Lockheed

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

Corrosion Control Strategy

Lockheed
SERVICE NEWS

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LOCKHEED CORPORATION

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Cover: The "City of Pittsburgh" overflies its namesake city. The new C-130H was recently presented to the 911th Tactical Airlift Croup by Lockheed-Georgia Executive Vice President Bard Allison. The 91Ith.which is based in Pittsburgh, Pa.,will receive a total of eight advanced-model C-130H Hercules airlifters.

Cover photographs by John Rossino

FocalPoint

KEN CANNESTRA

Total Quality Improvement at Lockheed

Spanning more than 35 years of outstanding service, Lockheed-Georgia Company has a long tradition of providing high-quality, reliable products. We have continually sought ways to improve our products and services to meet the needs of our customers.

Recently, we initiated a process that will intensify these efforts into a structured, total company approach. We call this process our Total Quality Improvement Program (TQIP). Thedriving force behind our renewed dedication to quality is to better satisfy the needs of our customers throughout the world.

Satisfying the needs of our customers means meeting the customer's requirements-from the design stage through delivery to field service. All aspects of our total quality concept focus on understanding our customer's requirements and meeting those requirements with defect-free products and services.

Our goal is to improve quality and reduce cost as a daily mode of operation throughout the company. Prevention of errors is the keystone of our approach. The more problems we eliminate in design or in the factory, the fewer the fixes needed on the flight line or in the field.

How do we eliminate problems and improve processes? TQIP begins with the people behind the products and services the customer receives. Since the people who are closest to the process know best how to improve it, we are actively seeking employee inputs and making extensive use of employee work groups, task groups, and improvement teams. Our dedicated, hard-working people are teaming together to seek ways to improve performance in all facets of our business.

Quality improvement is a never-ending, challenging process at the Lockheed-Georgia Company. Our aim is to gradually raise the quality standard of each individual and organization. As we raise this standard, we expect the quality and reliability of our products and services to continually imorove. therebv enabling us to deliver more value to our customers.

Sincerely,

Ken Cannestra
President
Lockheed-Georgia Company

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Extending Aircraft Service Life Through Corrosion Control

by Harold J. Singletary, Staff Engineer
Materials and Processes Engineering Department

Aircraft structural engineers tell us that the airframe of a modern transport aircraft is designed to have a potential service life of 100,000 flight hours, the equivalent of almost 11.5 continuous years in the air.

Few aircraft actually attain an economic service life that approaches 100,000 flight hours, but experience has shown that an effective program aimed at maintaining structural integrity can extend aircraft service life to 30 or more years.

The two paramount reasons why the maximum possible service life is not often realized from aircraft structure are corrosion and fatigue.

Corrosion tends to be time-dependent, whereas fatigue effects are more closely related to flight hours and flight profile. It is not easy to separate the two factors, however, because corrosion accelerates fatigue by introducing stress concentrations into structures, which leads to cracks in airframes.

The systematic application of corrosion prevention and control measures will contribute significantly to the goal of maximizing airframe service life. A good program of corrosion prevention and control is in fact crucial if structural damage and the resulting costly repair requirements are to be avoided.

Acquisitions and Economics

Until about 15 or 20 years ago, operators of transport aircraft were not too much concerned about getting the maximum possible **service** life from their equipment. By the economic standards of today, aircraft costs were a bargain. Fuel was plentiful and cheap, and obtaining new equipment or spare parts was a comparatively simple matter.

Since about 1970, however, there have been many changes in the world aerospace marketplace. For the transport operator, the principal impact of these changes has been economic, reflected mainly in the form of rapidly escalating costs for replacement equipment and spare parts. Figures 1, 2, 3, and 4 illustrate some of these cost escalations for new aircraft and accessories over the last several decades.

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ACTION PERIOD	AIRCRAFT	COST (each)
World War II	P-51D Mustang	$54,000
Korea	F-86A Sabre	$178,000
Vietnam	F-4E Phantom	$2,481.000
Middle East (1980s)	F-I 5 Eagle	$28-$35 Million
1990	Advanced Tactical Fighter	$40-$90 Million

Figure 1. ***Cost* Escalation of U.S. Fighter Aircraft**

ERA	AIRCRAFT	COST (each)
1940s	DC-3	$73,000
Early 1950s	DC-6	$1,180,000
Late 1950s	DC-8	$4 Million
Mid 1960s	DC-9	$4 Million
Late 1960s	DC-8 Stretch	$16 Million
1970s	DC-10	$18 Million
1980s	DC-9 Super 80	$24 Million
	Boeing 767	$30 Million
Mid 1980s	Boeing 747	$75 Million

Figure 2. Cost *Escalation of* Commercial Airliners

ERA	AIRCRAFT	COST (each)
1956	1st USAF C-130	$ 2.7 Million
1970	1st L-100-30	$ 4.2 Million
1985	L-I 00-30	$16.9 Million

Figure 3. Cost Escalation *of Hercules* Aircraft

ITEM	YEAR	COST(each)
DC-8 Engine	1969	$300,000
DC-8 Fuel-Efficient Engine	1985	$2 Million
C-130 Engine	1959	$60,000
C-130 Engine	1965	$500,000
C-I 30 Propeller System	1964	$108,000
C-I 30 Propeller System	1965	$608,000

***Figure 4. Cost Escalation for* Some Aircraft Accessories**

Difficult Choices

The high cost of new equipment, the need for more fuel-efficient engines, and the long lead times between ordering and receiving critical spare parts have forced operators to face some difficult choices. Some have elected to purchase refurbished, 20-year-old aircraft at prices twice as high, or higher, than those paid when the aircraft were new.

Figure 5 gives an example of the cost escalation that has taken place on two transport models between the time when they were new, and when offered for sale, refurbished, many years later.

AIRCRAFT	ORIGINAL PRICE WHEN NEW	PRICE FOR REFURBISHED A/C
DC-6	$4 Million (1956)	513 Million (1985)
DC-Q	$4 Million (1965)	$ 8 Million (1985)

Table 5. Cost **Escalation for Refurbished Aircraft**

Other operators have simply put off buying replacements, even though they know that as their equipment ages, repairs and component replacement will become more complex and time-consuming, and downtime will increase.

From an operator's point of view, the increased downtime commonly experienced with an aging fleet is particularly troublesome. If escalating costs and long lead times for replacement parts do not in themselves destroy profitability, downtime **will.**

When aircraft are not operational, they are not producing revenue. Furthermore, with airplanes out of service, the operator may be forced to revise operational commitments, rent expensive supplemental equipment, or even send his customers to a competitor.

Fortunately, there is a practical alternative to either of these approaches. That is for the operator to adopt a comprehensive corrosion-control program designed to extend the service life of the aircraft he already owns.

Corrosion Control and Aircraft Longevity

Quality programs in corrosion control pay excellent dividends in extending economic service life. The results of good maintenance practices are more than amply demonstrated by the service records of a number of large aircraft operated by the United States Air Force.

Although the average age of aircraft in the USAF inventory is less than 15 years, some individual airplanes have been on active duty for more than 30 years. Figures 6 and 7 provide more detailed information on the calendar age of several models and types of USAF aircraft presently in service.

AIRCRAFT MODEL	AGE (years)
All	14.6
B-52	25
C-I 35	24.2
c-130	17.9
C-I 41	19 1

Figure 6. Average Age of USAFAircraft in October, 1985

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AIRCRAFT MODEL SERIES	NUMBER IN SERVICE	AVERAGE AGE (years)
C-130A	60	27.9
AC-130A	10	29
C-I 30B	34	24.3
C-I 30E	41	22
C-130H	8	2.1
HC-130H	10	20.1
WC-130H	7	19.7
HC-130N	4	15.3

Figure 7. USAF Reserve C-730 Force in October, 1985

One C-130 Hercules aircraft, in fact the first C-130 manufactured by Lockheed-Georgia Company, is still active after more than 30 years of service.

Such longevity is not restricted to just military airplanes. One commercial Hercules has now logged over 55,000 flight hours and is still producing revenue. The price of such longevity is not cheap, but it is a pittance compared to the cost of replacement equipment.

The Cost of Corrosion

What price does one pay for corrosion-related maintenance and repairs to aircraft? In the late 1970s, the U.S. Navy indicated that 90 percent of all maintenance costs for its aircraft involved corrosion. During that same period, the USAF reported that its tab for aircraft corrosion was around a billion dollars a year.

Since the 1970s, maintenance costs have continued to increase. If the escalation rate for corrosion maintenance for aircraft is comparable to that for all corrosion in the United States, as shown in Figure 8, the current cost to USAF must be about two billion dollars, or double what it was in the late 1970s.

YEAR	# S T
1947	55.5 Billion
1965	In Excess of $6 Billion
1967	In Excess of $10 Billion
1975	$70 Billion
1962	$126 Billion
1985	$167 Billion

Figure 8. **Cost Escalation *for* Corrosion in the *USA***

Developing a Corrosion Control Action Plan

Where do operators look for direction when developing a corrosion control plan? One source occasionally used is to adopt the program of a successful operator.

This approach is better than none at all, but it can be risky. Even though two operators fly similar equipment and have organizations of about the same size, there is no assurance that a course of action that has been successful for one operator will prove successful for another.

The kinds of cargo flown can affect corrosion control costs.

There are many variables to be considered before adopting a corrosion control plan, including the geographic environment, the operator's facilities, the typical mission role, the proficiency of maintenance personnel, and even the age of equipment.

To illustrate the number of variables that can affect the design of a corrosion control action plan, one needs only to review the situation of organizations that operate C-130 Hercules airlifters, built by Lockheed-Georgia Company.

Over 1800 of these transports have been built in at least 37 versions since the first production rollout in 1956. Outwardly, all of the models appear to be more or less similar; but outside appearance is where the similarity ends. Beyond differences **in the way** that various operators have chosen to equip their Hercules aircraft, the airframe itself is a practical, functioning study of a design in evolution.

During the more than 30 years that the airplane has been in continuous production, many changes have been introduced in materials, heat treatments, and the profile of parts. The purpose of a large number of these changes has been to reduce susceptibility to corrosion. In addition, there have been numerous improvements in such areas as sealing and protective finishes, exclusion and removal of corrosive fluids, and other corrosion avoidance features.

Over 50 countries worldwide operate the C-130 Hercules, both as a military system and as a commercial transport. The airplane must perform its mission in a multitude of environments, from polar caps to equatorial jungles, from lowland deserts to isolated mountain regions, and it must be able to operate from both busy commercial airports and rough, unimproved fields.

The Hercules aircraft is used to move people, equipment, and foodstuffs, put out forest fires, hunt hurricanes, help control oil spills on the high seas, and to refuel airborne aircraft. One of its most unusual roles is that of a flying hospital, providing medical care to nomadic tribes and remote settlements.

The scope of environments, mission roles, operators, and design variations that are associated with the Hercules airlifter help give an appreciation of the difficulties involved in comparing the corrosion control requirements of one operator with the requirements of another.

A Cooperative Effort

A much more effective approach to the establishment of a corrosion control program is through the cooperative exploitation of the resources of both the operator and the airframe manufacturer.

After all, who knows the character of the airplane and the environment of its use better than the operator and manufacturer? Through close collaboration of user and builder, an effective, carefully tailored corrosion-control program can be developed and implemented.

The aircraft manufacturer provides engineering know-how about the airplane and about corrosion control technology. The operator furnishes information about his facilities, missions, and maintenance requirements.

The data are gathered and organized into a plan of action by the corrosion specialist furnished by the manufacturer. Once the operator approves the plan of action, the corrosion specialist refines it to help optimize the logistics of the implementation.

Although implementation is the task of the operator, technical help is furnished by the manufacturer on a basis of need and request. It is this approach that Lockheed-Georgia Company uses to help operators of the C-130 Hercules develop corrosion control programs.

The Corrosion Survey

Let us look at the specifics of how Lockheed-Georgia Company goes about setting up a modern corrosion-control program for a Hercules operator, keeping in mind that the same basic approach could be applied by other manufacturers to other large aircraft.

When an operator invites Lockheed-Georgia to conduct a corrosion study of his operation, the first step is a visit by a corrosion specialist from the Materials and Processes Engineering Department to the operator's base for a period of one to two weeks. While there, the engineer will devote his attention to the following elements:

Environment of the Operator's Base-A primary factor for corrosion initiation and acceleration is the physical environment. What is the geographical location of the operator's base? Is it near the sea, and if so, how close?

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It is noteworthy that normal sea breezes carry from 10 to 100 pounds of sea salt per cubic mile of air. Although the salt-laden air may travel inland on sea breezes for a distance of up to 12 miles, the major amount of salt fallout occurs within the first one-half mile of the beach. Beyond around 10 miles inland, the fallout is insignificant.

In the northern, cooler latitudes, the salt content of air is much less of a problem than in the temperate and equatorial regions, an effect which can be seen in Figure 9.

Salt is also much more concentrated in air at lower altitudes than at higher altitudes. The heaviest concentrations are below 1500-2000 feet over the water in areas of trade winds.

A base next to the sea in temperate areas is sometimes subject to fallout of iodine produced by masses of kelp floating along the coastline. Both salt and iodine are corrosive to aircraft structure, but among naturally occurring agents, the destructive effects of salt on aluminum are hard to beat.

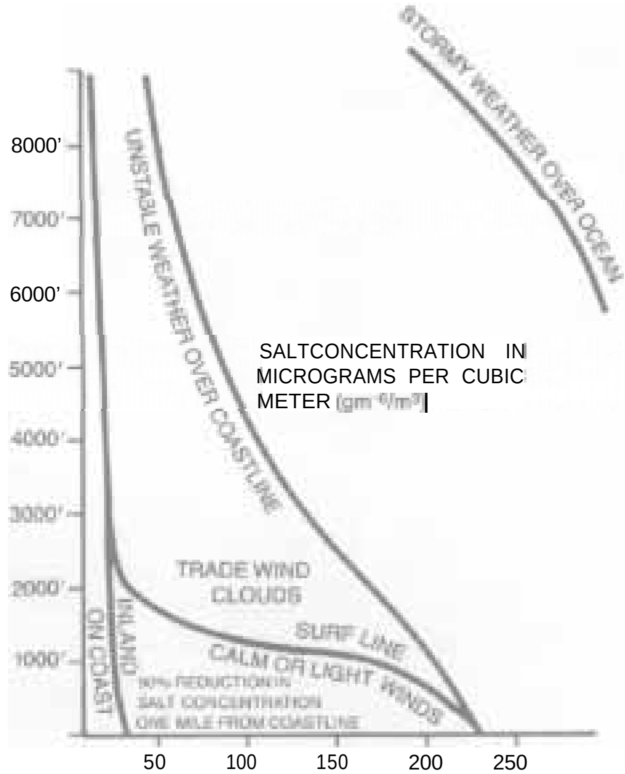

Figure 9. Salt Concentration in Atmospheric Tropical Environment Below 30 Degrees Latitude

Heat and humidity tend to accelerate corrosive processes.

When brought into contact with aluminum in the presence of moisture, salt initiates a complex reaction whose products include aluminum hydroxide and hydrochloric acid. Eventual destruction of all the available aluminum is practically guaranteed by the fact that the reaction products tend to draw additional moisture from the air, which keeps the process going.

But the sea is not the only source of corrosive agents. Desert sands, such as in Egypt, often have a high salt concentration. Sometimes the operator's base is located next to a jungle which produces decay and the associated atmospheric pollutants.

At numerous places throughout the world, aircraft are exposed to volcanic ash, which is both corrosive and abrasive. Another abrasive environment **which** leads to corrosion is that of ground coral rock, a material commonplace on many islands where Hercules airlifters are operated.

The corrosion engineer checks for prevailing winds, for temperature variations, fog, condensate, and rainfall frequency. He notes the presence of factories, mines, and water **sources** in the immediate vicinity of the base.

Industrial installations deserve particular attention. An air base in middle Florida had to be moved to another state because of the damage being caused by fallout from nearby phosphate mines. Steel mills, coke ovens, petroleum refineries, paper **mills**, and concrete plants can be equally harmful to aircraft.

A visit to the local water processor gives much insight into the quality of water being supplied to the operator for aircraft washing. Water sources may be from wells, rivers, lakes, or the sea. **The** contents of the water will be checked for chlorides, sulfides, total dissolvcd solids and pH.

Part of the engineer's observation will be the bird population and their nesting habits. Bird droppings and bird nests have a profound effect on corrosion susceptibility.

Finally, the engineer will check on the operator's practices with regard to locating his aircraft when they are not flying. Are they hangared, or do they remain on the ramp outdoors? What are the conditions to which they are exposed while on the ground?

Aircraft Mission Profile-Information is obtained from the operator about the environment to which each aircraft is exposed when in use. Some of the questions posed are:

- How many hours a month does the aircraft fly?
- Where does the aircraft fly, and what are the environmental conditions there?
- At what altitudes does the aircraft fly?
- Does the aircraft refuel at off-site bases? If so, does the fuel contain a biocidal additive?
- What type of cargo is hauled, and does the cargo present a corrosion susceptibility?
- Is any cleaning performed on the aircraft while the aircraft is away from home station?

Base Facilities-While walking around the operator's base, the corrosion engineer will look into practices and facilities for washing aircraft, and storage of parts and materials.

- **Washing capabilities-Can** exterior washing be accomplished thoroughly or only partially? Is the wash done indoors or outdoors? Is hot water rinsing available?

  What kind of application equipment is used? What safety devices are present? Are washing instructions and precautions posted? Are holding fixtures available for panels removed from the aircraft for washing and temporary storage?

- **Storage facilities-How does** the operator store spare parts, cleaning compounds, and corrosion control materials such as paints, sealants, and chemicals with limited shelf life? What corrosion control materials and equipment does he stock? A great deal of damage can be done to materials, equipment, and structure if proper consideration is not given to storage facilities.

Maintenance Records and Manuals-For each of his aircraft, the operator is required to maintain a log of discrepancies, maintenance performed, and historical data.

By reviewing the logs, the corrosion specialist engineer can learn where the aircraft has been based during its service life. He can find out which corrosion discrepancies have been reported, and what was done to correct those discrepancies. He can also pinpoint recurrences of corrosion problems, and see if an identifiable pattern emerges.

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Corrosive minerals are a common component of desert sand.

With the above information, the specialist can determine priority needs in remedial actions. In essence, he can show the operator where to put the emphasis in corrosion mitigation that will result in an economic advantage.

"Don't sweat the small stuff' is an expression that is on target here. It does not make good economic sense to devote time and effort to items that can be easily and cheaply replaced. The corrosion engineer can show the operator how to focus his primary effort on protecting and preserving structural components which are expensive to buy and time-consuming to replace.

Procedures on corrosion control and corrosion damage repair are provided to the operator by the aircraft manufacturer in the form of maintenance manuals. One of the purposes of the facility survey is to see where the operator keeps these manuals.

Are the major corrosion control documents readily accessible to personnel who need them? Are they current? Most important is to verify that maintenance personnel use the appropriate manuals for guidance on corrosion control problems.

Inspection of Aircraft-Unless an airplane is undergoing extensive repairs, it is not usually out of service long enough for a comprehensive inspection for corrosion. It is rare that access panels are off the aircraft or that insulation blankets inside the airplane are removed at the time the engineer is permitted to conduct his inspection.

Most of the time the guest will have to make the inspection on a "noninterference basis" because of the regular maintenance activities that are in progress; consequently, the inspection will be cursory.

In spite of these limitations, much can be learned about an airplane from a quick inspection if the engineer is familiar with the structure and has knowledge of the corrosion-susceptible areas. A typical brief inspection will include:

- General cleanliness inside and outside the airplane. What are the soils? What are the odors, and where do they originate?
- The condition of the protective paint systems, especially around fasteners in exhaust areas of the engines, and near overboard drains, urinals, and service centers.
- A check of the clear vision windows on the flight deck for a haze around the perimeter.
- The condition of environmental sealant for cracks, displacement, and damage.
- The chine plates in the cargo compartment for pits and exfoliation.
- Drain holes along the exterior of the fuselage for trapped fluids.
- Propeller blades for possible intergranular cracks along the leading edge.
- Wheels, landing gear, and other structure accessible to touch and close visual inspection.

Operator's corrosion control program-All aircraft operators will express the belief that they practice some form of corrosion control; however, many use the term corrosion control synonymously with aircraft washing. Others may include painting and lubrication along with washing and consider that corrosion control.

In a few cases, an operator will have a comprehensive program, including a dedicated number of maintenance people who have specific training in corrosion control practices. In most instances, however, the surveys disclose that airframe maintenance personnel with little real background in corrosion control techniques are tasked with corrosion recognition, treatment, and repair.

To help establish the quality of the operator's program of corrosion control, the Lockheed engineer will audit the operator's wash program as it relates to need, effectiveness, and compliance with factory procedures.

A basic concern is the compounds being used to wash the airplane, the mixtures used, and the method of application. Is the rinsing adequate? What happens to the materials and equipment after completion of the wash? Are drain holes and passages checked for blockage after wash completion?

How is the cargo compartment cleaned? Are the insulation blankets wet? Have water puddles been removed from the floor? What is the time lapse between completion of the wash and lubrication of components requiring grease? Is flash rust visible on these parts prior to lubrication? Are the lubricants nongraphitic?

Does the operator use supplemental protective measures to augment paint finishes, especially in highly corrosion-prone areas; for example, temporary protective coatings such as soil barrier films?

Preparing the Report

The second phase of the study occurs when the corrosion engineer returns to the Lockheed plant, analyzes his survey, and prepares a report to the operator.

In his report, the engineer furnishes a comprehensive list of observations, and where appropriate, he offers recommendations which will enhance the operator's corrosion control program and airframe service life extension measures. Typical of the recommendations offered are:

- Improvements in the washing program, including interim rinses between wash cycles.
- Addition of temporary protective coatings in corrosion-prone areas.
- Identification of corrosion-prone areas peculiar to the operator's environment and mission role.
- Directing inspection effort on corrosion control to optimal benefit and need.
- Specialized equipment, procedures, and inspections for hauling corrosive cargo, or when operating into specific corrosive environments.

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- Enhanced training in corrosion control for operator personnel.

- Changes in storage and handling practices for corrosion control materials and for spare and removed parts.

Implementation

Lockheed supports the operators in the implementation of their corrosion control program in several ways.

Corrosion Control Training-Operators can send their personnel to Lockheed for training in corrosion control or have Lockheed instructors train the personnel at the operator's bases.

The advantages of training at the factory are that students have access to many specialists and to the aircraft in its many stages of manufacture and assembly; moreover, the factory offers many instructional aids not generally available at the bases.

Factory instructors and corrosion specialists can supplement factory instruction with follow-on training at the operational facilities, orienting the training to facility capabilities and conditions.

Corrosion Control Manuals-Operators are furnished corrosion control maintenance guides applicable to the aircraft model in use.

Newsletters-Regular releases of newsletters and service publications are sent to the operators, providing information about enhancements and improvements which they can incorporate for better service life.

Feedback-Corrosion specialists at Lockheed review reports of maintenance actions involving corrosion on Lockheed-built airplanes. These reports enable the corrosion specialist to recommend corrective measures for both in-service aircraft and for new production.

Summary

The rapidly escalating costs of new transport aircraft have encouraged many operators to increase the effort they devote to extend the service life of their equipment.

To prevent reduced service life and extensive downtime for corrosion and fatigue-related repairs, economy-minded operators are looking for better ways to maximize the useful life of their aircraft.

The chemical retardants used to attack forest fires can attack airframes as well.

A highly effective way to extend the economic service life of a modern transport aircraft is to establish a program of corrosion control tailored to the environment of the operator's base and to the mission role of the aircraft.

It is difficult to conceive of a more practical and efficient way of developing such a tailored program than through a cooperative undertaking jointly carried out by the operator of the aircraft and the manufacturer of the airframe.

Credits: A version of this article was presented in March of 1987 as paper number 217 at the Corrosion 87 meeting of the National Association of Corrosion Engineers (NACE). Permission from NACE (Houston, TX 77084) to publish this adaptation is gratefully acknowledged.

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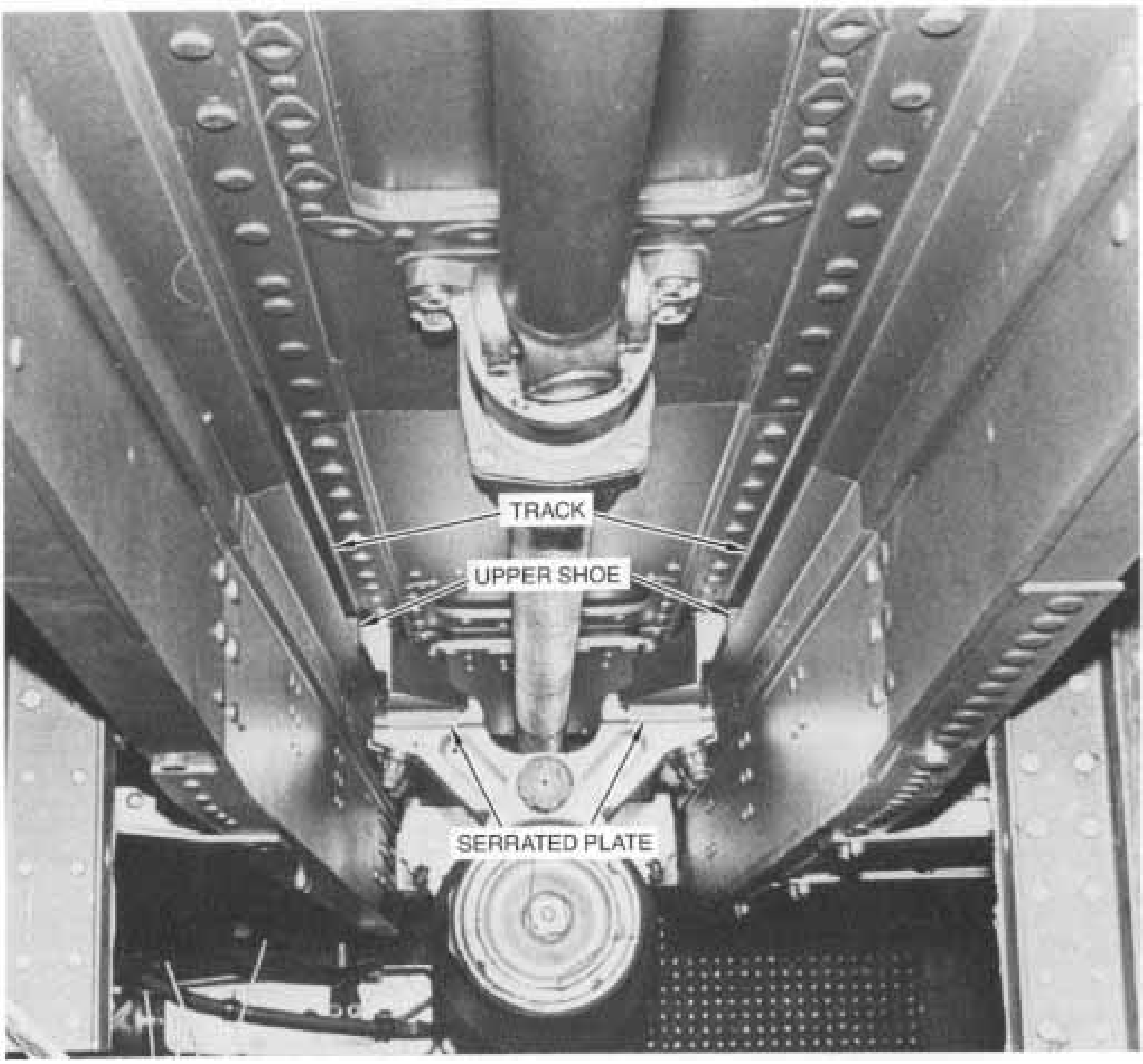
MLG Track Wear Gage Blocks

by C. W. Callan,
Specialist Engineer

You can fabricate gage blocks that will help you determine the extent of Hercules aircraft MLG track wear quickly and accurately. The gages described in this article were developed in cooperation with USAF maintenance personnel at Little Rock AFB, Arkansas. The inspection technique made possible by these gage blocks has enabled Little Rock AFB to identify worn tracks for replacement and virtually eliminate MLG rub problems from their fleet of C-130Es.

Excessive track wear can result in gear rub on the shelf bracket, side panel vertical beams, or track fastener heads (see "MLG Rub," *Service News*, Vol. 13, No. 1, January-March 1986). If gear rub cannot be corrected by adjusting shoes, replacing shoe facings, or substitution of thin serrated plates between the swivel bracket and upper shoes, it is likely that the tracks are worn beyond limits.



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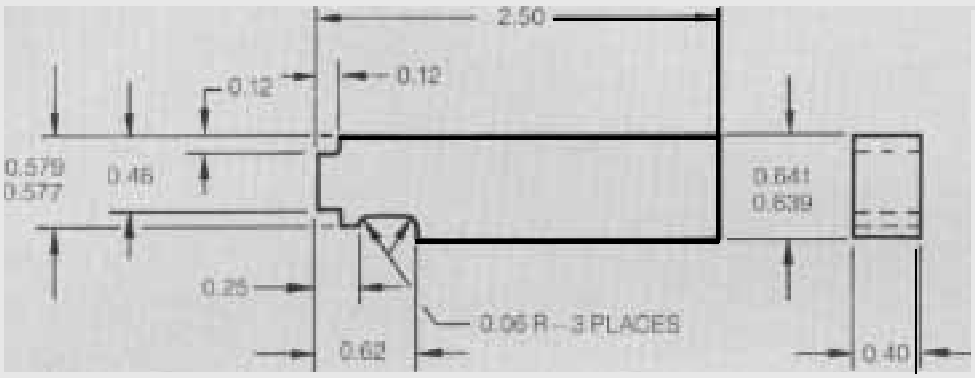
Gage blocks manufactured locally in accordance with the detail drawings in Figure 1 may be used to determine if the inboard and outboard flanges of the tracks have reached their wear limits. The gage blocks may be used with the tracks, gear, and ballscrews in place on the aircraft.

The gage blocks are used as follows:

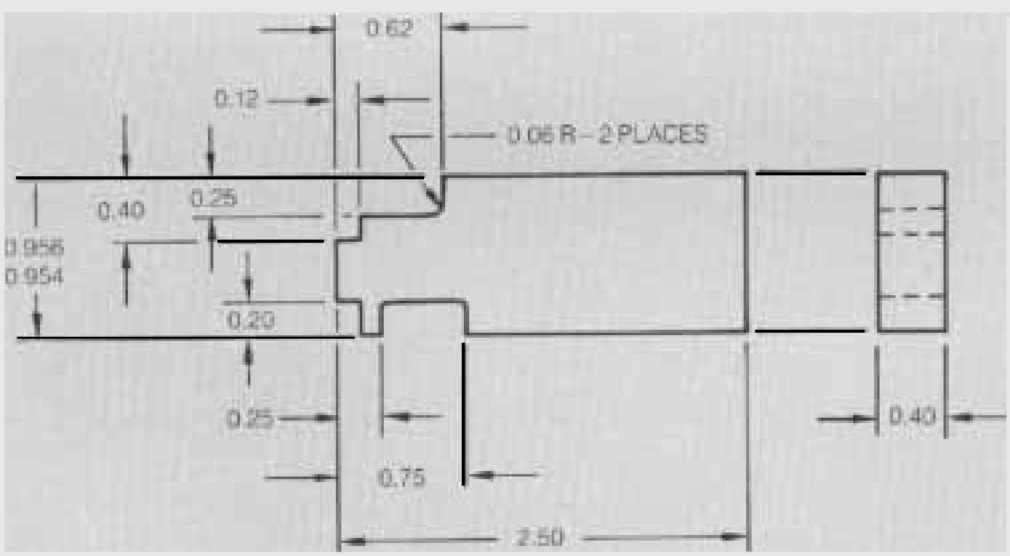
I. At approximately S-inch intervals, remove the paint from the track flange between the fasteners that attach the track to the side panel.

DETAIL-GAGE BLOCK A



MAT'L-LOW CARBON STEEL

DETAIL-GAGE BLOCK B



MAT'L-LOW CARBON STEEL

Figure 1. MLG Track Wear Measurement Gage Blocks

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2. At each location where the paint has been removed, use gage block A as shown in Figure 2 to determine wear on the inboard track surface. If the gage block fits completely flush against the recessed portion of the inboard flange, the track has reached or exceeded its wear limit.

3. At the same locations, use gage block B as shown in Figure 3 to determine wear on the outboard track surface. If the gage block fits completely flush against the recessed portion of the inboard flange, the track has reached or exceeded its wear limit.

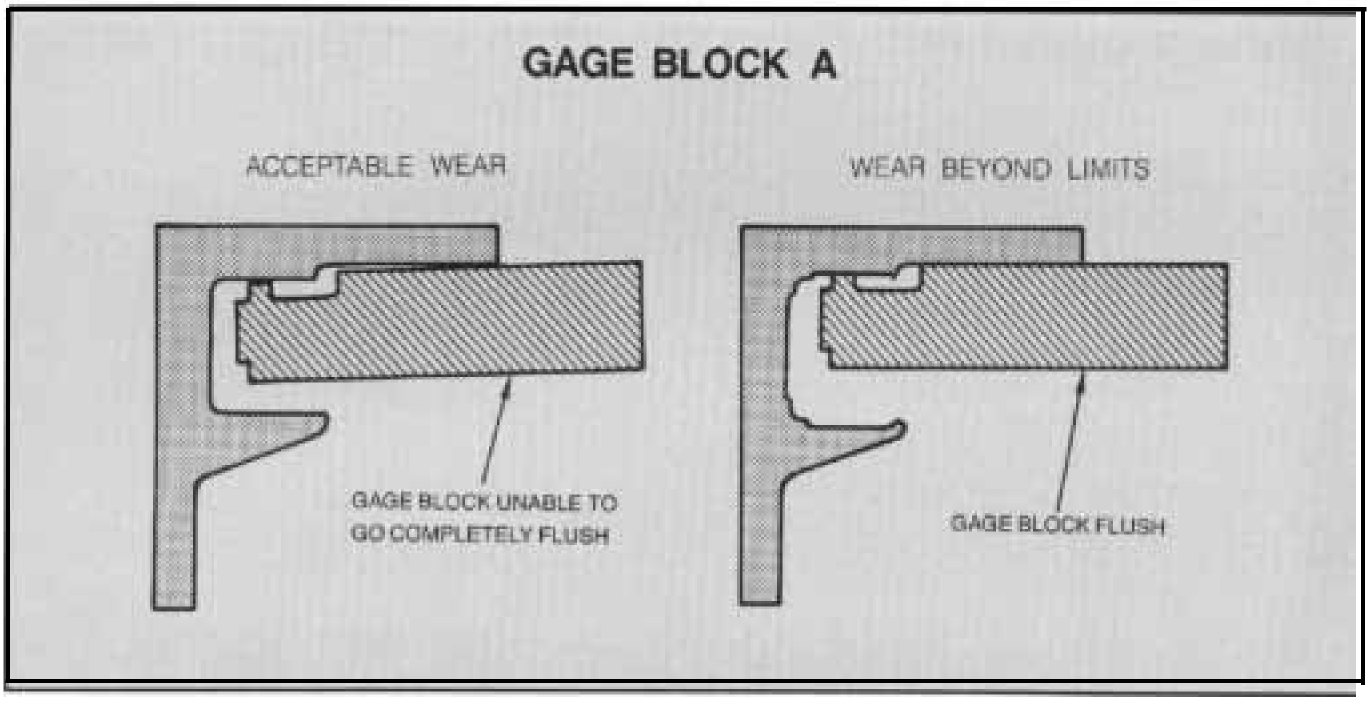


Figure 2. MLG Track Wear Measurement inboard Surface

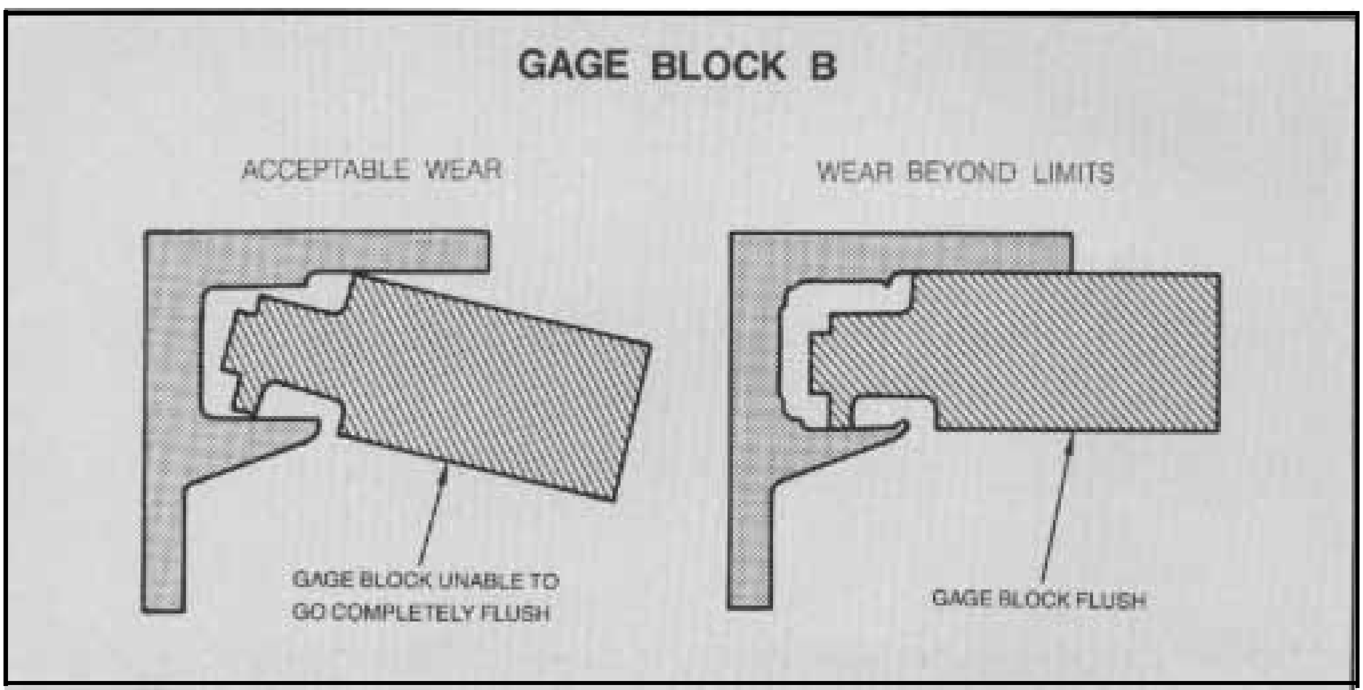


Figure 3. ***MLG Track Wear Measurement Outboard Surface***

In using these track wear gages, it is important to keep in mind just what they are designed to do, and what they are not designed to do. Track wear gages were developed primarily as an aid in dealing with gear rub. The gages are sized to determine if the tracks have worn to the extent **that** experience has shown to be conducive to gear rubs. They do not determine absolute structural wear limits,

The formal guidelines for determining the structural wear limits of the MLG tracks are as follows:

> Shoe tracks should be replaced when the wear on any of the three shoe contact surfaces exceeds 0.040 inch in the shoe area with the MLG in the down position, and/or 0.080 inch over all other areas.

What this means as a practical matter is that if shoe track wear has not exceeded the above structural wear limits, and gear or shoe rubs have not been experienced, the tracks may be continued **in** service regardless of what a check of the tracks with MLG gage blocks may indicate.

MLG gage blocks are not intended to show absolute wear limits, but they can be very useful in helping to determine the point at which track wear may begin to be a factor in MLG rub problems. It is important to remember that gear or shoe rubbing is dependent on many variables, and may occur before track wear reaches its structural limits.

For example, MLG shoes will rub on the heads of the track fasteners that have been used in some aircraft when the combined inboard track flange and shoe facing wear reaches 0.066 inch. Track wear gages were developed because of variables like this, and because of the difficulty of measuring wear on an individual track surface, as compared to measuring the combined wear of inboard and outboard faces.

As with many other tools used in aircraft maintenance, MLG track wear gages can save a lot of time and trouble if used for their intended purpose. They will help You determine if a significant amount of wear has taken place, but be sure to also apply the appropriate formal checks before deciding whether the MLG tracks on Your aircraft are really in need of replacement.

SERVICE NEWS

Improved Truss Mount Clamps

by Dare1 Traylor, Service Analyst
Field Service Department

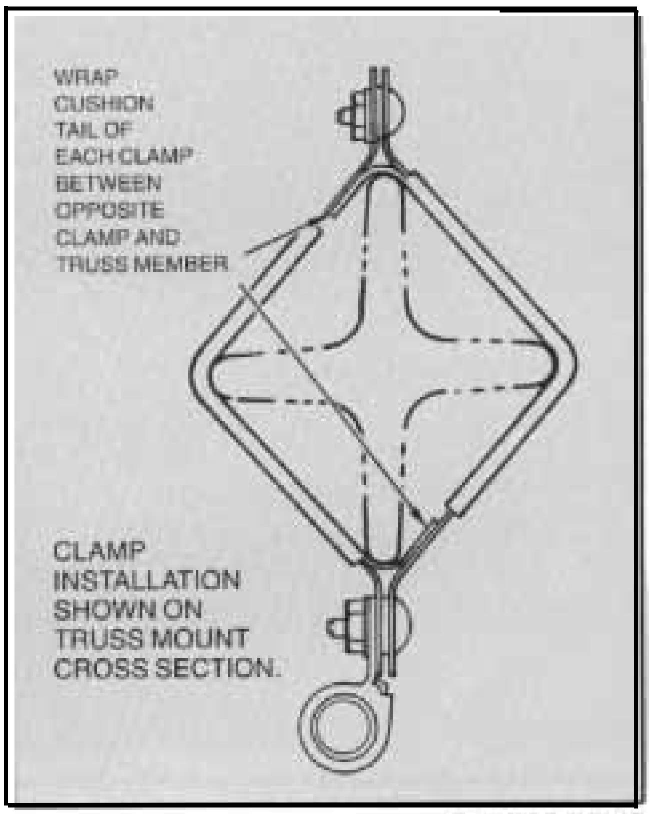
Some operators have found that corrosion of the truss mounts under, and adjacent to, the various electrical and tube support clamps is a continuing problem.

To minimize the possibility of this difficulty, Hercules aircraft Lockheed serial number LAC 4842 and subsequent incorporate improved clamps that eliminate dissimilar metals contact between the clamp and the truss mount.

This has been accomplished by the addition of a tail to the cushion of the clamp, as shown in the illustration. When properly installed, the cushion tail comes between the clamp and truss mount for protection on all four sides of the truss mount.

The new clamps, PN S484-4 and -6, have been installed on production aircraft since February of 1979 in place of the PN 352025-4 and -6 previously used. Note that both clamps are called out in the manual, with the usage code identifying the new clamp for use on late serial numbered aircraft.

Since the clamping arrangement is similar on early and late versions of the aircraft, it is preferable to use the improved clamps exclusively to minimize the possibility of corrosion resulting from the improper installation and improper positioning problems that are possible with the earlier style clamps



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