Documentation of the restoration and modification of 1967 Lotus Europa S1
46/0363
Fast, agile, rare, and with an extensive manufacturers racing pedigree, the original Lotus Europa has become a highly regarded classic sports coupe. The S1 Type 46 is the rarest model of Europa, with under 600 made, and approximately 70 known to have survived worldwide.

Europa S1 #46/0363 was built by the Lotus factory at Hethel, Norfolk, in 1967.
From 1967 until May of 2000, the history is unclear. It apparently spent some of its early life in the Louisiana area, before eventually being registered in Hanford, California. Later in 2000 it was sold to Drakes' British Motors, located in Kelowna, British Columbia, Canada.
In July 2001, 0363 was bought by a Lotus enthusiast in Port Coquitlam, BC, who performed a thorough teardown in preparation for a complete rebuild.

After a period of intense work, which included fabrication of redesigned door hinges, removal of all paint, and replacement of the chassis, the restoration stalled due to time constraints. At this point, knowing that I was interested, the owner offered to sell 0363.
When I first saw 0363, it was exactly as I expected. Completely disassembled, stripped of multiple colors of old paint, and containing a beautiful new chassis.

The previous owner had done an excellent job, and I was ready to take on the completion of the project.
0363 was picked up in two trips. The first trip was in early October, and consisted of a single truckload of parts, basically everything but the body and chassis. My friend Laird Ross supplied the truck and single malt.

The second trip was to pick up the body and chassis. Again, my good friend Laird was on hand to help, this time joined by Dave Rush of the BC Lotus Club. The flatbed truck was provided by my old buddy Rob Paterson.

I purchased Lotus Europa S1 0363 on September 24, 2005
363 came with the original, but unusable Renault engine. The engine had spent years open to the elements, was severely damaged, and the previous owner decided to part it out.
After looking into various engine swap options, the Toyota 4AGE was chosen. This engine was used in the Corolla and MR2 from the late 1980's and early 90's. The 4AGE was also the engine of choice of the Formula Atlantic racing series.

The new engine for 363 puts out around 130HP in stock form, which is about a third more than the original Renault.

I found a local 4AGE, and started a complete rebuild. Thompson Automotive handled the bottom end, while myself and mechanic Brian Curley started rebuilding the head.
The rebuild went well, without any major problems.
An adapter kit to install a 4AGE into a Lotus Europa is available from Texas manufacturer John Pels. The kit consists of motor mounts, alternator mount, additional idler gear mount, and a large aluminum adaptor plate in order to use the original Renault transaxle.

New alternator location using mount from adaptor kit.

The adaptor plate required a bit of modification. A large piece of aluminum had to be removed from the top right corner in order to allow the steel Toyota coolant tube to run across the side of the block.
The 4AGE came with an oil cooler, which is not needed, and the outlet for the cooler interferes with the new motor mounts.

The adaptor for the new remote oil filter can sit against the block, as long as the threaded mounting pipe is shortened.

Also, the new motor mount must be modified to fit under the remote oil filter plate.
The original air flow meter was giving some strange codes, so a replacement was found at a wrecker in Langley, BC.

The coil and ignitor were found at a wrecker in Prince George, BC.

The header is another spectacular product from John Pels. It is specifically made for the 4AGE/Europa application.
Due to the tight fit of the header, the alternator wiring must be well protected. Since this photo was taken, the closest header tube has been wrapped with extra insulation.

The distributor has been rebuilt using a kit from an Ontario Toyota specialist. The alternator is from a Geo Metro, and the starter is a 1987 MR2 part.

Computer, oil catch can, and K&N filter. The catch can prevents oil from migrating from the valve cover to the intake manifold under hard cornering.

Completed engine.
The trailing arms and rear axles, ready for disassembly and restoration.

The first bin of parts back from the sandblaster.

More sandblasting.

The original shocks and springs were checked, disassembled, cleaned, and painted. The lower shocks were provided by 363’s previous owner, and were from his Europa Twin Cam.
Primed drop links for the sway bar.

This damaged drop link was later repaired by a local welder.

Suspension, e-brake, gas pedal, and seatbelt parts, all sandblasted and painted with POR 15.

The sway bar was donated by a kind member of the Europa Yahoo list. The list is an incredible resource, populated by many experienced and generous Lotus enthusiasts.

Sandblasted and painted trailing arms.

Rear lower links. New bolts and nuts, bushings, and painted with POR 15.
Sandblasted lower A-arms.

New rear shock bushings.

Mocked up front suspension. New bearings, everything sandblasted and painted. New bushings, new trunnian kits, new ball joints, all new fasteners, etc. Freshly turned brake disc too.
The axles were very rusty and beat up.

One of the stub axles had damaged splines, and needed to be replaced.

Cracked seals also required replacing.
One clean, one soon to be. These were wirewheeled, rather than sandblasted. The only complication was when I temporarily misplaced the lug nuts.
The drop links were modified with removable rings. These allow easy installation and removal of the sway bar.
Steering rack before restoration.

Outer steering column, half stripped.

Steering column, ready for reassembly.

Steering column, rebuilt and painted.

Rebuilt rack. Bellows and tie rod ends are new. Rack has been cleaned, painted, greased, and the bolt on the grease cover has been replaced with a zerk for easy maintenance.
Rebuilt steering rack.

Steering wheel. The horn button has been rebuilt, and the clear button cap has been polished with an LMG polishing kit. The kit's sandpapers start at 1800 grit, and finish at 12,000.
The transaxle was incredibly filthy. Starting with small sculpting tools, I began excavating through the crud.

Degreaser and a toothbrush was the method used for cutting through the film of muck under the clay. Then, dental tools were used to remove every speck of dirt. Finally, q-Tips and degreaser finished the cleaning.

The last part of the cleaning was a polish with the coarse pads left over from the body work. The bits that still look dirty are just discolored. the transaxle is finally ready to be rebuilt.
Dis-assembly of the transaxle.

Replacing syncros and seals were the main jobs required during the transaxle rebuild.
While the end cap was removed, the shift spring was shortened in preparation for the switch to a cable shifter system.

The original throwout bearing on the right, and the new bearing from an 85 Corolla GTS. It's a press fit on to the original bearing mount, and has the same inner diameter.

Cleaned and painted transaxle mounts.
The new 200mm clutch is from an 82 Renault Fuego.

The pressure plate is stock Toyota.
A small lip on the inside of the bellhousing was interfering with the extension of the starter gear. A small corner had to be removed to provide clearance.

The finished transaxle.
In order to mount the transaxle, the mounting forks on the rear hoop needed to be moved back by about an inch. It appears that the makers of the replacement chassis made an error in measuring the hoop's location.
The fiberglass body was cracked and broken. Sanding through the layers revealed that 363 had been repainted a number of times.
The previous owner removed the many layers of paint.
The body after stripping the paint.

One of the large holes in the fiberglass. This is in the front compartment, near the spare tire mount.

Major crack in the footwell.

Damage to the lower "mouth" opening.

A close shot of a typical combination of spider cracks.

Wheelwell damage.
This large crack runs the length of the passenger side, from wheel well to wheel well. It's an original body seam, and must be carefully repaired.

Here's the same cracked area after Glenn Kozier's excellent body work..

Another crack repair..
Fixing the spider cracks started with using a Dremel to widen the cracks. I'm using a conical metal bit.

Brushing off the fiberglass dust.

The widened crack is then filled with cyanoacrylite. You can see how capillary action pulls the CA deep into the cracks.

Wipe off the excess CA.

Spray with accelerant.

Wipe off excess accelerant.

Repeat 1000 more times.
Cracks after putty, but before sanding.

Sanded and ready for cosmetic filler.
More cracks.......

363 has been sprayed with 3 coats of high-solids primer, and will now be examined for pinholes. After the pinholes are filled, the entire car will be block sanded and a final coat of primer applied.

After the first coats of primer were applied, more putty is used to fill pinholes and small scratches.
While doing bodywork, 363 has been sitting on two workmates.

We slid 2x4's under the car, lifted the corners, and lowered 363 to the ground.
The plywood reinforcement was necessary due to a huge crack running across the entire deck. It appears that the car may have been towed backwards, and the deck improperly secured. This can cause the deck to catch in the wind, flip up, and crack against the roofline. This plywood upgrade has really helped the overall rigidity of the deck.

Finished rear deck. All cracks and holes have been filled, and the plywood has been glassed in to reinforce the hinged area.
The original chassis was extremely rusty, and the previous owner decided to replace it.

The S1 Type 46 Europa has a chassis that is inserted through the rear of the body, rather than from the bottom. In order to access the chassis, the rear of the passenger compartment must be cut out.
Once the interior has been removed, the extent of the rust damage can be seen. The previous owner decided that the original chassis was not salvagable.
The previous owner purchased a new chassis from a builder in Quebec.
The new chassis was replaced via the firewall.

The chassis "T" is fiberglassed into the footwell.

Body rivetted to chassis.

The firewall is tacked in place with superglue.

Duramix 4050. I've been using this for all fiberglass glueing.

The firewall has now been glued in place with the Duramix.
This page shows the construction of the seatback re-enforcement.

Steel reinforcement panel riveted in place, and sealed with two layers of fiberglass.
Rusty original rear brake.

Brake caliper before disassembly. The bleeders came off easily, but spitting the caliper proved to be challenging. Applying heat coaxed the halves apart.

One of the Europa list members sold me two brand new calipers. Both pads for the front, and the shoes for the rears are still easily available, and inexpensive.

Freshly turned disks.
The backing plates have been sandblasted, primed with a metal etching paint, and painted with POR15. The plates had some pitting where the rust was removed. The pits were filled with a POR15 product called POR Patch. It's a thick version of POR15 paint, comes in a tube, and spreads like a grease.

The emergency brake was rusted and seized.

E-Brake components after rust removal.

E-Brake sleeve, after cleaning and priming with galvanizing paint.

Painted and ready for assembly.