



SPACE SHUTTLE PROGRAM
Space Shuttle Projects Office (MSFC)
NASA Marshall Space Flight Center, Huntsville, Alabama



STS-100/ET-108 Flight Readiness Review

External Tank Project



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April 5, 2001



Overview	Presenter P. Kopfinger/LMSSC	
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- **Limited Life Component Status**
 - All items within required life
- **Significant Processing Anomalies**
 - Crane Grease Contamination
- **No Significant Changes**
- **Waiver Status**
 - 95% Launch Probability Requirement
 - LO2 tank ogive has foam thickness below the minimum necessary to comply with the “95% launch probability” requirement (NSTS 07700, Vol. X, para 3.2.1.2.14)
 - Reduced foam thickness results in a minor decrease in launch probability due to ice formation (93.3% vs 95% required)
 - Waiver to requirement was approved for ET-102 & ETs 107-110
 - PRCBD S071290 (03/10/00)
- **Readiness Statement**



Crane Grease Contamination

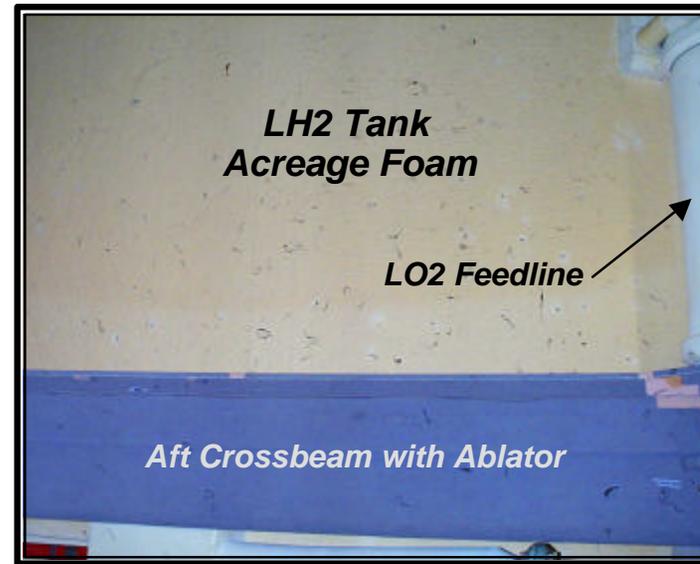
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- **Background**

- Grease from 175 ton crane at KSC leaked onto ablator, foam insulation, and metallic surfaces located primarily in +Y/+Z quadrant aft of XT1900
 - Presented at the STS-100 ET/SRB Mate Milestone Review (02/21/2001)



- Various methods were investigated for cleaning ablator, foam insulation, and metal
 - Methods included mechanical, solvents, surfactants, microbes and cryogenic
 - Ablator and foam cleaning processes were developed and validated by hot gas and flammability testing on simulated panels



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- **Discussion**

- Metallic surfaces
 - Standard process using isopropyl alcohol was used to clean metal surfaces
- Foam insulation
 - Solvent (Citrus Solve) used to remove grease on foam surfaces
 - Solvent performance on net sprayed “rind” surfaces - 90% removal
 - Solvent performance on machined “sanded” surfaces - 75% removal
 - Grease remains in the cells open to the surface, residual grease is acceptable
- Ablator (SLA-561)
 - Phenolic tool used to mechanically remove excess grease until non-transferable criteria met
 - Solvents were determined to be unacceptable
 - Testing indicated SLA absorbed grease along with solvent
 - Residual grease on ablator surface is acceptable



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- **Rationale for Acceptance**

- Testing

- Test panel configurations

- Control panels (foam and ablator) with no grease contamination
 - Foam and Ablator panels with grease contamination
 - Foam panels cleaned with “Citrus-Solve” solvent per developed procedures
 - Ablator panels mechanically cleaned per developed procedures

- Hot gas testing results

- No distinct difference in terms of char layer formation or material erosion characteristics compared to control panels

- Flammability tests results (performed at MSFC)

- All panels met flight requirements
 - Acceptance Category for Flight (B)

- Accessible External Tank surfaces contaminated by grease have been cleaned

- Excess grease removed from foam and ablator surfaces
 - All grease removed from metallic surfaces

Hot gas and flammability testing shows ET-108 is acceptable for flight



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**The External Tank, ET-108, is certified and
ready for STS-100 flight pending
completion/closure of open and planned work**