

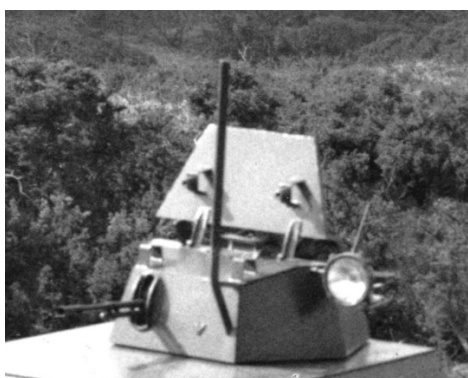
SHORLAND MODIFICATIONS & TIPS (Part 1)

The following is a collection of tips and modifications I have carried out on my Shorland APC Mk1 that may be of interest to other owners.

Wire cutter

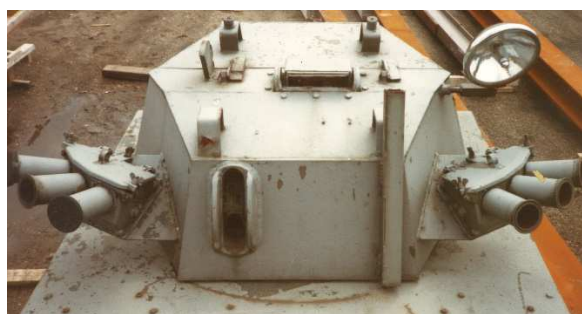
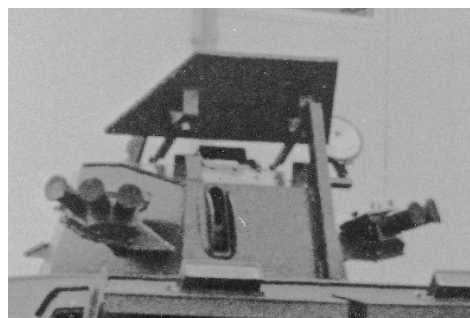
A wire stretched across the road to decapitate a motorcyclist or crew of an open bodied vehicle is an established guerrilla tactic. The crew of a Shorland would seem to be well protected, but very often the gunner would have his turret hatch open and be acting as an observer gaining a much greater appreciation of his surroundings than could be achieved by just looking through his periscope.

To give the gunner protection against this tactic a wire deflector or cutter was welded to the turret. Former RUC Shorlands that were issued to the UDR were modified in this way. Some Shorlands that were likely to be the tail vehicle had an additional cutter giving the gunner protection when the turret was reversed when giving 'rear cover'.



Note the supporting strut giving a forward off-set allowing the turret hatch to open fully. The disadvantage of a welded cutter was that it was rigid and could do damage to the roof of say a garage.

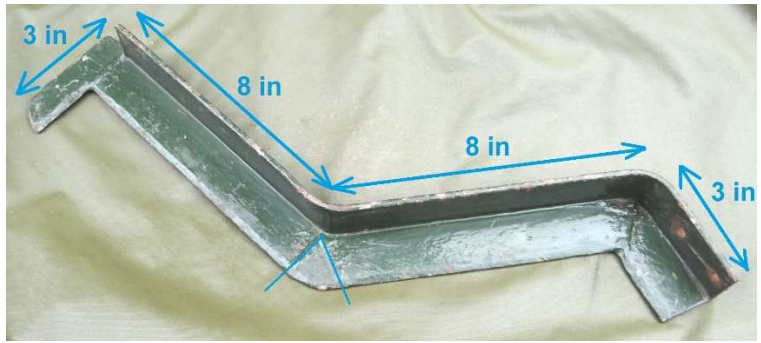
The later Shorlands (Mk 3) in UDR service had a length of steel box-section welded to the turret to which an angle-section extension was bolted.



The advantage of this was that the strength of the bolts was sufficient to deflect or cut a wire but striking a rigid obstruction would allow the bolts to snap.



Less common was this rather neat bolt-on cutter that did allow the roof hatch to opened fully.



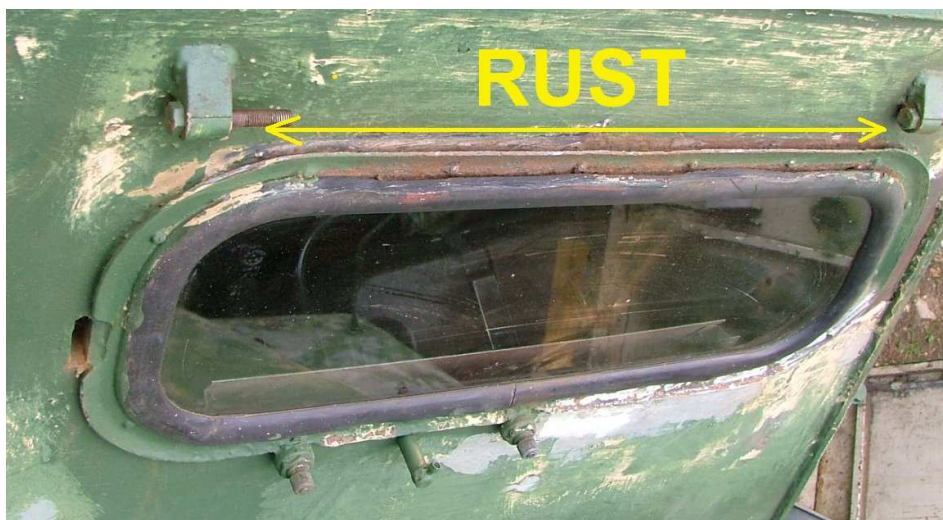
For a little while I did have one of these cutters fitted and nearly ripped open the roof of my garage because I forgot to remove it. As a failsafe precaution I fitted nylon nuts and bolts that snapped whenever I forgot to unbolt the cutter after a trip out.

Windscreen & Leakage

The two windscreens are supported by rubber edging held to the body by everted steel frames. The shape of the frame is such that it provides a degree of guttering so that trickling water is deflected from dribbling over the windscreen. Unfortunately this deflected water is encouraged to enter the cab via the rectangular holes provided for the visor lift arms.



With time the upper part of the frame retains water leading to rust.



My modification was to use filler to block over this guttering to discourage further rust and reduce the amount of water entering the cab. Filler was also used to reduce the size of the slots for the visor lift arms and after the rust was removed to fill the rust hollows.



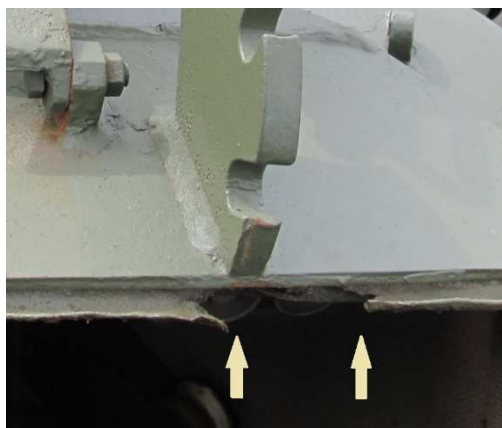
Although more rain can now dribble over the windscreens, this is not a problem as there are two wipers on each windscreen and the visors do provide some shielding from rain, something that a normal car doesn't provide.

Turret leakage

The hatch in the roof of the turret is hinged, there is a small gutter that runs the width of the join. No thought seems to have been given to the fact that when the hatch is lowered, the gutter gets progressively ripped by the spring-loaded bolt that sets the hatch angle.



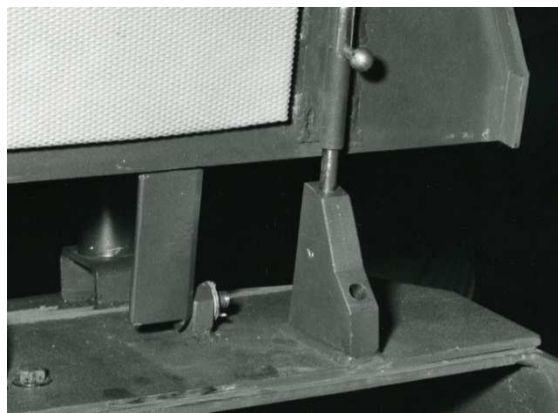
With the aid of rust eventually the gutter integrity is destroyed.



I welded on a small piece to allow the bolt to pass over the gutter without damaging it. It was shaped to allow water to still flow along the gutter.

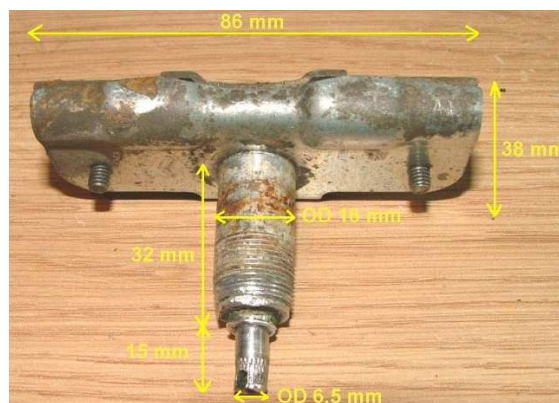


The potential for damage to the gutter should have been apparent from the outset, as can be seen in the gutter of this prototype.



Wiper mechanism

One wiper arm failed where it engaged with splines on the wiper arm spindle. I thought it would be a simple matter to fit a replacement. The part number 727848A stamped on the side yielded no results from Land Rover dealers and in the Mk 1 parts book, the part was only identified with a number unique to Shorts. The Mk 3 parts book identified it as Lucas 72849. The MOD contracts identified it as 54710357. This appears not to be a Land Rover part at all but for some other as yet unknown vehicle.



The splined collar was crimped onto the wiper spindle, cutting off the collar revealed a fairly short length of exposed spindle. Splined collars are available as 605904 updated to STC987. Unfortunately these are too deep to engage with the short spindle. I simply cut back the threaded section to reveal more shaft. I then filed the shaft to provide a flat for the grub screw to engage.



Replacement wipers are easily obtained by modifying PRC1330 and removing 2 in. from each end. To avoid tearing it best to cut the rubber with a sharp knife and the gently saw through the metal with a fine hack saw.



I suspect this was how the original wiper blades were configured. The early parts list gives no manufacturer's part number other than the internal part number used by Shorts as 557001-1. In later years a proper 6 in. blade became available as Lucas 54700102. Currently one surplus dealer has these for sale but at double the price of the longer ones and remember you do need four of them!

Fuel tank rust & gunge

If modern petrol is left in the tank for several years it will turn into a nasty brown gunge.



Because there are no baffles in the tank it is possible to reach in and clean the inside manually.



But in the case of the filler tube it is best just to replace it.



That shows the effects of modern fuel after 12 years, although it does seem to discourage rust! Where a tank has not seen fuel of any sort for a long time then rust will set in. When I first had my Shorland the base of the tank was pretty rusted and either needed replacing or repairing.

The fuel tank is not a standard Land Rover item as it has been extensively modified by Shorts to fit over part of the wheel arch. It cannot be extracted through the boot hatch and with the centre floor panel removed it cannot be dropped down through the chassis members on a Series 2A. I was told by one owner that with a bit of jiggling it can be dropped through on a Series 3 chassis. Another owner found he needed to lift the whole body from the chassis to remove the fuel tank.



As the base of my tank was rotten it needed to be cut away and replaced. So I decided to unclamp the tank and then cut about an inch from the height of the tank at the base whilst still inside the vehicle. The tank was then extracted from the rear boot hatch. A new base was constructed and silver soldered in place. The tank was refitted but now supported on a frame. The frame restored the top of the tank to its original height, which ensured the filling arrangements were the same. The underneath now provided an air space rather a haven for mud and water that can get thrown up through the drain hole in the floor supporting the tank. It also an easy maintenance solution for the tank as it can easily be removed.



The alternative option would have been to remove the floor beneath the tank and this is covered in the next section. It is worth remembering that although the fuel indicator system is linear, the lower third of the tank is not. So when the fuel tank reads one third full the rate of fall will increase, particularly important if you are running with only one fuel tank.

Boot floor

The rear boot accommodates the spare wheel and depending on the model one or two fuel tanks. The large central panel is secured by 20 hexagonal headed Whitworth $\frac{1}{4}$ in. bolts these should be straightforward to remove. However they are very likely to be severely rusted and may need to be cut off with an angle grinder. This will allow good access to inspect and restore much of the rear chassis.



To be really authentic they should be replaced with the same. But I didn't have any Whitworth bolts, so even fitting UNF or metric replacements would be a compromise. I made a further compromise by deciding to fit Rivnuts (nuts inserted with a rivet). This of course means that the floor plate can be removed by one person without needing an assistant underneath undoing the nuts. Using dome headed bolts makes the task quite easy. I feel that a more convenient access to this large area of rear chassis greatly increases the chance of regular maintenance, which is likely to prolong the vehicle's life.

The same arguments apply to the adjacent floor panels either side, but they present an even greater challenge to remove. Firstly these Whitworth bolts have countersunk slotted heads that were severely rusted and the nuts underneath are not axially accessible due to the inward slope of the armour.



Although the countersunk heads were rusted in place, it was impossible get a socket or ring spanner onto the nuts underneath. I used an Irwin stud extractor that was able to grip the nut albeit obliquely and was able to snap the bolts.



This of course was the opportunity to replace the floor edge supports, very important as the petrol tank sits here.



The brown colour of the metal work is from the effect of “Kurust” anti-rust treatment, prior to painting.

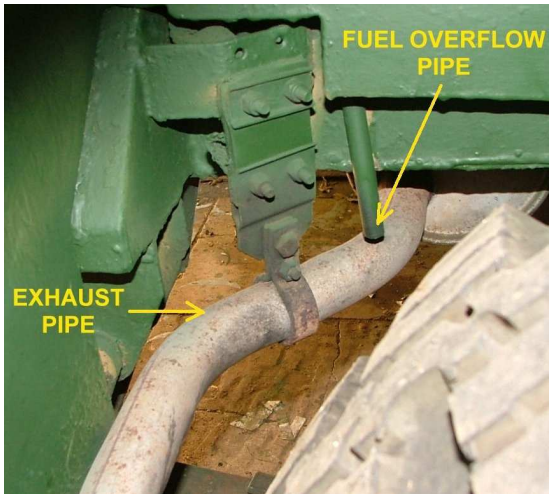


All these fixing holes also got the Rivnut treatment with low profile dome headed bolts.



Fuel fire risk

This only applies to Mk 1 & Mk 2 Shorlands where the exhaust tail pipe exits behind rear right wheel. Unfortunately this is immediately beneath fuel overflow pipe!



It was necessary to re-route the overflow pipe further back.



The modified position is in a very similar location in the first prototype.



Incidentally the horizontal band was an idea that was tried to assist in the removal of the spare tyre.

Exhaust down pipe

I kept getting leakage of exhaust gas from around the manifold to the down-pipe junction. Regularly tightening the three securing nuts did not solve the problem and even reassembly with exhaust sealing paste was futile. The effect of a blowing exhaust at the junction rapidly caused erosion of the rim of the down pipe.



Although this might seem to be purely an exhaust sealing problem, the real problem was that the engine and gearbox mounts had failed and were not holding engine securely. The engine was not secured but was merely resting upon broken rubber mounts. This meant movement of the engine was soon causing leakage at the manifold to down-pipe junction where a small leak was rapidly eroding the downpipe rim.

A new downpipe was fitted, but first the rim was polished smooth and also the receiving area in the manifold with the use of a polishing stone in a small hobby drill.



The rest of the exhaust system fittings were slackened off i.e. all the junction bolts and support brackets. The mating surfaces of the downpipe rim and manifold union were generously smeared with copper grease. This facilitated smooth mating and hopefully the copper residue would help with the integrity of the seal. Having made this union secure with new brass nuts then the rest of the system was tightened working down towards the tail pipe.

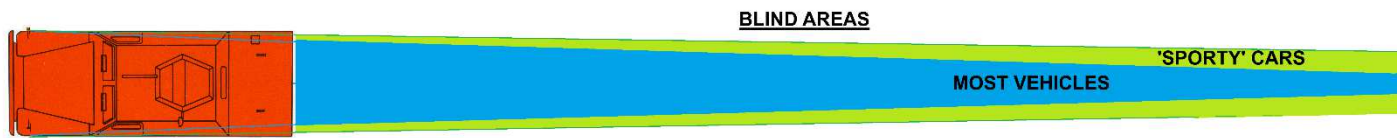
Rear view mirrors

Most vehicles, other than cars, have no cab rear view mirror and rely on the use of side mirrors. In the Shorland these are mounted on the wings rather than on the door hinges. Door mounted mirrors would be useless as they would be unseen when the side hatches were closed. Furthermore any glass from a broken mirror is at a safer distance from driver and front passenger.

These small mirrors were the standard fit from Mk 1 to Mk 3. I tried fitting larger mirrors but they are prone to vibration or being thrown off alignment by the wind or a hedge. I would sooner have a small mirror that is fairly rigid than a larger one that is shaking around. Operationally a smaller mirror is less likely to get damaged. Vision is more restricted than in a truck or van because even with the side hatches open there is not a great deal of side vision. The windscreens themselves are 22 in. x 7.5 in. although the driver's wing mirror is visible the other wing mirror is not and the driver must lean over to the passenger's side to observe the other mirror.

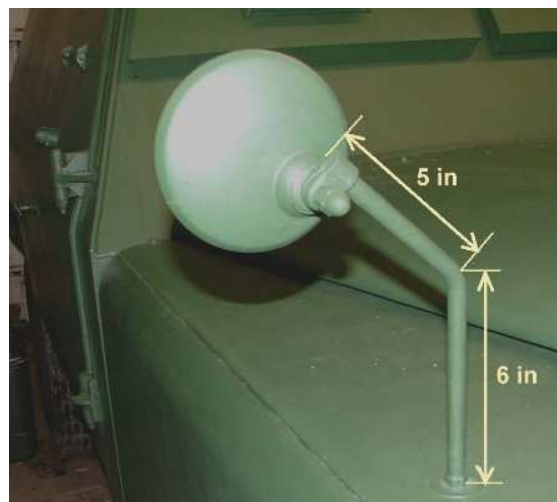
The mirrors give some rearward vision and due to the sideward slopes of the cab, this vision improves with height. It means that low profile sporty or high performance cars are less likely to be visible. It is the drivers

of some of these vehicles who are particularly impatient and will follow closely behind in an effort to register their disapproval of having to follow such a slow vehicle such as a Shorland. They seem to be unaware that driving up close makes them less likely to be seen.



The original wing mirrors were round and with a convex reflecting surface of 4½ inches diameter they were fitted on extended stalks to gain a little extra vision by being able to see further up the sloping cab armour. The mirror head is Rover 606187 and the assembly quoted as Rover 562912. However these days 562912 has come to mean the standard short stalk, although long stalks are available the increased length is in the angled section.

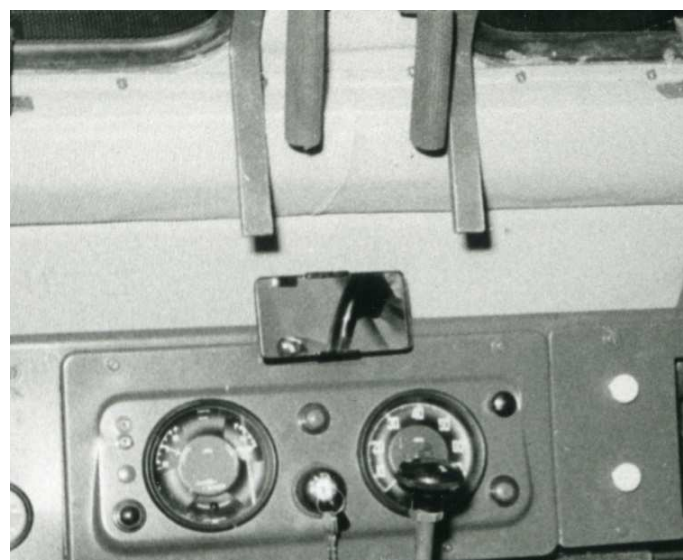
The Shorland mirror arms are long in the vertical section, the part number remains elusive. It would be a simple matter make up such an arm from ½ in. steel bar.



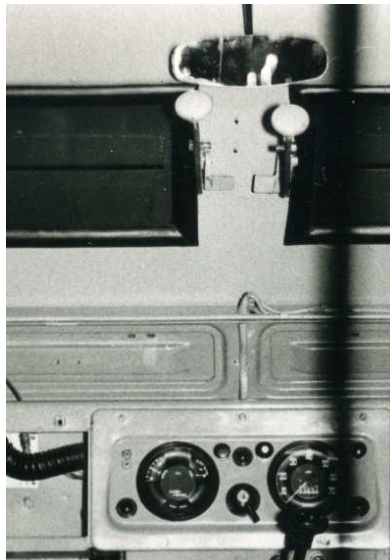
The increased length is not to project further outwards where they are more likely to get hit or suffer vibration. The height is to allow greater vision by viewing further up the sloping rear body.

Larger wing mirrors do not seem to be the answer as they are subject to vibration and more prone to damage or at least getting knocked out of alignment.

To address the rear view problem a mirror can be mounted on the dash and the rear escape hatch opened. This was not a temporary bodge it is actually depicted in Mk 1 user handbook and described as a reversing mirror.



The idea of a mirror to view the escape hatch goes back to the very first Shorland prototype.



However Shorlands that are fitted with a rear extractor fan means that the escape hatch does not lie flat and the rear view is further restricted. In operational use the eyes of the gunner in the turret would be of great assistance. But few of us have the benefit of a full crew so a more modern solution is needed.

Rear view camera

Rear view cameras are quite cheap these days, a camera can be discretely mounted under the rear cross member.



The problem of the display screen is having it easily visible, yet not detracting from the original look of the cab. Although my camera is permanently wired in place, the display is detachable. The screen heater duct provides a convenient place to mount it.



I used one of those metal plaques you often get given for attending a show, folded it over and screwed it to the rear of the display. It can be quickly detached and the connecting cable tucked out of sight.



Due to the fisheye lens in the camera, I do find that vehicles appear to be further away than they really are. When reversing I also switch on a bleeper that is also mounted on the cross member, people seem to have a poor appreciation of just how one's vision is restricted.

Access to engine manifolds

The normal process of access is to undo the left side radiator mesh fixings, then detach the Land Rover wing and then the side armour. It would seem a simpler solution to unbolt all the side armour fixings and jostle the side armour upwards. Unfortunately there is not quite enough room to allow this and I needed to cut 10mm of the corner away. In this rather tight space this was achieved with a small air-powered cut-off disc.



It was necessary to undo the bonnet support arm and tie the bonnet to the turret. This needs to be done securely as the bonnet with its armour is very heavy!



Seat harness supports

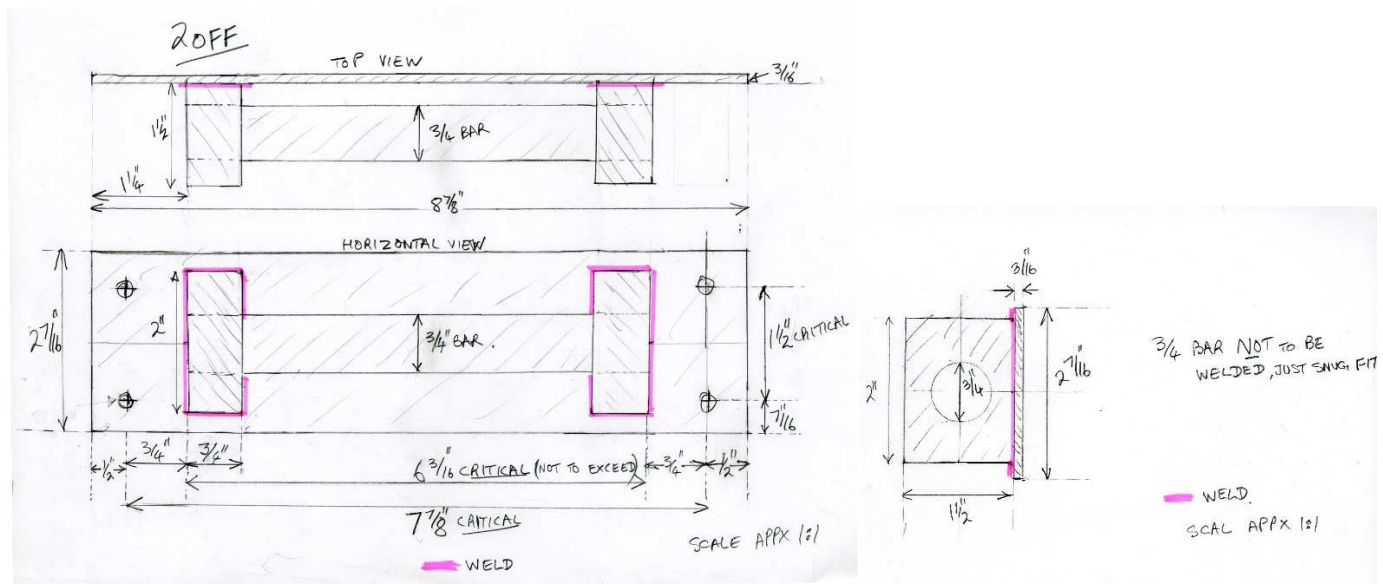
The front seats in a Shorland were provided with diagonal and lap type seat belts, but MOD Shorlands were fitted with a four-way harness.



The shoulder straps are supported by a horizontal bar mounted behind each seat on a pair of tubular struts. Each pair of struts also provide a rigid head support and also give additional support for the roof in place of the single strut originally fitted.



It is not unusual to find that the support bars are missing, indeed the one on this passenger's seat is absent. For those who wish to make replacements I took some measurements.



Repairing bonnet buffers

The height of the bonnet is adjusted by means two bolts at the front underside of the bonnet.



The armour makes the bonnet quite heavy and with time the fibre pads became compressed and eventually crushed. Periodic adjustment of the bolts is necessary to maintain a ¼ inch gap between the armour bonnet plate and the top of the radiator armour. In my experience the gap needs to be greater as the bonnet armour crushes the copper overflow pipe of the radiator.



I find a good guide is to make adjustments so that the bonnet edge remains parallel with wings. Inevitably with time the fibre cushions become crushed and need to be replaced.

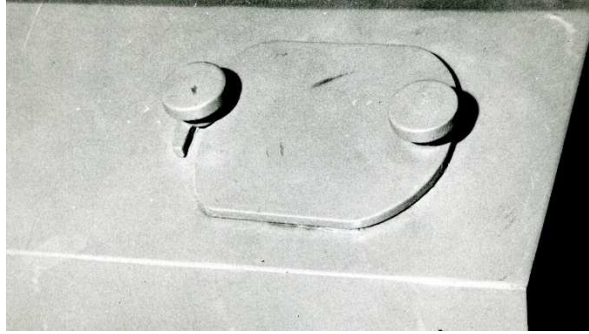


The cushions just consist of folded webbing and replacements can be easily fabricated. First glue about one inch of a webbing strap to the radiator armour make three folds then cut the webbing, place glue between adjacent surfaces and lower the bonnet which will hold it in place whilst the glue sets.

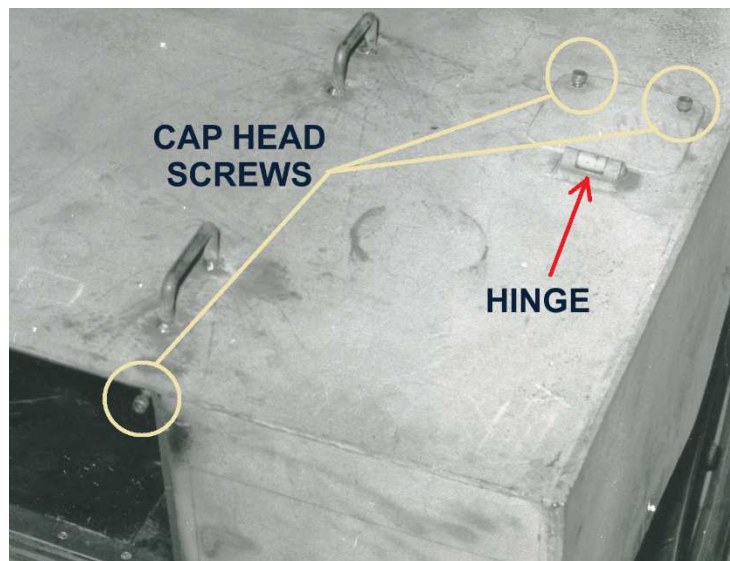


Fuel tank lock

Access to the fuel tank on the first prototype was simply a panel that could be slid aside by loosening two screws by hand.



The later prototype used a hinged flap secured with two cap head screws. An Allen key was needed to undo the screws, the key was also used to undo the two screws securing the boot door and the four screws for the vision block on each front visor.



The fuel security was still not good enough, even without the Allen key the screws could be undone by using a pair of adjustable grips. So in the production vehicle the fuel flap was secured by a spring-loaded catch operated from within the cab. It was a simple matter for the gunner to reach down and pull the round knob releasing the flap so that a second person outside the vehicle could lift it up.



Therein lies the problem of needing a second person to open the flap, because many private owners will be in the vehicle unaccompanied. It is possible for one person to open the escape hatch and with one hand pulling on the release knob whilst lifting the flap with the other hand. This is somewhat tedious and often impossible if there is some kit in the rear of the cab.

I found the way round this was to undo the release knob and locking nut, slide a tube over the control shaft and then a wing nut. The locking nut and knob were then screwed on in their original position.



On arrival at the filling station the wing nut is turned clockwise, which causes the control rod to be withdrawn. As the wing nut presses on the washer and tube this is forced against the armoured body then the rod's hold on the fuel flap is released and held there. Climbing out of the vehicle the fuel flap is just lifted up. Having filled up the tank then the wing nut can be disengaged so locking the fuel flap again. On a journey where several fuel stops are envisaged it might be worth considering just to leave the locking rod disengaged.

Battery isolator

There are several good reasons for having a battery isolating switch within easy reach of the driver:

In the event of an electrical fault the battery can be quickly isolated and prevent a fire as the loom overheats.

It avoids a flat battery from a light switch being accidentally left on or from some minor leakage that may not be dramatic but after some days or weeks may flatten the battery.

It is always a wise safety precaution to isolate the battery before doing any work on the vehicle, particularly electrical and when accessing the instrument panel.

A thief may not immediately realise that there is such a switch.

A meddlesome member of the public may try to start the vehicle, which would be dangerous or turn on some lights leading to a flat battery.

Circuit diagrams of Mk 1 to Mk 3 show no battery isolator switch, although one is shown in the Mk 4 diagram. Despite this factory work sheets show that an isolator switch has been incorporated from Mk 1 onwards. The general wisdom is that is best to have the isolating switch in the earth lead to the battery. So that a spanner used to undo the connector on the positive battery terminal does not have catastrophic effects if the spanner touches the battery case. This is not the case with the isolator switch in the Shorland as it is in the positive lead. So any adjustments to the connector on the positive terminal should only be done when the negative terminal connector has been disconnected. Mk 1 Shorlands were originally positive earth, but were later converted to negative earth to be compatible with negative earth radios.

The Shorland's isolator is within easy reach of the driver's right hand reaching back. The position of the switch is not particularly safe when viewed from beneath. Any loosening of the nut for the vehicle connector could cause a short circuit to the chassis. The original switch was rated to withstand 500 amps for 5 seconds during which considerable damage could take place.



As my switch was nearly 50 years old I decided it would be prudent to replace it. The original switch was a Lucas 76606B and the quoted equivalent is SSB106, the latter is available at a price in the classic car market. There are cheaper equivalents that look just as sturdy but together with SSB106 are not a direct replacement as the original hole was cut for 19.15 mm and the replacement needs the hole to be enlarged to accept 19.5 mm. The original switch has a flat on the mounting collar so that in a matching hole there can be no rotation of the entire switch. Unfortunately the reproduction switches have a much shallower flat so the hole needs to be enlarged to reduce the metal prominence that prevents the replacement being fitted easily.



The new switch still exhibits a risk that the upper terminal might be somehow short circuit to chassis. The design of the new switch provides an insulated ridge separating the two terminals and this gives resistance to turning of a connector in the event of the nut loosening. Reference to the manufacturing schedule shows that there should be a rubber boot (Lucas 31688) over each connection. This part is now obsolete, I tried many different rubber fittings but the problem was the width of the terminal on the cable. I found that type 405N9V14 provided the best fit and coverage.

