Can anyone really model DoD Space Acquisitions?

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Do we have a problem?

"Departments and agencies shall: Improve timely acquisition and deployment of space systems through enhancements in estimating costs, technological risk and maturity, and industrial base capabilities." -President Barack Obama

"… Second, we must ensure that requirements are reasonable and technology is adequately mature to allow the department to successfully execute the programs…Third, realistically estimate program costs, provide budget stability for the programs we initiate, adequately staff the government acquisition team, and provide disciplined and constant oversight." -former Secretary of Defense Robert Gates

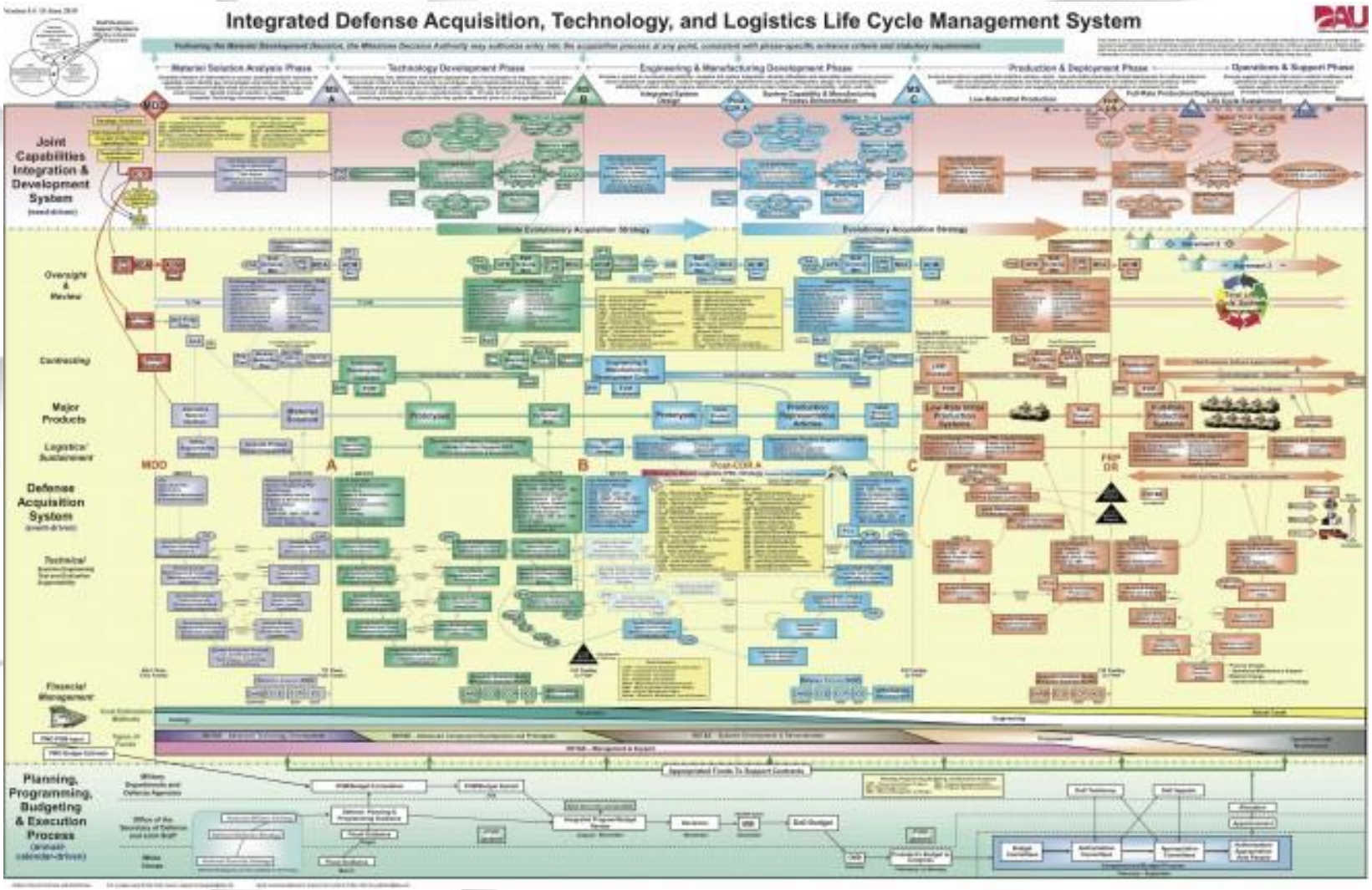
Challenges with Space

Current tools are insufficient and/or unavailable to quickly and comprehensively develop the requirements and acquisition program details for large and complex space systems.

M&S of the "system" can help!

Defense Acquisition Process

The AFIT of Today is the Air Force of Tomorrow



What is ERAM?

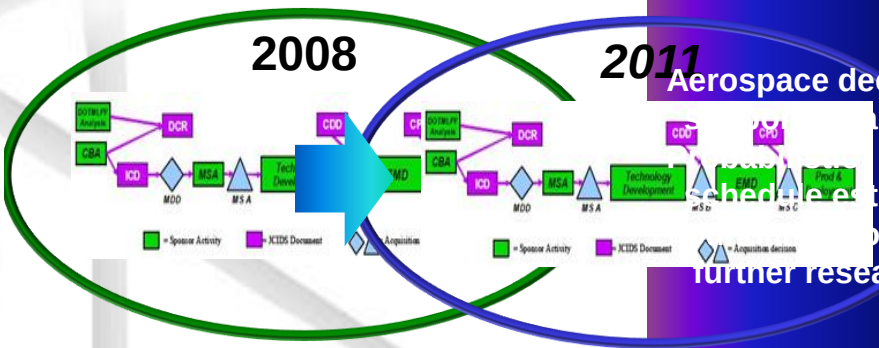
The AFIT of Today is the Air Force of Tomorrow

Group Research Project

Enterprise Requirements & Acquisition Model

Inputs:

DoDI 5000.2
JCIDS
PPBE
Heritage
Real-World
Experience



Results:

Aerospace decision
P
Schedule estimates
or
further research

Enterprise Acquisition Process Model (Within):

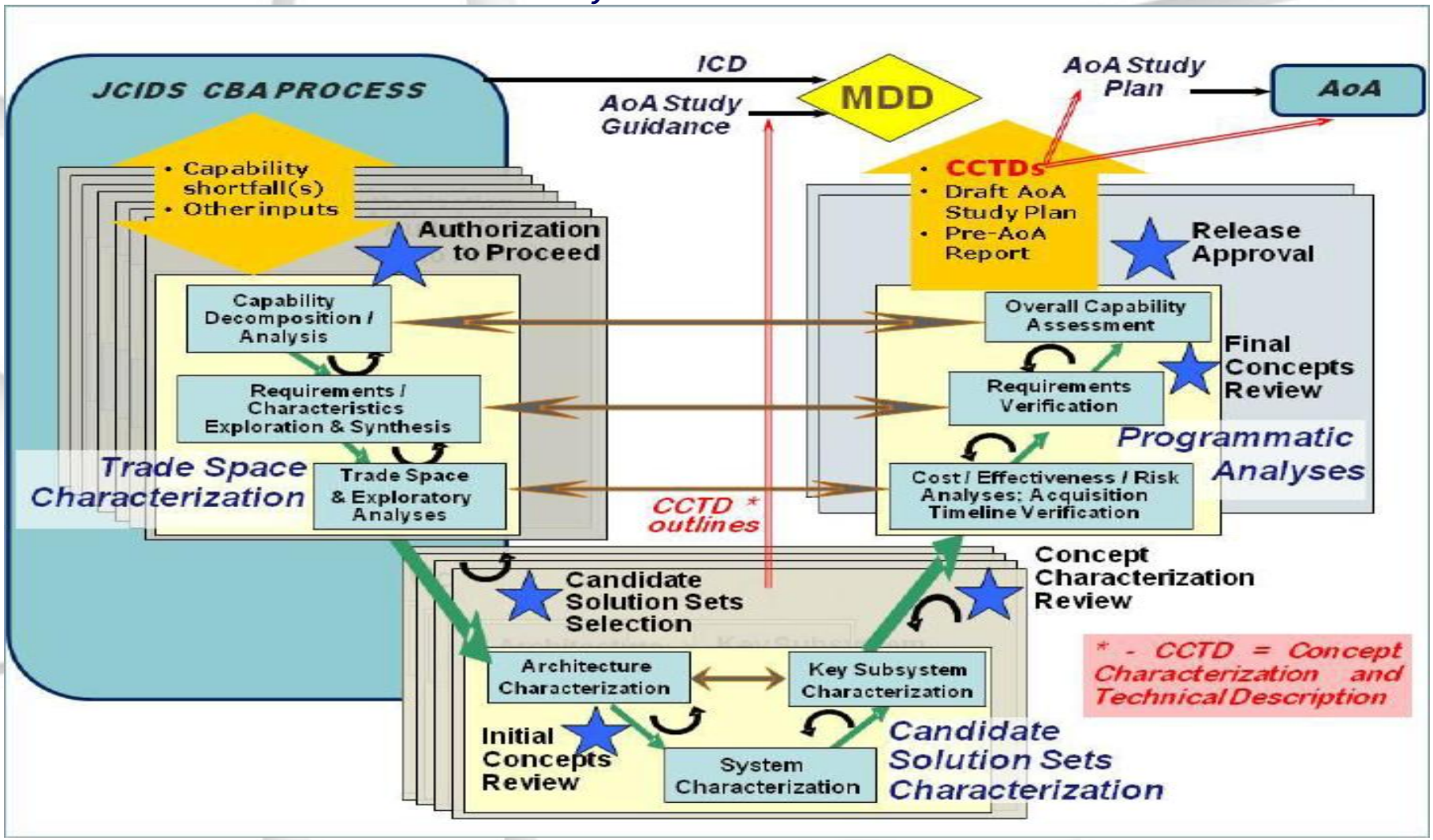
- Doctoral dissertation
- Aerospace acquisition focus
- Pre 2006 policy guidance
- Histogram of # of days for concept

ERAM 2.1 (Leach/Searle):

- SMC Sponsored
- Space acquisition focus
- Post 2006 policy guidance
- Histogram for # of days for space concept

ERAM is a discrete event model simulating the DoD Space Acquisition process providing early SE

ERAM and Early SE Process



USAF Early Systems Engineering Guidebook, Version 1, SAF/AQ, 31 March 2009

ERAM Evolution

The AFIT of Today is the Air Force of Tomorrow

PHASE 1: *Information collection & review*	Review policy, memorandums, instructions, guides, journal/research pubs relating to capability development, requirements validation & acquisitions
PHASE 2: *ERAM 1.0 analysis*	Familiarize with ERAM 1.0 in *Arena®* Review ERAM 1.0 in *ExtendSim®* (model by *Aerospace Corp.)*
PHASE 3: *Identify and design updates to ERAM 1.0*	Design ERAM 1.1, 1.2, 2.0 and 2.1 by applying information from Phase 1 to *ExtendSim©* ERAM 1.0
PHASE 4: *Implement updates to develop ERAM 1.1, 1.2, 2.0 and 2.1*	Implement design changes in *ExtendSim©* to develop new ERAM versions
PHASE 5: *Report and brief findings*	Write final report of findings and brief

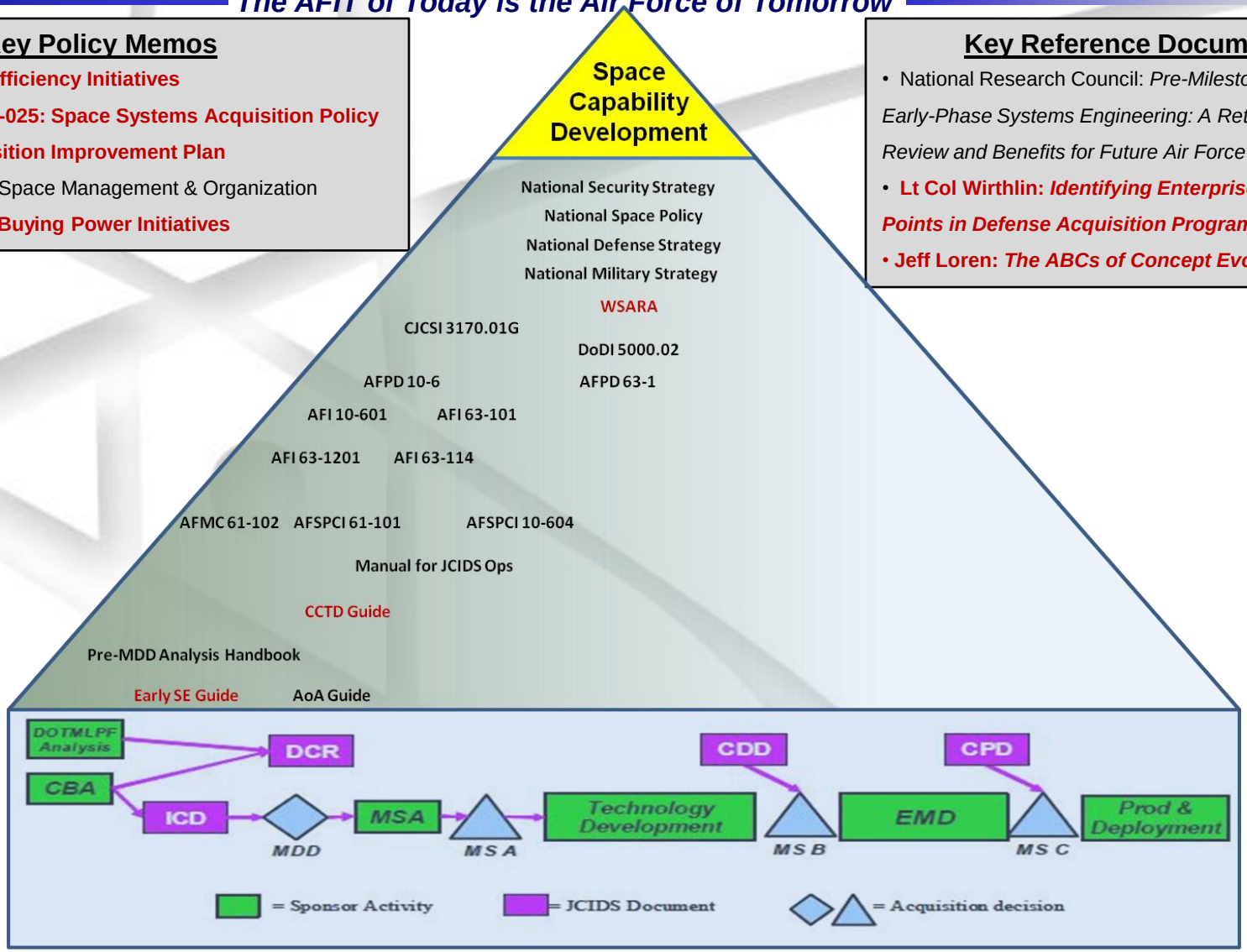
From Policy…

Key Policy Memos

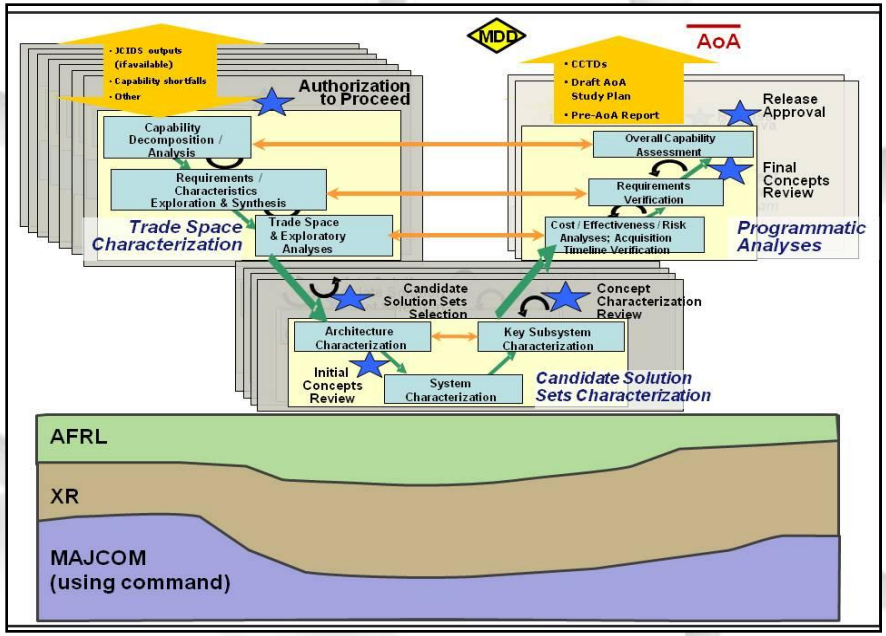
- **OSD Memo: DoD Efficiency Initiatives**
- **USD/AT&L DTM 09-025: Space Systems Acquisition Policy**
- **SAF Memo: Acquisition Improvement Plan**
- SAF Memo: HQ/AF Space Management & Organization
- **USD/AT&L: Better Buying Power Initiatives**

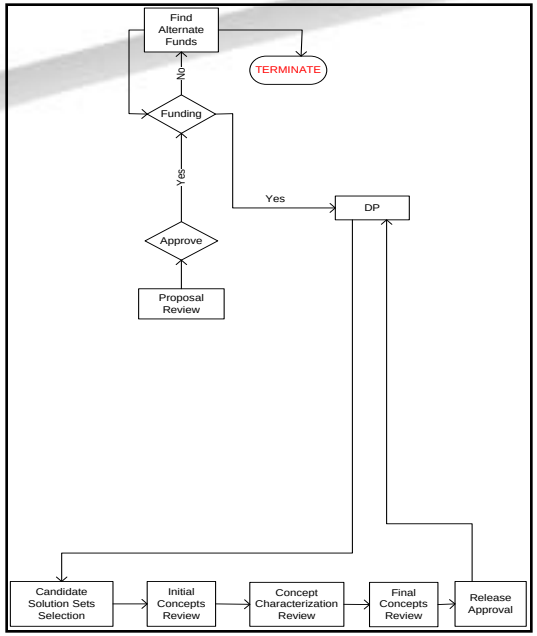
Key Reference Documents

- National Research Council: *Pre-Milestone A and Early-Phase Systems Engineering: A Retrospective Review and Benefits for Future Air Force Acquisition*
- **Lt Col Wirthlin: *Identifying Enterprise Leverage Points in Defense Acquisition Program Performance***
- **Jeff Loren: *The ABCs of Concept Evolution***

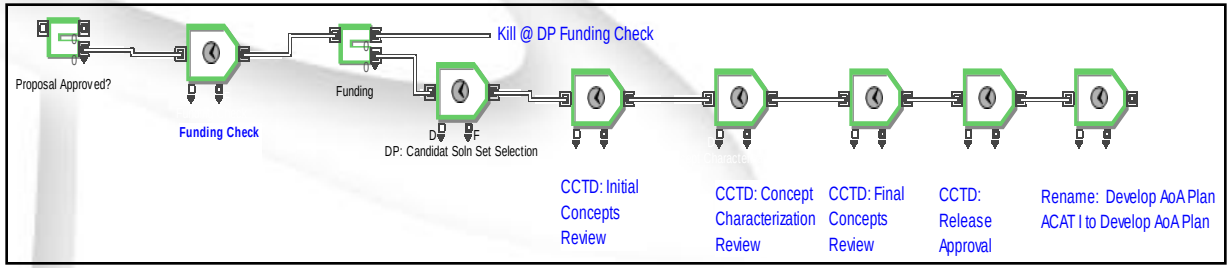


…to Practice

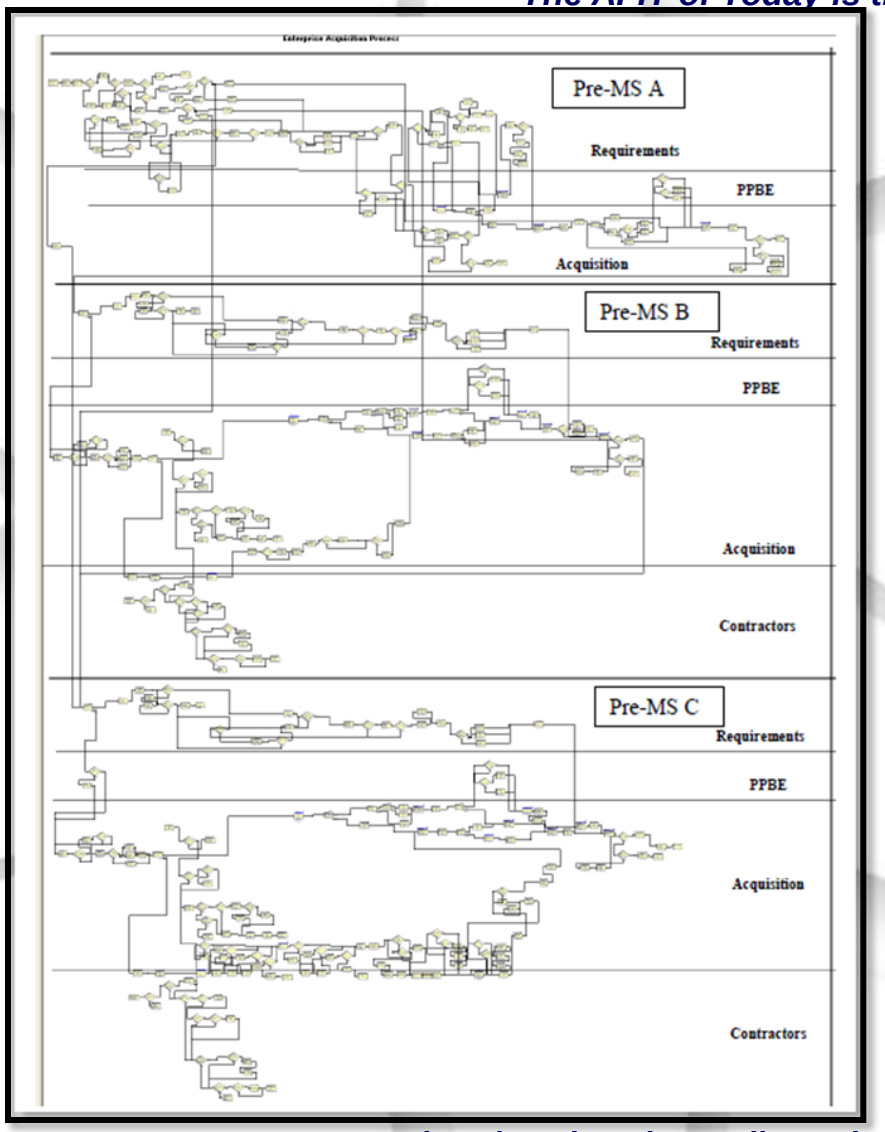




- **ERAM 2.1 Example**
  - Early SE "V"
  - CCTD Development
  - ERAM Framework
  - Coding in ExtendSim

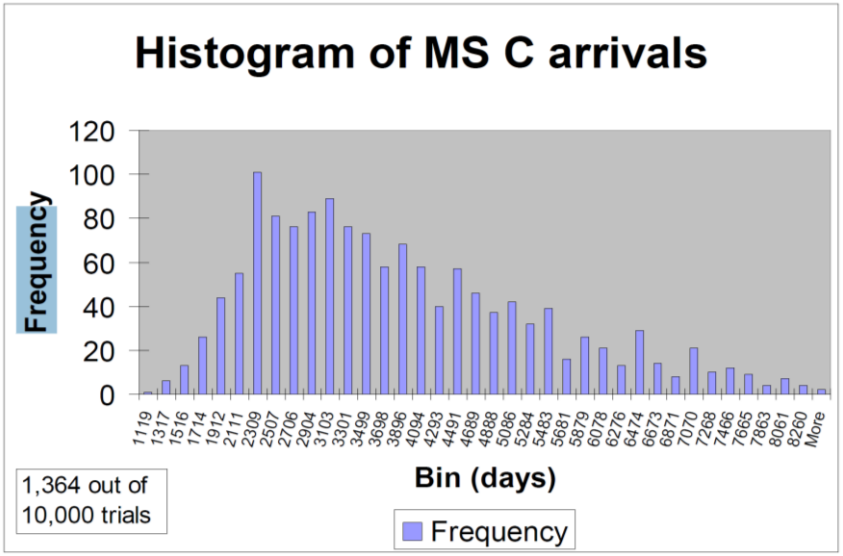


Baseline Model



ERAM 1.0: Wirthlin's Dissertation

- How does acquisition system work?
- Why does the system behave the way that it does?
- Are there things that can be done to improve the system?

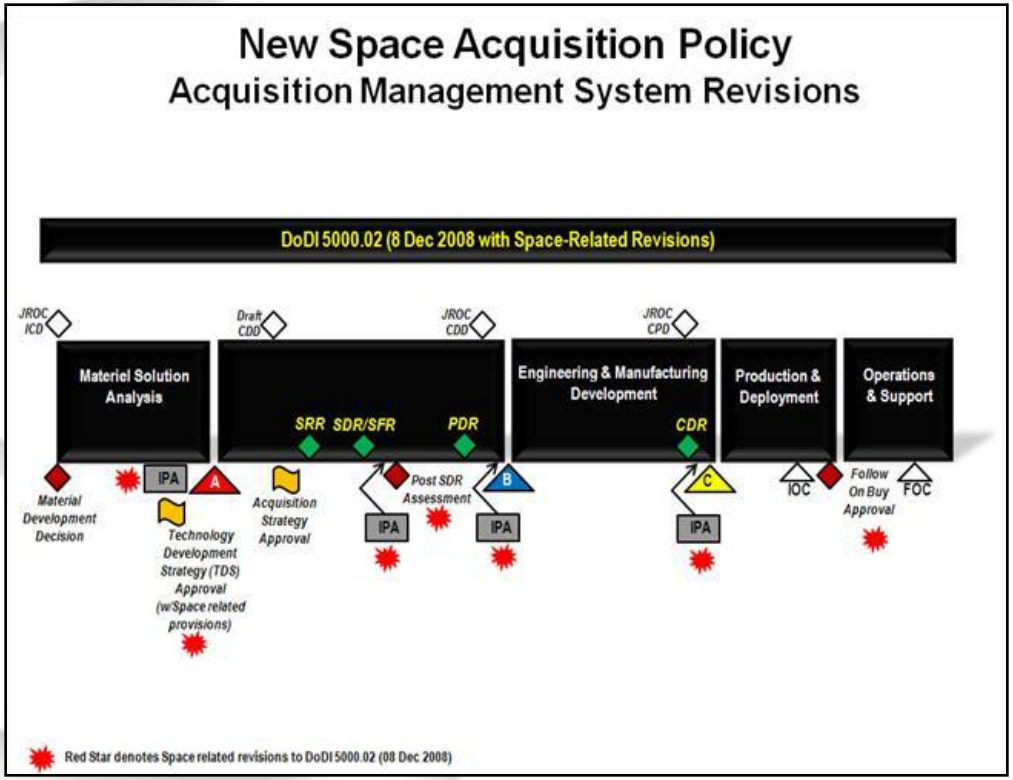


Wirthlin (Sep 2009)

Policy & Practice Updates

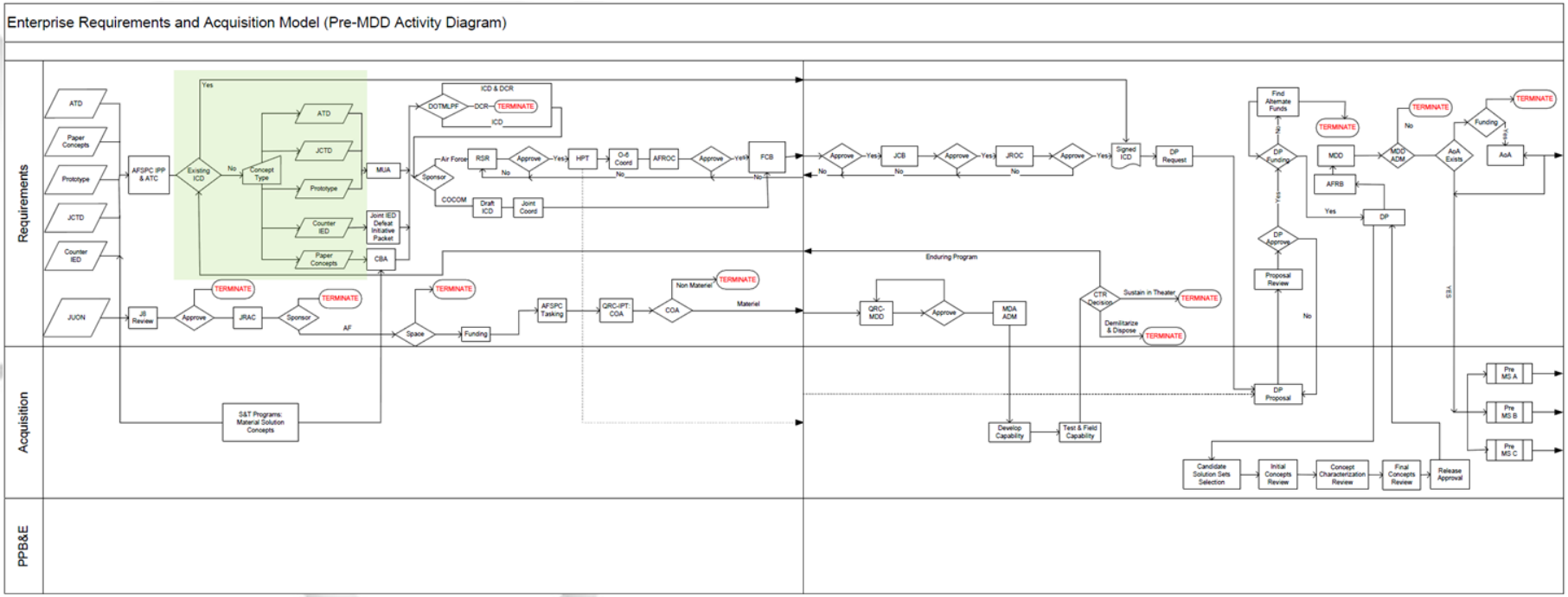
ERAM 1.2

	Model Change	Guidance
1	Move PDR to Pre MS-B,	DoD 5000.02, WSARA
2	SDR Submodel	DTM 09-025
3	Post SDR Assessment - Submodel	DTM 09-025
4	Post PDR/CDR Assessment - Submodel	DTM 09-025
5	Cost Growth Check	DoD 5000.02, WSARA



Early JCIDS Activities

	Model Change	Policy
1	Add JCIDS Initiation	JCIDS
2	Add/Update JCIDS Concept Review Process	JCIDS
3	Add Development Planning Initiation	JCIDS
4	Add CCTD Development Process	JCIDS
5	Add/Update MDD Process	JCIDS, Pre-MDD Handbook
6	Update AoA Process	AoA Handbook
7	Add JUON Process	AFI 63-114



Capability Matrix

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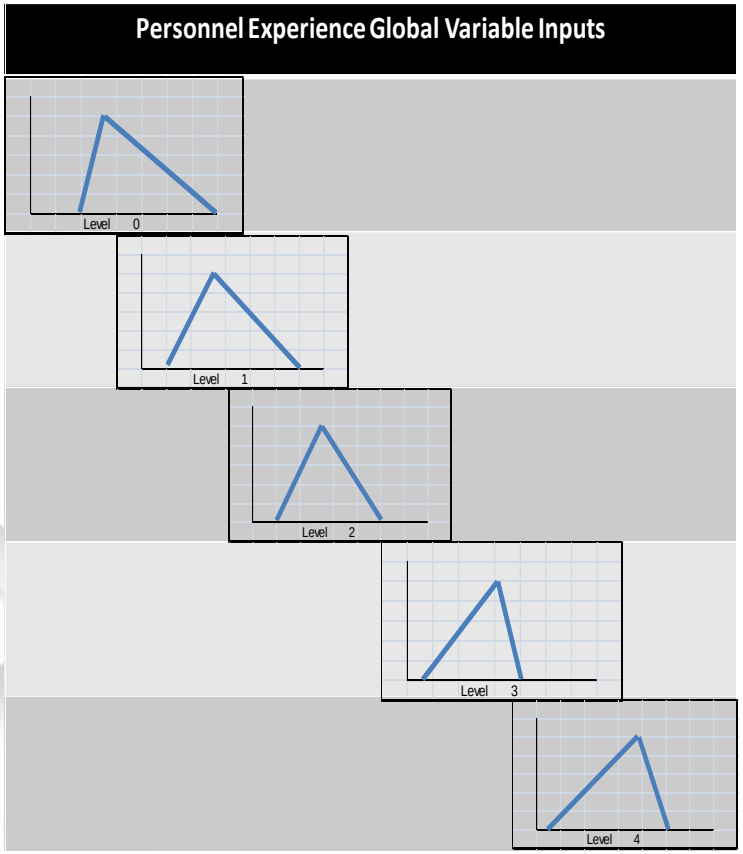
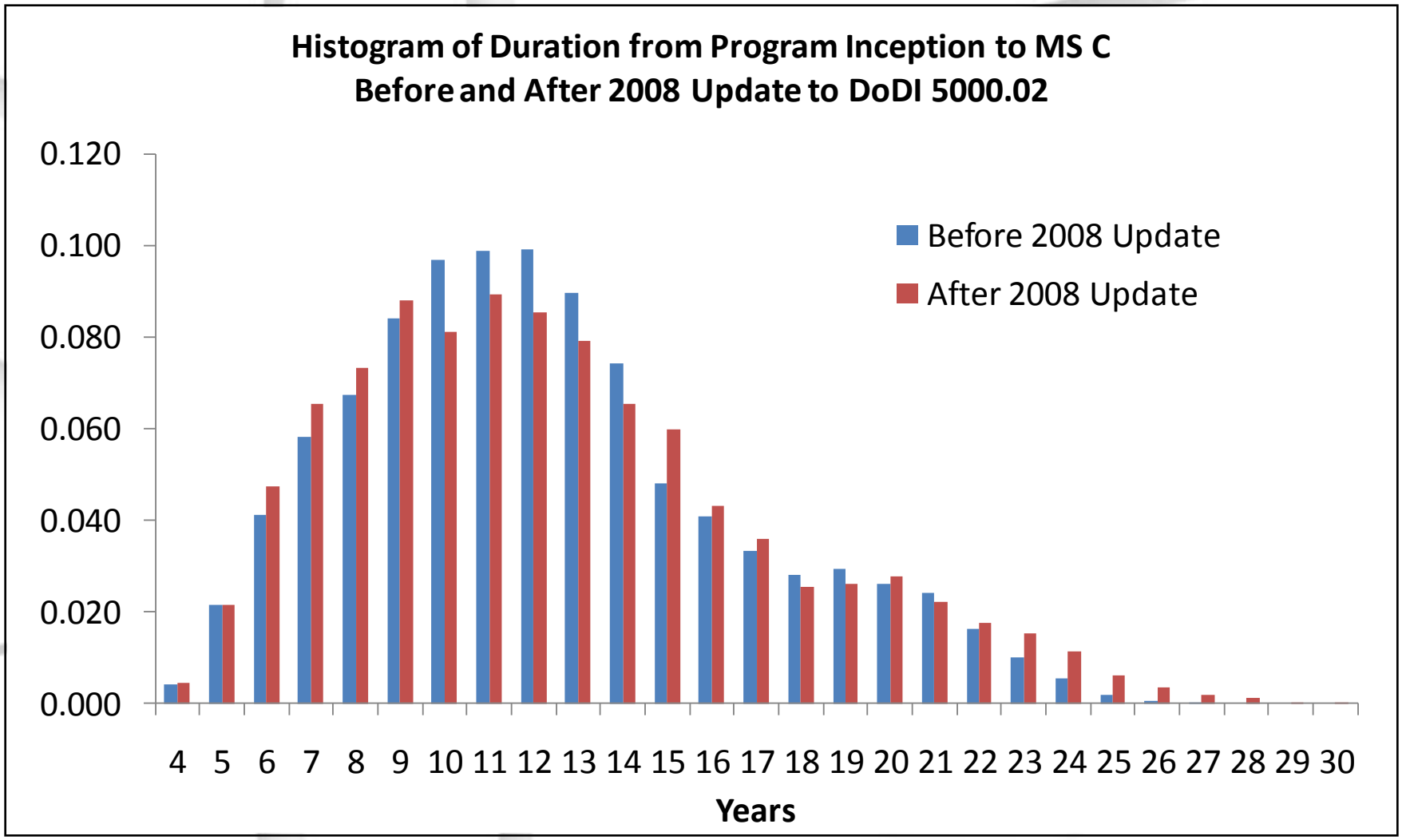
- **ERAM 2.0 – SPO Capability Matrix**
  - Determined impacted activities
  - Worked with Aerospace to design distribution impacts

Acquisition Maturity Potential Matrix

	Senior Leadership Experience in position	Staff Experience in position	Senior Leadership Cohesiveness	Staff Certifications, Training and Motivations	External Program Support	Program Office Size
Level 0	Has less than 1 year experience	Has less than 1 year experience	Has not worked together	Staff has minimal Acquisition training; few if any certifications	No interest beyond MAJCOM	No formal program office yet
Level 1	Has 1 to 3 years experience	Has 1 to 3 years experience	Has worked together for less than 6 months	Staff has some Acquisition training & Certifications	Some interest	Less than 50% of authorized staffing Level
Level 2 Baseline	Has 3 to 5 years experience with Acq processes	Has 3 to 5 years experience with Acq processes	Has worked together for 1 year	All Staff has some Acquisition training & Level I Certifications	Senior leadership helping with Acq process	Between 50% and 70% of authorized staffing Level
Level 3	Has years of Acquisition Experience	Has years of Acquisition Experience	Has worked together for 1 to 3 years	Motivated, certified (some Level II) and trained staff	Senior leadership wants program to go	Greater than 70% of authorized staffing Level
Level 4	Has been steering program through Acq Process	Has been steering program through Acq Process	Has worked together for 3 to 5 years but not more	Highly motivated and trained staff (Certifications Levels I, II, and III as appropriate)	Senior leadership and congressional interest	Fully staffed to authorized staffing Level



Results after ERAM update



Modeling Benefits

- *Early comprehensive schedule estimates for Concept Characterization and Technical Descriptions (CCTDs) – Early AF Systems Engineering Process*
- *Provides comprehensible picture of inter-organizational RRAs*
- *"Flight Simulator" for acquisition & requirements personnel; cornerstone for improved, rigorous training & evaluation program*
- *Tool that facilitates sensitivity analysis of the acquisition system*
- *The model accounts for much process variation in the acquisition process*

ERAM Limitations

- Human Factors
- Model data (distributions & decision points)
- OSD process deviation authority
- “Fire Fighting”—reactionary management
- Every program is unique

Research Opportunities

1) Utility of early systems engineering (cost/benefit)
2) PPB&E process analysis and integration
3) T&E activities
4) Coordination between SAF/AQR, MAJCOM & Center XR
5) Rapid acquisition process
6) Generalize ERAM across DoD

Conclusions

Problem Statement:

Current tools are insufficient or unavailable to quickly and comprehensively develop the requirements and acquisition program details for large and complex space systems.

ERAM:

- Provides improved early space concept schedule estimates for early systems engineering activities
- Provides context to a complex inter-organizational system
- Supplements standard DoD acquisition flow chart with real world processes & data

Questions?

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