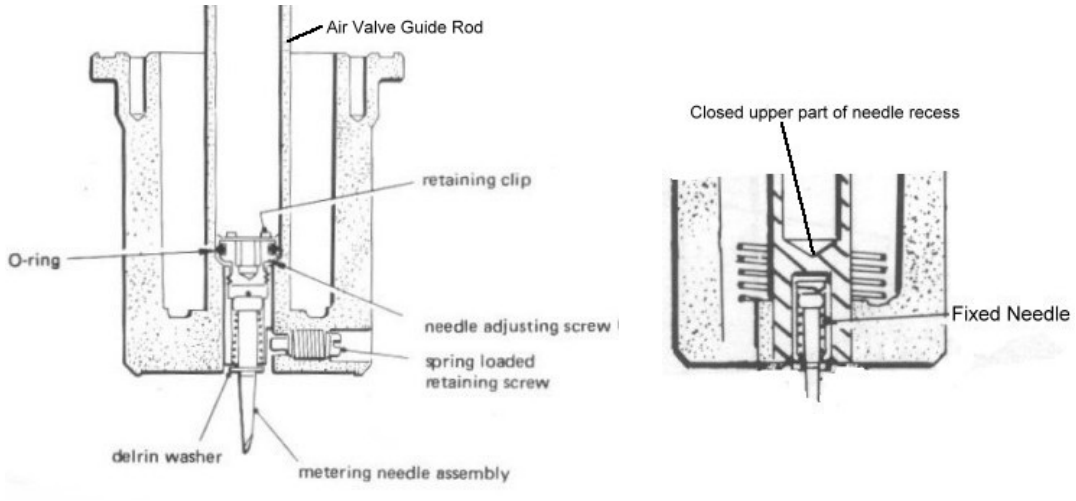
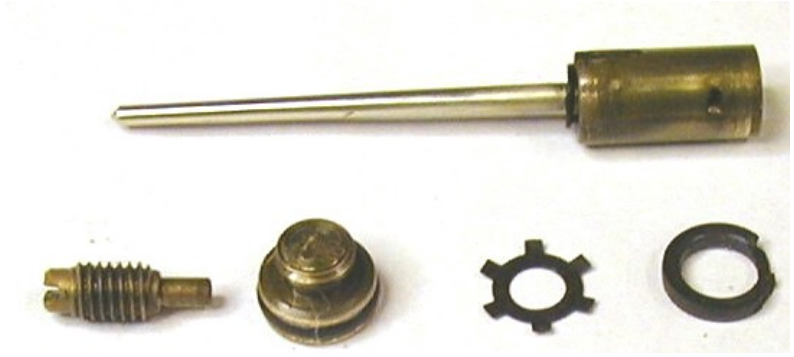
TR250 & Early TR6 Carburettors
Replacing Fixed Needles with Adjustable Needles

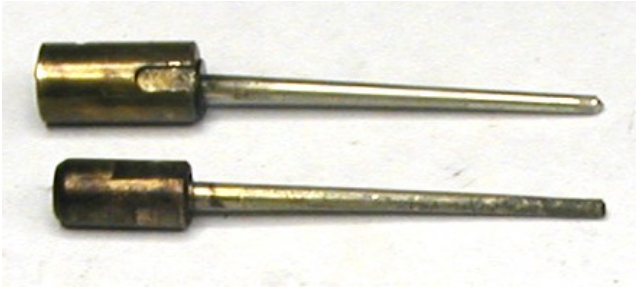
My friend Ryan Miles has recently acquired a fleet of TR250s. He plans to build an enhanced engine using triple ZS carburettors. Unfortunately, all his carbs have fixed metering needles and he prefers to have some adjustment capability. Both my TR250 and early TR6 are equipped with carbs that have adjustable needles while the rest of the carbs are original of the type supplied with fixed needles. Apparently the SPOs (Smart Previous Owners) changed the air valves to ones with adjustable needles. I volunteered to see if there was an easy way for Ryan to modify his TR250 carbs to accommodate stock adjustable needles.



The sketches above show the air valve with adjustable needle on the left and fixed needle on the right. The needle recess for the fixed needle is smaller than for the fixed needle and sealed at the top.



The photo above shows the adjustable needle with needle retaining screw, adjustment screw, adjustment screw retaining clip and an old damage O rig that fits in the slot on the adjustment screw. The photo below shows a comparison of the adjustable needle with the larger carrier and the fixed needle with the smaller carrier. The actual needles are essentially identical.



Needle Recess: Careful inspection of the fixed needle air valve revealed that if the needle recess were enlarged and the closed upper portion drilled out, this area of the two valves would be identical. Of special importance was that the position of the shoulder where the lower side of the lip on the adjustment screw rests is the same in both the adjustable needle air valve and the fixed needle valve.

The photo on the right shows drilling out the needle recess with a Letter O drill (0.316 inch). A 5/16 inch (0.312) was tried first but the hole was too snug for the needle carrier.

The adjustment screw slid down into the valve from the top with no problem. A 5/16 inch steel rod was used to tap the retaining clip into position. The needle also slid into position with no problem. These were then removed so that the

retaining screw could be dealt with

The Problem --- the Needle Retaining Screw: The fixed needle is secured with a 8-32 retaining screw that is threaded into a hole in the side of the valve guide rod (not shown on the sketch above, but similar to the set screw for the adjustable needle). The adjustable needle is also secured by a retaining screw. However, that screw is 10-32 and threads into the aluminum air valve just beyond the valve guide rod. The set screw used for the adjustable needle has a spring loaded plunger end that fits into a slot in the side of the needle carrier. The spring holds the plunger in the slot to keep the carrier from tuning as the adjustment screw is turned. However, the pressure is limited so the carrier can move up and down. The slot in the carrier runs only part way up the side of the carrier so that the plunger also keeps the carrier from dropping out the bottom of the air valve when the adjustment screw is turned all the way out of the carrier. This is a simple but very effective design. The left photo below shows the retaining screw and the right sketch shows a cross-sectional view of the screw with the spring on the inside.

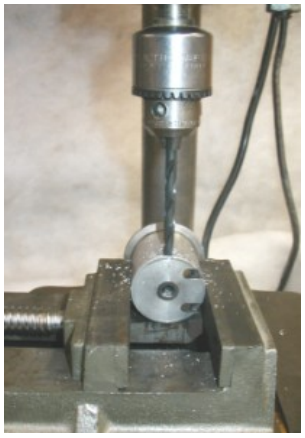
The problem is that the hole for the retaining screw in the side of the fixed needle air valve is ~7/32 (0.219) inch. The correct tap drill for the 10-32 screw is Number 21 (0.159 inch). That is, the hole is too big to thread for the screw. The only solution I could think of was to press a short piece of aluminum into the hole and then drill and tap it 10-32.

The Fix: The solution that I think is the best requires access to a lath. I first secured the air valve in a vise. A drill was inserted in the hole as a guide to help align the hole vertically. Next, the aluminum part of the hole was drilled 7/32 inch. The hole is nearly that size so only a thousands or so was removed. The drill was not run though the steel air valve guide rod, just through the aluminum part. Next the outer ~0.3 inch depth of the hole was enlarged with a Number 1 drill (0.228 inch). A 15/64 drill can be used if a Number 1 drill isn't available. (left photo below)

Next, a lathe was used to fabricate an aluminum plug. The plug outer diameter was turned to 0.224 inch. The center was drilled 0.159 inch with a Number 21 drill and the plug was cut to ~ 0.3 inch length. The plug slid in the first ~0.3 inch depth and then encountered resistance. The plug was then driven into the final ~0.3 inch with a punch (center photo below).

The hole in the plug was then taped 10-32. A tapered tap was used first and then a flat bottom tap made by grinding off the end of an old tapered tap. The hole was threaded in the aluminum plug but not through the air valve guide rod (right photo below). The thread depth was tested with a screw to insure that it was deep enough for the pin to enter the slot in the slot in side of the needle carrier but no so deep that vertical adjustment is restricted. I used the flat bottom tap to fine tune this depth by alternating the tap and the test screw.

The final results were that the modified valve is essentially identical to the valves originally made for adjustable needles.



Alternative Fix: I tried an alternative that doesn't require a lathe using 1/4 inch aluminum rod stock for the plug. The hole is drilled full depth (but not through the valve guide rod) with the Letter C drill (0.242 inch) instead of 7/32 inch as above. The upper part of the hole was enlarged to a depth of ~0.3 inches with a 1/4 inch drill. A ~0.3 inch length of the 1/4 inch rod was driven into the air valve. The 1/4 inch drill was used again to drill slightly into the plug to form a center mark. A Number 21 drill was used to drill through the plug. The plug was then tapped 10-32 as above.

This is not my preference because the wall between the bottom of the air valve and the 1/4 inch hole is very thin. It's possible (but not likely) that this wall might be fractured during the drilling operation. The first choice above has a much greater margin.

The Parts: The final step was to figure out where to get the parts. The following summarized my research.

Part	TRF	Moss	Victoria British
Needle (B1AF)	$27.50	$11.95	$17.95
Adjust Screw	$5.95	-	$5.95
Adjustment Screw retaining Clip	$0.79	$0.65	$0.60
O Ring on Adjustment Screw	$1.10	$0.75	$0.60
Needle Retaining Screw	$3.25	$3.85	$3.95

TR250-TR6 Carbs:
Part I - Disassembly & Theory
Part II – The Overhaul
Part III – Reinstall, Tune and Troubleshooting
Powder Coating ZS Carbs
Replacing Fixed Needles with Adjustable Needles
Air/Fuel Monitor
Using Air/Fuel Monitor