Aircraft Cleanability and Corrosion Issues
26 February 2008
Craig Matzdorf
NAVAIR
**Aircraft Cleanability and Corrosion Issues**

Surface Finishing and Repair Issues for Sustaining New Military Aircraft Workshop, February 26-28, 2008, Tempe, AZ. Sponsored by SERDP/ESTCP.
Outline

• Overview of M&P Linked to “Cleanability”
• Overview of M&P Linked to Corrosion Issues
• Efforts Underway
• M&P Technology Gaps for Sustaining Aircraft
M&P Needs Linked to Cleanability

• **Cleanability drives:**
  – Cosmetic painting and weight gain
  – Additional corrosion maintenance, reduced lifetime

• **Materials & Processes**
  – Topcoats: weathering, gloss & gloss retention, cleanability- as painted and after weathering or corrosion exposure
  – Semi-aqueous cleaners- AF and NAVAIR spec products
  – Cleanability Test- Used in topcoat and cleaner specs
  – Wash Pads
  – Wash and Rinse Intervals
  – Basing: geographic location, sheltering
M&P Needs Linked to Corrosion

- Mildew removal
- Chemical paint remover, field use
- Paints
  - Self-Priming Topcoat
  - Unauthorized aerosol paints
  - Primers & Topcoats
- Improved Corrosion Preventive Compounds
  - Navguard
  - MIL-L-87177
  - Fluid Film CID
- Pre-coated Fasteners- Fred Lancaster brief tomorrow
- Boot and Tape removal
- Conversion Coating Touch Up Pens
- Improved -85570 Type II Cleaners
- Repair of new coatings
Geographic Assessment

Comparison of Corrosion Rate Data for Navy Sites to Worldwide Distribution: 1-Year Cumulative Corrosion of 6061-T6 Aluminum

Corrosivity Sensor (AF)

Carrier Exposure Rack on CVN 74

Navy/Marine Aviation and Air Force Land Sites

(Abbott and Kinzie, 2004)
Naval Aviation Sheltering

EA-6B shelters at Whidbey Island, WA

T-45 shelters at NAS Meridian

- Evaluation of impact on aircraft corrosion (and other maintenance) planned for 2006-2008:
  - EA-6B at NAS Whidbey, WA
  - T-45 at NAS Kingsville & NAS Meridian
  - F/A-18 at NAS Oceana, VA
- Assess aircraft performance compared to sensor data
- EA-18G at Whidbey NAS- potential implementation during airfield upgrade

Funding: OSD Corrosion IPT and DLA Reliability Program
- Purchase and install shelters at Whidbey Island and Oceana (EOY 2006)
- Monitor performance of aircraft under shelters compared to control aircraft
- Install corrosivity sensors under shelter and next to shelter, collect data and compare results to aircraft

Corrosion Kinetics of 2024 T3 Aluminum At Navy Sites

Sheltering showing up to 5-fold reduction in corrosivity in carrier environment and similar attenuation at Tyndall AFB, FL
Corrosion-Inhibited Mildew Remover

- Joint NAVAIR & AMCOM assessment of reformulated Mildew Remover
  - Meets critical characteristics specified in MIL-PRF-85570 and ADS-61A-PRF cleaning specs
  - Effectively removes mildew without corrosion risk of bleach
- U.S. Patent applications filed for compositions & kit
- Composition and kit licensed to commercial supplier
- NAVAIR & AMCOM authorized in 2005
- Implementation pending FIFRA registration and NSN assignment
Paints

• Topcoats (MIL-PRF-85285)
  – CSG assessing properties of current topcoats with intent to upgrade overall topcoat requirement in spec or create new type for “APC” or “ELT” products with clearly defined performance requirements

• Primers
  – Current non-chromate products being field tested
  – Details in my talk tomorrow

• Unauthorized Aerosol paints: 2-prong attack to eliminate use
  – 2K products now authorized and being used (MIL-PRF-85285 and MIL-PRF-23377 products)
  – 1K products being assessed (MIL-PRF-81352)
    • Type I and Type III
Improved CPCs

• MIL-PRF-81309
  – Long-lived Internally-Applied Corrosion Preventive Compound ("Navguard")
    • Multi-year F/A-18 Field Test underway
    • Product Licensed to Industry
      - Commercial products being tested against requirements to MIL-PRF-81309 (Armick & Corrosion Technologies)

• MIL-L-87177
  – Raytheon test report delivered to NAVAIR
  – Decision on implementation pending

• Fluid Film
  – Commercial Item Description being developed by NAVAIR
**Tape and Adhesive Remover**

- **Objective-** Demonstrate & validate 3M TAR (Tape and Adhesive) Remover

- **Problem-** Mechanical removal of radome neoprene boots, polyurethane belly and leading edge tapes causes significant substrate damage – often these protective materials are not re-applied as a result

- **2008 Plans-** Dem/val of TAR product in field for squadron use, finalize testing and authorization
**Type II Touch Up Pen**

- **Objective** - Field test new MIL-PRF-81706 Type II products in applicator pen format

- **Problem** - NAVAIR has implemented Type II, non-chromate surface preparation for use under chromated primers. Two Type II touch up pen products are commercially available but have not been assessed.

- **2008 Plans** - Dem/val, qualify and implement (if successful) the Type II pens for “lead the fleet” use at FRC Cherry Point
RTU MIL-PRF-85570 Cleaner

• Objective- Assess and Implement Improved “RTU” or aerosol cleaners

• Problem- Current MIL-PRF-85570 Type I or II – Low cleaning efficiency – often high-pH deck cleaners used on A/C as well (shipboard)

• 2008 Plans- Review current “Sudsie Bubbles” use shipboard on A/C - 85570 Type I aerosol - Investigate OTS products to test against existing FRC cleaners/solvents
Technology Gaps for Sustaining Aircraft

- **Chemical Paint Stripper**- peroxide activated products not good enough
  - Need: Product that removes qualified primers and topcoats in field, at low temperatures, ~40 F, similar strip rates to methylene chloride

- **Semi-Aqueous Aircraft Cleaners**- not very good at cleaning aircraft soils, shelf-life stability issues
  - Need: More effective Type II (NAVAIR) and Type IV (AF) cleaners with improved shelf-life stability

- **Primers**
  - Need: Non-chromate primers with equivalent performance to chromated primers
  - Need: Water-reducible primers with similar barrier properties to solvent-borne primers

- **Topcoats**
  - Need: products with improved weathering, gloss retention, and corrosion performance with qualified primers (C and NC, solvent and water)