UNDERESTIMATION OF FUNDING REQUIREMENTS IN FIVE YEAR PROCUREMENT PLANS

(BRIEFING PAPER)

GAO/NSIAD-84-88
MARCH 12, 1984

PREFACE

UNDERCOSTING OF THE FIVE YEAR DEFENSE PLAN

Historical data shows that DOD's Five Year Defense Plans (FYDP) are consistently undercosted. The dramatic increases in the defense program since 1980 and the perception that the cost of these huge increases may continue to be significantly understated has become a serious concern of the Budget, Armed Services, and Appropriations Committees in the Congress. This briefing paper responds to a number of Congressional requests for an independent assessment to gauge the size of the underfunding problem with particular attention to the procurement accounts of the FYDP.

On balance, today's military weapon systems acquisition process is almost always characterized by programs which are extended, exceed original cost estimates and encompass fewer units than originally planned. One of the major contributing factors is a systematic bias in DOD cost estimating practices that encourages the use of optimistic cost assumptions while excluding actual cost experience and the reality of the budgeting process environment.

In analyzing the planned weapon systems cost versus actual Total Obligational Authority (TOA) provided for 97 major weapon systems from 1963 to 1983, we found that Congress must consistently provide substantially greater appropriations than anticipated (an average 32 percent more). Even with the additional monies, the number of weapon systems which DOD is actually able to procure is less than anticipated. We also found that undercosting in the procurement portion explains approximately two thirds of the variation in percentage underestimation of overall FYDP funding which will be realized. The remaining third of the total FYDP underestimate is due to underestimation in other accounts (i.e., operations and maintenance), the economy, and random underestimation. As an example of the magnitude of the problem we note that actual appropriated TOA for the FY 1980 to FY 1984 plan will exceed DOD's original projections by at least $246 billion. Although there is no certainty that these patterns will continue, if historical trends are projected the FY 1984 to FY 1988 five year plan is understated by $173 billion to as much as $324 billion.

DOD has taken the position that cost planning was often too optimistic in the past and despite efforts to address the problem it continued to plague the Department through the late 1970s. However, under the present administration DOD contends they have taken vigorous steps to deal with the problem on a systematic and decisive basis and that significant changes have occurred.

The Secretary of Defense has continually reemphasized the importance of achieving savings in Department of Defense (DOD) operations. GAO commends and supports the economies and effiencies program instituted in early 1982. However, we have seen since then that management reforms too can suffer from optimistic assumptions. Such programs as presented to the Congress often reflect an estimate of savings which may be realized if the Congress approved the budget as DOD proposed and all factors of engineering, design, and production maintained a constant state of stability. Such assumptions appear to be unrealistic for planning.

Members of Congressional Committees responsible for budgeting, authorizing, and appropriating need more accurate cost assessment of DOD's five year program if they are to make the right trade off decisions today on what will shape our long term defense policy.

APPROACH

The results of our analysis are presented in three parts:

--First, we discuss an historical perspective of the relationship between DOD's five year program plans and the Total Obligational Authority (TOA) appropriated in an attempt to execute those plans.

--Second, we discuss DOD cost estimating practices and methodologies, the disparity between estimates and reality, and the impact of DOD initiatives to control procurement cost growth.

--Finally, we present results of a statistical analysis forecasting potential future underestimates of DOD budget requirements. We look first at procurement and then the FY 1984 - 1988 FYDP as a whole.

SECTION ONE: HOW ACCURATELY HAS DOD FORECASTED ITS FINANCIAL REQUIREMENTS?

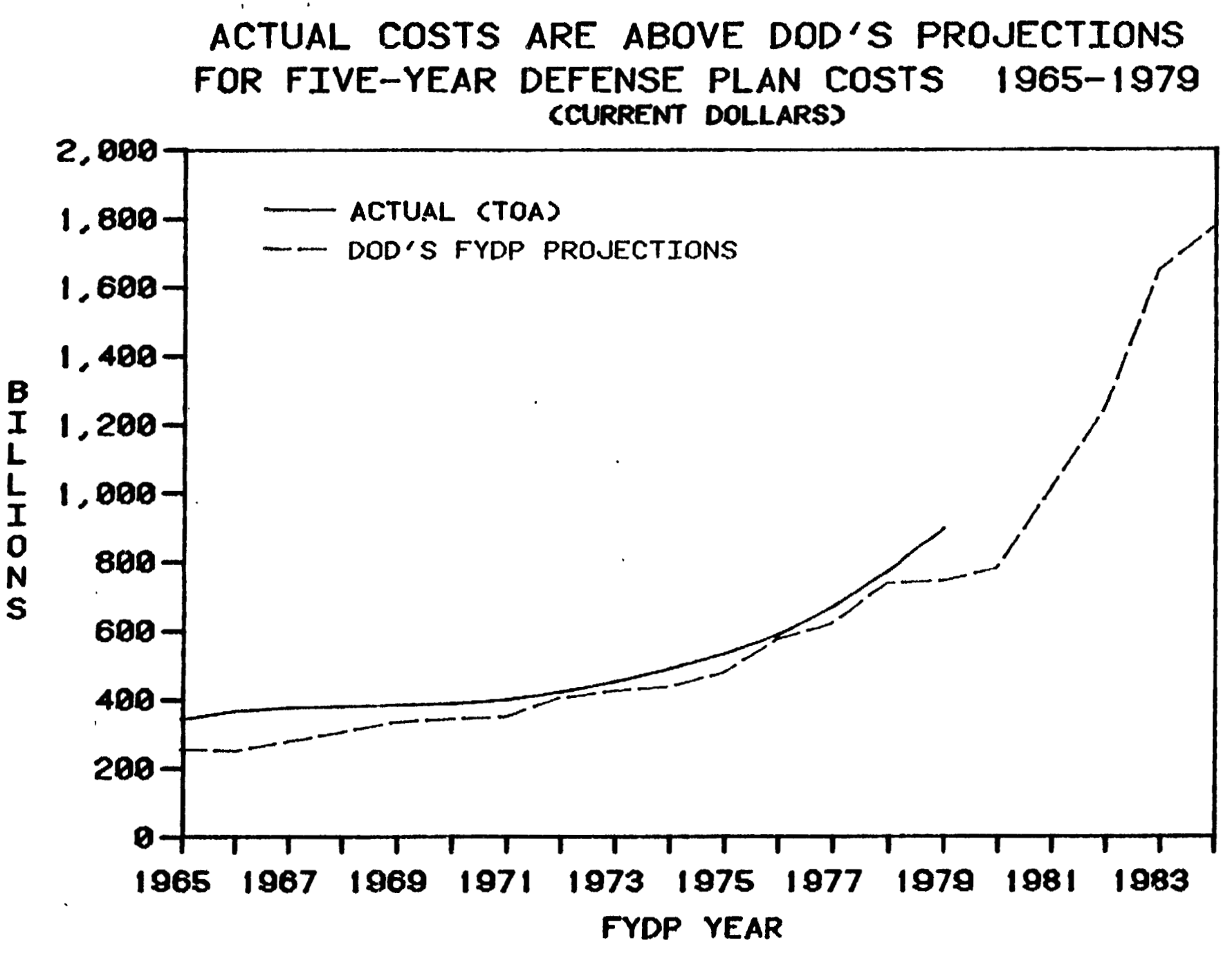

ACTUAL COSTS ARE ABOVE DOD'S PROJECTIONS
FOR FIVE-YEAR DEFENSE PLAN COSTS 1965-1979
(CURRENT DOLLARS)
ACTUAL (TOA)
DOD'S FYDP PROJECTIONS
BILLIONS
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
0
1965 1967 1969 1971 1973 1975 1977 1979 1981 1983
FYDP YEAR

FIGURE 1

The five year total dollar estimates are plotted on this chart for the 1965 through 1984 FYDPs (dashed line). Also plotted is the five year sum of Total Obligational Authority that was appropriated over the course of each FYDP to implement the plan (solid line). Each year on a line represents the sum of five years for that particular five year plan (e.g., the 1984 FYDP of $1,770 billion represents the projected funding from 1984 through 1988).

There are several observations to be made from this display:

(1) Both trend lines exhibit a relatively smooth exponential growth pattern over time.

(2) Without exception, total obligational authority appropriated by Congress over the course of any FYDP period exceeds DOD's original estimates.

(3) There has been a quantum jump (about $1 trillion) in the projected cost between the 1980 and 1984 FYDPs.

Over the years there have been various factors that would contribute to understated outyear cost in the FYDPs. In the 1960s for example, DOD was not permitted to plan for the Vietnam conflict for more than one year at a time. Until recently, projected pay raises or escalation factors for inflation have been excluded in five year plans. For whatever reason (and we have not tried to quantify these factors individually), Congress must routinely appropriate greater sums than proposed over the course of any five year plan.

We believe that undercosting of major weapon systems acquistions could be a major contributor to undercosted defense plans in the 1980s. In general we found that about two thirds of the variations in percentage underestimates in the overall FYDP can be explained by variations in the underestimates in the procurement portion. The remaining one third of the total FYDP underestimate is due to variations in the underestimation in other accounts (i.e., operations and maintenance), the economy, and random factors.

ACTUAL WEAPON SYSTEM PROCUREMENT FUNDING IS ABOVE FYDP ESTIMATE
SAMPLE OF MAJOR WEAPON SYSTEMS
(CURRENT DOLLARS)

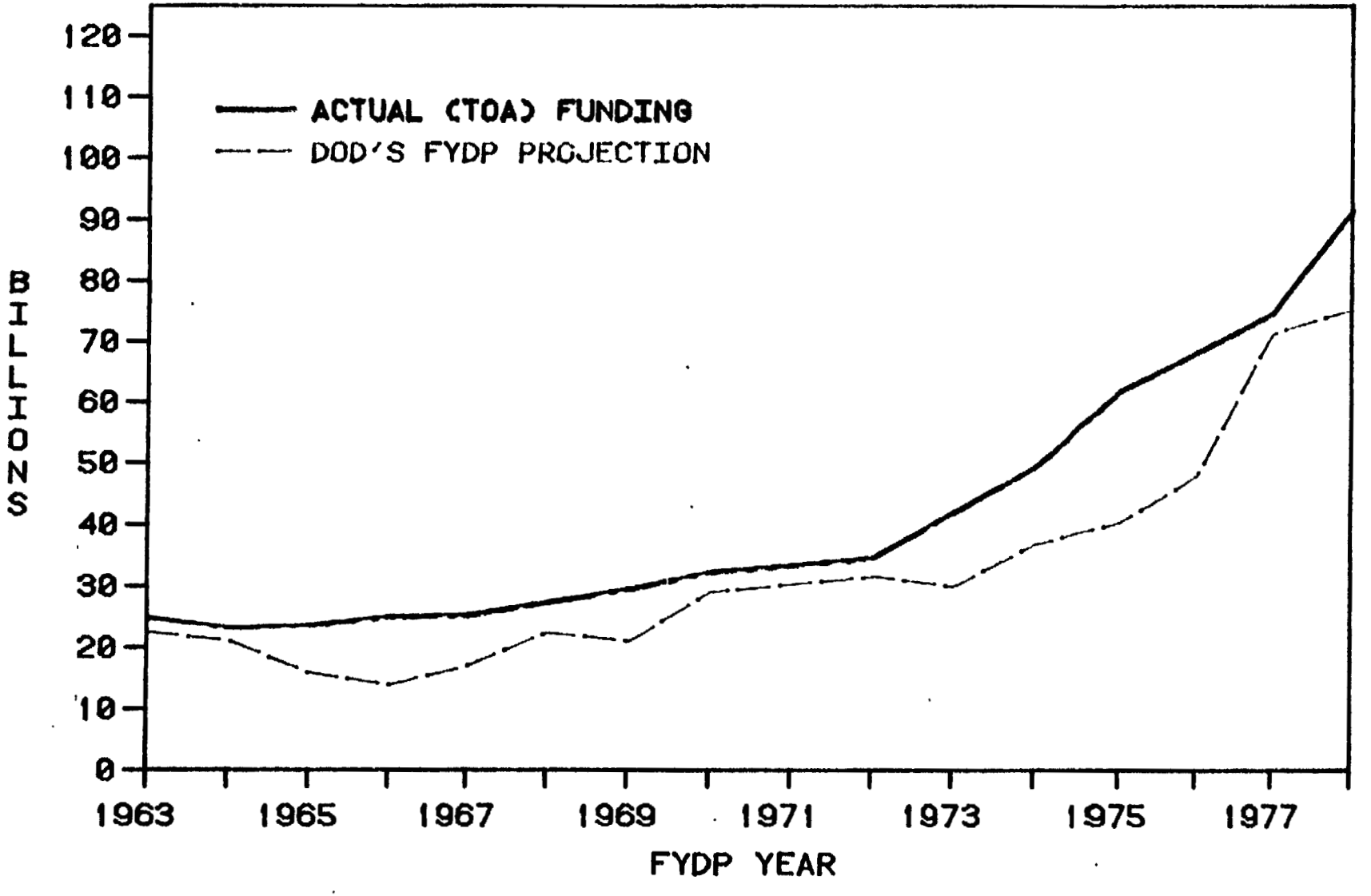


FIGURE 2

We tracked 97 major weapon systems contained in the 1963 through 1978 FYDPs. Over the course of this time, the sample consisted of 40 aircraft, 36 missiles, 9 tracked vehicles, and 12 ships (See Appendix II). The sample shows that on average these systems realized 32 percent more obligational authority than proposed by DOD.

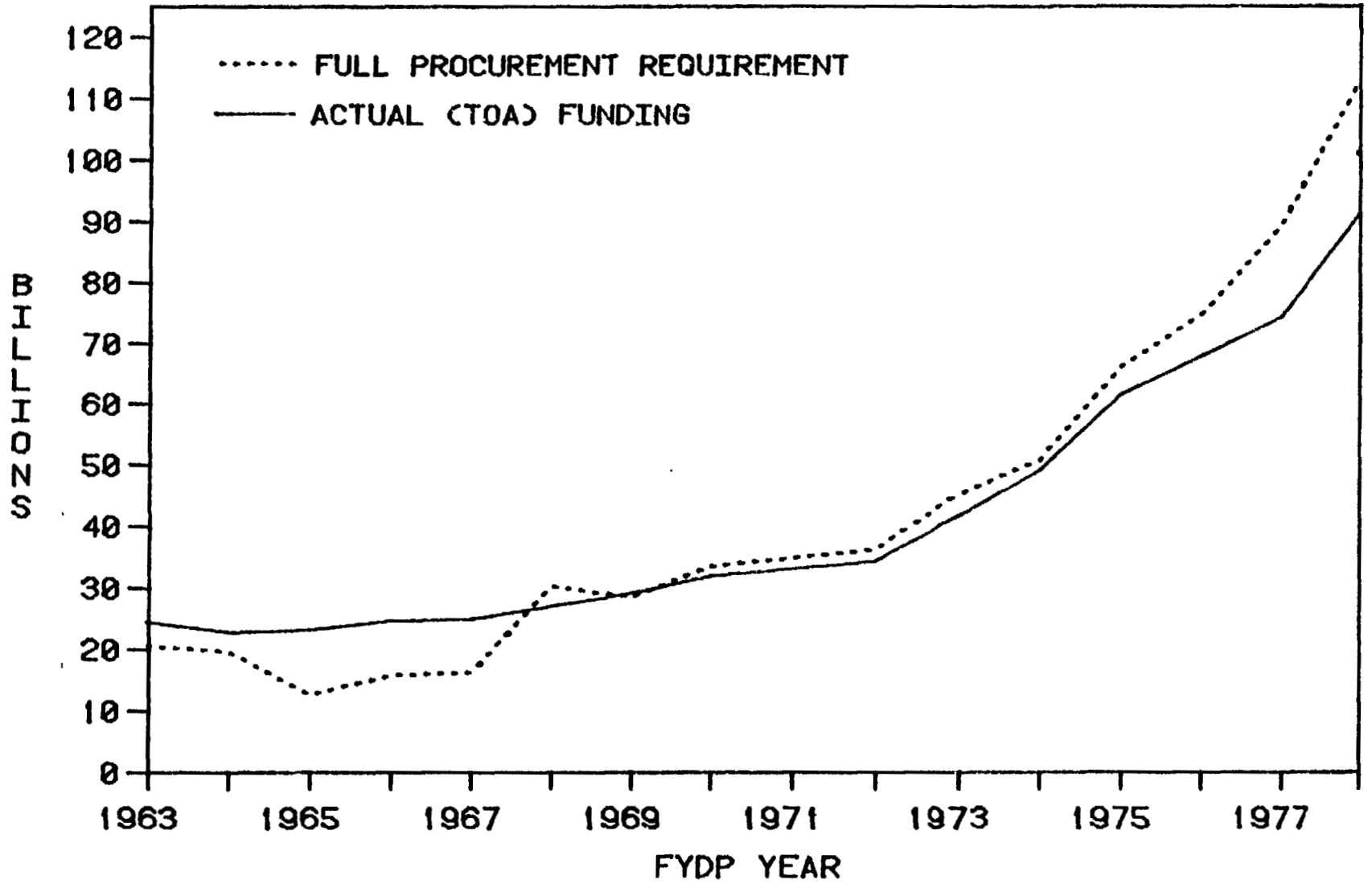
In figure 2, the five year sums of both the FYDP estimated cost (dashed line) and the Total Obligational Authority (TOA) actually provided for the sample are plotted. As in the total FYDP, both lines demonstrate exponential growth and TOA exceeds projected funding estimates.

Our analysis models the historical difference between FYDP estimates and actual TOA. In section 3 we project this historical pattern of underestimation over the current FYDP.

It is important to note that even this increase in TOA was not sufficient to purchase all quantities originally specified in the FYDP.

DOD HAS BEEN UNABLE TO PURCHASE PLANNED QUANTITIES SINCE 1970

(SAMPLE OF MAJOR WEAPON SYSTEMS, IN CURRENT DOLLARS)



Although Congress appropriated more than expected for these systems, DOD has been unable to purchase the planned quantities since 1970.

The dotted line in figures 3, 4 and 5 represents the approximate amount of additional funding that would have been required to purchase the planned procurement quantities. In the dotted line, the actual cost is multiplied times the planned number of weapons systems. Since 1970, this pattern of receiving more money and purchasing fewer quantities has gotten progressively worse.

In determining the extent of the undercosting problem for major weapon systems in the FY 1984 to 1988 FYDP, we did not attempt to quantify the actual cost of a full procurement buy. This has apparently been unaffordable since the end of the Vietnam conflict. As long as historical trends continue, Congress is likely to appropriate more current dollars and realize fewer quantities than proposed in Five Year Defense Plans for major weapon systems.

THE GAP BETWEEN FULL PROCUREMENT COST AND DOD'S PROJECTION IS GROWING
SAMPLE OF MAJOR WEAPON SYSTEMS
(CURRENT DOLLARS)

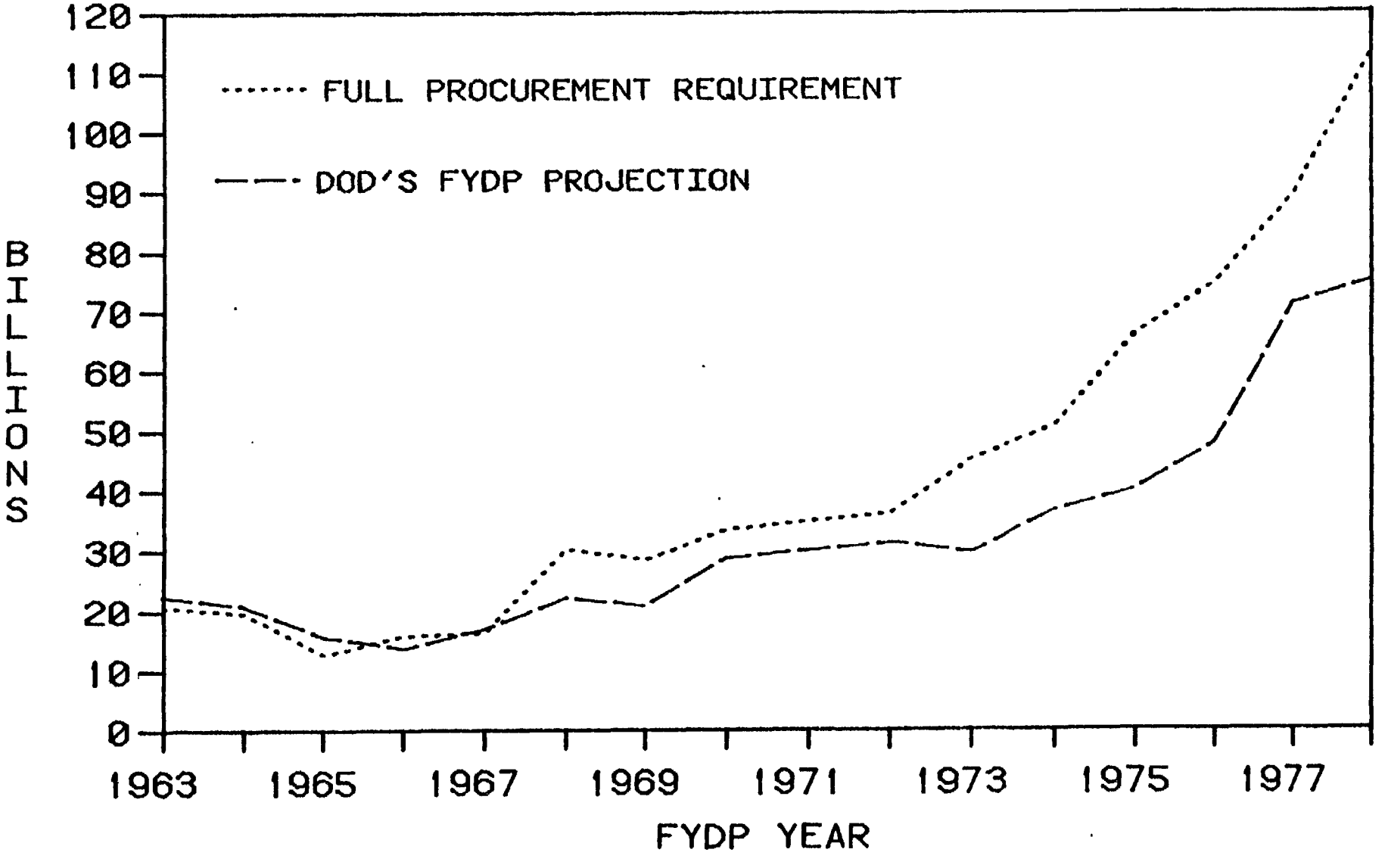


FIGURE 4

The gap between FYDP projected costs and actual costs has been growing. As a result, a cost growth wedge can be seen between the FYDP estimate (dashed line) and the Full Procurement Requirement (dotted line).

Both lines are based on the FYDP planned weapon system quantities. In the dashed line, the FYDP's estimated unit costs is multiplied times the planned quantities. The lines diverge because the actual costs exceed the planned costs.

As we will see later, this wedge between planned budget requirements and actual costs for procuring FYDP quantities can also be found at the individual weapon system level.

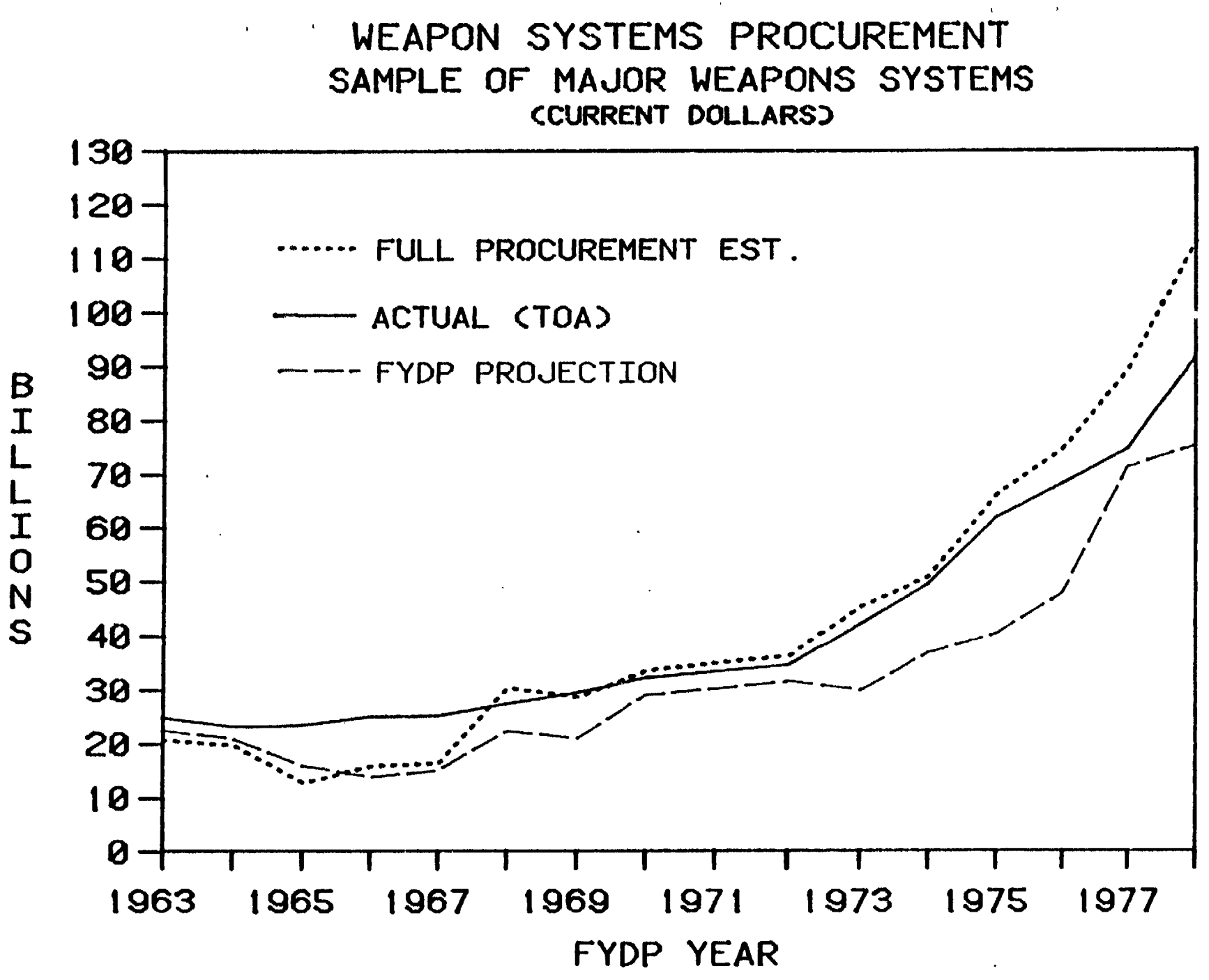

WEAPON SYSTEMS PROCUREMENT
SAMPLE OF MAJOR WEAPONS SYSTEMS
(CURRENT DOLLARS)
FULL PROCUREMENT EST.
ACTUAL (TOA)
FYDP PROJECTION
BILLIONS
130
120
110
100
90
80
70
60
50
40
30
20
10
0
1963
1965
1967
1969
1971
1973
1975
1977
FYDP YEAR

FIGURE 5

Figure 5 above displays all three trend lines for a full comparison of DOD's projections, actual TOA appropriated, and an estimate of funds that would have been required to make the full procurement buy. It is interesting to note that the amount of TOA provided over time to purchase major weapon systems represents neither the amount DOD estimated nor the amount required to purchase planned quantities.

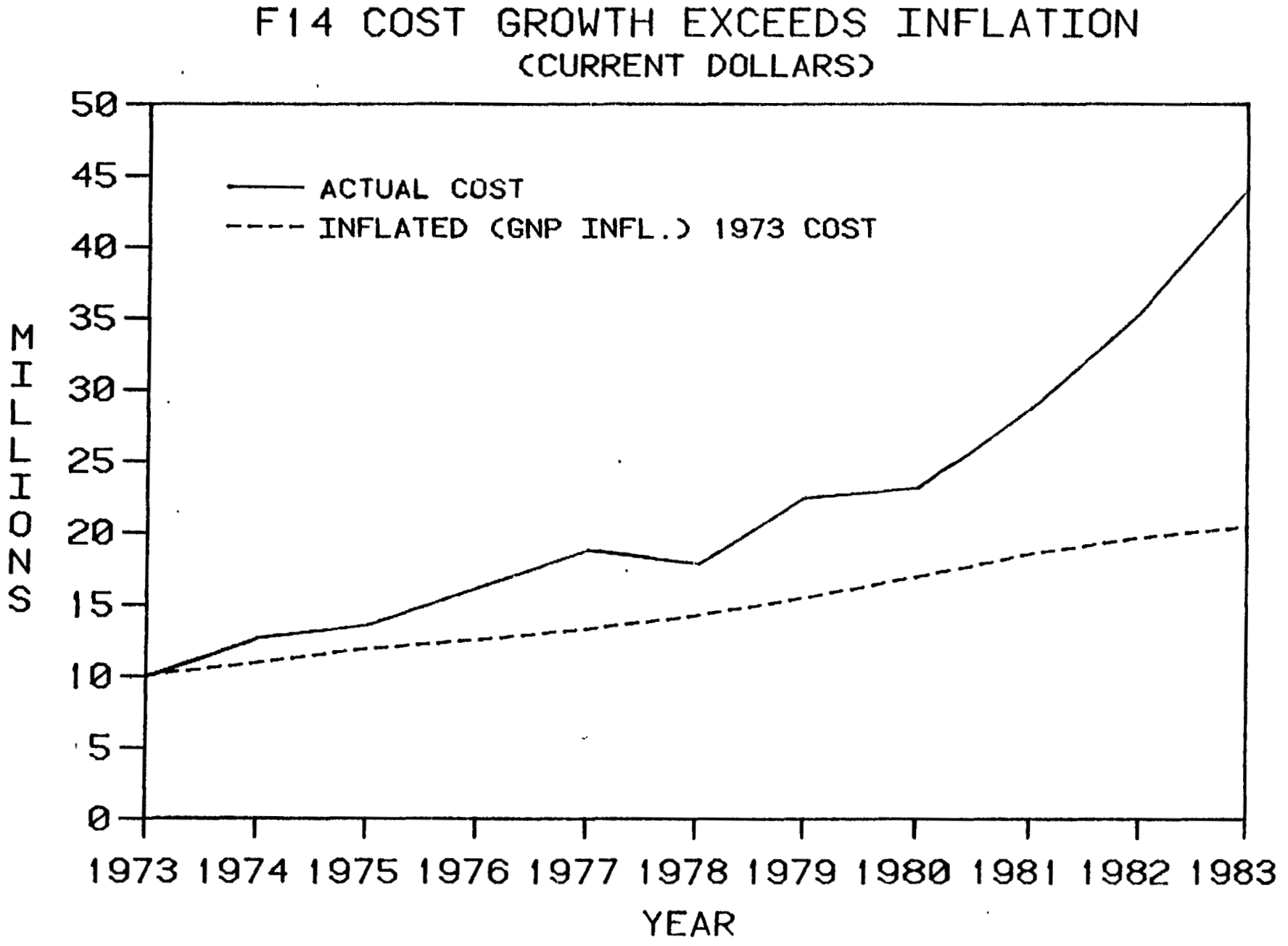

F14 COST GROWTH EXCEEDS INFLATION
(CURRENT DOLLARS)
ACTUAL COST
INFLATED (GNP INFL.) 1973 COST
MILLIONS
50
45
40
35
30
25
20
15
10
5
0
1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983
YEAR

FIGURE 6

The divergence between planned and actual cost in the four previous graphs illustrates growth in major weapon systems cost above planning estimates. Often this difference has been attributed to higher than anticipated inflation. However, while changing inflation rates can be a problem for planners, unanticipated inflation has not explained the bulk of cost growth in weapon systems.

In this graph, we take the cost history of the Navy's F14 aircraft as an example of weapon system cost trends. This graph illustrates that costs have grown in excess of general economic inflation. Here the dashed line represents the unit costs by year if general inflation was the only factor influencing the 1973 unit cost of $10.3 million. The solid line represents the actual cost of the F14 in current dollars. It is clear that the costs grew at a faster rate than if inflation had been the only influence on costs.

A breakdown of the F14 cost growth factors will be presented in Chart 1. Often, the greatest contributor to cost growth in sophisticated weapon systems is unplanned system changes or modifications. This was the case with the F14. Although the F14 has undergone numerous improvements over the years, the full cost impact of these modifications was not always reflected in budget projections.

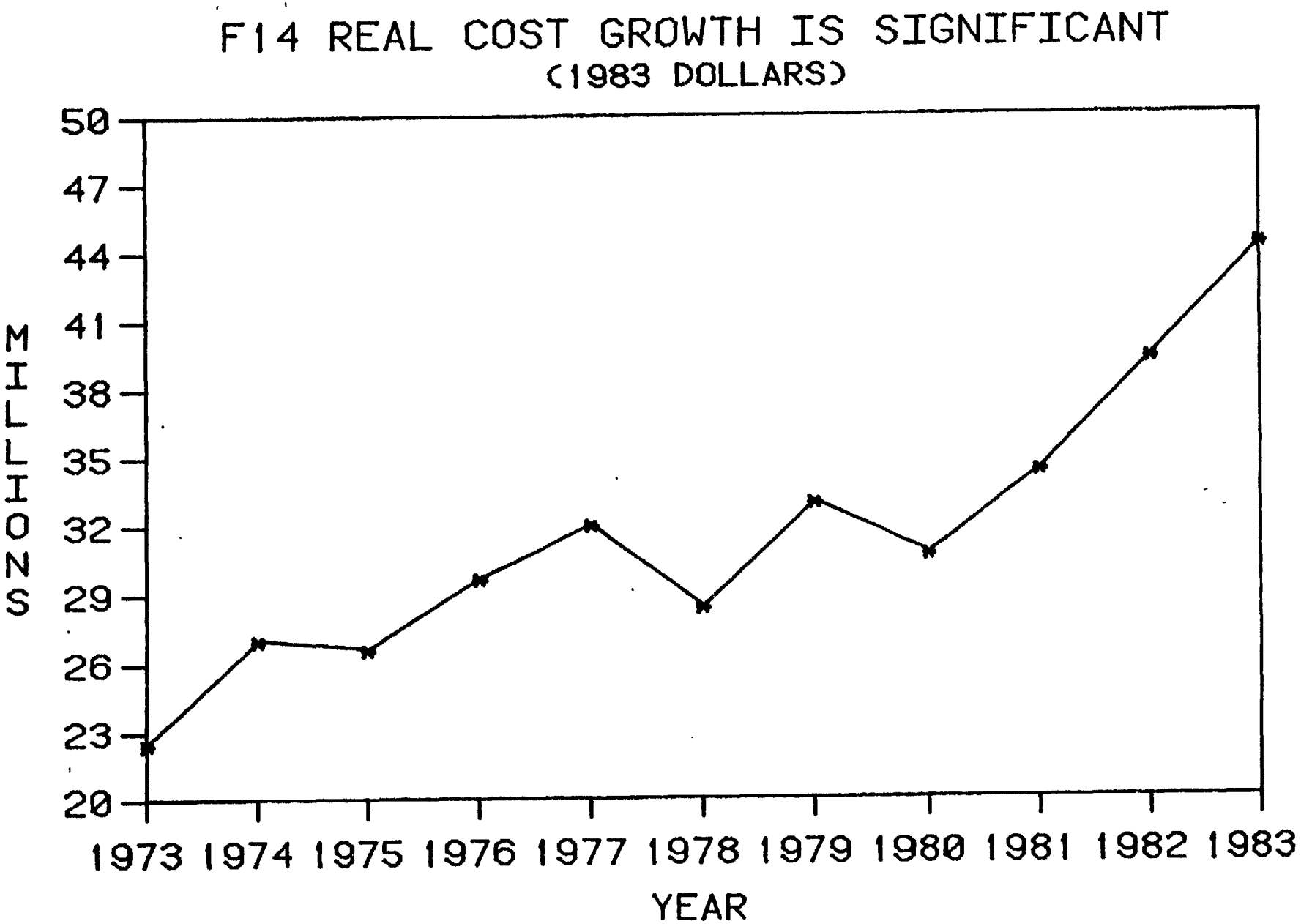

F14 REAL COST GROWTH IS SIGNIFICANT
(1983 DOLLARS)
MILLIONS
50
47
44
41
38
35
32
29
26
23
20
1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983
YEAR

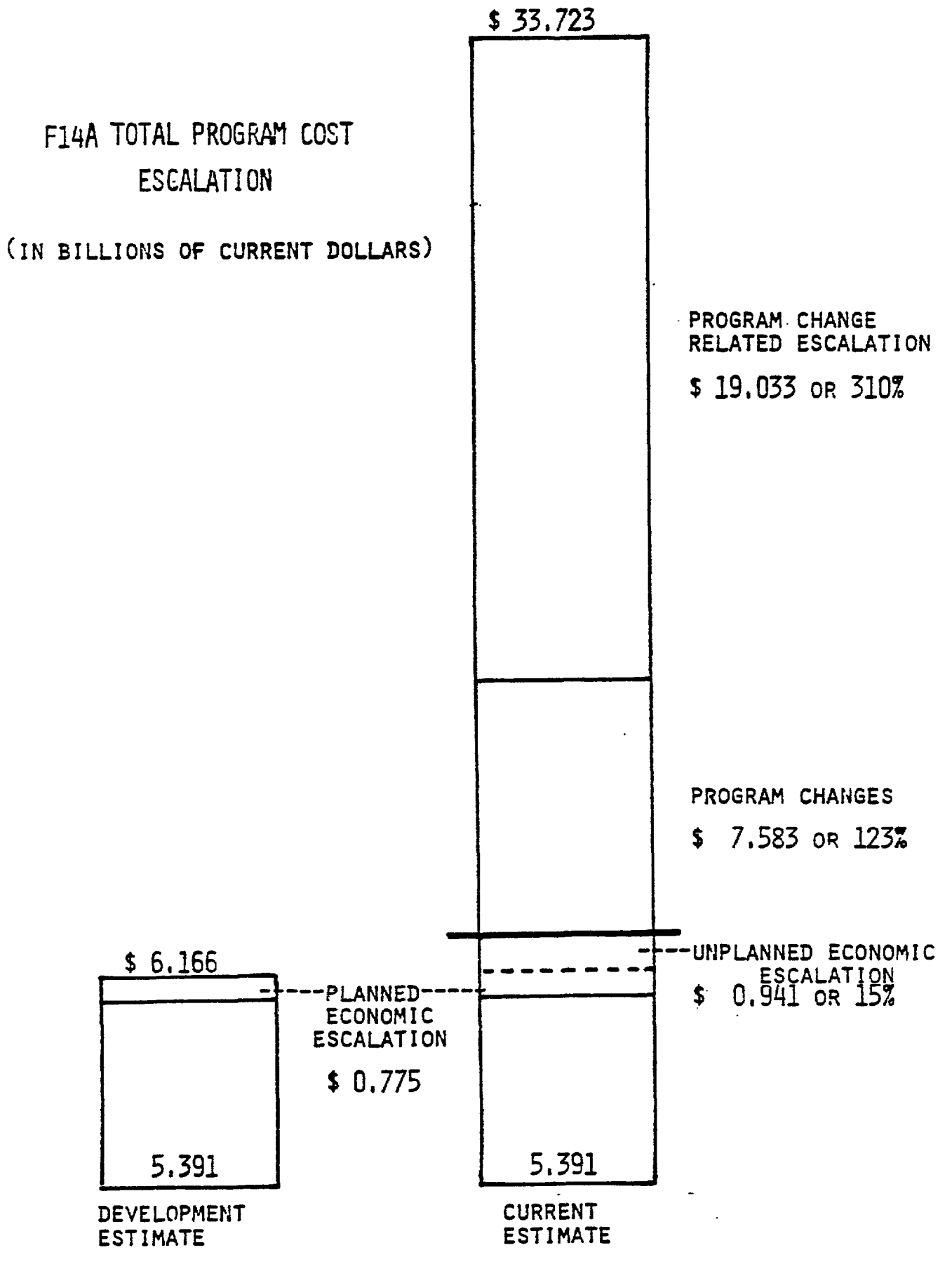
FIGURE 7

Even when inflation in weapon systems procurement is taken into account, costs have risen significantly. DOD's procurement inflation index is used in Figure 7 to convert F14 unit costs to constant dollars.

This graph demonstrates that real cost growth has occured beyond DOD's own estimate of inflation for procurement. Thus, no matter which inflation index is used, DOD's procurement index or the GNP inflation index, there has been a significant net of inflation trend towards cost growth.

The next chart illustrates major factors in unplanned cost growth for the F14.

CHART 1



SOURCE: SELECTED ACQUISITION REPORTS, SEPTEMBER, 1983.

This chart breaks out the areas of cost growth for the F14 as reported by DOD in the Selected Acquisition Reports (SARs). The SAR reports estimated program cost at completion and compares it with the development estimate. In this case, costs rose 448 percent over the original development estimate; $6.166 billion to $33.723 billion.

The cost growth is explained almost entirely by unplanned program changes. Only 15 percent of the growth was due to general economic escalation. The remaining 433 percent was due to Program Changes and Related Escalation.

The following table represents the cost catagories to which DOD has assigned F14 cost variances.

COST VARIANCE CATEGORIES	VARIANCE AMOUNT SINCE DEVELOPMENT ESTIMATE
Quantity Change	$18,319
Engineering Change	2,837
Support Change	5,141
Schedule Variance	1,528
Economic Factors	941
Estimating Change	(1,289)
Other	80
Total	$27,555 (difference from chart due to rounding)

CONCLUSION: HISTORICALLY ACTUAL COSTS HAVE CONSISTENTLY EXCEEDED DOD BUDGET ESTIMATES

SECTION TWO: DOD COST ESTIMATION PRACTICES VERSUS REALITY

DOD'S FORECASTING VIEW

- OUT YEAR COST WILL BE LOWER THAN BUDGET YEAR COSTS
  THAT IS: AS EXPERIENCE GROWS UNIT PRODUCTION COSTS WILL DECREASE
- THIS IS REFERRED TO BY DOD AS THE LEARNING CURVE

DOD estimates out-year costs (years two through five of the FYDP) to decrease as more and more units are procured. This view enables planning for greater quantities with similar or lower projections of funding in the out-years.

This represents a simplistic price and quantity relationship which says the more you produce, the less additional units cost. The relationship is referred to as the experience curve, the progress curve, or the learning curve in business economics.

In this section we discuss the validity of DOD's approach to projecting their procurement funding requirements. The emphasis is on planning and budgeting for weapon systems procurement, rather than explaining the factors which cause cost growth.

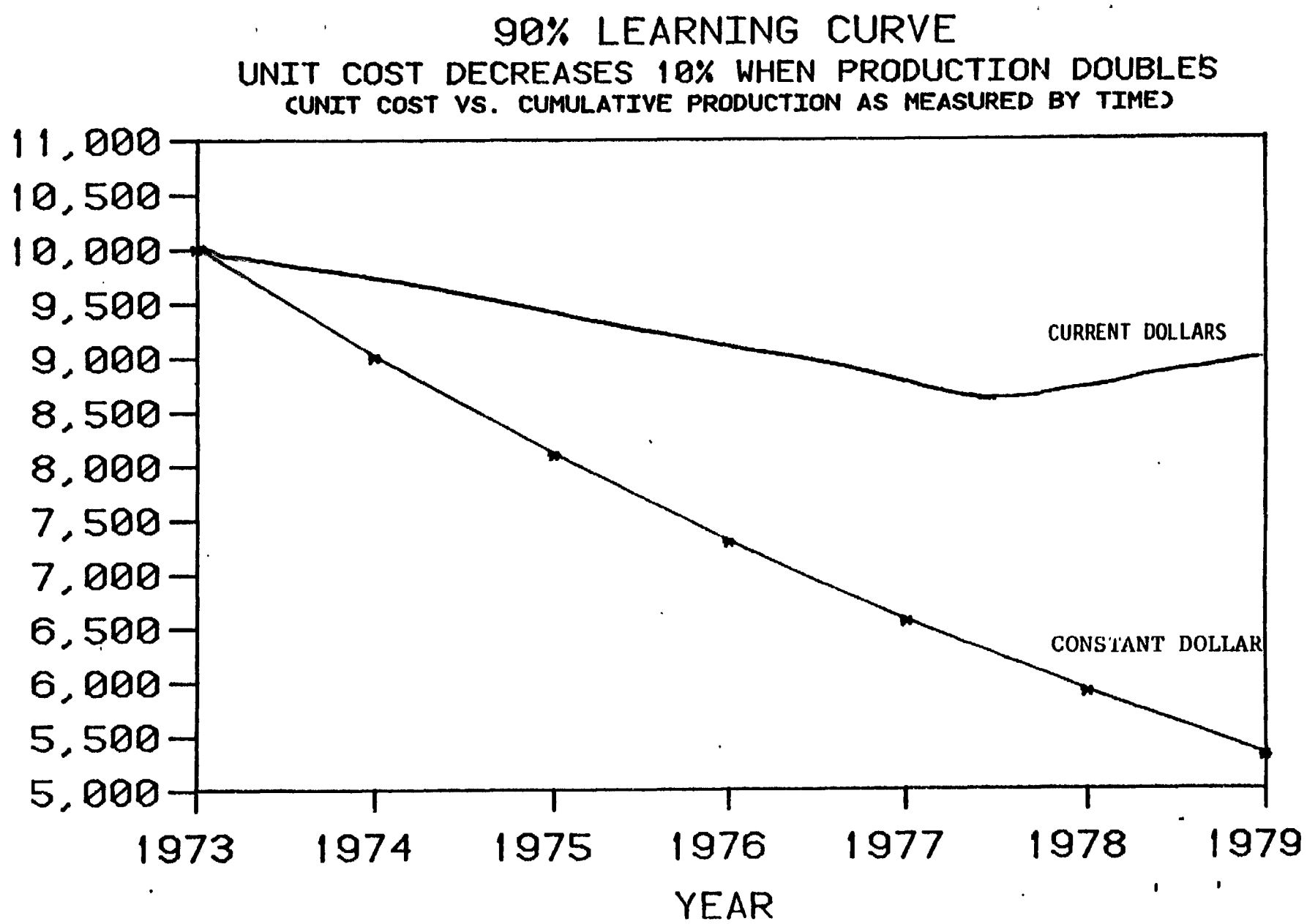

90% LEARNING CURVE
UNIT COST DECREASES 10% WHEN PRODUCTION DOUBLES
(UNIT COST VS. CUMULATIVE PRODUCTION AS MEASURED BY TIME)
11,000
10,500
10,000
9,500
9,000
8,500
8,000
7,500
7,000
6,500
6,000
5,500
5,000
CURRENT DOLLARS
CONSTANT DOLLAR
1973
1974
1975
1976
1977
1978
1979
YEAR

FIGURE 8

DOD often forecasts declining future costs with little attention to actual factors of production or cost experience. Commonly used models are the 90, 85, or 80 percent learning curves. In figure 8, we portray the 90 percent learning curve for a system originally costing $10,000. By applying a 90 percent learning curve formula, DOD projects constant dollar cost declines of 10 percent as cumulative production doubles.

The constant dollar forecast is then inflated using the DOD procurement inflation index. This is the forecast on which the FYDP program estimates are based.

THE LEARNING CURVE MODEL

$$A = B\,C^{-X}$$

OR

$$\text{LOG } A = \text{LOG } B - X \text{ LOG } C$$

A = UNIT COST

-X = RATE OF DECLINE IN UNIT COST AS MORE AND MORE QUANTITIES ARE PRODUCED

B = INITIAL UNIT COST

C = CUMULATIVE QUANTITY

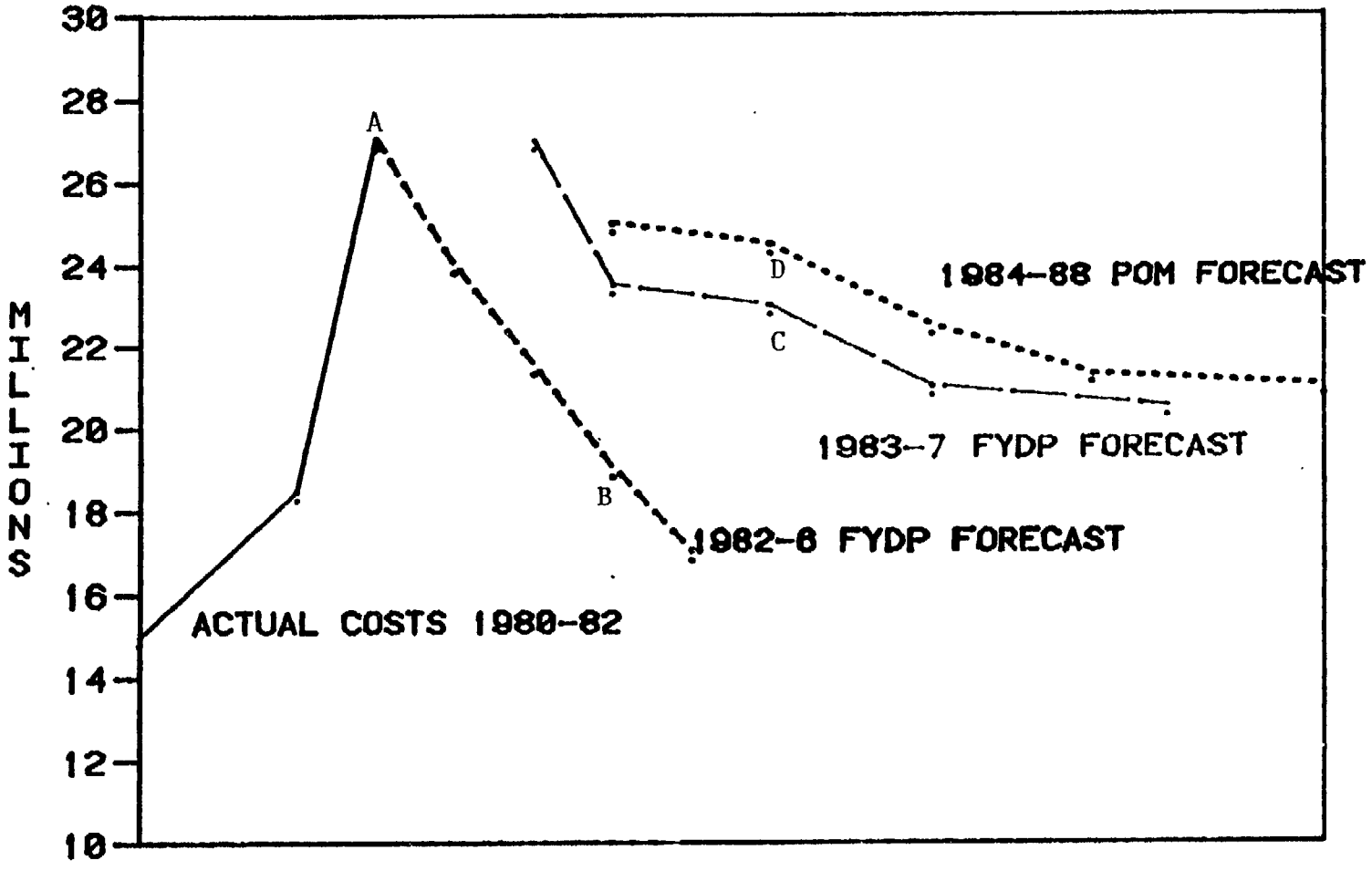
The formula above is the algebraic representation of the learning curve, relating unit cost to cumulative production. The important characteristic of this equation is a negative exponent (-x). The negative exponent indicates that larger volumes of production lower unit costs.

DOD does not report the historical validity of this representation when it submits its forecast to Congress. Additionally, DOD must make several questionable assumptions in utilizing this model for budget forecasts (i.e., engineering, design, and production stability).

Since we are only concerned with its ability as a budget tool, rather than its theoretical validity, we conducted statistical tests on several weapon systems to determine whether or not a -x realistically represented historical costs; that is, do costs decline as more weapons are procured? This corresponds to the issue of whether the learning curve will predict likely cost paths in the outyears.

PLANS/REALITY MISMATCH: AVERAGE INCREMENTAL COST OF A TAC FIGHTER IN FY1983 DOLLARS

SOURCE: F.C. SPINNEY, DOD, 1983.



CUMULATIVE QUANTITY

FIGURE 9

Figure 9, is a display of unit cost projections for a combination of 10 tactical fighter aircraft. DOD projects similar declining future costs for about 80 percent of major weapon systems (See Appendix I).

The disparity between planned cost declines and actual cost growth becomes evident from comparing the 1980-1982 actual cost paths with any FYDP forecasted cost path. It is further highlighted by the wedge that forms between an initial FYDP out-year projection and later FYDP projections as we get closer to the budget year. For example, the 1982 FYDP forecasted declining unit costs from point A in 1982 to point B (1985). In the 1983 FYDP, the cost estimate is revised upward to point C when declining costs were not realized. And, as we get closer to 1985, the cost estimates have been revised upward again to point D. The wedge resulting from optimistic forcasting is seen by connecting points A, B, C, D and back to A.

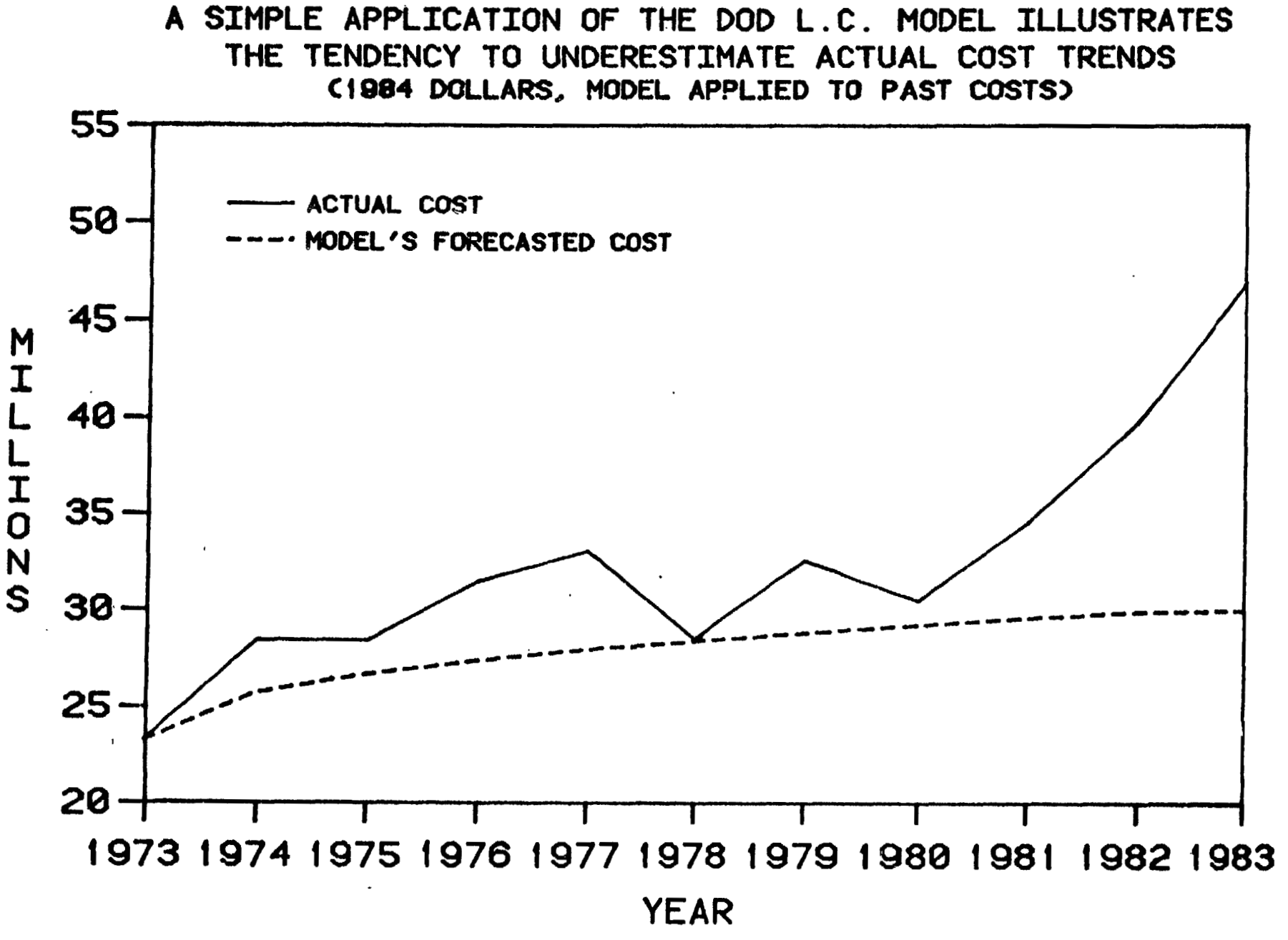

A SIMPLE APPLICATION OF THE DOD L.C. MODEL ILLUSTRATES
THE TENDENCY TO UNDERESTIMATE ACTUAL COST TRENDS
(1984 DOLLARS, MODEL APPLIED TO PAST COSTS)
ACTUAL COST
MODEL'S FORECASTED COST
MILLIONS
55
50
45
40
35
30
25
20
1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983
YEAR

FIGURE 10

Here we graph the results of a regression analysis using the learning curve model and actual F14 cost data. In this case, and others, a positive X (slope) value is obtained when actual data are used. An assumed learning curve would invert the dashed line, giving it a downward slope over time. However, a negative X (or slope) cannot be generated using the actual cost data without statistical manipulation and alteration of the basic learning curve model.

The wedge between actual costs and the learning curve estimate was illustrated in figure 9. Even with a postive X in the estimating model, or a rate of growth, as we see here, the learning curve is an altogether inadequate model when used in isolation to project future costs. This can be observed by looking at the wedge between the lines in the last four years depicted here.

The reason for an increasing wedge over time is that the learning curve model forecasts are dominated by the larger percentage growth in cumulative quantity during the first few years of production. In reality, many things occur which drive costs up, often overwhelming any actual cost declines from learning. Additionally, design changes require relearning. As a whole, a model which projects declining future costs for sophisticated major weapon systems produces an inaccurate picture of budget requirements.

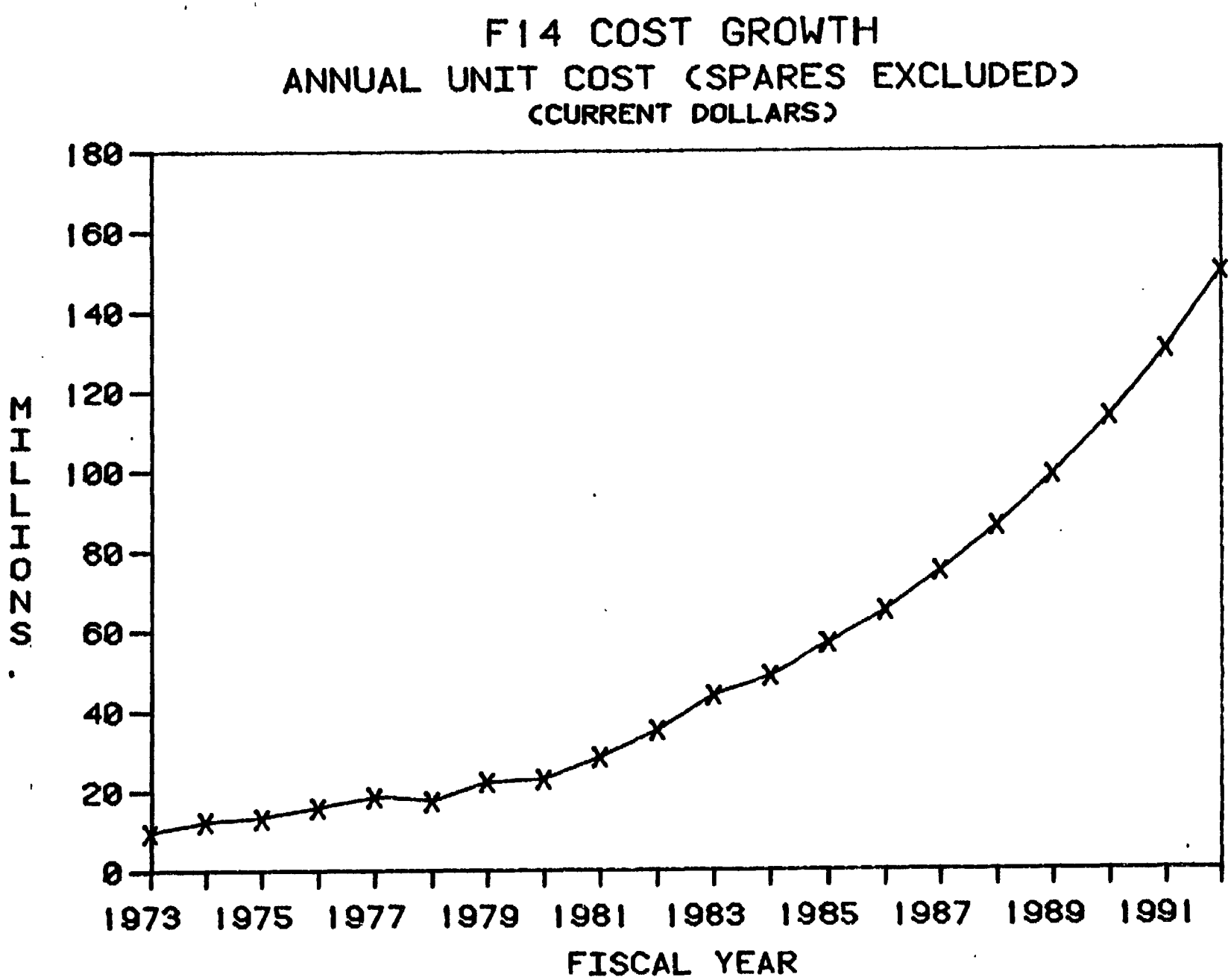

F14 COST GROWTH
ANNUAL UNIT COST (SPARES EXCLUDED)
(CURRENT DOLLARS)
MILLIONS
180
160
140
120
100
80
60
40
20
0
1973
1975
1977
1979
1981
1983
1985
1987
1989
1991
FISCAL YEAR

FIGURE 11

Figure 11 represents another type of statistical analysis we conducted. Here we used Box-Jenkins Time Series analysis to identify a pattern, or significant tendency, for F14 costs to rise. It shows the dominance of upward pressure on unit costs.

We conducted this analysis on six weapon systems and found a significant cost growth tendency in all. We do not doubt that weapons production does experience learning curve effects. However, it is clear that with the systems we have examined, the downward pressure on unit costs from learning is more than offset by other systematic forces which tend to push costs upward.

While the F14 does not represent the most common rate of cost growth in weapon systems, it is not the worst either. Most cost growth, while not this dramatic, still exhibits the same general pattern. There are numerous similar unplanned cost growth wedges throughout the procurement accounts.

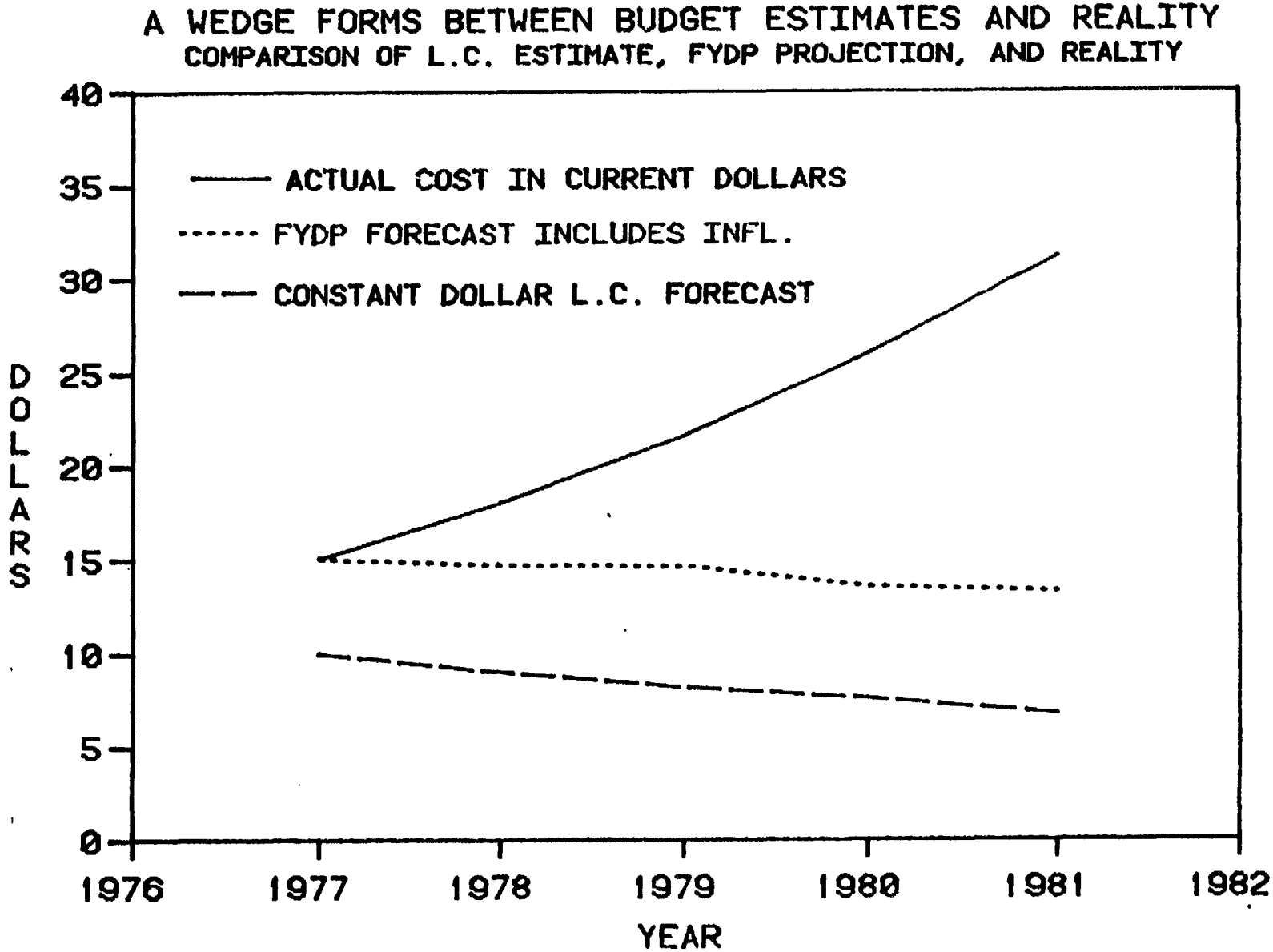

A WEDGE FORMS BETWEEN BUDGET ESTIMATES AND REALITY
COMPARISON OF L.C. ESTIMATE, FYDP PROJECTION, AND REALITY
ACTUAL COST IN CURRENT DOLLARS
FYDP FORECAST INCLUDES INFL.
CONSTANT DOLLAR L.C. FORECAST
DOLLARS
40
35
30
25
20
15
10
5
0
1976
1977
1978
1979
1980
1981
1982
YEAR

FIGURE 12

A wedge results from the divergence between declining planned costs and actual costs. The bottom line represents constant dollar declining unit cost as projected by an assumed learning curve. The middle line is the relatively flat current dollar projection which takes into account inflation. The top line represents actual current dollar cost growth as we saw in our historical analysis. These individual wedges can become quite large. For example the size of the F14 wedge in the 1978 FYDP was $10.2 million (in 1984 dollars).

If we sum the individual wedges over any FYDP period, the difference between the FYDP projections and the Full Procurement Requirement in Figure 4 becomes obvious. As we expand both the base of the procurement budget, by buying more types of weapons, and then try to procure larger quantities, we buy more wedges. This explains the widening difference between the budget estimates and the actual dollars to procure all quantities in Figure 4.

RECENT INITIATIVES TO CONTROL COSTS

- INDEPENDENT COST ESTIMATES BY THE OFFICE OF THE SECRETARY OF DEFENSE-PROGRAM ANALYSIS AND EVALUATION.
- MORE EFFICIENT PRODUCTION LEVELS WITH GUARANTEES (E.G., MULTI-YEAR PROCUREMENT, ECONOMIC ORDER QUANTITIES).
- DOD ESTIMATES SAVINGS OF $15.9 BILLION OVER THE PERIOD 1981 THROUGH 1988.

It is yet undetermined what the real impact will be from DOD cost control initiatives. While the initiatives are commendable, most are not new. Independent costing, for example, has been used since about 1969. Independent cost estimates being used currently may only represent a more rigorous application of old techniques. For example, regression analysis is used to more precisely estimate the rate of decline in a learning curve forecast rather than assuming a 80 or 90 percent learning curve. When we tested one of the independent costing models, we found it violated several assumptions required in applying regression analysis. Thus, these independent cost estimates may not be significantly improved.

Almost everyone familiar with DOD procurement practices believes that costs could be reduced through more economic production quantities and increased use of multiyear contracting. But such savings are not automatic and these programs could even result in higher cost. Defense plans have a propensity to change, systems do run into trouble, and it is not unusual to suffer funding reductions. Producing under economic order quantities or multiyear contracts will lower prices only if certain circumstances exist and can be maintained. If these circumstances do not exist, such programs could easily raise defense costs.

Congress severely limited multiyear contracting in 1972 after huge cancellation fees were paid on some Navy shipbuilding programs. DOD is, of course, aware of their experience in the past and plans to avoid known pitfalls by carefully selecting program candidates. The Center for Naval Analysis, however, concluded in 1982 that the best candidates for multiyear procurement are not necessarily those with the greatest cost saving potential. They stated that multiyear contracts may be valuable under a wider range of circumstances for standardized procurement items for which there is a long term, predictable demand. Savings due to multiyear contracts from these programs should not be used to predict savings for major weapons programs.

DOD had predicted $2.6 billion in savings due to more economic production rates over the period 1982-1989. To date, however, some of these programs have experienced funding reductions resulting in higher (not lower) program cost.

IMPACT OF DOD INITIATIVES
(BILLIONS)

CANCELLATION AND REDUCTION OF LOWER PRIORITY PROGRAMS (81-88)	$ 8.8
MULTIYEAR PROCUREMENT (81-83)	4.5
MORE ECONOMIC PRODUCTION RATES (82-89)	2.6*
TOTAL (OVER 7 YEARS)	$15.9

BLANK PAGE

SECTION THREE: THE EXTENT OF UNDERESTIMATION

METHODOLOGY

In this final section we analyze the percent of TOA in excess of the FYDP projection for our sample of major weapon systems and for the overall FYDP total. Mathematically, we use statistical techniques of time series analysis to examine historical trends in the percent underestimate [(Actual TOA - FYDP estimate)/ FYDP estimate] of DOD funding requirements. We use this statistical estimate of historical trends in the pattern of the underestimates to project potential future underestimates.

The particular statistical tool chosen for the analysis is the Box-Jenkins (or ARIMA) procedure. Box-Jenkins Time Series Analysis is a management analysis tool which can be used to forecast for planning purposes. Since it predicts by identifying a pattern of past movements, time series analysis provides a useful description of historical data. It will not explain why the data behaves as it does. However, the technique confirms and quantifies the existence of a systematic pattern which can be explained by knowledge or understanding of a situation.

Listed below are time series projections of the historical pattern of undercosting based on our 97 major weapon systems sample. These figures simply state that if the historical patterns continue through the current Five Year Plan, Congress will likely provide 31 percent more TOA than anticipated, and as in the past, this will not be sufficient to purchase the planned quantities.

PROJECTION OF HISTORICAL TRENDS

MAJOR WEAPON SYSTEMS PROCUREMENT

FYDP	PERCENT ABOVE FYDP ESTIMATE
1979 - 1983	35
1980 - 1984	34
1981 - 1985	31
1982 - 1986	31
1983 - 1987	31
1984 - 1988	31

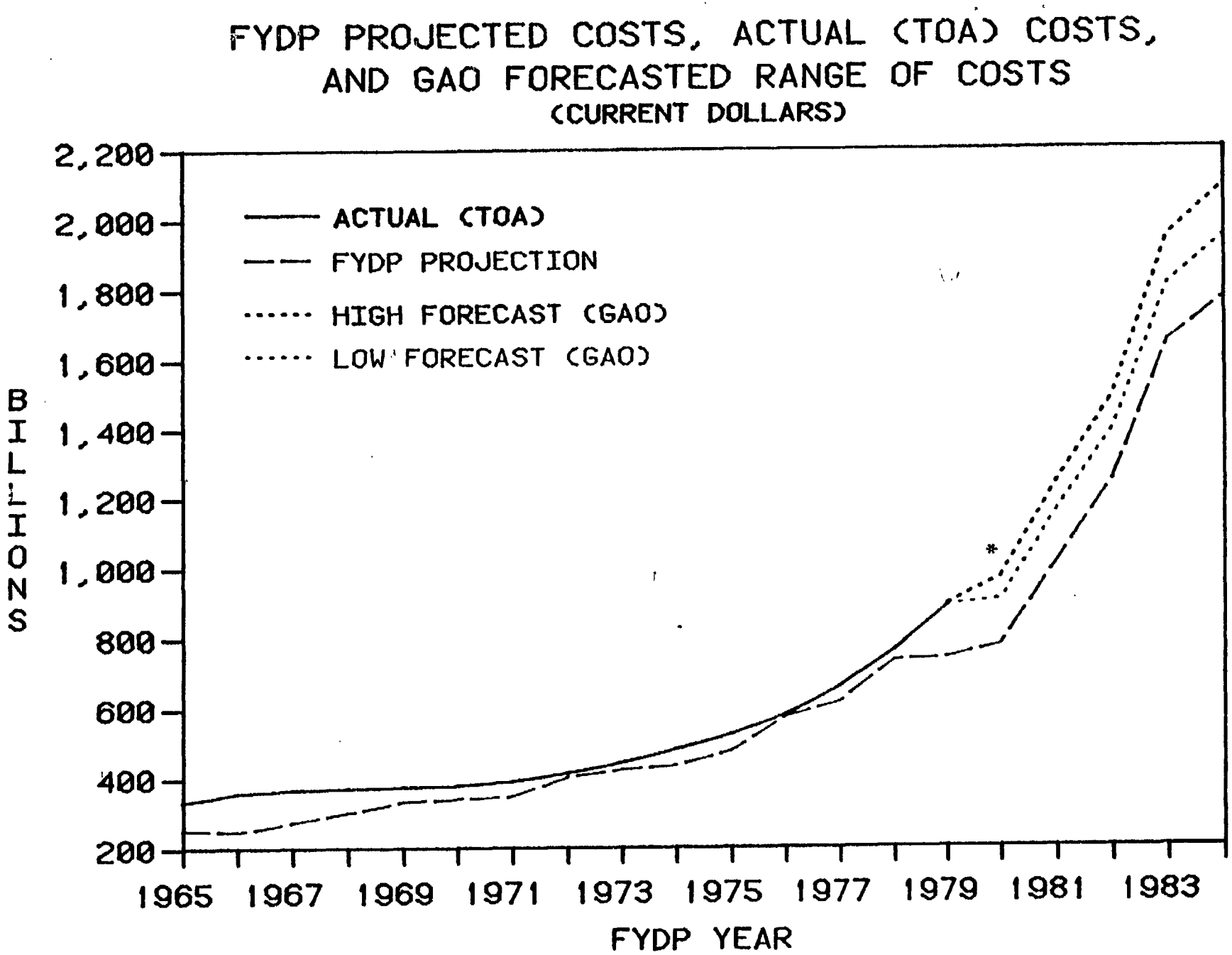

FYDP PROJECTED COSTS, ACTUAL (TOA) COSTS,
AND GAO FORECASTED RANGE OF COSTS
(CURRENT DOLLARS)
ACTUAL (TOA)
FYDP PROJECTION
HIGH FORECAST (GAO)
LOW FORECAST (GAO)
BILLIONS
2,200
2,000
1,800
1,600
1,400
1,200
1,000
800
600
400
200
1965
1967
1969
1971
1973
1975
1977
1979
1981
1983
FYDP YEAR

FIGURE 13

In the graph above we project a statistical range of probable future TOA levels based on the FYDP/TOA relationship since 1965. Although there is no certainty that these patterns will continue, if historical trends are projected, the FY 1984 to 1988 plan would absorb at least $173 billion or as much as $324 billion more (in current dollars) than DOD has estimated (see figures below).

	RANGE IN DOLLARS (BILLIONS)	RANGE IN PERCENT
1980 - 1984 FYDP	129.5 to 188.7	15 to 24
1981 - 1985 FYDP	152.0 to 227.7	15 to 22
1982 - 1986 FYDP	149.6 to 240.1	12 to 19
1983 - 1987 FYDP	164.8 to 303.9	10 to 18
1984 - 1988 FYDP	172.9 to 323.9	10 to 18

There is some reason to believe that even the upper range of these projections may be conservative. However, much will depend on whether the FYDP estimates for 1981 through 1984 are in fact more accurate than in the past. If the higher defense cost proposed by DOD in its' 1981 through 1984 FYDP's are a reflection of better procurement planning and cost estimating we should expect the level of TOA to more closely approximate the FYDP figures. While measures have been taken to improve the accuracy of the FYDP the impact of these measures is not yet visible. If we look at DOD's 1980 FYDP and the TOA apropriated to date, we see the pattern of underestimation continues. The estimated cost of the 1980 - 1984 FYDP was $781.4 billion. Through FY 1983 Congress had already appropriated $768.4 billion. DOD's current estimate of TOA for the final year of the plan is $259.1 billion. Using the FY 84 estimate, total TOA will exceed the FYDP estimate by $246.1 billion. This exceeds the higher range of our projections by $57.4 billion (see asterisk).

The important point is not so much the magnitude of the underestimate but the mere fact that there is a perpetual undercosting problem and that about two-thirds of this results from underestimates in the procurement portion.

SUMMARY

--HISTORICALLY FYDP COST HAVE BEEN UNDERESTIMATED. THERE IS LITTLE EVIDENCE TO INDICATE THE PATTERN OF UNDERCOSTING HAS CHANGED.

--OPTIMISTIC ASSUMPTIONS DRIVE WEAPON SYSTEMS COST PLANNING. FORECASTS OF FUTURE DECLINING COST ARE NOT PROPERLY OFF-SET WITH PROBABLE COST GROWTH FACTORS.

--RECENT INITIATIVES DO NOT RESOLVE SYSTEMATIC BIASES IN COST PLANNING.

--IF HISTORICAL TRENDS CONTINUE THE FY 1984 - 1988 MAJOR WEAPON SYSTEMS PROCUREMENT PROGRAM MAY ABSORB 31 PERCENT MORE FUNDS AND DELIVER FEWER THAN PLANNED QUANTITIES.

--ALTHOUGH THERE IS NO CERTAINTY THAT THESE PATTERNS WILL CONTINUE, IF HISTORICAL TRENDS ARE PROJECTED THE FY 1984 - FY 1988 DEFENSE PROGRAM COULD ABSORB $173 TO $324 BILLION MORE THAN PLANNED.

APPENDIX

APPENDIX I

APPENDIX I

FY 85-89 POM:

Planned Procurement Unit Cost changes (Const $)

% Chg	Service	Program	% Chg	Service	Program	% Chg	Service	Program	% Chg	Service	Program
-88	J	AMRAAM	-34	A	Divad	-12	N	LPD-4 SLEP	0	N	TAO
-84	N	VTX	-32	AF	F-15	-10	AF	Laser Bomb Kit	0	N	TAGOS
-82	AF	KC-10	-31	A	AH-64	-10	A	TOW	N/A	AF	E-3
-76	AF	HH-60	-31	N	SH-60B	-10	N	CH-53E	N/A	AF	TR-1
-72	AF	T-46	-31	N	E-2C	-10	N	BB Reactivation	N/A	A	RC-12
-68	AF	Bigeye	-30	A	GSRS	-10	J	AIM-7	N/A	A	Mob. Prot. Gun Sys.
-67	A	Patriot	-30	A	M-198	-9	A	M-109	N/A	N	MK-60
-63	AF	M-X	-29	N	F-18	-8	N	T-34	N/A	N	TAK (Conversion)
-58	N	ECX	-26	N	DDG-51	-8	N	MSH-1	N/A	N	TAGM
-54	N	Adv.Lt.Wt.Torp.	-26	N	AE	-7	A	Pershing	+3	N	U-12
-53	N	C-5	-25	A	M-2/3	-6	A	Chapparal	+3	N	SSN-688
-52	N	C-2	-24	A	Bushmaster	-6	N	Std. Missile	+5	A	LAV-25
-51	AF	B-1	-23	AF	CSU-89	-6	N	MK-75 Gun Mt.	+7	N	MCM
-51	AF	AGM-65D	-23	N	AOE	-5	N	Trident SSBN	+8	N	C-9
-46	AF	CBU 87	-20	AF	GLCM	-4	A	M-88	+8	N	LHD-1
-45	A	Stinger	-20	N	AIM-54	-4	N	LCAC	+9	N	CG-47
-44	N	Trident II Msl.	-19	AF	F-16	-3	N	LSD-41	+10	N	MK-15
-43	AF	C-17	-18	A	EH-60	-2	A	M-1	+21	N	AGM-84
-43	N	BGM-109	-18	N	EA-6	-2	N	MK-48 Torp.	+27	N	A-6E
-43	J	AGM-88	-18	J	Hellfire	0	AF	Airfield Att.Wpn.	+33	N	MK-30
-41	N	AV-8B	-14	A	UH-60	0	A	Fld. Arty. Ammo. Supt. Veh.	+56	J	AIM-9
-38	AF	MC-130	-14	N	AH-1				+86	AF	30mm NEI
-37	AF	C-140 Repl.	-13	AF	GBU-15	0	N	P-3	+111	N	MK-46
-36	A	M-252	-12	N	CV SLEP	0	N	LPDX	+157	A	30mm API
									+232	N	F-14

N/A • Programmed for FY85 Only

Source: Franklin C. Spinney, before House Budget Committee, Feb. 8, 1984

APPENDIX II

FYDP STUDY PROCUREMENT SAMPLE

AIRCRAFT

Army	Navy	Air Force
AH-1 Cobra	AV8A&B Harrier	A-7
CH-47A Chinook,	A-4 Skyhawk	A-10
UH-1 Iroquois	A-6 Intruder	AU-X Armed STOL
OV-1 Mohawk	A-7 Corsair	C-5
OH-6A	CH-46	C-130
CH-54A	CH-53E	C-135
UH-60A Blackhawk	EC-2 Hawkeye	KC-135
AH-64	F-4 Phantom	C-141
	F-14 Tomcat	E-3A AWACS
	F-18 Hornet	E-4 AABNCP
	P-3C Orion	EF-111A
	S-3A Viking	F-111A
	SH-3A Sea King	FB-111
	SH60B Lamps MK III	F-4
		F-5
		F-15
		F-16
		OV-10

SHIPS

Navy
AO Fleet Oiler
CG-47 Aegis Cruiser
CGN-38 Class
CVA
DDG-47
DD 963 Destroyers
FFG-7 Class GMF
LHA Amph. Assaul
NATO PHM
SSBN Submarines
SSN 688 Submarines
Trident Submarines

APPENDIX II

FYDP STUDY PROCUREMENT SAMPLE

MISSILES

Army	Navy	Air Force
Dragon	Captor MK-60	ALCM
Copperhead 155 mm.	Condor AGM-53B	GLCM
Hawk	Harm AGM-88A	Harm AGM-88A
Hellfire	Harpoon	Maverick
Honest John	Phalanx MX-15	Minuteman
Lance	Phoenix AIM-54	Sidewinder
Patriot (Sam-D)	Poseidon UGM-73A	Sparrow
Pershing	Sidewinder AIM-9	Titan
Pershing II	Sparrow AIM-7	SRAM AGM-69 A/B
Roland	Tomahawk SLCM	
Shillelagh	Torpedo MK-48	
SS-11	Trident UGM-96A	
Stinger		
TOW		
MLRS		

TRACKED VEHICLES

Army
Bradley Fighting Vehicle
Bridge, Mobile Assault
M-113 A1/A2 Pers. Carrier
DIVAD System
M109 155 mm Howitzer
M198 155 mm Howitzer
M-88 A1 Recovery Vehicle
M-60 Tank A1/A3
M-1 Abrams Tank