Wipe Reactivation of Aged Primer

ASETSDefense Workshop 2016

Orlando, Florida
December, 2016

Will Betush
Program Manager

Wipe Reactivation of Aged Primer

Contract F33657-97-L-2018, P00250, CLIN 0171, FSR F36257

LM Aero Project Leader: Will Betush

Objective

Qualify a wipe-on adhesion promoter system to replace the current material and labor-intensive F-35 aged primer reactivation process.

Process

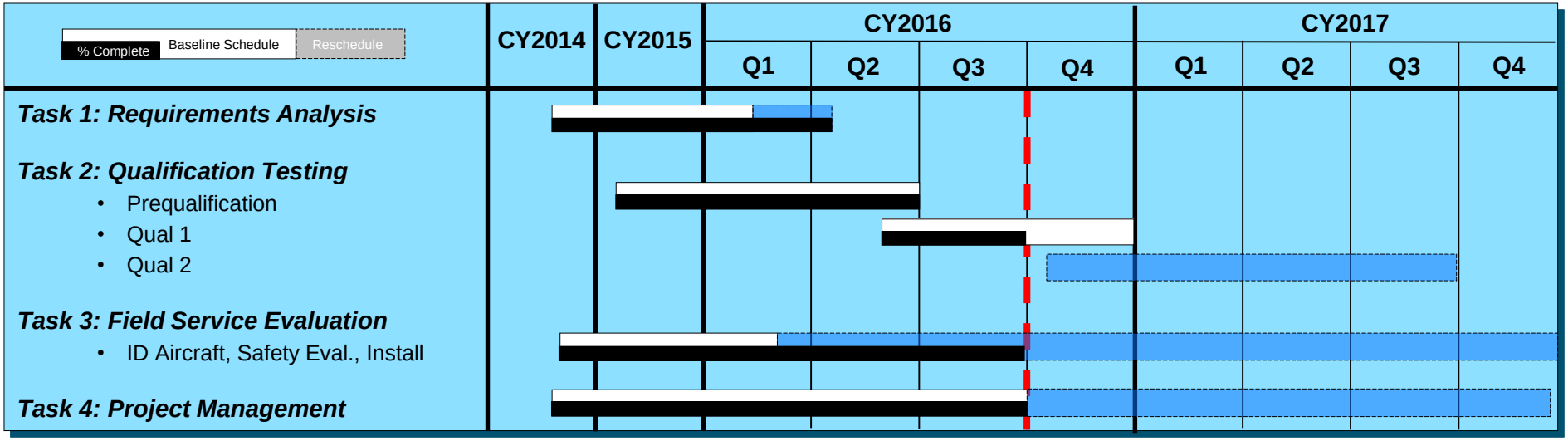
The Wipe Reactivation of Aged Primer (WRAP) process developed in Phase I will be qualified for production implementation through the development and execution of an appropriate test plan. Other material systems that can benefit from the WRAP process will be identified and verified through exploratory testing

Current Status

Phase 1 – Requirements, material formulation, lab-scale testing, material down-select. Status: COMPLETE

Phase 2 – Pre-qualification & qualification of adhesion promotor formulation, field service evaluation on F-16. Status: In-Work

Phase 3 – Expansion of WRAP process to fastener fills, flex primer, chromated primer, and alternate LVOC solvents. Status: In-Work



Benefits

- **Reduced Environmental Impact**
  - Primer reduction – 30 gal/aircraft
    - VOC reduction of 78 lbs/aircraft
  - Spray gun solvent reduction – 7 gal/aircraft
- **Improved Occupational Safety**
  - Accidental damage during scuff-sanding can release hazardous dust

Primer Reactivation Process	
Current Spec	**Wipe Reactivation**
• Pre-saturated IPA Wipe • Orbital Sand • Pre-saturated IPA Wipe • Primer Spray • Spray Gun Clean • Primer Cure *4 HOUR CURE TIME*	• Abrasive WRAP Wipe • Dry Wipe • WRAP Promoter Wipe *15 MINUTE DWELL TIME*

- **Robust Procedure**
  - No need for strict environmental controls (humidity, spray booth, etc.)
  - Reactivation can take place outside of paint booths or in the field
- **Reduced Reword**
  - Sanding primer can induce damage causing expensive rework operations
- **Transferable Technology**
  - Methodology can be conferred to other aircraft at depots and bases
  - Transferrable to other material systems
- **Span Time Reduction**
  - 1 day reduction on critical path
  - Generates significant program cost savings

Potential VOC Savings of WRAP Treatment

Coating	VOC Level	Annual VOC Reduction	Lifetime VOC Reduction
OML Primer Reduction (44GN098)	340 g/L 30 gal/aircraft	8.4 tons*	~128 tons**
Spray Gun Cleaning Solvent Reduction	238 g/L 7 gal/aircraft	1.4 tons*	~21 tons**

* - Based on 200 aircraft / year

** - Implementation estimated on 2/28/2018, 3,026 aircraft, based on PD-74 Iss25 Production Schedule

WRAP Material Testing

- **Qualification Test Series**
  - **Test two WRAP suppliers against topcoat adhesion specification**
  - **Various environments and potential surface contaminants:**
    - **Walking (floor panel)**
    - **Hydraulic Fluid**
    - **Hydraulic fluid + heat cycling**

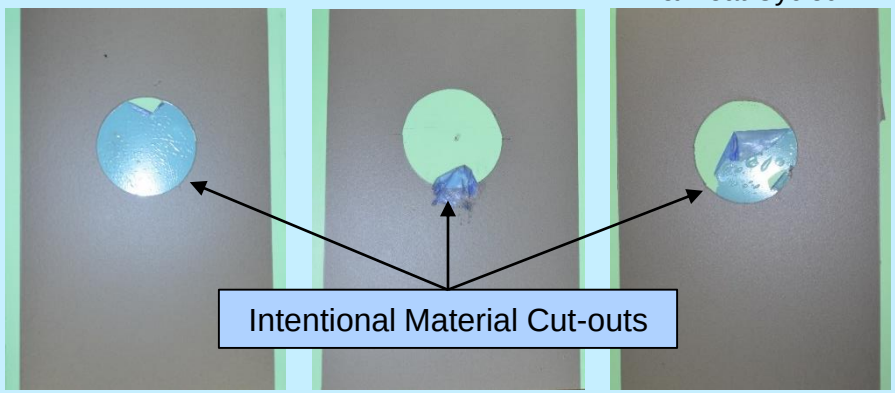
Test Data								
Coupon	**Test Type**	**Temp.**	**No Soak**	**JP-8**	**Hydraulic Fluid**	**Alkaline Cleaner**	**De-Icing Fluid**	**Soiled Surface**
Control - S&R	Roller Peel	RT	PASS	PASS	PASS	PASS	PASS	
Control - S&R	Roller Peel	+250°F	PASS	PASS	PASS	PASS	PASS	
WRAP 1	Roller Peel	RT	PASS	PASS	PASS		PASS	PASS
WRAP 1	Roller Peel	+250°F	PASS	PASS	PASS	PASS		PASS
WRAP 2	Roller Peel	RT	PASS			PASS		PASS
WRAP 2	Roller Peel	+250°F	PASS			PASS		PASS
Control - S&R	Lap Shear	RT	*	*	*	*	*	
Control - S&R	Lap Shear	-65°F	*	*	*	*	*	
Control - S&R	Lap Shear	+250°F	*	*	*	*	*	
WRAP 1	Lap Shear	RT	*	*	*	*	*	*
WRAP 1	Lap Shear	-65°F	*	*	*	*	*	*
WRAP 1	Lap Shear	+250°F	*	*	*	*	*	*
WRAP 2	Lap Shear	RT	*			*		*
WRAP 2	Lap Shear	-65°F	*			*		*
WRAP 2	Lap Shear	+250°F	*			*		*
Control - S&R	Low Temp Flex	-65°F	PASS	PASS	PASS	PASS	PASS	
WRAP 1	Low Temp Flex	-65°F	PASS	PASS	PASS	PASS	PASS	
WRAP 2	Low Temp Flex	-65°F	PASS			PASS		

* = No Specification Requirement

WRAP Material Testing

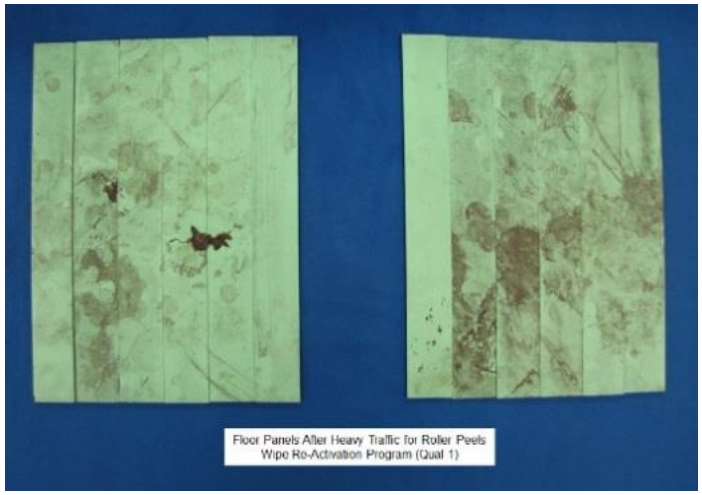
- **Successfully completed supersonic testing**
  - Testing showed excellent adhesion performance
- **Selected packaging options, beginning testing:**
  - Pre-mixed solvent bottle
  - Pre-soaked wipes
- **F-16 test panel for Field Service Evaluation (FSE) installed**
  - Surface soaked with hydraulic fluid, then heat cycled to ‘bake’ in contaminate
  - Will monitor performance

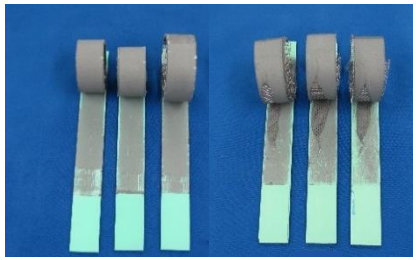
250°F Mach 1.3, 20° AOI, Heated Airflow Induced Flaw Test Setup



WRAP Qualification – Floor Panel Test

- **Taped down in high traffic area two test panels for ~6 months**
- **Treated with WRAP process and tested adhesion performance**
- **WRAP performance exceeds scuff and reactivate adhesion performance**



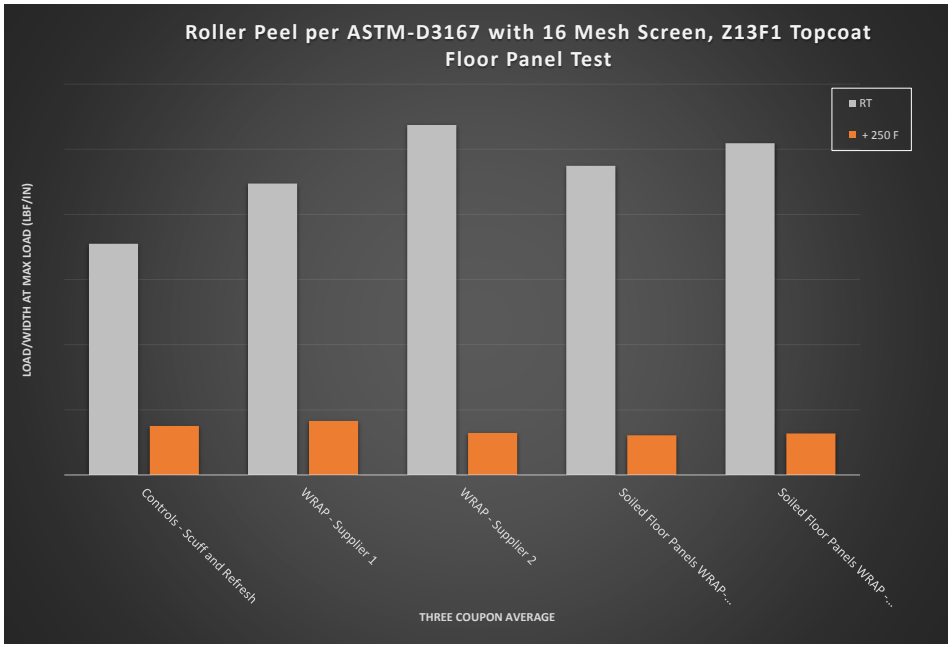


Scuff & Refresh Control - RT

WRAP - RT

Scuff & Refresh Control - +250°F

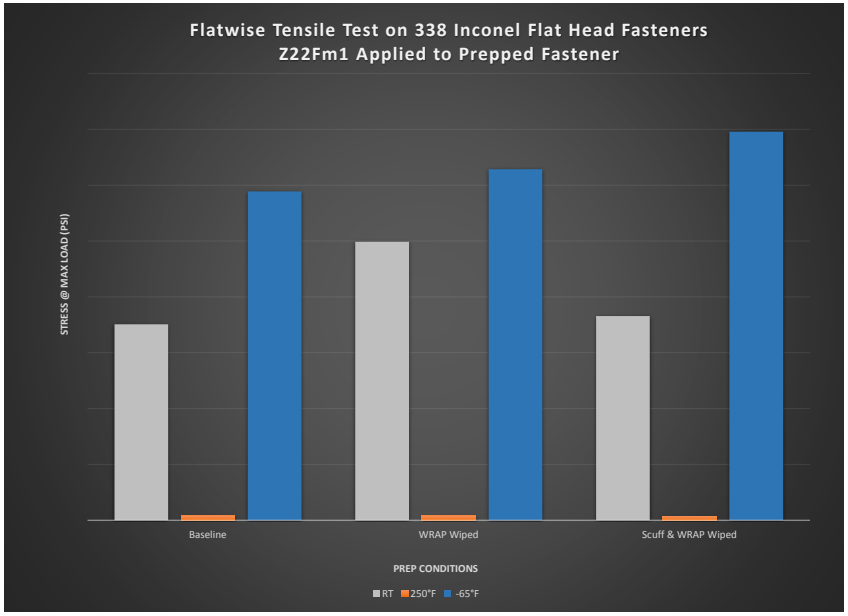
WRAP - +250°F



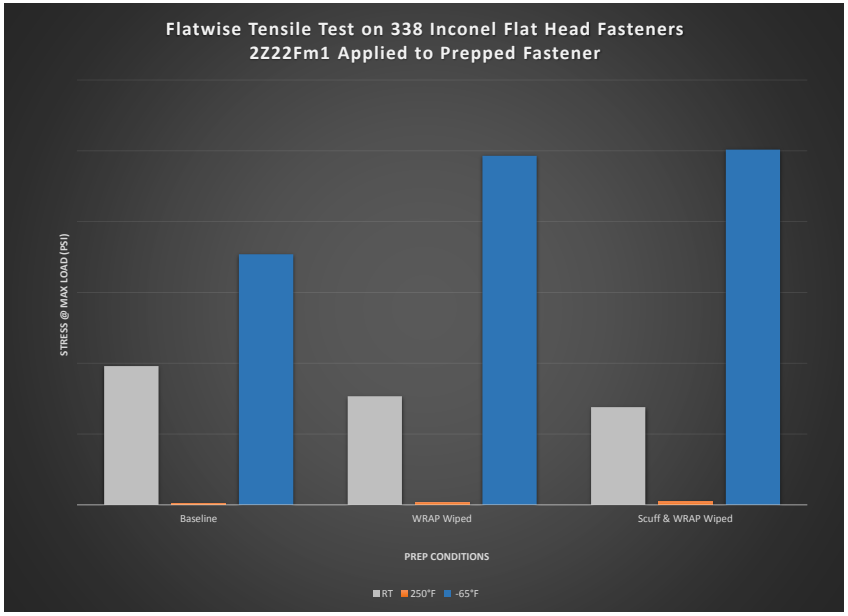
Even on dirty floor panels, WRAP performance exceeds Scuff and Reactivate

WRAP Fastener Testing

- **Tested removing primer over fasteners**
  - **Saves 5.25 hours of production span time, plus significant costs and chemical usage**
  - **Scuff and promote with WRAP only**
- **Inconel SS and Titanium fasteners tested**



Titanium Fasteners

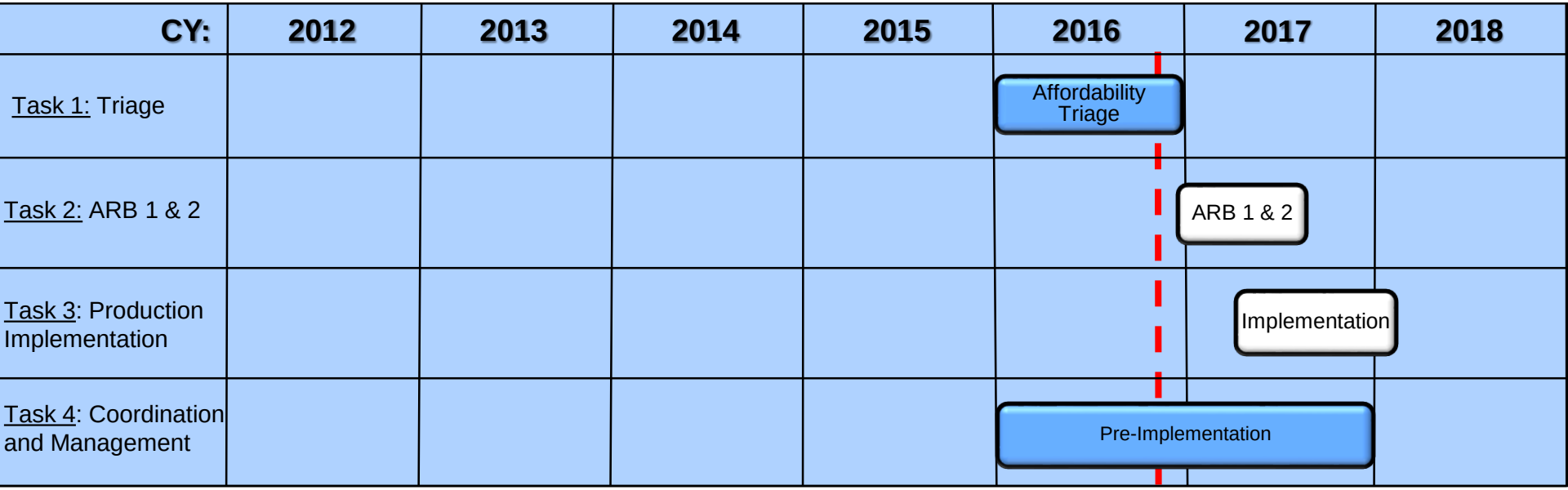


Inconel Fasteners

WRAP Could Replace Primer on Fasteners by Next Year

WRAP – Implementation Strategy

- **Task 1: Triage**
  - Gather Manufacturing and SCM Data
  - Prepare and hold Triage meeting
- **Task 2: ARB 1&2**
  - Prepare and hold ARB1
  - Prepare and hold ARB2
- **Task 3: Begin Production Implementation**
  - Coordinate with SCM and Suppliers
  - Production trials in AFF
  - Production Implementation
- **Task 4: Management and Support**



Pollution Prevention Spending | Production Funding