Disclaimer

The Opinions Expressed by the Speaker

Are His Own

and

Do Not Necessarily Reflect Anyone Else's

..although

They Might!

How to Paint a Room

The Role of Specs & Standards in the Systems Engineering… ..Business!

Robert B. “Scott” Kuhnen

ASC/AFRL Eng Stds Office

Wright-Patterson AFB OH

24 October 2007

Shall We Get Started?

Not so fast!!!

- “Proper interior paint preparation of your walls and ceilings before painting will often encompass more work than the actual painting. Up to 75% of the work can be getting a surface ready for painting.”

- Karl Crowder
- http://www.house-painting-info.com/index.html

Tools for Prepping Walls

- Safety glasses or goggles
- Respirator or face mask
- Ear protectors
- Rubber gloves
- Pry bar
- Paint scraper
- Wallpaper steamer (rent if needed)
- Can opener or widening tool
- Fan
- Hand sanding block
- Orbital sander
- Screwdriver
- Putty knife
- Sponge
- Cap or scarf
- Old clothes

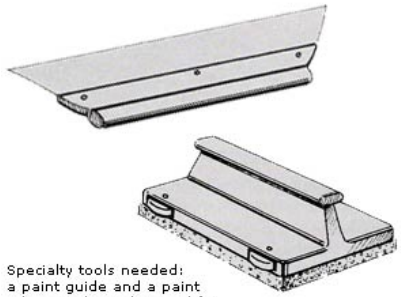
Materials for Prepping Walls

- Spackle (compound)
- Fine-grit sandpaper
  - (100 - 120-grit silicon carbide)
- Detergent and ammonia or tri-sodium phosphate (TSP)

- Self-adhesive drywall tape
- Primer or adhesive pad
- Sizing (for wallpapering)

Tools for Painting

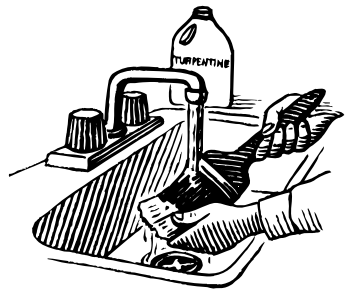
- Drop cloths
- Ladders
- Buckets
- Paint edger
- Brushes, 4", 3", and 11/2"
- Angled sash brushes, 1 1/2" and 2"
- Roller pan with screen
- Roller covers with appropriate naps
- Roller handle
- Roller extender
- Paint guide

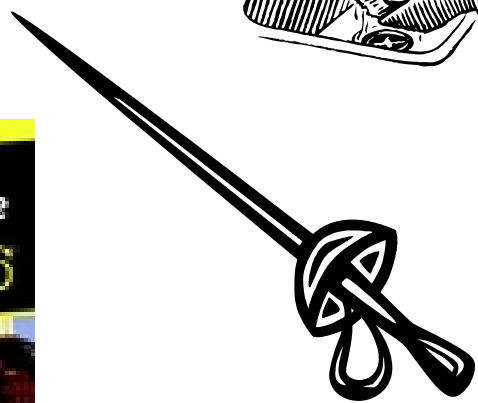


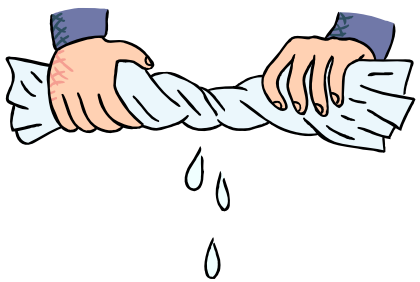
Specialty tools needed: a paint guide and a paint edger. Both can be used for "cutting in."

Materials for Painting

- Masking tape, 2" wide
- Newspaper
- Adhesive pad or primer
- Paint thinner (with oil-based paints)
- Aluminum foil
- Rags





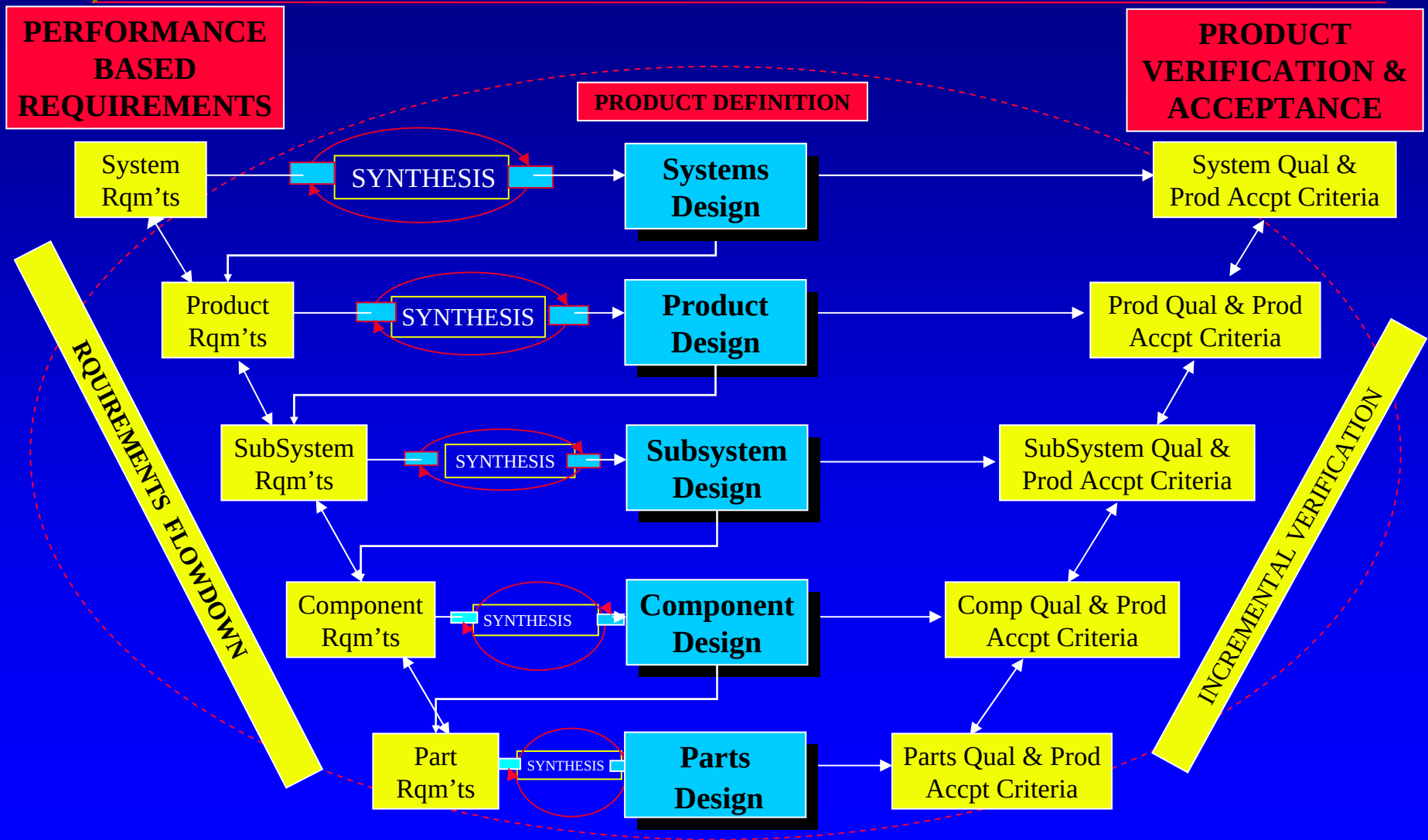


What the experts say…

- Most people think they know how to paint, and usually the results are pretty good. But for painting contractor John Dee, "pretty good" isn't good enough. After nearly three decades of rolling, brushing, and spraying paint he knows the subtle tricks for applying smooth, even coats to walls, ceilings, and woodwork, and for creating crisp boundaries between colors.

According to Dee, there's no magic to getting professional-looking results. Practice helps, and thorough surface preparation is essential. But the key, he says, is to paint in an orderly, systematic way. So whether he's painting a multi-paneled door or a flat expanse of wall, he proceeds almost scientifically from one step to the next, with no shortcuts. "Your approach to the task, the order in which you do things, can speed the work or slow you down," Dee says. "Here's the approach that works best for me."

ENGINEERING DESIGN PROCESS



There are lots of experts…

- “At Mario’s Painting, we believe that the secret to achieving flawless-looking, beautiful surfaces both inside and outside your home lies in the pre-painting preparation. Where some companies may try to cut costs by cutting back on quality preparation time, we put in a full day’s work before the first coat of primer even goes on your walls.”

- Preparing the surface is the most important part of any painting project. If the paint doesn't have a smooth, clean surface to adhere to, the result will be a poor-quality job that doesn't last very long. "You should spend at least as much time on surface prep as you will be painting," advises Horst.

- If it's worth doing, it's worth doing right the first time. And proper preparation is the key. Few of us really realize this, or even like to admit it, since it leads to more work. It is a step that is all too often left out, and the final job reflects its omission. It is too easy just to start painting and not go through the necessary prep steps. Indeed, for a while the paint job may even look pretty good. But sooner or later the poor quality will show up.

Talking about painting or…SE?

FIGURE 3. The Systems Engineering Process

- **Defense Specifications**
- **Defense Standards**
- **Qualified Products Lists**
- **Non-Gov't Standards**
- **Int'l Standards**
- **etc.**

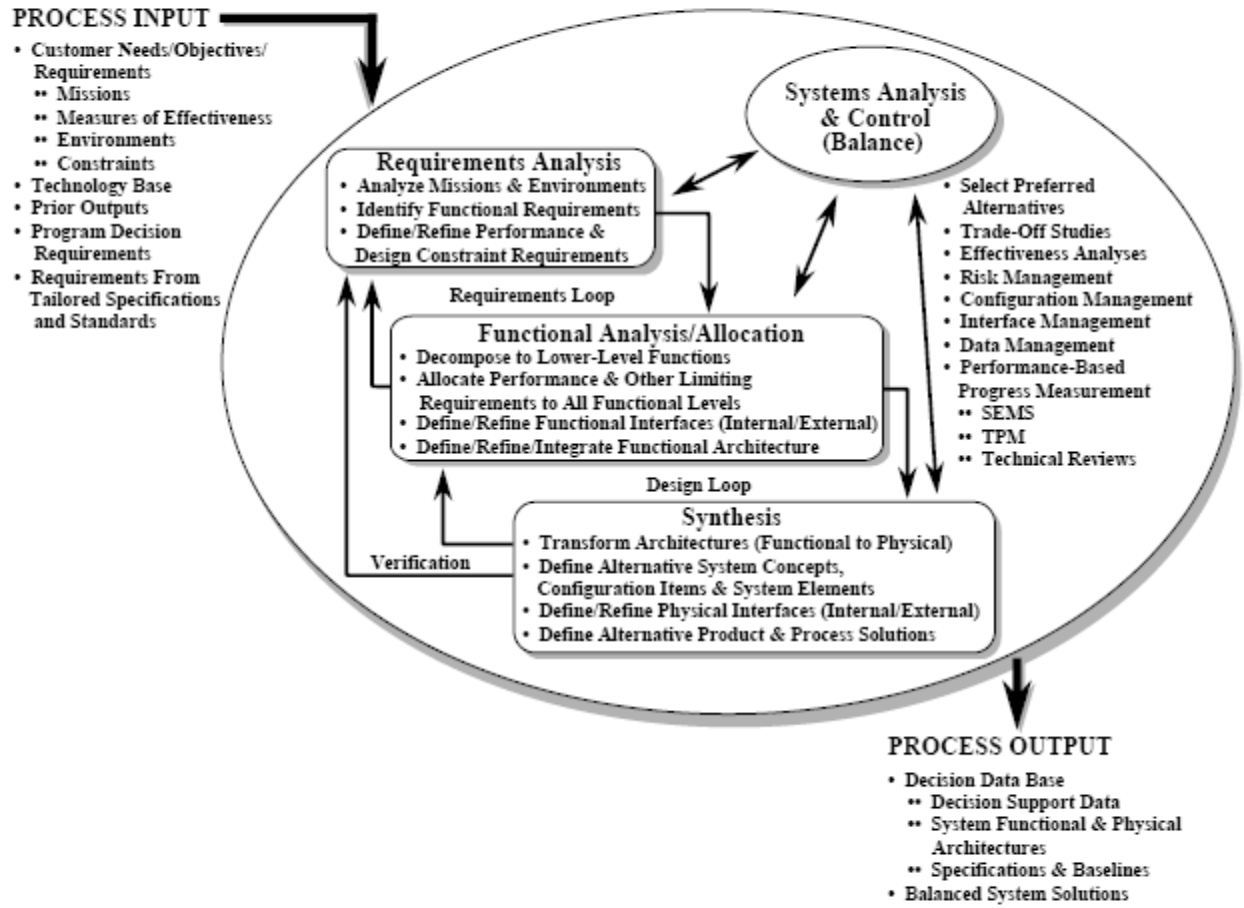
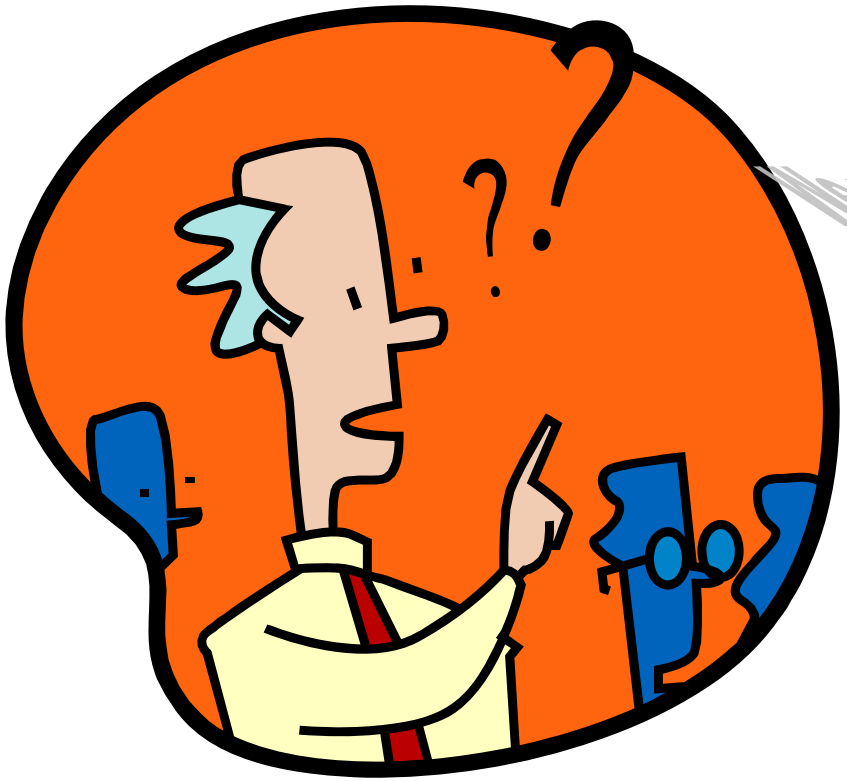


FIGURE 3. The Systems Engineering Process

DRAFT

Discussion
Non-Attribution



We want your Feedback!

What are we missing?

Is SE Important?

What do you think?
Are there barriers to SE?
Is this catching on?

Are we on the right track?

Top Five Systems Engineering Issues

- Lack of awareness of the importance, value, timing, accountability, and organizational structure of SE on programs
- Adequate, qualified resources are generally not available within government and industry for allocation on major programs
- Insufficient SE tools and environments to effectively execute SE on programs
- Poor initial program formulation
- Requirements definition, development, and management is not applied consistently and effectively

NDIA Study in January 2003

DoD Systems Engineering Shortfalls*

- Root cause of failures on programs include:
  - Inadequate understanding of requirements
  - Lack of systems engineering discipline, authority, and resources
  - Lack of technical planning and oversight
  - Stovepipe developments with late integration
  - Lack of subject matter expertise
  - Availability of systems integration facilities
  - Low visibility of software risk
  - Technology maturity overestimated

Major contributors to poor program performance

* DoD-directed Studies/Reviews

Are We on the Right Track?

- Study Findings
  - Inadequate understanding of requirements
  - Lack of SE discipline, authority, and resources
  - Lack of technical planning and oversight
  - Stovepipe developments with late integration
  - Lack of subject matter expertise at integration level
- Programs/SEPs
  - Incomplete discussion of program requirements
  - Minimal discussion of technical authority and IPTs
  - Incomplete technical baseline approach
  - Incomplete discussion of technical reviews
  - Integration of SEP sections

Strong correlation between initial findings and SEP and Program Support findings

Could the problem be…?

A PennWell Publication

Military & Aerospace ELECTRONICS™

Vol. 5, No. 9 | The Engineering Newspaper for the Worldwide Mil/Aero Electronics Industry | August 1994

Perry scraps mil-specs

By Bruce Rayner

WASHINGTON, DC—In late June, Defense Secretary William Perry ordered a dramatic about face in the Defense Department's use of military specifications and standards, ordering that all DoD programs rely more heavily on commercial parts and adopt a performance-based specification process.

While Perry's announcement was widely anticipated and publicly applauded by the defense electronics industry, many company officials are concerned that the changes will increase uncertainty in the acquisition process and threaten some existing systems that are operating well, such as the Qualified Manufacturing Line (QML), a DoD-specific system for certifying a manufacturing process.

"Right now it is a wait-and-see game," says Brad Paulsen, director of marketing for military and aerospace products at National Semiconductor (Santa Clara, CA). "There are a lot of issues that have not been clarified."

The directive, which will be phased in over the next six months, mandates that all DoD procurement contracts use commercial and industrial specs and standards where they exist; the use of mil-specs will require a waiver. Radiation-hardened components are exempt from the directive.

In another major change, program managers are now required to adopt performance-based specifications for new systems and major modifications. The performance specs describe how a system is to function but leaves the

(Continued on page 32)

Secretary of Defense William Perry has introduced far reaching changes to the procurement process, including mandating the use of performance specs.

DoD has adopted....

*Systems engineering is an **interdisciplinary approach encompassing the entire technical effort to evolve and verify an integrated and total life-cycle balanced set of system, people, and process solutions that satisfy customer needs.** Systems engineering is the **integrating mechanism** across the technical efforts related to the development, manufacturing, verification, deployment, operations, support, disposal of, and user training for systems and their life cycle processes. System engineering **develops technical information to support the program management decision-making process**. For example, systems engineers manage and control the definition and management of the system configuration and the translation of the system definition into work breakdown structures.*

Adopted from ANSI/EIA-632, "Processes for Engineering a System"

Systems Engineering Fundamentals from Past Programs

- SE was conducted by the design team
  - Systemic to the design process
  - Product of many designs by the same teammates over many programs and many years
- Common Characteristics: yesterday and today
  - Small, efficient systems engineering staff
    - Previous design engineers
      - Knack for requirements
      - Appreciated the larger challenge at the system level
  - Not always collocated and not always the same company

Source: Mr. John Griffin, former ASC/EN Director

Unintended consequences?

A PennWell Publication

Military & Aerospace ELECTRONICS™

Vol. 5, No. 9 | The Engineering Newspaper for the Worldwide Mil/Aero Electronics Industry | August 1994

Perry scraps mil-specs

By Bruce Rayner

WASHINGTON, DC—In late June, Defense Secretary William Perry ordered a dramatic about face in the Defense Department's use of military specifications and standards, ordering that all DoD programs rely more heavily on commercial parts and adopt a performance-based specification process.

While Perry's announcement was widely anticipated and publicly applauded by the defense electronics industry, many company officials are concerned that the changes will increase uncertainty in the acquisition process and threaten some existing systems that are operating well, such as the Qualified Manufacturing Line (QML), a DoD-specific system for certifying a manufacturing process.

"Right now it is a wait-and-see game," says Brad Paulsen, director of marketing for military and aerospace products at National Semiconductor (Santa Clara, CA). "There are a lot of issues that have not been clarified."

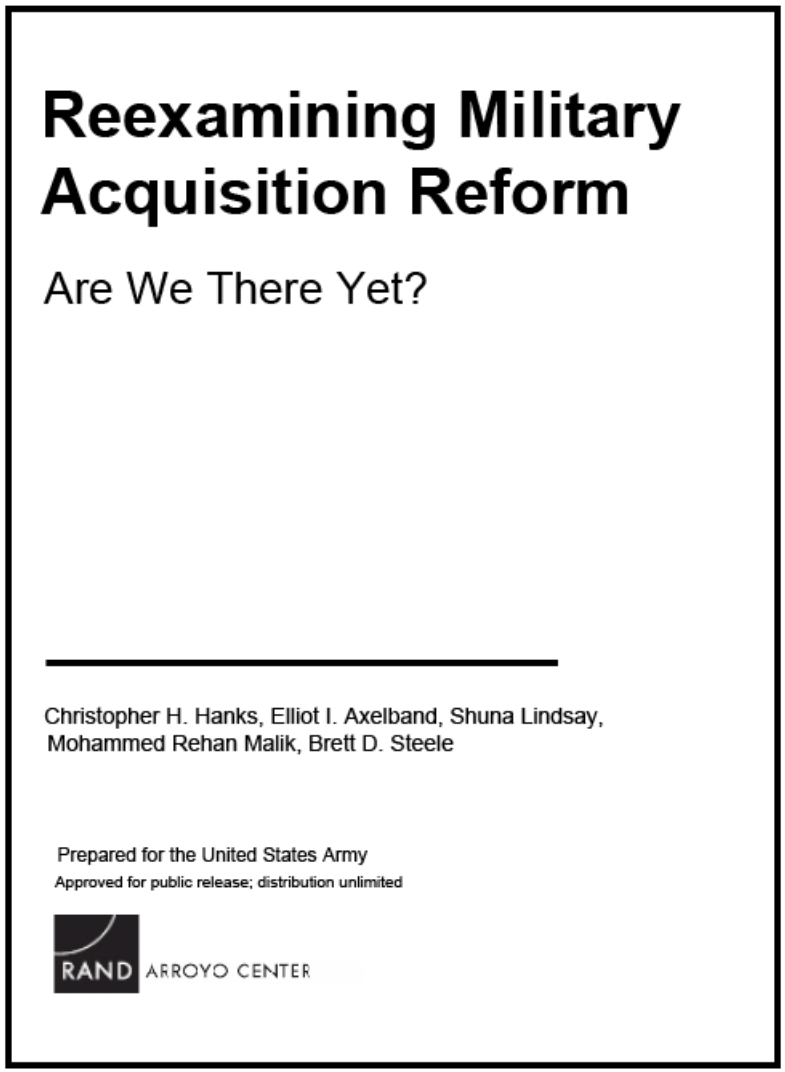
The directive, which will be phased in over the next six months, mandates that all DoD procurement contracts use commercial and industrial specs and standards where they exist; the use of mil-specs will require a waiver. Radiation-hardened components are exempt from the directive.

In another major change, program managers are now required to adopt performance-based specifications for new systems and major modifications. The performance specs describe how a system is to function but leaves the

(Continued on page 32)

Secretary of Defense William Perry has introduced far reaching changes to the procurement process, including mandating the use of performance specs.

Unintended Consequences Abound



- "While the report is Army-centric, I believe the discussion would fit all of the Services. The report covers some 63 different acquisition reform initiatives, some of the observations related to Mil Specs…"
- "I think you want to look to where we need to be headed in the future."

Steve Lowell, DSPO

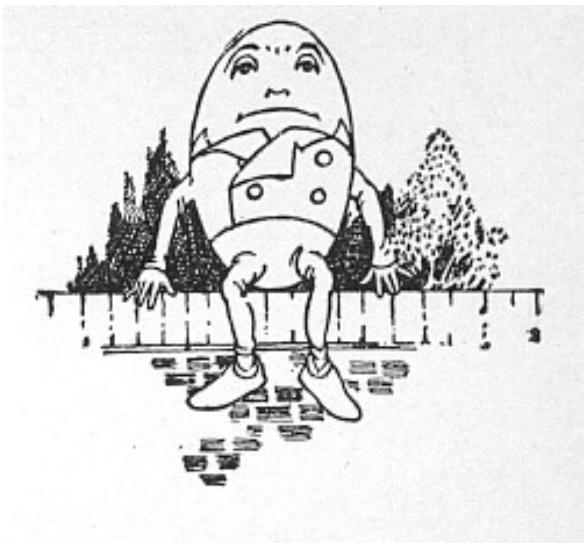
Examining Acq Reform…

- **The New Acquisition Environment Could Create Ongoing Problems**
  For many of the interviewees, some of the acquisition reforms implemented over the past decade may be creating an environment that will present ongoing problems. A deputy PM (civilian) said that the switch from mil specs to a performance-based approach (in which mil specs are not required as long as performance levels or specifications are met) has meant that the process has gone from "too tight to too fluffy." The use of "performance specs" in lieu of mil specs was already seen to be leading to problems with contractors, who are given a larger role in the process. On the one hand, contractors "now have far more freedom to get into trouble," as one individual put it in a group interview. On the other hand, some contractors do not know how to proceed with this new freedom, and could have trouble "implementing the discipline to handle their new responsibilities." Many contractors don't like the performance-based approach because of the uncertainty it entails. However, others are profiting from the new "vagueness" built into contracts. One deputy PEO (civilian) described a recent experience with a contractor: "The contract wanted to have everything quick, so it was vague, and now [we're] spending dearly for that vagueness. The contractor is . . . using the vagueness to do changes-so the vagueness is working to the contractor's benefit, not the government's."

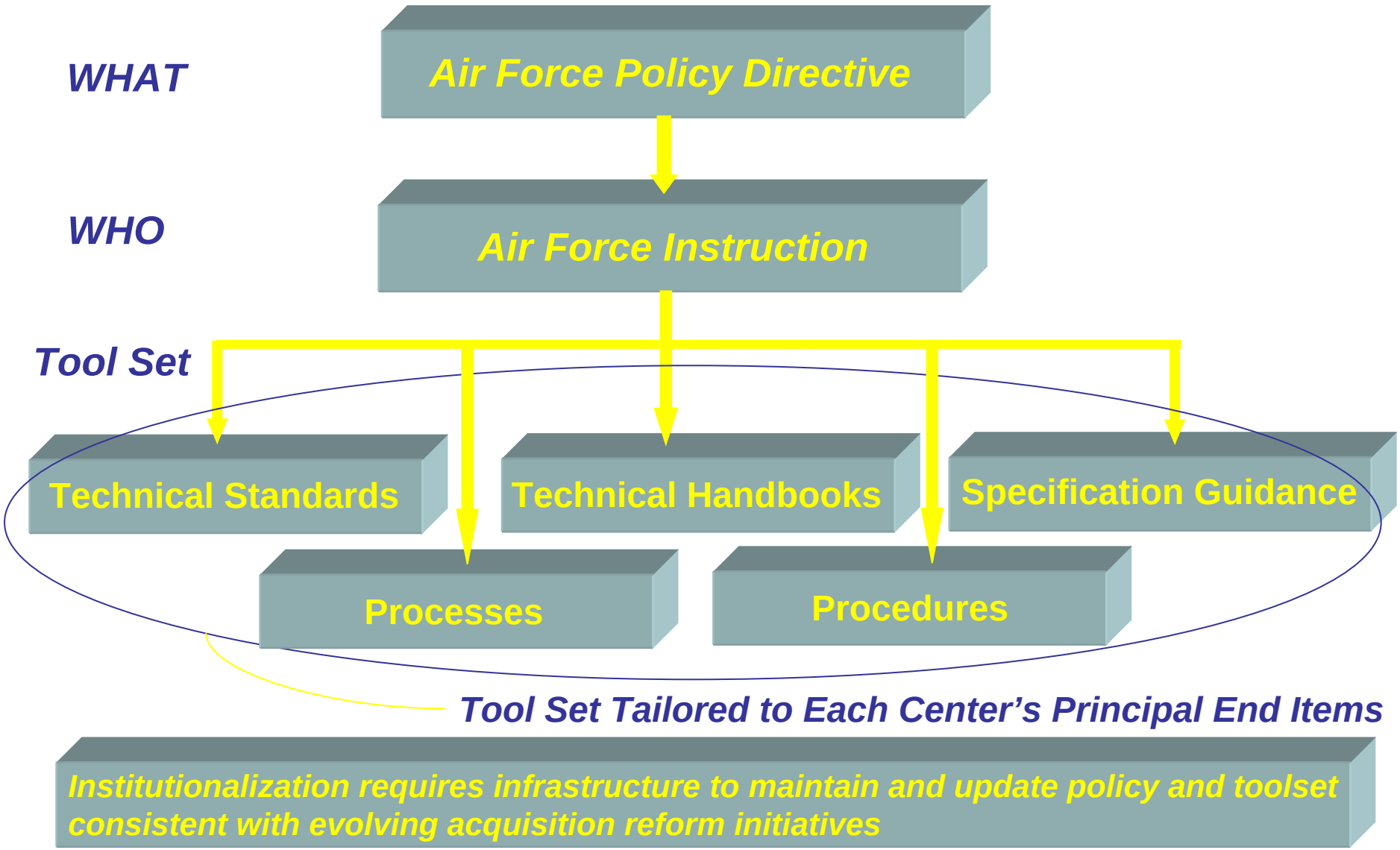
- One deputy PM (civilian) noted that the performance-based approach is not even increasing PM flexibility. Some interviewees mentioned that, without mil specs, many Technical Data Packages (TDPs) are not being updated and are now several years out of date. Some interviewees also questioned whether the reforms were really saving time or only shortening some processes while lengthening others. A PM staffer (civilian) noted, "Lots of regs are gone, but it's not clear things are taking less time as a result because other, different things are taking time to decide because we don't have the regs and specs to fall back on automatically. We've gone from "too much" to "too little."

Please recite with me…

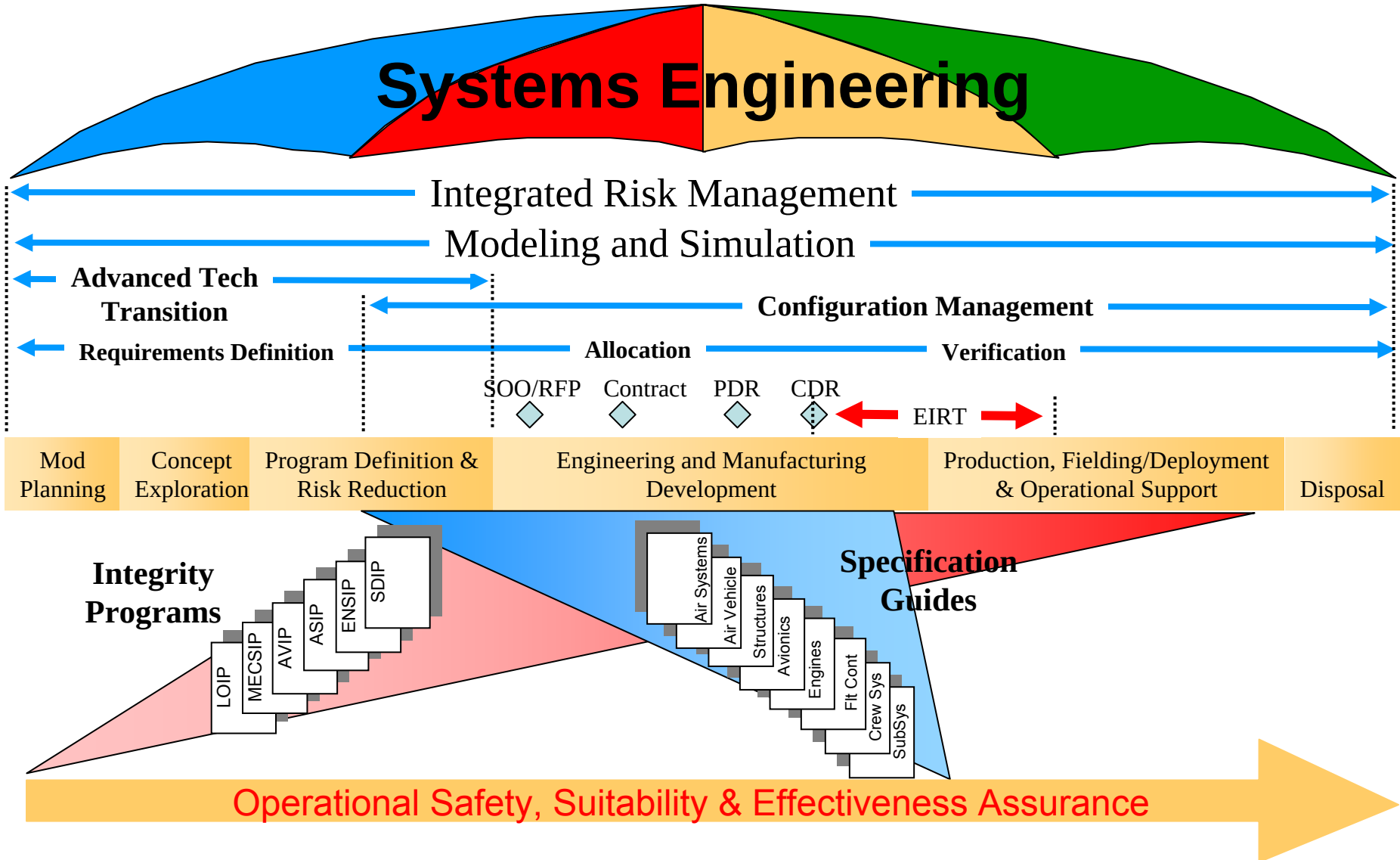
Humpty Dumpty sat on a wall,
Humpty Dumpty had a great fall.
All the King's Horses and
all the King's men
Couldn't put Humpty
together again!



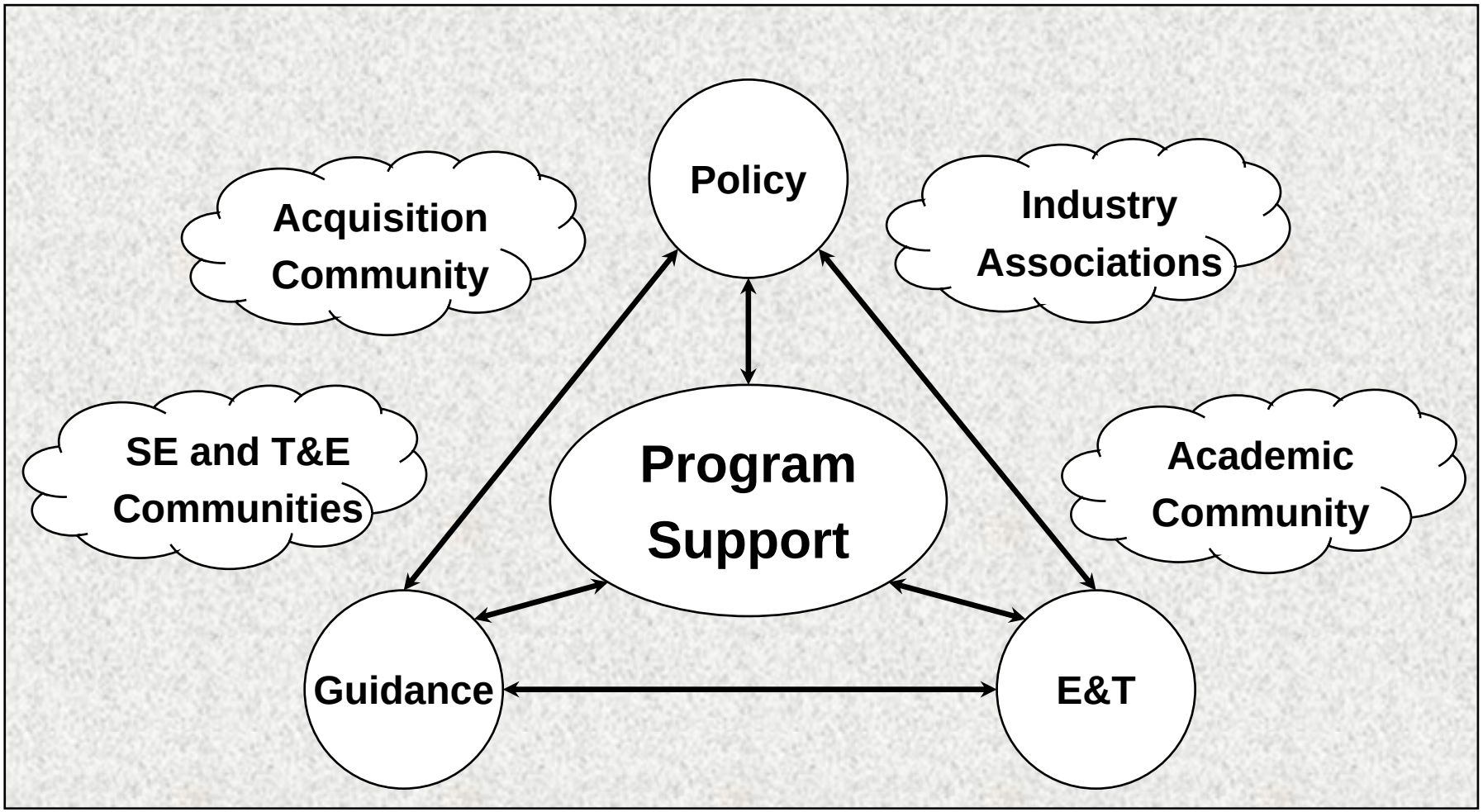
Institutionalizing OSS&E Through Regulatory Products



EN Technical Processes



Systems Engineering Revitalization Framework



Driving Technical Excellence into Programs!

Good Systems Engineering…

You'll know it when you see it?

or…

You'll know it only after you've verified that the product meets the specs & standards which define the product?

Fred Rall said…

- The best Statement of Work contains only three words:

"Meet the Spec!"

Concept Exploration

Purpose: evaluate alternative solutions to the initial concept; select preferred solution

Characterized by:

- Competitive, parallel, short term studies
- [illegible]
- [illegible]
- Analysis of Alternatives (AoA)
- Work guided by the ICD*

Market research is key.

*MNS until CJCSI 3170.01 is revised

Concept and Technology Development Phase
Key Activities, continued

- Develop draft performance specification
- Identify potential environmen
  consequences
- Prepar
  (if
- E
- Prep
- Meet exit criteria for C&TD Phase
- Propose exit criteria for next phase

System level performance spec. Guide spec may be used to help draft system performance spec.

System Development & Demonstration Phase

Standards provide proven solutions to reduce risk.

Purpose:

- To develop a system
- Reduce program risk
- Ensure operational supportabilit
- Ensure design fo
- Assure affordability
- Demonstrate system integration, interoperability, and utility

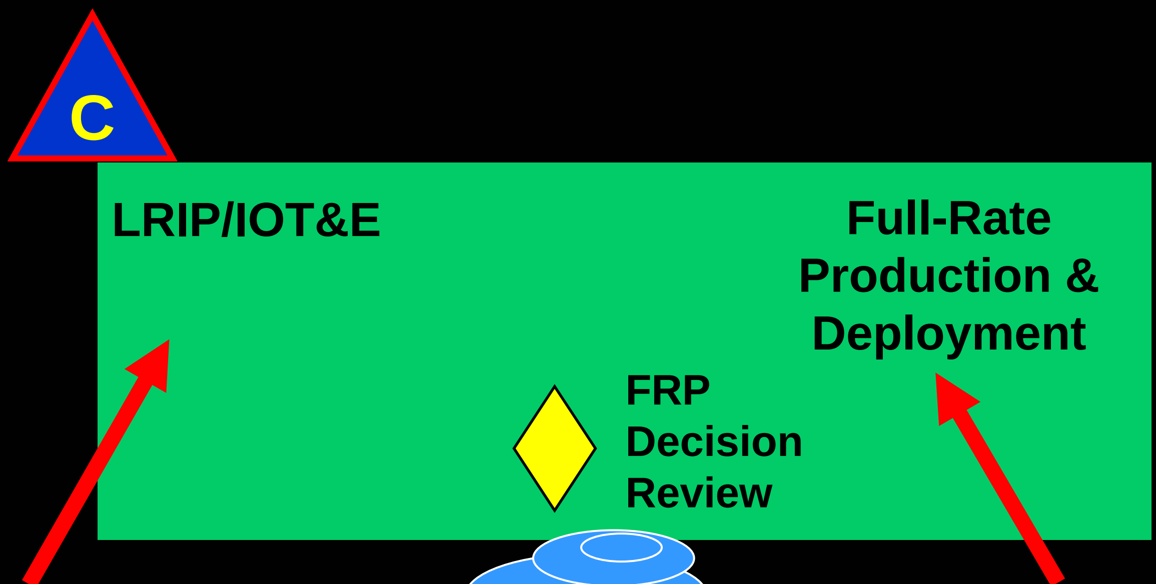
Standards define interoperability

System Demonstration

- **Purpose: Demonstrate the ability of the system to operate in a useful way consistent with the validated KPPs.**
- **Key Activities:**
  - **Conduct extensive testing: developmental, operati… …sting, as ap…**
  - **…**
  - **… envi…**
  - **Prepare RFP for Low Rate Initial Production**
  - **Prepare for Milestone C**
  - **Update: Information requirements**

Interoperability defined by standards is a key performance parameter.

Production & Deployment Phase



Testing & evaluation conducted to ensure conformance to performance specs and interoperability standards for full rate production.

LRIP

Enter:

Exit: suitab... production

Full-Rate Production & Deployment

...d LRIP (OSD T&E ...rograms) and LFT&E ...ed systems) ... Congress

...s: Full rate production. ... system. Start support.

Exit: Full operational capability; deployment compete

Operations and Support Phase*

- Emphasis shifts from design/development engineering to supporting the fielded system
- Operational units es[illegible]ished & readiness monitored
- Test and evalu[illegible]
- O[illegible]
- Syst[illegible]p[illegible]at [illegible]nd of its useful life

Using standard components makes it easier to support fielded systems and reduces DMS risk.

* Overlaps Production and Deployment Phase since items are deployed prior to the end of production, and must be sustained in the field

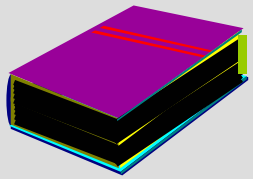
Which Standards?

- Def. Stdzn documents:

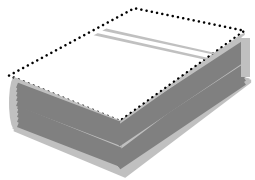
	Military	NGS	Total
Preparing Activity (speaks for DoD)	371	363	734
AF Custodian (speaks for AF)	6356	2742	9098
AF Review Activity (reviews for ASC)	1140	265	1405
	7867	**3370**	**11,207**

- Design Handbooks (17)
  - Shipping only 1- and 2-series documents today - on CD
- AF Characteristics Guides (6)
  - Shipping only - have only begun migration to CD
- Misc. support to other technical docs & publications
- Bottom Line: Each of the sectors (Space, Aeronautical Maritime…we all have a body of knowledge…standards.

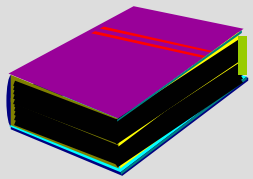
Joint Service Specification Guides



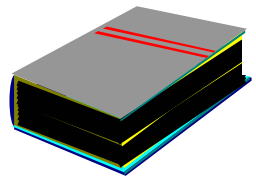
JSSG-2000
Air System



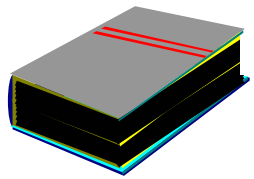
JSSG-2004
Weapons



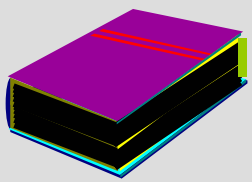
JSSG-2001
Air Vehicle



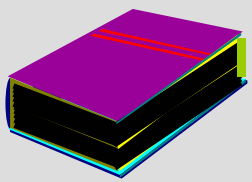
JSSG-2002
Training



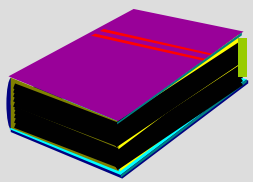
JSSG-2003
Support Sys



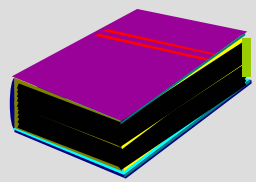
JSSG-2005
Avionics



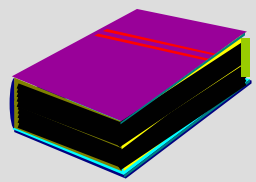
JSSG-2006
Structures



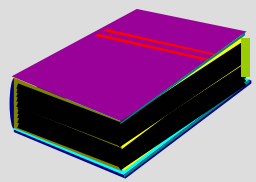
JSSG-2007
Engines



JSSG-2008
Vehicle Control
& Mgmt

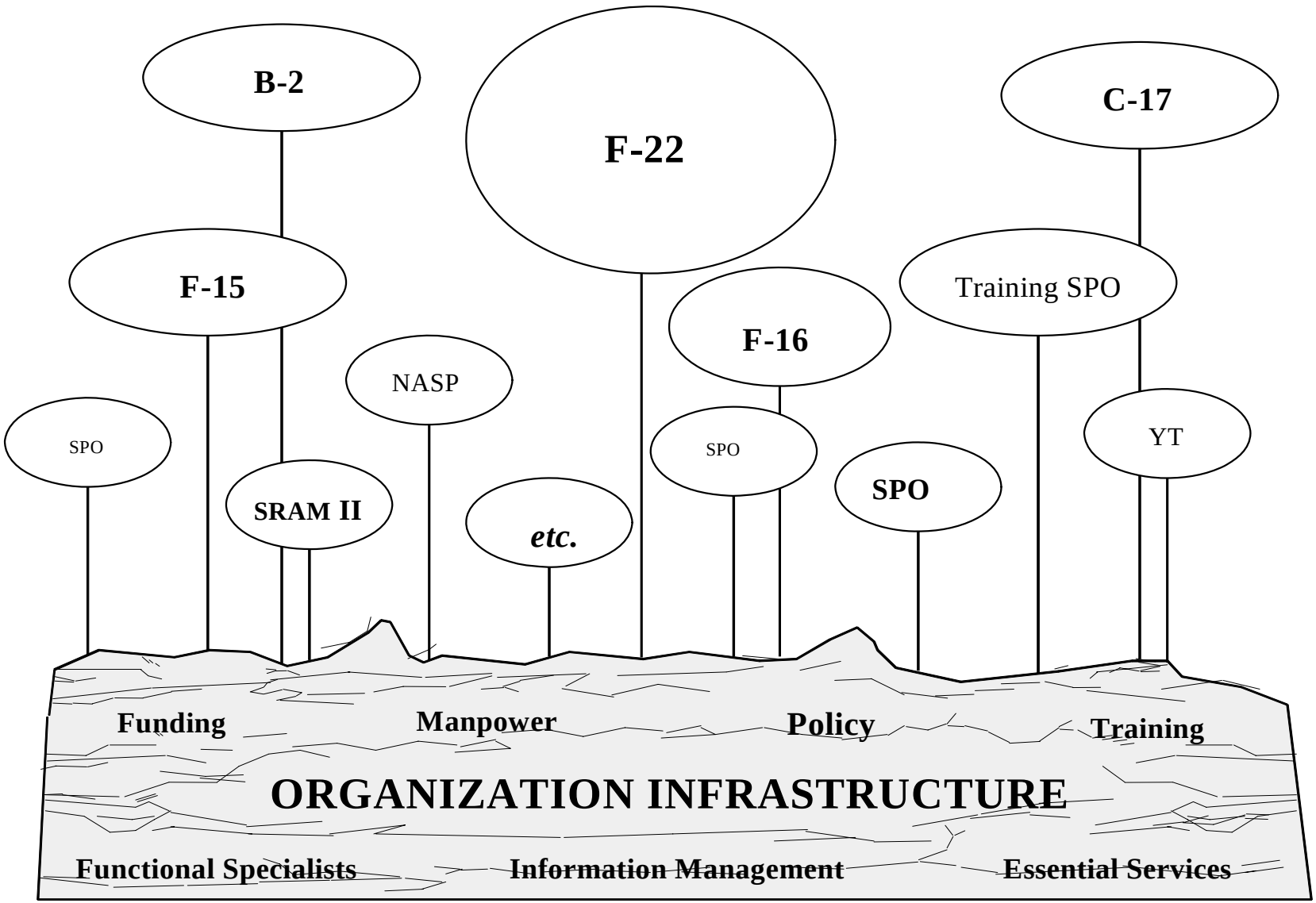


JSSG-2009
Vehicle
Subsystems



JSSG-2010
Crew
Systems

The Bedrock that is ASC



Defense Standardization Program

- ASC/EN is responsible for development and maintenance of Engineering Standards under Defense Standardization Program (DSP)
  - Mandated by Public Law 82-436; DoD 5000.1&2; DoDD 4120.24; DoD 4120.3-M; AFPD 60-1; AFI 60-101
- Wing engineering tailors and applies standards
  - Responsible for application feedback to ASC/EN, who cares and feeds for the REO's
- Industry design teams also use MIL specs and standards

It's part of your day job!

"Notional" REO Month

April

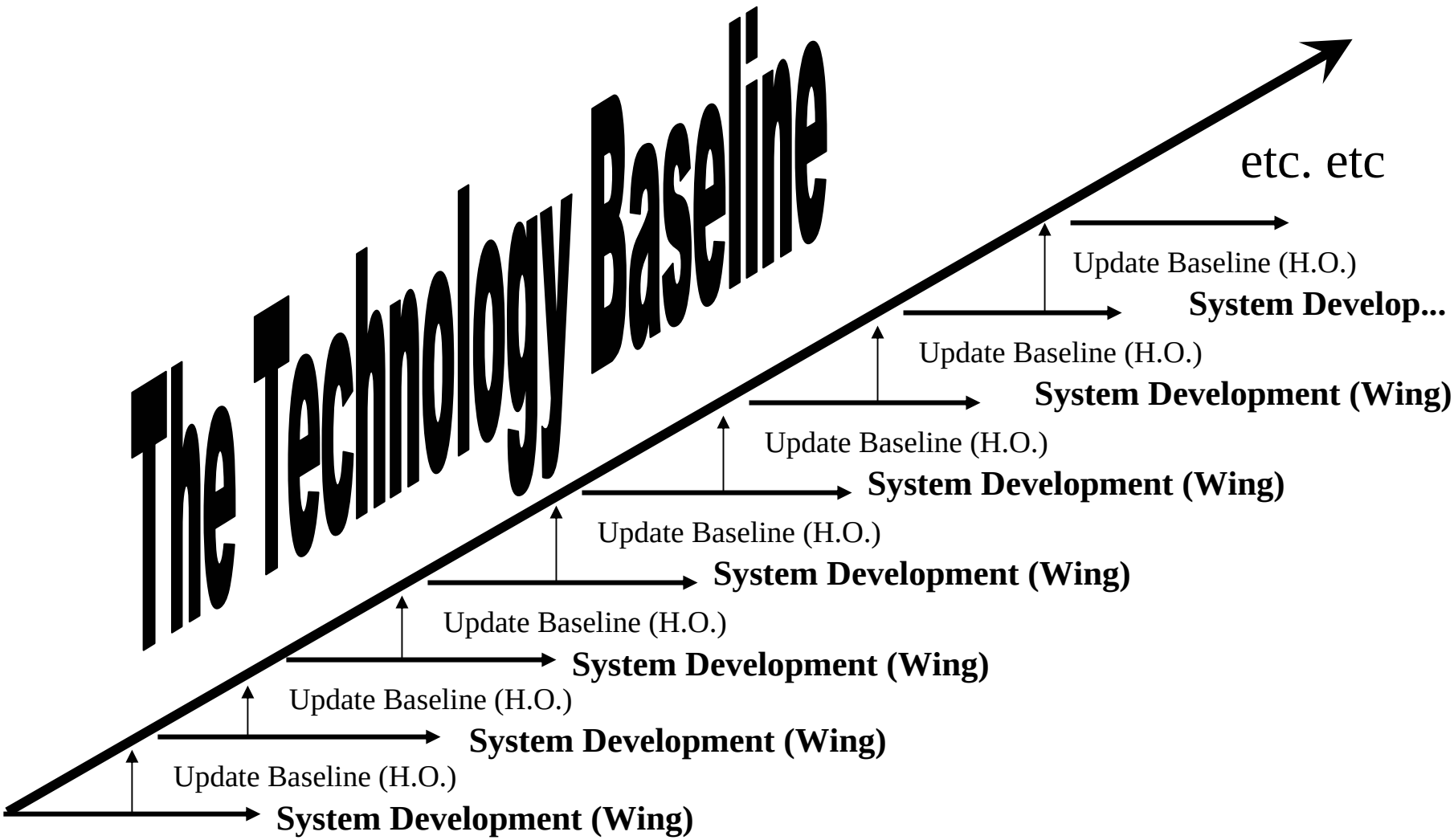
Sun	*Mon*	*Tue*	*Wed*	*Thu*	*Fri*	*Sat*
				1	**2**	**3**
4	**5** *ENF IMR*	**6**	**7** *SPO Support*	**8**	**9** *Int'l Stdzn Pre-Brief*	**10**
11	**12** *TDY - Int'l Stdzn Working Group*	**13**	**14**	**15**	**16** Trip Report	**17**
18	**19**	**20** *SAE Symposium, San Fran*	**21**	**22**	**23**	**24**
25	**26** Trip Report	**27** *Brfg to YF*	**28** *Revise JSSG-2010*	**29**	**30**	

Next Month Reminders: Tech Report; Training ("Boomerang"); ASC Quality Symposium; TDY - WR-ALC

2003

How Knowledge Works…

..or, why we document what we do!



Systems Engineering “Engine”

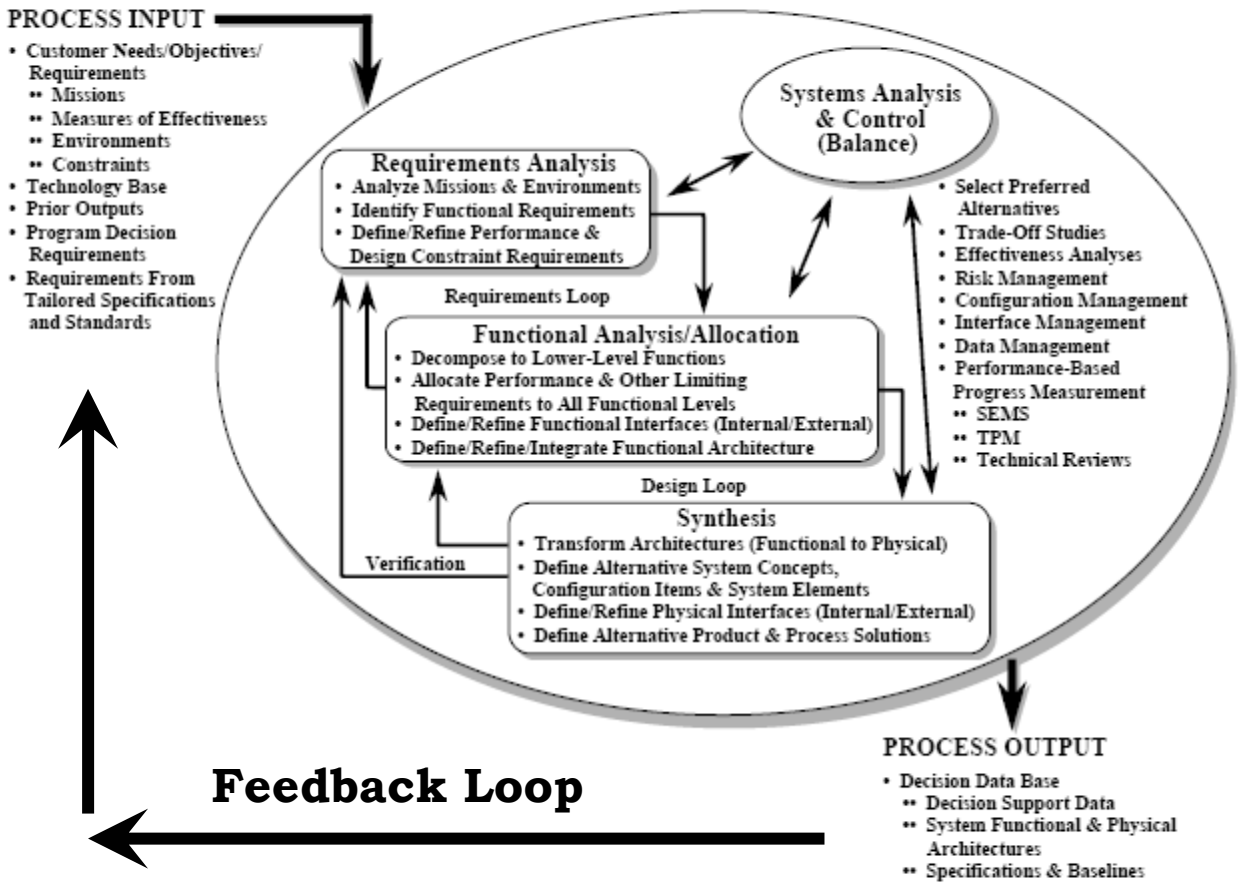


FIGURE 3. The Systems Engineering Process

Benefits of the DSP

- Standards are “foundational” to all that we do
  - Measuring program execution, success and/or failure
  - Moving both the State-of-the-Art and Tried-and-the-True
  - Reducing risk in programs and the SE process
  - Providing “confidence” to those who actually execute the SE process
  - Documenting & Communicating Lessons Learned
  - Mentoring the Next Generation
  - Communicating technologies and strategies across entire sectors…forming a common understanding
  - ..Shall I continue…?

My Assertion…

- Specs & Standards are not gone!
  - We are “down to” only 12,000 in the aero sector

- Spec & Standards, and all the work it takes to create them, coordinate them, update them, understand them, use them, is “foundational” to the execution of the SE process (not a “crutch!”)

- Development of, use of, translation of technical requirements is the heart of the technical portion of the SE process… ..as we revitalize SE, consider the role that specifications and standards play in the overall “business” of systems engineering.

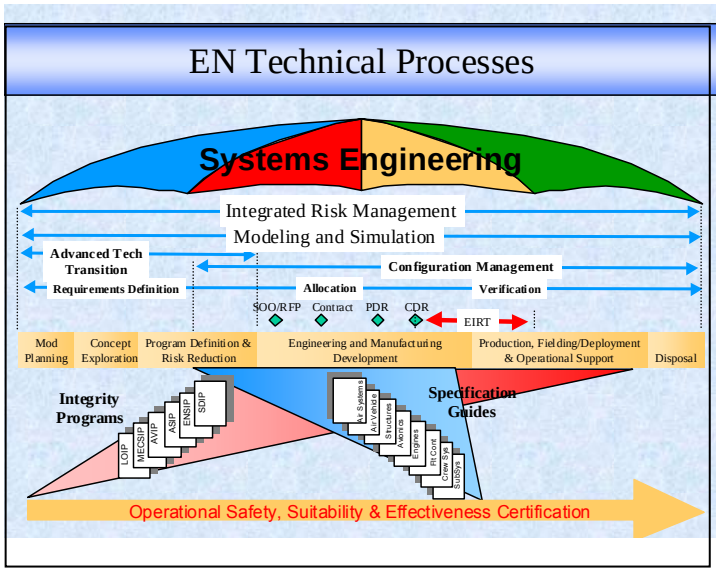
Now then…let's paint this sucker!

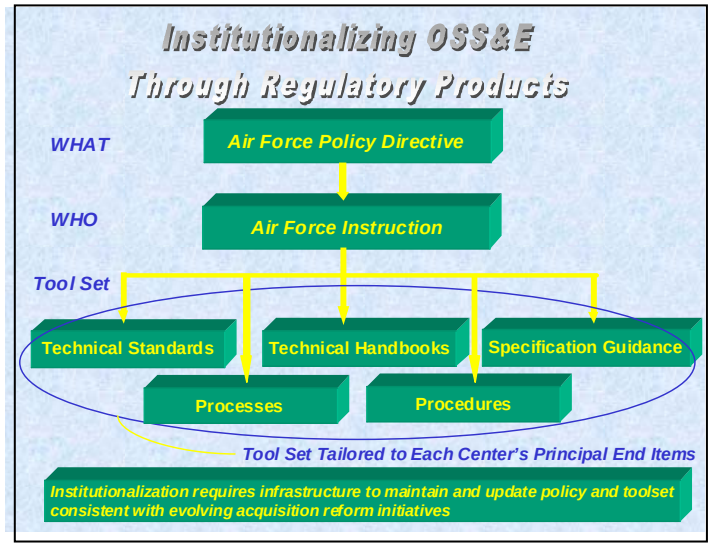
Back Up Material

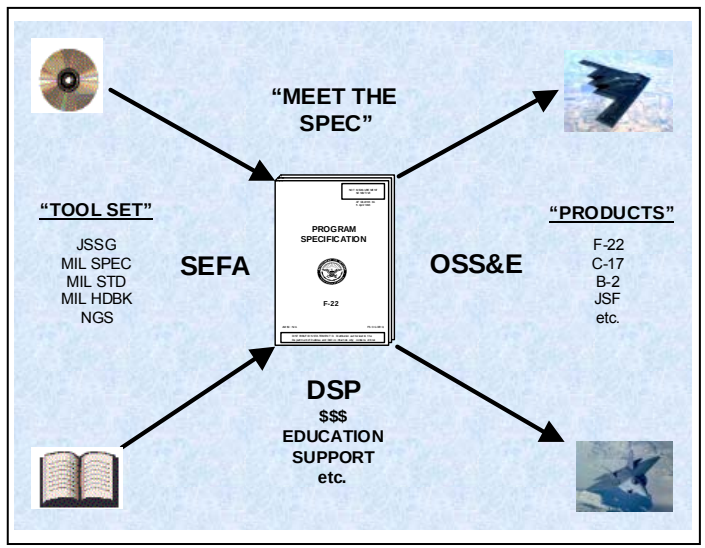
MNS	Mission Need Statement	ASR	Alternative Systems Review
MS	Milestone	CDR	Critical Design Review
ORD	Operational Requirements Document	PCA	Physical Configuration Audit
PPBS	Planning, Programming, and Budgeting System	PDR	Preliminary Design Review
STAR	System Threat Assessment Report	SFR	System Functional Review
		SRR	System Requirements Review
		SVR	System Verification Review

FIGURE 4. Example of a System Life Cycle

OSS&E “Toolset”







Headquarters U.S. Air Force

Integrity - Service - Excellence

Air Force "Pre-Acquisition" SE:
Technical Planning and Investment to Inform the Decision-Making Process

Mr. Terry Jaggers, SES

Chief Engineer

Office of the Assistant Secretary of the Air Force (Acquisitions)

23 February 2007

Aero Sector's JSSG's

- The JSSGs assist in the development of effective program-specific specifications. Such specifications, which define the expectations for the product and the confirmation those expectations are met throughout development, form the basis to further refine product requirements, the significant accomplishments that must be achieved throughout development, the activities and schedule by which those accomplishments will be achieved, and the definition of the work to be performed in the conduct of those activities. Linking the product expectations to the work to be accomplished in development provides the basis for contracts which are both executable and enforceable.