

Ground and Flight Testing of Non-Chrome Paint Systems; Part 2– Evaluation of Paint Systems

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Objectives

- Provide Supporting Data on Performance of Wide Range of Non-Chrome or Reduced Chrome Paint Stackups for Decisions Regarding **Chrome Elimination (This Briefing)**
- Evaluate Compatibility Between Combinations of Pretreatments, Primers, and Topcoat
- Evaluate Effects of Wide Range of Chemical Stresses on Corrosion Threats
- Evaluate Significance of A Severe Ground Exposure to Flight; i.e. **Acceleration Factors (Earlier Briefing)**

Review of Earlier Briefing

- A Large Flight and Ground Exposure Study Is Being Conducted To Evaluate Non-Chrome Paint Stackups In Comparison To Standard Chromated Paint Systems
- Emphasis is on Field Data
- Severe Coastal Environment Is An **Accelerated** Exposure Compared To Flight On Most USAF Assets
- Acceleration Factors Established For Painted and Scribed Samples
 - ~ 2:1 For Sensors On Beach vs. Sensor In Flight On Upper Fuselage (OML)
 - ~ 4:1 For Sensors On Beach vs. 2024 T3 In Flight

Conclusions From Flight Tests to Date (Sensor Data)

- Good Performance Time, Flying
 - Prekote/AE 2100/AE5000 (NC/NC) 4+ (a)
 - Alodine 5700/16708 TEP/99GY001 (NC/NC) 1.5 (b)
 - Alumigold/AE2100/ 99GY001 (C/NC) 1.5
 - Prekote/02GY040/Desothane HS (NC/C) 1.5
 - Prekote/02GY040/AE5000 (NC/C) 1.5

- Also Excellent Performance on Ground

(a) H60, P3, AH64A

(b) C130, C5, HC144

Acceleration Factor Application

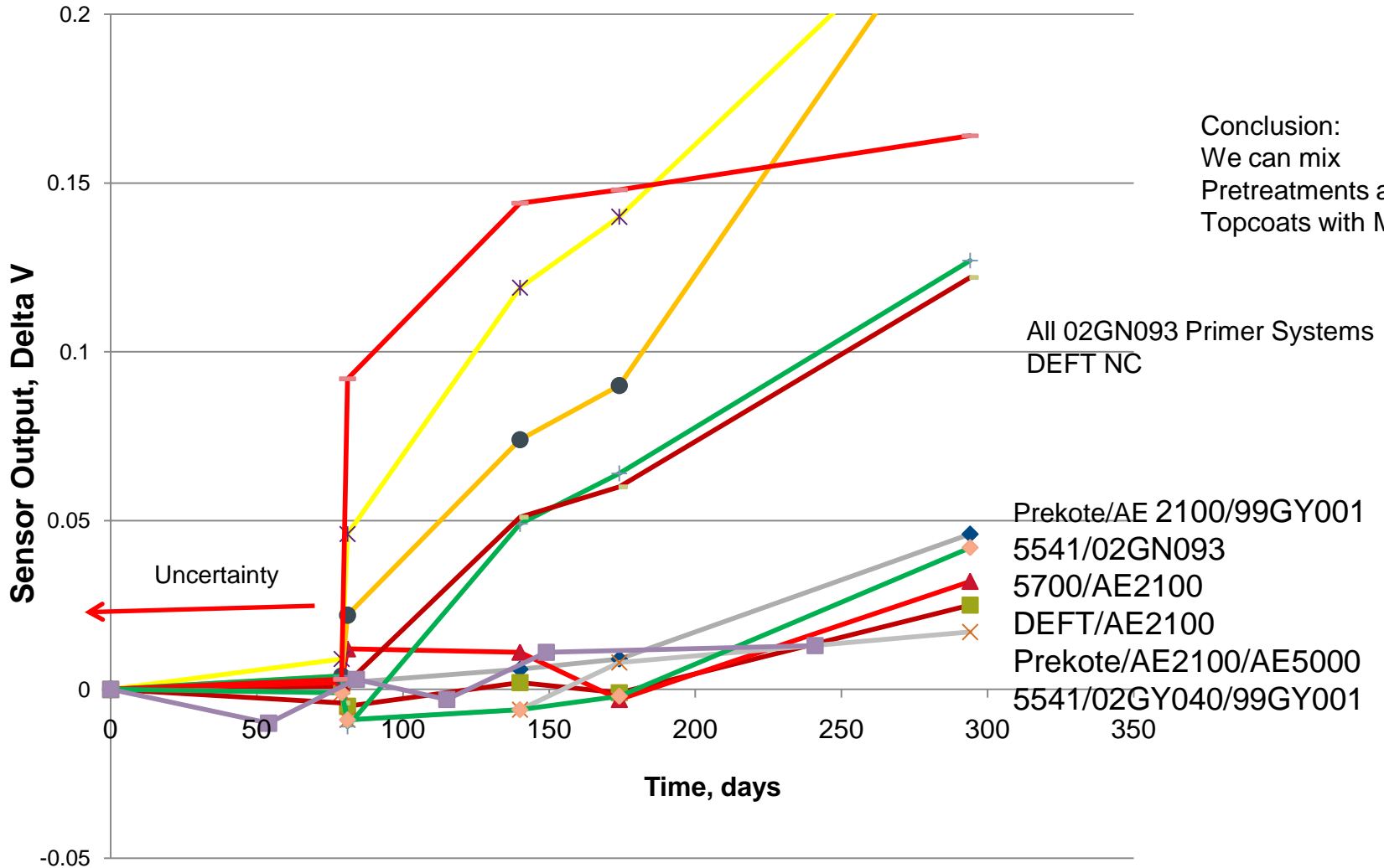
- Painted and Scribed 2024 AI Panels Require 2-4 Times Longer To Reach Visible Degradation Compared to Sensor Results
- Conservative Estimate = 4:1 Acceleration Factor For Severe Ground (Sensor) vs. Flight (2024 AI) For Worst Case Land Based Assets
- Significance of Sensor Results vs Painted 2024
 - Systems Deployed In 2007 Exposed to Equivalent of >10 Years On Wing of C130 and C5
 - Large Matrix Started 2009 Now Exposed to Equivalent of ~8 Years On Wing of C130 and Tail of C5

Best Performance Thru at Least 1 Year of Severe Ground Exposure

- Systems Showing Good Performance In Severe Environment to Date to At Least 1 Year on Sensors (=4+ Yrs Aluminum)

	»	<u>Sensor, Real Time</u>
– 5541/02GY040/99GY001 (C/C) –		4 yrs ID=4 (2007 ground)
– Alodine 1600/02GY040/99GY001 (C/C) --		1yr
– Alodine 1200s/02GY040/99GY001 (C/C) –		1 yr
– Alumigold/AE2100/AE5000 (C/NC) --		2 yr ID=2 (+ 2009 flight)
– TCP/AE2100/99GY001 (C/NC) –		1 yr
– Prekote/02GY040/AE5000 (NC/C) –		1 yr
– Alodine 5700/16708 TEP/99GY001 (NC/NC) –		1 yr ID=4 (+2009 flight)
– Alodine 5700/AE2100/AE5000 (NC/NC) –		1 yr
– DEFT/AE2100/99GY001 (NC/NC) –		1 yr
– Prekote/AE2100/AE5000 (NC/NC) --		4 yrs ID=2 (2007 ground and flight)
– Prekote/CA7236/CA9311 (NC/NC) –		1yr
– EAP9/CA7236/CA9311 (NC/NC) –		1 yr

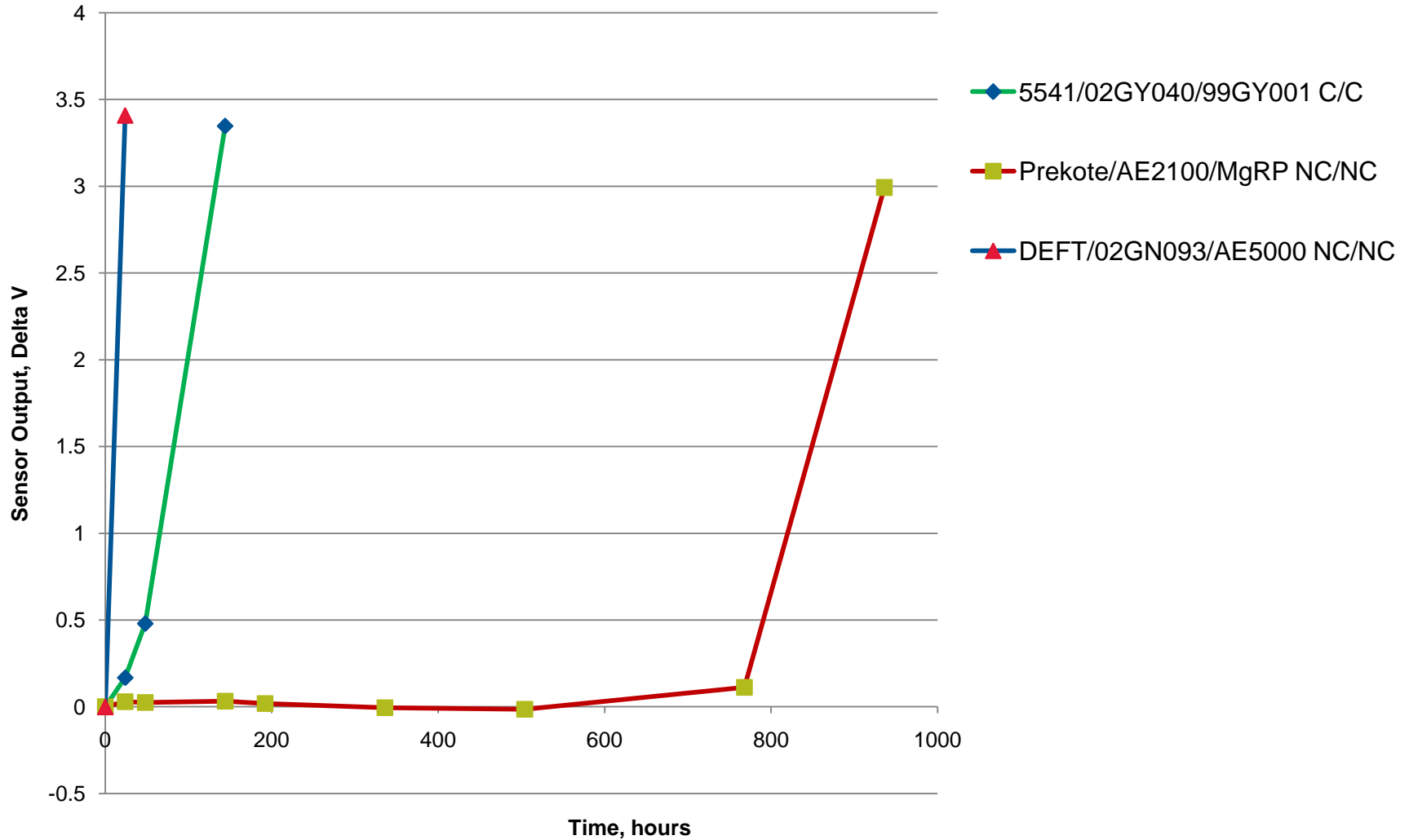
Effects of Pretreatments and Topcoats on Performance of MgRP and Comparisons To 02GN093 Primer; Daytona Ground Data



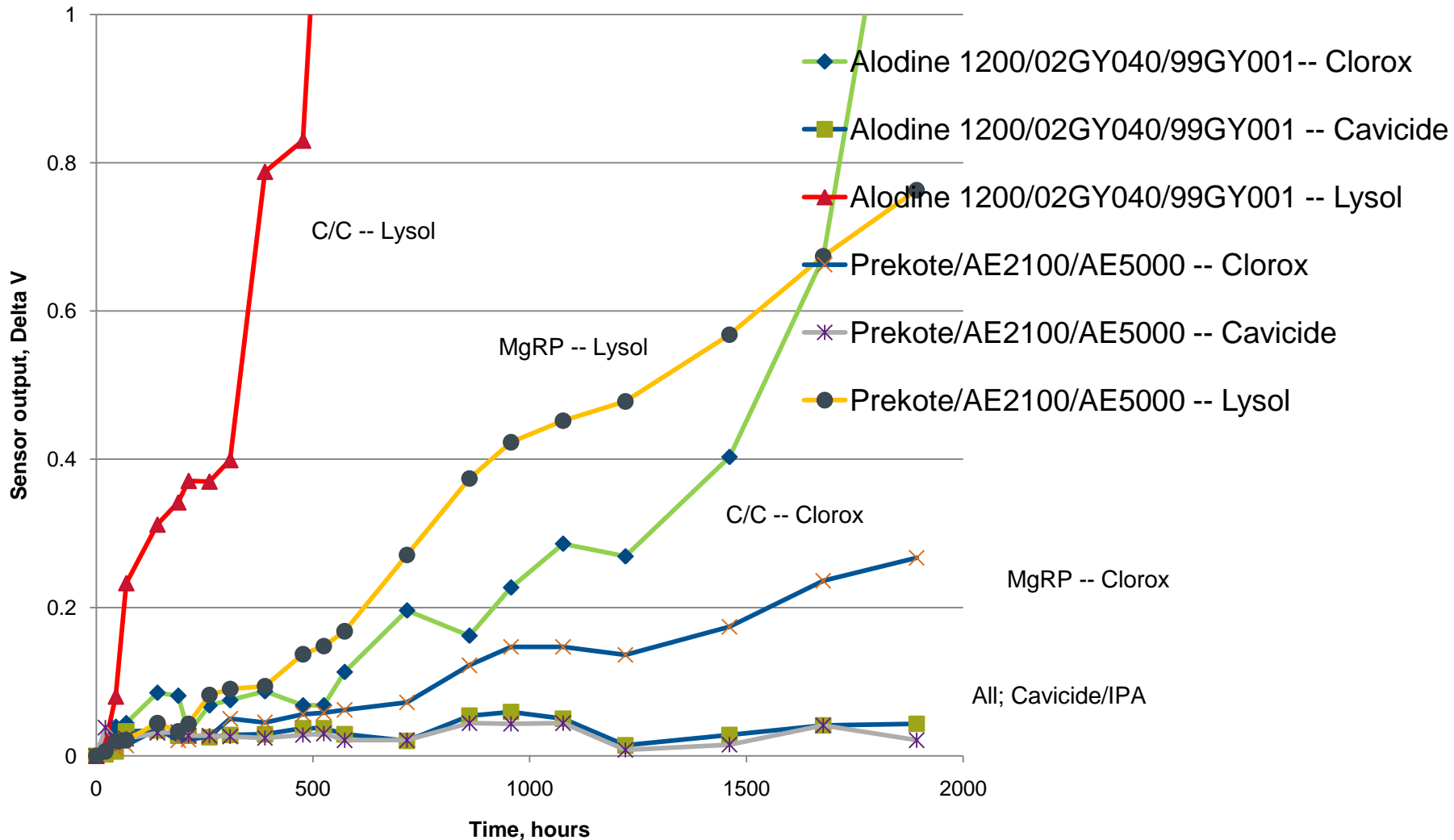
Effects of Other Chemical/Biological Stresses on Paint Systems

- The Threats From Other Chemical Stresses Are Real and Must Be Considered In Paint Evaluations
- One NC/NC System Has Shown Exceptional Resistance
- The Following Slides Show 3 Stress Examples
 - Urine – Bilges; Cockpits
 - Decon Solutions – General Use
 - Fungal Influenced Corrosion – IML; OML (TBD)

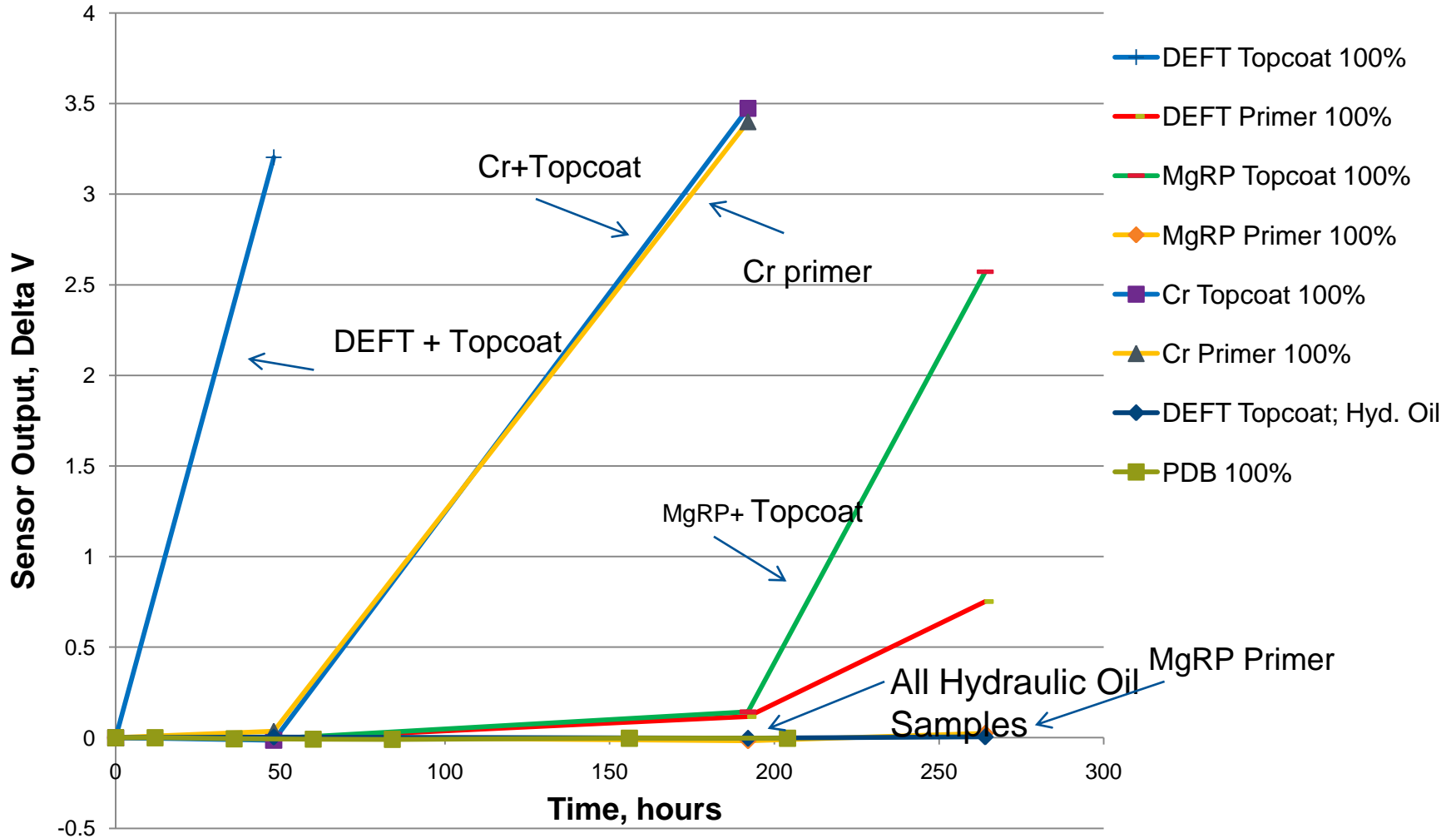
Effects of Urine on Corrosion Sensor Response For 3 Painted and Scribed Coatings; 30 C; 85% rh



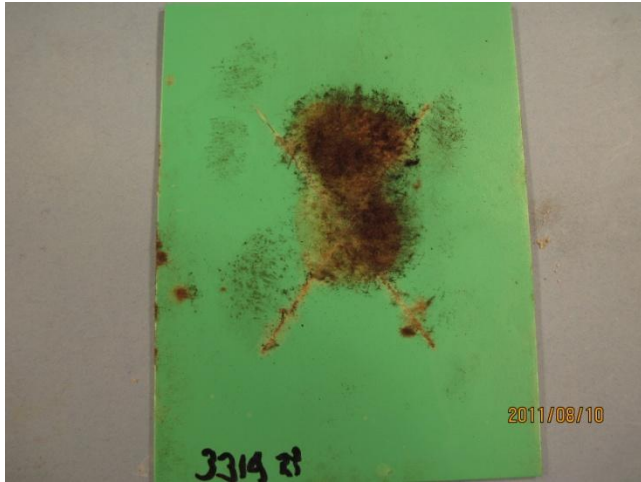
Effects of Disinfectants on Painted and Scribed Corrosion Sensors; 30 C, 85% rh; No Rinse Series



Painted and Scribed Sensors With 3 Primers (w and w/o Topcoats) Treated With Fungal Consortia In PDB Nutrient; Aged 30 C, 100 % rh



Effects of Fungal Growth on Painted and Scribed 2024 T3 Al With NC Primer Only



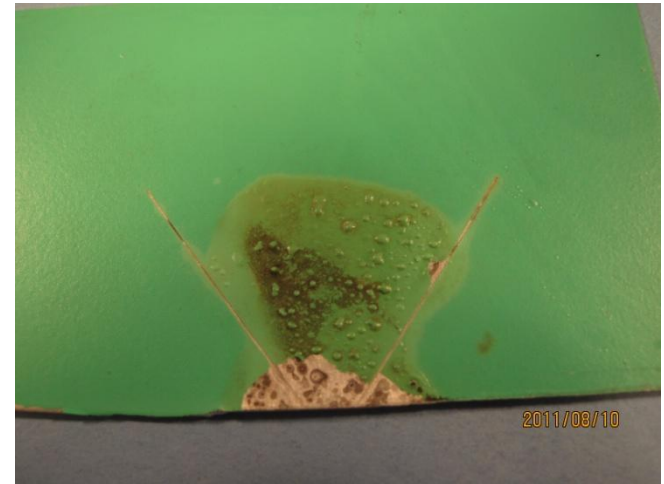
Intact Panel; 40 Days, 100% rh



After Cutting at Middle



SEM View of Aerial Hyphae/Growth



After IPA; Blistering, Pitting

Conclusions

- At Least 2 Totally Non-Chrome Systems Are Performing Well In Ground and Flight Tests
 - Data on Color, Gloss, and Chalking Being Developed
 - EIS Supporting Data being Developed
- Data For MgRP Appear To Eliminate Sole Source Concerns
- Other Systems Are Under Study; Possible That Other Competing Systems May Emerge
- All Data Support The Need To Thoroughly Evaluate Any New Paint System In The **Field**
 - Slow ?
 - Minimum of 1-2 Years In Field
- Need Still Exists For Better/More Realistic Lab Tests
 - ASTM B117 Not Realistic of Ground or Flight
 - Wrong Answers Otherwise