Logistics Engineering Center Cost Analysis Strategy Assessment 9.2.1

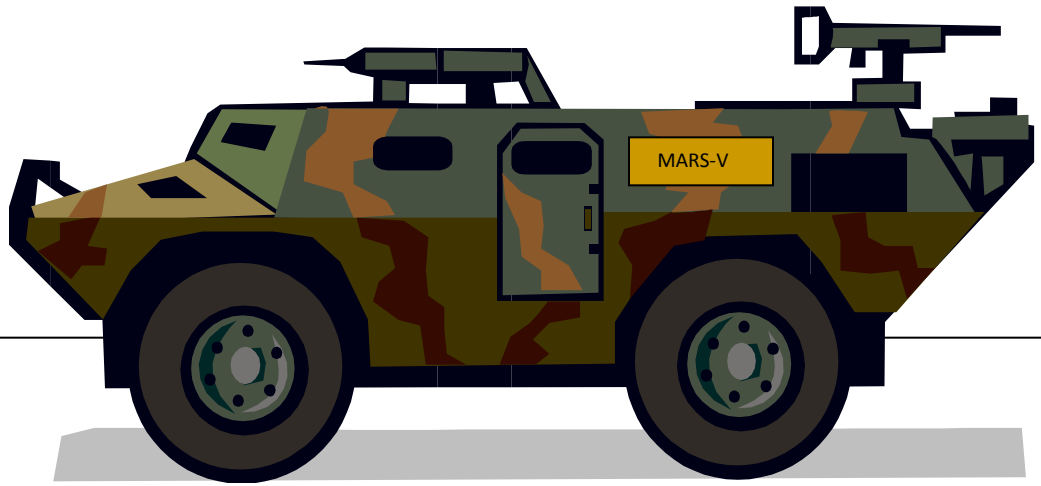
Practical Exercise

2012

Life Cycle Cost Analysis

- Perform and Examine a Total Life Cycle Cost Analysis for the MARS-V Computer Parts

PRACTICAL EXERCISE



Overview of the Practical Exercise

The MARS V CASA Practical Exercise is a hands-on exercise in which you will be developing a CASA data file for MARS V "Shadow" System Parts. The exercise provides a general overview of CASA input, output, basic command/movement keys, and steps for importing hardware data from a spreadsheet.

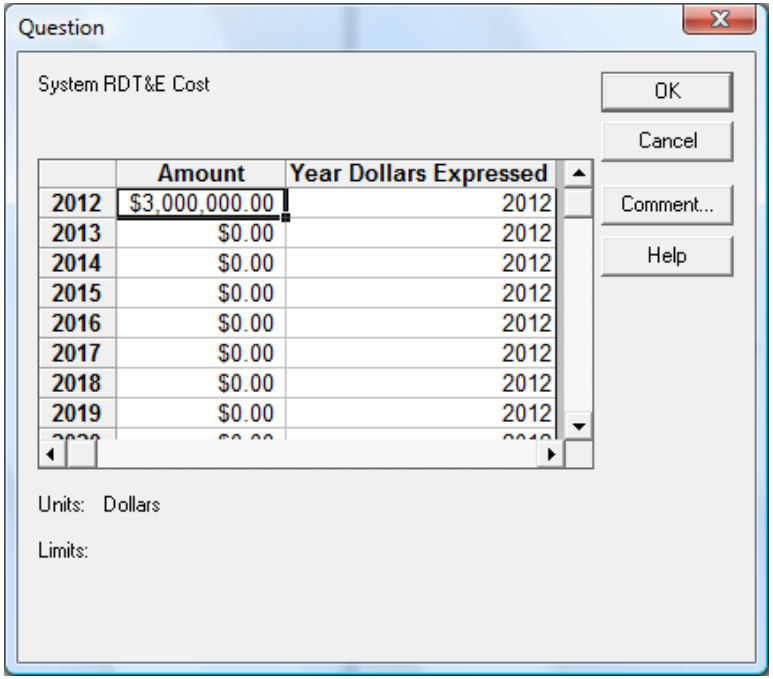
Remember to periodically save your data to disk. Like other Windows programs, you are working in a temporary workspace and can lose data if your computer crashes. CASA has an "Auto Save" feature which can be enabled. It is located under the "File" menu. The parameters for this option can be altered.

The following style is adhered to throughout this exercise: All "Menu Names" and "Menu Commands" are listed in quotes. Dialogue box options are denoted by <>. The data questions are formatted with an underline.

The data within this exercise has been created for the sole purpose of training and is not actual data or based on actual data from other systems

Standard Question Input Dialogue Box for Multiple Value Entry

Some questions require more than one value as input. The Input Dialogue Box for these types of questions is displayed in a grid format, shown at right. Within this dialogue box, you can widen the column width by placing the cursor on the separator line, then hold down the left mouse button and drag the separator to increase or decrease the width.



Developing a CASA Data File

When beginning a new CASA data file, there are three steps to follow to avoid possible data entry errors later.

1. The first set of questions that MUST be answered are the Beginning Questions. You cannot go further until the Beginning Questions are answered.

2. Next , you must "Set Default Year", which is the year in which most dollars are expressed. This allows easier data entry later. "Set Default Year" is located under the "Data" menu on Tool Bar.

3. Finally, you should run the "System Wizard" to input your production and deployment schedule. "System Wizard" is located under the "Data" menu on the Tool Bar.

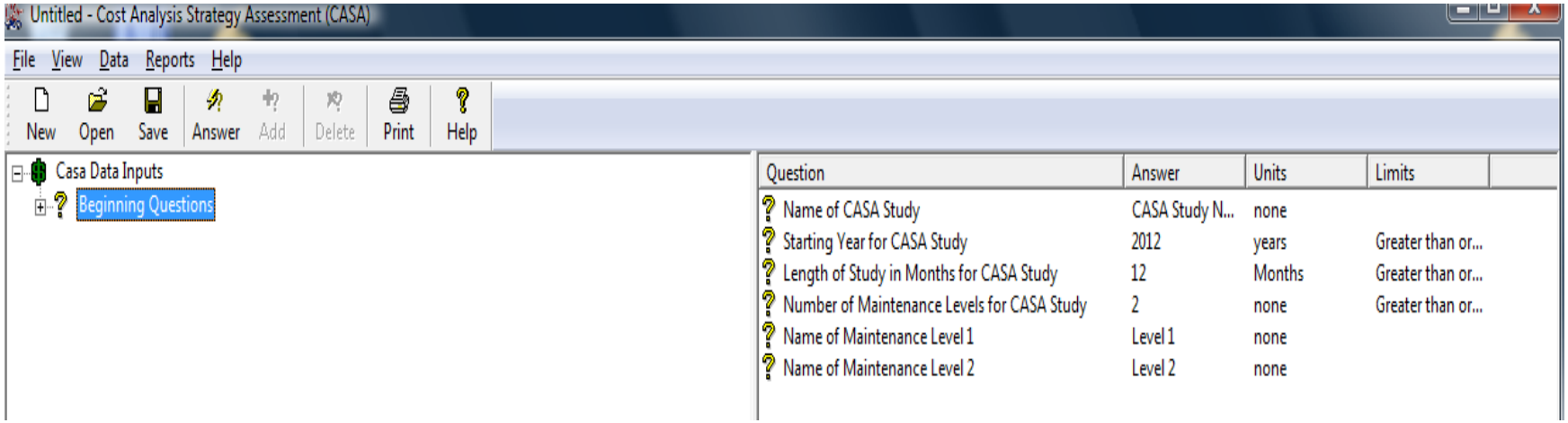
After completing these steps, you can enter data for the next data group. We recommend you complete each data group in order, so no data question is skipped. However, not all data groups/questions within the CASA Data Tree Structure need to be answered to execute the model.

CASA

START THE PRACTICAL EXERCISE AT THIS TIME

Opening Screen

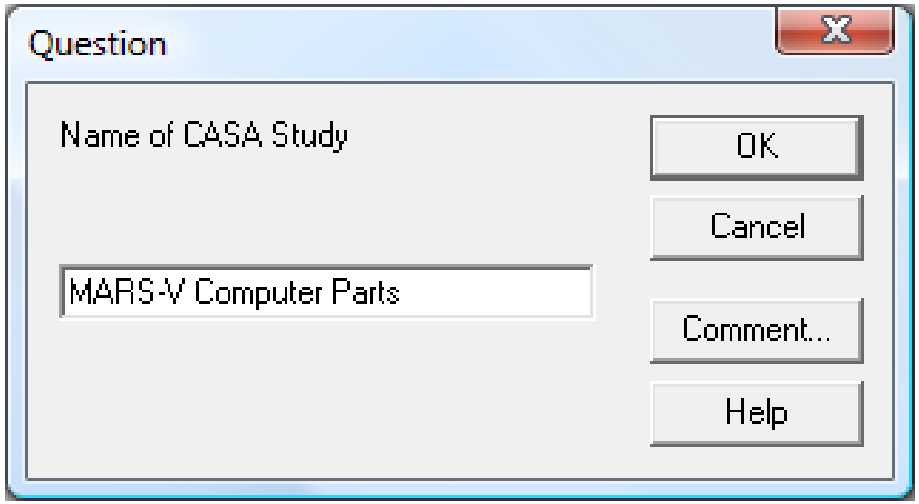
Double-click on the CASA icon on your Desktop to open the program.



Step 1 - Beginning Questions

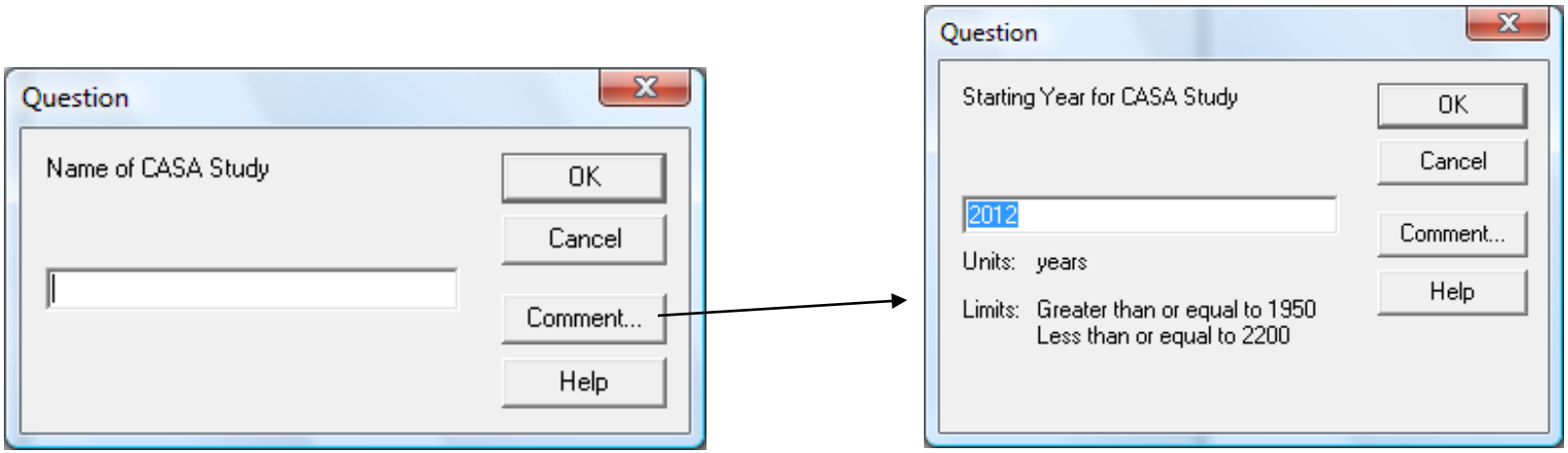
Use the mouse cursor to double-click on “Name of CASA Study” and a question prompt will appear similar to the one shown below.

For our practical exercise type in ‘MARS V Computer Parts’ and click <OK>



Standard Question Input Dialogue Box for Single Value Entry

Shown below is an example of a CASA Standard Question Input Dialogue Box for Single Value Entry. To enter a value, type in the answer and press <OK>. The CASA program will automatically display the next question within each data group until you have completed the section and then return you to the main screen. If you want to exit without entering or modifying the answer, press <Cancel>. Press the <Comment> button to bring up a dialog box for entering comments about the inputted data value (as shown in the picture, bottom right). When done with the comment press <OK> to return to the Question dialog box. Selecting <Help> will display information about the CASA data question.



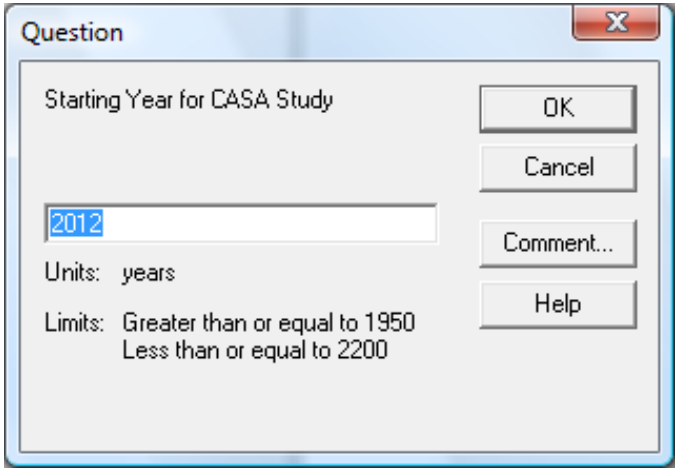
Step 1: Beginning Questions

The second question is “Starting Year for CASA Study” (i.e. the year in which the first costs are incurred). For our exercise input ‘2012’.

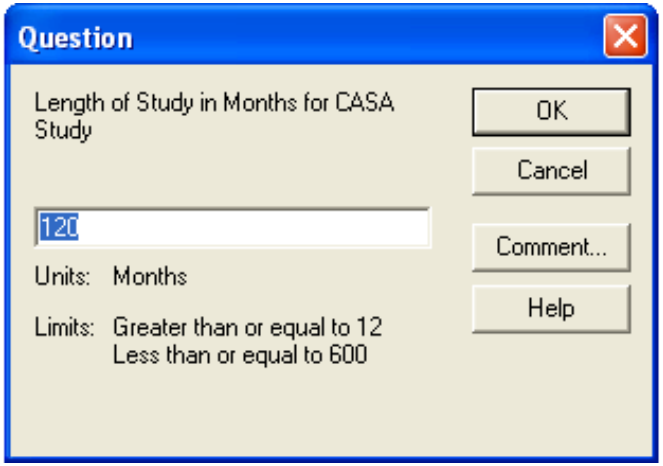
Next, enter the “Length of Study in Months for CASA Study”.

NOTE: Unit of time for this input is months, not years, so when you do another analysis, if you want 20 years, you need to input 240, not 20.

This exercise will cover a 10 year period, so input ‘120’ as the answer.



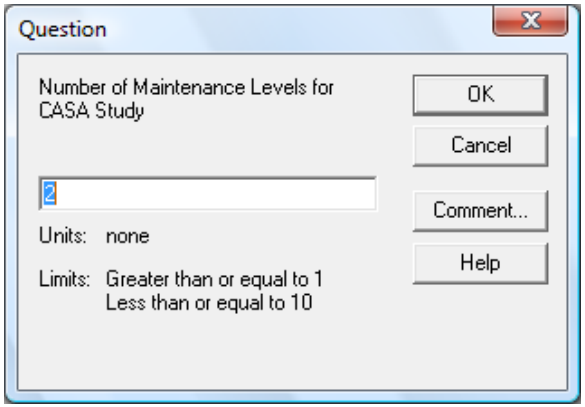
Note:
Once these data values are set they can only be changed by selecting “Change Beginning Year/Length” on the “Data” menu.



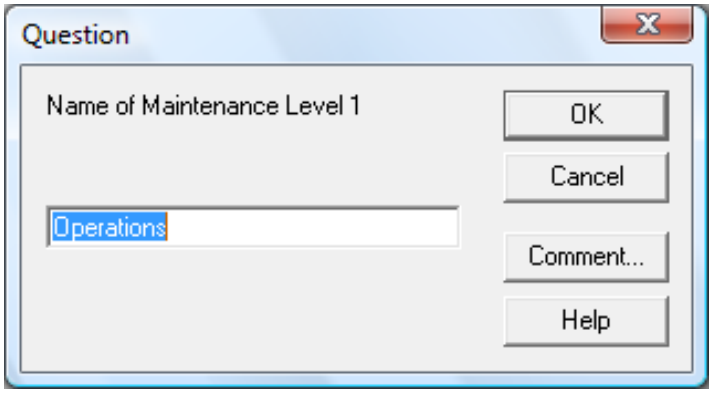
Step 1: Beginning Questions

The last three Beginning Questions are "Number of Maintenance Levels for CASA Study" and their corresponding names. The minimum number is 1 and the maximum is 10. After entering the number of levels you will be prompted to enter the name(s) based on the number you entered (i.e., if you enter 2 you will be prompted twice for a maintenance level name.)

For our exercise enter '2' for the number of maintenance levels and click <OK>. Then enter the names as 'Operations' and 'Depot'.



Note: If you want to change these inputs later, you must use the "Change Maintenance Level Wizard" under the Data menu



Completion of Step 1: Beginning Questions

Congratulations!

You've just configured your MARS V Computer System CASA data file. You will now notice all of the question marks to the left of each question under the "Beginning Questions" data group have a check mark over them. This signifies these questions have been answered.

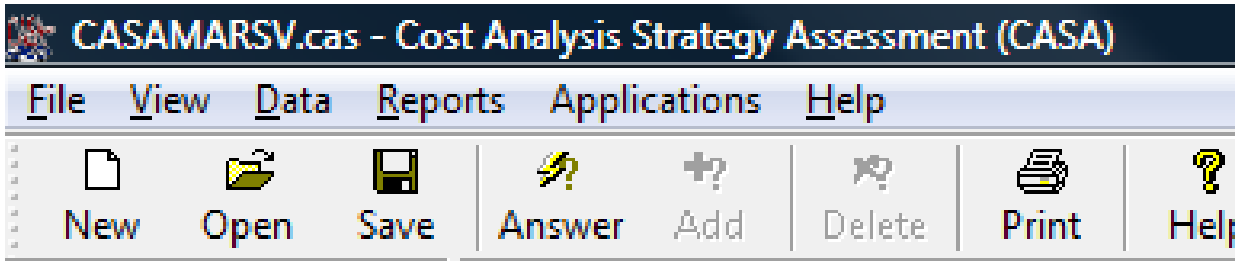
Before you enter more data, it is recommended you save your data to disk. To do this, select "Save" on the "File" menu or press "Save" on the toolbar. CASA will display the standard Windows "Save As" dialogue box.

Saving Your Data to a File

For this Practical Exercise, save your study to the Desktop.

Select the Desktop directory and type in the filename 'CASAMARSV', and click <Save> (default filename extension is ".cas"). Once the data is saved, you will return to the CASA main screen and notice the filename you typed in is now displayed in the window title bar.

Again: Remember to periodically save your data as you answer questions. Like other Windows programs, you are working in a temporary workspace and can lose data if your computer crashes. CASA does have an "Auto Save" feature which can be enabled. It is located under the "File" menu. Select it and the frequency with which you want to autosave.



Step 2: Set Default Year

Prior to entering your cost data, you need to set the default year in which most of your costs are expressed. This will save time and avoid data entry errors later. As each cost is entered, this default value can be over-ridden.

To set the default year, select the "Set Default Year" command under the "Data" menu at the top of the screen. Input the default year as '2012' for our example. Once entered, you will notice that if you select the "Data" menu, the "Set Default Year menu" will have a check mark on the left side.

NOTE: This is a global variable and if you select this command again and change the value CASA will change all "Year Dollars Are Expressed" data elements to this new value.

Step 3: Run System Wizard

The "System Wizard" is a labor saving tool that should be ran prior to entering your project cost data. The "System Wizard" stores and provides information on the production rate, deployment, and retirement of the systems throughout the life cycle.

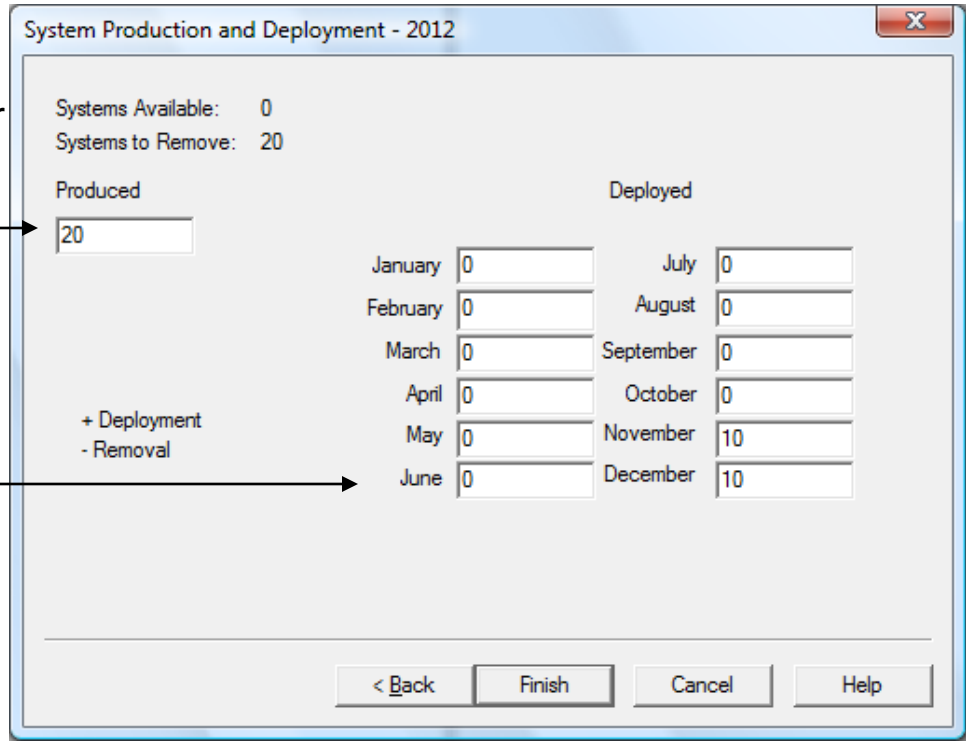
To run the “System Wizard", go to “Data” at the top of the main CASA window and select “System Wizard”. This will display the screen as shown on the next slide.

System Wizard (continued)

To start, enter the total number of units to be produced during the first year of production (Year 2012 as listed in the window title bar). Enter '20' in the "Produced" area for our example.

The number produced must be "Deployed". You can deploy systems produced on a per month basis in the same year as produced, or in following years.

NOTE: All systems produced must be deployed and retired within the life cycle of the system.

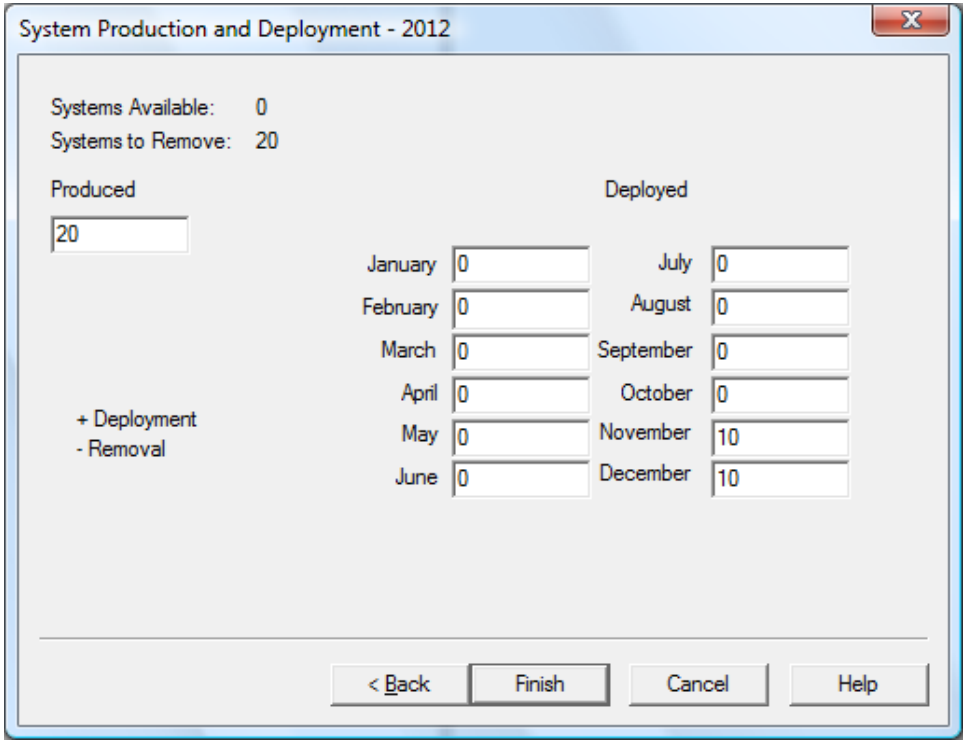


System Wizard (continued)

You deploy the systems by entering the number of systems fielded in specific month(s).

We need to deploy 20 systems. We will deploy them in Nov/Dec 2012 (same year as produced). Enter '10' in November and '10' in December.

Now, we need to retire/remove the systems from the field. Click <Next> on the lower right of the window to move to the last year of the life-cycle, 2021. The year, in the active title window, will change as the <Next> button is pressed.

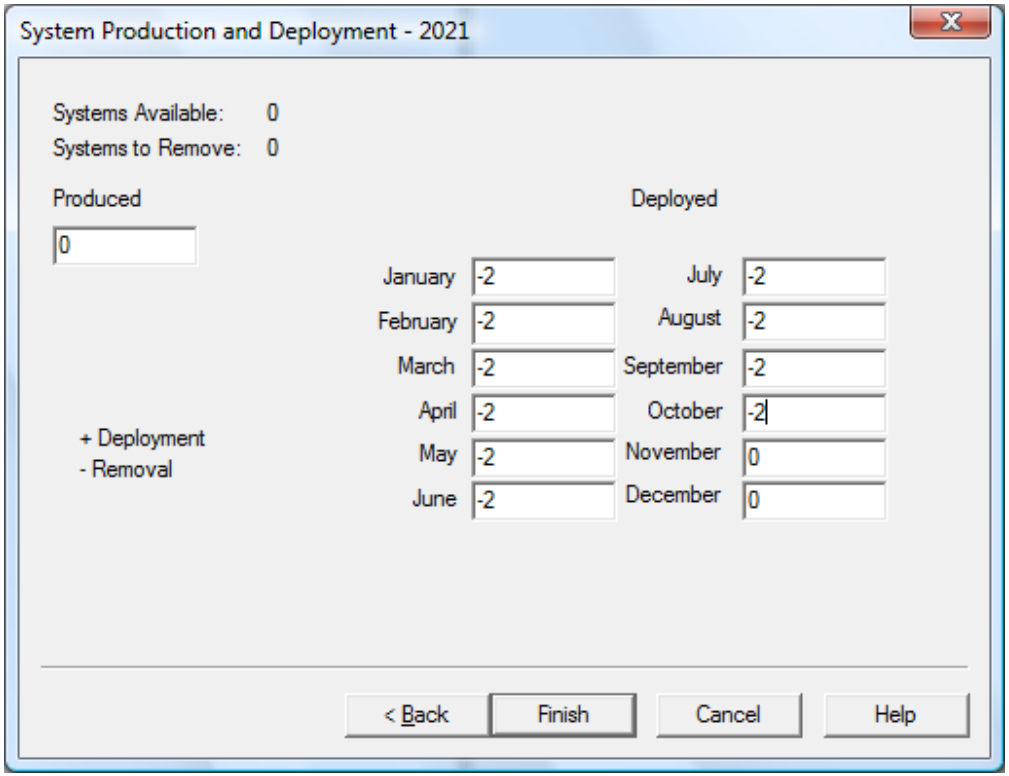


System Wizard (continued)

This window displays the last year of the life cycle for our project.

At the end of the life cycle, systems must be removed (disposed of). To do this, simply enter '-2' systems per month from January through October. Remember, you must enter these numbers as a negative value for the quantity removed in the month(s) you want the systems to be disposed.

As you will see, the "Systems to Remove" tally (upper left) will decrease until all systems have been removed. When done, click <Finish> at the bottom of the window.



Program Office Data

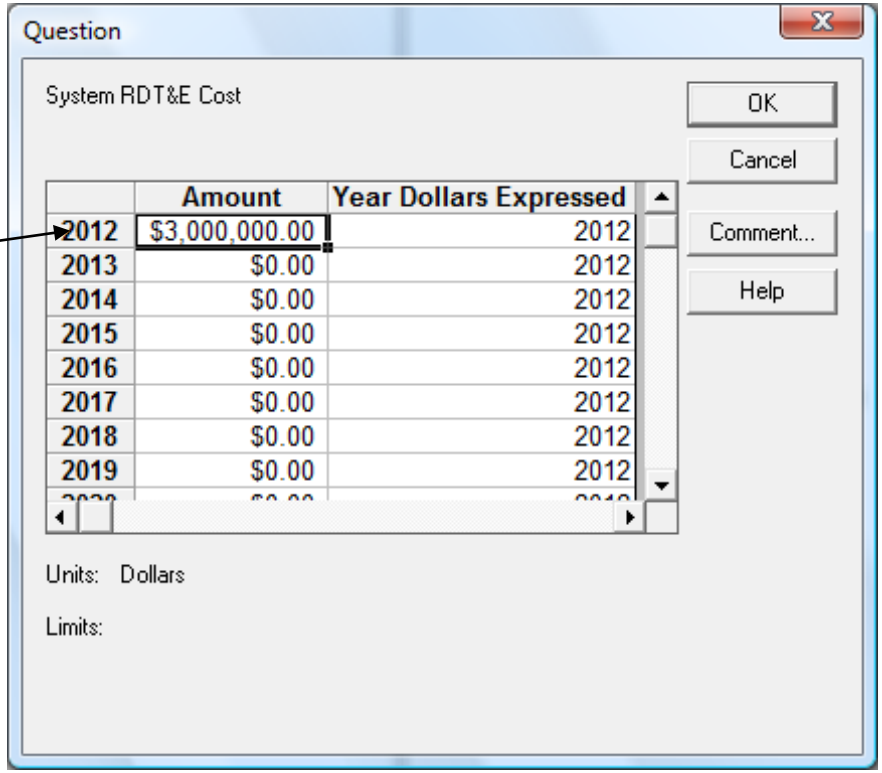
Program Office Data contains two main categories (Research and Development (R&D) and Production). Generally, data for R&D and Production are provided by the Acquisition Program Management Office.

As mentioned previously, CASA does not calculate R&D costs. Users input the total amount expended or budgeted by year and CASA throughputs these values.

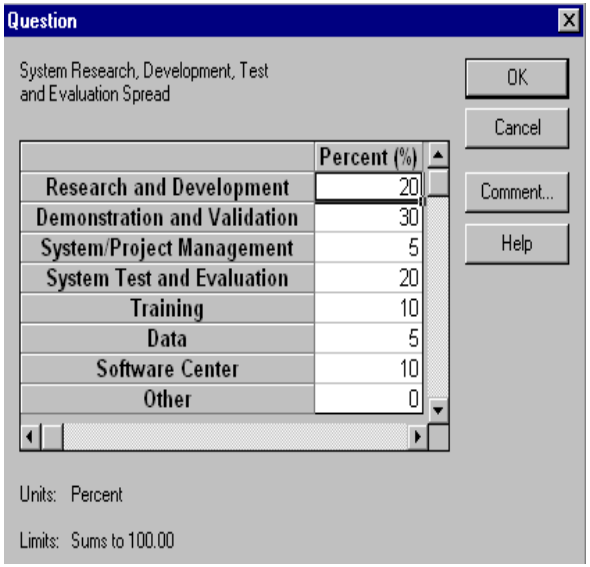
To start entering data in this section, expand "Program Office Data" and highlight "Research and Development Cost", right-click and select answer (or "Answer" on the toolbar or "Data" menu).

RDT&E Costs

Total RDT&E costs are entered by year. The year dollars can be changed from the default within this screen. For our example, enter '3000000' in year "2012" .CASA automatically enters dollar ($) signs.



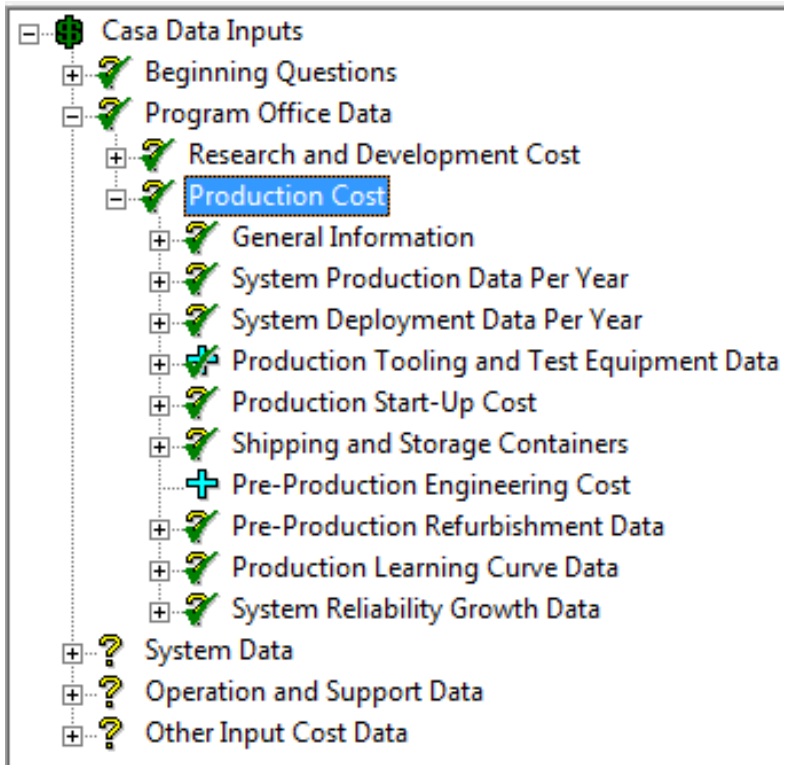
RDT&E Spread



You will now break out RDT&E costs in eight expense subcategories as shown at left. This information is entered into CASA as a distribution of percentages that must sum to 100%. The data is entered as whole numbers (i.e., enter 20% as 20, not 0.20). For our exercise, enter the following:

Research and Development.....20
Demonstration and Validation.....30
System/Project Management.....5
System Test and Evaluation.....20
Training.....10
Data.....5
Software Center.....10
Other.....0

Production Cost Data



Production Cost Data pertains to data associated with the production and acquisition of the system.

If the “System Wizard” has been completed then the questions “System Production Data Per Year” and “System Deployment Data Per Year” are displayed with a green check mark. This indicates answers have already been supplied for these subcategories.

Production Cost Data: General Information

Double click “General Information” under “Production Cost Data” to answer the following questions:
Year in which dollars are expressed – This is answered when we set the default year.
Cost Adjustment Factor - This factor is multiplied by the unit cost of each system and hardware item to derive new costs (i.e., similar to a scaling factor). If costs for basic logistics data will be used, then this input should be ‘1.0’ (enter ‘1.0’ for our exercise).

MTBF Adjustment Factor - For each item, the MTBF is divided by this factor. This value must be greater than 0.0 or a run time error will occur. The default value is ‘1.0’ and will be the value for our practical exercise.

Operating Hours Per Month Per System – Enter the predicted average hours per month the system will be operating. This will directly influence the number of maintenance actions required each month. Enter ‘320’ for the practical exercise.

Operator Required Portion - The percentage of time per system that an operator is chargeable to system operation costs. For each operator, sum the total together (two operators at 100% each should be ‘200’). For our exercise, enter ‘100’ to signify that one full time operator is needed.
System Operator Labor Rate – The average hourly salary for an operator, enter ‘20’.

Production Cost Data: General Information (Continued)

Support Equipment and Spares Factor - The estimated decimal fraction of available support equipment hours per month (Enter '0.8'). This means that the support equipment will be available 80% of the time to perform maintenance functions.

Portion of Repair Time for RTOK – The percentage of time spent re-testing at the maintenance facility only to determine that the unit is operational. Enter '0.05' for our exercise.

Consumables Factor - The portion of repair parts and materials cost that is expected to be required for consumables, such as alcohol, cleaners, swabs, solders, etc. (expressed as a decimal fraction). Enter '0.1' in our sample file.

Inflation Rate – Accepted inflation rate predictions are published by the Federal Government. Enter '0' for 2012 and '2.2' for all other years.

Interest Rate/Discount Rate - Accepted discount rates are published by the Federal Government. Enter '0' for the year 2012 and '2' for all other years. This variable also serves as the interest rate when calculating "Net Present Value" in the Net Present Value Report.

Production Cost Data: General Information (Continued)

Yearly MTBF Adjustment Factor - These factors adjusts the MTBF of each hardware item (except scheduled maintenance items) in order to obtain different MTBF values for each year. These factors are already entered and set to a default value of '1' for all years. Note: Each of these values must be greater than "0.0".

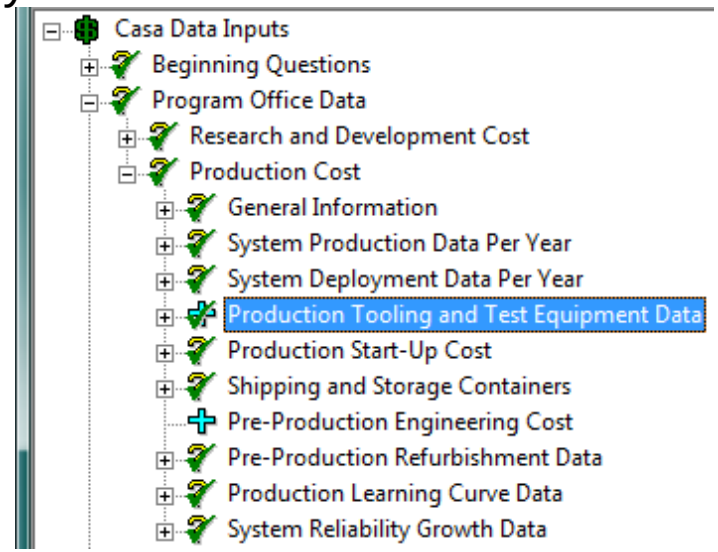
Previous Quantity of Systems Built – This input helps to characterize the maturity of the production facility. The total number of units previously built should be entered. For our sample file, enter '5000'.

Base System Unit Cost – If no previous units have been produced, then this input should contain the average unit cost of the system. If previous units have been produced, then this should contain the original price of the first unit. Enter '7500' for the "Base System Unit Cost" in the sample file.

Installation Cost per System – This prompt is for the total cost to install each unit. Enter '1200' for the "Installation Cost" per System.

Production Tooling and Test Equipment

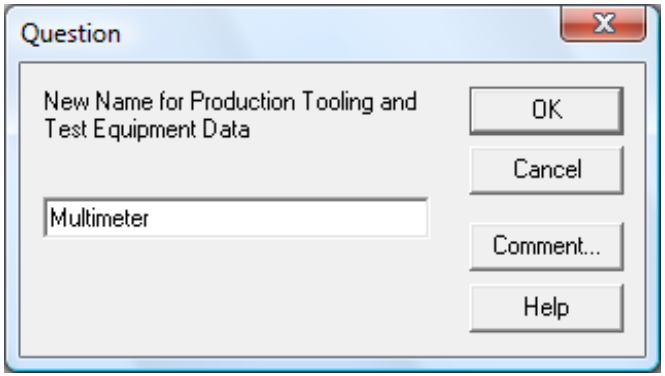
As shown, this data group has a big aqua colored plus sign. This means you can add/delete items to this category. Once the item has been entered, you can delete it by right-clicking and selecting delete. This data category pertains to items used during the production process only. Support/test equipment associated with repair are not entered here (enter in the O&S data group). An example of a Production Tooling and Test Equipment item might be a multimeter to be used for quality control.

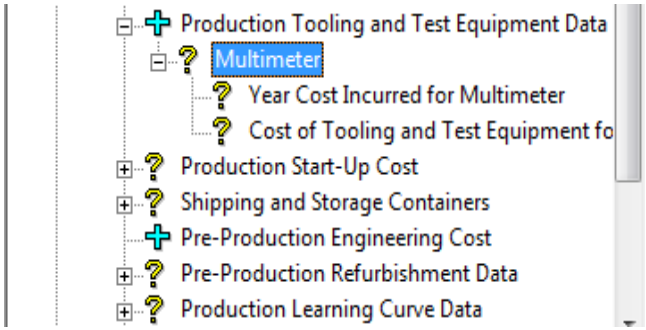


Production Tooling and Test Equipment
(continued)

To add an item, highlight “Production Tooling and Test Equipment Data”, right-click, and select “Add” from the pop-up menu. For our sample file, add one piece of test equipment entitled ‘Multimeter’ and press <OK>. The main screen will be displayed and you will notice that the item was added to the data tree under Production Tooling and Test Equipment. You will also notice there are two more questions listed under the Multimeter. You now have to input these answers which pertain to the cost of the Multimeter. As pieces of production test equipment are added, the data tree will expand and prompt you for specific cost details.

For our sample file, enter ‘2012’as the year in which the cost will be incurred and ‘75’ for the cost of the Multimeter.





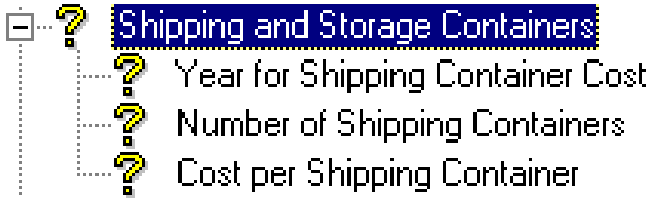
Production Cost Data: Production Start-Up Cost

Year of Production Start-Up – The year in which the production start-up cost is incurred (‘2012’).

Production Start-Up Cost - Start-up costs should include the cost of activities identified as necessary to initiate a production program. Items such as drawing updates, factory training, qualification tests, initial set-up of production flow, demonstrations, etc., should be included as applicable.

For the sample file, enter the start-up year as ‘2012’, with a cost of ‘275000’.

Production Cost Data: Shipping and Storage Containers



Year of Shipping Container Cost – The year in which the shipping containers will be purchased, enter '2012'.

Number of Shipping Containers – The number to be purchased, enter a quantity of '20'.

Cost per Shipping Container – The average cost per unit, enter '1000'.

Production Cost Data: Pre-Production Engineering Cost

For our Exercise, we will not enter pre-production engineering costs.

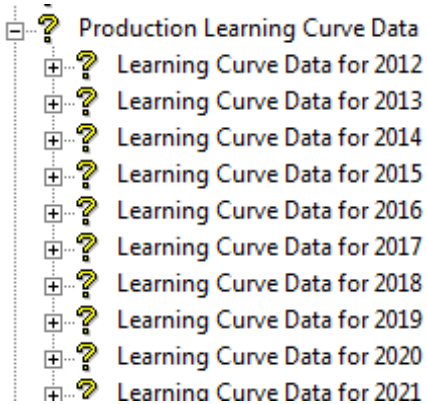
"Pre-Production Engineering Cost" is a data group in which items can be added/deleted. As with the "Production Tooling and Test Equipment" data group, as you add items, the CASA Data Tree Structure will expand and prompt you to answer questions pertaining to specific costs of the item added (an example is shown above). This cost is non-recurring and should include all items needed to fully characterize this data cost group

Pre-Production Refurbishment Data

Pre-Production Refurbishment Data addresses the costs incurred to refurbish or upgrade pre-production units for re-issue. One example of this could be a unit produced for acceptance testing, which has a configuration slightly different than the final production design. The refurbishment cost updates the unit to the production design specification.

For our sample file, enter ‘2012’ for “Year”, enter ‘2’ for “Number of Pre-Production Units to be Refurbished”, and enter a “Cost” of ‘2500’.

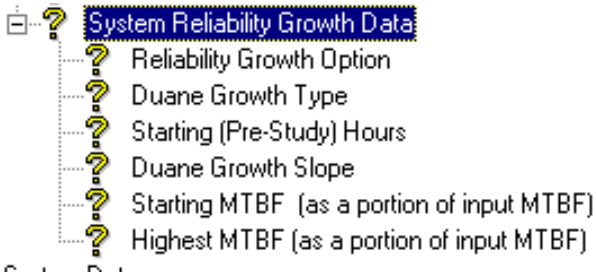
Production Learning Curve Data

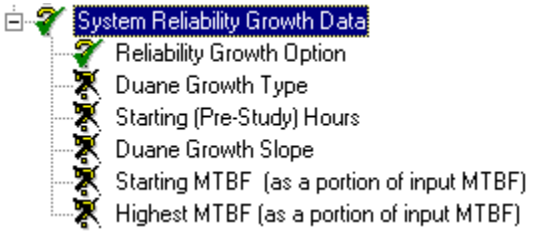


Quantity Slope: When the total quantity built doubles, the system unit cost is multiplied by Quantity Slope. For example, if Quantity Slope equals 0.90 (and Rate Slope equals 1.0) and the cost of the 100th system is 1000, then the cost of the 200th system would be 900 and the cost of the 400th system would be 810. *For our sample file, you will enter '0.98' for each year of the life cycle.*

Rate Slope: When the quantity built within a year doubles, the system unit cost is multiplied by Rate Slope. For example, if Rate Slope equals 0.90 (and Quantity Slope equals 1.0) and the system unit cost is 1000 when 100 systems are built in a year, then if 200 systems are built in a year, the system cost will be 900. It is recommended that your Rate Slope values be the same for each year. Changing the Rate Slope values between years can have a dramatic effect on system cost. *For our sample file, you will enter '1.0' for each year of the life cycle.*

System Reliability Growth Data





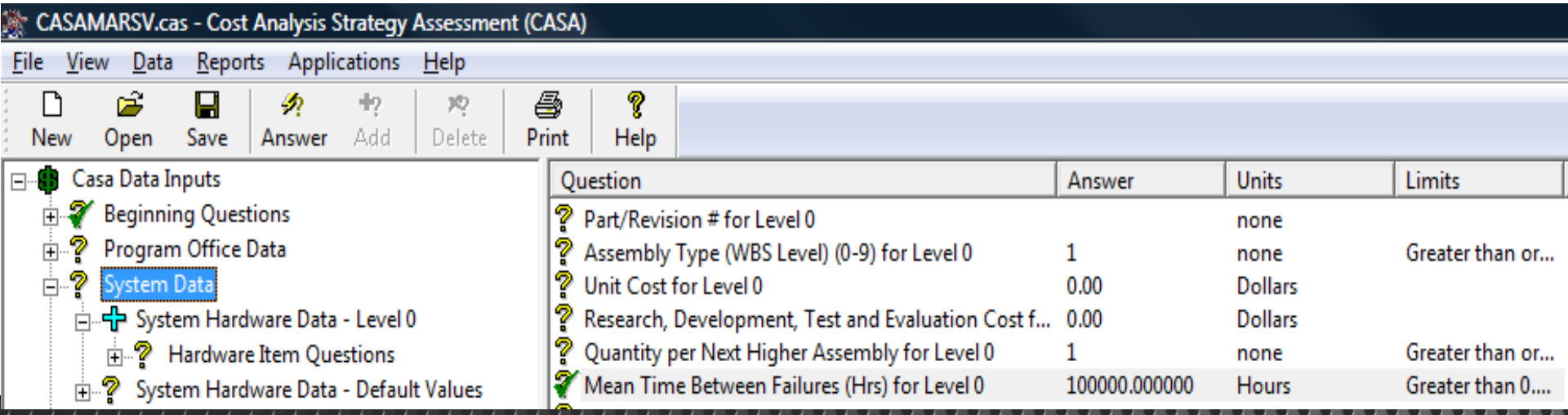
The “System Reliability Growth Data” group has four options: None, Annual, Duane, or Item. None means no reliability growth is considered. Annual growth is based on an annual factor for the system. The Duane method uses the Duane growth factor for the system. Item means the Duane growth factor for the item will be used. For the None option, the MTBF values from the data file will be used for each year. For the Annual and Duane options, the reliability growth is calculated for the system and each item within the system follows the same growth curve. For the Item option, reliability growth is calculated for each item.

For our sample file, select ‘None’. This will place an “X” over each input prompt that is no longer applicable (as shown in the figure at the top right). This example is seen on your Data Item Tree on CASA program.

System Data

The hardware data for your system can be entered manually from the data tree, or by importing data from an Excel file.

For this practical exercise, we will import data from an Excel file. Before importing, the "MTBF for System Hardware Level 0" must be changed to represent the overall system's MTBF. This is done by changing MTBF for Level 0 from '9999999.0000' to '100000'. Under "System Data" double-click "Mean Time Between Failures (hrs) for Level 0" to bring up the question dialogue box – enter '100000' and click <OK>.

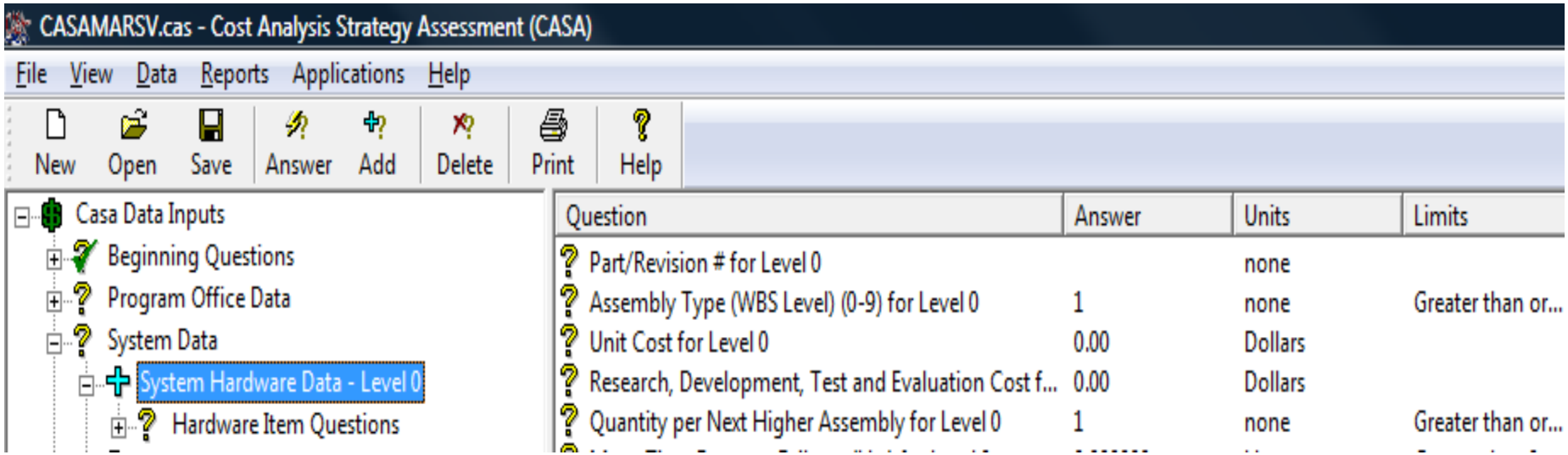


System Data
Import from Excel File

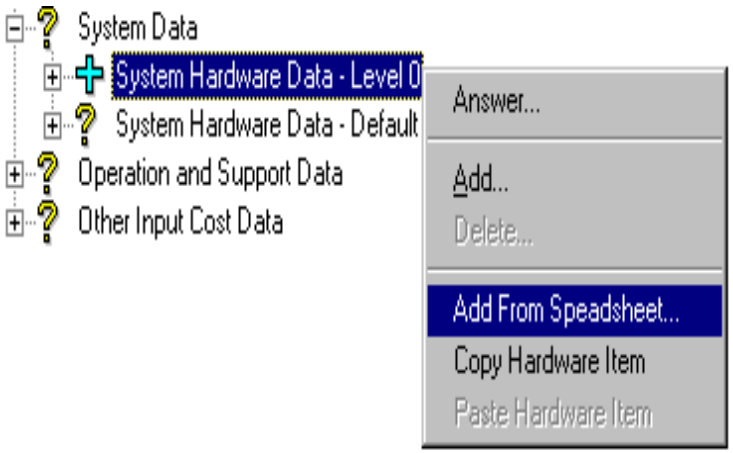
Now we will import hardware data from an Excel file. Two template Excel files are distributed with CASA and located on your desktop.

These files are called "Sample hardware.xls" and "TowExport.xls".

Highlight "System Data, System Hardware Data Level 0", indicated by a blue plus sign, as shown below. The blue plus means you can "Add" or import items.



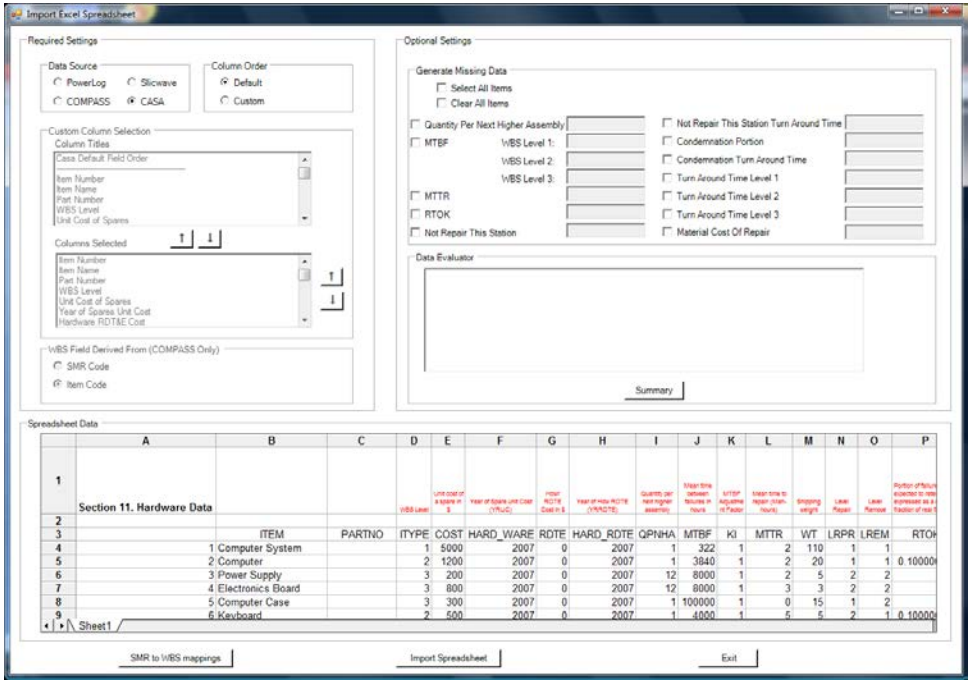
Importing Hardware Data from Excel



The next series of slides will lead you through the process of importing hardware data from an Excel file. You will import two files, therefore this process will be done twice, once for the Sample Hardware.xls and again for the TowExport.xls file.

To start, right-click on “System Hardware Data Level 0”. Select “Add from Spreadsheet.” The file chooser dialogue box will appear. Select the Sample Hardware Excel file from your Desktop. Click <Open> to open the file.

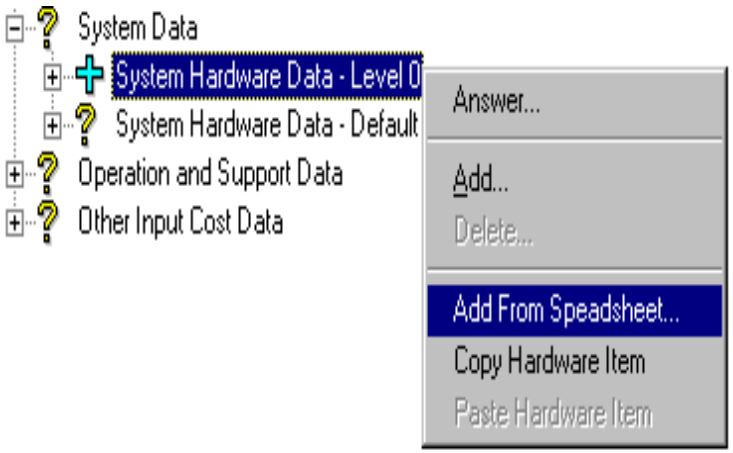
Importing Hardware Data from Excel



In the Data Source field select "CASA". In the Column Order field select "Default". In the Spreadsheet Data field, select the first item in the Excel file (row 4) by clicking on the "4", hold the left mouse button and pull down to the last item. Click the "Import Spreadsheet" button once.

CASA will return you to the main screen and the hardware data you selected is added to your data file.

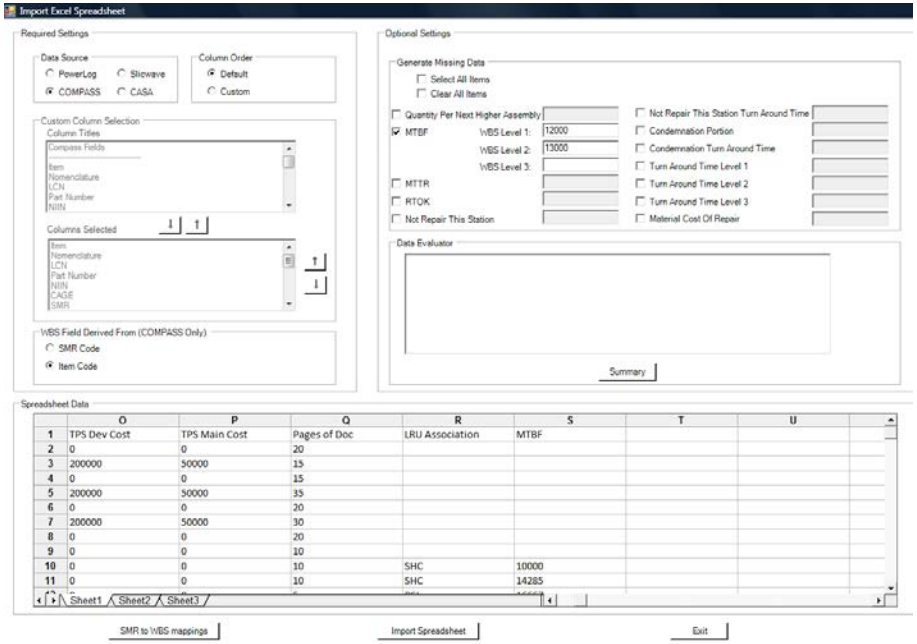
Importing Hardware Data from Excel



Now we will import the TowExport.xls file.

To start, right-click on “System Hardware Data Level 0”. Select “Add from Spreadsheet.” The file chooser dialogue box will appear. Select theTowExport Excel file from your Desktop. Click <Open> to open the file.

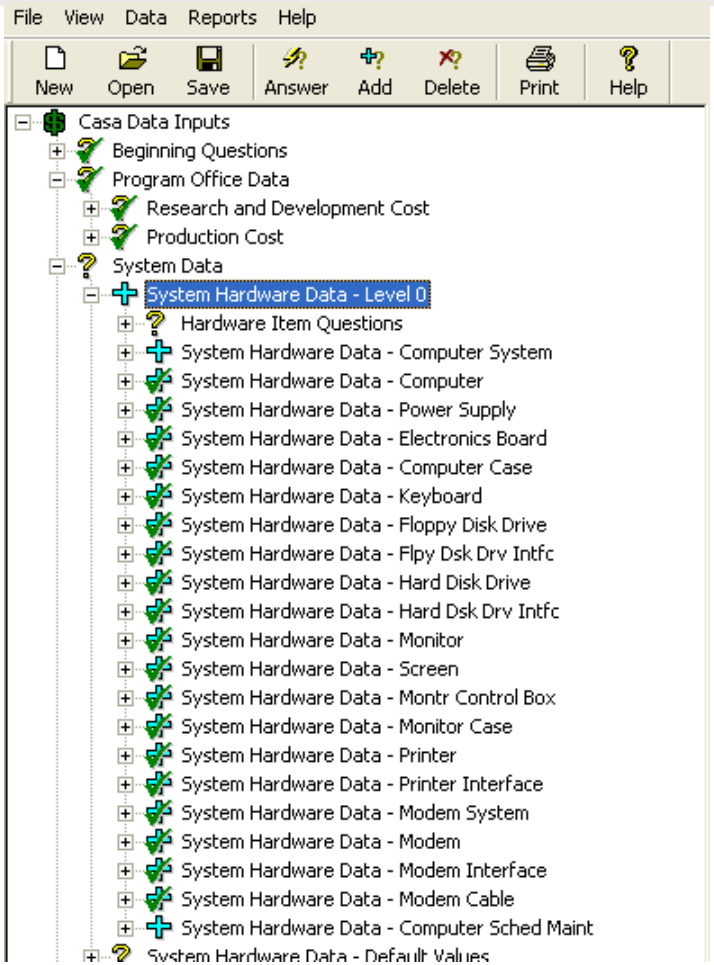
Importing Hardware Data from Excel



In the Data Source field select "COMPASS". In the Column Order field select "Default". This COMPASS file is missing an MTBF which CASA requires. In the Generate Missing Data field select the "MTBF" check box. WBS Level 1= '12000' and WBS Level 2='13000'. The Generate Missing Data function allows you to correct the spreadsheet to include the missing MTBF. In the Spreadsheet Data field, select the first item in the Excel file (row 2) by clicking on the "2", hold the left mouse button and pull down to the last item. Click the "Import Spreadsheet" button once.

Importing Hardware Data from Excel

(Continued)

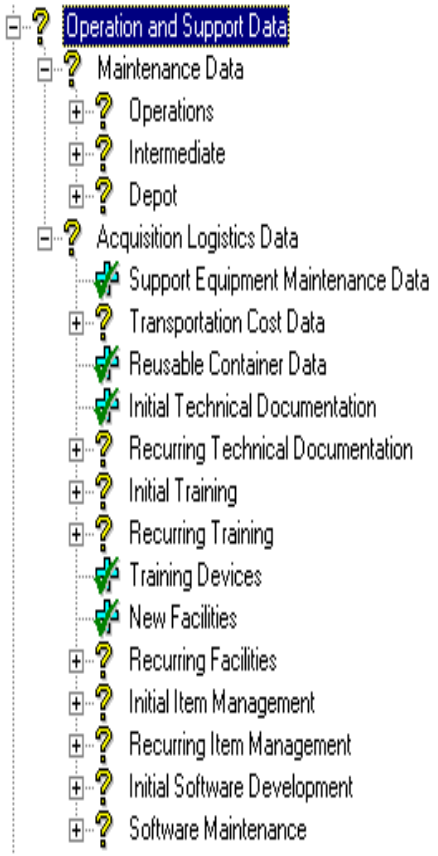


Once you return to the main screen, you will see the hardware items you imported by expanding the plus sign in the square next to “System Hardware Data – Level 0”.

Now you can highlight one of the Hardware Data items you imported, double click and expand it. You can see the data imported from the spreadsheet for that particular item.

The next item in this section is “System Hardware Data – Default Values”. This area is not necessary for our exercise. These questions should only be answered for a Risk Analysis. Continue to “Operation and Support Data”.

Operation & Support Data



- Now we move on to “Operation and Support Data”. Highlight this area on the Data Tree on the left side of the CASA main screen.

“Operation and Support Data” has two subgroups: “Maintenance Data” and “Acquisition Logistics Data”

“Maintenance Data” corresponds to data about the unique maintenance level(s) you previously defined in the “Beginning Questions” data group.

“Acquisition Logistics Data” deals with support items necessary to perform corrective maintenance. As the CASA tree shows, this data group includes, but is not limited to: Support Equipment, Transportation, Technical Documentation, Training/Training Devices, Facilities, Item Management, and Software Development/Maintenance.

Operation & Support Data Input

Enter the following O&S Maintenance Data for our example file

CASA Question	Operations	Depot
Number of Operating Systems Supported	1	30
Maintenance Labor Rate ($/hr)	45.00	75.00
Software Personnel Labor Rate ($/hr)	55.00	95.00
Available Support Equipment Hours per Month at	80	80
Support Equipment Utilization Factor at	0.8	0.8
Support Equipment Spares Cost Portion at	1.0	1.0
Spares Confidence Level at	0.95	0.95
Earned Hour Ratio at	1.0	1.0
System Repair Elapsed Time at	3.0	7.0

Operation & Support Data: Maintenance Data Definitions

Below are some data item definitions from the O & S data entry section on the previous page:

- Number of Operating Systems Supported - This variable indicates the maximum number of systems supported at a given type of maintenance facility. This ultimately will determine the number of facilities needed, and the cost to equip and operate each facility will add to the life cycle cost.
- Maintenance Labor Rate ($/hr) - This represents the average labor rate charged for repair work at the respective maintenance facility.
- Software Personnel Labor Rate($/hr) - This represents the average labor rate charged for software work performed at the respective maintenance facility.
- Available Support Equipment Hours per Month - The number of available hours per month for support equipment at this maintenance level. This is used to determine, based on maintenance demand, how many units of support equipment to buy and maintain. This can never be 0. If there is no activity at a particular level, enter a 1.
- Support Equipment Utilization Factor - The fraction of Available Support Equipment Hours per Month that the support equipment is actually available. This can never be 0, if there is no activity at a particular level, enter a 1. This is used in support equipment loading to determine the support equipment requirements.

Operation & Support Data: Maintenance Data Definitions

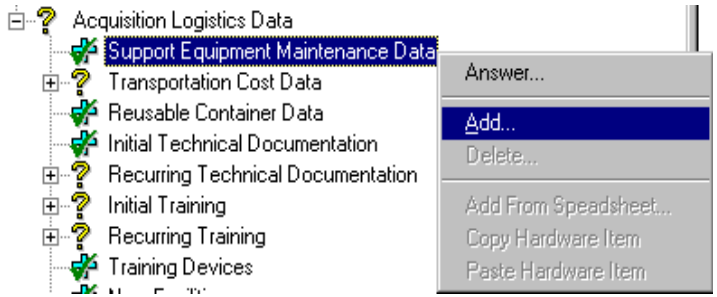
- Support Equipment Spares Cost Portion - The initial cost of support equipment spare modules, piece parts, and material for repair of support equipment at this maintenance level, expressed as a decimal fraction of support equipment acquisition cost.
- Spares Confidence Level - The spares no-stockout confidence level at this maintenance level, expressed as a decimal fraction. This is the probability of meeting all spares demands within the turnaround time of an item. This is used in initial acquisition of hardware spares.
- Earned Hour Ratio - The earned hour ratio at this maintenance level. This factor multiplies input Mean Time to Repair and Support Equipment Hours Required at Each Maintenance Level to obtain actual elapsed times. This is used in system and support equipment repair costs, and training cost. This provides a method for adjusting the Mean Time to Repair to account for logistics downtime or other factors.
- System Repair Elapsed Time - The mean elapsed time (in hours) to remove and replace an LRU from a system (used only in Ao equations). This time includes transportation time.

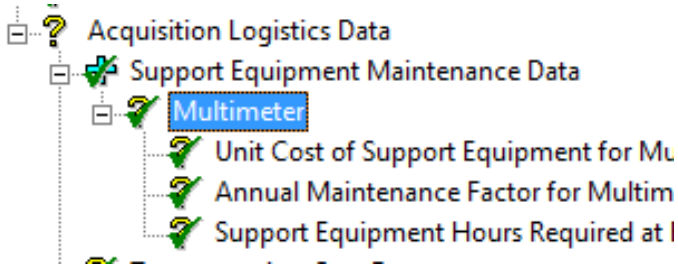
Operation & Support Data: Acquisition Logistics Data

Highlight “Acquisition Logistics Data” on the Data Tree and expand by clicking the plus sign.

Acquisition Logistics Data deals with the support items necessary to perform corrective maintenance. As the CASA tree shows, this data group includes, but is not limited to: Support Equipment, Transportation, Technical Documentation, Training/Training Devices, Facilities, Item Management, and Software Development/Maintenance.

Operation & Support Data: Acquisition Logistics Data



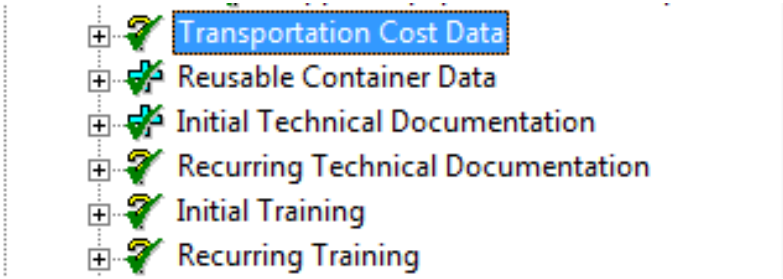


Support Equipment Maintenance Data: Add a piece of support equipment by highlighting "Support Equipment Maintenance Data" right click and select "Add." The name of the item is "Multimeter." Once you enter the name press <OK>, which will return you to the main screen.

Answer the three questions pertaining to data on the Multimeter. The 3 questions are: "Unit Cost", "Annual Maintenance Factor", and "Support Equipment Hours Required for Each Maintenance Level".

For our practical exercise enter the following values: "Unit Cost" = '500'; "Annual Maintenance Factor" = '0.1'; "Support Equipment Hours Required for Each Maintenance Level" = enter as '0.25' hours for the 'Power Supply' at each maintenance level.

Operation & Support Data: Acquisition Logistics Data



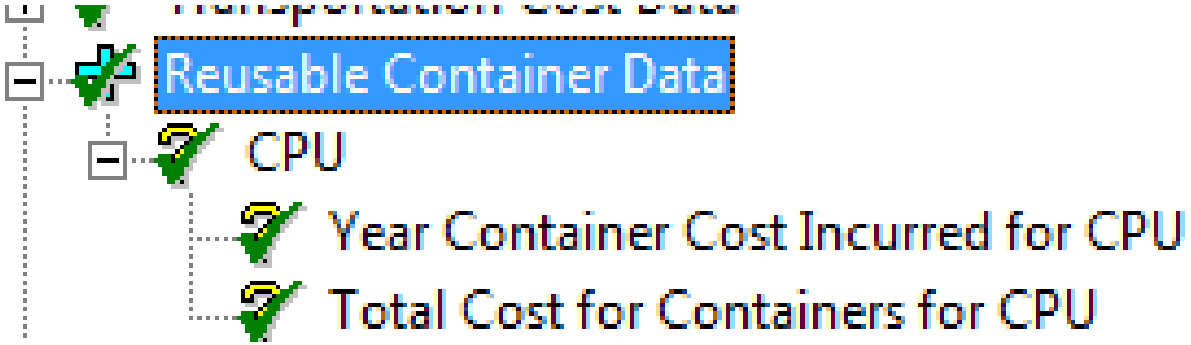
Question	Answer	Units
Operations to Depot Cost per Pound per Trip	3.00	Dollars
Depot to Factory Cost per Pound per Trip	0.00	Dollars
Packaging and Paperwork Cost per Trip	25.00	Dollars

Transportation Cost:

This area accounts for the cost of shipping items between maintenance levels. In CASA, transportation costs are based on weight and cost per pound.

Enter ‘3’ for Operations to Depot . Assume ‘0’ for Depot to Factory cost.
Enter ‘25’ for Packaging and Paperwork Cost.

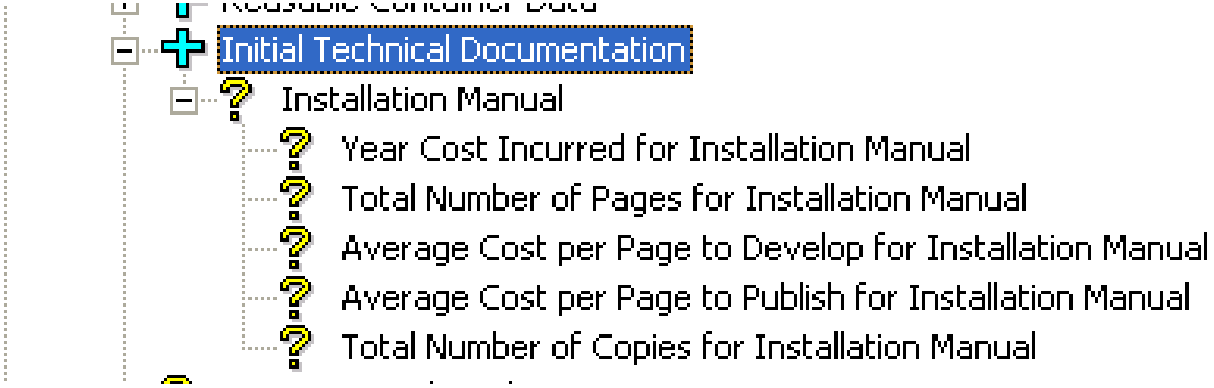
Operation & Support Data: Acquisition Logistics Data



Now add a reusable container by highlighting “Reuseable Container Data” on the Data Tree.

- Right click the mouse on the highlighted area, and select “Add.”
- Type in “CPU Shipping Box”
- Select <OK>
- Answer the questions pertaining to the item added.
- Enter ‘2012’ as the year and ‘300’ for the cost of the CPU Shipping Box.

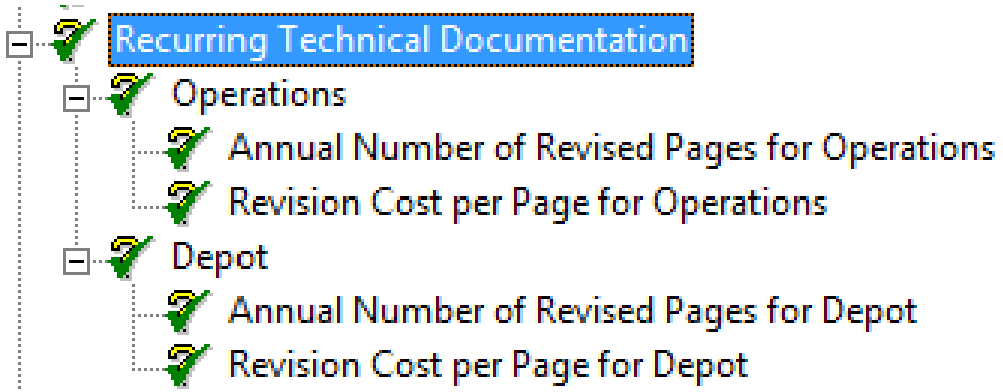
Operation & Support Data: Acquisition Logistics Data



Now add an "Installation Manual" under "Initial Technical Documentation".

- Highlight "Initial Technical Documentation", then right click.
- Click "Add" and type in "Installation Manual".
- Answer the additional questions that follow.
- "Year Cost Incurred" = '2012'
- "Total Number of Pages" = '100' pages long.
- "Average Cost per Page to Develop" = '500' per page.
- "Average Cost per Page to Publish" = '0.60' per page.
- "Total Number of Copies" = '50' Install manuals.

Operation & Support Data: Acquisition Logistics Data

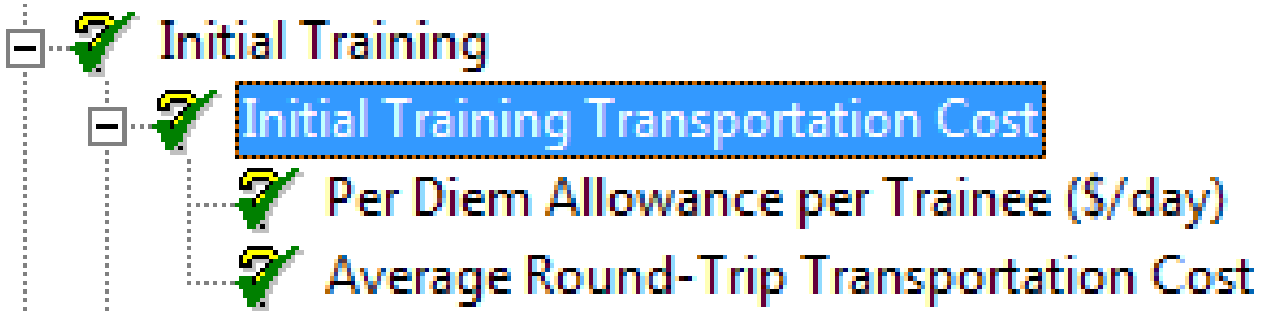


Recurring Technical Documentation:

This data group pertains to each level of maintenance. However, data may not always be required for all levels.

For this Practical Exercise, enter the following at *each maintenance level:*
> '2' revised pages per year
> cost of '1000' per page.

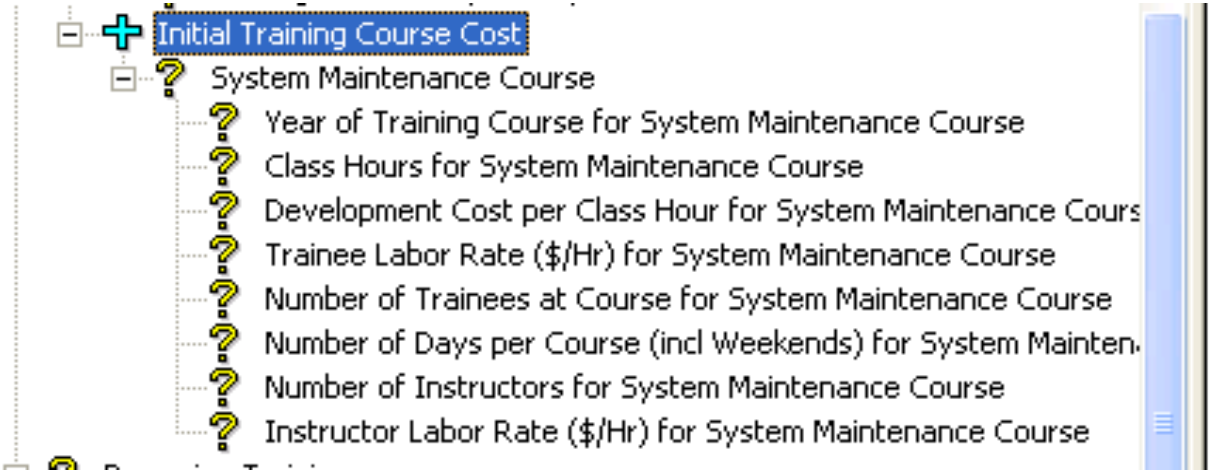
Operation & Support Data: Acquisition Logistics Data



Under “Initial Training Transportation Cost”, answer “Per Diem” and “Round Trip” cost as stated below:

Input a “Per Diem” estimate of ‘150’ for each trainee and a “Round-Trip” cost of ‘900’.

Operation & Support Data: Acquisition Logistics Data

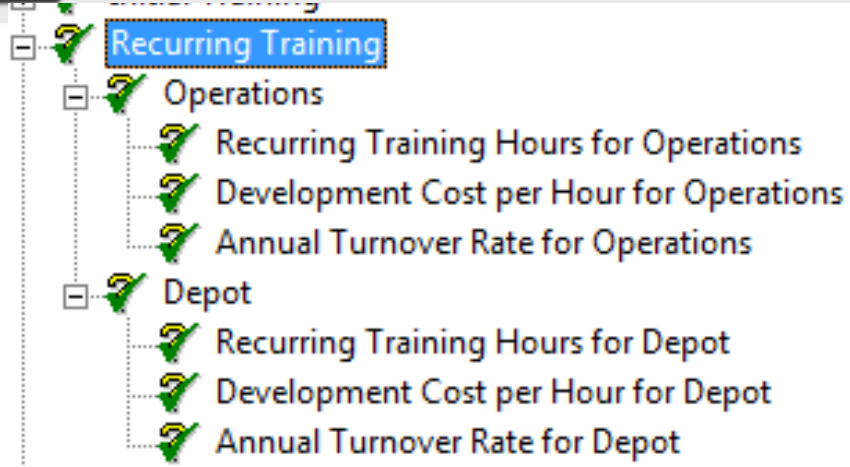


Also under this data subgroup, you can add courses for “Initial Training”. Right click on “Initial Training Course Cost” and add a “System Maintainer Course”.

Enter the following data pertaining to this course:

“Year” = ‘2012’; “Class Hours” = ‘16’ ; “Development Cost” = ‘250’; “Trainee Labor Rate” = ‘75’ ; “Number of Trainees” = ‘30’; “Number of Days” = ‘2’; “Number of Instructors” = ‘2’; and “Instructor Labor Rate” = ‘95’.

Operation & Support Data: Acquisition Logistics Data



Under “Recurring Training” enter the following values for both maintenance levels:

“Recurring Training” will be entered as ‘16’ hours

“Development Cost per Hour” of ‘250’.

“Annual Turnover Rate is ‘0.33’.

Operation & Support Data: Acquisition Logistics Data

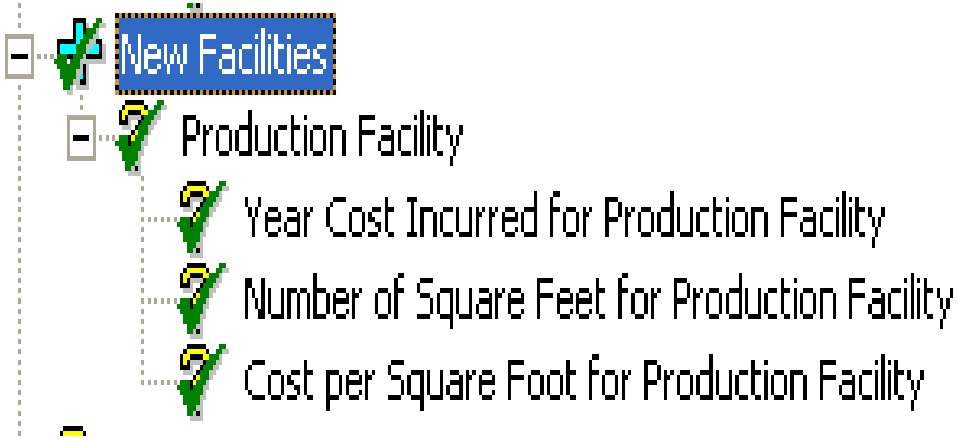
We will now add a “Repair Trainer Unit” under “Training Devices”.

Highlight “Training Devices” and right click.

Click “Add” and answer the questions for “Repair Trainer Unit”.

The unit will be procured in the year ‘2012’ and a quantity of ‘3’ training units will be purchased at a unit cost of ‘20000’.

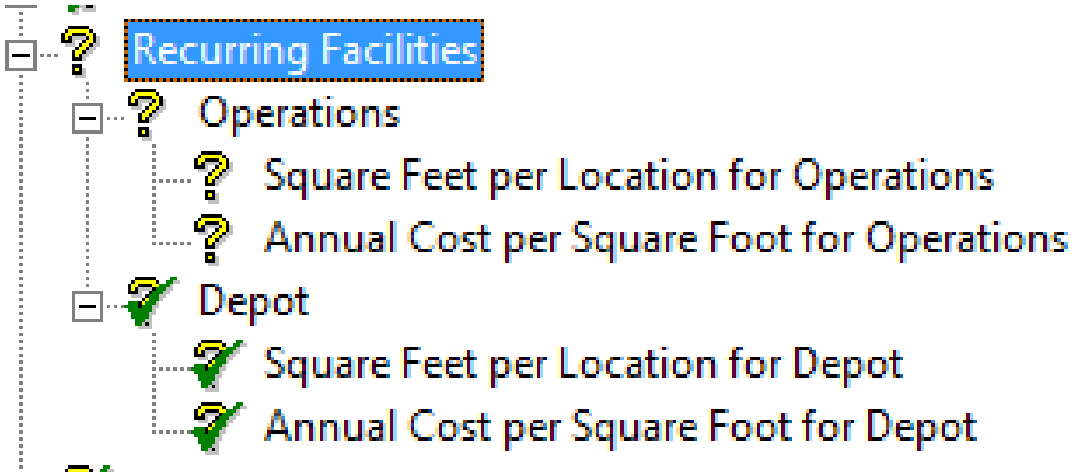
Operation & Support Data: Acquisition Logistics Data



A government owned "Production Facility" will be required under "New Facilities". Highlight "New Facilities", right click, and click "Add". Type 'Production Facility' and answer the following questions.

- "Year Cost Incurred for Production Facility" = '2012'
- "Number of Square Feet for Production Facility" = '5000'
- "Cost per Square Foot for Production Facility" = '200'

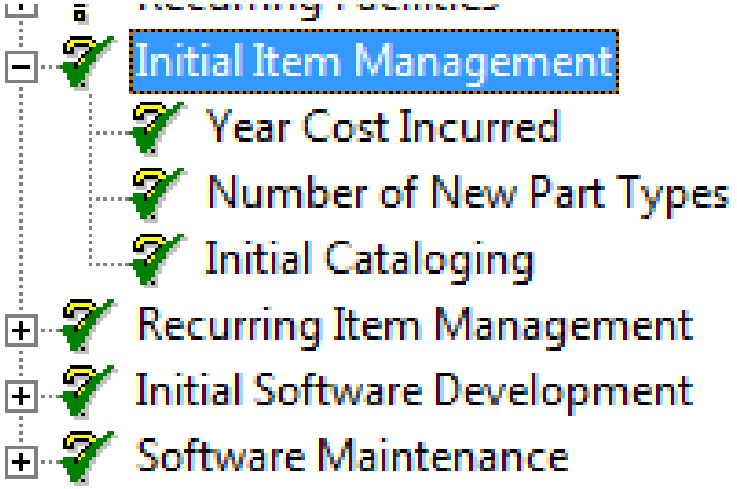
Operation & Support Data: Acquisition Logistics Data



In this example, there is no cost for “Recurring Facilities” at the Operations level. Therefore, input these values as ‘0’.

The Depot Maintenance Level requires ‘400’ square feet of space at an annual cost of ‘80’ per square foot.

Operation & Support Data: Acquisition Logistics Data

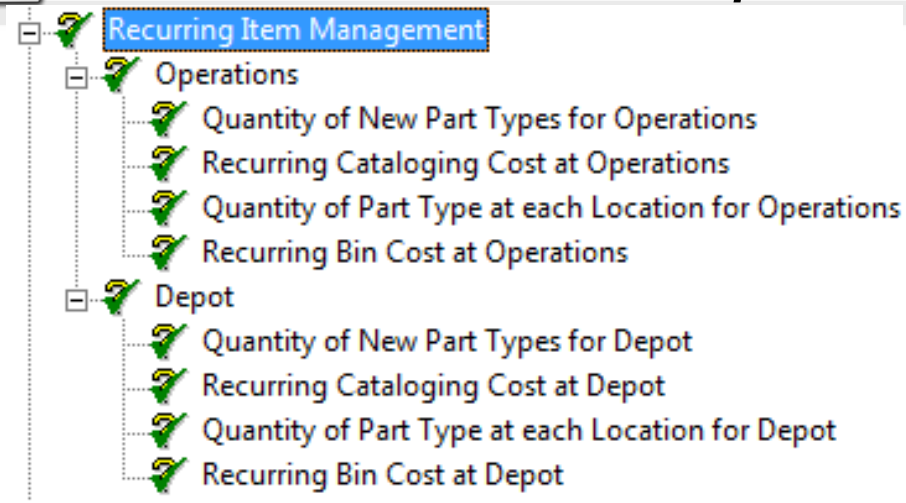


New parts may be introduced into the project under “Initial Item Management”.

For this exercise, input the following:

- “Year Cost Incurred” = ‘2012’
- “Number of New Part Types” = ‘10’
- “Initial Cataloging” = ‘1000’

Operation & Support Data: Acquisition Logistics Data

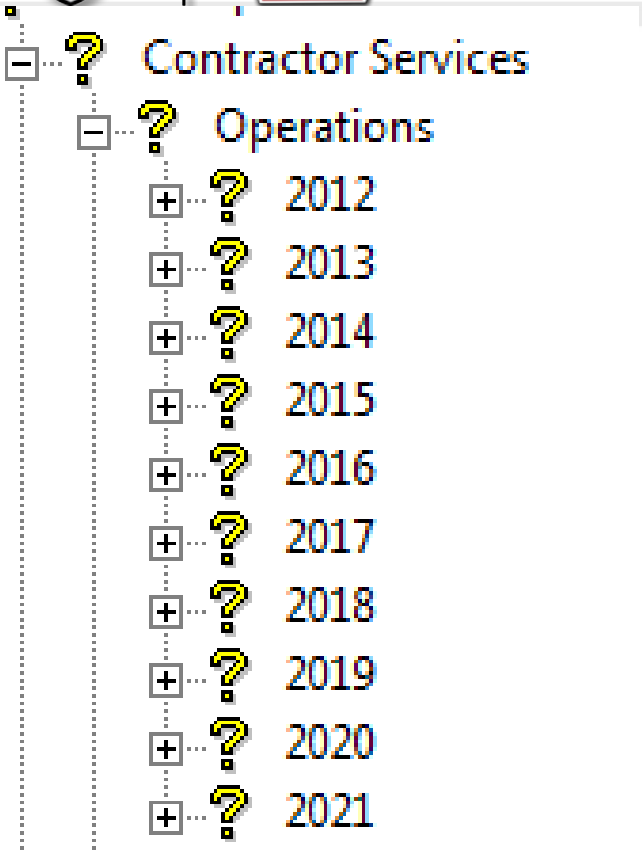


For “Recurring Item Management”, and the “Operations” level input:

- “Quantity of New Part Types for Operations” = ‘1’
- “Recurring Cataloging Cost at Operations” = ‘10’
- “Quantity of Part Type at each Location for Operations” = ‘1’
- “Recurring Bin Cost at Operations” = ‘1000’

- REPEAT these values at the Depot levels.

Other Input Cost Data Contractor Services



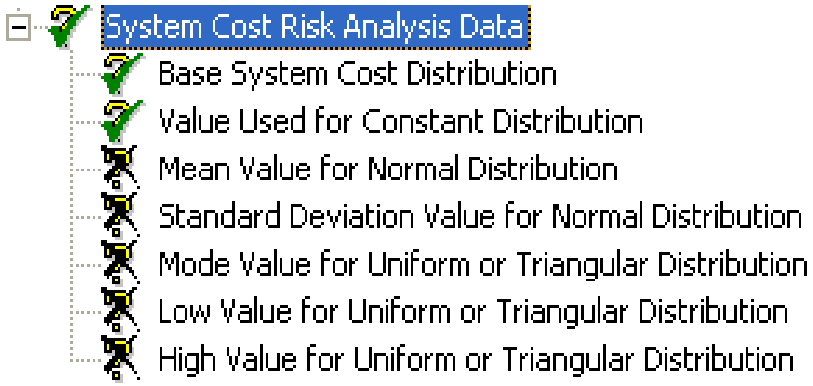
"Other Input Cost Data" covers contracted services, engineering changes, other anticipated miscellaneous costs, warranty costs and cost risks.

Input Contractor Technical Representative costs for 2012 in the Operations Level only.

Expand "Contractor Services", "Operations" Level, "2012", and answer the two questions.

Use '1' man-month and "Cost per Man-Month" = '10000'

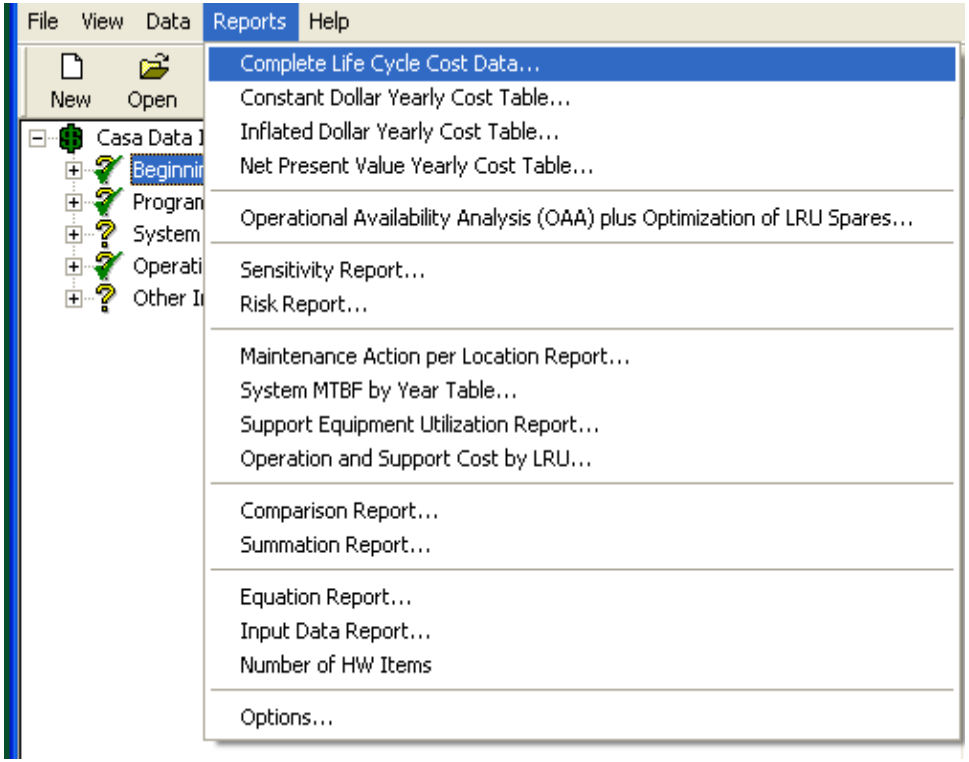
Enter Other Input Data: System Cost Risk Analysis Data



The purpose of the Risk Analysis is to examine the likelihood that the life cycle cost will fall within a specified range relative to the predicted point estimate. Uncertainty in unit cost, MTBF, and MTTR can be modeled using a constant, normal, triangular or uniform distribution.

For our exercise we will leave this value as a ‘Constant Distribution’ with ‘1’ used as the “Value for Constant Distribution”.

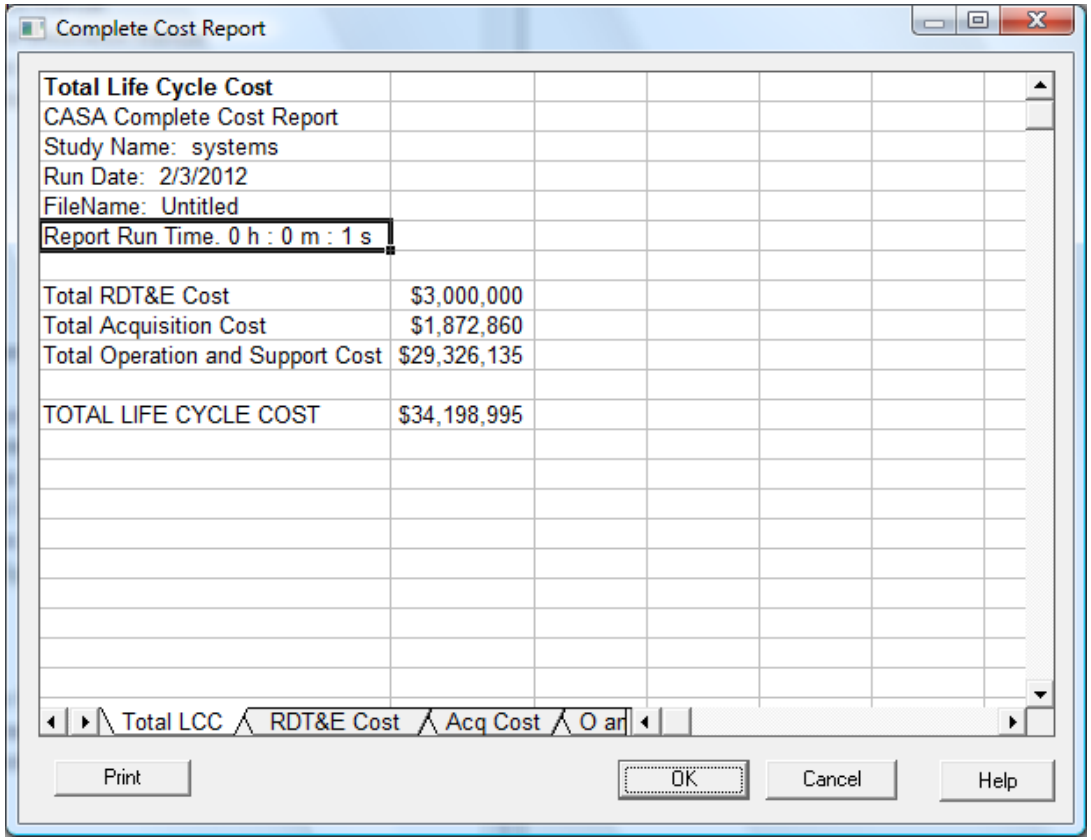
Create Reports



The CASA Reports are designed to support a specific need of the analyst. The reports summarize the LCC calculation results, characterize the validity of assumptions, identify cost drivers, and perform comparisons with other CASA files.

Go to “Reports” on the Menu Bar and click “Complete Life Cycle Cost Data” to run this report.

Output Reports: Complete Life Cycle Cost



The complete Life Cycle Cost Data Report is a summary report of all costs. Costs are shown in the RDT&E Phase, the Acquisition Phase and the Operation and Support Phase. The Total LCC tab provides costs for all phases. Further detail is shown by clicking on the individual tabs at the bottom of the spreadsheet.

Output Reports: Constant Dollar Yearly Table

Report

Yearly Costs | Chart

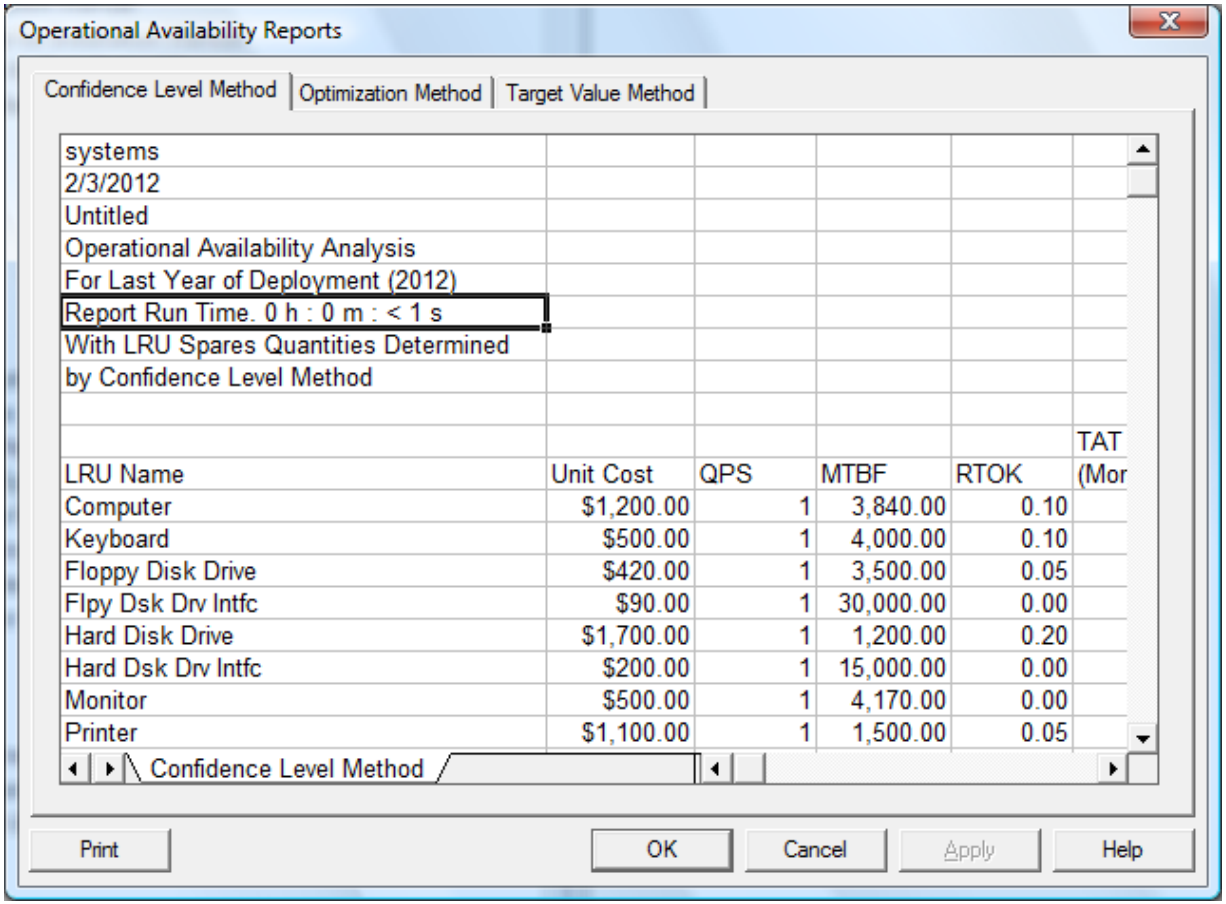
Constant Dollar Report		Constant Annual Costs			
systems 2/3/2012		(in Year 2012 Dollars X 1000)			
Untitled					
Report Run Time. 0 h : 0 m : < 1 s	2012	2013	2014	2015	2016
RDT&E Costs					
Total RDT&E Costs	$3,000.0	$0.0	$0.0	$0.0	$0.0
Acquisition Costs					
Tooling And Test Equipment	$0.0	$0.0	$0.0	$0.0	$0.0
Start Up	$275.0	$0.0	$0.0	$0.0	$0.0
System Acquisition	$117.0	$0.0	$0.0	$0.0	$0.0
Shipping Container	$20.0	$0.0	$0.0	$0.0	$0.0
Pre-Prod Eng Chnge	$0.0	$0.0	$0.0	$0.0	$0.0
Pre-Prod Refurbish	$5.0	$0.0	$0.0	$0.0	$0.0
Installation	$24.0	$0.0	$0.0	$0.0	$0.0
Support Equipment	$1.0	$0.0	$0.0	$0.0	$0.0
Hardware Spares	$210.4	$0.0	$0.0	$0.0	$0.0
Spares Reusable Containers	$0.3	$0.0	$0.0	$0.0	$0.0
Initial Tech Data	$53.0	$0.0	$0.0	$0.0	$0.0

Constant Dollar Report

Print | OK | Cancel | Apply | Help

The Constant Dollar Yearly Cost Table Report provides the same cost categories as the Complete Life Cycle Cost Report, but it breaks down the cost by year. The data is shown in both tabular and graphical formats. The graphical format can be viewed by clicking on the “Chart” tab at top of the window.

Output Reports: Operational Availability Report

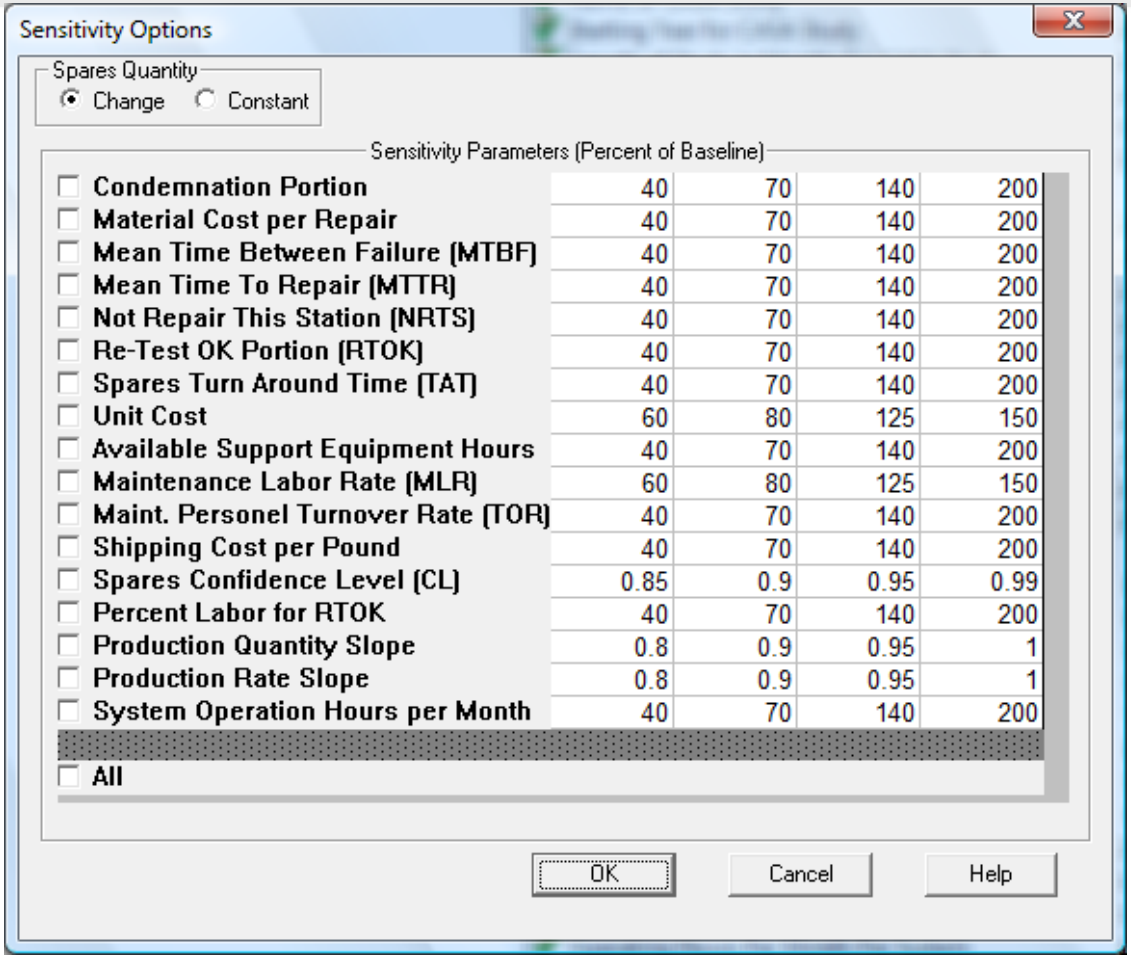


There are 3 options within this report. The "Confidence Level Method" allows users to define the acceptable spares confidence level at the lowest level of maintenance.

The "Optimization Method" determines the best spares inventory based on spares budget.

The "Target Value Method" optimizes spares based on Ao target. Click on the appropriate tab at the top to select which method to view.

Output Reports: Sensitivity Analysis

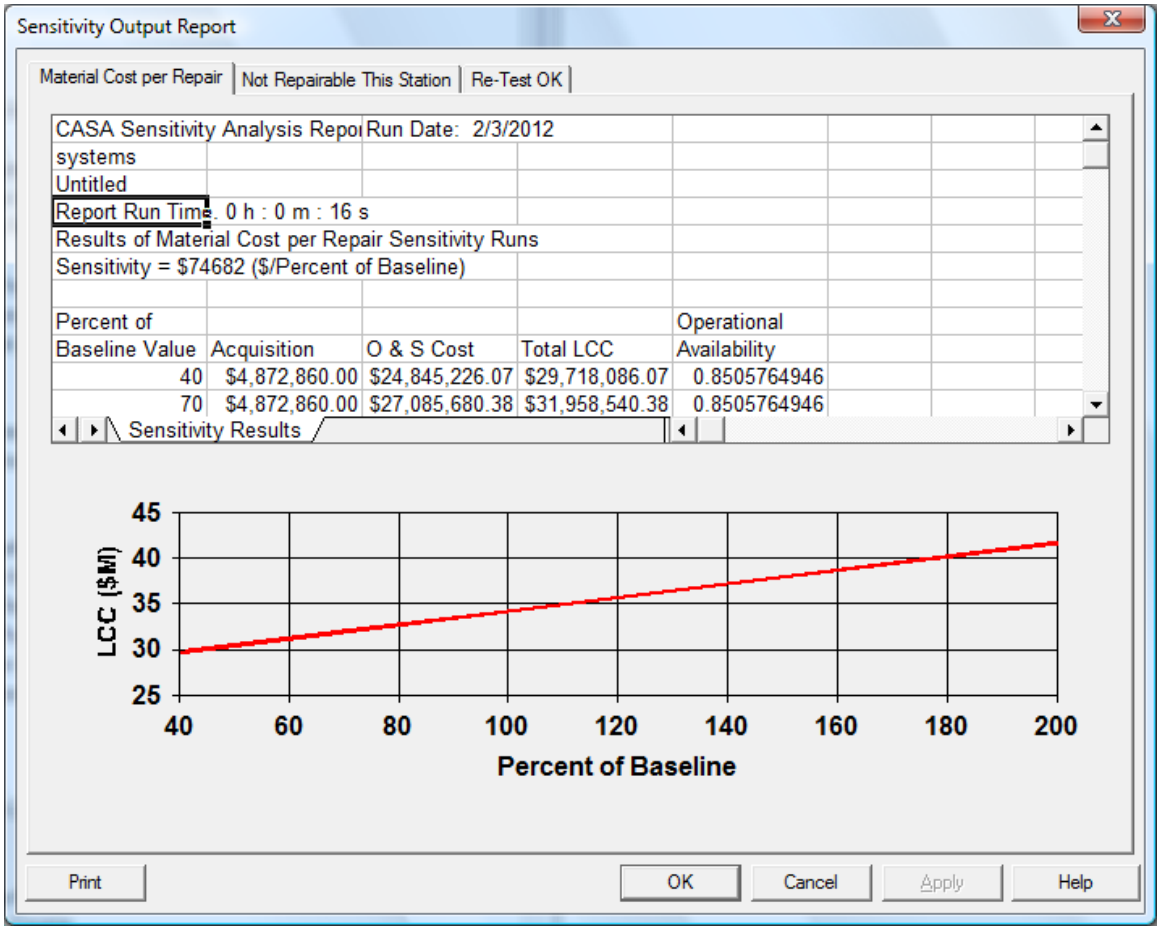


The Sensitivity Report provides a convenient tool to assess the impact of data estimates and assumptions.

Simply select the categories to check and enter four sensitivity parameters that are scaling factors based on a percentage of the original value.

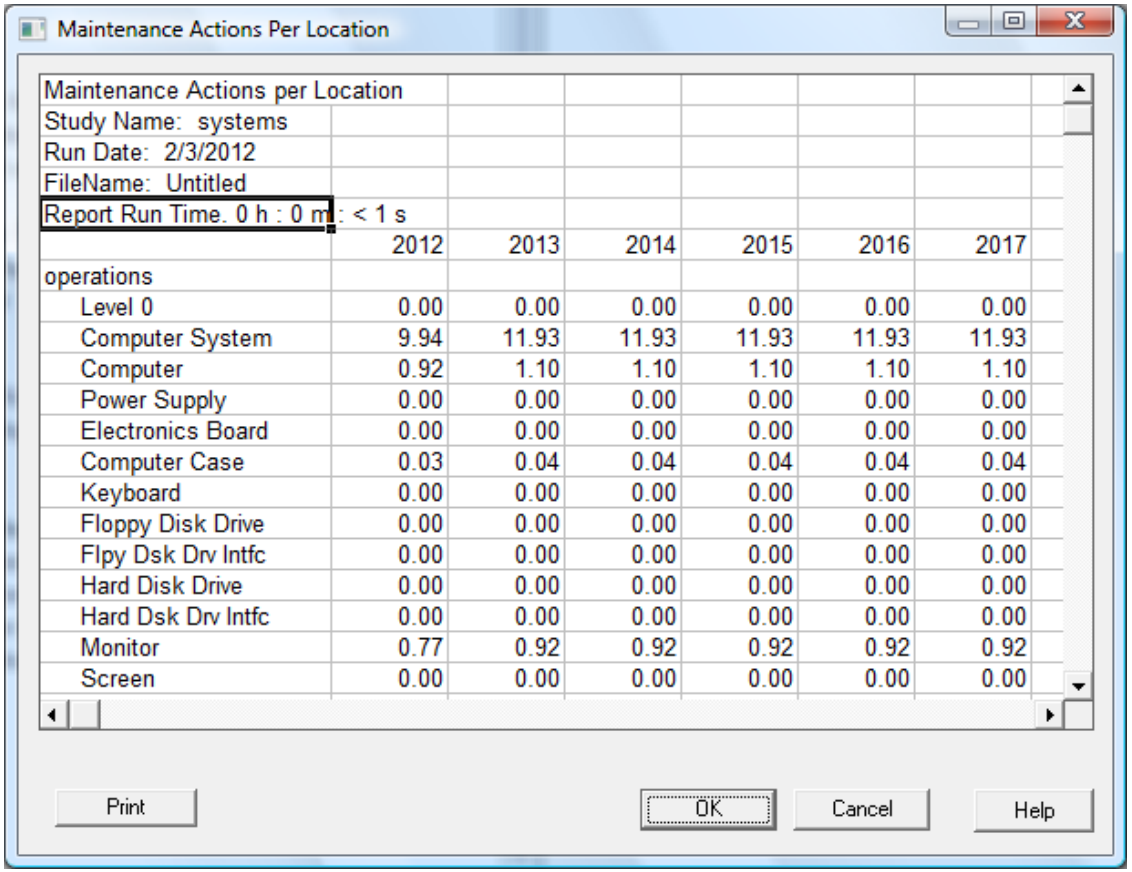
The report generated will show how the LCC for your project would change if your inputs were updated at a later time.

Output Reports: Sensitivity Analysis



The output values are displayed in both table and graphical formats. The results for each varied parameter are displayed on separate tabs.

Output Reports: Maintenance Actions Per Location



	2012	2013	2014	2015	2016	2017
operations						
Level 0	0.00	0.00	0.00	0.00	0.00	0.00
Computer System	9.94	11.93	11.93	11.93	11.93	11.93
Computer	0.92	1.10	1.10	1.10	1.10	1.10
Power Supply	0.00	0.00	0.00	0.00	0.00	0.00
Electronics Board	0.00	0.00	0.00	0.00	0.00	0.00
Computer Case	0.03	0.04	0.04	0.04	0.04	0.04
Keyboard	0.00	0.00	0.00	0.00	0.00	0.00
Floppy Disk Drive	0.00	0.00	0.00	0.00	0.00	0.00
Flpy Dsk Drv Intfc	0.00	0.00	0.00	0.00	0.00	0.00
Hard Disk Drive	0.00	0.00	0.00	0.00	0.00	0.00
Hard Dsk Drv Intfc	0.00	0.00	0.00	0.00	0.00	0.00
Monitor	0.77	0.92	0.92	0.92	0.92	0.92
Screen	0.00	0.00	0.00	0.00	0.00	0.00

The Maintenance Actions per Location report provides the number of maintenance actions at the location of the primary repair level.

Survey

After finishing this practical exercise in class, please go to the following address and fill out our training survey:

https://www.logsa.army.mil/lec/forms/training/survey.cfm

Life Cycle Cost Analysis

LEC SmartDesk

Contact the LEC staff through our SmartDesk at:

(256) 955-9847
DSN 645-9847

Or with email at:

Email: logsa.powerlog.help@conus.army.mil
Web: https://www.logsa.army.mil/lec/casa/