

Where cost analysis, capability
and innovation meet...

Joint Integrated Analysis Tool

JIAT

Using the Joint Integrated Analysis Tool (JIAT)

ISPA/SCEA WORKSHOP
JUNE 8-11, 2010

ODASA
Cost &
Economics



Agenda

- **Introduction (Daniel Schwartz, ODASA-CE)**
- **JIAT Use Case (Melissa Cyrulik, Tecolote Research, Inc.)**
- **JIAT's Continuing Evolution (Daniel Schwartz)**
- **Questions**

Introduction

The Army's Cost Estimating Challenge

- The logistics of accessing estimating resources can be a challenging task. You must work through several hurdles:
 - Knowing that the data and models exist,
 - Knowing where data and models are stored,
 - Getting access to the resources,
 - Understanding how to extract the data or interact with the resources, and
 - Reformatting the information so that it can be integrated into an estimate or analysis.

The Army's Cost Estimating Solution

- The Joint Integrated Analysis Tool (JIAT) is a web-based application that provides access to capability, performance, and operations and support databases and provides links to, cost estimating tools, engineering design models, and modeling and simulation tools.
- JIAT is administered by the Office of the Deputy Assistant Secretary of the Army – Cost & Economics (ODASA-CE) and Tecolote Research, Inc.
- This presentation shows how you can use JIAT to overcome the aforementioned challenges and perform your daily estimating and analysis work efficiently and from a broader variety of sources.

Three Challenges When Performing an Estimate or Analysis Task

Identifying Analogous Systems

- Identify Analogies
- Locate Analogous System Cost, Schedule, and Technical Data to Build Cost Estimating Relationships (CERs)

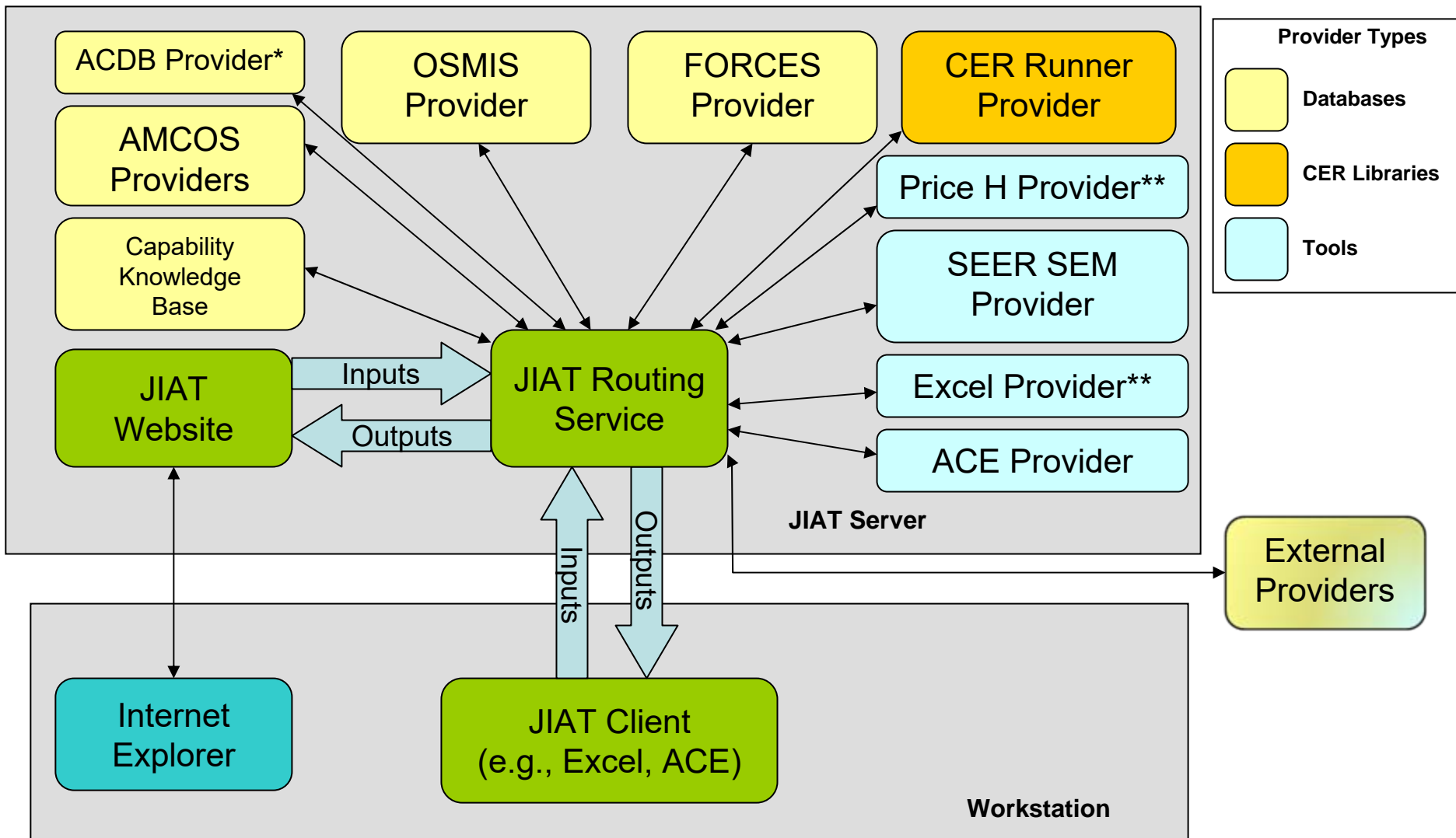
Collecting Source Data

- Gather Estimating Data from Various Sources:
 - Costs Associated with Military and Civilian Personnel
 - Cost of Unit Operations; flying hours, fuel, consumable and repairable costs
 - Operational Costs for analogous systems

Locating CERs and Source Models

- Search Libraries for appropriate CERs and Factors
- Locate existing estimating models that can provide estimates for portions of the system you are estimating - for example software or platform models

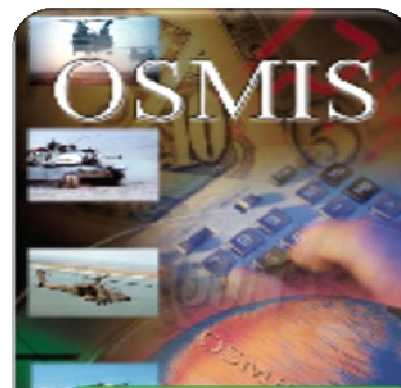
Current JIAT Components



* Currently only one sample ACDB database is hosted

**Price H and Excel Provider are under development at the time of publication

JIAT Provides Access to Multiple Databases



Identify Analogous Systems

- Capabilities
- Programmatic Data
- Technical Data

Collect Standard Rates

- Enlisted
- Officer
- Civilian
- Use for Manpower

Gather O&S Data

- Operate Vehicles Data
- Support Systems Data
- Aircraft Flight Data
- Maintain Software Data

Obtain Force and Organizational Data

- Flying Costs
- Fuel Costs
- Equipment Costs
- Replenishment Costs

JIAT Provides Access to Multiple Model Providers



SEER SEM

- Estimates Software Development and Maintenance
- Estimate effort, cost, schedule, staffing, reliability, and risk

PRICE H

- Estimates Hardware Acquisition and Development
- Estimates cost, resources, and schedules

Excel

- Host any Excel Model
- Specify Model Inputs and Outputs

ACEIT

- Host any ACE Session
- Specify Model Inputs and Outputs

Connect to JIAT in Two Ways: Web Browser and Clients

➤ JIAT uses a common interface to display information

JIAT Web Browser
<https://jiat.awps.army.mil>

Query Inputs		Query Results	
Name	Value	PNO	ProgramName
1	Capability Choice	10_Manuever 14_Air 21...	156BLACK HAWK (UH-60
2			179ARH
3			182LUH
4			202APACHE BLOCK III
5			202LONGBOW BLOCK III
6			254COMANCHE
7			278CH-47F
8			831LONGBOW APACHE

JIAT Clients
Excel and Others

Query Inputs		Query Results	
Name	Value	PNO	ProgramName
7	Capability Choice	156	BLACK HAWK (UH-60A/L)
8		182	LUH
9		202	APACHE BLOCK III
10		202	LONGBOW BLOCK III (AB3)
11		278	CH-47F
12		831	LONGBOW APACHE

JIAT Use Case

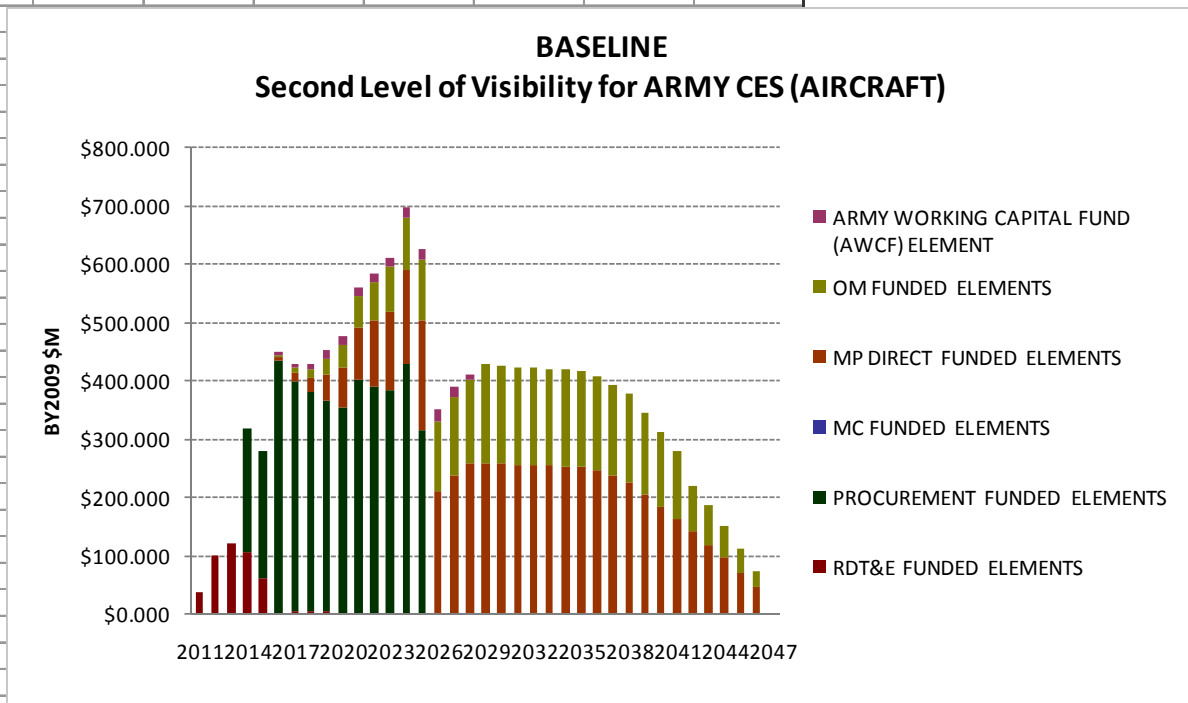
Utilizing JIAT to Cross Check an Estimate

- **Our task is to cross check an estimate for a helicopter program.**
- **The system capabilities of the helicopter are that it:**
 - **Will be man-operated (controlled by a person),**
 - **Can be deployed, and**
 - **Must provide ground support.**
- **To create an estimate or cross check one, analysts pull information together from a variety of sources.**
- **This presentation shows an example of how JIAT can help cross check an estimate. The cross check analysis is hosted in Excel. In addition, we show how working with this information in Excel can expand your analysis capabilities to include allowing you to perform portfolio analysis.**

Example Helicopter Estimate

➤ The task is to cross check the results of this Life Cycle Cost Estimate

Costs in BY2009 \$M									
WBS	Total	Prior	2014	2015	2016	2017	2018	2019	To Complete
ARMY CES (AIRCRAFT)	\$13,149.461	\$258.716	\$318.260	\$280.831	\$449.399	\$429.512	\$429.802	\$453.981	\$10,528.960
RDT&E FUNDED ELEMENTS	\$445.109	\$258.716	\$107.876	\$60.426	\$2.727	\$4.374	\$5.139	\$3.730	\$2.121
Block 1	\$429.182	\$258.716	\$107.876	\$60.426	\$2.163				
Block 2	\$15.927				\$0.564	\$4.374	\$5.139	\$3.730	\$2.121
PROCUREMENT FUNDED ELEMENTS	\$4,270.902								
NON-RECURRING PROD	\$12.261								
RECURRING PRODUCTION	\$3,955.025								
ENGINEERING CHANGES	\$54.975								
SYSTEMS ENGINEERING/MGMT	\$183.513								
SYSTEMS TEST AND EVAL									
TRAINING	\$35.991								
MODIFICATIONS	\$29.138								
OTHER PROCUREMENT									
MP DIRECT FUNDED ELEMENTS	\$5,089.939								
CREW	\$974.985								
MAINTENANCE (MTOE)	\$1,297.930								
SYSTEM SPECIFIC SUPPORT	\$989.421								
SYSTEMS ENGINEERING/MGMT	\$4.351								
REPLACEMENT PERSONNEL	\$1,823.251								
OTHER MP	\$0.000								
OM FUNDED ELEMENTS	\$3,165.873								
FIELD MAINT CIV LABOR	\$133.256								
SYSTEM SPECIFIC BASE OPS	\$102.710								
REPL SPARES (REPARABLES)	\$1,159.145								
REPL REPAIR PARTS (CONS)	\$411.499								
PETRO, OIL AND LUB (POL)	\$246.649								
END ITEM SUPPLY & MAINT	\$11.549								
TRANSPORTATION	\$17.281								
SOFTWARE	\$65.300								
SYSTEM TEST AND EVAL, OPER									
SYSTEMS ENGINEERING/MGMT	\$256.534								\$256.534
TRAINING	\$451.020				\$0.537	\$1.274	\$2.209	\$4.081	\$442.919
OTHER OM	\$310.931				\$0.370	\$0.878	\$1.523	\$2.813	\$305.346
ARMY WORKING CAPITAL FUND (AWCF) ELEMENT	\$177.638				\$4.555	\$6.073	\$9.110	\$15.183	\$142.718



Notional data

Items to Cross Check in the Estimate

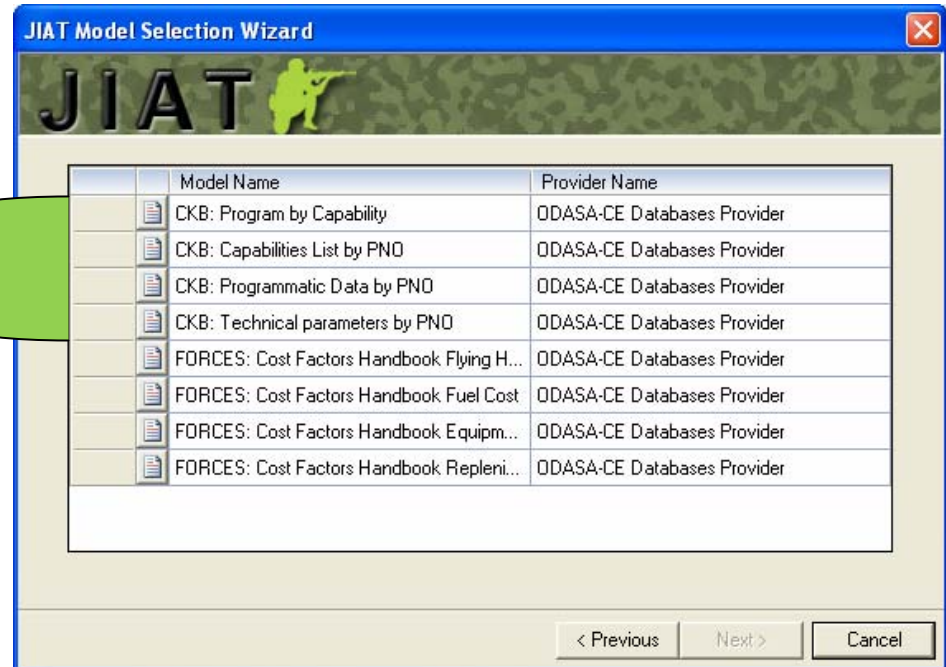
- For this use case we focus on **three main areas to cross check** the results in our estimate. All this information is gathered using JIAT.
 - For **procurement**... determining an analogous Average Unit Production Cost and compare it to that calculated from the estimate. We use **CKB** data to perform this check.
 - For **O&M**... calculate personnel costs and determine consumable to reparable cost factors to cross check the proportions of these items in the estimate. We use **AMCOS** and **OSMIS** data to check these items.
 - For **software development**... use the estimated lines of code to cross check the effort months used in software development. We use a **SEER SEM** model to show how to verify this portion of the estimate.

Cross Check Average Unit Production Cost with CKB Data

Using CKB to Identify Analogous Systems and Gather Cost and Technical Data

- Determining an analogous system provides a starting point for all other data gathering activities

CKB Options in JIAT



- CKB in JIAT offers four search options:
 - Program by Capability – obtain a list of programs based on capabilities
 - Capabilities List by PNO – view a list of all the capabilities of a system
 - Programmatic Data by PNO – view programmatic data by major phase
 - Technical parameters by PNO – view technical characteristics

Using CKB to Search for Analogous Systems

- Search CKB database

- CKB search results

Select Value(s)

Variable Value

10_Manuever

11_Ground

12_Maritime

13_Submerged

14_Air

15_Space

20_Control

21_Manned

22_Unmanned

30_Shoot

31_Line_of_Sight(LOS)

32_Beyond_Line_of_Sight(BLOS)

Check All Uncheck All OK Cancel

Search for Systems by Capabilities:
Example - Air, Manned,
Support, and Ground

JIAT Data Query				
Model: CKB: Program by Capability				
Description: Obtain Programs Bases on Capabilities				
Provider: ODASA-CE Databases Provider				
Query Inputs		Query Results		
Name	Value	PNO	ProgramName	
Capability Choice		156	BLACK HAWK (UH-60A/L)	
		182	LUH	
		202	APACHE BLOCK III	
		202	LONGBOW BLOCK III (AB3)	
		278	CH-47F	
		831	LONGBOW APACHE	

Six Systems in CKB met the search criteria

- Use CKB to understand the technical parameters of the analogies
- Search CKB “Technical Parameters by PNO” for each system
- Search results shown are examples of two notional analogous helicopter systems

JIAT Data Query										
Model: CKB: Technical parameters by PNO										
Description: List all technical data of a PNO										
Provider: ODASA-CE Databases Provider										
Query Inputs										
Name	Value	Subprogram Name	MILHDBK881A System Type	Cruise Speed	Max Speed	Rotor Diameter	Rate of Climb	Length	Height	
PNO	Aircraft A		Aircraft	184.32		61.8624	1100.16	57.6	19.584	
			Aircraft	202.752	210.816	61.8624	806.4	74.65	19.584	

Shows various technical parameters such as: speed, rotor diameter, rate of climb, length, height, weight, etc.

JIAT Data Query											
Model: CKB: Technical parameters by PNO											
Description: List all technical data of a PNO											
Provider: ODASA-CE Databases Provider											
Query Inputs											
Name	Value	Subprogram Name	MILHDBK881A System Type	Cruise Speed	Max Speed	Rotor Diameter	Rate of Climb	Length	Height	Wingspan	Max Gros
PNO	Aircraft 2		Aircraft		192.384	41.5872		38.477	13.018		

The technical parameters can be compared for all the analogous systems; this information can be used to develop CERs

Notional data

- Use CKB to understand the programmatic data of the analogies
- Search CKB “Programmatic Data by PNO” for each system
- Search results shown are examples of two notional analogous helicopter systems

JIAT Data Query									
Model: CKB: Programmatic Data by PNO									
Description: List all programmatic data of a PNO									
Provider: ODASA-CE Databases Provider									
Query Inputs					Query Results				
Name	Value	Latest SAR Date	RDTE Cost	Proc Cost	MILCON Cost	O&M Cost	Duration, MS II to MS III	Duration, MS II to IOC	Segment Name
PNO	Aircraft A	12/25/2000	0	1342	3	0			Aircraft A

Shows various program data such as: latest SAR data for RDTE, Procurement, MILCON, and O&M costs, plus milestone durations, and average unit production costs

JIAT Data Query									
Model: CKB: Programmatic Data by PNO									
Description: List all programmatic data of a PNO									
Provider: ODASA-CE Databases Provider									
Query Inputs					Query Results				
Name	Value	Latest SAR Date	RDTE Cost	Proc Cost	MILCON Cost	O&M Cost	Duration, MS II to MS III	Duration, MS II to IOC	Segment Name
PNO	Aircraft B	12/25/2000	3.7	2092.7	0	0			Aircraft B

The program data can be compared for all the analogous systems; this information can be used to develop CERs

Notional data

- To cross check our example use CKB data to develop CERs
- Compile data from various CKB data queries into one Excel/CO\$TAT worksheet and perform analysis

CO\$TAT data sheet

Pairwise analysis shows variable relationships

Developed a CER for Average Unit Production Cost

Notional data

I. Correlation Matrix

	RDTE\$	Proc\$	MILCON\$	OM\$	DurMSIItoMSIII	DurMSIItoIOC	Qty	AUPC
RDTE\$	1.0000	0.4347	-0.4688		0.4663	0.1030	0.6085	0.2396
Proc\$	0.4347	1.0000	-0.5968		0.9927	0.8999	0.2635	0.9665
MILCON\$	-0.4688	-0.5968	1.0000		-0.5682	-0.4052	0.3127	-0.6135
OM\$				1.0000				
DurMSIItoMSIII	0.4663	0.9927	-0.5682		1.0000	0.8538	0.2999	0.9595
DurMSIItoIOC	0.1030	0.8999	-0.4052		0.8538	1.0000	0.1648	0.8920
Qty	0.6085	0.2635	0.3127		0.2999	0.1648	1.0000	0.0419
AUPC	0.2396	0.9665	-0.6135		0.9595	0.8920	0.0419	1.0000

Log Linear Analysis for Dataset Helo Data
Wednesday, 24 February 2010, 2:00 pm

I. Model Form and Equation Table

Model Form: Unweighted Log-Linear model
Number of Observations Used: 4
Equation in Unit Space: $AUPC = 0.01992 * EmptyWgt^{0.2663} * Engineshp^{0.5106}$

II. Fit Measures (in Fit Space)

Coefficient Statistics Summary

Variable	Coefficient	Std Dev of Coef	Beta Value	T-Statistic (Coef/SD)	P-Value
Intercept	-3.9159	2.7958		-1.4007	0.3947
EmptyWgt	0.2663	1.1362	0.3250	0.2344	0.8534
Engineshp	0.5106	1.0856	0.6521	0.4704	0.7201

II. Scatter Plot

Program Compare | Helo Data | Pairwise Helo Data

Hosting the CER in JIAT

- Take any CER and store it in a JIAT CER library for others to search

The screenshot shows the JIAT web application interface. At the top, the browser title is "JIAT - Windows Internet Explorer" and the address bar shows "https://jiat.awps.army.mil/JIATWeb/Pages/CERPage.aspx". The user is identified as "User: MELISSA.ANN.CYRULIK" with roles "Administrator, CerAdmin, Analyst, Provider".

The main content area is titled "Add CER". It contains the following fields:

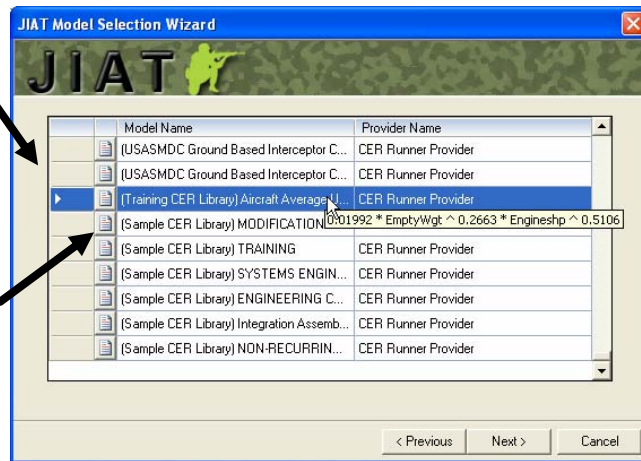
- Title: Aircraft Average Unit Production Cost
- Equation: $0.01992 * EmptyWgt ^ 0.2663 * Engineshp ^ 0.5106$
- Reference Cost: [empty]
- Learning Slope: [empty]
- Theory: [empty]
- Rate Slope: [empty]
- Fiscal Year: 2009
- Units: \$ - Dollars
- Domain Type: Cost
- Commodity: Aviation
- Phase: Pre-Development, Development, Production, Operations and Support
- Keywords: A to D Converter, Aerospace Grd Equip, Airborne Spt Equip, Airframe, Structure
- Fee Included: Yes
- G&A Included: Yes
- Overhead Included: Yes

On the left side, there is a "JIAT CER Libraries" section with a tree view showing "USASMDM Ground Based Interceptor Cost Model Lib". A green box labeled "Libraries listing" points to this section. Below it, a green box labeled "CERs listing" points to a list of categories under "All", including "USASMDM Demilitarization & Disposal", "Direct Demilitarization & Disposal", "Pre-Disposal", "Annual Post-Disposal", "Indirect Disposal", "Other Demilitarization & Disposal", "USASMDM Development CERs", "Data", "Development Engineering (Har)", "Development Phase", "Facilities", and "Other".

A green box labeled "Add CER to a library" points to a button with a folder icon. Another green box labeled "Includes CER definition and statistics" points to a "Definition:" field with a "Browse..." button and a "Save" button.

Working with JIAT Hosted CERs

➤ Search for a CER in the JIAT CER libraries



➤ Load and calculate CERs in Excel with your input variables

Variable Name	Appropriation	Model Unit	Convert From	Case 1	Smaller Weight	Smaller SHP
OUTPUT VARIABLES						
Aircraft Average Unit Production Cost Output				\$11.75	\$10.69	\$9.94
INPUT VARIABLES						
EmptyWgt				15720	11000	11000
Engineshp				1730	1730	1500

Using the JIAT Analysis Information in our Cross Check

➤ Results from the helicopter procurement estimate to cross check

Costs in BY2009 \$M		2011	2012	2013	2014	2015	2016	2017	2018	2019	To Complete
WBS	Total										
ARMY CES (AIRCRAFT)	\$13,149.461	\$36.944	\$101.740	\$120.062	\$318.260	\$280.831	\$449.399	\$429.512	\$429.802	\$453.981	\$10,528.960
PROCUREMENT FUNDED ELEMENTS	\$4,270.902						2.120	\$396.014	\$375.828	\$361.967	\$2,274.185
Production Quantity	585.0						50.0	50.0	50.0	50.0	350.0
Shaft Horsepower (lbs)	1,730.0										
Empty Weight (lbs)	15,720.0										
Average Unit Production Cost	7.3				14.0	11.0	8.6	7.9	7.5	7.2	n/a

Estimate AUPC = \$7.3 M

➤ Results from an average unit production cost CER developed from JIAT hosted data shows the estimate might be low

Variable Name	Appropriation Model Unit	Convert From	Case 1	Smaller Weight	Smaller SHP
OUTPUT VARIABLES					
Aircraft Average Unit Production Cost Output	RDTEF		\$11.75	\$10.69	\$9.94
INPUT VARIABLES					
EmptyWgt			15720	11000	11000
Engineshp			1730	1730	1500

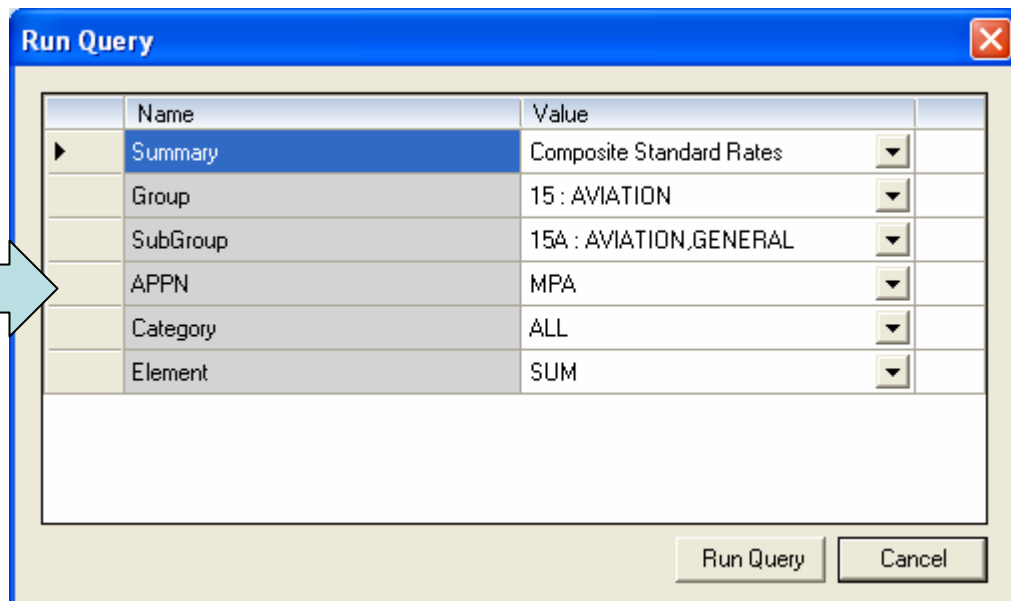
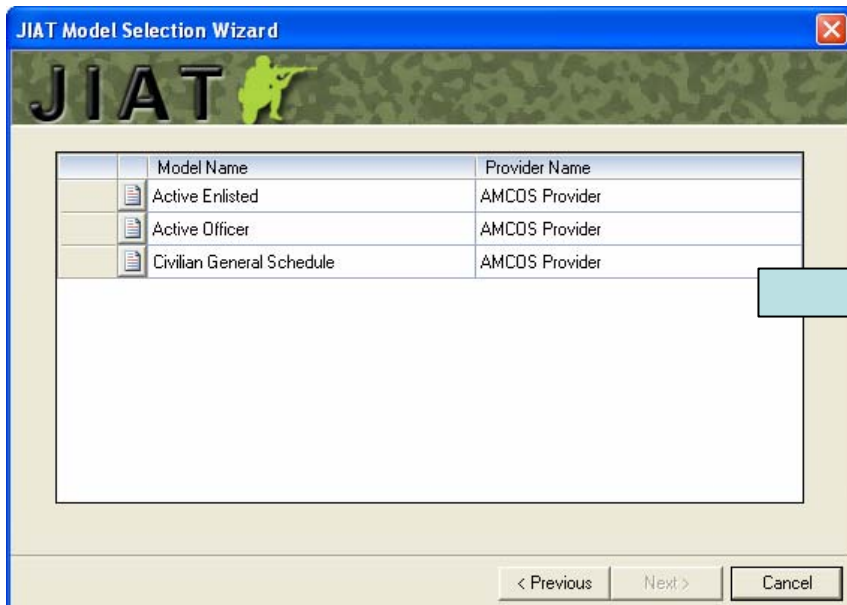
CER AUPC = \$11.7 M

Cross Check O&M Items with AMCOS and OSMIS

Obtaining data from the AMCOS Database

➤ Use AMCOS to assist with estimating personnel costs

- Search AMCOS enlisted, officer, and civilian tables
- Search by cost type, group, sub group, and appropriation



➤ **AMCOS data query results provided directly in Excel worksheet**

Personnel labor costs by pay grade

Query Inputs				Query Results									
Name	Value	APPN	Category	Element	Fiscal Year	Units	O1	O2	O3	O4	O5	O6	O7
Summary	Composite Standard Rates	MPA	Military Compensation TOTAL	SUM	2009	Dollars	53387.08	67821	88917.05088	117138.55	136465.09	163237.34	187213.66
Group	15 : AVIATION	MPA	Other Benefits TOTAL	SUM	2009	Dollars	11329.84	11362.74	11362.74048	11362.74	11362.74	11362.74	11362.74
SubGroup	15A : AVIATION,GENERAL	MPA	Permanent Change of Station Costs TOTAL	SUM	2009	Dollars	885.0931	5882.746	5745.16324	7073.0013	6369.5923	5702.089	6510.3552
APPN	MPA	MPA	Retired Pay Accrual TOTAL	SUM	2009	Dollars	10461.19	13842.3	18963.03744	24771.3565	28820.471	35914.89	41840.536
Category	ALL	MPA	Separation Costs TOTAL	SUM	2009	Dollars	5.65632	54.80064	1078.29504	774.19008	2596.7347	5406.1056	4784.7168
Element	SUM	MPA	Special Pays TOTAL	SUM	2009	Dollars	2949.454	4682.73	7339.97952	11755.711	12984.18	9074.5114	5360.9702

Shows results base year

Using AMCOS Data to Calculate Manpower

➤ Link AMCOS rates directly into FTEs per year in Excel worksheet

Formula bar: B4 =AMCOS - Off- Av Gen Sum (2)!!I7

	Pay Rate 2009	2016	2017	2018	2019	2020	2021	2022	2023
FTEs per Year									
Total		15	39	66	122	177	247	305	367
General Aviation 01	\$ 79,018.28	0	1	2	4	8	8	10	10
General Aviation 02	\$ 103,646.32	1	2	4	8	16	16	18	18
General Aviation 03	\$ 133,406.27	1	2	2	4	8	8	10	10
General Aviation 04	\$ 172,874.78	1	1	2	3	6	6	8	8
General Aviation 07	\$ 257,072.98	0	0	1	1	1	1	1	1
Notional data									
Aviation Specialist E3	\$ 52,782.94	4	14	26	40	60	80	100	120
Aviation Mechanics E4	\$ 62,058.08	5	14	20	30	40	68	82	100
Aviation Mechanics E5	\$ 71,839.48	2	4	8	28	34	54	70	90
Aviation Mechanics E7	\$ 100,324.95	1	1	1	4	4	6	6	10
Personnel Cost	Total BY2009	2016	2017	2018	2019	2020	2021	2022	2023
Total	\$ 974,558,111	\$ 1,175,353	\$ 2,721,455	\$ 4,730,816	\$ 8,840,431	\$ 13,145,200	\$ 17,575,925	\$ 21,627,720	\$ 25,638,513
General Aviation 01	\$ 4,346,006	\$ -	\$ 79,018	\$ 158,037	\$ 316,073	\$ 632,146	\$ 632,146	\$ 790,183	\$ 790,183
General Aviation 02	\$ 10,675,570	\$ 103,646	\$ 207,293	\$ 414,585	\$ 829,171	\$ 1,658,341	\$ 1,658,341	\$ 1,865,634	\$ 1,865,634
General Aviation 03	\$ 7,337,345	\$ 133,406	\$ 266,813	\$ 266,813	\$ 533,625	\$ 1,067,250	\$ 1,067,250	\$ 1,334,063	\$ 1,334,063
General Aviation 04	\$ 7,433,615	\$ 172,875	\$ 172,875	\$ 345,750	\$ 518,624	\$ 1,037,249	\$ 1,037,249	\$ 1,382,998	\$ 1,382,998
General Aviation 07	\$ 1,799,511	\$ -	\$ -	\$ 257,073	\$ 257,073	\$ 257,073	\$ 257,073	\$ 257,073	\$ 257,073

Using the JIAT Information in our Cross Check

- Results from helicopter manpower crew estimate to cross check
- Methodology based on cost per flight hour

Crew Cost = \$974.9 M

Costs in BY2009 \$M										
WBS	Total	2016	2017	2018	2019	2020	2021	2022	2023	To Complete
CREW	\$974.985	\$1.162	\$2.754	\$4.776	\$8.821	\$13.140	\$17.441	\$21.724	\$25.988	\$879.179

- Additional manpower FTE matrix was provided
- Used AMCOS rates to develop FTEs cost per year

FTEs per Year	Pay Rate 2009	2016	2017	2018	2019	2020	2021	2022	2023
Total		15	39	66	122	177	247	305	367
General Aviation 01	\$ 79,018.28	0	1	2	4	8	8	10	10
General Aviation 02	\$ 103,646.32	1	2	4	8	16	16	18	18
General Aviation 03	\$ 133,406.27	1	2	2	4	8	8	10	10
General Aviation 04	\$ 172,874.78	1	1	2	3	6	6	8	8
General Aviation 07	\$ 257,072.95	0	0	1	1	1	1	1	1
Notional data									
Aviation Specialist E3	\$ 52,782.94	4	14	26	40	60	80	100	120
Aviation Mechanics E4	\$ 62,058.08	5	14	20	30	40	68	82	100
Aviation Mechanics E5	\$ 71,839.48	2	4	8	28				
Aviation Mechanics E7	\$ 100,324.95	1	1	1	4				

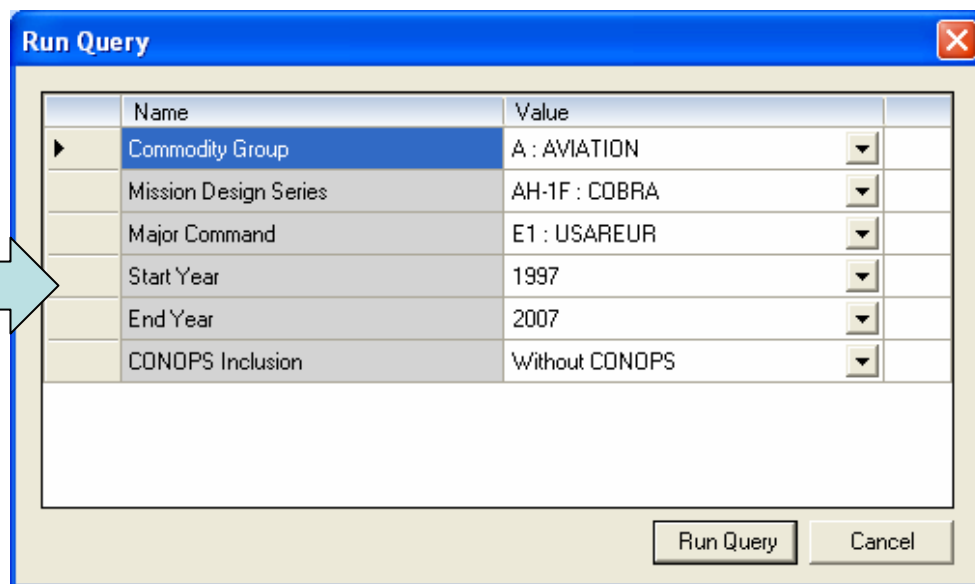
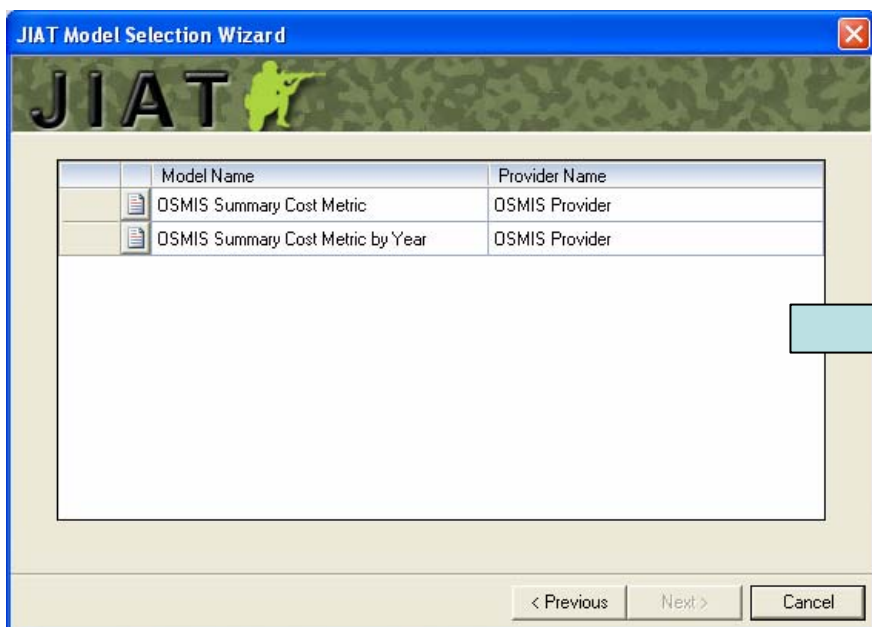
Crew Cost = \$974.6 M

Personnel Cost	Total BY2009	2016	2017	2018	2019	2020	2021	2022	2023
Total	\$ 974,558,111	\$1,175,353	\$2,721,455	\$4,730,816	\$ 8,840,431	\$ 13,145,200	\$17,575,925	\$21,627,720	\$25,638,513
General Aviation 01	\$ 4,346,006	\$ -	\$ 79,018	\$ 158,037	\$ 316,073	\$ 632,146	\$ 632,146	\$ 790,183	\$ 790,183
General Aviation 02	\$ 10,675,570	\$ 103,646	\$ 207,293	\$ 414,585	\$ 829,171	\$ 1,658,341	\$ 1,658,341	\$ 1,865,634	\$ 1,865,634
General Aviation 03	\$ 7,337,345	\$ 133,406	\$ 266,813	\$ 266,813	\$ 533,625				
General Aviation 04	\$ 7,433,615	\$ 172,875	\$ 172,875	\$ 345,750	\$ 518,624				
General Aviation 07	\$ 1,799,511	\$ -	\$ -	\$ 257,073	\$ 257,073				

Crew cost checks

Gathering Historical Consumable and Reparable Costs with OSMIS

- Use the OSMIS Provider to find consumable and reparable costs for analogous systems
- Search OSMIS summary cost metric data
- Search by commodity, design series (variant), major command of operation, years of operation and CONOPS



- OSMIS data query results provided directly in Excel worksheet
- Shows annual consumable and reparable cost by vehicle operating within a specific major command

Query Inputs		Query Results							
Name	Value	Variable Name	Units	2002	2003	2004	2005	2006	2007
Commodity	A : AVIATION	Consumables	\$	2967141.57	8525026.921	6405443.574	15159967.14	10046854.03	12430265.38
Mission Description	Aircraft C	Repairables	\$	10748457.1	40257355.33	25641447.89	49104873.25	44472976	67842768.37
Major Command	E1 : USAREUR	Operating Tempo	HOURS	877	7914	11901	18755	16797	15180
Start Year	1997	Density	SYSTEMS	22	28	46	60	65	65
End Year	2007	Consumables per System	\$ per SYSTEM	156165.4	355209.5	160136.1	352557.4	193208.7	221969.0
CONOPS In	With CONOPS	Repairables per System	\$ per SYSTEM	565708.3	1677389.8	641036.2	1141973.8	855249.5	1211478.0
		Consumables per Unit Activity	\$ per HOUR	3899.0	1240.9	620.0	931.2	689.0	943.3
		Repairables per Unit Activity	\$ per HOUR	14124.1	5859.9	2482.0	3016.3	3050.1	5148.6

Shows input specifications

Notional data 60

Shows results by year

➤ Helicopter Reparable and Consumable costs are shown below – from the estimate calculate a factor

Estimated consumables are 35.5% of repair costs

Costs in BY2009 \$M												
WBS	Total	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	To Complete
REPL SPARES (REPARABLES)	\$1,159.145	\$1.381	\$3.274	\$5.678	\$10.488	\$15.623	\$20.736	\$25.827	\$30.896	\$36.290	\$42.351	\$966.602
REPL REPAIR PARTS (CONS)	\$411.499	\$0.490	\$1.162	\$2.016	\$3.723	\$5.546	\$7.361	\$9.169	\$10.968	\$12.883	\$15.035	\$343.146
Factor	0.355	0.355	0.355	0.355	0.355	0.355	0.355	0.355	0.355	0.355	0.355	0.355

➤ Use JIAT OSMIS data to cross check consumable and reparable costs in the helicopter estimate

➤ Studied factors for five different systems in four different commands from 1997 to 2007; 70 data points total (example below of one system in one command)

JIAT Data Query											
Model: OSMIS Summary Cost Metric by Year											
Description: OSMIS Summary Cost Metric by Year											
Provider: OSMIS Provider											
Query Inputs						Query Results					
Name	Value	Variable Name	Units	1997	1998	1999	2000	2001	2002	2003	2004
Commodity A : AVIATION		Consumables	\$	4259316.3	3240327.3	4081465.7	3875511.2	3693283.3	4024180.8	3346901.4	411818
Mission Description : Aircraft A		Repairables	\$	15697667.6	11717012.6	15043728.8	14977361.2	13279778.9	16129709.2	15161263.5	1701916
Major Command : USARPAC		Operating Tempo	HOURS	7981	9981	7835	10283	9467	8632	8124	85
Start Year	1997	Density	SYSTEMS	69							
End Year	2007	Consumables per System	\$ per SYSTEM	70988.60	68943						
CONOPS In : With CONOPS		Repairables per System	\$ per SYSTEM	261627.79	24920						
		Consumables per Unit Activity	\$ per HOUR	614.80	374						
		Repairables per Unit Activity	\$ per HOUR	2265.83	1352						
Cons/Repair Factor				0.27133434	0.27654893	0.271306783	0.258757944	0.278113313	0.249488742	0.220753459	0.2419731

For 78% of the data points: factors range 19.5% to 37.9%

Cross Check Software Estimate with SEER SEM model

Run a SEER SEM Model with Your Inputs

- Look for a model to estimate software development effort months
- Search a SEER SEM Model Provider
- Select from a list of available models

JIAT Model Selection Wizard

JIAT

Providers to be Searched

- AMCOM SEER-SEM Provider
- AMCOS Provider
- Army ACE Provider
- CECOM ACE Session Provider
- CECOM SEER-SEM Provider
- CER Runner Provider
- Model Sequence Provider
- ODASA-CE ACE Session Provider
- ODASA-CE Databases Provider
- ODASA-CE Sample Aircraft ACDB F
- ODASA-CE SEER-SEM Provider
- OSMIS Provider
- SEER-SEM Provider

Search By

Model Name:

Model Description:

Phase: Development

Subject: Software

Commodity:

Domain Type:

< Previous Next > Cancel

JIAT Model Selection Wizard

JIAT

Model Name	Provider Name
UAV with Ground System	SEER-SEM Provider
Training Seer Model One	SEER-SEM Provider
Training SEER SEM example	SEER-SEM Provider
JMS Test	SEER-SEM Provider
Duel CSCI	SEER-SEM Provider
Flight Software	SEER-SEM Provider

< Previous Next > Cancel

➤ Software effort months used in the helicopter estimate

WBS	BASELINE
Software New Lines of Code	55,500.0
Software Effort Months	462.5

462 effort months in the estimate

➤ Use the SEER SEM model to cross check the software effort months portion in the helicopter estimate

The screenshot shows a spreadsheet titled "JIAT Non-Time Phased" with the following content:

- Model: Flight Software
- Description: Based on New Lines of Code
- Provider: SEER-SEM Provider
- Base Year 2009 \$

Variable Name	Appropriation	Model Unit	Convert From	Baseline	Smaller Software	Larger Software
Single CSCI-Development Effort Months		mo		535.25	472.24	587.74
Single CSCI-Development Schedule Months		mo		27.28	26.16	28.14
INPUT VARIABLES						
Single CSCI-New Lines of Code		SLOC		55500	50000	60000

Callouts in the image:

- "535 effort months in the cross check model" points to the 'Baseline' value of 535.25 in the first data row.
- "Calculate multiple cases" points to the 'Smaller Software' and 'Larger Software' columns.
- "Enter your inputs" points to the '55500' value in the 'Single CSCI-New Lines of Code' row.

➤ Estimate might not have enough effort months when compared to this cross check

Examine Model Results Trends in JIAT Web Browser

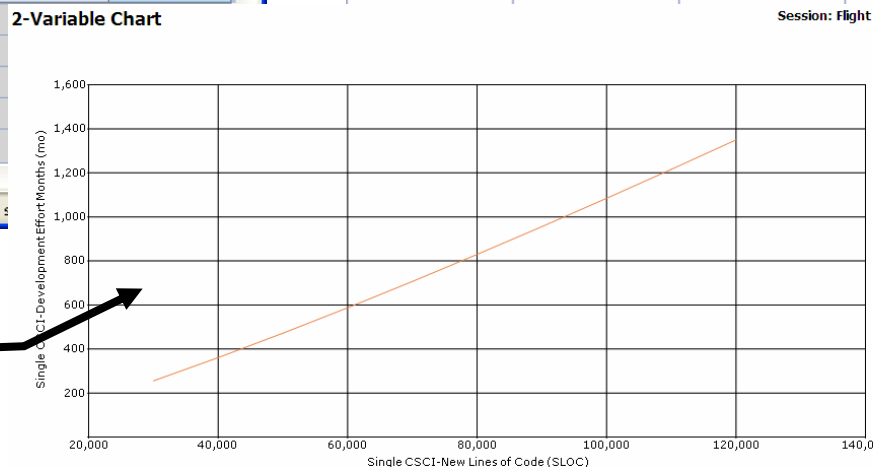
- Run on any JIAT hosted model in a batch mode
- Run with multiple input variables in a single batch

Calculated results for all the list inputs

Run #	Inputs	Outputs	Outputs
	Single CSCI-New Lines of Code	Single CSCI-Development Effort Months	Single CSCI-Development Schedule Months
1	30000	255.83	21.33
2	40000	361.30	23.93
3	50000	472.24	26.16
4	60000	587.74	28.14
5	70000	707.16	29.93
6	80000	830.06	31.57
7	90000	956.08	33.10

Enter a list of new lines of code inputs

Graph the batch results to visualize trends



Cross Check Summary

- **Used CKB to identify analogous systems and analyzed SAR data to develop a CER to cross check the average unit production cost of the estimate.**
- **Used AMCOS data to collect officer and enlisted pay rates to calculate the manpower cost with an FTE per year matrix and cross check the crew manpower cost in the estimate.**
- **Used OSMIS data to study the consumable and reparable costs of analogous systems. Calculated consumable to reparable factors. Compared the factors calculated from OSMIS data to the helicopter estimate.**
- **Used a SEER SEM flight software model to cross check the software effort months used in the software cost of the helicopter estimate.**

Working with JIAT Data in Excel Provides Benefits

- All JIAT data collection worksheets are stored in an Excel file.
- All JIAT hosted data is available in an environment that requires little additional training to operate.
- JIAT Excel worksheets can be updated as the JIAT host data is revised.
- Excel links and macros can be created to compile the data so that it can be analyzed with analysis packages like CO\$TAT.
- Excel links and macros can be created to integrate data together to build cost estimates.
- Excel links and macros can be created to perform portfolio analysis.

JIAT Supports Portfolio Analysis

- Perform quantity “What-if” drills by project
- Control what is visible by project, and JIAT user has identical interface regardless of model source (Excel, SEER SEM, Price H, database, etc.)

Control dollar type and units

Variable Name	Appropriation	Model Units	Convert From	Total	2006	2007	2008	2009	2010	2011	2012	2013
OUTPUT VARIABLES												
Air Vehicle	3010			\$226.03	\$14.32	\$29.40	\$44.80	\$75.80	\$61.63			
INPUT VARIABLES												
Air Vehicle Buy Quantity				15.00 *	1.00 *	2.00 *	3.00 *	5.00 *	4.00 *			

Roll up costs from any number different models

Ensure summing consistent dollar type and units

	FY, Units	Total	2006	2007	2008	2009	2010	2011	2012	2013
Total		\$3,075.08	\$28.64	\$132.30	\$194.14	\$333.88	\$416.02	\$454.51	\$542.41	\$389.77
Project 1	Then Year \$K	\$226.03	\$14.32	\$29.40	\$44.80	\$75.88	\$61.63			
Project 2	Then Year \$K	\$298.48		\$29.87	\$30.35	\$46.22	\$47.02	\$63.81	\$81.20	
Project 3	Then Year \$K	\$75.15		\$14.70	\$29.87	\$15.18	\$15.41			
Project 4	Then Year \$K	\$1,193.58				\$75.88	\$107.86	\$156.73	\$191.44	\$211.13
Project 5	Then Year \$K	\$632.73		\$73.50	\$59.73	\$91.06	\$107.86	\$141.05	\$159.53	
Project 6	Then Year \$K	\$649.09	\$14.32	\$14.70	\$29.87	\$45.53	\$77.04	\$109.71	\$127.63	\$97.44

JIAT's Continuing Evolution

- **Adding addition model providers this year**
 - **Excel**
 - **Price H**

- **Expanding Calculation Capabilities**
 - **Calculate models with Risk**

- **Creating CER Libraries and adding CERs with documentation**

- **Integrating engineering design tools**

- **Researching potential integration of modeling and simulation tools**

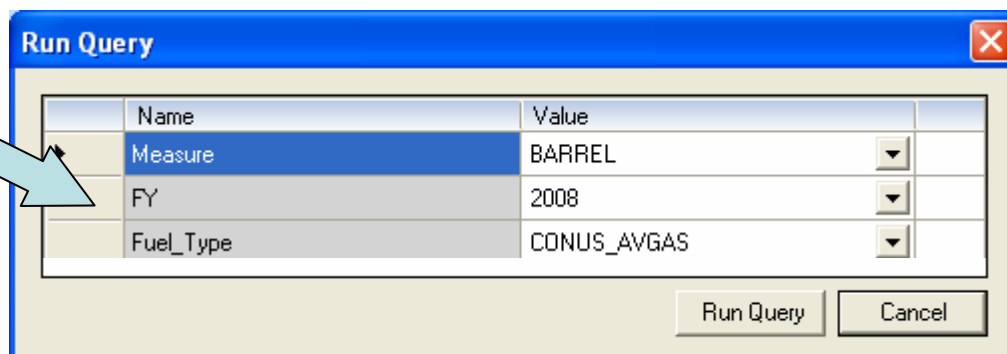
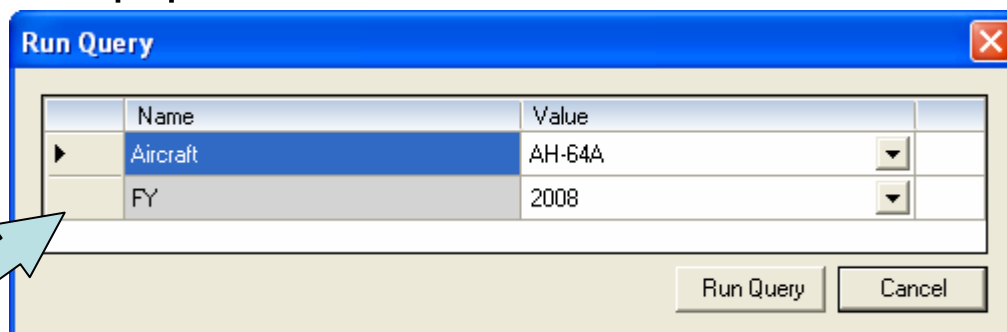
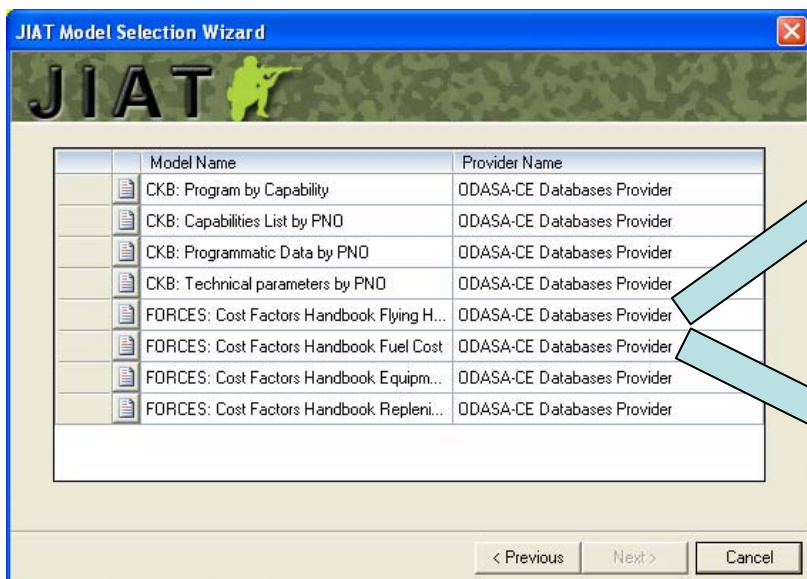
- **Providing JIAT for potential use by Navy, Air Force, and other services' cost analysts**



Back up

Gathering Historical Flying Hour and Fuel Costs with FORCES

- Use FORCES to find flying hour and fuel costs for the analogous systems
- Search FORCES cost factors handbook
 - Search by aircraft, fuel type, and equipment (not shown)



- FORCES data query results show flying hour costs directly in Excel worksheet
- Shows various metrics for aircraft

JIAT Data Query														
Model: FORCES: Cost Factors Handbook Flying Hour Cost														
Description: Obtain Total Costs of Flying Categories														
Provider: ODASA-CE Databases Provider														
Query Inputs			Query Results											
Name	Value	Aircraft	FY	CLS	FUEL	DLR	DEPOT_MTCE	OTHER	CREWPAY	ASSET_UTIL	DOD_RATE	FED_USER_RATE	FMS_RATE	PUBLIC_RATE
Aircraft	ALL	Aircraft C	2008	1303.32	295.89	3838.06	2641.48	1065.51				305.06	9305.06	9677.26
FY	2008	Aircraft D	2008	1303.32	319.43	3954.00	3496.82	1030.71				265.07	10265.07	10675.68
		Aircraft G	2008	35.95	275.77	0.00	0.00	1102.31				574.84	1574.84	1637.83
		Aircraft H	2008	241.79	1211.58	0.00	0.00	4608.92				348.18	6348.18	6602.10
		Aircraft I	2008	35.95	343.73	0.00	0.00	2140.16	223.34	109.73	2519.85	2743.19	2743.19	2852.92
		Aircraft J	2008	35.95	220.78	0.00	0.00	874.17	160.81	51.67	1130.92	1291.71	1291.71	1343.38
		Aircraft K	2008	241.79	866.70	0.00	0.00	5003.23	285.88	255.91	6111.72	6397.60	6397.60	6653.50
		Aircraft E	2008	1245.46	874.03	4366.54	2551.46	1570.14	285.88	435.74	10607.64	10893.52	10893.52	11329.26
		Aircraft L	2008	31.00	579.56	0.00	0.00	3779.39	160.81	182.03	4389.95	4550.76	4550.76	4732.78
		Aircraft B	2008	751.05	207.74	551.59	1004.56	226.11	223.34	123.86	2741.05	2964.38	2964.38	3088.25
		Aircraft M	2008	275.82	56.07	305.91	0.00	169.64	142.95	38.02	807.45	950.40	950.40	988.42
		Aircraft N	2008	626.76	91.46	1461.48	0.00	424.93	223.34	2604.63	2827.96	2827.96	2827.96	2941.08
		Aircraft O	2008	35.95	267.89	0.00	0.00	1652.87	160.81	84.70	1956.71	2117.51	2117.51	2202.21
		Aircraft P	2008	246.62	73.95	249.90	0.00	0.00	160.81	29.25	570.47	731.28	731.28	760.53
		Aircraft Q	2008	35.95	356.98	0.00	0.00	1113.49	160.81	66.69	1506.42	1667.23	1667.23	1733.92
		Aircraft R	2008	546.27	202.49	686.21	0.00	449.66	223.34	84.31	1884.63	2107.96	2107.96	2192.28
		Aircraft A	2008	853.71	290.32	2387.68	1641.40	575.04	223.34	238.86	5748.16	5971.50	5971.50	6210.35
		Aircraft F	2008	817.26	290.32	1604.71	1641.40	614.87	223.34	207.67	4968.56	5191.90	5191.90	5399.57

Contractor logistics support and fuel costs

Depot maintenance costs

Notional data

➤ **FORCES data query results show fuel rates directly in Excel worksheet**

JIAT Data Query												
Model: FORCES: Cost Factors Handbook Fuel Cost												
Description: Obtain Total Costs of Fuel by Type												
Provider: ODASA-CE Databases Provider												
Query Inputs				Query Results								
Name	Value	Measure	FY	CONUS_AVGAS	DIESEL	JP4	JP5	JP8	MOGAS_LEADED	MOGAS_UNLEADED	OCONUS_AVGAS	RESIDUALS
Measure	ALL	BARREL	2008	163.47	143.70	151.44	148.06	147.09	177.09	150.47	658.51	110.80
FY	2008	GALLON	2008	3.97	3.42	3.61	3.53	3.50	4.22	3.58	15.68	2.64

Fuel Rates by Type

Notional data



Capabilities Knowledge Base

- **The Capabilities Knowledge Base (CKB)** was designed and developed to facilitate the use of capabilities-based cost estimating. The CKB contains data and tools that will aid the analyst and high-level decision maker throughout the entire lifecycle of a defense program.
- The CKB contains the cross-service program capability, cost, and performance data required to produce cost forecasts within stricter timelines. The CKB, which is intended for cross-service and DoD-wide use, currently houses over 50,000 data points.
- The CKB is the result of an on-going study conducted by the Early Cost Team within The Office of the Deputy Assistant Secretary of the Army for Cost and Economics (ODASA-CE).
- The CKB is currently housed on ODASA-CE's Cost & Performance Portal (CPP).

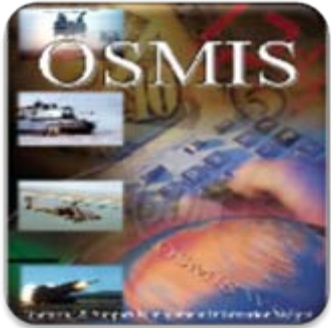
Source: Instructors for Accessing the Capabilities Knowledge Base (CKB) February 24, 2010



Army Manpower Cost System

- AMCOS is available on the OSMIS website at <https://www.osmisweb.army.mil>.
- AMCOS is an automated tool that helps users estimate the costs associated with personnel and personnel requirements for different components, grades, and skills.
- AMCOS Lite performs quick estimates of military, civilian and the private labor market.
- The JIAT server contains the most current update of AMCOS Lite rates.

Source: <https://www.osmisweb.army.mil>



Operating & Support Management Information System

- OSMIS is available at <https://www.osmisweb.army.mil>
- OSMIS is the Army's VAMOSOC system
- OSMIS is a historical archive of weapons system data to include:
 - Class IX Demands
 - Activity Data (miles/hours)
 - Parts (NSN Level) & Fuel
 - Ammunition
 - Intermediate Maintenance
 - Depot Maintenance
 - Year of Manufacture



Force & Organization Cost Estimating System (FORCES)

- FORCES is available at www.osmisweb.army.mil/forces.
- FORCES provides four main tools to Army analysts:
 - FORCE Cost Model (FCM)
 - End Strength Cost Model (ESCM)
 - Army Contingency Cost Model (ACM)
 - Cost & Factors Handbook (CFH)
- Provides a variety of data including OPTEMPO/Cost Factors, Equipment, Force Structure, Personnel, Base Operations, Movement, and Indirect Training Costs.
- Currently only the CFH is available in JIAT.

Source: www.osmisweb.army.mil/forces/public/whatisforces.htm