



**Boeing Commercial Aviation Services  
THE STATUS OF THERMAL SPRAY COATINGS  
AS REPLACEMENT FOR CHROME PLATE ON  
LANDING GEAR COMPONENTS**

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**20 JULY 2004**

**HCAT MEETING  
PARK CITY, UTAH**

# AGENDA

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- **OHM REVISION LANGUAGE**
- **OVERHAUL/REPAIR OPTIONS**
- **POTENTIAL HSS LG PARTS FOR CHROME REPLACEMENT**
- **SPECIFICATION REVISIONS TARGET DEC 2004**
- **BSS7072**
- **RESTORATIVE REPAIR STATUS**
- **CURRENT WORK**
- **ACKNOWLEDGEMENTS**

# OHM REVISION LANGUAGE

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- **APPLICABLE ONLY TO HIGH STRENGTH STEEL(HSS) PARTS**
- **APPLY BMS10-67, TYPE I OR TYPE XVII, CLASS 2, 3, OR 4 THERMAL SPRAY IN ACCORDANCE WITH SOPM 20-10-05. MAXIMUM FINISHED THICKNESS SHALL NOT EXCEED 0.010 INCHES. OBSERVE MAXIMUM 0.08 INCH RUN OUT. FINISH GRIND TO A 4 Ra MICROINCH FINISH OR FINER. APPLY LOW HYDROGEN EMBRITTLEMENT CADMIUM-TITANIUM PLATING, (SOPM 20-42-02) AFTER FINISH GRINDING TO THE RUN-OUT.**

## **OVERHAUL/REPAIR OPTIONS**

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- **NO RESTRICTION ON APPLICATION TECHNIQUE**
  - **CLASS 2 HVOF**
  - **CLASS 3 D-GUN**
  - **CLASS 4 SUPER D-GUN**
- **COATINGS DO NOT HAVE TO BE REMOVED IN SUBSEQUENT REPAIR CYCLES IF SURFACE INTEGRITY IS NOT COMPROMISED AND MEETS DESIGN DIMENSIONS**
- **INDICATIONS AS A RESULT OF FPI ARE NOT A REASON TO REMOVE COATING**

# FPI INDICATIONS

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# POTENTIAL HSS LG PARTS FOR CHROME REPLACEMENT

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- 727 15 NLG 37 MLG
  - NO OHM REVISIONS PLANNED
- 737 CLASSIC 20 NLG 64 MLG
  - ALL OHM'S REVISED DEC 2003
- 757 25 NLG 36 MLG
  - CMM PLANNED REVISION SCHEDULED COMPLETION DEC 2004
- 767 27 NLG 33 MLG
  - NO TARGET DATE ESTABLISHED
- 747
  - NO TARGET DATE ESTABLISHED
- 777 & 737NG Ti COATED PARTS IN ADDITION TO HSS
  - NO TARGET DATE ESTABLISHED

# SPECIFICATION REVISIONS TARGET DEC 2004

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- **BMS10-67 PLUS QUALIFIED PRODUCT LIST (QPL)**
  - **ESTABLISHES A NEW CLASSIFICATION FOR WC-12Co AS BMS10-67, TYPE XVIII**
- **BAC5851 PLUS A RE-DEFINED QUALIFIED PROCESSOR LIST (QPL)**
  - **ADDS NEW GRADE CLASSIFICATIONS:**
    - **GRADE A – GENERAL USE COATINGS**
    - **GRADE B – COATINGS THAT HAVE BEEN SUBJECTED TO FATIGUE TESTING IAW BOEING ENGINEERING REQUIREMENTS AND HAVE EXHIBITED ACCEPTABLE PERFORMANCE FOR FATIGUE CRITICAL APPLICATIONS**
      - **FATIGUE ROUND AXIAL Kt 1.2**
      - **FATIGUE FLAT AXIAL Kt 1.5**
      - **WEAR TESTING**
        - **ROLLING**
        - **SLIDING**

# BSS7072

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- **NEW SPECIFICATION**
- **TITLE - QUALIFICATION PROCEDURES AND REQUIREMENTS FOR THERMAL SPRAY COATINGS**
- **BASED ON PERFORMANCE RATHER THAN APPLICATION**
- **SCOPE**
  - **PROVIDES OEM SUPPLIERS WITH A PROCEDURE FOR QUALIFICATION**
  - **THE SPECIFICATION ESTABLISHES THE RECOMMENDED TESTING WHICH AIRLINES, AND MROs SHOULD COMPLETE TO SATISFY THEMSELVES AND THE APPLICABLE LOCAL REGULATORY AUTHORITY THAT ITS PROCESS WILL PRODUCE COATINGS THAT MEET THE REQUIREMENTS OF THE APPLICABLE SOPMs AND OHMs/CMMs THROUGH SELF QUALIFICATION FOR THE REPAIR OF PARTS USING HVOF IN LIEU OF CHROME**

## BSS7072 - CONTINUED

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- **SUBSTRATES**
  - **LOW ALLOY STEELS**
  - **CORROSION RESISTANT STEELS**
  - **TITANIUM AND TITANIUM BASED ALLOYS**
  - **NICKEL BASED ALLOYS**
  - **COPPER BASED ALLOYS**
- **AFTER BSS7072 IS RELEASED SOPM 20-10-05 WILL BE REVISED TO INCORPORATE BSS7072 AS A REQUIREMENT TO APPLY COATINGS**

## BSS7072 CONTINUED

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- **COMPLETION**

**SUCCESSFUL COMPLETION OF REQUIREMENTS BY AN AIRLINE OR AN MRO DOES NOT CONSTITUTE A FORMAL APPROVAL BY THE BOEING COMPANY NOR DOES IT IMPLY OR GRANT APPROVAL TO COAT OEM PARTS**

- **NTO'S**

**A “NO TECHNICAL OBJECTION” WILL **NOT** BE GRANTED BY THE BOEING COMPANY UNDER ANY CIRCUMSTANCES.**

## RESTORATIVE REPAIR STATUS

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- **THREE REPAIR THICKNESS – 0.020, 0.040, AND 0.060**
  - ALL WITH A 0.005 WC-Co-Cr CAP
- **FOUR FILL MATERIALS**
  - 95Ni-5Al COATING ON SPECIMENS - STATUS - COMPLETE
  - 80Ni-20Cr COATING ON SPECIMENS – STATUS - COMPLETE
  - WC-Co-Cr FABRICATION COMPLETE – SPRAY IN 2005
  - NEW EXPERIMENTAL POWDER MEETS CHEMICAL COMPOSITION OF SAE-AMS-S-5000(E4340) – SPRAY IN 2005
- **BASELINE STANDARD CHROME OVER Su-Ni – IN PROGRESS**
- **FATIGUE TESTING WILL BEGIN WHEN ALL SPECIMENS HAVE BEEN COATED – PLANNED FOR 3RD QUARTER OF 2005**

## CURRENT WORK

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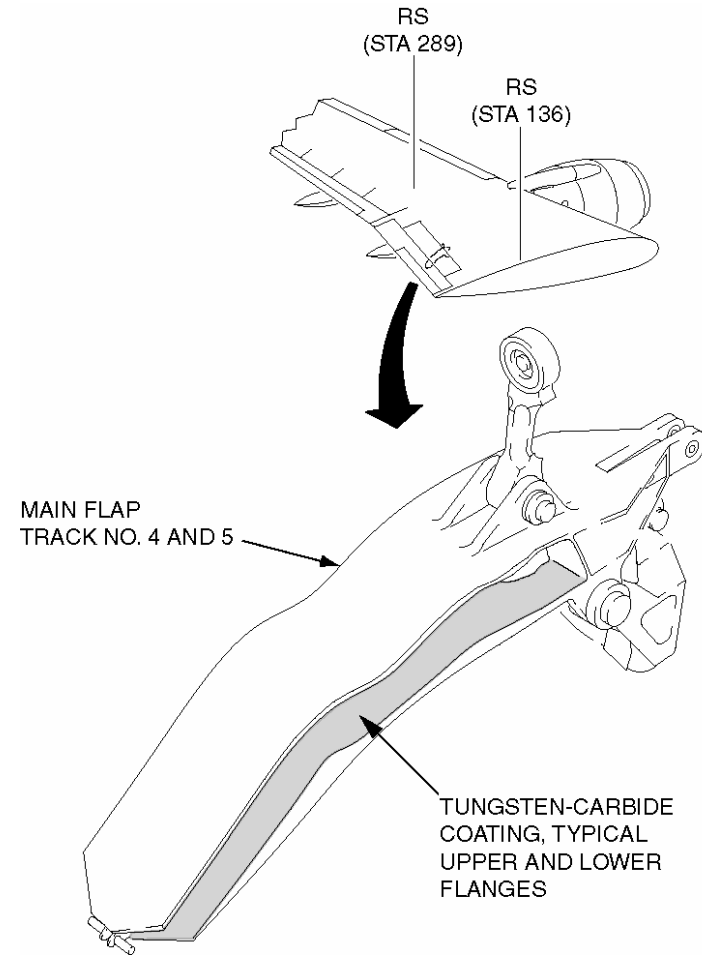
- **INCREASED EMPHASIS ON ROLLER WEAR TESTING**
  - NOW PART OF BAC5851 AND BSS7072 REQUIREMENTS
- **FLAP TRACK DESIGN FOR 737NG SIMILAR TO 777 – Ti TRACKS**
  - 777 BMS10-67 TYPE I, BAC5851 CLASS 3 AS APPLIED NO EVIDENCE OF SPALLING
  - 737NG BMS10-67 TYPE I, BAC5851 CLASS 4 SPALLING HAS BEEN REPORTED
- **CONTRIBUTING FACTORS**
  - RUNWAY DEBRIS CONTRIBUTES TO 737NG SPALLING – CLOSER TO GROUND
  - Ti TRACKS FLEXIBLE COMPARED TO HSS
  - SUBSURFACE SHEAR LOAD PROMOTES FAILURE AT BOND LINE.
- **LAB TESTING PERFORMED ON CONTAMINATED TRACKS SHOW HVOF LESS LIKELY TO SPALL AT 737NG STRESS LEVELS DUE TO THE HIGHER Co CONTENT OF THE AS SPRAYED COATING**
- **737NG FLAP TRACK FINISH BEING CONVERTED FROM BAC5851 CLASS 4, (SDG), TO BAC5851 CLASS 2, (HVOF)**

# P/N 113A1111-X

**APPLY F-15.387 IAW BAC5851**

**FINAL THICKNESS TO BE  
0.004/0.006 INCHES**

**MINIMUM COBALT CONTENT  
NLT 15%**



## CURRENT WORK - CONTINUED

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- **737 CLASSIC SLAT TRACKS**
  - **OPTIONAL FINISH BMS10-67 TYPE I, IAW BAC5851, CLASS 2 (HVOF), OR CLASS 4 (SDG)**
- **INCREASED ACTIVITY ON PLASMA APPLICATIONS FOR SMALL ID APPLICATIONS. MINIMUM 4 INCH DIAMETER**

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