Flight Rationale for STS-108 (OV-105) Based on Wheel Testing

- Stress and Fracture Analysis Limitations
  - Current crack analysis software, NASGRO 3.0, has inadequate capability for stresses above yield and for the specific 3D crack geometry
  - Historical Stress Data Was Possibly Over-Conservative
    - Strain-Gage Data Doesn't Represent Sub-Surface Stress Fields
- Rationale for Dynamometer Testing Using Flawed Wheel at WPAFB
  - EDM Flaw Bound Worst-Case Corrosion Pits in Worst-Case Locations & Orientations
  - Langley Demonstrated Similar Fatigue Life Behavior For EDM Flaws and Corrosion Pits
  - Dyno Tests Allow Accurate Representation of Actual Landing Load Spectrums
  - WPAFB Test Conditions Conservatively Bound Scenarios for the Next Three Flights
    - Worst Corrosion Pit Found to Date: 0.0385"-deep; EDM Flaw Size: 0.049"-deep
    - WPAFB Abort-like Load Case More Conservative Then Worst-Case Expected Landing
    - WPAFB Load Cases Include More Cycles Than Actual Landings
- Test Results
  - No Crack Growth Was Observed After 3 Required Nominal and 1 Abort-like Load Scenarios
    - Crack Growth Monitored Using Both eddy Current and Dye Penetrant NDE Techniques
    - Eddy Current Resolution Believed to Be +/- 0.005"
    - Tests Underway at JSC/ES to Verify Eddy Current Detectability Limits
- Conclusion: Testing showed adequate margin for flight
  - MSFC (Drs. Munafo, McGill, Swanson & Wells) evaluated the flight rationale as presented and accept the rationale for flight