl | inder Verifica | tion | /Insp | ection | Information | n | |
| Cylinder | | | (| CYL | | EQ3 Head | | Crack Present |
| Position | Serial | Number | HO | DURS | | Verified | | (Circle One) |
| | | | | | (| Circle One) | | |
| #1 | | | | | | Yes / No | | Yes / No |
| #2 | | | | | | Yes / No | | Yes / No |
| #3 | | | | | | Yes / No | | Yes / No |
| #4 | | | | | | Yes / No | | Yes / No |
| #5 | | | | | | Yes / No | | Yes / No |
| #6 | | | | · | | Yes / No | | Yes / No |

This form can be submitted electronically through the TCM website, by facsimile or by phone.

- 1. Web site entry can be accomplished at: www.tcmlink.com/cylinder
- 2. The form can be e-mailed to TCM.CYLINDER@TELEDYNE.COM
- 3. The form can be faxed to (251) 432-7352.
- 4. You can call in your information to (888)-200-7565 or (251)-436-8665
- 5. The form may be mailed to: PO Box 1436, Mobile, AL 36633-1436

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