



Comprehensive Evaluation and Transition of Non-Chromate Primers within DoD

WP-201132

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Division

ASETS Defense
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Overview

- Purpose
- Project Team
- On-going efforts (Lab Validation)
- Demos
- Implementation
- Questions?

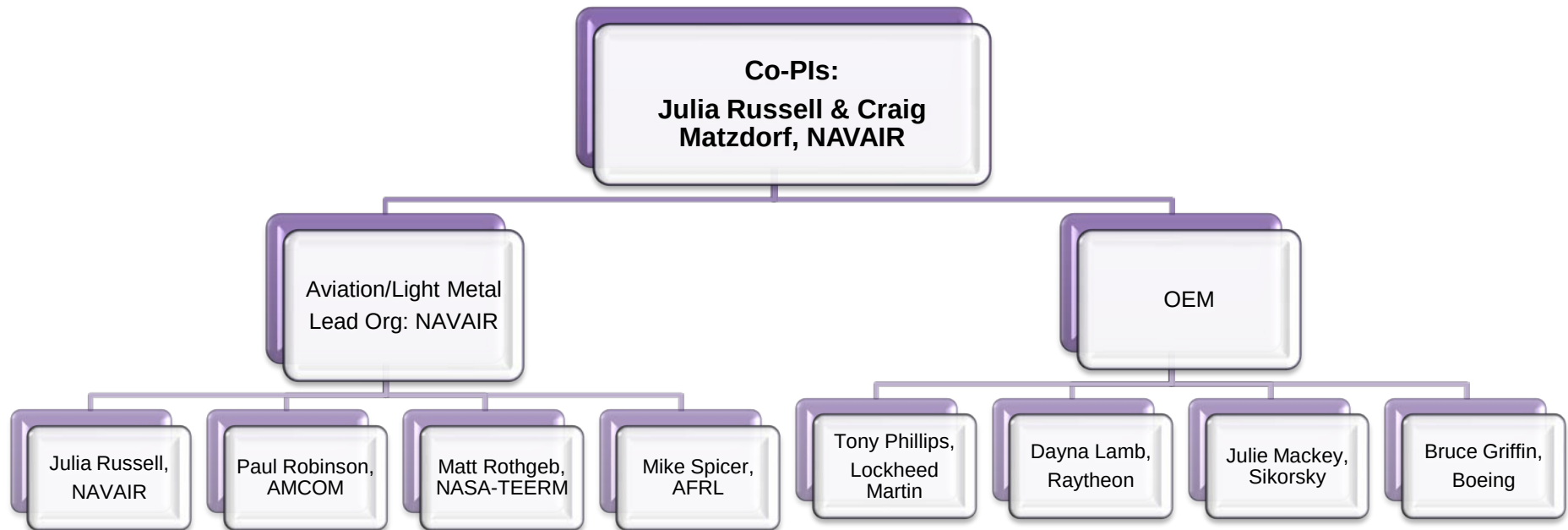


Objective/Purpose

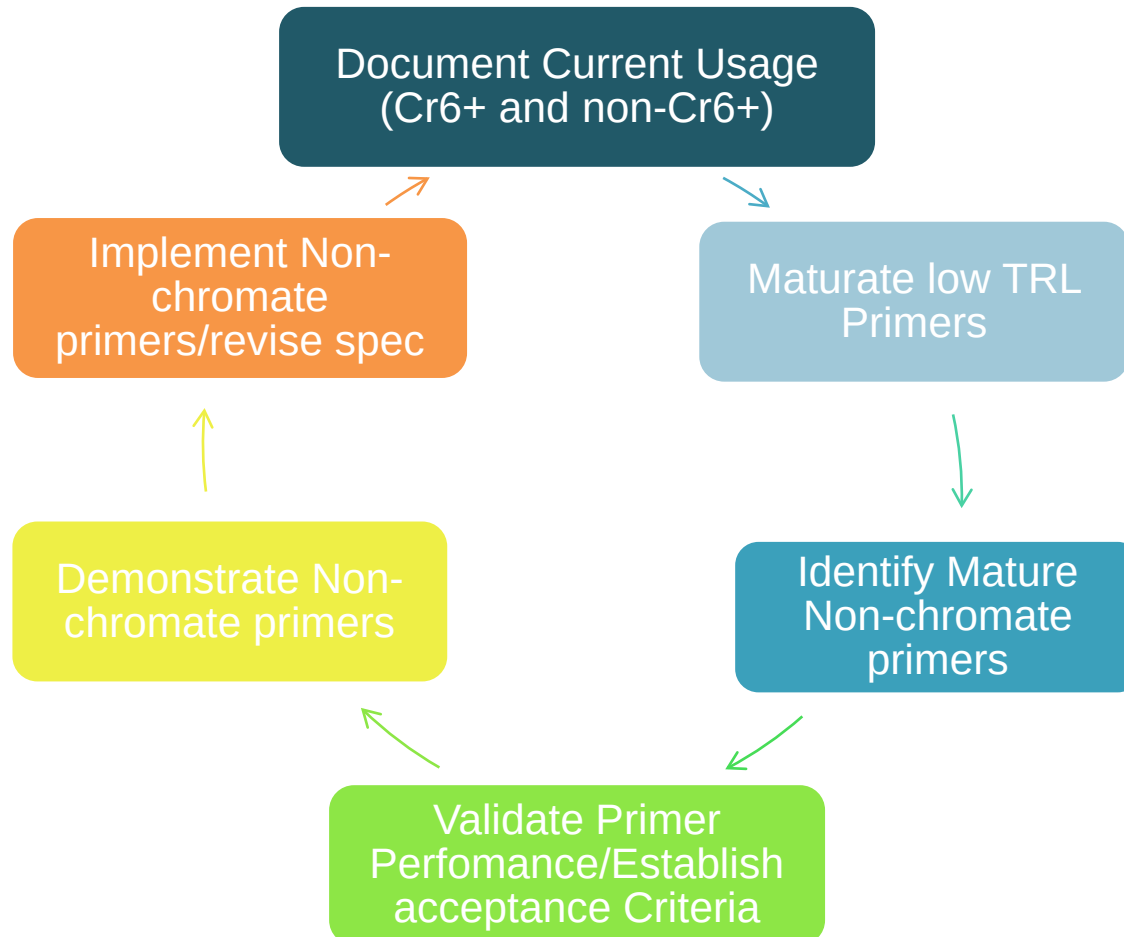
- **GOAL**
 - *“Top down” assessment of current NC primer technology, including coating process MRL and coating TRL*
 - *Dem/val NC primers and processes with sufficient process and coating maturity and invest in development of promising newer technologies*
- Test multiple substrates, surface conditions, exposure environments and coating combinations, comparing to CCC
- Joint service demonstration (Army, AF, USCG, USMC)
- Leveraged with NESDI Project #458 – focused on NAVAIR dem/vals



Project Team



Technical Objective



Technical Approach

Minimize Current Usage by identifying and filling gaps

“Top-down” vs. “bottoms up” assessment of Non-chromate primers

Develop DoD/service testing guidelines

Mature lower TRL primers

Modify primer specifications to account for improved testing procedures/new types of primers

Primer validation

- AF/NAVAIR
 - Mg Oxide Corrosion performance (Phase I – **on going**)
 - Skydrol Resistance (Phase II – **planning**)
- AMCOM
 - Mixed Metal (depot-level rework) metal-rich primer evaluation
- Crosslink Primer Development



US Navy P-8A & USAF KC-46

- BCA switched to non-chromate coating system for 737, 747, 767, 777 production lines:

Sol-gel & PPG CA7502



USN P-8A to replace P-3C

New coating system – Risk Item for PO



USAF KC-46A to replace KC-135

***BCA agreed to keep chromate primer on OML of EMD a/c**

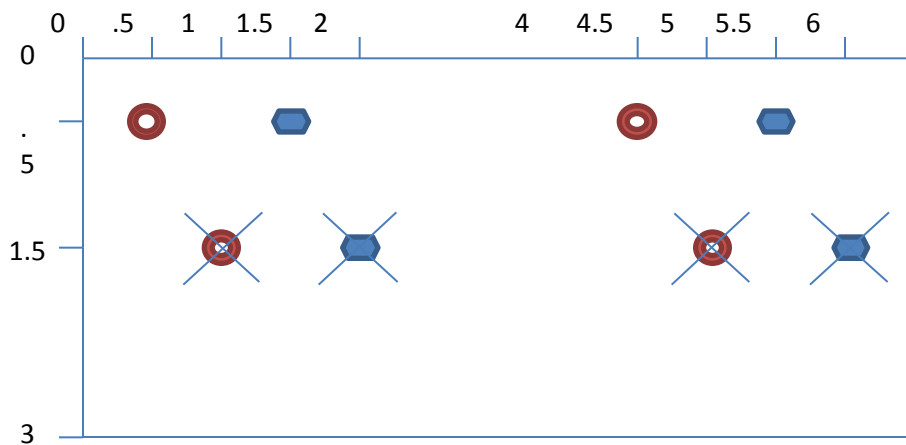
NAVAIR/USAF Statement of Need

- Solgel/CA7502 Coating system requires the use of acid-activated strippers
 - Banned use of acid-activated strippers in USN & USAF
- Compare PPG CA7502 to other Mg Oxide primer formulations and a chromate control.

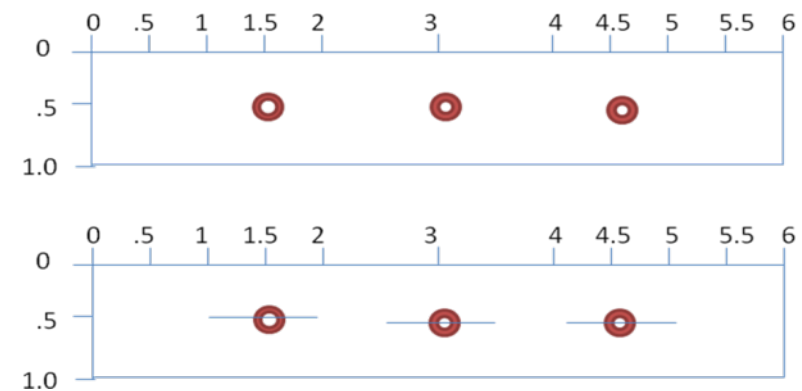
	Flat Panels (3"x5" or 6"x0.032")	NAVAIR Galvanic (3"x6"x0.25")	AF Galvanic
Substrates:	AA2024-T3 AA7075-T6 Clad AA2024- T3	AA2024-T3 AA7075-T6	AA2024-T3 AA7075-T6
Pretreatments:	Boegel EAP9 Alodine 1600		
Primers :	Akzo Nobel MgO 2111 PPG CA 7236 PPG CA 7211 PPG CA 7222 PPG CA 7233		
Topcoat	Deft ELT		
Corrosion tests:	ASTM B117 (x2) ASTM G85 A4	ASTM B117 ASTM G85 A4 Beachfront	ASTM B117 ASTM G85 A4 Beachfront

NAVAIR/USAF Statement of Need

- Compare & correlate NAVAIR and AFRL galvanic panel test methods



NAVAIR Galvanic Assembly



USAF Galvanic Assembly

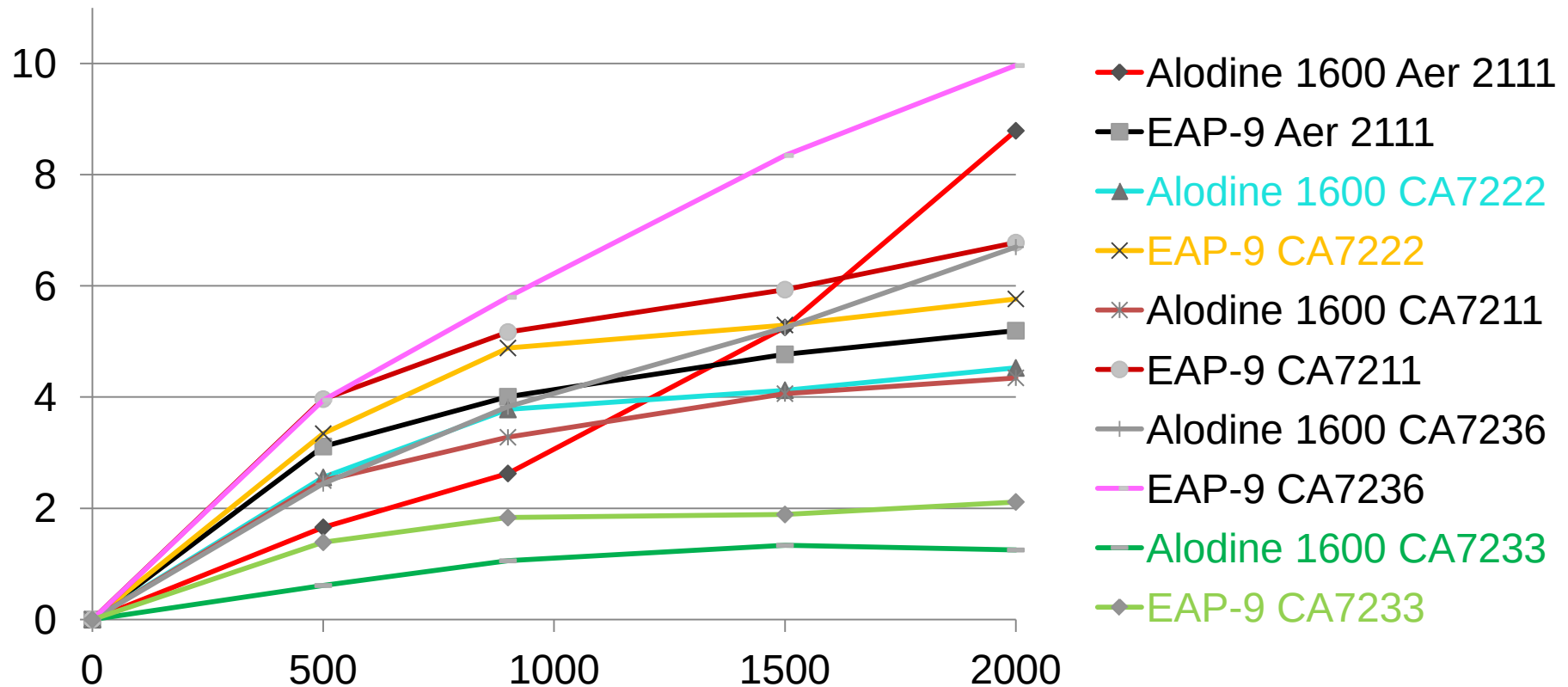
NAVAIR/USAF Testing to date

- Flat panel evaluation
 - ASTM B117: Complete (2000 hrs)
 - ASTM G85.A4: Complete (1000 hrs)
- Galvanic Panel evaluation
 - ASTM B117: Complete (???)
 - ASTM G85.A4: Complete (336 hrs NAVAIR; 500 hrs USAF)
 - Beachfront: on-going



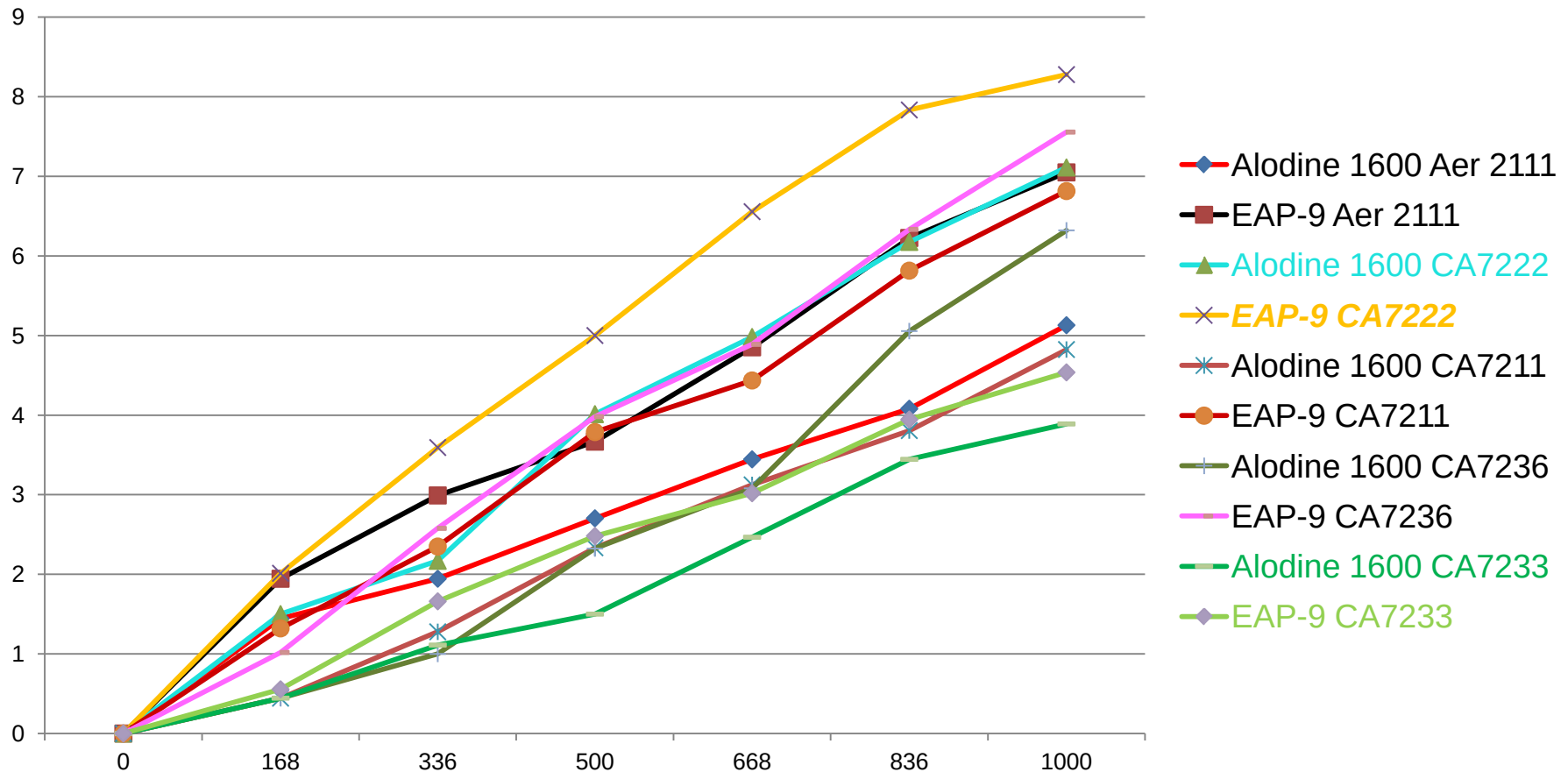
Flat Panels ASTM B117 2000 hrs

Coating System (All Ratings)



Flat Panels ASTM G85.A4 1000 hrs

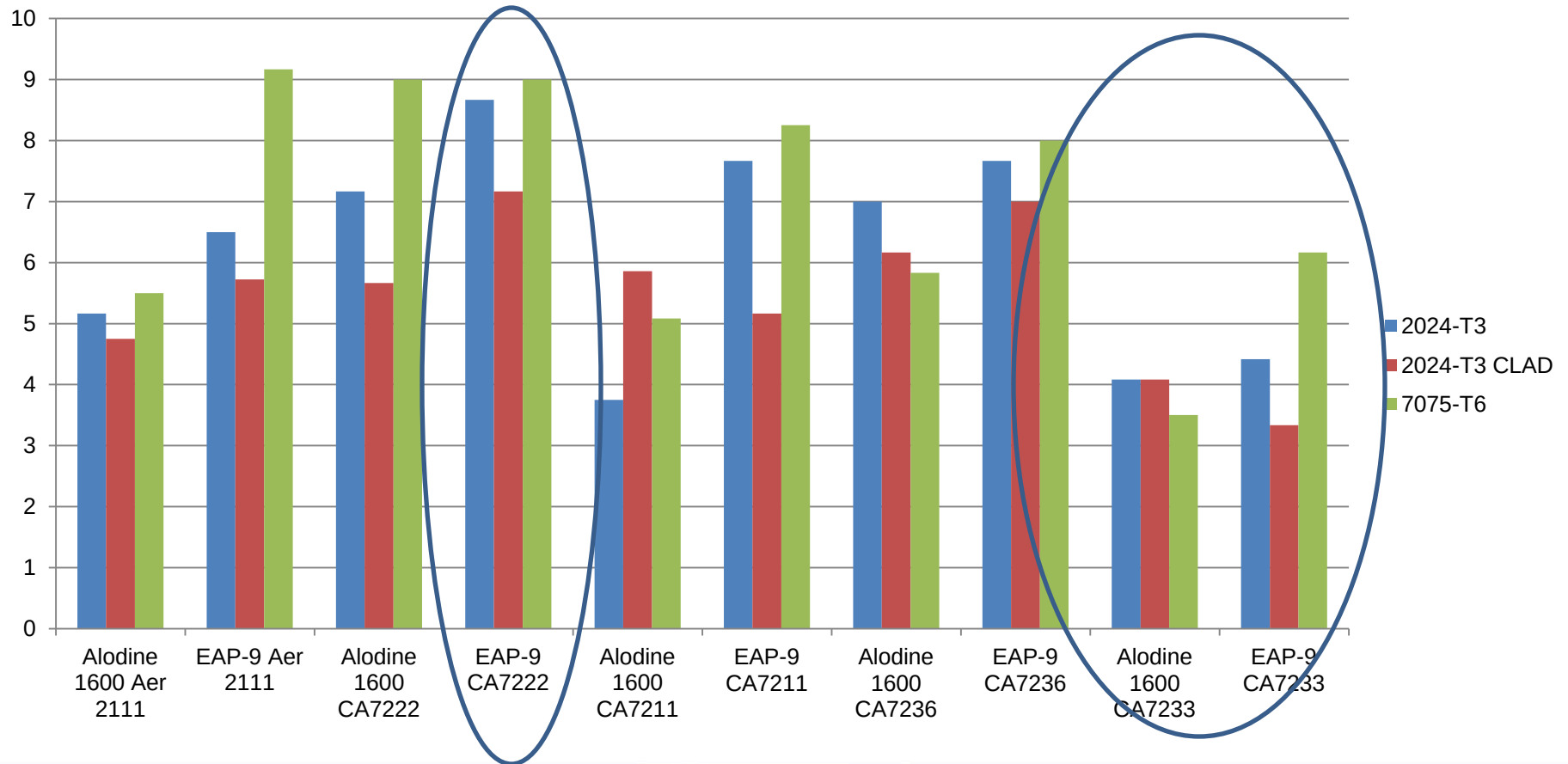
Coating Systems (All Ratings)



Flat Panels ASTM G85.A4

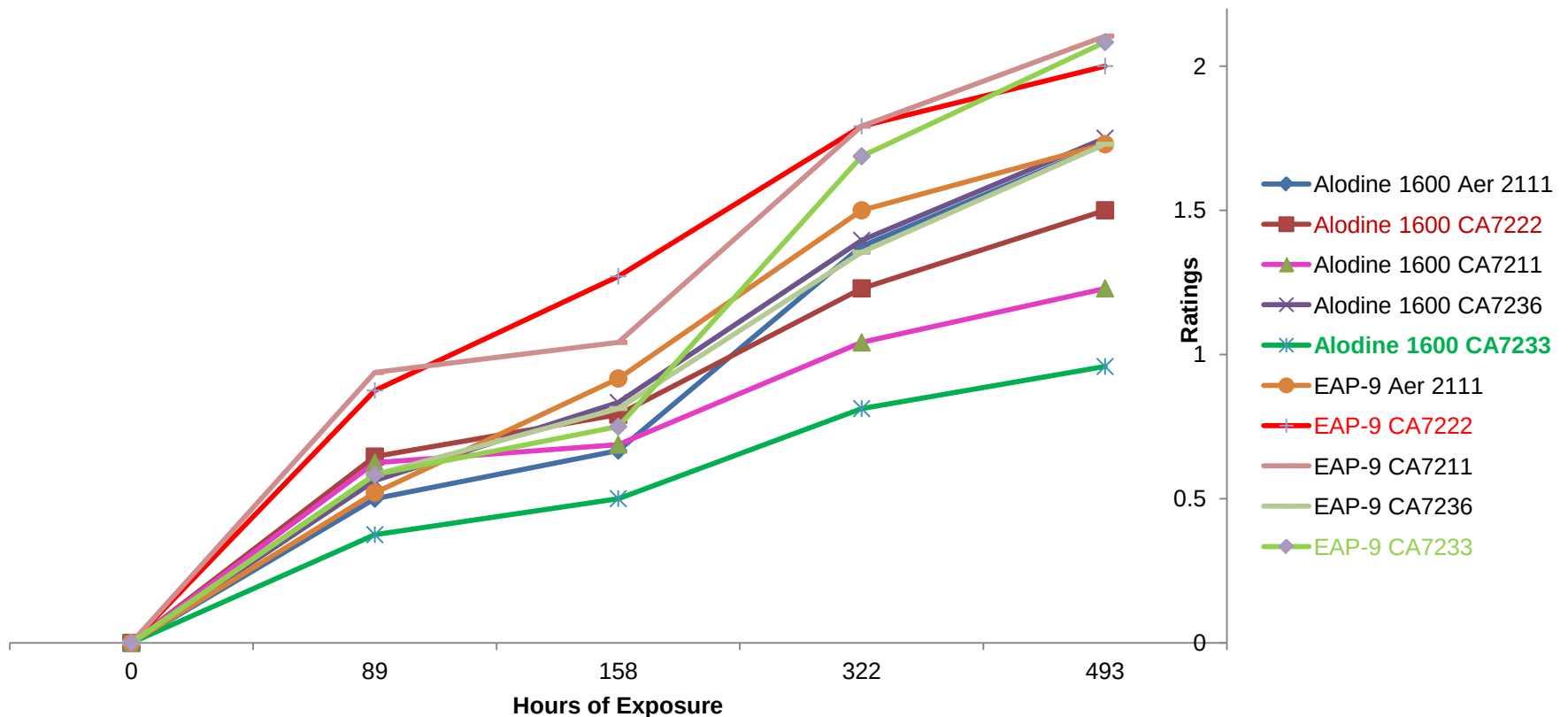
1000 hrs

All ratings 1000hrs



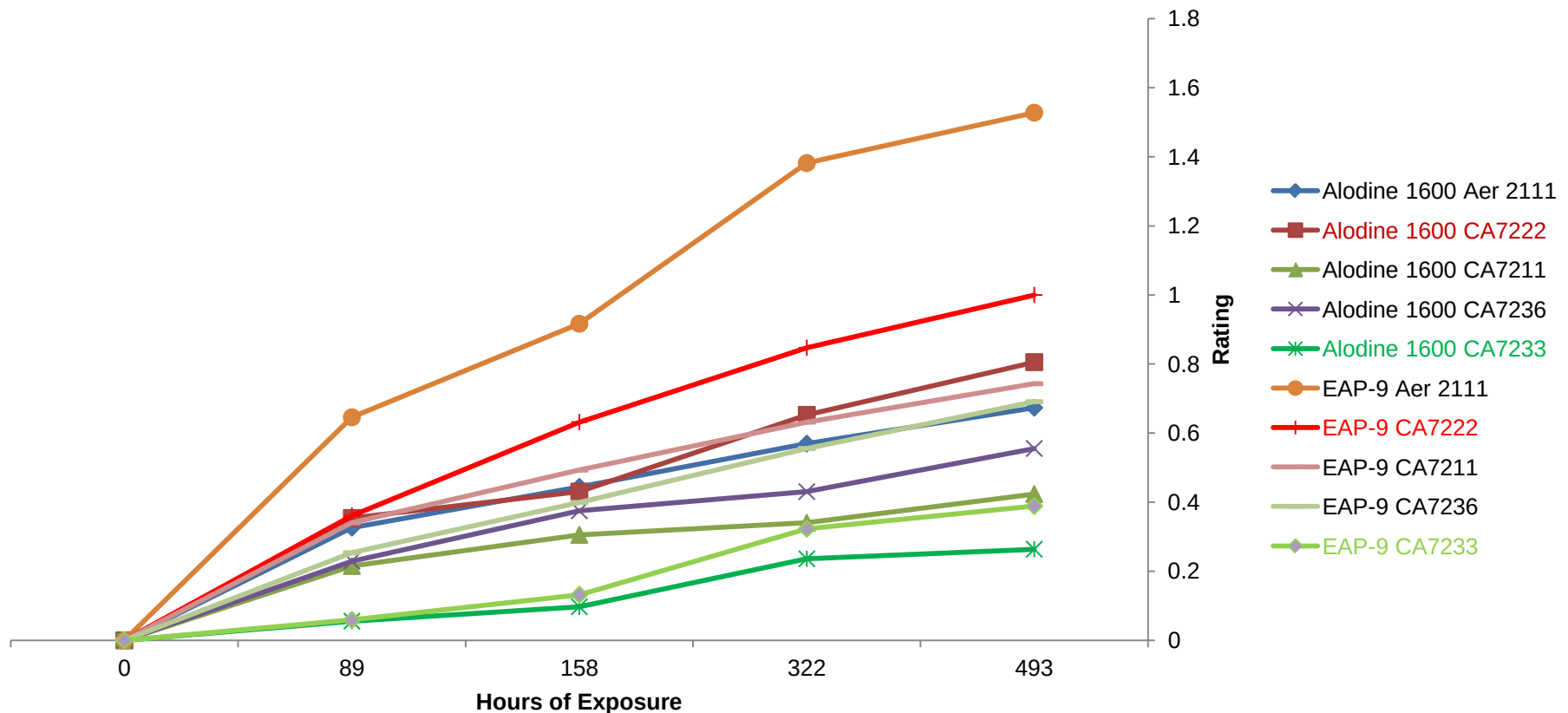
Galvanic Assemblies: ASTM B117-NAVAIR

Coating System (All Ratings)



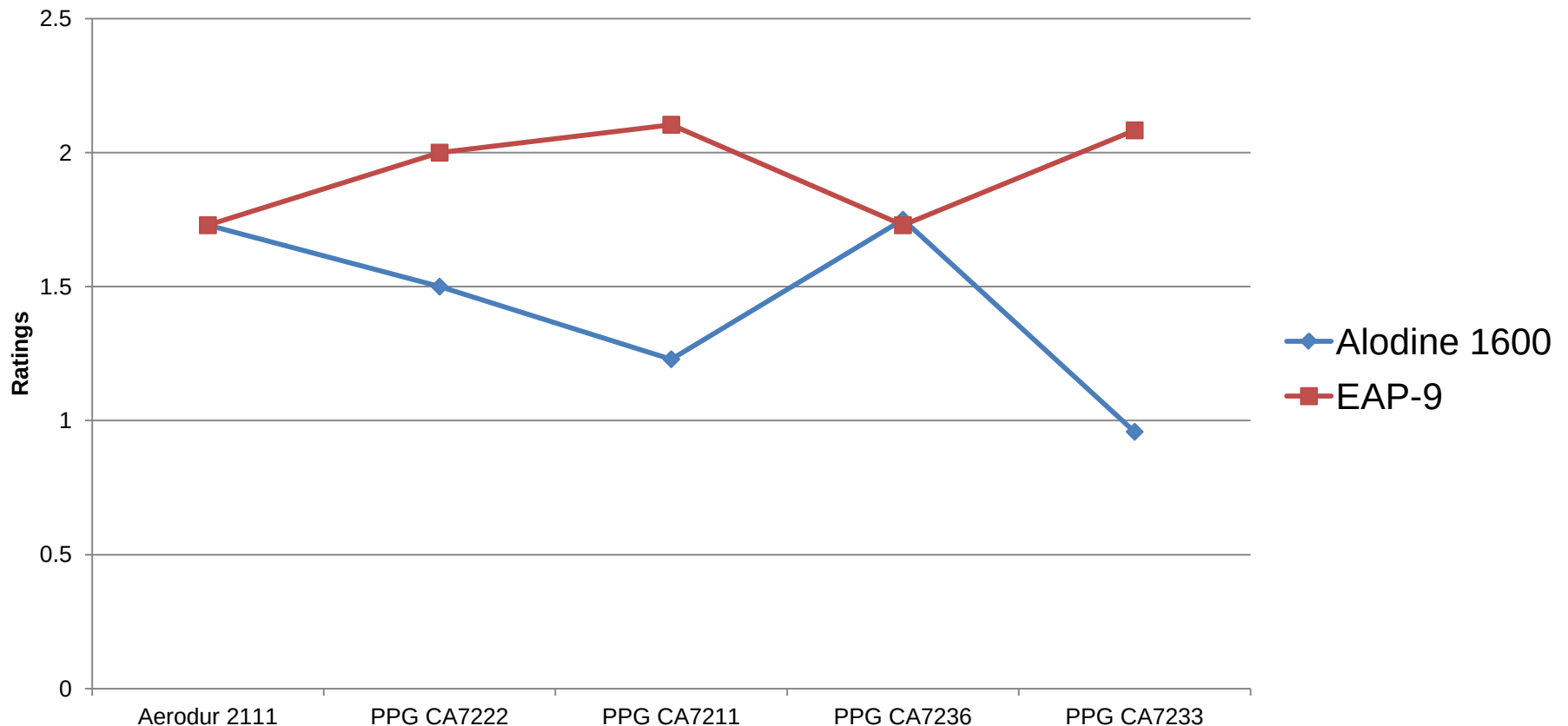
Galvanic Assemblies: ASTM B117 - USAF

Coating System (All Ratings)



Galvanic Assemblies: ASTM B117-NAVAIR

Primer Performance per pretreatment



US Army (GSE & Aviation)

- During Depot re-work, systems may not be completely disassembled resulting in components that are comprised of “mixed” materials
 - aluminum-aluminum
 - aluminum-steel
 - aluminum-composite
- Components are then reassembled into the finished item and preserved with the CARC system coating “stack up”.

Mixed Metal – Test Plan

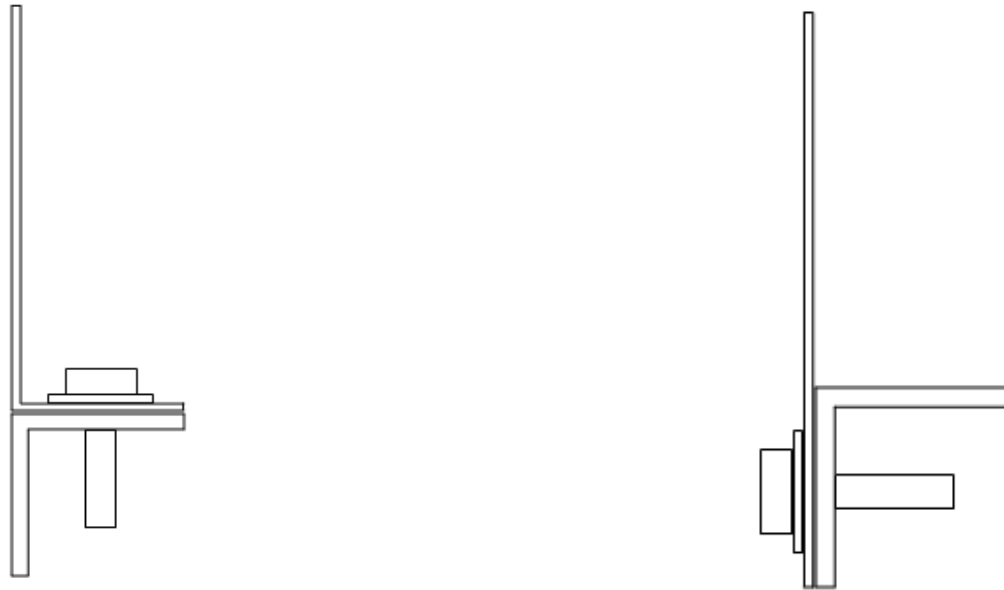
Steel and Aluminum mixed structures Corrosion and Galvanic Tests

Coating System Component	Control	Alternate 1	Alternate 2
Pretreatment	DoD-P-15328	MIL-DTL-81706 Type II (TCP)	
Primer	MIL-DTL-53022 Ty II		
Alt Primer 1	N/A	Mg-Rich	Magoxide
CARC Top Coat	MIL-DTL-53039 Type IV or IX		

Al / Al, and Al / Composite mixed Structures Test Coatings for Corrosion and Galvanic Tests

Coating System Component	Control	Alternate 1	Alternate 2
Pretreatment	MIL-DTL-81706 Type II (TCP)		
Primer	MIL-PRF-23377 Type I Class N		
Alt Primer	N/A	Mg-Rich	Magoxide
Top Coating	MIL-DTL-53039 Type IV or IX		

Mixed Metal: Galvanic Specimen Configuration



(LEFT) Configuration of the Aluminum-Steel and Aluminum-Aluminum test coupons. Joint between the steel and aluminum components will be faced sealed with SAE-AMS-S-8802 along with bolt heads and nuts.

(RIGHT) Configuration of the Aluminum-Composite test coupons. Joint between the aluminum and composite components will be faced sealed with SAE-AMS-S-8802 along with bolt heads and nuts.

Crosslink Primer

- Previously funded through ESTCP Project #WP-200904
- 3-component primer based on promising new NC pigment package
- Crosslink partnered with Hentzen Coatings, Inc. and Wayne Pigment Corporation to optimize and mature primer formulation
- Hentzen/Crosslink evaluating mature formulas in-house prior to sending to NAVAIR

On-going Demos



Implementation



US Army ~
Deft 02GN084

USN/USMC V22 ~
Hentzen 17176KEP



USN trainers ~
Deft 02GN084



Sikorsky H-60 ~
Deft 02GN084



Lockheed Martin F-35 ~
Deft 44GN098



Questions?

