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Jabiru Engine Oil Pump / Oil Cooler				

**SERVICE BULLETIN: JSB 004-3**

Issue: 3

Date: 31<sup>st</sup> March 2005

Subject: Jabiru Engine Oil Pump  
/ Oil Cooler

### 1. Applicability:

All Jabiru engines fitted with oil coolers. This document contains some additional material to clarify the different modifications to oil pump port plates of different ages. It replaces Issue 2 of this Bulletin.

### 2. Background:

Jabiru engines fitted with K&J Thermal Products oil coolers have experienced abnormally high failure rates. While Issue 1 of this Bulletin dealt mainly with the oil coolers themselves, the cause of these failures has now been found to be the output pressure of the oil pump rather than an inherent fault of the cooler.

Testing was carried out using a rapid response pressure transducer plumbed into the oil cooler lines and monitored by computer. The output showed that when the engine oil is cold and thick the pump can experience cavitation, which causes high frequency fluctuations in the pressure of the output from the pump. This pressure fluctuation eventually leads to fatigue cracking and failure of the oil cooler. 6 cylinder engines showed much worse fluctuations than 4 cylinders, but both engines will experience problems when the oil is at it's coolest.

While a procedure has been given below to modify the pump's port plate to reduce the likelihood of cavitation, the majority of failures could be prevented simply by adhering to the existing recommended practices for oil temperature given in the aircraft Owner's Manuals and Engine Manuals. These recommendations are repeated below, along with the recommendations of Issue 1 of this Bulletin.

### 3. Recommendations:

#### i) Oil Warming / Temperature Management.

As stated in Section 4.3.5 of the Jabiru Owner's manual, it is important that the oil temperature be raised to around 50 °C before full power is applied. This thins the oil and prevents serious pressure fluctuations.

In cruise, the oil temperature should be above 80 °C (ideally between 80° - 100°). This maintains good viscosity, while evaporating most contaminants. If a cooler

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installation gives cruising temperatures of 80°C in summer but 60°C in winter, the cooler must be partially covered during winter to maintain cruising oil temperatures. Practices such as operating the aircraft with oil temperatures below 80°C and taking off before the oil temperature reaches 50°C substantially increases the risk of oil cooler failure.

**ii) Oil Selection.**

In colder climates (air temperatures at ground level below approximately 15°C) an Aero Oil Multigrade oil should be used, as specified in the Owner's Manual. Note that the use of Multigrade oil does not remove the need to warm the oil before flight – the oil temperature should still be at least 50°C before flight. If necessary, sections of the oil cooler can be covered to allow the oil to warm faster and maintain temperature in flight.

Appropriate oils:    Aero Oil W Multigrade 15W- 50 or  
                                  Or equivalent oil Complying with MIL-L-22851C or  
                                  Lycoming Spec301F or Teledyne Continental Spec MHF-24B.

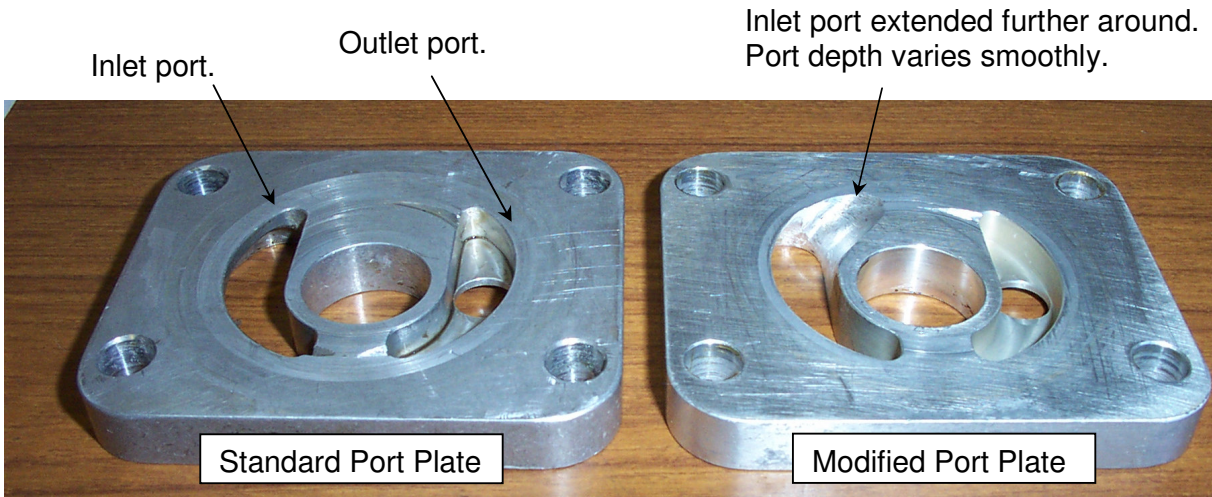
**iii) Oil Cooler Installation.**

Check the cooler installation. The cooler must be isolated from engine vibration as much as possible. Check that the oil cooler is “soft” mounted; when the cooler is installed it should be possible to easily wriggle the cooler on it's mounts by hand when gripping with one finger and thumb. Ensure that the bolts through the rubber mounting grommets are tightening onto spacers inside the grommet and not onto the rubber itself; check that the grommet is not being clamped tightly to the cooler. Ensure that the cowls etc are not rubbing on the cooler.

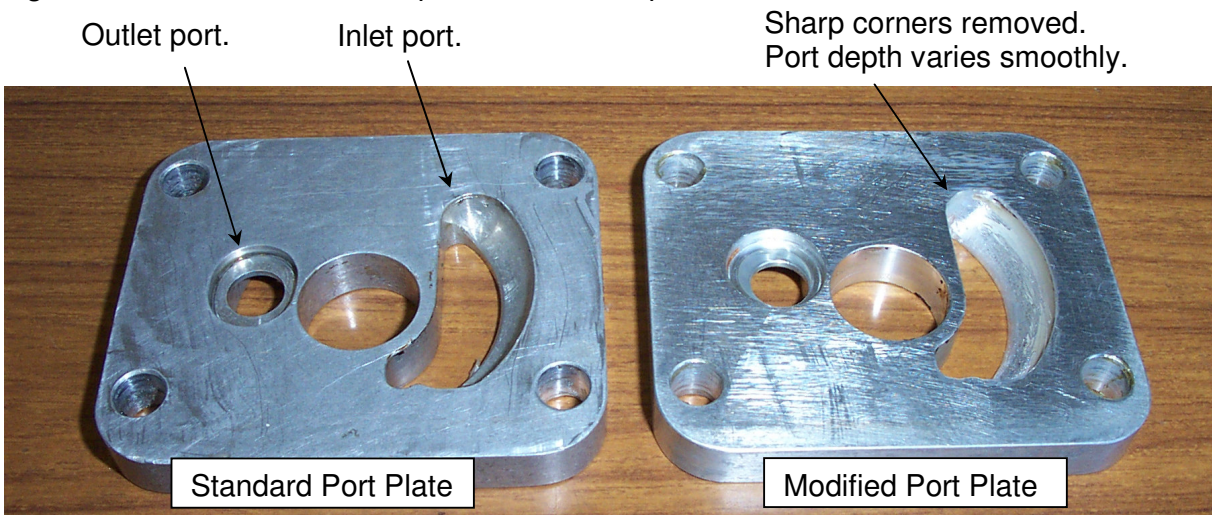
**iv) Oil Pump Port Plate Modification**

The oil pump port plate can be reworked to reduce cavitation. Refer to Figures below. This change supersedes the port plate modification detailed in Issue 1 of this Bulletin.

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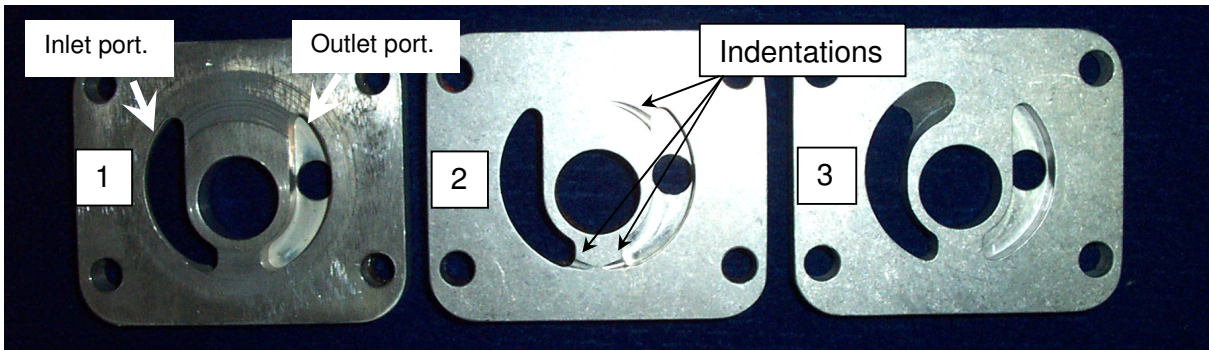


**Figure 1. Front Side of Port Plates (Tractor Installation)**



**Figure 2. Rear Side of Port Plate (Tractor Installation); when assembled this side faces the crankcase.**

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**Figure 3. Port Plate Evolution**

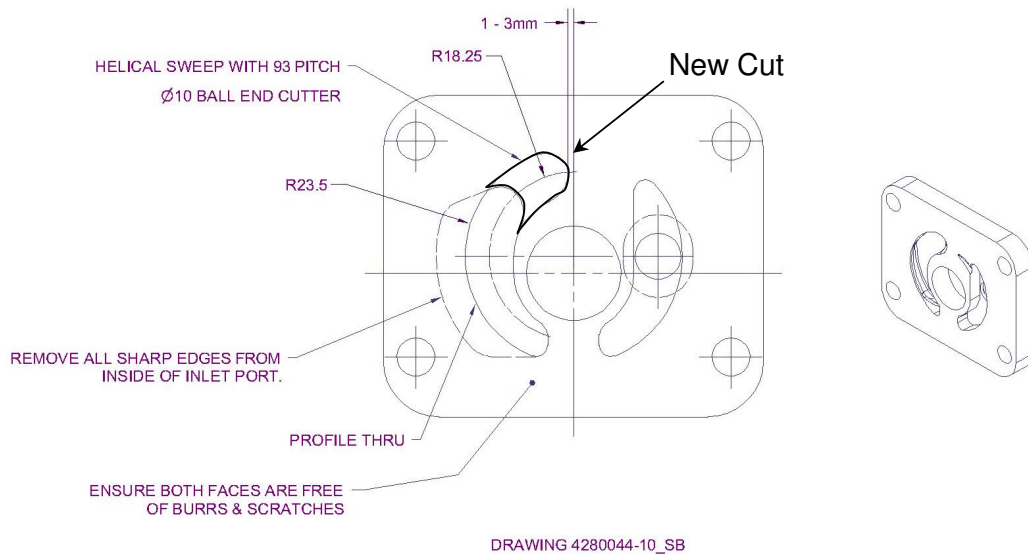
The Figure above shows 3 different styles of oil pump port plate.

**Plate #1:** This is the original design, with the port plate outline unbroken by indentations.

**Plate #2:** This is a more recent design. At the top of the outlet port and at the bottom of both ports there are small tapered indentations. Some versions of this plate will only have the larger indentation at the top of the outlet port, and not the pair at the bottom.

**Plate #3:** This is the current plate design. The small indentations have been replaced by a large tapered cut at the top of the inlet port. Changes have also been made to the other side of the plate (which faces the crank cases) to remove sharp edges & reduce cavitation.

Plates like Plate #1 & Plate #2 can be modified to be equivalent to Plate #3. Where the plate already has the indentation on the top of the outlet port, care must be taken to leave at least 2mm between it and the end of the new cut on the inlet side.



**Figure 4. Modified Port Details**

This work can be carried out by hand using a Die Grinder or similar tool. Jabiru Aircraft can provide a 1:1 template if required. This work requires the disassembly of the oil pump and should only be carried out by an approved person with appropriate skills.

Exchange port plates are available from Jabiru Aircraft.

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#### 4. Compliance:

Oil Pump Port Plate – 4 Cylinder Engines:	Recommended but not mandatory.
Oil Pump Port Plate – 6 Cylinder Engines:	Upgrade within 10 hours.
Oil Cooler Inspections – All Engines:	Oil coolers should be inspected for leaks or signs of rubbing during every daily inspection.

#### 5. Procedure:

Note that it is normally not necessary to remove the propeller to carry out this work. It is strongly recommended that the procedure below be read through and understood before beginning work on the aircraft.

- a) Remove the 4 cap screws holding the oil pump housing to the front of the engine and remove the pump & housing. Take care not to loose the oil pump drive key. Remove the port plate from the engine (note that it may be necessary to tap the side of the plate with a soft hammer to break the sealant between the plate and the crankcase.)
- b) Rework the port plate as shown. Take care not to damage the faces of the plate.
- c) Clean the residual sealant from the sealing faces of the crankcases, port plate and pump housing using a knife or scraper. Clean the threads of the cap screws using a wire brush or similar to remove residual loctite. It is also recommended that the threads in the holes in the crankcase be cleaned of excess loctite using a 5/16" UNC tap before reassembly. Clean the dried sealant from the housing O-Ring (or fit a replacement O-ring).
- d) Clean the sealing faces using Aerostart or Loctite primer. Apply a thin coat of Loctite 518 Master Gasket sealant to the crankcase side face of the pump port plate and the mating face of the pump housing.
- e) Place the port plate back on the engine. Ensure that the plate is oriented correctly, as shown in Figure 1. The inlet port is on the Passenger's side of the aircraft (tractor installation). The less symmetric face of the port plate (the side with one large, curved port and one smaller, round port) mates to the crankcase.
- f) Place the key into the slot in the cam, then place the oil pump inner gear onto the cam. Take care that the key stays in place when fitting the inner gear. The oil pump housing and outer gear should be lightly oiled. Note that if too much oil is added to the housing it will drip out on assembly, spoiling the seal and leading to oil leaks once the job is complete.
- g) Place the clean (or new) O-ring into the housing. Place the pump outer gear into the housing. Assemble the housing & outer gear onto the inner gear. It should be a firm fit, but not too tight. Do Not Force the housing on. Ensure the housing is oriented the right way up, as shown by the Jabiru bird engraving. It may be necessary to rotate the outer gear of the pump in the housing to make the holes line up.

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- h) Prime the cap screws and apply Loctite 262 Threadlocker to the threads. Tighten the screws until sealant begins to be squeezed from between the parts. At this point, before fully tightening the cap screws, it is **Very Important** to turn the engine over by hand at least twice. This centres the pump and housing over the end of the cam. If this is not done, the housing can exert pressure on the end of the cam, leading to cam failure in a very short time.
- i) Tighten the cap screws and wipe off excess sealant. Turn the engine over by hand twice more.
- j) To reduce engine wear it is recommended that the engine be turned over with the starter motor with both ignitions OFF until some oil pressure registers on the gauge. This ensures oil pressure comes up quickly once the engine is started. Once pressure shows on the gauge, the engine can be started, warmed and then test run.
- k) After the run, check that there are no oil leaks from the pump. If there are leaks, it will be necessary to remove the pump, clean the sealing faces, re-apply sealant then re-assemble the pump following the procedure above.