

DOD Weapon Acquisition Program Outcomes and Opportunities for Improvement

**11th Annual Acquisition Research Symposium
May 14, 2014**

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DEFENSE ACQUISITIONS
Assessments of Selected Weapon Programs
GAO-14-340SP

**Selected Findings from GAO's Analysis of DOD's
Portfolio of Major Defense Acquisition Programs**

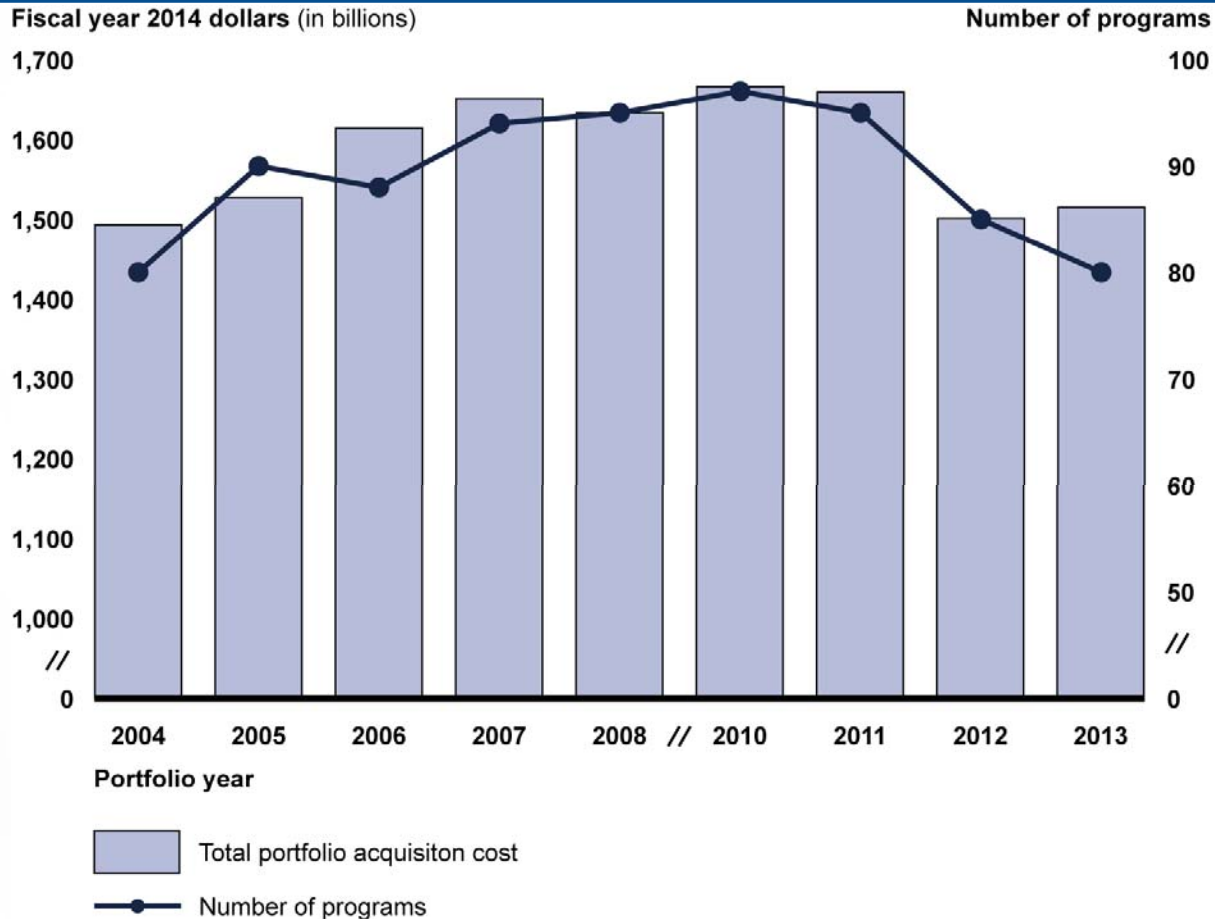
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Observations on Cost and Schedule Performance

- 1) When compared to the 2012 portfolio, the number of programs in the current portfolio decreased from **85 to 80**, and overall cost increased by **\$14.1 billion** from **\$1,501 billion to \$1,515 billion**. The decrease in programs follows a trend from the past 3 years.
 - 2) For the 80 programs in the 2013 portfolio we found cost growth of **\$12.6 billion** and an average schedule delay in delivering operational capability of **2 months** over the past year. From first full estimates, the total cost increased by nearly **\$448 billion** with an average delay of **28 months**.
 - 3) While the overall cost of the portfolio increased, **50 of the 80 programs reduced** their costs over the past year. The majority of the net cost growth can be attributed to a single program, the Evolved Expendable Launch Vehicle (EELV).
 - 4) When the effects of quantity changes are accounted for, DOD **improved buying power on 64 percent** of the programs in the portfolio over the past year.
 - 5) While the short-term trends are positive, they should be balanced against longer term metrics discussed by GAO, OMB, and DOD in 2008. **Fifty-five percent** of programs had less than 10 percent growth over the past 5 years and **44 percent** had less than 15 percent growth since first full estimates.
 - 6) The total acquisition cost of the portfolio is driven by the 10 costliest programs which represent **59 percent** of the total cost. These 10 programs alone incurred a **\$15.4 billion** increase over the past year while the other 70 programs reported a net decrease of **\$2.8 billion**.
 - 7) The majority of the cost of the portfolio is concentrated in two system types and the amount and type of cost growth from first full estimate, as well as the schedule delay, varied significantly by system type.
 - 8) DOD has already been appropriated more than **\$833 billion** for the current portfolio, leaving approximately **\$682 billion** to be funded, mostly for procurement. Approximately **45 percent** of the remaining cost represents growth from first full estimates. Almost two-thirds of the funding is needed for ten programs, **35 percent** for the **F-35** program alone.
-

In comparison to the 2012 portfolio, the number of programs in the current portfolio decreased from 85 to 80. Its overall cost increased by \$14.1 billion, primarily in procurement, from \$1,501 billion to \$1,515 billion. The decrease in portfolio size follows a trend from the past 3 years.

DOD Portfolio Cost and Size, 2004-2013



Source: GAO analysis of DOD data.

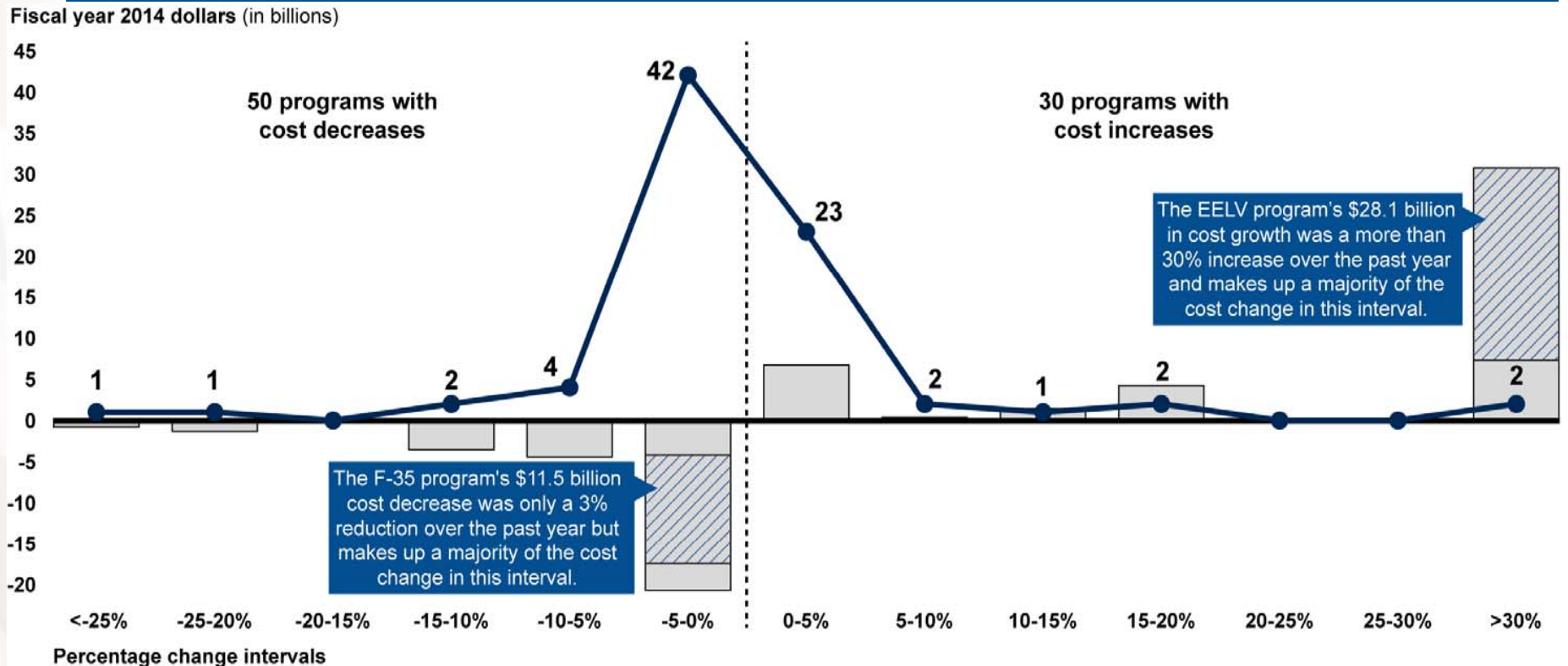
The 80 programs in the 2013 portfolio grew by \$12.6 billion in total cost over the past year and initial operating capability slipped an average of 2 months. From first full estimates, the total cost increased by nearly \$448 billion with an average delay of 28 months in operating capability.

Changes in DOD's 2013 Portfolio of 80 Current MDAPs over the Past Year

Fiscal year 2014 dollars in billions	Estimated current portfolio cost in 2012	Estimated current portfolio cost in 2013	Cost and schedule change since 2012	Percentage change since 2012
Total estimated research and development cost	\$286.7	\$288.7	\$2.0	0.7%
Total estimated procurement cost	1,201.6	1,213.2	11.5	1.0
Total other acquisition costs	14.3	13.3	-0.9	-6.3
Total estimated acquisition cost	1,502.6	1,515.2	12.6	0.8
Average delay in delivering initial capabilities	--	--	2 months	2.8
Source: GAO analysis of DOD data.				

While the overall cost of the portfolio has increased, 50 of the 80 programs within the portfolio reduced their costs over the past year. The majority of the net cost growth can be attributed to the Evolved Expendable Launch Vehicle (EELV). The F-35 Joint Strike Fighter reported the most significant cost decrease.

Distribution of the Total Acquisition Cost Change for the 2013 Portfolio



Amount of cost change in each percentage change interval over the past year

Number of programs in each cost change interval (n=80)

Source: GAO analysis of DOD data.

When the effects of quantity changes are accounted for, DOD improved buying power on 64 percent of the programs in the portfolio over the past year.

Increases in Buying Power for the 2013 Portfolio over the Past Year

Fiscal year 2014 dollars in billions	Number of programs	Actual procurement cost change	GAO calculated cost change attributable to quantity changes	GAO calculated cost change not attributable to quantity changes
Increased buying power	51	-\$23.0	\$4.9	-\$27.9
Procurement cost decreased with no quantity change	35	-22.6	0	-22.6
Quantity increased with less cost increase than anticipated	10	4.8	7.9	-3.1
Quantity decreased with more cost decrease than anticipated	6	-5.2	-3.0	-2.2
Decreased buying power	25	\$34.6	\$22.4	\$12.1
Procurement cost increased with no quantity change	16	4.7	0	4.7
Quantity increased with more cost increase than anticipated	5	32.1	25.3	6.8
Quantity decreased with less cost decrease than anticipated	4	-2.3	-2.9	0.5
No change in buying power	4	\$0	\$0	\$0
Totals	80	\$11.5	\$27.3	-\$15.8
Source: GAO analysis of DOD data.				



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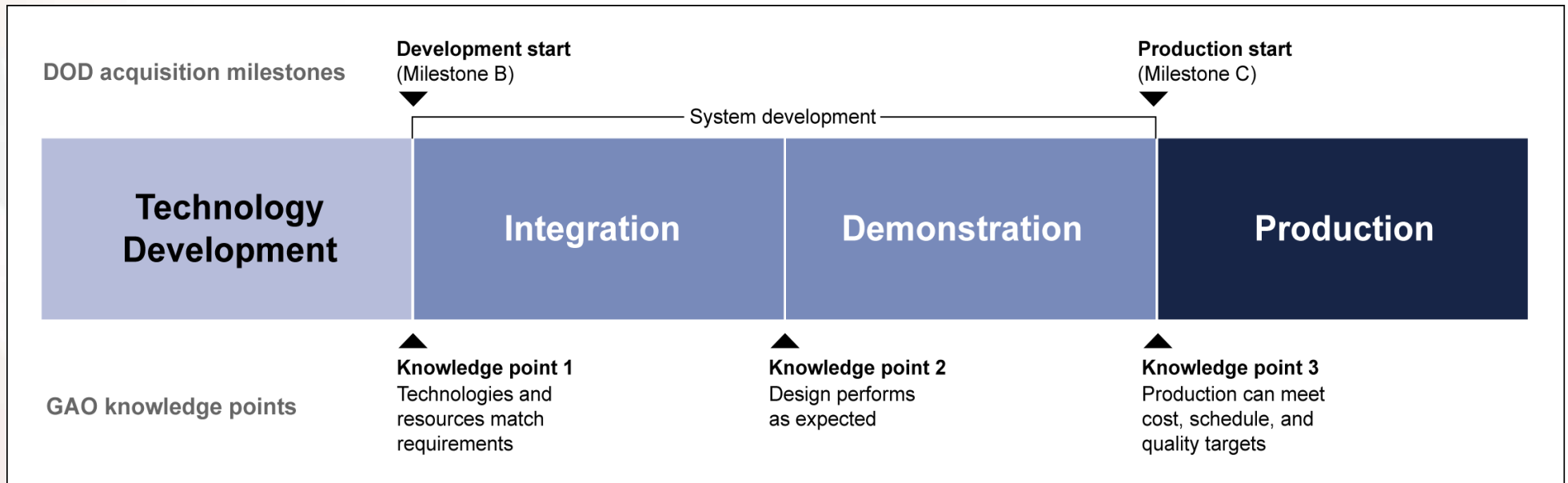
DOD has already received more than \$833 billion for the 2013 portfolio, leaving \$682 billion to go, mostly for procurement. About 45 percent of this represents growth from first full estimates. Almost two-thirds of remaining funding is for ten programs, 35 percent for the F-35 program.

Future Funding and Future Funding Required Due to Cost Growth from First Full Estimates		
FY 2014 \$s in billions		
Program name	Future funding required	Amount of future funding due to cost growth from first full estimates
F-35 Joint Strike Fighter	\$239.6	\$107.0
Evolved Expendable Launch Vehicle	42.9	38.4
KC-46 Tanker	40.8	0
Virginia-class Submarine	28.2	16.2
Joint Light Tactical Vehicle	23.0	0
CH-53K Super Stallion	20.7	7.4
Littoral Combat Ship	19.6	19.6
CVN 78 Class Aircraft Carrier	17.5	0
P-8A Poseidon	16.8	1.7
DDG 51 Destroyer	14.0	14.0
10 programs with the largest future funding requirements	\$463.2	\$204.3
Total for remaining programs	\$218.8	\$107.3
2013 portfolio totals	\$682.0	\$311.6

Source: GAO analysis of DOD data.

Note: Future funding is measured as all fiscal year 2014 funding to completion of procurement.

DOD's Acquisition Cycle and GAO Knowledge Points



Source: GAO.

Observations on Knowledge Point 1: Resources and Requirements Match

Knowledge-based practices at development start			Other 36 programs		
	F-22 Inc 3.2 B	AMDR	●	○	---
Demonstrate all critical technologies in a relevant environment	●	●	15	11	10
Demonstrate all critical technologies in a realistic environment	○	○	4	22	10
Complete system functional review and system requirements review before development start	●	●	10	25	1
Complete preliminary design review before development start	●	○	8	22	6
Constrain development phase to 6 years or less	●	●	19	4	13

- Practice implemented
- Practice not implemented
- Practice not applicable or information not available per the program office response

Source: GAO analysis of DOD data.

F-22 Increment 3.2B and AMDR did not demonstrate all their critical technologies in a realistic environment.

AMDR failed to hold a system-level preliminary design review prior to system development. They did receive a waiver for this requirement.

Both programs, intend to constrain their development phase to 6 years or less.

Of the 36 other programs we assessed, only 4 fully matured their technologies, 8 completed preliminary design review prior to system development, and 19 planned for a constrained development phase.

Observations on Knowledge Point 2: Product Design is Stable

Knowledge-based practices at critical design review	JLTV	KC-46	WIN-T INC 3	●	○	---
Demonstrate all critical technologies in a realistic environment	○	○	○	6	18	6
Release at least 90 percent of drawings or 100 percent of 3D zones	●	●	---	6	18	6
Test a system-level integrated prototype	○	○	○	3	18	9
Establish a reliability growth curve	●	●	●	14	12	4
Identify key product characteristics	●	●	●	26	1	3
Identify critical manufacturing processes	○	●	●	21	3	6
Conduct producibility assessments to identify manufacturing risks for key technologies	●	●	---	23	3	4
Complete failure modes and effects analysis	●	●	---	21	4	5

- Practice implemented
- Practice not implemented
- Practice not applicable or information not available per the program office response

Source: GAO analysis of DOD data.

KC-46 and JLTV demonstrated design stability by releasing 90 percent of planned engineering drawings, WIN-T 3 does not track this metric.

None demonstrated all program critical technologies in a realistic environment prior to design review.

None tested an early system-level integrated prototype.

All three satisfied some of the best practices related to preparation for production.

Of the 30 other programs we assessed for this review, 6 released 90% of their design drawings and 3 tested system level prototypes. Significant numbers had conducted activities to plan for production.

Observations on Knowledge Point 3: Manufacturing Processes are Mature

Knowledge-based practices at production start			Other 16 programs		
	PIM	G/ATOR	●	○	---
Demonstrate all critical technologies in a realistic environment	●	●	8	4	4
Release at least 90 percent of drawings	●	●	6	5	5
Demonstrate manufacturing process capabilities are in control	○	○	3	7	6
Demonstrate critical processes on a pilot production line	○	●	6	4	6
Test a production-representative prototype in its intended environment	○	●	6	5	5

- Practice implemented
- Practice not implemented
- Practice not applicable or information not available per the program office response

Source: GAO analysis of DOD data.

Paladin Integrated Management and G/ATOR both reported mature technologies and stable designs entering production.

Neither program has demonstrated that all their critical manufacturing processes are in statistical control.

Only G/ATOR demonstrated performance through the testing of a production-representative prototype or used a pilot production line to demonstrate processes.

Few of the other 16 programs in our assessment implemented these practices; 3 had critical processes in control and 6 had used a pilot production line.

Observations on Acquisition Reform

1. Only 30 of 56 current and future programs we assessed established an affordability constraint as directed by the “Better Buying Power” memos, an implementation rate that has not improved from our prior assessment. All programs with a cap or goal in place reported they are on track to meet it.
2. About 82 percent of the current programs we assessed have conducted a “should-cost” analysis as directed by the “Better Buying Power” memos, resulting in anticipated savings of approximately \$24 billion. Over half of this amount has or will be reallocated from these programs for other priorities.
3. Many of the future programs we assessed do not plan to conduct competitive prototyping before development start and many current programs do not have acquisition strategies that ensure competition through the end of production, as required by the Weapon System Acquisition Reform Act of 2009. Fifteen future and current programs reported they will not take actions to promote any of the competitive measures enumerated in the act before or after development start.
4. All but one of the 38 current programs we assessed had conducted a configuration steering board review, as required by law, with 29 programs reporting that this review occurred during the past year. Only 10 programs reported that changes were approved or recommended at their last review.

Observations on Program Concurrency

- Concurrency in this analysis is overlap in production and development testing.
- 15 out of the 18 programs we assessed that have started production intend to or have already executed 30 percent or more of their developmental testing concurrent with production.
 - 7 of these 15 programs have completed developmental testing with 4 reporting quality problems during production.
 - For the 8 programs currently conducting concurrent testing and production, 5 expect to have more than 10 percent of their procurement quantities under contract before developmental testing is completed.
- 12 other programs we assessed are scheduled to make a production decision in the near future.
 - 6 of them intend to execute 30 percent or more of their developmental testing concurrent with production.
 - 2 of these 6 expect to have more than 10 percent of their total procurement quantity under contract before developmental testing ends.

Program assessments

- In addition to the portfolio assessments, we produced brief “Quick Look” assessments of individual programs analyzing their cost, schedule, and performance as well as their adherence to knowledge-based best practices.
 - 37 2-page assessments on current major defense acquisition programs, generally in development or early production.
 - 19 1-page assessments on programs in technology development , were recently cancelled or curtailed, or are well into production.
- For a copy of the full report: www.gao.gov/products/GAO-14-340SP

Comparison of Two Major Programs: F-35 Joint Strike Fighter and KC-46 Tanker

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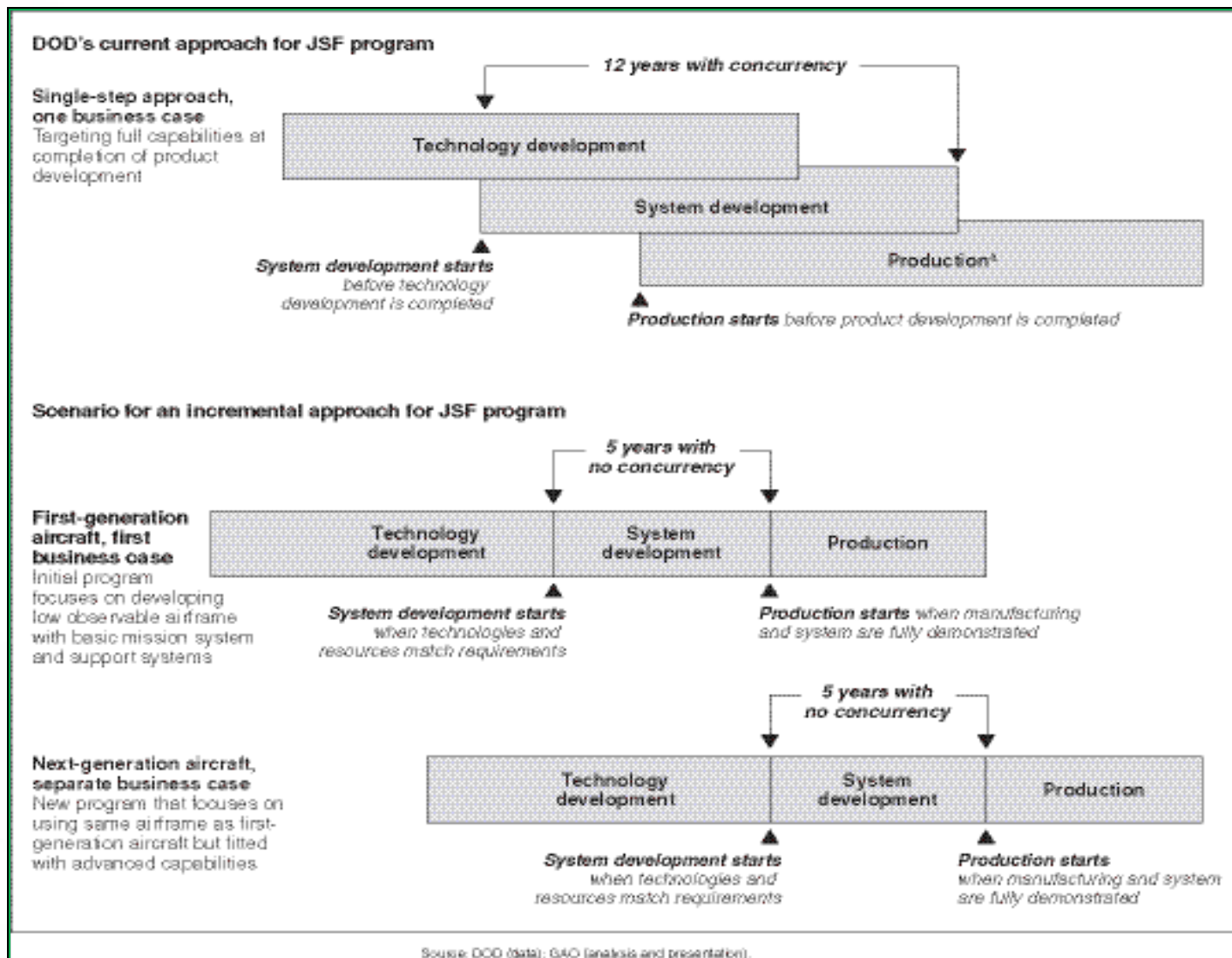
F-35 and KC-46 Comparison

- Programs are using different overall acquisition and contracting approaches
- F-35 began with limited knowledge, high levels of concurrency, and has experienced significant cost and schedule problems
- KC-46 began with higher levels of knowledge, limited concurrency, and is currently tracking closely to its cost and schedule baselines

Top-level Program Comparison

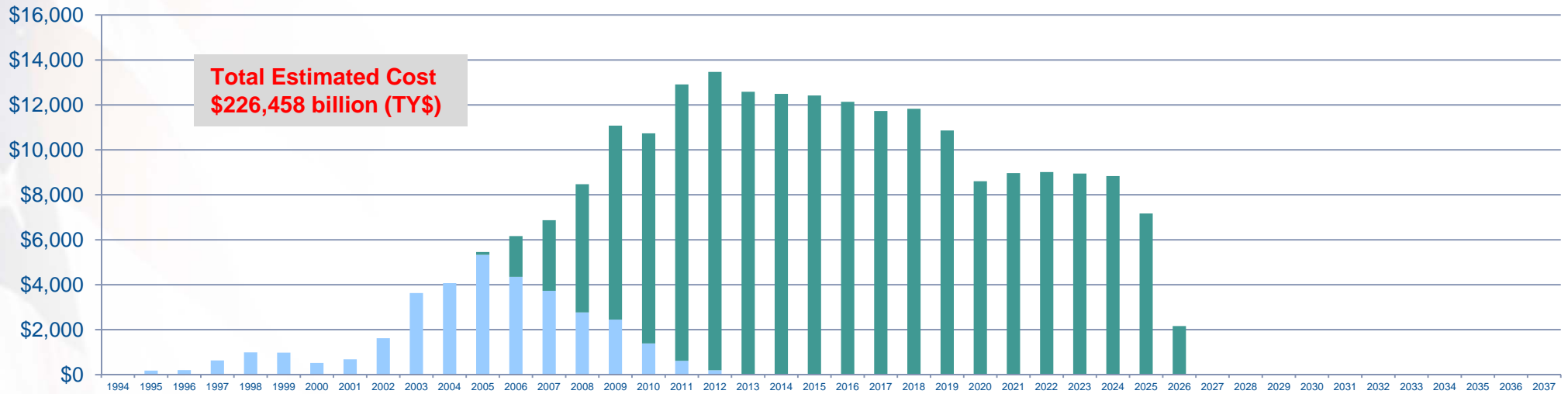
Key Characteristic	F-35 Joint Strike Fighter	KC-46 Tanker
Acquisition Approach	Single-Step (15-16 years)	Evolutionary (5-6 years)
Development Contract Type	Cost Plus	Fixed Price
Technologies Nearing Maturity at Development Start (DOD standard is TRL6)	25% (2 of 8)	100% (3 of 3)
Concurrency (Development Start to End of Initial Operational Testing)	around 12 years	around 1½ years
Design Maturity at Critical Design Review (best practice is 90% drawings released)	STOVL 46%; CTOL 3%; CV 43%	90%
Cost Change (from initial baseline)	Development: \$21B (60%) Procurement: \$134B (68%)	Development: fixed price cap Procurement: fixed / not to exceed
Quantity Change (from initial baseline)	- 409 aircraft	no change
Schedule Change (initial operational capability date)	5-6 year slip	no change

F-35 Joint Strike Fighter Concurrency

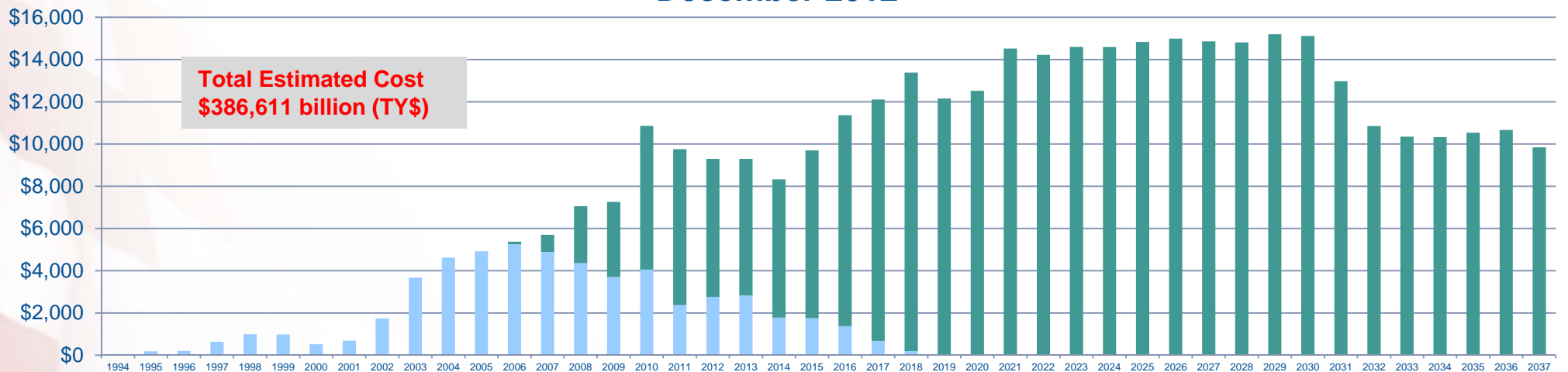


F-35 Acquisition Funding Changes

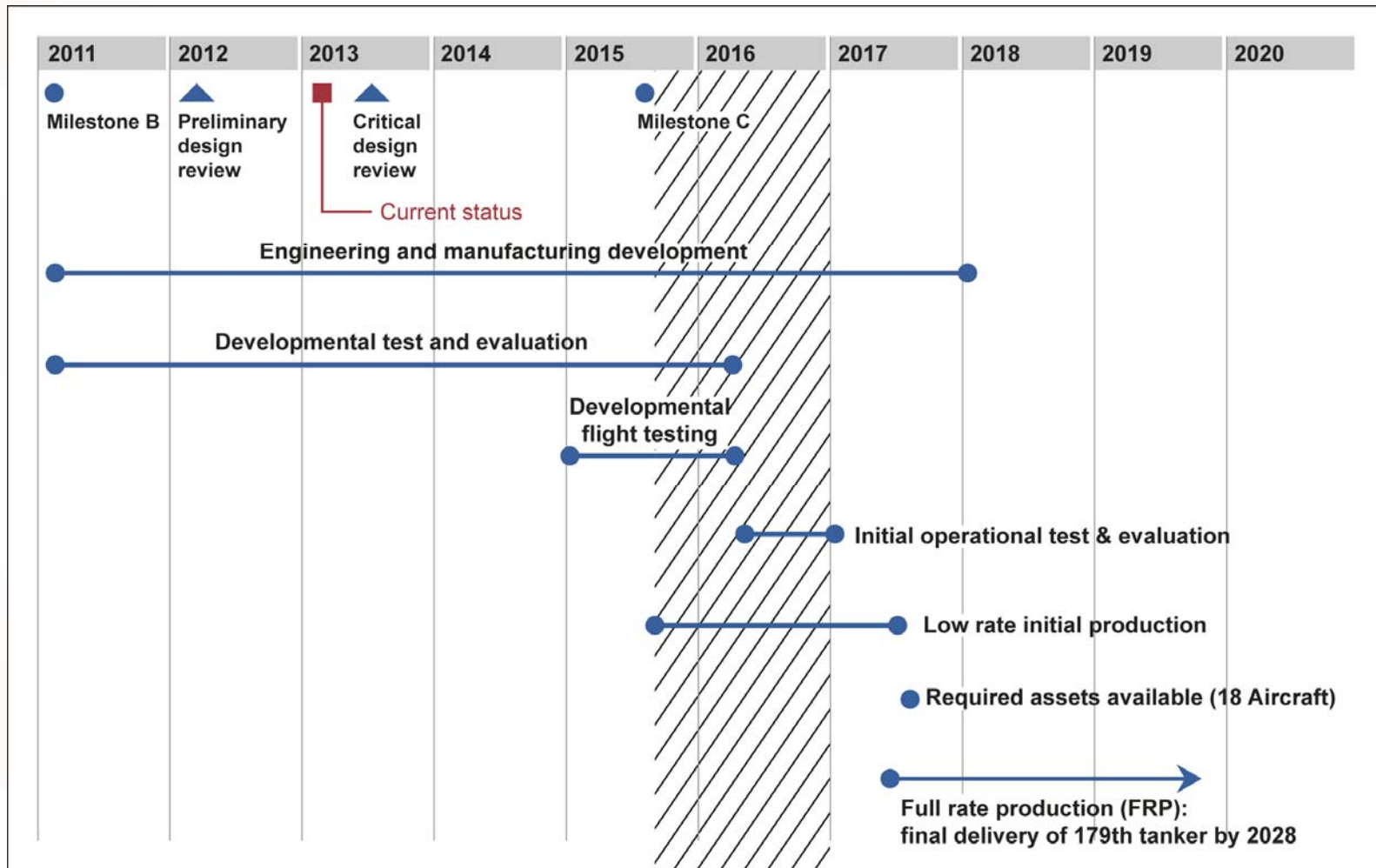
December 2001



December 2012



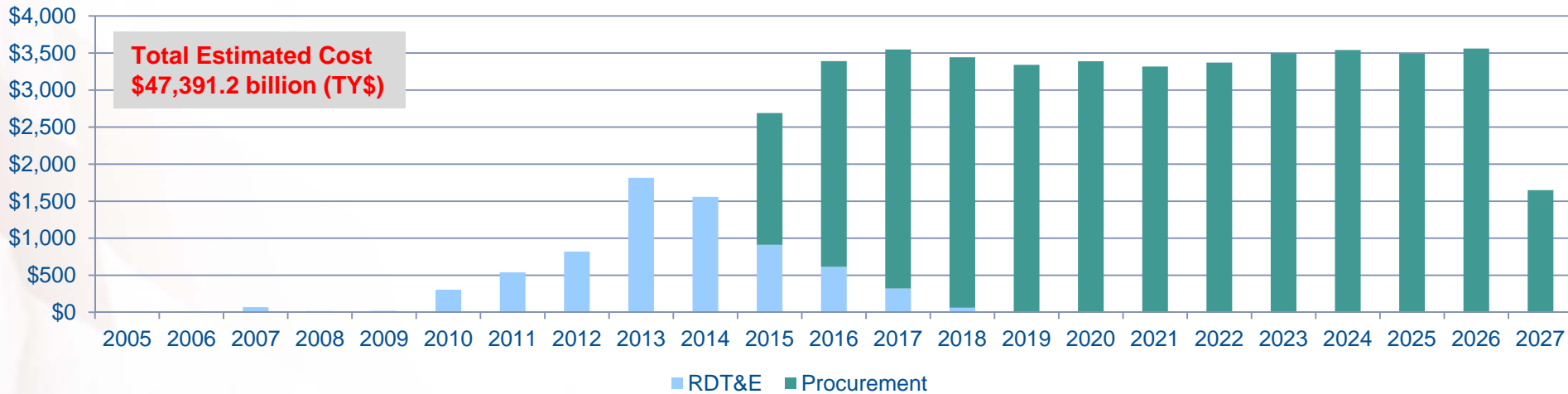
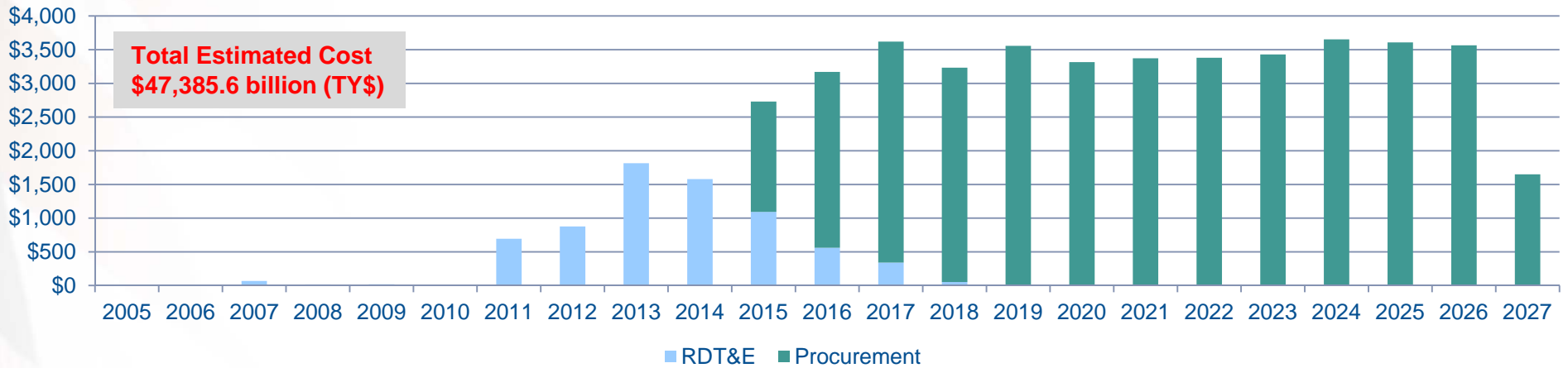
KC-46 Tanker Concurrency



Period of concurrency

Source: GAO presentation of Air Force data.

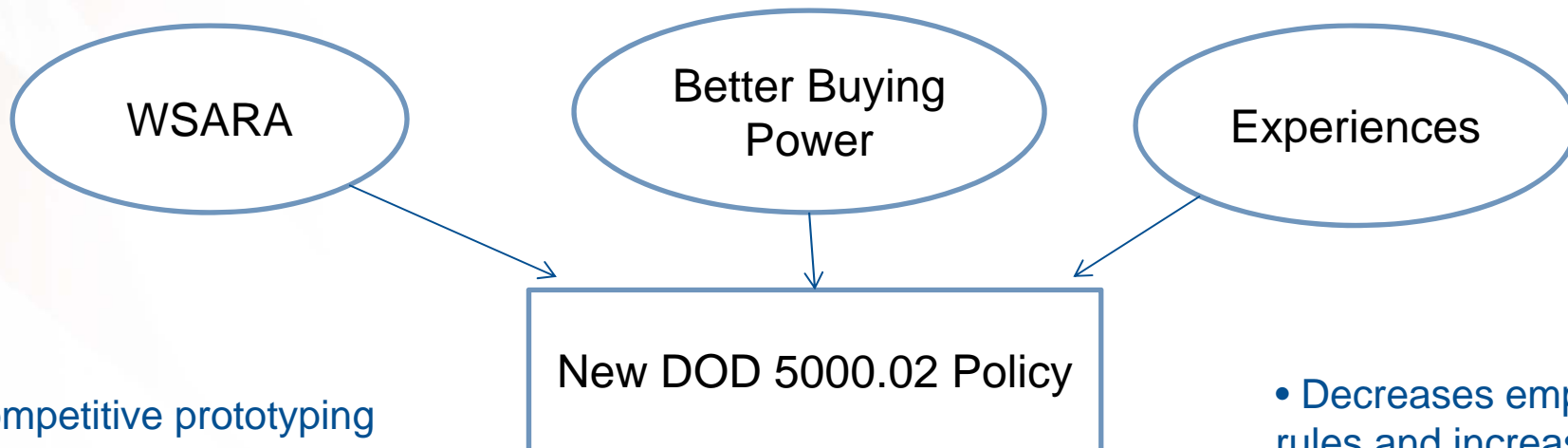
KC-46 Acquisition Funding Changes



Efforts to Improve DOD's Weapon Acquisition Program Processes and Outcomes

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Recent Legislation, Initiatives, and Experiences are Incorporated in New 5000.02 Policy



- Competitive prototyping
- PDR before start of development
- Competition throughout acquisition lifecycle
- Affordability trade-offs at Milestone B
- Material Development Decision for all programs

- Shorter program timelines
- Treats affordability like a KPP
- Portfolio analyses to eliminate redundancies
- Stresses use of systems engineering analysis to show how cost varies with schedule and design parameters.
- Stronger partnerships with the requirements community
- Total acquisition workforce improvements

- Decreases emphasis on rules and increases emphasis on process intent and thoughtful program planning
- Includes 4 example program models, tailored for the product being acquired

We Previously Found that Organizations Established by the Reform Act are Influencing Program Decisions

Program	Requirements	Cost and Schedule	Testing	Reliability
Before Milestone B				
Ground Combat Vehicle	✓	✓	✓	✓
Joint Light Tactical Vehicle*	✓	✓	✓	✓
Ohio Class Replacement	✓	✓	✓	✓
Ship to Shore Connector*			✓	✓
After Milestone B				
Joint Strike Fighter		✓		
Global Hawk		✓	✓	✓
Gray Eagle	✓	✓	✓	✓
KC-46 Tanker			✓	✓
Littoral Combat Ship Seaframe		✓		
Remote Minehunting System		✓	✓	✓
Small Diameter Bomb II		✓	✓	✓

JLTV and SSC held a Milestone B review during the course of our review.

Examples of New Organizations' Influence on Weapon Acquisition Programs



Requirements: The GCV began with inflexible requirements and an aggressive schedule. Systems Engineering participated in a review that led GCV to reduce requirements by 25% and prioritize the remainder.

Cost and Schedule Estimates: The CAPE has reviewed the Joint Strike Fighter many times. After a 2010 Nunn McCurdy breach, it did an independent estimate that led OSD to extend the test schedule, cut quantities, and increase development costs by \$4.6 billion.

Examples of New Organizations' Influence on Weapon Acquisition Programs



Developmental Testing: Based on DT&E recommendations, Small Diameter Bomb II officials added \$41 million to the budget for a 28-shot test program. This increased program knowledge and reduced operational test risks.



Reliability: Based on recommendations from DT&E, officials added two test vehicles and 40,000 more miles to the Joint Light Tactical Vehicle's reliability test program. The reliability goal was also reduced by 33 percent, making it more realistic and achievable.

GAO Acquisition Efficiencies Review

- Mandated by Section 824 of FY 2014 NDAA
 - “Identify the...processes and procedures that provide little or no value added, or for which any value added is outweighed by the cost or schedule delay of the processes or procedures.
 - Elements of organizations and layers of review that are redundant or unnecessary, add cost, or create schedule delays to the acquisition of weapon systems without commensurate value.”
 - Report due January 31, 2015

Review Objectives

- What are the best practices of leading commercial companies and successful DOD programs for establishing an efficient development process?
- What key changes is DOD making to improve the efficiency of its acquisition process?
- What opportunities, if any, exist for improving DOD's acquisition process?

Primary Areas of Focus (DOD and Commercial)

- Organizational Structure (The Who)
 - Levels and layers of decision making
- Process (The How, The When)
 - Milestone/Gate procedures and documentation required
- Reviews (The What)
 - Purpose, Frequency, Timing, Participants, Deliverables, Metrics, and Quality of Reviews



Key Enablers

- Solid business case
- Incremental acquisition strategies
- Clear, well defined, stable requirements
- Realistic cost and schedule estimates
- Stable funding
- Investing in early planning and systems engineering
- Leveraging mature technology
- Leadership continuity
- Empowering program managers and holding them accountable

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