



**CTMA**

## Kinetic Spray for Corrosion Protection and Metal Part Restoration

Magnesium Gear box housing supplied  
NAVAIR Depot Cherry Point for repair



Repair IVD aluminum on high  
strength steel Landing Gear



## CTMA Program Objectives

- **1. Corrosion Protection of Ferrous Materials**
  - Painted structures – viz. ALV – access cover (USMC)
  - High strength steel landing gear parts (Boeing - IDS)
- **2. Corrosion Protection and Restoration of Magnesium**
  - Repair ZE41 & AZ91-D Magnesium (U.S. Army Research Lab, Navair–Cherry Point, Ford)

**Problem**

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## CORROSION OF STEEL PANELS AND PARTS



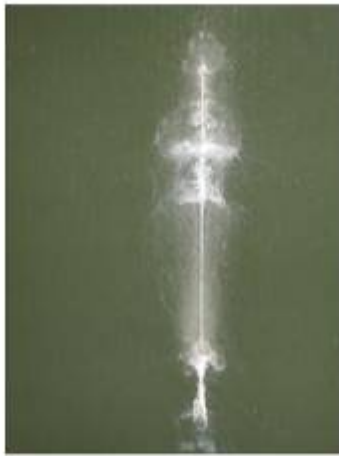
**Coupon 55, 60 cycles**  
**Baseline Test**



# Solution



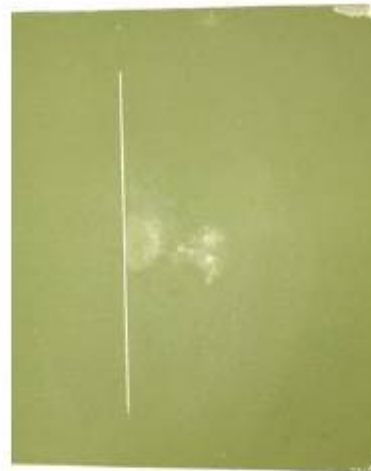
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Centerline Zn, 60 cycles



Centerline Zn-Al, 60 cycles



Centerline Al, 60 cycles



ARL C.S. Aluminum  
60 cycles

**Comparison of corrosion appearance at 60 APGE cycles for pure Zn, Zn-Al alloy and pure Al Cold Sprayed layers produced using the Cold Spray process.**





## Implementation

### ➤ USMC

➤ The use of cold spray for the repair of LAV'S is being evaluated

### ➤ US Space Command

➤ Currently there are 2 test on going for spot corrosion repair on launch pads for missile

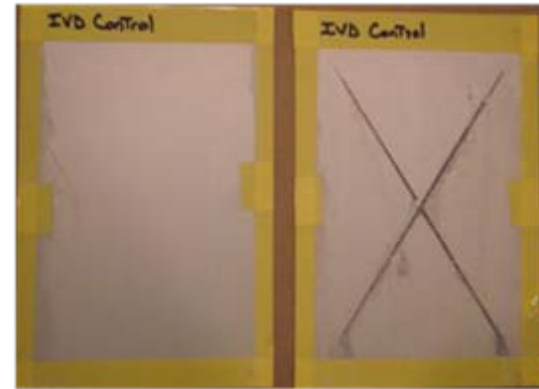
## Benefits

➤ Cold Spray offers infield repairs of spot corrosion that could be at Depot or in Theater

**Problem**

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**Corrosion of Damaged IVD aluminum on high strength steel Landing Gear**



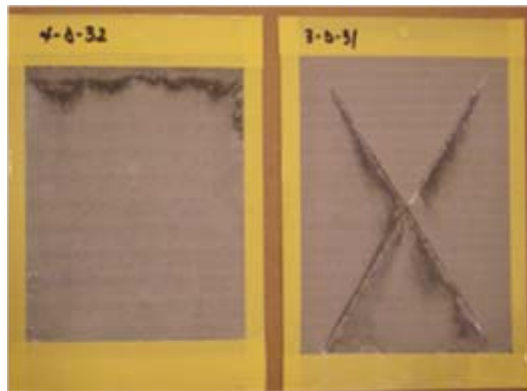
**IVD Aluminum - Control**

Baseline Test 

**Solutions**

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## Corrosion Resistance Corrosion MIL-DTL-83488



**Delphi**



**Centerline**



**ARL**

All of the test specimens passed the inspection after 1000 hours





## Implementation

- **Boeing Intergraded Defense Systems and Wright-Patterson AFB are continuing to qualify the repair of IVD Aluminum coated landing gear**

## Benefits

- **Cold spray Aluminum process is non- embrittling to high strength steel**
- **Cold spray Aluminum exceeds the corrosion requirements of MIL-TL-83488**
- **Repair can be made in the field**





**Problem**



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## Corrosion and Wear Damaged Magnesium castings for Aircraft



Images provided by  
NAVAIR Depot Cherry  
Point of H-53 Helicopters  
in service.

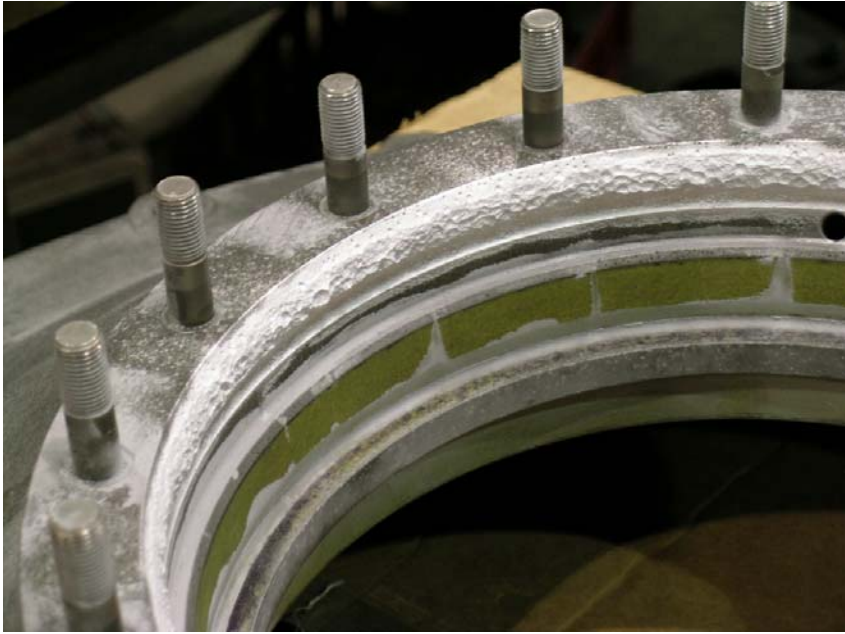


# Solution



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**Gear box housing supplied by NAVAIR Depot Cherry Point**



**Part machined after spraying**



Part sprayed by **centerline**<sup>®</sup>  
(WINDSOR) LIMITED



## Implementation

- Navair Cherry Point is continuing the study of cold spray properties to qualify repairs.
- Tinker AFB in conjunction with General Dynamics has also purchased a portable system to qualify magnesium casting repairs

## Benefits

- A depot repair article slated for scrap was sprayed and successfully demonstrated the repair capabilities of the SST system.



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# Acknowledgments



DELPHI

