Dryden Flight Research Center
Critical Chain Project Management Implementation

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Outline

• The Need for Change at Dryden
• Choosing a solution and first year Results
• How did we do it, what did we change?
• Implementation Challenges
• Next steps and Conclusions
Dryden Work Environment

- Almost equal support of ARMD, SMD, and HEO with growth in Space Technology
- Majority of work occurs at sub-project or task level
- Work content and schedule driven from outside Dryden
- Program demand exceeds FTE center ceiling
- Highly matrixed Center organization
- Limited number of certain skills in key areas such as structures engineering and backshop support
- Multi-project environment causes resource conflict
The Need For Change at Dryden

- Recent NASA audits have indicated that our workforce is stressed to keep up with project demand.
  - Many individuals will work on 10 different projects in 1 pay period
- In a Dryden-wide survey, workforce identified improved project planning as the number one area to improve work/life balance
- Need to become more efficient due to a combination of program demand growth and declining budgets
Goals

For Our People

• Reduce stress for people
• Reduce multi-tasking
• Improve prioritization of work
• Improve sense of accomplishment

For Our Business

• Improve on-time performance
• Improve Time for:
  – Training
  – R&D
  – Near Term Opportunities
  – Infrastructure Improvement

Position us for Available Opportunity

Significant productivity gains (>20%) are required to meet these goals
Determining a Solution

Dryden senior management realized that we needed to change the way we work.

In July 2010, Dryden Management chose to implement CCPM methodology at the start of FY11.
First year results

- 25% increase in work completed for the first 6 months!
- Results declined for a few months as we attacked bottlenecks and thought through mechanical changes
- First QTR FY 2012 we are back on track
Results – 1st QTR 2012
Variance to original Planned Date (BCD)

- New measure developed to drive the correct behavior
- Goals set to cut the variance in half over the next year
Other Benefits of CCPM

- Increase time employees can spend on research, training, job skill improvement
- Provide a better work environment for DFRC workforce
- Improved visibility into current & projected status of Center project portfolio for management chain
- Ability to project future resource pinch points and monitor corrective actions
- Concerto software that implements CCPM provides the prioritized task list and buffer consumption charts to assist in conflict resolution
How did we do it?

Followed some simple rules based on CCPM concepts...

PIPELINING
• We staggered project starts to reduce WIP for management and support and staggered the due-dates to enable stable priorities for direct resources

BUFFERING
• Removed measurements based on local efficiency and schedules
• Created aggressive/feasible plans with 1/3rd buffers

BUFFER MANAGEMENT
• Set priorities based on buffer consumption
• Used buffer consumption for control
Buffers

Before

After

- Traditional networks have safety embedded in the tasks

- Safety is removed from tasks and moved to the end to be shared by all who need it
How buffer signals drive priorities

Project 1

- Project Completion = 50%
- Buffer Consumption = 40%
- Priority Index = 0.4/0.5 = 80%

Project 2

- Project Completion = 33%
- Buffer Consumption = 50%
- Priority Index = 0.5/0.33 = 150%
Priorities for resources

*Synchronized priorities and sense of urgency*  
*(what to do and how urgently)*
Priorities for management

Resource managers look to see where tasks are stuck and their urgency

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Data is Notional
What did we change?

BEFORE

WORKLOAD
- Projects accepted with no regard for capacity or overloads
- All projects are worked at the same time
- No mechanism to say no or yes to work

PRIORITIES
- Projects fight for resources and the Squeaky wheel gets priority

RESOURCE ALLOCATION
- Resources spread thin over many projects

SOLVING ISSUES
- Issues tackled as they move into crisis mode, managers overloaded with issues

AFTER

WORKLOAD
- Stagger project starts based on capacity
- Limit work in execution… so we can do more
- Test to see if we can accept the work

PRIORITIES
- Synchronize resource needs across all projects in work based on buffer signal

RESOURCE ALLOCATION
- Resources focused on fewer tasks at a time, allocated to real need

SOLVING ISSUES
- Issues raised and identified early and solved quickly to avoid delays
Project Lifecycle Process
Integration of the lifecycle process of preparing and conducting ARMD research

Pre-Phase A: Advocacy / Concept Studies
Phase A: Concept Development & Requirements Definition
Phase B: Preliminary Design
Phase C: Detailed Design & Fabrication
Phase D: System Integration & Test, Ground Tests
Phase E: Flight Op/ System Op
Phase F: Closeout / Disposal

Planning
Implementation
Operation & Closeout

Phase A Network
Phase BCD Network
Phase EF Network

Integrated Resource Loaded Schedules/Networks

Project Management Board (PMB)
Implementation Challenges

• Development of project networks that are simple, execution oriented, and reflect how work should be accomplished
• Changing the way resources are assigned to projects
• Determining how much WIP can be undertaken
• Training personnel to update their tasks daily
• Breaking the habit of multi-tasking
• Concentrating resources on the high priority task
• Customer awareness & buy-in of CCPM
Next Steps

• Improve project network modeling techniques
• Improve early project planning
• Focus on how to continue good resource concentration and flexibility
• Develop interfaces for external reporting
• Integrated CCPM into budget planning process
Conclusions

• Changing the way we do our work is critical for our future
• Results indicate that we can increase our project throughput with same resources
• Implementing CCPM has increased the need for horizontal integration across organization
• Cultural change is a challenge
• CCPM concepts may have broader applicability to other Dryden areas
Buffer signal used to synchronize and control

Project 1
- Project Completion = 50%
- Buffer Consumption = 40%

Project 2
- Project Completion = 33%
- Buffer Consumption = 50%

Project 2 is eating buffer at a faster rate = Higher priority