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*Dunlop Mini Se7en & Miglia
Championships 2005*

mini7
racing club

Beginner's Guide

CONTENTS

Introduction		1
Scrutineering & Safety		2
Bodywork		8
Suspension (& Subframes)	9	
Front Subframe	9	
Front Suspension		9
Rear Subframe	10	
Rear Suspension		10
Basic Mini Seven/Miglia set-up	12	
Electrics		13
The Engine		
Parts Checklist	14	
The Cylinder Head		15
Engine Cylinder Block Assembly	16	
The Valve Train	18	
Gearbox & Gear Ratios	17	
Ancillaries		19
Building the Engine		20
Engine Building - Important Tips & Points		21
Useful Telephone Numbers		21
Summary		23

INTRODUCTION

The contents of this booklet are for the Novice Mini 7/Miglia vehicle builder and/or racer; they should give him or her a good start, with the answers to many questions.

The contributors have all been in the same position as you and their articles are drawn from their experience in building and racing Mini's in the Mini se7en club series. If you follow these guidelines you should have some success and a great time with the other competitors, also the fulfilment of having done it yourself.

The essence of the series is to promote competitive racing on an affordable basis whilst utilising the greatest car in the world as the basis.

These guidelines should be read in conjunction with the regulations of the Mini Se7en Racing Club, that are now also available as an online download (adobe acrobat.pdf).

SO GOOD LUCK!

Note: Every year at the AGM technical changes may be proposed and voted on/in. These changes are often aimed at simplifying the formula or stopping development and costs spiralling. Any changes do not come into force until the following year (so familiarise yourself with the minutes of the previous AGM) and if in doubt ask, as decisions made may affect how you build your car.

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SCRUTINEERING & SAFETY

SCRUTINEERING

Scrutineering has two separate aspects for the competitor. Initial safety scrutineering at the circuit has to be completed before a car can take part in practice or in racing. This takes the form of a formal inspection usually first thing in the morning of race day at a dedicated area within the race circuit. All scrutineers who inspect your vehicle are licensed by the RACMSA though they may have assistants to help.

Eligibility scrutineering is for a cars compliance with the technical regulations of the respective Se7en and Miglia formula. Cars are checked on various items post practice, post race and detailed stripping by routine sample inspection or protest, usually conducted by technical commissioners licensed and appointed by the RACMSA. We are lucky to have our own dedicated technical scrutineer who has built and raced within the series.

Times on race day to take your car to the scrutineering bay are printed in the supplementary regulations of the meeting, sent prior to the race meeting. Take your race suit, helmet, etc along with your car, it is useful to have a screwdriver or similar (if required) for opening bonnets, bootlids and lift off fronts, as the scrutineer will need to inspect these areas for compliance with RAC blue book regulations. You need to sign on at Race control before scrutineering, to obtain the correct paperwork for the scrutineer.

Common sense, attention to detail and tidiness in car preparation costs nothing. Build the car carefully and finish of neatly. Always present your car clean and you are unlikely to have any problems, and issues that are raised are always with the competitors and others safety as paramount importance.

Whether buying or building your car, look for and avoid poor assembly, dodgy welding or crude brackets, or a bird's nest of wiring. Keep the car clean and nicely painted/presented.

SAFETY

ROLL CAGES - Read regulations carefully (Unless you are certain of material origin and type, use only seamless steel, minimum CDS).

Welded tube is not acceptable.

Mini 7 forbids tubes diagonally across the car from main roll hoop to nearside front hoop/floor mounting on the grounds of safety - (known as petty bars).

It is highly recommended to have a lateral bar at driver's foot level attached across the front bulkhead and attaching to the front hoop for drivers foot protection.

Cages may be fully welded into the bodyshell with the feet welded to additional strengthening plates. Never drill holes in any of the tubes for any purpose.

Cages must incorporate side protection (lateral bars) (X-pattern type are recommended).

All cages must have RAC MSA certificate. If in any doubt of your welding skills then have a weld in type cage fitted by one of the many Mini preparation specialists.

All parts of the cage in the proximity of the driver's body or helmet must be padded with fire resistant foam material. It weighs next to nothing and you can never have too much padding.

FRONT SUBRAMES - Where the steel wings and inner flich panel are removed and replaced with a removable front end (be it Carbon fibre, GRP or Steel), it is essential that

the forward corners of the subframe are substantially triangulated back to the main cross member that supports the front suspension turrets. This reduces the risk of the rear of the subframe pushing up the floor in a frontal impact.

SEATS - This is the most important safety item. The Mini seven club insist on the mandatory use of a FIA Approved seat with a wrap around head restraint due to the driver's proximity to main role hoop and b-post due to the compact nature of the Mini. The seat mounting is also critical; the seat mounting frame needs to act as a rigid secure structure. Remember it must support your body under considerable G-forces, particularly on impact and this demands substantial mountings to the front seat cross member and lower lateral bar of the main role hoop and floor. If a seat mounting fails the rest of your safety equipment, seatbelts and helmet might as well be useless. Make sure that when seated in your comfortable racing position, that you can reach all controls easily and intuitively, this includes the fire extinguisher operating mechanism and ignition cut out.

SAFETY HARNESS - These should conform to FIA specification with secure mounts, preferably attached to the cage. Rear mounts should be as close to horizontal as possible – locating on a rear cage cross member. Only complete sets (not a mix) as supplied by manufacturer should be used. Only one release mechanism is permitted on each seat belt configuration and this must be operable with the driver seated in his racing position. It is recommended to use a 5 or 6 point harness to avoid submarining (driver sliding out under front).

Seat belts once involved in a serious accident should be discarded, as it is likely that they have stretched. Distress in the stitching is easily recognised. Belts subject to contamination by oil, acid or excessive heat should be replaced as a matter of caution. If in doubt – new belts.

STEERING WHEEL - Composition wheels (separate rim) are totally unsuitable. Good Construction, solid spoke, padded rim and boss are important, as is a suitable diameter. Too small and things become very hard work behind the wheel of a racing Mini due to large castor angles. Remember to pad the steering column and the upper mounting to protect the driver's legs

FIRE EXTINGUISHER – Regulations are becoming tighter and your life could depend upon it. Forget the minimum, fit a plumbed in system (AFFF. 2.25L) with outlets in both the cockpit and engine bay/bulkhead. Never allow the internal outlet to point directly at any part of the driver, particularly the face, hands or feet. Bottles must be securely mounted, preferably in the passenger seat footwell area away from any sources of heat. If retained by over centre locks, tape these down and add a webbing strip. Refer to the RAC blue book for the current fire extinguisher specification allowed. Keep an eye on the service schedule and get the extinguisher recharged if necessary.

ELECTRIC CIRCUIT BREAKER – Regulations demand both an internal and external cut out and this and the exterior firing mechanism for the extinguisher should be mounted in front of and below the windscreen in the scuttle area, preferably on the driver's side. They should not be recessed into the wing. It is important that marshals easily locate them in an emergency, if they are all over the place it wastes time and your life could depend upon it. They must be marked clearly with the correct decals.

BATTERIES – Must be securely fixed – recommended to fit a strap and securing brackets through the vehicle floor. Irrespective of type used, if the battery is located in the cockpit it must be housed in a non conductive box. Do not rely on the box alone for location. A battery is very heavy and compact and becomes a lethal projectile inside the cockpit if inadequately restrained.

HELMETS - Keep dry in a dark place and free from surface damage. Be aware of any changes to approvals and also life the helmet at about 5 years as GRP is broken down over time by UV light. The user must ensure that the helmet is to a standard currently specified in the blue book (at the time of publishing – BS6658-85 Type A (Type B is not acceptable). BS6658-85 Type A/FR SNELL 2000, SFI Foundation 31.1,31.2) and that it fits properly. With the helmet securely fastened and comfortable it should not be able to be pulled forward off the drivers head. Always make sure that the helmet is secured properly and that it is in a serviceable condition. As a general rule of thumb, buy the best that you can afford. It is strongly recommended that a nomex-lined helmet is purchased, failing that the use of fireproof balaclava or helmet bib also may be worn.

OVERALLS - Clean flame-resistant overalls, must be worn. Competitors are also strongly advised to wear flame resistant gloves, socks, balaclavas and underwear. Plastic shoes, nylon socks & underwear should be avoided.

BS 6249 part I Index A or B (but not C), pr EN533 : 1995 INDEX 3, or FIA standard overalls are mandatory. This standard will be clearly marked on the label within the garment. Overalls manufactured to other European standards which have FIA approval are acceptable, and will display the FIA logo stitched into the fabric of the garment at the collar. Earlier types with label stitched to waistband remain currently acceptable for RAC MSA events.

NB It is essential that current MSA regulations – Section Q – be studied before fitting or purchasing any safety equipment.

FUEL TANKS – Properly constructed tanks with screw fillers are best. Securely mount within the rear subframe but not below it gives maximum protection. Outlets and breather connections should be on top of the tank with the breather pipe having 6mm internal diameter. The breather pipe should rise as high as possible with a loop at the top and finish lower than the bottom of the fuel tank. This is to stop the fuel siphoning away, irrespective which way the vehicle is resting in an accident. It must be firmly clipped – P-clips are ideal for the job. If the boot floor is fully cut away a spill collector is not necessary. However, if the tank is within a sealed boot area it must have a collector around the filler neck and a suitable drain tube away from the boot

FUEL LINES - While expensive, the aircraft quality (aero quip or similar), screw-fitting hoses are unmatched for reliability and safety. Under no circumstances may there be plastic/rubber fuel lines inside the cockpit. Copper pipe in the cockpit is most commonly used.

THROTTLE RETURN EXTERNAL SPRING - An additional external throttle return spring must be fitted.

FRONT BULKHEADS - Particularly where an air box is let into the bulkhead for carburettor clearance, this must always be absolutely fluid and flameproof. Use fire retardant putty to seal any holes or gaps.

WINDSCREEN - Must be laminated glass or Perspex (minimum 4mm). Only the official Dunlop Mini Se7en Challenge screen header strip is permitted.

Drivers surname must be displayed on the side rear windows. Letters to be white with no background and Helvetica Bold Type face, upper and lower case. The maximum height for the upper case letter is 100mm. Letters should be positioned 30mm from the lower edge of the window. Championship decals should be positioned on the vehicle in accordance with championship regulations.

In damp conditions drivers must ensure adequate vision/de misting capabilities and not compromise vision. A single wiper is sufficient – recommend a rear wiper motor off a tailgate equipped hatchback with a 180-degree sweep. Use an anti fogging spray or light application of Swarefega to keep interior mist at bay.

LIGHTS - The car must have working and operable headlights, tail lights and stoplights. Indicators lenses must be fitted front and rear but do not have to be operable. A high mounted high intensity light is required for bad conditions as a safety requirement.

WHEELS & TYRES - Wheels should be checked regularly for cracks/fretting signs of distress in the wheel centre at wheel nut fixings. All wheels must be subject to regular crack testing. Keep wheel nuts and studs clean and ensure adequate stud penetration into nuts. Always use the correct wheel nut derivative on the wheel (se7en 100+/minilight – Migs Misc). Equally, ensure that the nut has not bottomed out on the stud length before becoming fully tightened on the wheel. Respect wheel manufacturers recommended torque settings and do not over/under torque wheels.

Ensure that when purchasing second hand wheels that they are not accident damaged. It has been known for wheels to fail and break up after a severe impact. Remember, you can never really be sure of the history of an old wheel.

Tyres are obtainable from Dunlop direct (sometimes we are supported by the Dunlop lorry at race meetings).

A recommended starting point for dry tyre pressures is 42 p.s.i front – 40 p.s.i rear Mini Se7ens and 30 p.s.i front – 28 p.s.i rear for Miglias. These are starting points and will be honed by driver preference and prevailing track and ambient temperature conditions.

All Dunlop race tyres have a number, compound and construction code on the sidewall of the tyre. The recommended position of the stencil is as follows: Stencil outward – N/S front and O/S rear. Stencil inward – O/S front and N/S rear.

Eligibility – This is quite simple and straightforward. The Mini Se7en challenges are aimed at close club racing with regulations enforced to keep costs as low as possible. The regulations are well worded to avoid misunderstanding. If you are unsure if you are allowed to do a modification then discuss it first with the eligibility scrutineer or put it in writing to the racing committee who will consider aspects and whether it is within the spirit of the regulations. If you are caught with a car that is not within the regulations then you must accept the liability and consequences.

Please remember - "It is essential that the current MSA regulations - section Q - are studied before fitting or purchasing any safety equipment"

Happy Building & Scrutineering!

BODYWORK

These words are aimed at the beginners who have a range of practical skills a certain level of understanding. If you do not possess such skills I would advise against trying to prepare your own bodyshell. Also it must be understood that this will not cover everything in ultimate detail. What will be set out should guide you towards preparing a safe and useful chassis. Above all, do look and crib ideas from existing cars before you start. Note their details and formulate your own opinions of the best and neatest ways to perform all the different jobs.

OK, the bare shell, everything that will unbolt has been taken off. I would suggest that you use the latest shell possible, check for good structural integrity (sills and box sections) before you part with money or begin work on the shell. Stitching sections in now is much easier than with a roll cage in place! Any variety of round nosed saloon shell can be used and there is ample proof that Mk1 shells win races.

Late shells have sound deadening material on the inside of the floorpans and this is best removed, as it is just unnecessary weight. Removal is not exciting and requires the bitumen based pads to be broken up and scraped off. Good luck.

The rear map pockets and overhang of the rear seat squab should be carefully cut out using an angle grinder, torch or some heavy duty tin snips. Take time and care, and then, think before you cut marking out all your intentions with paint pen, indelible marker or similar. With the pockets removed you will notice a gap between the sill and B-post. Let in a plate to maintain strength.

Next task is to prepare for a rollcage. Take your proprietary cage and position it inside the car and bolt it together but leave the feet unbolted and simply mark around all six. If you intend multipointing the cage, the positions should be decided at this point so that the body may be marked where captive fittings may be required. That done, remove the cage. The feet positions should now be reinforced using minimum 3mm thick steel plate, slightly larger than the feet. Continuously seam weld these plates to the floor, inner sill and rear wheel arches.

With the welder to hand, complete any seam welding you intend to do (recommended) and remember that all seam sealer needs to be scraped out first.

Next task is to provide an air box/dash panel. Options are the fashionable full width affair or the smaller airbox (to provide space for the carb, air cleaner and ancillaries). Methods are many and varied; take a look at existing cars for ideas. Remember that the bulkhead must be left fully sealed and impervious to fluids, so check it is done properly with fireproof putty because the scrutineers do. The same applies to the rear bulkhead, which is left unsealed from the factory to allow air extraction. Do this job fastidiously as the scrutineers always check it.

The rear parcel shelf has some very large diameter holes in it, which need to be sealed. Common practice is to remove the parcel shelf and replace and seal with a piece of aluminium/GRP and seal. It is an arbitrary point – some people say much strength tying the back quarters of the car is lost. It depends what cage configuration has been chosen as to whether you decide to do this modification.

The rear wheel arches need to be cut and raised in the shell to facilitate extensive suspension lowering (see regulations for diagram). Look at the other cars to assess method and think before you cut. Similarly front arches need to be raised. Removal of a two-inch strip all around the arch is usually sufficient. It is important and part of the bodywork regulations that a return lip is reformed to provide you with a place to mount the wheelarch

extension, but more importantly to prevent sharp edges coming into contact with the tyres in full bump travel, should the bodywork be pushed back onto the tyre due to contact.

Moving to the boot, an aluminium foam filled tank or fuel cell is ideal – usually between 3-5 gallons is ideal. Modified van and saloon tanks have been used successfully though. Locate within the perimeter of the subframe for maximum strength. The standard boot floor may be retained; common practice is to replace it with a flat GRP or Aluminium skin. Mount the tank securely and robustly, five gallons of fuel is 37lb or 16.5kg.

Replace the side windows with Perspex or polycarbonate (minimum thickness 4mm) and ensure if a glass screen is used that it is laminated. If you intend to dispense with seals and bolt in your Perspex try and do it before painting.

Plastic Wheel arch extension must cover the full tread width of the tyre when viewed from above. If the inner door pocket or panel of the door is removed, as is normal to save weight – the door must be stiffened with a diagonal support or replacement door panel (door card can be plastic/GRP/Carbon). The door should be fire retardant foam filled to provide driver protection.

A considerable amount of brackets are required and should be made and attached prior to painting. Look at other cars and try and remember, instrument mountings, switch panel, steering column support, radiator mountings, header tank fixings and additional brackets for engine mounting and oil coolers as a starter.

To summarise, this is a big job, but done properly the results are very rewarding.

SUSPENSION (& SUBFRAMES)

The Mini Se7en/Mini Miglia regulations for suspension allow a fair amount of freedom in the modification of the, basically, standard Mini set up. It is not the aim of this guide to give exact details of suspension settings, but to explain the modifications that are permitted, those which are not, and to provide a few hints and tips.

FRONT SUBFRAME - Must be fitted in the original positions and the rubberised mountings may be replaced with solid items to prevent the subframe from 'floating'. The subframe can be seam-welded to add strength and rigidity. It is highly recommended that the locating point for the suspension tie-bar is continuously welded all the way round (as this is only spot-welded as standard) and triangulated as it is not uncommon for these to break or bend. A strong towing-eye, or two, should then be fitted to the front of the subframe and painted a contrasting/noticeable colour.

FRONT SUSPENSION - The front suspension utilises most of the standard components and **ALL** original mounting points. The rubber cone 'spring' must be retained, but competition type can be fitted. The aluminium trumpet that locates in the rubber cone may be replaced with a telescopic version called a 'HI-LO' or 'Adjusta-Ride'. This is to facilitate easy adjustment of the car's ride-height and corner weights. The standard top suspension arm must be used. The lower or bottom suspension arm can be modified by replacing the rubber locating bush with an adjustable rose-joint. This gives a positive location and allows for adjustment of camber. This modification should not be carried out by anyone other than a highly competent fabricator/welder.

The front tie-bar may be modified by threading the end of the bar that mounts on the subframe and screwing on a female rose-joint. This gives a positive location of the subframe, which helps to minimise weaving under braking and allows for adjustment of the castor angle. Appropriately modified bottom arms and tie-bars are available from a variety of specialist outlets such as Mini Spares Centre, Ripspeed or Selby Engineering etc. Always use a good quality rose-joint.

A standard hub/upright assembly (disc-brake) type should be used. Cooper 'S' type discs and callipers are mandatory on Se7en – A four pot (Maximum) set up best on a Mini Miglia. Assemble on an annual basis with new bearings, c.v. joints and the new, correctly adjusted, ball joints (all available from Minispares/Minisports).

A bump-stop of some description should always be used to prevent the ball-joints from exceeding their travel.

Adjustable shock absorbers are generally used and must be fitted in the original position. The body-mounting for the 'shocker' must be bolted on in the original position but can be 'cut-and-shut' upwards to give more bump travel when the car has been drastically lowered. When the car has been lowered and negative camber has been wound on to the front wheels, you will find that the standard track-rod ends are only screwed on to the steering-rack by a few threads so it is a good idea to use longer track rod ends (commercially available). Triumph Herald ones can be used, as these too are longer.

Care should be taken to route all brake pipes inside the car tidily and in such a way as to minimise risk of them being crushed or snagged. Use of metal braided flexible rubber brake hoses is advisable.

REAR SUBFRAME - The rear subframe must be fitted in the original position and use the original mounting points on the body. The subframe mounting points can be modified by fabricating direct mounts to the body or by substituting the rubber bushes for aluminium ones (care should be taken to align the rear subframe accurately as they very rarely are from new). It is permissible to add additional mountings.

The subframe can be lightened by trimming lips and by drilling holes and can also be seam-welded for rigidity.

At least one if not two towing eyes should be solidly attached to the rear bar of the frame and painted a contrasting/noticeable colour.

REAR SUSPENSION - The rear suspension uses most of the original components and ALL the original mounting points. The rubber cone 'spring' must be retained but, as at the front, the aluminium trumpet that is located in it may be substituted for the 'HI-LO' or 'Adjusta-Ride' version.

The standard production radius arm must be retained. The radius arm pivot-pin mounting holes can be slotted to enable camber and tracking adjustment. (Ready-made adjustable camber plates are available from outlets such as Mini Spares etc.)

Special care should be taken when routing the rear brake pipes and hoses. They should pass underneath the radius arms, not as standard, as when the car is lowered these can foul on the underside of the body. The original rear brake set-up should remain although aluminium 'Mini Fin' drums can be used and up to a 1 inch spacer can be fitted. Once a spacer has been fitted, extra-long wheel studs will be required (part no. STR 1080).

Refer to the regulations to ensure that **MAXIMUM TRACK WIDTH IS NOT EXCEEDED**. Wheel studs should all be changed annually and must always be tightened with a torque wrench to 42lb/ft (NOT 42lb/ft plus a tweak!).

It is recommended for extra strength and durability Standard wheel bearings be replaced with Timken taper type (part no. GHK 1548).

The rear shock absorbers may be adjustable but must mount in the standard position both on the arm and on the body. They should be shorter than standard, to allow for ample travel when the vehicle has been substantially lowered. It is a common mistake made for rear shock absorbers to bottom out due to them being too long, causing severe handling problems.

Remember as in the other sections of this manual, if you have any doubts or questions, **ASK**.

BASIC MINI SE7EN & MIGLIA SET-UP GUIDE

Tracking -	Front – Parallel Rear – Parallel to 45 minutes tow out
Camber -	Front 1½ – 2° negative Rear ½ – 1° negative
Castor -	6.5°
Ride Height -	Front 7¼" to ground measured from outer sill lip (behind front arch) Rear 8¼" to ground measured from outer sill lip (in front or rear arch)
Tyre Pressures -	Recommended starting point for dry tyre pressures: M7 - 42 p.s.i front – 40 p.s.i rear MM - 30 p.s.i front – 28 p.s.i rear

These figures are only meant to be a starting point, obviously with experience and experimenting you will find your optimum settings. Remember weather/track conditions should always be taken into consideration.

ELECTRICS

TIPS

- The need for good connections is essential – many people are using aerospace connections for ultimate reliability. Make sure the crimp connectors are crimping the conducting part of the wire firmly. Oil and grease on terminals do not aid good electrical connections.
- Check earthing points for good bonding with the chassis.
- You can have the most powerful engine in the Club, but if say the positive feed to your coil is poor then you could be wasting your time. Tidy and well laid out wiring often means reliable wiring.
- The fusing of separate circuits, such as lights, wipers, fuel pump, ignition is a sensible move – having one fuse protecting all the circuits is not!
- It is recommended to run with fuses!

Note: As with all other sections of this booklet if you want advice ask Club members, remember they were all in the same position as you once.

THE ENGINE

ENGINE PARTS CHECK LIST

(M7 – Mini Seven only, MM – Mini Miglia only)

- 998cc Mini engine block (A series or A+) – M7 / 1275cc block (A series, 'S' or A+) - MM
 - 1 x crank (998cc type – M7 / 1275cc type – MM)
 - 4 x connecting rods (2 left-hand, 2 right-hand) – M7
 - 4 x con rods "Steel", 'S' or 1300 depending on crank - MM
 - 4 x pistons as specified in regulations (with rings & gudgeon pins)
 - 1 x camshaft as specified in regulations
 - 8 x cam followers
 - 8 x push rods (998 length type – M7 / 1300cc – MM)
 - 1 x 1300cc (12G940) Mini type cylinder head modified to within regulations, with valves, springs, retainers, stem seals, collets
 - 1 x set of main bearings
 - 1 x set of connecting rod big end bearings
 - 1 x set of crank thrust bearings
 - 8 x Teflon gudgeon-pin buttons (if required)
 - 1 x oil pump
 - 1 x oil-pressure relief valve assembly

 - 1 x rocker shaft
 - 8 x rockers
 - 4 x rocker-shaft pillars
 - 4 x rocker shaft spacers if reqd.

 - 1 x flywheel housing and cover
 - 1 x flywheel (Lightweight)
 - 1 x backplate (steel)
 - 1 x centre plate
 - 1 x pressure plate
 - 1 x gearbox

 - 1 x starter motor
 - 1 x water pump
 - 1 x alternator/dynamo
 - 1 x crankshaft pulley
- Plus: nuts, bolts, washers, brackets etc.

STARTING FROM THE TOP - THE CYLINDER HEAD

These are generally based on the 12G 940 castings. The only restrictions to modifying them are as laid out in the technical regulations.

With enough time and patience you can modify your own head, but other people offer this service.

A second hand head could also be purchased. This should be checked for damage and legality - ask another competitor to check it for you if you are not sure.

The following should come with your cylinder head.

VALVES - Use race-developed valves of up to maximum diameter as in the regulations.

SPRINGS - Use heavy-duty double springs. Ask other drivers which types they use (to allow for maximum RPM of 8500 plus).

RETAINERS & COLLETS - Use steel ones or specially developed racing ones.

STEM SEALS - Use 1300cc type seals.

VALVE GUIDES - Use special race-developed guides (do not use standard).

A thermostat blanking sleeve should be used in place of a standard thermostat, available from Mini Spares etc. This stops No. 4 cylinder running hot, as flow around the head is maintained.

Some people chose to "dry deck" the cylinder block/head interface – doing away with the water transfer ports and fitting a block/head outlets to allow a "cross flow" cooling system to the cylinder head in a quest for even better temperature distribution across the cylinder head.

THE MIDDLE BIT

ENGINE CYLINDER BLOCK ASSEMBLY

BLOCK - You can use a second-hand block or a new one. Once you have a bare block it should have its cylinders bored and honed to a maximum diameter given in the technical regulations.

N.B. Make sure your second-hand block is on its standard bore-size so it can be bored before you go too far.

Mini 7 - Exhaust valve pockets must be machined into the block (to prevent the valves striking the block when using the 1300cc head).

The centre main-cap should be machined to accept a steel strap. This strap helps prevent crank shaft flex. Straps can be machined or purchased from Mini Spares etc. Alternative is to have a 4-bolt main cap made and then the block line bored.

CRANK - You can use new or second-hand. Consult Club members as to the journal sizes that they feel you should use.

The crank can be tufrided (chemically heat treated) to increase its resistance to fatigue and surface fractures. It should also be dynamically balanced (along with your flywheel, backplate, pressure plate and pulley). Normally 'S' cranks are already treated as are Metro Turbo ones, however standard 1300 cranks need tufriding.

Make sure that the journals are well polished before assembly.

CONNECTING RODS – M7 – 998cc or 1100cc production rods or any Cooper 'S' rods may be used, but not 970S. these can be lightened.

MM – Proprietary Steel Rods or 1275cc production rods or any Cooper 'S' rods may be used, but not 970S.

Rods will require balancing. Use new high quality rod end bolts and nuts.

The rods are fitted with the big-end oil hole towards the distributor side of the block.

N.B. 1) Mini Se7en - these rods are not all identical, the big-ends are offset to the water pump end on two rods and offset to the flywheel end on the other two (for 998cc and 1100cc rods).

2) Where interference-fit connecting rods are used then 'Teflon buttons' are not required.

Check that the rod oil hole has been drilled out!

PISTON & RINGS – Mini 7 Use specified Omega pistons available through the club. Mini Miglia may use specialist pistons (or Rover ones!).

In Mini 7 you are only permitted to balance and reduce the crown height. Minimum crown to top land height 0.270".

Make sure that the piston rings are fitted the correct way up and in the correct grooves. Mark elsewhere if any machining is to take place.

The pistons are fitted so that the crown markings are towards the water pump end.

TEFLON BUTTONS - These fit into the end of the piston gudgeon pins (prevents serious bore damage) where fully floating ones are in use.

CAMSHAFT & FOLLOWERS - Use specified camshaft Mini Se7en CAM6648 – Miglia Piper STR930 (649). You can use Rover followers or special race-developed ones.

BEARINGS - Make sure that the main bearings are correct, i.e. A-series or A+ types.

Check running clearance of thrust bearings. Ask other engine builders which makes of bearing they suggest. Rover production spec bearings are OK.

If the crank has been ground then the relevant size bearings must be fitted.

CAMSHAFT DRIVING - There are many types available, i.e.:

- 1) Steel-Duplex chain kits
- 2) Belt-drive kits
- 3) Gear-drive kits

These may be adjustable, or you can buy offset woodruff keys, to enable exact valve timing.

CRANK DAMPER - Use one or else!!!! (cheaper than a new crank or engine). Some people don't use them; it's your engine. A damper will help a poorly balanced engine.

HEAD STUDS - Use high-tensile strength ones (i.e. Metro Turbo or similar).

THE VALVE TRAIN

PUSH RODS – Mini 7 - Use 998cc push rods or special race-developed ones.

Mini Miglia – Use longer 1300cc push rods or special race developed ones.

ROCKERS – 1.3 ratio roller rockers or production rockers are permitted in Mini 7. These include pressed steel types, Cooper 'S' types, plus the latest Mini Metro types (ratio 1:1.25 for Mini 7). Pillar spacers may be used.

Mini Miglia – The rocker gear is free up to a maximum lift of 425 thou. 1.3 roller rockers are the norm with the posts packed to achieve optimum lift. (1.5 Rockers outlawed from 2004 season on)

ROCKER SHAFT - Use special race-developed shaft (i.e. heavy duty).

ROCKER SHAFT PILLAR - Use steel pillars (make sure that you put the one with the oil hole in the correct place).

ROCKER SPACERS - You can use the standard spacer springs, or two springs with a washer between them, or solid spacers.

GEARBOX

Many different types are available:

1. 3 - syncro with remote change
2. 4 - syncro with remote change
3. 4 - syncro with rod change
4. 4 speed 'dog' box with rod change

ALL MUST BE **4-SPEED ONLY**

FINAL DRIVE RATIO - See who uses what! Apart from the differential ratio, you can alter the 'crank-to-1st-motion shaft' ratio by using special 'drop-gear' sets.

To start with, dependent on class chosen, you may be allowed two, to have different ratios available. For example – Mini 7 – 4.5 or 4.6 : 1 diff ratio in conjunction with 1 : 1 or 1.04 : 1 drop gears. Mini Miglia – 3.9 : 1 diff ratio with 1:1 drop gears are mandatory from 2004 season on (14:55 pinion/crown wheel).

The overall gearing of the car is given by the product of the differential gearing, the drop-set gearing and the gearbox gearing selected. The overall gearing is usually quoted in 4th gear (1:1). The drop-set gearing is the easiest to change at a race circuit and most teams will have at least two drop-set gearings to choose from. The drop-set gearing is given by the ratio of the number of teeth on the gearbox input gear to the number of teeth on the primary gear. (It is the primary gear that is normally changed at circuits). So if the gearbox input gear has 24 teeth and the primary gear has 23 teeth, then the drop-set gearing is 24/23:1 or 1.043:1. Common drop-set gearings are:- 1:1, 1.043:1, 1.091:1, 1.136:1.

If the differential gearing is 4.31:1 and the drop-set gearing is 1.043:1 then the overall gearing in top gear is 4.31 x 1.043:1 or 4.495:1. This means that in top, 4.495 revolutions of the crank result in 1 revolution of the wheels. The approximate distance covered by 1 revolution of a Mini Se7en wheel is 5 feet. The formula to work out speed in top gear per 1000rpm is given by:

Speed in mph per 1000 rpm in top = 56.818 ÷ overall gearing

So for an overall gearing of 4.495:1, the speed in mph per 1000rpm in top =

$$\frac{56.818}{4.495} = 12.64 \text{ mph}$$

FLYWHEEL - Use either a steel or an alloy flywheel with a steel centre.

CLUTCH BACK PLATE - **Do not use standard cast iron back plate.** Use a high graded material for competition use. It is possible to check the back plate to see if it is cracked or cast by holding gently between fingers and striking gently with a metal object (such as a spanner) and listening for long ringing sound, not a short dull sound.

CENTRE PLATE - Use either a riveted/bonded race/rally plate or a sintered bronze paddle plate.

PRESSURE PLATE - Use a race/rally plate ('Grey' coded) or rally/fast road ('Orange' coded).

ANCILLARIES

CARBURETTOR - Use a Weber 45 DCOE. For Mini 7 you must use only one choke (other 45mm choke carbs may be used such as Reece-Fish and S.U.).

INLET RESTRICTOR - Mini 7 only - A 38mm diameter restrictor must be added between the carb and manifold. The restrictor must retain the maximum bore over a minimum width of 3mm, and should be made of non porous material.

INLET MANIFOLD - This should be smoothly curved from the restrictor to the cylinder head face. It should have the facility to correctly mount a 45 DCOE if this is used. (IMPORTANT: check how people mount these – rubber mount rings).

Miglia – short 'maniflow' manifold is most commonly used.

EXHAUST MANIFOLD - Use LCB (Long Centre Branch) type or three-into-one type (LCB is most common). Different bore sizes may be tried.

SILENCER - As per technical regulations.

Single system - 1x Complete RC40 system / 1x Manifold CLRH06 or STR1069 single box.

Twin systems - Complete 2x RC40 / 2x Manifold CLRH06 or 2x STR1069.

OIL COOLER - This should be fitted between the oil filter housing and the oil outlet on the top left of the block (13-row upwards would be OK).

WATER RADIATOR - Use a Metro or similar radiator running behind the front grill as a minimum (this may not be enough cooling in the summer). Most manufacturers will make a special front mounted alloy radiator to suitable specification (Radtec etc).

OIL PUMP - If standard crank journal sizes are used then a standard pump is sufficient. Renew annually.

WATER PUMP - Use a Metro pump (no bypass hose fitting) or electric alternative.

ALTERNATOR – In line with RACMSA regulations a device capable of trickle charging the electrical system must be engine driven.

BUILDING THE ENGINE

First of all, obtain a good quality workshop manual, this will tell you how it all goes together. It is also advised that you read Vizard's "How to modify your Mini" and "Modifying the A Series Engine". Below is extra information that should help you.

Make sure that the crank journals are well polished. The crank thrust clearance should be slightly increased (approx. 2 thou - 5 thou). As each main bearing cap is tightened down make sure the crankshaft turns freely without becoming tight.

Check connecting rod big-end side clearance.

As each piston/rod assembly is fitted, make sure that the crankshaft can still turn (as each assembly is fitted it will become increasingly difficult to turn the crank - this is normal).

When the camshaft is fitted make sure that it turns OK.

Fit the oil pump after the camshaft and before the timing gear. Check that the camshaft still turns - if not, the oil pump is jamming up (you will have to relocate the pump and try again).

Locate the crankshaft pulley before the timing cover bolts are tightened - this locates the oil seal correctly, sometimes it is necessary to enlarge the holes slightly.

When fitting the flywheel housing protect the primary gear oil-seal from contact with the primary gear spline. If you don't the seal will fail and this will cause the clutch to start slipping due to oil contamination (there is a special tool for this made by Sykes Pickavant). If correct tool is not available, masking tape can be rapped around primary gear splines to protect the oil seal.

Must use extended central oil pick-up pipe in the gearbox due to oil surge during cornering at high speeds.

Make sure that the oil pick-up rubber 'O'-ring is in place when fitting the block to the gearbox.

The flywheel and crankshaft pulley nuts should be done up very tight (125lb/ft - 75lb/ft respectively).

THE ENGINE

IMPORTANT TIPS & POINTS

1. Existing Club members are your most useful source of technical information. They are usually very approachable and only too willing to give helpful advice.
2. Advice on WHERE and HOW engine building can and should be done may be obtained from Club members.
3. There are Club members who can do it all for you.
4. With care you can do all the engine, head and gearbox building yourself.
5. Keep everything really clean.
6. **DON'T RUSH IT.**
7. Read as much Mini technical information as you can find.
8. Look at other racing Minis.

USEFUL TELEPHONE NUMBERS

- Motor Sport Parts 01865383328 Fax 01865 714070
- SP Tyres UK Ltd (Dunlop) 0121 3062675 Fax 0121 3063815
- SPAX 01869 244771 Fax 01869 240536
- ST Products 01993 707200 Fax 01993 707222
- Mini Spares 01 707607700 www.minispares.com
- The Mini Shop 020 8805 8085 www.theminishoplondon.com
- Mini Sport 01282 778731 www.minisport.com
- Minispeed 01932 400567 www.minispeed.co.uk
- Demon Tweaks 01978 664466 Fax 01978 664467
- KAD 01303 874082 Fax 01303 872451

SUMMARY

Hopefully this download has provided some key points, which should help in preparing your Mini Se7en/Miglia. Remember to thoroughly read and adhere to the technical rules of the Club.

It is advisable to visit race meetings prior to competing and acquaint yourself with the racing members and their cars. Gain as much information as possible.

Always remember that the Mini Se7en Club members welcome you on and off the track. If you want any information then don't forget to contact your driver's reps (their phone numbers are listed in the Mini Se7en Club Magazine).

Finally, **HAVE FUN.**