
29M. Main landing gear - monowheel

Overview

The main landing gear is a partially retractable trailing link type with a rubber shock absorber suspension. Retraction is mechanical via a lever in the cockpit and is assisted with a bungee rubber cord. The main wheel is a standard 600 x 6 size, however the tyre utilised is an 800 x 6 size to provide good rough field capability. A 700 x 6 size is also acceptable. A single disc brake is mounted to the starboard side of the wheel and is operated by a hand lever in the cockpit. Refer to the figures at the end of this chapter for exploded diagrams of the various sub-assemblies.

Shock absorber

The shock absorber is constructed of upper and lower reaction plates, which house pivot bearings, in between which is a solid polyurethane block which provides the energy absorption. Two hydraulic dampers are fitted within the shock absorber. See figure 1 at the end of this chapter.

Assembly

Insert one 25mm (1") long AIC 060816 bush into each lug of the lower reaction plate, using Loctite 638, so that it is flush with the outer face and protrudes on the inside only. You may need to file one end of the bush a little for clearance. Cut an AIC 060820 bush in half and file the ends so that they are flush with the lugs then, using Loctite 638, push one short bush into each lug on the upper reaction plate.

Slide the two long M8 x 100 bolts through the upper plate LG05 from the top, and slide up the polyurethane block LG06. Orientate the lower plate LG07 according to figure 1 and position it onto the bolts then, with an M8 washer and M8 Nyloc nut on each, tighten the plates together until the distance between the plates is 79mm (3.1"). This dimension is important to enable correct landing gear operation.

Hydraulic dampers

First extend the pistons of the dampers so that there is approximately 133mm (5 1/4") between the attachment hole centres, then insert them into the holes through the shock absorber. Ensure that the cylinders are uppermost. Attach the cylinder end of the damper to the tower on LG05 using the EUR026 bolt, EUR027 nut and EUR033 washers.

Note: *It may be necessary to shorten the bolt slightly to ensure adequate clearance with LG08. Ensure you check for this clearance before you retract the landing gear for the first time.*

To support the pin LG04 which attaches the shock absorber to the landing gear swinging arm a "U" channel support LG14 is to be bonded to the underside of the lower reaction plate LG07.



Ensure that the area between the two large holes in LG07 is clean and also the bonding surface of LG14. Mix a small quantity of Araldite 420 and add flox to prevent the mix from running.

Apply the mix to the face of LG14 and then position it in place using the pin LG04 through the lugs in the reaction plate LG07. Ensure that LG14 is central and leave to cure before completing the installation.

To ease lining up the dampers when installing the swinging arms later, fit a 3/8" diameter bar, 4 1/2" long through both dampers and LG14. Installing the correct pin LG04 will drive it out.

Attach the shock absorber assembly to the LG08 retraction arms using the MS20392-5C37 clevis pins as shown in figure 1, using an EUR 020 washer each side, and securing them with an SP90/F8 split pin.

Main wheel assembly

The main wheel is constructed from two half castings held together with six long 6mm bolts. See figure 2 at the end of this chapter.

Insert the inner-tube into the main tyre and partially inflate it to prevent it pinching or folding during wheel assembly.

Lay the tyre onto the wheel half with the inflation valve hole in it and push the valve stem through the hole. Slide the axle LG18 into the bearing of the wheel half and slide the spacer tube LG16 over the axle inside the wheel. Push the 6mm bolts through the six holes of the wheel half and slide over the other wheel half. Locate the brake disc in the second wheel half and tighten the bolts with the 6mm Nyloc nuts.

Note: *The brake disc bolt holes are threaded for ease of assembly only. The nuts **must** be installed before pressurising the tyre.*

Inflate the tyre to a gauge pressure of 18 psi (1.24 bar) (1.26 kg/cm²) (1.18 atü).

Swinging arm installation

Refer to figure 3 at the end of this chapter.

The shock absorber pin support channel LG02A bolted to the swinging arm channel requires profiling to allow clearance for the shock absorber during landing gear retraction. Remove LG02A, noting it can only be repositioned one way round for the pin holes in the channel walls to align, and cut off the excess material according to figure 4. Before replacing LG02A, install the bungee anchor tube LG02B into the larger diameter holes. The swinging arm channel will prevent it from sliding out when assembled. Replace LG02A, making sure the pin can still be easily installed.

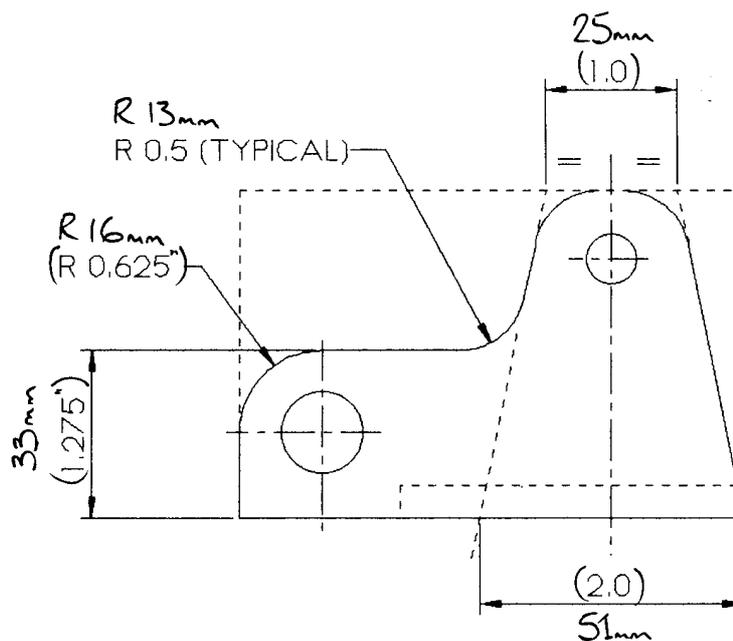


Fig 4. Required profile of LG02A

The aluminium bronze pivot bearings LG03 are machined after assembly with the swinging arm LG02 so it is advisable to mark them to orientate them and so ensure they are always replaced in the positions they came from. Marker pen marks are preferable to stamping which would cause stress in the material.

Remove each of the four bolts from the bearings and drill each through the head across the flats with a 1.5mm (1/16") drill for lockwire to pass through.

With the flat base of the swinging arm lowermost, attach it to the landing gear mounting frame lower member via the pivot bearings, setting them outside of the locating half tubes welded in place. Tighten the bearing securing bolts evenly each side and a little at a time. If you find the swinging arm starts to become stiff on its pivot, don't tighten the bearing bolts any further. Measure the gaps between the bearing halves with feeler gauges then cut shims from brass shim material of the required thickness to go between the bearings and so prevent damage to the landing gear mounting frame.

Note: The bolts should be finally torqued to 130 - 150 inch pounds/ 1.5 - 1.7kgf m. Any tighter than this will result in stripping the thread in the swinging arm. Do not grease the bolt threads as this may allow over-torquing and you may strip the threads.

After final tightening, lockwire the pairs of bolts together. Remember that for lockwiring to be the correct way round it should take the form of a reversed 'S'. See figure 5.

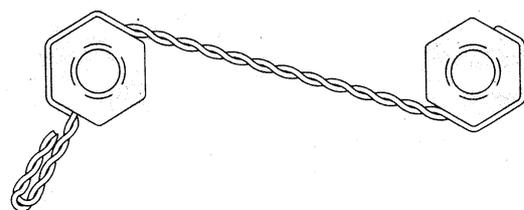


Fig 5. Typical wire-locking of two bolts.



Withdraw the pin LG04 then rotate the swinging arm up to position the shock absorber lower reaction plate lugs so that the pin LG04 can be replaced, attaching the swinging arm to the shock absorber. Operating the retraction lever LG12 should now cause the swinging arm to retract and extend.

Main wheel and brake installation

Referring to figure 2, slide the spacer / nut plate LG20, with its flange outermost, onto the brake disc side of the wheel. Next to LG20 slide onto the axle the brake torque plate LG21 with the two bosses pointing in towards the centre of the wheel. Put the plain spacer LG19 onto the other end of the axle then place the wheel assembly between the arms of the swinging arm with the brake torque plate on the starboard side. Insert the two flanged stub axles LG25 and LG26 through the holes in the swinging arm and into the axle of the wheel. Rotate the nut plate, torque plate and stub axles to align the bolt holes then install the bolts. The heads of these bolts should be drilled for locking wire. Install the long 6mm bolt through both stub axles and tighten them together with the appropriate nut.

Note: *The torque plate LG21 should be aligned so that the brake caliper will be approximately in line with the swinging arm.*

Brake caliper

Remove the two bolts securing the brake back plate LG24 to the caliper slave cylinder and drill 1.5mm (1/16") holes through the heads for lockwire.

To install the brake caliper assembly slide the pressure plate LG22 onto the slave cylinder LG23 with the brake pad facing away from the piston, then slide the slave cylinder studs into the torque plate bosses. Position the back plate and screw in the two bolts to secure the assembly. Lock wire the two bolts together.

Brake hose routing

Connect the brake hose to the elbow fitting in the rear of the slave cylinder. Clip the pipe along the top of the swinging arm as far as the LG04 pin. Inexpensive plastic p-clips P408-008 secured with small self-tapping screws should be adequate. Stay on the outside and pass the pipe forward of LG08 and then route it back over the top of the large tube inside the diagonals, and up to the top of the cockpit module. Keep it near the centre to avoid the flap push-rod (this will take it very close to the throttle cables which will be fitted later). Where the pipe passes the rudder cables there is a possibility of abrasion over the long term, so it would be a good precaution to wrap the pipe with some form of sheath such as spiral wrap or stainless steel sheath.

Brake bleeding

It's easiest to fill and bleed the brake system by adding fluid through the bleed nipple of the slave cylinder and so allow the air to escape upwards to exit the filler hole in the master cylinder. Automotive hydraulic fluid to **DOT4 or DOT3 (SAE spec J1703) only** must be used.



Use a clean oil-can or other vessel which can be used to pump the hydraulic fluid. Connect the oil-can to the bleed nipple with a flexible, and ideally transparent, tube. Remove the filler plug of the master cylinder and open the bleed nipple just sufficient to allow the fluid to pass. Pump the fluid into the slave cylinder until it completely fills the master cylinder then close the bleed nipple. Replace the filler cap and try operating the brake. If the brake has a springy feel to it when operated, there could still be air in the system.

To ensure all air is extracted from the slave cylinder, remove the caliper from the swinging arm and hold it so the bleed nipple is pointing vertically upwards. Connect the oil-can, remove the filler plug and add fluid as required, allowing time for any air to escape. Installing the bleed nipple with PTFE tape can also help in preventing air leaking past the thread during bleeding.

To purge air which may be trapped in the master cylinder due to the filler hole being lower than the cylinder, even with the aircraft in the level attitude, gently pull the brake lever fully back with the filler cap removed. Fluid may overflow so be prepared to catch it; air bubbles may also be seen. With the fluid at the filler hole neck, slowly release the lever whilst continuously topping up the fluid so that it doesn't drop below the bottom of the filler hole. Once the lever has reached the end of its travel, reinstall the filler plug.

Bungee cord

To assist the pilot in retracting the landing gear into the centre tunnel a bungee cord is used. The bungee cord is looped under an anchor tube attached to the swinging arm and over the top horizontal member of the landing gear mounting frame.

Tie one end of the bungee cord to the top horizontal member of the landing gear mounting frame with two half hitch knots and, using three plastic cable ties, secure the short end below the knots to the rest of the bungee. See figure 6. Thread the cord down under the anchor tube and back up and over the upper member of the mounting frame. Repeat this until all the bungee has been used.

Setting bungee tension

With the retraction lever in its down gate tension the bungee, adjusting each strand so they all have equal tension, until the landing gear, complete with wheel assembly and with wings installed, can be easily retracted and extended. It's important when making these adjustments that the wings are rigged so that the weight of the flaps is taken into consideration. In flight the flaps will not aid retraction of the landing gear. Final adjustments can be made to ease retraction or extension as preferred. The flaps will not help or hinder retraction or extension when in flight. See figure 7.

To secure the bungee at the required tension tie the remaining end, in the same manner as the other end, to the top member of the landing gear mounting frame. Cut or tie off any excess bungee.

Note: *With the bungee cord installed take care if you retract the landing gear with the wheel assembly removed as the swinging arm will retract rapidly.*

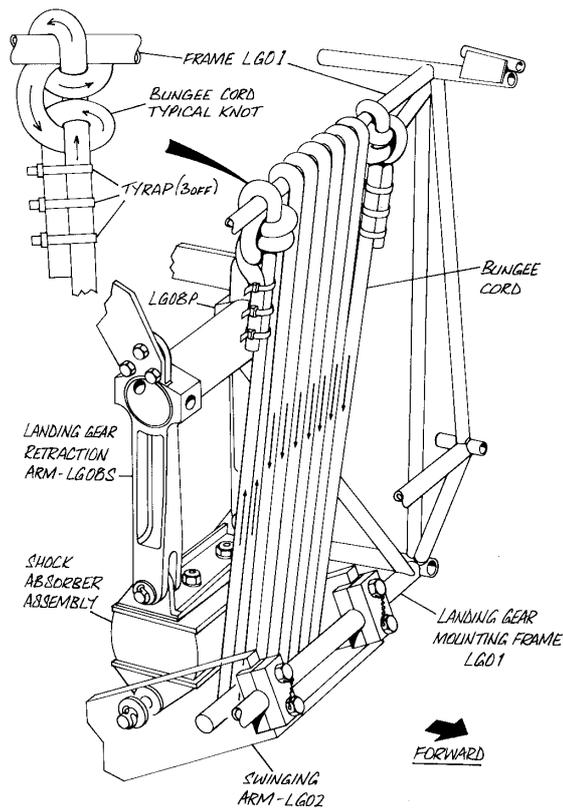


Fig 6. Installation of bungee rubber cord.

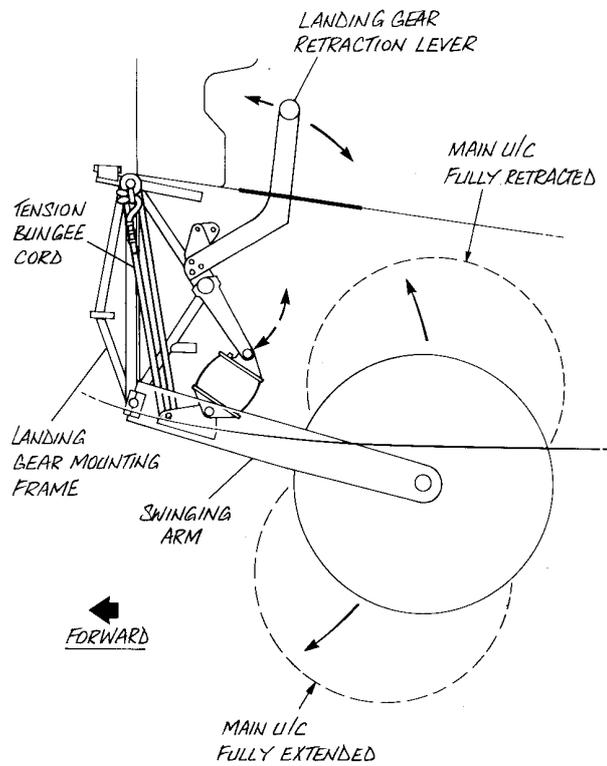
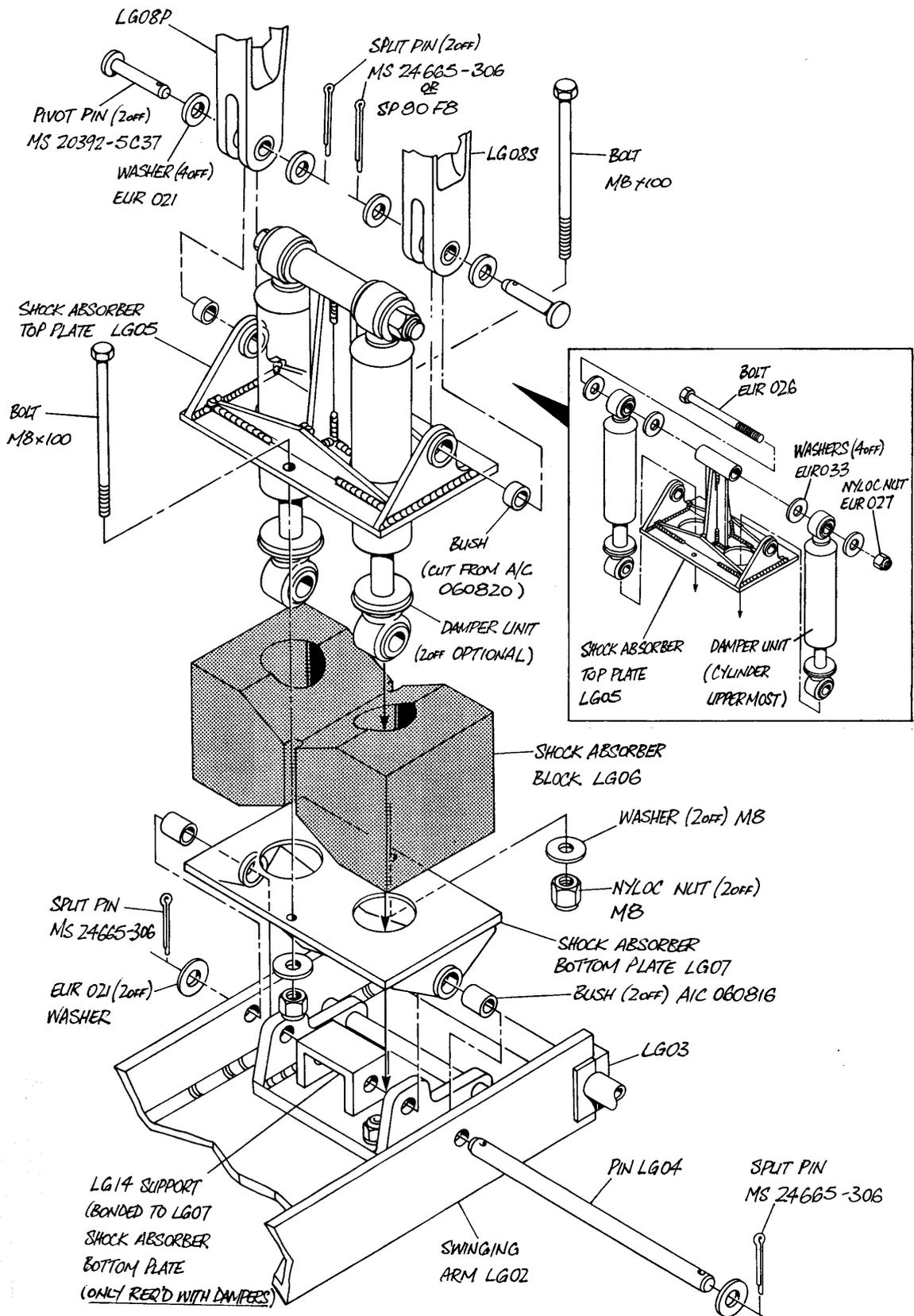


Fig 7. Setting bungee tension.



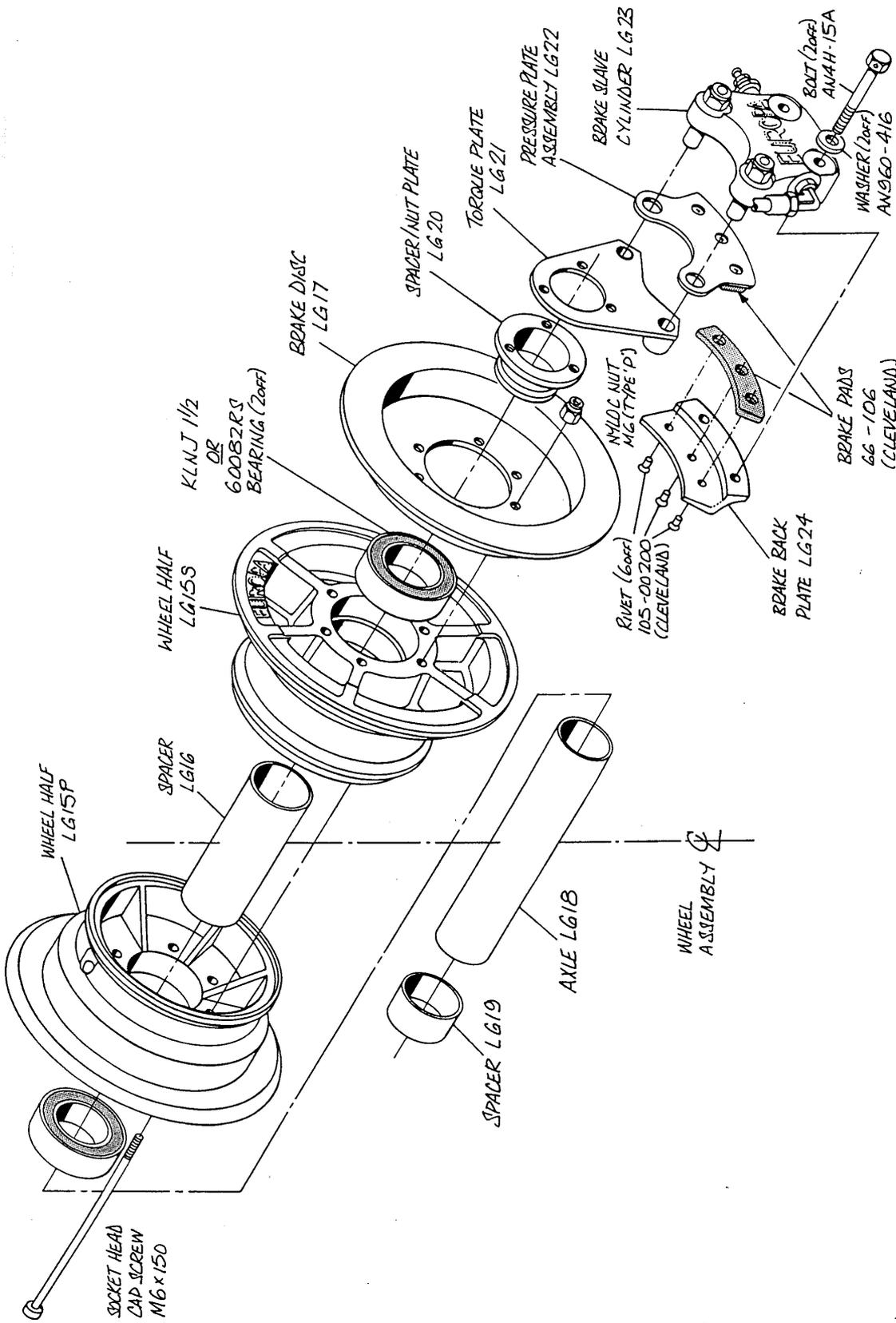
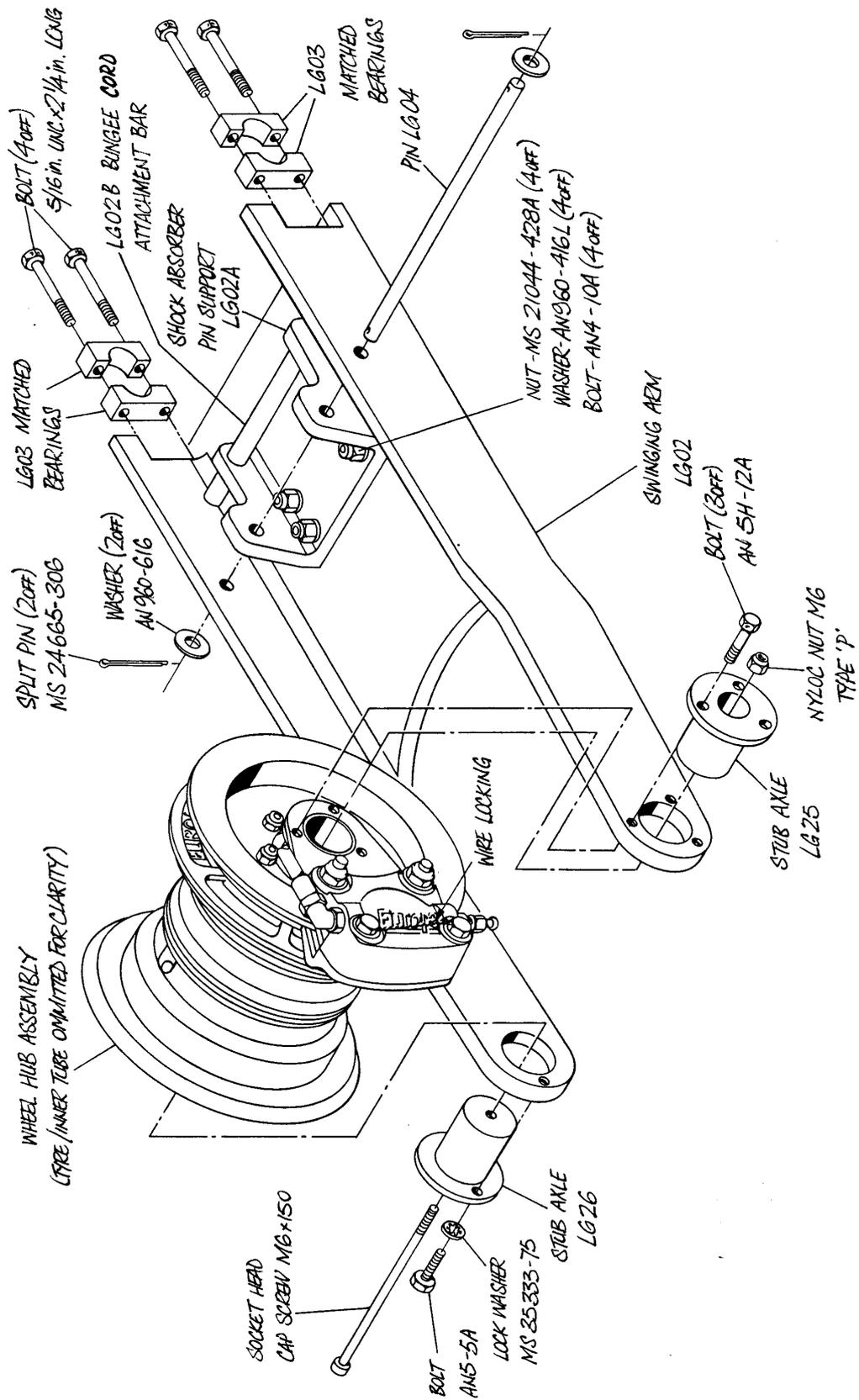


FIG. 2. MAIN LANDING GEAR - WHEEL HUB ASSEMBLY





INTENTIONALLY BLANK