



# Aging Aircraft Branch Overview

U.S. ARMY  
CORROSION  
SUMMIT  
2009



AMTC Steve Smith

# Report Documentation Page

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# Corrosion Cell/AAB

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Working specifically on supporting programs like sheltering, dehumidification and other corrosion prevention methods. Leveraging DoD and industry on joint initiatives to mitigate corrosion

Coordinate with CG Headquarters and Aviation Facility Manager to support initiatives which improve mission readiness and reduce life cycle costs



Among the challenges the services face in keeping their equipment and supplies in good operating condition is corrosion caused by exposure to the environment. GAO-06-709



# Coast Guard Corrosion Program Goals

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## Where the Rubber Meets the Road.....

Identify and Implement Real Time Corrosion Mitigation Initiatives.

- Introduce State-of-the Art Technology.
- Institute a Continuing Comprehensive Corrosion Training Program.
- Establish an Extensive Corrosion Mapping Program.
- Cultivate an Aggressive Corrosion Preventative Advocate Program.
- Construct Environmental Severity Indices.
- Implement a Dehumidification Program.
- Drive PDM and MPC Schedules.





# U.S. Coast Guard Aircraft

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**HH60**  
**41 Aircraft**  
**8 Air Stations**

Total Aircraft: 199

Total Air Stations: 27  
(Including HITRON & APO)



**HU25**  
**23 Aircraft**  
**5 Air Stations**



**HH65**  
**99 Aircraft**  
**17 Air Stations**



**HC144**  
**3 Aircraft**  
(5 additional on order)  
**1 Air Station**



**HC130**  
**33 Aircraft**  
(incl. 6 "J" models)  
**5 Air Stations**



# Corrosion in Coast Guard Aviation

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- Age of Aircraft
- Environmental Severity
- Operational Demands
- Remote Deployments
- Hanger Deck Experience Level
- Rescue Swimmer Ops
- New Deepwater/Homeland Security Challenges





# Corrosion Prevention Advocate

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Drives the Air Station Corrosion Program...

- Ownership
- Prime Duty
- Billet (E7/E6)
- Water Testing
- Provide Training
- Approved Chemical List
- Station TIMI / Eng Instruction
- Report Directly to Engineering Officer





# Logistics Compliance Inspections

Ensure Your House is in Order ...

- Evaluate Effectiveness of Corrosion Control Program
- CPA Involvement
- Engineering Instruction
- Adherence to Process Guide
- Aircraft Inspections





# Water Analysis

Tested Semi-Annually by CPA

Aircraft Computerized Maintenance System (ACMS)

- Dissolved Solvents < 500 ppm
- Chlorides < 50 ppm
- pH: 6 – 8
- HH65C Turbomeca requirements

MPC – GS 159001.0





# Aircraft Cleaning

Most Effective Tool in Preventing Corrosion  
Required: Hot Water (120-140 Degrees) & Foamers

## C-130

Wash: 2 Weeks (Flap/Wheel Wells)

Wash: Monthly (Fuselage)

## HU-25

Wash: Weekly

Rinse: Daily (Engines)

## HH-60

Wash: Daily & 14 Day Detail Inspection

Rinse: 50' Salt Water Hover

## HH-65

Wash: After last flight of day/Post Flight

Rinse: Flights below 500 feet

Wash: For 7, 14, 30 inspections





# Corrosion Prevention Compounds

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## C-130

ACF-50: Fogging airframe application /Amalgard

## HH60 / HH65

Fluid Film - Fogging w/ Liquid A

## HU-25

Mil-PRF-81309 Type 1 - Fogging

## New Revision

MIL-PRF-81309

Mil-PRF-85054





# Corrosion Training

➤ Aircraft Corrosion Control - Pensacola FL. (Air Force)

Course Code # 500783 (Resident and Exportable)

➤ Advanced Composite Technology - Sparks, NV

Course Code # 140200 (Resident and Exportable)

➤ Aging Aircraft Corrosion Control

(Fills requirement for Corrosion Process Guide)

➤ Annual CPA Seminar (Sandia Natl. Labs)

Now includes training for Student

Engineering Officers





# Sheltering & Dehumidification

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GAO-06-709 Report

Reports to Congressional Committees June 2006

**Higher rates of corrosion result in increased repairs and replacements, drive up costs, and take critical systems out of action, reducing mission readiness. Corrosion can also reduce the safety of equipment items. Although reliable cost data are not available, estimates of corrosion costs DOD-wide have ranged from \$10 billion to \$20 billion annually.**

## 3 Month Study Elizabeth City



Ambient



H60 Hangar



DRS Climate  
Controlled Hangar

**One Army study showed that sheltering equipment in a humidity-controlled facility had a return on investment, at minimum, of \$8 for every \$1 invested.**



# Battelle Corrosion Severity Test Results

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3 Month Outdoor Exposure  
E-City Air Station



12 Month Indoor Exposure  
E-City HH-60 Hanger



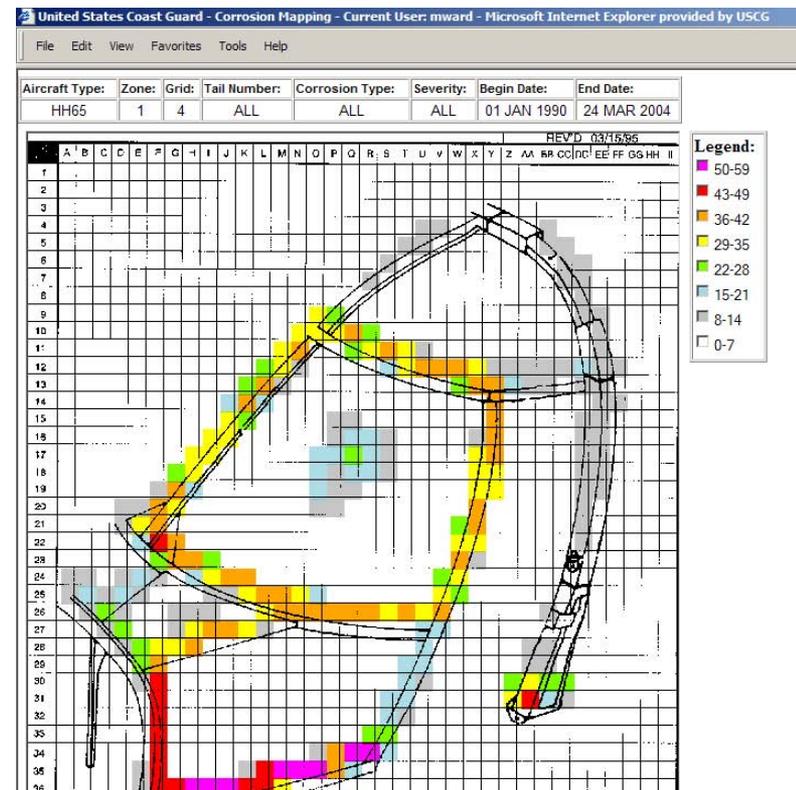
12 Month Indoor Exposure  
HMF Environmentally Controlled



# Corrosion Mapping

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- Physical Airframe inspections
- Target Specific Grid/Zones
- Currently Depot Only
  - Light – 7,684
  - Moderate – 1,988
  - Severe – 3,840
  - Other – 2,746
  - Total – 16,258
- ACMS - ALMIS Data Base
- Pictorial & Data Views



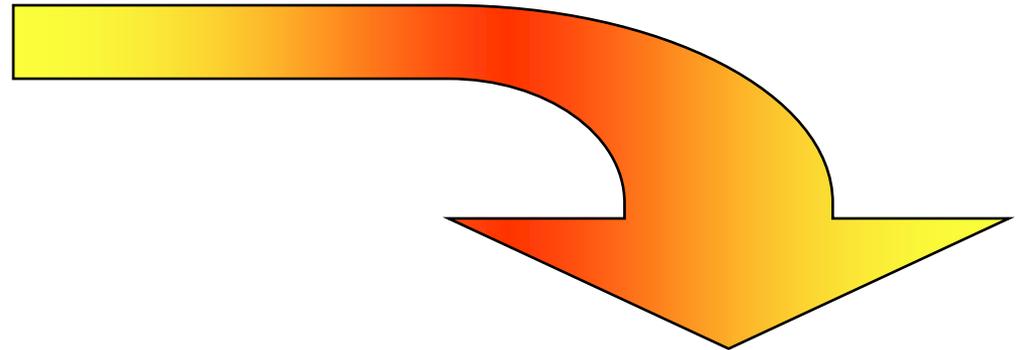


# Dehumidification Program

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Bringin' Arizona to the Air Stations



USCG Air Stations



**Maintaining low humidity levels reduces corrosion because moisture is a primary cause of corrosion.**

**GAO-06-709**

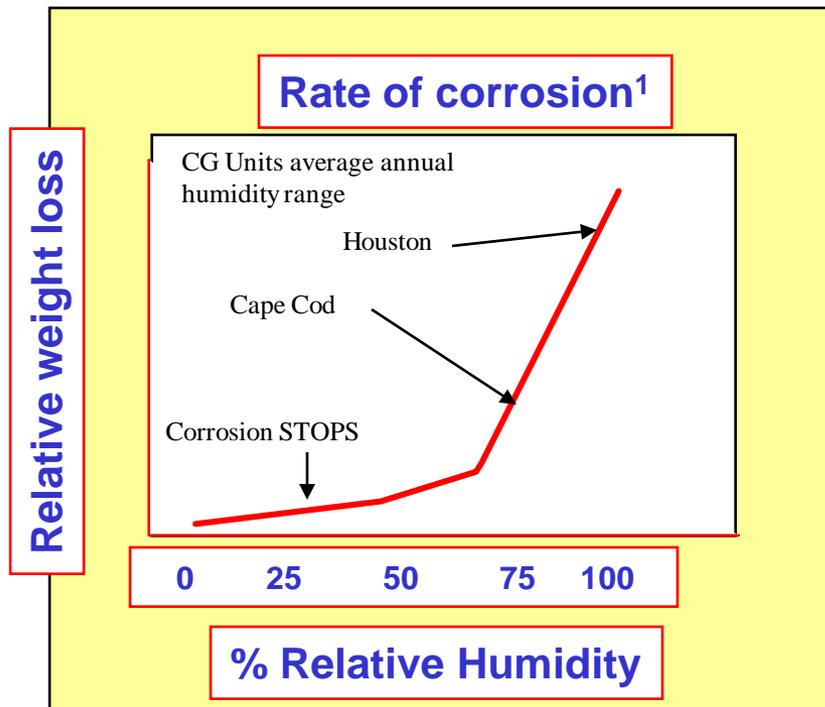


# DH & Corrosion Rates/Avionic Benefits

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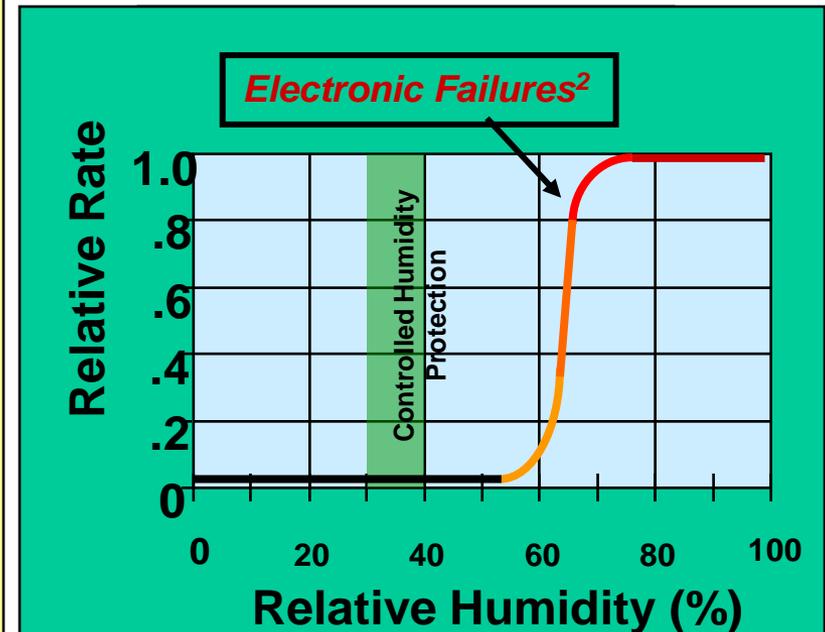
- Why use Dehumidification? Reduction in Relative Humidity (moisture). A dry airframe is a happy airframe.
- Corrosion increases at RH levels above 60%. Below 45% RH, corrosion process virtually ceases.

(Source: Naval Audit Service 025-95)



<sup>1</sup> Vernon, W. H. J. (1926).

MTBF greatly reduced with humidity levels below 50%



<sup>2</sup> Sandia National Laboratories



# Dehumidification Efforts

Site assessments complete at all CG Prime Units.

## Requirements:

- Ease of use – On /off in 5 minutes
- Lower relative humidity in 1 hour to at or below 40% RH
- Hangar / ramp operations
- Temperature / Relative Humidity
  
- C130/HH60 – Elizabeth City, NC
- HH65 – Atlantic City, NJ
- HU25 – Mobile Alabama

Units have been delivered to all Prime Units, OT&E underway.

**Note:** One Army study showed that sheltering equipment in a humidity-controlled facility had a return on investment, at minimum, of \$8 for every \$1 invested.





# Dehumidification Increases Readiness & Availability

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- **20% increase in aircraft availability.**
- **24% decrease in “no fault found discrepancies.**
- **15% decrease in unit level maintenance of avionics\***

\* Source: United Kingdom testing on the Tornado aircraft.



**Higher rates of corrosion result in increased repairs and replacements, drive up costs, and take critical systems out of action, reducing mission readiness.**

**GAO-06-709**





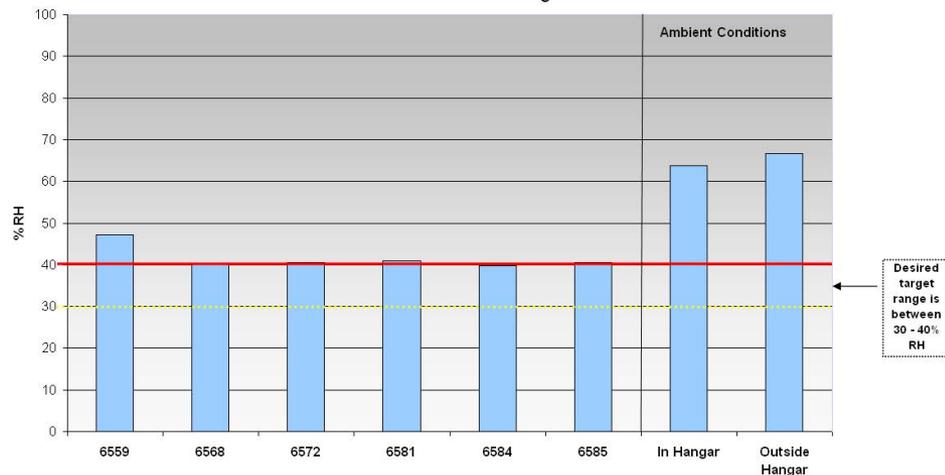
# DH Metrics

- **Exceeding 8 hrs/day**

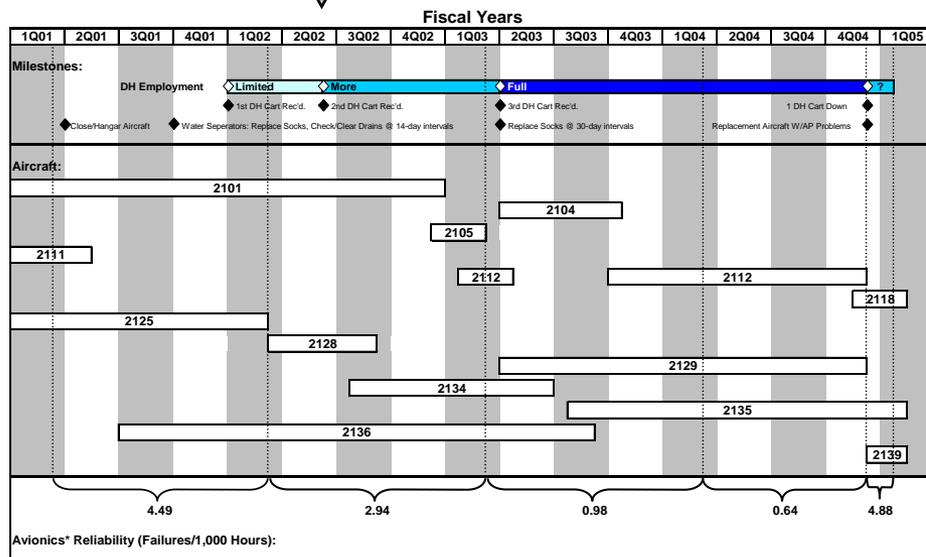


- **Increased Reliability**

CGAS Atlantic City Average RH  
in each HH-65 & Hangar



Summary 10 May - 31 August 2006



**Data that could help reduce corrosion of pre-positioned assets are not available. They are not available because the services consider this information to be a low priority and do not systematically collect it.**  
GAO-06-709

\* Avionics composite average of APC-80M, APA-80M, 618M-3A, SCC-807, ADC-80, and SCD



# New DH Carts from

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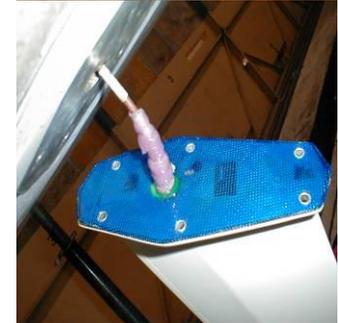




# Wiring Corrosion Prevention

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- Use CPCs like MIL-C-81309 to prevent cannon plug corrosion. Develop a training program for aircraft aging wiring.
- Implemented the use of Avdec SLG to prevent cannon plug corrosion.
- Implemented the use of Avdec antenna gaskets to prevent corrosion.

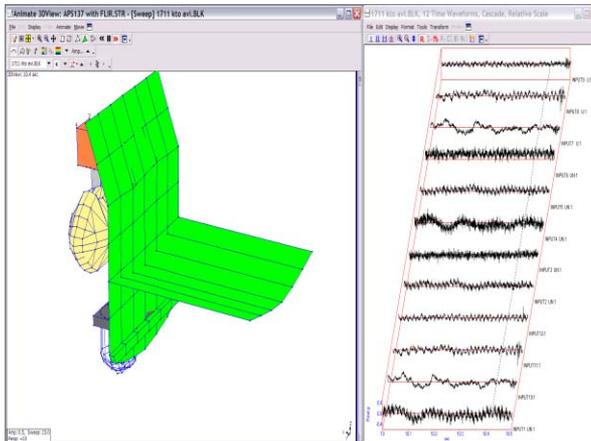




# Vibration Lab (Technical Capabilities)

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- Helitune Field Support
- Real-Time Dynamic Data Acquisition and Analysis
- Historical Data Archive & Trending
- Model Testing



Commanding Officer  
US Coast Guard ARSC  
Engineering Vibration Lab  
Hwy 34, Bldg 100  
Elizabeth City, NC 27909

Attn: AMTC Ramirez or Jim Cowgill  
Phone No. 252-335-6620/6835  
D05-SMB-ARSC\_Vibe\_Lab@uscg.mil



# USCG Nondestructive Inspection

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Tools used to detect metallic and non-metallic defects and evaluate / monitor for limitations after repairs



Bond master style instrument to determine Unbond, debonding and disbonding in composite materials.



Ultrasonic Method currently being trained To detect corrosion and measure material thicknesses

Rusty Waldrop  
USCG NDI Program Manager  
[Rusty.G.Waldrop@USCG.MIL](mailto:Rusty.G.Waldrop@USCG.MIL)  
252-335-6935



Radiography Currently in use at ARSC



Thermal Imaging acquisition system Currently being reviewed for depot level Maintenance



Staveley Eddy current machines, Currently being used in the fleet..



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# Partnership Industry Sister Services

Ongoing relationship with Joint Council of Aging Aircraft (JCAA) provides unique opportunities through Corrosion Steering Group (CSG)

- Funding for HH60 AvDec gaskets
- Funding for magnesium coating evaluation

Interaction with Office Secretary Defense (OSD)

- Guidance through a focused corrosion Team effort

Army/Air Force Corrosion Office / NAVAIR



# Control or Prevention

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# Control or Prevention

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# No Magic Bullet

Basic Maintenance Practices

Ownership / Buy In

Attention to detail

Pride in your efforts





# Questions?

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AGING AIRCRAFT IPT: "WHAT'S EATING YOU?"

**Website: [http://cgweb.arsc.uscg.mil/eisd/content/corrosion\\_control/corrosion\\_control.cfm](http://cgweb.arsc.uscg.mil/eisd/content/corrosion_control/corrosion_control.cfm)**

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