MOTOR SPORT

SECTION XA - ELISE '96 - '00 M.Y.

XA.1 - INTRODUCTION

Lotus Cars is marketing a range of performance products for the Elise, aimed primarily at competition and/or track use of the vehicle. Some of the kits may be used alone, but others may be recommended for use only in conjunction with other complimentary kits. Using the car on the public highway with competiton parts fitted may contravene emission and/or noise regulations and invalidate insurance cover. In addition, the specification will be compromised in terms of comfort and refinement, and demand increased maintenance and service. In most cases, the standard vehicle warranty will not apply after the fitment of 'off road' or 'competition' oriented parts.

XA.2 - 190 VHPD ENGINE

The 190 VHPD (Very High Performance Derivative) engine is designed for motorsport track use only, and may not comply with emission regulations. The unit is based on the same 1.8 litre Rover 'K series' block as the standard engine, but with a revised cylinder head featuring new inlet and exhaust camshafts, solid tappets, and new throttle bodies providing individual throttle butterflies for each cylinder and a competition type oiled foam air cleaner. The engine bottom end includes forged pistons, strengthened connecting rods and crankshaft, and a lightened flywheel. A reprogrammed ECM is an integral part of the package. The preferred fuel is 98 RON unleaded ('Super Unleaded'), although 95 RON is useable. Oil recommendation is Mobil 1 5W/50 fully synthetic after running in on a good quality mineral oil.

Output: Max. power; 190 ps @ 7,500 rpm
Max. torque; 189 Nm @ 5,600 rpm

The engine is supplied only as a complete assembly for competition use, and does not carry the normal vehicle or parts warranty. Included in the engine package are:

Engine harness and new ECM with matched security 5AS module.
Exhaust manifold (unchanged).
Inlet manifold, throttle bodies and competition air filter. Air filter oil aerosol.
Fuel rail and injectors.
Alternator and auxiliary belt (unchanged).
Lightened flywheel (no clutch).
Engine mounted water rails.
Oil filter.
Ignition coil, spark plugs and H.T. harness.

Engine Fitting Kit

The additional parts required in order to fit the VHPD engine, are contained in fitting kit A111E0034J, and comprise:

- Carbon fibre cold air box and trunking. Requires removal of boot bulkhead to accommodate the air box, and cutting down of the standard air filter mounting plate for the trunking. The charcoal canister also requires removal, with a corresponding modification to the filler neck breather hose routing.
- New throttle cable.
- New fuel feed and return pipes with clips.
- Crankcase breather pipe kit.
- Throttle cable 'U' bracket.
- Cobra immobiliser bridging plug.
  Unless already so equipped, the later type closer finned (20 f.p.i. instead of 16 f.p.i.) engine cooling radiator must also be ordered and fitted - A111K0021F.

Additional parts strongly recommended:

In order fully to exploit the performance of the VHPD engine, it is strongly recommended to fit the following components:

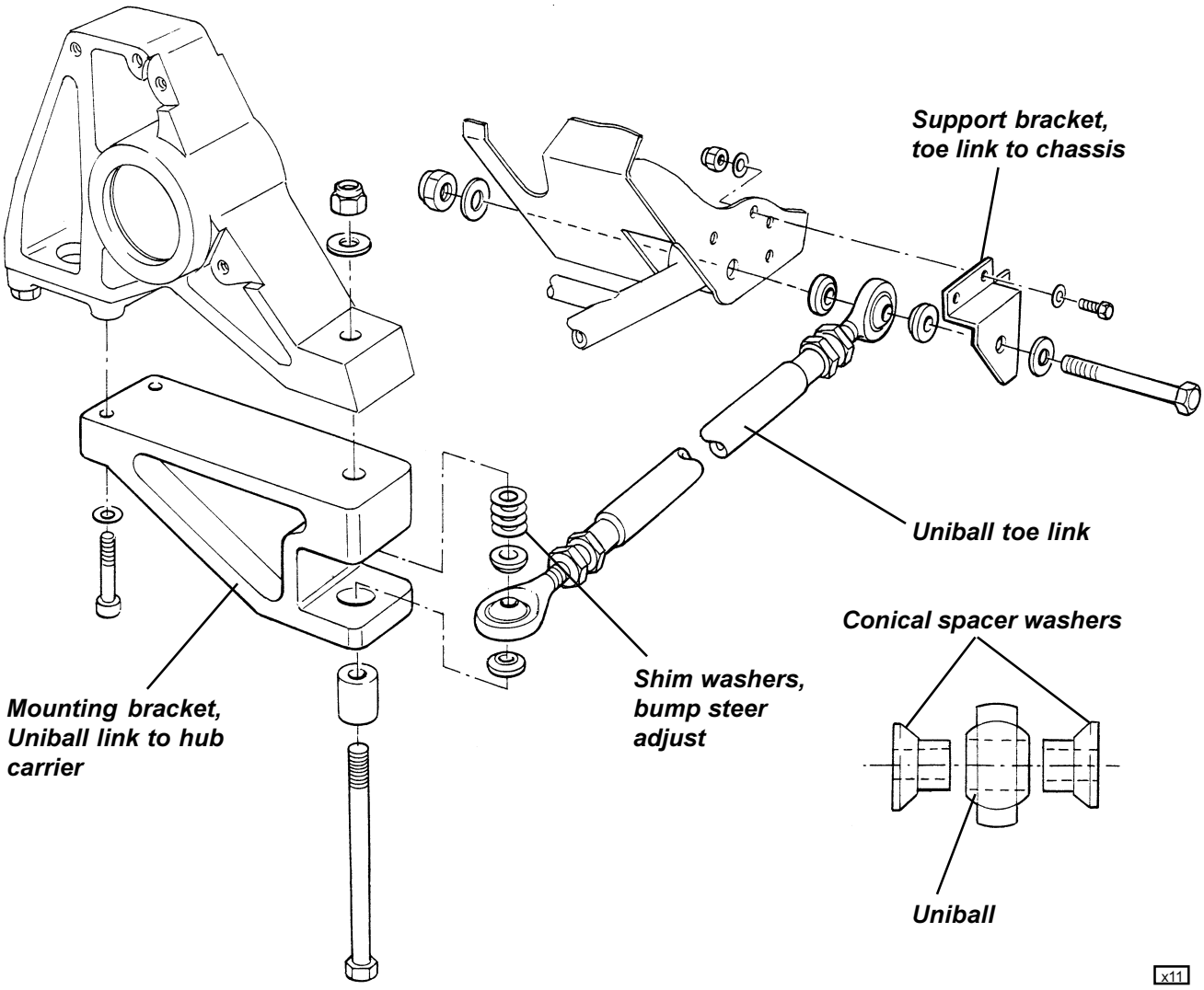
- Oil cooler kit (A111K0037S).
- Competition silencer kit (A111S0037S) and catalytic converter substitution pipe (A111S0048S).

XA.7 - UNIBALL TOE LINK KIT - A111D0127S

For competition use, especially if slick tyres are to be used with the associated increase in suspension loadings, it is recommended to replace the rear suspension toe control links with uniball type links, complete with brackets which support both ends of the pivot bolts, and provides additional strength to the chassis and hub carrier fixings. This kit is designed to be used in conjunction with the Road Spring & Damper Set A111C0138S, using the lowered ride height (100/110mm) as detailed in sub-section XA.8. The correct bump steer characteristic is not attainable at the standard ride height.

At the inboard, chassis, end of the link, a steel bracket supports the rear end of the pivot bolt, and requires that the chassis be drilled to accept the four M6 screws fixing each of the brackets. Locate the bracket using the pivot bolt before marking up the four fixing hole positions on the chassis rear subframe. At the outboard end of the link, a milled aluminium bracket is bolted to the bottom of the hub carrier, utilising two of the lower ball joint plinth fixings. The pivot bolt uses a sliding sleeve in the lower leg of the bracket to avoid any bending stress in the bracket when the bolt is tightened. Note that each side of each of the Uniball joints must be faced by the smaller end of a conical washer in order to allow full articulation of the joint.

A stack of six shim washers is provided at the outboard end of the link, to be distributed above and below the Uniball in order to adjust the joint height and attain the desired bump steer characteristic. The default setting of the stack is for one washer above the joint, and five below, but for fine tuning of the toe curve refer to Service Notes sub-section XA.8.



XA.8 - ROAD SPRING & DAMPER SET - A111C0138S

Road springs and dampers are available as a vehicle set, designed to be used with a lowered ride height for track use. The front springs are uprated from 27.5 N/mm to dual rate 25/40 N/mm springs, and the rears are uprated from 40 to 50 N/mm. All four fixed calibration Koni dampers are both stiffer and shorter and feature different bump stops and adjustable spring platforms (without lock rings) to allow setting of ride height and corner weighting. Also included, for use on cars prior to their introduction at VIN W 3580 (approx.), are stronger top rear damper mounting brackets with repositioned (10mm higher) damper holes, together with load spreading clamp plates to fix the brackets to the chassis. The pair of steering rack positioning plates are provided in order to maintain the desired bump steer characteristic if the lowered ride height is used.

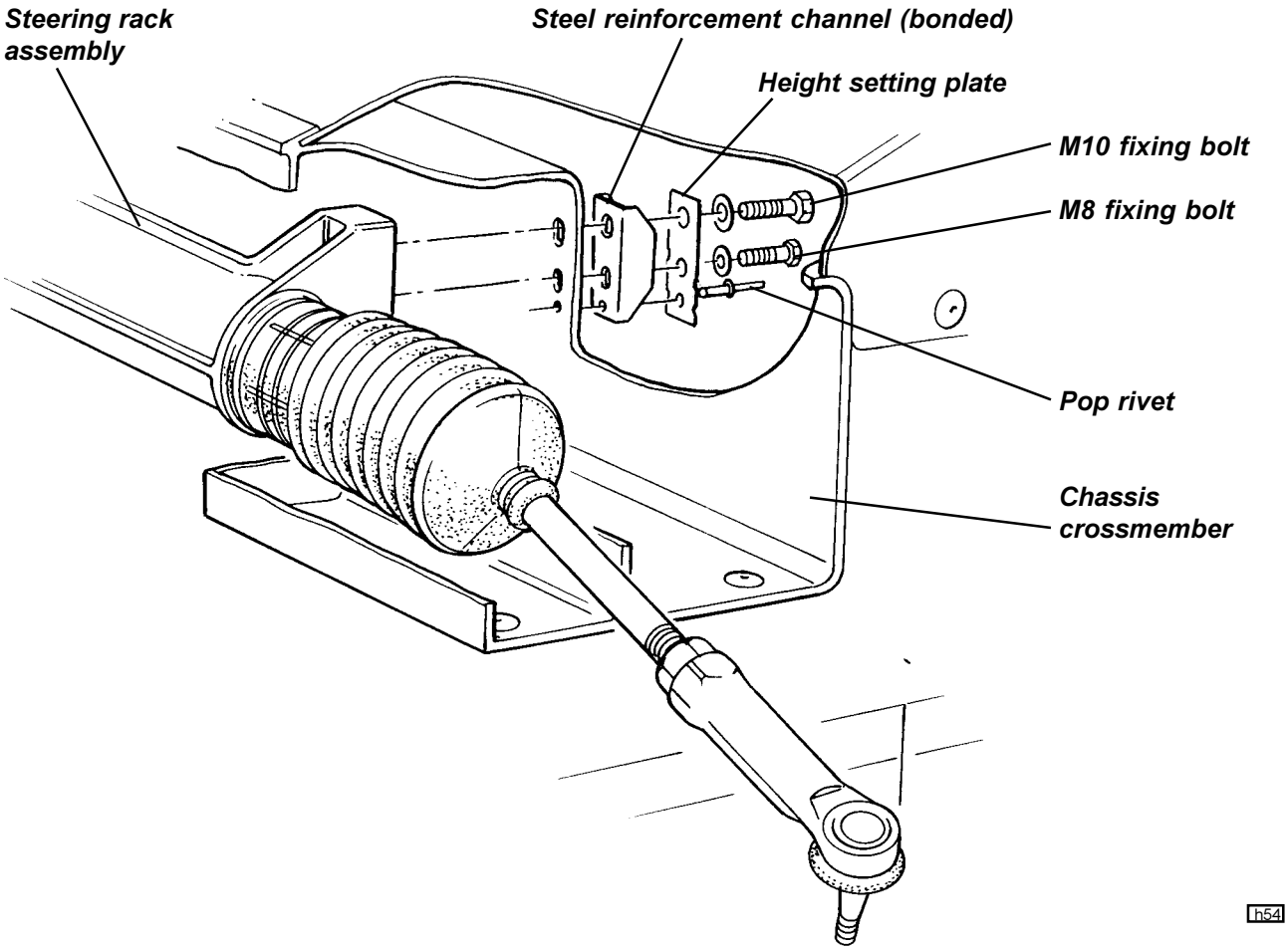
Additional parts recommended to be fitted with this kit are:

- Front hub bearing clamp bolt set - A111C0137S (applicable to cars prior to VIN: V 1830 - Sept.'97)
- Rear Uniball toe link kit - A111D0127S.
- Adjustable, uprated front anti-roll bar - A111C0134S.

The springs, dampers and rear top damper mounting brackets with spreader plates, are direct replacements for the standard parts. The dual rate front springs are fitted with the close coiled end lowermost. The recommended mid-laden ride height (2 people, 1/2 tank fuel) to be used with these springs and road tyres is as follows:

Front: 100 mm below front end of chassis siderail (standard setting 140 mm).
Rear: 110 mm below rear end of chassis siderail (standard setting 140 mm).

At the lowered ride height, the steering rack should be repositioned by removing the rack fixings from the front of the footwells, drilling out the pop rivets retaining the standard (5 notch) rack height setting plates, and fitting new (10 notch) plates A111H0021F. Refit the rack fixings using a suitable threadlocking compound, and torque tighten the M8 bolts to 27 Nm, and the M10 bolts to 45 Nm.



At the lowered ride height, the suspension geometry should be set as follows:

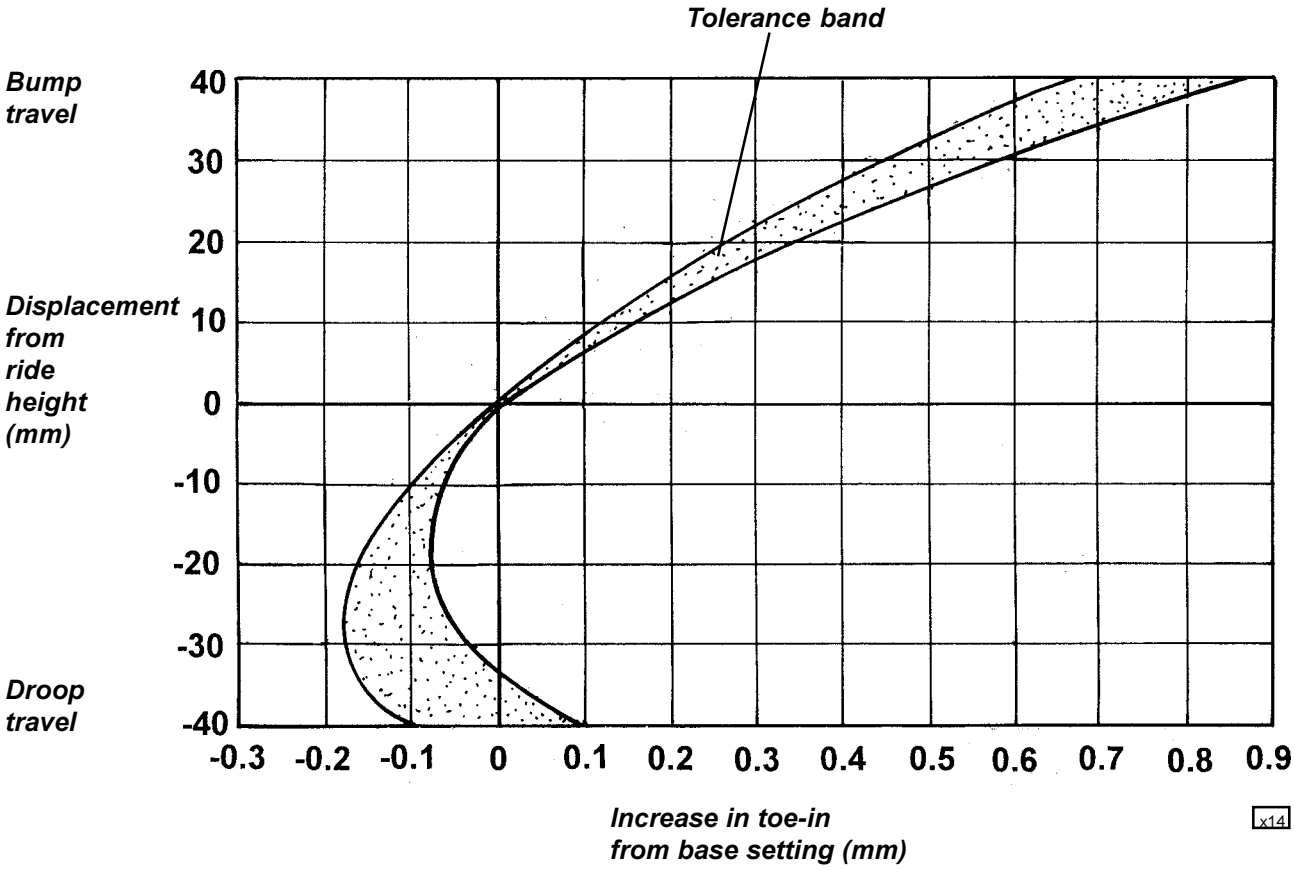
Subject	*Specification*	*Tolerance*	*Max. difference side/side*
Front Camber:	- 0.3° (std. ride height: - 0.1°)	+ 0.1°, - 0.2°	0.2°
Front Caster	+ 3.8°	± 0.2°	0.2°
Front Toe	0.2 mm **toe out overall**	- 0, + 0.2 mm	
Rear Camber*	- 2.0° (std. ride height: - 1.8°)	± 0.2°	0.2°
Rear Toe	1.2 mm **toe in each side**	- 0, + 0.2 mm	0.2 mm

* In extreme cases, it may be necessary to machine the top ball joint plinth in order to attain sufficient negative camber.

Rear Bump Steer

The rear suspension toe-links are designed to steer the rear wheels in incremental amounts as the car rolls with cornering forces, in order to produce the required handling characteristics. The general requirement is for the outside wheel to adopt a small amount of toe-in as it moves towards bump with roll.

A shim stack is provided at the outboard end of the toe-link, by which the joint height, in relation to the wishbone pivots, may be adjusted. A basic stack dimension detailed below, will provide an approximately correct geometry, but in order to optimise the characteristic, accurate individual wheel alignment equipment (or a dedicated bump steer gauge) must be used to measure the toe change for each rear wheel. Lowering the joint height by 0.9 mm (1 shim washer) will increase the toe-in at 40 mm bump travel by approx. 0.2 mm. Refer to the graph below, and select a shim stack to provide a toe change on bump travel to lie within the tolerance band. Note that if the Uniball toe link is used, the shim stack is distributed above and below the joint.



Base Setting

Standard toe link with female threaded pivot balls*:	4 x 1 mm shim washers
Standard toe link with integral stud ball joints:	3 x 1 mm shim washers
Uniball toe link:	3 x 1 mm shim washer above joint

When changing ride height, the length of the toe link will need to be adjusted to maintain the specified rear toe setting, but the base setting of the shim washers is the same for standard (140mm) and race (100/110mm) ride heights.

*** Note**

The standard toe-link with female threaded pivot balls requires a very specific assembly configuration with different bolt lengths and washers used for different shim pack thicknesses. Refer to sub-section DE.4 for full details. If a car with this joint type is found to require more than 5 shim washers to produce the required characteristic, both outboard ball joints should be changed for the integral stud type, or Uniball links fitted.

XA.14 - STAGE 2 (135 BHP) ENGINE TUNE UP KIT - A/B111E6215S

This kit comprises a reworked cylinder head assembly and cast alloy intake manifold and plenum. It is designed to be used in conjunction with the competition silencer (A111S0037S), and for track use, with the catalyst replacement pipe (A111S0048S). Cars fitted with an aluminium boot bulkhead will also require this item changing for a reprofiled version supplied in the kit. A modified engine cover lid in composite material is available to clear the new intake plenum, but it is possible to trim/modify the existing aluminium lid to fit.

A running change made to the cam belt tensioner mechanism on the Rover K16 engine requires that cylinder heads with different belt tensioner machining details are used. On engines with serial numbers prior to 153993, kit A111E6215S should be used, with later engines using B111E6215S.

Contents of Stage 2 Kit	*Qty*
Cylinder Head Assembly comprising:	1
Cylinder head	1
Cam cover	1
Cam cover bolts	15
Tappets	16
Valve spring cap	16
Valve stem seal	16
Valve spring	16
Modified inlet valve	8
Modified exhaust valve	8
Valve collets	32
Inlet camshaft	1
Exhaust camshaft	1
Camshaft oil seal	4
Cam cover gasket	1
Cylinder head gasket	1
Blanking plate/vac. spigot	1
Inlet manifold stud	2
Exhaust manifold stud	5
Inlet manifold gasket	1
Exhaust manifold gasket	1
Upper/lower manifold gasket	1
Screw	5
Manifold support strut	1
Screw	1
Screw	1
Spark plug	4
Spark plug cover (green)	1
Modified inlet manifold upper	1
Inlet manifold lower	1
Screw, upper to lower manifold	5
Adaptor, AIT sensor	1
Water outlet elbow gasket	1
Fuel return pipe	1
Boot bulkhead	1

1. Check parts supplied against above list.

2. Refer to Elise Service Notes manual section EE, and remove the cylinder head. If the car is fitted with an aluminium boot bulkhead, remove the bulkhead.

3. Remove from the old cylinder head the plastic inlet manifold assembly.

4. From the plastic inlet manifold assembly, remove the following components for re-use:

- Air inlet temperature sensor;
- Fuel rail and injectors;
- Idle air control stepper motor;
- Throttle body and breather pipes.

5. Remove from the old cylinder head the following components for re-use:
   - Cam belt tensioner spring pedastal bolt;
   - Rotor arm and anti-flash shield;
   - Distributor cap and HT leads;
   - Water outlet elbow.

6. Assemble the new inlet manifold:
   - Fit the new upper inlet manifold (plenum) to the new lower manifold with gasket and screws;
   - Fit the throttle body assembly to the new plenum;
   - Fit the air inlet temperature sensor with its new adaptor into no.4 branch of the new lower manifold;
   - Fit the new blanking/vac. spigot plate with gasket to the end of the new intake plenum;
   - Fit the fuel rail assembly and injectors into the new lower inlet manifold;
   - Fit the new fuel return pipe to the fuel rail;

7. Assemble the new cylinder head;
   - Fit the cam belt top cover;
   - Fit the camshaft pulleys;
   - Fit the two new inlet manifold studs into the top two fixing holes in the head;
   - Fit the five new exhaust manifold studs;
   - Fit the distributor cap and leads;
   - Fit the timing pedastal bolt;
   - Fit the water outlet elbow and gasket;
   - Fit the new inlet manifold assembly.

8. Fit the new cylinder head assembly as detailed in service notes section EE, paying attention to the crankshaft and cam positioning to avoid piston/valve foul.

9. Fit the new manifold support strut to the manifold and cylinder block using the new bolts supplied.

10. Connect the fuel pressure regulator valve sensing hose and MAP hose to the right hand end of the intake plenum via the two spigots, or single spigot and 'T'-piece.

11. Fit the exhaust manifold.

12. With camshaft cover removed, pour oil over the camshafts and valve gear to ensure adequate lubrication on start up.

13. Fit cam cover and new spark plug cover.

14. If applicable, fit the new aluminium boot bulkhead.

15. Fettle and/or modify the engine cover lid as necessary to provide sufficient clearance to new intake plenum.

16. Fill the engine with a good quality mineral (not synthetic) oil meeting the viscosity requirements of the standard engine, (see Owner's Handbook or Service Notes Section OG), and change the oil and filter after the running in period of 1,000 miles. Part or fully synthetic oil may be used to advantage after running-in, with the same viscosity requirement.
    Note that for the hydraulic tappets to prime, the engine may require cranking for an extended period.

17. For normal road use, the standard maintenance schedule may be used, with oil and filter changes at 9,000 mile intervals. For cars used on circuit 'track days', it is recommended to reduce the change interval to 3,000 miles, and for full race use, change every two meetings.