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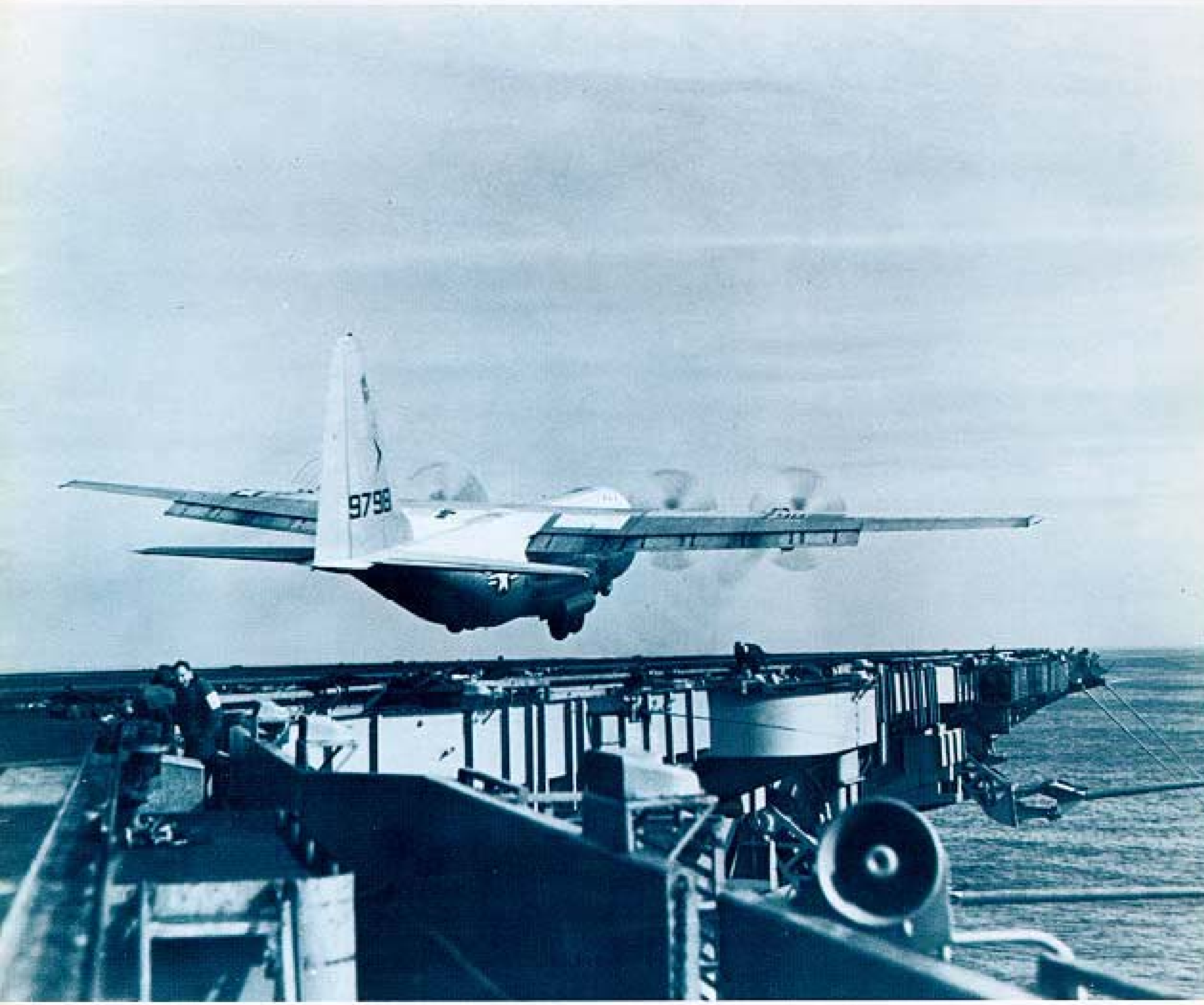
service news

A SERVICE PUBLICATION OF LOCKHEED-GEORGIA COMPANY, A DIVISION OF LOCKHEED AIRCRAFT CORPORATION



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A SERVICE PUBLICATION OF
LOCKHEED-GEORGIA COMPANY
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COVER: Operation of the Hercules from a carrier deck was demonstrated by the U. S. Navy during sea trials aboard the attack carrier U.S.S. Forrestal in 1963. During the sea trials, 29 touch-and-go landings and 21 unarrested, full-stop landings and takeoffs were accomplished at airplane weights up to 120,000 pounds.

Vol. 2, No. 4, October – December

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WASHING THE HERCULES

Washing any airplane is a big job. Washing an airplane the size of the Hercules is a formidable task. But it is a task that will return benefits far outweighing the investment of time and equipment. A clean airplane not only looks better, it is easier to inspect and maintain. And most important, it will aid in preventing costly corrosion.

How often to wash the Hercules must be determined by the individual operator after a thorough study of his operation. Some of the questions he must answer are: What are the operating conditions? Climate? Is the airplane exposed to sea water? What type of cargo is hauled? The important thing is to wash as often as necessary and do a good job of it.

A regular cleaning and inspection program will considerably reduce the possibilities of corrosion. The schedule is determined largely by the environmental conditions to which the aircraft are subjected. Since exhaust collections depend on operating hours, this is one criterion to consider. Cargo hauled, climate, and operating conditions all enter into the preparation of a schedule. Deviations from the schedule would include such tasks as rinsing the airplane completely with fresh water after a low-level "over water" mission. The washing schedule should be considered a part of and just as important as any other task in the airplane maintenance schedule.

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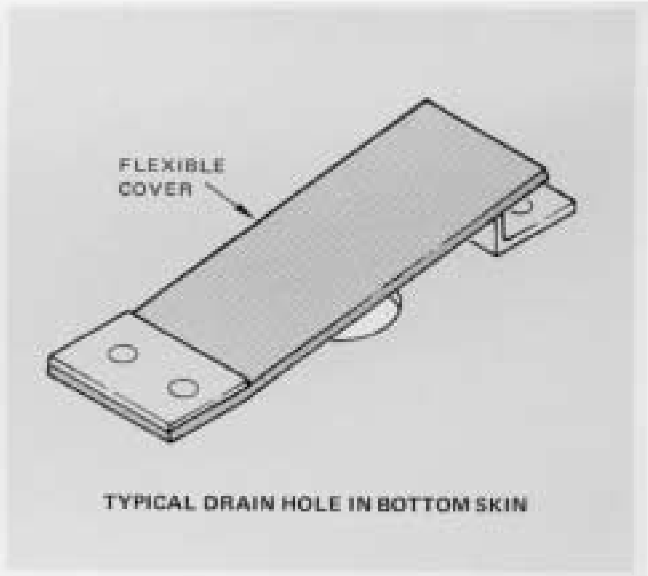
Corrosion from entrapped contaminants in wing fairing.

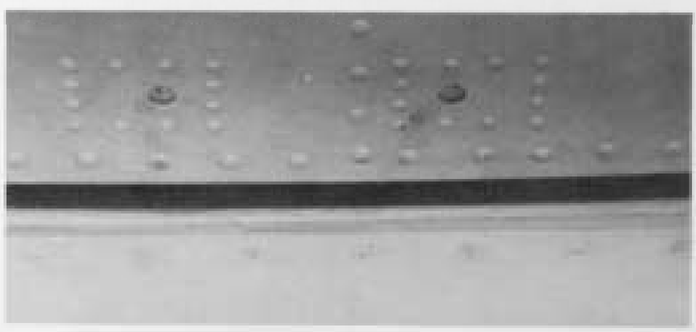
General

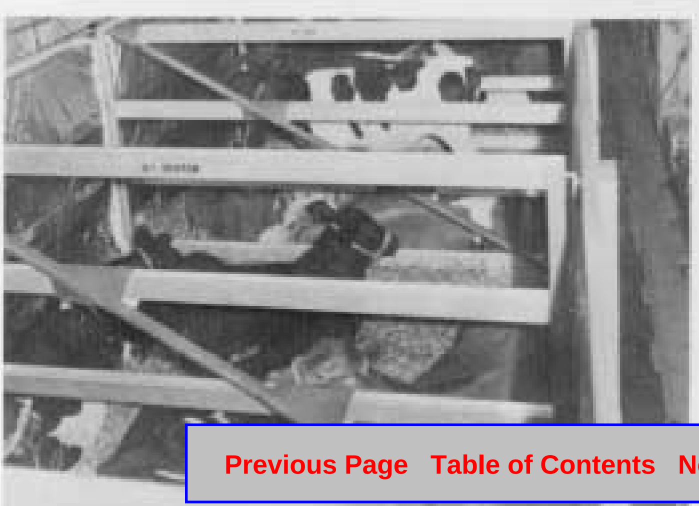
Corrosion – any corrosion – shortens the life of metal structure. Corrosion is being found on some Hercules airplanes in critical areas such as the center wing section, flap wells, and beneath the cargo floor. Exhaust deposits from the engines swirled into the flap wells by propeller blast are corroding the flap wells; exhaust deposits and salts in solution in the atmosphere attack the center wing section; hauling cargo such as cattle, gasoline, fertilizer, and other such items can leave corrosive deposits beneath the cargo floor to attack the fuselage skin. Low level flights over water, ground operation of engines with flaps extended, low and slow flights, all add their part to the corrosion problem.

Corrosion protection is provided in the form of selection of the right material, special alloys, treatments, and protective finishes. Sealing compounds assist in corrosion control by protecting the metal as well as sealing out corrosive elements. Drain holes are provided in critical areas such as the fuselage skin below the cargo floor to drain off accumulations of fluids and provisions are made to ventilate areas where condensation has a tendency to form. But the best corrosion protection is a good inspection and preventive maintenance, and the first step in corrosion protection is a good washing.



Lower Left: A more frequent cleaning of the engine exhaust trails is necessary in any environment. Upper Right: Drain holes in cargo door skin. Lower Right: A cargo that leaves corrosive deposits.





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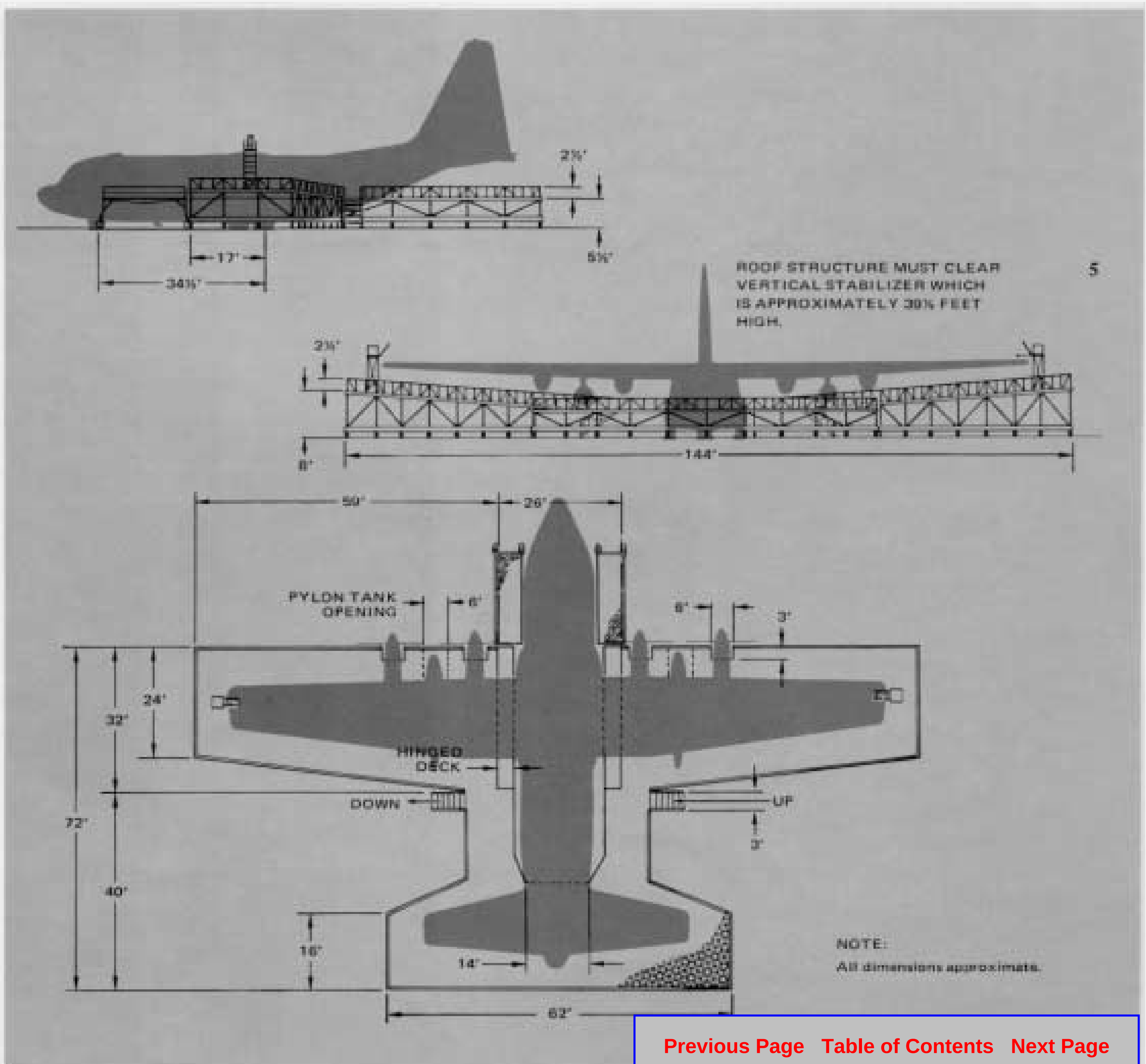
A good washing entails more than a quick rinse off, or a flight through a rain shower. It requires preplanning, a minimum of correct equipment, a conscientious, thoroughly trained wash crew, and attention to detail. It requires the removal of all dirt and deposits, especially in the hard-to-get-to areas. An up-to-date wash rack is especially helpful, and, for cold weather, an enclosed wash rack is a must to do a good job.

The Washrack

The most important recommendation we can make is that a suitable washrack area be set aside for washing the airplanes. The area should be carefully selected taking into consideration the local environment, damage to surrounding property and equipment, drainage, waste disposal aspects, and access to the area.

The washrack should include work stands, fixed or movable, that will give the washrack crew "arms length" access to all of the surface areas and enclosures that need cleaning and inspecting. Spray equipment should not be of the high-pressure impingement type. A source of clean, medium-pressure (40 psi) rinse water is a must. If the water can be heated to 160°F, so much the better. These are basic – barely basic – requirements.

The ideal washrack has plumbing with outlets for water, cleaner solution, solvent, compressed air, fresh water, and heated water for rinsing. Electric power is provided with outlets for waterproof lights and other electrical equipment. For the finishing touch, the whole facility is housed in a suitable hangar, making year round washing feasible.



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Grilled drains should be used to carry off the waste water, with the use of a sewage pump as necessary. Larger than normal drain pipes are necessary to carry off the sluggish waste water since the first mixture rinsed off the airplane is usually more dirt and cleaner than water. Depending on location and environment, it is sometimes necessary to trap and separate the chemically strong waste water from the mild rinse water. Cleaning agents not soluble in water should be avoided except as specified in the cleaning instructions applicable to the Hercules.

Satisfactory results have been obtained with less than the ideal washrack. A 4000 gallon tank truck, long handled brushes, and hard work by a conscientious crew have cleaned many airplanes. The important thing is- wash it.

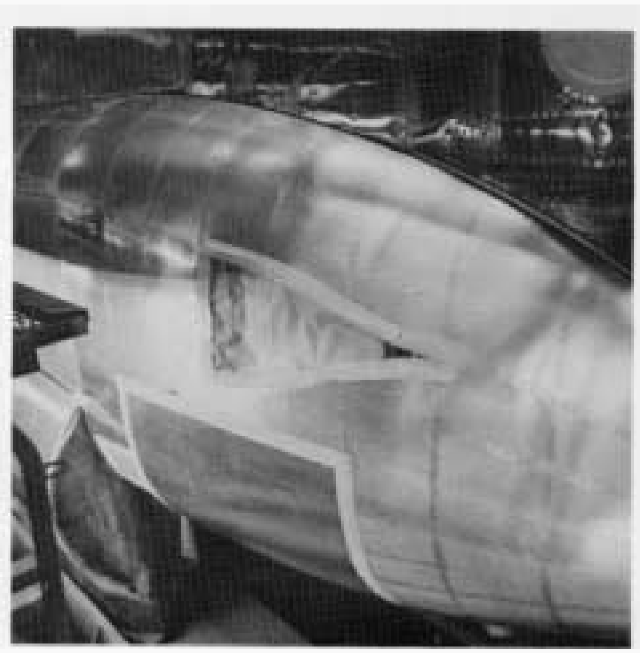
Washing

Cleaning solutions and rinse water are best kept out of many areas on the Hercules, so before you start spraying water, install the protective plugs and covers for the engines, air conditioning openings, GTC, and wheel covers as called out in the Technical Manual. Tape around areas such as wheel bearing grease seals, cracks around window seals, access doors, static openings, and other places where trapped strong solution can cause corrosion. Mask carefully. Remember, components requiring lubrication, such as flap drive screws, will need to be lubricated once the washing is complete. If it doesn't need to be washed, mask it off. Use only the specified cleaning methods and materials unless authorization for deviation is obtained from the Engineering and Maintenance office.

The best sequence for washing the Hercules is shown in the step-by-step illustrations accompanying this article. Starting at the bottom and working up prevents streaking that occurs if you start at the top and let cleaner run down on the unwashed areas. Keeping the rinse water going helps prevent streaking. In fact, a good wetting before starting to wash will not only remove some surface dirt, but through capillary action can help build up a clean water barrier in small crevices, and will tend to keep strong solutions from getting into the crevices. Being difficult to remove, the solution can lead to corrosion in these areas.

Don't permit cleaning solvents to get on windows - mask off windshields and windows. Use only TT-N-95 Type II Aliphatic Naphtha for windshields.

Above: Engine tailpipe plug being installed to prevent entrance of contaminants. Below: Waterproof adhesive tape and sheet material are used to prevent damage by cleaning solutions during washing. Openings are closed, plastic areas are covered and the landing gear is shielded with these materials.



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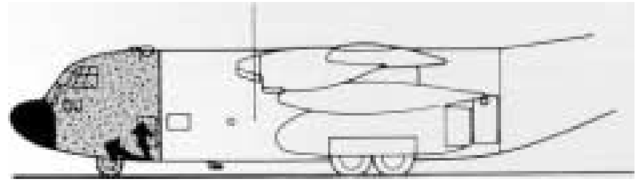
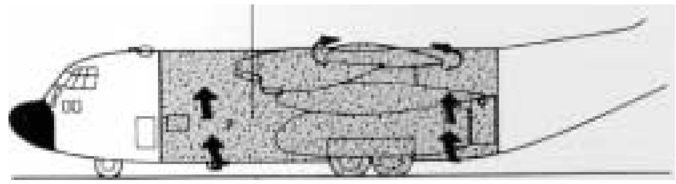
WASHING SEQUENCE

STEP 1. The washing usually starts with the forward fuselage:



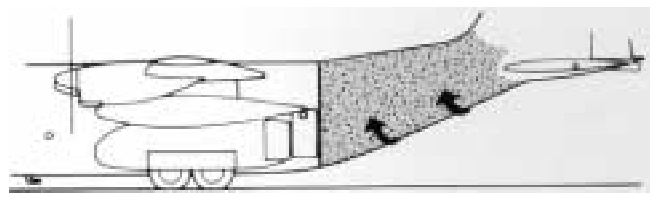
a. Wash from bottom to top.
b. Wash from mid-fuselage forward.
c. Be sure to scrub-in the cleaning solutions in correct sequence.
   Note: All areas must be kept wet with the cleaning solutions or water at all times.
d. Scrub as you rinse, this time from top to bottom.

STEP 2. Wash the mid-fuselage next, in conjunction with the wing:



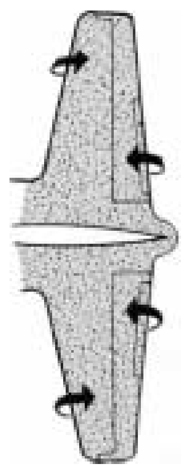
a. Start with the under surfaces and progress upward.
b. Scrub as you rinse, top to bottom.
   Note: Always keep areas wet, either with solutions or water, while washing.

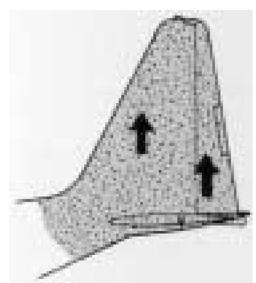
STEP 3. Aft Fuselage:



a. Wash the under surfaces first, progressing upwards.
b. Rinse, with scrubbing, from top to bottom.
   Note: Keep the areas wet.

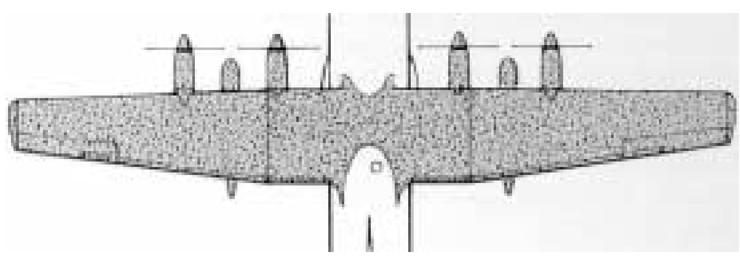
STEP 4. When washing the empennage:





a. Wash the bottom of the horizontal stabilizer/ elevator.
b. Wash the top of the horizontal stabilizer/ elevator.
c. Wash the vertical tail and that portion of the aft fuselage subject to fluid run-down, washing from bottom to top.
d. Rinse (with scrubbing) from top to bottom.
   Note: Keep all surfaces wet with solutions or water at all times.

STEP 5. If the wings weren't washed in conjunction with the mid-fuselage:



a. Wash the underside first, spraying from the fuselage toward the wing tip.
b. Extend the flaps and give the flap wells special attention.
c. Wash the top side.
d. Rinse while scrubbing.
   Note: Keep all surfaces wet with solution or water at all times.

STEP 6. Wheel wells:

a. The wheel wells can be washed first or last.
b. Concentrate on the interior first.
c. Clean all landing gear components.
d. Rinse well.

STEP 7. Rinse complete airplane thoroughly.

STEP 8. Dry the surfaces.

STEP 9. Relubricate gear drives, flap drives, etc.

STEP 10. Remove all masking and taping.

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CLEANING AGENT SPECIFICATION	NOMENCLATURE	MIXING AGENT	SOIL CONCENTRATION	METHOD OF PREPARATION AND USE
MI L-C-25769 Type I (liquid) Type I I (powder)	Water Base Alkaline Cleaner	Clean Water	Normal	One part concentrate to seven parts water. Stir thoroughly. Painted or unpainted surfaces – exterior.
MI L-D-26937	Synthetic Detergent	Clean Water	Normal	One to two ounces of detergent to one gallon of water. Transparent plastic.
Federal P-S-600	Soda Soap Bars	Clean warm water	Soil on plastics and windows (glass and plastic).	Two to four ounces to one gallon of water, Radomes and exterior reinforced plastic parts.
Federa I O-0-303	Chromic Acid	Clean water	To neutralize alkaline residue left after cleaning.	Three to four ounces to ten gallons of water. All cleaned surfaces.
Federal O-S-5766	Sodium Bicarbonate	Clean water	Acidic residues in battery compartment.	One pound to one or one and one-half gallons of water (until solution is saturated). Battery compartment.
Federal 0-T-620	1, 1, 1, Tri-chloroethane	None	Oil or grease type soils.	DO NOT MIX WITH OTHER SOLVENTS. As necessary before water soluable cleaner.
Federal TT-N-95 Type II	Aliphatic Naphtha	None	Heavy grease or oil.	As received. Use for cleaning windshields.

Keep cleaning solutions agitated with soft bristle brushes and hose off with fresh water. When the rinse water runs off a surface in a continuous film, the surface is clean. Rivulets indicate uncleaned areas. Check all drain holes for cleanliness, especially in the bottom fuselage skin.

Special Areas

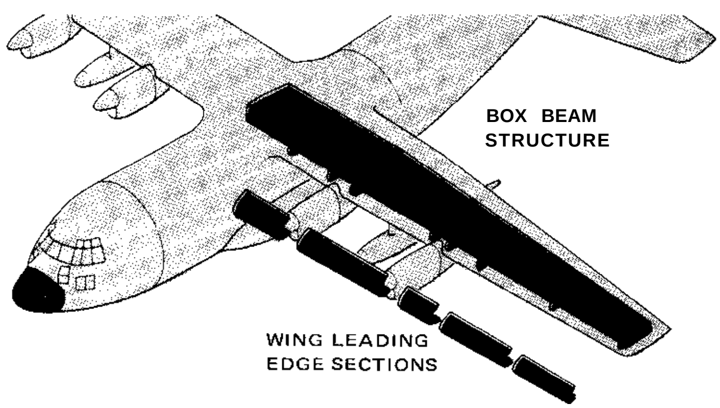
Depending on type of cargo that has been hauled, the floor boards of the cargo floor should be taken up and the underneath section washed out. Hauling any type of animal life can be detrimental if excretions aren't flushed out. Fertilizer dust collecting in the area beneath the cargo floor will react with moisture in the atmosphere to corrode the structure if not removed and treated.

The wing dry bay areas should be washed as part of the regular wash operation. Electrical wiring, plumbing lines, etc., could possibly be damaged by cleaning fluids or personnel, so adequate instructions should be issued to the wash crew. Washing should be done with a standard cleaning solution and light scrubbing with pads such as the *white* "Scotchbrite" pads. Remove the dirty cleaning solution with a "wet" vacuum cleaner. Follow the cleaning with a thorough water rinsing. Remove all rinse water with a "wet" vacuuming, pads, and/or compressed air.

Wing leading edge sections should be periodically removed and the front wing beam washed. Use undiluted cleaner applied with pads. Keep the cleaner and water off of wire bundles and electrical connectors. Wipe the wire bundles with a rag dampened with cleaner and rinse with a rag dampened with clean water. Rinse the cleaned beam and structure with plenty of water, one section at a time, using a low pressure, coarse spray to avoid wetting areas and wires that shouldn't be wet.

The underside of the fuselage doesn't always get the attention it needs. This area should come in for a particularly good scrubbing.

Solvent emulsion cleaners do a good cleaning job, but offer the problem of pollution. These materials can be used if provisions are made to collect and properly dispose of the waste. Use these materials as follows: one – do not premix the solvent / cleaner /water, but apply each separately; two – spray the area to be cleaned with the petroleum solvent and agitate with brushes (or equivalent) to dissolve all oil soluble soils and collect the solvent run-off; three – spray on the cleaner and agitate to mix in with the solvent and its dirt; four – follow this with a light mist of water and agitate to emulsify the mix; five – add more water and agitate until the mix starts to run, then lightly rinse; six – remove the collection container to disposal and pressure rinse to complete the wash job. This should clean the hard to clean areas.



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Finish

After washing, drying, and clean-up, remove all maskings, plugs, and covers and inspect for trapped solvents, corrosion, breaks in protective coatings, and lubricated components. Replace paint, sealant, etc., to restore the protective finish. Lubricate units that have had the lubricant removed by the washing process. This is the time to attack any corrosion that may have started. Check all drain holes to be sure they are clean and functioning.

CAUTION

Be sure to remove masking from the static openings.

SUMMARY

Alert maintenance personnel will be sensitive to climatic and local atmospheric changes which can accelerate corrosive attacks on the aircraft structure.

Washing the Hercules more frequently is the answer; how frequent depends on how fast the corrosive elements accumulate. While not always practical, it would be ideal if the airplane could be sprayed with fresh water immediately after each mission at low altitude over salt water and/or after being subjected to excessive industrial fallout. Moisture with salts, mineral particles and other chemicals are extremely corrosive to the light metal alloys necessary for aircraft construction. Even rinse water should not be allowed to stand on aircraft metal surfaces. While more frequent washing is the general need, care must be taken not to overwash certain areas such as landing gears which require relubrication.

Maintenance Manuals call for washing the Hercules before certain periodic inspections (the 600 hour checks) and, in too many cases, this is the only time that it is washed. In ideal operating conditions in a clean dry climate, this schedule may be sufficient. Even in ideal climates the powerplants contribute their part of the corrosive elements as products of engine combustion which includes moisture.

The question, "How often should a Hercules be washed?" can be answered best by a Corrosion Control Specialist who has studied the operating conditions and the base of operations of the airplanes in question. If operating in a dry climate where the atmosphere is free of industrial fallout, the longest period recommended is 600 hours. General recommendations given in U.S. Military T.O.'s for the cleaning cycles of washing aircraft is at least every 30 days. The simplest answer is that any Hercules should be washed as often as necessary to prevent harmful accumulations of corrosive elements. The allowable time lapse between thorough cleanings can vary greatly, depending on the degree of corrosion control needed. The schedule must be determined for each Hercules Operator on an individual basis.

Washing and thorough cleaning of an airplane is the least expensive phase of corrosion control.

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StarTips

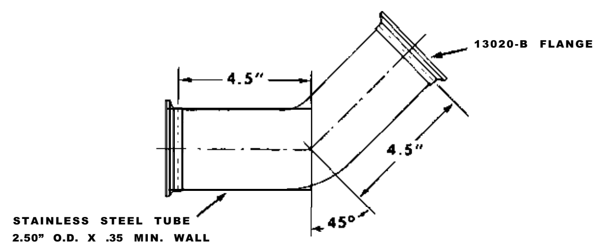
PRESERVATION OF T-56 ENGINES

by Roger Coley, Jr., ***Field Service Representative***

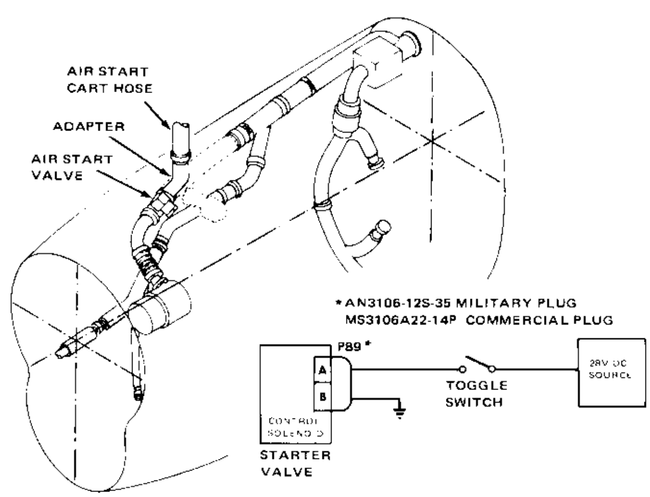
To do a good job of preparing theT-56 engine for storage, it is necessary to rotate the engine with the starter. This can sometimes be difficult, especially when the engine is in the QEC and no run stand is available. Here is an adapter that can be locally manufactured and used with available air sources to motor the engine. To provide regulated air to the starter, the adapter should be installed upstream of the starter valve. The electrical schematic shows a simple wiring assembly that can be put together to control opening and closing of the valve.

NOTE

Observe all safety precautions and limitations in the applicable technical manuals for rotating and preserving the engine.



ADAPTER



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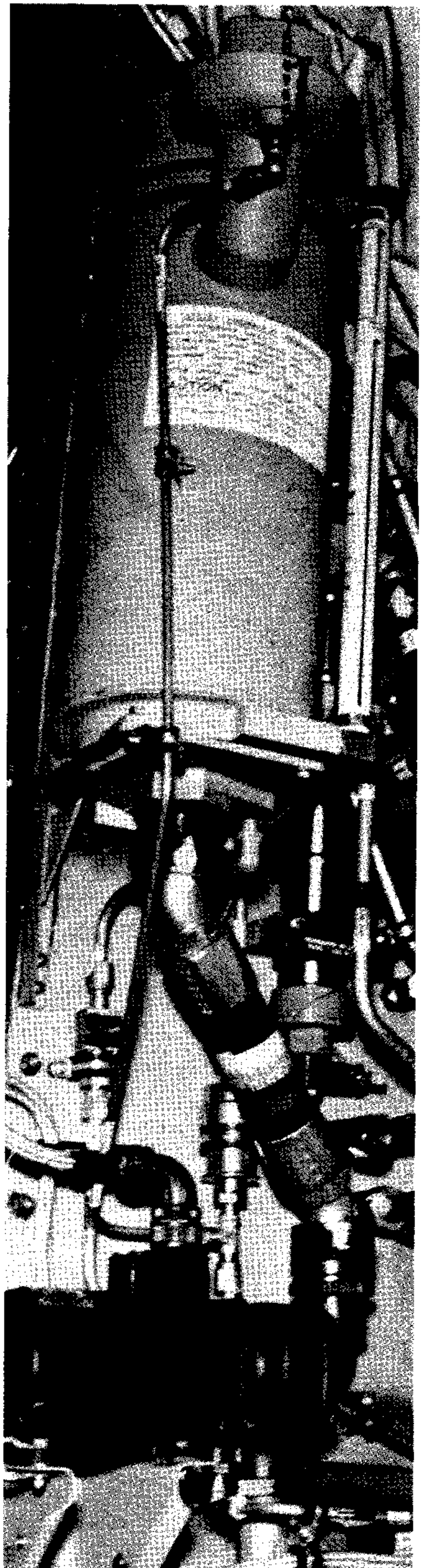
HYDRAULICS



The following two articles by John Walters, Design Engineer, Senior, are a result of questions concerning the two areas. The first article is a result of needless field replacement of hydraulic system interconnect valves that are not malfunctioning; the second article answers questions as to why there is a lag in pressure indications.

Hercules Hydraulic System Interconnect Valve Positioning Procedure

Periodically some operator will report a series of hydraulic ground test interconnect valve failures. The system symptom which has caused him to select the ground test interconnect valve as the failed component is a transfer of fluid between the auxiliary and utility systems. The operator will change the valve and report that this has cured the problem. On several occasions the "malfunctioning" valve has been returned to Lockheed. Never have we been able to confirm the malfunction. All evidence leads us to the most likely conclusion that ground crews are not getting the word – that is:

> All utility and auxiliary hydraulic systems pressures, including normal and emergency brakes, must be zero prior to shifting the ground test interconnect valve handle.

Procedure Before Shifting Valve

It is imperative that the following precautionary steps be strictly adhered to prior to shifting the ground test interconnect valve handle in either direction:

1. System hydraulic pressure must read zero on all utility and auxiliary system gages; and all accumulator air pressure gages must read pre-charge pressure only. Utility system pressure can be depleted by cycling the controls. Auxiliary system pressure can be depleted by cycling the aft cargo door.

2. Actuate the normal and emergency brakes until pressure on both cockpit gages is zero.

Trouble Shooting Check List

If fluid is being interchanged between the utility and auxiliary reservoirs and it has definitely been established

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that this is not a result of improper operation of the ground test interconnect valve, then the following components should be checked for excessive leakage:

1. Nose landing gear shuttle valve.
2. Four main brake shuttle valves.
3. Two brake metering valves (leakage through the casting has occurred in one isolated case).
4. Nose landing gear uplock cylinder.
5. Nose landing gear downlock cylinder (if installed).
6. Ground test interconnect valve. (The reliability of this valve is much higher than is reflected by removal data. The corrective action used to disposition fluid interchange write-ups has been the indiscriminate replacement of the valve. Laboratory testing of many removed units has failed to verify leakage; therefore, the evidence indicates that many valves have been removed in error.)

DISCUSSION – for better understanding of the system

Although it is possible for hydraulic fluid to be interchanged between the utility and auxiliary systems if certain valves leak, experience has shown that in the majority of cases reported, the interchange has resulted from improper actuation of the ground test interconnect valve. When Lockheed representatives investigate these reported fluid transfer problems they usually find that maintenance personnel do not completely deplete the pressure in the brake accumulators prior to repositioning the ground test interconnect valve handle.

One need only observe the utility reservoir during pressurization of the system to see that the fluid level decreases by several inches when the engine driven pumps are switched on in a completely unpressurized system – i.e., zero system pressure and zero brake pressure.

The reason that the fluid level decreases is two fold:

1. The two accumulators (utility system and normal brake) in the system are filled with pressurized fluid.
2. The lines expand when pressurized to 3000 psi.

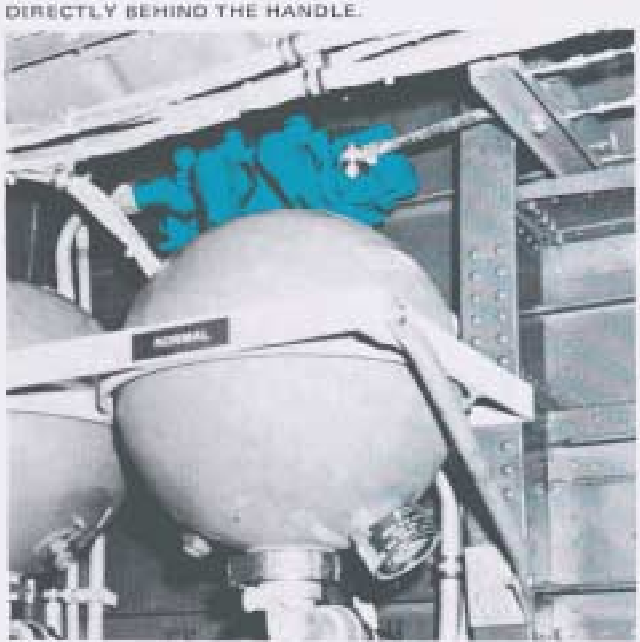
When the system is pressurized and these two actions occur, fluid is being taken from the utility reservoir and no fluid is being returned.

If the utility system pumps are then switched off and five (5) minutes later a check of the utility reservoir fluid level is made, it will be observed that only a portion of the fluid has returned to the reservoir. The remainder of the fluid is trapped by a check valve in the normal brake system accumulator and lines. The only two ways to cause the fluid to return to the reservoir are:

1. Depress the brake pedals several times.
2. Wait several hours for normal system leakage to return it to the reservoir.

Using an imaginary situation, assume that the utility system has been pressurized while the ground test interconnect valve is in the normal position. Some 50 cubic inches of fluid from the utility reservoir will have been routed to the engine driven pumps where it is pressurized to 3000 psi and then sent to fill the normal brake accumulator. The utility system pumps are then shut off. The 50 cubic inches of fluid will remain trapped in the normal brake accumulator. Assume then that the ground test interconnect valve is positioned to interconnect the utility and auxiliary systems. If the brakes are then actuated several times, the 50 cubic inches

PHOTOGRAPH OF ENCLOSED AREA ABOVE LEFT MAIN WHEEL WELL. HIGHLIGHT SHOWS LOCATION OF THE GROUND TEST INTERCONNECT VALVE ON PRODUCTION HERCULES SINCE A CHANGE IN 1965. VALVE IS ACTUATED MANUALLY BY CABLES FROM A HANDLE LOCATED IN THE LEFT WHEEL WELL FAIRING. EARLY HERCULES HAD TWO INTERCONNECT VALVES DIRECTLY BEHIND THE HANDLE.



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of fluid which came from the utility reservoir will return to the auxiliary reservoir. If the ground test interconnect valve is then repositioned to normal, the transfer of 50 cubic inches of fluid from the utility to the auxiliary reservoir will have been completed.

The transfer can also occur from auxiliary to utility. If the normal brake accumulator is pressurized from the auxiliary system during a time when the valve is in the interconnect position, the fluid to fill the accumulator will come from the auxiliary reservoir. If the interconnect valve handle is then returned to the normal position and the brakes subsequently actuated, that fluid which came from the auxiliary reservoir will return to the utility reservoir.

This fluid transfer may not be observed at the time that it occurs but may be observed some time later. The most logical time to discover that transfer has occurred is at the end of a flight. The fluid has been heated and thermal expansion has occurred. The system is depressurized and the increased volume of fluid in the reservoir (due to the combination of transferred fluid and thermal expansion) may cause the reservoir to overflow out the vent filter line. The reservoir air space is adequate to handle the increase in volume due to thermal expansion but it is not designed to also accommodate transferred fluid. It is possible to transfer enough fluid during one improper operation of the ground test interconnect valve to overflow either the utility or auxiliary reservoir. If the transfer is made with the utility system pressurized and parking brakes on, there is a possibility of transferring the following volumes of fluid:

1. Normal brake accumulator .... 50 cu. in.
2. Utility system accumulator .... 25 cu. in.
3. Four wheel brakes .... 20 cu. in.
4. Volume due to oil compressibility, seal deflection and line expansion .... 30 cu. in.

TOTAL: ....125 Cu. In.

Since the air volume space provided in the top of the utility and auxiliary reservoir is 103.65 cubic inches, it is obvious that the reservoirs can overflow as a result of one improper actuation of the ground test interconnect valve.

Fluid can also be transferred if the nose landing gear actuating cylinder position is changed between actions of the ground test interconnect valve. A differential of fluid is required from the reservoir to extend the cylinder since the cylinder holds more fluid when it is fully extended than it does fully retracted.

In addition to the fluid transfer that can occur due to improper operation of the ground checkout valve, another problem can also occur if the valve is cycled with either the utility or auxiliary system pressurized. The interconnect valve is a non-interflow type of valve. This means that when the valve spool is shifted from one position to the other it passes through a point where the return line and case drain line from the utility subsystems are completely blocked. If at that instant another valve is cycled, pressure can be dumped into the blocked return or case drain line, causing some component to rupture.

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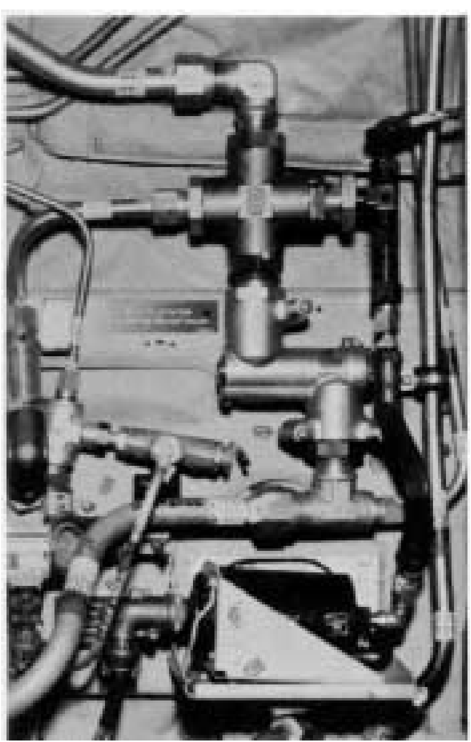
Pressure Indicator Lag



HYDRAULIC SNUBBER IN LINE TO PRESSURE TRANSMITTER HIGHLIGHTED

Several questions have been asked regarding the time lag in hydraulic pressure indications at the copilot's hydraulic panel.

These questions are:

Why is there a lag?
What is the maximum allowable lag?
How can the lag be different on two gages in the same system?

Although several variables are involved, normally the primary reason for the lag is the snubber (P/N 695767-l) which is installed just upstream of each hydraulic pressure transmitter. The snubber has an extremely small opening and allows very little flow. This is necessary due to the fact that the transmitters are very delicate instruments

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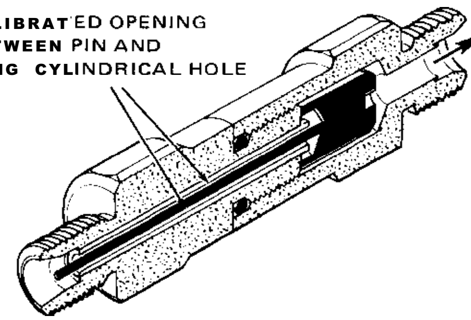
which would be damaged if any pressure surge whatsoever was allowed to impinge on the internal mechanism.

Internally the snubber consists of a long pin which has a nominal outside diameter of 0.067 inches. This pin fits in a long cylindrical hole which has a nominal inside diameter of 0.0695 inches. This provides a fluid passage with a nominal diametrical clearance of only 0.0025 inches.



SNUBBER

Pressure And Temperature

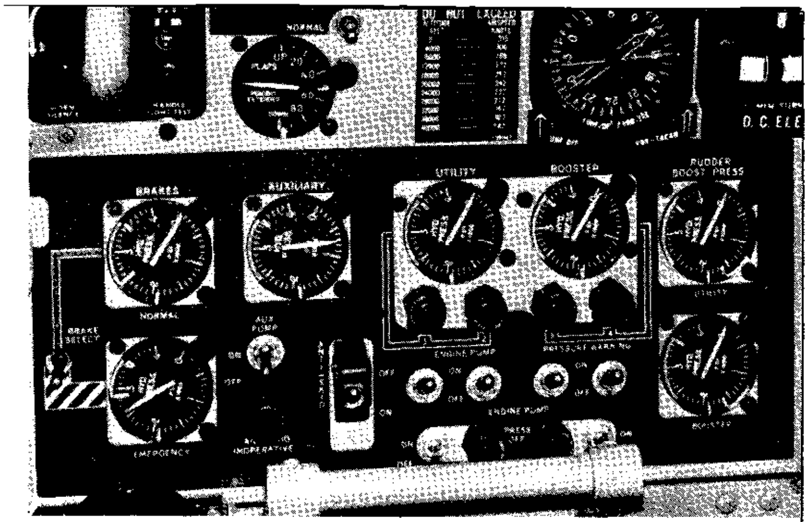
At a differential pressure of 3000 psi (3000 psi at inlet and zero pressure at outlet) the flow rate through the snubber with 70°F hydraulic fluid is approximately 0.001 gallons per minute (GPM). Thus the average flow rate when raising the downstream pressure from 0 psi to 3000 psi will be 0.0005 CPM.

The flow rate of the fluid through the snubber is inversely proportional to the viscosity of the fluid. The viscosity (resistance to flow) decreases as the temperature rises. For example, the viscosity of MIL-H-5606 at certain pertinent temperatures is as follows:

TEMPERATURE	VISCOSITY
-65'F	1600 Centistokes*
O°F	120
70°F	24
100'F	15
14O'F	9

* Units of measure of viscosity.

For example, it can be seen that the flow rate of fluid at 70°F through a given opening is five (5) times that of fluid at O°F; therefore, if a differential pressure of 3000 psi causes a flow of 0.001 GPM through the snubber with 70°F fluid, only 0.0002 GPM will flow through the snubber if the fluid is at O'F. Calculations reveal that approximately two and one-half (2-l/2) minutes would be required to push the approximately four (4) milliliters (ML) of fluid required to displace the transmitter mechanism from its 0 psi to 3000 psi position with -65'F fluid. The calculation is based on the assumption that 3000 psi is continuously available at the snubber inlet; this will never be the case when the system pumps are first



COPILOT'S HYDRAULIC PANEL

turned on. There is, initially, a lag while the pump reaches 100% RPM; a lag due to the flow required for expansion of tubes and hoses in the system; a lag due to flow required to fill the system accumulators.

In addition to the effect of temperature (which can be significantly different at different transmitter locations) the lag comparison at the gages is also affected by other factors. The transmitter is allowed a one (1) to three (3) second lag in keeping with its design specification. Also, one transmitter may start with more pressure initially on it than another transmitter in the same system.

For example, pressure at the normal brake transmitter can be trapped by a check valve in the brake circuit, causing the brake pressure transmitter to signal up to 3000 psi while the pressure at the utility system transmitter is zero. In this case, if the system is pressurized there will be less lag at the brake transmitter because less flow is required to deflect the transmitter's indicating mechanism. On the other hand, if the fluid in the brake circuit has cold soaked and the fluid coming from the pumps and to the system transmitter is hot, the lag will be reversed.

Still other factors also affect the gage readings. Due to transmitter and gage tolerances, two indicating systems installed at the same location can have a variance in readings of up to 140 psi. Also, flow, with resulting pressure drop, will make two gages, which are located some distance apart, read different values; and we must remember that there is always some flow due to bypass and leakage in the system even though nothing is being operated. For example, the elevator boost pack continuously bypasses over 3 GPM per system with the surfaces sagged full down.

Since there are so many variables involved it becomes impractical to specify a time limit within which the gages must always read true system pressure since the figure would of necessity have to cover the "worst condition" which would be some two and one-half (2-l/2) minutes. It is also impractical to attempt to define lag values for all of the variable conditions, since you have no way of

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measuring the variables – such as fluid temperature. For these reasons, we will tell you what to normally expect on a summer day and ask that you consider the effect of the variables described in this article in forming a judgment if the pressure lag varies from the normal.

The pressure at any cockpit gage should come to a stabilized value within approximately twenty-five (25) seconds after turning the pumps on if the system and environment are normal. Additional lag of up to 10 seconds can indicate that there is air in the line. It is good to stress bleeding of these lines since they are "dead ended", and air entering has no path of escape except by bleeding. If additional gage lag exceeds 10 seconds then either contamination or malfunctioning equipment such as a snubber, transmitter, or gage, should be suspected.

If an indication problem is suspected, a check of the direct reading pressure gages at the accumulators will indicate whether the system is performing normally.

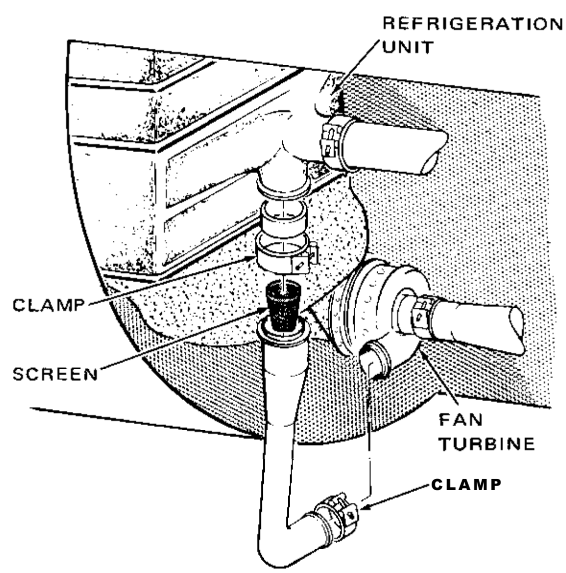
service news

StarTips

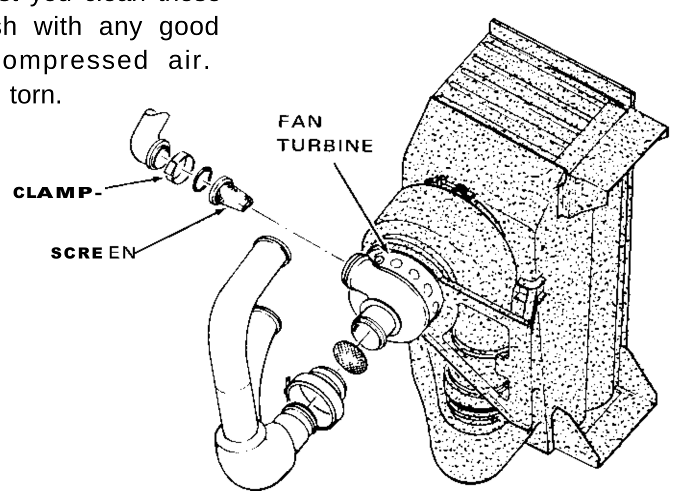
THE FORGOTTEN SCREENS

The small-mesh screens located between the heat exchangers and cooling turbines in the Hercules air conditioning systems do a good job of collecting any stray nuts and screws that find their way into the air duct system during maintenance operations, thereby protecting the fast spinning turbine from damage. Since the ducts are carrying bleed air, it is reasonable to assume that there will be no objects of any consequence entering from outside the system, since said objects would have to pass through the engine compressor and would make their presence known immediately.

But dust is a different story. In extremely dusty conditions these screens can collect quite a load of dust. However, they seem to have been forgotten when it comes to cleaning and inspecting. When operating continuously in extremely dusty areas, we suggest you clean these screens every 800 hours. Wash with any good detergent and blow dry with compressed air. Inspect the screen and replace if torn.



CARGO COMPARTMENT AIR CONDITIONING



FLIGHT STATION AIR CONDITIONING

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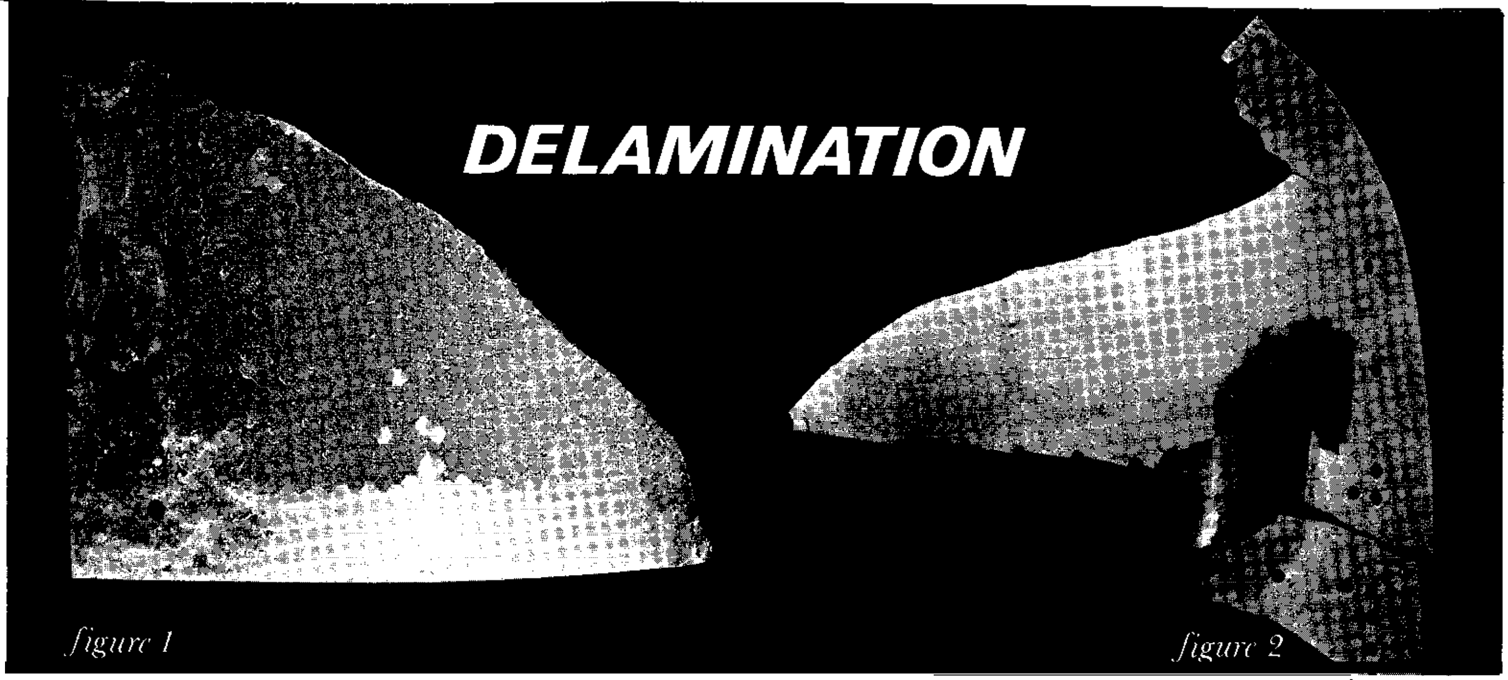


figure 1 *figure 2*

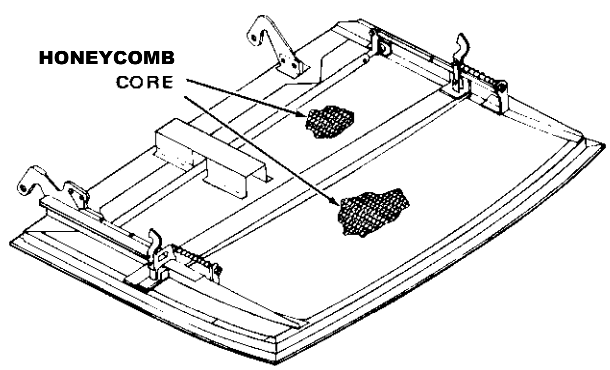
DELAMINATION of WHEEL WELL DOORS

The wheel well doors of the JetStar are of honeycomb construction: a honeycomb core is bonded between two panels – the inner (or upper) panel, and the outer panel. A continuous bond between the inner and outer panel mating surfaces around the edges of the core forms the flange of the door. This type of structure gives better strength to weight ratios than the conventional stiffener structure, but it offers a potential maintenance problem.

Some operators have reported a problem with separation of the outside skin on the inboard door. Separation can begin with a crevice being formed between the panels (at the outer edge, or flange of the door) by a rock or other foreign object impacting the door edge during ground operation. The small crevice can go unnoticed. Moisture enters the crevice and corrosion starts. At high altitudes (or any freezing temperature) the moisture freezes, expands, and the separation spreads. As shown in Figure 1, the combination of forces can result in a wide area of corrosion. Air loads at cruise speed add their toll and, if the separation has progressed far enough, a part of the panel can peel away as shown in Figure 2. This is a rare incident. The rest of the door retained its structural integrity. OMR A-52, dated 15 March 1975, gives instructions for replacing the outside skin on the main landing gear door.

In addition to close scrutiny of the gear doors to see if damage is being done by foreign objects, some operators. are providing added security to the bond of the panels with the installation of 1/8 inch rivets (MS20426 AD4) around the leading, outboard, and trailing edges of the door. The rivets should be spaced 0.75 to one (1) inch apart (Ref. HOMI, Fig. 59-48A) and should be flush on both sides. See OMR A-33, dated 15 August 1973, for similar information concerning the nose gear strut cover door.

Any inspection of the doors should include a check, such as the coin tapping method, to determine the integrity of the honeycomb bond. If a hollow sounding area as large as four (4) square inches is found in a door that is otherwise in good condition, the panels and the honeycomb should be rebonded by injecting epoxy into the honeycomb cavities. When the epoxy has cured, holes can be drilled and rivets installed through the core and both skins. The rivets should be soft and countersunk so they are flush on both sides. The cured epoxy prevents skin panel collapse around the rivet. Make a good inspection; this condition could have been caused by a small separation at the door edge.



JETSTAR INBOARD WHEEL WELL DOOR

To sum it up, small, unnoticed separations at the edges of the gear doors can be the start of a problem. Check closely. Repair can be made in accordance with the HOMI and applicable OMR's. Preventive maintenance can be accomplished by the installation of rivets around the door flanges. If possible, all rivets should be squeezed rather than driven.

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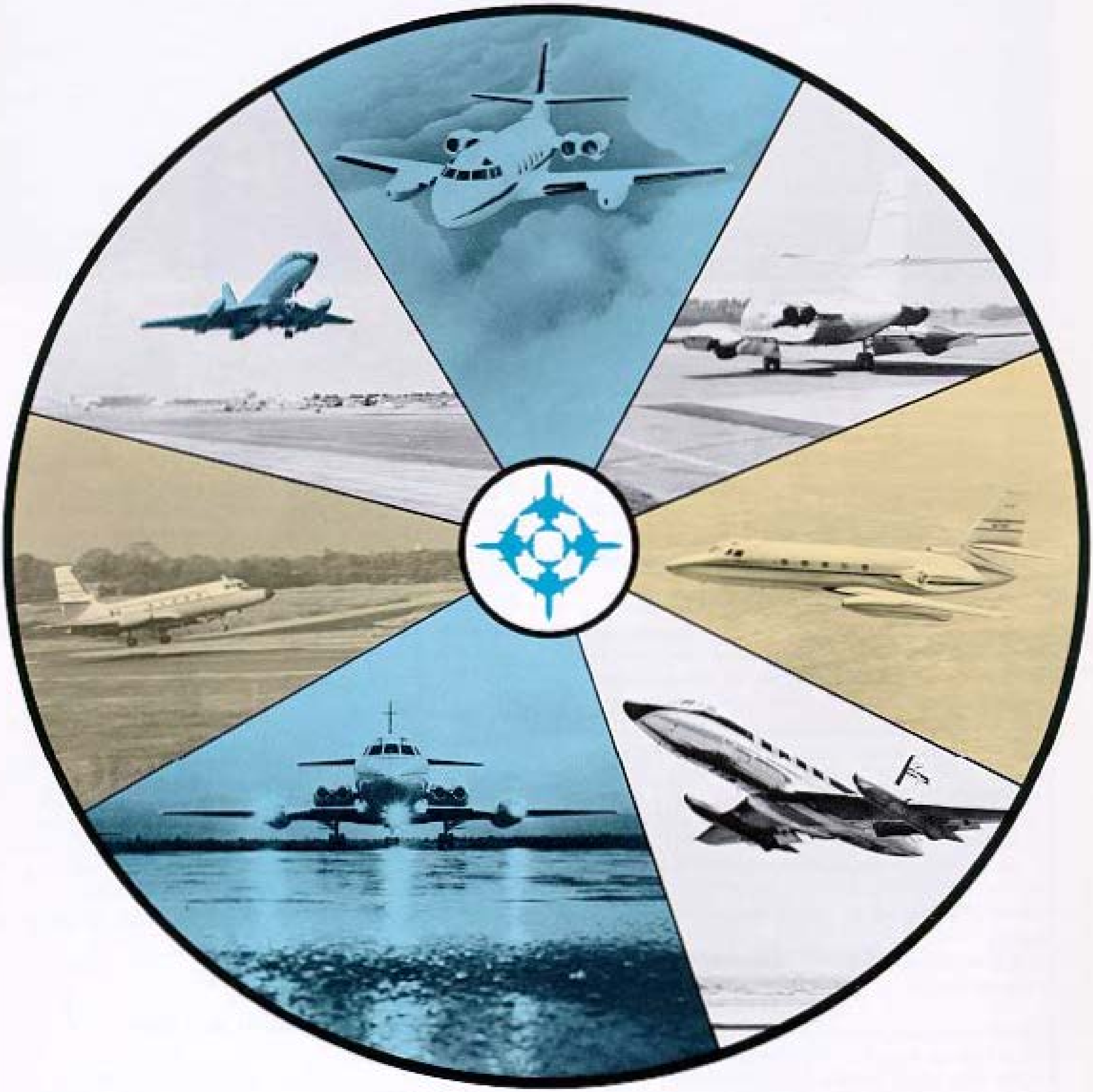

JETStar JETStar II

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