APPENDIX A
COST VARIANCE EXAMPLES

I. INTRODUCTION

A. BACKGROUND

1. The yardstick of a program's financial success is the magnitude of program cost growth. Cost growth is the difference between the original program cost estimate, the baseline, and the cost of the delivered system. Such a simplistic measure of cost growth yields little insight to a program's true cost experience and can be misleading. A program which has experienced no net cost growth but delivers only half the original quantity is not a financial success. On the other hand, a program completed on time, within specifications, and in full quantity but with a 50 percent cost growth because of inflation should not be considered a financial disaster.

2. Measuring cost growth in an analytically and managerially useful fashion requires the segregation of economic and quantity factors from all other cost growth. DoD Instruction 7000.3 (reference (a)) requires the segregation of cost variances into seven categories of which the Economic and Quantity categories are of paramount importance. This appendix is intended to portray typical approaches to the categorization of SAR cost variances with emphasis on multiple category changes and integrity maintenance of the Economic and Quantity categories.

B. DATA REQUIREMENTS

1. Computation of variance categories requires a baseline (usually the DE) and a CE at some level of detail by fiscal year. The minimum required detail is determined by two requirements:

a. The detailed estimate must have a line for each data element required in the Program Acquisition Cost section of Format E.

b. The detail must include a separate line for each item of hardware for which a cost quantity curve, SAR Format I, is required.

2. Because of the requirement to calculate variances in base year dollars and escalated dollars, the analyst will usually find that calculations are easier if the detailed working estimate is in base year dollars. Escalation can be identified in either a single line for each appropriation or individually for each line of the detailed estimate.

3. If the SAR analyst does not participate in the preparation of the formal detailed program estimate, he or she must make the estimator aware of the input detail required for variance calculations. This can be troublesome when the budget process results in program funding estimates which do not directly relate to the estimating assumptions and techniques of the cost analyst. When this occurs, it may be necessary to distribute the budget estimate arbitrarily to the required lines of the SAR estimate.

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When making this distribution, the analyst should be careful to assign hardware line item values in a manner consistent with the appropriate cost-quantity curves. Sloppiness in maintaining the.integrity of cost-quantity curve-related data elements may result in a requirement to recompute prior variances when updated cost-quantity curves are formally submitted. Updated curves are required when "there is a 10 percent increase in a cost-quantity curve-related data element or when a program cost estimate is formally updated via a Program or Milestone review;

c. PROCEDURE

1. This appendix follows a hypothetical aircraft program through five SAR iterations. The computation formats and procedures portrayed are not mandatory unless specifically directed by DoD Instruction 7000.3 (reference (a)). However, the analyst's task will be easier if he or she establishes a consistent routine in terms of procedures and formats for variance calculations.

2. The following general procedures should be typical and will be followed in this appendix:

a. Prepare the CE for the previous SAR submission in the required line item detail by fiscal year. The estimate should include base year and escalated dollars by appropriation.

b. Determine, in order of calculation, the required change categories by line item.

c. Ensure that all new cost inputs are in terms of the necessary line item detail as determined in step b.

d. "If inputs are in escalated dollars, convert them to base year dollars.

e. Compute the basic changes in the required order.

f. Make allocations and adjustments to basic change calculations. Allocations and adjustments will usually be required in the following circumstances:

(1) A quantity change is made when DE and CE learning curves are different.

(2) A quantity change and schedule change occur in the same report.

(3) A change results in a cost reduction.

g. Update the previous detailed CE with the current changes.

h. Prepare SAR Formats E, G, and H.

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II. THE DEVELOPMENT ESTIMATE BASELINE

A. THE ESTIMATE

1. Table II. 1 displays the DE by appropriation and major cost element. Major cost elements are displayed in constant FY 79 (base year). dollars with escalation shown as a single line for each appropriation. For purposes of this example, the DE is defined at the minimum level of detail consistent with the cost variance requirements of DoD Instruction 7000.3 (reference (a)). This minimum detail is driven by three requirements:

a. Each major appropriation must be separately displayed in Formats E, G, and H. In this example there are three appropriations: RDT&E, Procurement, and Military Construction.

b. Procurement costs in Format E must be displayed as flyaway cost, other weapon system cost, and initial spares and repair parts with the level of aggregation in each major increment determined on a program-by-program basis. In this example, flyaway cost is required in terms of airframe, engine, and avionics. Other weapon system cost is divided between Peculiar Support Equipment and all other.

c. Quantity changes must be computed from the original cost-quantity curves. For this example, engines and airframes are computed from cost-quantity curves. For simplicity, avionics are assumed to exhibit no learning. Although there is no SAR requirement to break out development costs , airframe and engines are detailed because prototype costs are related to the procurement cost-quantity curves. Engine spares are separately detailed because they are estimated on the same cost-quantity curve as the engines included in flyaway cost.

2. The footnotes to Table 11.1 identify the cost-quantity curve assumptions and relationships between prototype and production units. SAR preparers should be familiar with learning curve theory, but this knowledge is not mandatory for preparing a SAR. The analyst can perform all necessary variance calculations provided he or she is given the new costs by fiscal year in the detail contained in Table 11.1.

3. Tables 11.2 and 11.3 portray the economic assumptions used in the DE. The composite indices are determined by the methods explained in paragraph 4-3.c. of the guide.

TABLE II. 1
DEVELOPMENT ESTIMATE **BASELINE**
September 30, 1978

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	**TOTAL**	
Development:												
Airframe												
Qty		**1**	**1**	2							4	
cost		150.0	105.0	178.5							433.5	1/
Engine												
Qty	6	8	10								24	
Cost	27.4	28.8	32.6								88.8	2/
Other	272.6	221.2	512.4	621.5	750.0	300.0					*2,677.7*	
Total **79$**	$300.0	3/ $400.0	3/ $650.0	$800.0	$750.0	$300.0					$3,200.0	3/
Index	0.917	0.972	1.030	1.092	1.158	1.227						
Escalation	3/	3/	19.5	73.6	118.5	68.1					279.7	
Total (Esc $)	$300.0	$400.0	$669.5	$873.6	S368.5	$368.1					$3,479.7	
Procurement:												
Airframe												
Qty				10	20	40	40	40			150	
cost				720.9	1111.9	1823.8	1590.6	1460.9			6,708.1	4/
Engine												
Qty				50	100	200	250				600	
cost				140.4	234.9	415.2	475.2				1,265.7	5/
Avionics				105.0	190.0	370.0	360.0	355.0			1,380.0	
Subtotal **(Flyaway)**				966.3	1536.8	2609.0	2425.8	1815.9			9,353.8	
Peculiar Support				150.0	320.0	500.0	70.0				1,040.0	
Other Weap. Sys. Cost 6/				80.0	70.0	30.0	30.0	15.0			225.0	
Initial Spares												
Engine												
Qty				25	50	60	60	45			240	
cost				(70.2)	(117.5)	(124.6)	(114.0)	(82.3)			(508.6)	5/
Other				(75.0)	(110.0)	(140.0)	(150.0)	(149.0)			(624.0)	
Total Spares				145.2	227.5	264.6	264.0	231.3			**1,132.6**	
Total Proc. (?9$)				$1341.5	$2154.3	S3403.6	$2789.8	$2062.2			**$11,751.4**	
Index				1.313	1.392	1.476	1.565	1.658				
Escalation				419.9	844.5	1620.1	1576.2	1356.9			5,817.6	
Total Proc. (Esc $)				**$1761.4**	**$2998.8**	$5023.7	$4366. o	$3419.1			$17,569.0	
Construction (79$)				100.0	150.0						250.0	
Index				1.313	1.392							
Escalation				31.3	58.8						90.1	
Total Const. (Esc $)				$131.3	$208.8						**$340.1**	

1/ Airframe cost calculated from tbe following log-linear cumulative average cost-quantity curve:

$Y = AX^b$ where
Y . cumulative average unit cost
A = cost of the first **unit**
X = cumulative quantity
b = slope exponent

For the Airframe, A = $150.0 **and** the exponent for the assumed 85% slope (b) is -0.234465. **For** this **exercise, the** first unit cost **of** $150.0 is assumed to be **constant** FY78 dollars **as** well **as** constant FY79 dollars.

2/ Engine cost is calculated the same as in 1/ **above except** A = $6. o and b = -0.152003 for a 90% **slope.**

3/ Since the base year is **FY79,** the FY77 and 78 values are **actuals.** The **amount** of escalation which must **be** added to arrive at the **FY79$** value for those years is calculated as **follows: (Pre-base** year **actuals)** ÷ (index) = **(base** year dollars) ; (300 ÷ 0.917) + (400 ÷ 0.972) = $738.7: **amount** to be added is (738.7) - (300 + 400) = $38.7 and should **be shown** on SAR **format** E by footnote.

4/ Airframe **costs** are based on the same cost quantity curve **as** for R&D prototypes **except that the** calculation **assumes** three rather than four prototype units to account for the effects **of** the production break **between** R&D and procurement.

5/ Engine costs **are based on** the **same cost quantity curve as** for R&D **prototypes except** that the calculation assumes 18 rather **than** 24 prototype **units to account for the** effects **of the** production **break** between R&D and procurement. Costs are computed **on** the **basis of total annual buys , including spares ,** and allocated to **Flyaway** and Spares lines proportionally (e.g. , FY82 engine **buy is** 50 **flyaway plus** 25 **spares for** a total engine buy of 75. The **cost** of 75 engines **is** 210.6 **(FY79$) and as** allocated **to flyaway** by (50 ÷ 75) x 210.6 = 140.4. The balance of 70.2 (210.6 - 140.4) **is for** the 25 **engine spares) .**

6/ Training and data per DoDI 5000.33 and MIL STD 881.

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Fiscal Year	Annual Rate(%)	Price Level Index	Composite Indices		
			RDT&E	Procurement	Construction
1977	6	0.890	0.917		
1978	6	0.943	0.972		
1979	6	1.000	1.030		
1980	6	1.060	1.092		
1981	6	1.124	1.158		
1982	6	1.191	1.227	1.313	1.313
1983	6	1.262		1.392	1.392
1984	6	1.338		1.476	
1985	6	1.419		1.565	
1986	6	1.504		1.658	
1987	6	1.594			
1988	6	1.689			
1989	6	1.791			
1990	6	1.898			

Table 11.2 Indices

Appropriation	Outlay Percent/Year 1st	2nd	3rd	4th	5th
RDT&E	55	40	5		
Procurement	10	40	30	15	5
Construction	10	40	30	15	5

Table 11.3 Outlay Rates

Table 11.4. shows how the FY 84 composite procurement index was calculated. The tabular format is identical to Table 4-5 in Chapter 4 of the guide.

Outlay % ÷ 100	Fiscal Year	1984	1985	1986	1987	1988
	Price Level Index	1.338	1.419	1.504	1.594	1.689
.10		0.134				
.40			0.568			
.30				0.451		
.15					0.239	
.05						0.084
	Composite Index = sum of diagonal =					1.476

Table 11.4 FY84 Composite Index

B. FORMATS

1. Tables 11.5, 11.6, and II.7 portray SAR Formats E, G, and H for the example. These formats should be compared to Table II. 1 so that the reader understands the relationship between the SAR formats and the DE detail. Since this is the first SAR, the DE and CE are the same. Note that the base year is FY 79. This means that FY 77 and 78 values are represented in Table II. 1 as prebase year actuals. The values for these 2 years are never affected by the escalation calculations in this example.

2. The remainder of this example complies with the following format:

a. The changes to be made will be described.

b. Calculations will be made by variance category for each appropriate line item of Table 11.1.

c. The line item changes will be summarized into the Table 11.1 format to become the detailed CE on which the next set of changes will be based.

d. The CE values for SAR Formats E and H will be extracted from the new summary CE detail.

TABLE 11.5
Selected Acquisition Report
System: B-X

As of Date: 30 September 1978

(Dollars in Millions)

E. Program Acquisition 1. cost	(1) Development Estimate (FY77-86)	(2) Changes	(3) Current Estimate (FY77-86)
Development	.$3,200.0 1/		$3,200.0
Procurement	11,751.4		11,751.4
Airframe	6,708.1		6,708.1
Engines	1,265.7		1,265.7
Avionics	1,380.0		1,380.0
Total Flyaway	9,353.8		9,353.8
Peculiar Support Equip.	1,040.0		1,040.0
Other Weap. Sys. cost	225.0		225.0
Initial Spares	1,132.6		1,132.6
Construction	250.0		250.0
Total : Constant FY79$	$15,201.4 1/		$15,201.4
Escalation	6,187.4		6,187.4
Total Program Cost	$21,388.8		$21,388.8
2. Quantities			
Development	4		4
Procurement	150		150
Total	154		154
3. Unit Cost			
Procurement:			
Constant FY79$	$78.3		$78.3
Escalated	117.1		117.1
Program:			
Constant FY79$	$98.7		.$98.7
Escalated	138.9		138.9

Funding	(4) Current & Prior Yrs	(5) Budget Year (FY79)	(6) Balance to Complete FYDP	(7) Balance to Complete Beyond FYDP	(8) Total
Development	$700.0	$669.5	$2,110.2		$3,479.7
Procurement			4.760.2	12,808.8	17,569.0
Construction			340.1		340.1
Total	$700.0	$669.5	$7,210.5	$12,808.8	$21,388.8
Quantity					
Development	1	1	2		4
Procurement			30	120	150
Total	1	1	32	120	154

4. Approved Design to Cost Goal: Average Flyaway Cost for 150 units at a peak production rate of 4 per month.

	Development Estimate	Approved Program	Current Estimate
Constant FY79$	$62.4	$62.4	$62.4
Escalated	93.8	93.8	93,8

5. Foreign Military Sales: None

1/ Includes $300.0 in FY77 and $400.0 in FY78 actuals. .$38.7 must be added to raise total pre-base year actuals to FY79$.

TABLE 11.6
COST VARIANCE ANALYSIS
(Dollars in Millions)

As of Date: 30 September 1978
Base Year: 1979

G.	Base Year/FY79 Constant $ DEV	PROC	CONST	SUBTOTAL	ESC	TOTAL	REMARKS
Development Estimate	$3,200.0	$11,751.4	$250.0	$15,201.4	$6,187.4	$21,388.8	Esc : Dev. 279.7; Proc. 5817.6; Const. 90.1
Previous Changes							
Current Changes							
Total Changes							
Current Estimate	$3,200.0	$11,751.4	$250.0	$15,201.4	$6,187.4	$21,388.8	Esc : Dev. 279.7; Proc. 5817.6; Const. 90.1

TABLE 11.7
Selected Acquisition Report
System: B-X

As of Date: 30 September 1978

H. BUDGET YEAR AND OUT YEAR PROGRAMS

Fiscal Year	Current Estimate Budget Year Thru Completion			Escalation (Base Year FY79) Amount			Rate 1/		
	Dev.	Proc.	Const.	Dev.	Proc.	Const.	Dev	Proc	Const
1979	$669.5			$19.5,			6.0		
1980	873.6			73.6			6.0		
1981	868.5			118.5			6.0		
1982	368.1	1,761.4	131.3	68.1	419.9	31.3	6.0	6.0	6.0
1983		2,998.8	208.8		844.5	58.8	-	6.0	.6.0
1984		5,023.7			1,620.1			6.0	-
1985		4,366.0			1,576.2			6.0	-
1986		3,419.1			1,356.9			6.0	-
Total	$2,779.7	$17,569.0	$340.1	$279.7	$5,817.6	$90.1			

1/ Since the annual rates shown do not incorporate spend-out rates or the compounding effect of prior years' escalation, they cannot be used to track the inflation amounts shown for applicable years.

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III. CURRENT ESTIMATE CHANGES , DECEMBER 31, 1978

A. SITUATION

1. Three changes to the CE have been directed as a result of the FY 80 PPBS process:

a. Escalation rates for the FY 80 budget and subsequent years have been revised. The new annual rates and resultant composite indices are shown in Table 111.1 below.

Fiscal Year	Annual Rate(%)	Price Level Index	Composite Indices[1] RDT&E	Procurement	Construction
1977	6	0.890	0.917		
1978	6	0.943	0.972		
1979	6	1.000	1.030		
1980	6	1.060	1.095		
1981	6.5	1.129	1.166		
1982	6.6	1.203	1.243	1.337	1.337
1983	6.5	1.282	1.323	1.421	1.421
1984	6.4	1.364		1.508	1.508
1985	6.3	1.450		1.599	
1986	6	1.537		1.695	
1987	6	1.629		1.796	
1988	6	1.726		1.904	
1989	6	1.830			
1990	6	1.940			
1991	6	2.056			
1992	6	2.180			

[1]Outlay rates are unchanged from Table 11.3.

TABLE 111.1 Indices

b. Budget limitations have resulted in a reduction of planned FY 80 funding and a restructuring of the remaining development schedule. The revised development funding is shown in Table 111.2. Note that the restructuring has added 1 year to the development program and deferred one prototype airframe from FY 80 to FY 81. As a result, the start of the procurement and construction program has also been delayed 1 year.

	FY80	FY81	FY82	FY83
Prototype Qty (Airframe)	1	1		
Airframe 79$	(92.8)	(85.7)	-	
79$ Total	725.0	775.0	325.0	30.0
. Index	1.095	1.166	1.243	1.323
Escalated $ Total	793.9	903.7	404.0	39.7

TABLE 111.2 Development Funding

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c. The engine spares requirement has been increased from 240 to 270 engines. This will be accomplished by increasing the engine spares buy from 60 to 70 in the 4th year and from 45 to 65 in the 5th year.

2. Note that the funding change in Table III.2 is shown in both base year and escalated dollars. When program changes are provided to the SAR analyst in escalated dollars, the analyst should restate the values in base year dollars before proceeding with the required calculations. The 79$ values in Table 111.2 are derived by dividing the escalated dollar values by the appropriate composite index in Table 111.1. This table is used rather than Table 11.2 because the values are for the FY 80 budget submission and reflect the new budget indices. Although it is possible to do the required variance computations in escalated dollars and backout the escalation later, it will generally be easier to restate the initial input data in base year dollars. This will be especially true for the December SAR since the December CE will usually assume different indices than the September CE. All calculations in this appendix are done in base year dollars.

B. VARIANCE CATEGORIES AND COMPUTATIONS

1. The next step is to determine which variance categories will be involved.

a. The change in indices is clearly an Economic Change.

b. The restructuring of the development program results in a Schedule Change for all three appropriations: RDT&E, Procurement, and Construction.

c. The additional cost associated with the engine spares increase is a Support Change because spares are not part of the flyaway cost. However, since spares and flyaway engines are procured from the same production line, they are estimated on the same cost-quantity curve. The spares increase occurs in the 4th and 5th years of the procurement schedule. The last engine buy for production aircraft is in the 4th year of the procurement program. The increased spares buy in the 4th year will increase the total 4th year engine buy, spares plus flyaway, resulting in a lower average unit cost for all engines in the 4th year. The reduced cost of the 4th year production engine buy is an Estimating Change.

d. Four variance categories are involved. In accordance with DoD Instruction 7000.3 (reference (a)), the variance categories will be computed in the following order: Economic, Schedule, Estimating, and Support.

2. Table 111.3 displays the required variance calculations.

a. First, the Economic Change is calculated by appropriation. The Economic Change is the difference between the immediately preceding SAR CE (September 1978) and the same estimate using the new indices. For 1980 RDT&E, the new escalation amount is the September 1980 value in base year dollars ($800.0 from Table II.1) times the new composite index (1.095 from

Table III. 1) less the base year value ($800.0) . Subtracting the September . SAR escalation amount for 1980 ($73.6 from Table II. 1) from the new 1980 escalation amount yields the Economic Change for 1980. The arithmetic looks like this:

$800 X 1.095 = $876.0
$876.0 - $800.0 = $76.0 New Escalation
$76.0 - $73.6 = $+2.4 Economic Change

Repeating the above procedure for each year and each appropriation yields a total Economic Change of $+394.8.

b. Next, the Schedule Change is calculated by appropriation.

(1) The new development funding from Table 111.2 is spread (including the FY 77-79 values from Table II.1) and escalated by the new indices. The Total column shows a value of $3205.0 (J?Y 79$) which is $5.0 greater than the September FY 79$ RDT&E total of $3200.0. The $+5.0 is the base year dollar portion of the RDT&E Schedule Change. In Table 111.3 the total RDT&E escalation is $305.8- Subtracting the total September RDT&E escalation of $279.7 (from Table 11.1) the total escalation has increased by $26.1. This total change includes the $+13.2 RDT&E Economic Change calculated in B.2.a. Subtracting the Economic Change portion leaves a net program change-related escalation value of $+12.9 for the RDT&E Schedule Change. :

(2) Unlike the development program which was stretched from a 6- to a 7-year program, the procurement program remains a 5-year program with no change in the annual base year dollar amounts. The start has been delayed from FY 82 to FY 83, causing an increase in the escalated dollar totals. The procurement schedule PCR is computed exactly as it was for RDT&E in B.2.b. (1). The new total procurement escalation is $7,278.4. Subtracting the September procurement escalation (from Table 11.1) yields a total Escalation Change of $+1,460.8. Subtracting the previously calculated procurement Economic Change of $374.8 yields PCR escalation of $+1,086.0. The procedure is repeated for construction.

c. The Estimating Change relating to the flyaway engines but caused by the increased engine spares buy is calculated next. This is done by subtracting the prior (September 1979 values in 79$ from Table 11.1) flyaway engine funding profile, entered on the new schedule, from the new engine flyaway funding. The result is the base year dollar change of $-0.6. The changes by fiscal year are then escalated by the new composite indices to determine the Estimating PCR escalation.

(1) Note that in this case only FY 86 has changed. This is because the cost and quantities of both flyaway and spares engines are the same prior to FY 86.

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TABLE 111.3
PROGRAM CHANGES (DECEMBER 31, 1978)

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	TOTAL	HAN
SEP. PDT&E (79$)	$300.0	$400.0	$650. 0	$800.0	$750.0	$300.0						$3,200.0	
New Index	see footnote 1/		1.030	1.095	1.166	1.243							
New Esc			19.5	76.0	124,5	72.9						292.9	
Previous Esc			19.5	73.6	118.5	68.1						279.7	
Econ. Chg			-0-	+2.4	+6. 0	+4.8						+13.2	+13. 2 Economic (RDT&E)
SEP. PROCUREMENT (79$)						$1341.5	$2154.3	$3403.6	$2789.8	$2062.2		$11,751.4	
New Index						1.337	1.421	1.508	1.599	1.695			
New Esc						452.1	907.0	1729.0	1671.1	1433.2		6,192.4	
Previous Esc						419.9	844.5	1620.1	1576.2	1356.9		5"817.6	
Econ. Chg						+32.2	+62.5	+108.9	+94 .9	+76 .3		+374.8	+374. 8 Economic (Proc)
SEP. CONSTRUCTION (79$)						$100.0	$150.0					$250.0	
New Index						1.337	1.421						
New Esc						33.7	63.2					96.9	
Previous Esc						31.3	58.8					90.1	
Econ. Chg						+2.4	+4.4					+6.8	+6. 8 Economic (Const)
TOTAL ECONOMIC CHANGE				$+2.4	$+6. 0	$+39.6	$+66.9	$+108.9	$+94.9	$+76. 3		$+394.8	+394. 8 Economic (Total)
REV IS ED SCHEDULE:													
RDT&E (79$)	$300.0	$400.0	$650. 0	$725.0	$775.0	$325.0	$30.0					$3,205.0	+5. o Schedule ($3205.0
New Index	see footnote 1/		1.030	1.095	1.166	1.243	1.323						- $3200.0) (FY79$)
Esc $ Total	$300.0	$400.0	$669.5	$793.9	$903.7	$404.0	$39.7					$3,510.8	
										Total RDT&E Esc		305.8	
										Less Previous RDT&E Esc		-279.7	
										Total Esc Change		+26.1	
										Less RDT&E Econ		-13.2	
												+12.9	+12. 9 PCR Escalation
Procurement (79$)							$1341.5	$2154.3	$3403.6	$2789.8	$2062.2	$11,751.4	
New Index							1.421	1.508	1.599	1.695	1.796		
Esc $ Total							$1906.3	$3248.7	$5442.4	$4728.7	$3703.7	$19,029.8	
										Total Proc. Esc		7,278.4	
										Less Previous Proc. Esc		-5,817.6	
										Total Esc Change		+1,460. B	
										Less Proc. Econ		-374.8	
												$+1,086. O	+1086. O PCR Escalation
Const. (79$)							$100.0	$150.0				$250.0	
New Index							1.421	1.508					
Esc $ Total							$142.1	$226.2				$368.3	
										Total Const Esc		118.3	
										Less Previous Const Esc		90.1	
										Total Esc Change		+28.2	
										Less Const Econ		-6.8	
												$+21.4	+21, 4 PCR Escalation

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TABLE III. 3 (Continued)
PROGRAM CHANGES (DECEMBER 31, 1978)

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	TOTAL	CHANGES
Estimating Change: 2/													
Engine (Flyaway)													
Qty							50	100	200	250		600	
New 79$							140.4	234.9	415.2	474.6		1,265.1	
Prior 79$ 3/							140.4	234.9	415.2	475.2		1 265.7	
79$ Change							-o-	-o-	-o-	-0.6		-0.6	-0.6 Estimating Change (79$)
New Index										1.695			
Esc $ Change										-1.0		-1.0	
Escalation										-0.4		-0.4	-0.4 PCR Escalation (-1.0 - (-0.6))
Support Change:													
Engine Spares													
New Qty							25	50	60	70	65	240	
New 79$							70.2	117.5	124.6	132.9	118.5	563.7	
Prior Qty							25	50	60	60	45	27o	
Prior 79$ 3/							70.2	117.5	124.6	114.0	82.3	508.6	
79$ Change							-o-	-o-	-o-	+18.9	+36.2	+55.1	+55. 1 Support Change (FY79$)
New Index										1.695	1.796		
Esc $ Change										+32.0	+65.0	+97 .0	
Escalation										$+13.1	$28.8	$+41 .9	+41.9 PCR Escalation

1/ Recall from the baseline (DE) that these are pre-base year actuals.
2/ This change is due to the fact that all engines (spares and f lyaway) are estimated from the same learning curve. In other words, the cost of a particular buy is independent of whether the engines are for spares or for airframe integration (see note 5/, Development Estimate Baseline Table II. 1.)
3/ Note that these costs are entered on the new schedule.

(2) Note that these prior annual funding figures are unchanged but they are entered in terms of the new schedule (FY 83-86 rather than the September 1979 schedule of FY 82-85) . This is. because the engine portion of the Schedule Change is already included in the previously calculated total procurement Schedule Change.

(3) The new engine estimate in this example is derived from the cost-quantity curve described in the footnotes to Table 11.1. However, it is not necessary for the SAR analyst to actually perform the cost-quantity curve calculation. All that is necessary is that the analyst be provided with the engine funding profile. Just remember that if the profile is provided in escalated dollars, the profile should be deescalated to base year dollars.

d. The Support Change is determined by subtracting the September 1979 engine spares estimate from the new engine spares estimate. These annual differences in base year dollars are then escalated by the new indices. The resulting escalation amount is the Support PCR escalation. The Table 111.3 entries for Prior 79$ are extracted from the Engine Spares line of Table 11.1 and represent the September 1979 values.

3. Table 11.1 should now be updated with the changes from Tables 111.2 and 111.3. The result is Table 111.4 which represents the detailed CE for the December 1979 SAR. This table becomes the basis from which future SAR variances will be calculated.

4. Tables 111.5, 111.6, and 111.7 are the SAR Formats E, G, and H, respectively. The values in these tables are extracted directly from Tables 111.3 and 111.4.

5. The calculations for the CE of the Approved Design-to-Cost Goal in Format E, Table 111.5 are derived as follows:

a. The FY 79$ value of $62.4 can be obtained from Table 111.4 by dividing the FY 79$ flyaway subtotal of .$9,353.2 by 150 aircraft.

b. The escalated Design-to-Cost value of 101.6 is obtained by escalating the flyaway subtotal annual amounts by the Table 111.1 composite indices and summing for a total flyaway cost in escalated dollars. This total is then divided by 150 aircraft.

c. Note that if quantities or production rates had been changed, this procedure could not have been used. Subsequent iterations of this example will display the detailed procedures for computing the DTC goal only to make Format E complete. It is not the intent of these examples to show how to update the DTC CE. Design-to-cost tracking should be an ongoing formal practice of the program office, and the values should be provided to the SAR analyst for direct insertion in Format E.

TABLE 111.4

CURRENT ESTIMATE (DECEMBER 31, 1978)

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	TOTAL
Development:												
Airframe												
Qty		1	1	1	1							4
cost		150.0	105.0	92.8	85.7							433.5
Engine												
Qty	6	8	10									24
cost	27.4	28.8	32.6									88.8
Other	272.6	221.2	512.4	632.2	689.3	325.0	30.0					2,682.7
Total 79$	300.0 1/	400.0 1/	650.0	725.0	775.0	325.0	30.0					3,205.0
Index			1.030	1.095	1.166	1.243	1.323					
Escalation			19.5	68.9	128.7	79.0	9.7					305.8
Total (Esc $)	$300.0	$400.0	$669.5	$793.9	$903.7	$404.0	$39.7					$3,510.8
Procurement:												
Airframe												
Qty							10	20	40	40	40	150
cost							720.9	1111.9	1823.8	1590,.6	1460.9	6,708.1
Engine												
Qty							50	100	200	250		600
cost							140.4	234.9	415.2	474.6		1,265.1
Avionics							105.0	190.0	370.0	360.0	355.0	1,380.0
Subtotal (Flyaway)							966.3	1536.8	2609.0	2425.2	1815.9	9,353.2
Peculiar Support							150.0	320.0	500.0	70.0		1,040.0
Other Weap. Sys. Cost							80.0	70.0	30.0	30.0	15.0	225.0
Initial Spares							(70.2)	(117.5)	(124.6)	(132.9)	(118.5)	(563 .7)
Engine Cost							25	50	60	70	65	270
Qty							(75.0)	(110.0)	(140.0)	(150.0)	(149.0)	(624.0)
Other							145.2	227.5	264.6	282.9	267.5	1,187.7
Total Spares							$1341.5	$2154.3	$3403.6	$2808.1	$2098.4	$11,805.9
Total Proc. (79$)							1.421	1.508	1.599	1.695	1.796	
Index							564.8	1094.4	2038.8	1951.6	1670.3	7,319.9
Escalation							$1906.3	$3248.7	$5442.4	$4759.7	$3768.7	$19,125.8
Total Proc. (Esc $)												
Construction (79$)							100.0	150.0				250.0
Index							1.421	1.508				
Escalation							42.1	76.2				118.3
Total Const. (Esc $)							$142.1	$226.2				$368.3

1/ See Format E, footnote 1.

TABLE 111.5

Selected Acquisition Report

System: B-X

As Of Date: 31 December 1978

(Dollars in Millions)

E. Program Acquisition 1. cost	(1) Development Estimate (FY77-86)	(2) Changes	(3) Current Estimate (FY77-87)
Development	$3,200.0 1/	$+5.0	$3,205.0
Procurement	11,751.4	+54.5	11,805.9
Airframe	6,708.1		6,708.1
Engines	1,265.7	-0.6	1,265.1
Avionics	1,380.0		1,380.0
Total Flyaway	9,353.8	-0.6	9,353.2
Peculiar Support Equip.	1,040.0		1,040.0
Other Weap. Sys. cost	225.0		225.0
Initial Spares	1,132.6	+55. 1	1,187.7
Construction	250.0		250.0
Total: Constant FY79$	S15,201.4 1/	$+59.5	S15,260.9
Escalation	6,187.4	+1,556.6	7,744.0
Total Program Cost	$21,388.8	$+1,616.1	$23,004.9(CH-1)

Funding	(4) Current & Prior Yrs	(5) Budget Year (FY80)	(6) Balance to Complete FYDP	(7) Beyond FYDP	(8) Total
Development	$1,369.5	$793.9	$1,347.4		$3,510.8
Procurement			5,155.0	13,970.8	19,125.8
Construction			368.3		368.3
Total	$1,369.5	$793.9	S6,870.7	S13,970,8	.$23,004.9
Quantity					
Development	2	1	1		4
Procurement			30	120	150
Total	2	1	31	120	154

2. Quantities

Development	4		4
Procurement	150		150
Total	154		154

3. Unit Cost

Procurement:			
Constant FY79$	S78. 3	+0.4	S78.7
Escalated	117.1	+10.4	127.5
Program:			
Constant FY79S	S98.7	+0.4	$99.1
Escalated	138.9	+6.8	149.4

4. Approved Design to Cost Goal: Average Flyaway Cost for 150 units at a peak production rate of 4 per month.

	Development Estimate	Approved Program	Current Estimate
Constant FY79$	$62.4	S62.4	$62.4
Escalated	93.8	93.8	101.6

5. Foreign Military Sales: None

1/ Includes S300.0 in FY77 and S400.0 in FY78 actuals. S38.7 must be added to raise total pre-base year actuals to FY79$.

TABLE 111.6

COST VARIANCE ANALYSIS

(Dollars in Millions)

As of Date: 31 December 1978
Base Year: 1979

G.	Base Year/FY79 Constant $ DEV	PROC	CONST	SUBTOTAL	ESC	TOTAL	REMARKS
Development Estimate	$3,200.0	$11,751.4	$250.0	$15,201.4	$6,187.4	$21,388.8	Esc : Dev. 279.7; Proc. 5817.6; Const. 90.1
Previous Changes							
Current Changes							
Economic					+394 .8	+394.8	Esc : Dev. +13.2; Proc. +374.8; Const. +6.8
Schedule	+5.0			+5.0	+1,120.3	+1,125.3	Esc : Dev. +12.9; Proc. +1086.0; Const. +21.4
Estimating		-0.6	-	-0.6	-0.4	-1.0	Esc : Proc. -0.4
Support		+55.1		+55.1	+41.9	+97 .0	Esc : PrOc. +41.9
Subtotal	+5.0	+54.5	-	+59.5	+1,556.6	+1,616.1 (CH-1)	Esc : Dev. +26.1; Proc. +1502.3; Const. +28.2
Total Changes	+5.0	+54.5		+59.5	+1 ,556.6	+1,616.1	Esc : Dev. +26.1; Proc. +1502.3; Const. +28.2
Current Estimate	$3,205.0	$11,805.9	$250.0	$15,260.9	$7,744.0	$23,004.9	Esc : Dev. 305.8; Proc. 7319.9; Const. 118.3

Changes Since Previous Report:

(Ch 1) The Current Estimate for total Program Acquisition Cost changes as follows:

	Current $	FY 79$
Development		
Reduction of $75.0 in FY80 necessitating delay of prototype #4 from FY80 to FY81 and restructure of remaining R&D effort (Schedule)	$ +17.9	$ +5.0
Revision of escalation indices (Economic)	+13.2	0
TOTAL Development Cost Change	$ +31.1	$ +5.0
PROCUREMENT		
Revision of escalation indices (Economic)	$+374.8	$ 0
One year delay in production as a result of Development change above (Schedule)	+1086.0	0
Reduction in "flyaway" engine cost as a result of economics associated with increased engine spares quantity (Estimating)	-1.0	-0.6
Increased engine spares quantity (Support)	+97.0	+55.1
TOTAL Procurement Cost Change	$+1556.8	$+54.5
CONSTRUCTION		
Revision of escalation indices (Economic)	$ +6.8	$ 0
One year delay due to Development change above (Schedule)	+21.4	0
TOTAL Construction Cost Change	$ +28.2	$ 0
TOTAL PROGRAM COST CHANGE	$+1616. 1	$+59.5

TABLE 111.7
Selected Acquisition Report
System: B-X

As of Date: 31 December 1978

H. BUDGET YEAR AND OUT YEAR PROGRAMS

Fiscal Year	Current Estimate Budget Year Thru Completion			Escalation (Base Year FY79) Amount			Rate 1/		
	Dev.	Proc.	Const.	Dev.	Proc.	Const.	Dev	Proc	Const
1980	793.9			68.9			6.0		
1981	903.7			128.7			6.5		
1982	404.0			79.0			6.6		
1983	39.7	1,906.3	142.1	9.7	564.8	42.1	6.5	6.5	6.5
1984		3,248.7	226.2		1,094.4	76.2		6.4	6.4
1985		5,442.4			2,038.8			6.3	
1986		4,759.7			1,951.6			6.0	
1987		3,768.7			1,670.3			6.0	
	$2,141.3	$19,125.8	$368.3	$286.3	$7,319.9	$118.3			

1/ Since the annual rates shown do not incorporate spend-out rates or the compounding effect of prior years' escalation, they cannot be used to track the inflation amounts shown for applicable years.

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IV. CURRENT ESTIMATE CHANGES , JUNE 30, 1979

A. SITUATION

1. "Three changes are required based on direction and program experience since the December SAR:

a. As the result of an April 1979 special DSARC review," the Secretary of Defense signed a Decision Memorandum directing an increase in procurement quantity from 150 to 170 aircraft. The memorandum also directed a stretchout of the procurement schedule to reflect a peak annual buy of 35 aircraft rather than the previous peak rate of 40 per year.

b. A major design change in the hydraulic systems of the aircraft has been approved beginning with the second prototype aircraft. The change will increase airframe costs by 4 percent in FY 79$.

c. Experience on the first prototype aircraft indicates that airframe costs will be 6 percent higher in FY 79$ than previously estimated.

2. Reprogramming actions for FY 78 and 79 and a supplemental request for FY 80 have been denied, so increased costs for these 3 years must be absorbed within current funding levels.

B. VARIANCE CATEGORIES AND COMPUTATIONS

1. Examination of the needed changes indicates five variance categories will be involved.

a. The increase of 20 aircraft is a Quantity Change.

b. The increased aircraft quantity causes an increase in spares requirements. For this example, only the engine spares requirement will change. The change will require 9 additional spares engines to be bought in FY 87. This will be a Support Change.

c. Reduction of the peak annual buy requirement from 40 to 35 aircraft will cause a schedule stretch in the procurement program. In this example only, the airframe buys will be stretched. Engines and avionics will be procured on the schedule shown for the December 1978 SAR. This change is a Schedule Change.

d. The design change to the hydraulic systems is an Engineering Change.

e. The prototype actual cost experience results is an Estimating Change.

2. The required order of calculation is Quantity, Schedule, Engineering, Estimating, and Support.

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a. The Quantity Change must be calculated before the Engineering and Estimating Changes. This calculation will be based on the DE cost-quantity curve. Since no previous. changes have affected the cost-quantity curves, the DE curve used in the Quantity variance calculation is also the CE curve. Since there is no difference between the DE and CE quantity calculations, no allocation to other variance categories is required.

b. Since quantity and schedule are changing in the same report, there will be a need to adjust the initial Quantity Change values by the amount of the Schedule Change. The reason for this adjustment will be clarified later in the discussion of variance calculations.

3. Table IV. 1 displays the required variance calculations.

a. The new airframe profile is based on the previous (December 1978) CE cost-quantity curve. The Engineering and Estimating Changes to be calculated later will change the CE curve only for future SAR Quantity Changes. Since the December SAR CE curve is identical to the DE (baseline) curve, the Quantity Change calculation is straightforward.

(1) The FY 79$ airframe profile for the prior program (December 1978 SAR, Table III. 4) is subtracted from the new airframe profile to obtain the FY 79$ value of the Quantity Change. Note that the two profiles are on different schedules.

(2) The annual FY 79$ changes are escalated by the December 1979 indices. The FY 79$ values are subtracted from this total to determine the escalation associated with the change. For example, the FY 85 change of $-211.7 is multiplied by the FY 85 index of 1.599 to arrive at an escalated change value for FY 85 of $-338.5. Subtracting the $-211.7 yields an escalation amount of $-126.8 for the FY 85 change. Summing the annual escalation changes yields a total of $+745.9.

(3) Since the change calculations have been based on two different procurement schedules, the total escalation change of $+745.9 includes the effects of the schedule stretch. The schedule portion will be determined later and should be subtracted from this total to arrive at the net Quantity PCR escalation.

b. The 20 new aircraft require 80 additional engines (4 each) . In this example they are added to the end of the previous engine buy. No Schedule Change is involved because the previous quantity of 600 engines will still be procured as scheduled in the December 1978 SAR estimate. The calculations are identical to those for the airframe change above, except that no Schedule Change adjustment is required. (Note: If the reader is checking the learning curve computations, recall that flyaway engines and spares engines are determined from the same learning curve. Therefore, the FY 87 engine cost assumes the purchase of 80 flyaway engines and 9 additional spares engines.)

TABLE IV. 1

PROGRAM CHANGES (JUNE 30, 1979)

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	TOTAL	
QUANTITY (PROC)														
Airframe														
New Qty							10	20	35	35	35	35	170	
New 79$							720.9	1111.9	1612.1	1419.2	1308.1	1231.7	7,403.9	
Prior Qty							10	20	40	40	40		150	
Prior 79$							720.9	1111.9	1823.8	1590.6	1460.9	-	6,708.1	
Chg (79$)									-211.7	-171.4	-152.8	+1231.7	+695.8	+695. 8 Quantity (79$)
Index							1.421	1.508	1.599	1.695	1.796	1.904		
Chg (Esc $)									-338.5	-290.5	-274.4	+2345.1	+1,441.7	
Escalation									-126.8	-119.1	-121.6	+1113.4	+745.9	+628. 9 PCR Escalation (745.9 less Schedule component of 117.0 from below)
Engine														
New Qty							50	100	200	250	80		680	
New 79S							140.4	234,9	415.2	474.6	144.8		1,409.9	
Prior Qty							50	100	200	25o			600	
Prior 79$							140.4	234.9	415.2	474.6	-		1 265.1	
Chg (79$)											+144.8		+144.8	+144. 8 Quantity (79$)
Index											1.796			
Chg (Esc $)											+260.1		+260.1	
Escalation											+115.3		+115.3	+115. 3 PCR Escalation
Avionics														
New 79S							105.0	190.0	370.0	360.0	355.0	184.0	1,564.0	
Prior 79$							105.0	190.0	370.0	360.0	355.0	-	1,380.0	
Chg 79$												+184.0	+184.0	+184. O Quantity (79$)
Index												1.904		
Chg (Esc $)												+350. 3	+350.3	
Escalation												+166.3	+166.3	+166. 3 PCR Escalation
SCHEDULE (PROC)														
Airframe														
Prior Qty, New Sched							10	20	35	35	35	15	150	
New 79$							72o.9	1111.9	1612.1	1419.2	1308.1	535.9	6,708.1	
Prior Qty & Sched							10	20	40	40	40		150	
Prior 79$							720.9	1111,9	1823.8	1590.6	1460.9	-	6 708.1	
Chg (79$)									-211.7	-171.4	-152.8	+535.9		-O- Schedule (79$)
Index									1.599	1.695	1.796	1.904		
Chg (Esc S)									-338.5	-290.5	-274.4	+1020.4	+117.0	
Escalation									-126.8	-119.1	-121.6	+484.5	+117.0	+117. 0 PCR Escalation (Subtract from Total Escalation calculated for Quantity Change)
ENGINEERING														
Development														
Airframe (After Chg)	150.0	109.2	96.5	89.1									444.8	
Airframe (Before Chg)	150.0	105.0	92.8	85.7									433.5	
Chg (79$)		+4.2	+3.7	+3.4									+11.3	+11. 3 Engineering (79$)
Index		1.030	1.095	1.166										
Chg Esc $		+4.3	+4.0	+ 4 . 0									+12 .3	
Escalation		+0.1	+0.3	+0.6									+1.0	+1. 0 PCR Escalation
Procurement														
Airframe (After Chg)							749.7	1156.4	1676.6	1476.0	1360.4	1281.0	7,700.1	
Airframe (Before Chg)							720.9	1111.9	1612.1	1419.2	1308.1	1231.7	7,403.9	
Chg (79$)							+28.8	+44.5	+64 .5	+56.8	+52.3	+49.3	+296.2	+296. 2 Engineering (79$)
Index							1.421	1.508	1.599	1.695	1.796	1.904		
Chg (Esc $)							+40 .9	+67 .1	+103.1	+96 .3	+93.9	+93.9	+495 .2	
Escalation							+12. 1	+22.6	+38.6	+39. 5	+41.6	+44.6	+199.0	+199. 0 PCR Escalation

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TABLE IV. 1 (Cent 'd)
PROGRAM CHANGES (JUNE 30, 1979)

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1968	TOTAL	
ESTIMATING														
Development														
Airframe (After Chg) 1/		158.7	115.5	102.1	94.3								470.6	
Airframe (Before Chg) 2/		150.0	109.2	96.5	89.1								444.8	
Chg (79$)		+8.7	+6.3	+5.6	+5.2								+25.8	+25. 8 Estimating (79$)
Index		3/	1.030	1.095	1.166									
Chg (Esc $)		±8. 7	_+6.5	+6.1	+6.1								+27.4	
Escalation			+0.2	+0.5	+0.9								+1.6	+1. 6 PCR Escalation
Procurement														
Airframe (After Chg) 1/							793.0	1223.1	1773.3	1561.2	1438.9	1354.9	8,144.4	
Airframe (Before Chg) 2/							749.7	1156.4	1676.6	1476.0	1360.4	1281.0	7,700.1	
Chg 79$							+43.3	+66 .7	+96,7	+85.2	+78 .5	+73,9	+444. 3	+444.3 Estimating (79$)
Index							1.421	1.508	1.599	1.695	1.796	1.904		
Chg (Esc $)							+61.5	+100.6	+154.6	+144.4	+141.0	+140.7	+742.8	
Escalation							+18.2	+33.9	+57.9	+59.2	+62 .5	+66.8	+29S.5	+298. 5 PCR Escalation
Development 4/														
Other (Before Chgs)	272.6	221.2	512.4	632.2	689.3	325.0	30.0						2,682.7	
Total Eng 'g & Est 'g Chgs To Be Absorbed	_	_	-8.7	-10.5	-9.3	-							-28.5	-28.5 Estimating
Other (After Chg)	272.6	212.5	501.9	622.9	689.3	325.0	30.0						2,654.2	
Total PCR To Be Absorbed			-0.3	-0.9									-1.2	-1.2 PCR Escalation
SUPPORT														
Procurement														
Engine Spares														
New Qty							25	50	60	70	74		279	
New 79$							70.2	117.5	124.6	132.9	133.9		579.1	
Prior Qty							25	50	60	70	65		270	
Prior 79$							70.2	117.5	124.6	132.9	118.5		563.7	
Chg (79$)											+15.4		+15.4	+15.4 Support (79$)
Index											1.796			
Chg (Esc $)											+27.7		+27.7	
Escalation											+12.3		+12.3	+12. 3 PCR Escalation
DESIGN TO COST (CE)														
Airframe (Qt y)							10	20	40	40	40		150	
cost							793.0	1223.1	2006.2	1749.7	1607.0		7,379.0	
Engine (Qty)							50	100	200	250			600	
cost							140.4	234.9	415.2	474.6			1,265.1	
Avionics							105.0	190.0	370.0	360.0	355.0		1,380.0	
Total (79$)							1038.4	1648.0	2791.4	2584.3	1962.0		10,024.1	
Index							1.421	1.508	1,599	1.695	1.796			
Total (Es C $)							$1475.6	$2485.2	$4463.4	$4380.4	$3523.8		$16,328.4	

1/ Theoretical first unit cost including Engineering and Estimating Changes is $165.0, but actual first unit is only $158.7 because the Engineering Change is not included in the first prototype.
2/ These values are before the Estimating Change but after the previously calculated Engineering Change.
3/ Recall that FY77/78 represent pre-base year actuals.
4/ These changes reflect absorbing the previously calculated Engineering and Estimating Changes within FY78-80 funding levels.

c. The avionics Quantity Change is calculated as described in paragraph B.3.b. The $184.0 in FY 88 is based on an assumption of 20 additional avionics sets at $9.2 each. Recall from Section II, paragraph A.1.c. that no learning is assumed for avionics.

d. The Schedule Change results from a reduction in peak annual buy quantities. To determine the Schedule Change, the previous airframe funding and schedule are compared to the funding profile of the previous quantity on the reduced buy schedule. In Table IV.1, the lines titled, Prior Qty & Sched and Prior 79$ are taken from Table 111.4. The Prior Qty, New Sched and new 79$ lines are determined by reducing the FY 85-87 quantities to 35 each year and adding the 15 delayed airframes to the end of the buy schedule FY 88). The result is the funding profile associated with buying 150 airframes at a peak rate of 35 per year rather than 40. The difference between the two lines is the FY 79$ (base year) value of the schedule change. Note that in this example the value is zero. This is because the costs are computed from the cost-quantity curve with an assumption of no increased cost due to reduced buys or the extra year. For relatively minor perturbations of the procurement schedule this may often be the case, especially for production estimates prepared early in the development phase. Later in the program, when detailed production estimates and contractor proposals are available, this may not be the case.

(1) As in the Quantity calculations, the annual FY 79$ changes are escalated to determine the PCR escalation of $+117.0.

(2) Recall from paragraph B.3.a. (3) that the airframe Quantity Change PCR escalation included the schedule effects. Therefore, the Schedule PCR escalation must be subtracted from the airframe PCR to avoid a double count. If there had been a base year dollar Schedule Change, that portion of the Schedule PCR escalation associated with the base year dollar change would not be subtracted from Quantity PCR.

e. The Engineering Change must be calculated separately for Development and Procurement.

(1) The hydraulics change will increase costs by 4 percent for the second through fourth prototype airframes. Comparing the previous airframe prototype costs from Table 111.4 with the revised costs in Table IV.1 results in an Engineering Change of $+11.3 (79$). The PCR calculations shown are accomplished as previously described.

(2) The procurement Engineering Change is calculated the same as for the Development prototypes. The Before Change line in Table IV.1 is after the previously calculated Quantity and Schedule Changes. Therefore, the values are taken from the New 79$ line under QUANTITY (PROC) Airframe, Table IV.1. The After Change line can be calculated by multiplying the Before Change line by 1.04 (4 percent). This is equivalent to increasing the cost-quantity curve theoretical first unit cost by 4 percent.

GID

f. The Estimating Change must be accomplished in three parts. Airframe changes are computed separately for development and procurement. Then, the impact of absorbing FY 78-80 increases within existing funding limitations must be calculated.

(1) The Development airframe costs, including the just computed Engineering Change (the Airframe (After Chg) line under ENGINEERING, Development) , is subtracted from the airframe cost with the 6 percent estimating increase. The resulting $+25. 8 (79$) change is then escalated to arrive at PCR escalation.

(2) The airframe procurement Estimating Change is done in the same manner as the development change.

(3) Since Quantity Changes must always be related to the DE and CE cost-quantity curves, the increased FY 78-80 development costs in the development Airframe or Engine lines should not be absorbed. This means the adjustment must be made in the Other development line from Table 111.4. The sum of the development Engineering and Estimating changes, by year, is subtracted from the Other line. This results in the $-28.5 (79$) Estimating Change shown in Table IV. 1. For example, the FY 79 reduction of $10.5 is the sum of the $4.2 Engineering and $6.3 Estimating Changes previously calculated for FY 79. Similarly, the PCR escalation is $0.1 Engineering PCR and $0.2 Estimating PCR for FY 79. (Note: The FY 80 PCR will not check exactly due to a rounding error.)

g. The Support Change in this example is for engine spares only.' It is assumed that the other spares requirements have not been affected by either the Quantity Change or the Engineering and Estimating Changes to the airframe. This assumption is usually not valid but it in no way detracts from the realism of this example in terms of computational procedures. As in the preceding steps, the engine spares line from the preceding CE (Table 111.4) is subtracted from the new estimate and the changes are escalated to determine,PCR escalation.

h. The Design-to-Cost calculations are shown only for completeness. As noted in Section III, these calculations should be done by the program office in accordance with their program specific requirements.

4. Changes are calculated on a line item basis from the previous detailed CE. The previous line values are subtracted from the new line values to get the base year dollar value of the change. These annual line item changes are then escalated to determine PCR escalation. As the calculations proceed, any line changed in a prior calculation is used in place of the previous SAR CE line as the base from which the next variance category change is calculated. Calculations will generally follow this rolling sequence except when Schedule and Quantity for the same line change at the same time, as was the case in this example.

5. Table III. 4 is now updated with the changes from Table IV. 1. This results in Table IV.2, which will be the basis for future SAK variance calculations.

6. SAR Formats E, G, and H are prepared from the information in Tables IV.1 and IV.2. Tables IV.3, IV.4, and IV.5 display the results.

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TABLE IV.2

CURRENT ESTIMATE (JUNE 30, 1979)

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	TOTAL
Development:													
Airframe													
Qty		1	1	1	1								4
cost		158.7	115.5	102.1	94.3								470.6
Engine													
Qty	6	8	10										24
cost	27.4	28.8	32.6										88.8
Other	272.6	212.5	501.9	622.9	689.3	325.0	30.0						2,654.2
Total 79$	300.0	400.0 1/	650.0	725.0	783.6	325.0	30.0						3,213.6
Index			1.030	1.095	1,166	1.243	1.323						
Escalation			19.5	68.9	130.1	79.0	9.7						307.2
Total (Esc $)	$300.0	$400.0	$669.5	$793.9	$913.7	$404.0	$39.7						$3,520.8
Procurement:													
Airframe													
Qty							10	20	35	35	35	35	170
cost							793.0	1223.1	1773.3	1561.2	1438.9	1354.9	8144.4
Engine													
Qty							50	100	200	250	80		680
cost							140.4	234.9	415.2	474.6	144.8		1,409.9
Avionics							105.0	190.0	370.0	360.0	355.0	184.0	1,564.0
Subtotal (Flyaway)							1038.4	1648.0	2558.5	2395.8	1938.7	1538.9	11,118.3
Peculiar Support							150.0	320.0	500. Q	70.0			1,040.0
Other Weap. Sys. cost							80.0	70.0	30.0	30.0	15.0		225.0
Initial Spares													
Engine Cost							(70.2)	(117.5)	(124.6)	(132.9)	(133.9)		(579.1)
Qty							25	50	60	70	74		279
Other							(75.0)	(110.0)	(140.0)	(150.0)	(149 . 0)		(624.0)
Total Spares							145.2	227.5	264.6	282.9	282.9		1,203.1
Total Proc. (79$)							$1413.6	$2265.5	$3353.1	$2778.7	$2236.6	$1538.9	$13,586.4
Index							1.421	1.508	1.599	1.695	1.796	1.904	
Escalation							595.1	1150.9	2008.5	1931.2	1780.3	1391.2	8,857.2
Total Proc.(Esc $)							$2008.7	$3416.4	$5361.6	$4709.9	$4016.9	$2930.1	$22,443.6
Construction (79$)							100.0	150.0					250.0
Index							1.421	1.508					
Escalation							42.1	76.2					118.3
Total Const. (Esc $)							$142.1	$226.2					$368.3

1/ See Format E, footnote 1.

TABLE IV.3

Selected Acquisition Report

System: B-X

As of Date: 30 June 1979

(Dollars in Millions)

1. Program Acquisition cost	(1) Development Estimate (FY77-86)	(2) Changes	(3) Current Estimate (FY77-88)
Development	$3,200.0 1/	$+13.6	$3,213.6
Procurement	11,751.4	+1,835.0	13,586.4
Airframe	6,708.1	+1,436.3	8,144.4
Engines	1,265.7	+144.2	1,409.9
Avionics	1,380.0	+184.0	1,564.0
Total Flyaway	9,353.8	+1,764.5	11,118.3
Peculiar Support Equip.	1,040.0		1,040.0
Other Weap. Sys. Cost	225.0		225.0
Initial Spares	1,132.6	+70.5	1,203.1
Construction	250.0		250.0
Total : Constant FY79$	$15,201.4 1/	$+1,848.6	$17,050.0
Escalation	6,187.4	+3,095.3	9,282.7
Total Program Cost	$21,388.8	$+4,943.9	$26,332.7(CH-1)

Funding	(4) Current & Prior Yrs	(5) Budget Year (FY80)	(6) Balance to Complete FYDP	(7) Beyond FYDP	(8) Total
Development	$1,369.5	$793.9	$1,357.4	-	$3,520.8
Procurement			5,425.1	17,018.5	22,443.6
Construction			368.3		368.3
Total	$1,369.5	$793.9	$7,150.8	$17,018.5	$25,964.4
Quantity					
Development	2	1	1		4
Procurement			30	140	170
Total	2	1	31	140	174

2. Quantities

Development	4		4
Procurement	150	+20	170
Total	154	+20	174

3. Unit Cost

Procurement:			
Constant FY79$	$78.3	+1.6	$79.9
Escalated	117.1	+14.9	132.0
Program:			
Constant FY79$	$98.7	-0.7	$98.0
Escalated	138.9	+8.7	151.3

4. Approved Design to Cost Goal: Average Flyaway Cost for 150 units at a peak production rate of 4 per month.

	Development Estimate	Approved Program	Current Estimate
Constant FY79$	$62.4	$62.4	$66.8
Escalated	93.8	93.8	108.9

5: Foreign Military Sales: None

1/ Includes $300.0 in FY77 and $400.0 in FY78 actuals. $38.7 must be added to raise total pre-base year actuals to FY79$.

TABLE IV.4
COST VARIANCE ANALYSIS
(Dollars in Millions)

As of Date: 30 June 1979
Base Year: 1979

G.	Base Year/FY79 Constant $ DEV	PROC	CONST	SUBTOTAL	ESC	TOTAL	REMARKS
Development Estimate	$3,200.0	$11,751.4	$250.0	$15,201.4	$6,187.4	$21,388.8	Esc : Dev. 279.7; Proc. 5817.6; Const. 90.1
Previous Changes							
Economic					+394.8	+394.8	Esc : Dev. +13.2; Proc. +374.8; Const. +6.8
Schedule	+5.0			+5.0	+1,120.3	+1,125.3	Esc : Dev. +12.9; Proc. +1086.0; Const. +21.4
Estimating		-0.6	-	-0.6	-0.4	-1.0	Esc : Proc. -0.4
Support		+55.1	-	+55.1	+41.9	+97 .0	Esc : Proc. +41.9
subtotal	+5.0	+54.5	-	+59. 5	+1,556.6	. +1,616.1	Esc : Dev. +26.1; Proc. +1502.3; Const. +28.2
Current Changes							
Quantity		+1,024.6	-	+1,024.6	+910.5	+1,935.1	Esc : Proc. +910.5
Schedule					+117.0	+117.0	Esc : Proc. +117.0
Engineering	+11.3	+296.2	-	+307. 5	+200.0	+507 .5	Esc : Dev. +1.0; Proc. +199.0
Estimating	-2.7	+444 .3		+441.6	+298.9	+740.5	Esc: Dev. +0.4; Proc. +298.5
Support		+15.4		+15.4	+12.3	+27.7	Esc : Proc. +12.3
Subtotal	+8.6	+1,780.5	-	+1,789.1	+1,538.7	+3,327.8 (CH-1)	Esc : Dev. +1.4; Proc. +1,537.3
Total Changes	+13.6	+1,835.0	-	+1,848.6	+3,095.3	+4,943.9	Esc : Dev +27.5; Proc. +3,039.6; Const. +28.2
Current Estimate	$3,213.6	$13,586.4	$250.0	$17,050.0	$9,282.7	$26,332.7	Esc : Dev. 307.2; Proc. 8,857.2; Const. 118.3

Changes Since Previous Report:

(Ch 1) The Current Estimate for total Program Acquisition Cost changes as fol OWS : 1/

	Current $	Base Year $
Development		
Hydraulic systems design changes (Engineering)	$ +12.3	$ +11.3
Increased prototype cost and refinement of R&D estimate (Estimating)	-2.3	-2.7
TOTAL Development Cost Change	$ +10.0	$ +8.6
PROCUREMENT		
Addition of 20 aircraft (Quantity)	+1,935.1	+1,024.6
Stretchout of FY85-87 procurement (Schedule)	+117.0	0
Hydraulic systems design changes (Engineering)	+495.2	+296.2
Revised production estimate based on prototype experience (Estimating)	+742.8	+444 .3
Increased engine spares requirement due to quantity change (Support)	+27.7	+15 .4
TOTAL Procurement Coet Change	$+3,317.8	$+1,780.5
TOTAL PROGRAM COST CHANGE	$+3,327.8	$+1,789.1

l_/ Summary explanations of "Previous Changes" are not shown in this example but are required in actual practice.

TABLE IV.5

Selected Acquisition Report

System: B-X

As of Date: 30 June 1979

H. BUDGET YEAR AND OUT YEAR PROGRAMS

Fiscal Year	Current Estimate Budget Year Thru Completion			Escalation (Base Year FY79) Amount			Rate 1/		
	Dev.	Proc.	Const.	Dev.	Proc.	Const.	Dev	Proc	Const
1980	793.9			68.9			6.0	-	
1981	913.7			130.1			6.5	-	
1982	404.0			79.0			6.6	-	
1983	39.7	2,008.7	142.1	9.7	595.1	42.1	6.5	6.5	6.5
1984		3,416.4	226.2		1,150.9	76.2	-	6.4	6.4
1985		5,361.6			2,008.5			6.3	-
1986		4,709.9			1,931.2			6.0	-
1987		4,016.9			1,780.3			6.o	-
1988		2,930.1			1,391.2			6.0	-
	$2,151.3	S22,443.6	$368.3	$287.7	$8,857.2	$118.3			

1/ Since the annual rates shown do not incorporate spend-out rates or the compounding effect of prior years' escalation, they cannot be used to track the inflation amounts shown for applicable years.

V. CURRENT ESTIMATE CHANGES, SEPTEMBER 30, 1979

A. SITUATION

1. The FY 80 Appropriation Bill was signed by the President on September 26, 1979. The bill includes $5.5M (escalated $) more than originally requested. The additional money is to be used to initiate planning and demonstration of a tactical bombing/ocean control mission capability, as directed by the Congress.

2. A 60-day wildcat strike at Alpha Industries, a major avionics subcontractor, has resulted in a restructuring of test efforts in FY 79, 80, and 81. Reprogramming restrictions directed by higher headquarters require that the FY 80 restructuring be accomplished with no increase in FY 80 funding. As a consequence, escalated dollar funding is reduced by $2.0M in FY 79 and increased by $3.3M in FY 81.

3. A review of B-X deployment has resulted in a requirement to upgrade runways at nine of the originally planned bases and the addition of two more bases to the original basing plan. The upgrade cost is $28.4M in FY 83 and $45.2M in FY 84 (escalated $). The cost of preparing the two additional bases (the bases already exist) for B-X deployment is $52.8M (escalated $) in FY 84.

B. VARIANCE CATEGORIES AND COMPUTATIONS

1. In accordance with DoD Instruction 7000.3 (reference (a)), the $5.5M FY 80 addition will be footnoted on Format E. This funding plus any impact on subsequent year requirements will not be shown in the Program Acquisition Cost or related variance categories until the December 1979 SAR.

2. The strike impact will be classified as an Other Change. Use of this category is highly judgmental and in general is sharply restricted. The factors which led to this judgment include:

a. Labor disputes that seriously disrupt programs are rare. A disruption due to a wildcat strike is even more uncommon.

b. No one could have forecast a potentially disruptive dispute at Alpha Industries given its history of good labor relations and the fact its unions were under a long term agreement.

c. The occurrence and settlement of a strike is totally unrelated to the Government's planning, funding, execution, and overall management of the program.

3. The requirement to upgrade runways is an Engineering Change. DoD Instruction 7000.3 (reference (a)) generally requires construction costs associated solely with operational/site activation to be categorized in accordance with the standard variance category definitions. Since the runway upgrade can be viewed as an alteration in the physical or functional characteristics of the base, it is an Engineering Change.

4. The cost of preparing two additional bases for B-X deployment is a Support Change. Although this cost is a construction cost associated solely with operational/site activation, it is a change in overall requirements. As such, it. could be viewed-as an increase in the quantity of bases. DoD Instruction 7000.3 (reference (a)) requires changes in construction requirements (quantities) to be classified as support changes, thereby effectively limiting quantity changes to flyaway costs.

5. We have determined three variance categories that are to be computed in the following order: Engineering, Other, and Support.

6. Table V.1 portrays the required variance calculations.

a. The construction line from the June 1979 SAR (from Table IV.2) is subtracted from the new construction estimate to arrive at the Engineering Change in base year dollars. The annual changes are escalated to arrive at the PCR escalation.

b. To compute the Support Change, the base year dollar line including the Engineering Change is subtracted from the new construction estimate, including two additional bases that will be added in FY 84. The base year dollar change is then escalated to arrive at PCR escalation.

c. The Other Change, due to the strike delay, is a change in development cost only. The change does not impact the prototype airframe or engine costs. To determine the change, the line titled Other in Table Iv.2 under Development is subtracted from the new estimate of this line. The resulting figures are then escalated to determine PCR escalation.

7. Table IV.2 should now be updated with the changes in Table V.1. The resulting Table V.2 is the basis for the next change calculations. Tables V.3, V.4, and V.5 represent SAR Formats E, G, and H and are prepared from Tables V.1 and V.2.

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TABLE V.1
PROGRAM CHANGES (SEPTEMBER 30, 1979)

	1977	1978	1979	1980	1981	1982	1983	1984	TOTAL	CHANGES
ENGINEERING (Const)										
New 79$							120.0	180.0	300.0	
Prior 79$							100.0	150.0	250.0	
Chg (79$)							+20.0	+30.0	+50.0	+50.0 Engineering (79$)
Index							1.421	1.508		
Chg (Esc $)							+28.4	+45 .2	+73.6	
Escalation							+8.4	+15.2	+23.6	+23.6 PCR Escalation
suPPORT (conSt)										
79$ (After Chg)							120.0	215.0	335.0	
79$ (Before Chg)							120.0	180.0	300.0	
Chg (79$)								+35.0	+35.0	+35.0 Support (79$)
Index								1.508		
Chg (ESC $)								+52.8	+52.8	
Escalation								+17.8	+17.8	+17.8 PCR Escalation
OTHER (Development)										
Other										
New 79$	272.6	212.5	500.0	622.9	692.1	325.0	30.0		2,655.1	
Prior 79$	272.6	212.5	501.9	622.9	689.3	325.0	30.0		2,654.2	
Chg (79$)			-1.9	-	+2.8	-			+0.9	+0.9 Other (79$)
Index.			1.030		1.166					
Chg (ESC $)			-2.0		+3.3				+1.3	
Escalation			-0.1		+0.5				+0.4	+0.4 PCR Escalation

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TABLE V.2

CURRENT ESTIMATE (SEPTEMBER 30, 1979)

	1977	1978	1979,	1980	1981	1982	1983	1984	1985	1986	1987	1988	TOTAL
Development:													
Airframe													
Qty		1	1	1	1								4
cost		158.7	115.5	102.1	94.3								470.6
Engine													
Qty	6	8	10										24
cost	27.4	28.8	32.6										88.8
Other	272.6	212.5	500.0	622.9	692.1	325.0	30.0						2,655.1
Total 79$	300.0 1/	400.0 1/	648.1	725.0	786.4	325.0	30.0						3,214.5
Index			1.030	1.095	1.166	1.243	1.323						
Escalation	—	—	19.4	68.9	130.6	79.0	9.7						307.6
Total (Esc $)	$300.0	$400.0	$667.5	$793.9	$917.0	$404.0	$39.7						$3,522.1
Procurement:													
Airframe													
Qty							10	20	35	35	35	35	170
cost							793.0	1223.1	1773.3	1561.2	1438.9,	1354.9	8144.4
Engine													
Qty							50	100	200	250	80		680
cost							140.4	234.9	415.2	474.6	144.8		1,409.9
Avionics							105.0	190.0	370.0	360.0	355.0	184.0	1,564,0
Subtotal (Flyaway)							1038.4	1648.0	2558.5	2395.8	1938.7	1538.9	11,118.3
Peculiar Support							150.0	320.0	500.0	70.0			1,040.0
Other Weap. Sys. cost							80.0	70.0	30.0	30.0	15.0		225.0
Initial Spares													
Engine Cost							(70.2)	(117.5)	(124.6)	(.132.9)	(133.9)		(579.1)
Qty							25	50	60	70	74		279
Other							(75.0)	(110.0)	(140.0)	(150.0)	(149.0)		(624.0)
Total Spares							145.2	227.5	264.6	282.9	282.9		1,203.1
Total Proc. (79$)							$1413.6	$2265.5	$3353.1	$2778.7	$2236.6	$1538.9	$13,586.4
Index							1.421	1.508	1.599	1.695	1.796	1.904	
Escalation							595.1	1150.9	2008.5	1931.2	1780.3	1391.2	8,857.2
Total Proc. (Esc $)							$2008.7	$3416.4	$5361.6	$4709.9	$4016.9	$2930.1	$22,443.6
Construction (79$							120.0	215.0					335.0
Index							1.421	1.508					
Escalation							50.5	109.2					159.7
Total Const. (Esc $)							$170.5	$324.2					$494.7

1/ See Format E, footnote 1.

TABLE V.3

Selected Acquisition Report

System: B-X

As of Date: 30 September 1979

(Dollars in Millions)

E. Program Acquisition 1. cost	(1) Development -Estimate (FY77-86)	(2) Changes	(3) Current Estimate (FY77-88)
Development	$3,200.0 1/	$+14.5	$3,214.5
Procurement	11,751.4	+1,835.0	13,586.4
Airframe	6,708.1	+1,436.3	8,144.4
Engines	1,265.7	+144.2	1,409.9
Avionics	1,380.0	+184.0	1,564.0
Total Flyaway	9,353.8	+1,764.5	11,118.3
Peculiar Support Equip.	1,040.0		1,040.0
Other Weap. Sys. Cost	225.0		225.0
Initial Spares	1,132.6	+70.5	1,203.1
Construction	250.0	+85.0	335.0
Total: Constant FY79$	$15,201.4 1/	$+1,934.5	$17,135.9
Escalation	6,187.4	+3,137.1	9,324.5
Total Program Cost	$21,388.8	$+5,071.6	$26,460.4 (CH-1)

Funding	(4) Current & Prior Yrs	(5) Budget Year (FY80)	(6) Balance to Complete FYDP	(7) Balance to Complete Beyond FYDP	(8) Total
Development	$1,367.5	$793.9 2/	$1,360.7		$3,522.1
Procurement			5,425.1	17,018.5	22,443.6
Construction			494.7		494.7
Total	$1,367.5	$793.9	$7,280.5	$17,018.5	$26,460.4
Quantity					
Development	2	1	1		4
Procurement			30	140	170
Total	2	1	31	140	174

2. Quantities

Development	4		4
Procurement	150	+20	170
Total	154	+20	174

3. Unit Cost

Procurement:			
Constant FY79$	$78.3	+1.6	$79.9
Escalated	117.1	+14.9	132.0
Program:			
Constant FY79$	$98.7	-0.2	$98.5
Escalated	138.9	+9.5	152.1

4. Approved Design to Cost Goal: Average Flyaway Cost for 150 units at a peak production rate of 4 per month.

	Development Estimate	Approved Program	Current Estimate
Constant FY79$	$62.4	$62.4	$66.8
Escalated	93.8	93.8	108.9

5. Foreign Military Sales: None

1/ Includes $300.0 in FY77 and $400.0 in FY78 actuals. $38.7 must be added to raise total pre-base year actuals to FY79$.

2/ Congress added $5.5 to FY80 to initiate planning for Tactical Bombing/Ocean Control mission. This change Plus total program impact will be reflected in the next SAR.

TABLE V, 4

COST VARIANCE ANALYSIS

(Dollars in Millions)

As of Date: 30 September 1979
Base Year: 1979

G.	Base Year/FY79 Constant $ DEV	PROC	CONST	SUBTOTAL	ESC	TOTAL		REMARKS
Development Estimate	$3,200.0	$11,751.4	$250.0	$15,201.4	$6,187.4	$21,388.8	Esc :	Dev. 279.7; Proc. 5817.6; Const. 90.1
Previous Changes								
Economic					+394.8	+394.8	Esc :	Dev. +13.2; Proc. +374.8; Const. +6.8
Quantity		+1,024.6		+1,024.6	+910.5	+1,935.1	Esc :	Proc. +910.5
Schedule	+5.0			+5.0	+1,237.3	+1,242.3	Esc :	Dev. +12.9; Proc. +1203.0; Const. +21.4
Engineering	+11.3	+296.2		+307.5	+200.0	+507.5	Esc :	Dev. +1.0; Proc. +199.0
Estimating	-2.7	+443.7		+441 .0	+298 .5	+739.5	Esc :	Dev. +0.4; Proc. +298.1
Support		+70.5		+70.5	+54 .2	+124.7	Esc :	Proc. +54 .2
Subtotal	+13.6	+1,835.0	= - -	+1,848.6	+3,095.3	+4,943.9	Esc :	Dev. +27.5; Proc. +3039.6; Const. +28.2
Current Changes								
Engineering			+50.0	+50.0	+23.6	+73.6	Esc :	Const. +23.6
Other	+0.9			+0.9	+0.4	+1.3	Esc :	Dev. +0.4
Support			+35.0	+35.0	+17.8	+52 .8	Esc :	Const. +17.8
Subtotal	+0.9	=-	+85.0	+85 .9	+41 .8	+127.7 (CH-1)	Esc :	Dev. +0.4; Const. +41.4
Total Changes	+14.5	+1,835.0	+85.0	+1,934.5	+3,137.1	+5,071.6	Esc :	Dev. +27.9; Proc. +3039.6; Const. +69.6
Current Estimate	$3,214.5	$13,586.4	$335.0	$17,135.9	$9,324.5	$26,460.4	Esc :	Dev. +307.6; Proc. +8857.2; Const. +159.7

Changes Since Previous Report:

(Ch 1) The Current Estimate for total Program Acquisition Cost changes as follows: 1/

	Current $	Base Year $
Development		
60 day strike at vendor's facility (Alpha Industries) has resulted in restructuring of test efforts (Other)	$ +1.3	$ +0.9
CONSTRUCTION		
Upgrade runaways at 9 bases (Engineering)	$ +73.6	+50.0
Added 2 bases to B-X deployment requirements (Support)	+52.8	+35.0
TOTAL Construction Cost Change	$+126.4	$+85.0
TOTAL PROGRAM COST CHANGE	$+127.7	$+85.9

1/ Summary explanations of "Previous Changes" are not shown in this example but are required in actual practice,

TABLE V.5

Selected Acquisition Report

System: B-X

As of Date: 30 September 1979

H. BUDGET YEAR AND OUT YEAR PROGRAMS

Fiscal Year	Current Estimate Budget Year Thru Completion			Escalation (Base Year FY79) Amount			Rate 1/		
	Dev.	Proc.	Const.	Dev.	Proc.	Const.	Dev	Proc	Const
1980	793.9			68.9			6.0		
1981	917.0			130.6			6.5		
1982	404.0			79.0			6.6		
1983	39.7	2,008.7	170.5	9.7	595.1	50.5	6.5	6.5	6.5
1984		3,416.4	324.2		1,150.9	109.2		6.4	6.4
1985		5,361.6			2,008.5			6.3	
1986		4,709.9			1,931.2			6.0	
1987		4,016.9			1,780.3			6.0	
1988		2,930.1			1,391.2			6.0	
	$2,154.6	$22,443.6	$494.7	$288.2	$6,857.2	$159.7			

1/ Since the annual rates shown do not incorporate spend-out rates or the compounding effect of prior years' escalation, they cannot be used to track the inflation amounts shown for applicable years.

VI. CURRENT ESTIMATE CHANGES, DECEMBER 31, 1979

A. SITUATION

1. The FY 81 PPBS process has resulted in three changes to the CE.

a. Escalation rates for the FY 81 budget and subsequent years have been revised. The new annual rates and resultant composite rates are shown in Table VI.1. There have been no changes in outlay rate assumptions from those displayed in Table 11.3.

Fiscal Year	Annual Rate(%)	Price Level Index	Composite Indices		
			RDT&E	Procurement	Construction
1977	6.0	0.890	0.917		
1978	6.0	0.943	0.972		
1979	6.0	1.000	1.030		
1980	6.0	1.060	1.095		
1981	6.5	1.129	1.168		
1982	6.8	1.206	1.247		
1983	6.8	1.288	1.331	1.432	1.432
1984	6.7	1.374		1.522	1.522
1985	6.4	1.462		1.615	
1986	6.2	1.552		1.712	
1987	6.0	1.646		1.815	
1988	6.0	1.744		1.924	
1989	6.o	1.849			
1990	6.0	1.960			
1991	6.0	2.078			
1992	6.0	2.202			

TABLE VI.1 Indices

b. The quantity of production aircraft has been reduced from 170 to 160. In addition, the peak annual procurement has been increased from 35 per year to 40. The new airframe cost and schedule are shown in Table VI.2. As a result of the reduced aircraft buy, engine procurement is reduced by 40 engines in FY 87 ($130.9M, Escalated $), avionics are reduced by $180.5M (Escalated $) in FY 88, and engine spares are reduced by 16 engines in FY 87 ($51.5M, Escalated $).

	FY 83	FY 84	FY 85	FY 86	FY 87	FY 88	Total
Airframe:							
Qty	10	20	40	40	40	10	160
cost	$1135.6	$1861.6	$3240.0	$2995.5	$2916.7	$741.5	$12890.9

TABLE VI.2 Airframe Funding (Escalated $)

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c. The Congressionally directed demonstration of a tactical bombing/ocean control mission capability is to be included. The revised development funding amounts for the years FY 80-83 are $799.3M, $927.9M, $409.0M, and $39.9M, respectively, all in escalated dollars.

2. The dollars provided in paragraphs A.1.b. and A.1.c. reflect the FY 81 budget submission and include escalation per the indices in Table VI.1.

B. VARIANCE CATEGORIES AND COMPUTATIONS

1. Review of the required changes indicates six variance 'categories will be required: Economic, Quantity, Schedule, Engineering, Estimating, and Support. By appropriation, Economic is required for all three appropriations (RDT&E, procurement, construction); Estimating in RDT&E and procurement; and Quantity, Schedule, Engineering, and Support in procurement only. The requirement for Estimating and Engineering Changes in procurement may not be readily apparent. This requirement stems from the fact that the Quantity Change adjustment involves the use of DE and CE cost-quantity curves that are no longer identical. The difference between the DE and CE cost-quantity calculations must be allocated to the Estimating and Engineering Change categories. In addition, there is the problem of a quantity reduction. DoD Instruction 7000.3 (reference (a)) requires that any time a change results in a net cost reduction, escalation associated with the reduction must be reported as an Economic Change to the extent such escalation was previously reflected in the CE.

a. The change in indices is an Economic Change.

b. The quantity reduction is a Quantity Change. However, in addition to reducing the quantity, procurement schedule is accelerated. This means that the 160 remaining aircraft will be procured sooner than if they were procured based on the September 1979 procurement schedule that limited the peak annual buy to 35. This is a Schedule Change.

c. In determining the Economic Change associated with the cost reduction, notice that we need only address those previous Economic Changes that have affected the last 10 aircraft (units 161 through 170). Recall that these units were not included in the program until the June 1979 SAR. Since the only Economic Change prior to now occurred in the December 1978 report, there have been no previous economic changes associated with these units. However, there is an Economic Change in this report. Since the Economic Change must be calculated before we incorporate any other changes, remember to adjust the Economic Change for the quantity reduction.

d. Since the Quantity Change must be computed from the DE cost-quantity curves, the magnitude of the change will be underrated. This is corrected by subtracting the DE based Quantity Change from the change as calculated from the CE cost-quantity curves. The difference must then be allocated to the Schedule, Engineering, Estimating, and Other categories. Reviewing these change categories shows that the schedule for the 10 aircraft to be deleted has never changed, and there have never been any Other changes

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in procurement. The CE cost. of these 10 aircraft does, however, include the impact of the Engineering and Estimating Changes made in the June 1979 SAR. Therefore, the excess Quantity Change, or the difference between the DE and CE, is allocated to the Engineering and Estimating categories.

e. The engine spares requirement has been reduced as a result of the aircraft reduction. This is a Support Change because spares are not part of flyaway cost. Changes in nonflyaway costs (except for some construction cost changes) are always classified as Support Changes.

f. In summary, we have six categories to compute. However, categories that result strictly from an allocation need not be calculated in the required order. The procedure will be to calculate the basic program changes in the following order: Economic, Quantity, Schedule, Estimating, and Support. After the Schedule Change is calculated, the Quantity PCR escalation is adjusted for the Schedule component as we did in Section IV, paragraph B.3.d. (2). The Economic Change adjustment caused by the quantity reduction will then be determined. Next, the excess Quantity Change allocation will be computed. Finally, the allocations are applied to the basic changes and the procedure is complete.

2. Table VI.3 displays the basic change calculations.

a. The Economic Change is calculated exactly as described in Section III, paragraph B.2.a. The September 1979 SAR escalation amounts (by appropriation from Table V.2) are subtracted from figures that reflect what the September escalation amounts would have been had the new indices (Table VI.1) been used. Note that this calculation is based on the September program for 170 aircraft. We will have to reduce the procurement Economic Change by the amount related to the 10 aircraft that are being deleted. This adjustment will be determined later.

b. Because the DE and CE cost-quantity curves are different {because of the June 1979 Engineering and Estimating Changes), calculate the impact due to the quantity reduction in two steps.

(1) First, deescalate the new airframe cost figures from Table VI.2. The New 79$ (CE cost-quantity curve) line in Table VI.3 shows the result. From this line we subtract the prior 79$ (CE cost-quantity curve) values from Table V.2. The result is $-380.0M (79$) for the change. The annual changes are then escalated to determine the PCR escalation of $-481.4M. As was the case in Section IV, paragraph B.3.a. (3), the PCR total includes the impact of the accelerated schedule. This correction will be determined later under Schedule Change.

(2) Using the DE cost-quantity curve and the new schedule and quantity (160 airframes), we get the values shown in the table on the line titled, New 79$ (Orig. cost-quantity curve). From this, subtract the costs of the September 1979 170 airframe program and schedule based

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TABLE VI.3
PROGRAM CHANGES (DECEMBER 31, 1979)

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	TUTAL	CHANGES
SEPT RDT&E (79$)	$300.0	$400.0	$648.1	$725.0	$786.4	$325.0	$30.0						$2,655.1	
New Index			1.030	1.09s	1.168	1.247	1.331							
New Esc			19.4	68.9	132.1	80.3	9.9						310.6	
Previous Esc	~	~	19.4	68.9	130.6	79.0	9.7						307.6	
Econ Chg		-	-	-	+1.5	+1.3	+0.2						+3.0	+3. 0 Economic (RDT&E)
SEPT PROC (79$1							S1413.6	?2265.5	S3353.1	$2778.7	S2236.6	$1538.9	S13,586.4	
New Index							1.432	1.522	1.615	1.712	1.815	1.924	-	
New Exc							610.7	1182.6	2062.2	1978.4	1822.8	1421.9	9,078.6	
Previous Es.							595.1	1 1 5	02008.9	1780.32		81391.8	5 7 . 2	
Econ Chg							+15.6	+31.7	+53.7	+47.2	+42.5	+30.7	+221.4	+221. 4 Economic (Proc)
SEPT CONST (79$)							120.0	215.0					335.0	
New Index							1.432	1.522						
New Es.							51.8	112.2					364.0	
Previews Esc							50.5	109.2					159.7	
Ec." Chg							+1.3	+3.0					+4.3	+4. 3 Economic (Const)
TOTAL ECON CHG					+1.5	+1.3	+17.1	+34.7	+53.7	+47.2	+42.5	+30,7	+228.7	+228. 7 Economic (Total before 'Quantity Reduction Adjustment)
QUANTITY (PROC)														
Airframe														
New Qty & Sched							10	20	40	40	40	10	160	
New 79$ (CE cost/qty curve)							793.0	1223.1	2006.2	1749.7	1607.0	385.4	7,764.4	
Prior Qty & Sched							10	20	35	35	35	35	170	
Prior 79$ (CE cost/qty curve)							793.0	1223.1	1773.3	1561.2	1438.9	1354.9	8,144.4	
Actual Chg (79$)									+232.9	+188.5	168.1	-969.5	-380,0	-380.0 Total Chg (79$)
Index									1.615	1.712	1.815	1.924		
Chg (Esc $)									+376.1	+322.7	+305.1	-1865.3	-861.4	
Escalation									+143.2	+134.2	+137.0	-895.8	-481.4 1/	-351.1 C.E. Based PCR Escalation Total (Before Economic Adjustment)
New 79$ (Orig cost/qty curve)							720.9	1111,9	1823.8	1590.6	1460.9	350.4	7,058.5	
Prior 79$ (Orig cost/qty curve)							720.9	1111.9	1612.1	1419.2	1308.1	1231.7	7,403.9	
Qty Chg (79$)									+211.7	+171.4	+152.8	-881.3	-345.4	-34S.4 Quantity (79$)
Qty Chg (Esc $)									+341.9	+293.4	+277.3	-1695.6	-783.0	
Qty Escalation									+130.2	+122.0	+124.5	-814.3	-437.6 2/	-319.2 D.E. Based PCR Escalation (Before Economic Adjustment)
Engine														
New Qty							50	100	200	250	40		640	
New 79$							140.4	234.9	415.2	474.6	72.7		1,337.8	
Prior Qty							50	100	200	250	80		680	
Prior 79$							140.4	234.9	415.2	474.6	144. B		1,409.9	
Chg 79$											-72.1		-72.1	-72.1 Quantity (79$)
Index											1.815			
Chg Esc $											-130.9		-130.9	
Escalation											-5S.8		-58.8	-58.8 PCR Escalation (Before Economic Adjustment)
Avionics														
New 79$							105.0	190.0	370.0	360.0	355.0	90,2	1,470.2	
Prior 79$							105.0	190.0	370.0	360.0	355.0	184.0	1,564.0	
Chg 79S												-93.8	-93.8	-93.8 Quantity (79$)
Index												1.924		
Chg Esc $												-180.5	-180.5	
Escalation												-86.7	-86.7	-86.7 PCR Escalation (Before Economic Ad j ustment)
SCHEDULE (PROC)														
Airframe														
Prior Qty, New Sched							10	20	40	40	40	20	170	
New 79$							793.0	1223.1	2006.2	1749.7	1607.0	765.4	8,144.4	
Prior Qty & Sched							10	20	35	35	35	35	170	
Prior 79$							793.0	_	1773.3	1561.2	1438.9	1354.9	8,144.4	
Chg (79$)									+232.9	+188.5	+168.1	-589.5		-O- Schedule (79$)
Index									1.615	1.712	1.815	1.924		
Chg (Esc $)									+376.1	+322.7	+305.1	-1134.2	-130.3	
Escalation									+143.2	+134.2	+137.0	-544.7	-130.3	'130. 3 PCR Escalation (Before Economic Adjustment) (To be subtracted from Quantity Change PCR above: See 1/ and 2/

CONTINUED : XT PAGE

1/ Includes -130.3 Schedule PCR escalation calcuntity PCR based on the CE cost/quantity curve i s, therefore, calculated as -481.4 - (-130.3) = -351.1.

2/ Includes schedule PCR escalation of -118. 4; determined as follows: (DE cost/qty curve PCR) , (CE cost/qty curve PCR) X (Schedule PCR) = (437.6 ÷ 481.4) (-130.3) = 118.4. Quantity PCR based on the DE cost/quantity curve is, therefore, calculated as -437.6 - (-118.4) = -319,2.

TABLE VI. 3 (Continued)
PROGRAM CHANGES (DECEMBER 31, 1979)

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	TOTAL	HAN
ESTIMATING (Development)														
Other (After Chg)	$272.6	$212.5	$500.0	$627.9	$700.1	$328.0	$30.0						$2,671.1	
Other (Before Chg)	272.6	212.5	500.0	622.9	692.1	325.0	30.0						2,655,1	
Chg (79$)				+5.0	+8. 0	+3.0	-						+16.0	+16. O Estimating (79$)
Index				1.095	1.168	1.247								
Chg (Esc $)				+5.5	+9.3	+3.7							+18.5	
Escalation				+0.5	+1.3	+0.7							+2.5	+2.5 PCR Escalation
SUPPORT (PROC)														
Engine Spares														
New Qty							25	50	60	70	58		263	
New 79$							70.2	117.5	124.6	132.9	105.5		550.7	
Prior Qty							25	50	60	70	74		279	
Prior 79$							70.2	117.5	124.6	132.9	133.9		579.1	
Chg 79$											-28.4		-28.4	-28.4 Support (79$)
Index											1.815			
Chg (Esc $)											-51.5		-54.6	
Escalation											-23.1		-23.1	-23.1 PCR Escalation (Before Economic Ad j ustment)
DESIGN TO COST (CE)														
Airframe Qty							10	20	40	40	40		150	
cost							793.0	1223.1	2006.2	1749.7	1607.0		7,379.0	
Engine Qty							50	100	200	250			600	
cost							140.4	234.9	415.2	474.6			1,265.1	
Avionics							105.0	190.0	370.0	360.0	355.0		1,380.0	
Total 79$							$1038.4	$1648.0	$2791.4	$2584.3	$1962.0		$10, O24.1	
Index							1.432	1.522	1.615	1.712	1.815			
Total (Esc $)							$1487.0	$2508.3	$4508.1	$4424.3	$3561.0		$16,488.7	

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on the original (DE) curve. In this case, Table IV. 1 for the June 1979 SAR has the required values in the second line entry under QUANTITY (PROC) . (Note: These values can be used only because there have been no Schedule Changes since the last Quantity Change. If the schedule had changed in the interim, the base year dollar total from Table IV. 1 would have been correct, but the annual amounts would have to be rephased to reflect the Schedule Changes.) The result of the DE-based subtraction is $-345. 4M. This is the base year dollar value of the Quantity Change. The difference between this value and the CE based change ($-380.0M) is $-34.6M and is the amount to be allocated to the Engineering and Estimating variance categories. The allocation will be done later. The DE-based changes are escalated to determine the PCR escalation total of $-437.6M under the TOTAL column in Table VI.3. As was the case in paragraph B.2.b. (.1), this total contains Schedule related escalation, the amount of which will be determined in the subsequent Schedule Change calculations.

c. Since the engine CE cost-quantity curve is unchanged from the DE curve, compute the engine quantity reduction in a single step. The September engine line from Table v.2 is subtracted from the new engine line (the new line is the September line changed by the information in paragraph A.1.b.). The difference is then escalated to determine the engine portion of PCR escalation. If the reader is recomputing cost-quantity curves, remember to include spares per Table 11.1 footnote 5.

d. The Avionics Change is calculated from the same sources and in the same manner as for engines.

e. Only the airframe schedule has changed. Fewer engines and avionics sets are being procured, but those being procured are on the same schedule as in the September SAR.

(1) The September SAR airframe program from Table V.2 is subtracted from a line representing the September 170 airframe buy, rephased to the new higher rate schedule. Again, as was the case in Section IV, paragraph B.3.d., the base year dollars have not changed. However, the rephasing does result in PCR escalation of $-130.3. This escalation was included in the $-481.4 PCR escalation calculated in paragraph B.2.b. (1) and should now be subtracted from that total. The resulting $-351.1M PCR Escalation (Before Economic Adjustment) is shown in the CHANGES column of Table VI.3 (see footnote 1 of this table).

(2) Since the Schedule Change is based on the CE, the resulting Schedule PCR escalation was subtracted in paragraph B.2.e. (1) from the total CE based PCR escalation. Now determine what part of the Schedule PCR escalation relates only to the DE-based Quantity Change PCR escalation of .$-437.614. The easiest way to do this is to split the Schedule PCR of $-130.3M by the ratio of DE Quantity PCR and CE Quantity PCR as follows:

$$\frac{\text{DE PCR}}{\text{CE PCR}} \times (\text{Schedule PCR}) = \text{DE Schedule PCR}$$

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$$\frac{\$\text{-}437.6}{\$\text{-}481.4} \text{ X } (.\$\text{-}130.3) = \$\text{-}118.4$$

The resulting $-118.4M represents the, DE-based portion of the total Schedule PCR of $-130.3M. The $-118.4M should be subtracted from the DE-based Quantity PCR of $-437.6M resulting in a net DE Quantity PCR of $-319.2M as shown in the CHANGES column of Table VI.3 (see footnote 2 of the table) .

f. Before calculating the Estimating Change for the Congressionally directed tactical bombing/ocean control demonstration, the funding " estimate in paragraph A.1.c. should be deescalated to base year dollars. Subtracting the September 1979 base year dollar estimate for development (from Table V.2) yields the total change in base year dollars in Table VI.4. Since these changes do not affect prototype costs, they must be applied to the Other line of the development cost shown in Table v.2. Table VI.3 shows the Other lines before and after the change. The differences are then escalated to arrive at PCR escalation.

	FY 80	FY 81	FY 82	FY 83
Esc $	799.3	927.9	409.0	39.9
79$	730.0	794.4	328.0	30.0
Less Sept.	725.0	786.4	(325.0	$30.0)
Change (79$)	+5.0	+8.0	+3.0	

TABLE VI.4 Development Cost Change

g. Support Change is calculated as the reduction in cost associated with 16 fewer spares engines per paragraph A.1.b. Subtracting the September engine spares line from the new line and escalating the difference results" in the Support Change and PCR as shown in Table VI.3.

h. The design-to-cost calculation is shown, as before, only for completeness.

3. The basic estimates of all changes and PCR escalation are now complete. The procedures have been identical to those used in prior sections of this appendix. We must now compute the allocations required by the quantity reduction and the fact that the DE and CE cost-quantity curves are different.

c. ECONOMIC CHANGE RELATED TO COST REDUCTION

1. The cost reduction requires an adjustment to the Economic Change for the reasons discussed in paragraphs B.1. and B.1.c. In this example, the Economic adjustment is required only because of the Economic Change made in this iteration. However, the procedure is identical to the case where one or more economic changes are made prior to the SAR in which the cost reduction occurs. The procedure used in this example is not mandatory. It merely portrays a means of approximating the required allocations. The

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analyst may use other approximations that suit the specific situation and available information. The procedure should not distort the result, however, and should recognize that economic changes have a greater impact on effort in the later stages of a program than on effort in the earlier stages. The following procedure is used in this example:

a. Identify the total prior economic changes by appropriation that have affected the units or effort now being reduced. In this example, only the change determined in paragraph B.2.a. affected units 161-170. This is $+221.4M and is for procurement only (from Table VI.3). The December 1978 Economic Change did not affect these units because they were not in the program at that time. When they were added in June 1979, all associated escalation was identifi"ed as PCR escalation.

b. Divide the value identified in paragraph C.1.a. by the total program escalation for the appropriation being reduced. In this example, total escalation can be obtained from Format G of the September 1979 SAR (Table V.4). From the REMARKs column of Table V.4 total procurement escalation was $8,857.2M prior to the December 1979 changes. To this we must add the $+221.4M Economic for this SAR for a total procurement escalation of $9,078.6M. Dividing this into the $221.4M from paragraph C.1.a. and multiplying this ratio by 100 yields the percent of total escalation that is associated with the effort being reduced, 2.4 percent.

c. The derived percentage is then applied to the total basic PCR escalation calculated for the reduction to arrive at the amount of Economic adjustment required. In this example, total PCR related to the reductions is the sum of $-351.1M (airframe Quantity PCR before cost-quantity curve allocation), $-58.8M (engine Quantity PCR), $-86.7M (avionics Quantity PCR), $-130.3 (airframe Schedule PCR), and $-23.1M (engine spares Support PCR). The total reduction related PCR escalation is $-650.0M; 2.4 percent of $-650.0M is $-15.6M and is the amount of the required Economic adjustment.

2. Adjust the PCR escalation amounts calculated for each variance category by line item. Table VI.5 shows the adjustments for this example. The last column of the table shows the variance category PCR escalation amounts resulting from the $-15.6M change to the Economic Change category.

	Initial PCR Escalation From Table VI.3	Percent of Total	Reduction Amount $\frac{\%}{100}$ x 15.6	Net PCR
Airframe (Qty)	$-351.1	54.0	$-8.4	$-342.7
Engine (Qty)	-58.8	9.0	-1.4	-57.4
Avionics (Qty)	-86.7	13.3	–2.1	-84.6
Airframe (Sch)	-130.3	20.1	-3.1	–127.2
Engine Spares (Spt)	-23.1	3.6	-0.6	-22.5
Total	$-650.0	100.0	$-15.6	$-634.4

TABLE VI.5 Economic Adjustment

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D. EXCESS AIRFRAME QUANTITY VARIANCE

1. Since the DE and CE cost-quantity curves differ, we calculated. the impact of the airframe quantity reduction shown in Table VI. 3 f rom both curves. The SAR Quantity variance category is limited solely to changes resulting from the DE curve. The difference between the DE and CE calculations must be allocated to the other variance categories. As in paragraph C., the procedure in this example is an approximation and is not mandatory.

a. First, identify the amounts to be allocated. In this example the allocation totals are obtained from Table VI.3 as follows:

(1) The DE-based change of $-345.4M (79$) is subtracted from the CE-based change of $-380.0M (79$) for an allocation amount of $-34.6M {79"$).

(2) The amount of PCR escalation to be allocated is complicated by the Economic adjustment described in paragraph C. The amount of PCR to be allocated is the difference between the DE and CE Quantity Change PCR figures. However, the CE PCR of $-351.1M was reduced by $8.4 in paragraph C.2. Determine how much of the $8.4 Economic adjustment pertains to the DE-based PCR that was initially calculated as $-319.2. Do this by pro-rating the $8.4 adjustment based on the DE and CE PCR ratio:

$$\frac{\text{DE PCR } (\$-319.2)}{\text{CE PCR } (\$-351.1)} \times (\$-8.4) = \$-7.6$$

Therefore, $-7.6 of the total $-8.4 applies to the DE estimate of PCR. $-319.2 minus $-7.6 yields an adjusted DE PCRof $-311.6. The PCR to be allocated is then the CE PCR minus the DE PCR: the adjusted CE PCR of $-342.7 (from Table VI.5) less the adjusted DE PCRof $-311.6 or $-31.1.

(3) In summary, allocate $-34.6 in base year dollars and $-31.1 in PCR escalation.

b. Identify the categories to which the allocation must be made. In paragraph B.1.d., the Engineering and Estimating categories were identified to receive the allocation. To the extent practicable, we should identify only those Engineering and Estimating Changes associated with the airframe. Reviewing the Current Changes entries for all prior SAR submissions reveals that only the Engineering and Estimating Changes in the June 1979 SAR apply to the airframe.

(1) The total base year dollar Engineering and Estimating Changes in procurement are taken from Format G of the June 1979 SAR, Table IV.4. Using the ratio of each change category to the total Engineering and Estimating Changes, multiply by the amount to be allocated to arrive at the required distribution shown in Table VI.6.

	Total 79$ Changes	.	Ratio of Change to Total	X	1979$ To Be Allocated	=	1979$ Allocation
Engineering	$+296 .2		0.40		$-34.6		$-13.8
Estimating	+444.3		0.60		-34.6		-20.8
Total	$+740.5		1.00				$-34.6

TABLE VI.6 Excess Quantity Allocation
(Base Year Dollars)

(2) The PCR allocation is done in the same fashion as for base year dollars except the ratios on the PCR amounts are based from the REMARKS column of Table IV.4 for the allocation categories. The procedure is illustrated in Table VI.7.

	Prior PCR Escalation	Ratio of PCR to Total PCR	X	PCR To Be Allocated	=	PCR Allocation
Engineering	$+199 .0	0.40		$-31.1		$-12.4
Estimating	+298.5	0.60		-31.1		-18 .7
Total	$+497.5	1.00				$-31.1

TABLE VI.7 Excess Quantity PCR Escalation Allocation

(3) The allocation ratios for base year dollars and PCR escalation are the same. This is due to the changes that affected the program in a constant proportional manner over identical timeframes (a 4 percent Engineering Change and a 6 percent Estimating Change). Because this will not always be the case, the analyst should always allocate the base year and PCR escalation amounts separately. For example, all of the procurement Schedule Changes in this example have resulted in PCR escalation with no changes in base year dollars. Had the Schedule Changes affected the deleted airframes, PCR escalation allocation would be made to Schedule if only the base year dollar ratios had been used because the Schedule ratio would have been 0. This would clearly have been an improper allocation.

E. SUMMARY

1. The changes in Tables VI.3, VI.5, VI.6, and VI.7 are summarized in Table VI.8.

2. The line item changes by year from Table VI.3 are added to Table V.2 to arrive at Table VI.9. Tables VI.8 and VI.9 are used to prepare SAR Formats E, G, and H shown as Tables VI.10, VI.11, and VI.12, respectively.

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TABLE VI.8
SUMMARY OF CHANGES AND ADJUSTMENTS

	Development		Procurement			Construction	
				PCR Escalation			
	1979$	PCR	1979$	Before Economic Adjustment	After Economic Adjustment	1979$	PCR
Economic		+3.0		+221.4	+205.8 1/		+4.3
Quantity							
Airframe			-345.4	-319.2	-311.6		
Engine			-72.1	-58.8	-57.4		
Avionics			-93.8	-86.7	-84.6		
Schedule				-130.3	-127.2		
Engineering			-13.8	-12.7	-12.4		
Estimating	+16.0	+2.5	-20.8	-19.2	-18.7		
Support			-28.4	-23.1	-22.5		
Total	+16.0	+5.5	+574.3	-428.6	-428.6		+4.3

1/ Procurement Economic Change of +221.4 less adjustment for prior Economic associated with negative cost changes of -15.6 (from paragraph C.1.c.) = +221.4 - (-15.6) = +205.8

TABLE vI.9

CURRENT ESTIMATE (DECEMBER 31, 1979)

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	TOTAL
Development:													
Airframe													
Qty		1	1	l	l								4
cost		158.7	115.5	102.1	94.3								470.6
Engine													
Qty	6	8	10										24
Cost	27.4	28.8	32.6										88.8
Other	272.6	212.5.	500.0	627.9	700.1	328.0	30.0						2,671.1
Total 79$	300.0 l/	400.0 l/	648.1	730.0	794.4	328.0	30.0						3,230.5
Index			1.030	1.095	1.168	1.247	1.331						
Escalation			19.4	69.3	133.5	81.0	9.9						313.1
Total (Esc $)	$300.0	$400.0	$667.5	$799.3	$927.9	$409.0	$39.9						$3,543.6
Procurement:													
Airframe													
Qty							10	20	40	40"	40	10	160
cost							793.0	1223.1	2006.2	1749.7 .	1607.0	385.4	7,764.4
Engine													
Qty							50	100	200	250	40 '		640
cost							140.4	234.9	415.2	474.6	72.7		1,337.8
Avionics							105.0	190.0	370,0	360.0	355.0	90.2	1,470.2
Subtotal (Flyaway)							1038.4	1648.0	2791.4	2584.3	2034.7	475.6	10,572.4
Peculiar Support							150.0	320.0	500.0	70.0			1,040.0
Other Weap. Sys. Cost							80.0	70.0	30.0	30.0	15.0		225.0
Initial Spares													
Engine Cost							(70.2)	(117.5)	(124.6)	(132.9)	(105.5)		(550.7)
Qty							25	50	60	70	58		263
Other							(75.0)	(110.0)	(1 4 0	(150.0)	(149.0)		(6 2 4 . 0)
Total Spares							145.2	227.5	264.6	282.9	254.5		1,174.7
Total Proc. (79$)							$1413.6	$2265.5	$3586.0	$2967.2	$2304.2	$475.6	$13,012.1
Index							1.432	1.522	1.615	1.712	1.815	1.924	
Escalation							610.7	1182.6	2205.4	2112.6	1877.9	439.4	8,428.6
Total Proc. (Esc $)							$2024.3	$3448.1	$5791.4	$5079.8	$4182.1	$915.0	$21,440.7
Construction (79$)							120.0	215.0					335.0
Index							1.432	1.522					
Escalation							51.8	112.2					164.0
Total Const. (Esc $)							$171.8	$327.2					$499.0

l_/ See Format E, footnote 1.

TABLE VI.10
Selected Acquisition Report
System: B-X — As of Date: 31 December 1979

(Dollars in Millions)

E. Program Acquisition 1. cost	(1) Development Estimate (FY77-86)	(2) Changes	(3) Current Estimate (FY77-88)
Development	$3,200.0 1/	$+30.5	$3,230.5 1/
Procurement	11,751.4	+1,260.7	13,012.1
Airframe	6,708.1	+1,056.3	7,764.4
Engines	1,265.7	+72.1	1,337.8
Avionics	1,380.0	+90. 2	1,470.2
Total Flyaway	9,353.8	+1,218.6	10,572.4
Peculiar Support Equip.	1,040.0		1,040.0
Other Weap. Sys. cost	225.0		225.0
Initial Spares	1,132.6	+42.1	1,174.7
Construction	250.0	+85.0	335.0
Total: Constant FY79$	$15,201.4 1/	$+1,376.2	$16,577.6 1/
Escalation	6,187.4	+2,718.3	8,905.7
Total Program Cost	$21,388.8	$+4,094.5	$25,483.3(CH-1)

Funding	(4) Current & Prior Yrs	(5) Budget Year (FY81)	(6) Balance to Complete FYDP	(7) Balance to Complete Beyond FYDP	(8) Total
Development	$2,166.8	$927.9	$448.9	-	$3,543.6
Procurement			11,263.8	10,176.9	21,440.7
Construction			499.0		499.0
Total	$2,166.8	$927.9	$12,211.7	$10,176.9	$25,483.3
Quantity					
Development	3	1	-		4
Procurement			70	90	160
Total	3	1	70	90	164

4. Approved Design to Cost Goal: Average Flyaway Cost for 150 units at a peak production rate of 4 per month.

2. Quantities			
Development	4		4
Procurement	150	+10	160
To ta 1	154	+10	164
3. Unit Cost			
Procurement:			
Constant FY79$	$78.3	+3.0	$81.3
Escalated	117.1	+14.9	134.0
Program:			
Constant FY79$	$98.7	+2.3	$101.1
Escalated	138.9	+12.8	$155.4

	Development Estimate	Approved Program	Current Estimate
Constant FY79$	$62.4	$62.4	$66.8
Escalated	93.8	93.8	109.9

5. Foreign Military Sales : None

1/ Includes $300.0 in FY77 and $400.0 in FY78 actuals. $38.7 must be added to raise total pre-base year actuals to FY79$.

TABLE VI.11

COST VARIANCE ANALYSIS

(Dollars in Millions)

As of Date: 31 December 1979
Base Year: 1979

G.	Base Year/FY79 Constant $ DEV	PROC	CONST	SUBTOTAL	ESC	TOTAL		REMA
Development Estimate	$3,200.0	$11,7s1.4	$250.0	$15,201.4	$6,187.4	$21,388.8	Esc :	Dev. 279.7; Proc. 5817.6; Const. 90.1
Previous Changes								
Economic					+394 .8	+394 .8	Esc :	Dev. +13.2; Proc. +374.8; Const. +6.8
Quantity		+1,024.6		+1,024.6	+910. 5	+1,935.1	Esc :	Proc. +910.5
Schedule	+5.0			+5.0	+1,237.3	+1,242.3	Esc :	Dev. +12,9; Proc. +1203.0; Const. +21.4
Engineering	+11. 3	+296. 2	+50. 0	+357.5	+223.6	+581.1	Esc :	Dev. +1.0; Proc. +199.0; Const. +23.6
Estimating	-2.7	+443.7		+441.0	+298. 5	+739.5	Esc :	Dev. +0.4; Proc. +298.1
other	+0.9			+0.9	+0.4	+1.3	Esc :	Dev. +0.4
Support		+70.5	+35.0	+105.5	+72, 0	+177.5	Esc :	Proc. +54. 2; Const. +17.8
Subtotal	+14.5	+1,835.0	+85 .0	+1,934.5	+3,137.1	+5,071.6	Esc :	Dev. +27.9; Proc. +3,039.6; Const. +69.6
Current Changes								
Economic					+213.1	+213.1	Esc :	Dev. +3.0; Proc. +205.8; Const. +4.3
Quantity		-511.3	-	-511.3	-453,6	-964.9	Esc :	Proc . -453.6
Schedule					-127.2	-127.2	Esc :	Proc. -127.2
Engineering		-13.8	-	-13.8	-12,4	-26.2	Esc :	Proc. -12.4
Estimating	+16.0	-20.8	-	-4.8	-16,2	-21.0	Esc :	Dev. +2.5; Proc. -18.7
Support		-28.4	-	-28.4	- 2	2 ,50.5	Esc :	Proc. -22.5
Subtotal	+16.0	-574.3	-	-558.3	-418.8	-977.1	Esc :	Dev. +5.5; Proc. -428.6; Const. +73.9
Total Changes	+30.5	+1,260.7	+85.0	+1,376.2	+2,718.3	+4,094.5 (CH-1)	Esc :	Dev. +33.4; Proc. +2,611.0; Const. +73.9
Current Es timate	$3,230.5	$13,012.1	$335. 0	$16,577.6	$8,905.7	$25,483.3	Esc :	Dev. 313.1; Proc. 8,428.6; Const. 164.0

Changes Since Previous Report:

(Ch 1) The Current Estimate for total program Acquisition Cost changes as follows: 1/

	Current $	Base Year $
Development		
Revised escalation indices (Economic)	$+ 3.0	$ -
Congressionally directed requirement to demonstrate tactical bombing/ocean control capability (Estimating)	+ 18.5	+ 16.0
TOTAL Development Cost Change	$+ 21.5	$+ 16.0
PROCUREMENT		
Revised escalation indices (Economic)	$+ 2(35 .8	$ -
Reduction in aircraft buy from 170 to 160 (Quantity)	- 964.9	-511.3
Accelerated procurement schedule (Schedule)	- 127.2	
Previous Engineering changes related to the 10 deleted aircraft (Engineering)	26.2	- 13.8
Previous Estimating changes related to the 10 deleted aircraft (Estimating)	39.5	- 20.8
Reduced spares requirement related to reduced aircraft buy (Support)	50.9	- 28.4
TOTAL Procurement Cost Change	$-1,002.9	$-574.3
CONSTRUCTION		
Revised escalation indices (Economic)	$+ 4.3	$ -
TOTAL PROGRAM COST CHANGE	$.- 977.1	$-558.3

1/ Summary explanations of "Previous Changes" are not shown in this example but are required in actual practice.

TABLE VI. 12

Selected Acquisition Report
System: B-X

As of Date: 31 December 1979

H. BUDGET YEAR AND OUT YEAR PROGRAMS

Fiscal Year	Current Estimate Budget Year Thru Completion			Escalation (Base Year FY79) Amount			Escalation (Base Year FY79) Rate 1/		
	Dev.	Proc.	Const.	Dev.	Proc.	Const.	Dev	Proc	Const
1981	927.9			133.5			6.5		
1982	409.0			81.0			6.8		
1983	39.9	2,024.3	171.8	9.9	610.7	51.8	6.8	6.8	6.8
1984		3,448.1	327.2		1,182.6	112.2		6.7	6.7
1985		5,791.4			2,205.4			6.4	
1985		5,079.8		-	2,112.6			6.2	
1987		4,182.1			1,877.9			6.0	
1988		915.0			439.4			6.0	
	$1,376.8	$21,440.7	$499.0	$224.4	$8,428.6	$164.0			

1/ Since the annual rates shown do not incorporate spend-out rates or the compounding effect of prior years' escalation, they cannot be used to track the inflation amounts shown for applicable years.