



Assuring Safe Access To Space by Improving Process Control across the Space Shuttle Program

Sixteenth Annual NASA Continual
Improvement (CI) and Reinvention
Conference

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PROCESS CONTROL
Mission Success Depends On You



Background

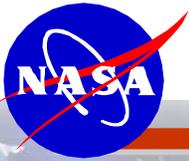
Are you ready
for us to go?



- Process control problems were causing delays and mission impacts to Shuttle Program
 - Hatch latch actuator problem prevents EVA, STS-80
 - Contaminated cleaning cloth causes extensive testing and analysis before launch of STS-103

Shuttle Program Manager Concern

- Safety Risk
- Need to Improve Process Control across SSP



Government-Industry Team Formed



- **Process Control Focus Group:**
 - Chartered by Shuttle Program Manager, October 1999
- **Membership:**

NASA Centers

- JSC, Lead
- MSFC
- KSC

– United Space Alliance

- Rocketdyne
- Lockheed Martin
- Thiokol
- Hamilton Sundstrand
- Pratt Whitney



CI Tools Used



Root Cause Analysis

- Process Escapes analyzed to determine underlying contributing factors

Brainstorming

- To determine possible approaches to solving process problems

Bimonthly Team Meetings

- To develop, implement and track solutions

Benchmarking of Best Practices

- To develop process control standards



Root Causes Determined

- *Changes at Suppliers Not Adequately Assessed and Technically Verified*
 - ◆ Seemingly minor changes to “noncritical” processes causing significant problems
 - ◆ Existing Quality Systems, ISO 9000, contractual requirements inadequate to protect against some changes
 - ◆ Rigorous control over critical processes

Contributing Factors

- Process drift over time
- Unreported, well-intentioned process improvements
- Changes caused by environmental regulations
- Business realignments
- Aging program/Loss of corporate knowledge



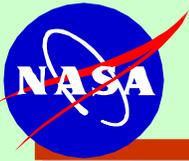
Team Developed Solutions



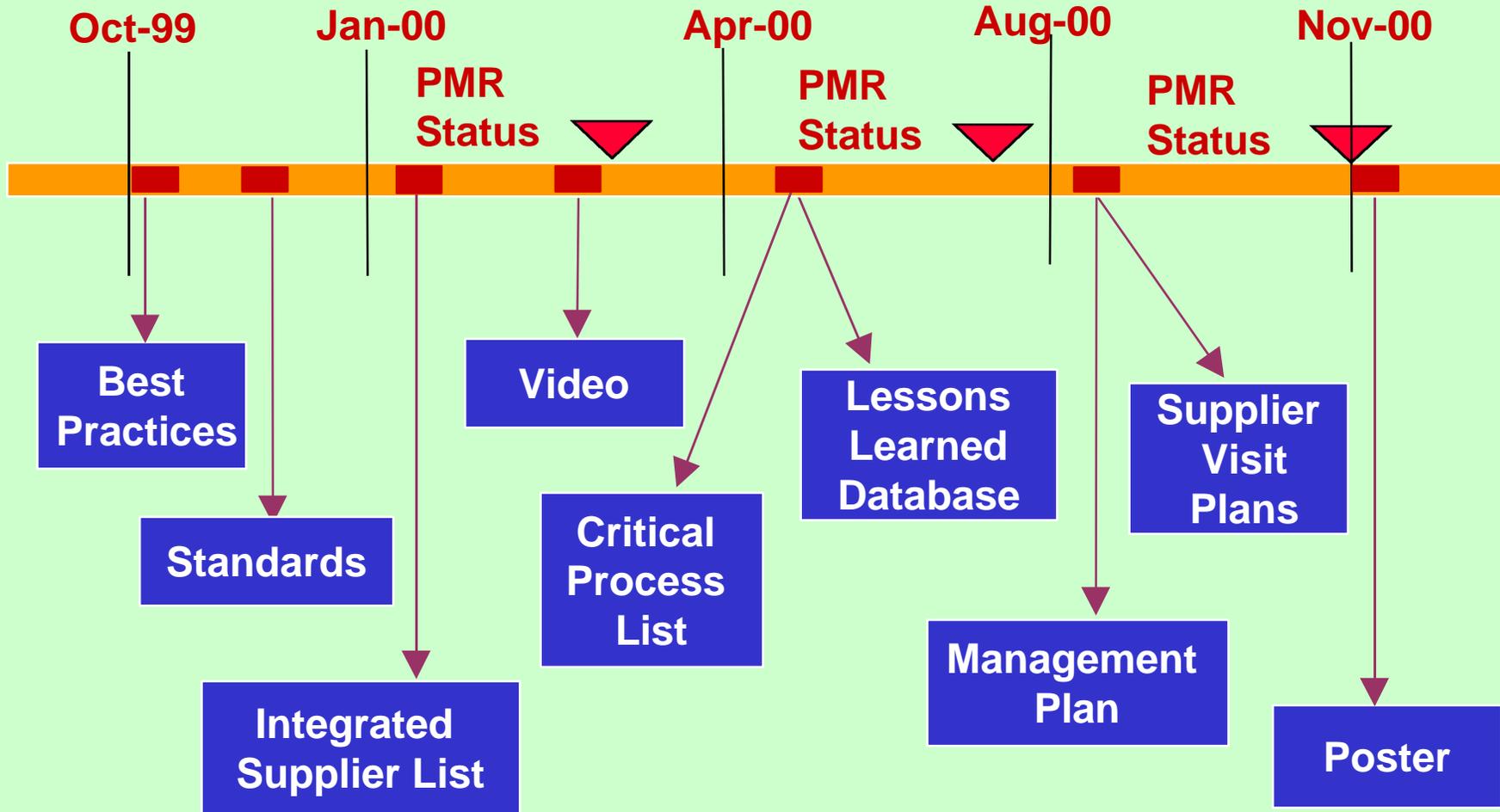
- Determine **best practices** for process control used across program
- Create program process control **standards** from these best practices
- Communicate process control **lessons learned** across program elements
- Increase **awareness** of importance of process control across all levels of Shuttle Program

CHALLENGE:

- ✓ Large Supplier Base - >850 Active Suppliers of Flight Hardware Across 50 States
- ✓ Thousands more 2nd and 3rd Tier Suppliers



Schedule and Products

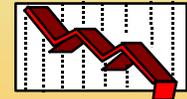




Metrics Indicators of Program Success

- Process Escapes
- Lessons Learned
- Awareness Activity

Reported
Quarterly to
Program Manager



**Culture Change – Difficult to Measure Short Term
Real Results >1 year**

We've Only Just Begun!

Developing NEW methods to:

- Focus on Process Details*
- Define & Analyze Risks*
- Communicate Lessons Learned*
- Improve Processes*



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