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MATERIALS AND PROCESSES CONTROL
FOR
SPACE APPLICATIONS

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- o CONTAMINATION CONTROL IS AN INTEGRAL PART OF GOOD MATERIALS AND PROCESSES CONTROL.
- o IT IS ESSENTIAL THAT MATERIALS AND PROCESSES ENGINEERING BE CONSIDERED A "TOTAL CONTROL" ELEMENT OF ANY MANNED AEROSPACE PROGRAM.
- o FUTURE AEROSPACE PROGRAMS WILL REQUIRE A "SYSTEMS" PERSPECTIVE.



M&P CONTROL
FOR
SPACE APPLICATIONS

MATERIALS AND PROCESS CONTROL APPLIES TO THE PROPER SELECTION, USAGE EVALUATION, DOCUMENTATION AND THE TRACKING OF MATERIALS AND PROCESSES TO AVOID OR REDUCE THE RISKS OF SYSTEM PERFORMANCE FAILURES FROM FLAMMABILITY, TOXICITY, THERMAL/VACUUM STABILITY, CORROSION, FLUID INCOMPATIBILITIES, FATIGUE, OXYGEN IMPACT SENSITIVITIES, CONTAMINATION CONTROL, ETC.

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M&P CONTROL
FOR
SPACE APPLICATIONS

A TOTAL MATERIAL AND PROCESS CONTROL SYSTEM CONSISTS OF
TWO ELEMENTS:

1. AN ENGINEERING REVIEW/EVALUATION SYSTEM
 - PROGRAM REQUIREMENTS
 - DESIGN REVIEW/APPROVAL
 - MATERIALS/CONTAMINATION TEST PROGRAMS
 - SPECIFICATIONS
 - HAZARD REMOVALS
 - FAILURE ANALYSIS

- 2 AN ENGINEERING DATA MANAGEMENT AND TRACKING SYSTEM
 - MATERIALS SELECTION LISTS
 - PROPERTIES MANUAL
 - MATERIAL/CONTAMINATION IDENTIFICATION & TRACKING
 - AS/BUILT CONTROLS
 - COMPLETENESS VERIFICATION



N&P CONTROL
FOR
SPACE APPLICATIONS

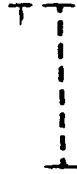
MATERIALS & PROCESSES ENGINEERING
A SYSTEMS APPROACH

REQUIREMENTS - DESIGN - FABRICATION - OPERATIONS - LOGISTICS
ASSEMBLY MAINTENANCE

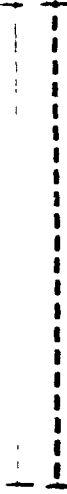
ORBITER



STS



PAYLOADS



SPACE
STATION



PROGRAM
TECHNOLOGY



PLUMBING

STANDARD
PRACTICES

EARTHBOUND

DATA
MANAGEMENT
SYSTEMS

HI TECH

SYNERGY
OF COMBINED
ELEMENTS

ORBITAL
LUNAR ETC.

MONITORING
(REALTIME)
MAPPING

MODELING

ORIGINAL PAGE IS
OF POOR QUALITY



CONTAMINATION CONTROL ISSUES *

ISSUES	CURRENT DATA BASE TO RESOLVE	CONTROL W/CURRENT TECHNOLOGY	NEW TECHNOLOGY
o INHERENT HARDWARE CONTAMINATION LEVELS	50%	X	
o ASCENT/LAUNCH DRAG ALONG/INDUCED	20%		X
o ORBITAL DEBRIS	?		X
o OPERATIONS/CROSS CONTAMINATION	?	X	X
o MATERIALS DEGRADATION	20%	X	X
o MAINTENANCE PROCEDURES	30%	X	X
o PROBLEM ANTICIPATION/TRACKING/MONITORING	30%		X

* BASED ON APOLLO/SHUTTLE PROGRAM EXPERIENCE 1960 - 1984



MATERIALS AND PROCESSES
ISSUES *

ISSUE	CURRENT DATA BASE TO RESOLVE	CONTROL W/CURRENT TECHNOLOGY	NEW TECHNOLOGY
o ADVANCED ENGINEERING MATERIALS TRACKING DATA BASE SYSTEM	70%	X	—
o IMPROVED MATERIALS AGE LIFE DATA BASE	40%	X	X
o EFFECTS OF RADIATION ON MATERIAL PROPERTIES	30%	X	X
o INTEGRATED LOGISTICAL DATA BASES	?	X	—
o MATERIAL/CONFIGURATION MAPPING (LOCATOR)	?	X	X

*. BASED ON APOLLO/SHUTTLE PROGRAM EXPERIENCE 1960 - 1984



EXPERIENCE:

- o OUR INVESTMENT IN MATERIALS & PROCESSES CONTROL PROCEDURES/ SYSTEMS HAS BEEN REPAYED BY REDUCED RISK/HAZARDS AS WELL AS TIMELY FAILURE ANALYSIS WHEN NEEDED.
- o MATERIAL FAILURES AND CONTAMINATION ARE STILL A MAJOR CAUSE OF SYSTEM FAILURES.
- o THE FUTURE NON-RECOVERABLE SYSTEMS SUCH AS SPACE STATION WILL DEMAND EVEN GREATER RELIABILITY, MONITORING & CONTROL.
- o AT THIS TIME, WE DON'T HAVE SUFFICIENT EXPERIENCE WITH PERMANENT MANNED AEROSPACE SYSTEMS TO PROPERLY DETERMINE ALL OF THE CRITICAL USEABILITY FACTORS.

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RECOMMENDATIONS:

- o THERE IS AN IMMEDIATE NEED TO DEVELOP A COMPREHENSIVE MATERIALS & PROCESSES DATA BASE TO SUPPORT PHASE 'B' SPACE STATION STUDIES.

- o DEVELOP A FLIGHT PROVEN "CONTAMINATION" REAL-TIME MONITORING SYSTEM.

- o DEVELOP AN INTEGRATED/OPERATIONAL DATA BASE FOR A MATERIALS/MAINTENANCE/INCIDENTS TRACKING SYSTEM.

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