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INSTALLATION OF HEMISPHERICAL(CROSS-FLOW) RENAULT ENGINES IN LOTUS EUROPA S1 & S2

INSTALLATION OF HEMISPHERICAL(CROSS-FLOW) RENAULT ENGINES IN LOTUS EUROPA S1 & S2

Installation of a RENAULT All Aluminium engine with Cross-Flow (Hemi)cylinder head in place of the now out of production #697(S1) & #821(S2)flat head stock units is an interesting conversion in view of the higher possibilities of the Hemi-Head allowing higher power and higher torque without reducing reliability. Unfortunately,most of the Renault Hemi-Head motors available in the U.S. are "detuned" in order to meet the anti-emission standards. Therefore, without a knowledge of the various models of hemi-heads ,it is possible to end up with less power than the original flat heads which were souped up versions of the Renault stock engine with a power of 80bhpsSAE @6,000rpms(73bhpsDIN) which can be increased easily to 90bhps DIN by replacing carburetion and camshaft. Also, contrarily to representations made by some misinformed Renault or Lotus "experts", replacement of stock flat head by hemi unit is more than just a "bolt-on"job.It requires not only a mechanic with ingenuity,but,in some cases,availability of a machine shop. Remember that no Renault all aluminium Hemi-Head motor was designed for midship installation in a car but only for front wheel drive cars.where all kind of engine compartment room is available.Also important changes have been made in the post 1975 Renault block chassis mounting which do not fit the Lotus any more.(see chapter Motor Mounts)

SELECTION OF AN ENGINE: THE FOLLOWING RENAULT CROSS-FLOW ENGINES TO BE INSTALLED IN EUROPA ARE LISTED IN ORDER OF POWER WITH THEIR SPECIFICATIONS:

MODEL	Application	Compression Ratio	Bore	Displ.	Carb.	Block	Rods	Piston Pin	Power SAE	DIN
FRENCH ENGINES :										
807-20	R12 Gordini Berlinetta Alpine 1600S	10.25/1	77mm	1565cc	2xSD	82,5mm	RR	21mm	125	113
844-12	R17TSS Europe Berlinetta Alpine 1600S	10.25/1	78mm	1605cc	2xSD	82,5mm	RR	21mm	119	108
807-03	various	7.6/1	77mm	1565cc	1xOD	82,5mm	NR	20mm	88	80
U.S.ENGINES:										
807.13	R17 Gordini U.S.(1313/23)early	10.25/1	77mm	1565cc	FI	82,5mm	NR	20mm	103	94
843.13	R17 - (1316/26)late	9.3/1	79mm	1647cc	FI	84mm	NR	21mm	95	86
843.15	R15-R17TL - (1308/18 Manual)	8/1	79mm	1647cc	1xDD	84mm	NR	21mm	72	65
843.16	R15/17TL - (1308/18 Automatic)	8/1	79mm	1647cc	1xDD	84mm	NR	21mm	72	65
843.10	R12 Manual - (1174/1334)	8/1	79mm	1647cc	1xDD	84mm	NR	21mm	72	65
843.11	R12 Automatic (1174/1334)	8/1	77mm	1647cc	1xOD	84mm	NR	21mm	72	65
RACING ENGINES: SPECIAL ORDER ONLY										
845	Competition	11.8/1	84mm	1861cc	2xSD	87mm	RR	21mm	215	195
807-GA	-	11.5/1	82mm	1775cc	2xSD	85mm	RR	21mm	170	153
807-G (809)	Berlinetta Alpine Competition	11.5/1	77.8mm	1590cc	2xSD	82.5mm	RR	21mm	160	144

DD- Downdraft RR- Reinforced Rods
SD- Side-Draft NR- Non-reinforced rods
FI- Fuel injection

FOR ENGINES STILL AVAILABLE, CONSULT PRICE-LIST ATTACHED.
XX

CONVERSION OF FLAT HEAD ENGINE INTO HEMI-HEAD: Though this conversion is technically feasible and we can supply the parts for it, it has very little interest since the cost of the parts alone is higher than a new Hemi-Head engine type 807-20 or 844-12.

As can be seen above, it is more interesting to start from a French engine or from an early U.S. 807-13 than from an#843 which will require a lot of modifications to be brought to a decent power, and for which there are less High Perfo components available.

If dealing with the French 807-03 engine or with the "detuned" U.S. motors, it will be necessary in first place to increase the compression ratio to 9.5/1,which can be obtained on Renault engines ONLY by installing domed instead of flat pistons. IN NO CASE,due to the particular shallow shape of the combustion chambers,should the cylinder head be milled over .020". Not only the power will not be increased that way, but a loss of 20 to 25% is likely as well as head gasket problems. Also note that pistons & liners should be purchased as a matched kit and not separately. The following PISTON-LINER-RING-PIN-SEAL KITS are available fo this purpose:

For #807,844 engines with 82,5mm block:	9.3/1	Ø77mm kit	20mm wrist pin	
	10.25/1	Ø77mm kit	21mm - -	
	11.5/1	Ø77.8mm -	21mm - -	For connecting rods and pistons matching, see 1986 addition .
For #843 engines with 84mm block:	9.3/1	Ø79mm kit	21mm - -	
	10.25/1	Ø79mm -	21mm - -	

PISTONS & CON RODS: When selecting cylinder liners,pistons & rods, be aware of the fact all models are not always compatible: -807 & 844 series engine blocks use removable 82,5mm liners with flat lower edges sealed with paper shims of various thicknesses,protruding into the cylinder head.

-843 series engine blocks use bevel lower edge liners sealed with a concentric O-ring which cannot be interchanged with the earlier 807 type.

INSTALLATION OF HEMISPHERICAL (CROSS-FLOW) RENAULT ENGINES IN LOTUS-EUROPA S1 & S2 (2)PISTONS & CON RODS (ctd.) :

Pistons come in two different wrist pin sizes : 20mm and 21mm .

Rods come also in two small end sizes: 20mm and 21mm , and in various designs:

see 1986 addition for rods available

-standard with bolts and nuts cap

-reinforced with special thin threaded bolts only.

Be sure therefore to identify properly your engine before ordering parts. Engine identification plate is located on block under cylinder head nest on water pump side.

CAMSHAFTS: on 807-03 French engines and all U.S. motors except early 807-13, the camshaft will have to be replaced by the Gordini unit (lift .240") or by another sports or competition camshaft (see list) . Higher lift cam will necessitate stiffer valve springs in some engines.

FUEL SYSTEMS: The following FUEL SYSTEMS are currently used on Renault hemi-head engines:

-one Downdraft Dual Barrel WEBER carburetor(32DIR/DAR/DARA-anti-emission)or 28/36DCDR (Europe) *

-one Side Draft - - - - - (40 or 45DCOE) -

-twin - - - - - (17TSS-12G) -

-Bosch Electronic Fuel Injection (807-13 & 843-13) * see 1986 addition for additional fuel systems

Downdraft Systems are the easier to install, the most reliable and most free of maintenance of any system, especially the systems equipped with the 28/36DCDR Weber carburetor designed specifically for Renaults in Europe. They will give excellent performance at low and medium regimes (up to 5,000 rpms), with moderate fuel consumption. They are perfect for motors equipped with low-lift camshafts and lower compressions, such as the 807- and 843

Single Side Draft systems allow faster introduction of larger amount of fuel mixture as far as the breathing capacity of engine will permit . Therefore it will be particularly interesting for higher lift camshafts, larger passages and larger valves head, where breathing is improved. It will enhance performance particularly at medium and high regimes (over 3500rpms) . It is not recommended for lower power engines where the results will be very poor.

Twin Side-Draft systems should be used only with High-Performance or Racing engines where high regimes are maintained constantly. They also require regular re-adjustments and synchronization of both units. Fuel consumption of side-drafts carburetors is also higher. When using Twin Carbs, use matched units specified for Gordinis with Air Flow adjustments.

Fuel Injection: If you purchase a used engine already equipped with fuel injection, make sure you are getting all parts and external electric components, switches & harnesses, including the fuel pump and the air filter. These parts are all extremely expensive when bought separately and cannot be substituted in the system. Also you will have some problem to fit everything under the Lotus rear deck . Since the Bosch system has been designed for use in a much heavier car and with a different air intake , it might be necessary to adjust it, an operation which can be done only in a shop specialized in Bosch electronics with proper test equipment. If you want to do it yourself, you will need the BOSCH Electronic Fuel Injection Manual to understand how it works. (see list). Early engines (807) are equipped with the JETRONIC-K system, later engines (843-13) with the JETRONIC-L system with EGR (Exhaust Gas Recirculation).

Fuel injection heads are not suitable for side-draft carburetors without modifications. (see page 5) .

Throttle Cable ; No matter what fuel system is used, it will be necessary to reroute the Europa cable and to install proper cable anchor. The original Europa bell crank can be used if the hemi-head engine rocker cover is fitted with a pivot. Proper linkages for downdraft and side-draft carburetors are available with rods of different sizes, or are supplied with the systems. Twin side-drafts are particularly critical in order to obtain perfect synchronization of both carbs. Throttle cable should be inspected and replaced if not in perfect operating condition, since, in particular with side-draft twin systems, additional load will be put on it.

843 engines with carburetors are equipped with a Turret type throttle linkage for which there is no conversion part available and which will require some mechanical ingenuity to attach cable to turret.

Choke Cable: stock Europa choke cable made for Solex carb is too large in diameter and will not fit WEBERS. A regular 12" choke cable should be installed. Note that U.S.#843 engine are equipped with automatic choke which does not require any cable.

Air Filters: This is an important question on the Europa due to the limitation in engine compartment space. On the other hand, adequate protection should be supplied to the engine which can be obtained only with large or remote filters. For selection, see Sport Air Filters special page .

28/36DCDR Weber-Renault carb.: re-use stock Renault air filter which is the best you can get by drilling holes in bottom plate and installing conversion kit (see list) . If original air filter not used, install larger Sports Filter available. Maximum height : 60mm

32DIR/DAR/DARA Anti-emission carbs.: these Weber-Renault carbs necessitate collar clamped type filters specially modified which are different from the regular DIR/DAR attached with a bolted flange (see list). You can also use the original Renault nozzle with remote Renault air filter which insures excellent protection.

Single Side-Draft carb.: Use larger filter available preferably RAMFLO or KN

Twin Side-Draft carbs: a space problem is encountered and it might be necessary to grind some internal fiberglass on the right side to accommodate the second carb and its filter. Three kinds of air filters are available for this system:

- the original calibrated Renault-Gordini Twin Carb Air Filter designed specifically for the Renault Twin Side Draft system. Not only does this unit provides adequate volume of air and protection, but it features a large external air inlet allowing better engine breathing through a flexible hose and can be used as an air box for racing by removing the internal filter element (see picture). Replacement for internal filter element are available. This is by far the best unit providing adequate external air inlet is supplied.
- a remote air filter which can be connected with inlet nozzle plate and flex hoses -minimum space required. (see picture & list)
- twin Sports Air Filter which require frequent cleaning or replacement (every 1,000 miles) of the filtering material . Note that these filters maximum width should not exceed 172mm or should be offset in order to clear each other.

FOR ALL FILTERS MOUNTED ON LOTUS, MAKE SURE THE UNIT IS PROTECTED FROM WATER POURING DOWN FROM REAR DECK OPENING. THIS CAN BE ACHIEVED BY INSTALLING DEFLECTOR OR OBTURATOR.

BREATHER DEVICE: All Hemi-Head Renault engines are fitted with oil vapors recirculating devices located on rocker cover and connected with inlet systems. These devices can be retained by selecting an air filter with proper spout (inlet tube) or by brazing one. The inlet tube OD should be 1/2" in order to take hose of same size, and fitted with flame arrestor .

INSTALLATION OF HEMISPHERICAL(CROSS-FLOW)RENAULT ENGINES IN LOTUS-EUROPA (3)

Other recirculating and anti-pollution devices: depending on year model and engine application, there will be more or less systems and devices. It is advised to stay with original system of the engine you have or by-pass it completely by plugging all lines. For 843 engines fitted with air pump, this device should be removed and all connected lines and devices plugged or removed, or by-passed, since it will absorb some unwarranted power. Only U.S engines equipped with fuel injection or downdraft DIR/DARA carburetors can be equipped with complete anti-emission systems.

Fuel Pump: French engines are equipped with mechanical pump giving a pressure of 2.5/ 4 psi. U.S engines do not have any provision for such pump. Therefore, an electric fuel pump with a maximum pressure of 4psi should be installed. In no case should the Fuel Injection 807-13 and 843-13 pumps be used with carburetor(s) because of their excessive pressure (28-30psi). When installing new fuel system, always check fuel lines and replace.

Velocity Stacks(Air Horns): are primarily for competition use and do not offer any protection against dust and other particles, which can wear a new engine in a few weeks. They come in different styles and lengths. LONGER STACKS favorize HIGHER REGIMES, SHORTER STACKS help at LOWER REGIMES, and acceleration. As a rule, stay with model specified for carburetor. For rallies and racing in dusty environment, use "AIR HORN MUFFS" which are porous foam filtering elements fitted on top of each stack as a glove. (see picture & list). They give excellent temporary protection. For various styles and sizes of stacks, see separate page.

* Bracing Kit: due to the combined weight of twin side draft manifolds, carburetors and filters, it is recommended to prop them up by installing a bracing kit attached to block (see picture & list). This will avoid air leaks which can damage engine. This device is not necessary for the Twin Side Draft Racing Kit with neoprene spacers (see pict.)

Ignition: the Europa flat head stock distributor does not fit the Hemi-head, which come with a different unit. It is recommended to use the distributor designed for the particular engine used, except if the camshaft has been replaced in which case, the distributor should correspond with the new cam. For fuel injection engines, it is mandatory to use the corresponding Bosch unit. For Twin Carbs engines, the GORDINI distributor no. 4355 should be used. When purchasing a new distributor, insist in receiving the specifications so that you can time it adequately. Note that, when using side-draft carburetor(s) not designed for vacuum advance connection, the vacuum advance pump should be removed from distributor and a new centrifugal advance only contact point plate installed. If not available, modification should be made to distributor so that vacuum advance cannot move.

Coil: Stock Europa coil is marginal for high-performance engines requiring a more powerful spark at high regimes. A heavy duty unit such as the new Epoxy-filled SEV-MARCHAL coil or the DUCEL External Resistor Racing Coil (see list) should be used.

EXHAUST SYSTEMS: the original exhaust system of the Europa cannot be used with hemi-head engines, which come with TWO different exhaust manifolds:

- a 4-into-2 header with a connecting flange which will not clear the Lotus chassis and which is difficult to modify since it is made of cast iron. (807 engines)
- a 4-into-1 IX header with a collar connecting end, which, coupled with an elbow shaped IX connector with flattened pipe, will clear the Europa chassis. (see pict. & list)

This pipe can then be connected to an exhaust pipe and silencer.

Other Exhaust Manifolds and Headers : see pictures

- Alpine Dyno-Tuned Exhaust Manifold with collar -Best road unit available for hemi engines.
- Alpine Dyno-Tuned Racing Headers with bottom transverse exit (for track only)

Silencers: you can use either Renault components designed for Gordini engine or have a good muffler shop put together an exhaust system. The only requirements are to use 2" OD exhaust pipe and corresponding silencer. Two kinds of mufflers are available: -the Flow-Thru mufflers also called Free-Flow where the flow is not restricted in any way but only "expanded" through a surrounding padded chamber. They are the more efficient, but also the louder and might not comply with local noise regulations.

-the regular mufflers which submit the flow of gases to different restrictions and chicanes in order to reduce the noise to accepted levels. They can be called all kinds of names but are easy to identify since you cannot see through them.

Two kinds of mufflers designed for the Gordini engine with carburetors are available:

- 1- a Flow-Thru ellipse-shaped first stage silencer - Length: 320mm OD: 5mm - highway-rallye
- 2- a Rear baffled muffler - Length: 380mm OD: 5mm - street-highway

In Sedans, they are both mounted, one in front, one in rear, but, in the Europa, due to position of engine, it is not necessary to use both of them.

Motor Mounts: the stock Lotus Europa Renault engine is suspended by 3 points:

- 2 motor mounts no. 054E6000 which are Lotus parts. These mounts are fitted with two L-shaped brackets, one right and one left. The right bracket has a hole through it for passage of shift rod. Both brackets bolt to the motor mount on one side and the engine block on the other side, with 3 bolts in a triangle pattern.
- 1 rear transaxle mount which is a Renault part.

First, make sure the mounts are all in good condition and replace them if necessary.

The early (807) Renault Hemi-Head engines have the same bolt pattern on block, and can use the Lotus original motor mount without any problem. However, the later engine (843) blocks have been modified, and they will require extensions of the right and left L-shaped brackets no. 46E 377 & 46E0378. This extension will be achieved by welding a plate and a spacer to each bracket, as shown on attached sketches. We can supply these plates & spacers or complete welded units. (see list). No modification necessary for rear transaxle mount.

Flywheel & Clutches: the Lotus stock flywheel will fit all Renault hemi-heads. However, it is better to use flywheel supplied with hemi-engine.

II U.S. Hemis are fitted with a flywheel for 200mm Ferodo clutch. However, French engines 807-20 and 844-12 as well as 807-6 racing engine are fitted with a 215mm Reinforced Ferodo clutch & flywheel which is necessary over 115bhp. For engines over 150bhp, a 3-piece aluminium racing clutch is used with special flywheel. (see list)

Important: when using 200mm clutch on hemis, please note the following:

- only the original Ferodo 200D325 Lotus reinforced unit should be used and not the weaker 200D unit used in Renault R16.
- the clutch used on Renault Hemi-Head engines whether 200mm or 215mm use a different release bearing riding

Flywheel & Clutches(ctd.):

directly on the clutch diaphragm instead of a withdrawal pad plate .

Installation of the new release bearing in the original Europa bell housing being difficult, it will be necessary to replace the complete bell housing by the new model fitted with new bearing as used in #352 and #365 transaxles of the Twin Cam.

All clutches are compatible with any center splined transaxle main shafts whether #330 ,#352 ,#365 or #395. The Flywheel should also be inspected and surfaced if scratched. This flywheel can be machined to take a 215mm clutch. It is not recommended to lighten flywheel to increase performance, but, in any case, not under 12lbs.(original 200mm flywheel = 16lbs.)

Bell Housing: the stock bell housing of the 4-speed Europa type #336 Renault transaxle will fit any Renault hemi engine . However it will have to be filed slightly internally to clear the larger 215mm clutch if used.

Oil Cooling: it is imperative to install an oil cooling device when converting to a Hemi-Head engine, to help the original diminutive cooling system which is already inadequate. When installing an oil cooler or radiator, it will also be necessary to move the original motor oil filter from block to a remote location, this for three reasons:

- lack of space to install pick-up plate and return under motor oil filter
- easier access to filter
- larger capacity and better availability of new SAE filter.

All Oil Coolingsystems are composed of the following:

- one engine pick up and return by-pass adapter fitted to block in place of original filter
- one remote oil filter mount
- one tubular coil type cooler or an aircraft type honeycomb oil radiator
- fittings and hoses.

Outside of that, there is a substantial difference in cooling capacity between the standard tubular oil coil which is made of a bent copper tube sunk into thin aluminium fins and a honeycomb-shaped aircraft type aluminium radiator which has an average of three times more cooling capacity for the same cooling surface. Also most tubular oil cooler kits are fitted with clamped hoses and fittings which are less reliable than the aircraft safety fittings mandatory for sanctioned competition. Unfortunately, the relationship between a standard oil cooler system and an aircraft safety kit is also 1 to 4 in cost.

In view of the high cost of aircraft fittings, it is customary to install them only on the most vulnerable side of the system which is the engine pick up, and eventually the remote oil filter base.

We supply both types of cooling systems .

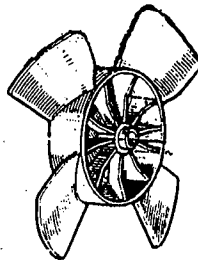
On the other hand, if you want to use your own oil radiator, we remote filter mount.(see list)

Always use 1/2" Oil Safety Braided Hose 300psi in your installations.

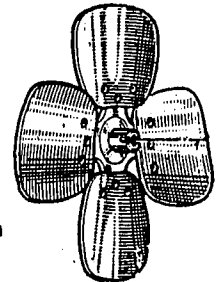
High Volume Oil Pump: installed on early 807-13 engines, 807-G and 844-12, this larger pump increases volume of oil circulated by 33% , a very desirable feature for high performance or souped up engines. It is therefore recommended to install this pump whenever possible in non-equipped engines.

Oil Sumps: CAST ALLOY sumps with anti-surge oil baffle are available.

COOLING SYSTEM: The Europa original cooling system is already deficient because of location and size of water radiator. It will therefore be IMPERATIVE when installing new more powerful engine to CHECK THOROUGHLY not only radiator but all hoses, pipes, clamps, etc.. Note that Europa radiator has an internal welded baffle plate separating water inlet and outlet which should be inspected since it gets corroded or unwelded very often and let the coolant run directly from inlet to outlet pipe without going through radiator core, thus eliminating any cooling. Caution radiator shop accordingly when having it reconditioned. Of course, if you can have a larger radiator installed, it would still be better.



High
Volume
Fan
Aluminium
NLA

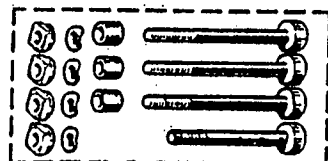
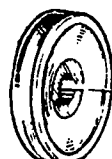


Starter Motor: the stock Europa flat head starter motor will fit any Hemi-Head engine . However it will be marginal for highest compression engine. Therefore, it should either be replaced by a Heavy Duty unit, or at least checked and reconditioned if necessary to have maximum cranking power. (see list)

Alternators & Pulleys: The Europa stock alternator is located more towards the block than in the hemi units. Also most recent hemi-heads are fitted with a belt tensioning system which does not exist in the Europa. The cheapest and easiest way to install the stock Europa alternator is to discard the tensioning system and replace the water pump pulley by a different unit fitting the Hemi-Head pump, so that the pulleys will line up. We can supply the modified pulley(see list) or you can make your own. It will also be necessary to transfer the stock alternator bracket and camshaft pulley from old flat head to new hemi to obtain proper line up.

However, if your engine is equipped with the belt tensioning system, it is much better to retain it though it requires several additional parts:

- special alternator pulley
- bolt-spacer kit to lengthen alternator front support frame
- 2 spacers 6mm long: -1 with 10mm diameter
- 1 with 6mm



Engine Front Cover: All U.S. Hemis are fitted with an opened Timing Cover & a pulley, used to activate air conditioner. This pulley will not

be usable in the Lotus Europa and might not clear the chassis. Therefore, it will have to be removed and the timing cover opening plugged or replaced (see list) .

INSTALLATION OF HEMISPHERICAL(CROSS-FLOW)HEAD RENAULT ENGINES IN LOTUS EUROPA (5)

Sender-Units-Gauges: all instrument gauge sender units from stock Europa flat head engine will have to be transferred to new engine since they must match the British gauges of the Europa. There is no major problem since the threads are the same on both flat head and hemi-heads. Only the position of these sender units (water temp, oil temp, oil pressure) might be different :

- Water Temperature: original sender unit located on left side of cylinder head behind water pump will have to be transferred to the other side of the hemi-head (inside alternator support) where a hole of similar 14mm x 1.5mm thread is available. This unit has to be the original Lotus unit to match the Smiths instrument.
 - Oil Pressure Warning lite; can be either the flat head or hemi-head sender unit. Located on oil galley towards timing cover, on left side of block.
 - Oil Pressure gauge sender unit: the original sender unit has to be re-used with the new engine. However, if it does not fit the same hole as the flat engine, move it towards the timing cover where you will find an Allen wrench square plug which will be removed and replaced by the original Lotus sender unit, as it came out of the old engine. As to the non-used supplementary sender units, they will be kept in place as plugs. None of the hemi-head sender units can be used with the Smiths instruments except the oil pressure warning lite which is the same.
- On all #843 engines, the last oil galley plug towards the Timing Cover has to be used to install Lotus oil pressure sender unit.

CYLINDER HEAD:

Important: Note that U.S. Hemi engines Cylinder Heads are often featuring smaller or restricted inlet & exhaust ports. This is done in order to facilitate compliance with anti-emission standards or particular fuel injection requirements. Also fuel injection heads need extra turbulence at port level, and this is why some fuel injected heads show a recess at intake port level. When fitting carburetor(s) especially side-drafts, it is imperative TO ELIMINATE ANY RESTRICTION BOTH IN INLET AND EXHAUST PORTS, so that Fuel Mixture can flow smoothly. This is obtained by having head ported and polished preferably with a Flow Bench Tester and ports matched with manifold(s), if possible. Not only will restricted or bossed ports in head reduce performance, but they can make engine altogether unadjustable, and running erratically. Also note late #843 engine Combustion Chambers are Elliptical instead of Round and cannot be used with dome pistons without being machined and re-contoured appropriately. When performing this machining, Combustion Chamber Volume should be brought as close as possible to 43,45cc (2.652 cu.in).

Some fuel injection cylinder heads also feature bracket and water inlet castings on the inlet port side which are used for fuel injection purposes only. In order to fit Manifold(s), it will be necessary to cut bracket casting or to plug the water inlet, or to grind the inlet manifold casting, whatever is the easiest. For Preheated Manifolds, caution however will have to be exerted not to break in water passage.

All Fuel Injection sensors will have to be disconnected or plugged if injection not used. Plugs are available from us providing you supply the thread dimension in mm.

Rocker Covers: Two kinds of CAST ALLOY ROCKER COVERS are available for the hemi-head engine: Both are finned to provide extra dissipation of cylinder head heat:

- the Alpine cover -see pict.- marked "A" -polished
- the Turbo - - - "TURBO"- with safety screw oil plug

These covers also provide a beautifying look to engine, instead of the Renault sheet metal stock unit.

PISTON WRIST PINS:

Important: When ordering High Compression Pistons with 21mm piston pins, it might be necessary to bore con rod small end from 20mm to 21mm depending on what model of engine you are using. This operation can be done in two different way by machine shop:

- by boring small end until proper clearance is obtained to fit 21mm pin- Press-Fit*or Floating**
- by boring small end and press fit Gordini bushing which is used in Gordini 21mm rods. This way is safer at high regimes but also more costly. Lubrication holes will have to be drilled through rod & bushing.

*Press-fit means pin tight in rod small end and loose in piston -no end clips necessary

** Floating means pin floating in both rod and piston with lateral movement controlled by end clips.

For your information, note various pin diameters in relation with engine models:

- all 807 engines except 807-12, 807-20 = 20mm P.F. 807-13 US = 20mm PF
- 807-12, 807-20, 807-G, 844 engines = 21mm F.F. with bushing
- 843 engines: all 21mm P.F. except #843-13 from veh.R-1316 no.1 to 89 & R-1326 no.1 to 349 -- 20mm PF
- 843-13 from veh.R-1326 no.90 and R-1326 no.350 on = 21mm F.F. with bushing

807-13 & 843-13 = US Fuel Injection engines veh.= vehicle no.

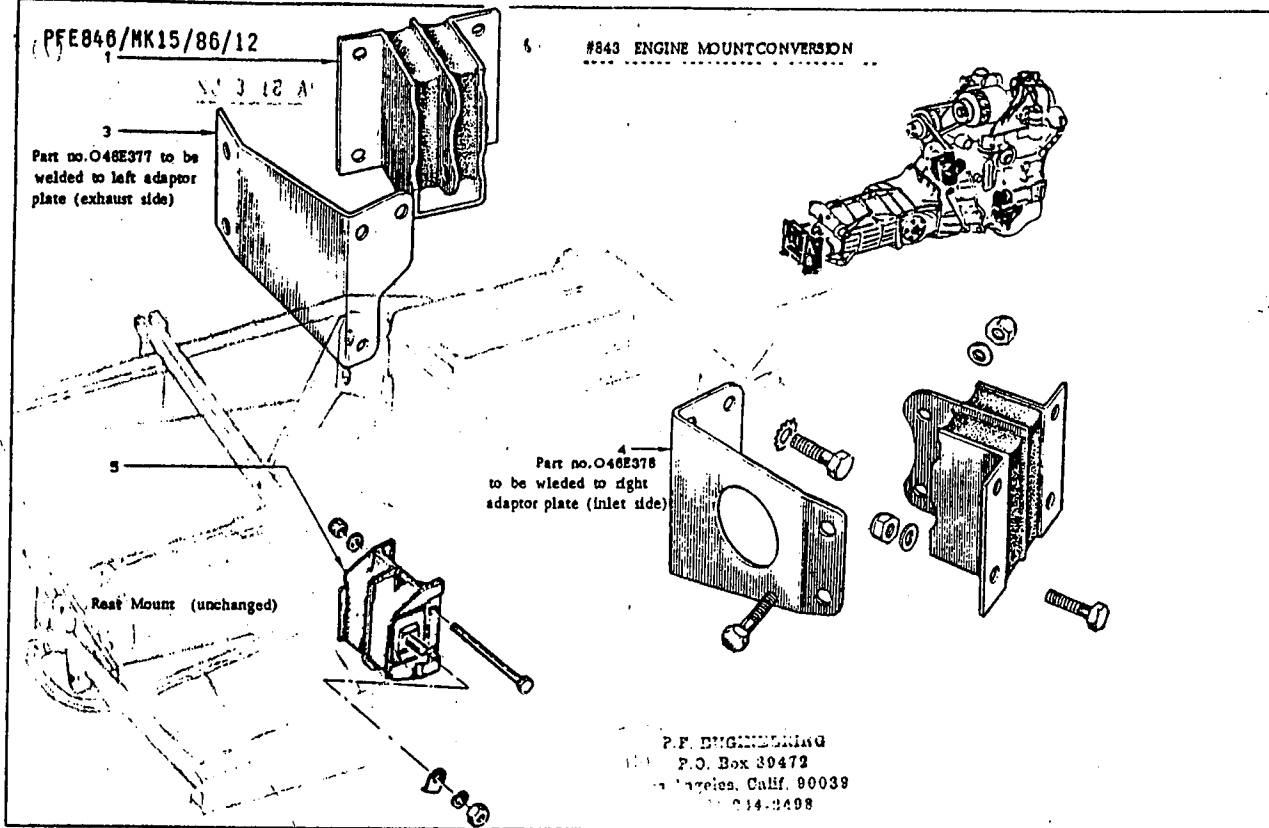
PF= Press-Fitting(no bush) FF= Floating Pins (bushing)

We are equipped to modify one type of rod into the other (see list).

For all high power or high revolution engines, reinforced Gordini rods with special thin-threaded bolts or Blueprinted racing rods are necessary. (see list) .

FINAL CAUTION: Before installing a new engine, it would be also a good time to inspect other components which are going to receive the new plant such as transaxle(main shaft play-lateral play-seals, etc..) clutch and clutch control motor & transaxle mounts, drive shafts & U-joints, rear hub bearings & seals, suspension springs & shock-absorbers, etc.. Any defect which did not show up with stock used engine might appear with new and more powerful unit.

Also initial adjustments of carburetion and ignition should be made along engine or equipment specs, but might have to be altered later due to particular conditions such as climate, altitude, weight of car, size of wheels & tires, kind of driving (city, highway, rallying or various kinds of racing), and particularly quality of fuel used. These final adjustments or refinements can be made by any local experienced mechanic.



FAM 3/77 MOTOR MOUNT ADAPTATION KIT FOR 8807/843 ENGINES

PLATE NO. 1 - INTAKE (RIGHT) SIDE

INTAKE SIDE (RIGHT)

- 1) MAKE PARTS AS PER DRAWING OR PURCHASE FROM FAI
- 2) WELD ALONG EDGES - BARS
- 3) DRILL $11/32$ " HOLES TO MATCH CRANKCASE AFTER WELDING. X

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WELD ALONG THIS EDGE - BARS TO PART 046E378 RIGHT

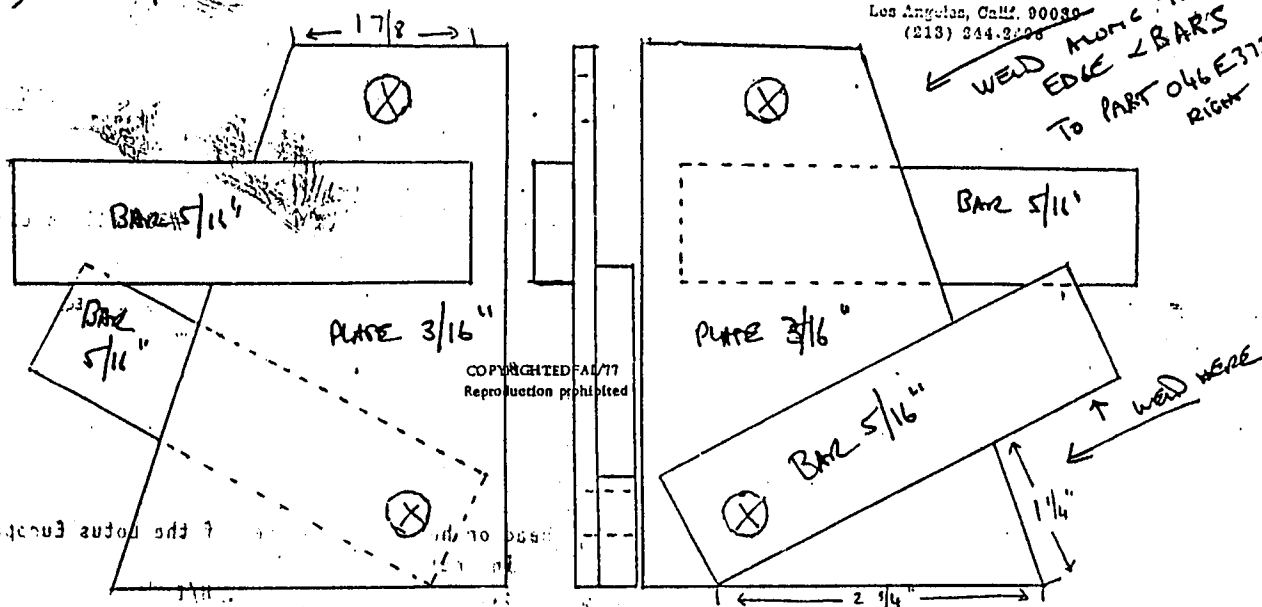


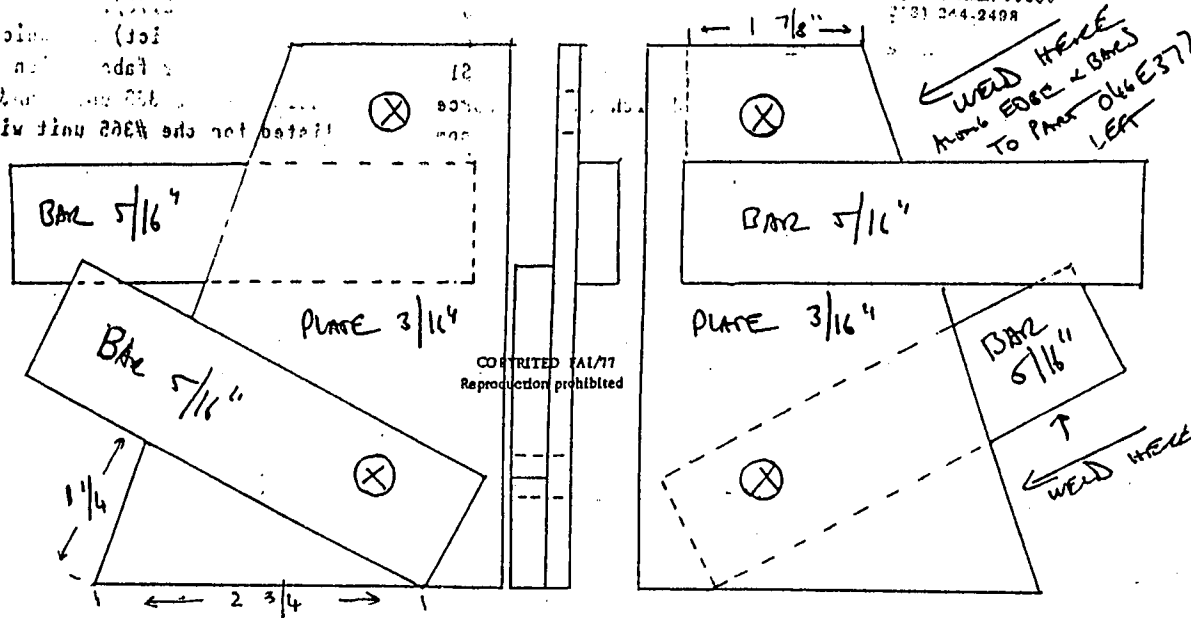
PLATE NO. 2 - EXHAUST (LEFT) SIDE

EXHAUST SIDE (LEFT)

- 1) MAKE PART AS PER DRAWING OR PURCHASE FROM FAI
- 2) WELD ALONG EDGE - BARS
- 3) DRILL HOLES ($11/32$ ") TO MATCH CRANKCASE HOLES X

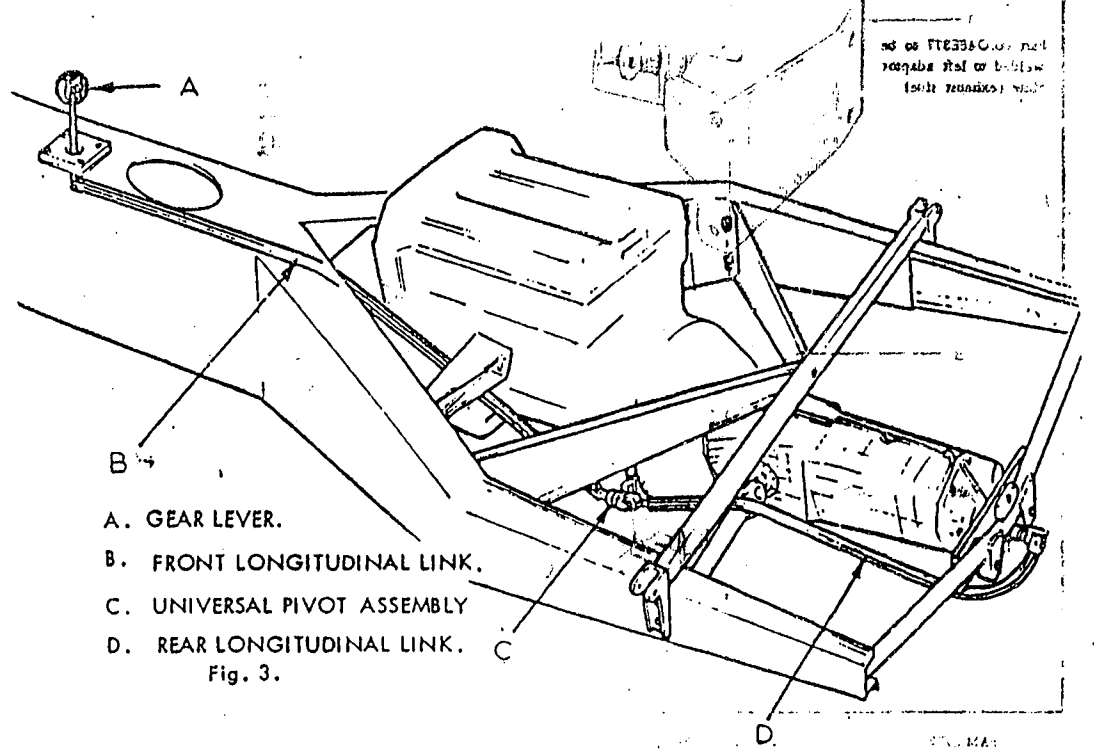
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P.O. Box 39472
Los Angeles, Calif. 90039
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WELD HERE ALONG EDGE - BARS TO PART 046E377 LEFT



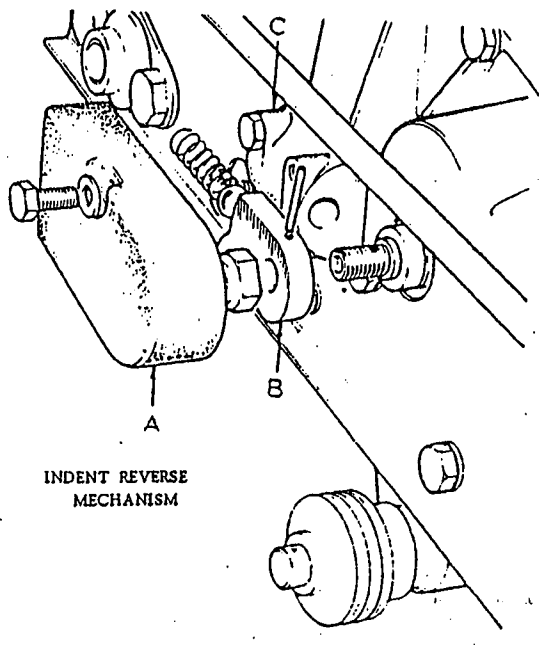
INSTALLATION OF 5-SPEED RENAULT TRANSAXLE INTO LOTUS EUROPA S1 & S2

SHIFT LINKAGE

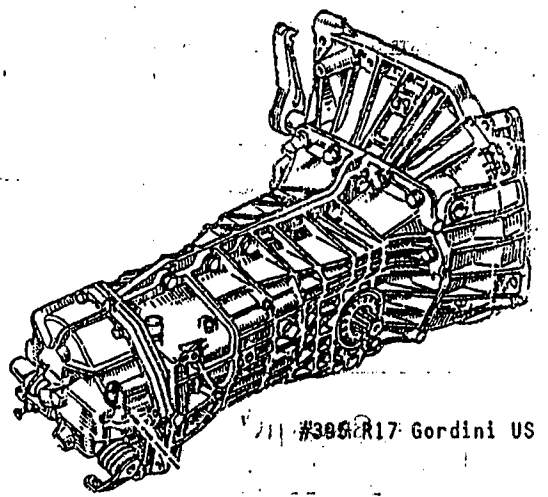


- A. GEAR LEVER.
 - B. FRONT LONGITUDINAL LINK.
 - C. UNIVERSAL PIVOT ASSEMBLY
 - D. REAR LONGITUDINAL LINK.
- Fig. 3.

REVERSE MECHANISM



INDENT REVERSE MECHANISM



For 365-07 unit, see illustration under Equipment for Renault all aluminium engines.

Installation of 5-Speed Renault Transaxle in Lotus Europa S1 & S2

Two types of 5-speed transaxles can fit the stock Renault flat head or hemi-head engines of the Lotus Europa S1/S2.

- * -the #365-07 model as used in the Lotus Twin Cam with following ratios:
 -1st:3.61/1 - 2nd:2.33/1 - 3rd:1.61/1 - 4th:1.21/1 - 5th:.87/1 - Final Drive:3.78/1

Installation of this unit which is controlled by a selector shaft located in rear cover requires a completely different linkage all the way to the shift layer.(see pict).It will also be necessary to replace or modify:

- driveshaft inboard yokes * This transaxle is no longer available
- lower link mount
- rear mounting plate & supports

The Lotus reverse indent mechanism will have to be added. All these parts are available from Lotus only and are extremely costly. You can also have a custom linkage made by a speed shop.

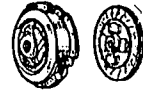
- the #395 model used in Renault 17 Gordini US model only,which features the following ratios:
 -1st:3.45/1 - 2nd:2.24/1 - 3rd:1.48/1 - 4th:1.21/1 - 5th:.94/1 - Final Drive:3.78/1

This transaxle is fitted with a rear cover lower transverse selector shaft (see pict) for which no usable linkage exists,requiring extensive modifications of the S1/S2 linkage or outright fabrication of a new one. Also note this transaxle is not equipped with the reinforced differential of the 365 units and therefore cannot accept as much torque as the 365. The same other components listed for the #365 unit will also be necessary. NOTE ALSO THAT GEAR RATIOS ARE DESIGNED FOR A 6000lb.SEDAN AND NOT FOR a 1500lb SPORTS CAR.

We will supply upon demand a list of the Lotus parts necessary for conversion with parts nos. (cost \$3-)

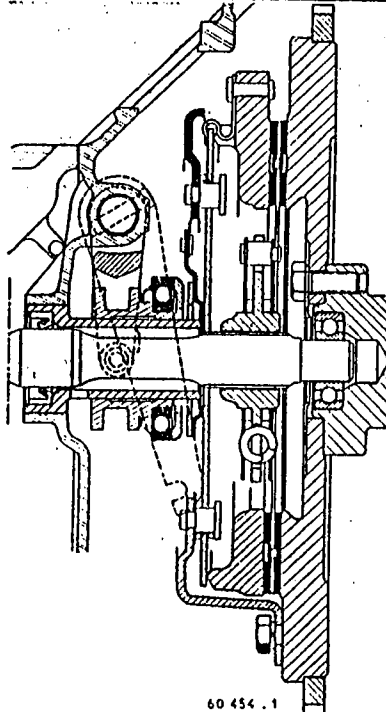
Bell Housing: note that #395 bell housing will fit any Renault alu engine whether flat head or hemi-head where the 365-07 Lotus unit will require a new bell housing to replace the original part designed to fit the FORD engine. The stock S1/S2 4-Speed transaxle bell housing can also be used with stock 200mm clutch but will have to be replaced to take the 215mm clutch because of a different clutch cover and throw-out bearing;Also note clutch cable will have to be rerouted to right side of bell housing if using #395 unit. Clutch Shaft and lever will have to be turned of 190 deg. to face down instead of up.

CLUTCH SPECIFICATIONS



First assembly:

Stock SI/S2
 821 engine flat head.
 200 D 325
 With withdrawal pad thrust plate



Second assembly:

807/843/U.S. engines hemi-head
 uses same flywheel,
 200 DBR 325
 without withdrawal pad thrust plate.
 215 DBR 450 -
 807-20 Gordini engine
 864 Alpine engine
 807-G Competition engine
 without withdrawal pad thrust plate.
 requires 215mm flywheel

