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# Fixed-Price Development Contracts: A Historical Perspective

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# Background

- ➔ DoD acquisition efforts have not improved significantly since at least the 1960s, when the first large scale analysis of DoD acquisition performance took place.
- ➔ The Department of Defense (DoD) continues to face numerous difficulties in its acquisition of Major Defense Acquisition Projects (MDAPs)
  - A 2006 RAND report found that the average adjusted total cost growth for a completed program was 46 percent (RAND TR-343)
  - The roughly 100 MDAPs under development during fiscal year 2007 experienced average cost growth of **26 percent** and average schedule delay of **21 months** over initial estimates (GAO-08-1159T)
  - GAO also estimated that these programs will cost **\$295B** more than originally projected



# Costs Growth Creates Serious Problems

- ➔ Budget shortfalls lead to actions that often include:
  - Reprogramming, leading to shortfalls elsewhere
  - Quantity reductions, that often mean less efficient production, and significantly reduced force effectiveness
  - Reduced credibility in future estimates
- ➔ Long history of swings between the use of cost-plus and fixed-price in an effort to control cost growth



# Two Primary Types Of Defense Contracts

- ➔ Cost reimbursement—Government reimburses the contractor for actual cost incurred
  - Various profit arrangements are possible, such as fixed-fee, no fee, cost sharing, incentive, award fee
- ➔ Fixed-price—contractor undertakes the work for a fixed amount of compensation
  - Often combined with incentives, where there is a target price, as well as a ceiling price
- ➔ A fixed-price contract only makes sense when:
  - The uncertainties can be reduced so that reliable estimates can be made
  - Contract changes are kept to a minimum
  - Often neither is the case with MDAPs



# Challenges in MDAPs Acquisition

- ➔ MDAPs face a high level of uncertainty
- ➔ The uncertainties inherent in these projects stem from a variety of factors, including:
  - the hundreds or thousands of interrelated design details required
  - the incorporation of new technologies, processes, and materials
  - the use of specialized equipment brought together to produce first-of-a-kind products
  - budget changes
  - quantity changes
- ➔ Consequently, neither the military sponsor, nor its contractors can accurately estimate the time, or costs, a project will require
  - It is sometimes difficult to know with high confidence whether it is even possible to achieve all the objectives of a project.



# Research Questions

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What outcomes DoD can expect when fixed-price contracts are used for development of weapon systems?

- ➔ How has DoD utilized fixed-price contracts for development in the past?
- ➔ What have been the typical results of fixed-price contracts?

# Historical cases in MDAPs Acquisition

- ➔ The C-5 Galaxy
- ➔ F-111 Aardvark
- ➔ A-12 Avenger II





# The C-5 Galaxy Background

- ➔ RFP was issued in December 1964
  - Three companies responded—Boeing, Lockheed, and Douglas (later McDonnell-Douglas)
- ➔ Lockheed nearing the end of its C-141 production, was almost completely dependent on DoD
  - This was a must win, or they would need to layoff 10,000 personnel
- ➔ Source Selection Board picks the Boeing proposal (\$2.2B)
  - Douglas proposal (\$2.0B) was judged inadequate, and Lockheed's proposal (\$1.9) met requirements, but last minute design changes were not adequately reflected in the cost and schedule
- ➔ AF leadership overruled the Source Selection Board recommendation and picked Lockheed based on low-cost



# The C-5 Galaxy

- ➔ Large, complex strategic airlift aircraft
  - Only 18 yds. shorter than football field, 223 ft. wingspan, and a tail that is 6 stories high
  - Short field land capability, terrain following radar, precision airdrop
  
- ➔ Fixed price incentive contract
  - Ceiling price was 130% of target, with a 70/30 cost share
  - Total Package Procurement System (TPPS) for 115 C-5As
    - Incorporated all development, production, and support procurements
    - Initial order was for 58 aircraft with a pricing formula for the remainder
  - Any costs above the ceiling price would be borne by the contractor (Lockheed)--assuming no government changes.



# The C-5 Galaxy Cost Overrun

- ➔ Program suffers from many changes
  - 300 changes, 1600 pages of modifications, and 783 clarifications in contract definition stage
  - Significant technical and production problems arose in the development phase (e.g. Static stress tests produced wing cracks, landing gear issues, terrain following radar)

	April 1965	October 1968
R&D (5 A/C)	\$ 977.0M	\$1,002.7M
1 <sup>st</sup> Production Run (53 A/C)	\$1,210.0M	\$1,551.1M
2 <sup>nd</sup> Production Run (62 A/C)	\$ 891.0M	\$1,808.3M
Spares	\$ 293.0M	\$ 968.0M
Total	\$3,371.0M	\$5,330.1M

**58% Increase**

# Program Aftermath

- ➔ Lockheed experienced a serious financial crisis
- ➔ Production was limited to 81 A/C (vs. the planned 115)
- ➔ Production aircraft were accepted with acknowledged deficiencies
- ➔ Lockheed agreed to accept \$200M loss, and the contract was restructured to cost-minus the \$200M fixed loss

## *C-5A Foe Says Pentagon Stripped Him of Duties*

By United Press International

WASHINGTON, Nov. 17—A. Ernest Fitzgerald, the civil servant who first disclosed huge cost overruns on the C-5A cargo plane, told Congress today that he spent the last year at the Pentagon in virtual isolation before he finally was dismissed last week.

Mr. Fitzgerald, testifying before a House-Senate subcommittee on economy in government, said that his superiors had ostracized him and gradually stripped away his duties until he had been reduced to menial tasks like supervising a bowling alley in Thailand.

The Pentagon announced Nov. 4 that Mr. Fitzgerald's job was one of those being abolished as an economy move. It insisted that economy was the only reason, and that Mr. Fitzgerald's actions had nothing to do with the dismissal.

Now that his job as deputy for management systems has been abolished, Mr. Fitzgerald testified, he is worried about finding work because of "unfounded accusations" that he had violated security by giving secret information to Congress.

He testified one year after he disclosed to the subcommittee on Nov. 13, 1968, that the C-5A world's biggest air-

plane would cost the Government more than \$5-billion to build rather than the \$3.4-billion estimated by the Air Force.

The 44-year-old engineer spoke in a soft southern drawl, disclaiming any responsibility for cutting Air Force procurement costs. But the subcommittee chairman, William Proxmire, Democrat of Wisconsin, told him that if it had not been for his testimony, the C-5A overruns would never have been exposed, and the taxpayers would have been out \$2-billion.

Mr. Fitzgerald's disclosure touched off an investigation that led last week to a Pentagon decision to buy only 81 of the planes, rather than the 120 contracted for.

Mr. Fitzgerald said that his decision to "commit truth," as he put it, led to retaliation in the form of "social ostracism" and hints that he would be dismissed.

His immediate superior, he said, told him "You have lost your usefulness," and Air Force Secretary Robert C. Seamans Jr. suggested that he no longer had a future at the Pentagon because "the staff doesn't like you." This apparently was a reference to the uninform military staff.



United Press International  
TELLS OF DISMISSAL BY PENTAGON: A. Ernest Fitzgerald, who called attention to cost of C-5A plane, putting away his papers after testifying yesterday at a Senate-House subcommittee inquiry on economy in government.

The New York Times  
Published November 18, 1969  
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# F-111 (“TFX”) Background

- ➔ The AF and USN were both seeking new fighter aircraft, when Robert McNamara was appointed as SecDef in January 1961
- ➔ In February 1961, McNamara directed that the services study the development of a single aircraft that would satisfy both requirements.
- ➔ In June 1961, Secretary McNamara approved the development of the Tactical Fighter Experimental (TFX) –an RFP was issued in October 1961.
- ➔ In December proposals were received from Boeing, General Dynamics, Lockheed, McDonnell, North American and Republic.
  - Air Force reviewers favored Boeing's offering, but the Navy found both submissions unacceptable for its operations.
  - Two more rounds of updates to the proposals were conducted with Boeing being picked by the selection board
- ➔ However, in November 1962 McNamara selected General Dynamics' proposal
  - The GD aircraft had greater commonality between Air Force and Navy variants
  - The Boeing aircraft shared less than half of the major structural components.

# F-111 (“TFX”)

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- ➔ A multipurpose tactical fighter bomber capable of supersonic speeds
  - 1st terrain-following radar, allowing it to fly at high speeds and low altitudes
  - 1st production aircraft with variable swing wings
  - 1st crew escape module
  
- ➔ Fixed-price incentive fee contract for R&D and first production lot
  - “Total package procurement” system





## F-111 (“TFX”) Challenges

- ➔ In an effort to accelerate schedule, the program introduced concurrency between the R&D phase and production
- ➔ However numerous problems were uncovered during testing; this led to costly redesign and retrofits of the production versions.
  - Problems included inlet-engine compatibility, structural failures in the wing carry-through structure, and introduction of technically immature digital avionics system.
- ➔ Navy dropped out
- ➔ Cost growth, as calculated by OSD CAIG, was over 100%.

“The technical difficulties experienced in the program suggest the data upon which the Government relied in support of its use of a fixed-price contract was considerably less firm than the Department believed it was.”

Staats, Elmer B., GAO 1970





# Congress recognizes problems with fixed-price development

- ➔ In 1988 Congress passed Section 8118 of the Defense Appropriations Act
- ➔ Section 8118 prohibited DoD from awarding a fixed-price contract in excess of \$10 million for development of a major system or subsystem “unless the Undersecretary of Defense for Acquisition determines, in writing, that program risk has been reduced to the extent that realistic pricing can occur, and that the contract type permits an equitable adjustment and sensible allocation of program risk between the contracting parties.”
- ➔ It also refines the FAR policy that cost-type contracts are usually more appropriate for development contracting due to program risk and uncertainty. (see FAR 35.006)



# A-12 Avenger II Background

- ➔ In 1984, the DepSecDef directed the Navy to develop and acquire the A-12 as a replacement for the Navy's A-6 attack aircraft.
- ➔ The Navy intended the A-12 R&D program to design and develop eight new carrier-based aircraft
- ➔ Stealth characteristics would significantly reduce the radar cross section
  - The aircraft would carry ordinance internally
  - Significant use of composites was planned--this would require dramatic advances in the structure and manufacturing capabilities



# A-12 Avenger II

- ➔ The A-12, an all-weather, carrier-based stealth bomber, was designed to replace the A-6 Intruder
- ➔ Performance was planned to be better than either the A-6 or F-18
- ➔ In 1988, the Navy awarded the Team of General Dynamics and McDonnell Douglas a \$4.4 billion fixed-price incentive contract for full-scale development of the A-12
  - Eight aircraft to be delivered in 1991
  - Target price \$4.379B, ceiling price \$4.777B, 60/40 cost share
  - Planned buy was for 858 A/C





# A-12 Avenger II Challenges

- ➔ The program encountered significant delays and cost overruns, due to many technical problems
  - Difficulties in designing a low-observable plane that can survive the harsh "controlled crash" environment of a carrier-landing.
  - Complexity of the low-observable radar system
  - Extensive use of composites did not result in the anticipated weight savings
  - Some of the structural composites had to be replaced with heavier metal components
  - Post-cold war quantity reduced to 620 aircraft (vs. planned 858 A/C)
- ➔ Contract cost was estimated to exceed the contract ceiling by \$1B
- ➔ SecDef terminated the contract for default in 1991
- ➔ Years of litigation between contractors and DoD
  - Recent Supreme Court decision (May 2011) set aside appeals court ruling, and sent it back to the appeals court to consider other issues



## A-12 Avenger Summary

*“The A-12, I did terminate. It was not an easy decision to make because it’s an important requirement that we’re trying to fulfill. But **no one could tell me how much the program was going to cost, even just through the full scale development phase, or when it would be available. And data that had been presented at one point a few months ago turned out to be invalid and inaccurate.**”*

Secretary of Defense Dick Cheney, 1991



# Current Acquisition Environment

The Obama Administration's government contracting reform initiative in 2009

- Cost-reimbursement contracts “*creates a risk... [that is] ...wasteful, inefficient, subject to misuse, or otherwise not well designed ...*”
- “*there shall be a preference for fixed-price type contracts*”

President Obama  
March 4, 2009



# KC-46

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- ➔ After its previous award was protested, the Air Force released a significantly revised KC-X RFP in February 2010.
- ➔ Boeing won the new competition to develop and build 179 new KC-46s at an estimated cost of \$51.7 billion.
  - The development portion of the contract (design and build 4 test aircraft, and then bring those aircraft to a final production configuration), is valued at \$4.4 billion
    - Boeing is obligated to incorporate any mods required to correct flight test issues into the production line, without any additional cost to the AF
  - There are two contract options for 19 initial production aircraft
  - There are also additional contract options for production of the remaining 156 aircraft through year 2027, at a target production rate of 15 aircraft per year

# KC-46

- ➔ The program development contract is a \$4.4B fixed-price incentive contract
- ➔ Current estimates are \$900M higher than the February 2011 contract award amount (gov't is responsible for about \$500M)



Contract amounts (\$M)	Target price	\$4,327.3	} 957.1
	Ceiling price	\$4,831.0	
Current estimates by (\$M)	Contractor	\$5,096.9	
	Government	\$5,284.4	

- ➔ Schedule risk
  - Overlap among development and production activities
  - Testing schedule not executable as planned
- ➔ Technical risk
  - Although based on commercial aircraft, there will structural modifications, a fly-by-wire refueling system, and software integration



# Lessons Learned

- ➔ A "Fixed-Price" contract is often anything but fixed-price; problems frequently caused by:
- Technological unknowns
  - Changing requirements
  - Design stability
  - Inaccurate cost estimates
  - Production maturity
  - Knowing what to incentivize has also proven to be a challenge with fixed-price incentive contracts



# Conclusion

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- ➔ Fixed-price contracts appear to be less risky than cost-reimbursement contracts, but results prove that not to be the case.
- ➔ Large, complex projects will generally experience schedule slips, technical changes, and cost growth, as the programs evolve.
- ➔ Fixed-price contracts do not eliminate these challenges, and may produce perverse incentives that make the problems worse.
- ➔ These lessons appear to be easily forgotten.