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SERVICE BULLETIN: JSB 016-1

Issue: 1

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Subject: J160 Family Engine Cooling

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2 Applicability

All Jabiru J160 family aircraft (All J160 & J170 models)

Note that for aircraft in the LSA category, this document is equivalent to a Manufacturer's Safety Direction.

3 Background

While the engine cooling capacity of the J160 family meets design requirements, recent operational experience has shown that in unusual conditions – such as very high ambient temperatures or during extended ground running – the airflow over the engine is insufficient to prevent cylinder head temperatures reaching yellow or red-arc levels. Repeated operations at these temperatures greatly increase the potential for engine overheating & subsequent damage.

The following bulletin describes several levels of modification to the lower cowl which improve airflow and engine cooling – particularly on the ground & during low speed flight.

4 Recommendations:

4.1 General

The following table has been designed to allow the engine cooling to be judged more accurately by operators. It contains a list of "Risk Criteria" which are known indicators of how well the engine is being cooled. The operator then assesses how often these factors are apparent in their aircraft & adds up the totals. Note that the temperature assessments (CHT & Oil Temp in climb) must be made after the engine has been broken in and is no longer using run-in oil.

Example: An aircraft does not overheat it's CHT or oil in a climb of 2000', is used for flight training with taxi times occasionally above 10 minutes. Lower head bolts sometimes need more than 1/8th of a turn & once had a leak on cylinder head #3. The aircraft also has a lower cowl with the NACA oil cooler inlet (tick either the "sometimes" or "never" column for this entry). Example entries are shown in *grey italics* below:

Table 1 – Risk Assessment

	Score ➔	**Never** Scale Value 1	**Sometimes** Scale Value 2	**Frequently** Scale Value 3
Risk Criteria	CHT reaches yellow-line values in climbs of 2000' – including en-route climbs.	✓		
	Oil temperature reaches yellow-line values in climbs of 2000' – including en-route climbs.	✓		
	Aircraft is used for flight training			✓
	Taxi Times exceed 10 minutes		✓	
	The lower head bolt (between intake & exhaust ports) of one or more heads need 1/8th of a turn or more to restore proper tension at service		✓	
	Cylinder to Cylinder head seal failed (burnt oil visible on rear face of lower cylinder head fins – See Figure 1).		✓	
	Aircraft currently has lower cowl with NACA-style oil cooler inlet.		✓	
	Basic total	*2*	*4*	*1*
	Scaled total = Basic Total x Scale Value	*2*	*8*	*3*
	Final Total = Sum of Scaled Totals	*13*		

Final total value from 7 to 8 = Low risk. Refer to Section 4.2
Final total value from 9 to 11 = low-medium risk. Refer to Section 4.3
Final total value from 12 to 17 = Medium risk. Refer to Section 4.4
Final total value from 18 to 20 = High risk. Refer to Section 4.5.

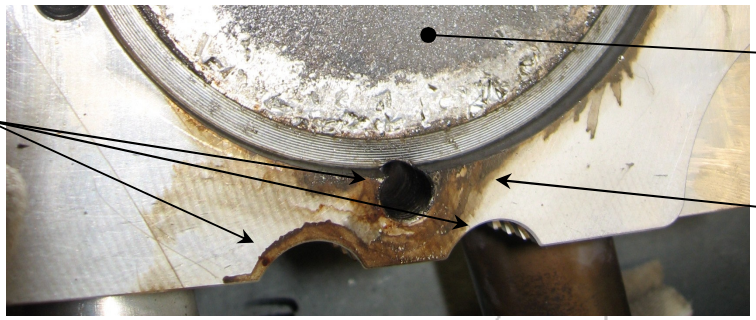


Figure 1 – Burnt Oil on Cylinder Head (Indicates leaking head-cylinder seal).

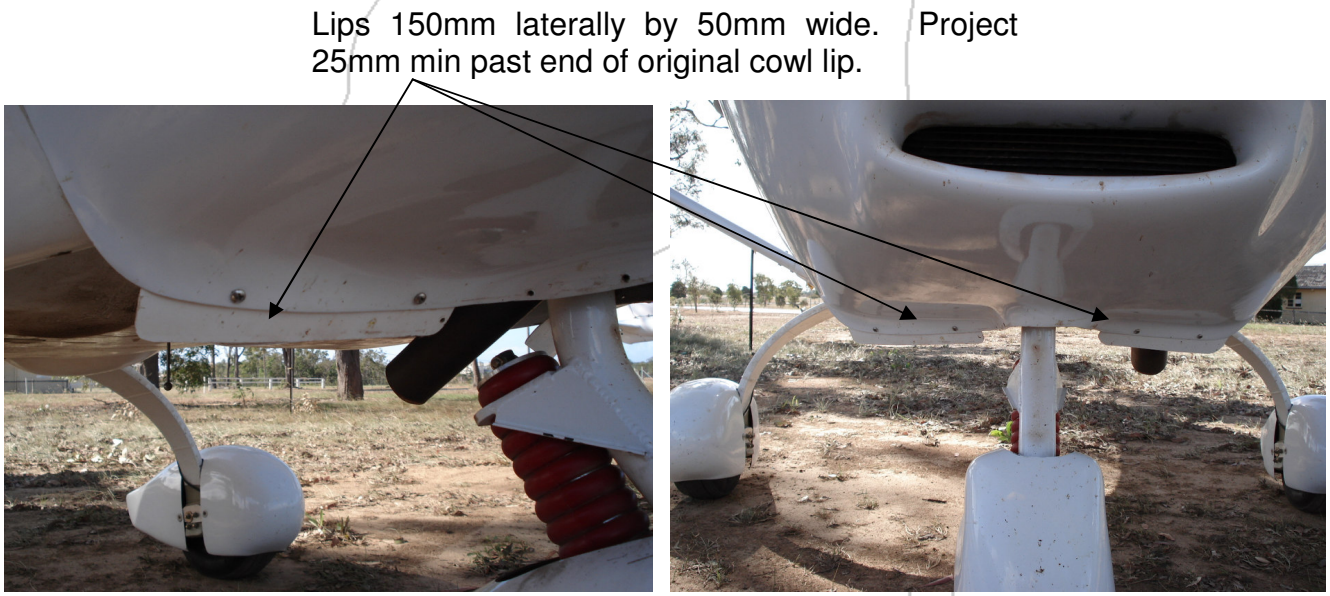
4.2 Level 1 – No Mandatory Change

An aircraft which falls into this category does not require any mandatory modifications. Nonetheless, installation of a small lip (Section 4.3) is recommended during the next scheduled maintenance.

4.3 Level 1 – Small Cowl Lip

An aircraft which falls into this category is exposed to sufficient risk factors that the modification listed below is mandatory & is to be carried out during the next scheduled maintenance.

A fixed lip added to the lower cowl opening significantly improves cowl airflow. The examples shown in Figures 2 are made from fibreglass sheet and have been attached using self-tapping screws – though other materials & methods of attachment are acceptable – i.e. 0.050" thick aluminium sheet or 0.5mm stainless steel sheet. Rivets or adhesives may also be used for attachment. The lips added should be angles at approximately 40° to 60° to the level datum of the aircraft.

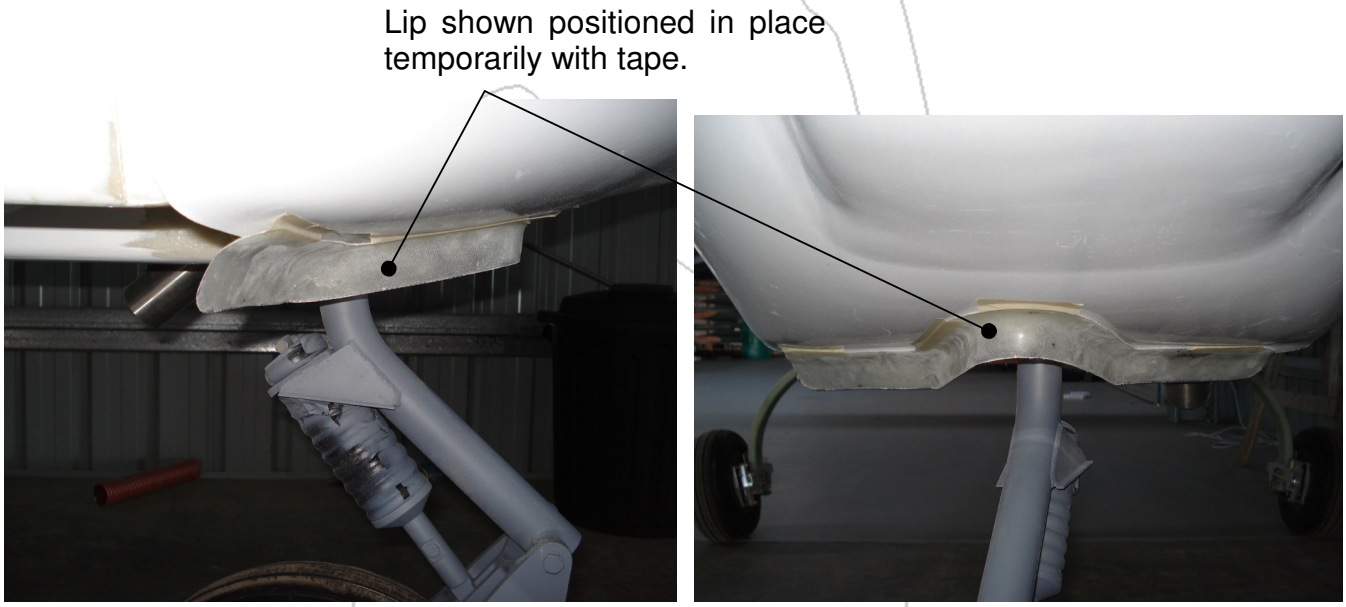


Figures 2 – Small Cowl Lip

4.4 Level 2 – Medium Cowl Lip

An aircraft which falls into this category is exposed to sufficient risk factors that the modification listed below is mandatory & is to be carried out during the next scheduled maintenance.

The fixed lip shown in Figures 3 is available from Jabiru Aircraft. To fit, the lip is centred on the cowl, with it's rearmost tips touching the rear of the cowl opening. The shape of the inside of the lip is marked out on the cowl, and the section of the cowl aft of the line is cut out. The lip is then permanently attached using rivets or adhesive. Note that the smoothness of the transition between the original cowl and the new lip affects the efficiency of the airflow, so the newly-cut edges must be sanded to remove any rough or sharp edges.



Figures 3 – Medium Cowl Lip

4.5 Level 3 – Large Cowl Lip

An aircraft which falls into this category is exposed to sufficient risk factors that the modification listed below is mandatory & is to be carried out during the next scheduled maintenance.

The fixed lip shown in Figures 5 is available from Jabiru Aircraft. To fit, the lip is centred on the cowl with it's rearmost tips touching the rear of the cowl opening. The shape of the inside of the lip is marked out on the cowl, and the section of the cowl beyond aft of the line is cut out. The lip is then permanently attached using adhesive & a layer of fibreglass. Note that the smoothness of the transition between the original cowl and the new lip affects the efficiency of the airflow, so the newly-cut edges must be sanded to remove any rough or sharp edges.

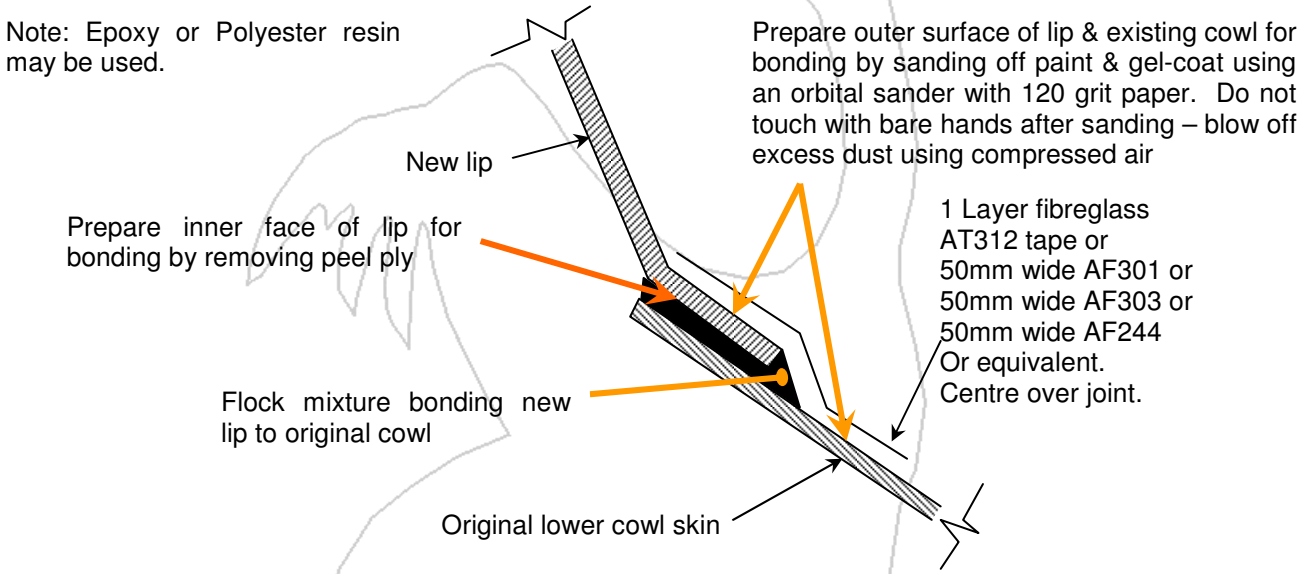


Figure 4 – Cross Section View Through Large Cowl Lip Attachment

Note: Figure 4 is shown with cowl sitting **upside down** (as shown in Figures 5 below).

Figures 5 – Large Cowl Lip

4.6 Ongoing Monitoring

Once the aircraft has been modified the installation should continue to be monitored. If the installation continues to run at consistently high temperatures (best indicated by the amount of rotation needed to restore head bolt tension during servicing) the operator may opt to fit the next largest lip or – in consultation with Jabiru Aircraft – to introduce a revised maintenance system.

5 Aircraft Condition Notes

The above bulletin assumes an engine installation in good condition, meeting factory specifications. For older aircraft, or for kit-built aircraft many other factors can affect engine cooling. The following is a sample list of such factors.

- Rubber seals – Rubber seals are used to close gaps between the engine and oil cooler and the cowls but can deteriorate over time. For best cooling, these seals must be in good condition with no large gaps or openings. Gap or opening size is judged by area – so a gap 15mm wide by 15mm long is generally acceptable, but a slot 10mm wide by 100mm long is excessive.

- Ram Air Ducts – Over time ram air ducts can deteriorate. Check for tears or missing baffles & ensure the bolts holding the ducts to the cylinder heads are gripping on intact material.

- Alignment – Over time engine mount rubbers can deteriorate. Visually check that the oil cooler & ram air ducts align with their respective cowl openings.

- Oil level – over filling the engine can give high oil temperature readings and high levels of oil being blown out of the crankcase breather.

- Engine Intake Mixture – Engine temperatures can be increased by alterations to the engine's fuel/air mixture which, in turn, can be affected by propeller or airframe loads. Jabiru Service Letter JSL 002 provides additional information on tuning of the Jabiru engine.

- Incorrect Valve Clearance Adjustment – In older (non hydraulic lifter) engines which require manual adjustment of valve clearances it is possible to have too little valve clearance. Among other symptoms, this can result in hot running of the engine in general and the valves in particular. **Correct valve clearance adjustment is essential for safe operation of the engine.**

6 Compliance – Implementation:

Compliance with the requirements of this bulletin is considered mandatory for all aircraft involved in Air Work operations (flying training, hire etc) and is strongly recommended for all other aircraft. Section 4 above gives details of the work required, and the recommended timeframe for carrying it out.

7 Airworthiness Note:

Ensure that the latest issues of the aircraft servicing information are being used (engine manual, technical manual, flight manual).

Where required, work called for by this Bulletin must be carried out by authorised personnel. For the aircraft detailed herein this means the owner, an RA-Aus Level 2 holder or a Licensed Aircraft Maintenance Engineer (LAME) – as appropriate to the aircraft registration (or the local equivalent for aircraft outside of Australia).

On completion of the work, the authorised person must note the completion of the actions required by this bulletin in the aircraft's maintenance logbook. This note should refer to the completion of maintenance requirements of this Service Bulletin, indicate the risk level found in Table 1, date the work and the identity (including licence number where appropriate) of the person carrying out the work.