INTERIM REPORT
Bicarbonate of Soda Stripping Evaluation

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EXECUTIVE SUMMARY

The purpose of the bicarbonate of soda stripping (BOSS) evaluation is to determine if medium pressure water/sodium bicarbonate paint removal process (MPW) used by WR-ALC to strip C-130 and C-141 aircraft is allowing ingress/entrapment of sodium bicarbonate and possibly causing corrosion damage to the airframe.

Under certain environmental conditions, sodium bicarbonate decomposes to sodium sesquicarbonate and eventually to sodium carbonate with increasing values of pH at each stage of the transformation process. In addition, the factors influencing this decomposition (temperature, atmospheric carbon dioxide concentration, and relative humidity) are encountered in the aerospace operational environment.[1]

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[1] Church & Dwight., Inc., “Sodium Bicarbonate Chemical Data, 1 August 1989

ACKNOWLEDGMENTS

Our office would like to thank the efforts of Gary Stevenson and Donna Ballard of AFRL/MLSA in collecting the samples and Leanne Petry and James F. Dante of the University of Dayton Research Institute (UDRI) for the analysis of the samples. In addition, our office would like to thank MSgt Nancy Jamieson (HQ AFSOC) and all the POCs/personnel (who are too many to name here) at each of our inspection locations.

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BACKGROUND

One of the original bicarbonate of soda stripping (BOSS) processes evaluated by the Air Force was a formulated sodium bicarbonate compound tradenamed, ARMEX. The manufacturer performed tests on various alloys of aluminum along with an independent laboratory and military personnel, however, there were conflicting results. The results of one study suggested that the blast media decomposes at highly elevated temperatures into compounds that are extremely corrosive to aluminum aircraft materials. Conversely, other studies indicated that the media remains stable and relatively non-corrosive under realistic operating service environments. In response to these differing conclusions, the Air Force Corrosion Program Office requested Battelle conduct a two-phase research program to characterize the potential detrimental corrosion effects of the BOSS media on representative military structures.

Battelle concluded the decomposition product of sodium bicarbonate entrapped within crevices and exposed to simulated "worst-case" environmental conditions for operational aircraft will be sesquicarbonate. No sodium carbonate, expected to be more aggressive for inducing corrosion of aluminum than sesquicarbonate, was detected in the analysis of residue from the BOSS stripping process.

The Air Force had an additional concern about using the ARMEX BOSS process for stripping airframes. Because the procedure required extensive amount of bicarbonate of soda injected at high pressure, media intrusion was possible. The Air Force Corrosion Program Office chose not to approve this process for inclusion in T O. 1-1-8.

In 1994, Battelle conducted a study for WR-ALC to investigate the use of a modified medium pressure water (MPW) process on military aircraft and equipment. The primary objective of this program was the evaluation, development, and implementation of the modified MPW system as an effective and efficient alternative organic finish removal (paint stripping) method for aircraft. The stripping equipment used was the Aqua Miser BOSS system consisting of a 15 ksi, 3.2 gpm medium-pressure water pump and a bicarbonate of soda injection system with controls and peripheral equipment. After extensive testing and development of process controls, the Air Force Corrosion Program Office, based on Battelle's work concluded that the MPW system was a viable and economical replacement for methylene chloride chemical stripping of the C-130 and C-141 aircraft. The MPW process was added to T.O. 1-1-8, and has been used since 1994 to augment the environmentally acceptable (EA) chemical stripping process currently used to strip C-130 and C-141 aircraft.

In December of 1997, WR-ALC/LC asked AFRL/MLSS, at the request of SA-ALC/LA, for their concurrence in using the medium pressure water with bicarbonate of soda injection (MPW) for paint removal on the C-5. Mr. Gary Stevenson of MLSS stated in his 16 January 98 response that the potential to convert trapped sodium bicarbonate to the more alkaline, corrosive sodium carbonate is great. He further stated that even if such conversion does not occur, residual sodium bicarbonate could still compromise subsequent coating integrity. He suggested the acceptance of the MPW depaint process for the C-5 be dictated by the risk management approach, and the process/quality controls implemented to minimize as much as possible the ingress and entrapment of sodium bicarbonate. He further suggested SA-ALC/LA contact the C-130 and C-141 directorates and evaluate their depaint processes using MPW and take advantage of any lessons learned. Mr. Stevenson also recommended a small engineering team comprised of interested parties conduct a field survey of several aircraft that have undergone the MPW process at WR-ALC.

TEAM MEMBERS

Major Dave Robertson	AF Corrosion Prevention & Control Office
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Edmund Rowe	WR-ALC/LJEA
Gary Stevenson	AFRL/MLSA
Donna Ballard	AFRL/MLSA
Lawrence C. Clark	NCI Information Systems

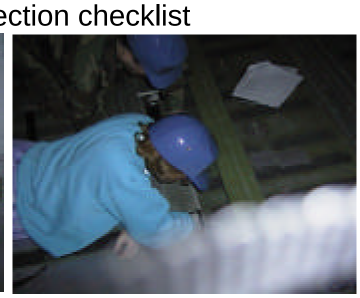
ASSESSMENT PLAN

Our goal was to select and inspect at least seven (actual number TBD upon further analysis of any found intrusion) aircraft (comprised of C-130s and C-141s) that have been MPW stripped at WR-ALC and determine:

1. If media intrusion has occurred
2. If found, has the media decomposed to sodium carbonate, and what damage, if any, to the airframe or coating system has evolved
3. If intrusion, coating integrity, or corrosion damage is found, what are the problems with current process controls and what are the future risks involved in continuing this process

Our initial plan/approach was to use a cross-section of various inspections to include isochronal, post-PDM acceptance, and AMARC teardowns. To date, we have completed three isochronal inspections. Our team assessed two C-130s at Hurlburt Field and a C-141 at Charleston AFB. After the completion of the three aircraft, it was discussed (and further recommended by UDRI…see recommendations page) that we should assess aircraft that were "dropped in" at WR-ALC for unplanned depot maintenance and inspect during the aircraft's next isochronal inspection

<u>Isochronal:</u> All panels/doors/areas normally opened for an isochronal will be inspected for evidence of bicarbonate of soda and any corrosion or coating damage. Quality Deficiency Reports (QDRs) from past PDM Acceptance Inspections submitted for media intrusion (C-130 only…none submitted for C-141) have shown repetitive areas where intrusion has occurred and therefor particular attention needs to be placed on these areas. See table 4/5 for sample of our inspection checklist



<u>Non-planned depot maintenance:</u> Inspection criteria would be the same as the isochronal inspection.

<u>Post-PDM Acceptance</u>: The team will participate in selected C-130 unit's PDM Acceptance Inspection. The focus here will not be for corrosion detection, but an assessment of WR-ALC's MPW process controls to prevent the ingress of media. If media intrusion is detected, a comprehensive list detailing specific area of intrusion (fuselage station… waterline…), suspected cause, and amount of media found will be compiled.

<u>AMARC Teardown:</u> Specific suspect areas of the C-141 airframe will be opened (rivets/skin panels removed) enabling a more thorough inspection (lap joints, under fasteners, etc.) than an isochronal. Like the isochronal inspection, any evidence of bicarbonate of soda/corrosion/compromise of coating integrity found in these normally inaccessible areas will be collected and laboratory tested.

FINDINGS

Twenty-three samples were analyzed by capillary electrophoresis for the presence of carbonated species. Each sample designation and the location on the aircraft from which it was taken are given in table 1.

The samples were stored in polystyrene vials with low-density polyethylene lids. Each sample was soaked in deionized water in the vial in which it was stored for 24 hours before the analysis was performed. As there were varying amounts of sample material in each vial, the amount of water added to the vial was adjusted to not overly dilute the ionic species dissolved from the sample:

- 2 ml of deionized water was added to the vials containing a major amount of sample product.

- 1 ml of deionized water was added to the vials containing a minor amount of sample product.

- 0.4 ml of deionized water was added to the vials containing a trace amount of sample product.

Actual corrosion products analyzed were contained in samples 225-5, 225-6, 165-3, 165-5, 165-10, 6574-1, 6574-3, 6574-4 and 6574-5.

The solutions were analyzed by capillary electrophoresis. Capillary electrophoresis is a solution analysis technique that allows the ionic speciation of small volumes (on the order of 1 µL or less) to be detected with high sensitivity (on the order of 100 ppb). It involves the differential separation of ions during migration through a narrow bore fused silica capillary under the influence of a large electric field. Detection is generally accomplished by either indirect or direct ultraviolet (UV) absorbance. The resulting plot of absorbance versus migration time is referred to as an electropherogram. Comparison of migration times with standard injections, as well as spiking of the sample solutions with standards, is used to confirm the identity of the ionic species present. Quantification is achieved by comparing the magnitude of UV absorbance to that of standard solutions for the ionic species detected.

The solutions were analyzed for aggressive anions like chloride, nitrite, sulfate, nitrate and phosphate, as well as for some organic anions like formate and acetate, using a temperature-controlled Waters Quanta 4000 (Milford, MA) equipped with a negative power supply. The capillary was a 60 cm x 75 µm fused silica capillary (Polymicro Technologies, Phoenix, Arizona). The analysis was performed using a 0.5 mM CrO_4^{2-} electrolyte containing 3.5 mM of the osmotic flow modifier tetradecyltrimethyl ammonium bromide (TTAB). Indirect photometric detection was used at a wavelength of 254 nm. Samples were introduced into the capillary using a 30-second hydrostatic injection from a height of 10 cm. The separation was achieved using a constant current of 16 µA. Data were collected with a LAC/E interface card and analyzed using Millenium Version 2.10 software.

The analysis by capillary electrophoresis was able to detect carbonate species as well as chloride, nitrite, sulfate, nitrate, formate, phosphate and acetate anions in the soak solutions. Background levels of carbonate species in the fresh deionized water, after being stored in either the sample vials (polystyrene) or glass vials for 24 hours, were on the order of 1.0 µg. The carbonate species background levels did not increase significantly over 48 and 72 hours.

Hydration of the samples allowed analysis of the major water-soluble ionic species present. Table 3 gives the relative amounts of the species identified in each sample. In a few samples (e.g., 225-5 & 225-6), small peaks at very high migration times (> five minutes) were observed but could not be identified using the current method. From the data given in table 3, the following observations can be made:

- Chloride and nitrite were present. [Cl^-] ranged from trace amounts to 78 µg and [NO_2^-] ranged from trace amounts to 28 µg.

- Sulfate was present in large quantities (greater than 100 µg) in samples 225-2 (429 µg), 165-8 (810 µg), 6574-2 (892 µg), and 6574-7 (286 µg). The remaining samples contained sulfate in amounts ranging from trace to 87 µg.

- Nitrate concentrations ranged from trace to 45 µg.

- Minimal amounts of formate were detected, as compared to the levels observed in the baseline analyses on fresh deionized water and on deionized water which had been stored in either glass or polystyrene vials for 24 hours.

- Minimal amounts of phosphate were detected, as compared to the presence of the other species. Concentrations of phosphate ranged from trace amounts to 20 µg and were not present in every sample.

- Carbonate species mass levels were analyzed as follows:

  - In the samples designated 165-1 to 165-10 (Aircraft C-141 67-0165, Charleston), mass levels ranged from trace amounts to 6 µg.
  - In the samples designated 6574-1 to 6574-7 (Aircraft C-130 69-06574, Hurlburt), mass levels ranged from trace amounts to 4 µg.
  - In the samples designated 225-1 to 225-6 (Aircraft C-130 66-00225, Hurlburt), mass levels ranged from no trace amounts to 68 µg. The two largest concentrations were 53 µg (225-5--right horizontal stabilizer) and 68 µg (225-6--left horizontal stabilizer).

- Acetate was present in a fairly large quantity in sample 165-5 (356 µg). The remaining samples contained acetate in concentrations ranging from trace amounts to 5 µg. [2]

In addition to the suspected carbonate species samples found, our in depth inspection on numerous enclosed areas on the aircraft resulted in detecting several defects that have a high potential for increased corrosion:

- Primer removed to bare metal on the L/E spar and vertical Webb, in the "horse collar" area. (C-130 acft. all engines) NOTE. The primer had been removed/damaged by previous depaintings using chemical paint removers.

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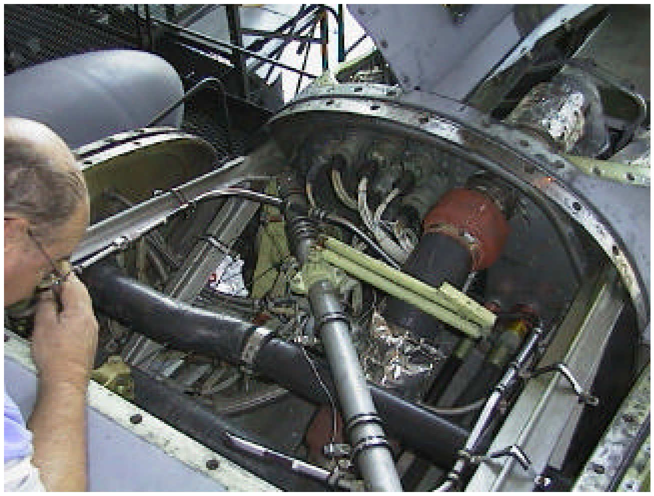
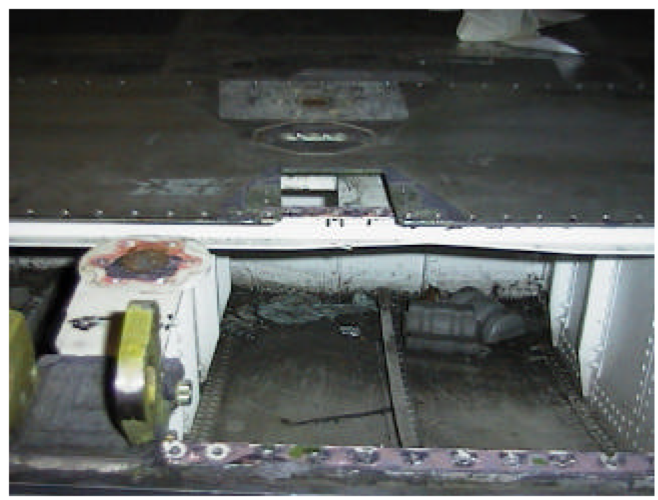
[2] AFRL/MLSA Report 99-36 (Analysis of Samples by Capillary Electrophoresis Special Emphasis on the Detection of Bicarbonate)

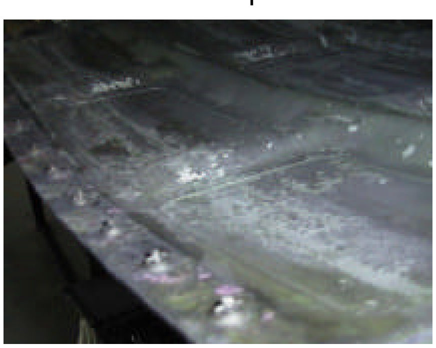


- Under flow area (Bilge), of the C-141 aircraft was contaminated, (severely) with dirt, hydraulic fluid, and other unknown substances. When we asked a maintenance specialist, "How often is the under floor area on the C-141 cleaned". His reply, "Since refurbishment is no longer accomplished as a special inspection, except for a single floor panel adjacent to the forward lavatory (rt. fwd), and the aft center panel, none of the floor panels are removed unless a major spill occurs in the cargo compartment". *(NOTE)* No



evidence of soda was detected in the "bilge" area.

- Numerous areas in the wing-to fuselage attach area on the C-130 and C-141 had been contaminated with pant remover from previous depaint operations. The paint remover



had removed the primer and the bare metal surfaces were not adequately protected from corrosion. Several areas showed signs of dried paint remover. Again, no evidence of soda residue.

- Minor liquid paint remover residue and contamination from routine operations was detected in the forward and aft interior areas of the main landing gear pods on the C-130 and C-141 aircraft as well as the air deflector wells on the C-130. Again no residue.

- The latrine areas on the C-130 aircraft were very dirty, especially the lower area where the outer skin, ribs, and sloping longhorn attach. (FS 737 to FS 800) It appears the latrine area has/was not cleaned in conjunction with each scheduled aircraft wash. REF. TO 1C-130A-23CL-1

(NOTE) The lower skin on the Lt./Rt. aft. fuselage is removed during every depot cycle to clean area and treat corrosion damage. Many sloping longerons are replaced at depot due to major corrosion damage. If this area was cleaned/treated IAW the -23-1, major repair/replacement during depot maintenance would be drastically reduced or eliminated plus major cost savings in man-hours, material, and a reduction in depot flow days.

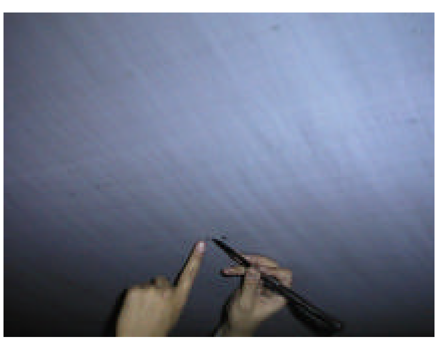
DISCUSSION

Nine of the twenty-three samples in this study (225-5, 225-6, 165-3, 165-5, 165-10, 6574-1, 6574-3, 6574-4 and 6574-5) were from corroded sites. Of these nine sites, six were from the C-130 and C-141 horizontal stabilizers (225-5, 225-6, 165-3, 165-10, 6574-4 and 6574-5) where corrosion frequently occurs. For example, the C-130 horizontal stabilizers often display corrosion on upper surfaces due to the urinal discharge mechanisim. From the data shown in table , it can be seen that all samples, with the exception of two, contain very minimal amounts (less than 30 μg**)** of carbonate species. There is no well-defined correlation between the mass of the carbonate species and the material collected from corrosion sites. In fact, three of the nine corroded sites had relative amounts of carbonate species that were below the detection limits of this method and four of the nine samples collected from corroded sites had carbonate concentrations of 4 μg or less.

It is possible the larger concentration of carbonate species found in the samples designated 225-5 and 225-6, as compared to samples taken from other horizontal stabilizers, could possibly be due to the presence of uric acid. Unfortunately, the presence of uric acid cannot be detected directly by the technique of capillary electrophoresis. At alkaline pH levels, uric acid breaks down to a urate ion that oxidizes to bicarbonate and the neutral species allantoin.

No well-defined pattern can be found between chloride ion concentration from samples collected from corroded versus noncorroded sites. The highest concentration of Cl^- **(**78 μg) was from an area where no corrosion was present. Three of the nine corrosion samples had Cl^- concentrations of 25 μg to 56 μg and the remaining six had very low Cl^- concentrations.

It is interesting to note the corrosion product for sample 165-5 came from the lower fuselage of the C-141 aircraft and had a large quantity of acetate found in this sample. Such a concentration may come from runway ice control materials. No conclusion from just this one sample, however, can be drawn between acetate ion and aluminum corrosion.



It is also interesting to note the samples with the highest mass of sulfate (possibly from cleaning compounds) were from noncorroded samples. [3]

[3] AFRL/MLSA Report 99-36 (Analysis of Samples by Capillary Electrophoresis Special Emphasis on the Detection of Bicarbonate)

CONCLUSIONS

AFRL/MLSA/UDRI: Results of this capillary electrophoresis effort found no correlation between the amount of water-soluble carbonate species and the corrosion products collected from the three aircraft.

Only minor quantities (less than 30 μg with five, most less than 4 μg) of water-soluble carbonate species were found in any samples collected from corrosion free areas. That is, most samples had quantities of carbonate species within background levels of the equipment used.

Likewise, no pattern could be found between chloride ion concentration and collected corrosion products versus sample material from non-corroded areas.

RECOMMENDATIONS

From AFRL/MLSA/UDRI: There are several limitations to the current capillary electrophoresis methodology. Soaking the samples in deionized water allows only for the extraction of water-soluble species. Additionally, all water-soluble carbonate species will be detected as bicarbonate because of the neutral pH 7 of water. It is possible that during corrosion reactions, carbonate ion is present at an alkaline corrosion site. Carbonate can readily combine with several of the dissolved metal cations to form a water insoluble product. The water insoluble product will not be detected by the current method of analysis. A more appropriate method may include extracting product using alkaline sodium hydroxide at a pH of 12 in the soak solution if adequate quantities of sample are available.

For this study, capillary electrophoresis was selected as the optimal methodology to analyze these extremely small amounts of sample materials available. Sampled corrosion products intended for capillary ion analysis need to be in amounts greater than five milligrams for the reproducibility of the results to be validated and to run experiments aimed a checking for water-soluble as well as water insoluble products.

Collect samples from an aircraft that was "dropped in " at WR-ALC for non-planned depot maintenance (non-PDM) related corrosion control. Cleaning of normal aircraft going through PDM may have accounted for the low levels of carbonate ion concentrations found in this effort.

AFRL/MLS-OLR: The data clearly show at this stage in the BOSS evaluation that the “sky is not falling.” It was a surprise to all members of the assessment team that so little evidence of intrusion had occurred on the three inspected aircraft. However, we have added a statement to Technical Order 1-1-8, which states, "It is important to prevent intrusion of bicarbonate of soda blast media as it may become corrosive if left entrapped within the aircraft structure. Make sure thorough inspection and rinsing is accomplished to prevent residue from being retained in the aircraft.” Our office fully concurs with UDRI’s recommendation for further collection of samples from “dropped in” non-planned depot maintenance. We further recommended continued HQ AMC involvement in locating and choosing aircraft that have met the “dropped in” criteria.

Table 1

Medium Pressure Water/Sodium Bicarbonate Aircraft Paint Stripping Data

MDS	**Tail Number**	**Base**	**Inspection Location**	**Field Survey**	**Depot Paint Date**
C-130	66-00225	Eglin	ISO Dock at Hurlburt	2 Dec 98	21 Nov 95
C-130	69-06574	Hurlburt	ISO Dock	16 Dec 98	2 Feb 95
C-141	67-0165	Charleston	ISO Dock	13 Jan 99	16 Aug 95

Table 2

Collected Sample Designation and Description

Sample Designation	Amount	Location	Comments
225-1	Trace	Forward air conditioning pack	Extremely small sample, no structural corrosion in area; white stains
225-2	Trace	Aft wing to fuselage fillet panel; left side (aft interior region)	White stains in flow pattern; no corrosion in area
225-3	Major	Nose wheel well; right side rib area next to fuselage skin	Sand, paint chips, metal shavings; no corrosion in area
225-4	Major	245 bulkhead below cargo floor, below flapper valves	General debris; no corrosion in area
225-5	Minor	Right horizontal stabilizer; upper surface; inboard leading edge	Lots of corrosion blisters in area; straw-yellow powder with light gray-white powder next to metal substrate
225-6	Minor	Left horizontal stabilizer; upper surface; inboard leading edge	Lots of corrosion blisters in area; straw-yellow powder with light gray-white powder next to metal substrate
165-1	Major	Bilge area (station 770)	Water, dirt and debris
165-2	Major	Interior of aircraft, adjacent to floor	Powder residue, possibly sand or other debris; did not appear to be bicarbonate or soap
165-3	Trace	Tip of upper LH horizontal stabilizer	Blistered paint and corrosion products
165-4	Minor	Wing interior of RH Inboard LE	Possibly bicarbonate or NDI developer; white residue
165-5	Minor	Lower fuselage	Two small areas of blistered paint; white deposit, probably corrosion product
165-6	Trace	Forward RH MLG Pod LOX Converter compartment	Small amount of white residue along lap joint; possibly bicarbonate or soap residue
165-7	Trace	Forward RH MLG Pod LOX Converter compartment	Small amount of white residue along lap joint; white residue with some blue-green
165-8	Minor	Top aft trailing edge panel LH wing root area	White streaks along and adjacent to lap joint
165-9	Major	Lower area of RH MLG Pod LOX Converter compartment	Dirt and debris
165-10	Trace	RH horizontal stabilizer tip	White residue from blistered paint on the end, probably corrosion product
6574-1	Trace	Right side wing root area above wheel well, water line 200 base plate under LOX converter	Corrosion product collected from several fastener countersinks, sample very small
6574-2	Minor	Interior right side area around crew escape hatch	White samples in faying surface/edge of seams collected from several sites
6574-3	Minor	Right side of beaver tail sealing area, other side of lightening hole	Corrosion products and loose paint
6574-4	Trace	Top right horizontal stabilizer, leading edge	Corrosion products, surface only corroded, several sites served as collection points
6574-5	Trace	Top left horizontal stabilizer, leading edge	Corrosion products, surface only corroded, several sites served as collection points
6574-6	Trace	Exhaust track behind engine 1, below cove for flap	White material removed from carbon coated parts, no corrosion in area
6574-7	Trace	Fuselage interior wall, left side, FS 380	White powder along seam, no corrosion in area

Table 3

Results of Analysis of Solutions by Capillary Electrophoresis

Sample No.	**Sample Amount**	**Cl^- mg**	**NO_2^- mg**	**SO_4^{2-} mg**	**NO_3^- mg**	**Formate mg**	**PO_4^{3-} mg**	**Carbonate mg**	**Acetate mg**
D.I. water - fresh	-	-	-	-	-	-	-	< 0.001	< 0.001
D.I. water in glass	-	-	-	-	-	< 0.003	-	< 0.001	< 0.001
D.I. water in polystyrene	-	-	-	-	-	< 0.002	-	< 0.001	< 0.001
225-1	Trace	trace	-	0.002	0.002	0.001	-	0.001	-
225-2	Trace	0.001	-	0.429	0.002	-	-	-	-
225-3	Major	0.003	-	0.006	0.002	0.005	trace	0.026	0.002
225-4	Major	0.020	-	0.025	0.004	0.003	0.020	0.016	0.001
225-5	Minor	0.056	-	0.087	0.031	0.004	0.005	0.053	0.005
225-6	Minor	0.025	-	0.064	0.004	0.003	0.005	0.068	0.004
165-1	Major	0.012	0.001	0.015	0.001	0.003	-	0.003	0.001
165-2	Major	0.002	-	0.005	0.004	0.003	0.004	trace	0.001
165-3	Trace	0.001	trace	0.002	trace	trace	-	0.002	trace
165-4	Minor	0.001	trace	0.003	0.005	0.001	-	0.002	0.002
165-5	Minor	0.027	0.028	0.001	0.001	0.001	-	0.002	0.356
165-6	Trace	0.008	-	0.021	0.007	0.001	0.001	trace	trace
165-7	Trace	trace	trace	trace	0.001	trace	trace	0.001	trace
165-8	Minor	0.008	-	0.810	0.016	-	-	-	-
165-9	Major	0.008	0.001	0.010	0.006	0.003	0.002	0.006	0.001
165-10	Trace	trace	trace	trace	trace	0.001	-	trace	0.001
6574-1	Trace	trace	trace	0.002	trace	0.001	-	trace	0.001
6574-2	Minor	0.078	-	0.892	0.045	0.004	-	-	-
6574-3	Minor	0.015	-	0.064	0.018	0.002	-	0.004	0.001
6574-4	Trace	0.001	trace	0.001	trace	0.001	trace	0.003	trace
6574-5	Trace	0.004	trace	trace	trace	0.001	-	trace	0.001
6574-6	Trace	0.002	trace	0.013	0.001	0.002	-	trace	0.002
6574-7	Trace	0.022	-	0.286	0.010	0.003	-	0.003	-

TABLE 4 *C-130 Sodium Bicarbonate Intrusion* **Inspection Checklist**	Corrosion Deposits	Potential $NaHCO^3$	REMARKS (Type Corrosion, Severity, Sample #, Etc)
Left Wing			
Wing Tip Area			
Wing Tip Light			
Aileron Access panels			
Aileron Cove Area			
Aft Lower Spar Lip			
Push/Pull Rods and Bearings			
Leading Edge Panels			
Bleed Air Ducts			
Lower Lip/Hinge Forward Spar Cap			
Throttle Control Cables and Brackets			
#1 Engine "Horse Collar Area"			
Cables and Brackets			
QEC Attach Structure			
QEC Access Doors			
QEC Access Coves			
QEC Sloping Longerons			
#2 Engine "Horse Collar Area"			
Cables and Brackets			
QEC Attach Structure			
QEC Access Doors			
QEC Access Coves			
QEC Sloping Longerons			
Flap Wells			
Aft Lower Spar Cap			
Flap Jackscrews and Flap Tracks			
Life Raft Liners and Brackets			
Lower Surfaces in Flap Well			
Landing Lights and Housings			
Wing to Fuselage Fillet Panels			
All Structure in Wing to Fuselage Fillet Area			
Note: Remove Aft Wing to Fuselage Fairing for Inspection			
Upper Wing Seams and Crevices			
Interior Wing Dry Bays			
Lower Wing Splice Plate Cover (Wing Station 220.0)			
Right Wing			
Wing Tip Area			
Wing Tip Light			
Aileron Access Panels			
Aileron Cove Area			
Aft Lower Spar Lip			
Push/Pull Rods and Bearings			
Leading Edge Panels			
Bleed Air Ducts			
Lower Lip/Hinge Forward Spar Cap			
Throttle Control Cables & Brackets			
#3 Engine "Horse Collar Area"			
Cables and Brackets			
QEC Attach Structure			
QEC Access Doors			
QEC Access Coves			
QEC Sloping Longerons			
#4 Engine "Horse Collar Area"			
Cables and Brackets			
QEC Attach Structure			
QEC Access Doors			
QEC Access Coves			
QEC Sloping Longerons			

Flap Wells			
Aft Lower Spar Cap			
Flap Jackscrews & Flap Tracks			
Life Raft Liners and Brackets			
Lower Surfaces in Flap Well			
Landing Lights and Housings			
Wing to Fuselage Fillet Panels			
All Structure in Wing to Fuselage Fillet Area			
Note: Remove Aft Wing to Fuselage Fairing for Inspection			
Upper Wing Seams and Crevices			
Interior Wing Dry Bays			
Lower Wing Splice Plate Cover (Wing Station 220.0)			
Fuselage			
Interior Nose Landing Gear Well			
Ribs/Stringers/Brackets			
Area around Battery Box			
Landing Gear Attach Area			
Nose Gear Follow-up Door			
Area around Windscreen and Windows			
Windshield Wiper Attach Area			
Radome Attach Area			
Pitot Tubes/Attach Area			
Crew Entry Door & Attaching Area			
Lower and Upper Longeron Caps (W.L. 146 and 200)			
Bilge Area (Forward of F.S. 245 Bulkhead)			
Static Discharge Ports			
Antenna Attach Areas			
Drain Holes in Bottom of Fuselage			
Inside Belly Band & Attaching Area (F.S.737)			
F.S. 737 Lower Bulkhead			
Forward Edge of Cargo Door			
Urinal Vents			
Fuselage Interior			
Area around "Kick" Windows (Lt & Rt Crew Compartment)			
Interior Fuselage Just Inside Crew Entry Door			
Lower Accessible Skin Electrical Racks (F.S. 245 & Forward)			
Belly of Aircraft (F.S. 245 to 737)			
Latrine Area F.S. 737 to 800/ W.L. 146 Up to W.L. 200 Left and Right			
Inside Cargo Door			
Inside Cargo Ramp			
Drain Holes - Cargo Ramp, Pedestal & Cargo Door			
Left Main Landing Gear, Well & Pod			
Gas Turbine Compressor Compartment			
Ribs, Stringers, and Skin in AC Compartment			
Interior Main Landing Gear Door & Hinge Area			
Ribs, Stringers, and Doublers in Main Landing Gear Wheel Well			
Splash/Mud Guards			
Interior of Inboard Fairing			
Main Landing Gear Tracks			
Forward & Aft Main Landing Gear Jackscrews			
Right Main Landing Gear, Well & Pod			
Forward "POD" AC Compartment			

Ribs, Stringers, & Skin in Lower AC Compartment			
Interior Main Landing Gear Door & Hinge Area			
Ribs, Stringers, & Doublers in Main Landing Gear Wheel Well			
Splash/Mud Guards			
Interior of Inboard Fairing			
Main Landing Gear Tracks			
Forward & Aft Main Landing Gear Jackscrews			
Empennage			
Lower Elevator & Horizontal Stab			
Elevator/Rudder Counterbalance Attach Well			
Beaver Tail			
Antenna & Attach Area on Vertical Stabilizer			
Vertical Stabilizer Attach Area			
Dorsal Fin			
Upper Surfaces and Walkway Areas			
Left and Right Elevator Access Area			
Note: Remove Panel			
General Areas			
All Drain Hole Areas			
Seams			
External Straps			
Inadequately Sealed Areas			

Table 5 *C-141 Sodium Bicarbonate Intrusion* **Inspection Checklist**	Corrosion Deposits	Potential NaH CO^3	REMARKS (Type Corrosion, Severity, Sample #, Etc)
Left Wing			
Wing Tip Area			
Wing Tip Light			
Aileron Access panels			
Aileron Cove Area			
Aft Lower Spar Lip			
Push/Pull Rods and Bearings			
Leading Edge Panels			
Bleed Air Ducts			
Lower Lip/Forward Spar Cap			
#1 Engine			
Pylon to Wing Attach			
Cowl Doors			
Fire Extinguisher Blow-out Door			
Engine to Pylon Attach			
Sucker Doors on Nose Ring Cowl			
#2 Engine			
Pylon to Wing Attach			
Cowl Doors			
Fire Extinguisher Blow-out Door			
Engine to Pylon Attach			
Sucker Doors on Nose Ring Cowl			
Flap Wells			
Aft Lower Spar Cap			
Flap Jackscrews, Flap Tracks, & Flap Drain Holes			
Life Raft Liners and Brackets			
Lower Surfaces in Flap Well			
Landing Lights and Housings			
Wing to Fuselage Fillet Panels			
All Structure in Wing to Fuselage Fillet Area Covered by Fillet Panels			
Note: Remove Aft Wing to Fuselage Fairing for Inspection			
Right Wing			
Wing Tip Area			
Wing Tip Light			
Aileron Access Panels			
Aileron Cove Area			
Aft Lower Spar Lip			
Push/Pull Rods and Bearings			
Leading Edge Panels			
Bleed Air Ducts			
Lower Lip/ Forward Spar Cap			
#3 Engine			
Pylon to Wing Attach			
Cowl Doors			
Fire Extinguisher Blow-out Door			
Engine to Pylon Attach			
Sucker Doors on Nose Ring Cowl			
#4 Engine			
Pylon to Wing Attach			
Cowl Doors			
Fire Extinguisher Door			
Engine to Pylon Attach			
Sucker Doors on Nose Ring Cowl			
Flap Wells			
Aft Lower Spar Cap			
Flap Jackscrews, Flap Tracks & Flap Drain Holes			
Life Raft Liners and Brackets			

Lower Surfaces in Flap Well			
Landing Lights and Housings			
Wing to Fuselage Fillet Panels			
All Structure in Wing to Fuselage Fillet Area Covered by Fillet Panels			
Note: Remove Aft Wing to Fuselage Fairing for Inspection			
Interior Wing Dry Bay			
<u>Fuselage</u>			
Interior Nose Landing Gear Well			
Ribs/Stringers/Brackets			
Landing Gear Attach Area			
Area around Windscreen and Windows			
Windshield Wiper Attach Area			
Radome Attach Area			
Pitot Tubes/Attach Area			
Crew Entry Door & Attaching Area			
Longeron Area (Lt & Rt) (F.S. 1292 - 1398)			
Bilge Area (Forward of F.S. 451 Bulkhead)			
Static Discharge Ports			
Antenna Attach Areas			
Drain Holes in Bottom of Fuselage & Ramp			
Inside Belly Band & Attaching Area (F.S. 1292)			
F.S. 1292 Lower Bulkhead			
Forward Edge of Ramp			
Urinal Vents & Battery Vents			
Paratroop Door Areas			
Side Emergency Escape Door Area			
#1, 2, 3, & 4 Escape Hatch Areas			
Latrine Service Door Area			
External Power Door Area			
Hayloft Area (F.S. 1292 to 1398 in Fuselage Comp) and F.S. 1398 to 1725 Above Petal Doors)			
A/C Intake & Exhaust Louver Panels at Wing Root on Fuselage			
Ram Air Ducts at Wing Root			
A/C Exhaust Area (Bottom of Fuselage, Approx. F.S. 400)			
UARSI (Air Refueling Door) Area			
Air Vent for Flight Deck (Fwd Rt Side of Fuselage)			
Tail Cone Screen			
Door Area for Extendable Support Legs (Aft of Paratroop Doors)			
<u>Fuselage Interior</u>			
Area around Windows (Opening Type) (Lt & Rt Crew Compartment)			
Interior Fuselage (Just Inside Crew Entry Door)			
Lower Accessible Skin Below Electrical Racks & Crew Latrine (F.S. 451 & Forward)			
Bilge of Aircraft (F.S. 451 to 1292)			
Inside Cargo Ramp			
<u>Left Main Landing Gear, Well & Pod</u>			
APU Compartment (Including Air Intake & Exhaust Areas)			
Interior Main Landing Gear Door & Hinge Area			
Ribs, Stringers, and Doublers in Main Landing Gear Wheel Well			

Splash/Mud Guards (Fwd & Aft)			
Main Landing Gear Structure (Including Interior of Bogie Beam**)**			
Right Main Landing Gear, Well & Pod			
LOX Converter Compartment			
Ribs, Stringers, & Skin in LOX Compartment			
Interior Main Landing Gear Door & Hinge Area			
Ribs, Stringers, & Doublers in Main Landing Gear Wheel Well			
Splash/Mud Guards (Fwd & Aft)			
Main Landing Gear Structure (Including Interior of Bogie Beam)			
Empennage			
Lower Elevator & Horizontal Stab			
Elevator/Rudder Counterbalance Attach Well			
Elevator Well			
Horizontal to Vertical Stabilizer Attach Area			
Vertical Stabilizer Attach Area			
Dorsal Fin Area			
Rudder Hinge Access Panels			
Upper Surfaces and Walkway Areas			
Left and Right Elevator Access Areas			
Note: Remove Panel			
General Areas			
All Drain Hole Areas			
Seams			
External Straps			
Inadequately Sealed Areas			