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CSAT Meeting June 19-20, 2018

Mr. Victor Champagne

ARL Center for Cold Spray

Weapons and Materials Research Directorate

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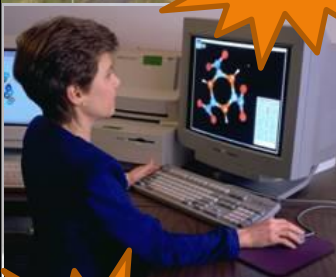


Government

Engineer

Industry

Operator



Academia

Policy Maker



Sales



Technician



Researcher



Manager

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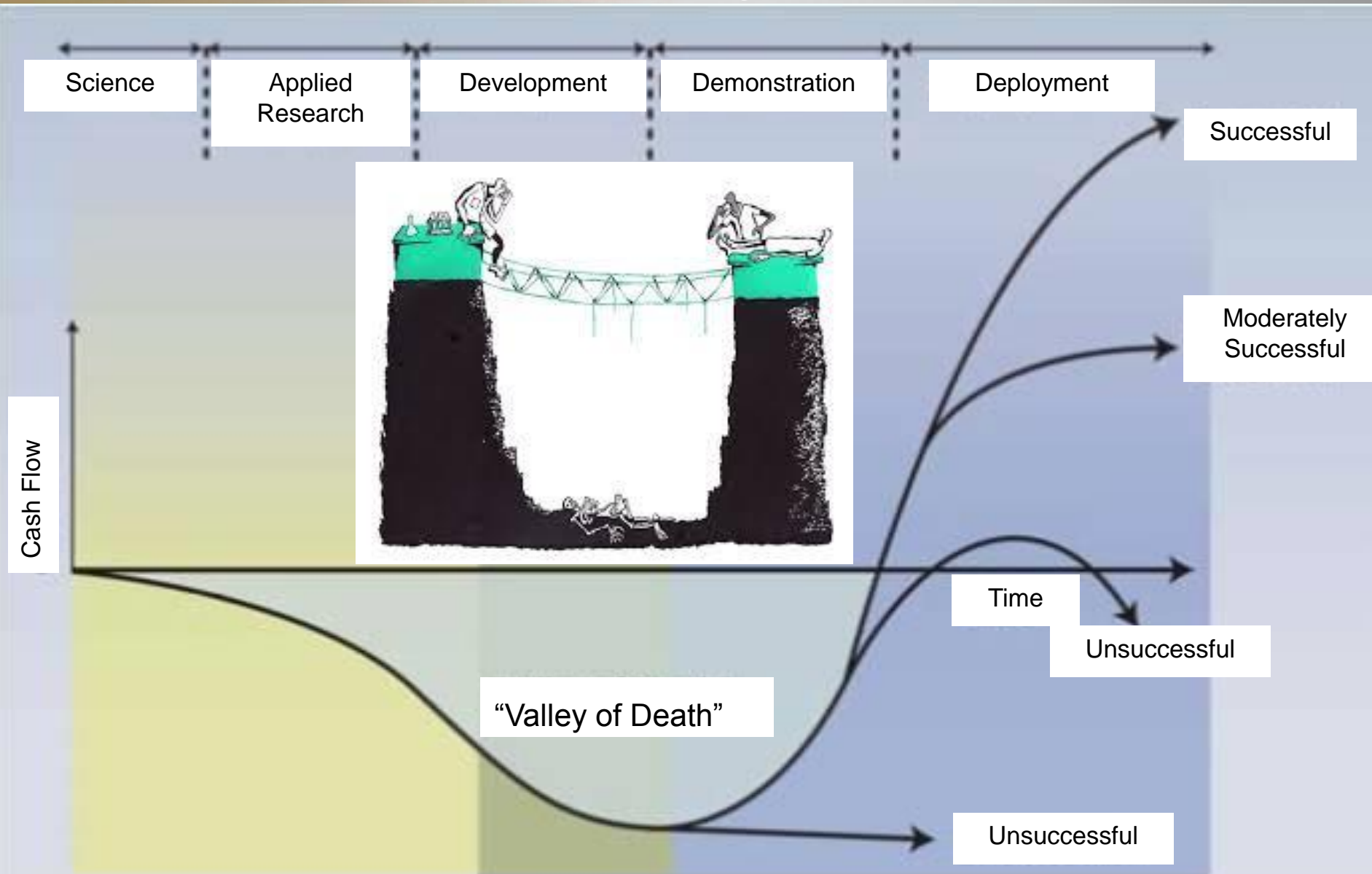
- Army-Navy-Air Force Roadmaps
- Structural Repair-Additive Manufacturing - Near Net Parts
- Nondestructive Inspection
- Research & Development
- Applications (OEMs, Government and Academia)
- Chrome and Nickel Electroplating Replacement
- Powder Development, Processing, Storage and Handling
- Cold Spray Powder Specification
- Transition and Establishment of Cold Spray Facilities

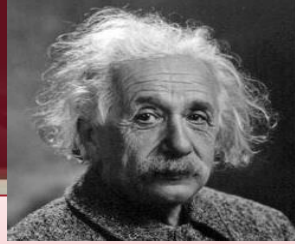
2018 Achievements

- FEB Panel Repair Approval
- Apache Static Mast Support Repair Approval
- Patriot Missile AM Cold Spray Part
- Uniform Industrial Process Instruction (in-process)
- Cold Spray Powder Specification

Four in five technologies fail to cross the 'Valley of Death'

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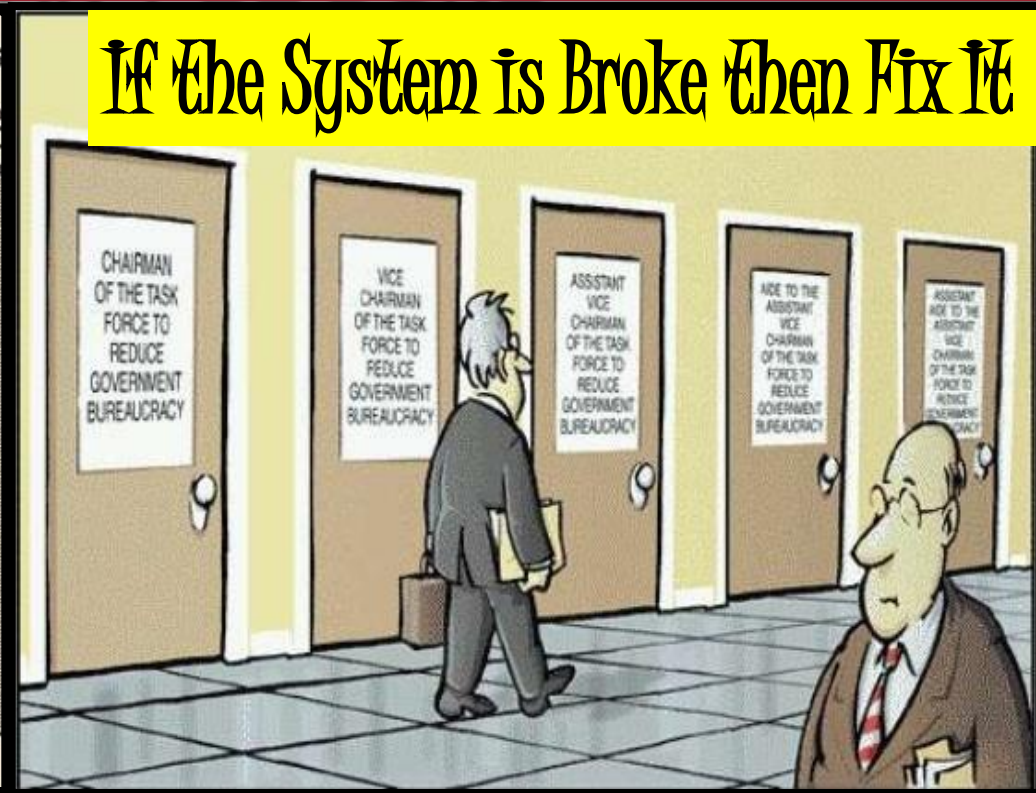
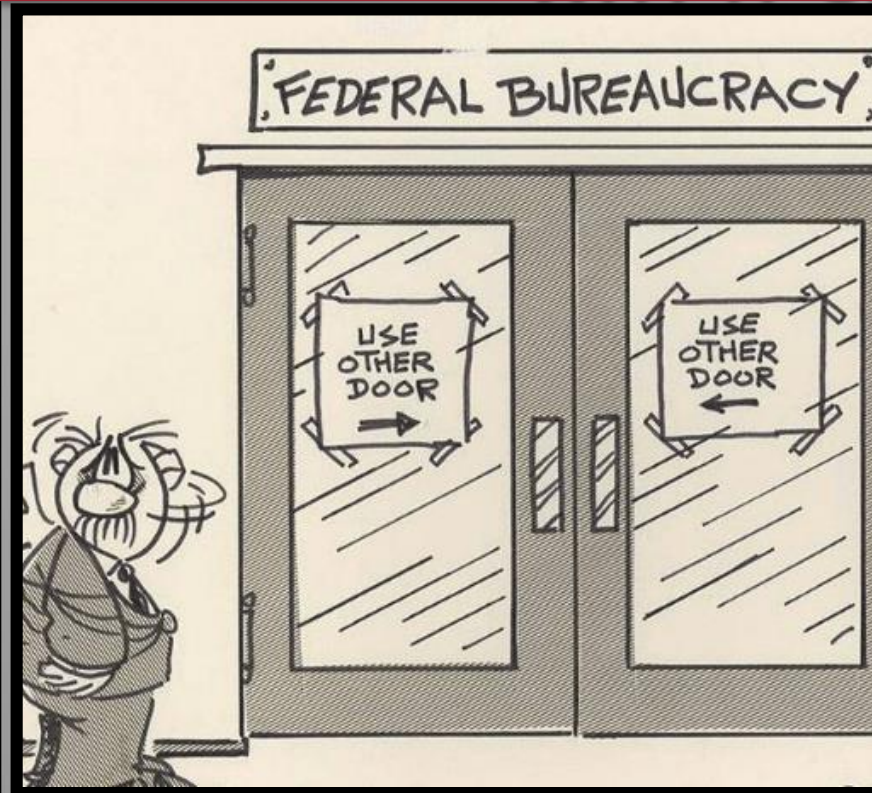




Bureaucracy is the death of all sound work.

(Albert Einstein)

TRY TO FIND THE WAY TO GET SOMETHING DONE AND AVOID THE NUMEROUS REASONS WHY IT CAN'T BE DONE



“THE ABILITY TO GET THINGS DONE”

“good enough for our transatlantic friends.....but unworthy of the attention of practical or scientific men -**British Parliamentary Committee, 1878** referring to Edison’s light bulb.

"Fooling around with alternating current is just a waste of time. Nobody will use it, ever." -
Thomas Edison, 1889

"Heavier-than-air flying machines are impossible." - **Lord Kelvin, 1895** president, Royal Society.

"Who the hell wants to hear actors talk?" - **H.M. Warner, Warner Brothers, 1927.**

"There is not the slightest indication that nuclear energy will ever be obtainable. It would mean that the atom would have to be shattered at will." – **Albert Einstein, 1932**

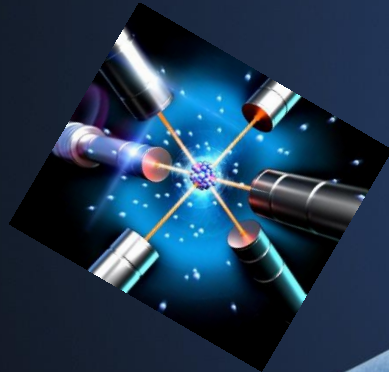
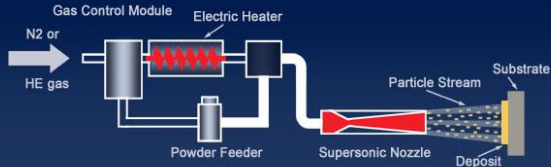
"640K ought to be enough for anybody." - **Bill Gates, 1981**

“Everything that can be invented has been invented”

Charles H. Duell, 1899
US Commissioner, Office of Patents.

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The Cold Spray Process



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Additive Manufactured Cold
Spray Part

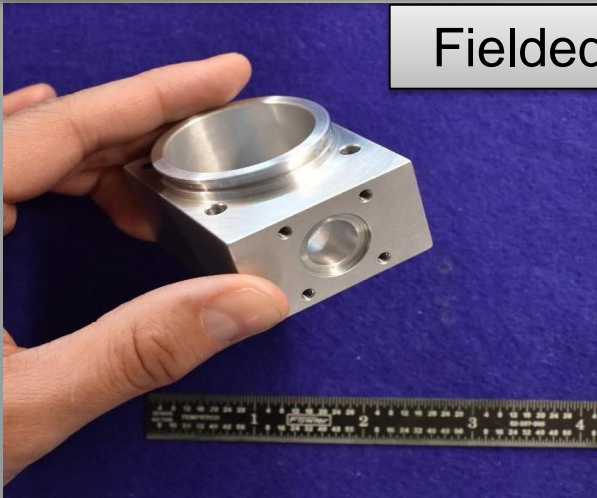
First Fielded AM
Cold Spray Part



Fielded Sep 2017

Sensitive Switch Housing for the Patriot Missile Launcher

Fielded May 2018



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AERTA PP-2-02-04: Toxic Metal Reductions in Surface Finishing Processes

- The Army must comply with OSD policy to minimize the use of Cr(VI)
- Need to eliminate costly OSHA compliance bills and clean-up costs



Hazardous
Fumes & Waste



CAUTION
IRRITATING TO SKIN
EYES AND LUNGS
CAUTION
CORROSIVE
SOLUTIONS

Electroplated Chrome Process

DANGER

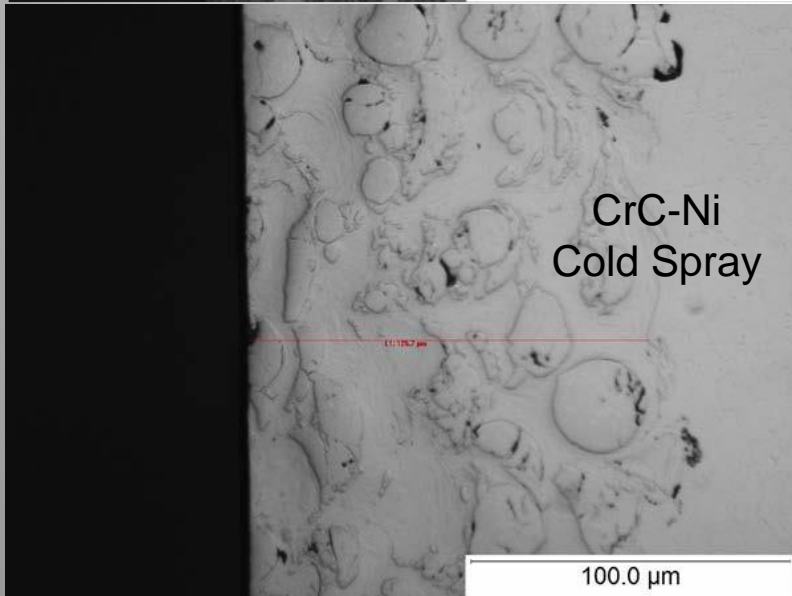
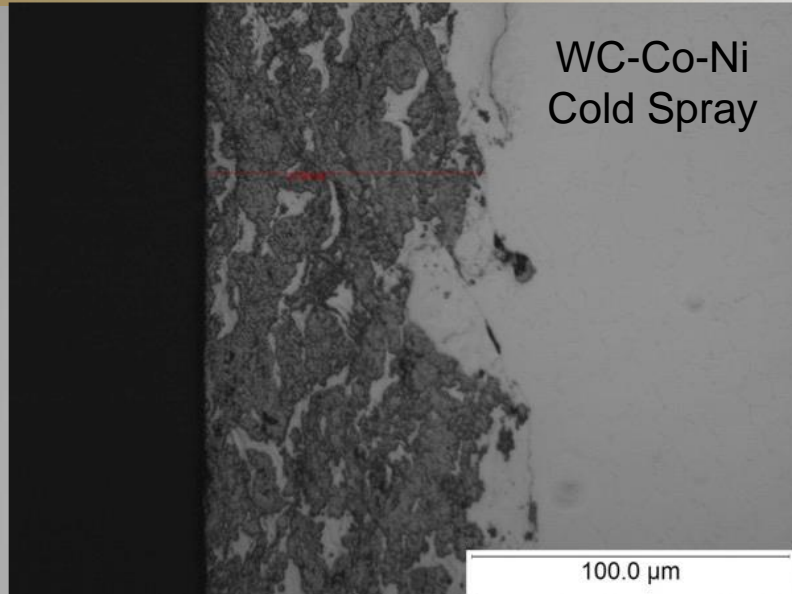
TANK T-11
CHROMIC ACID ANODIZE
CHROMIC ACID

3 0 1
OXIDIZING

TEMP: 91 - 99F VOLUME: 2431G



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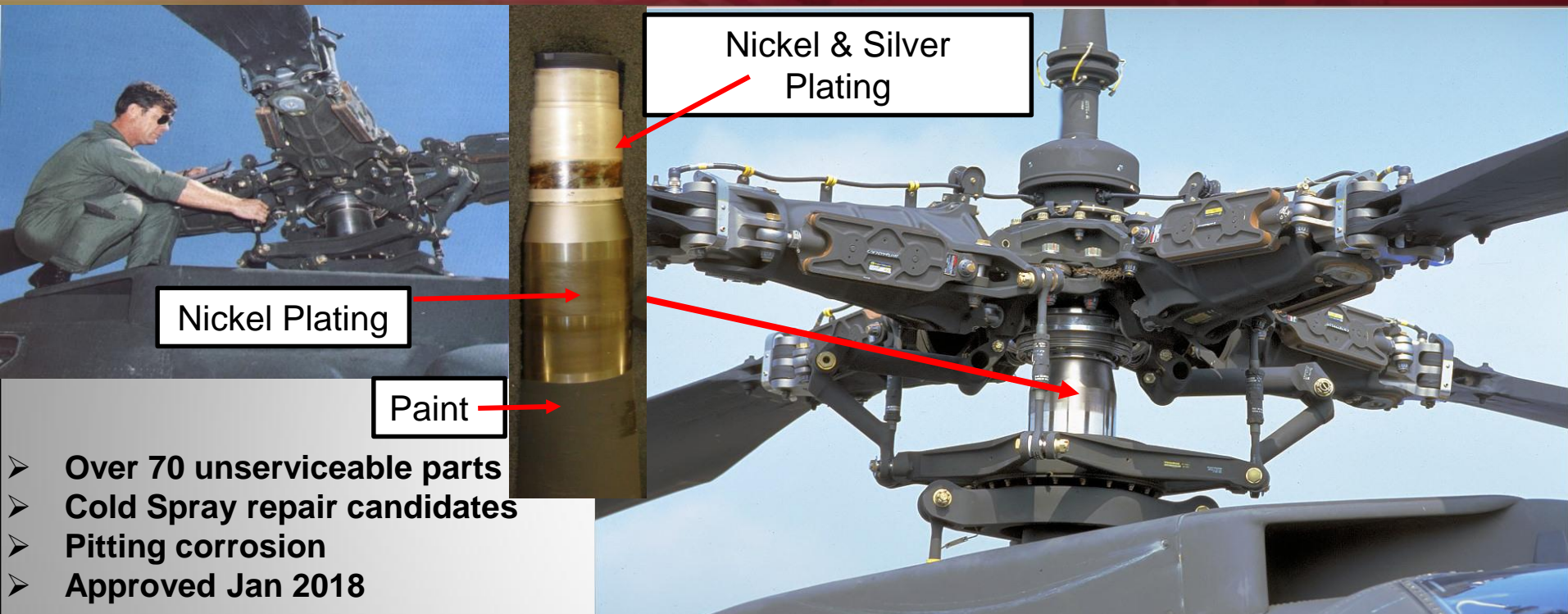
PF PRODUCTS FINISHING
PFonline.com

Cold Spray Alternatives
Military Looks for Chrome, Nickel Replacement

PLATING U.S. Army Research Lab investigates cold spray - 14
POWDER Manufacturer Takes Powder Coating in the Air - 20
CLEANING Vacuum Degreasing Offers Greener Technology - 28
INNOVATION Airspray and Airless Combine for a Fine Finish - 46

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Storage Bins of Apache Mast Supports
DLA Warehouse at Boeing



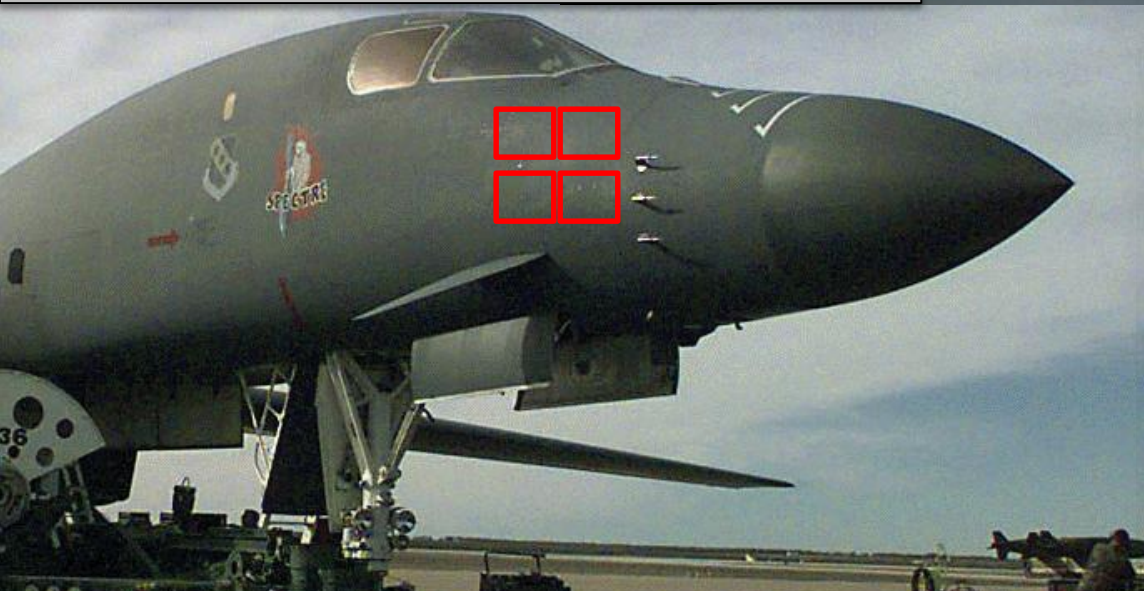
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- Repaired June 2012
- 6+ Years in service
- 2,363 Flight Hours

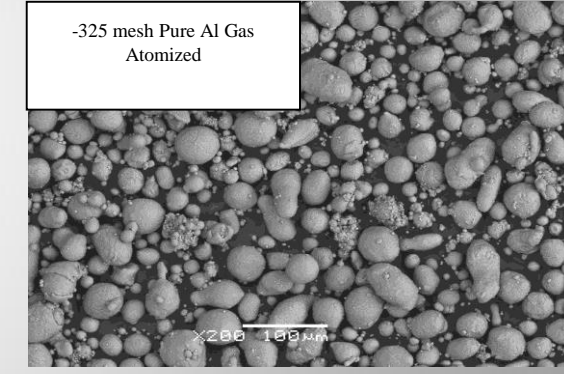
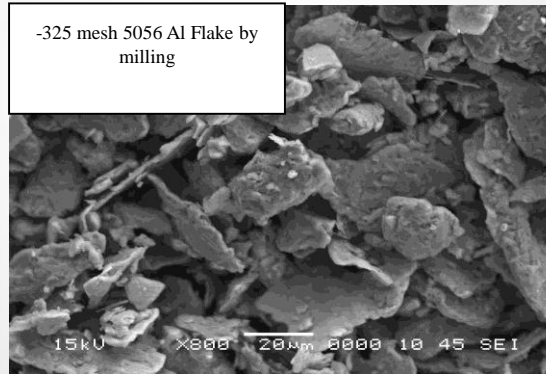
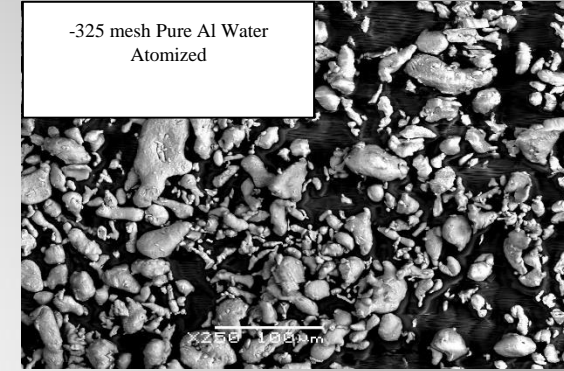
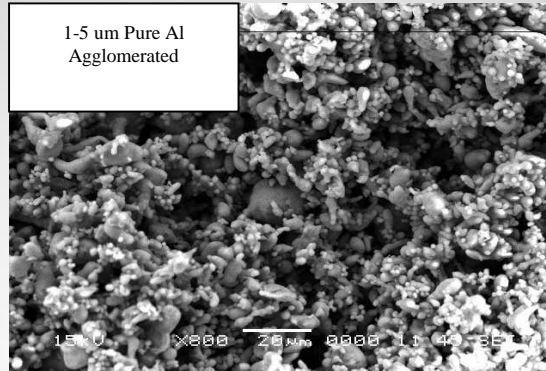


8 panels/aircraft, 4 panels/side Lt and Rt sides

Wear beneath bolt heads on FEB panels



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The morphology of aluminum powders produced by different processes.




**Manufacturing plan to protect aluminum powder after gas atomization.
Bag shown contains 6061 Al provided by Valimet Corporation, CA.**

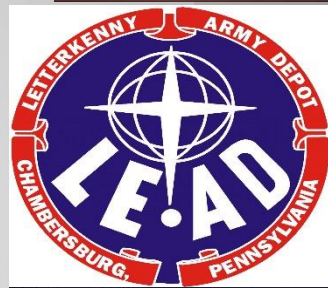


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Component Qty

- 1. Bell AH-1 Elevator Horns 1 
- 2. KC-135 IDG Housings 39
- 3. Submarine TD-63 Actuators 3 
- 4. T-700 Front Frame 1
- 5. H-60 Sump 2
- 6. B-1 FEB Panel 2
- 7. UH-60 Main Gearbox Housing 1
- 8. T700 Shafts 40
- 9. Nimitz Class Carrier Main Pump Housing 1
- 10. F-18 AMAD 4
- 11. Class 688 Submarine Cone Assembly 1 
- 12. H-53 Main Transmission 1
- 13. H-53 Nose Gearbox 1
- 14. Patriot Missile (Pedestal, Door, Filter Box) 6
- 15. AH-64 Static Mast Support 2



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<u>Platform</u>	<u>Qty</u>
1.S-64 Components	11
2.S-92 Components	33
3.H-46 Components	8
4.AW-139 Components	7
5.S-76 Components	9
6. <u>Landing Gear Components</u>	<u>223</u>
Totals	291

MOOG



Pending Military Components

Awaiting Final Qualification

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Component	Qty
1.UH-60 Sump	21
2.UH-60 Main Gearbox Housing	50
3.F-15 AMAD	10
4.F-16 ADG	4
5.B-1 Hydrotubes	TBD
6.AH-64 Static Mast Support	70
7.AH-64 Nose Gearbox	15
8.AH-64 Input Flange	200
9.LA Class Submarine Stern Tube	1
10.Stryker Armored Vehicle	TBD
Totals	371+



**THINGS DO NOT
HAPPEN. THINGS
ARE MADE TO
HAPPEN.**



John F. Kennedy

35th U.S. President

(1917-1963)

20 June 2018

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**“ THERE ARE PEOPLE IN
EVERY TIME AND EVERY
LAND WHO WANT TO STOP
HISTORY IN ITS TRACKS.
THEY FEAR THE FUTURE,
MISTRUST THE PRESENT
AND INVOKE THE SECURITY
OF A COMFORTABLE PAST,
WHICH IN FACT,
NEVER EXISTED. ”**

Robert F. Kennedy