

Modeling Potential Cost Savings by Synchronizing Commercial Derivative Acquisition & Lifecycle Programs

Bradley C. Boehmke

Booz Allen Hamilton

Associate

Boehmke_Brad@bah.com

937.271.4242

Joint effort with Aeronautical Systems Center (ASC)

Presented to Air Force Institute of Technology (27 May 2011)

Table Of Contents

▶ Purpose

▶ Literature Review

▶ Methodology

▶ Results

▶ Take Away

Purpose

To model commercial derivative aircraft lifecycle costs and assess possibilities of cost savings by combining program efforts.

Sponsored by:

ASC/XRE

Aerospace Systems Design & Analysis

Purpose



Can we gain significant savings by synergizing commercial derivative acquisition programs

Purpose

- ▶ Analyzed two commercial derivative development planning efforts
 - Due to sensitivity program names will not be released and cost numbers have been altered; will refer to subject programs as Program X and Program Y

- ▶ **Primary Question:** Do the following types of synergy produce cost savings in comparison to the baseline program estimates?
 - Type 1: Airframe Acquisition Synergy – same green a/c with same airframe mods (synchronizes part of RDT&E only)
 - Type 2: Acquisition & Mod Synergy – includes Type 1 plus all modification requirements (synchronizes entire acquisition process)
 - Type 3: Acquisition, Initial & On-going Mod Synergy – includes Type 2 plus synchronizing future modification efforts
 - Type 4: Full Program Synergy – includes Type 3 plus synchronizing housing the programs at the same base and combining the System Program Offices (SPOs)

Table Of Contents

- ▶ Purpose

- ▶ Literature Review

- ▶ Methodology

- ▶ Results

- ▶ Take Away

Literature Review

▶ Primary Sources

- Program X Early Assessment Study
- Program Y Early Assessment Study
- Program X Predecessor Assessment Study
- Program Y Predecessor Assessment Study
- IOI: Inform Senior Leaders of the benefits of synchronizing Program X and Program Y

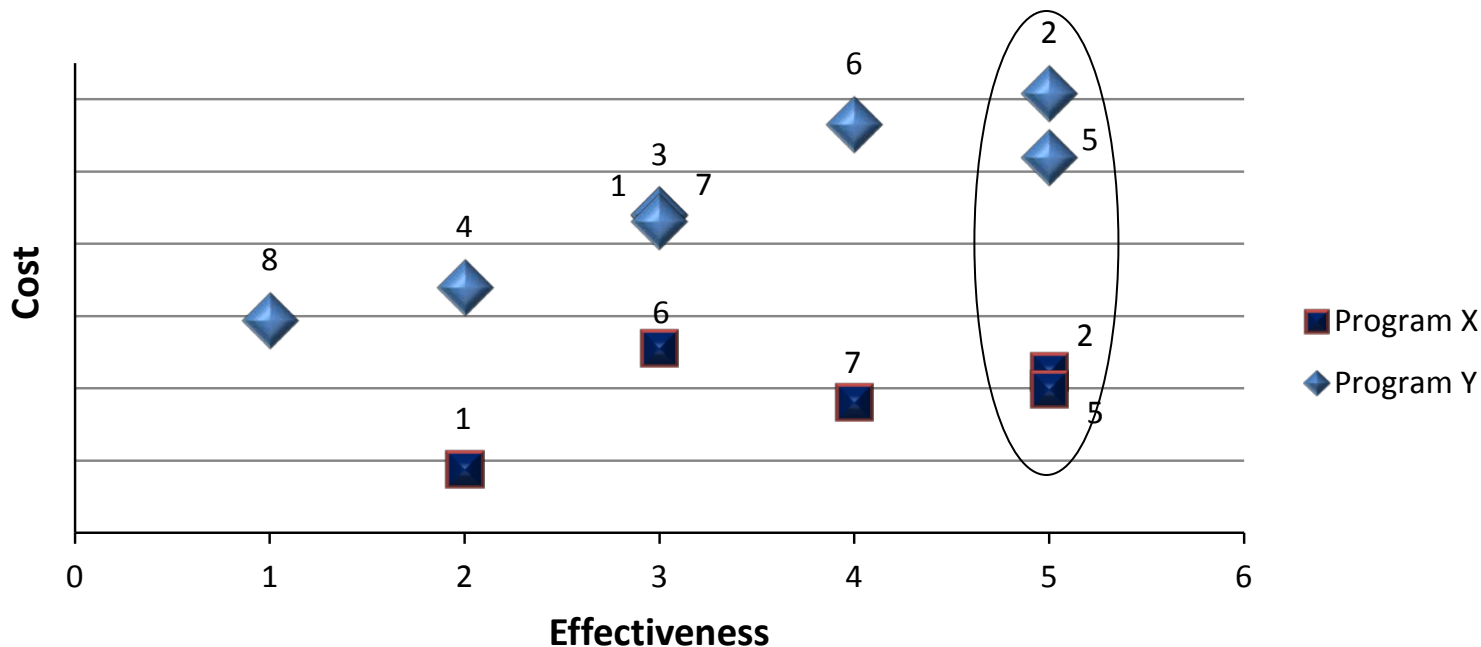
▶ Additional Lit Reviews (sample)

- Commercial Item Acquisition: Considerations and Lessons Learned
- GAO: Best Practices for Estimating and Managing Program Costs
- GAO: Cost Estimating and Assessment Guide
- ASC: Historical Cost Studies

Sparse Info & Studies on Combining 2 Acquisition Programs

Literature Review

Program X & Y Early Assessment Studies



- ▶ Alternatives 2 & 5 were the most effective options for both early assessment studies and were the recommended alternatives
- ▶ Primary differences in cost were:
 - Fleet size
 - Communication equipment
 - Interior accommodations

Literature Review

- ▶ Previous studies analyzed “opportunities for synergies between Program X and Program Y efforts and found that the possibility of achieving significant benefits and real cost savings exists”
 - Could possibly save \$120M in RDT&E
 - \$50-200M in O&S

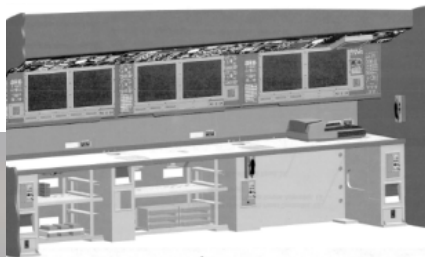
- ▶ Follow on studies and out-briefs suggested:
 - Synergies could potentially save around \$1B
 - \$300M EMD savings from similar mods
 - \$700M in production and in O&S costs (ROMs)
 - Reduction in integrated logistics cost for Mx planning, spares procurement data, etc.
 - If COMBS facilities can be combined there are addt'l savings
 - Significant savings can be obtained in O&S with additional investment in improved design for maintainability which is more feasible with synchronized development activity

Literature Review

Avionics



Mission Comms



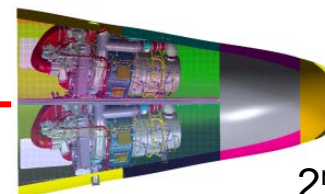
Interior Rest & Work Environments



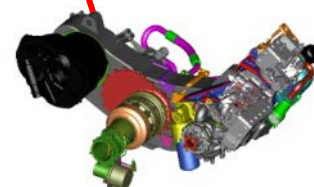
Universal Aerial Refueling Receptacle Slipway Installation



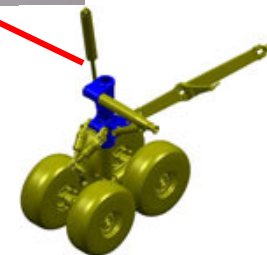
Airstairs



2nd APU



Integrated Drive Generator Upgrade



Landing Gear Upgrade

Table Of Contents

- ▶ Purpose
- ▶ Literature Review
- ▶ Methodology
- ▶ Results
- ▶ Take Away

Methodology

- ▶ Build baseline estimates for Program X & Program Y
 - Develop common Ground Rules & Assumptions (GR&As)
 - Develop common WBS
 - Develop detailed bottoms up estimate from available data

- ▶ Build Synergy estimates
 - Develop synergy schedule
 - Identified program commonalities where efforts could be reduced
 - Used similar baseline methodology and developed discrete synergy saving estimates at the lower WBS level

- ▶ Compare & Analyze results

Methodology

BY08 (\$M)		Qty	Sep TOTAL 7	Program Y 4	Program X 3	Methodology
1.0	Development		\$ 23,956.1	\$ 14,694.9	\$ 9,261.1	
1.1	PME		\$ 2,049.6	\$ 1,282.1	\$ 767.6	
1.1.1	Non-Recurring		\$ 1,013.0	\$ 722.8	\$ 290.3	
1.1.1.2	Mission Package Design		\$ 1,013.0	\$ 722.8	\$ 290.3	
1.1.1.2.1	Airframe Design		\$ 83.5	\$ 40.9	\$ 42.6	ANALOGY
1.1.1.2.2	Avionics Design		\$ 722.3	\$ 597.8	\$ 124.5	ANALOGY / PARAMETRIC
1.1.1.2.3	Interior		\$ 207.3	\$ 84.1	\$ 123.2	ANALOGY / PARAMETRIC
1.1.1.2.4	GFE		\$ -	\$ -	\$ -	
1.1.1.3	Refurbishment		\$ -	\$ -	\$ -	
1.1.2	Recurring		\$ 1,036.6	\$ 559.3	\$ 477.3	
1.1.2.1	Aircraft Purchase		\$ 435.0	\$ 217.5	\$ 217.5	ACTUALS
1.1.2.2	Mission Package Equipment		\$ 601.6	\$ 341.8	\$ 259.8	
1.1.2.2.1	Airframe Mods		\$ 40.4	\$ 18.6	\$ 21.8	ANALOGY / PARAMETRIC
1.1.2.2.2	Mission Avionics		\$ 211.2	\$ 171.7	\$ 39.5	ANALOGY / PARAMETRIC
1.1.2.2.3	Interior		\$ 350.0	\$ 151.5	\$ 198.5	ANALOGY / PARAMETRIC
1.1.2.2.4	GFE		\$ -	\$ -	\$ -	
1.1.2.3	Refurbishment		\$ -	\$ -	\$ -	
1.2	System Design		\$ 12.8	\$ 8.0	\$ 4.8	FACTOR
1.3	System Testing		\$ 768.2	\$ 452.4	\$ 315.8	
1.3.1	Contractor Flight/Ground		\$ 205.0	\$ 128.2	\$ 76.8	BUILD UP / PARAMETRIC
1.3.2	FAA Flight		\$ 2.0	\$ 1.0	\$ 1.0	ANALOGY / ROM
1.3.4	SIL		\$ 561.3	\$ 323.2	\$ 238.0	ANALOGY
1.4	FAA Cert/Military Cert Office		\$ 32.5	\$ 23.5	\$ 9.0	FACTOR / ANALOGY
1.5	Development Support (SEPM)		\$ 348.4	\$ 218.0	\$ 130.5	HISTORICAL
1.6	Flight Test Spares		\$ 111.9	\$ 61.8	\$ 50.1	FACTOR / ANALOGY
1.7	Other NR Cost		\$ 584.6	\$ 364.3	\$ 220.3	ANALOGY/HISTORICAL / FACTOR
2.0	Procurement		\$ 3,582.2	\$ 2,278.8	\$ 1,303.4	
2.1	PME		\$ 2,635.6	\$ 1,679.4	\$ 956.2	
2.1.1	Aircraft Purchase		\$ 1,087.5	\$ 652.5	\$ 435.0	ACTUALS
2.1.2	Mission Package Equipment		\$ 1,545.1	\$ 1,025.4	\$ 519.6	
2.1.2.1	Airframe Mods		\$ 99.3	\$ 55.7	\$ 43.5	ANALOGY
2.1.2.2	Mission Avionics		\$ 594.2	\$ 515.1	\$ 79.1	ANALOGY / PARAMETRIC
2.1.2.3	Interior		\$ 851.6	\$ 454.6	\$ 397.0	ANALOGY / PARAMETRIC
2.1.2.4	GFE		\$ -	\$ -	\$ -	
2.1.3	Refurbishment/Retrofit		\$ 3.1	\$ 1.5	\$ 1.5	ANALOGY
2.2	Initial Spares		\$ 263.6	\$ 167.9	\$ 95.6	FACTOR/ANALOGY
2.3	SEPM		\$ 131.8	\$ 84.0	\$ 47.8	FACTOR
2.4	Other Rec Cost		\$ 551.3	\$ 347.4	\$ 203.8	ANALOGY/HISTORICAL / FACTOR

Recurring costs in Development represent test aircraft for each program

Methodology

- ▶ Baseline Program X and Program Y cost estimates

BY08 (\$M)		Qty	Sep TOTAL	Program Y	Program X
			7	4	3
Total Cost			\$ 23,956.1	\$ 14,694.9	\$ 9,261.1
1.0	Development		\$ 3,908.1	\$ 2,410.1	\$ 1,498.1
2.0	Procurement		\$ 3,582.2	\$ 2,278.8	\$ 1,303.4
3.0	MILCON		\$ 335.7	\$ 158.1	\$ 177.6
4.0	O&S		\$ 16,129.6	\$ 9,847.6	\$ 6,282.1
5.0	Retirement		\$.4	\$.4	\$.0

*Non-Risk Adjusted

Methodology

- ▶ Analyzed Areas for Synergy Savings
 - Looked at requirements and worked with engineering SMEs to identify possible requirement changes to allow for synergy (i.e. LOPA)
 - Found the main areas of commonality to be:
 - Non-recurring (Design) effort
 - MILCON
 - O&S
 - Assumed not enough economy of scale to justify discounts on recurring product purchases

	Non-Recurring	Recurring
Prime Mission Equipment (PME)		
Aircraft		
Airframe Mods		
Mission Avionics		
Avionic Mod 1		
Avionic Mod 2		
Software		n/a
Interior		
GFE	n/a	n/a
Refurbishment		
System Design		
System Testing		
Contractor Ground Testing		
FAA Flight		
SIL		
FAA Certification/MCO		
System Engineering & Program Mgt (SEPM)		
Spares		
Other Support Costs		
Support Equipment		
Govt Test		
Data		
Training		
Mission Support/Planning		
ECO		
MILCON		
Operations & Support (O&S)	n/a	
Unit Mission Personnel	n/a	
Unit Level Consumption	n/a	
Intermediate Maintenance	n/a	
Depot Maintenance	n/a	
Contractor Support	n/a	
Sustaining Support	n/a	
Indirect Support	n/a	
On-Going Mods (post delivery)	n/a	
Retirement	n/a	

Methodology

- ▶ Defined the Magnitude of Synergy
 - Looked at each WBS element to see how much effort was being duplicated vs. truly needing separate efforts
 - Ex: NRE Design for Prime Mission Equipment (PME)

			Program Y	Program X	Synergy
Airframe Modifications					
AF Mod 1					
Rec	Dollar	\$	1,023,036	\$ 1,023,036	\$ 1,023,036
NR	Dollar	\$	1,534,554	\$ 1,534,554	\$ 1,534,554
AF Mod 3					
Rec	Dollar	\$	3,584,707	\$ 3,584,707	\$ 3,584,707
NR	Dollar	\$	1,792,353	\$ 1,792,353	\$ 1,792,353
AF Mod 4					
Rec	Dollar	\$	2,775,173	\$ 2,775,173	\$ 2,775,173
NR	Dollar	\$	1,460,224	\$ 1,460,224	\$ 1,460,224
AF Mod 5					
Rec	Dollar	\$	1,279,500	\$ 1,279,500	\$ 1,279,500
NR	Dollar	\$	20,472,000	\$ 20,472,000	\$ 20,472,000
AF Mod 6					
AF Mod 6 Config 1	Dollar	\$	970,157	\$ 970,157	\$ 970,157
AF Mod 6 Config 2		\$	1,272,553	\$ 1,272,553	\$ 1,272,553
NR	Dollar	\$	11,782,896	\$ 11,782,896	\$ 11,782,896
Avionics Mod Assumptions					
Avionic Mod 1					
Rec	Dollar	\$	5,556,705	\$ 8,964,627	\$ -
NR	Dollar	\$	7,956,244	\$ 10,630,524	\$ 10,630,524
Software					
NR Dev	Dollar	\$	117,500,000	\$ 56,622,780	\$ 169,622,780

Methodology

► Avionic Modification #1 Discrete Estimate Example

Avionic Mod 1							
Item	Unit Cost	Number of Units for Program Y	Total Program Y Cost	Number of Units for Program X	Total Program X Cost	Number of Units for Synergy	Total Synergy Cost
Subsystem 1	\$ 40,000	2	\$ 80,000	2	\$ 80,000	2	\$ 80,000
Subsystem 2	\$ 100,000	2	\$ 200,000	2	\$ 200,000	2	\$ 200,000
Subsystem 3	\$ 60,000	2	\$ 120,000	2	\$ 120,000	2	\$ 120,000
Subsystem 4	\$ 40,000	2	\$ 80,000	2	\$ 80,000	2	\$ 80,000
Subsystem 5	\$ 173,640	2	\$ 347,280	2	\$ 347,280	2	\$ 347,280
Subsystem 6	\$ 670,000	2	\$ 1,340,000	2	\$ 1,340,000	2	\$ 1,340,000
Subsystem 7	\$ 500,000	2	\$ 1,000,000	2	\$ 1,000,000	2	\$ 1,000,000
Subsystem 8	\$ 2,500,000	0	\$ -	1	\$ 2,500,000	1	\$ 2,500,000
Subsystem 9	\$ 100,000	0	\$ -	1	\$ 100,000	1	\$ 100,000
Subsystem 10	\$ 110,000	0	\$ -	2	\$ 220,000	2	\$ 220,000
Subsystem 11	\$ 500,000	2	\$ 1,000,000	2	\$ 1,000,000	2	\$ 1,000,000
Total Group B			\$ 4,167,280		\$ 6,987,280		
Group A			\$ 833,456		\$ 1,397,456		
Installation			\$ 639,320		\$ 714,360		
TOTAL RECURRING			\$ 5,556,705		\$ 8,964,627		
Non recurring			\$ 7,956,244		\$ 10,630,524		\$ 10,630,524



Methodology

► Additional design savings come from factored costs

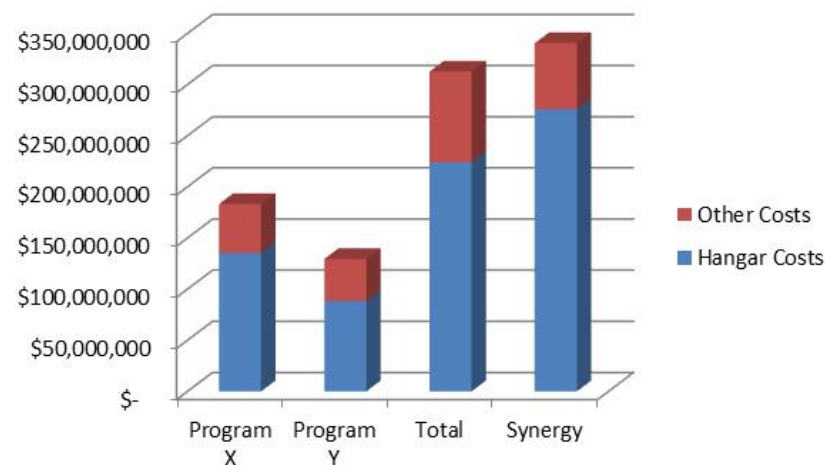
		Program Y	Program X	Synergy	
System Testing & Certification					
NR Test					
Contractor Testing	Percent	10%	10.0%	10.0%	Contractor Test as percent of PME FAA flight testing, ROM cost provided by FAA contact
FAA Testing	Dollar	\$ 1,000,000	\$ 1,000,000	\$ 1,000,000	
NR Annex Test	Dollar				
Rec Test					
Rec FAA/MCO	Percent	10%	10.0%	10.0%	10% of NR FAA Cert cost; covers the cost of certification book-keeping for each additional a/c
Annex Equipment	Dollar				
FAA Certification	Percent	4.0%	4.0%	4.0%	4% of non-certified equipment; covers the cost of the initial certification for an a/c type; Input provided by BAH SMEs and aircraft OEMs
NR Contractor Cost Factors					
System Design					
Engineering		0.4%	0.4%	0.4%	% of PME; Input from Jim Pitstick (ASC SME)
Plans		0.3%	0.3%	0.3%	% of PME; Input from Jim Pitstick (ASC SME)
Flight Test Spares		7.0%	7.0%	7.0%	% of Recurring Development; Input from Predecessor SPO
Other Government Cost Factors during Development Phase					
Support Equip	Percent	0.5%	0.5%	0.5%	% of PME; Input from Blair/Freistler study
Gov Test	Percent	5.0%	5.0%	5.0%	% of PME; Input from Blair/Freistler study
Data	Percent	0.5%	0.5%	0.5%	% of PME; Input from Blair/Freistler study
Training	Percent	0.2%	0.2%	0.2%	% of PME; Input from Blair/Freistler study
Mission Support/Planning	Percent	15.5%	15.5%	15.5%	% of PME; Input from Blair/Freistler study
ECO & Other Program Costs	Percent	10.0%	10.0%	10.0%	% of PME; Input from Blair/Freistler study
SEPM	Percent	17.0%	17.0%	21.3%	% of PME; Input from Chris Rupp Study

**Due to time constraints on study, forced to use factors for many support costs.
Must identify which factors adjust due to synergy effort.**

Methodology

	Synergy	Program Y	Program X
Fleet Size	7	4	3
Aircraft In Hangar at One Time	6	3	3
Sq Ft Pricing to Use ---Select---	Program X		
Future Hangar floor Req. (sqft)	450,969	227,815	227,815
Cost Factor	0.92	0.92	0.92
Location factor	1.02	1.00	1.02
"X" Factor	1.59	1.00	1.59
MILCON avg \$/sqft	267.38	\$ 267.38	\$ 267.38
Adjusted avg \$/sqft	397.80	\$245.99	\$397.80
Hangar Total Price	\$ 179,394,250	\$ 56,040,038	\$ 90,624,067
COMBS Area			
SqFt Increase for COMBS	154%	158%	150%
COMBS SqFt	242,240	131,741	113,003
COMBS Area total price	\$ 96,362,421	\$ 32,406,817	\$ 44,952,183
TOTAL HANGAR BLDG COST:	\$ 275,756,671	\$ 88,446,856	\$ 135,576,251
Other Costs:	\$ 64,756,928	\$ 41,010,144	\$ 47,605,885
Percent of Hangar & Combs	23%	46%	35%

- ▶ Synergy results in higher hangar cost due to Program X security
- ▶ Savings achieved in “other” costs
- ▶ Result: No Savings achieved with MILCON



Methodology

▶ 3 Main areas of O&S synergy

1. COMBS manpower reduction

- 25% reduction in COMBS personnel (per predecessor Ktr)
- Resulted in 8% reduction in Normal Mx (part of CLS WBS element)

2. Indirect Support (facility Mx, medical care, etc)

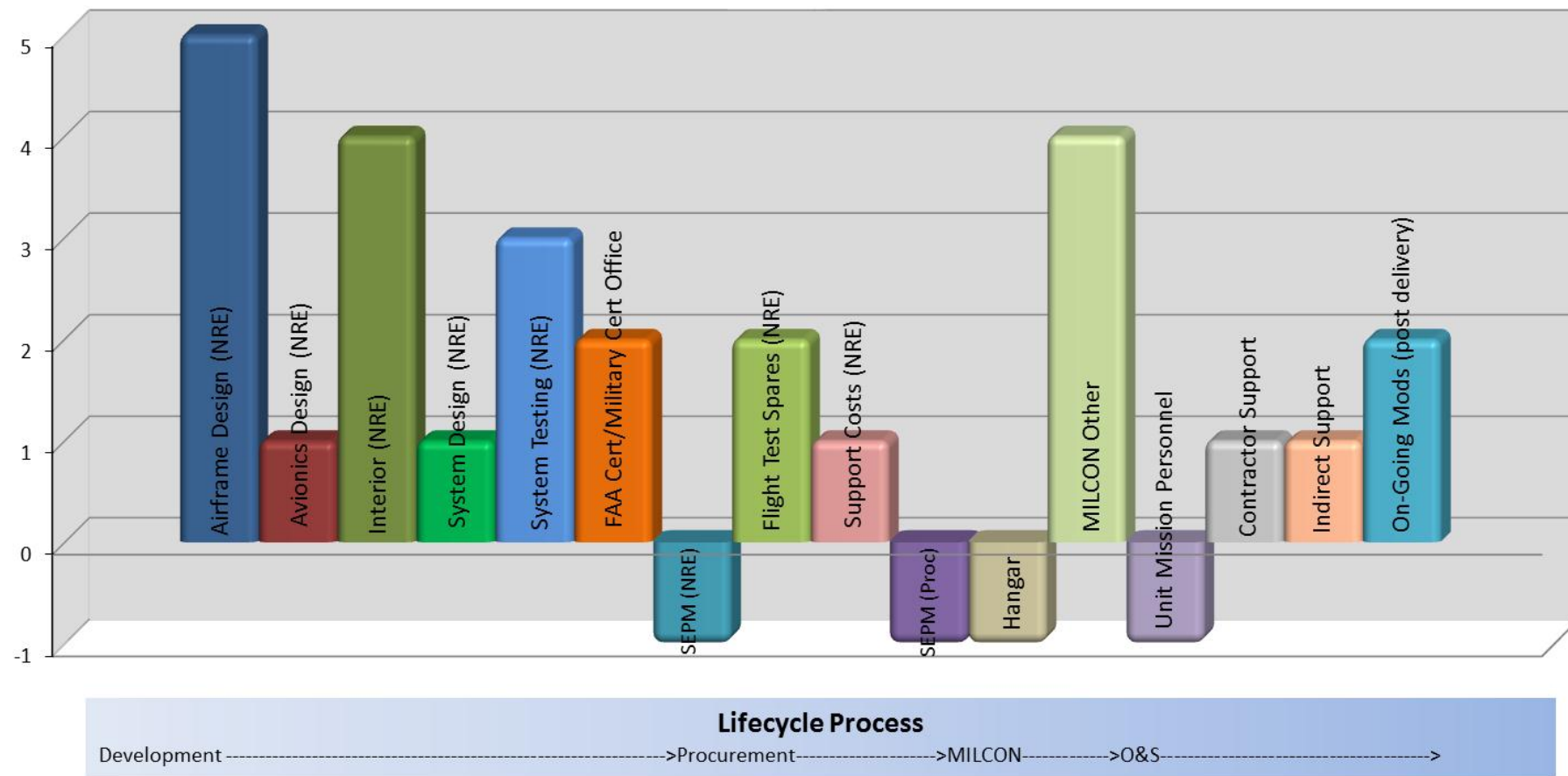
- 10% reduction to Indirect Support

3. On-going Mods

- Program X & Y sustainment studies showed similar mods planned for FY10-30
- 46% of planned NRE costs for on-going mods are common

SYNERGY MODIFICATION NRE EFFORTS (FY10-30 / BY08 \$M)									
	Program X Predecessor			Program Y Predecessor			Total Synergy		
	Synergy	Total 3600	Percent	Synergy	Total 3600	Percent	Total Synergy	Total 3600	Total Percent
Avionics	\$298.88	\$303.08	99%	\$396.59	\$413.21	96%	\$695.48	\$716.29	97%
Interior	\$510.72	\$601.63	85%	\$80.94	\$120.47	67%	\$591.67	\$722.10	82%
Airframe	\$127.20	\$177.20	72%	\$111.56	\$155.76	72%	\$238.76	\$332.96	72%
Mission Comm	\$0.00	\$939.57	0%	\$0.00	\$619.50	0%	\$0.00	\$1,559.07	0%
TOTAL	\$936.81	\$2,021.49	46%	\$589.09	\$1,308.93	45%	\$1,525.90	\$3,330.41	46%

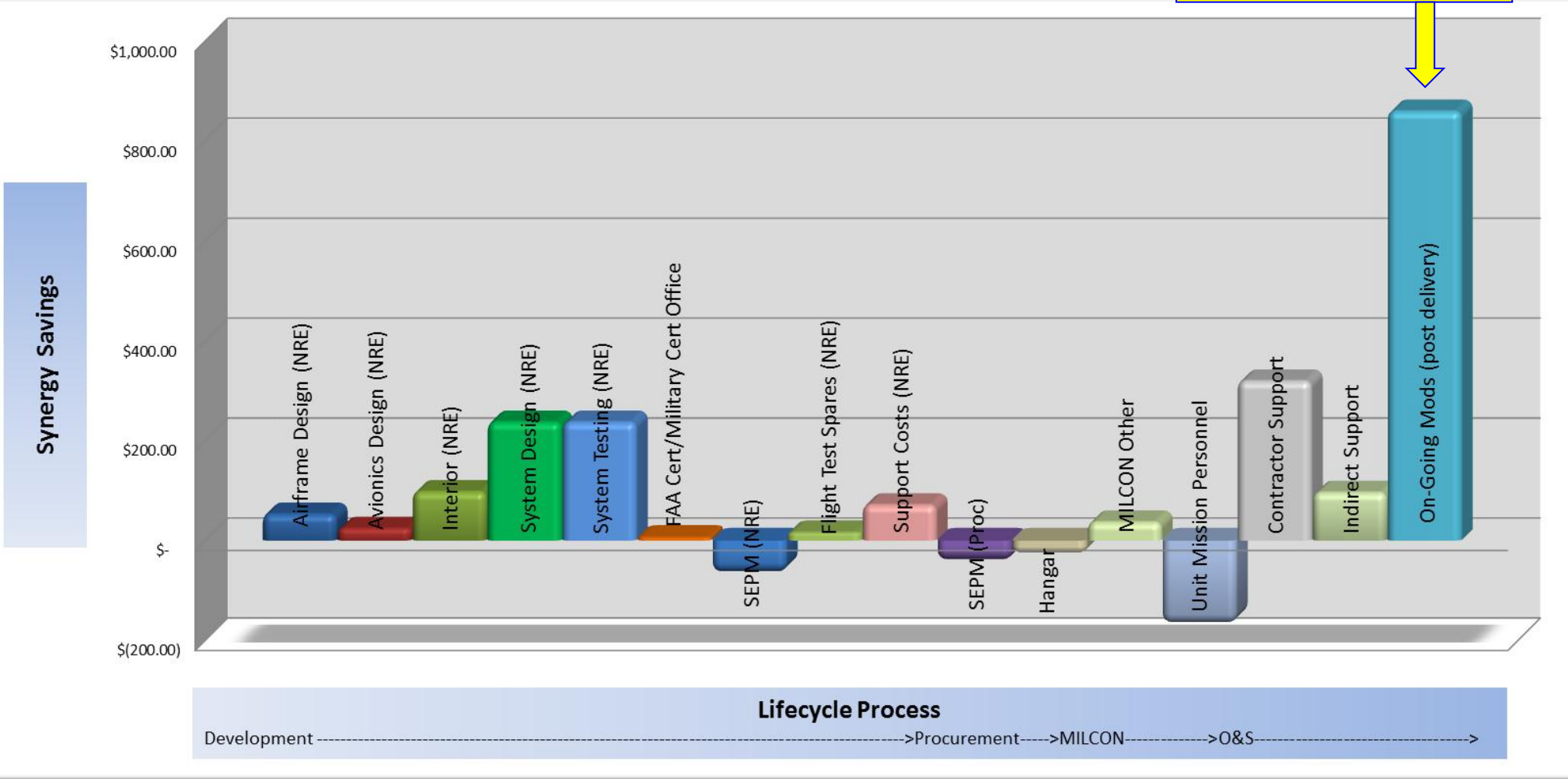
Methodology



Represents Amount of Commonality in each WBS Element

Methodology

55% of total savings achieved in 6% of possible saving categories



Represents Synergy Savings in each WBS Element -- 80/20 Rule

Methodology

- ▶ Incorporated Synergy cost estimates into cost model

BY08 (\$M)		Synergy	Sep TOTAL	Program Y	Program X
		7	7	4	3
	Total Cost	\$ 22,762.8	\$ 23,956.1	\$ 14,694.9	\$ 9,261.1
1.0	Development	\$ 3,607.7	\$ 3,908.1	\$ 2,410.1	\$ 1,498.1
1.1	PME	\$ 1,920.3	\$ 2,049.6	\$ 1,282.1	\$ 767.6
1.1.1	Non-Recurring	\$ 883.7	\$ 1,013.0	\$ 722.8	\$ 290.3
1.1.1.2	Mission Package Design	\$ 883.7	\$ 1,013.0	\$ 722.8	\$ 290.3
1.1.1.2.1	Airframe Design	\$ 42.6	\$ 83.5	\$ 40.9	\$ 42.6
1.1.1.2.2	Avionics Design	\$ 707.9	\$ 722.3	\$ 597.8	\$ 124.5
1.1.1.2.3	Interior	\$ 133.1	\$ 207.3	\$ 84.1	\$ 123.2
1.1.1.2.4	GFE	\$ -	\$ -	\$ -	\$ -
1.1.1.3	Refurbishment	\$ -	\$ -	\$ -	\$ -
1.1.2	Recurring	\$ 1,036.6	\$ 1,036.6	\$ 559.3	\$ 477.3
1.1.2.1	Aircraft Purchase	\$ 435.0	\$ 435.0	\$ 217.5	\$ 217.5
1.1.2.2	Mission Package Equipment	\$ 601.6	\$ 601.6	\$ 341.8	\$ 259.8
1.1.2.2.1	Airframe Mods	\$ 40.4	\$ 40.4	\$ 18.6	\$ 21.8
1.1.2.2.2	Mission Avionics	\$ 211.2	\$ 211.2	\$ 171.7	\$ 39.5
1.1.2.2.3	Interior	\$ 350.0	\$ 350.0	\$ 151.5	\$ 198.5
1.1.2.2.4	GFE	\$ -	\$ -	\$ -	\$ -
1.1.2.3	Refurbishment	\$ -	\$ -	\$ -	\$ -
1.2	System Design	\$ 12.0	\$ 12.8	\$ 8.0	\$ 4.8
1.3	System Testing	\$ 597.4	\$ 768.2	\$ 452.4	\$ 315.8
1.3.1	Contractor Flight/Ground	\$ 192.0	\$ 205.0	\$ 128.2	\$ 76.8
1.3.2	FAA Flight	\$ 2.0	\$ 2.0	\$ 1.0	\$ 1.0
1.3.3	Annex Equipment	\$ -	\$ -	\$ -	\$ -
1.3.4	SIL	\$ 403.3	\$ 561.3	\$ 323.2	\$ 238.0
1.4	FAA Cert/Military Cert Office	\$ 27.5	\$ 32.5	\$ 23.5	\$ 9.0
1.5	Development Support (SEPM)	\$ 408.1	\$ 348.4	\$ 218.0	\$ 130.5
1.6	Flight Test Spares	\$ 100.8	\$ 111.9	\$ 61.8	\$ 50.1
1.7	Other NR Cost	\$ 541.6	\$ 584.6	\$ 364.3	\$ 220.3

Total Point Estimate Synergy Savings Identified ~\$1.2B (BY \$)

Methodology

- ▶ Applied Monte Carlo Simulation via Crystal Ball software
- ▶ Synergy estimate compared to Baseline estimates

		Qty	BY08 Mean	BY08 Mean	BY08 Mean	BY08 Mean
\$BY08 (\$M)			Synergy	Sep TOTAL	Program Y	Program X
Total Cost (\$M)			7	7	4	3
			\$ 25,203.9	\$ 26,751.1	\$ 16,322.0	\$ 10,429.1
1.0	Development		\$ 4,557.4	\$ 5,025.1	\$ 3,115.0	\$ 1,910.0
2.0	Procurement		\$ 4,179.8	\$ 4,135.8	\$ 2,651.3	\$ 1,484.4
3.0	MILCON		\$ 353.7	\$ 365.6	\$ 177.7	\$ 187.9
4.0	O&S		\$ 16,112.6	\$ 17,224.2	\$ 10,377.5	\$ 6,846.7
5.0	Retirement		\$.48	\$.48	\$.44	\$.03

*Risk Adjusted

Total Risk Adjusted Synergy Savings Identified ~\$1.5B (BY \$)

Methodology

- ▶ Assigned Synergy Cost Savings to its respective Synergy Option
 - **No Synergy**
 - **Type 1: Airframe Acquisition Synergy**
 - Mainly Airframe mods & ground testing
 - **Type 2: Acquisition & Mod Synergy**
 - Entire Acquisition phase (all mods, testing, & support costs)
 - **Type 3: Acquisition, Initial & On-going Mod Synergy**
 - Entire Acquisition phase & coordinating on-going modification efforts
 - **Type 4: Full Program Synergy**
 - All program elements

Table Of Contents

- ▶ Purpose
- ▶ Literature Review
- ▶ Methodology
- ▶ Results
- ▶ Take Away

Results

► Total Program Costs (Risk Adjusted)

Program Costs (BY \$M)	No Synergy	Type 1 Synergy	Type 2 Synergy	Type 3 Synergy	Type 4 Synergy
Total Program Costs	\$ 26,751.10	\$ 26,674.71	\$ 26,323.10	\$ 25,463.13	\$ 25,199.62
RDT&E	\$ 5,025.08	\$ 4,948.69	\$ 4,557.39	\$ 4,557.39	\$ 4,557.39
Procurement	\$ 4,135.78	\$ 4,135.78	\$ 4,175.47	\$ 4,175.47	\$ 4,175.47
MILCON	\$ 365.56	\$ 365.56	\$ 365.56	\$ 365.56	\$ 353.71
O&S	\$ 17,224.21	\$ 17,224.21	\$ 17,224.21	\$ 16,364.24	\$ 16,112.58
Retirement	\$ 0.48	\$ 0.48	\$ 0.48	\$ 0.48	\$ 0.48

Program Costs (TY \$M)	No Synergy	Type 1 Synergy	Type 2 Synergy	Type 3 Synergy	Type 4 Synergy
Total Program Costs	\$ 50,814.93	\$ 50,719.24	\$ 50,219.96	\$ 48,488.57	\$ 47,909.78
RDT&E	\$ 6,259.33	\$ 6,163.63	\$ 5,673.46	\$ 5,673.46	\$ 5,673.46
Procurement	\$ 5,643.36	\$ 5,643.36	\$ 5,634.26	\$ 5,634.26	\$ 5,634.26
MILCON	\$ 437.51	\$ 437.51	\$ 437.51	\$ 437.51	\$ 423.33
O&S	\$ 38,473.34	\$ 38,473.34	\$ 38,473.34	\$ 36,741.95	\$ 36,176.92
Retirement	\$ 1.40	\$ 1.40	\$ 1.40	\$ 1.40	\$ 1.82

Results

► Synergy Savings

Synergy Savings:	Airframe Acquisition Synergy (Type 1)		Acquisition & Mod Synergy (Type 2)		Acquisition, Initial & On-going Mod Synergy (Type 3)		Full Program Synergy (Type 4)	
	BY \$M	TY \$M	BY \$M	TY \$M	BY \$M	TY \$M	BY \$M	TY \$M
Total Cost Savings	\$ 76.39	\$ 95.69	\$ 428.00	\$ 594.97	\$ 1,287.97	\$ 2,326.35	\$ 1,551.48	\$ 2,905.15
RDT&E	\$ 76.39	\$ 95.69	\$ 467.69	\$ 585.87	\$ 467.69	\$ 585.87	\$ 467.69	\$ 585.87
Procurement	\$ -	\$ -	\$ (39.69)	\$ 9.10	\$ (39.69)	\$ 9.10	\$ (39.69)	\$ 9.10
MILCON	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 11.85	\$ 14.18
O&S	\$ -	\$ -	\$ -	\$ -	\$ 859.97	\$ 1,731.39	\$ 1,111.62	\$ 2,296.42
Retirement	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ (0.42)

► Performed an Analysis of Variance (ANOVA) Test using JMP Software

- Ran 100 individual trials of Monte Carlo simulation to the inputs
- Recorded BY savings for each individual trial
- Results concluded...

Results

P-Value <0.0001


Synergy Savings:	Airframe Acquisition Synergy (Type 1)		Acquisition & Mod Synergy (Type 2)		Acquisition, Initial & On-going Mod Synergy (Type 3)		Full Program Synergy (Type 4)	
	BY \$M	TY \$M	BY \$M	TY \$M	BY \$M	TY \$M	BY \$M	TY \$M
Total Cost Savings	\$ 76.39	\$ 95.69	\$ 428.00	\$ 594.97	\$ 1,287.97	\$ 2,326.35	\$ 1,551.48	\$ 2,905.15
RDT&E	\$ 76.39	\$ 95.69	\$ 467.69	\$ 585.87	\$ 467.69	\$ 585.87	\$ 467.69	\$ 585.87
Procurement	\$ -	\$ -	\$ (39.69)	\$ 9.10	\$ (39.69)	\$ 9.10	\$ (39.69)	\$ 9.10
MILCON	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 11.85	\$ 14.18
O&S	\$ -	\$ -	\$ -	\$ -	\$ 859.97	\$ 1,731.39	\$ 1,111.62	\$ 2,296.42
Retirement	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ (0.42)

- At the .05 level of significance Type 1 and Type 2 are not statistically different
- At the .05 level of significance Type 3 and Type 4 are not statistically different
- At the .05 level of significance Type 1/2 and Type 3/4 are statistically different

Results


- ▶ Primary Question: Do the following types of synergy produce cost savings in comparison to the baseline program estimates?

- Type 1
- Type 2



Yes, but your savings will only range between 0.3-1.6% of the baseline LCCE

- Type 3
- Type 4



Yes, but your savings will only range between 4.8-5.8% of the baseline LCCE

- For all synergy options the range of savings achieved during program acquisition phase is 0.8 - 4.6%

Savings are achieved but are they significant enough to force a change?

Table Of Contents

- ▶ Purpose
- ▶ Literature Review
- ▶ Methodology
- ▶ Results
- ▶ Take Away

Take Away

► Follow on Opportunities

- Program X & Program Y Predecessor SPO relationship
 - The two programs have and are planned to perform many similar modifications
 - Opportunities exist to work together and create synergy savings in the current FYDP and for the next 20 years (\$1.5B)
- Possible synergy between KC-46 (Boeing 767) and other commercial derivative fleets
 - If KC-46 is IDIQ could leverage learning curve buying power
- Common platform for entire VIP fleet – all commercial derivatives (C-32, C-37, C-40, etc)
 - Could create large enough fleet to produce a tipping point in economy of scale savings and O&S savings
 - Possible opportunity for organic maintenance efforts
- Global Hawk and BAMS synergy opportunities
 - O&S synergies by combining organic support activities
- Additional analysis on sharing COMBS assets
 - Predecessor OEM was not overly generous on providing data that could be analyzed to see if opportunities exist in sharing spare parts
 - Could provide even greater cost savings in the Type 3 & 4 synergy options

QUESTIONS

Back Up Slides

	Qty	\$BY08 (\$M)	BY08 Mean	BY08 Mean	BY08 Mean	BY08 Mean	BY08 Mean
			Synergy Input	Synergy Savings	Sep TOTAL 7	Program Y 4	Program X 3
Total Cost (\$M)			\$ 26,674.7	\$ 76.4	\$ 26,751.1	\$ 16,322.0	\$ 10,429.1
1.0 Development			\$ 4,948.7	\$ 76.4	\$ 5,025.1	\$ 3,115.0	\$ 1,910.0
1.1 PME			\$ 2,582.0	\$ 53.8	\$ 2,635.7	\$ 1,657.1	\$ 978.6
1.1.1 Non-Recurring			\$ 1,250.5	\$ 53.8	\$ 1,304.3	\$ 934.2	\$ 370.1
1.1.1.2 Mission Package Design			\$ 1,250.5	\$ 53.8	\$ 1,304.3	\$ 934.2	\$ 370.1
1.1.1.2.1 Airframe Design			\$ 53.4	\$ 53.8	\$ 107.2	\$ 52.9	\$ 54.3
1.1.1.2.2 Avionics Design			\$ 931.3	\$ -	\$ 931.3	\$ 772.6	\$ 158.7
1.1.1.2.3 Interior			\$ 265.7	\$ -	\$ 265.7	\$ 108.7	\$ 157.0
1.1.1.2.4 GFE			\$ -	\$ -	\$ -	\$ -	\$ -
1.1.1.3 Refurbishment			\$ -	\$ -	\$ -	\$ -	\$ -
1.1.2 Recurring			\$ 1,331.5	\$ -	\$ 1,331.5	\$ 722.9	\$ 608.6
1.1.2.1 Aircraft Purchase			\$ 558.4	\$ -	\$ 558.4	\$ 281.1	\$ 277.3
1.1.2.2 Mission Package Equipment			\$ 773.1	\$ -	\$ 773.1	\$ 441.8	\$ 331.3
1.1.2.2.1 Airframe Mods			\$ 51.8	\$ -	\$ 51.8	\$ 24.0	\$ 27.8
1.1.2.2.2 Mission Avionics			\$ 272.3	\$ -	\$ 272.3	\$ 221.9	\$ 50.4
1.1.2.2.3 Interior			\$ 449.0	\$ -	\$ 449.0	\$ 195.9	\$ 253.1
1.1.2.2.4 GFE			\$ -	\$ -	\$ -	\$ -	\$ -
1.1.2.3 Refurbishment			\$ -	\$ -	\$ -	\$ -	\$ -
1.2 System Design			\$ 16.5	\$ -	\$ 16.5	\$ 10.4	\$ 6.1
1.2.1 Engineering			\$ 9.9	\$ -	\$ 9.9	\$ 6.2	\$ 3.7
1.2.2 Plans			\$ 6.6	\$ -	\$ 6.6	\$ 4.1	\$ 2.4
1.3 System Testing			\$ 964.8	\$ 22.6	\$ 987.4	\$ 584.8	\$ 402.6
1.3.1 Contractor Flight/Ground			\$ 240.9	\$ 22.6	\$ 263.6	\$ 165.7	\$ 97.9
1.3.2 FAA Flight			\$ 2.6	\$ -	\$ 2.6	\$ 1.3	\$ 1.3
1.3.3 Annex Equipment			\$ -	\$ -	\$ -	\$ -	\$ -
1.3.4 SIL			\$ 721.3	\$ -	\$ 721.3	\$ 417.8	\$ 303.5
1.4 FAA Cert/Military Cert Office			\$ 41.9	\$ -	\$ 41.9	\$ 30.4	\$ 11.5
1.5 Development Support (SEPM)			\$ 448.1	\$ -	\$ 448.1	\$ 281.7	\$ 166.4
1.6 Flight Test Spares			\$ 143.7	\$ -	\$ 143.7	\$ 79.8	\$ 63.8
1.7 Other NR Cost			\$ 751.8	\$ -	\$ 751.8	\$ 470.9	\$ 280.9
2.0 Procurement			\$ 4,135.8	\$ -	\$ 4,135.8	\$ 2,651.3	\$ 1,484.4
2.1 PME			\$ 3,043.0	\$ -	\$ 3,043.0	\$ 1,954.0	\$ 1,089.0
2.1.1 Aircraft Purchase			\$ 1,254.6	\$ -	\$ 1,254.6	\$ 759.2	\$ 495.4
2.1.2 Mission Package Equipment			\$ 1,784.9	\$ -	\$ 1,784.9	\$ 1,193.1	\$ 591.8
2.1.3 Refurbishment/Retrofit			\$ 3.5	\$ -	\$ 3.5	\$ 1.8	\$ 1.7
2.2 Initial Spares			\$ 304.3	\$ -	\$ 304.3	\$ 195.4	\$ 108.9
2.3 SEPM			\$ 152.1	\$ -	\$ 152.1	\$ 97.7	\$ 54.4
2.4 Other Rec Cost			\$ 636.4	\$ -	\$ 636.4	\$ 404.2	\$ 232.1
3.0 MILCON			\$ 365.6	\$ -	\$ 365.6	\$ 177.7	\$ 187.9
3.1 Hangar			\$ 260.5	\$ -	\$ 260.5	\$ 121.4	\$ 139.1
3.2 Ramp			\$ -	\$ -	\$ -	\$ -	\$ -
3.3 Other			\$ 105.1	\$ -	\$ 105.1	\$ 56.3	\$ 48.8
4.0 O&S			\$ 17,224.2	\$ -	\$ 17,224.2	\$ 10,377.5	\$ 6,846.7
4.1 Unit Mission Personnel			\$ 2,459.6	\$ -	\$ 2,459.6	\$ 1,627.6	\$ 832.0
4.2 Unit Level Consumption			\$ 1,213.9	\$ -	\$ 1,213.9	\$ 817.7	\$ 396.2
4.3 Intermediate Maintenance			\$ -	\$ -	\$ -	\$ -	\$ -
4.4 Depot Maintenance			\$ -	\$ -	\$ -	\$ -	\$ -
4.5 Contractor Support			\$ 5,725.8	\$ -	\$ 5,725.8	\$ 4,736.6	\$ 989.3
4.6 Sustaining Support			\$ -	\$ -	\$ -	\$ -	\$ -
4.7 Indirect Support			\$ 978.5	\$ -	\$ 978.5	\$ 872.6	\$ 105.9
4.8 Annex Equipment			\$ -	\$ -	\$ -	\$ -	\$ -
4.9 On-Going Mods (post delivery)			\$ 6,846.5	\$ -	\$ 6,846.5	\$ 2,323.1	\$ 4,523.4
5.0 Retirement			\$.48	\$ -	\$.48	\$.44	\$.03

	Qty	\$BY08 (\$M)	BY08 Mean	BY08 Mean	BY08 Mean	BY08 Mean	BY08 Mean
			Synergy Input	Synergy Savings	Sep TOTAL 7	Program Y 4	Program X 3
Total Cost (\$M)			\$ 26,323.1	\$ 428.0	\$ 26,751.1	\$ 16,322.0	\$ 10,429.1
1.0 Development			\$ 4,557.4	\$ 467.7	\$ 5,025.1	\$ 3,115.0	\$ 1,910.0
1.1 PME			\$ 2,440.2	\$ 195.5	\$ 2,635.7	\$ 1,657.1	\$ 978.6
1.1.1 Non-Recurring			\$ 1,108.7	\$ 195.5	\$ 1,304.3	\$ 934.2	\$ 370.1
1.1.1.2 Mission Package Design			\$ 1,108.7	\$ 195.5	\$ 1,304.3	\$ 934.2	\$ 370.1
1.1.1.2.1 Airframe Design			\$ 53.4	\$ 53.8	\$ 107.2	\$ 52.9	\$ 54.3
1.1.1.2.2 Avionics Design			\$ 888.2	\$ 43.1	\$ 931.3	\$ 772.6	\$ 158.7
1.1.1.2.3 Interior			\$ 167.0	\$ 98.7	\$ 265.7	\$ 108.7	\$ 157.0
1.1.1.2.4 GFE			\$ -	\$ -	\$ -	\$ -	\$ -
1.1.1.3 Refurbishment			\$ -	\$ -	\$ -	\$ -	\$ -
1.1.2 Recurring			\$ 1,331.5	\$ -	\$ 1,331.5	\$ 722.9	\$ 608.6
1.1.2.1 Aircraft Purchase			\$ 558.4	\$ -	\$ 558.4	\$ 281.1	\$ 277.3
1.1.2.2 Mission Package Equipment			\$ 773.1	\$ -	\$ 773.1	\$ 441.8	\$ 331.3
1.1.2.2.1 Airframe Mods			\$ 51.8	\$ -	\$ 51.8	\$ 24.0	\$ 27.8
1.1.2.2.2 Mission Avionics			\$ 272.3	\$ -	\$ 272.3	\$ 221.9	\$ 50.4
1.1.2.2.3 Interior			\$ 449.0	\$ -	\$ 449.0	\$ 195.9	\$ 253.1
1.1.2.2.4 GFE			\$ -	\$ -	\$ -	\$ -	\$ -
1.1.2.3 Refurbishment			\$ -	\$ -	\$ -	\$ -	\$ -
1.2 System Design			\$ 15.1	\$ 1.4	\$ 16.5	\$ 10.4	\$ 6.1
1.2.1 Engineering			\$ 9.0	\$ 0.8	\$ 9.9	\$ 6.2	\$ 3.7
1.2.2 Plans			\$ 6.0	\$ 0.6	\$ 6.6	\$ 4.1	\$ 2.4
1.3 System Testing			\$ 749.5	\$ 237.9	\$ 987.4	\$ 584.8	\$ 402.6
1.3.1 Contractor Flight/Ground			\$ 240.9	\$ 22.6	\$ 263.6	\$ 165.7	\$ 97.9
1.3.2 FAA Flight			\$ 2.5	\$ 1.1	\$ 2.6	\$ 1.3	\$ 1.3
1.3.3 Annex Equipment			\$ -	\$ -	\$ -	\$ -	\$ -
1.3.4 SIL			\$ 506.1	\$ 215.2	\$ 721.3	\$ 417.8	\$ 303.5
1.4 FAA Cert/Military Cert Office			\$ 34.6	\$ 7.3	\$ 41.9	\$ 30.4	\$ 11.5
1.5 Development Support (SEPM)			\$ 512.0	\$ (63.9)	\$ 448.1	\$ 281.7	\$ 166.4
1.6 Flight Test Spares			\$ 126.5	\$ 17.2	\$ 143.7	\$ 79.8	\$ 63.8
1.7 Other NR Cost			\$ 679.6	\$ 72.2	\$ 751.8	\$ 470.9	\$ 280.9
2.0 Procurement			\$ 4,175.5	\$ (39.7)	\$ 4,135.8	\$ 2,651.3	\$ 1,484.4
2.1 PME			\$ 3,043.0	\$ -	\$ 3,043.0	\$ 1,954.0	\$ 1,089.0
2.1.1 Aircraft Purchase			\$ 1,254.6	\$ -	\$ 1,254.6	\$ 759.2	\$ 495.4
2.1.2 Mission Package Equipment			\$ 1,784.9	\$ -	\$ 1,784.9	\$ 1,193.1	\$ 591.8
2.1.3 Refurbishment/Retrofit			\$ 3.5	\$ -	\$ 3.5	\$ 1.8	\$ 1.7
2.2 Initial Spares			\$ 304.3	\$ -	\$ 304.3	\$ 195.4	\$ 108.9
2.3 SEPM			\$ 191.8	\$ (39.7)	\$ 152.1	\$ 97.7	\$ 54.4
2.4 Other Rec Cost			\$ 636.4	\$ -	\$ 636.4	\$ 404.2	\$ 232.1
3.0 MILCON			\$ 365.6	\$ -	\$ 365.6	\$ 177.7	\$ 187.9
3.1 Hangar			\$ 260.5	\$ -	\$ 260.5	\$ 121.4	\$ 139.1
3.2 Ramp			\$ -	\$ -	\$ -	\$ -	\$ -
3.3 Other			\$ 105.1	\$ -	\$ 105.1	\$ 56.3	\$ 48.8
4.0 O&S			\$ 17,224.2	\$ -	\$ 17,224.2	\$ 10,377.5	\$ 6,846.7
4.1 Unit Mission Personnel			\$ 2,459.6	\$ -	\$ 2,459.6	\$ 1,627.6	\$ 832.0
4.2 Unit Level Consumption			\$ 1,213.9	\$ -	\$ 1,213.9	\$ 817.7	\$ 396.2
4.3 Intermediate Maintenance			\$ -	\$ -	\$ -	\$ -	\$ -
4.4 Depot Maintenance			\$ -	\$ -	\$ -	\$ -	\$ -
4.5 Contractor Support			\$ 5,725.8	\$ -	\$ 5,725.8	\$ 4,736.6	\$ 989.3
4.6 Sustaining Support			\$ -	\$ -	\$ -	\$ -	\$ -
4.7 Indirect Support			\$ 978.5	\$ -	\$ 978.5	\$ 872.6	\$ 105.9
4.8 Annex Equipment			\$ -	\$ -	\$ -	\$ -	\$ -
4.9 On-Going Mods (post delivery)			\$ 6,846.5	\$ -	\$ 6,846.5	\$ 2,323.1	\$ 4,523.4
5.0 Retirement			\$.48	\$ -	\$.48	\$.44	\$.03

	Qty	\$BY08 (\$M)	BY08 Mean	BY08 Mean	BY08 Mean	BY08 Mean	BY08 Mean
			Synergy Input	Synergy Savings	Sep TOTAL 7	Program Y 4	Program X 3
Total Cost (\$M)			\$ 25,463.1	\$ 1,288.0	\$ 26,751.1	\$ 16,322.0	\$ 10,429.1
1.0 Development			\$ 4,557.4	\$ 467.7	\$ 5,025.1	\$ 3,115.0	\$ 1,910.0
1.1 PME			\$ 2,440.2	\$ 195.5	\$ 2,635.7	\$ 1,657.1	\$ 978.6
1.1.1 Non-Recurring			\$ 1,108.7	\$ 195.5	\$ 1,304.3	\$ 934.2	\$ 370.1
1.1.1.2 Mission Package Design			\$ 1,108.7	\$ 195.5	\$ 1,304.3	\$ 934.2	\$ 370.1
1.1.1.2.1 Airframe Design			\$ 53.4	\$ 53.8	\$ 107.2	\$ 52.9	\$ 54.3
1.1.1.2.2 Avionics Design			\$ 888.2	\$ 43.1	\$ 931.3	\$ 772.6	\$ 158.7
1.1.1.2.3 Interior			\$ 167.0	\$ 98.7	\$ 265.7	\$ 108.7	\$ 157.0
1.1.1.2.4 GFE			\$ -	\$ -	\$ -	\$ -	\$ -
1.1.1.3 Refurbishment			\$ -	\$ -	\$ -	\$ -	\$ -
1.1.2 Recurring			\$ 1,331.5	\$ -	\$ 1,331.5	\$ 722.9	\$ 608.6
1.1.2.1 Aircraft Purchase			\$ 558.4	\$ -	\$ 558.4	\$ 281.1	\$ 277.3
1.1.2.2 Mission Package Equipment			\$ 773.1	\$ -	\$ 773.1	\$ 441.8	\$ 331.3
1.1.2.2.1 Airframe Mods			\$ 51.8	\$ -	\$ 51.8	\$ 24.0	\$ 27.8
1.1.2.2.2 Mission Avionics			\$ 272.3	\$ -	\$ 272.3	\$ 221.9	\$ 50.4
1.1.2.2.3 Interior			\$ 449.0	\$ -	\$ 449.0	\$ 195.9	\$ 253.1
1.1.2.2.4 GFE			\$ -	\$ -	\$ -	\$ -	\$ -
1.1.2.3 Refurbishment			\$ -	\$ -	\$ -	\$ -	\$ -
1.2 System Design			\$ 15.1	\$ 1.4	\$ 16.5	\$ 10.4	\$ 6.1
1.2.1 Engineering			\$ 9.0	\$ 0.8	\$ 9.9	\$ 6.2	\$ 3.7
1.2.2 Plans			\$ 6.0	\$ 0.6	\$ 6.6	\$ 4.1	\$ 2.4
1.3 System Testing			\$ 749.5	\$ 237.9	\$ 987.4	\$ 584.8	\$ 402.6
1.3.1 Contractor Flight/Ground			\$ 240.9	\$ 22.6	\$ 263.6	\$ 165.7	\$ 97.9
1.3.2 FAA Flight			\$ 2.5	\$ 1.1	\$ 2.6	\$ 1.3	\$ 1.3
1.3.3 Annex Equipment			\$ -	\$ -	\$ -	\$ -	\$ -
1.3.4 SIL			\$ 506.1	\$ 215.2	\$ 721.3	\$ 417.8	\$ 303.5
1.4 FAA Cert/Military Cert Office			\$ 34.6	\$ 7.3	\$ 41.9	\$ 30.4	\$ 11.5
1.5 Development Support (SEPM)			\$ 512.0	\$ (63.9)	\$ 448.1	\$ 281.7	\$ 166.4
1.6 Flight Test Spares			\$ 126.5	\$ 17.2	\$ 143.7	\$ 79.8	\$ 63.8
1.7 Other NR Cost			\$ 679.6	\$ 72.2	\$ 751.8	\$ 470.9	\$ 280.9
2.0 Procurement			\$ 4,175.5	\$ (39.7)	\$ 4,135.8	\$ 2,651.3	\$ 1,484.4
2.1 PME			\$ 3,043.0	\$ -	\$ 3,043.0	\$ 1,954.0	\$ 1,089.0
2.1.1 Aircraft Purchase			\$ 1,254.6	\$ -	\$ 1,254.6	\$ 759.2	\$ 495.4
2.1.2 Mission Package Equipment			\$ 1,784.9	\$ -	\$ 1,784.9	\$ 1,193.1	\$ 591.8
2.1.3 Refurbishment/Retrofit			\$ 3.5	\$ -	\$ 3.5	\$ 1.8	\$ 1.7
2.2 Initial Spares			\$ 304.3	\$ -	\$ 304.3	\$ 195.4	\$ 108.9
2.3 SEPM			\$ 191.8	\$ (39.7)	\$ 152.1	\$ 97.7	\$ 54.4
2.4 Other Rec Cost			\$ 636.4	\$ -	\$ 636.4	\$ 404.2	\$ 232.1
3.0 MILCON			\$ 365.6	\$ -	\$ 365.6	\$ 177.7	\$ 187.9
3.1 Hangar			\$ 260.5	\$ -	\$ 260.5	\$ 121.4	\$ 139.1
3.2 Ramp			\$ -	\$ -	\$ -	\$ -	\$ -
3.3 Other			\$ 105.1	\$ -	\$ 105.1	\$ 56.3	\$ 48.8
4.0 O&S			\$ 16,364.2	\$ 860.0	\$ 17,224.2	\$ 10,377.5	\$ 6,846.7
4.1 Unit Mission Personnel			\$ 2,459.6	\$ -	\$ 2,459.6	\$ 1,627.6	\$ 832.0
4.2 Unit Level Consumption			\$ 1,213.9	\$ -	\$ 1,213.9	\$ 817.7	\$ 396.2
4.3 Intermediate Maintenance			\$ -	\$ -	\$ -	\$ -	\$ -
4.4 Depot Maintenance			\$ -	\$ -	\$ -	\$ -	\$ -
4.5 Contractor Support			\$ 5,725.8	\$ -	\$ 5,725.8	\$ 4,736.6	\$ 989.3
4.6 Sustaining Support			\$ -	\$ -	\$ -	\$ -	\$ -
4.7 Indirect Support			\$ 978.5	\$ -	\$ 978.5	\$ 872.6	\$ 105.9
4.8 Annex Equipment			\$ -	\$ -	\$ -	\$ -	\$ -
4.9 On-Going Mods (post delivery)			\$ 5,986.5	\$ 860.0	\$ 6,846.5	\$ 2,323.1	\$ 4,523.4
5.0 Retirement			\$.48	\$ -	\$.48	\$.44	\$.03

	\$BY08 (\$M)	Qty	BY08 Mean	BY08 Mean	BY08 Mean	BY08 Mean	BY08 Mean
			Synergy Input	Synergy Savings	Sep TOTAL 7	Program Y 4	Program X 3
Total Cost (\$M)			\$ 25,199.6	\$ 1,551.5	\$ 26,751.1	\$ 16,322.0	\$ 10,429.1
1.0 Development			\$ 4,557.4	\$ 467.7	\$ 5,025.1	\$ 3,115.0	\$ 1,910.0
1.1 PME			\$ 2,440.2	\$ 195.5	\$ 2,635.7	\$ 1,657.1	\$ 978.6
1.1.1 Non-Recurring			\$ 1,108.7	\$ 195.5	\$ 1,304.3	\$ 934.2	\$ 370.1
1.1.1.2 Mission Package Design			\$ 1,108.7	\$ 195.5	\$ 1,304.3	\$ 934.2	\$ 370.1
1.1.1.2.1 Airframe Design			\$ 53.4	\$ 53.8	\$ 107.2	\$ 52.9	\$ 54.3
1.1.1.2.2 Avionics Design			\$ 888.2	\$ 43.1	\$ 931.3	\$ 772.6	\$ 158.7
1.1.1.2.3 Interior			\$ 167.0	\$ 98.7	\$ 265.7	\$ 108.7	\$ 157.0
1.1.1.2.4 GFE			\$ -	\$ -	\$ -	\$ -	\$ -
1.1.1.3 Refurbishment			\$ -	\$ -	\$ -	\$ -	\$ -
1.1.2 Recurring			\$ 1,331.5	\$ -	\$ 1,331.5	\$ 722.9	\$ 608.6
1.1.2.1 Aircraft Purchase			\$ 558.4	\$ -	\$ 558.4	\$ 281.1	\$ 277.3
1.1.2.2 Mission Package Equipment			\$ 773.1	\$ -	\$ 773.1	\$ 441.8	\$ 331.3
1.1.2.2.1 Airframe Mods			\$ 51.8	\$ -	\$ 51.8	\$ 24.0	\$ 27.8
1.1.2.2.2 Mission Avionics			\$ 272.3	\$ -	\$ 272.3	\$ 221.9	\$ 50.4
1.1.2.2.3 Interior			\$ 449.0	\$ -	\$ 449.0	\$ 195.9	\$ 253.1
1.1.2.2.4 GFE			\$ -	\$ -	\$ -	\$ -	\$ -
1.1.2.3 Refurbishment			\$ -	\$ -	\$ -	\$ -	\$ -
1.2 System Design			\$ 15.1	\$ 1.4	\$ 16.5	\$ 10.4	\$ 6.1
1.2.1 Engineering			\$ 9.0	\$ -	\$ 9.9	\$ 6.2	\$ 3.7
1.2.2 Plans			\$ 6.0	\$ 1.6	\$ 6.6	\$ 4.1	\$ 2.4
1.3 System Testing			\$ 749.5	\$ 237.9	\$ 987.4	\$ 584.8	\$ 402.6
1.3.1 Contractor Flight/Ground			\$ 240.9	\$ 22.6	\$ 263.6	\$ 165.7	\$ 97.9
1.3.2 FAA Flight			\$ 2.5	\$ -	\$ 2.6	\$ 1.3	\$ 1.3
1.3.3 Annex Equipment			\$ -	\$ -	\$ -	\$ -	\$ -
1.3.4 SIL			\$ 506.1	\$ 215.2	\$ 721.3	\$ 417.8	\$ 303.5
1.4 FAA Cert/Military Cert Office			\$ 34.6	\$ 7.3	\$ 41.9	\$ 30.4	\$ 11.5
1.5 Development Support (SEPM)			\$ 512.0	\$ (63.9)	\$ 448.1	\$ 281.7	\$ 166.4
1.6 Flight Test Spares			\$ 126.5	\$ 17.2	\$ 143.7	\$ 79.8	\$ 63.8
1.7 Other NR Cost			\$ 679.6	\$ 72.2	\$ 751.8	\$ 470.9	\$ 280.9
2.0 Procurement			\$ 4,175.5	\$ (39.7)	\$ 4,135.8	\$ 2,651.3	\$ 1,484.4
2.1 PME			\$ 3,043.0	\$ -	\$ 3,043.0	\$ 1,954.0	\$ 1,089.0
2.1.1 Aircraft Purchase			\$ 1,254.6	\$ -	\$ 1,254.6	\$ 759.2	\$ 495.4
2.1.2 Mission Package Equipment			\$ 1,784.9	\$ -	\$ 1,784.9	\$ 1,193.1	\$ 591.8
2.1.3 Refurbishment/Retrofit			\$ 3.5	\$ -	\$ 3.5	\$ 1.8	\$ 1.7
2.2 Initial Spares			\$ 304.3	\$ -	\$ 304.3	\$ 195.4	\$ 108.9
2.3 SEPM			\$ 191.8	\$ (39.7)	\$ 152.1	\$ 97.7	\$ 54.4
2.4 Other Rec Cost			\$ 636.4	\$ -	\$ 636.4	\$ 404.2	\$ 232.1
3.0 MILCON			\$ 353.7	\$ 11.8	\$ 365.6	\$ 177.7	\$ 187.9
3.1 Hangar			\$ 286.4	\$ (25.9)	\$ 260.5	\$ 121.4	\$ 139.1
3.2 Ramp			\$ -	\$ -	\$ -	\$ -	\$ -
3.3 Other			\$ 67.3	\$ 37.8	\$ 105.1	\$ 56.3	\$ 48.8
4.0 O&S			\$ 16,112.6	\$ 1,111.6	\$ 17,224.2	\$ 10,377.5	\$ 6,846.7
4.1 Unit Mission Personnel			\$ 2,625.2	\$ (165.6)	\$ 2,459.6	\$ 1,627.6	\$ 832.0
4.2 Unit Level Consumption			\$ 1,213.9	\$ -	\$ 1,213.9	\$ 817.7	\$ 396.2
4.3 Intermediate Maintenance			\$ -	\$ -	\$ -	\$ -	\$ -
4.4 Depot Maintenance			\$ -	\$ -	\$ -	\$ -	\$ -
4.5 Contractor Support			\$ 5,405.7	\$ 320.1	\$ 5,725.8	\$ 4,736.6	\$ 989.3
4.6 Sustaining Support			\$ -	\$ -	\$ -	\$ -	\$ -
4.7 Indirect Support			\$ 881.3	\$ 97.2	\$ 978.5	\$ 872.6	\$ 105.9
4.8 Annex Equipment			\$ -	\$ -	\$ -	\$ -	\$ -
4.9 On-Going Mods (post delivery)			\$ 5,986.5	\$ 860.0	\$ 6,846.5	\$ 2,323.1	\$ 4,523.4
5.0 Retirement			\$.48	\$ -	\$.48	\$.44	\$.03

Schedule Comparison

	Program Y	Program X	Synergy
Start Year			
Development Start	2014	2014	2014
Development Length in Yrs	9	9	9
Procurement Start	2019	2019	2019
MILCON Start	2014	2014	2014
O&S Start	2021	2021	2021
Retirement Start	2047	2046	2046
A/C Buy #1	2016	2016	2016
Funding Profile	Test	Test	Test
A/C Buy #2	2019	2019	2016
Funding Profile	Procurement	Procurement	Test
A/C Buy #3	2020	2022	2018
Funding Profile	Procurement	Procurement	Procurement
A/C Buy #4	2022		2019
Funding Profile	Procurement	N/A	Procurement
A/C Buy #5			2020
Funding Profile			Procurement
A/C Buy #6			2021
Funding Profile			Procurement
A/C Buy #7			2022
Funding Profile			Procurement

Airframe Mod Inputs

		Program Y	Program X	Synergy
Airframe Modifications				
AF Mod 1				
Rec	Dollar	\$ 1,023,036	\$ 1,023,036	\$ 1,023,036
NR	Dollar	\$ 1,534,554	\$ 1,534,554	\$ 1,534,554
NR Factor	Percent	100%	100%	100%
Installation	Percent	10%	10%	10%
AF Mod 2 (rec cost) per foot	Dollar	\$ 88	\$ 88	\$ 88
AF Mod 3				
Rec	Dollar	\$ 3,584,707	\$ 3,584,707	\$ 3,584,707
NR	Dollar	\$ 1,792,353	\$ 1,792,353	\$ 1,792,353
NR Factor	Percent	100%	100%	100%
AF Mod 4				
Rec	Dollar	\$ 2,775,173	\$ 2,775,173	\$ 2,775,173
NR	Dollar	\$ 1,460,224	\$ 1,460,224	\$ 1,460,224
NR Factor	Percent	100%	100%	100%
AF Mod 5				
Rec	Dollar	\$ 1,279,500	\$ 1,279,500	\$ 1,279,500
NR	Dollar	\$ 20,472,000	\$ 20,472,000	\$ 20,472,000
NR Factor	Percent	100%	100%	100%
AF Mod 6				
AF Mod 6 Config 1	Dollar	\$ 970,157	\$ 970,157	\$ 970,157
AF Mod 6 Config 2		\$ 1,272,553	\$ 1,272,553	\$ 1,272,553
NR	Dollar	\$ 11,782,896	\$ 11,782,896	\$ 11,782,896

Avionic Mods & Testing Inputs

		Program Y	Program X	Synergy
Avionics Mod Assumptions				
Avionic Mod 1				
Rec	Dollar	\$ 5,556,705	\$ 8,964,627	\$ -
NR	Dollar	\$ 7,956,244	\$ 10,630,524	\$ 10,630,524
NR Factor		100%	100%	100%
Avionic Mod 2				
Rec		\$ 143,740,449	\$ 25,416,165	
NR		\$ 394,344,995	\$ 40,992,256	
NR Factor		100%	100%	100%
Software				
NR Dev	Dollar	\$ 117,500,000	\$ 56,622,780	\$ 169,622,780
System Testing & Certification				
NR Test				
Contractor Testing	Percent	10%	10.0%	10.0%
FAA Testing	Dollar	\$ 1,000,000	\$ 1,000,000	\$ 1,000,000
Rec Test				
Rec FAA/MCO	Percent	10%	10.0%	10.0%
FAA Certification	Percent	4.0%	4.0%	4.0%
NR Contractor Cost Factors				
System Design				
Logistics Support Planning			0.0%	
Engineering		0.4%	0.4%	0.4%
Plans		0.3%	0.3%	0.3%
Flight Test Spares		7.0%	7.0%	7.0%

“Other” Govt Costs & MILCON Inputs

		Program Y	Program X	Synergy
Other Government Cost Factors during Development Phase				
Support Equip	Percent	0.5%	0.5%	0.5%
Gov Test	Percent	5.0%	5.0%	5.0%
Data	Percent	0.5%	0.5%	0.5%
Training	Percent	0.2%	0.2%	0.2%
Mission Support/Planning	Percent	15.5%	15.5%	15.5%
ECO & Other Program Costs	Percent	10.0%	10.0%	10.0%
SEPM	Percent	17.0%	17.0%	21.3%
Other Government Cost Factors during Procurement Phase				
Support Equip	Percent	1.0%	1.0%	1.0%
Production Test	Percent	3.8%	3.8%	3.8%
Data	Percent	0.5%	0.5%	0.5%
Training	Percent	0.2%	0.2%	0.2%
Mission Support/Planning	Percent	9.0%	9.0%	9.0%
ECO & Other Program Costs	Percent	5.0%	5.0%	5.0%
SEPM	Percent	5.0%	5.0%	6.3%
Spares	Percent	10.0%	10.0%	10.0%
MILCON				
Hangar				
Min Clearances (ft)				
Nose/Tail		10	10	10
Wing-Wall		15	15	15
Wing-Wing		10	10	10
Hangar Scaling Factor		1.15	1.15	1.15
COMBS Scaling Factor		158%	150%	154%
MILCON Avg \$/sqft		\$ 267.38	\$ 267.38	\$ 267.38
Cost Factor		0.92	0.92	0.92
Location Factor		1.00	1.02	1.02
Special "X" Features Factor		1.00	1.59	1.59
Adjusted \$/sqft		\$245.99	\$ 397.80	\$ 397.80
MILCON Other Cost		46%	35.1%	23.5%

O&S Inputs

		Program Y	Program X	Synergy
On-Going Modifications				
On-Going Modifications	Dollar	\$ 2,174,442,769	\$ 4,120,394,186	\$ 5,591,127,932
O&S				
Fuel Efficiency	Percent	91%	91%	91%
Weight Factor	Percent	122%	122%	122%
Personnel Fixed	Percent	10%	5%	
Maintenance Work Ramp Up	Percent	25%	25%	
CLS Fixed	Percent	15%	17%	
CLS Maintenance Growth	Percent	0%	5%	5%
Studies & Minor Upgrades	Dollar	0	\$ 10,000,000	
Heavy Maintenance		22%	\$ 5,000,000	
Indirect Support Fixed	Percent	0%	20%	

		Min	Max	Average	Value in Model	Diff from List	RFI Value
Aircraft Model 1	\$	56.0	\$ 62.1	\$ 59.1			
Aircraft Model 2	\$	63.3	\$ 77.3	\$ 70.3			
Aircraft Model 3	\$	73.2	\$ 80.6	\$ 76.9			
Aircraft Model 4	\$	87.7	\$ 92.8	\$ 90.3			
Aircraft Model 5	\$	176.3	\$ 185.5	\$ 180.9	\$ 160.5	-23.7%	\$ 134.5
Aircraft Model 6	\$	180.6	\$ 187.7	\$ 184.2			
Aircraft Model 7	\$	195.9	\$ 205.7	\$ 200.8			
Aircraft Model 8	\$	211.8	\$ 219.2	\$ 215.5			
Aircraft Model 9	\$	233.0	\$ 241.1	\$ 237.1			
Aircraft Model 10	\$	245.0	\$ 253.7	\$ 249.4	\$ 223.0	-5.0%	\$ 232.8
Aircraft Model 11	\$	205.9	\$ 211.5	\$ 208.7			
Aircraft Model 12	\$	238.2	\$ 242.9	\$ 240.6			
Aircraft Model 13	\$	267.0	\$ 272.2	\$ 269.6			
Aircraft Model 14	\$	327.7	\$ 348.7	\$ 338.2	\$ 298.2	-18.1%	\$ 268.4
Aircraft Model 15	\$	50.0	\$ 57.0	\$ 53.5			
Aircraft Model 16	\$	74.0	\$ 85.0	\$ 79.5			
Aircraft Model 17	\$	228.0	\$ 260.0	\$ 244.0	\$ 207.5		240.4
Aircraft Model 18	\$	232.0	\$ 261.0	\$ 246.5			
Aircraft Model 19	\$	293.0	\$ 308.0	\$ 300.5	\$ 266.7	-5.4%	277.1
Aircraft Model 20	\$	294.0	\$ 297.0	\$ 295.5			
Aircraft Model 21	\$	124.5	\$ 135.5	\$ 130.0	\$ 113.3	-1.5%	122.6
Aircraft Model 22	\$	141.0	\$ 157.5	\$ 149.3			
Aircraft Model 23	\$	200.0	\$ 225.0	\$ 212.5			
Aircraft Model 24	\$	231.0	\$ 256.5	\$ 243.8			
Aircraft Model 25	\$	250.0	\$ 279.0	\$ 264.5	\$ 227.5	-0.2%	249.6
Aircraft Model 26	\$	246.0	\$ 254.0	\$ 250.0			
Aircraft Model 27	\$	189.0	\$ 200.0	\$ 194.5			

Flight Deck Avionics Estimate

Flight Deck Avionics							
Item	Unit Cost	Number of Units for Program Y	Total Program Y Cost	Number of Units for Program X	Total Program X Cost	Number of Units for Synergy	Total Synergy Cost
Subsystem 1	\$ 40,000	2	\$ 80,000	2	\$ 80,000	2	\$ 80,000
Subsystem 2	\$ 100,000	2	\$ 200,000	2	\$ 200,000	2	\$ 200,000
Subsystem 3	\$ 60,000	2	\$ 120,000	2	\$ 120,000	2	\$ 120,000
Subsystem 4	\$ 40,000	2	\$ 80,000	2	\$ 80,000	2	\$ 80,000
Subsystem 5	\$ 173,640	2	\$ 347,280	2	\$ 347,280	2	\$ 347,280
Subsystem 6	\$ 670,000	2	\$ 1,340,000	2	\$ 1,340,000	2	\$ 1,340,000
Subsystem 7	\$ 500,000	2	\$ 1,000,000	2	\$ 1,000,000	2	\$ 1,000,000
Subsystem 8	\$ 2,500,000	0	\$ -	1	\$ 2,500,000	1	\$ 2,500,000
Subsystem 9	\$ 100,000	0	\$ -	1	\$ 100,000	1	\$ 100,000
Subsystem 10	\$ 110,000	0	\$ -	2	\$ 220,000	2	\$ 220,000
Subsystem 11	\$ 500,000	2	\$ 1,000,000	2	\$ 1,000,000	2	\$ 1,000,000
Total Group B			\$ 4,167,280		\$ 6,987,280		
Group A			\$ 833,456		\$ 1,397,456		
Installation			\$ 639,320		\$ 714,360		
TOTAL RECURRING			\$ 5,556,705		\$ 8,964,627		
Non recurring			\$ 7,956,244		\$ 10,630,524		\$ 10,630,524

Flight Deck Avionics Installation Cost Per Aircraft			
'CER=382.5+375.3*SYS_ADD+1048.5*DTBUS_IN+46.9*ALL_LRU			
	Program Y	Program X	Synergy
SYS_ADD = Number of Military Sytems Added	1	1	1
DTBUS_IN = Number Of Data Buses Added	0	0	0
TO_LRU = Number of LRUs	52	60	60
Additional LRUs for E-XX Nav Panel	4	0	0
Manhours	3,197	3,572	3,572
Rate Per Hour	\$200	\$200	\$200
Installation Costs	\$639,320	\$714,360	\$714,360

Communication Equipment Estimate

Items displayed are only a small representative of equip from each program

Program Y Group B Based on Notional Design by Estimator for Replacement Systems		
Avionic Mod 1	LBS	Total Cumm. Weight
Subsystem 1		
Component	165	165
Component	35	200
Component	35	235
Component	40	275
Component	155	430
Component	20	450
Component	39	489
Component	5	494
Component	135	629
Component	14	643
Component	205	848
Component	190	1038
Component	39	1077
Component	7	1084
Total LRU's	56	1084
Subsystem 2		
Component	375	375
Total LRU's	1	375
Subsystem 3		
Component	75	75
Component	99	174
Component	15	189
Component	9	198
Component	38	236
Component	6	242
Total LRU's	26	242
Subsystem 4		
Component	36	36
Component	7	43
Component	5	48
Component	5	53
Component	5	58
Component	5	63
Component	5	68
Component	24	92
Total LRU's	11	92
Subsystem 5		
Component	208	208
Component	110	318
Component	252	570
Component	9	579
Component	120	699
Component	6	705
Component	5	710
Component	24	734
Component	6	740
Component	144	884
Component	28	912
Component	28	940
Component	62	1002
Component	23	1025
Total LRU's	58	1025

Program X Group B Costs Based on Notional Design by Estimator for Replacement Systems				
Subsystem 1				
Item	No. LRUs	Cost/Unit	Total Cost/Acft	Notes
Component	2	\$ 50,000	\$ 100,000	Vendor ROM
Component	2	\$ 100,000	\$ 200,000	Vendor ROM
Component	2	\$ 20,000	\$ 40,000	Vendor ROM
Component	2	\$ 12,675	\$ 25,350	Vendor ROM
Component				
Component	2	\$ 1,500	\$ 3,000	SME
Component				
Component	2	\$ 1,500	\$ 3,000	Analogous system
Component				Captured in Group A Costs
Component	2	\$ 1,500	\$ 3,000	Analogous system
Component	2	\$ 12,675	\$ 25,350	Vendor ROM
Component	2			Included in Power Supply
Component	2	\$ 17,265	\$ 34,530	Vendor ROM
Component	1	\$ 17,265	\$ 17,265	Vendor ROM
Total	21		\$ 451,495	
Subsystem 2				
Item	No. LRUs	Cost/Unit	Total Cost/Acft	Notes
Component	4	\$ 50,000	\$ 200,000	SME / Analogous
Component	4	\$ -	\$ -	Captured in Group A Costs
Component	4	\$ 12,675	\$ 50,700	Vendor ROM
Component	4	\$ 100,000	\$ 400,000	Vendor ROM
Component	4	\$ 17,265	\$ 69,060	Vendor ROM
Component	1	\$ 4,000	\$ 4,000	SME
Component	1	\$ 1,500	\$ 1,500	SME
Component	1			Captured in Group A Costs
Total	23		\$ 725,260	
Subsystem 3				
Item	No. LRUs	Cost/Unit	Total Cost/Acft	Notes
B Kits	5	\$ 272,000	\$ 272,000	Analogous system
A Kit				Analogous system
Total	5		\$ 272,000	
Subsystem 4				
Item	No. LRUs	Cost/Unit	Total Cost/Acft	Notes
Component	4	\$ 7,690	\$ 30,760	GSA Quote
Component	4	\$ 24,686	\$ 98,744	GSA Quote
Component	4	\$ 16,850	\$ 67,400	GSA Quote
Component	4			GSA Quote
Component	4	\$ 4,661	\$ 18,644	GSA Quote
Component	4	\$ 1,000	\$ 4,000	GSA Quote
Component	4	\$ 500	\$ 2,000	GSA Quote
Total	28		\$ 221,548	

Communication Equipment Estimate

Communication System Estimate			
	Program Y	Program X	Synergy
Communication System Estimate			
Comm Equip Methodology	Weight-based	Grp B Unit Cost based	
Total LRUs	1,300	391	
Number os Systems	21	11	
Number of Databases Added	3	3	
Total LRU Weight	16,300		
High Level Electronic Weights	4,890	n/a	
High Level Electronic Cost/Lb	\$ 6,000	n/a	
Low Level Electronic Weights	11,410	n/a	
Low Level Electronic Cost/Lb	\$ 3,000	n/a	
Racks	7,627	n/a	
Racks Cost/Lb	\$ 1,000	n/a	
Grp B Costs	\$ 63,570,429	\$ 10,550,508	
Grp A Costs	\$ 35,015,820	\$ 4,545,603	
OEM Burden Factor ----- Choose Yes or No ----- <input type="text" value="No"/>	0%	0%	
Installation Costs			
Manhours: CER: $\text{Manhours} = 382.5 + 375.3 * \text{SYS_ADD} + 1048.5 * \text{DTBUS_IN} + 46.9 * \text{ALL_LRU}$			
Max LRU Range for CER	90	90	
Total LRUs/Max LRU Range	14	4	
Total Install Costs	\$ 45,154,200	\$ 10,320,054	
Total Recurring Costs	\$ 143,740,449	\$ 25,416,165	There is no synergy commonality
Non-Recurring Costs	\$ 394,344,995	\$ 40,992,256	There is no synergy commonality

Software Estimate

Software Estimate			
	Program Y	Program X	Synergy
Integration	\$ 75,000,000	N/A	
Planning	\$ 30,000,000	N/A	
Software Test	\$ 7,500,000	N/A	
OFP Software Changes	\$ 5,000,000	N/A	
Total	117,500,000	56,622,780	\$ 169,622,780
Avionic Mod 1 Software	\$ 5,000,000	\$ 5,000,000	\$ 5,500,000
Number of Avionic Mod 1 Systems	20	20	
Cost per Avionic Mod 1 System	\$ 250,000	\$ 250,000	
Avionic Mod 2 Software	\$ 112,500,000	\$ 51,622,780	\$ 164,122,780
Synergy Inputs			
Avionic Mod 1 Commonality ---- Select ---->	<input type="text" value="90%"/>		
Avionic Mod 2 Commonality ----- Select ---->	<input type="text" value="0%"/>		
Total Software Costs	\$ 117,500,000	\$ 56,622,780	\$ 169,622,780

Risk Methodology

- ▶ Used Crystal Ball software to run risk analysis
- ▶ Monte Carlo Simulation
- ▶ Applied risk at the lowest CES element
- ▶ Used 50% CV to account for adequate risk when historical info wasn't available
- ▶ Most factored costs and O&S costs had historical CV available

Assumption	Input Type	Assumption Value	Crystal Ball			
			Distro	Min	ML	Max
General Assumptions						
Manufacturer's Empty Weight						
Green Aircraft MEW	Pounds	429,000	Normal		429,000	1%
New A/C Assumptions						
New A/C Price	List/CER	List				
RFI/Published List Price	Dollar	\$ 266,669,360	Normal	\$ 226,668,956	\$ 266,669,360	10.0%
List Price ln(\$04M) = \$-5.008787 * lnEW + 0.81 + ε			-5.008787003	0.81		
List Price CER		0	Normal		0	0.078
List Price Discount						
New Aircraft Discount		18.4%	Normal		18.4%	3.2%
Airframe Modifications						
AF Mod 1	Yes/No	Yes				
Rec	Dollar	\$ 1,023,036	Normal	\$ 511,518	\$ 1,023,036	50%
NR	Dollar	\$ 1,534,554	Normal	\$ 767,277	\$ 1,534,554	50%
AF Mod 2 (rec cost) per foot	Dollar	\$ 88	Normal	\$ 44	\$ 88	50%
AF Mod 3	Yes/No	Yes				
Rec	Dollar	\$ 3,584,707	Normal	\$ 1,792,353	\$ 3,584,707	50%
NR	Dollar	\$ 1,792,353	Normal	\$ 896,177	\$ 1,792,353	50%
AF Mod 4	Yes/No	Yes				
Rec	Dollar	\$ 2,775,173	Normal	\$ 1,387,587	\$ 2,775,173	50%
NR	Dollar	\$ 1,460,224	Normal	\$ 730,112	\$ 1,460,224	50%
AF Mod 5	Yes/No	Yes				
Rec	Dollar	\$ 5,118,000	Normal	\$ 2,559,000	\$ 5,118,000	50%
NR	Dollar	\$ 20,472,000	Normal	\$ 10,236,000	\$ 20,472,000	50%
AF Mod 6	Yes/No	Yes				
AF Mod 6 Config 1	Dollar	\$ 970,157	Normal	\$ 485,078	\$ 970,157	100%
AF Mod 6 Config 2	Dollar	\$ 1,272,553	Normal	\$ 636,276	\$ 1,272,553	100%
NR	Dollar	\$ 11,782,896	Normal	\$ 5,891,448	\$ 11,782,896	50%
Avionics Mod Assumptions						
Avionics Mod 1	Yes/No	Yes				
Rec	Dollar	\$ 8,964,627		\$ 4,482,313	\$ 8,964,627	50%
NR	Dollar	\$ 10,630,524		\$ 5,315,262	\$ 10,630,524	50%
Avionics Mod 2	Yes/No	Yes				
Comm Systems	Yes/No	Yes				
Rec	Dollar	\$ 25,416,165	Normal	\$ 12,708,082	\$ 25,416,165	50%
NR	Dollar	\$ 40,992,256	Normal	\$ 20,496,128	\$ 40,992,256	50%
Software	Yes/No	Yes				
NR Dev	Dollar	\$ 56,622,780	Normal	\$ 28,311,390	\$ 56,622,780	75%

Risk Methodology

- ▶ Performed separate Monte Carlo simulations for each Program

BY \$M	Synergy	Program Y	Program X
Total Cost - Mean Confidence Level	\$ 25,203.9	\$ 16,322.0	\$ 10,429.1
Total Cost - Point Estimate	\$ 22,762.8	\$ 14,694.9	\$ 9,261.1
Total Risk Dollars Added	\$ 2,441.2	\$ 1,627.0	\$ 1,168.0
Development - Mean Confidence Level	\$ 4,557.4	\$ 3,115.0	\$ 1,910.0
Development - Point Estimate	\$ 3,607.7	\$ 2,410.1	\$ 1,498.1
Risk Dollars Added	\$ 949.7	\$ 705.0	\$ 412.0
Procurement - Mean Confidence Level	\$ 4,179.8	\$ 2,651.3	\$ 1,484.4
Procurement - Point Estimate	\$ 3,615.1	\$ 2,278.8	\$ 1,303.4
Risk Dollars Added	\$ 564.6	\$ 372.5	\$ 181.0
MILCON - Mean Confidence Level	\$ 353.7	\$ 177.7	\$ 187.9
MILCON - Point Estimate	\$ 335.1	\$ 158.1	\$ 177.6
Risk Dollars Added	\$ 18.6	\$ 19.5	\$ 10.3
O&S - Mean Confidence Level	\$ 16,112.6	\$ 10,377.5	\$ 6,846.7
O&S - Point Estimate	\$ 15,204.5	\$ 9,847.6	\$ 6,282.1
Risk Dollars Added	\$ 908.1	\$ 529.9	\$ 564.6
Retirement - Mean Confidence Level	\$.48	\$.44	\$.03
Retirement - Point Estimate	\$.41	\$.38	\$.03
Risk Dollars Added	\$.06	\$.06	\$.00

Then-Year Phasing

- ▶ Phased costs out according to the program schedules to calculate the Then Year (TY) costs

Select Alternative:	Alt C
IOC Date:	2022
Fleet Size:	3
Confidence Level:	Mean CL
Level of Synergy:	Full Program Synergy

Program X														
Action	Appn	Total Cost BY08	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	To Complete FY21 - FY49	TOTAL TY FY10 - FY49
Development	3600	\$ 1,633				\$ 63.019	\$ 172.727	\$ 256.498	\$ 312.828	\$ 338.694	\$ 331.235	\$ 287.492	\$ 282.791	\$ 2,045.283
Test A/C	3600	\$ 277						\$ 245.560	\$ 84.195					\$ 329.755
Lot 1	3010	\$ 742									\$ 334.099	\$ 638.414		\$ 972.513
Lot 2	3010	\$ 742											\$ 1,059.599	\$ 1,059.599
MILCON	3300	\$ 188				\$ 6.310	\$ 12.907	\$ 30.892	\$ 174.782					\$ 224.891
O&S	3400	\$ 6,847											\$ 15,297.497	\$ 15,297.497
Retirement	3400	\$ 0.03											\$ 0.100	\$ 0.100
Total		\$ 10,429	\$ -	\$ -	\$ -	\$ 69.329	\$ 185.634	\$ 532.949	\$ 571.805	\$ 338.694	\$ 665.334	\$ 925.906	\$ 16,639.987	\$ 19,929.638

Program Y														
Action	Appn	Total Cost BY08	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	To Complete FY21 - FY49	TOTAL TY FY10 - FY49
Development	3600	\$ 2,834				\$ 109.38	\$ 299.802	\$ 445.204	\$ 542.976	\$ 587.873	\$ 574.925	\$ 499.000	\$ 490.841	\$ 3,550.001
Test A/C	3600	\$ 281						\$ 248.935	\$ 85.352					\$ 334.287
Lot 1	3010	\$ 884									\$ 397.818	\$ 760.171		\$ 1,157.989
Lot 2	3010	\$ 884										\$ 409.355	\$ 782.216	\$ 1,191.571
Lot 3	3010	\$ 884											\$ 1,261.684	\$ 1,261.684
MILCON	3300	\$ 178				\$ 5.966	\$ 12.203	\$ 29.206	\$ 165.245					\$ 212.620
O&S	3400	\$ 10,378											\$ 23,175.839	\$ 23,175.839
Retirement	3400	\$ 0.44											\$ 1.298	\$ 1.298
Total		\$ 16,322	\$ -	\$ -	\$ -	\$ 115.348	\$ 312.005	\$ 723.344	\$ 793.573	\$ 587.873	\$ 972.743	\$ 1,668.526	\$ 25,711.879	\$ 30,885.291

Synergy														
Action	Appn	Total Cost BY08	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	To Complete FY21 - FY49	TOTAL TY FY10 - FY49
Development	3600	\$ 3,999				\$ 154.35	\$ 423.052	\$ 628.228	\$ 766.194	\$ 829.549	\$ 811.278	\$ 704.140	\$ 692.627	\$ 5,009.416
Test A/C (Program X)	3600	\$ 279						\$ 247.247	\$ 84.774					\$ 332.021
Test A/C (Program Y)	3600	\$ 279						\$ 247.247	\$ 84.774					\$ 332.021
Lot 1 (Program X #2)	3010	\$ 835								\$ 365.310	\$ 698.052			\$ 1,063.362
Lot 2 (Program Y #2)	3010	\$ 835									\$ 375.904	\$ 718.296		\$ 1,094.200
Lot 3 (Program Y #3)	3010	\$ 835										\$ 386.805	\$ 739.127	\$ 1,125.932
Lot 4 (Program X #3)	3010	\$ 835											\$ 1,158.584	\$ 1,158.584
Lot 5 (Program Y #4)	3010	\$ 835											\$ 1,192.182	\$ 1,192.182
MILCON	3300	\$ 354				\$ 11.878	\$ 24.296	\$ 58.149	\$ 329.006					\$ 423.330
O&S	3400	\$ 16,113											\$ 36,176.918	\$ 36,176.918
Retirement	3400	\$ 0.48											\$ 1.443	\$ 1.443
Total		\$ 25,200	\$ -	\$ -	\$ -	\$ 166.227	\$ 447.348	\$ 1,180.872	\$ 1,264.747	\$ 1,194.858	\$ 1,885.234	\$ 1,809.241	\$ 39,960.880	\$ 47,909.408

Savings														
Action	Appn	Total Cost BY08	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	To Complete FY21 - FY49	TOTAL TY FY10 - FY49
Development	3600	\$ 468				18.052	49.477	73.473	89.609	97.018	94.882	82.351	81.005	585.868
Test A/C	3600	\$ 0						0.000	0.000					0.000
Production	3010	\$ (40)								(365.310)	(342.039)	702.839	13.607	9.098
MILCON	3300	\$ 12				0.398	0.814	1.948	11.022					14.182
O&S	3400	\$ 1,112											2,296.418	2,296.418
Retirement	3400	\$ -											(0.045)	(0.418)
Total		\$ 1,551				18.450	50.291	75.421	100.631	(268.291)	(247.157)	785.191	2,390.986	2,905.147

Synergy Savings Bubble Chart

