

## SERVICE LETTER Ref. No.:

## 0014/2014

*Refers to:* Safety recommendations and information for maintenance organizations, aircraft owners and operators re. Case of aircraft forced landing as a result of the significant damage of the engine M137A. Analogic situations might occur at the engine types M337/M332/M137/M132 of all models.

*Purpose:* The destruction of the connecting rod No. 6 big end arose on the engine M137A in 2013 year. The follow-up investigation discovered the cumulation of significant – and concurred circumstances:

- Improper performance of the crown nuts locking on all connecting rods in the entire engine (the cotter pins persist as freely moveable in the holes of the locking bolts)
- The dimensions of the entire cotter pins did not comply with requirements shown in mandatory bulletin reg. no. M137A/8
- Substantial corrosion occurrence on the crankpins holes plugs p/n Sh2036
- Abnormal deposits consistency in the crankpins holes; suspect for the non-authorized blending of mineral- with additive oils while engine service
- Application of the non-approved sealing material for installation of the crankpins holes plugs p/n Sh2036 on the crankshaft
- Engine operation under exceeding of the defined operational limits of oil- and cylinder heads temperatures. The increased carbon deposits development was apparent on the entire engine

The described factors in the above came to the substantial engine damage:

The reduced intensity of the big end bearings lubrication in combination with cotter pins releasing and clearing out from the locking bolts holes on the connecting rod No.6 caused the movability of the big end bearings in the big end hole; the bearings was released from its locked position in the hole. The mutual position big ends upper- and lower halves change caused the additional flexural stress; in combination with increased friction forces intensity between chain connection rod big end- released big end bearings-crank pin came to the static fracture of the connecting rod big end.

### **Description of the selected engine parts images shown in below:**

The crank pin No. 6 on the crankshaft and big end bearings were seized – Fig.1

Connecting rod No.6 big end is destructed – Fig.2

Big end lower half is deformed after impact; Both locking bolts persist in the deformed big end lower half – Fig. 3

The crown nuts persist on both locking bolts; the cotter pins were cleaned out - Fig.4

Cotter pins fragments were detected inside of the engine – Fig.5.

The crankpins hole plugs p/n Sh2036 belonging to the crankpin No.1+6 were affected by heavy corrosion on the internal walls. The corrosion caused the item wall thickness reduction – Fig.6

The area of the corrosion origination is the contact zone of plugs internal surface with the centrifuged oil deposits on the internal surface of the crankpin holes. One crankpin

plug belonging to the crankpin No. 6 shows the crack at the area of the item wall thickness reduction – Fig. 7, 8, 9.

The identified crack was the source of the oil leakage from the pressure oil circuit; the intensity of lubrication- and cooling of the big end bearing on the connection rod No.6 was reduced.

The crankpins plugs corrosion was caused by the water content in the lubrication oil in combination with negative influence of the components in the non-approved sealing slush (acetate factors).

*Actions:*

The introduced safety recommendations are intended for skills refresh of the concerned subjects and for the provisions supplementation prescribed in the instruction “Operator’s manual M337A,AK, M332A,AK, M137A,AZ, M132A/AK aircraft engines” (further **OMAE**) and terms shown in the Mandatory bulletin reg. no. M137A/8.

For flight service:

- The engine maintenance shall be performed by the maintenance approved organizations only.
- The crankshaft assembly maintenance kind is above the maintenance scope defined in **OMAE**. These demanding maintenances shall be performed by the organizations with approval “engines M132-M337 of all models, overhaul including” if not defined in the bulletins otherwise.
- To use for the engine service the approved lubrication oil kinds only; always in the compliance with provisions shown in the Service letter reg. no. č. 0001/2004; to follow the instructions and periods of oil change from the aircraft oil circuit as defined in **OMAE**. Following of these principles reduces the danger of the corrosion occurrence inside of the engine.
- To inspect the records relevancy in the Engine log books re. performed maintenance.

For approved maintenance organization (approval scope incl. engine overhaul):

- To follow the provisions defined in the mandatory bulletin reg. no. M137A/8 related to the cotter pins installation. The cotter pin has to be plugged in the locking bolt holes with the minimal clearance; the cotter pins ends shall be shaped as shown on the Fig. 10.
- For the locking of the crown nuts on the locking bolts to use the brand new cotter pins of the proper dimensions only; the cotter pins origin shall be available and parts have to be dully released for the flight service by the appropriate certificate.
- The crankpins plugs have to assure the proper sealing effect by the clean cone seating faces only. The application of sealing slushes of any kind is strictly forbidden.

For approved maintenance organization (approval scope excl. engine overhaul):

- In the case of the crankcase top lid removal (from any reasons) inspect the presence of the cotter pins in the crown nuts on all connection rods locking bolts; check the proper cotter pins clamping. Inspect the condition of the crankpin plugs, just visually without plugs disassembly.
- The water content in the lubrication oil might cause the engine internal parts corrossions which might lead to unsafe conditions while engine service. Engine long term storage without appropriate preservation develops conditions for corrossion initialization.
- Corrosion might reduce the engine operational period. The corrosion might cause the damage of the parts affected while engine service. The destruction of sensitive parts could lead to the engine substantial destruction. And finally: The corrosion increased the costs of the maintenance (as a result of more wide scope of the renovation processes or necessity of the parts replacement).

- Application of non-approved sealing parts and agents at the stage of the engine maintenance is strictly forbidden.

*Costs incurred:* Not relevant.

*Effectiveness:* Since date of issue.

*Approval date:* 18<sup>th</sup> November 2014.

*Approved by:*

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Head of design organization ref. EASA.21J1306

The technical content of this document is approved under the authority of DOA ref  
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Fig 1 – Crankpin No. 6 – M137A engine



Fig 2 – Big end upper half No. 6 fragments and deformed big ends bearing.



Fig 3 – Detail = Deformed big end lower half No.6 and locking bolts w/ female nuts without cotter pins.



Fig 4 – Female nut on the locking bolt on the connecting rod No.6 is turned and not locked by the cotter pin.



Fig 5 – Fragments of the cotter pins belonging to the bolts of the connecting rod No. 6.



Fig 6– Corrosion of the crankpins holes plugs, upper part = plugs from crankpin No. 6, lower part = plugs from crankpin No.1 (referential).



Fig 7 – Plug from crankpin No. 6, side view.  
Significant wall wearing by the corrosion affecting.



Fig 8 – Plug from crankpin No. 6, bottom view.  
Significant wall wearing by the corrosion affecting.



Fig 9 – Crack at the area of the wall wearing on the opposite surface compare to these shown on the Figs 7 and 8 ones.

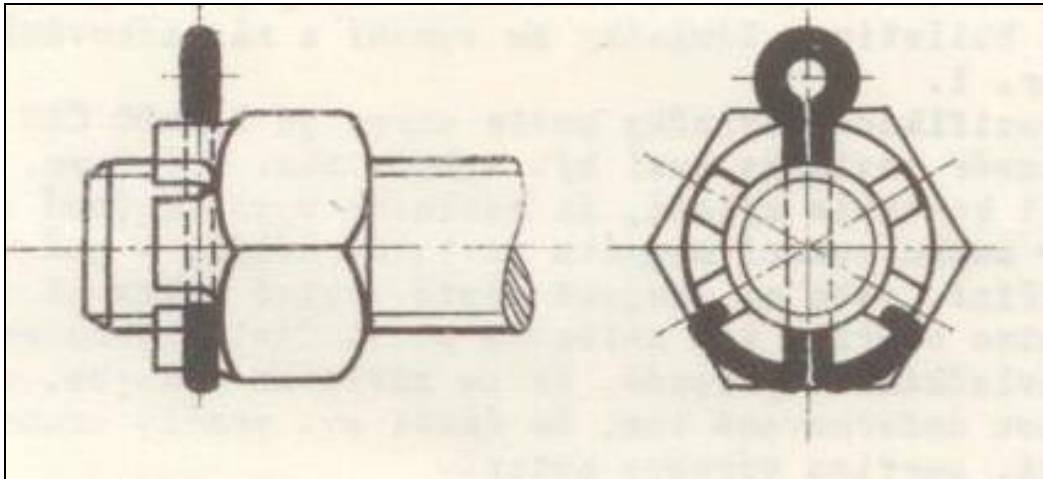


Fig 10 – Sketch shown in Bulleting ref. no M137A/8; the correct way of the cotter pin shaping by the locking of the female nut; the support of the cotter pin in the hole in the locking bolt has to be thigh with aim to eliminate the cotter pin movement or fluttering.