



# Innovation in Cost Estimating: the Joint Integrated Analysis Tool (JIAT)



**ACEIT USER WORKSHOP  
JANUARY 26, 2010**

**ODASA  
Cost &  
Economics**

# *Agenda*

- **JIAT Overview (Daniel Schwartz, ODASA-CE)**
- **JIAT Applications (Melissa Cyrulik, Tecolote Research)**
- **JIAT Benefits and Vision (Daniel Schwartz)**
- **Questions**

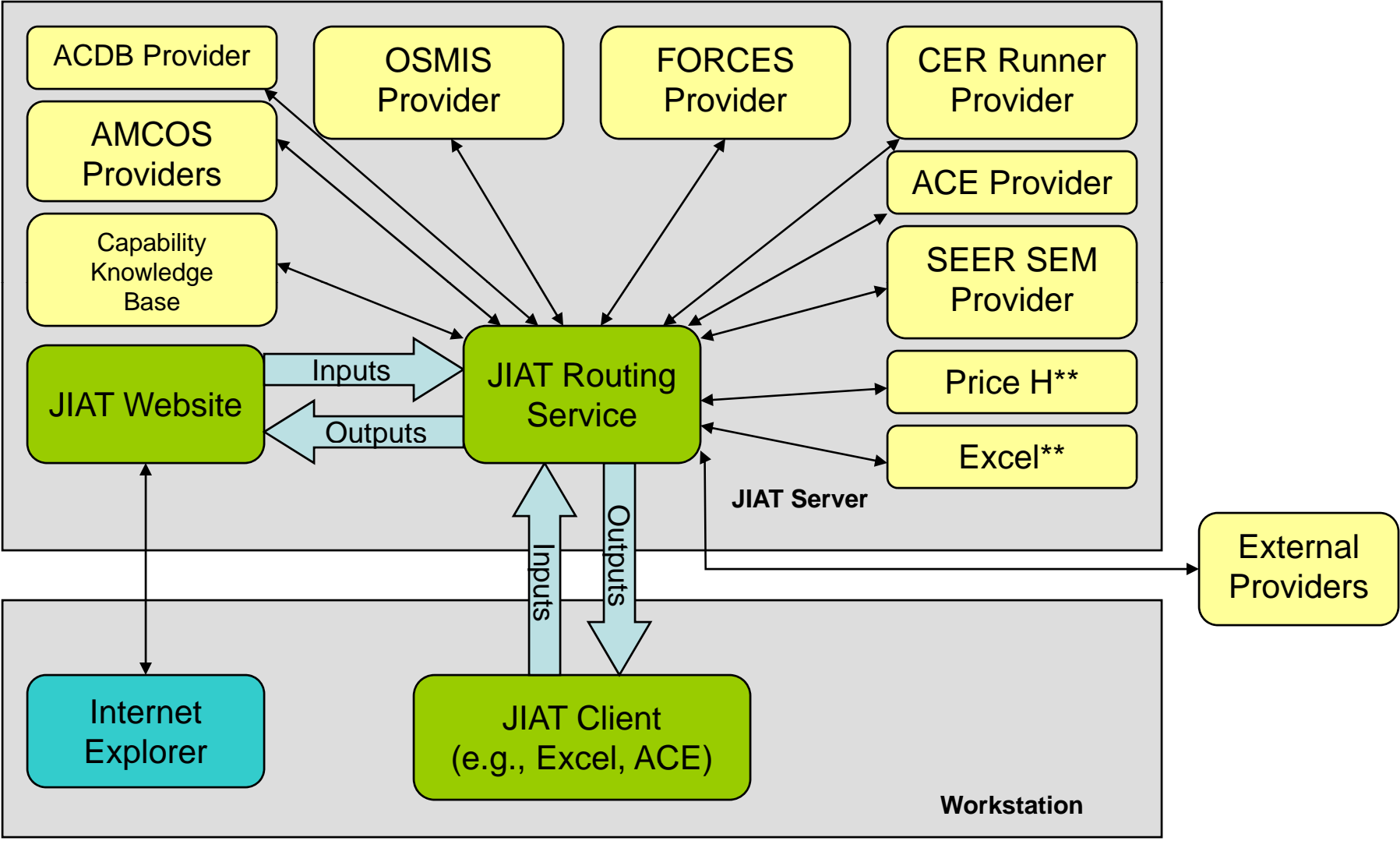


# JIAT Overview

# *The Army's Cost Estimating Challenge*

- The Joint Integrated Analysis Tool (JIAT) is administered by the Office of the Deputy Assistant Secretary of the Army – Cost & Economics (ODASA-CE) and Tecolote Research, Inc.
- JIAT is a web-based application that provides seamless linkages between cost estimating tools, engineering design models, modeling and simulation tools, as well as capability, performance and operations and support databases.

# JIAT Architecture "Big Picture": Running a JIAT Model



\*\*Price H and Excel Provider are under development at the time of publication  
 PRT-25, 18 Jan 10 Approved For Public Release



# JIAT Applications

# ***JIAT is an Estimating Workspace***

- **JIAT delivers a wide variety of applications for cost analysts, requirements professionals, and engineers from a single location.**

## **Gather Data**

- Identify Analogous Systems
- Locate Analogous Cost, Schedule, and Technical Data to Build Estimating Relationships

## **Run Models**

- Retrieve and Run Models with Your Inputs:
  - Hardware and Software Models
  - Engineering Models
  - Modeling and Simulation Models

## **Build Integrated Estimates**

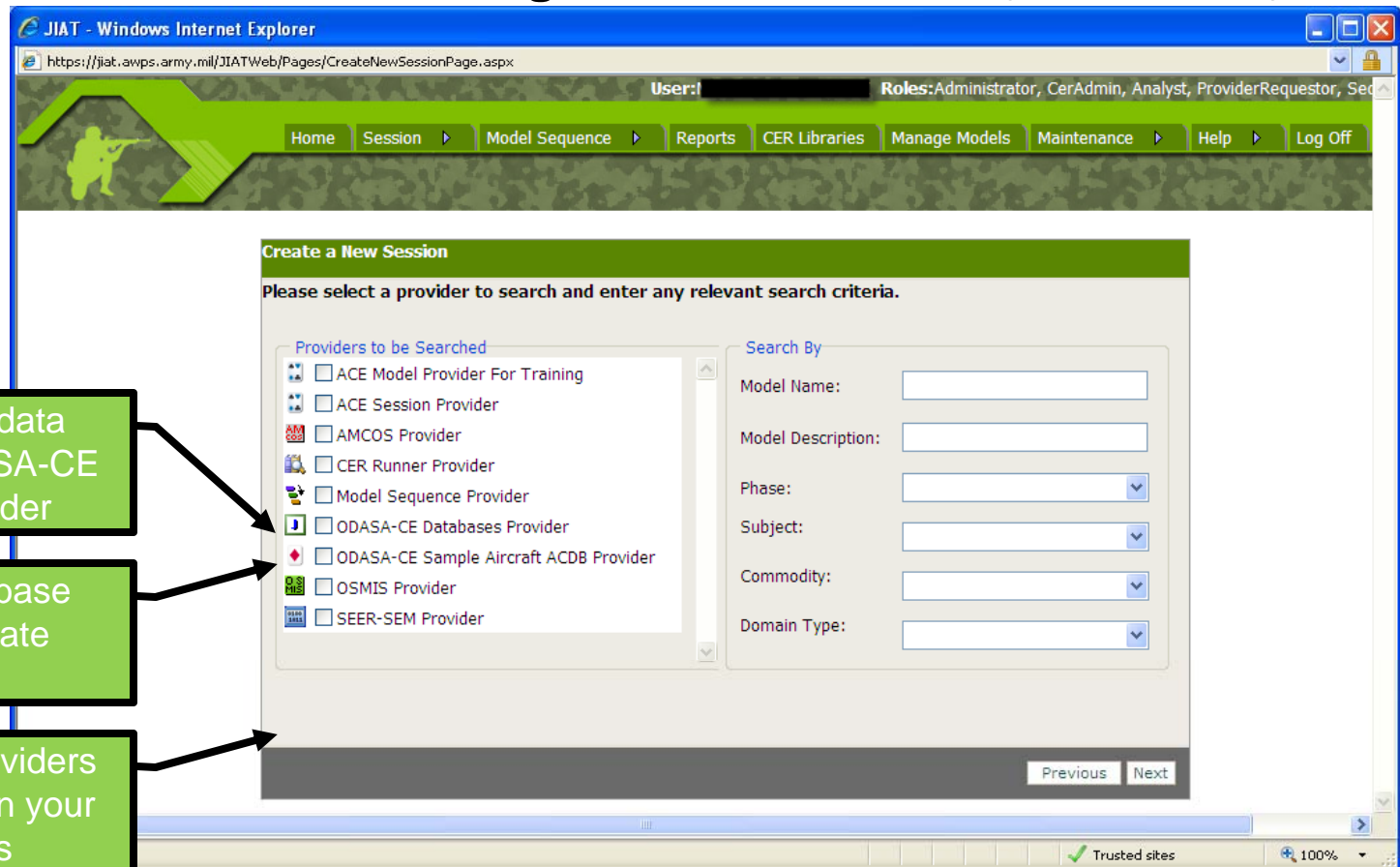
- Build Estimating Models from Data, CERs, and Models Stored on JIAT
- Build Models in Excel or ACE

## **Build Model Sequences**

- Build a Larger Estimating Model from a Series of Existing Smaller Models
  - The Results of One Model Provide the Inputs to Another Model
  - The Sequence is Run as a Single Model

# Gathering Data with JIAT

- Access all data sources from a single location – <https://jiat.awps.army.mil>



CKB and Forces data located in the ODASA-CE Databases Provider

Each ACDB Database listed as a separate Provider

List of available providers varies depending on your login privileges

**JIAT Process: Data sources come to the Analyst**



# Common Data Query Interface

- Source data can be gathered and incorporated into analysis and estimates

**Data Query Model Runner - Example**

Model: Active Enlisted  
 Description: Amcos Lite for Active Enlisted Pay Plan  
 Provider: AMCOS Provider

Session Edit Run Documentation

Query Inputs		Query Results						
Name	Value	APPN	Category	Element	Fiscal Year	Units	E1	E2
1 Summary	Composite Standard Ra...	MPA TOTAL	SUM	SUM		2009Dollars		
2 Group	15 : AVIATION							
3 SubGroup	15F : AIRCRAFTELECTR...							
4 APPN	ALL							
5 Category	SUM							
6 Element	ALL							

AMCOS Data

**Data Query Model Runner - ACDB**

Model: Cost By CES  
 Description: ODASA-CE Sample Aircraft ACDB Provider  
 Provider: ODASA-CE Sample Aircraft ACDB Provider

Session Edit Run Documentation

Query Inputs		Query Results					
Name	Value	Name	Task 1	Task 2	Task 3	Task 4	Task 5
1 WBS Type	Standard WBS	System Type	ENGINE	ENGINE	ENGINE	ENGINE	ENGINE
2 CES Item	2.04 SYSTEM/PROJEC...	System	T-53	T-53	T-53	T-53	T-55
3 Resource	TOT : TOTAL, TOTAL D...	Model	T-53-L-703	T-53-L-703	T-53-L-703	T-53-L-703	T-55-L-712
4 System Type	ENGINE	Contract Number	DAAJ01-76-C-0254	DAAJ09-86-C-A270	DAAJ01-76-C-0649	DAAJ01-77-C-0053	DAAJ09-80-C-0109
5 System Name	T-53 T-55 T700	Task	REMANUFACTURE T53 AH-1S	T53-L-703 ENGINE (FT53-L-703 ENGINE (FT55-L-712 ENGINE (F			
6 Model		Contractor	AVCO	TEXTRON INC	AVCO	AVCO	AVCO UNITED
7 Contract Number		Life Cycle Phase	FRP	FRP	FRP	FRP	FRP
8 Task		Source Document	CDSR (1921)	CDSR (1921)	CDSR (1921)	CDSR (1921)	CDSR (1921)
9 Contractor		Report By	Prime/Associate	Prime/Associate	Prime/Associate	Prime/Associate	Prime/Associate
10 Life Cycle Phase	FRP	LREDate	09/30/1978	12/31/1988	01/30/1979	11/30/1978	11/30/1982
11 Source Document	CDSR (1921)	Units	\$K, HR	\$K, HR	\$K, HR	\$K, HR	\$K, HR
12 Cost Data Source	REMANUFACTURE T53-...	BaseYear	2008	2008	2008	2008	2008
13		Total % Spent (ACW)	100.000	93.200	89.000	85.800	70.700
14		System By Quantity	120	44	150	162	33
15		System First Unit	1	1	1	1	1
16		System Last Unit	120	44	150	162	33
17		Resource	Production Total	Production Total	Production Total	Production Total	Production Total
18		1 AIRCRAFT SYS	0.0000	0.0000	0.0000	0.0000	0.0000
19		1.3 SYSTEMS I	0.0000	0.0000	0.0000	0.0000	0.0000
20		1.3.1 SYSTE					
21		1.3.2 PROG		0.0000			
22		1.3.2.1	0.0000		0.0000		

ACDB Databases

Enter Data Query Inputs and view Query Results

Notional data

# Searching For and Running CERs

**Create a New Session**  
Please select a provider to search and enter any relevant search criteria.

**Providers to be Searched**

- ACE Model Provider For Training
- ACE Session Provider
- AMCOS Provider
- CER Runner Provider
- Model Sequence Provider
- ODASA-CE Databases Provider
- ODASA-CE Sample Aircraft ACDB Provider
- OSMIS Provider
- SEER-SEM Provider

**Search By**

Model Name:

Model Description:

Phase:

Subject:

Commodity:

Domain Type:

Previous Next

**Create a New Session**  
Please select a model and click Next.

Model Name	Provider
(USASMDC Ground Based Interceptor Cost Model Librar) Missile Independent Cost Model, SEPM	CER Runner Provider
(Sample CER Library) SYSTEMS ENGINEERING/MGMT	CER Runner Provider
(Sample CER Library) SEPM [Rotocraft Model] .8720* (DE\$ + PM\$)	CER Runner Provider
(Sample CER Library) SEPM	CER Runner Provider
(Sample CER Library) SYSTEMS ENGINEERING/MGMT	CER Runner Provider

Previous Next

**Non-Time Phased Model Runner - CER**

**Model:** SYSTEMS ENGINEERING/MGMT  
**Description:** [Rotocraft Model] .8720\* (DE\$ + PM\$)  
**Provider:** CER Runner Provider  
**Base Year** 2008 \$

Session Edit Calculate Case Documentation

Variable Name	Appropriation	Model Units	Convert From	Case 1	Case 2
<b>OUTPUT VARIABLES</b>					
SYSTEMS ENGINEERING/MGMT Output	RDTEF			\$401.12	\$348.80
<b>INPUT VARIABLES</b>					
DE\$				120	100
PM\$				340	300

Enter Search By Criteria

Use the CER Runner Provider to locate and calculate CERs with your inputs

View list of potential CERs

Notional data

Calculate the CER with various inputs

# Running Models



## Working with Existing Hardware and Software Models

- Identify potential pre-existing models
- Understand the cost drivers associated with different types of models
- Provide rough order of magnitude estimates on basic components
- Identify new Providers
- Provide Cross Checks



### Looking for Tools

## Working with existing engineering models

- Understand the technical characteristics associated with various hardware and software objects
- Understand trade space for various hardware and software
- Calculate cost driver inputs based on technical characteristics

### Looking for Tools

## Working with existing modeling and simulation models

- Model operational and system designs and assess their feasibility
- Model operational and system designs and asses their effectiveness

# Run a Provider Model via a Web Browser

ACE Model

Generate Multiple excursions with a Model

Convert units

Enter model inputs

Variable Name	Appropriation	Model Units	Convert From	Case 1	Larger UAV
<b>OUTPUT VARIABLES</b>					
2 Total	3010			\$101,322.60	\$105,741.19
3 Manufacturing	3010			\$73,578.16	\$76,803.41
4 SEPM	3010			\$27,223.92	\$28,417.26
5 Other	3080			\$520.52	\$520.52
<b>INPUT VARIABLES</b>					
7 Air Vehicle Unit Cost	3010			\$9,140.14 *	\$9,540.80 *
8 Air Vehicle Buy Quantity				7.00 *	7.00 *
9 Air Vehicle Takeoff Weight (lbs)		lb		12000.00 *	15000
10 Air Vehicle Range (nmi)		nmi	mi	250.00 *	300

- Provider software is hosted on the JIAT server allowing you to run a model via a Web Browser
- Create and calculate various cases with different model inputs
- Save session for later use

Notional data

# Common Model Runner Structure

**Non-Time Phased Model Runner - SEER SEM**

Model: Training SEER SEM example  
 Description: This is a SEER Example for JIAT Training  
 Provider: SEER-SEM Provider  
 Base Year 2009 \$

Session Edit Calculate Case Documentation

Variable Name	Appropriation	Model Units	Convert From	Case 1	Better Team
<b>OUTPUT VARIABLES</b>					
1 UAV Software-Development Base Year Cost	RDTEF			\$19,246,589.10	\$17,124,636.54
3 UAV Software-Development Schedule Months		mo		46.25	41.35
4 UAV Software-Effective Size		SLOC		95000.00	93000.00
5 UAV Software-Productivity Lines/Person Month		SLOC/person mo		116.00	147.00
6 Ground Segment-Development Base Year Cost	RDTEF			\$12,209,869.37	\$10,923,643.18
7 Ground Segment-Development Schedule Months		mo		46.26	41.38
8 Ground Segment-Effective Size		SLOC		75000.00	75000.00
9 Ground Segment-Productivity Lines/Person Month		SLOC/person mo		138.00	193.00
<b>INPUT VARIABLES</b>					
11 Ground Segment-New Lines of Code		SLOC		75000.00 *	75000.00 *
12 Ground Segment-Pre-existing lines of code NDR		SLOC		0.00 *	0.00 *
13 Ground Segment-Programmer Capabilities					
14 Ground Segment-Development System Experience					
15 Ground Segment-AVERAGE MONTHLY LABOR RATE	RDTEF				
16 Flight Software-New Lines of Code					
17 Flight Software-Pre-existing lines of code NDR					

SEER SEM Model

- Analysts can explore models without detailed knowledge of the provider's software
- Supports Non-Time-Phased and Time-Phased models

**Time Phased Model Runner - ACE Demo**

Model: Training ACE Example  
 Description: This is an ACE Example for JIAT Training  
 Provider: ACE Model Provider For Training  
 Base Year 2006 \$K

Session Edit View Calculate Documentation

Variable Name	Appropriation	Model Units	Input Units	Total	2006	2007	2008	2009	2010	
<b>OUTPUT VARIABLES</b>										
2 Total				\$1,080,542.81	\$144,121.55	\$144,118.71	\$288,109.60	\$288,107.31	\$216,085.65	
3 Manufacturing				\$788,337.44	\$105,111.66	\$105,111.66	\$210,223.32	\$210,223.32	\$157,667.49	
4 Air Vehicle	3010			\$685,510.82	\$91,401.44	\$91,401.44	\$182,802.89	\$182,802.89	\$137,102.16	
5 Integration	3010			\$102,826.62	\$13,710.22	\$13,710.22	\$27,420.43	\$27,420.43	\$20,565.32	
6 SEPM	3010			\$291,684.85	\$38,891.31	\$38,891.31	\$77,782.63	\$77,782.63	\$58,336.97	
7 Other	3080			\$520.52	\$118.57	\$115.74	\$103.65	\$101.37	\$81.19	
<b>INPUT VARIABLES</b>										
9 Air Vehicle Unit Cost	3010			\$9,140.14 *						
10 Air Vehicle Buy Quantity		unt		75.00 *	10	10	20			
11 Air Vehicle Takeoff Weight (lbs)		lb		12000.00 *						
12 Air Vehicle Range (nmi)		nmi		250.00 *						

ACE Model with Time Phased Inputs and Results

Notional data

- Analyst posting a model to JIAT controls which Input and Output rows are visible

# Examining Trade Space

- Examine a systems trade space to understand how sensitive your model is to varying degrees of cost driver changes
- Run any JIAT hosted model in multiple run model
- Set up and calculate a batch run to see model results for various input combinations

Multiple Run Model Runner - ACE Demo

Model: Training ACE Example  
 Description: This is an ACE Example  
 Provider: ACE Model Provider For

Session Edit Run

Inputs

1	8000
2	9250
3	10000
4	11100
5	12000
6	13450
7	14850
8	15000
9	16850
10	17000

OK Cancel

Type Input List

List \$9,140.14 \*  
 Fixed 7.00 \*  
 List 12000.00 \*  
 Fixed 250.00 \*

Enter a list of inputs for your input variables

Results Tabular Report

Session: ACE Example

Export to Excel

Run #	Inputs				Outputs					
	Air Vehicle Unit Cost	Air Vehicle Buy Quantity	Air Vehicle Takeoff Weight (lbs)	Air Vehicle Range (nmi)	Total	Manufacturing	Air Vehicle	Integration	SEPM	Other
1	9135.24667955	7	8000	300	101268.584666115	73538.7357703949	63946.7267568651	9592.00901352976	27209.3322350461	520.516660673599
2	9306.57276853	7	9250	300	103158.054438478	74917.9107867184	65146.0093797552	9771.90140696327	27719.6269910858	520.516660673599
3	9401.09841435	7	10000	300	104200.530523335	75678.8422355194	65807.6889004517	9871.15333506775	28001.1716271422	520.516660673599
4	9530.46706075	7	11100	300	105627.272640227	76720.25983909	66713.2094233536	10000.990157393	28006.4961404633	520.516660673599
5	9629.27473934	7	12000	300	106716.973123556	77515.661651739	67404.113092233536	10268.07948111434	28009.7948111434	520.516660673599
6	9777.26444175	7	13450	300	108349.077556623	78706.9787561677	68440.853092233536	10404.5502854731	28121.5821397821	520.516660673599
7	9909.09550997	7	14850	300	109802.976492426	79768.2188552941	69363.6685698209	10404.5502854731	29514.2409764588	520.516660673599
8	9922.65417887	7	15000	300	109952.508272438	79877.3661399741	69458.5792521514	10418.7868878227	29554.6254717904	520.516660673599
9	10081.9848429	7	16850	300	111709.686500903	81159.9779855689	70573.8939004947	10586.0840850742	30029.1918546605	520.516660673599
10	10094.3122989	7	17000	300	111845.639849519	81259.2140064568	70660.1860925712	10599.0279138857	30065.909182389	520.516660673599

Batch Run Results - Result of each WBS Output for each input variable combination

# Building Integrated Estimating Models

- Tools like Excel and ACE can be used to build models that incorporate data using the JIAT System
- From Excel: Query Databases and run any JIAT hosted model

The screenshot displays two Excel workbooks. The primary workbook, 'Book2 - Microsoft Excel', shows a 'JIAT Data Query' window with the following details:

- Model:** Cost By CES
- Description:** Comparable to the ACEIT Report Wizard 7.1 "Select WBS Elements and Associated Resources" with 2 predetermined items: First, all CES elements must be...
- Provider:** ODASA-CE Sample Aircraft ACDB Provider

The 'Query Inputs' table is as follows:

Name	Value	Name	Task 1
WBS Type	Standard WBS	System Type	UTILITY
CES Item	2.0 PRODUCTION	System	UH-60
Resource		Model	UH-60A
System type		Contract Number	DAAJ01-77-C-0001
System Name		Task	UH-60A LOT 1 AIR VEHIC
Model		Contractor	SIKORSKY AIRCRAFT DI

The secondary workbook, 'COSTAT', displays 'ACDB Query Results' in a grid format with columns for variables and task numbers (Task 1 to Task 11). A callout points to a specific cell in this grid labeled 'Notional data'.

Callouts in the image include:

- ACDB in Excel:** Points to the 'Run Query' dialog box.
- ACDB Query Results:** Points to the 'JIAT Data Query' window.
- ACDB Results in COSTAT:** Points to the 'COSTAT' workbook.
- Notional data:** Points to a cell in the 'COSTAT' grid.

# JIAT Models in Excel

- Run any JIAT hosted model from Excel
- Model runs off the JIAT server and data results are stored in your Excel workbook

The image displays two overlapping screenshots of the Microsoft Excel interface. The left screenshot shows a worksheet titled 'Non-Time Phased S (1)' with a table of model variables. A green callout box points to the 'SEER-SEM Model in Excel' text. The right screenshot shows the 'JIAT' menu with the 'Cases' option selected, opening a sub-menu with options like 'Add Case', 'Delete Case', and 'Insert Case'. A green callout box points to the 'Create New Cases' text.

Variable Name	Appropriation	Model Unit	Input Units	Case 1
<b>OUTPUT VARIABLES</b>				
Single CSCI-Development Effort Months		mo		0
Single CSCI-Development Schedule Months		mo		0
<b>INPUT VARIABLES</b>				
Single CSCI-New Lines of Code		SLOC		0.00 *

**Link Results from Data Queries and Models together in Excel**



# Excel Provider

- Publish Excel workbooks containing data and formulas as JIAT models
- Add Excel JIAT Template to Excel Workbook and run the model with JIAT common runner

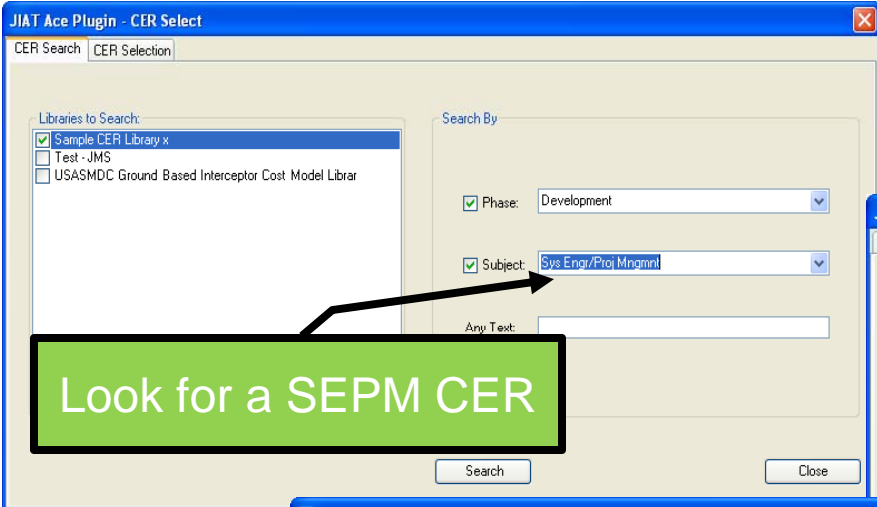
The image shows two overlapping Excel windows. The background window is titled 'Microsoft Excel - My Cost Model.xls' and displays a 'Generic Excel workbook' with a table of cost components. The foreground window is titled 'Microsoft Excel - My Cost Model.xls' and displays a 'JIAT Excel Provider Time Phased' model. A callout box points to the 'Excel Provider Sheet' menu, highlighting the 'Create New...' option. Another callout box points to the 'Create JIAT Template worksheet' text. A third callout box points to the 'Use Excel links to link data into Input and Output Variables' text, which is linked to the 'Air Vehicle Unit Cost' cell in the foreground model's input variables table.

Variable Name	Appropriation Model Units	Total	2006	2007	2008	2009	2010
<b>OUTPUT VARIABLES</b>							
Total		\$101,322.60	\$14,518.87				
Manufacturing		\$73,578.16	\$10,511.17				
Air Vehicle	3010	\$63,981.01	\$9,140.14				
Integration	3010	\$9,597.15	\$1,371.02				
SEPM	3010	\$27,223.92	\$3,889.13				
Other	3080	\$520.52	\$118.57				
<b>INPUT VARIABLES</b>							
Air Vehicle Unit Cost	3010	\$9,140.14					
Air Vehicle Buy Quantity		7.00	1.00				
Air Vehicle Takeoff Weight (lbs)		12000.00					
Air Vehicle Range (nmi)		250.00					

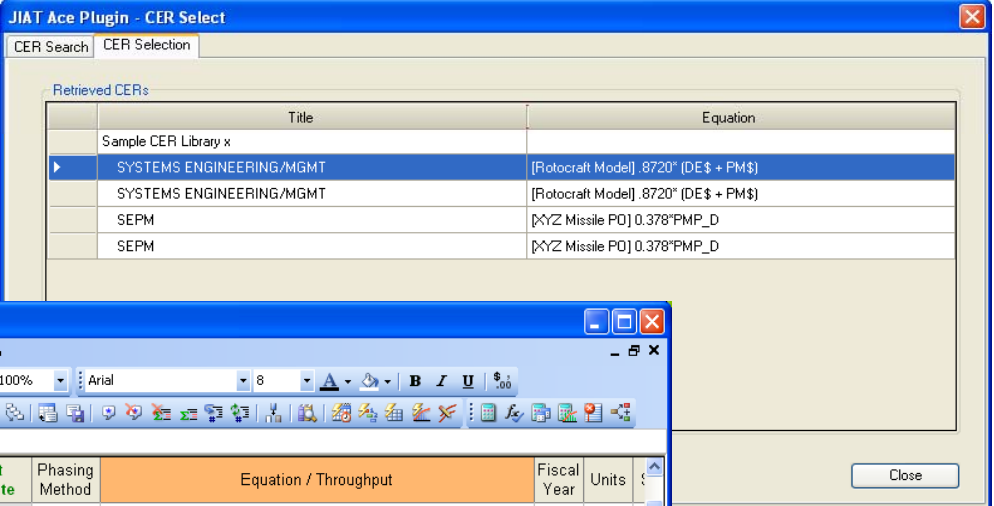
- Once templated and loaded to the JIAT website, Excel based models can then run in JIATs common model runner

# Pull JIAT Hosted CERs into ACE

- From within ACE, search JIAT CER libraries
- Select a CER and incorporate it into your ACE estimate

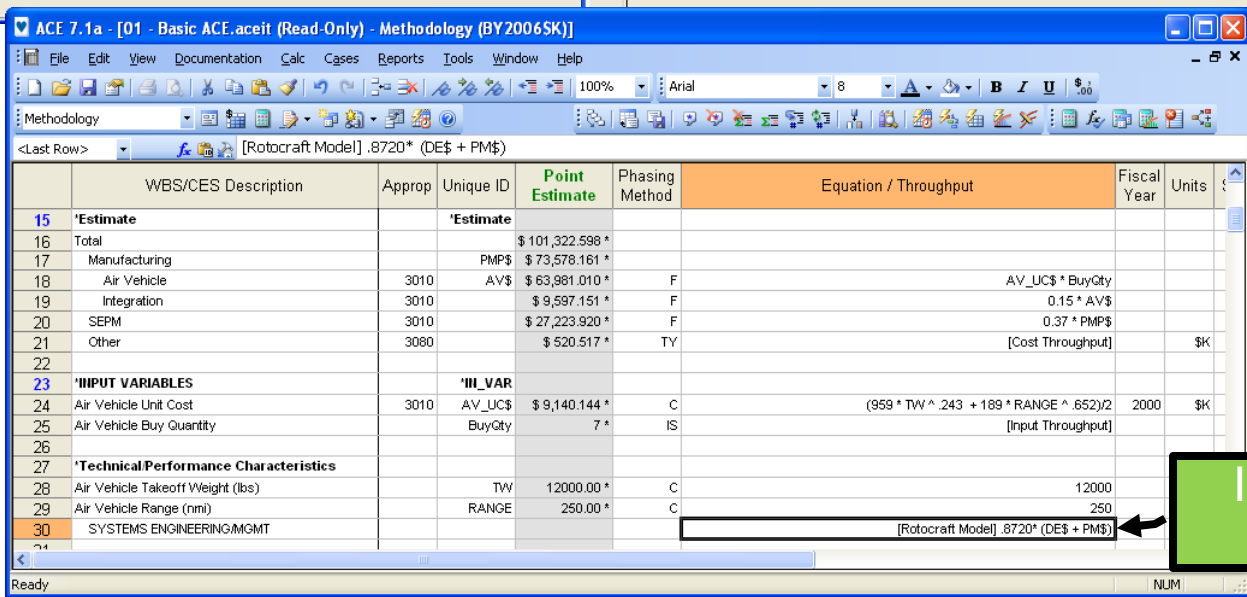


Look for a SEPM CER



Title	Equation
Sample CER Library x	
SYSTEMS ENGINEERING/MGMT	[Rotocraft Model].8720* (DE\$ + PM\$)
SYSTEMS ENGINEERING/MGMT	[Rotocraft Model].8720* (DE\$ + PM\$)
SEPM	[XYZ Missile PO] 0.378*PMP_D
SEPM	[XYZ Missile PO] 0.378*PMP_D

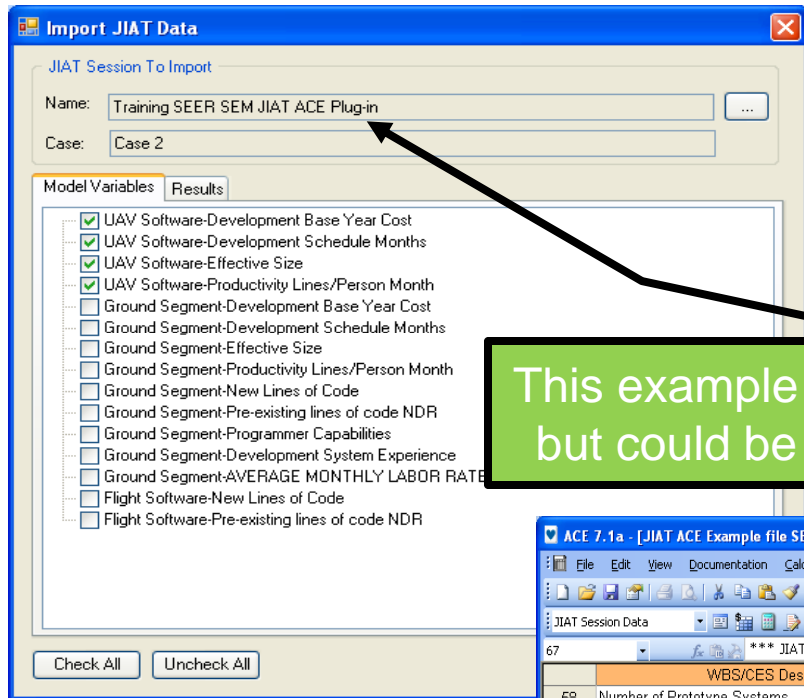
Include in your Estimate



WBS/CES Description	Approp	Unique ID	Point Estimate	Phasing Method	Equation / Throughput	Fiscal Year	Units
<b>15 *Estimate</b>		<b>*Estimate</b>					
16 Total			\$ 101,322.598 *				
17 Manufacturing			PMP\$ \$ 73,578.161 *				
18 Air Vehicle	3010	AV\$	\$ 63,981.010 *	F	AV_UC\$ * BuyQty		
19 Integration	3010		\$ 9,597.151 *	F	0.15 * AV\$		
20 SEPM	3010		\$ 27,223.920 *	F	0.37 * PMP\$		
21 Other	3080		\$ 520.517 *	TY	[Cost Throughput]		\$K
<b>23 *INPUT VARIABLES</b>		<b>*III_VAR</b>					
24 Air Vehicle Unit Cost	3010	AV_UC\$	\$ 9,140.144 *	C	(959 * TW ^ .243 + 189 * RANGE ^ .652)/2	2000	\$K
25 Air Vehicle Buy Quantity		BuyQty	7 *	IS	[Input Throughput]		
<b>27 *Technical Performance Characteristics</b>							
28 Air Vehicle Takeoff Weight (lbs)		TW	12000.00 *	C		12000	
29 Air Vehicle Range (nmi)		RANGE	250.00 *	C		250	
30 SYSTEMS ENGINEERING/MGMT					[Rotocraft Model].8720* (DE\$ + PM\$)		

Include in your Estimate

# Pull JIAT Session Cases into ACE



- The results from your JIAT sessions on the web for any model can be pulled into your ACE session
- This is an area for future expansion as more engineering and modeling and simulation models are added to JIAT

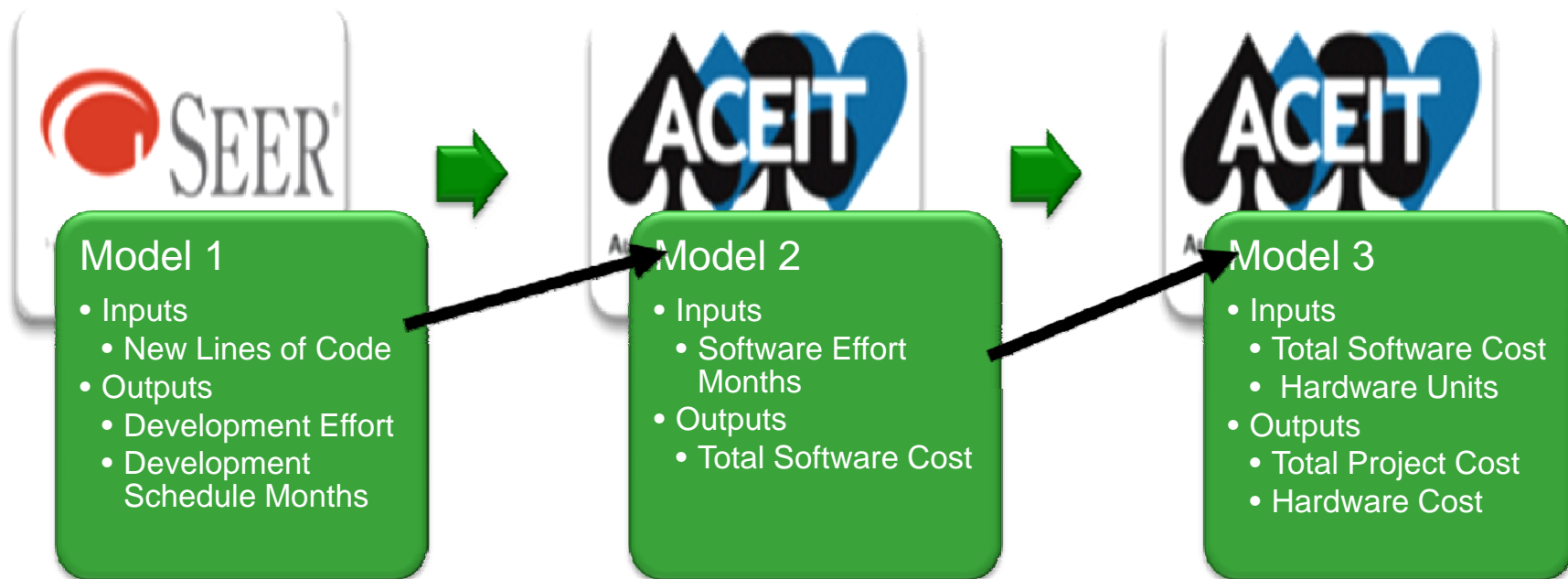
This example is a SEER-SEM model but could be an engineering model

- Advantage with JIAT is that you don't need to have SEER-SEM on your computer

WBS/CES Description	JIAT_NONCOST_TOTAL (\$) Total	JIAT_COST_TOTAL (\$) Total	JIAT_SESSION_ID (*) JIAT	JIAT_VARIABLE_ID (*) JIAT
58 Number of Prototype Systems				
59				
60 *Air Vehicle System Configuration Matrix				
61 Number of Processor per System				
62 Number of Amplifiers per System				
63 Number of COTS Antenna per System				
64				
65 Fee Rate				
66				
67 *** JIAT Session: Training SEER SEM JIAT ACE Plug-in ***			fa30f34b-467c-499e-869f-3fbcab40	JiatSessionRow
68 UAV Software-Development Base Year Cost		12794081.02	fa30f34b-467c-499e-869f-3fbcab40	UAV Software-Development Base
69 UAV Software-Development Schedule Months	46.25		fa30f34b-467c-499e-869f-3fbcab40	UAV Software-Development
70 UAV Software-Effective Size	75000		fa30f34b-467c-499e-869f-3fbcab40	UAV Software-Effective Size
71 UAV Software-Productivity Lines/Person Month	138		fa30f34b-467c-499e-869f-3fbcab40	UAV Software-Productivity
72				

# JIAT Model Sequencing

- Build a larger estimating model from a series of existing smaller models
- Input feeds for each model in the sequence may be mapped to other model inputs or outputs that have been generated earlier in the sequence



# JIAT Model Sequencing

## ➤ Setting up the Model Sequence

The screenshot shows the 'Model Sequence Designer - Training Model Sequence' window. It features two main panes: 'Model Sequence' and 'Variable Mapping'. The 'Model Sequence' pane contains a table with three models:

Model	Provider
test: Seer-ModelOne	SEER-SEM Provider
test: ACE Model Two	ACE Session Provider
test: ACE Model Three	ACE Session Provider

The 'Variable Mapping' pane is divided into 'Inputs' and 'Outputs' sections. The 'Inputs' section shows 'Software Cost' mapped to 'Total Software Cost' from 'test: ACE Model Two'. The 'Outputs' section shows 'Total Project Cost' and 'Hardware Cost' as visible outputs.

Three models in the sequence

Identifies how inputs feed for each model

Identifies sequence outputs

The navigation bar includes the following menu items: Home, Session, Model Sequence, Reports, CER Libraries, Manage Models, and Maintenance.

- Run the sequence like any JIAT model
- Create New Cases and Calculate results

The 'Non-Time Phased Model Runner - I:'adsl;d'l';! window displays the following information:

- Model:** Training Model Sequence
- Description:** This is an example for Training.
- Provider:** Model Sequence Provider
- Base Year:** 2009 \$

The interface includes a menu bar with 'Session', 'Edit', 'Calculate', 'Case', and 'Documentation'. Below is a results table:

	Variable Name	Appropriation	Model Units	Input Units	Case 1
1	<b>OUTPUT VARIABLES</b>				
2	Total Project Cost				15000.00
3	Hardware Cost				15000.00
4	<b>INPUT VARIABLES</b>				
5	Single CSCI-New Lines of Code		SLOC		0.00 *



# JIAT Benefits and Vision

## *Promoting JIAT's Future Growth*

- As JIAT moves forward we are planning to:
  - Involve other Services and agencies across the federal government
  - Include engineering design models
  - Expand to integrate modeling and simulation tools
  - We are looking for assistance with identifying potential providers



Questions?