



HVOF Coatings at Hill AFB



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■ AGENDA

■ Implementation at Hill AFB

- Specifications
- Landing gear components approved for spraying
- Coating studies

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HVOF SPECIFICATIONS

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- **Specifications written at Hill AFB for HVOF coatings**
 - **Spraying/Stripping Spec # 200310641**
 - **Grinding/Super Finish Spec # 200310642**
- **Tech Orders updated to include specs which allows for components to be HVOF coated**
- **Spraying Spec going through first major revision**
 - **Providing clearer understanding for**
 - **Porosity/Carbide pullouts**
 - **Voids/Oxides**
 - **Interface contamination(embedded alumina grit)**
- **Grinding spec calls for belts or stones for super finish**
 - **Evaluating feasibility of using 800 grit diamond wheel to produce super finish coating**
 - **Initial trial run looks promising**
 - **Super finish parameters look good**
 - **Evaluating seal life testing**
 - **If approved spec will be updated to include diamond wheel for super finish operations**



Components Approved for Spraying



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- **Landing gear components approved for HVOF coating at Hill AFB**
 - **A-10 MLG Piston Barrel**
 - **A-10 NLG Piston Barrel**
 - **B-1 MLG FWD/AFT Axles**
 - **KC-135 NLG Piston Barrel**
 - **C-5 MLG Roll Pin Journals**
 - **C-5 MLG Ball Screw Journal(In-service)**
 - **C-5 MLG Outer Pitch Cylinder(In-service)**
 - **C-5 Gudgeon Pin**
 - **F-15 Drive Keys**
 - **KC-135 FWD/AFT Axle(In-service)**
 - **F-16 MLG Axle**



Components Approved for Spraying



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- **B-1 MLG Inner Piston**
- **B-1 NLG Inner Piston/Axle**
- **F-15 C/D MLG Trunnion Pin**
- **F-15 C/D NLG Piston/Axle**
- **F-15 E MLG Trunnion Pin**
- **F-15 E NLG Piston/Axle**
- **F-16 LW Tension Strut**
- **F-16 HW Tension Strut**
- **C-5 MLG Trunnion Pin**



COATING STUDIES

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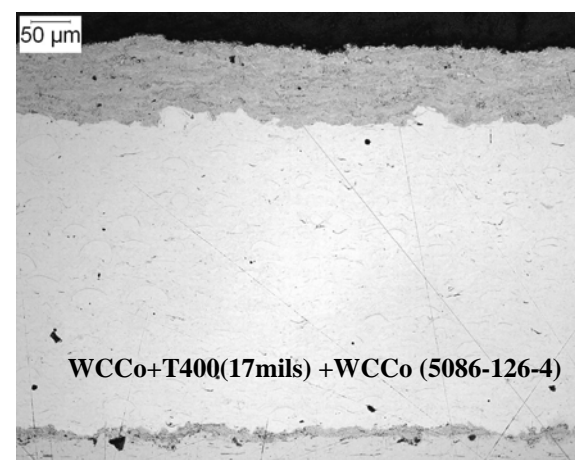
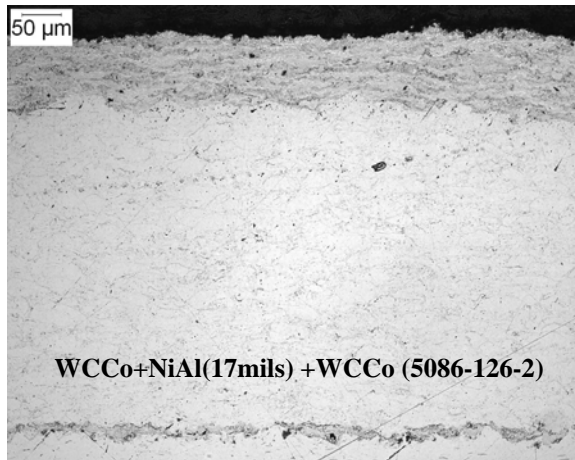
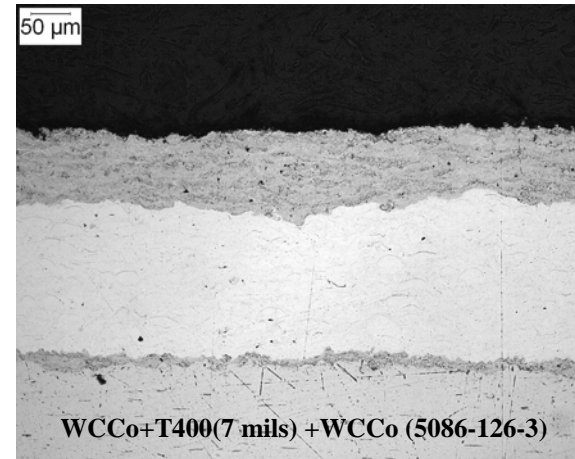
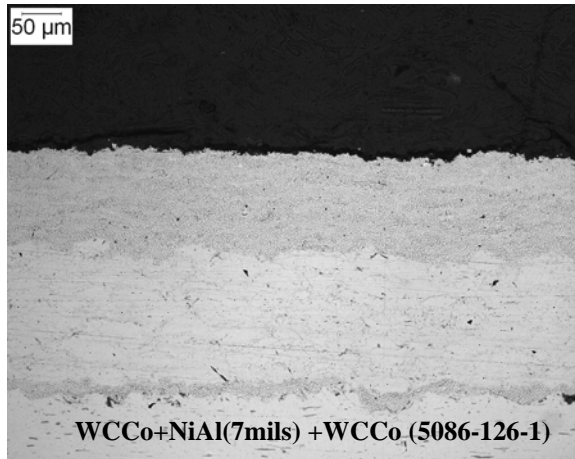
- **Hill AFB moving forward with additional HVOF coating studies**
 - **Duplex HVOF sprayed coatings(thick repair)**
 - Working with Praxair Surface Technology
 - Replacement for electroplated sulfamate nickel build-up and cap with chrome plating(current repair approach)
 - 300M steel substrate
 - Bond coat(WC-17%Co)
 - Build-up coat
 - Ni-Al, T400 and other powders being investigated
 - Topcoat(WC-17%Co)
 - Tensile bond strength > 12 ksi
 - 4 pt bend tests
 - Axial fatigue tests
 - **Additional powders**
 - WC-10%Co-4%Cr
 - ?????



Duplex HVOF Coating Microstructure



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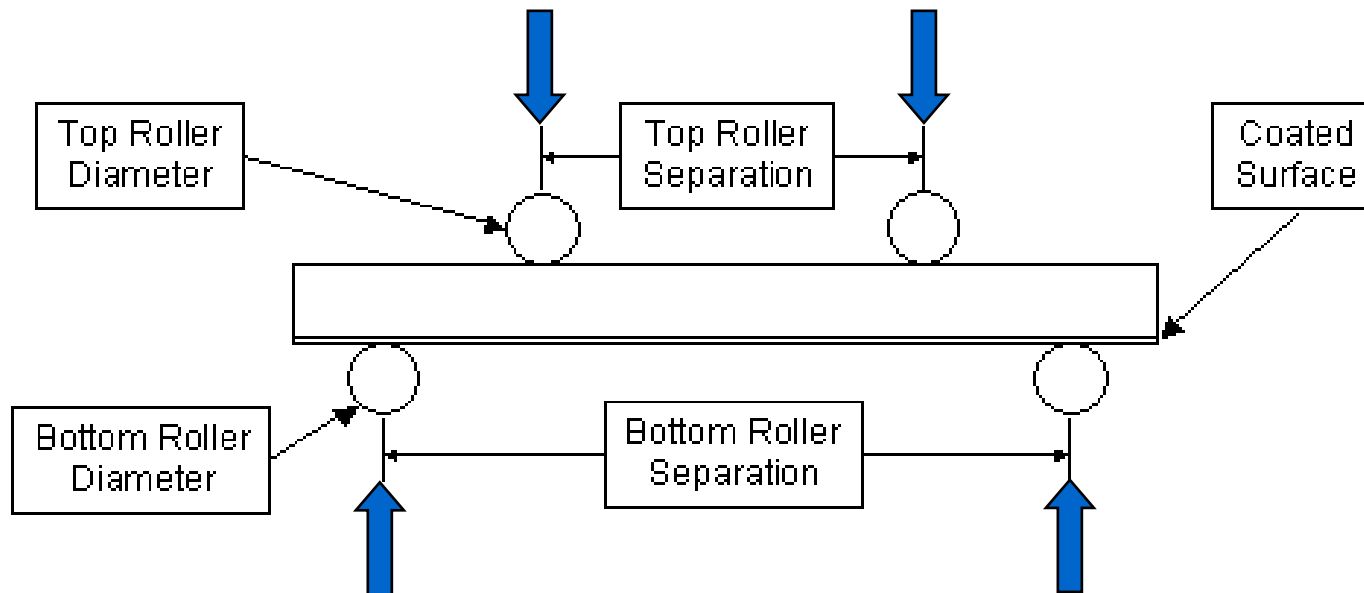
DUPLEX HVOF COATINGS



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■ Monotonic Testing of Duplex HVOF coatings

- Using 4-pt bend beams(300M) to study strain to fracture and spallation



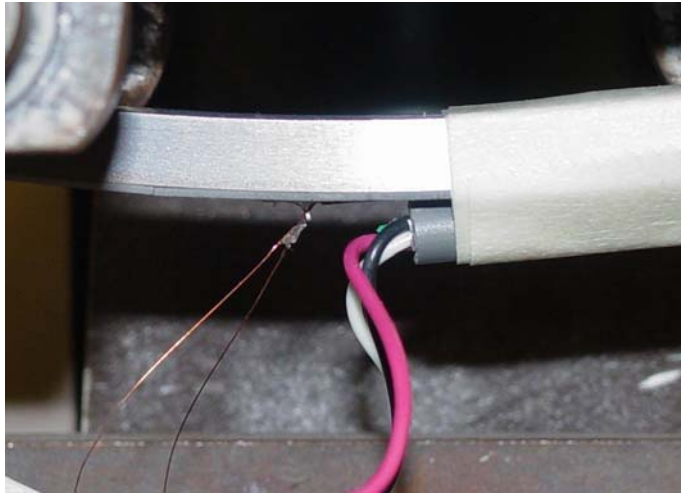
4-Point Bend Test Schematic



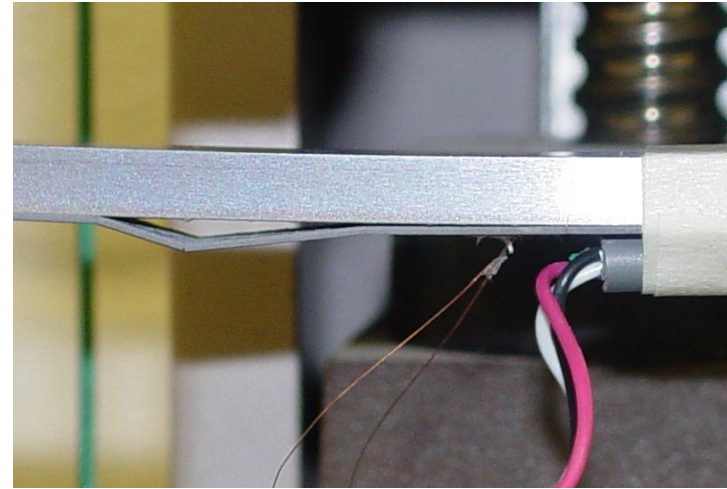
Spalling of Thick Duplex HVOF Coating



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Detection of Spallation Initiation
During Loading



Spallation When Load is Removed
Spallation occurred above YS of
300M bar

WC17Co+T400+WC17Co (0.020")
(1343VM+CO109-7+1343VM)



4-Point Bend Test Specimens with Duplex HVOF Coating Designs on 300M



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WC17Co+Ni5Al+WC17Co
(1343VM+NI-356-7+1343VM)



WC17Co+T400+WC17Co
(1343VM+CO109-7+1343VM)



HVOF



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■ **Questions??**