ACEIT Overview

Version 7.5

released August 2016
ACEIT Overview

ACEIT in Action
- ACE Basic
- Incorporating Uncertainty Analysis
- Generating Reports and Presentations
- Analyzing an Estimate
- CO$TAT
- JACS
The ACEIT Concept

**Goals**
- Bring structure and consistency to the cost analysis process
- Allow analysts to focus on estimate methodology rather than spreadsheet mechanics
- Incorporate approved processes to perform repetitive functions: WBS building and summing, inflation, learning curves, phasing, adjustments (fee, G&A, OH), risk, documentation, reports, etc
  - This eliminates many sources of potential errors found in spreadsheets
- Promotes efficient, systematic cost estimating approach and standardized methodology/auditing/documentation/reporting

**Team Approach to Develop ACEIT for and by Cost Analysts**
- Multi-Service funding sources for development (US Army is current lead)
- Available to governments, support contractors and commercial users
ACEIT is Widely Accepted

- Over 30 Years of Ongoing Success
  - Continued funding by the Government for enhanced functionality
  - Mandated by the US Army for ACAT I and II programs
  - Mandated by US Homeland Security National Protection and Programs Directorate
  - Endorsed by the Air Force and Marine Corps
  - Australia DoD LHD SPO selected ACEIT as standard modeling tool
  - NASA selected JACS as 1 of 2 Approved JCL Tools

- In use at 250+ sites with over 8000 students trained
  - Army, Air Force, Navy, USMC
  - NASA, USCG, DHS, Dept of Education, DOE
  - Over 40 SETA and FFRDC companies
  - Over 50 DoD contractors (Boeing, Lockheed, etc)
  - Australian Defence
Who is Using ACEIT?

224 ACEIT Sites
- Commercial: 32
- US Govt: 142
- Spt Ctr: 16
- Foreign: 34

139 Government Sites
- Army: 83
- Federal Govt Other: 6
- Air Force: 14
- Navy: 28
- USMC: 6
- DOD Other: 6

32 Support Contractor Sites
- Army: 13
- Other: 19

Tecolote Sites are not included in site counts
As of 19 Jan 2017
Nine integrated software tools

- **ACDB** – Warehouses raw and normalized cost/technical data tailored to organization's needs
- **CO$TAT** – Tool specifically focused on cost estimating statistics and regression analysis
- **ACE** – Automated inflation, learning, phasing, risk, documentation, and other essential cost estimating processes to help you build a robust, accurate, and defendable cost model
- **POST** – Program Office Support Tool, automates what-if drills, charts, and tables from Excel and their transfer to PowerPoint and Word
- **POST Doc** – Post Documentation Designer, integrates session data and results with any Word document
- **JACS** – Joint Analysis of Cost and Schedule utilizing the schedule logic and framework of MS Project, P6, and the powerful ACEIT engine for processing
- **Librarian** – Manage and share custom inflation indices and CERs
- **ACEIT Admin** – Manages the ACEIT interaction and share data
- **Inflation Utility** – Powerful Excel add-in for access to the latest OSD inflation indices
ACEIT and Building Estimates
What is ACE?

- Framework to build models
- Calculation engine to compute/process information

ACE files (sessions) contain user-developed cost estimate

- Methodology
- Documentation
- Inputs
- Integrated uncertainty analysis

Create risk adjusted, integrated cost/schedule life cycle estimates for any project!
Each workscreen shows only the relevant fields supporting specific functions involved in building a cost estimate

- Building a WBS/CES
- Implementing methodologies
  - Adjusting for FY, dollar units, Fee, Overhead, G&A
  - Applying learning curve theory
  - Time phasing the estimate (Annual and Monthly)
  - Incorporating a risk analysis
- Viewing What if results
- Entering documentation
ACEIT

Results are Automatically Summed Based on Element Hierarchy

- ACE uses an indenture structure to sum elements, thereby ensuring proper calculation
  - Add/remove elements when the WBS changes without need to redo summing equations
- Tools available to simplify navigation and data entry
Specific columns are used to enter equations and annual data
Data is referenced by naming of rows / columns by Unique IDs
All data used for the estimate is immediately visible
Integrated inflation indices to correctly normalize results and develop annual outlays

 Logs to show potential estimate errors

 Tools to trace model logic
ACE offers several types of built-in functions to automate relationships between elements in an ACE session:

- Mathematical
- Date
- Economic Analysis
- Time Period (operate on specific yearly or monthly inputs or results)
- ACE Specific
- Inflation
- Logic and Mathematical
- Matrix
- Operational Life
- RI$K
Open Platform Allows Integration with 3rd Party Applications

- **Multiple methods for integration with other applications**
  - Direct export to .rtf and .txt file formats
  - ACE results integrate with Excel through POST
  - ACE clipboard allows dynamic data export/import from/to an ACE session
  - ACE API enables
    - Ability to embed ACE sessions into other tools
    - Ability to create plug-ins that allow direct interaction inside ACE

- **Current ACE plug-ins**
  **Getting data into ACE**
  - ACE-to-ACE
  - Microsoft Excel
  - Microsoft Project
  - SEER
Analysts can document in real time:
- WBS
- Methodology
- Phasing
- Risk
- Adjustments

Documentation can be imported via:
- RTF and MS Word files
- Copy and Paste Commands

Documentation Available via:
- Input All Form
- Narrative Report
- MS-Word Document
Quick Access to Estimate Results

- Time-Phased Base Year and Then Year results can be quickly generated
- Estimated costs can be “racked and stacked” by various breakouts ( Appropriation, Funding Agency, Contract Line Item, Job Order Number, Budget Line Item, etc.)
Baselines can be Established as Basis for Scenario Evaluation

- Main methodologies are basis for all calculations
- Add an unlimited number of alternative scenarios (what if cases)
- Scenarios are enabled by overriding methodology equations and/or input variables (total or yearly)
- Supporting documentation, reports, time-phased (BY or TY) and risk results can be created for any scenario
- Cost Benefit Analysis calculations can be added to the session and evaluated for each alternative
Graphically View Results in ACE

Export charts to PowerPoint or Word

RI$K Charts

Estimate Charts (Single Case, Drill down)

Comparative Charts (Multiple Cases)
Graphical Outputs to Compare What-if Cases
Uncertainty Analysis in ACE
RI$K Wizard. Designed for new analysts, provides easy-to-follow screens that apply RI$K distributions to the estimate.

- The wizard gives guidance on whether uncertainty should be specified:
  - on the current row
  - and/or on the variables
  - or not recommended for that type of methodology

- Easy-to-understand options help the analyst characterize the uncertainty.

- The wizard also displays any rows or variables feeding into the current row and shows if they already have uncertainty specified. The analyst is given the opportunity to specify uncertainty on these rows also.

**NOTE:** Advanced analysts will most likely continue to use the Advanced mode of the Input All form or the RI$K workscreens to enter uncertainty.
Basic and Advanced Mode

**Basic mode:**
- Provides descriptive choices for specifying uncertainty
- Diagram changes based on selection

**Advanced mode:**
- Guides you through valid parameter choice
- Status tells you when the specification is Complete
Correlation can be Assessed and Modeled

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RDT&amp;E</td>
<td>1.000</td>
<td>1.000</td>
<td>0.849</td>
<td>0.567</td>
<td>0.520</td>
<td>0.008</td>
<td>0.226</td>
<td>0.495</td>
<td>0.141</td>
</tr>
<tr>
<td>2</td>
<td>Prime Mission Product</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Hardware (HW)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Cables, Conduits, and Connectors (CCC)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Structure</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Engine (with learning)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Software (SW)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>CSCI1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>CSCI2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>CSCI3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Integration and Assembly (I&amp;A)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>ISA Check-Out</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>HW/SW Integration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Tooling and Test Equipment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Grouping and Correlation Wizard

- **Group Name:** HW
- **Assign the same correlation to all elements:**
- **Enter individual group strengths:**
- **Enter a correlation matrix:**
- **Automatically display strength column:**
## Risk Statistics Easily Available

![Image of ACEIT software interface](image)

**ACE 7.5 - [Demo ACE Session.exe] - Inputs/Results Viewer (BY2017SK)**

### WBS/ACE Description

<table>
<thead>
<tr>
<th>Description</th>
<th>25%</th>
<th>30%</th>
<th>35%</th>
<th>40%</th>
<th>45%</th>
<th>50%</th>
<th>55%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Generation Plant</td>
<td>$135,219.432</td>
<td>$137,212.003</td>
<td>$139,225.795</td>
<td>$141,339.340</td>
<td>$142,639.023</td>
<td>$144,949.610</td>
<td>$147,349.192</td>
</tr>
<tr>
<td>Prime Mission Product</td>
<td>$87,550.618</td>
<td>$89,458.917</td>
<td>$91,358.634</td>
<td>$93,258.341</td>
<td>$95,158.047</td>
<td>$97,057.753</td>
<td>$98,957.459</td>
</tr>
<tr>
<td>Hardware (HW)</td>
<td>$29,578.125</td>
<td>$30,223.395</td>
<td>$30,868.666</td>
<td>$31,513.937</td>
<td>$32,169.208</td>
<td>$32,824.479</td>
<td>$33,479.749</td>
</tr>
<tr>
<td>Structure</td>
<td>$21,386.302</td>
<td>$21,346.921</td>
<td>$21,297.540</td>
<td>$21,248.159</td>
<td>$21,200.198</td>
<td>$21,151.837</td>
<td>$21,102.475</td>
</tr>
<tr>
<td>Engine (with training)</td>
<td>$5,001.165</td>
<td>$5,189.567</td>
<td>$5,365.403</td>
<td>$5,541.052</td>
<td>$5,716.693</td>
<td>$5,892.334</td>
<td>$6,067.975</td>
</tr>
<tr>
<td>Software (SW)</td>
<td>$42,547.513</td>
<td>$42,354.923</td>
<td>$42,162.333</td>
<td>$41,970.743</td>
<td>$41,779.153</td>
<td>$41,587.563</td>
<td>$41,395.973</td>
</tr>
<tr>
<td>CSE1</td>
<td>$10,636.610</td>
<td>$10,752.795</td>
<td>$10,869.980</td>
<td>$10,987.165</td>
<td>$11,104.350</td>
<td>$11,221.535</td>
<td>$11,338.720</td>
</tr>
<tr>
<td>CSE2</td>
<td>$12,351.665</td>
<td>$12,564.854</td>
<td>$12,778.044</td>
<td>$12,990.234</td>
<td>$13,202.424</td>
<td>$13,414.614</td>
<td>$13,626.804</td>
</tr>
<tr>
<td>CSE3</td>
<td>$17,695.500</td>
<td>$17,908.740</td>
<td>$18,121.980</td>
<td>$18,335.220</td>
<td>$18,548.460</td>
<td>$18,761.700</td>
<td>$18,974.940</td>
</tr>
<tr>
<td>Integration and Assembly (I&amp;A)</td>
<td>$22,302.303</td>
<td>$22,573.700</td>
<td>$22,845.107</td>
<td>$23,116.514</td>
<td>$23,387.921</td>
<td>$23,659.328</td>
<td>$23,930.735</td>
</tr>
<tr>
<td>I&amp;A Check-Out</td>
<td>$7,632.451</td>
<td>$7,780.775</td>
<td>$7,928.100</td>
<td>$8,075.425</td>
<td>$8,222.750</td>
<td>$8,370.075</td>
<td>$8,517.400</td>
</tr>
<tr>
<td>HW/SW Integration</td>
<td>$11,131.573</td>
<td>$11,482.094</td>
<td>$11,833.610</td>
<td>$12,185.125</td>
<td>$12,536.650</td>
<td>$12,888.175</td>
<td>$13,239.700</td>
</tr>
<tr>
<td>Tooling and Test Equipment</td>
<td>$3,306.570</td>
<td>$3,364.990</td>
<td>$3,423.410</td>
<td>$3,481.830</td>
<td>$3,540.250</td>
<td>$3,600.000</td>
<td>$3,659.750</td>
</tr>
<tr>
<td>SEPM (FDT&amp;E)</td>
<td>$32,243.010</td>
<td>$33,092.296</td>
<td>$33,940.580</td>
<td>$34,788.860</td>
<td>$35,637.140</td>
<td>$36,485.420</td>
<td>$37,333.700</td>
</tr>
<tr>
<td>Training</td>
<td>$561.440</td>
<td>$585.738</td>
<td>$611.035</td>
<td>$636.332</td>
<td>$661.630</td>
<td>$686.927</td>
<td>$712.224</td>
</tr>
<tr>
<td>Data</td>
<td>$604.050</td>
<td>$631.472</td>
<td>$659.322</td>
<td>$687.172</td>
<td>$715.024</td>
<td>$743.876</td>
<td>$773.025</td>
</tr>
<tr>
<td>System Testing and Evaluation (ST&amp;E)</td>
<td>$2,542.271</td>
<td>$2,585.244</td>
<td>$2,628.408</td>
<td>$2,671.575</td>
<td>$2,714.741</td>
<td>$2,757.908</td>
<td>$2,801.075</td>
</tr>
<tr>
<td>Procurement</td>
<td>$260,546.677</td>
<td>$263,511.236</td>
<td>$264,329.490</td>
<td>$265,131.103</td>
<td>$265,939.745</td>
<td>$266,748.380</td>
<td>$267,557.013</td>
</tr>
<tr>
<td>Hardware (HW)</td>
<td>$171,844.583</td>
<td>$174,532.417</td>
<td>$177,220.651</td>
<td>$179,908.772</td>
<td>$182,596.935</td>
<td>$185,285.100</td>
<td>$187,973.265</td>
</tr>
<tr>
<td>Cables, Conduit, and Connectors</td>
<td>$123,176.356</td>
<td>$124,164.646</td>
<td>$125,152.934</td>
<td>$126,141.225</td>
<td>$127,129.516</td>
<td>$128,117.807</td>
<td>$129,106.108</td>
</tr>
</tbody>
</table>

**May 2017**

*[Image of logo]*

*Copyright © Tecolote Research, Inc. 2017*
Estimates can be Adjusted to Desired Confidence Levels

In constant or then year dollars
TY RISK Results

- TY time phased RISK results allocated at specified confidence level from a specified level in the WBS.
- In this case, 50% from 2nd level, meaning RDT&E and Procurement are the 50% statistical results, remaining levels adjusted to sum.

TY RISK cumulative distribution curve
Graphical Outputs to Present Uncertainty Results

Tech Baseline
POWER GENERATION PLANT
Results as EV Statistics
Calculated with 7000 iterations, CV = 0.146

Multiple cases
POWER GENERATION PLANT
Results as EV Statistics
Calculated with 7000 iterations, CV (Tech Baseline) = 0.146

Tech Baseline
Convergence for POWER GENERATION PLANT
Calculated with 10000 iterations, CV = 0.146

Tech Baseline
Cost Contributors for POWER GENERATION PLANT
Results as EV Statistics
Calculated with 7000 iterations, CV = 0.146
Sorted on 90% Total Value

Structure
SEPM (Procurement)
Engine (with...ing)
SEPM (RD&T&E)
Integration
Structure
Cables, Condu... (CDD)
CSCD
HR/WS Integration

BY2014 $K
$0 $35,000 $70,000 $105,000 $140,000 $175,000 $210,000

Point Estimate Mean 70% 90%

BY2014 $K RBK
$2,500 $25,500 $77,500 $102,500 $127,500


Point Estimate 30% 70% 95% Bound
Excursions and Reports
Charts in ACE

- **Estimate Reports**
  - Pie
  - Phased Column
  - Phased Areas
  - Pareto

- **Comparison Reports**
  - Column
  - Phased Line

- **RISK Reports**
  - Histogram
  - Cumulative Distribution
  - Contributors
  - Fan Area
  - Fan Columns
  - Convergence
POST is an Excel Add-in to:

- Conduct an unlimited number of alternative scenario estimates for one or more ACE sessions
- Graphically drill-down through estimates to identify cost drivers
- Compare deltas between cost estimate scenarios
- Generate sensitivity reports to identify cost and uncertainty drivers
- Generate charts and tables for comprehensive reporting of the estimate
- Populate PowerPoint presentations and Word Documents
POST Reports and Charts

**Graphical Charts**
- **Estimate:**
  - Sand
  - Multi-Axis Line
  - Drill-Down Pie
  - Pareto
- **Comparative:**
  - Drill-Down
  - Phased Line
- **RI$K:**
  - RI$K chart (Histogram/CDF)
  - Fan
  - Joint Probability
  - Convergence
  - Contributors
- **Analysis:**
  - Tornado
  - Spider
  - Variance Analysis

**Tabular Reports**
- **Estimate:**
  - Time Phased
  - DEC
- **Comparative:**
  - What If
  - What If Case Delta
  - Time Phased Case Delta
  - Time Phased Row Delta
  - System of Systems
- **RI$K:**
  - Statistics
  - Allocation
  - Correlation

Copyright © Tecolote Research, Inc. 2017
View Cost Estimates Graphically in ACE or POST

ACE charts provide on the fly graphics

POST Reports and Charts are interactive, providing useful macros to update charts and full Excel charting controls
## POST - Time Phased Report
Allocated at 70% Confidence

**Funding in TY $K, 7000 hours, TY Allocated at 70% from Level 2**

<table>
<thead>
<tr>
<th>Row</th>
<th>WBS</th>
<th>Total 2017</th>
<th>Total 2018</th>
<th>Total 2019</th>
<th>Total 2020</th>
<th>Total 2021</th>
<th>Total 2022</th>
<th>Total 2023</th>
<th>Total 2024</th>
<th>Total 2025</th>
<th>Total 2026</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Totals for each row close to desired confidence level**

Allocated from WBS level 2
Identifies the top contributors to the target parent level WBS

Two SEPMs are identified, and two “Structure” elements

- (xx) identifies session row numbers… useful when names are not unique

- Evaluate point estimate and allocated case
Contributors Chart

- Identifies top contributors and impacts of uncertainty

Chart drop-down provides access to user specified values to plot, probability levels, and sort options.
Tornado Chart

- Rank orders the impact of input variations on a specific cost result
  - Variations based on arbitrary Fixed Range or the model’s RI$K Range
  - RI$K range captures the bounds assigned by the analyst which should make it a more realistic assessment
ACE/POST Convergence chart provides guidance on the number of iterations to use.

POST Joint Probability chart illustrates the joint probability of hitting two targets.
Present Value report options for Phased Reports

Available for Base Year and Then Year
- Base Year --> Real Discount Rate
- Then Year --> Nominal Discount Rate

OMB Discount Rates stored and updated annually as part of the ACEIT inflation updates
Presentations Can be Auto-Generated by ACE and POST

- Reports can be exported to PowerPoint
  - Built-in POST feature
  - Minimizes links and PPT file size
- Reports can be updated with a single button
Data Analysis – CO$TAT
CO$TAT is the statistics package of the ACEIT platform

Statistical analysis tool designed specifically for the cost analyst

Use it to conduct univariate, multivariate, linear, log-linear, non-linear, beta curve, data sampling, and learning curve analysis

Easily exports analogies or CO$TAT analyses to ACE or Librarian
CO$TAT - Excel Based Add-in

- Datasets easily created, updated, and managed in Excel workbooks
- CO$TAT readable datasets can easily be created from any source
- Allows for entire analysis and data to be self-contained in a simple file.
- Data manipulation is simple and intuitive
- Users are in familiar application (Excel)
- Access all functionality from the Excel menu
- Model specification form (Dependent / Independent variables) is straight-forward
- Develop methodologies specific to system types/technologies based on available historical data for use as primary estimate or to cross-check relationships
- Prediction intervals and results can be quickly displayed
Comprehensive Statistics

- Statistical results can be viewed quickly and a detailed report can be created in an Excel workbook
- Graphical charts are generated
- Entire detailed statistics report can be exported into ACE CER libraries an ACE estimate documentation
Easily Compare Metrics

- Compare and view all solutions from a simple interface
- Assess which model forms meet statistics criteria
- Export desired methods with documentation for use in ACE
Distribution Finder is used to find the distribution shape that most closely fits a set of data.

It can also be used to manually calculate the prediction interval for a CER by fitting a distribution to the residuals in the form of multipliers (Actual/Predicted).
CO$TAT Statistical Analysis

- Run regression analysis
- Export equation and uncertainty bounds to ACE
**CO$TAT Key Features**

- Simple dataset creation in Excel
- Access to Statistical Analysis Methods
  - Distribution fit analysis
  - Pairwise correlation analysis
  - Univariate and multivariate analysis
  - Stepwise analysis
  - Multicollinearity analysis
  - Linear, log-linear, non-linear regression analysis
  - Least-squared analysis
  - Iterative method for non-linear regression
  - Identification of outliers, leverage points and data with undue influence
  - Use of dummy and weighting variables allowed
  - Cumulative average and unit theory learning curve analysis
  - Rate adjusted and broken learning
  - Spend profile analysis to determine beta curves
  - Ridge regression
  - MUPE analysis
  - Prediction interval calculations

- Comprehensive Descriptive Statistics
  - Coefficient Statistics
  - Goodness of Fit
  - Analysis of Variance
  - Standard deviation
  - Mean, median, quartiles
  - Predictive Measures
  - Ridge statistics

- Integrated Documentation
  - Statistical reports
  - Pairwise correlation matrices
  - Interactive scatter plots, standardized residuals, actuals vs predicted, equation vs variable
  - Created as Excel worksheets

- Compare methodologies
  - Summary statistical report interface
  - Ability to set selection criteria

- Export to Libraries and ACE Estimates
  - Include dataset
  - Include statistical reports and graphics
  - Include prediction intervals and/or risk bounds
JACS is a robust risk analysis tool compatible with MS Project and Primavera P6.

• Conduct schedule risk analysis

• Integrate cost & schedule

• Perform joint confidence level analysis
Directly integrates with schedule, no Separate File required

- Data stored directly in working files, allowing continual update and input review
- Currently JACS for Project add-in for MS Project and JACS for P6 standalone tool that interfaces with P6 database

Proven customer focused support

- Tecolote Research has over 30 years of product development, maintenance, and customer support experience
- Direction controlled by the primary customer base (NASA and US Federal Agencies)
- Developed by authors of risk analysis handbooks, noted researchers in the field of cost and schedule risk analysis, and practitioners

Open architecture

- Only application to provide all calculation data to allow advanced analytics
- Fully enables the analyst to assess, understand, and communicate results

Low cost

- Included in ACEIT software suite
Identify Cost and Schedule Range

Expected Finish and Final Cost

Likelihood of meeting cost and schedule

15.9%
32.4%
39.2%
12.6%
Integrated Risk & Uncertainty Landscape – the JACS Paradigm

**TD $ = Segment Duration X Burn Rate**

*TD = Time-Dependent Cost, e.g. ‘marching army’ cost*

*TI $ = Time-Independent Cost, e.g. Materials*

*TD $ = Segment Duration X Burn Rate*

*U/C*
Fully Integrated Cost and Schedule Method (FICSM)

**Risk**
- Collect Risk Data
- Assign Likelihood, Estimate Impact
- Map to Schedule Activities
- Assign Event Impact Uncertainty

**Sched**
- Collect Schedule Data
- Validate File
- Create Analysis Schedule
- Update Analysis Schedule
- Assign Duration Uncertainty

**Cost**
- Collect Cost Data
- Identify as TD or TI
- Map to Schedule Activities
- Assign Cost Uncertainty

**Apply Correlation**
- Validate File
- Run Analysis

---

May 2017

Copyright © Tecolote Research, Inc. 2017
JACS Functionality and Purpose

- JACS supports Program Management in cost and scheduling analysis
- Empowers the analysts to answer Key Program/Project Management questions

  - Does the program have enough funds to complete the effort scope by the target date?
  - What is the likelihood of completing the effort scope by the target date?
  - What can be done to increase the likelihood of on-time completion?
  - If the program slips beyond target end date, what is the potential cost overrun and schedule slip?
  - What adjustments are needed?
Schedule
- Work effort (activities) with durations to meet target deliverables milestones (includes funded work, e.g., funded risk mitigation activities)
- **Uncertainty** to meet planned duration
- Linkage between work efforts – dependencies internally and externally
- Incorporation of *discrete risk* impacts into the schedule network

Cost
- Cost to accomplish scope of identified work activities
- Mapping of WBS costs into high-level schedule activities
- **Uncertainty** associated with costing of required resources

Risk Events
- Identification of events that will cause a technical/cost/schedule impacts
- Quantification of events in terms of schedule, technical, and cost impacts
- Identification of impacted schedule activities if risk event occurs and **uncertainty**

Risk Factors
- Risk Factors are activities that may or may not occur, with some percent likelihood.
- When the activity occurs, the risk factor increased an impacted events cost and/or duration directly by a user defined percentage
Simple Interface - Data Entry

- JACS Edit Form is analogous to the ACE Input All Form

- Systematically enter duration, cost, uncertainty and risk for a given task
  - Mark task as a Hammock or as a Program Event
  - Map costs to relevant tasks and split into Time Dependent and Time Independent Costs
  - Specify uncertainty
  - Apply correlation
  - Create risk events

- Data entered is stored directly into configured custom fields
Data stored in “custom fields” directly within schedule file

Provides full transparency to model inputs

Allows non-JACS users to view the key inputs

<table>
<thead>
<tr>
<th>Name</th>
<th>Duration</th>
<th>JACS Duration Uncertainty</th>
<th>Cost</th>
<th>JACS Baseline Cost</th>
<th>JACS TI Task Cost</th>
<th>JACS TI Cost Uncertainty</th>
<th>JACS TI Spending Contour</th>
<th>JACS TD Task Cost</th>
<th>JACS TD Cost Uncertainty</th>
<th>JACS Threat ID</th>
<th>JACS Is Threat</th>
<th>JACS Threat % Likelihood</th>
<th>JACS Is Threat Active</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Vehicle Project</td>
<td>490 days</td>
<td></td>
<td>$30,920,000.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td></td>
<td>$0.00</td>
<td>$0.00</td>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>490 days</td>
<td></td>
<td>$22,000,000.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td></td>
<td>$0.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No</td>
</tr>
<tr>
<td>Air Vehicle (T1)</td>
<td>180 days</td>
<td>(Manu=0.75)</td>
<td>$9,900,000.00</td>
<td>$9,900,000.00</td>
<td>$4,400,000.00</td>
<td>Early Peak</td>
<td></td>
<td>$5,500,000.00</td>
<td></td>
<td>No</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Integration (T1)</td>
<td>90 days</td>
<td>(Manu=0.75)</td>
<td>$1,480,000.00</td>
<td>$1,480,000.00</td>
<td>$900,000.00</td>
<td>Turtle</td>
<td></td>
<td>$580,000.00</td>
<td></td>
<td>No</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Air Vehicle (T2)</td>
<td>180 days</td>
<td>(Manu=0.75)</td>
<td>$9,200,000.00</td>
<td>$9,200,000.00</td>
<td>$5,500,000.00</td>
<td>Early Peak</td>
<td></td>
<td>$3,700,000.00</td>
<td></td>
<td>No</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Integration (T2)</td>
<td>90 days</td>
<td>(Manu=0.75)</td>
<td>$1,420,000.00</td>
<td>$1,420,000.00</td>
<td>$860,000.00</td>
<td>Turtle</td>
<td></td>
<td>$560,000.00</td>
<td></td>
<td>No</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>SEPM (Hammock)</td>
<td>490 days</td>
<td></td>
<td>$8,400,000.00</td>
<td>$8,400,000.00</td>
<td>$0.00</td>
<td></td>
<td></td>
<td>$8,400,000.00</td>
<td>$8,400,000.00</td>
<td>LN(100,20)</td>
<td>No</td>
<td>0</td>
<td>No</td>
</tr>
<tr>
<td>SEPM Start</td>
<td>0 days</td>
<td></td>
<td>$8,400,000.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td></td>
<td></td>
<td>$0.00</td>
<td></td>
<td></td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>SEPM Finish</td>
<td>0 days</td>
<td></td>
<td>$0.00</td>
<td>$0.00</td>
<td>$0.00</td>
<td></td>
<td></td>
<td>$0.00</td>
<td></td>
<td></td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Other</td>
<td>160 days</td>
<td>LN(95,15)</td>
<td>$520,000.00</td>
<td>$520,000.00</td>
<td>$0.00</td>
<td></td>
<td></td>
<td>$520,000.00</td>
<td></td>
<td></td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
Analyze Allows Specification of Scenarios

- Control various aspects of the simulation in the Analyze dialog
- The Run Drill button runs the simulation, then imports results into Project and creates a cache file of all the generated data
- Observer or Insight launches when the calculation is complete
Assess required funds over time

Forecasted Expense Range
Identify areas with highest potential impact

Duration Tail Contingency Delta from Estimate
Missile System Project

Activities

Prod ST&E

EMD HW Malfunction (RQ#1)

Prod Air Vehicle

EMD SW Design Failure (RQ#2)

Prod IAT&G

Prod Procure Materials

EMD SW Refinements

EMD Initial Design Multi-Impact

Duration (Days) - Conditioned on Criticality

Legend

Mean
75%
90%
Find hidden problems

Deterministic Critical Path

<table>
<thead>
<tr>
<th>Name</th>
<th>y1</th>
<th>January 1</th>
<th>September 1</th>
<th>May 1</th>
<th>January</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Start</td>
<td>7/4</td>
<td>10/31</td>
<td>2/27</td>
<td>6/26</td>
<td>10/23</td>
</tr>
<tr>
<td>Project Completion</td>
<td></td>
<td>2/19</td>
<td>10/15</td>
<td>6/18</td>
<td>2/8</td>
</tr>
<tr>
<td>Characterisation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feasibility &amp; Design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front End Eng Design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Board approvals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contract process</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External approvals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Site mobilisation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procure 3rd party contractors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean strip out</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contaminated strip out</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decontaminate structures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building demolition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post implementation finishes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final report, historic records and</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Probabilistic Critical Path

<table>
<thead>
<tr>
<th>Name</th>
<th>y1</th>
<th>January 1</th>
<th>September 1</th>
<th>May 1</th>
<th>January</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Start</td>
<td>7/4</td>
<td>10/31</td>
<td>2/27</td>
<td>6/26</td>
<td>10/23</td>
</tr>
<tr>
<td>Project Completion</td>
<td></td>
<td>2/19</td>
<td>10/15</td>
<td>6/18</td>
<td>2/8</td>
</tr>
<tr>
<td>Characterisation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Feasibility &amp; Design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front End Eng Design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Board approvals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design development</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>External approvals</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implementation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procure 3rd party contractors</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reduce hazards</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contaminated strip out</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decontaminate structures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Building demolition</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post implementation finishes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final report, historic records and</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contract Delay</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Testing fails</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delivery Overrun</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Not drivers

Hidden drivers
Insight Provides Executive Dashboard

Finish Date vs. Total Cost
Missile System Project (Correlation: 24.95 %)

Overlay Analysis

Multi-Metric Driver
Missile System Project

Annual Cost Uncertainty
Missile System Project
Insight Provides Executive Dashboard

![Dashboard Image](image-url)

**Schedule CDF vs. PDF**
- Missile System Project
- Histogram Count

**Duration Tail Contingency Delta from Estimate**
- EMD HW Malfunction (RR#1)
- EMD SW Design Failure (RR#2)
- Prod ST6E
- Prod Air Vehicle
- EMD Initial Design Multi-Impact...
- EMD System Design Multi-Impact...
- SW System Design Risk
- SW Initial Design Risk

**Criticality Index**
- Missile System Project
- Delayed Award
- Prod Procure Materials
- Prod Air Vehicle
- EMD SW Refinements
- EMD SW Detailed Design

**Schedule Cruciality**
- Missile System Project
- Prod SEPA (Hamrock)
- Prod Air Vehicle
- Prod Procure Materials
- EMD SW Refinements

Legend:
- Mean
- 75%

Copyright © Tecolote Research, Inc. 2017
Observer enables detailed analysis

1. Select chart type
2. Select task and view data
3. View/Plot Uncertainty Metrics
4. Customize chart-specific options
Benefits of Using ACEIT

- **Implements standardized process and increases estimate quality**
  - Supports development of consistent, systematic, and defendable Life Cycle Cost Estimates
  - Delivers integrated, automated documentation, with complete audit trail
  - Improves estimate review and verification process through consistent model structure
  - Contains industry approved algorithms and databases to model inflation, learning, and phasing
  - Integrates statistical and risk analysis to quantify uncertainty in estimates
  - Enhances quality by eliminating many errors often made in spreadsheets (which frequently go undetected)

- **Provides flexibility to model any system type**
  - Unlimited flexibility to model any type of system linking all life cycle phases and facilitate any type of Analysis of Alternatives
  - Huge variety of automated and customizable reports

- **Integrates with other applications through an open platform**
  - Ability to link to virtually any other tool
  - Robust Application Programming Interface (API) to facilitate electronic interaction

- **Reduces management challenges**
  - Structured modeling platform shortens time for ACE users to learn a new model
  - Eases organization-wide distribution of key standards (WBS, inflation, etc.)
  - Empowers the analysts to answer Key Program/Project Management questions
- Instructors have real world experience using ACEIT to solve complex estimating problems
- Onsite courses available upon request
For more information please contact ACEIT Sales

Email: aceit_sales@tecolote.com
Phone: (805) 964-6963

Thank You