Implementing Systems Engineering in a Sustainment Environment

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So What is the Problem?

- High-level policy is a good and necessary first step, however, more detailed direction is essential to turn the policy into a workable, grass-roots program
- Sustainment different than acquisition
- Our organization had insufficient direction, documentation, and procedures to begin implementing an effective, comprehensive Systems Engineering program

So What Are Doing About It?

- Instigated a step-by-step approach to begin implementing systems engineering throughout the sustainment organization
- Tangible approach that is:
  - Aimed at the working level
  - Affects all phases of a program's lifecycle
  - Applicable throughout entire organization
  - Accounts for organization's progress through metrics

Systems Engineering Implementation Phases

- Phase 1: Awareness of Need
- Phase 2: Workforce Training
- Phase 3: Identify Applicable Programs/Orgs
- Phase 4: Identify and Define Processes
- Phase 5: Incentivize Contractors/Partners
- Phase 6: Develop Library of Tools
- Phase 7: Track Progress via Metrics

Phase 1: Awareness of Need

- ✓ Brief senior leadership and got documented buy-in
- ✓ Identify focal point for organization
- ✓ Prepare SE re-invigoration briefing
- ✓ Present briefing to all:
  - ✓ Supervisors (Squadron Commanders/Directors)
  - ✓ Program Manager's
  - ✓ Logisticians
  - ✓ Engineers
  - ✓ Equipment Specialists
  - ✓ Telecommunication Specialists

Phase 2: Workforce Training

- ✓ Determine appropriate amount/level of training by working with:
  - ✓ Internal engineering management
  - ✓ Center-level functional offices
  - ✓ Higher headquarters (HQ AFMC)
  - ✓ Senior Program Managers
- ✓ Ensure training consistent with other ALC, AFMC and DoD efforts
- ✓ Determine training plan robust enough to make a difference yet realistic based on workload
- ❑ Train Workforce

Phase 2: Workforce Training

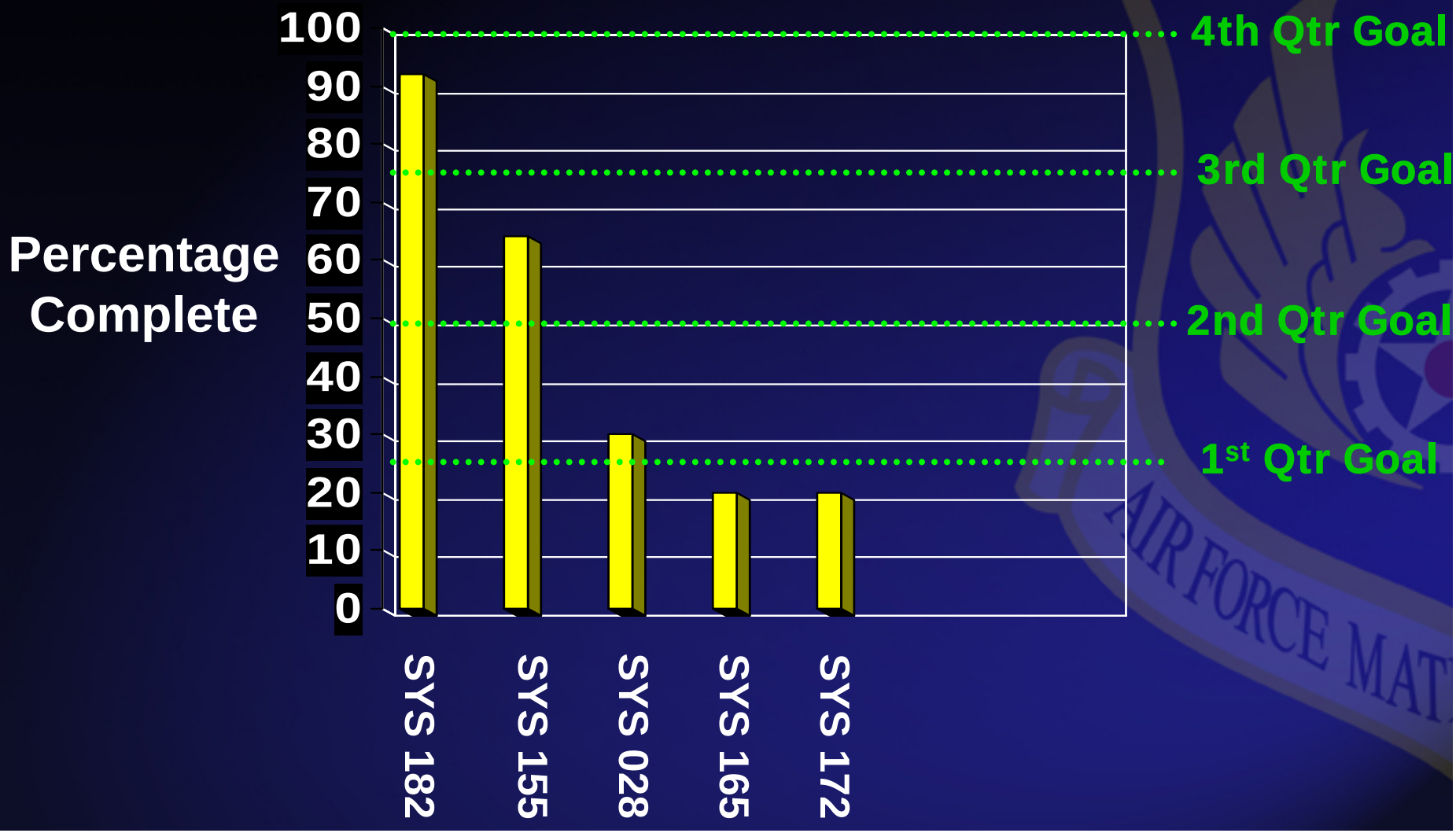
Courses Selected (All CBT):

- SYS 182 Intro to Systems Engineering ~ 3 hrs
- SYS 155 Operational Safety, Suitability & Effectiveness ~ 9 hrs
- SYS 028 Intro to Configuration Management ~ 16 hrs
- SYS 165 Intro to Risk Management ~ 21 hrs
- SYS 172 Modification Management Process ~ 6 hrs

Who: All PM's, Equipment Specialists and Engineers
When: Complete in 12 months

Phase 2: Workforce Training

Org A Training Progress (45 People)



Phase 3: Identify Applicable Programs/Orgs

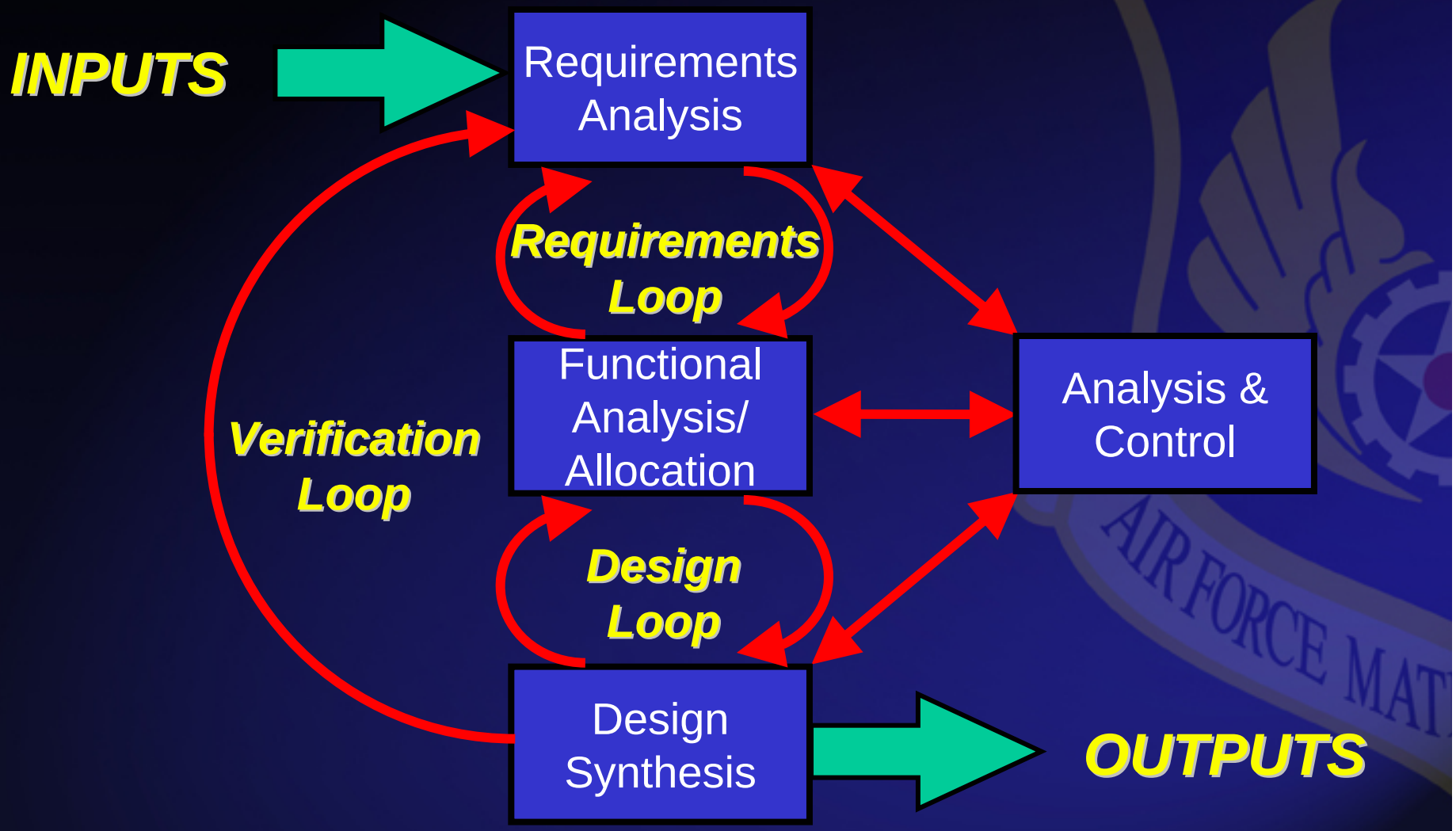
- ✓ Determine Applicable Programs Criteria:
  - ✓ All OSS&E Programs
    - * C-9
    - * C-20
    - * C-21
    - * C-38
    - * KC-10
    - * Peace Lotus
    - * Academy Fleet
    - * VC-25
    - * C-12
    - * C-21
    - * C-26
    - * E-9
    - * KDC-10
    - * T-43
    - * E-4B
    - * HFGCS

Phase 4: Identify and Define Processes

- ✓ Ensure processes incorporate systems engineering
  - ✓ Jumpstarted SE revamp with 3 Key Processes:
    - ✓ Requirement Management OI
    - ✓ Risk Management OI
    - ✓ Test Management OI
- ❑ Will springboard into other organizational processes
- ❑ Goal to standardize and share Best Practices across organization

Phase 4: Identify and Define Processes

Basic Systems Engineering Process

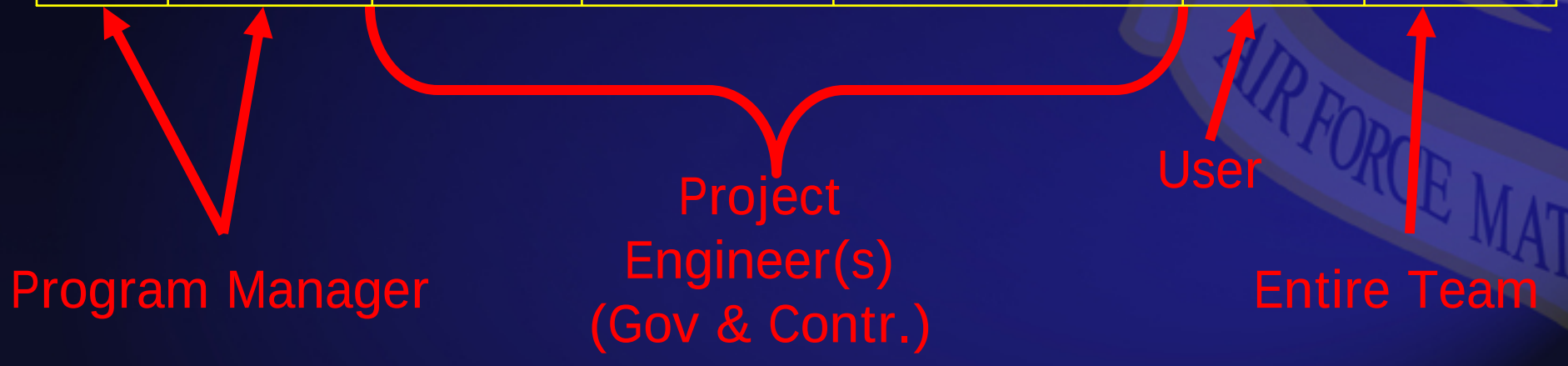


Phase 4: Identify and Define Processes

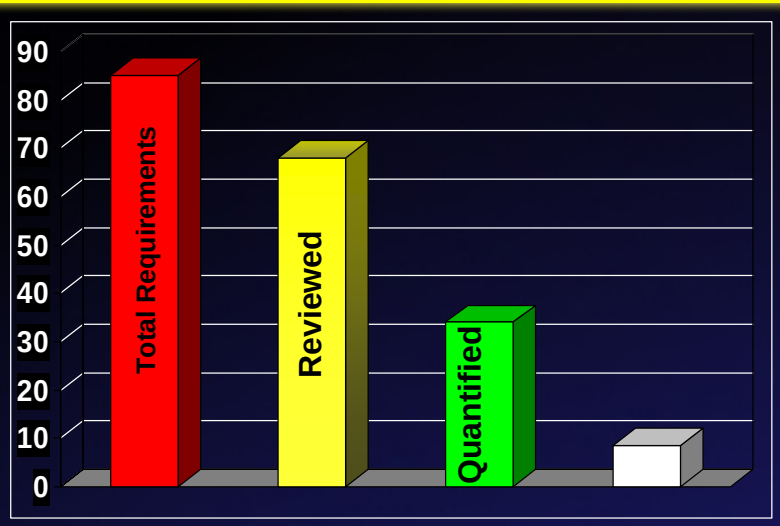
- Break requirements down in a Requirements Correlation Matrix (RCM):
- Spreadsheet with following columns:
  - Requirement
  - Requirement Source
  - Derived Requirements
  - Quantification
  - Initial Risk Assessment
  - Operational Conditions
- Give RCM to
  - Test Team for their planning
  - Risk Mngt Team for their planning

RCM

Req Title	Req Source	Derived Req	Req Definition	Quantification	Op Cases	Risk (R/Y/G)



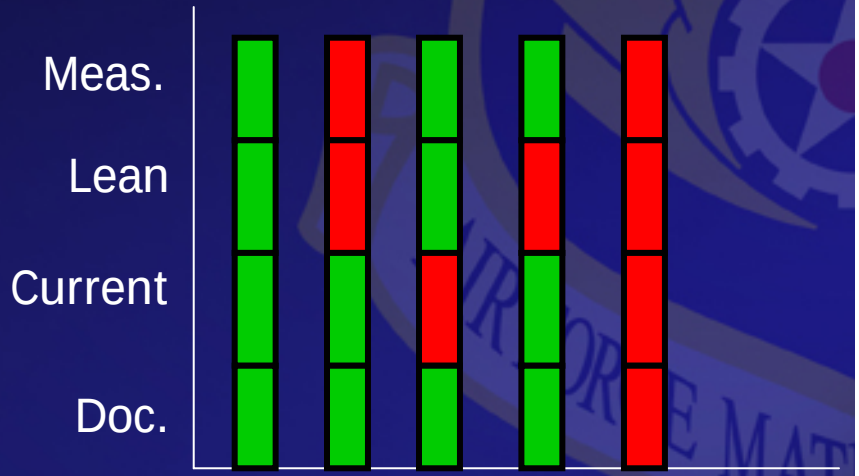
Phase 4: Identify and Define Processes



Requirements

	Low	Med.	High
High	0	2/4	1/2
Med.	1/6	0/1	3/4
Low	1/3	2/4	2/3

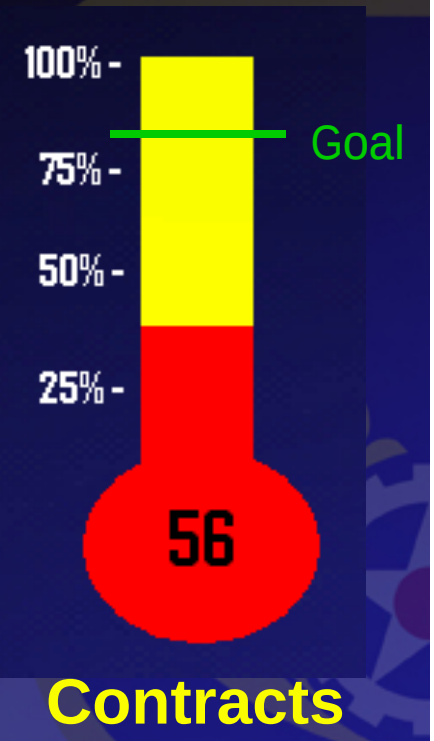
Risk



Processes

Phase 5: Incentivize Contractors/Partners

- ❑ Ensure Systems Engineering is an incentivized factor in all applicable contracts
- ✓ List all Contracts
  - ❑ Determine which should have SE
  - ❑ Determine appropriate SE wording
  - ❑ Develop plan, so as contracts renewed, incorporate SE incentivization
- ❑ Work with contractor/partner to improve implementation of systems engineering



Already incorporated in two major contracts!

Phase 6: Develop Library of Tools

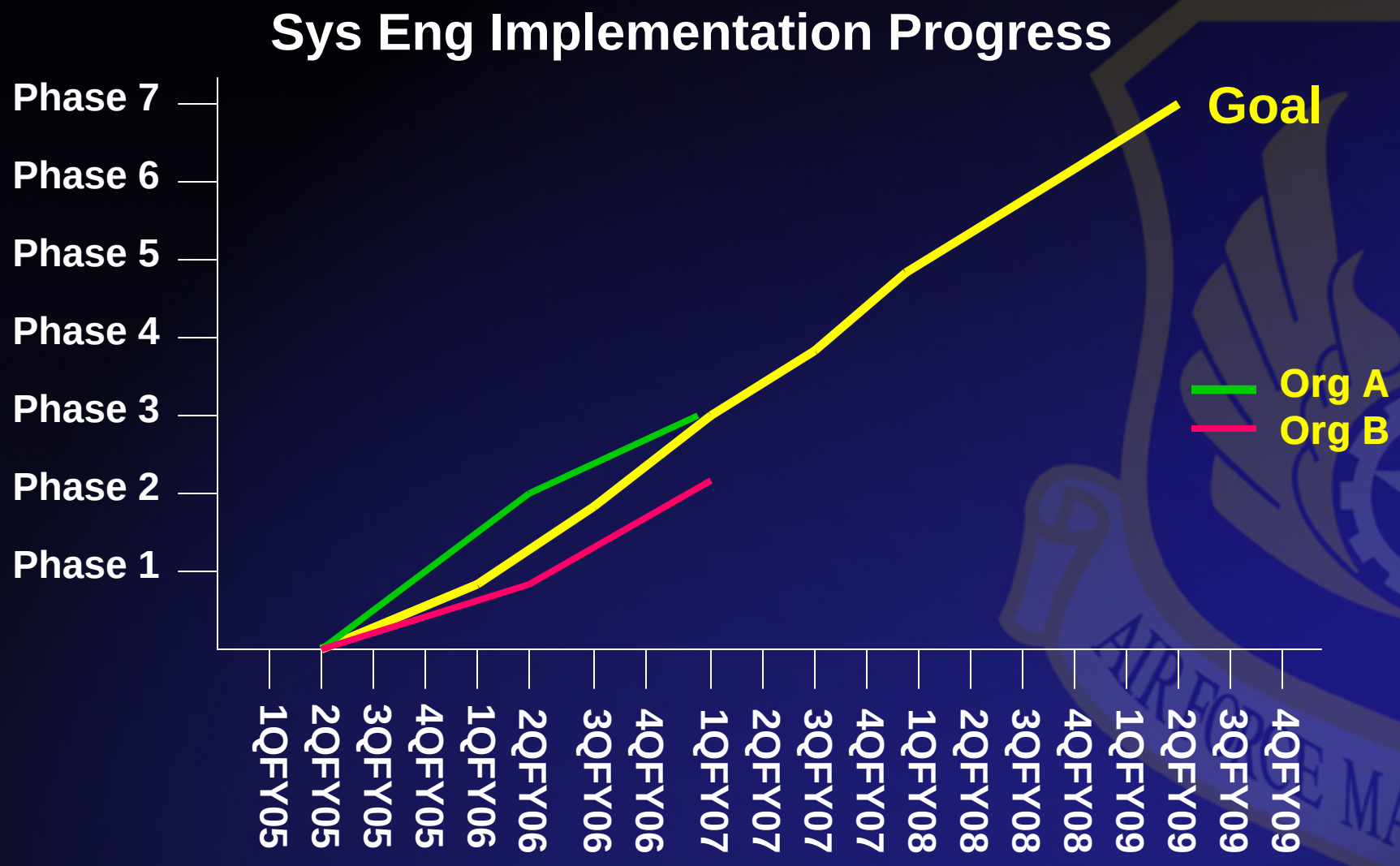
- Need good SE "toolbox"
  - Templates
  - Metrics
  - How-to's (fishbone, 5-whys, paredo, …)
  - Lessons Learned
  - Explanations
  - Best Practices
  - Peer Review
  - Case Studies
  - Life Cycle Cost consideration
  - Contractual language
  - Etc…

Functional Office to Develop/Obtain….Not Started Yet

Phase 7: Track Progress via Metrics

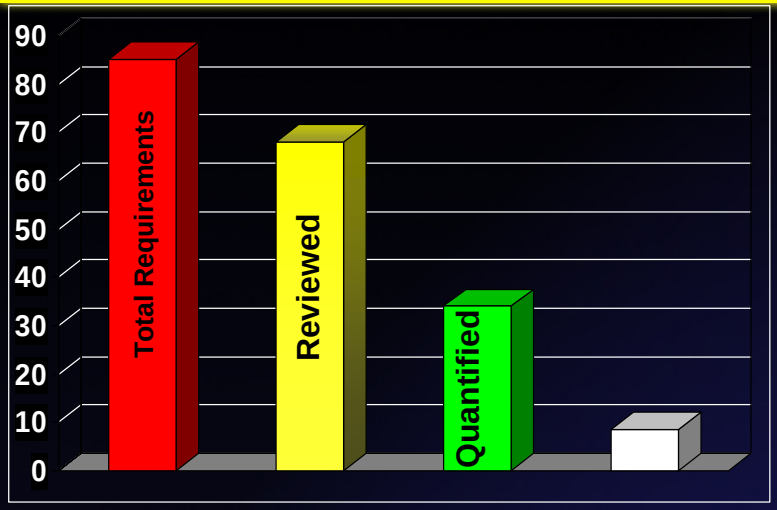
- ✓ Metrics developed to track progress
- ✓ Metrics shown regularly to upper management
  - ❑ 1st staff meeting of month
  - ❑ Quarterly Weapon System Reviews
  - ✓ Metrics must be able to roll up
- ✓ Metrics will track:
  - ✓ Systems Engineering Implementation
  - ✓ Requirements
  - ✓ Risk
  - ✓ Processes
  - ✓ Training
  - ✓ Contracts

Phase 7: Track Progress via Metrics

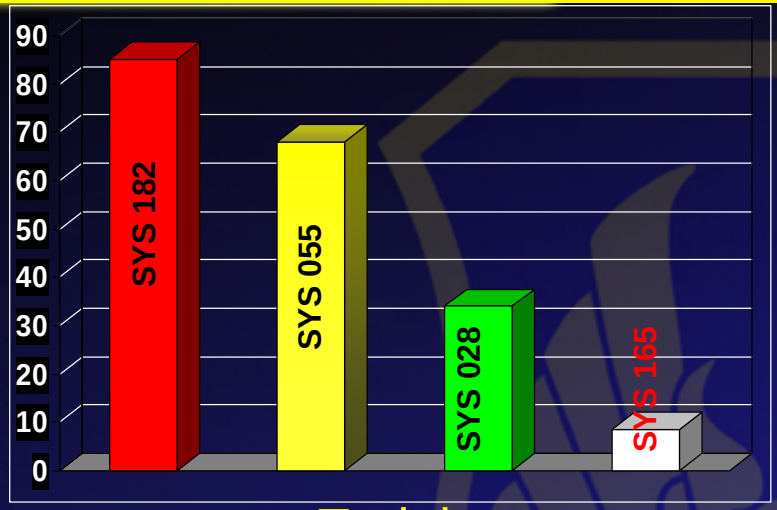


Still Refining Goal Dates

Sample Program Sys Eng "Dashboard"



Requirements

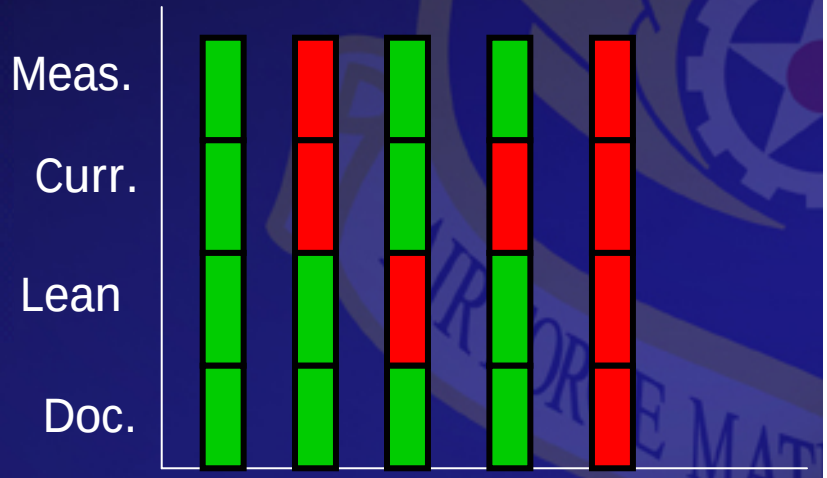


Training

Contracts

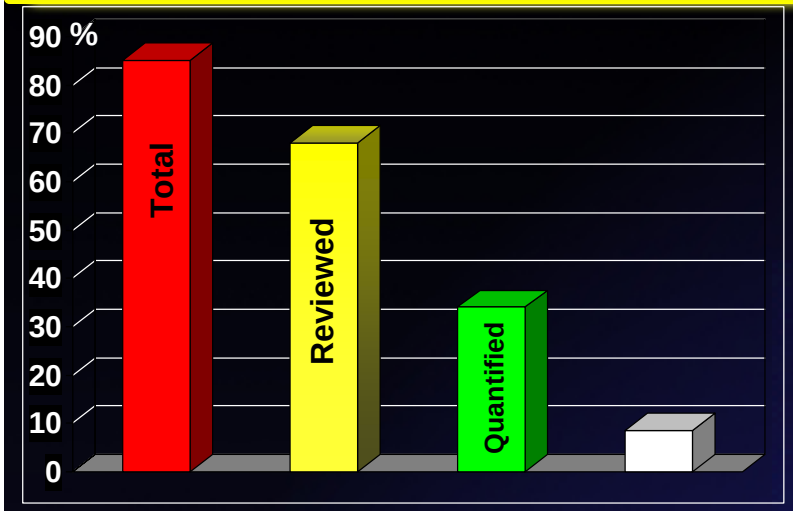
	Low	Med.	High
High	0	2/4	1/2
Med.	1/6	0/1	3/4
Low	1/3	2/4	2/3

Risk



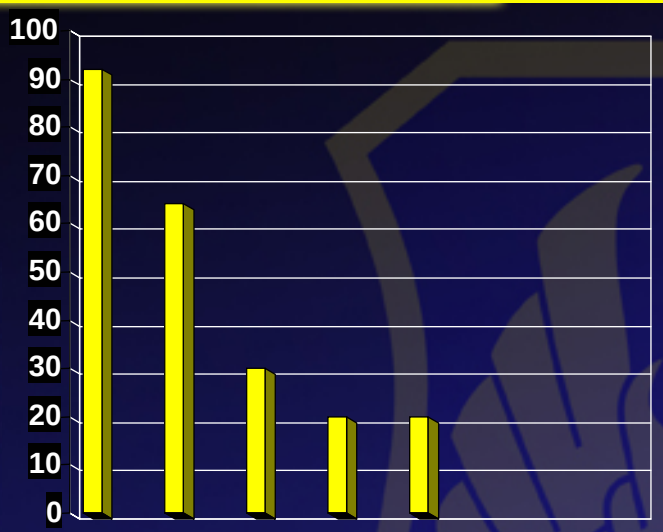
Processes

Sample Organization Sys Eng "Dashboard"



Requirements (%)

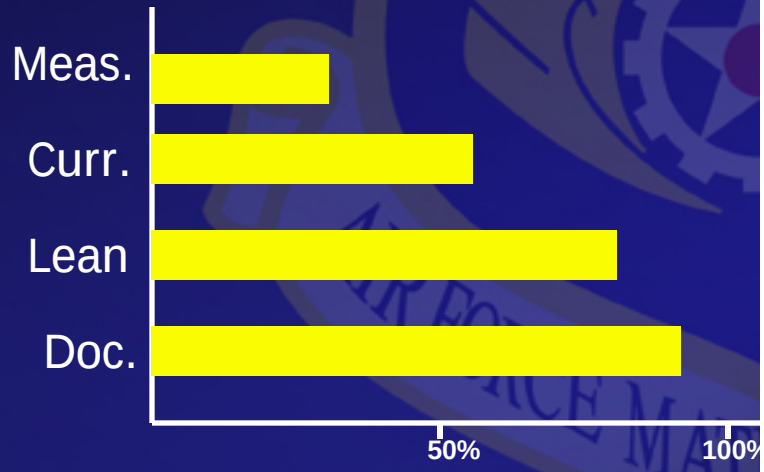
Contracts



Training (%)

	Low	Med.	High
High	20	40	80
Med.	5	50	60
Low	10	5	40

Risk (%)



Processes (%)

What's Next

- Continue implementation throughout organization
- Measure/Track results
- Increase and standardize systems engineering presentation in quarterly Weapon System Reviews and Staff Mtgs
- Start configuration management Process Improvement Team

Systems Engineering can be implemented, applied AND make a difference

Summary

- Recent high-level policy issued
- 727th ACSG developed grass-roots means to implement SE in Sustainment Environment
- Clear-cut, tangible processes steps for the working-level; metrics to measure progress for management

In Place and In Use Now

Questions ?