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Systems Engineering (SE) In Early Development Planning for the Automated Aerial Refueling (AAR) Project

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Background

- **AFRL AAR II Program Developing Requirements**
  - **System and Segment Level**
  - **Safe KC-135 Fleet Refueling Via Boom and Receptacle**
    - **Minimal Tanker Modifications**
  - **Future Unmanned Aerial Vehicles (UAV)**
  - **Rationale & Sensitivity Analyses Included**
    - **Since Future Transition Platform Not Yet Defined**
- **Three AAR Segments**
  - **Tanker**
  - **Receiver**
  - **Mission Control Station (MCS)**
    - **Operated by an Air Vehicle Operator**

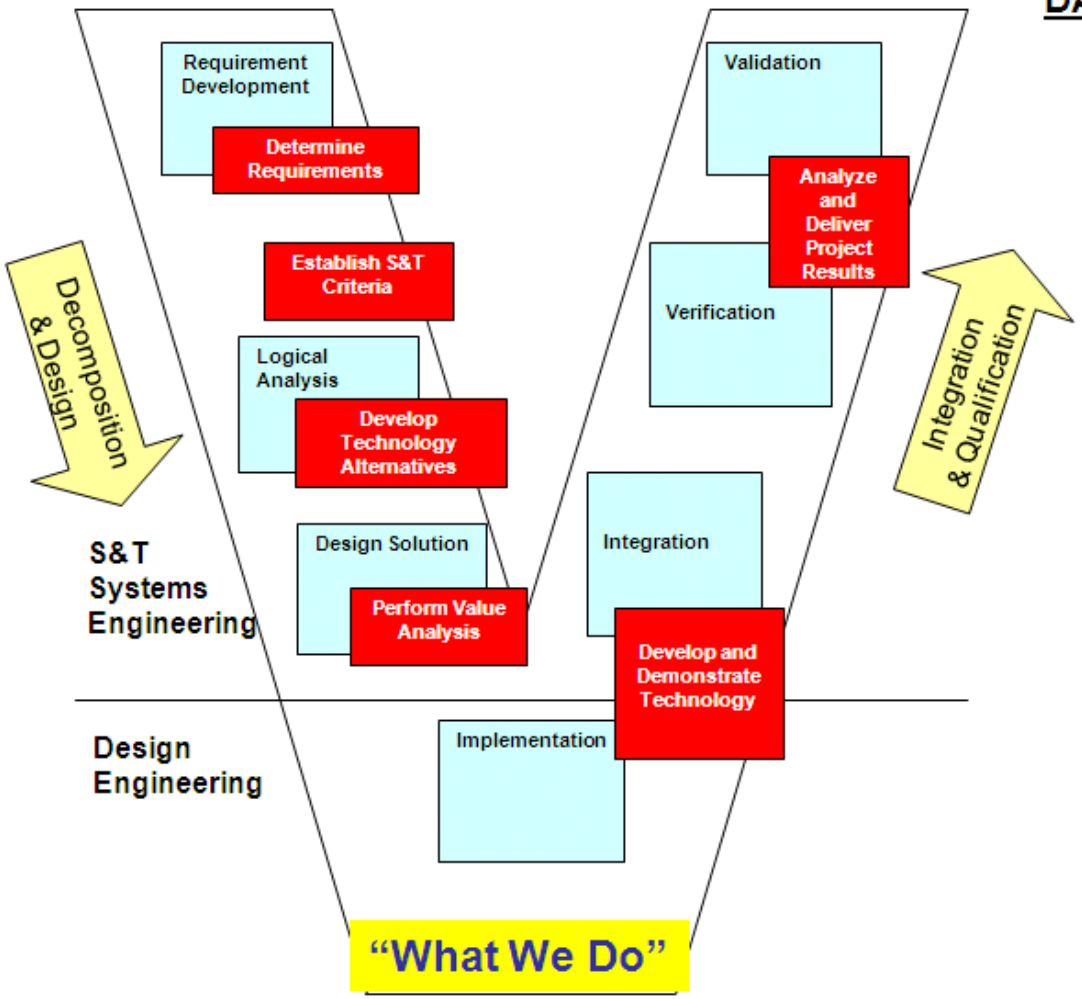
Presentation Outline

- AFRL Science & Technology (S&T) SE
- Early Development Planning for Future Platforms
- Automated Aerial Refueling (AAR) Project
- Functional and Segment Level Physical Architecture
- Configuration Item Architecture and Requirements
- AAR Preferred System Concept (PSC)
- AAR System/Subsystem Design Description (SSDD)
- Benefits of S&T SE to Support Development Planning

AFRL S&T SE

- Draws upon AFRL's Process Based Framework
- Uniquely Tailored to AFRL's S&T Mission
  - SE Rigor Appropriate to S&T Program
- Recognizes that Technology Must be "Systemized" to Enable Capability
- Facilitates Technology Transition -- Turning Technology into War Winning Capabilities
- Enables Necessary S&T Influence Across Acquisition Life Cycle
  - What We Do Today Is the Basis of Future System Acquisition

S&T SE Process Consistent With Defense Acquisition Guide SE Processes



DAG Technical Mgmt Processes

- Decision Analysis
- Tech Planning
- Tech Assessment
- Requirements Mgmt
- Risk Mgmt
- Configuration Mgmt
- Data mgmt
- Interface Mgmt

"How We Do It"

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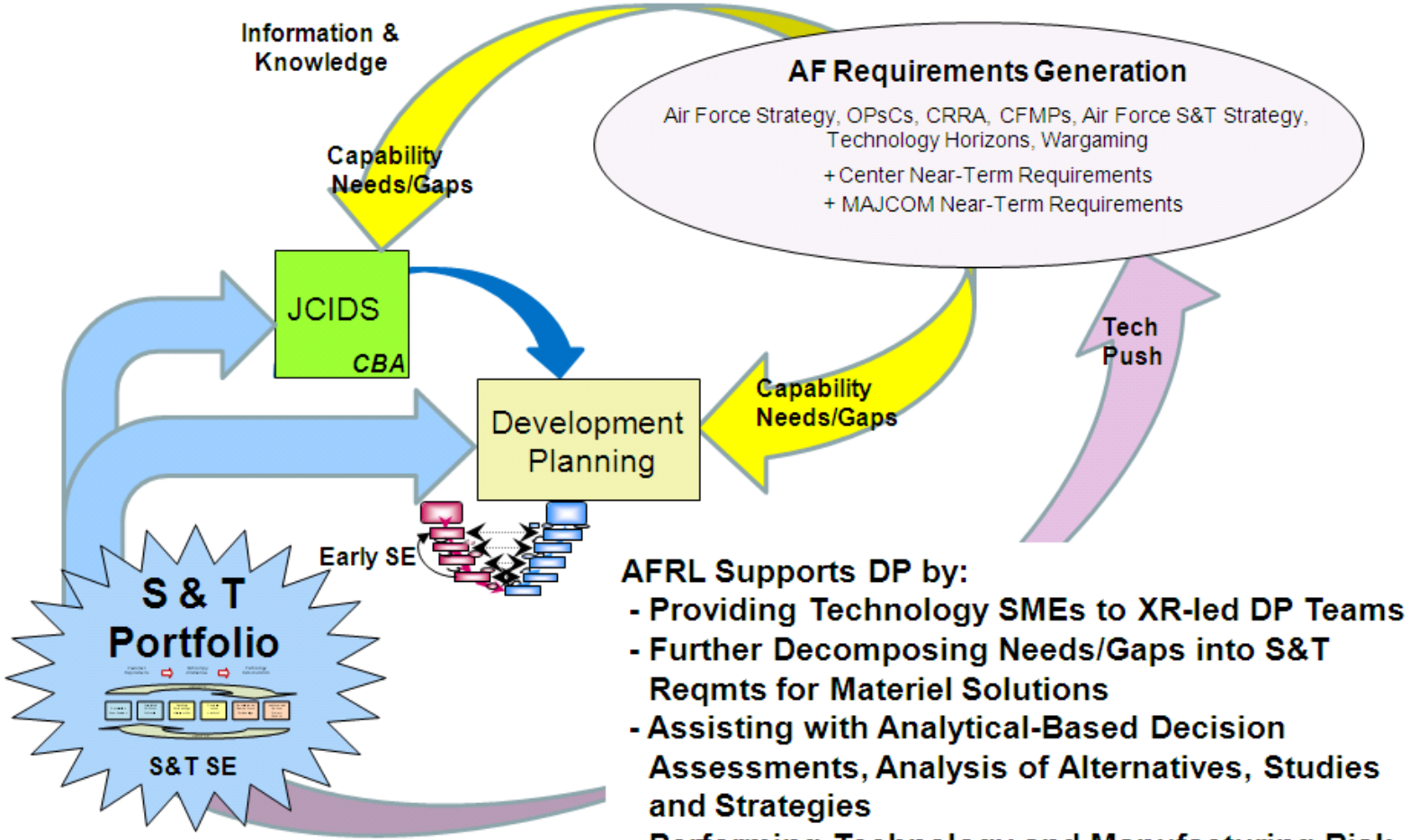
AFRL S&T SE And The Acquisition Life Cycle



AFRL Supports DP by:

- Providing Technology SMEs to XR-led DP Teams
- Further Decomposing Needs/Gaps into S&T Reqmts for Materiel Solutions
- Assisting with Analytical-Based Decision Assessments, Analysis of Alternatives, Studies and Strategies
- Performing Technology and Manufacturing Risk Assessments

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AAR
National AAR Team

BOEING

LOCKHEED MARTIN

NORTHROP GRUMMAN

Calspan

CTSi

Aurora FLIGHT SCIENCES

Rockwell Collins

GENERAL DYNAMICS
Advanced Information Systems

Booz | Allen | Hamilton

SIERRA NEVADA CORPORATION
ELECTRONIC SYSTEMS AND INTEGRATION
INNOVATIVE & AGILE TECHNOLOGY SOLUTIONS

AARII Team Combines War fighters with Nationally Recognized Technologists

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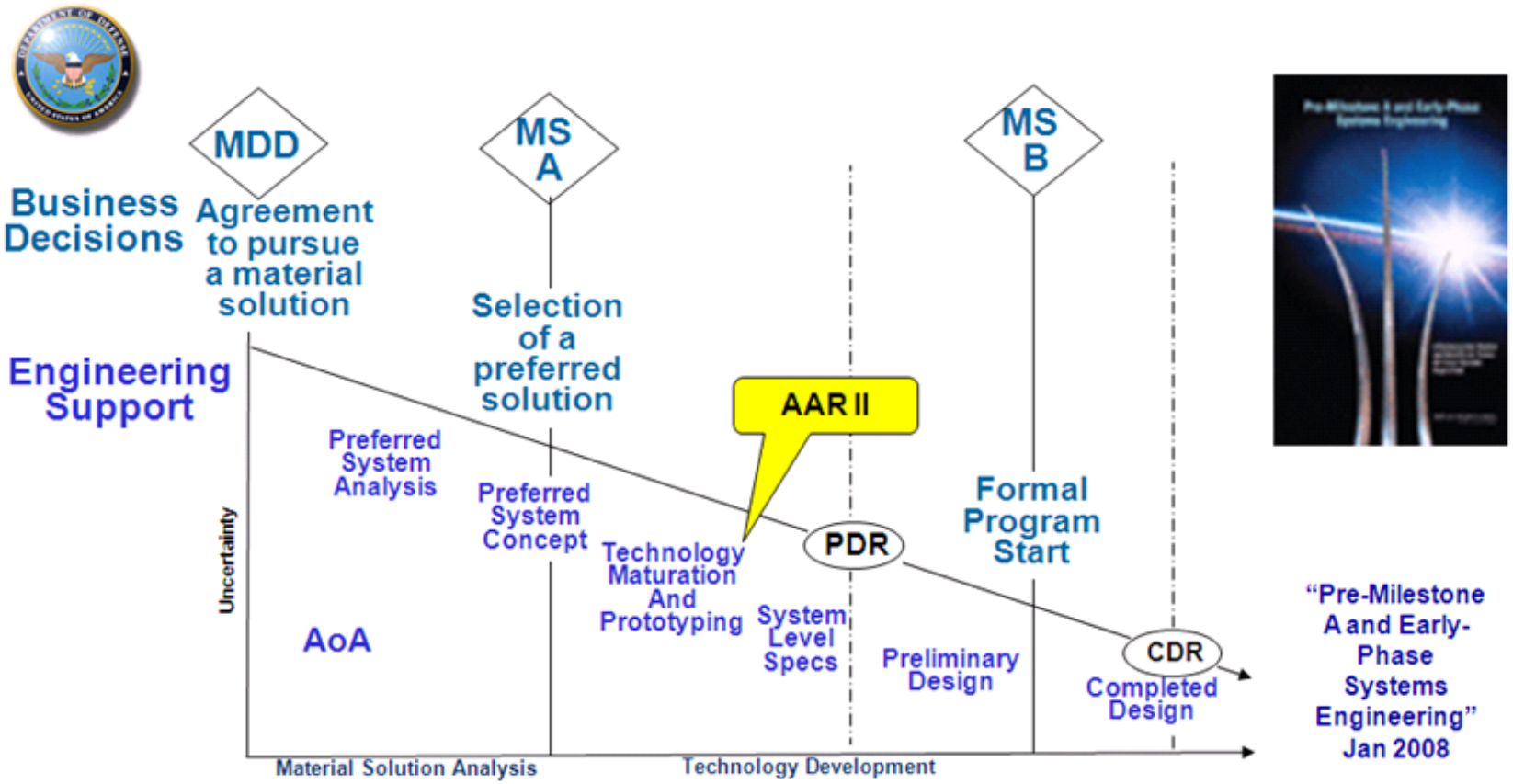
AAR



Systems Engineering is effective when it informs, and is informed by, other Acquisition process owners

AAR

Will Accomplish:

- **Systems Engineering Technical Reviews**
  - **System Requirements Reviews**
  - **System Functional Reviews**
  - **Technology Readiness Assessments**

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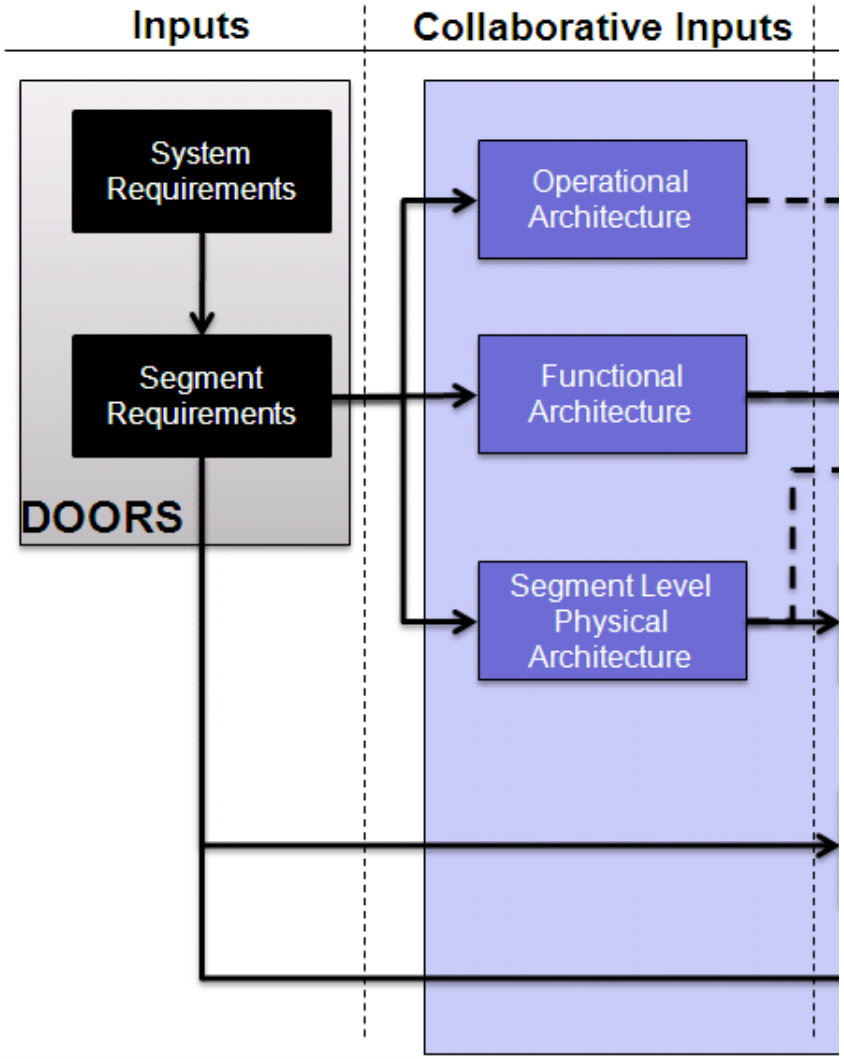
Functional and Segment Level Physical Architecture



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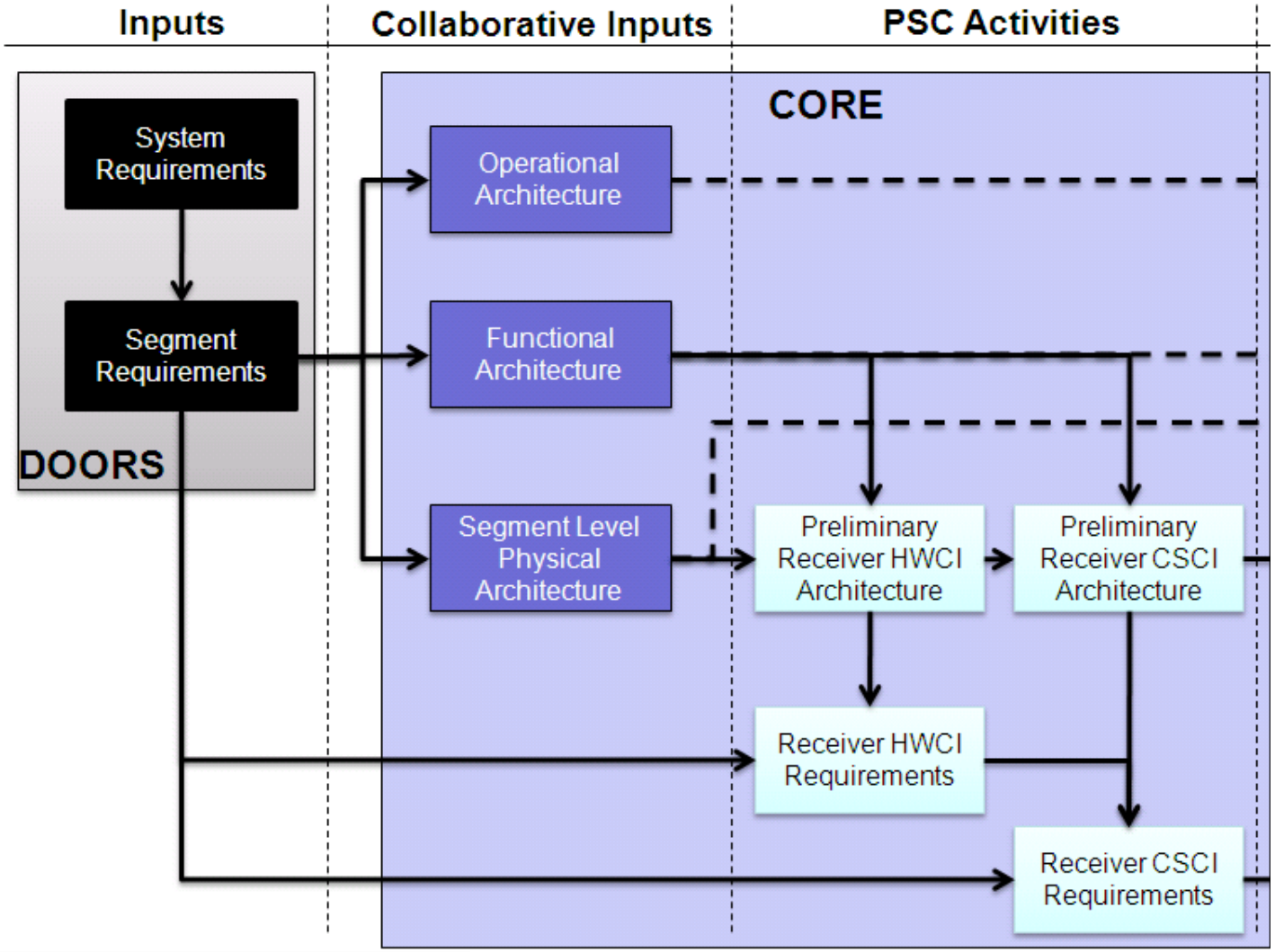
Configuration Item Architecture and Requirements



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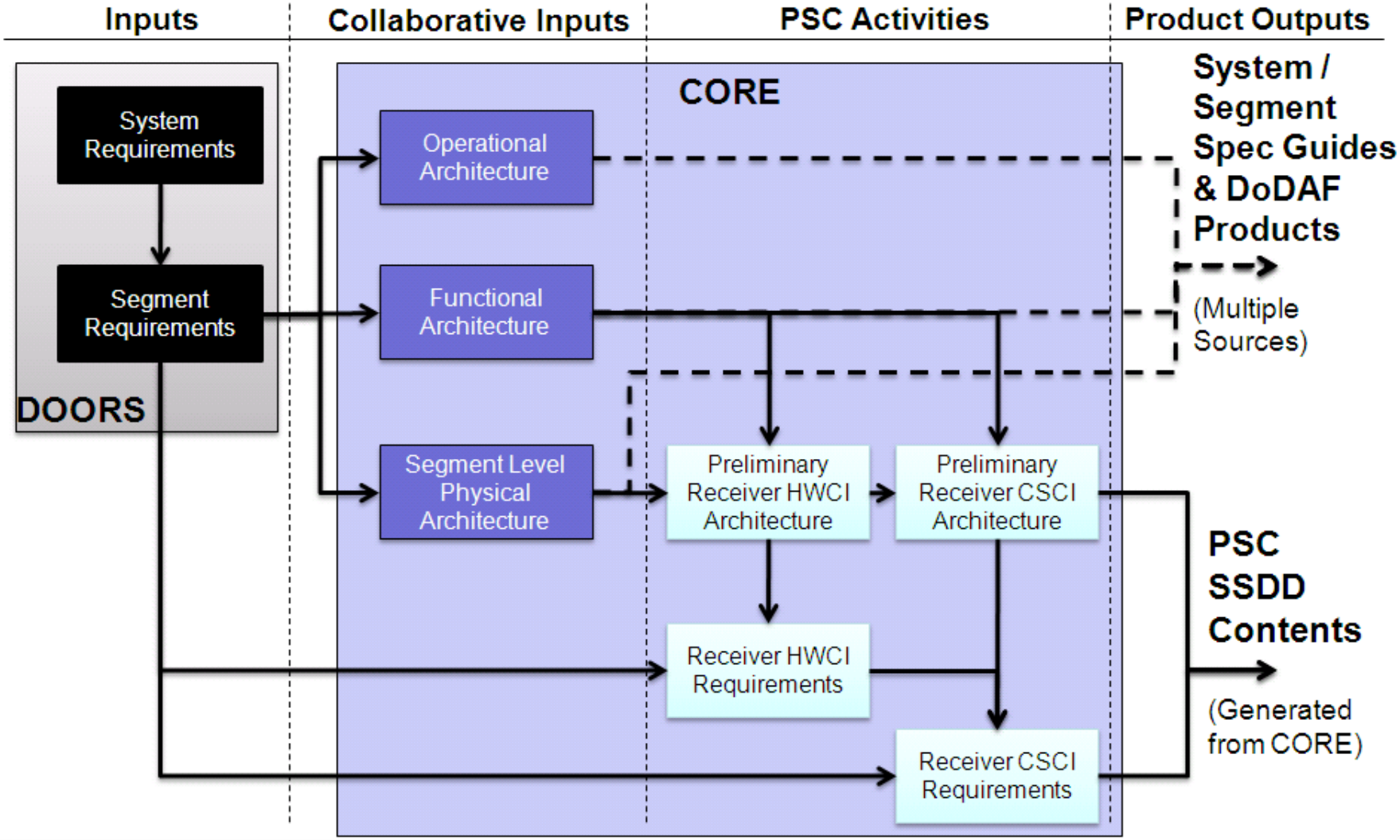
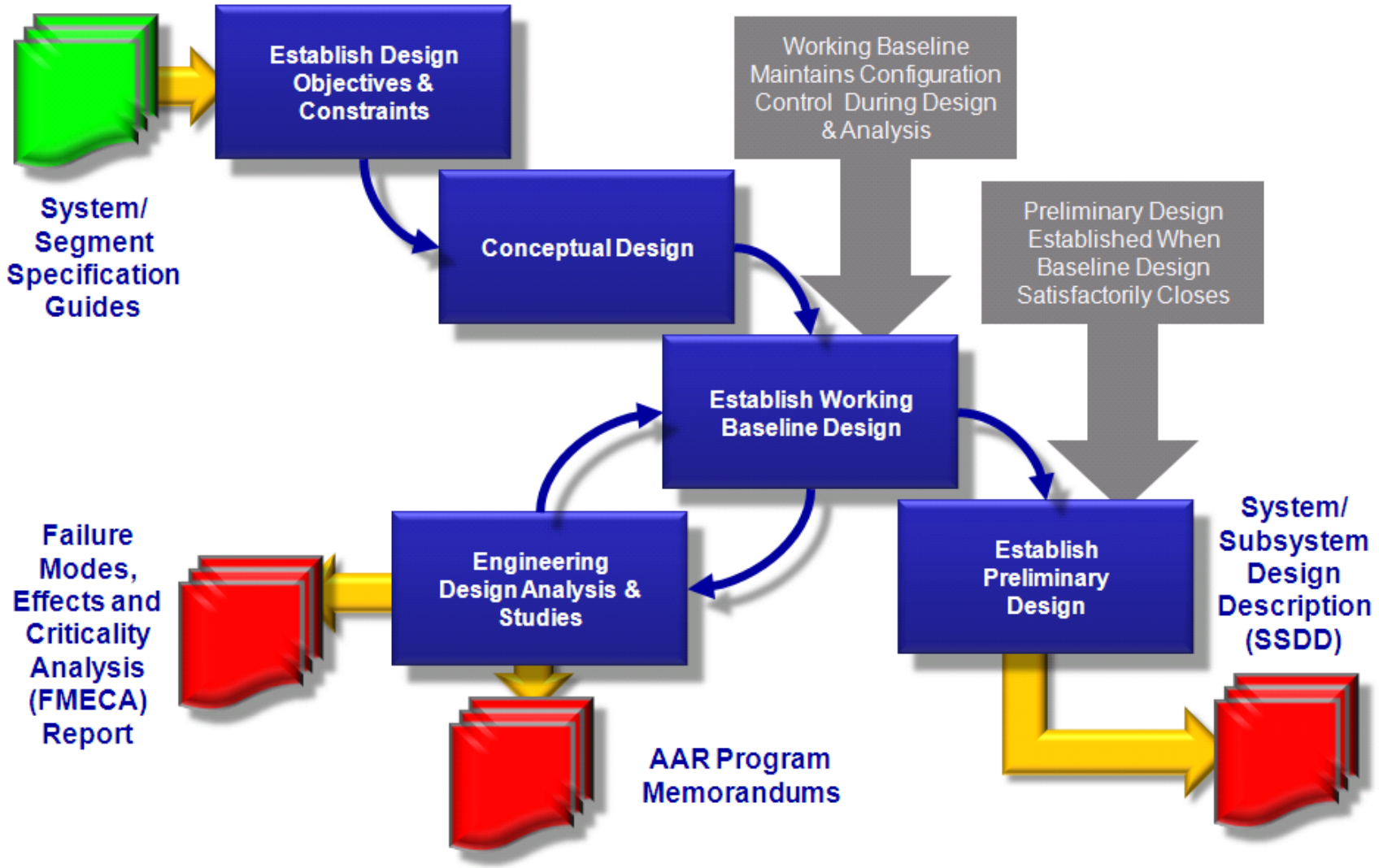


PSC Design Process



Path Ahead and Summary

- Some Refinement of PSC Working Baseline
  - Additional Analyses/Trades
  - Performance Characterization
  - Interface Definition
- Create SSDD
- Present final PSC design at Final System Requirements Review (FSRR)

DoDAF Products

OPERATIONAL (OV)

- 1: High-Level Operational Concept Graphic
- 2: Operational Node Connectivity Description
- 3: Operational Information Exchange Matrix
- 4: Organizational Relationships Chart
- 5: Operational Activity Model
- 6a: Operational Rules Model
- 6b: Operational State Transition Description
- 6c: Operational Event/Trace Description
- 7: Logical Data Model

SYSTEMS (SV)

- 1: Systems Interface Description
- 2: Systems Communications Desc.
- 3: Systems-Systems Matrix
- 4: Systems Functionality Description
- 5: Operational Activity to System Function Traceability Matrix
- 6: Sys Data Exchange Matrix
- 7: Sys Performance Parameters Matrix
- 8: Systems Evolution Description
- 9: Systems Technology Forecast
- 10a: Systems Rules Model
- 10b: Systems State Transition Desc.
- 10c: Systems Event/Trace Desc.
- 11: Physical Data Model

TECHNICAL (TV)

- 1: Technical Standards Profile
- 2: Technical Standards Forecast

ALL (AV)

- Overview & Summary
- Integrated Dictionary

Spreadsheets	Static Models & Graphics
Text	Dynamic Models

CADM: CORE Architecture Data Model

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Benefits of S&T SE to Support Development Planning

- SE is Fundamental to Establishing the Right Technology Effort to Meet Customer Needs
- AFRL's SE Process Uniquely Tailored to S&T Mission
- Understanding Critical Operational Needs/Gaps Crucial to Fully Understanding Requirements
  - Which is Critical to Selecting Appropriate Technology-Based Solutions
- Iterative Requirements Development Process is the Keystone to Overall Success

Contact Information

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