***PROPULSION DIRECTORATE***

# T56 SIII Compressor Coating Update

**29 Jul 14**

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# T56 SIII Background



- **Commercial Technology Maintenance Activities (CTMA) program initial evaluations**
  - **MCT BlackGold™ competitively selected for corrosion/erosion evaluations**
  - **Corrosion/erosion, cut-up, and surface finish testing**
- **Environmental Security Technology Certification Program (ESTCP) sand ingestion testing**
  - **Demonstrate the benefits of a coated compressor**
  - **Full engine test of coated and uncoated compressors**
  - **Characterized post test chord loss, surface finish and shape change differences**
  - **Frequency and high cycle fatigue testing conducted**

# T56 SIII Benefits



- **Benefits of coated versus uncoated blades**
  - **Excellent corrosion/erosion resistance**
  - **Significant engine performance retention**
    - **Uncoated lost 3x more power during engine test**
    - **Estimated engine time on wing increase: 4%**
    - **Estimated compressor time on wing increase: 20%**
    - **Reduced man-hours and maintenance costs**
  - **Specific fuel consumption was calculated to be 1-2% better at 95% power**
    - **3 million gallons in USAF fuel savings per year**
    - **Reduction in cost and emissions**

# T56 SIII Transition



- **Move from demonstration to qualification**
  - **Funded by Component Improvement Program (CIP)**
  - **Leverage as much prior work as possible**
  - **Must ensure airworthiness is maintained**
  - **MIL-HDBK-516 used for guidance**
- **MIL-HDBK-516 relevant criteria**
  - **Performance - demonstrated to be better**
  - **Stability margin - impact has not been tested**
  - **High cycle fatigue - durability needs to be reassessed**

# T56 SIII Transition



- **Stability margin impact**
  - **As coated condition is not of concern**
    - **Surface finish is as good or better**
    - **Additional thickness is minimal**
  - **Degraded condition may be of concern**
    - **Previous NAVAIR experience indicates no concern**
  - **Plan to use AE1107 data to evaluate T56 SIII impact**
  - **Working with OEM to finalize plan**
    - **Requested formal OEM position in mid-July**

# T56 SIII Transition



- **High cycle fatigue (HCF)**
  - **Improvement seen in 2 of 3 stages in initial HCF testing**
  - **5th Stage blade showed reduction**
  - **OEM recommended re-test during final Fixed Process Approval (FPA) testing**
    - **FPA "locks down" production process**
    - **Ensures process output meets drawing requirement**
  - **Agreed to include HCF testing in FPA**

# T56 SIII Way Forward



- **Define final stability margin verification plan**
- **Initiate and conduct FPA**
- **Approve ECP/Airworthiness documents**

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