

Competitive Prototyping in the Department of Defense

Defense Acquisition University

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The Limits of Competition in Defense Acquisition

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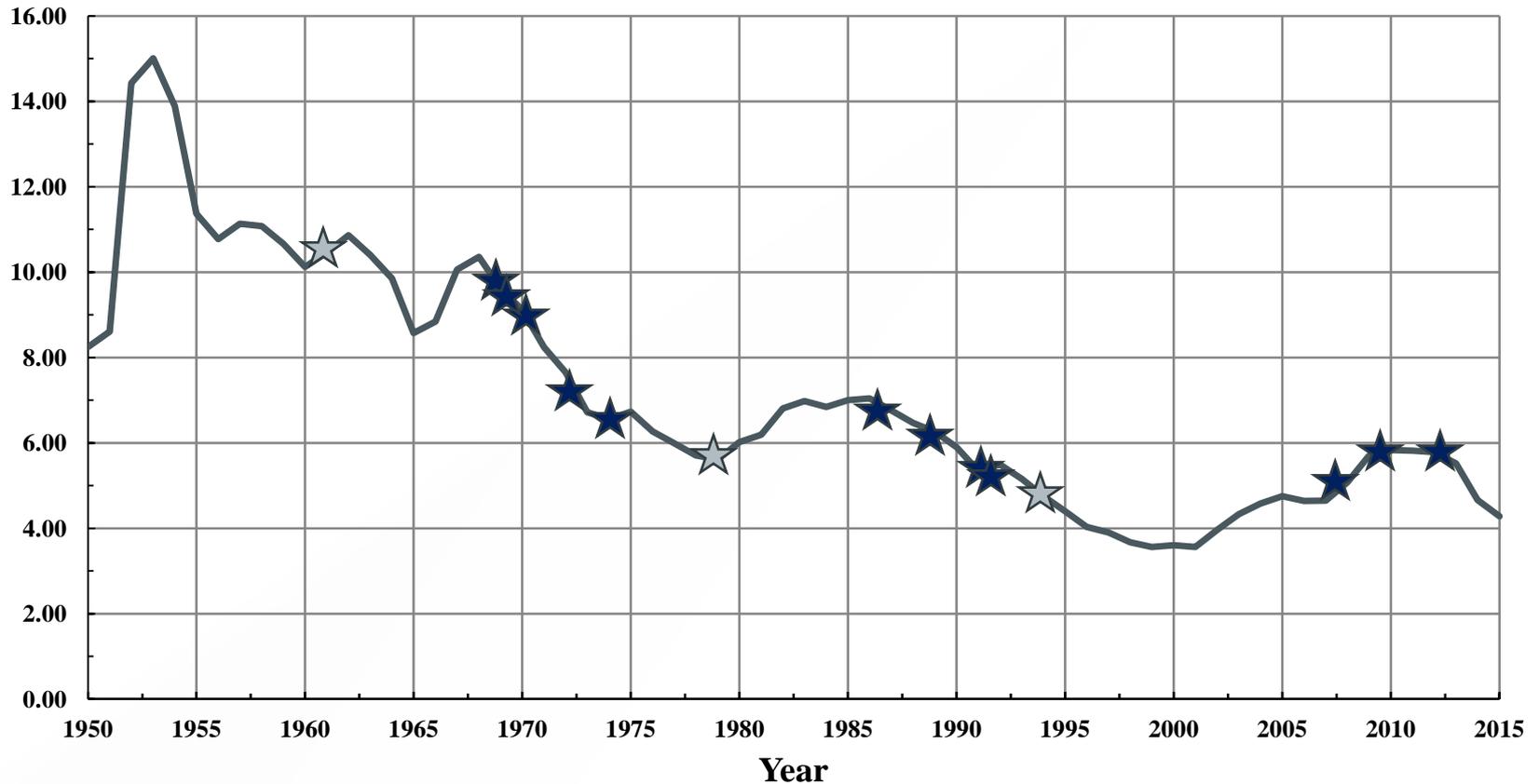
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Overview

- Competitive prototyping: a timeline.
 - Why we should, and why we don't.
 - Apparent conclusions from 50 years of reform.
- An approach to prototyping.
- Harnessing competition effectively.
- Open issues.
- Conclusion.

Competitive Prototyping: A Timeline

Defense Spending as % of GDP



Competitive Prototyping: A Timeline

- ★ 1960: McNamara becomes SECDEF.
- ★ 1969: GAO, DSB, and Packard all contemplate reform.
- ★ 1970: Fitzhugh Commission.
- ★ 1972: Comm'n on Government Procurement.
- ★ 1974: GAO's review of 5 Major DOD Weapon Systems.
- ★ 1978: DSB's 1977 Summer Study.
- ★ 1986: Packard Commission.
- ★ 1992: Prototyping-plus/Rollover-plus Strategies.
- ★ 1993: DSB's Task Force on Aircraft.
- ★ 1994: DoD Inspector General Audit Report.
- ★ 1994: Federal Acquisition Streamlining Act.
- ★ 2007: Under Secretary Young's prototyping directive.
- ★ 2009: Weapons Systems Acquisition Reform Act.
- ★ 2012: GAO's evaluation of first WSARA waiver.

Most Recent Legislation

- **Weapon Systems Acquisition Reform Act:**
 - Ensure competition throughout the life cycle through one or more of the following (§ 202):
 - Competitive Prototyping;
 - Next-generation prototyping of systems or sub-systems; and
 - Periodic competitions for subsystem upgrades.
 - Prototyping requirements for MDAPs (§ 203):
 - Competitive prototyping is required up to Milestone B.
 - This requirement can be waived when:
 - The costs exceed the expected benefits (cost, performance, risk); or
 - It is necessary to meet critical national security objectives.

Competitive Prototyping

Why prototype?

- It's practical.
 - Estimates are put to the test.
 - Test results are more reliable.
 - It provides a hedge and room to maneuver.
- Prototyping enables better outcomes.
 - It can uncover problems early.
 - It lessens uncertainty and provides better information.
 - Better information leads to improved program posture.
- Competition is good.
 - It stokes innovation.
 - It's good for industry.
 - Its presence resembles the private sector.
- The private sector embraces it.

Why not?

- It's not practical.
 - Prototyping takes longer, costs more, and can't help but be duplicative.
 - Test results can be deceiving.
 - It reduces management's flexibility (macro and micro).
- Prototyping outcomes have been mixed.
- Change marginalizes its value:
 - Instability in acquisition personnel; and
 - Defense acquisition is volatile (funding, requirements, etc.).
- Competition is not worth the costs.
 - It taxes program personnel.
 - It's bad for industry.
- It's rational not to.

Competitive Prototyping

- Apparent conclusions from 50 years of reform:
 - Prototyping requires more time and money up front.
 - Prototyping is justified to the degree it enables future returns.
- DOD has not perfected the practice of prototyping.
 - Positive correlations exist, but experience has been mixed.
 - 1994 IG Report: Programs need better guidance on prototyping.
 - Determining what to prototype is the most important part.
 - Competition is only one aspect of a prototyping strategy.
- Competitive prototyping can be very effective, but it is not a procurement cure-all.
 - How does one approach prototyping to enable future returns?
 - How does one harness competition effectively?

An Approach to Prototyping

- Prototyping demonstrates capabilities through testing.
 - Prototypes are test articles.
 - The test article can be a concept, subsystem, or system.
- Maturity of the test article can and does vary.
 - Production-representative v. something less.
 - Prototyping entails costs.
 - There is a point of diminishing returns.
- To control costs, one must be selective and:
 - Focus on the next decision-point; and
 - Focus on areas of high technical risk.

An Approach to Prototyping

- Prototyping v. paper studies and analysis
 - “Known unknowns” and “unknown unknowns” are vexing.
 - Assumptions are too optimistic.
 - Paper studies are less reliable.
- E.g., ATF v. A-12 programs.
- Prototyping is a source of realism.
 - Don’t just estimate, demonstrate through testing.
 - Use test results to guide decisions.
 - Demonstrate no more than is necessary.

An Approach to Prototyping

- Prototyping is a risk reduction tool.
 - Identify problems early and fix them more cheaply.
 - E.g., Air Force A-10 v. Army BAT programs.
- Prototyping generates information.
 - How do designs compare?
 - Is the technology worth the cost?
 - Is the operational concept sound?
 - Is the force properly structured?
- The information is valuable; all should use it.

An Approach to Prototyping

- Prototyping allows and results in change.
- It provides a hedge against various uncertainties:
 - Merits of a particular technology;
 - Attainability of requirements;
 - Operational concept; and
 - Threat environment.
- Too much change marginalizes the value of prototyping.

Tactical (YC-14, YC-15) v. Strategic Airlift (C-17)

YC-14 Prototype (Boeing)



YC-15 Prototype (McDonnell Douglas)



Feasibility v. Suitability

XV-15 Tiltrotor
Demonstrator



V-22 Osprey



Prototyping Defined

- A “**prototype**” is a test article designed to demonstrate areas of high technical risk that are essential to system success. A prototype need not be a full system, but, in scope and scale, it is tailored to accommodate a series of decisions, and as such, can represent a concept, subsystem, or end item according to the decisions to be made. Rather than reflect the final design, prototypes are built with the expectation that, as decisions are made, change will follow.
- “**Prototyping**” is the practice of testing prototypes, of appropriate scope and scale, for the purpose of obtaining knowledge about some requirement, capability, or design approach. The knowledge obtained informs a decision-making process the output of which results in some degree of change. The degree of allowable change is bounded, in inverse proportion, by the scope and scale of the prototype.

Harnessing Competition

- Competition is not the goal; the goal is better value.
 - E.g., better performance, lower costs, or both.
 - Competition is often presented as a source selection ally.
 - Competition introduces its own costs.
- When prototyping, harness competition in ways that allow the best value to emerge.
 - Deal with budgetary pressures effectively.
 - Approach competition creatively.
 - Give direction but preserve some trade space.

Dealing with Budgetary Pressures

- Allocate resources to what matters most.
 - What matters most varies by acquisition phase.
 - Technology development v. Systems development.
 - Make room for mature technology as MS B nears.
- Introduce flexibility in performance objectives.
 - Requirements reflect needs, not present capabilities.
 - Prototyping, in some ways, tells you how much capability you can afford.
- Independent research and development may have a role, but . . .

Dealing with Budgetary Pressures

- When competitively prototyping, the Government should absorb most of the cost pressures.
 - It encourages discipline in the decision-making process.
 - Doing so lets the Government shape the prototypes.
 - Resources can be better allocated considering:
 - Performance objectives;
 - Perceived technological risk; and
 - Complementary development activities.
- Capping the Government's capital commitments may be a best practice.

Approaching Competition

- Resist the urge to dispense with competition too quickly.
- Approach competition based on:
 - Performance objectives;
 - Life cycle objectives; and
 - Perceived technological risk.
- Various levels of competition include:
 - Competition among prime contractors:
 - System level;
 - Subsystem level; or
 - A mix of the two (i.e., new system v. targeted upgrades).
 - Competition among subcontractors.
- Competition triggers additional trade-offs.

Close-Air-Support Program

System competition



Sub-system competition (?)



Putting It All Together

- Competition is about obtaining the best value.
 - Securing a technological advantage is about two things: (1) performance and (2) price/costs.
 - The goal is often to find the best mix of the two.
- Give direction, preserve some trade space, and know what matters most.
- When competitively prototyping:
 - The better technological solution emerges through performance, not estimates; and
 - The results can be surprising.

Advanced Attack Helicopter Program

YAH-63 Prototype



YAH-64 Prototype



Open Issues

- Prototyping's lexicon needs improvement.
- Better prototyping guidelines are needed.
 - Prototyping's relationship to the acquisition process is unclear.
 - Guidelines should likely vary according to weapon system.
- Waiving WSARA's competitive prototyping requirement pits short term concerns against long term rewards.
 - Estimating costs v. estimating expected returns.
 - E.g., Enhanced Polar Orbiting System (GAO-12-983R).
- Prototyping works within a different paradigm.

Conclusion

- Prototyping is not the point; dealing with risk is.
 - Risk cannot be contracted away; both parties must face it.
 - Prototyping can reduce/reveal risk, but it is no cure-all.
- Competition is not the goal; the goal is better value.
- Prototyping is justified to the degree it enables future returns.
 - Prototyping requires more resources up front.
 - Prototyping (almost always) provides value—how much is debatable.
 - Competitive prototyping is more taxing.
- With both competition and prototyping, there are points of diminishing returns.