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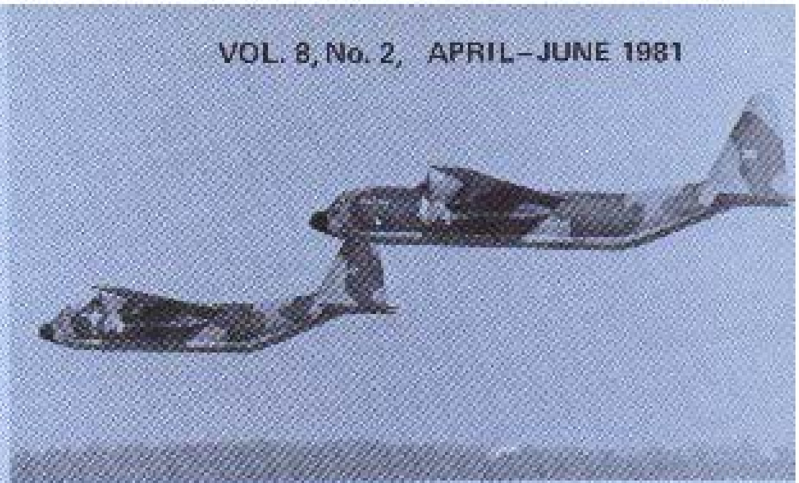

Lockheed

service news

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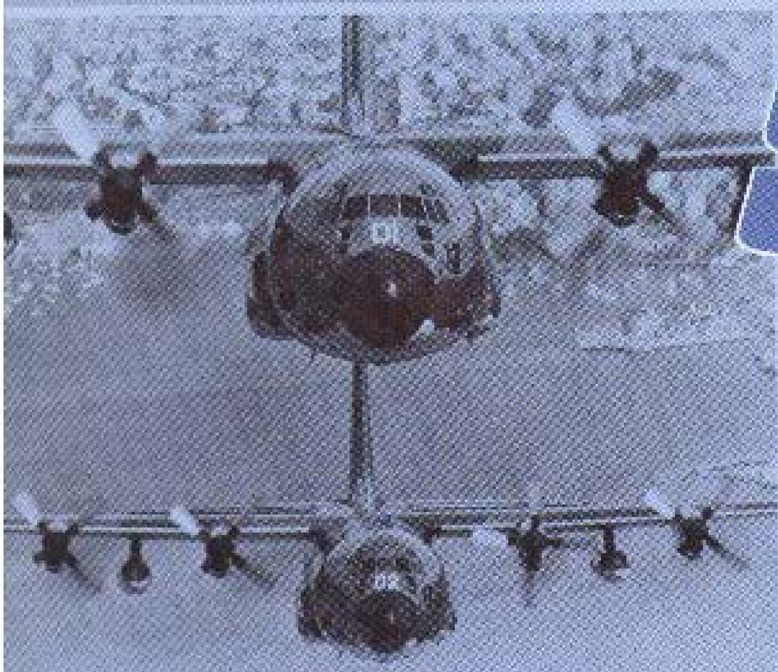

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Lockheed
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A SERVICE PUBLICATION OF
LOCKHEED-GEORGIA COMPANY
A DIVISION OF
LOCKHEED CORPORATION

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Vol. 8, No. 2, April- June 1981

CONTENTS

Cover: Our front and hack covers show a few of the many Hercules aircraft that take to the air each day. serving 52 nations throughout the world. Over 1600 of these versatile airlifterr have now been delivered (see page 19).

C. L. Ray

FocalPoint

LOOK TO LOCKHEED, FOR THE LONG TERM

The cover of this issue of Service News shows only a sample of the Lockheed. Georgia airlifters flown by our customers throughout the world. Many of our customers have operated our aircraft for decades. and many are repeat buyers.

Let me tell you why I think that so many operators stay with Lockheed-Georgia products.

First, Lockheed strives for the long-term relationship with customers. We want you to be satisfied with our products and services today, and when you need more. next year, or ten years from now . we want you to return to Lockheed with the sure knowledge that you will find quality and value at a fair price from a manufacturer who stands behind his product.

Next, we strive to make sure that our airlifters will do the job you want done. That's the reason we have engineers and other specialists help you to define your operational requirements in specific terms. .to assist you with mission and route analyses, economic evaluations, and other applications studies. Such studies, conducted in close cooperation with our customers, have led to the development of over 30 versions of the Hercules.

Next, we stress after-sale customer support. There are over four times as many Lockheed employees involved in supporting our airlifters as there are in selling them. We want our customers to have the training, data. spares, and handling equipment to keep our airlifters flying safely and efficiently throughout their lifetime.

Finally, we are constantly looking for better ways to serve our customers. In the last issue of Service News. our President, Bob Ormsby, wrote about our new computerized Customer Feedback and Evaluation System (CFES). Bob summarized Lockheed's policy as follows: 'We consider the support of our airplanes just as important as the airplanes themselves, and CFES is another step in the Lockheed-Georgia tradition of providing unparalleled service to our customers." We place great value on the comments and suggestions of our customers. Through conscientious review of your feedback, we are able to. blend your operational know-how into our new design and product support functions.

Lockheed-Georgia is committed to the long-term relationship with our customers. We succeed only if you succeed. over the long term.

ncerely,

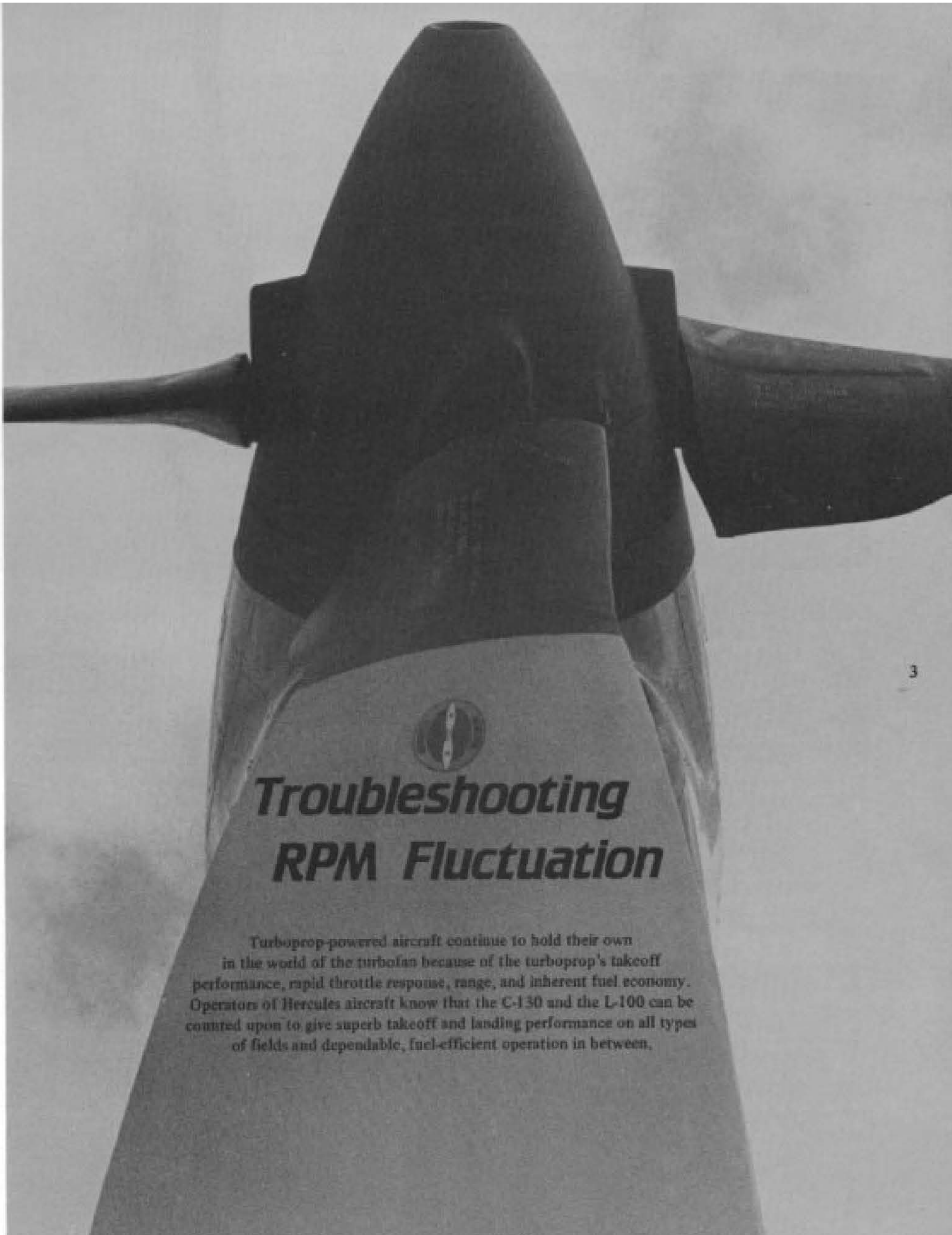
Charlie Ray

C. L. Ray
ice President.Marketing

PRODUCT SUPPORT LOCKHEED-GEORGIA COMPANY MARIETTA, GEORGIA 30063

T. J. Cleland Director

CUSTOMER SERVICE	INTEGRATED LOGISTICS SUPPORT	CUSTOMER SUPPLY
A. H. MCCRUM DIRECTOR	J. L. THURMOND DIRECTOR	M. M. HODNETT DIRECTOR



Troubleshooting RPM Fluctuation

Turboprop-powered aircraft continue to hold their own in the world of the turbofan because of the turboprop's takeoff performance, rapid throttle response, range, and inherent fuel economy. Operators of Hercules aircraft know that the C-130 and the L-100 can be counted upon to give superb takeoff and landing performance on all types of fields and dependable, fuel-efficient operation in between.

Two prime contributors to the outstanding performance characteristics of the Hercules are the Detroit Diesel Allison 501 /TS6-series turboprop engine and the Hamilton Standard 54H60-series propeller, both of which have been in continuous use on Hercules aircraft for many years.

A key element in the successful operation of this power team is a properly functioning propeller control system. The propeller control system must ‘be able to maintain engine RPM within close tolerances if high engine efficiency, effective noise control, and maximum operational safety are to be attained. Like all mechanical systems, propeller control systems are occasionally subject to problems. In the case of the Hercules power plant-propeller combination, propeller control system malfunctions often show up in the form of RPM fluctuation while the affected engine is operating in the flight (alpha) range.

It should be noted here that the causes of unstable engine RPM are not limited to the propeller control system. Malfunctioning engine components can also be responsible, and this possibility should always be considered. But many of the more elusive RPM fluctuation problems can in fact be traced to trouble within the propeller or propeller control system.

Jn this article, we are going to discuss the RPM fluctuation problems which are specifically traceable to propeller control system malfunctions. In addition to troubleshooting procedures that will help you determine the possible causes, we shall also offer suggestions on how to remedy the problems and restore normal system operation.

PROPELLER OPERATING MODES

There are three possible modes of propeller operation on Hercules aircraft: mechanical governing, normal governing, and synchrophasing.

In the mechanical governing mode, engine operating RPM is controlled by a hydromechanically actuated centrifugal governing system which functions without any electronic interface.

In the normal governing mode of operation, speed stabilization and throttle anticipation features of the synchrophaser electronic unit augment the mechanical governing system. The speed stabilization and throttle anticipation circuits provide improved response to transient speed changes caused by throttle lever movement and changing flight conditions.

In the synchrophasing mode of operation, the synchrophaser further enhances propeller governing by providing automatic control of the relationship among the propellers with respect to RPM and rotational position (phase).

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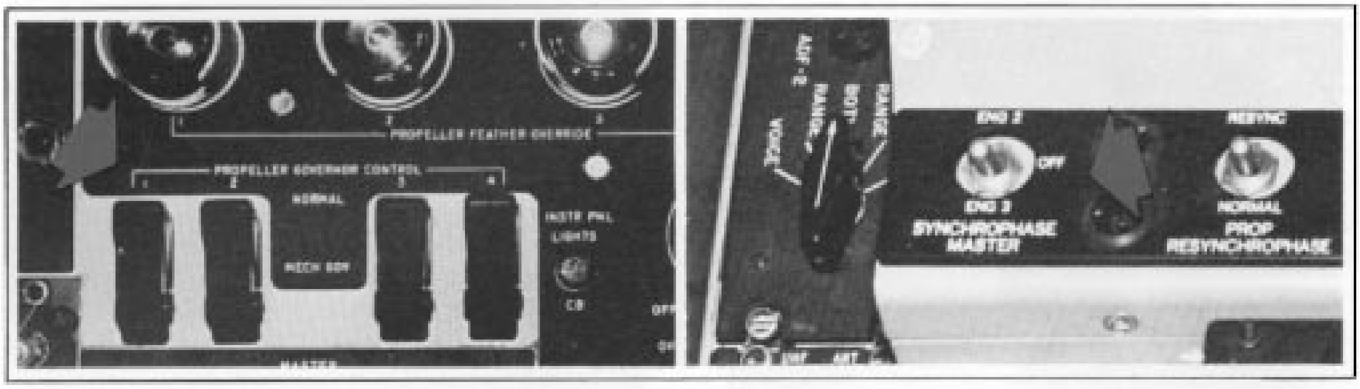


Figure 1. **Left: Propeller governor control switches on the copilot's side shelf. Right: Synchrophase master switch, located** on **the** engine control quadrant.

Maintaining the same RPM and a constant phase relation. ship within close limits for all four propellers reduces vibration and noise.

In flight, the usual mode of operation is the synchrophasing mode. This mode of operation is accomplished by placing the propeller governor control switches in the NORMAL position and the synchrophase master switch in either the ENG 2 or ENG 3 position (Figure 1).

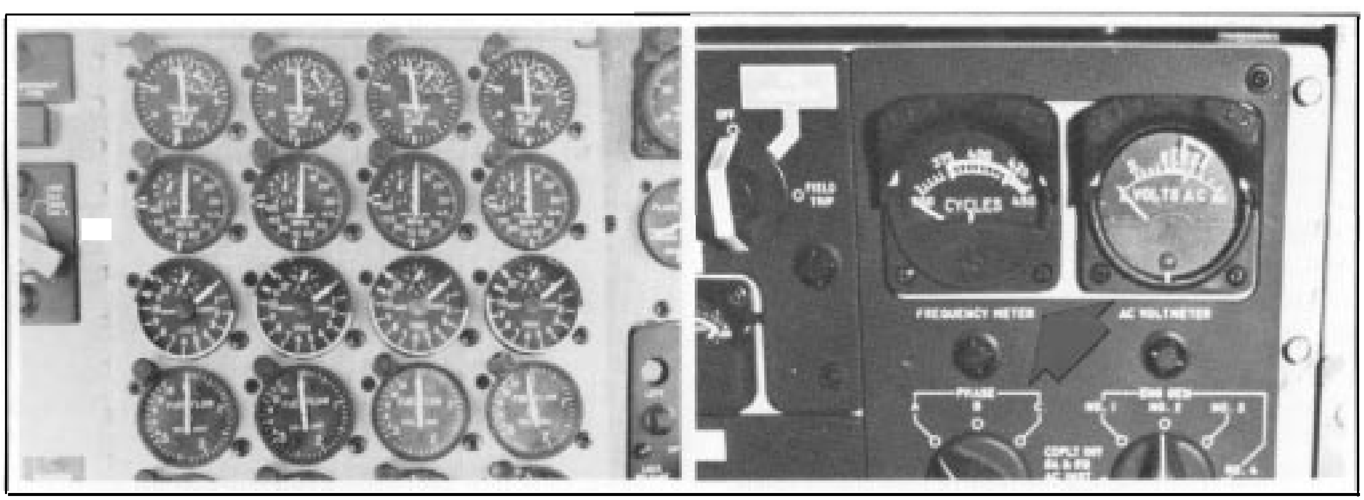
RPM FLUCTUATION

RPM fluctuation is indicated when the engine RPM cannot be maintained within a cyclic variation of plus or minus 0.5 percent RPM as indicated by the tachometer located on the engine instrument panel (Figure 2). RPM fluctuation can be further verified by observing the frequency meter on the overhead electrical control panel. A 0.5 percent RPM fluctuation will be displayed on the frequency meter as a variation of 2 cycles per second.

When RPM fluctuation in the alpha range is cited as a problem, the propeller valve housing is often singled out as the responsible component and replaced. However, there are a number of other possible causes of RPM fluctuation that should be explored before replacing a valve housing. Defective operation of the NTS system, tachometer generators, synchrophaser, or other components can all contribute to RPM fluctuation. Members of the flight crew of an affected airplane can make a real contribution toward speeding up the troubleshooting process by noting under which conditions the unstable RPM occurs.

When an RPM fluctuation is noticed by the flight crew, an effort should be made to isolate the problem by first positioning the synchrophase master switch to OFF. If the fluctuation still occurs, the propeller governor control switch for the affected propeller should be placed to MECH GOV. If the condition persists with the switch in the mechanical governing position, the problem has been pinpointed to the hydromechanical governing system. This eliminates the need to check the synchrophaser system, which controls the normal governing and synchrophasing modes of operation. If the fluctuation ceases when mechanical governing is selected, the hydromechanical governing system is functioning properly and the problem is in the synchrophaser system. **By** noting on the

Figure 2. Left: Engine instrument panel. Right: Overhead electrical control panel.



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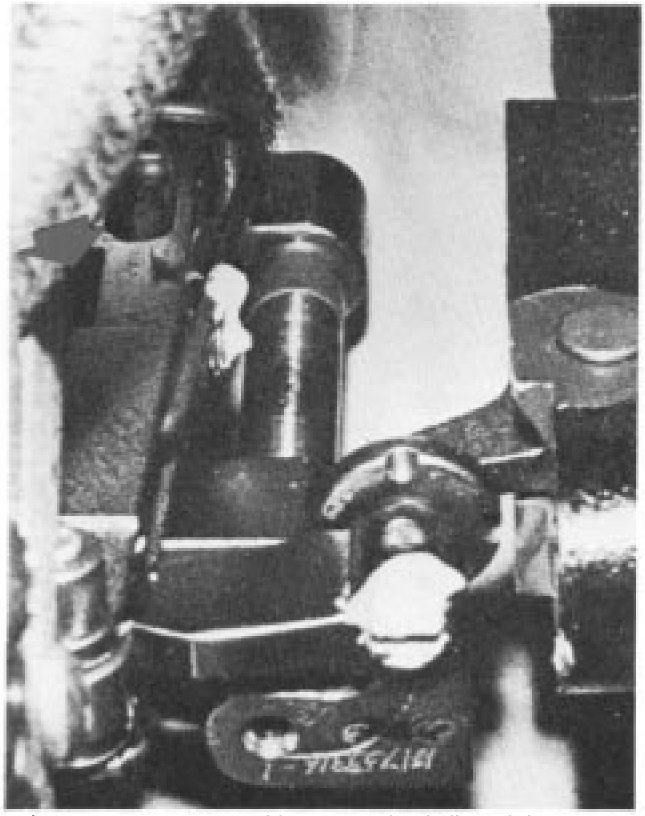

Figure 3. Insert screwdriver at point indicated by arrow to perform “NTS bracket check.”

maintenance forms whether the RPM fluctuation occurs in all three modes, or just in one or two, the flight crew has made the task of troubleshooting much easier for the maintenance crew.

TROUBLESHOOTING PROCEDURES

If the flight crew has determined that an RPM fluctuation problem persists in all three modes of operation, i.e., mechanical governing, normal governing, and synchrophasing, the following troubleshooting procedure should be utilized. Later we will discuss the case in which the RPM fluctuation occurs only in the normal governing and synchrophasing modes of operation and not the mechanical governing mode.

RPM Fluctuation in Mechanical Governing, Normal Governing, and Synchrophasing Modes

Troubleshooting should begin with a check of the negative torque signal (NTS) system. The NTS system is designed to prevent the propeller from driving the engine. This can occur under a variety of circumstances such as air gusts on the propeller, steep and rapid descents, or improper propeller governing. Negative torque results in uneven power distribution, causing the aircraft to yaw because of propeller drag.

The NTS system compensates for negative torque and propeller drag by increasing the propeller blade angle, which increases the loading on the propeller and relieves the negative torque condition. An NTS bracket, located on the engine, is actuated by a plunger that is part of the reduction gearbox. When negative torque occurs, the plunger extends, and the movement is transmitted through the mechanism of the NTS bracket to the propeller valve housing. This action causes the propeller blade angle to increase. If the components of the NTS bracket are binding or otherwise malfunctioning, it will not be possible for the propeller to respond properly to NTS signals, and unstable engine RPM may be the result.

To check the operation of the NTS bracket, two mechanics are needed: one at the NTS bracket and the other in the flight station. With AC power on the airplane and the engine static, check the operation of the NTS bracket components by performing the following NTS bracket lever check.

First, move the throttle to the flight idle position. Next, insert a wide, flat-bladed screwdriver between the NTS bracket lever and the forward end of the reduction gearbox (Figure 3). Position and hold the condition lever to AIR START so that the propeller auxiliary pump operates, providing pressure to change the propeller blade angle.

The recommended duty cycle of the auxiliary pump is 60 seconds on and 60 seconds off with a maximum of two minutes in a 30-minute period. However, continued motor operation is permissible if the motor body temperature does not exceed 65.6 degrees C (150 degrees F). A temperature of 65.6 degrees C or less is indicated if you can grasp the motor body with your bare hand for at least 5 seconds. When this temperature condition is exceeded, allow the motor to cool before additional operation.

With the condition lever held to AIR START, twist the screwdriver until the NTS bracket roller moves forward and out of its curved saddle and onto the flat part of the cam. This causes the propeller blade angle to increase toward feather. Observe the propeller blades and allow them to travel at least 75 degrees toward feather, and then slowly release the twisting force on the screwdriver. Note whether or not the NTS bracket roller movement back to the saddle is smooth. If the roller movement is smooth, go to the next troubleshooting procedure. If the roller movement back to the saddle is not smooth, lubricate the NTS bracket. If lubricating the bracket does not result in smooth operation, remove and replace the NTS bracket.

If the NTS bracket roller movement is smooth, the next component to be checked is the NTS control lever in the prop valve housing cover. To check the NTS control

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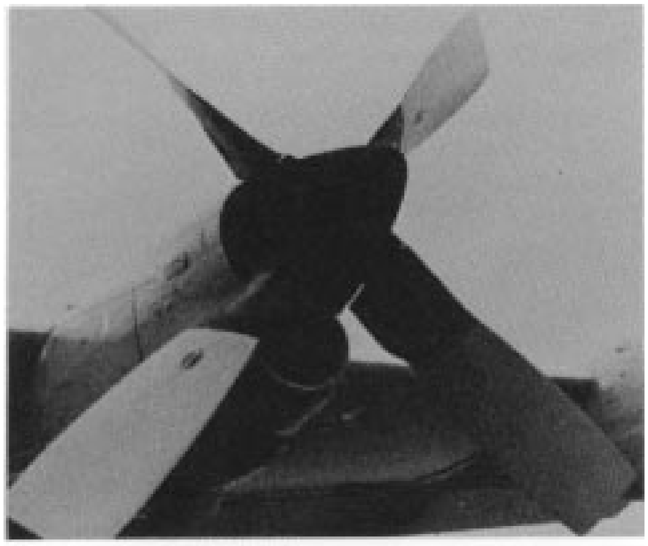


With engine static, propeller blade feathering is accomplished by use of the propeller auxiliary pump.

lever, start by once again carrying out the "NTS bracket check." That is, position the throttle to flight idle, insert a screwdriver between the NTS bracket and reduction gearbox, position and hold the condition lever to AIR START, twist the screwdriver, and then release it after observing that the prop has moved at least 75 degrees toward feather. Note whether or not the NTS control lever in the prop valve housing cover returns smoothly to the normal position. If the NTS control lever does return smoothly, continue to the next step. If the lever does not return smoothly, remove the prop valve housing cover, repair it to regain freedom of motion of the lever. and then reinstall it.

The next troubleshooting step is to check the feather solenoid assembly by again performing the NTS bracket check as above. After releasing the twisting force on the screwdriver when the prop has moved 75 degrees toward feather, observe whether the propeller blades reverse their direction of travel and start toward flight idle. If the propeller operates normally. proceed to the next step. If the propeller blades do not start back toward flight idle after the screwdriver twisting force is released, remove the prop valve housing cover and verify the part number of the feather solenoid assembly. If the feather solenoid assembly is Hamilton Standard part number 519560, replace it with Hamilton Standard part number 557983. The 519560 feather solenoid assembly is an outdated part and is no longer available in supply inventories. By now most prop valve housings should already have the current replacement feather solenoid installed.

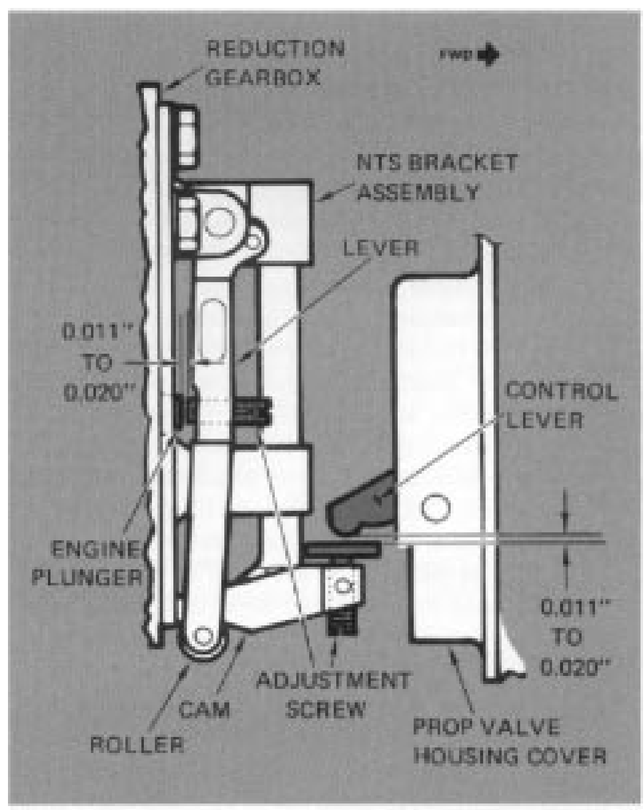
At this point, if the feather solenoid functioned properly, **check the two clearances at** the NTS bracket on the reduction gearbox to determine that each of the two clearances are between 0.011 and 0.020 inch (Figure 4).

If the clearances are not between 0.011 and 0.020 inch, adjust the NTS bracket by turning the two adjustment screws on the bracket as required to obtain the correct clearances. Prior to checking the NTS bracket clearances, make sure that the propeller control assembly is rotated clockwise (as viewed from the aft side) firmly against the propeller control drive bracket assembly. The drive bracket assembly is located on the forward side of the reduction gearbox at the 6 o'clock position.

If the **NTS** clearances in the previous step were found to be satisfactory, check the prop control drive bracket assembly for security and proper clearance. The clearance to be checked is the clearance between the control drive bracket pads and the torque retainer lugs on the prop control assembly (Figure 5). The combined clearances between the drive bracket and the torque retainer lugs should be between 0.025 and 0.050 inch. If the combined clearances are not within proper limits, remove and replace the control drive bracket, which could have worn pads.

If the drive bracket clearances were within tolerance, check to make sure that the propeller control linkage is properly rigged and secured in accordance with the propeller maintenance instructions. If the control linkage is found to be properly rigged and secured, go to the next step. **If** not, re-rig the engine.

Figure 4. **NTS bracket: the clearance at the two adjustment screws should be between 0.011 and 0.020 inch.**



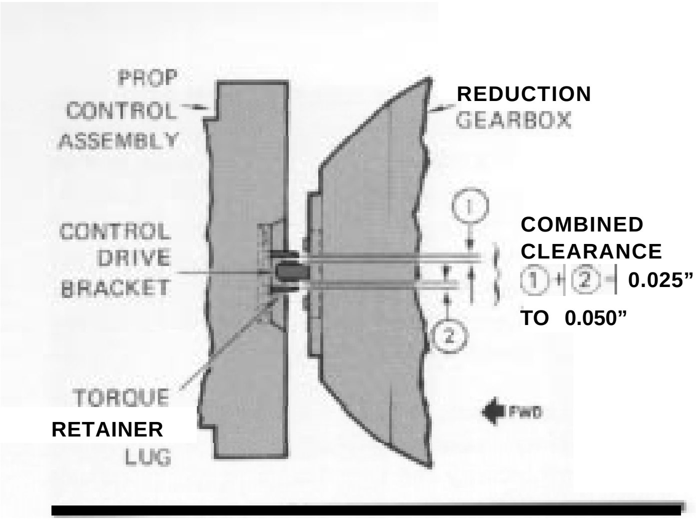


Figure 5. **The combined value of the clearances between the control drive bracket and the torque retainer lugs should total 0.025 to 0.050 inch.**

The next step is to perform a pitchlock check in accordance with the propeller maintenance instructions. This must be accomplished with the engine running. Note that during ground runs, gusty crosswinds can make it difficult to evaluate fluctuations. Therefore, when the objective is to check for RPM fluctuation, ground runs should not be performed during gusty conditions.

Check the engine RPM with the Autotach BH172 or the GS 3940 RPM and Phase Angle Indicator test set, and determine if the RPM stabilizes in pitchlock. If the RPM does stabilize in pitchlock, proceed to the next step. If the RPM does not stabilize in pitchlock, the problem is not in the propeller control system, but in the engine itself. At this point, refer to the power plant maintenance instructions for the appropriate troubleshooting procedures.

The next step is to determine if the tachometer indicating system is functioning correctly. This must be checked with the engine running. A problem with the tachometer indicating system is suggested if TIT, fuel flow, and torque are all stable with the indicated RPM fluctuating. A tachometer indicating system malfunction makes itself apparent if the frequency meter on the overhead electrical control panel shows a constant frequency while the tachometer shows the RPM to be fluctuating. If the frequency meter indication is not fluctuating along with the RPM, the problem is likely to be a defective tachometer generator or indicator, or faulty wiring. Troubleshoot these three items in accordance with the power plant maintenance instructions. If TIT, fuel flow, torque, and the frequency all fluctuate with RPM, the problem is not in the tachometer indicating system, and further checks need to be accomplished.

At this point, shut down the engine and clean the propeller valve housing filter elements ultrasonically. Once the filters have been cleaned, restart the engine and check for RPM fluctuation. If fluctuation still occurs, the malfunction could be caused by trouble inside the propeller valve housing. At this point, remove the propeller valve housing for depot overhaul, and replace it.

If RPM fluctuation still occurs after replacement of the propeller valve housing, there is a possibility that the low pitch stop quad seal located on the aft end of the low pitch stop assembly may be leaking (Figure 6).

The quad seal can be replaced without removing the dome. Removal of the low pitch stop will provide the necessary access to the seal. Proceed as follows:

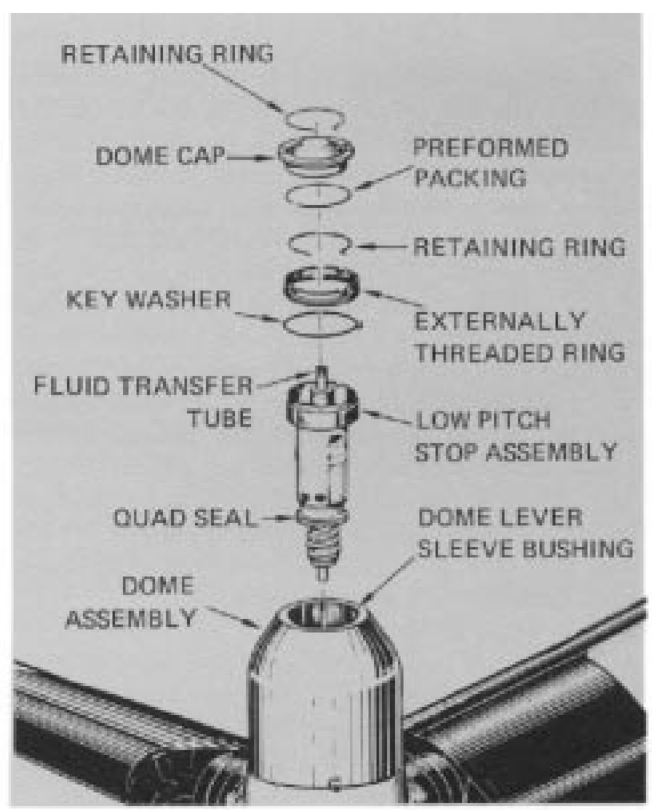
1. Remove the dome cap retaining ring, the dome cap, its preformed packing, and the fluid transfer tube.

2. Remove the low pitch stop retaining ring and the externally threaded ring.

3. Mark the groove of the dome lever sleeve bushing and the slot of the low pitch stop assembly which are in alignment for the tab of the key washer. Also, measure and record the depth from the top of the dome lever sleeve bushing to the top of the low pitch stop assembly. This step will ensure that the low pitch stop can be properly positioned during reinstallation after the quad seal has been replaced.

4. Remove the key washer and then the low pitch stop assembly.

Figure 6. Low pitch stop assembly. The quad seal is located on the aft end of the low pitch stop.



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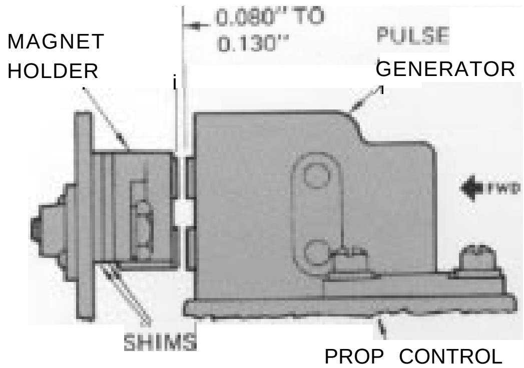

Figure 7. Ensure that the pulse generator clearance is between 0.080 and 0.130 inch.

After replacing the low pitch stop quad seal, the following procedure should be used to reinstall it:

1. Using petrolatum or hydraulic fluid, lubricate the quad seal and the mating inside surface of the piston sleeve in the dome.

2. Insert the low pitch stop assembly in the dome, making sure the stop levers do not drag along the threads in the lever sleeve bushing. Make sure that the quad seal enters the piston sleeve properly before the thread engagement is reached.

3. Using the appropriate spanner wrench, screw in the low pitch stop assembly until it reaches the previously measured depth and the previously marked slot and groove are aligned.

4. Install the key washer, the externally threaded ring, and its retaining ring.

5. Lubricate the dome cap preformed packing and the outside of the fluid transfer tube.

6. Install the dome cap, its packing, and the fluid transfer tube. Tighten the dome cap and install its retaining ring.

Finally, if replacing the low pitch stop quad seal does not cure the problem, the propeller must be removed and replaced. Under most circumstances, you will not reach this step in your troubleshooting procedure since most RPM fluctuation problems will have already been isolated and corrected in one of the earlier steps.

RPM Fluctuation in Normal Governing and Synchrophasing Modes Only

Up to this point we have been discussing RPM fluctuations that have occurred in all three modes, i.e., mechanical governing, normal governing, and synchrophasing. If the fluctuation disappeared when mechanical governing was selected by the flight crew, the troubleshooting procedures just discussed can be bypassed. The following troubleshooting procedures are to be used when RPM fluctuation occurs in the normal governing mode or the synchrophasing mode, or both.

The first step in this procedure is to determine whether the RPM is stable with all four engines running, the propeller governor control switch in NORMAL, and the synchrophase master switch in ENG 2 or ENG 3. If the RPM is not stable, index all propellers in accordance with the propeller maintenance instructions in order to reestablish the proper relationship between the mechanical governing system and the normal governing system.

If the RPM is not stable after indexing the propellers, check the pulse generator clearance of the affected engine. The pulse generator clearance should be between 0.080 and 0.130 inch (Figure 7). If it is not, adjust it to these limits by adding or subtracting shims.

If RPM still fluctuates after checking and adjusting the pulse generator clearance, use the Synchrophaser Test Set GS-6090 to check out the system. This test set can check the prop valve housing, phase and trim control, switches, wiring, and the synchrophaser. When using this test set, follow the procedures outlined in the propeller maintenance instructions and Hamilton Standard maintenance manual P5059 or T.O. 33D2-11-75-1, as applicable.

If, after checking the system with the GS-6090 test set, the RPM is not stable, remove the synchrophaser and bench check it. This bench check can only be accomplished on tube-type synchrophasers; to date, a bench check for the solid-state synchrophaser has not been established. If a tube-type synchrophaser is found to be bad during the bench check, replace it. Solid-state synchrophasers will have to be replaced or not, depending upon the results of the GS-6090 check. Also, inspect the synchrophaser connector plugs for damaged pins and corrosion.

The troubleshooting procedures we have outlined here should isolate any RPM fluctuation problem you might encounter in the field. Obviously, a properly functioning propeller system is fundamental for the inherent safety, performance, and economy of a propjet airlifter. We hope that this article will reduce the amount of time required to troubleshoot the propeller control system and help your organization realize the maximum number of trouble-free hours from its Hercules aircraft.

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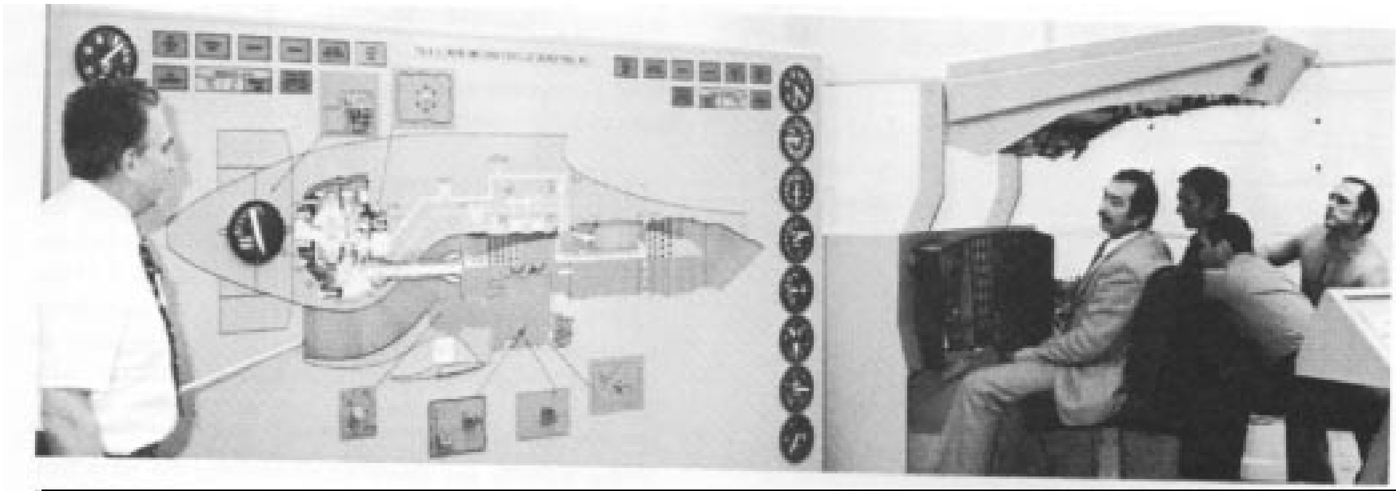

NEW C·130H Engine System Trainer

To further enhance the already high standards of the professional training that it offers, the Lockheed-Georgia Company Customer Training' Department has recently acquired a new C-130H Engine System Trainer. The new engine trainer was manufactured for the Customer Training Department by the Lockheed Aircraft Service Company of Ontario, California. The Engine System Trainer is specially designed to assist in the development of skills and the acquisition of knowledge by personnel who are assigned to operate and maintain the engine and propeller systems of the C-130H aircraft.

The Engine System Trainer is an integrated training system, consisting of a Digital Equipment Company computer/microprocessor system, a flight station simulation panel, and an instructor's panel. The trainer allows students to initiate and monitor engine and propeller operations, as well as detect and correct malfunctions that can be inserted into the training program by the instructor.

One advantage of the new Engine System Trainer is that it offers the students the opportunity to perform hands-on training without the requirement of having an actual C-130H aircraft available. Another outstanding feature of the engine trainer is that it is capable of performing normal or emergency operations in which functioning trainer components and simulated displays respond just as they would on an actual C-130H under the same conditions. Also, use of the trainer eliminates the noise distractions which would be present when training on actual aircraft. And it offers complete safety.

Students who have used the new trainer find that it makes reaching fundamental learning goals on the engine system both easier and quicker. The new engine trainer also significantly simplifies the instructor's job of teaching a complex system, leaving him more time to stress important collateral concepts such as operational safety and efficient fuel management.

The Customer Training Department has always been proud of the general excellence of its training programs. The C-130H System Trainer represents a valuable addition to the modern training facilities that support those programs.

Materials for

Fuel Tank Maintenance

A helpful list of materials and equipment necessary for maintaining the integral fuel tanks on Hercules aircraft...

A fuel leak on any aircraft is hazardous and can result in the loss of an aircraft or human life. Common sense, if nothing else, dictates that a fuel leak be repaired at the earliest possible opportunity.

Making prompt and effective fuel tank repairs requires not only sound troubleshooting procedures and skilled personnel, but also approved, up-to-date equipment and materials. Many different kinds of supplies are required to support fuel tank repair activities, and unfortunately it is not always possible to find the relevant ordering data conveniently listed in one place. This article attempts to at least partially remedy that situation.

We have compiled a list of sealing supplies and equipment necessary to maintain Hercules aircraft integral fuel tanks. The list includes cleaning and sealing materials, chemicals, and the equipment needed to make temporary or permanent repairs. In most instances, the federal or national stock number has been included to facilitate ordering the listed materials. Also included are lists of sources for sealants and other chemicals, as well as the addresses of the vendors of these materials.

We hope that this information will help speed up the process a bit the next time you order fuel tank maintenance supplies for your organization.

PROTECTIVE CLOTHING

Specification	Nomenclature	Federal or National Stock Number
MI L-C-2202	Coveralls, small	8405-00-037-9184
MI L-C-2202	Coveralls, medium	8405-00-037-9234
MI L-C-2202	Coveralls, large	8405-00-037-9274
–	Cotton gloves	8415-00-268-8330
–	Rubber gloves, size 9	8415-00-266-8679
–	Rubber gloves, size 10	8415-00-266-8677
–	Rubber gloves, size 11	8415-00-266-8675
–	Cap	8415-634-2410

CLEANING MATERIALS

Specification	Nomenclature	federal or National Stock Number
MIL-C-38736	Cleaning solvent	6850-00-538-0929
—	Rags	8305-983-9386
—	Scrapers, sealant (P/N, 60A90351)	—
—	Scales, triple beam balance	—
UU-C-834	Paper cups	7350-290-0588
—	Spatulas, wooden	6515-753-4533
H-D-643	Brush, acid	7920-223-8005
H-B-695	Brush, varnish	8020-260-1306
H-B-328	Brush, stiff bristle	7920-619-9162

APPLICATION MATERIALS

Nomenclature	Federal or National Stock Number
Sealant gun, air operated	4940-693-8070
Sealant cartridges	5120-00-670-3294
Tips for sealant cartridges:	
Straight – 4 inches long, 1/16-inch orifice	5120-NL
45’ bend – 4 inches long, l/16-inch orifice	5120-670-l 185
Straight – 4 inches long, 1/8-inch orifice	5120-773-3791
45’ bend – 4 inches long, 1/8-inch orifice	5120-670-l 186
Extension – 6-3/8 inches long	5120-670-l 187

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SEALING MATERIALS

Specification	Nomenclature	Federal or National Stock Number
MI L-S-8802	Sealant, A-112	8030-753-5010
MI L-S-8802	Sealant, A-2	8030-723-5344
MI L-S-8802	Sealant, B-l /2	8030-753-5004
MI L-S-8802	Sealant, B-2	8030-616-9167
MI L-S-8802	Sealant, 8-4	8030-850-0758
MI L-S-8784	Sealant, A-2	8030-29 I-8380
MI L-S-8784	Sealant. B-1/2	8030-598-2910
STM40-111	Sealant, A-2	
STM40-111	Sealant, B-l/2	
STM40-111	Sealant, B-2	
MI L-C-27725	Corrosion protection coating	8030-062-7581
–	Primer, two-part epoxy	–
MI L-C-8301 9	Fuel-resistant sealant top coating (l-pint kit)	8030-00-498-5268
MI L-C-8301 9	Fuel-resistant sealant top coating (l-quart kit)	8030-00-241-2498
MI L-C-83019	Fuel-resistant sealant top coating (l-gallon kit)	8030-00-496-9275
MI L-L-25567	Leak test compound	6850-185-0423
PR148	Adhesion promoter	8030-00-560-8756

FIELD REPAIR KITS

Nomenclature	Federal Stock Number
Semco Model 100A- gun & mixer kit	5180-674-5830
Semco Model 400A- field repair kit for external sealing of leaking fasteners	5180-450-6925

EQUIPMENT

Nomenclature	Federal or National Stock Number
Respirator	4240.2753177
Fire extinguisher, CO2	4210-288-9652
Blacklight	6635-969-4172
Air mover	4730-00-313-0680
Air conditioner	4 120-684-6103
Combustible qas indicator	6665-00-941-6554
Leak detector	4940-00-928-4698
Fuel container	See Air Force drawings 60MOD342, 60MOD343, and 60MOD344

Model 400A Field Repair Kit

SEALANT SOURCES

Specification	Vendor	Product Number
MI L-S-8802, A-l/2	Chem Seal Corporation of America	CS-3204
	Essex Chemical Corporation	Pro-Seal 890
	Goal Chemical Sealants Corporation	GC-408
	Products Research and Chemical Corporation	PR-1422
MI L-S-8802, A-2	Chem Seal Corporation of America	CS-3204
	Essex Chemical Corporation	Pro-Seal 890
	Goal Chemical Sealants Corporation	G C-408
	Products Research and Chemical Corporation	PR-1422
MI L-S-8802, B-1/2	Chem Seal Corporation of America	CS-3204
	Essex Chemical Corporation	Pro-Seal 890
	Products Research and Chemical Corporation	PR-1422
MI L-S-8802, B-2	Chem Seal Corporation of America	CS-3204
	Essex Chemical Corporation	Pro-Seal 890
	Goal Chemical Sealants Corporation	GC-408
	Products Research and Chemical Corporation	PR-1422
MI L-S-8802, B-4	Products Research and Chemical Corporation	PR-1422
MI L-S-8784, A-2	Chem Seal Corporation of America	cs-3300
	Essex Chemical Corporation	Pro-Seal 706
	Goal Chemical Sealants Corporation	GC-200
	Products Research and Chemical Corporation	PR-1321
MI L-S-8784, B-l /2	Chem Seal Corporation of America	cs-3300
	Essex Chemical Corporation	Pro-Seal 706
	Goal Chemical Sealants Corporation	GC-200
	Products Research and Chemical Corporation	PR-1321
STM40-111, A-2	Products Research and Chemical Corporation	PR-14226
STM40-111, B-1/2	Essex Chemical Corporation	Pro-Seal 870
	Products Research and Chemical Corporation	PR-1422G
STM40-111, B-2	Chem Seal Corporation of America	CS-3213
	Goal Chemical Sealants Corporation	GC-450
	Products Research and Chemical Corporation	PR-14226

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ADDITIONAL CHEMICAL SOURCES

Specification or Nomenclature	Vendor	Product Number
MI **L-C-27725**	Products Research & Chemical Corp.	PR 1560 M
MI L-C-27725	De Soto Inc. - Garland Plant	823-01 I/91 O-099/ 020-037
MI L-C-83019	Dexter Corp. - Midland Div.	Magna Flex Clear 7-C-27
MI L-C-83019	Advance Coating & Chemical	Advance 2-1 C-2
MI L-L-25567	American Gas & Chemical	Oxy-Tee Type 1
MI L-L-25567	Cee Bee Chemical Company	F-19
MI L-L-25567	United States Gulf Corporation	Detek Beta 24
Adhesion promoter	Products Research & Chemical Corp.	PR147/PR148
Adhesion promoter	Essex Chemical Corporation	Pro-Seal 151
Primer (two-part epoxy)	Bostik-Finch Inc.	Bostik 454-I with CA109

VENDORS AND ADDRESSES

American Gas and Chemical **Co,, Ltd.**
220 Pegasus Avenue
North Vale, New Jersey 07647

Advance Coating and Chemical
2213 North Tyler Avenue
South El Monte, California 91733

Bostik-Finch Inc.
Middleton, Massachusetts 01949

Cee Bee Chemical Company
9250 **E. Cee Bee Drive**
Downey, California 90241

Chem Seal Corporation of America
11120 Sherman Way
Sun Valley, California 91352

De Soto Inc.-Garland Plant
Forest Lane and Shiloh Road
Garland, Texas 75040

Dexter Corporation
Midland Division
31500 Hayman Street
Hayward, California 94544

Essex **Chemical Corporation**
Specialty Chemical Division
Coast Pro-Seal
19451 Susana Road
Compton, California 90221

Goal Chemical Sealants Corporation
3137 East 26 Street
Los Angeles, California 90023

Products Research and
Chemical Corporation
5430 San Fernando Road
Glendale, California 91203

SEMCO
410 Jersey Avenue
Gloucester City, New Jersey 08030

United States Gulf Corporation
P. 0. 80x 233
Stony Brook, New York 11790

Upper Refueling Tube Installation

When the right wheel well upper refueling tube, P/N 373611-6, is removed for repair or replacement, difficulty is often encountered when it comes time to reinstall the new or repaired tube. The main problem comes when an attempt is made **to secure** the top end of the assembly. Interference from structural components in this area can make torqueing the fitting to the proper values something of a challenge.

In an effort to uncover an approach that would help make replacing the upper refueling tube a little less of an undertaking, we checked to see how our own people in the C-130 Fuselage Structures Department install it in new aircraft. It turns out that they use a specially modified spanner wrench which greatly simplifies the task. We thought it might be helpful if we passed along the particulars on how Lockheed personnel do this job, and also included information on how to modify the appropriate spanner wrench.

The upper refueling tube is located at fuselage station 613.50 in the wing root area at waterline 260. It is a section of typical 3.5inch fuel manifold tubing, curved in shape and fitted with Wiggins couplings at each end to connect it to the adjoining tubes. The upper refueling tube has a male Wiggins coupling at the top end, and a female coupling at the bottom end.

There are also two support brackets attached to the tube. The upper support bracket is attached to the fuselage structure with four bolts, while the lower support bracket is attached to the structure with two links and a bolt.

If both ends of the upper refueling tube were easily accessible, after installation the couplings would be torqued by tightening the female Wiggins coupling at the bottom end of the tube and, at the top end, by tightening the female Wiggins coupling of the adjoining tube. Both female couplings would be torqued to 940 (+/-20) inch-pounds with spanner wrench P/N 3600-56DH, which is the standard spanner wrench for a 3.5-inch diameter tube.

As it is, however, only the Wiggins coupling at the bottom end of the upper refueling tube is readily accessible. The female Wiggins coupling of the tube which connects to the top end of the upper refueling tube is not readily accessible because of Huck bolts protruding from the adjacent structure (Figure 1). To avoid this interference, Lockheed personnel secure the top end of the upper refueling tube by torqueing its male coupling to 800 (+/- 17) inch-pounds with a specially modified spanner wrench.

The modified spanner wrench is just a P/N 3600-48DH spanner wrench with a short extension welded onto it. An unmodified 360048DH spanner wrench (Figure 2) is normally used to torque the female Wiggins couplings on 3-inch diameter tubes. It must be modified to make it convenient to use in this application. Also, note that adding an extension to the spanner means that a greater moment of force will be applied to the fitting at the same torque wrench reading than would be the case for an unmodified spanner. For this reason, a nominal value of 800 inch-pounds is used with this tool. In actual torque at the fitting, it is equivalent to 940 inch-pounds.

The fabrication steps for the modified spanner wrench include cutting a 3600-48DH in two, welding in an extension, and then grinding off some of the wrench around the inside of the jaws. Figure 3 shows the construction details. Be sure to follow given dimensions carefully so that the correct torque values will be obtained.

The upper refueling tube can be installed with very few problems if you remember to connect both ends of the

Figure 1. **Top end of upper refueling tube. Note that working space is restricted by Huck bolts protruding from adjacent structure.**

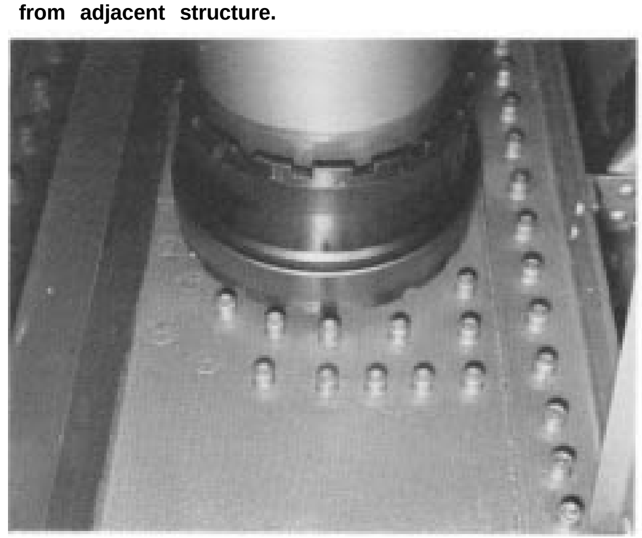

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Figure 2. Unmodified (left) and modified 3600.48DH spanner wrench.

tube and install all support bracket bolts before tightening any of them. The following installation procedure should make the task relatively simple when you use the modified spanner wrench.

Installation Procedure

1. Connect the male Wiggins coupling at the top end of the upper refueling tube to the female coupling of the adjoining tuhe. Do not tighten the coupling halves at this time.

2. Connect the female Wiggins coupling at the bottom end of the upper refueling tube to the male coupling of the adjoining tube. Again, do not tighten the coupling halves at this time.

3. Connect the links, bolt, washer, and nut in the lower support bracket, but do not tighten the nut.

4. Connect the upper support bracket with four bolts, washers, and nuts, but do not tighten the nuts.

5. Torque the male fitting at the top end of the upper refueling tube to 800 (+/- 17) inch-pounds with the modified 3600.48DH spanner wrench.

6. Torque the female coupling at the bottom end of the upper refueling tube to 940 (+/-20) inch-pounds with a P/N 3600-56DH spanner wrench.

7. Finally, tighten the lower bracket bolt and nut, and then the four upper bolts and nuts.

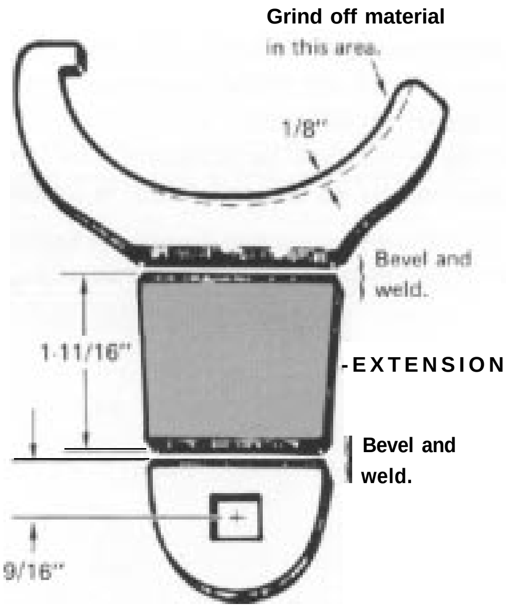

Figure 3. Fabrication details **of the modified spanner wrench.**

We hope that the above installation procedure and spanner wrench modification details will help make the job of changing the right wheel well upper refueling tube much easier to do on those occasions when it becomes necessary.

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SOLDERING FUEL QUANTITY INDICATING SYSTEM CONNECTORS

Replacement of soldered (NuLine) fuel quantity indicating system coax connectors in the field usually results in a great deal of time and patience being expended because of the reluctance of the nickel-plated coax center conductor to accept solder during tinning. Failure to properly tin the wire prior to soldering will result in a poor or cold solder joint, which will more than likely cause problems at a later date. Experience at Lockheed-Georgia has turned up one solder and flux combination which will result in a satisfactory soldering job being accomplished. The solder is Kester “44” Resin Core Solder (0.032” diameter) and the flux is Kester 1544. This flux is slightly activated and is used when tinning the wire.

Do not continue to heat the wire after flux boil-off. The heat will cause the flux residue to blacken or char and make it impossible to obtain the needed fluxing action on the wire. A 27-watt soldering iron should be adequate. The ideal time to apply solder to the conductor is immediately after flux boil-off. After tinning, the flux residue should be removed by applying isopropyl alcohol or methylene chloride to the area with a soft brush.

The solder and flux can be obtained from the vendor at any of the below addresses:

Kester Solder Company
Division of Litton Industries
Chicago, IL 60690

or

Kester Solder Company
Division of Litton Industries
Newark, NJ 07101

or

Kester Solder Company
Division of Litton Industries
Anaheim, CA 92803

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The Old and the New

Few who were present to watch the third production C-130A rise into a bright Georgia sky in July of 1955 (above) would have been able to predict that the Hercules aircraft production line would still be going strong more than a generation later, or that by then over 1600 of these remarkable airlifters would have been built.

But the picture below speaks for itself. The 1600th Hercules, a C-130H-30, was delivered to the Indonesian Air Force in December of 1980. The Republic of Indonesia is one of 52 nations throughout the world that flies the incomparable Hercules aircraft, using their fleet for missions as diverse as disaster relief and maritime patrol.

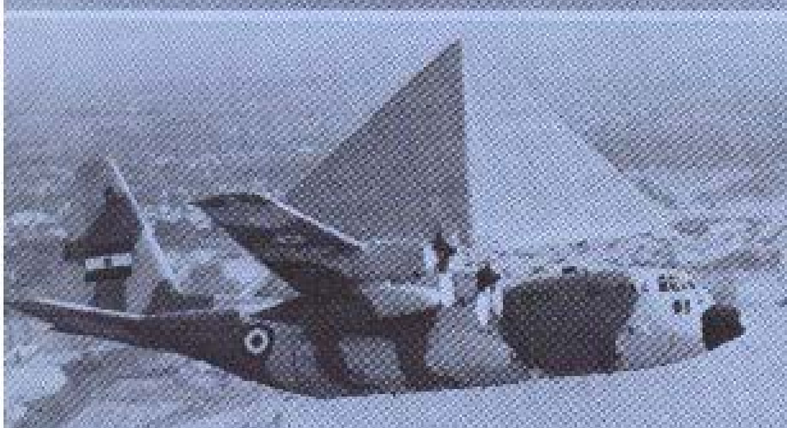
Despite such obvious differences as the design of the nose and the optional extra length of the fuselage, our pictures show that a strong resemblance still persists between the earliest and latest members of the Hercules family. Small wonder. That distinctive, practical shape would be hard to improve upon.

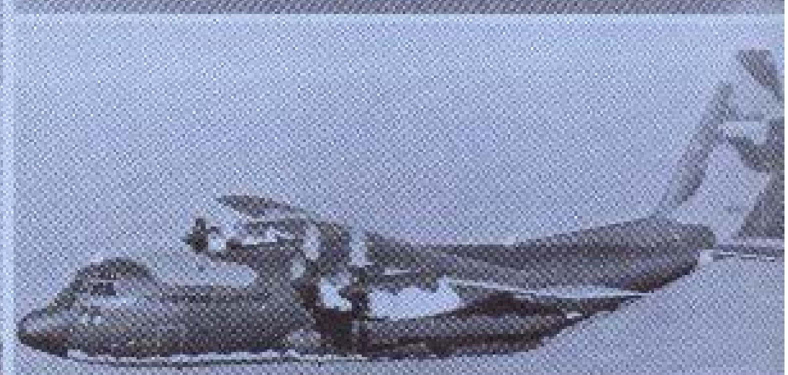
Appearances can be deceiving, however. Beneath the superficial similarity of form, more than a quarter century of technological advancement has been taking place. Almost everything about the Hercules aircraft is constantly being updated and improved. Advanced engineering, and state-of-the-art materials, construction techniques, and system components go into each Hercules we deliver.

It is this kind of approach that keeps yesterday's Hercules on the job year after year. It also makes today's Hercules aircraft as modern as tomorrow.

service news

Lockheed-Georgia Company
CUSTOMER SERVICE
LOCKHEED GEORGIA COMPANY
A Division of Lockheed Corporation
Marietta, Georgia 30063





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