



Acquisition Research Program: Creating Synergy for Informed Change

Control of Total Ownership Costs of DoD Acquisition Development Programs Through Integrated Systems Engineering Processes and Metrics

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Outline

- **Goals and Objectives**
- What is TOC?
- What is the problem?
- What are we doing?
- What have we found, to date?



Goals and Objectives

- **Problem:** Systems engineering (SE) is optimized for designing for best system performance but may not be aligned, prioritized, or defined well to designing for affordability and TOC objectives.
 - **Research question 1:** How does SE contribute to TOC estimation, reduction, and control objectives and activities?
 - **Research question 2:** Can SE activities be improved, better defined, or integrated into other TOC reduction activities to improve TOC estimation and control?
 - **Research question 3:** Can TOC metrics be developed and integrated into SE and program activities and toolsets to quantitatively develop TOC KPPs, KSAs, MOEs, etc. and quantitatively assess program performance against those metrics?



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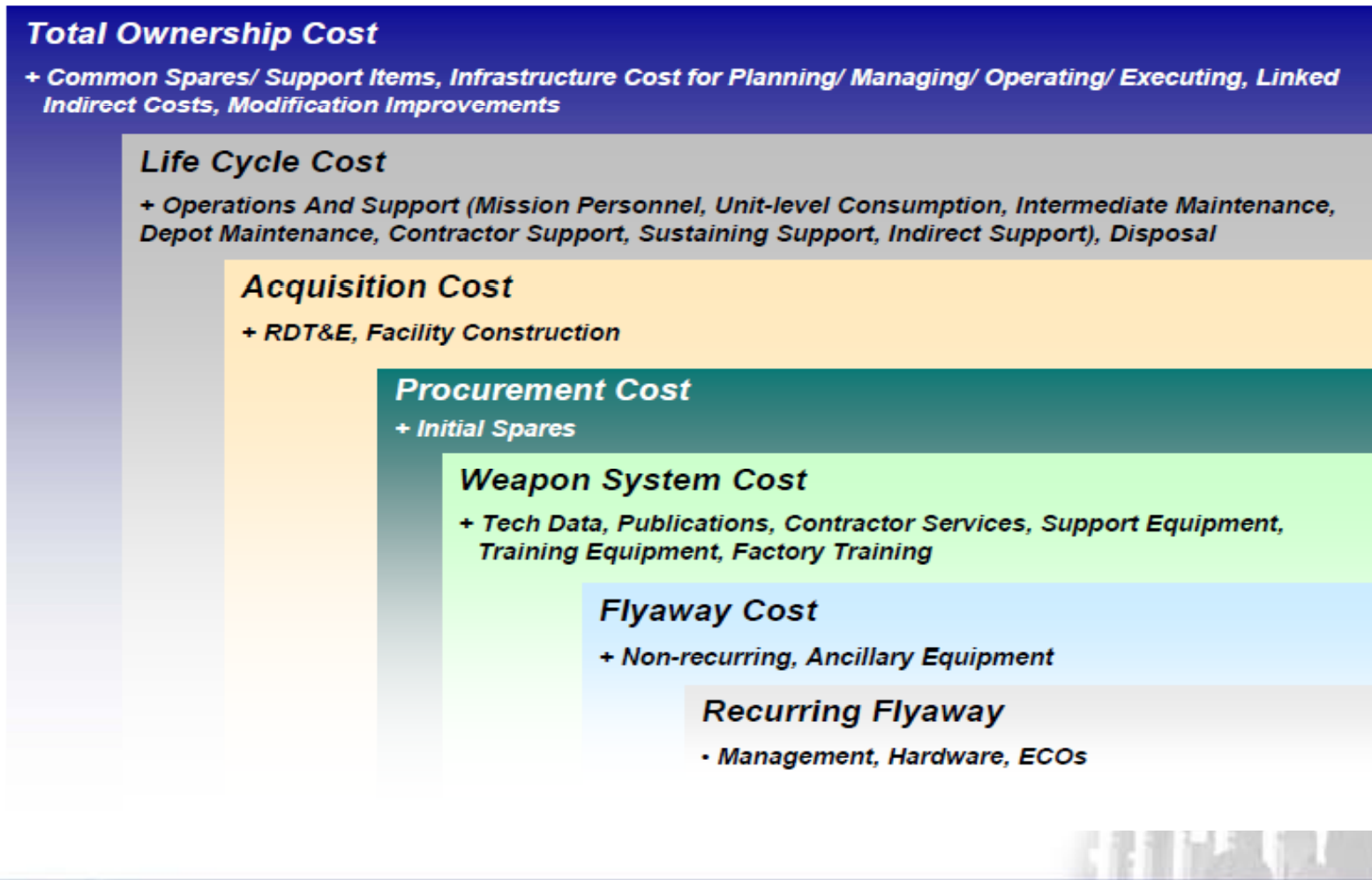


What is TOC?

- “... TOC is comprised of costs to research, develop, acquire, own, operate, and dispose of weapon and support systems, other equipment and real property, the costs to recruit, train, retain, separate and otherwise support military and civilian personnel, and all other costs of business operations of the DoD”. ([Gansler, 1998](#)).
- Research and development cost which extend from the concept phase to the technology development phase and through to development and demonstration.
- Costs associated with system production
- Operations and support cost during sustainment phase
- Disposal and retirement costs



Components of TOC (NAVAIR)

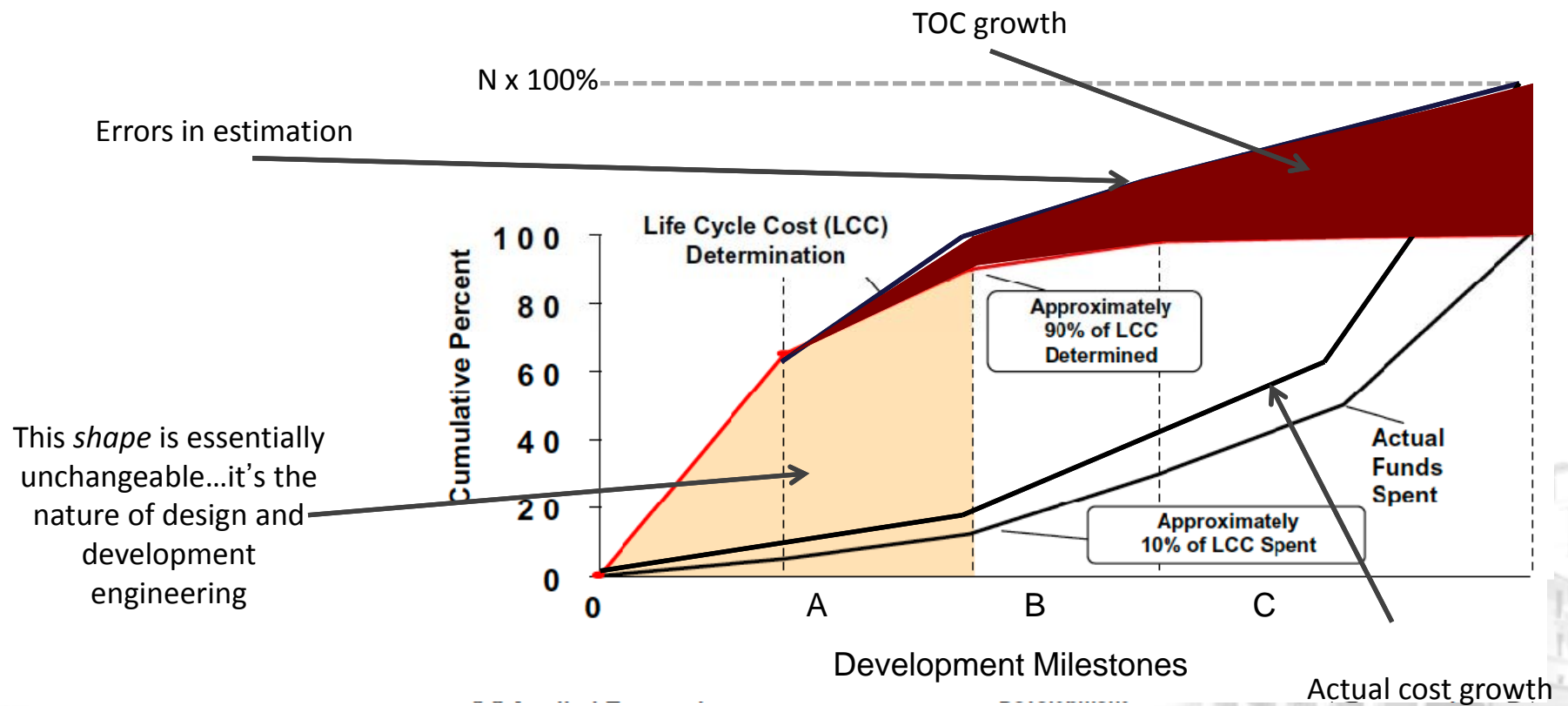
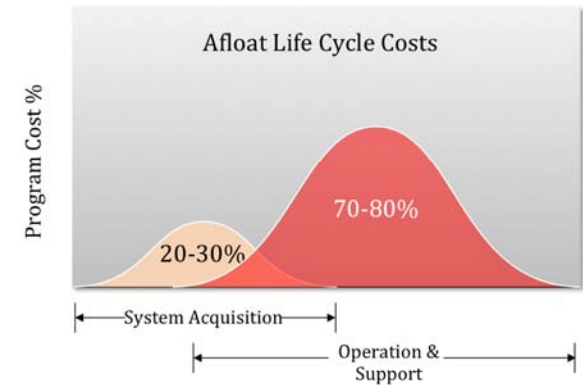


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The TOC Problem

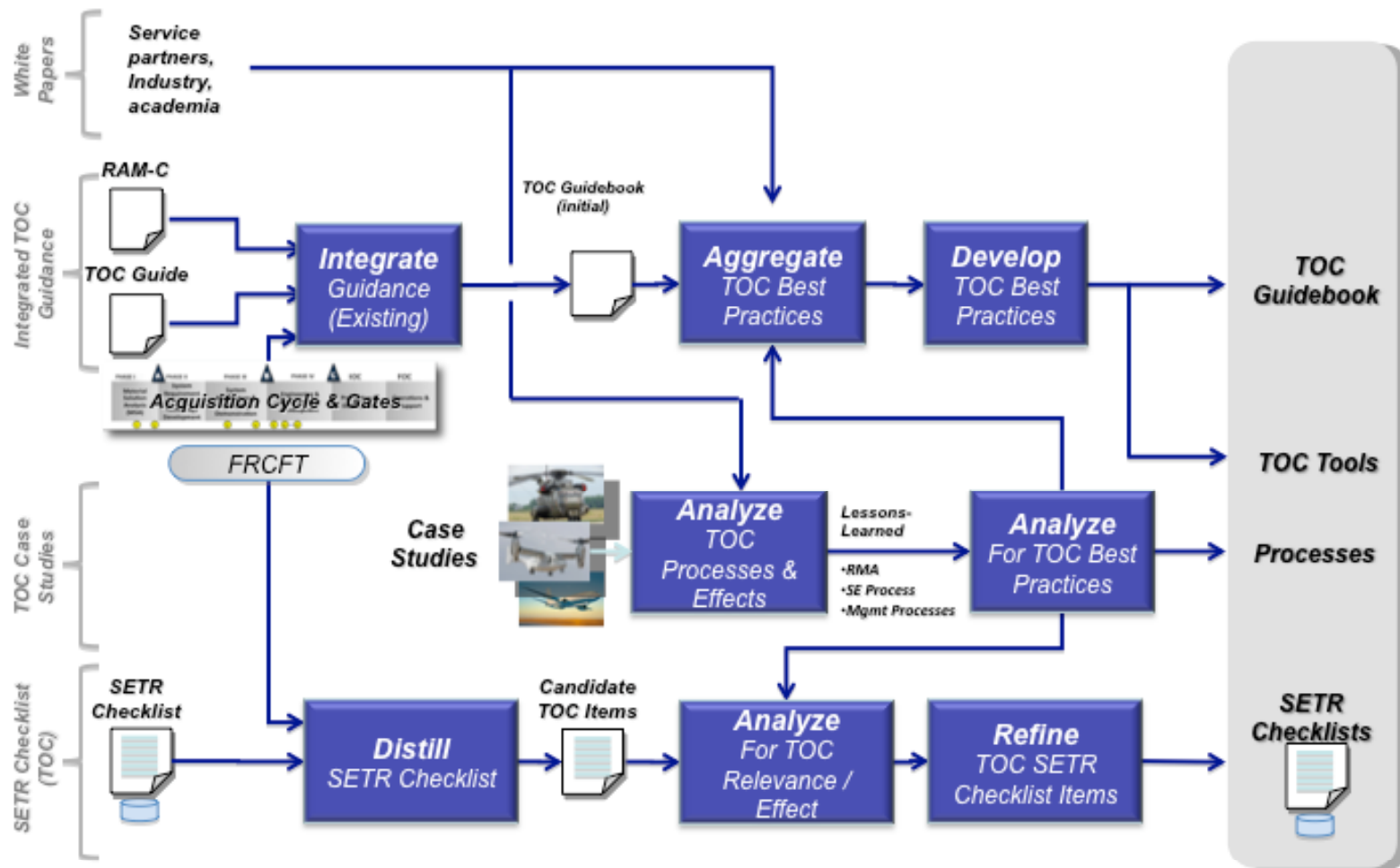


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TOC Research Technical Approach

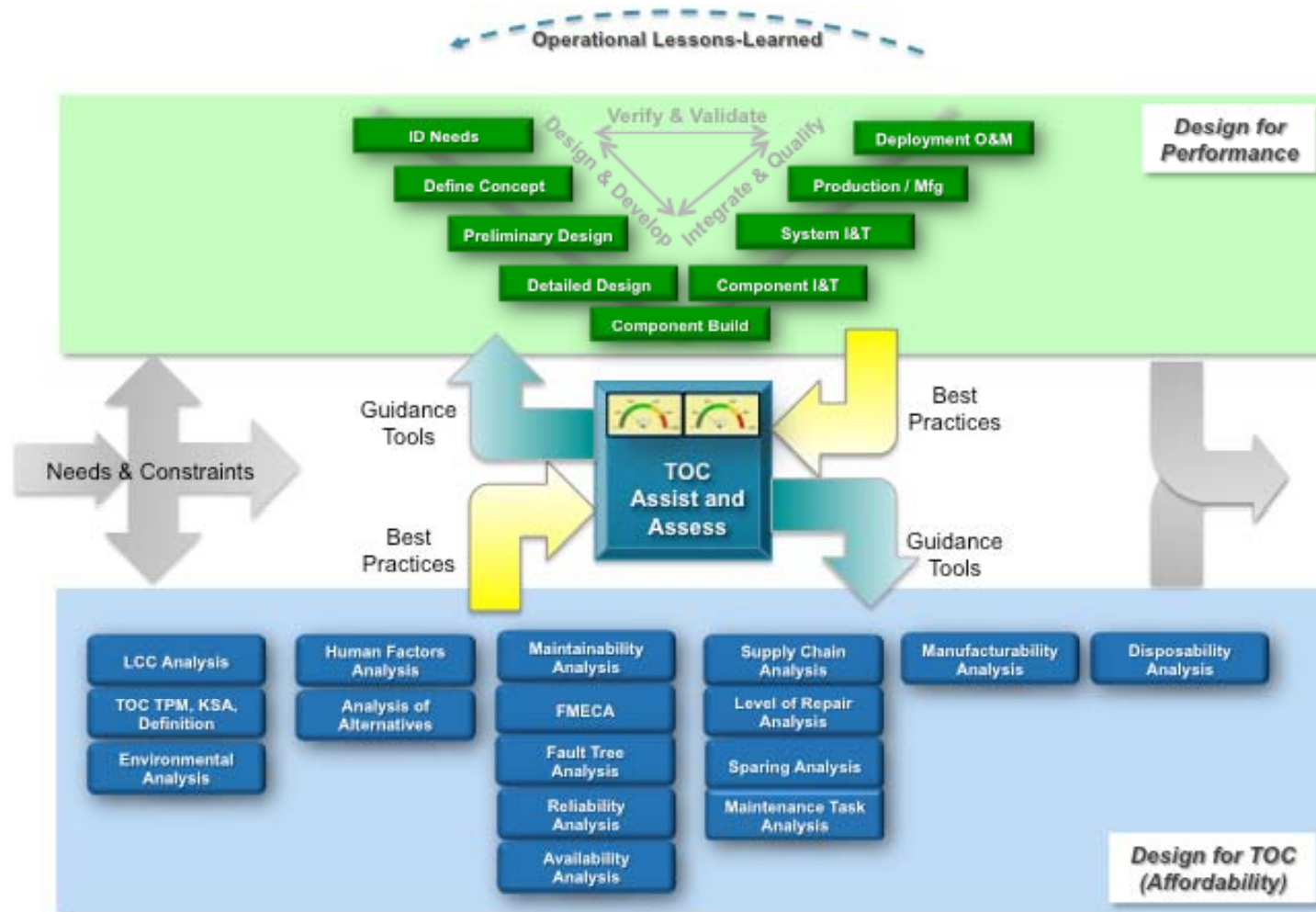


Previous Related Methodologies

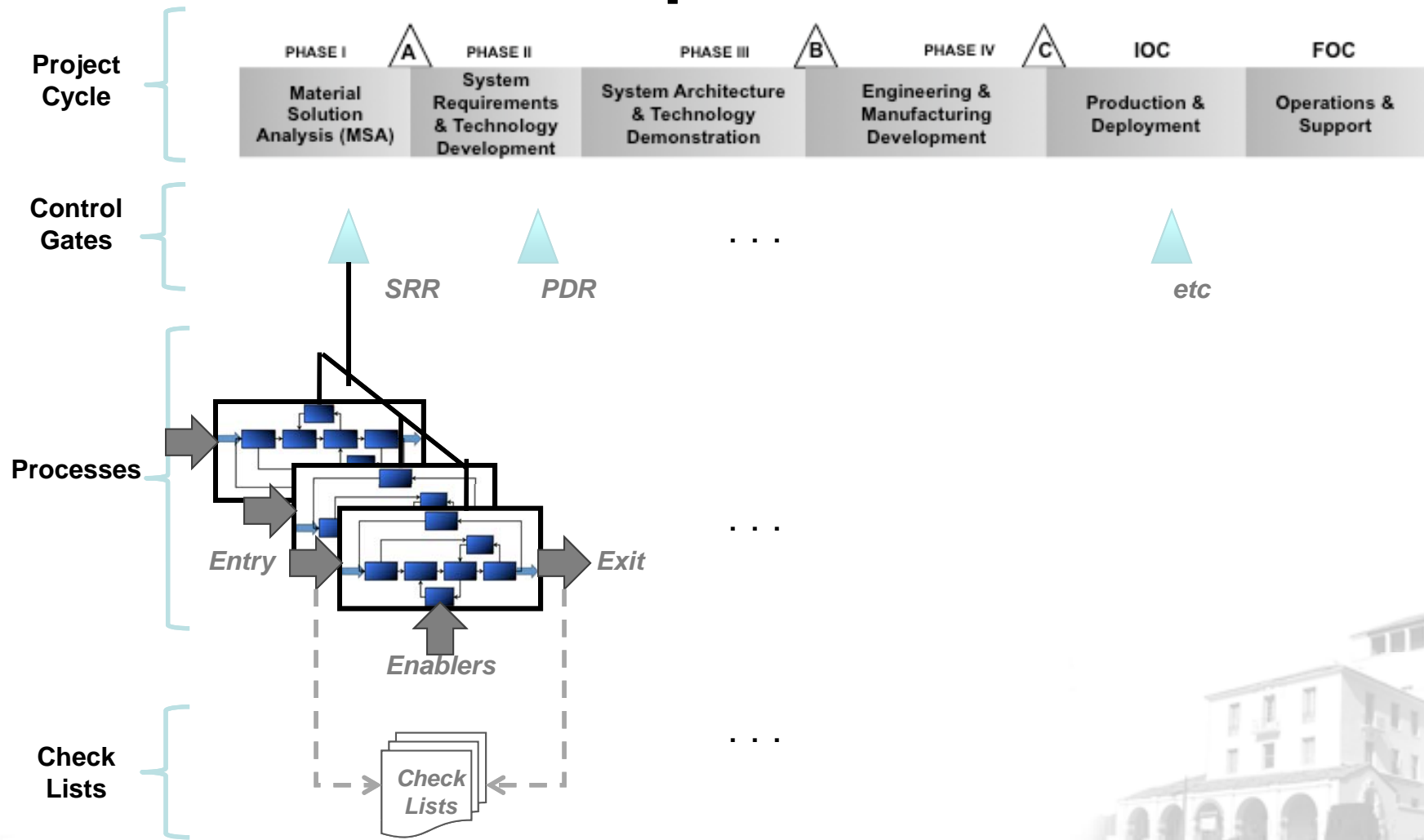
- Value Methodology / Value Engineering
- Cost Engineering
- Design to Cost (DTC)
- Cost as an independent variable (CAIV)



SEDIC TOC Architecture – Focusing on the Intersection of *Design-for-Performance* and *Design-for-Affordability*



TOC Research Impact Areas



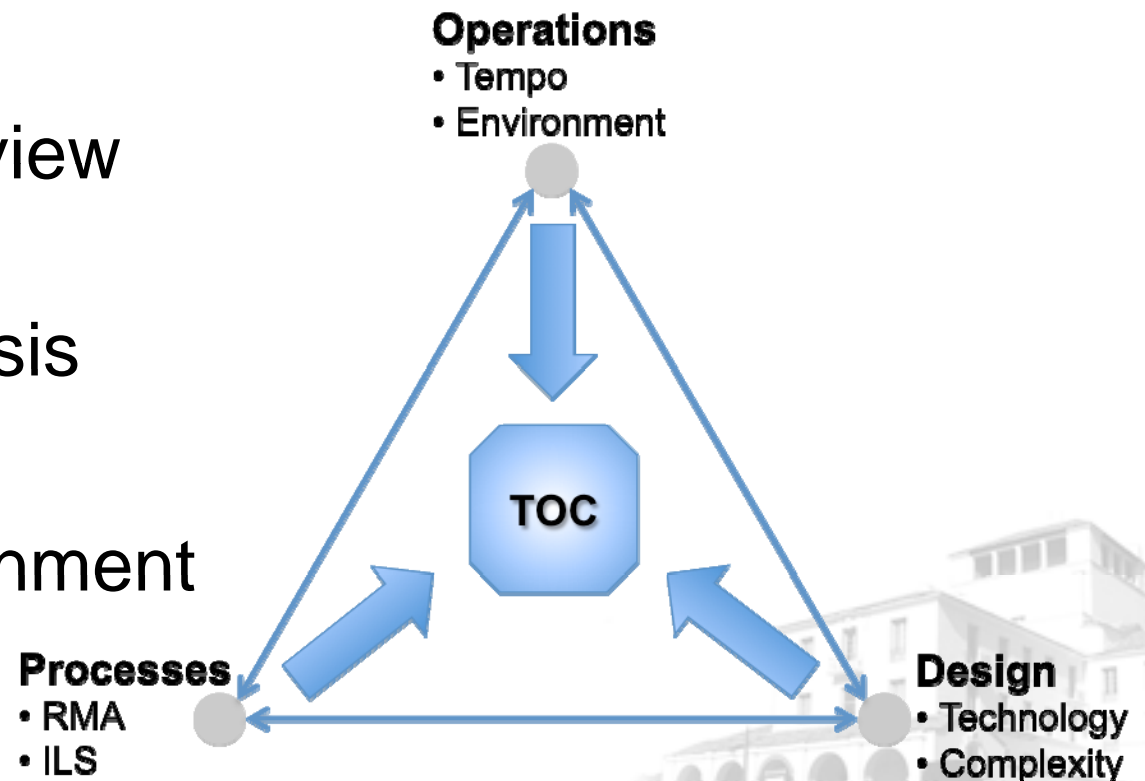
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Initial Findings

- Existing documentation and guidance
- SE technical review checklists
- Reliability analysis
- Cost modeling
- SE process alignment

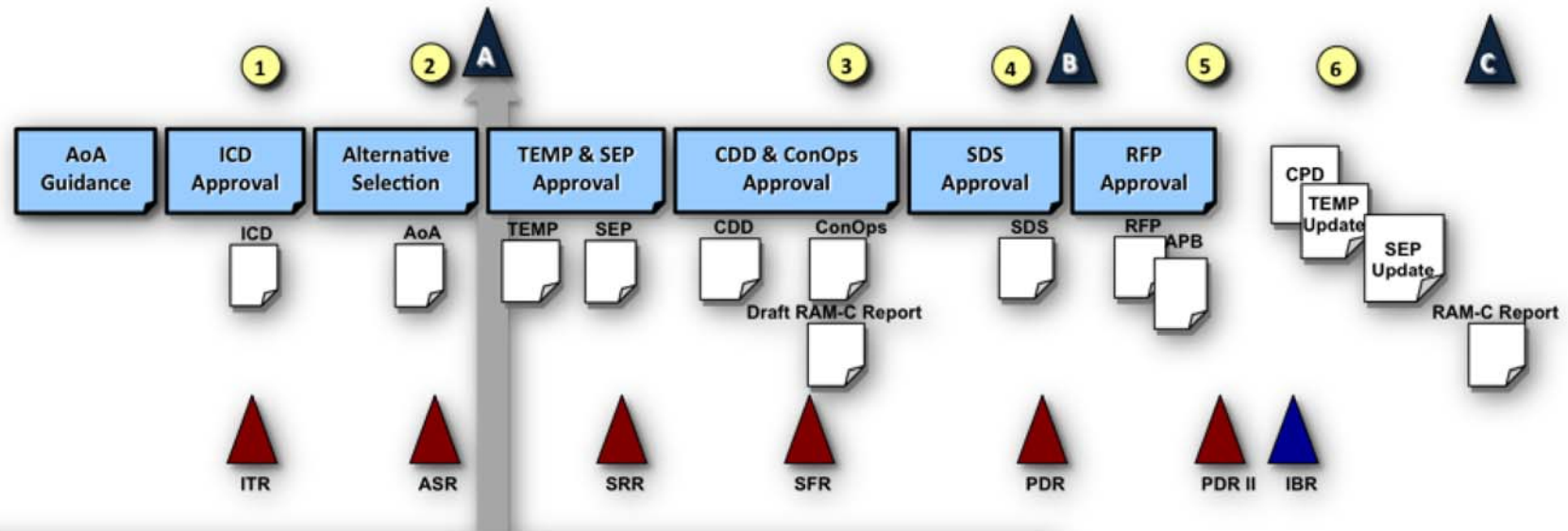


Existing TOC Documentation / Guidance

- Lack of common usage
- Different perspectives
- Did not translate well into the design phase
- Little quantitative prescriptions



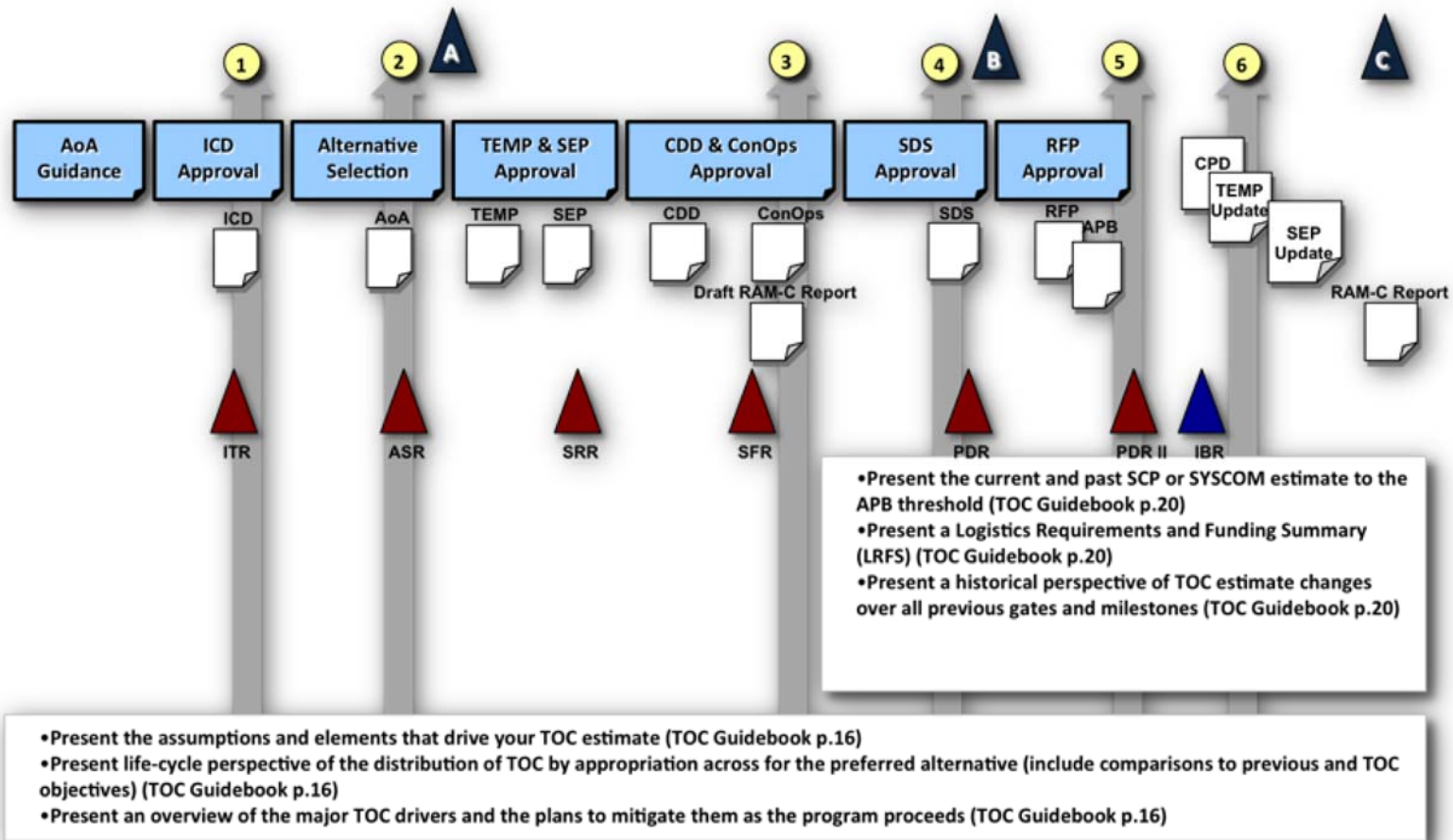
TOC Guidance Aligned to Milestones



- Document the development of the RAM Goals (RAM-C p.29)
- ID maintenance/reliability cost drivers & Life-cycle costs (RAM-C p.29)
- ID risks and incorporate into initial cost estimate (RAM-C p.29)
- ID sustainment MOEs/MOPs (RAM-C p.29)
- Document lessons learned from the previously used systems (RAM-C p.29)
- Develop the OMS/MP (RAM-C p.29)

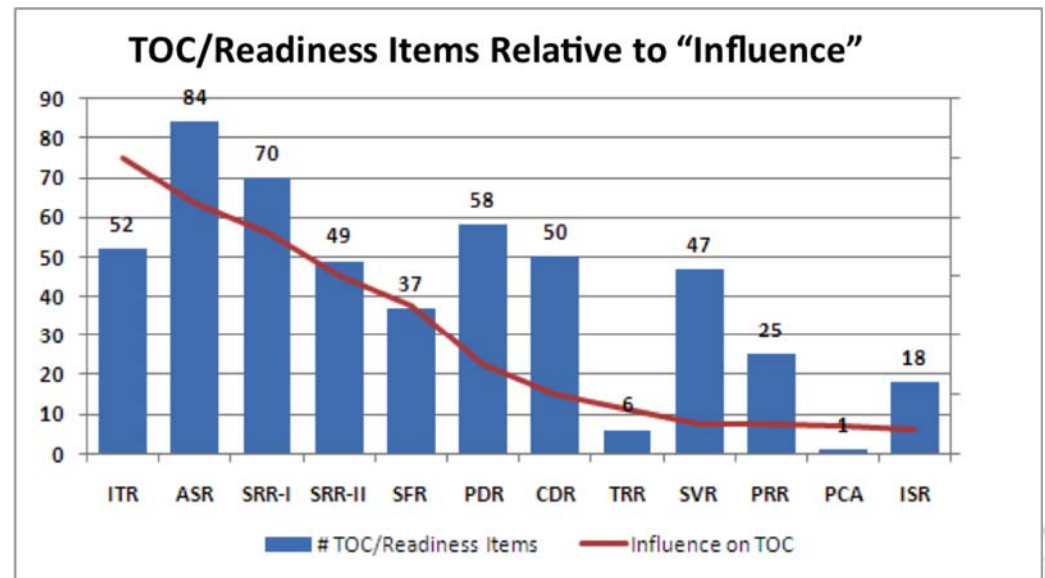


TOC Guidance Aligned to Gates



SETR Checklists (TOC emphasis)

- SETR checklists specify questions that prepare engineering teams for reviews
- SETR checklist tool is web-based
- Checklist questions are being strengthened to reflect TOC objectives and timing (based upon lessons-learned)



Reliability Analysis

- Strong correlation between early reliability analysis and accuracy of TOC projections
- “Catch-22”
 - Early RAM estimates needed for TOC estimates
 - Early RAM is based upon immature design
 - Early TOC estimates can become “anchored”
- Investigation continues for process improvements, metrics, and quantifying above correlation strength



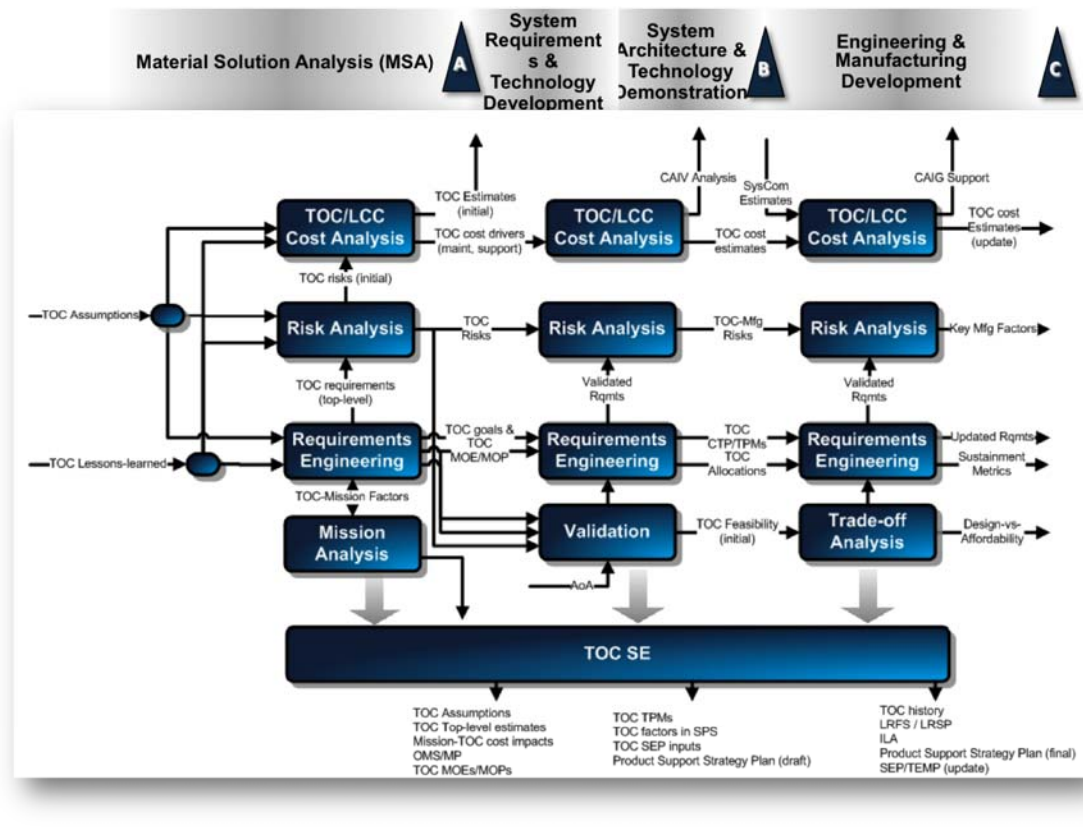
Cost Modeling

- Cost Modeling
 - Cost models are mature and trusted
 - “TOC” inputs (particularly those derived from early RAM analysis) may have high variance and uncertainty
 - Results may have high TOC estimate variance



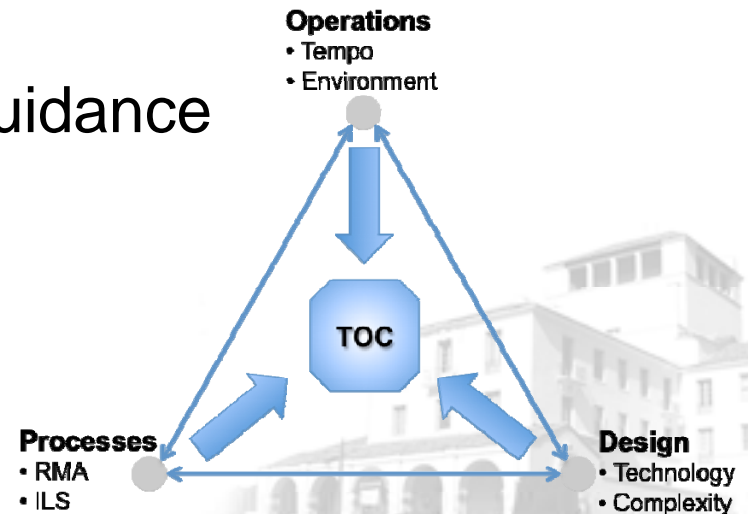
SE Process Alignment

- How can SE processes be aligned, more integrated, or optimized to reflect higher accuracy or TOC estimates early?
- Early SE process alignment concepts: →



Summary

- **Goal:** How can SE processes and methods can be improved to increase the fidelity of TOC estimation and, ultimately, TOC control at NAVAIR?
- **Early findings:**
 - Existing documentation and guidance
 - SE technical review checklists
 - Reliability analysis
 - Cost modeling
 - SE process alignment



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