HC-130: The Cost of Corrosion

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AFLCMC/WIU
SOF/PR and Rotary Division
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SOF/PR Mission Design Series

- **Fixed Wing**
  - AC-130U/W (16/12)
  - EC-130J (7)
  - HC-130N/P/(H)N (13)
  - MC-130/H/P (18/4)

- **Rotary Wing**
  - HH-60G (97)
  - TH-1H (28)
  - UH-1N (62)

SOF/PR Supports multiple Lead Commands – ACC, AETC, AFGSC, AFMC, AFRC, AFSOC, ANG, PACAF, & USAFE

- **WIU also supports** AC/MC/HC-130J, CRH, UH-1 Replacement
HC-130N/P
Overview

• Purpose
• The Big Picture: Cost of Corrosion
• HC-130 Corrosion IPT
  – The Issue: What Went Wrong?
  – Root Cause Process
• Enterprise Corrosion Case Study
  – Lessons Learned
• Impact
• Summary
Purpose

• Provide synopsis of events leading to Corrosion Control Issue which forced early retirement of six HC-130 aircraft
• Discuss impacts to Personnel Recovery mission
• Provide lessons learned for all levels of leadership
Big Picture: Cost of Corrosion

- Annual corrosion cost for AF aviation and missiles ~$5.5B
- ~2.9M hours of non-availability (~18% of total non-availability)
- Preventative maintenance accounts for ~2/3 of total corrosion related non-availability
- Corrosion cost as a percentage of maintenance is high
- An increased emphasis on corrosion prevention should result in improved corrosion-related aircraft availability

Data from “Estimated Impact of Corrosion on Cost and Availability of DoD Weapon Systems”, Mar 16 by LMI Report SAL4IT2 p. 4-5
Issue: What Went Wrong

- Jun 2015: 920th Maintenance Group (MXG), Patrick AFB discovered severe corrosion on their HC-130P aircraft; 920th grounded all six HC-130s
- Jul 2015: IPT stood up to find Root Cause (RC)
  - Multiple orgs from across AFMC, AFRC, AMC, HAF/A4L
- Nov 2015: RC-IPT determined 4 primary factors as Root Cause for corrosion
  - Inadequate Corrosion Prevention and Control Program (CPCP) at Patrick AFB
  - Inadequate field & depot level maintenance inspection/repair
  - Inadequate Inspection Requirements
  - Highly corrosive operating environment

- Dec 2015: AFSC & AFLCMC CCs stood up cross-center Tiger Team
- 18 Enterprise-wide action items identified (7 c/w)
- Informed AFMC/CC & CSAF; updates at PSSB
Root Cause IPT Process

- Developed “reality chart” for HC-130s at Patrick
- Reviewed complete set of C-130 scheduled maintenance requirements for definition/interval adequacy
  - Compared 486 findings to over 5,600 C-130 requirements
- Collected/analyzed data from every maintenance interval
  - Depot Work Control Docs and unpredicted findings
  - T.O. 00-25-107 requests for technical assistance
  - Unit acceptance inspection photos
  - IMDS data for maintenance trends
- Subject Matter Experts reviewed data
- Compared data to reality chart; identified key contributors
- Assembled findings in report & out brief
  - Status and actions assigned to PSSB
  - AFMC/CC directed enterprise corrosion case study

Note: Color does NOT indicate severity of corrosion. Some areas found by the unit are NOT included in this graphic.
**What did we learn?**

**Training, Materiel, Leadership & Education**

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<tr>
<th>Training</th>
<th>Materiel</th>
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<tr>
<td>1) Emphasize field identification prior to aircraft entering depot maintenance</td>
<td>5) Ensure proper materials (e.g., tape, corrosion preventative compound) available and utilized</td>
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<td>2) Improve depot identification/repair during inspection</td>
<td>6) Emphasize existing corrosion preventative schemes utilized</td>
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<td>3) Incorporate wash contractor identification during aircraft washes prior to local inspection</td>
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<td>4) Ensure personnel maintain training currency</td>
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**Leadership & Education**

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<td>7) Heighten focus on identification and correction of corrosion issues</td>
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<td>8) Incorporate automated tools, coupled with thorough understanding of various operating environments, to better inform decision making (second and third order effects)</td>
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<td>9) Emphasize necessary corrosion control compliance over schedule compliance to limit/mitigate effects of corrosion</td>
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*Am I placing proper emphasis on CPCP in my sphere of influence?*
What Did We Learn?
Personnel, Facilities, Policy

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<tr>
<td>10) Increase utilization of Aircraft Structural Maintainers for Quality Assurance efforts</td>
<td>13) Factor in aircraft structural maintenance facility space and bio/environmental limitations</td>
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<td>11) Ensure adequate manning, qualifications, and prioritization of tasks to benefit corrosion control efforts and alleviate overwork, task saturation, and inefficiencies</td>
<td>14) Utilize adequate corrosion control facilities, particularly in deployed locations, could advance corrosion control efforts</td>
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<td>12) Empower Corrosion Managers across organizations to ensure appropriate corrosion preventative tasks are accomplished</td>
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<td>15) Ensure Work Specs &amp; Work Decks clearly define structural inspections under insulation blankets</td>
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<td>16) Depot maintenance Work Spec must ensure inspection of all appropriate areas</td>
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<td>17) Document longevity of protection schemes to better inform decision making</td>
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<td>18) Mature corrosion control efforts as systems age to mitigate effects of corrosion</td>
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<td>19) Use enhanced data to drive appropriate risk indicators to mitigate corrosion in a timely manner</td>
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<td>20) Emphasize Organic Product Spt Provider accountability to Product Spt Mgr for CPCP compliance</td>
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**Do I have sufficient resources? Are my procedures sufficient?**
HSI Learning Points
On Human-Related Requirements and Considerations

1) Human-centered requirements focus across the lifecycle positively impacts ops effectiveness.
2) Early & iterative determination of human capabilities and limitations is critical to system design.
3) *Long work hours* with a *limited manpower pool* will lead to degraded human performance.
4) Working conditions within the operating environment significantly affects user performance.
5) Timely/iterative *manpower and personnel analysis* reduces total ownership costs (TOC).
6) Input from critical SMEs is essential to achieving mission effectiveness.
7) During sustainment, application of *HSI principles* to *modifications* and upgrades is valuable.
8) HSI-related cost assessments can demonstrate impact of HSI domain tradeoff effects on TOC and total system performance.
Impact

Six HC-130s grounded & ultimately retired (25% C-130 PR fleet)

- Initially operated without HC-130s for four months
  - HC-130N/Ps and C-130Hs planned for retirement were diverted to Patrick AFB to fill operational gap due to zero available a/c
  - In order to maintain currency/qualifications aircrew had to fly at other bases

- Aircraft retired 2 – 4 years earlier than planned
  - Impacted HC-130J recapitalization fielding plan
  - AFRC responsible for ~$1M unplanned a/c retirement cost

HC-130P/N Unit Cost: $77M (FY08 replacement cost)*
PAFB retires 6 HC-130P/Ns

*AF.mil Fact Sheet HC-130P/N

$472M!
Summary

• Corrosion is a ~$5.5B effort within AF maintenance
• Increased emphasis being applied to address issue
• Be on the lookout for similar issues within your sphere of influence
• How can YOU make a difference?
Questions?