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Life Rafts

Service News

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Cover: An Air Force Hercules participates in air rescue exercises near Eglin AFB, Florida.

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The Customer Service Division is designed exactly for what the name implies · · complete customer service. The Lockheed-Georgia Company believes in the "cradle-to-grave" type support for its aircraft. For example, we have offered over 23 years of support for the Hercules and expect to continue for a long time to come.

A few of the services this division offers are training of customer maintenance personnel, technical liaison/support through a world wide network of field representatives, company contacts to assist if a full-time field representative is not available, and the *Service News*.

We realize that our customers expect the maximum possible value for their dollars, and we believe that customer service and training plays a vital role in customer satisfaction.

Our field representatives are excellent sources of information. Please do not hesitate to call on them either for help or if you wish to pass along a better solution to a problem you may have experienced. You will find an index of our senior Hercules foreign field representatives on the inside back cover of this issue.

If personally, or someone else at the company, can be of help please notify us. The Customer Service Division is staffed with talented, hardworking people dedicated to make the efforts of the Customer Service Division successful.

D. L. Braund, Manager
Customer Service Division

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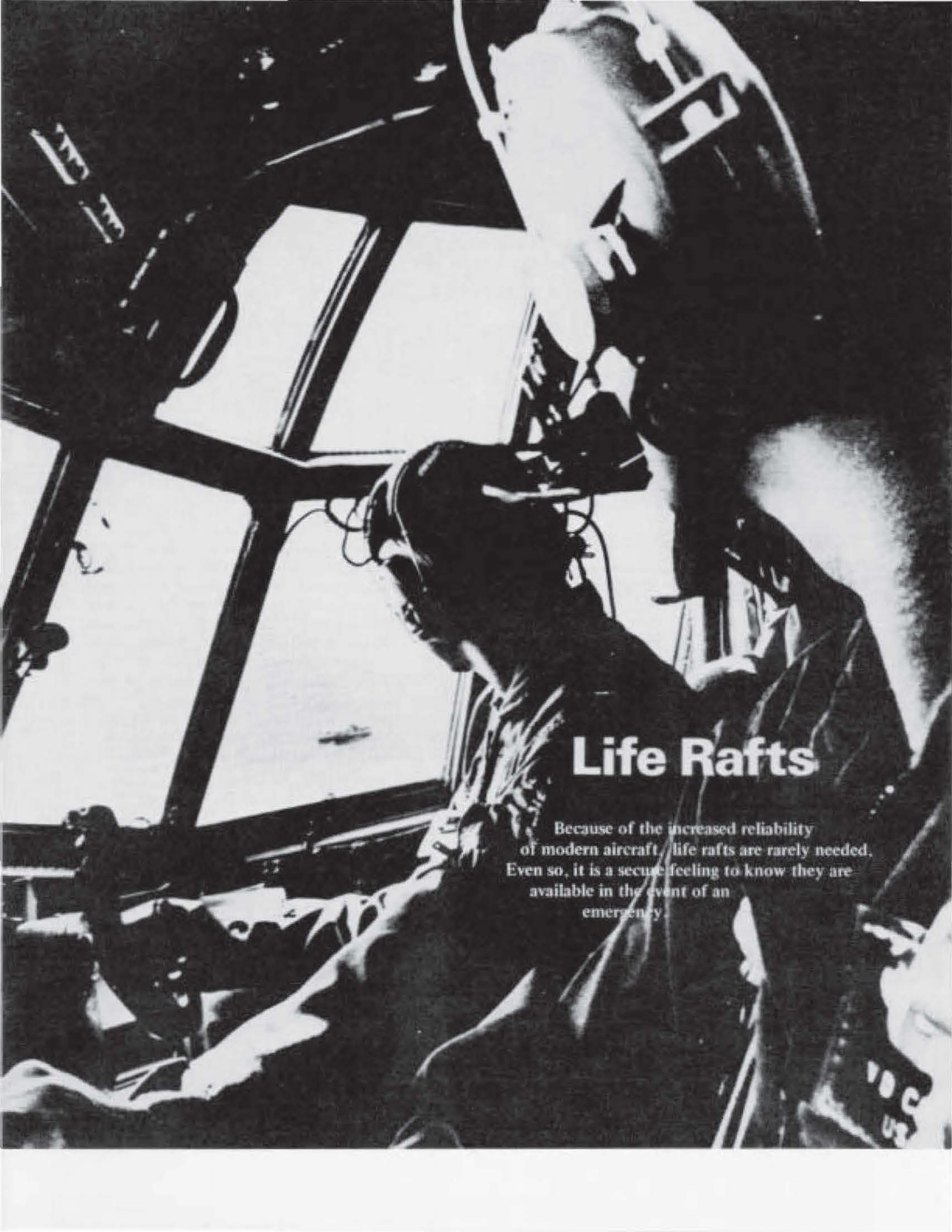
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Life Rafts

Because of the increased reliability of modern aircraft, life rafts are rarely needed. Even so, it is a secure feeling to know they are available in the event of an emergency.

VBC
US

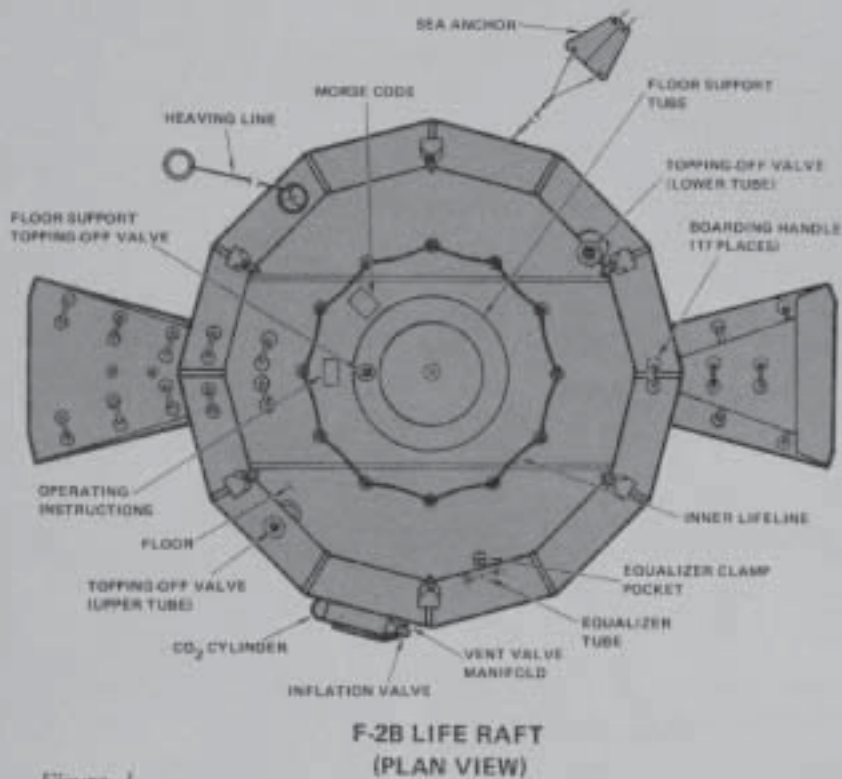


Figure 1

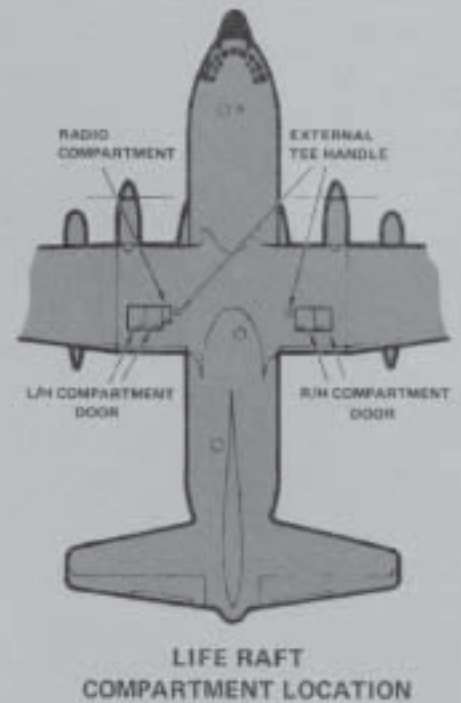


Figure 2

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Proper handling and installation procedures must be followed to ensure this availability and to prevent accidental loss of the life rafts in flight.

The life rafts used on today's Hercules are the 20-man Type F2B for USAF and commercial customers. The US Navy life raft system is currently designated LRU-15/A. This raft system was previously known as the MK-20 (Figure 1). These life rafts have a reputation for dependability. In fact, problems with life rafts are usually due to a human factor, and incidents usually occur on board the aircraft rather than when the life rafts are in use.

The life rafts are normally stowed in four compartments in the Hercules center wing section; two compartments are on the left side and the other two on the right. A smaller compartment stores the emergency radio, and is located adjacent to the left inboard raft compartment (Figure 2).

The life raft is constructed of two inflatable circular tubes connected by an equalizer tube. A noninflatable floor is suspended between the circular tubes. A smaller tube is centered in the floor for manual inflation. Topping-off valves, used to regulate the air in the raft, are located on each of the circular tubes.

The rafts are made of rubberized fabric, and are inflated by carbon dioxide (CO₂) from a cylinder which is a component of the life raft assembly. The rafts are deployed through operation of three sets of two tee handles. One

tee handle is marked RIGHT WING and the other LEFT WING & RADIO, in each set. The first set is located just below the escape hatch on fuselage station 245 bulkhead in the flight station. The second set is in the right-hand side of the cargo compartment aft of the wheel well bulkhead. The third set is on the exterior of the airplane, inboard of the life raft compartments; one tee handle is on the left wing and the other on the right. Each of the exterior handles is recessed in the wing surface and is covered with a patch of easily removed fabric. A stencil around each recess identifies the handle location. FAA

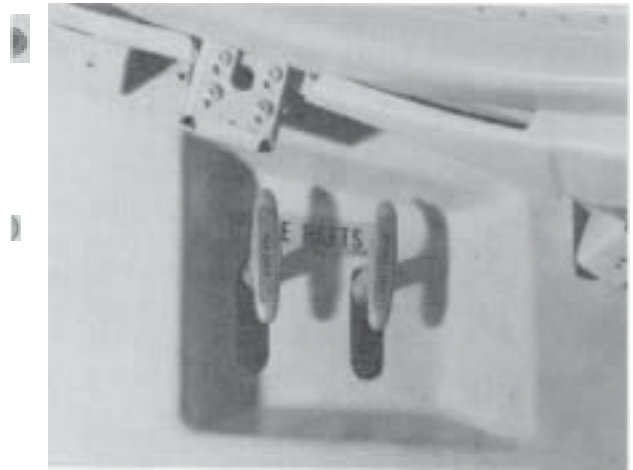
Topping-off valves allow regulation of the amount of air in the life rafts. One is located in the lower tube, another in the upper tube, and the third is in the floor support.



certified aircraft do not have tee handles at the cargo compartment location. When the tee handles are pulled, doors in the top of the wing and the CO2 cylinder valves are opened in sequence; i.e., inboard door then inboard cylinder followed by outboard door, then outboard cylinder. The rafts then inflate, causing them to pop out of the compartment. A tether line prevents the raft from drifting away. This line will break at 50 to 150 pounds tension to prevent the raft from being pulled under should the aircraft sink.

Since the life raft compartment locations are outside the pressurized area of the aircraft, air trapped in the rafts will expand as altitude increases. This expansion could possibly cause the rafts to be accidentally deployed. Therefore, it is essential that they be completely deflated and evacuated each time they are removed and reinstalled.

Altitude chamber tests with life rafts which were thought to be deflated have proven quite dramatically how a small amount of trapped air at sea level can exert a considerable force when the raft is carried to altitudes of 30,000 or 40,000 feet. This expansion can produce sufficient force to open the compartment door. The only remedy to this problem is to get the raft sufficiently evacuated before it is stowed aboard the airplane. Follow the instructions in your Hercules maintenance manuals and in manuals published for these life rafts. For example, the U.S. Military uses T.O. 14S-1-102/TM5-4220-202-14 or NAVAIR 13-1-6.1 for the raft and T.O. 1C-130B-2-2 specifically for the Hercules. Commercial operators utilize SMP 581 for rigging procedures.



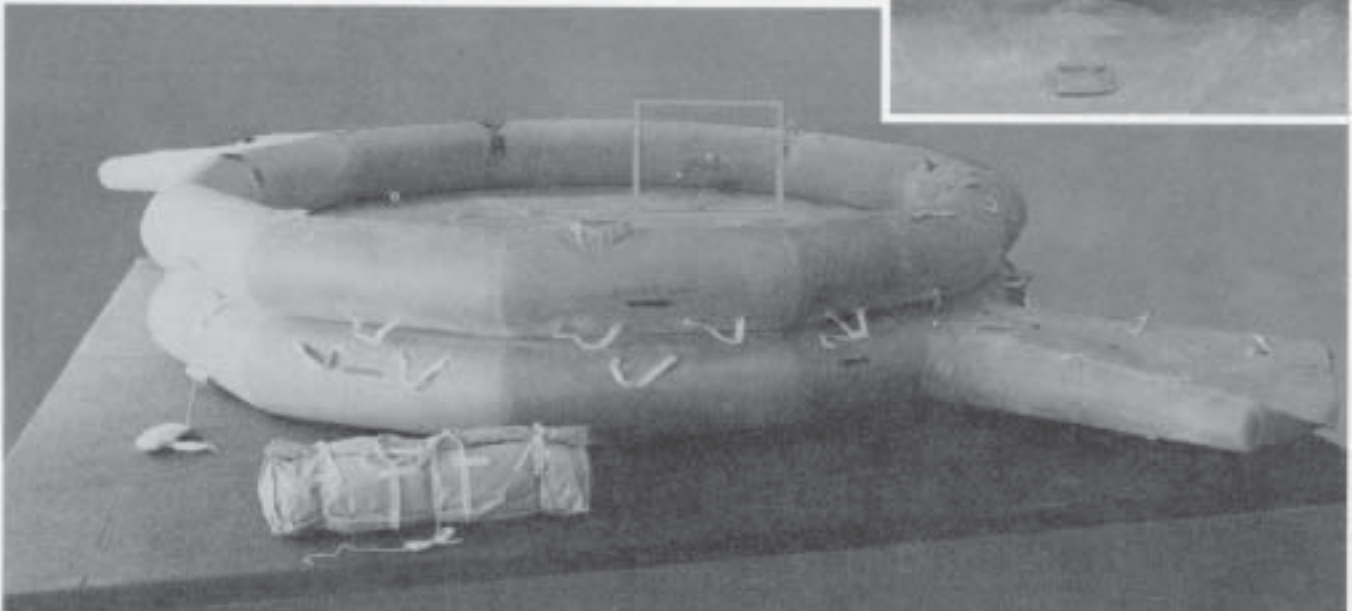
The life rafts are deployed through operation of tee handles.

EVACUATION

Although evacuation procedures in your maintenance manual lists the basic procedures and essentials, here are a few additional tips on completely evacuating the air from the life rafts:

- Close the manifold vent valve.
- Secure the positive displacement vacuum pump hose to a threaded adapter for the raft's topping-off valve. Deflate the compartments in the following order; boarding station, main chambers on the sides of the raft, and floor supports.

The equalizer tube connects the upper and lower tubes of the raft. It can be clamped shut to isolate the air in either of the two tubes.

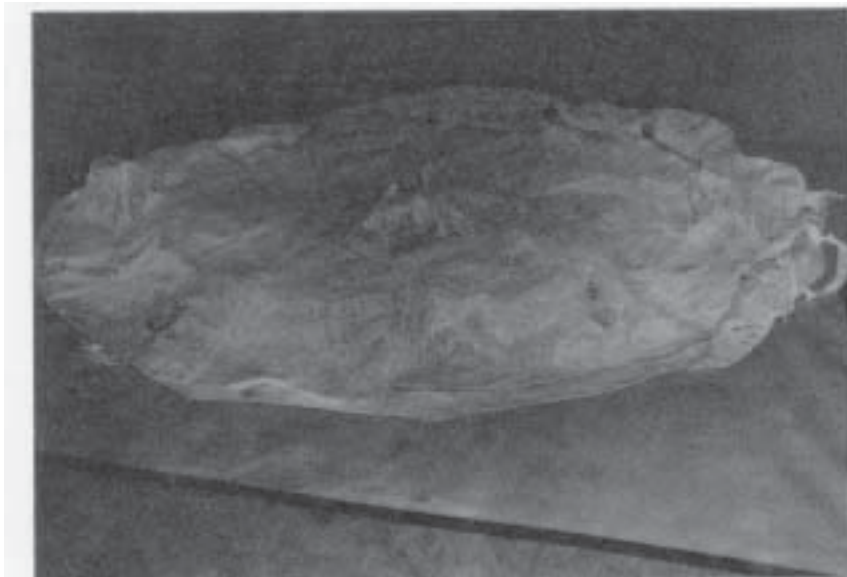


- The material must be smoothed out, starting with the pockets farthest from the topping-off valve and working toward the valve. A nearly deflated compartment will tend to trap air in the folds of the fabric as it collapses. To be absolutely certain that you get all compartments smoothed out flat, it is necessary to have the raft laid out on a smooth, flat surface which is free of dirt, oil, and metal particles. Avoid wood or concrete floors unless they are covered with a suitable material such as carpet, linoleum, or heavy paper.
- It is easier to deflate the main side chambers if the equalizer tube is closed, since this prevents air in the opposite chamber from entering into the chamber you are trying to deflate. Keep the equalizer tube closed until you have finished deflating all chambers; however, be sure that you open it before folding and stowing the raft. This is most important because it ensures an equal inflation of the raft side compartments when the CO2 is discharged.
- Work on one compartment at a time. When you have smoothed out all the air pockets and the compartment lays perfectly flat, first close the valve, and then disconnect the vacuum line. The valves should be closed tight with fingers only; do not use pliers or wrenches. After all compartments have been deflated and all valves closed, open the equalizer tube, and you are ready to start folding.

FOLDING

First, dust the raft liberally with lubrication compound (specification MIL-C-5204 or equivalent) and follow the folding procedure given in T.O. 1C-130A-2-2 or T.O.1C-130B-2-2. The T.O.'s contain a pictorial series showing how to make the folds. The photos in this article further illustrate this procedure. The pertinent maintenance manuals give the complete raft installation procedure.

STEP 1



STEP 2



STEP 3

Make sure the raft is on a smooth, flat surface such as linoleum or carpet. Remember to carefully go through the proper evacuation procedures before beginning the folding process. Proceed with folding from Step 1 through Step 6. Again, refer to the applicable manual for detailed instructions.



STEP 4 ↑



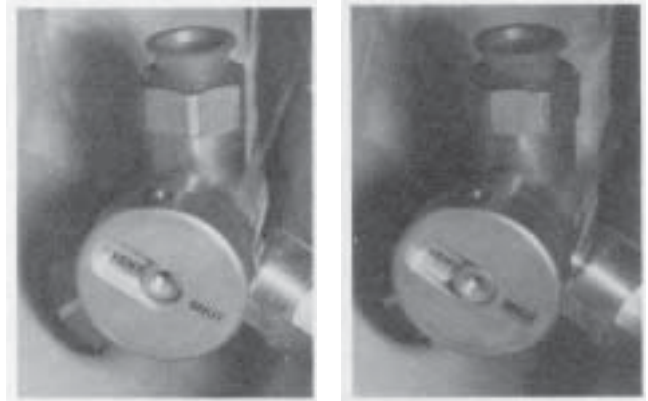
STEP 5 ↕



STEP 6 ↓

MANIFOLD VENT VALVE

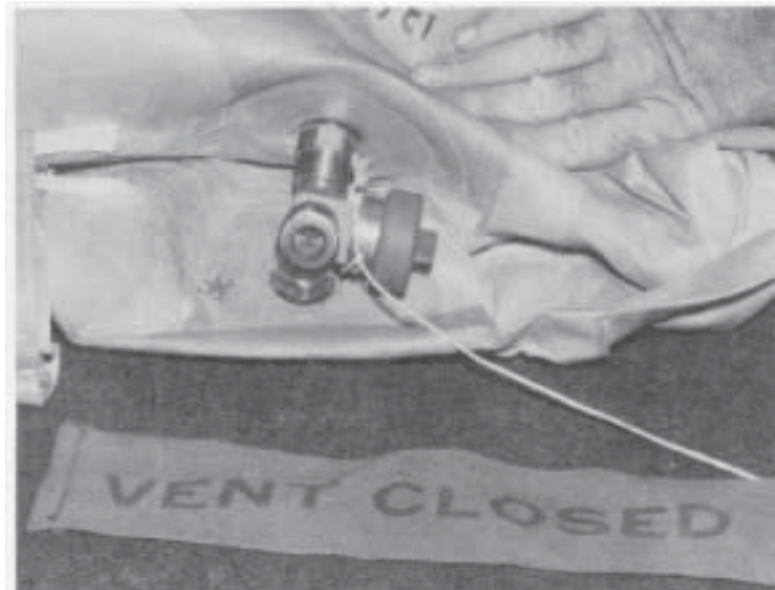
One of the most important items requiring specific attention is the manifold vent valve, P/N 9153. One function of the manifold vent valve assembly is as a manifold connection or fitting for the CO₂ cylinder to supply each of the two raft compartments. The vent valve in this assembly is to prevent entrapment of gas or air in the raft. During testing and then after evacuation and folding of the raft, the valve is to remain closed to prevent air from reentering the chambers. When the raft is installed



At first glance these two photographs look the same. Actually the valve shown on the left is open (plunger flush with the recessed surface marked VENT) and the one on the right is closed (plunger flush with the outer surface marked SHUT).

in the aircraft, the vent is opened to allow any accumulation of gas to escape to the atmosphere, thus preventing expansion of the raft as altitude increases. Keep the vent closed after evacuation until just before closing the compartment door. This will keep air from entering the raft as it is installed in the wing. Use appropriate warning streamers as reminders that essential steps of the inspection and installation procedures have been accomplished, especially the streamer marked VENT CLOSED. Be certain, however, that the manifold vent valve is in the open vent position at the completion of raft installa-

The VENT CLOSED streamer should not be removed until the valve is opened just prior to closing the raft compartment door.



Placing the raft in the compartment is an important step. A quick check of the vent manifold valves, the life raft's attach points, and the latches on the compartment doors, will prevent a lot of accidents.



tion. The purpose of this valve is defeated unless it can allow the escape of trapped air or leaking CO2 from the raft. Trapped air will escape through the open vent valve gradually. The high volume surge of CO2 will cause the valve to close.

DOOR LATCHES

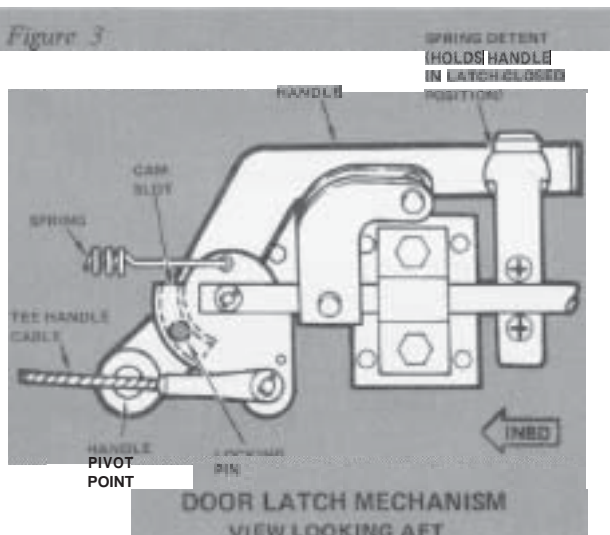
After properly evacuating, preserving, and packing the life rafts, ensure that all steps of the rigging procedure given in your handbook/manual are followed in placing rafts in compartments on the airplane, and in closing the doors. Particular attention must be given to the location of the pin in the door mechanism lever in relation to the upper edge of the cam flanges (Figure 3).

is nothing to hold the roller assembly in the latched position. With the handle in detent, the door may appear to be properly latched when actually it could vibrate open. Before closing the compartment door the following things must be accomplished:

- Remove the moisture cap on the manifold vent valve.
- Open the vent manifold valve on the life raft assembly by depressing the plunger.
- Reinstall the moisture cap.
- Remove the VALVE CLOSED safety streamer.
- Attach the life raft release cable to the CO2 cylinder cable attach point.

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Figure 3



Refer to your Hercules maintenance manual for details on these steps.

Check the door catches and latch rollers to see that they are in good condition. Inspect the cam flanges to ensure that they are not deformed or cracked. Also make sure that each latch roller positively engages the catch and that the handle will engage properly in the spring detent. With the door closed and the latch handle in place, safety wire the handles into the detent with one wrap of 0.020-inch copper breakaway wire as illustrated in your maintenance manual.

Life rafts are very reliable for the purpose they serve. Take the time to go through the proper safety procedures to be positive they will be ready in case of an emergency.

If you are not already familiar with the door release mechanism, you should manually operate the latch handle inside the life raft compartment and note the part played by the locking pin in the cam slot. If the locking pin is not located in the cam slot when the door is closed, there



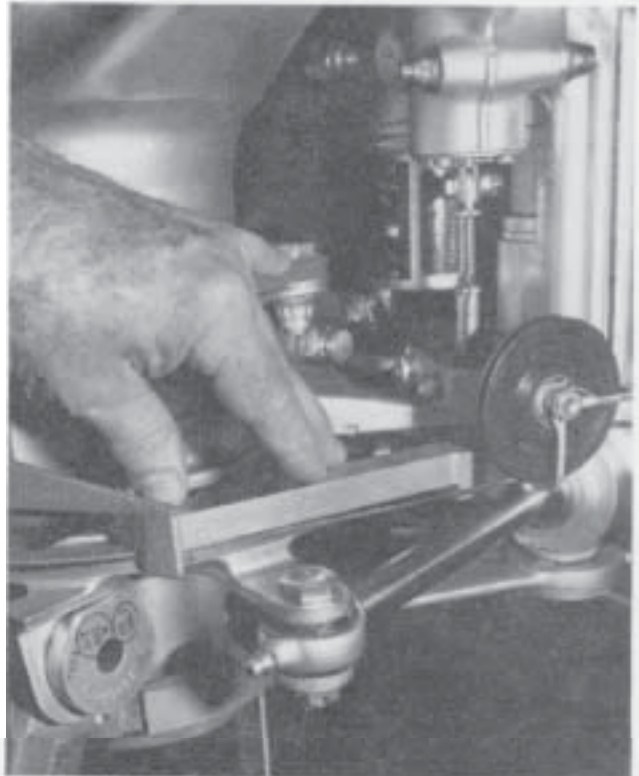
A Handy Nose Landing Gear Rigging Tool

One cause of nose landing gear steering problems can be improper rigging of the link **between the rocker arm and the steering valve**. This is a possibility that should always be investigated when nose wheel steering problems are encountered. Some other possible causes are discussed in Vol. 3, No. 1 of *Service News*.

The usual method of checking this portion of the NLG rigging is to measure the distance between a line drawn level with the top of the steering collar and the bottom of the steering control cable 1/2 inch forward of the pulley guard to see if the clearance is within the specified 0.16 inch to 0.16 inch range. In order to do this, a straightedge must be placed on top of the steering collar and oriented so that it extends over the cable. The distance between the bottom of the cable and the straightedge is then measured with a scale graduated in 0.01-inch increments.

Although this sounds simple enough, in practice it is often difficult to check measurements in this area accurately because the working space is limited and the lighting may be poor. A good solution to this problem is to fabricate a gage which will do the necessary measuring more or less automatically.

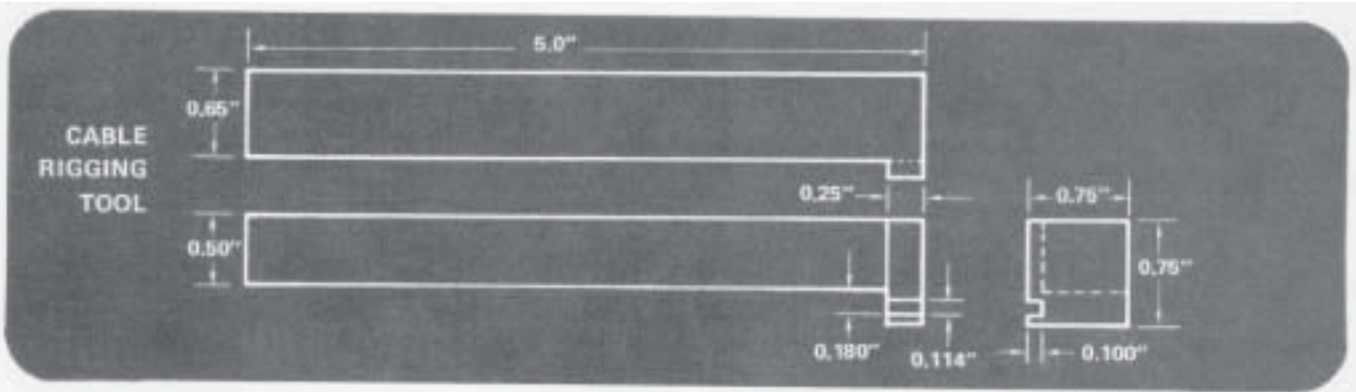
A simple gage design that will perform this task admirably is shown in the illustration. The gage can be clamped or held on top of the steering collar. If the link between the rocker arm and steering valve is adjusted correctly, the cable will fit neatly into the 0.114 inch slot on the end of the gage.

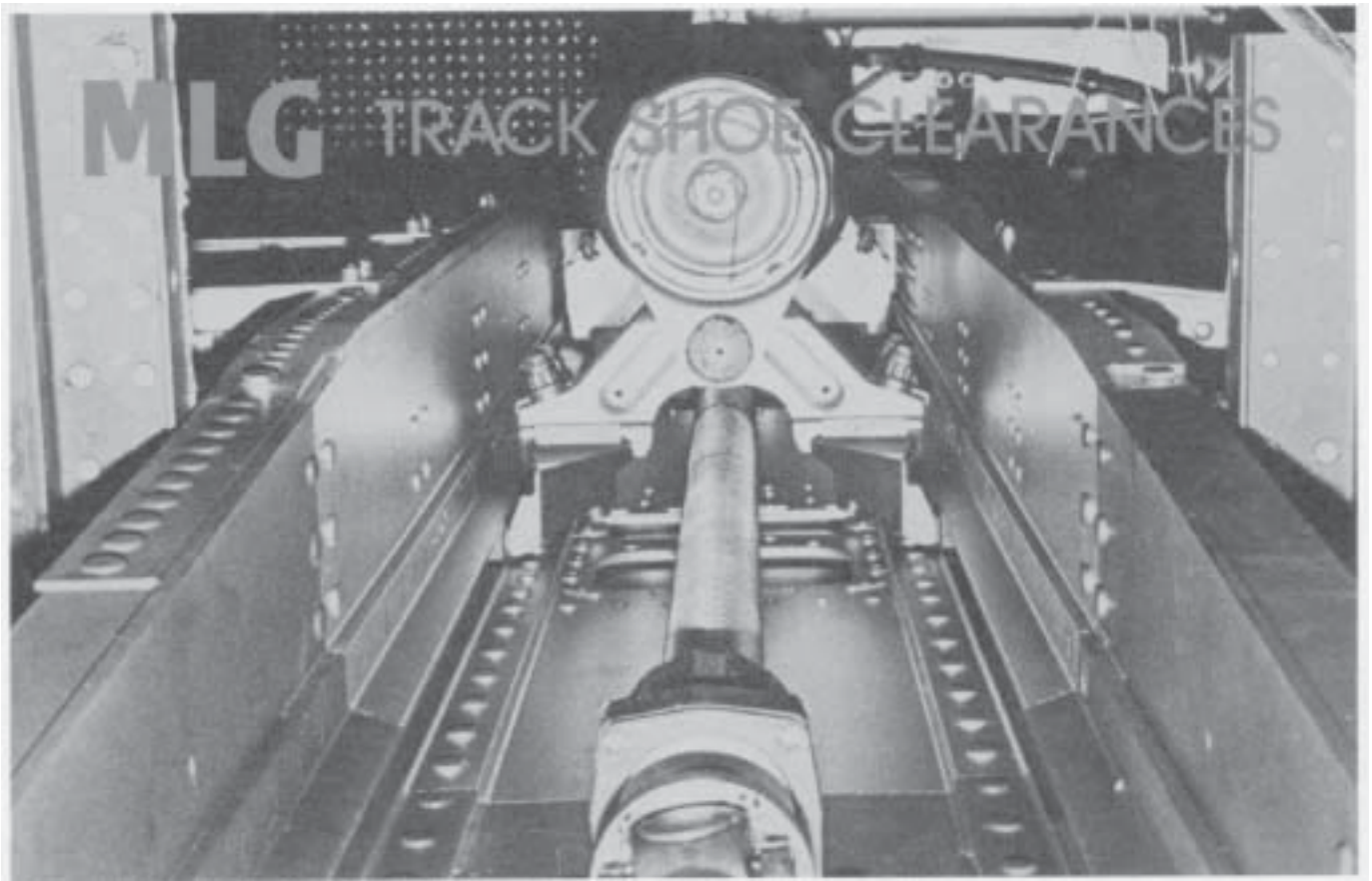


NLG rigging tool in position to check cable pulley adjustment.

The only critical dimension on the tool is the distance from the surface that contacts the top of the steering collar and the lower edge of the slot into which the cable fits.

If a check with the tool shows the link between the rocker arm and steering valve to be out of specifications, correct the adjustment by following the steps given in the applicable section of your Hercules technical publications.





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by C. R. Bush, Design Engineer Specialist

When you are troubleshooting problems with the extension and retraction of the Hercules main landing gear, one important item to check is the freedom of movement of the landing gear shoes in their tracks. In some cases where the shoes were reported to be binding in the tracks, it was discovered that even though the shoe clearances were within specifications, the tolerances were not adequate for reliable operation under extreme weather conditions. Very cold ambient temperatures can cause the shoes to bind and stick as they move up and down during normal cycling. The problem may be compounded by foreign materials in the tracks. The shoes and tracks are exposed to dirt and dust blown up from taxiways and runways, and regular cleaning to keep the tracks free of debris is recommended.

Careful adjustment of the shoes has always been a very important part of ensuring proper operation of the main landing gear. This is easy to understand when we recall the function of the shoe. The clearances must be small enough so that the shoe and track can effectively brace the gear for takeoffs, landings and ground operations; however, there must be enough clearance to allow free movement of the shoes in the tracks when the gear is extended and retracted.

After reviewing reports from the field concerning landing gear problems and examining the adjustment procedures given in the Hercules technical publications, Lockheed engineers have authorized a change in the minimum shoe clearance as measured fore and aft. They recommend that the 0.005inch total minimum clearance previously specified be increased to 0.010 inch. This change is already reflected in most of the applicable maintenance manuals. The greater clearance will allow normal landing gear operation where there is a moderate amount of track contamination, and will better accommodate clearance changes due to the inherent difference in thermal contraction between the aluminum track sidewalls and the steel strut.

Lockheed has also approved an alternate, improved method of MLG shoe adjustment. The new procedure makes use of a recently developed track width indicating tool (PN 3402044-1) which greatly simplifies the determination of correct shoe settings. The tool is a special dial indicator assembly which is designed to measure **variations** in the width of the MLG tracks fore and aft. It is placed inside the track and moved up or down to establish the narrowest points in the track that will be encountered by each set of shoes as the gear is raised and

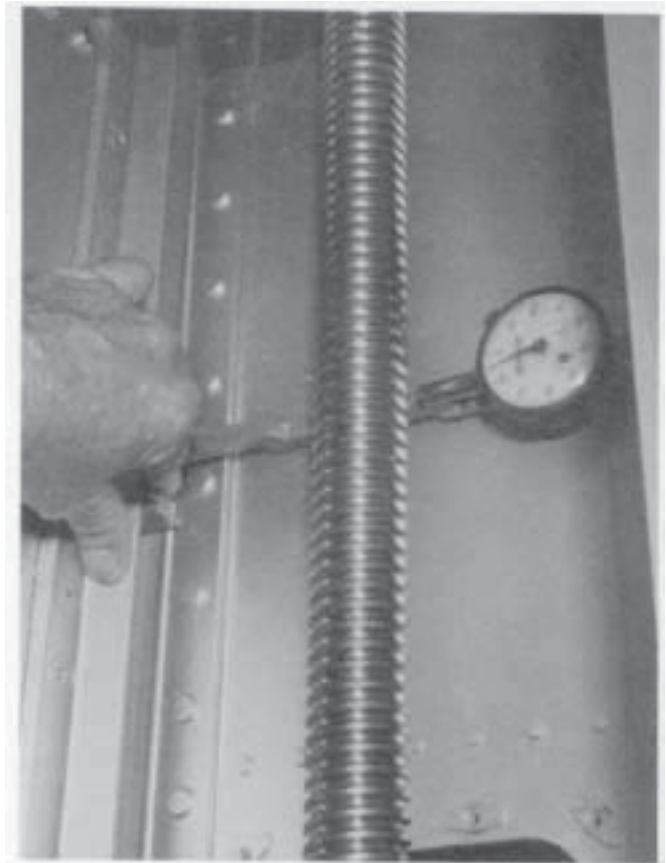
lowered. These measurements are then used to calculate shoe settings which will yield the proper minimum clearances at all gear positions.

An important advantage of this method of shoe adjustment is that the gear needs to be repositioned just once, so that the track areas covered by the shoes in the initial gear position can also be measured. This is a notable improvement in convenience over the older procedure, which requires that the gear be retracted in 8-inch intervals and the shoe clearances checked at each position with a feeler gauge.

The New Procedure in Brief

The new procedure which makes use of the track width indicator in setting MLG shoe clearance begins, as does its earlier counterpart, with the airplane supported by jacks and the gear in the fully extended position. Both lower and upper shoes are installed and set to initial clearances in the usual manner. In the case of the lower shoes, the inboard-outboard clearances are adjusted by the use of laminated shims; the initial values should be set at 0.002 to 0.007 inch. The fore and aft clearances may be adjusted by loosening the nuts that hold the shoes in place and moving the shoes up or down in their mountings on the shock strut. The correct initial clearance is 0.015 to 0.023 inch, measured at each shoe facing.

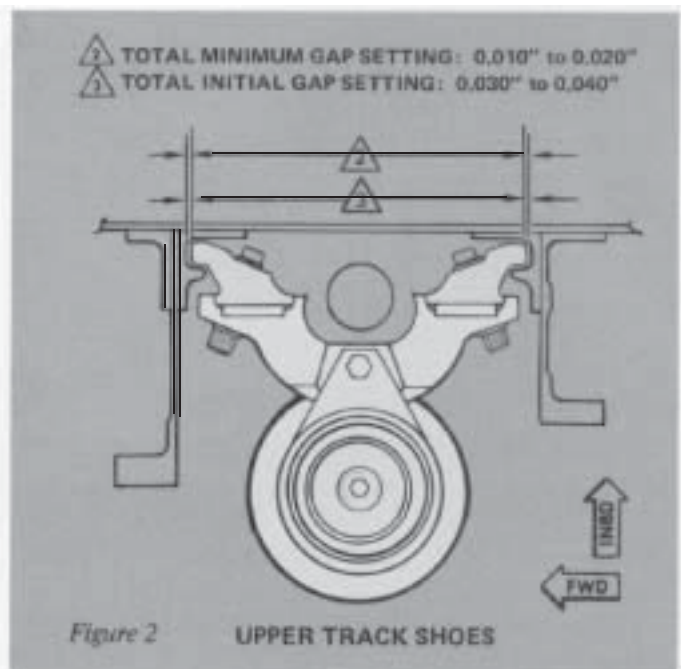
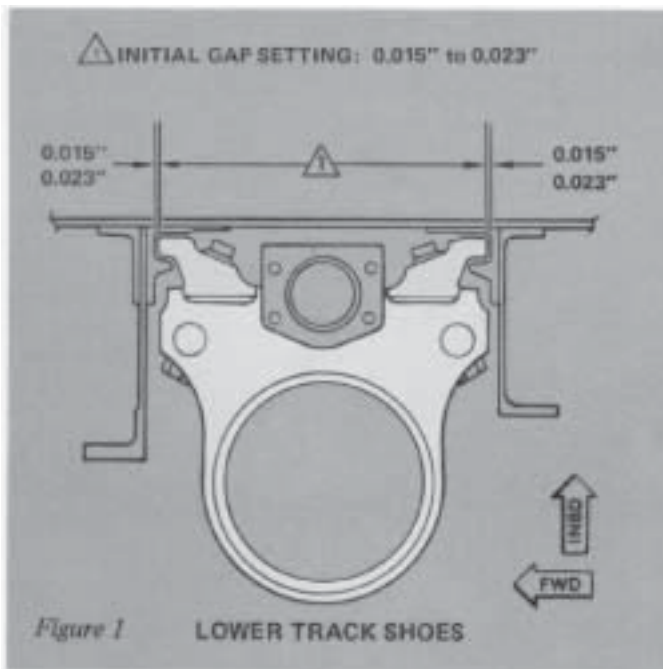
For the upper shoes, only the fore and aft clearances need to be set. Again the adjustment is made by repositioning each shoe up or down in its mounting, but because the upper shoes are supported by a swivel bracket which has some freedom of movement, it is the sum of the

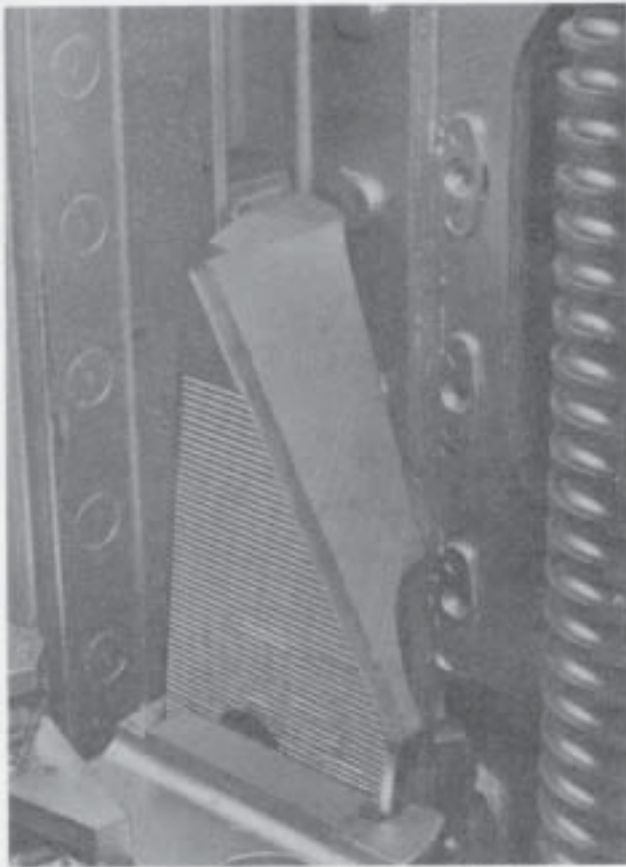


Movement of the track width indicating tool in the track shoe grooves measures variations in the track width.

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clearances fore and aft that is important. The total initial clearance for each pair of the upper shoes should be 0.030 to 0.040 inch.





Track shoe in place showing serrated surface which helps prevent slippage after adjustment to the MLG strut bracket.

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After the initial clearances have been set, mark the location of the approximate center of the upper and lower shoes on the tracks with a wax crayon. Retract the gear about 18 inches and use the track width indicating tool to take readings at the marked locations. Record these measurements as dimension "L" for the lower shoes, and dimension "U" for the upper shoes.

Now extend the gear and, with the aid of the track width indicator, establish and record the minimum readings in these areas:

- From the lower shoes to the upper shoes; record your measurement here as dimension "X".
- From the upper shoes to the ballscrew pillow block; record the reading at this location as dimension "Y",
- From the pillow block to the top of the tracks; record this value as dimension "Z".

When the minimum dimensions have been obtained, you are ready to proceed with the clearance checks. For the lower shoes, subtract the smaller of dimensions "X" or "Y" from dimension "L". If the difference is less than

0.020 inch, or if "X" and "Y" are larger than "L", the initial clearances of the lower shoes are satisfactory and no further adjustment is necessary. If, on the other hand, the difference turns out to be greater than 0.020 inch, subtract 0.020 from this difference, add 1/2 of the remainder to the initial 0.015 to 0.023-inch clearance range, and readjust the lower shoes accordingly.

An example may be helpful here: If the difference is 0.036, add 0.008 (0.036 minus 0.020, divided by 2) to the initial range. The new range will be 0.023 to 0.031 inch.

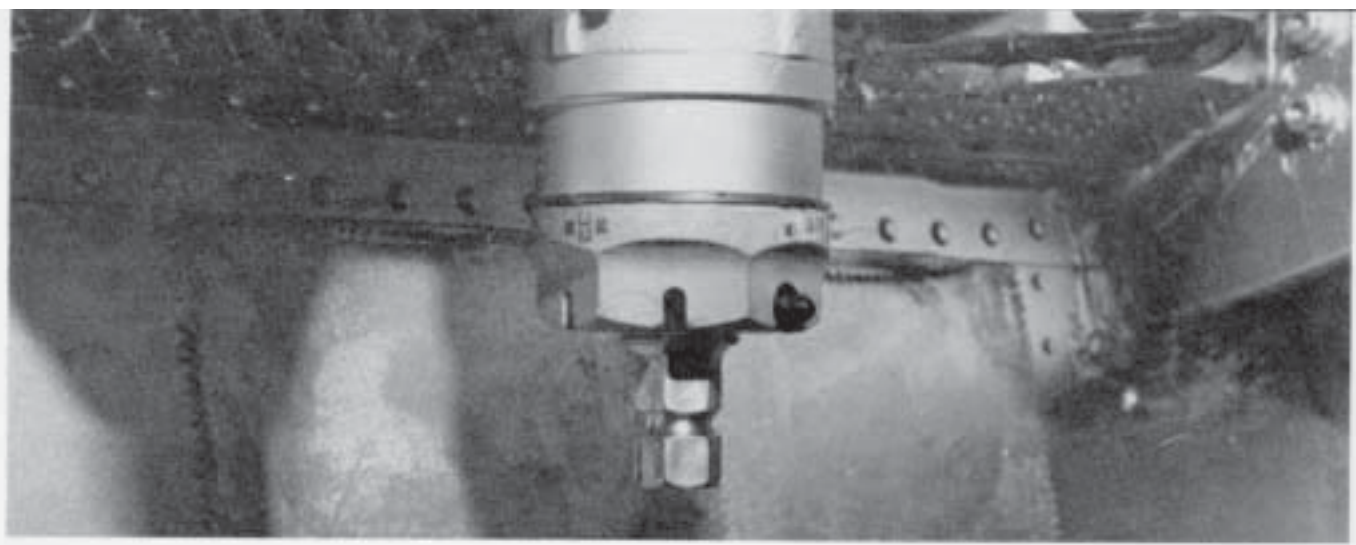
To determine the final clearances for the upper shoes, subtract the smaller of dimension "Y" or dimension "Z" from dimension "U". If the difference is less than 0.020 inch, or if dimension "Y" and "Z" are greater than dimension "U", the upper shoe clearances are satisfactory and need not be changed. If, however, the difference is more than 0.020 inch, subtract 0.020 from the difference, add all of the remainder to the initial 0.030 to 0.040-inch range, and readjust the upper shoes accordingly.

Consider this example: If the difference is 0.035 inch, add 0.015 (0.035 minus 0.020) to the initial range of 0.030 to 0.040 inch, making the new range 0.045 to 0.055 inch.

When you have made the adjustments that your measurements with the track width indicator showed to be necessary, the settings of the shoe clearances will be within the range of the revised specifications. You can complete your check of the MLG shoe rigging by verifying that the clearance between the shelf bracket and the piston axle is adequate in each case, and that the restrictor valve adjustments have been properly set. The details of these steps, together with complete revised data on main landing gear shoe rigging and lubrication will be found in the applicable Hercules technical publication.

The use of the new track width indicator offers a quick and accurate way of establishing the proper MLG clearances for Hercules aircraft. This new technique, when combined with the more liberal minimum shoe clearance values, will help ensure smooth, dependable operation of the main landing gear under all weather conditions.

SERVICE NEWS



Lost Locking Screw

means **MLG**
Trouble

by C. R. Bush, *Design Engineer Specialist*

Every part of the Hercules, no matter the size, is important to the aircraft. This includes items as small as the locking screw for the large nut on the main landing gear ballscrew. In fact, without it, the aircraft could be seriously damaged.

The large nut, P/N 388225-1, on the bottom of the main landing gear ballscrew, is adjusted to provide proper clearance between the friction washer, P/N 339462 or 3309043-1, and the spacer, P/N 352301 or 352301-3. A locking screw assembly, consisting of an NAS623-3-38 screw, AN960-10 washer, and NAS1291-3 or MS21042-3 self-locking nut, is used to lock the large nut to the ballscrew shaft while maintaining the 0.005-inch minimum clearance (Figure 1).

Note : On C-130A and C-130B type airplanes a different adjusting nut and shorter locking screw is used.

Loss of the locking screw will permit the large nut to turn on the ballscrew shaft. If the large nut moves upward on

the shaft, it can, in effect, apply the downlock when the gear is in an intermediate position. If it moves downward, it can come off the lower end of the shaft so that the gear will rise in the tracks without restraint on landing. In either case, damage to the aircraft will likely result.

The NAS623-3-38 screw is established as a time change item, however, the associated nut, P/N NAS1291-3 or MS21042-3, is not so designated. It is recommended that when the locking screw is changed, the nut should also be changed, using a new nut with the proper self-locking capability. (Some new nuts have been found with a defective self-locking feature.)

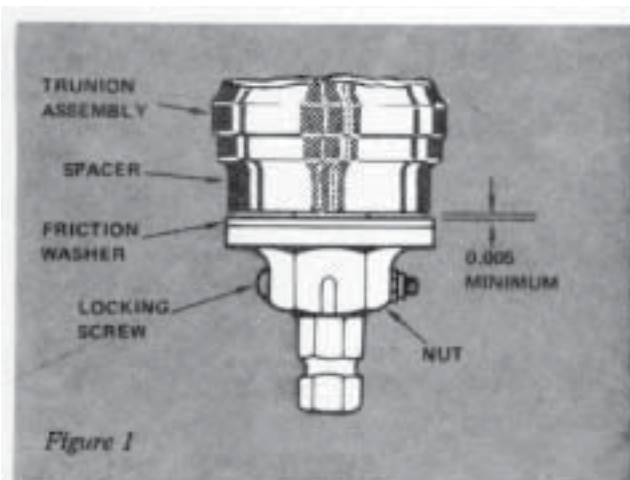
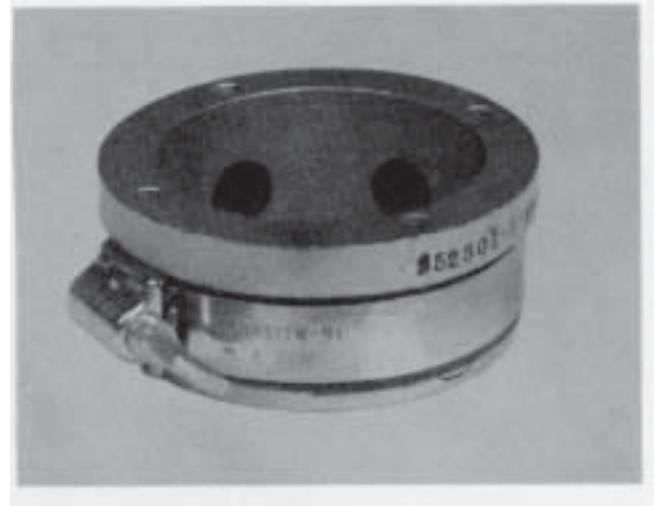


Figure 1

It is recommended that all Hercules operators perform a one-time inspection for presence of the locking screw and effectiveness of the self-locking feature of the nut.

In view of the importance of the locking screw installation, maintenance and inspection of the assembly should be explained and emphasized to all those involved with the operation.

Friction Washer Spacer Modification - Another preventive maintenance tip concerns the spacer which is used in conjunction with the friction washer at the lower end of the main landing gear ballscrews. On earlier aircraft, the P/N 352301 spacer has six 9/16-inch lightening holes around the circumference. Later aircraft use a P/N 352301-3 spacer without the holes to prevent entrance of contamination into the cavity above the friction washer. The P/N 352301 spacer with holes can be sealed by blocking them off as follows: Wrap two turns of 3/4-inch wide fabric-base tape around the spacer, covering the holes. Install a P/N AN737TW-91 hose clamp over the tape. The P/N 352301 spacer will then be functionally the same as the P/N 352301-3 spacer.



Clamp and tape on older spacers to prevent entry of dirt.

SERVICE NEWS

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Gyros are precise instruments and are extremely delicate. Because of effective shock mounting, they are seldom damaged while installed in the aircraft and, when properly packed, damage is uncommon during shipment. However, when the gyro is drawn from stores for installation in an aircraft, improper handling can result in a shortened service life or immediate failure of the unit.

By observing the following precautions you can minimize the possibility of damage to gyros in transit from supply stores to the aircraft:

1. Use special shipping containers for moving gyros. The gyro should be removed from the container only at the aircraft or in in the repair shop.
2. Keep the shipping container upright and avoid rough treatment.
3. Avoid unnecessary handling of the gyro. Refer to the paperwork to determine identification numbers, etc.

Visual examination of the gyro will probably not reveal much about its condition, but the unnecessary handling could damage it.

4. Do not place a gyro on hard, unpadded surfaces.
5. If a gyro is dropped or hit, report the incident immediately and send it to the repair shop for inspection. Do not install the gyro in the aircraft without first verifying that it is in perfect condition.
6. When changing gyros on an airplane, remove power and wait 15 minutes before moving the component or an instrument panel containing a gyro. A spinning gyro can slam hard against internal stops and shock load the bearings.
7. Don't forget; just because a gyro may be unserviceable doesn't mean that it is immune to receiving additional damage.

Keep it in the shipping container.





Chic Postier
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The Lockheed Hercules has just completed a decade of service with the Argentine Air Force.

Since the first Hercules was delivered to Argentina in December of 1968, Argentine C-130s have proved their mettle as reliable workhorses for defense, disaster relief, rural development, scientific research, and in the export of high-value products to other nations.

Argentina has utilized these versatile airlifters in an unusual number of specialized and difficult applications. In 1974, an Argentine C-130 made a record flight from Buenos Aires across the south polar regions to Australia and New Zealand and back, a total distance of more than 15,000 statute miles. The long hop across the ice cap was accomplished with one refueling stop each way at the Argentine research station at Marambio AAF Base, Antarctica. This historic flight demonstrated the highest degree of professional airmanship and pioneered a potential commercial airline route that could one day cut many hours off of the present flight time between Australia and Europe.

The C-130s are in regular use supporting Argentina's scientific missions in the Antarctic, but they have often been called upon to do a great deal more than just resup-

ply the scientific personnel who winter over on the ice. Since 1968, the AAF has performed 15 polar rescue missions, ferrying out the sick or injured researchers of several nations, including some from the United Kingdom and the United States. The Argentine Air Force has also accepted a commitment to the International Civil Aeronautical Organization to provide air search and rescue coverage throughout the wide empty reaches of the South Atlantic, a task for which the long-range Hercules is uniquely well suited.

The Argentine C-130s are maintained in a high state of readiness at all times. A resupply mission can be underway 24 hours after it has been requested by a participating nation of the Antarctic Community.

The capability to perform all levels of C-130 maintenance is well established in AAF squadrons. On two occasions, engine and propeller changes have been successfully completed in the Antarctic environment in temperatures below -60°F (-15°C).

We at Lockheed-Georgia would like to offer the Argentine Air Force our congratulations and our thanks as we mark 10 years of a good working relationship.