British Klemm L 25c Swallow G-ACXE, 30.12.06

A Description of the Undercarriage Suspension Strut. as shown by Drawing No. 031

Dowty Shock Absorber Strut, Type 1124, Issue 4, Serial No's 1037 & 1390, manufactured in 1934

A light-alloy streamlined fairing may be fitted over the upper strut and needs be removed before servicing.

Drawing No. 031 depicts the shock absorber strut in a "no load" situation. The three springs (W), (X) and (Y) will be under a slight compression of less than 1/8", and in this state, there is no need for restraint when removing either of the end blocks (A) or (M)

The wheel and it's axle, together with the wheel brake back plate, although not shown in the above mentioned drawing, are part of an assembly we shall call the lower strut. This lower strut is a sliding fit within the upper strut. It is positioned laterally by brass rubbing pads, (F) and (J), between the lower and the upper struts and in the vertical sense it is constrained by the three coiled springs (W), (X) and (Y) and a cleverly designed friction damper (U) and (V).

The lower strut. The steel axle is a tight push fit into the lower strut and is locked in place by a washer, nut, and split pin. The axle can be removed before servicing the strut. Attached to end block (A) is an inner, circular section, steel tube (B) and they are locked together by steel pins (C). They are not to be separated. The (A)(B) sub assembly is a push fit within the bottom end of the lower strut casing (D) which is a squared section steel tube. (A)(B) is locked in place by two ¼" bolts (E) and held by nuts and split pins. (These two bolts also attach the brake back plate to the lower strut). The (A)(B) sub assembly is separated from Tube (D) for servicing. On the outside of the upper end of the casing (D) there are four brass rubbing plates (F) fixed in place by 16 mild steel rivets (G). Eight of these rivets also secure a steel band (H) to the inside of the strut casing (D).

The upper strut. This consists of the outer, squared section, steel casing (I) with four brass rubbing pads (J) fixed to the inside of (I), at it's lower end, by 16 mild steel rivets (K). These same rivets also lock the external steel band (L) which incorporates all the mounting lugs for attaching the strut to the airframe lateral and longitudinal stays. (L) is not removable from (I). At the top end of (I) there is a composite block (M) made up of two steel mounting plates (N) sandwiched between aluminium and all locked together by four mild steel rivets (O). The mounting plates are the main means of attaching the complete strut to the airframe. Passing through (M) is a steel tubular dowel (P) that also passes through and holds the circular section inner steel tube (Q). Block (M) is a push fit inside casing (I) and is held in place by a ¼" bolt (R), which passes through (I) and (P), and is held by a nut and split pin. (This bolt also locates the light-alloy fairing when fitted). The casing (I), the block (M) and the tube (Q) are all separated during servicing.

Tube (Q) has, at it's lower end, a collar (S) shrunk on to it and it is further locked on by two mild steel rivets (T). Onto tube (Q) is slid a brass cone (U) which is paired with a close fitting brass inverse cone (V). (U) is a close sliding fit on (Q) and (V) is a close sliding fit within tube (B). Both (U) and (V) are split on one side and nearly split on the other so that when under axial pressure, (U) is forced further into (V), squeezing (U) to contract inwardly and grip the tube (Q) and forcing (V) to expand outwardly to grip the inside of tube (B). The axial pressure comes from the three coil springs (W), (X) and (Y) pressing on both top and bottom of the (U)(V) sub- assembly. The more the lower strut is displaced upwards under landing loads the greater the resistance by the springs under compression and the greater is the resultant friction between the sub-assembly (U)(V) and the tubes (Q) and (B) and therefore the greater the damping

effect between the upper and lower strut assemblies. A wonderfully simple but effective aid to a landing with minimum bounce.

But, there is also the problem of rebound to be contended with, particularly when landing on undulating grass surfaces where there is usually some bouncing when landing.

In the bounce, when the load is quickly taken off the shock absorber strut, the energy in the compressed springs will shoot the lower strut assembly downwards and this must be resisted and the energy taken out of the lower strut, axle and wheel, before it reaches the end of it's permitted travel.

You will see from the drawing that the upper two springs (X) and (Y) are separated by the spacer (Z) which slides freely on tube (Q). On rebound the lower strut assembly moves quickly downwards until the inner band (H) comes up against (Z) and, because of this, starts to compress spring (X) against the sub-assembly (U)(V) which is held by the collar (S) at the end of rod (Q). Spring (X) is compressed and together with the sub assembly (U)(V) they absorb the rebound energy.

Servicing the shock-absorber strut. This work is only for experienced engineers. It is easy to cause irreparable damage if not handled correctly. A good supply of clean rag is needed to deal with all the Molybdenum Di Sulphide grease that all internal parts are coated with (it used to be graphited grease, but both are/were equally black and messy) You will need the normal range of service tools plus a few specials. These might be, assorted bits of wood to aid clamping the unit to the bench, two or three G clamps, a rubber headed mallet for persuading tight fitting sliding metal parts to slide and part. More assorted bits of wood to help the mallet reach deep into the strut assemblies. Also, a) a steel drift 5/16" diam stepped down to ¼" diam at one end for, say, ½" of length (see viii. below) and, b) a steel drift of 5/16" diam with a taper down to 3/16"over 3/8"length and rounded at the end (see " Reassembly of the strut" below).

i) Remove the wheel and the brake back plate from the lower strut.
ii) Detach both the longitudinal and the lateral bracing members from the strut bracket (L).
iii) Detach the strut assembly from the airframe at the plates (N).
iv) Remove the axle if, desired.
v) Remove the bolt (R) from the upper strut and the two bolts (E) from the lower strut. You can now lay the strut assembly on the bench, makers plate down, with the upper strut casing on a thin, but at least 1/8" thick, piece of wood or plywood or similar material, of, say, 12" length (but do not put it under band (L)).
vi) Place a piece of wood (say, 1" x ¾" x 12") on the top face of the strut, to spread the load, and clamp with at least three clamps and not too tight or the casing may distort.
vii) Using a piece of wood, to protect the aluminium, apply pressure to the lower face of block (A).
viii) The strut will move into the upper strut and press upon the three springs (W), (X) and (Y).
ix) This should then push the top block (M) out of the casing (I) far enough to expose the tubular dowel (P).
x) Use the special drift, a), to knock (P) out of block (M). This will allow (M) and spring (Y) to be pulled from casing (I) leaving (Q) inside.
xi) Now the lower strut can be slid out from the top of the upper strut.
xii) Clamp the lower strut to the bench and, with a wooden drift to the upper end of (Q), push assembly (A)(B) out from the bottom of casing (D) along with all the parts within tube (B). Without tube (Q) to keep spacer (Z) correctly orientated (Z) will cock over and jam.
xiii) Tube (Q) can be reversed and fed back into (Z) and withdrawn together from casing (D).

Re-assembly of the strut.

This process is virtually the reverse of that described above. However when reassembling rod (Q) to be held within end block (M) you may need the 5/16" steel drift mentioned at the end of the paragraph headed "Servicing the shock absorber strut" to align (Q) and (M) before the tubular dowel (P) can be pushed home from the opposite side.