

TECHNICAL NOTES SERIES

**JOWETT JAVELIN – PA, PB, PC, PD & PE
JOWETT JUPITER – SA & SC**



The cylinder head gasket support Part Number J54396.

– PART XII –

ENGINE CYLINDER HEAD GASKET SUPPORT INCLUDING No. 4 CYLINDER HEAD STUD SEAL INSTALLATION

The Jowett Car Club of Australia Incorporated is not responsible for any inaccuracies or changes that may occur within this document. Every effort has been made to ensure accuracy. It is not a Jowett Car Club publication and, therefore, the Club has no control over its contents. These Technical Notes have been compiled by using the information that was available, which was deemed accurate at the time.

*Compiled by Mike Allfrey – 12th November, 2015.
Revised – February, 2024.*

CONTENTS

Topic Discussed	Page No.
INTRODUCTORY COMMENT FOR TECHNICAL NOTES	3
A JOWETT ENGINE'S VITAL CORSET (SUPPORT)	3
INTRODUCTION	3
CONCERNS AFFECTING THE CYLINDER HEAD GASKET SUPPORT	4
INSTALLING THE HEAD GASKET SUPPORT	5
FINAL ASSEMBLY	6
INSTALLING THE OUTER SEAL, PART NUMBER 52193 – TWO METHODS	7



WARNING!
ASBESTOS COULD BE PRESENT IN
GASKETS AND FIBRE WASHERS



INTRODUCTORY COMMENT FOR TECHNICAL NOTES

These introductory notes should be read prior to reading Part XII of the Technical Notes Series.

The Jowett Technical Notes Series have been an ongoing activity for several years. That means that some techniques and specifications may have been superseded in later notes on the same, or associated topics in the series. Also be aware that some topics and recommendations may be specific to certain Engine Serial Number ranges. It appears that, in Australia, the various State Main Agents did not carry out Service Bulletin information during Jowett active times. A set of known Service Bulletins is in Part III.

Some of the notes are restorations of what was written by members of the Jowett Car Club (UK), the Jowett Car Club (NZ) and by members of the JCCA.

Over the years of involvement with matters Jowett, and with the dawning of the personal computer age, a personal decision was made to help members of the Jowett Car Club of Australia Inc. with technical information. Included with the Technical Notes are 'restored' versions of the Javelin and Jupiter Maintenance Manuals and the associated Spare Parts Catalogues. Future generations will prefer to flick through images on their personal device screens, rather than leafing through pages in a tattered and oil stained book to access information.

The term 'restored' has been used because it soon became apparent that, as with our efforts in restoring Jowett vehicles, we desire excellent quality of workmanship in the reproduction of Jowett related documentation. Not for us the crude, and crooked, photocopies that have been issued over the years. These have, even though accurate at their time, become partly out of date.

Hence the decision to 'restore' the publications and documents that have come to hand.

It should be noted that the Javelin and Jupiter Spare Parts Catalogue is a combination of all the catalogues that were to hand (from 1948 to 1953).

The Maintenance Manuals were originally written on the assumption that they would be used by skilled motor mechanics who had attended service training courses conducted by Jowett Cars Limited and after works closure, were made available for owners who had reasonable mechanical knowledge of motor car maintenance and overhaul.

Included with the Technical Notes Series is a Lucas Overseas Correspondence Course, which can be of great assistance when trouble-shooting electrical problems related to your Jowett, or any other British vehicle of the same period.

Please be aware that this is an ongoing project

Mike Allfrey – February, 2024

A JOWETT ENGINE'S VITAL CORSET (SUPPORT)

Introduction

Close to the introduction of the Series III Javelin and Jupiter engines, Jowett Cars Limited introduced an improved cylinder head gasket support, Part Number J54666. The support was introduced at Javelin Engine Number E2 PE 23184 and at Jupiter Engine Number E2 SC 948. The new supports were quickly introduced as replacement parts and were fitted to reconditioned engines. This improved support is a one-piece aluminium casting, that *should* eliminate the requirement for shims to adjust the support height. The earlier style support system was made up of a steel plate, Part Number 52142, that fitted over the No. 4 cylinder head stud (see *Figure 1*), and lodged directly against the machined ledges provided on the two cylinder liners. Outboard of the plate a thin-walled aluminium tube, Part Number (not listed), was placed over the stud to lodge against the liner locating plate and, in theory, the outer face of the tube should have been flush with the outer lip surfaces of the cylinder liners. Shims were available to set the tube absolutely flush with the outer lips of the liners, so that the cylinder head gasket was properly supported. Over the years there have been differing methods employed by mechanics to support the cylinder head gasket, some formed a centre support distance washer to prevent the clamp plate from bending, and a thicker-walled distance tube. No doubt such items were fitted early in the engines' lives.

Thus, it can be seen that a one piece casting is a much better proposition. A bonus was that, at the time of the single piece support introduction, a zinc plated centre head stud was introduced. This

avoided, to a certain extent, the non-getting-along-together of the different metals that comprised the earlier support system. Over the years, the single piece support was installed in engines with cylinder head studs that had not been zinc plated. At assembly time this was quite alright, but after several years use without corrosion inhibitors, and even more years being left in a drained of coolant condition, severe corrosion has made its presence known.

This corrosion has been such that both cylinder liners have had to be pressed out together, in the hope that the cylinder liner locating lugs would break off. That is another story.

Currently, our club stocks new-manufacture cylinder head gasket supports. The new supports have been deliberately machined so that their overall length is too long for installation in earlier engines. A great amount of care needs to be taken here, mainly because we don't, in most cases, know who has been into the engine before. It could be good to know – but, then again, perhaps it is best if we remain in ignorance on this one! Over the years engines have been overhauled and problems found that may have been easily and cheaply fixable (a Jowett owner trait) rather than corroded components being renewed. There are several areas that can affect the way a cylinder head gasket support works effectively.

Concerns Affecting The Cylinder Head Gasket Support

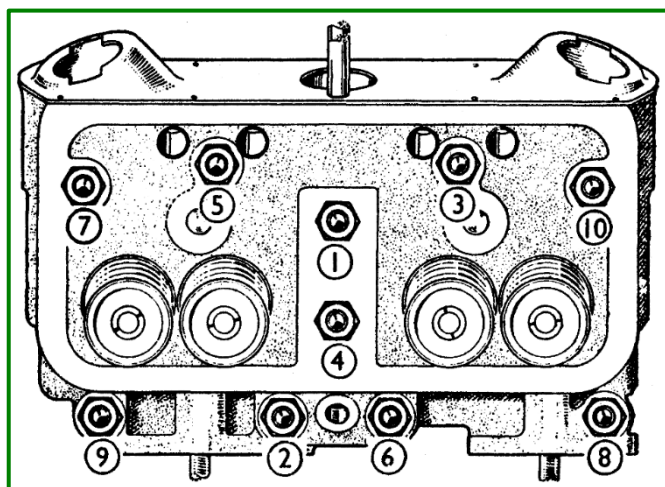
Concerns that can affect the Series III cylinder head gasket support can be summarised as follows:

- There have been instances where crankcase sets have been welded to repair physical damage, i.e. cracking due to either a broken connecting rod or crankshaft.
- Cracks in a crankcase due to frozen cooling system water. It still happens in those areas where temperatures can drop below freezing and anti-freeze has been regarded as an expensive luxury designed to get more money out of us.
- Welding to repair damaged (corroded or stripped) cylinder head stud threads in the crankcase.
- Crankcase sets have been left for many years, with cylinder liners remaining in place and being affected by dampness, along with the reaction between aluminium and cast iron.
- Welding activities to build up coolant jacket walls in a crankcase that has corroded to a very thin state.
- It should also be appreciated that some crankcases are now more than seventy years old.
- Cylinder liners that have had their outer lips machined, for whatever reason.
- In addition to all of that, there were the normal production tolerances.

Skilful welding can restore a crankcase set and, confidence can be placed in good quality welding. However, due to the welding process there is a great likelihood of distortion affecting various areas of the crankcase set. Modern engine reconditioning workshops are now familiar with aluminium crankcases and welded areas can be machined smooth again.

Right: Figure 1. Cylinder head stud identification.

The Jowett crankcase set has four sliding fit bores for the cylinder liners and, between each pair of bores there is a boss for the No. 4 cylinder head stud, see *Figure 1*, to be threaded into. The thread for the stud is one of the more common areas affected by corrosion and stripping. Due to repair work, or corrosion in this area, there have been instances where the faces for the liner shims have been machined to ensure a good surface for the cylinder liners and their shim/spacer ring packs to seat against. Or, the No. 4 cylinder head stud boss may have been machined, so that its face is below the seat facings for the liners – watch out for this condition. Accurate measurements need to be taken to confirm the height of the liner seats and the No. 4 stud boss (the part that the stud screws into).



There could also be the situation where the cylinder head gasket surface of the crankcase has been machined to restore absolute flatness so that the gasket can make an effective seal, when the cylinder head is installed. Machining these surfaces should not be carried out.

All of this, combined with machining of the cylinder liner outer lips, and the current use of copper spacer washers, instead of sealing rings made of brass reinforced gasket material, with cylinder liner protrusion control shims, means that the proper fitting of the cast aluminium support must be treated as individual activities. To vindicate this individual setting up and fitting process, there is the possibility of different type and tolerance cylinder liners making up a 'new' set of four.

Essentially, there are four types of cylinder liner used in Javelin or Jupiter engines:

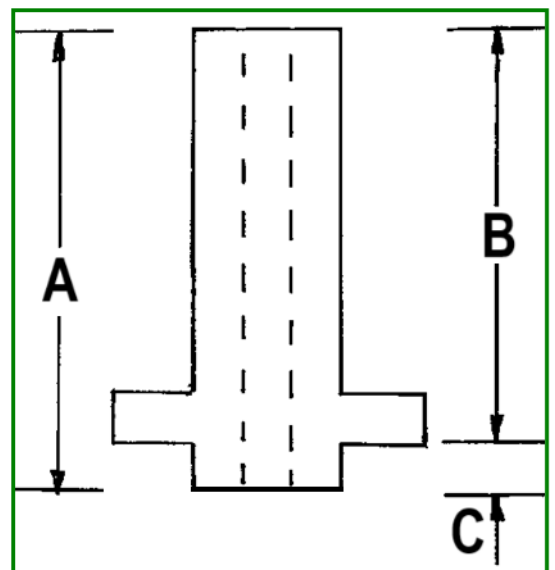
- (i) The early, Jowett thin wall section at the coolant jacket area combined with a thinner head gasket support clamp lip. These are usually manufactured by Hepolite or have the trade name 'Vacrom' etched into the skirt.
- (ii) The later, Jowett with thicker wall section at the coolant jacket and a larger diameter head gasket contact lip.
- (iii) The even later Jowett Engineering liner that was set up to employ Wills type sealing rings at the lip.
- (iv) In Australia, and maybe New Zealand, there can be cylinder liners manufactured by Repco. The writer has not encountered this type of liner during engine overhauls.

Installing The Cylinder Head Gasket Support

To cope with numerous variances, the club supplied cylinder head gasket support must be machined to suit. However, it is a good idea to mark one support with '1-3' and the other with '2-4', then they should be kept on their respective sides of the engine. The actual machining part is quite easy, it is the measuring and calculations that absorb a considerable amount of input for little to see after the work is done. That said, it is well worth while to take the time and effort to ensure that the two supports are set correctly. To do this, the following steps should be taken:

1. Make sure that the crankcase liner seats and the No. 4 stud boss are clean and in good condition.
2. Make sure that the cylinder liner skirts, seat, outer lip and support ledge are clean and in good condition.
3. Lightly oil the liner spigots to ease installation and removal.
4. Using copper spacers and shims, set the liner lip to protrude 0.006 – 0.008-in. (0.15 mm – 0.20 mm), but aim for 0.006-in protrusion beyond the crankcase head gasket surface. Using different combinations of shims, very similar protrusions can be achieved – hence the requirement for numbering each cylinder liner (see below). Do not use gaskets.
5. Using an oil based felt tip marker (preferably white), write the cylinder liner number on the coolant jacket of each cylinder liner – 1 & 3, 2 & 4, to help keep them in pairs, in their correct locations.
6. To keep track, it is a good idea to set out, on a clean sheet of paper, two sketches of the support as shown in the sketch, at right. The face that is required to be flush with the liner lip is at the top of the sketch. Each sketch should be identified by its cylinder numbers.

Right: Figure 2. A crude sketch of the cylinder head gasket support. Dimension 'A' is the overall length of the support, usually 2.439-in. (61.95 mm), Dimension 'B' is a reference dimension, from the liner clamp flange to the liner's lip, and Dimension 'C', after machining correlates to the dimension at Step 8.



Do not rely on a cheap digital display Vernier calliper for these measurements – they are too inaccurate. The best option for digital reading is a Starrett calliper.

7. When the liner spacer and shim packs for cylinders 1 and 3 have been established, use a micrometer or a Vernier calliper to measure the assembled spacer/shims and the liner clamp flange, when held firmly together. Write this dimension on the liner support's sheet of paper for reference.
8. Ensure that the previously marked supports are kept to their respective sides of the crankcase set.
9. The bottom dimension, 'C' in the sketch, will probably need to be machined to the dimensions for the two cylinder liners that were recorded at Step 8.

Important Note: Should there be a situation where one of a pair of liners is an early type, and the other is of the later type, as described above – in such a case, the liner with the thicker clamp flange should have its flange machined to exactly the same dimension as the other liner's flange. This will ensure even clamping of both cylinder liners.

10. Repeat Steps 6, 7, and 8, above, for the cylinders numbered two and four.
11. Apply a smear of Nulon L90 Anti-seize lubricant to the insides of the crankcase liner bores and over the support's cylinder head stud. Trial fit both cylinder liners, with spacer/shim packs, along with the machined cylinder head gasket support, so that all three components slide home together in a smooth action.

Initially this could be difficult, because if the width of the support's flange is too wide, it will cause the cylinder liners to jam in their bores. Filing the ends of the flange to a reasonable clearance (0.005-in. [0.127 mm]) between the machined flats on the liners, can be a trial and error task. It is important that, when the three components are in their home positions, the liner skirts are relaxed in their crankcase bores. After filing the ends of the flange, be sure to remove any burrs that could upset further measurements.

12. Using suitable spacers on the cylinder head studs, firmly clamp the three components into their home position.
13. Hold a good quality straight edge, on its edge, against the liner lips, use a feeler gauge to measure the amount of shim washers that may be required to bring the support's outer end level with the cylinder liner lips, there could also be a requirement to machine a small amount off the outer end of the support – depending on whether machining work on the crankcase and cylinder liners has affected the support's position in the crankcase.

Note: Shim washers can be made by clamping pieces of brass shim-stock firmly between two pieces of steel, about 5 mm thick and, in an appropriate position, drill a $\frac{3}{8}$ -in. diameter hole through the plates and shim-stock. Then with a $\frac{3}{8}$ -in. BSF bolt clamp the pieces of drilled shim-stock between two sharp edged plain washers with a fully tightened nut. Excess shim-stock can be trimmed back with tinsnips and finished-off by lightly rotating the clamped washers against a fine bench grinder wheel. If multiple shim washers are required, they can be clamped together at once and finish ground. This is labour intensive, but very worthwhile.

14. Should metal need to be machined from the outer end of the support, it would be best to machine a snug fitting mandrel in the three-jaw chuck. Mounting the support on the mandrel maintains concentricity for machining. set the support up in a three jaw chuck, with one jaw between the two gussets.

There is a slim chance that dimension 'C' could be too long, due to the cylinder liners being corroded or tampered with, the support will need to be reversed on the mandrel for machining the inner face of the support.

Setting up the cylinder head gasket supports in this manner ensures that the cylinder liners are properly clamped, and this is particularly of benefit, because when a cylinder head is removed for service operations, the cylinder head gasket support can be clamped by using a suitable spacer and nut. This will allow rotation of the crankshaft without dislodging the liner-to-crankcase shims.

Final Assembly

At final assembly time, thoroughly clean the cylinder liners, spacers and shims. Final wash them with methylated spirit. Also, final clean the liner seat faces in the crankcase with methylated spirit. When dry, apply a light smear of Loctite Master Gasket 518 sealant to the shoulder of the liner, then apply a smear of the sealant to both sides of the spacer rings. Place the shims on the liner skirt first,

but not fully home against the shoulder on the liner. Then slide the spacer rings on to the skirts. The sealant is anaerobic and will not harden during installation. Apply a light smear of Nulon L90 lubricant to the shank of the centre head stud and install the pair of cylinder liners, accompanied by the support and push the assembly fully home in the crankcase. Using suitable spacers on the cylinder head studs clamp the installed components quickly to be held in place during the sealant's curing. If Loctite Primer-Activator has been used for the final cleaning operation, the Loctite 518 will set very quickly indeed.

It should be carefully noted that, after clamping the three components firmly into the crankcase, the Loctite 515 will 'grow' a very small amount, increasing cylinder liner protrusion, therefore it is best to aim for 0.006-in. cylinder liner protrusion.

Installing The Outer Seal, Part Number 52193 – Two Methods

The No. 4 head stud drilling in the cylinder head can be exposed to engine coolant. Due to this condition, even though the coolant seal rubber 'O' ring has been installed, coolant can still leak past this seal into the rocker cover. The seal in the cylinder head counterbore needs to be compressed enough to seal against the shank on the cylinder head stud. The following seal installation procedure should be adopted to successfully effect a water tight seal.

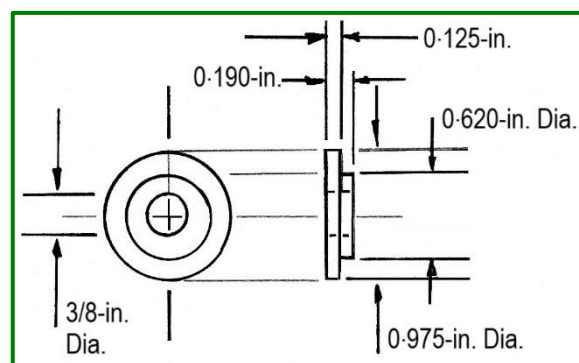
The recess in the outer cylinder head face and the cylinder head stud must be absolutely clean and free of oil. The coolant seal rubber 'O' ring that replaces the original square-section seal, Part Number 52192, is then slid over the stud and pushed firmly into the recess. Apply a small bead of Loctite 518 sealant around the cylinder head stud adjacent to the seal rubber. Next, install the plain washer, Australian Part No. 52193-SM, and push it into the seal recess. This washer is followed by the larger outside diameter plain washer, Part No. 52193-LG, and the cylinder head nut. The nut is then torqued in sequence with the other cylinder head nuts. The smaller diameter washer compresses the seal further into its recess than would be the case if a large diameter washer only was employed, thus effecting a good seal. **Tighten the cylinder head nuts, in Figure 1 sequence, to 35 – 37 lb. ft. torque, in three equal stages.**

The immediate foregoing procedure was brought to the writer's notice by Ed Wolf, for which thanks are due.

Right: Figure 3. Stepped 'O' Ring Collar. This sketch is not to scale. Material – Mild Steel.

In addition to the above procedure, there is the following option:

The Number 4 cylinder head stud hole in the cylinder head has a counter bore for a rubber seal ring ('O' ring). The sketch, *Figure 3*, shows the dimensions for a collar that will squeeze the 'O' ring so that it forms a coolant-tight seal. Two collars per engine are required.



Mike Allfrey.
