AEROSPACE
Assuring Space Mission Success

# Integrated Change Control for the Concurrently Developed Complex Systems – Lessons Learned

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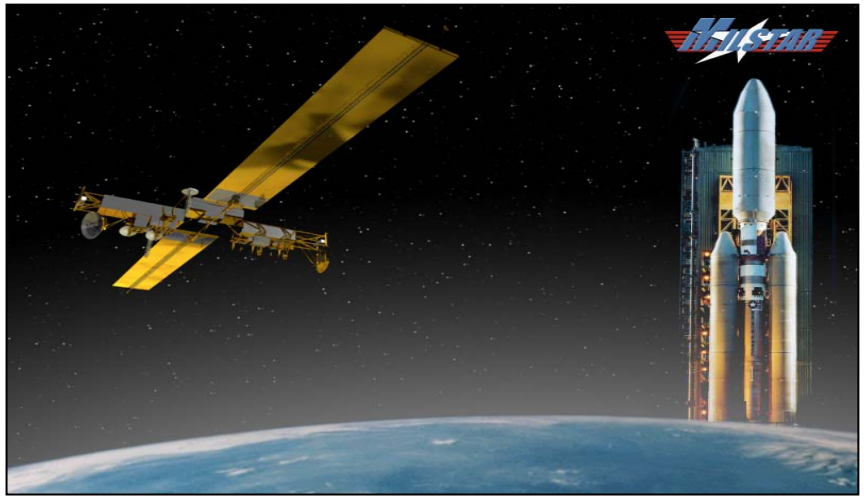
# Before We Begin…

There were many contributors to this effort.
Thank you everyone who helped!

# Advanced Extremely High Frequency (AEHF) System

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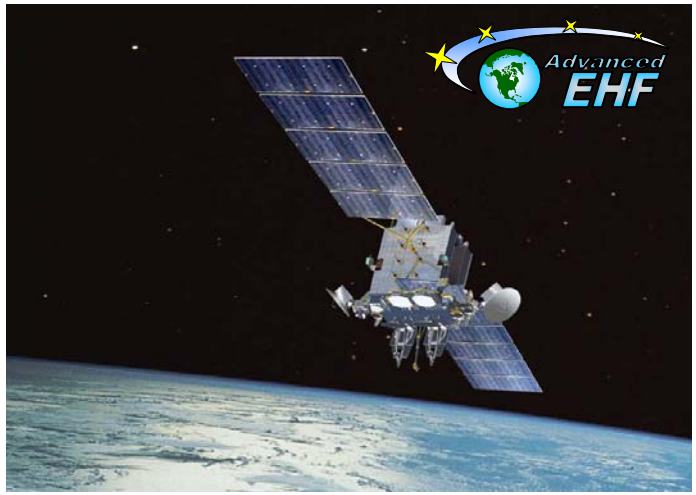


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- Mission – Provide protected satellite communications for strategic and tactical defense missions
- Designed to augment and eventually replace the Milstar system
- AEHF Program Office is located at the Space Missile Center (SMC), Los Angeles Air Force Base

# AEHF Program Challenges

- Concurrent development and acquisition of major AEHF system elements
- Concurrent development of interfaces
- Most elements have different
  - *Contracts*
  - *Contracting agencies*
  - *Contract schedules*
  - *Development teams*
- Backward compatibility requirements with existing operational systems
- Operational systems are in the process of changing while in sustainment mode
- New, post contract award requirements
- International Partners
- Budgetary and regulatory requirements and constraints

# Change Dilemma…

- Change is inevitable on a large, multi-year, concurrent development program
- Change is disruptive by its nature
- Managing change is not easy
- Having a well defined and understood process for managing change is imperative
- Processes need to be constantly adjusted to reflect the needs at hand

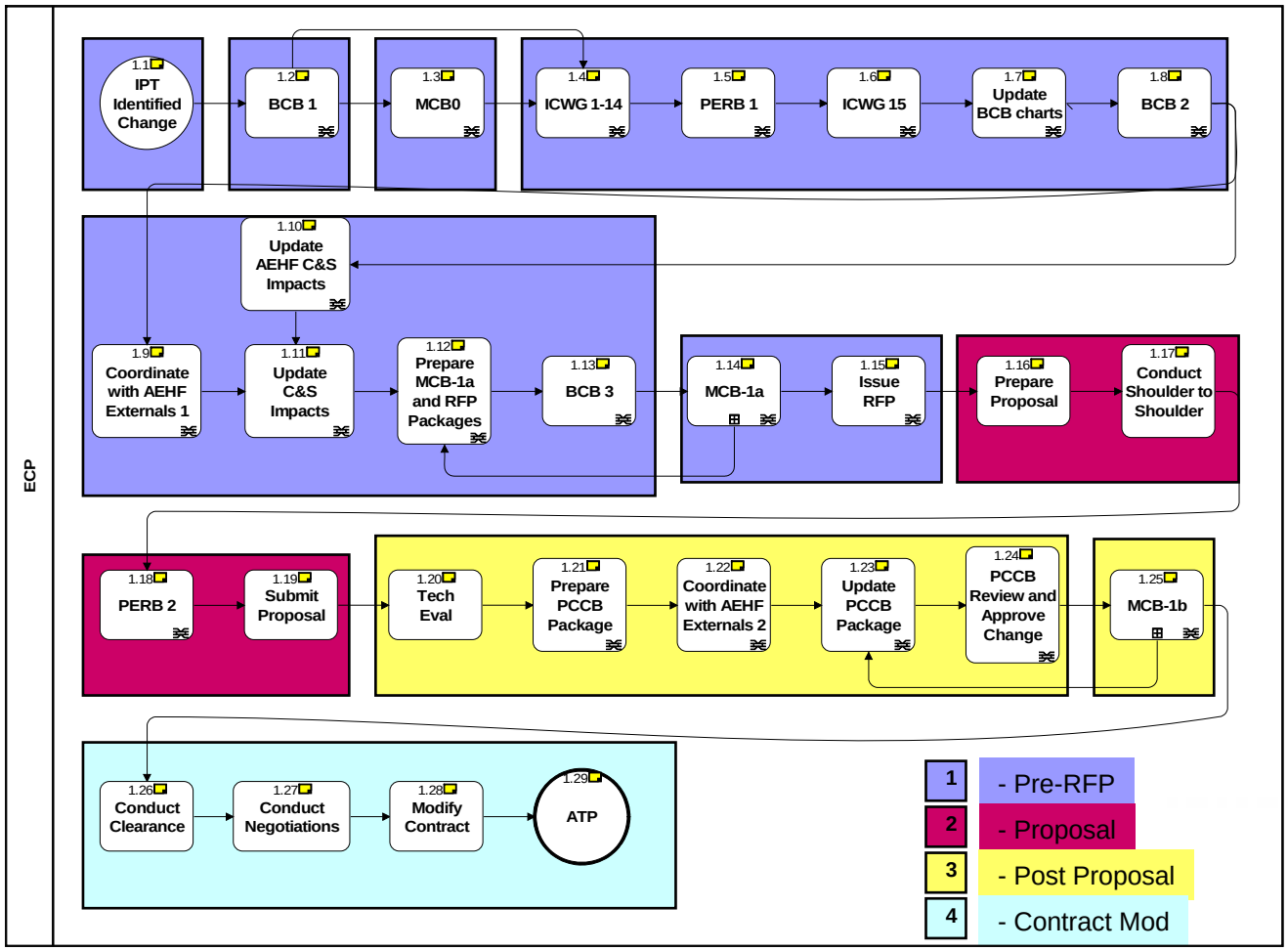
# In the Beginning…

- AEHF Program Office Change Process existed since the beginning of the program
- December 2003 – SMC/CMMI Program Office Assessment recommends review of the existing change process
- September 2004 – Comprehensive review of the AEHF Change Process is initiated
- July 2005 – “New and Improved” AEHF Change Process makes its debut

# What We've Learned About the AEHF Change Process Since…

- Define, document, and implement the process
  - *Identify what needs to be accomplished, e.g., Engr. Change vs. Contr. Change*
  - *Know your stakeholders*
  - *Provide enough detail to map it into the process above (e.g. Group to Wing)*
  - *Define Entry and Exit criteria for each step*
  - *Identify Artifacts created and modified*
  - *Define realistic, nominal timelines*
  - *Apply a "KISS" principle at every opportunity*
- Train, train, and train again
- Execute and measure process performance
- Implement Process Volume controls
  - *Addresses multiple, simultaneous changes and resource contention*
- Adjust the process as needed
  - *Conduct process improvement activity (e.g., VSM)*
  - *Implement changes as needed and as possible*
  - *Avoid "Big Bang" approach to changes, "evolutionary" vs. "revolutionary"*
- Be vigilant about your process

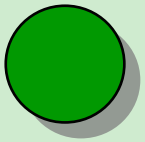
# AFSO21 VSM
# AEHF Change Process Current State – July 2006




- 1 – Pre-RFP
- 2 – Proposal
- 3 – Post Proposal
- 4 – Contract Mod

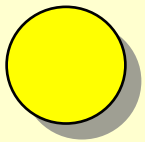
# AFSO21 VSM Process Activity Value Definitions

## Pure Value Activities



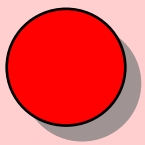
- Activities that change the form, fit or function of the product/service and
- Activities that, when asked, the customer is willing to pay for and
- Activities done right the first time.

## Business Value Activities



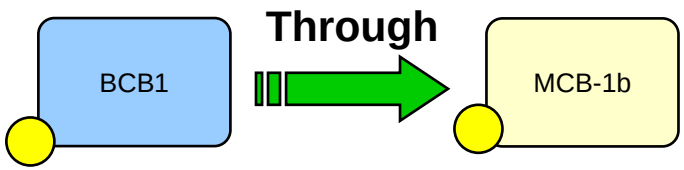
- Activities causing no value to be created but that cannot be eliminated based on current state of technology or thinking
- Required (regulatory, customer mandate, legal)
- Necessary (due to non-robustness of process, currently required)

## Non Value Activities



- Activities that consume resources but create no value in the eyes of the customer
- Pure waste
- If you can't get rid of the activity, it turns to yellow.

# AFSO21 AEHF CP Initial State VSM Analysis

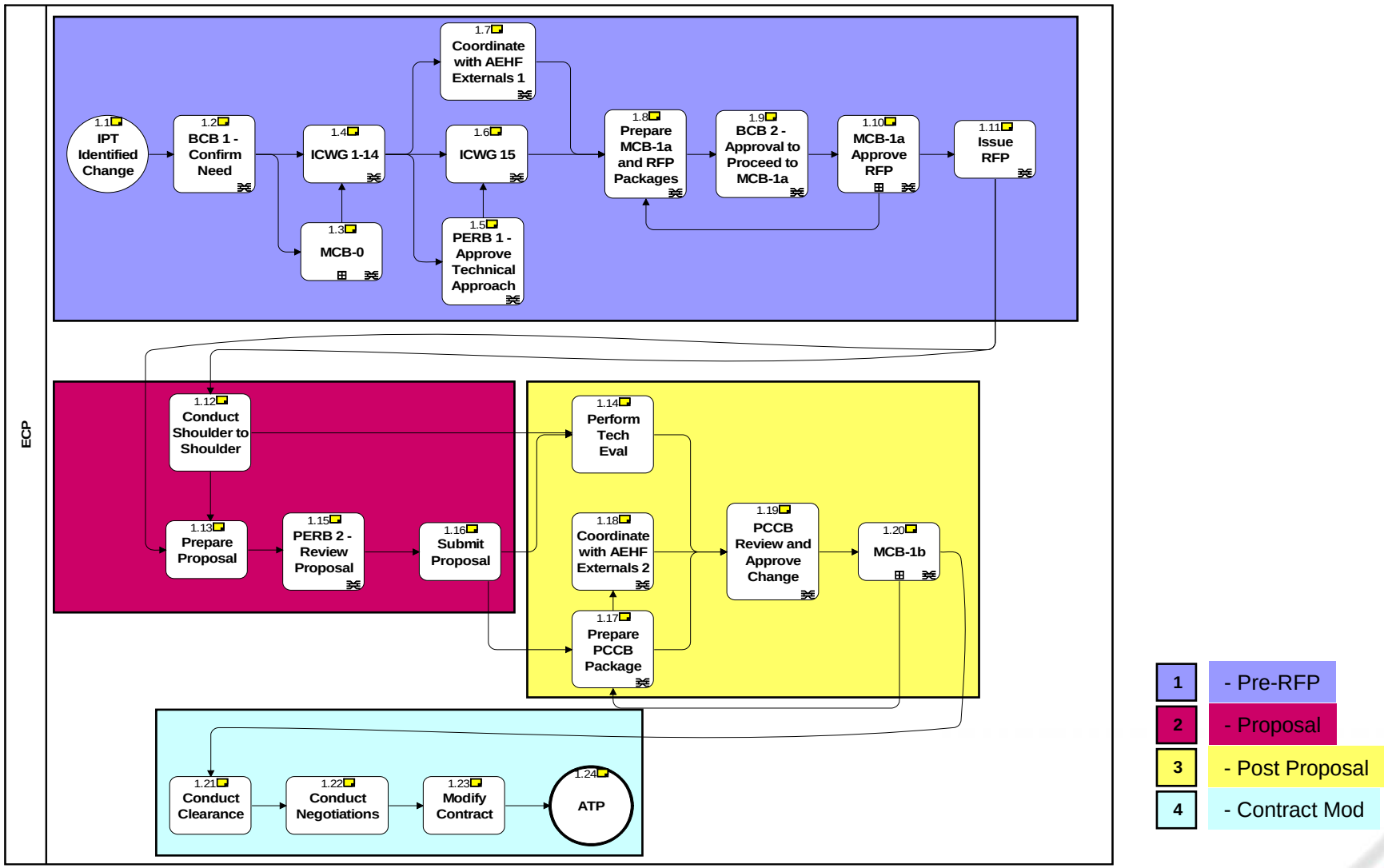



| TOTAL | |
|---|---|
| Task | |
| Trigger | |
| Done | |
| Cycle Time (days) | 321 |
| Touch Time (days) | 40.25 |
| TAKT Time | |
| No. of People | 492 |
| Items in In-Box | |
| No. of Approvals | 143 |
| Distance Item Travels | |
| ESH Issue | |
| % Rework | |
| Top 3 Rework Issues | |

| 25 STEPS | |
|---|---|
| 10 GREENS | 40% |
| 8 YELLOWS | 32% |
| 7 REDS | 28% |

| Wait Time (%) | 87% |
|---|---|

# AFSO21 VSM AEHF Change Process Future State – July 2006



# AFSO21 Value Stream Mapping Event – July 2006
# AEHF Change Process

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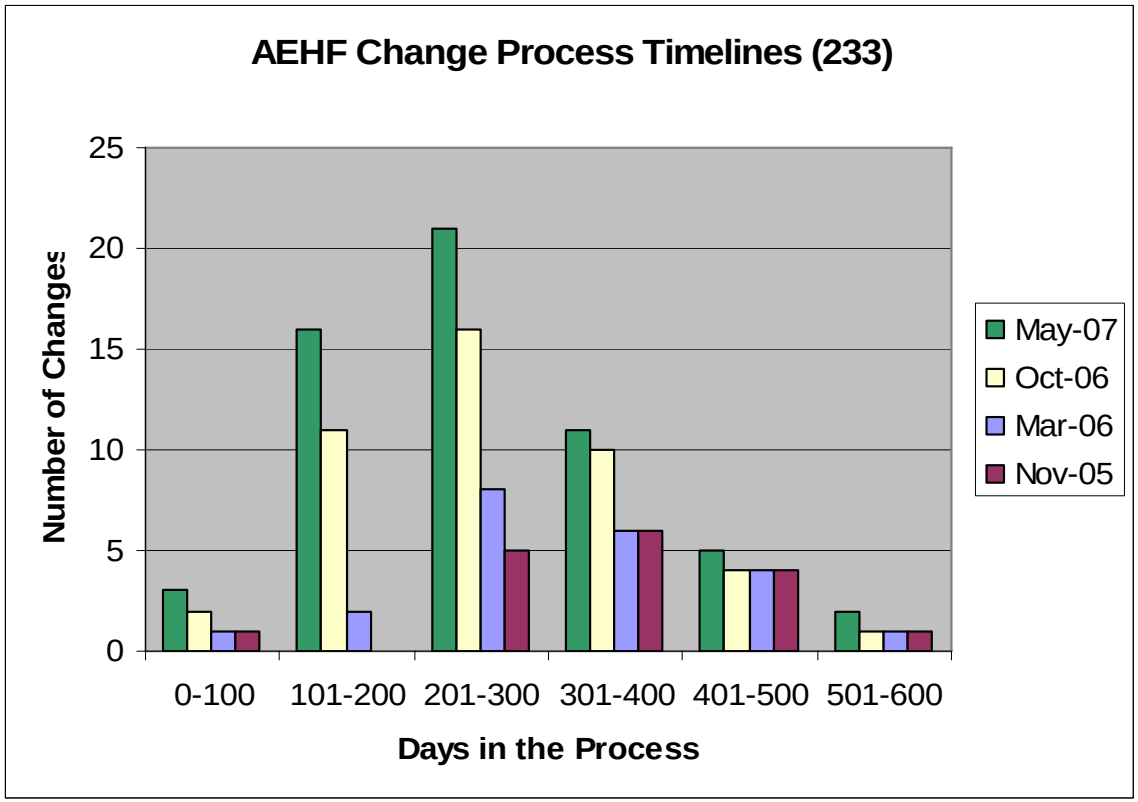
- What Existed
  - *25 Steps, 321 Days of cycle time (Excluding Mod Phase)*
- What We Did
  - *Eliminated steps – Consolidated board meetings*
  - *Optimized Process Flow*
    - Performing technical and programmatic coordination in parallel
    - Improved Organizational Impact Analysis
  - *Started Activities Earlier – Improved Shoulder-to-Shoulder (StS) process to allow the Tech Evaluation to begin during the Proposal preparation phase*
- Results
  - *Excluding Mod Phase*
  - *19 steps – 24% Improvement*
  - *Cycle time 196 days – 39% Improvement*

# Metrics – How Are We Doing?
## Start through Contract Modification




- 17 ECPs/CCPs put on contract (05/05 – 10/05)
- 23 ECPs/CCPs put on contract (05/05 – 03/06)
- 44 ECPs/CCPs put on contract (05/05 – 10/06)
- 58 ECPs/CCPs put on contract (05/05 – 05/07)

- Median
  - *11/05 – 303 days ~ 43 weeks*
  - *03/06 – 252 days ~ 36 weeks*
  - *10/06 – 243 days ~ 35 weeks*
  - *05/07 – 233 days ~ 33 weeks*

- 30% Improvement including Mod Phase

# VSM Lessons Learned

- VSM technique is a valuable tool in identifying “waste” in a process
- Keep the team lean and effective – 10-15 people
- Must have representation from all stakeholders
- Participants need to know the current process
- Participants need to have basic training in process improvement techniques
- Need experienced event facilitators
- Do not allow changes in team membership once the event starts
- Team leaders need to stay engaged throughout the event, especially during the “heavy lifting” activities
- Team leaders must be careful not to dominate the discussion
- Team leaders must make sure the discussion does not deviate to far from the plans
- Be vigilant to keep the “out-of-bounds” items out of discussions
- Have fun!

# CMMI AEHF Program Office Assessment 2007 – Excerpts

- SMC Tailored CMMI® / Acquisition models, no numerical rating or process quality

- AEHF Best Practices – Within the Model
  - *A rigorous Change Management process is used to baseline and maintain requirements*
  - *All types of program changes are analyzed via the Change Management process*
  - *A rigorous Change Management System of boards and reviews includes the relevant stakeholders*

- Strengths Above the Model
  - *Baseline ECO Board (BEB) Master Matrix and waterfall chart are used to regulate change management process flow*

# Summary

- A comprehensive Change Process has successfully supported the AEHF program for the past 3 years
- Further improvements are possible, necessary, and are being implemented

Any Questions?