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Competition Among Near-Substitutable Systems

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- Introduction
- Case studies
 - C-17 versus Commercial Cargo Aircraft
 - Joint Air-to-Surface Standoff Missile and Standoff Land Attack Missile-Expanded Response
 - The KC-X Competition
- Conclusions

Systems that have overlapping capabilities, but are substantially different in some dimensions

- Limited to items of the same commodity class
 - E.g., long-range artillery and strike aircraft may have overlapping target sets but are not near-substitutes
- Systems not originally designed to fulfill the same military requirement
 - E.g., F-22 and F-23 were not near-substitutes
- Usually a non-developmental item that can be modified or repurposed to fill a specific military need

- What is a Major Defense Acquisition Program (MDAP) franchise?
 - Firms compete with technology development projects followed by a program proposal to fulfill a defined military requirement
 - Winner of the competition is paid to develop the system for production
 - Serial fixed-price procurement contracts for the winner
- What is the value of an MDAP franchise to a contractor?
 - Profitable monopoly – fee allowing for economic rents with little risk of competition
 - It is difficult in the short run to compete serial production (dual source) because of specific investments, system complexity, and knowledge transition costs
 - “Prize” of economic rents seen as encouraging innovation
- How do near-substitutes fit in?
 - Competitors in an Analysis of Alternatives (AoA) prior to a franchise competition
 - A competitor for a new franchise
 - Potential threat to an existing franchise

- Nature of competition
 - Generally not head-to-head competition with competing proposals in response to a single RFP; more likely less formal competitive pressure
 - Usually occurs early in the acquisition process; near-substitutes often are compared as a part of AoAs
 - Other instances of competitive pressure
- Important attributes
 - Generally less investment required than for dual source competition
 - Already existing production base may provide for economies of scale
 - Can bring new players into the industrial base
 - Cost-effectiveness analysis key in comparing near-substitutes
 - Analysis useful in determining the viability of near-substitutable systems
 - Examine trade-offs between divergent attributes through effectiveness analysis

- Motivation for case studies
 - Competition between near-substitutes has no fixed definition in acquisition regulations or statute
 - Historical examples can help illuminate the role near-substitutes can play in increasing competition
 - Lessons learned may be extracted from past experience
- Themes in case studies
 - How did competition come about and what was the nature of that competition?
 - What attributes did the near-substitutes share and how were they different?
 - What was the role of cost-effectiveness analysis and the AoA process?

- In the late 1980s/early 1990s, the C-17 program encountered substantial difficulties
 - Performance shortfalls, cost overruns, and schedule delays
- In FY 93, the Congress directed DoD to conduct a Defense Acquisition Board (DAB) review of the program
 - The C-17 was in the early production phase of a planned 120-unit buy
 - Review would cover requirements and affordability
 - New cost and operational effectiveness analysis (COEA) specified
- COEA showed procuring commercial freighters (747-400Fs) was a viable alternative to a full C-17 buy
- December 1993 DAB
 - C-17 put on a two-year “probation”
 - OSD initiated a parallel acquisition of non-developmental airlift aircraft (NDAA) open to new or used freighters/transport

Characteristic	C-17	747-400F
Average payload (tons)	48.3	73.7
Surge utilization rate (hours/day)	15.2	12.5
Block speed (knots)	423	445
Million-ton-miles/day (MTM/D)	.146	.191
Maximum on ground (MOG), ^a robust conditions	26	15
MOG, constrained conditions	16.5	5.0

Note: Data from Greer, W. L. et al., 1993.

^a Maximum number of aircraft on ground simultaneously in theater for the Major Regional Contingency-East scenario.

- Both the C-17 and 747-400F could carry bulk and oversize cargo
- Only the C-17 could carry outsize cargo and perform military-specific missions (e.g., airdrop, combat delivery)
- The 747-400F had greater payload but was more subject to airfield bottlenecks than the C-17 (MOG metric)
- The COEA found synergies between the 747-400F and other aircraft; 747-400 bulk/oversize capacity freed up space for outsize cargo in the C-5 and reduced C-17 fleets

- 1993 DAB Fallout
 - C-17 management and manufacturing process improvements
 - Boeing was the only respondent to the NDAA RFP with the 747-400F
- Late 1995 OSD actions
 - The C-17 program had satisfied the DAB with its progress
 - An 80-aircraft multi-year procurement (MYP) was approved
 - The NDAA program was shelved
- Observations
 - General view was that the two-year probationary period was a success
 - Program cost outcomes going forward were favorable
 - Additional aircraft were procured beyond the planned 120

Competitive pressure contributed to positive outcomes

Joint Air-to-Surface Standoff Missile; Standoff Land Attack Missile-Expanded Response

- Air-to-surface stand-off cruise missiles
- The Joint Air-to-Surface Standoff Missile (JASSM) program was initiated as a joint Navy/Air Force program
 - MS 0: September 1995
 - MS I: June 1996; flying prototypes from two contractors
 - MS II: November 1998; down-select to a single contractor
- Navy Standoff Land Attack Missile-Expanded Response (SLAM-ER) - evolution of the Harpoon anti-ship missile
 - EMD contract awarded in March 1995
 - Modification of SLAM which was based on the Harpoon; sole-source
- AoA activity for JASSM
 - COEA 1: prior to MS 1 – comparison of different concepts
 - COEA II: prior to MS II – comparison of two JASSM competitors with SLAM-ER
 - No formal AoA after MS II despite difficulties in the program
 - An FFRDC performed an “independent market survey” in support of the 2004 MS III decision: comparative effectiveness analysis with SLAM-ER and others

Characteristic	JASSM	SLAM-ER
Length (ft)	14.0	14.3
Diameter (inches)	18.0	12.5
Total weight (lbs)	2,250	1,388
Warhead weight (lbs)	990	488
Maximum range (nmi)	180–200	150

Note: Data from Forecast International.

- Similar GPS midcourse/IR terminal guidance; both missiles use the same Williams turbojet engine
- JASSM has a larger penetrating warhead and stealth capabilities
- SLAM-ER has a two-way data link with man-in-the loop capability; can attack some mobile targets
- JASSM can only attack fixed targets – “fire-and-forget” automatic target recognition capability
- JASSM and SLAM-ER are competitors for international sales

- JASSM
 - Substantial procurement cost growth; \$720K versus \$400K FY 95 dollars (Nunn-McCurdy breach)
 - The Navy dropped out of the program – no procurement
 - Upgrade path incorporated some SLAM-ER capabilities
- SLAM-ER
 - Little change in planned costs or quantities, although quantities were bought out more quickly
 - The Air Force was not likely to buy SLAM-ERs
 - Upgrade path incorporated some JASSM capabilities
- Observations
 - JASSM advantage over SLAM-ER in COEA II was due to more capability at a similar price – prices, however, diverged
 - No “second look” AoA after this became apparent

Some competitive pressure – Navy could have bought JASSM and fewer SLAM-ERs

- Air refueling tankers to recapitalize the KC-135 fleet
 - Northrop Grumman/EADS: KC-45 based on A330 Multi-role Tanker Transport (MRTT)
 - Boeing: KC-767 tanker-transport
 - A330 MRTT and KC-767 had prior sales to international customers
- The Air Force originally proposed to lease Boeing KC-767s
 - Outside of normal acquisition process – no AoA or competition
 - Shelved due to program shortcomings and irregularities
 - DoD Inspector General recommended a new acquisition program following standard procedures, including an AoA
- The AoA compared the current KC-135 fleet with alternatives
 - New and used airliners, existing and new-development military aircraft
 - Found new medium-to-large-sized wide-body commercial aircraft-based tankers (767-747) were the best solution
 - Recommended open competition

Exceptional case where near-substitutes were in a formal direct competition with an RFP and down-select

IDA | **KC-135, KC-767, and A330 MRTT Attributes**

Characteristic	KC-135R	KC-767	A330 MRTT
Length (ft)	136	159	193
Wing Span (ft)	130	156	198
Maximum Fuel Weight (Klbs)	200	202	245
Max. Gross Take-off Weight (Klbs)	323	395	514
Integrated fleet aerial refueling assessment (IFARA) factor	1.00	1.72	1.90

Note: Data from U.S. Air Force, Boeing, EADS North America, and GAO.

- Large difference in aircraft size
 - Maximum fuel weight is a central metric in determining tanker effectiveness
 - Constraints on employing tankers could advantage a smaller aircraft
- Relative effectiveness captured by Integrated Fleet Aerial Refueling Assessment (IFARA) factor
 - Specified in RFP
 - Derived using a modeling and simulation tool applied to various scenarios
 - Inverse of quantity of competitors' aircraft divided by KC-135R quantities required to perform scenarios
- Some additional development to meet U.S. Air Force requirements

- January 2007 RFP for EMD and initial procurement
 - Offerors to meet or exceed KC-135 performance (KC-135 KPP)
 - Did not indicate that any consideration would be given to *by how much it was exceeded*
 - IFARA factor was only a second-order discriminator with low weighting
 - KC-45 selected – however, Boeing protest was sustained
 - Use of performance above the KC-135 KPP as a decisive factor in violation of the RFP instructions
- February 2010 Revised RFP
 - IFARA factor included as an adjustment factor on pricing data
 - Boeing was the winner
- Observations
 - Direct competition between near-substitutes presents challenges
 - Effectiveness analyses can frame choice between near-substitutes

Sole-source lease prices will likely be improved upon

- Observations on case studies
 - Near-substitutes can provide options to fill capability gaps, and thus competitive pressure
 - Up-front investment for competition is relatively small
 - Near-substitutes can expand the base of suppliers
 - Cost-effectiveness analysis can help determine the relative value of near-substitutes
 - However, AoAs and similar activities after Milestone B (II) have been *ad hoc* in nature
- A formal “rolling AoA” process could foster competition between near-substitutes
 - If post-MS B material changes to programs and/or environment are evident, a fresh cost-effectiveness analysis can bring viable near-substitutes to the fore.