Components that fail must either be discarded or repaired. RAM Commander provides you with a flexible module for developing and performing maintainability prediction and analysis.

Maintainability is a measure of how long a product is not available for use. When components are being maintained, they pass through a sequence of repair tasks that transform them from failure status to available status. Such tasks typically fall into the categories of disassembly, diagnosis, repair and reassembly.

RAM Commander allows you to build your own time and task libraries. Standard times are times you define for performing a particular activity. A standard task is a sequence of standard times. You can use standard time and task libraries to compute maintainability times for your system.

RAM Commander allows you to build libraries of skill types, equipment items and material types. You may use these libraries to specify skills, equipment and materials required to perform each maintenance task. From Maintenance Tasks Analysis report you may get a prediction of work load for each skill type and equipment, and usage of materials.

RAM Commander’s maintainability prediction module is based on the recommendations in MIL-HDBK-472, Procedure 5, Method A. The main definitions, models and assumptions presented in this chapter are taken from this document. Refer to MIL-HDBK-472 and MIL-STD-721 for more information on RAM Commander’s maintainability prediction module.

Method A, Procedure 5 of MIL-HDBK-472 is used to predict maintainability parameters for any type of system or equipment, including avionics, ground and shipboard electronics, or mechanical
equipment, at organizational, intermediate, depot, supplier and manufacturer levels of maintenance.

See Appendix H for a theoretical discussion of maintainability prediction.

**Philosophy and Assumptions**

RAM Commander assumes that all corrective action consists of the following maintenance tasks:

- Preparation
- Fault isolation
- Disassembly
- Interchange (Remove/Replace)
- Reassembly
- Alignment (Calibration)
- Checkout (Verification)
- Start-up
- Other (all other tasks not in the above list)

In addition to the general assumptions listed in MIL-HDBK-472 Procedure 5, the RAM Commander maintainability prediction process includes an additional term: *level of replace*. Level of replace represents the specific maintenance level (location) where an item is to be removed and replaced. Therefore, the level of replace of an item corresponds to the level of repair of its parent. This assumes that an assembly is repaired by replacing one or more of its lower level parts. The level of replace of the lower level parts must be equal to the level of repair of the assembly. MTTR can only be calculated for this situation.
Chapter 13  
Maintainability Prediction  

When there are functional items in the product tree, then use “level of replace = unapplicable” so that these items will be transparent for MTTR calculation purposes. Unapplicable may be assigned to as many levels as required.

**Information Required**

You must provide the following data to perform maintainability prediction:

- The list of maintenance tasks or activities, including the number and description of all steps required to restore each replaceable item.
- For each task, the list of skills, equipment and materials required to perform the task.
- The failure rates associated with each replaceable item. These are taken automatically from the reliability prediction module.
- The estimated or required fault isolation resolution, expressed as a percentage of faults isolated to each of the ambiguity groups.
**Note** RAM Commander is able to take the ambiguity groups data from FMECA.

**Preliminary Steps**

You must be in maintainability mode to access the standard times and tasks libraries.

**To enter maintainability mode**

1. Activate the Product tree view.
2. From the **Project** menu, choose **Configuration**.
3. In the Project Configuration dialog box, select **Maintainability** as the current processor, and choose **OK**.
   - OR -
   Select the Maintainability button in the Product tree view button bar.
4. You may also set up maintenance levels names:
   1. Activate the Project tree view
   2. Choose the Project Configuration from the Project menu; the Project Configuration dialog box is displayed.
   3. Click to choose the type of Current Analysis.
   4. Click the Repair/Replace Levels button; the dialog box with maintenance levels is displayed.
   5. Change them as you wish and click OK. The level names appear in Maintainability Data Tab of Item Edit dialog box as well as in other related dialogs and reports, like Maintainability reports and Spare Parts Calculation/Analysis.

All RAM Commander windows and dialog boxes change their appearance to accommodate maintainability mode.
**Maintenance Corrective Time - Mct**

The first step in calculating the MTTR of an item is to define its level of repair and then to calculate the Mct for all its next lower level items.

**To enter Mct data**

1. Select the required item in the Product tree view.

2. From the Tree menu, choose Edit; the Item Data dialog box opens.

The three fields grouped together in the upper left section of the dialog box contain information required to calculate maintainability parameters for the current item.

Define the following:
Method of Mct calculation

If you select default from the list box, then RAM Commander uses the maintainability method defined in the Project Configuration dialog box. If you select user defined, then you can select a maintainability method in the Method list box.

Method

Make a selection from this list box if you selected user defined in the Method of Mct calculation list box.

Level of Replace

Make a selection from this list box if you want to consider the item during maintainability prediction. (This selection must be made according to the rule on page 328).

In addition to these three fields, you must also make a selection for the source of Mct. In the list box, just under the maintainability parameter fields, you can select one of the following three values:

Predicted

The computation is made according to the selected maintainability prediction method. RAM Commander displays the result in the Mct(c) field.

User defined

You explicitly enter a value in the Mct(m) field.

Allocated

Select this value when you want to use the result of the maintainability allocation. See page 346 for details on maintainability allocation.

The lower part of the dialog box includes information required for the MTTR calculation of the current item as an assembly. Here you define the following parameters:

Level of Repair

Select Discard, Unapplicable, Organizational, Intermediate, Depot, Supplier or Manufacturer

Confidence level

Select a percentile used for calculating $Mct_{\text{max}} (\Phi)$
Fault Isolation and Ambiguity

In most products, a few components are responsible for most of the product failures, while the remaining components tend to function perfectly throughout the product’s life. This behavior is similar to the Pareto principle discussed in Chapter 11.

As a product undergoes the diagnostic phase of repair, the technician will first examine the problematic components in an attempt to locate the fault as quickly as possible. This effort can be modeled using fault isolation.

To define the fault isolation scenario, you first define up to five groups of parts $N_1$, $N_2$...$N_5$. Each group is a subset of the next group that the technician examines. $N_1$ includes the set of parts examined first, $N_2$ includes the parts examined in $N_1$ plus the next set of parts, and so on. If all sets of parts $N_1$...$N_5$ are examined, then in effect the technician has examined the entire product tree.

Associated with each part grouping is a probability of fault isolation. This is the probability that the faulty component is a member of any one of the examined sets. Suppose you group all the problematic components for the first set $N_1$. Then the probability ($X_1$) that the fault will be detected while examining the set of parts in group $N_1$ will be high. If the fault is not detected while examining $N_1$, then the probability ($X_2$) of detecting the fault while examining the set $N_2$ will be higher. This continues until the technician examines the last set of parts - $N_5$, whereupon the probability of isolating the fault after examining all components is $X_5 = 100\%$.

For example, if a failure is always isolated to a single part in group $N_1$, then

$$X_1 = \ldots = X_5 = 100\%$$

and $N_1 = 1$.

If in 80% of the cases a failure is isolated to a single part, and in the remaining 20% to two parts, then $X_1 = 80\%$, $X_2 = 100\%$, $N_1 = 1$ and $N_2 = 2$. 
In the Fault Isolation group box, enter your values for $N_1 \ldots N_5$ and $X_1 \ldots X_5$.

The value of the *ambiguity factor* $S$ is calculated based on fault isolation and is used to calculate the MTTR for an assembly.

**MIL-HDBK-472-Procedure 5 Maintainability**

If you selected *default* for Method of MCT Calculation and MIL-472-Procedure 5 was selected as the default maintainability prediction method in the Project Configuration dialog box, then choosing OK in the Item Data - Maintainability dialog box displays the Maintainability-MIL-472-Procedure 5 button in the upper right section of the Item data dialog box. Click on the button. The maintenance task list will appear.
To define MIL-472 Procedure 5 maintainability task information

1. If necessary, update the reference designator in the Ref. Des. field.

2. Do one of the following:

   - To append a new task type to the end of the task list, choose **Append**. The Maintainability Task Description dialog box opens (see above). Follow the steps in the next procedure.
   
     - OR -

     Enter the task information directly into the last row marked with an *

   - **To insert a new task** type above the one currently highlighted, choose **Insert**. The Maintainability Task Data dialog box opens. Follow the steps in the next procedure.

   - **To edit a highlighted task** type, choose **Edit**. The Maintainability Task Data dialog box opens. Follow the steps in the next procedure.

   - **To copy a task**, select it and choose **Copy**. RAM Commander appends it at the end of the task list.

   - **To delete a task**, select it and choose **Delete**. RAM Commander deletes the task and redisplay the task list.

   - **To set the tasks order** – use the move up and move down buttons to move that task accordingly.

3. Choose **Close**.

RAM Commander stores the maintenance task list for the current item.
Preventive Maintenance

In addition to Corrective Maintenance, Maintainability module supports Preventive Maintenance procedures.

Choose Preventive in Maintenance type list box of Maintainability/RCM dialog box. Click on Add button. Add/edit procedure name box appears. Enter required procedure and click on OK.

In Preventive Maintenance procedure type list box choose Condition Monitoring, Failure Finding, or Restore or Discard.

A number of different maintenance procedures may be defined, each procedure with its own frequency.

The frequency may be user-defined or optimized.

Choose Task type and enter Task description.

Your screen looks like below:
You can edit or delete your defined maintenance procedures by clicking respectively on **Edit** or **Delete** buttons in the upper right hand part of the screen.

**MIL-472-Procedure 5 Task Definition**

Customize tasks by taking data from the standard task library, standard times library, or by creating your own user-defined tasks and times. All the procedures relate to the following dialog box.
You can use this dialog box to specify maintainability tasks using the standard tasks and times libraries supplied with RAM Commander.

To define a tasks using user-defined times
1 Select User Defined from the list box in the upper right hand corner of the dialog box.
2 Enter a task name in the Description field.
3 Enter the time in the User Defined Time field.
4 Enter a value for Mp (if different from 1).
5 Choose OK.

RAM Commander redisplays the Maintainability/RCM dialog box with the updated task.
To retrieve a standard time from the standard times library
1 Select Standard Times from the list box in the upper right hand corner of the dialog box.
2 In the Standard Times group box, select a standard time from the Description list box.
3 Enter a quantity for the standard time in the adjacent Qty field; the standard time is displayed in the adjacent Time field.
4 Repeat steps 2-3 for each additional standard time in the task.
5 Choose OK.
RAM Commander redisplays the Maintainability/RCM dialog box with the updated task.

To retrieve a standard task from the task library
1 Choose Tasks Library from the list box in the upper right hand corner of the dialog box.
2 In the Tasks Library list box, select a task. RAM Commander takes the task description and time displayed in the Total Time field from the Tasks Library.
3 Choose OK.
RAM Commander redisplays the Maintainability/RCM dialog box with the updated task.

To define a task’s maintenance data
1 Switch to Skills tab
2 Choose from the Maintenance Library types of skills required to perform the task, enter number of workers for each skill:
3 Switch to STE (Support and Test Equipment) and enter (by choosing from the Maintenance Library) all the equipment required to perform the task:

4 Switch to Materials tab and enter (by choosing from the Maintenance Library) all the materials required to perform the task:
Mean Time To Repair - MTTR

Before computing MTTR for an item, you must

- Enter all the maintainability information on the item’s children.
- Perform reliability calculations. See Chapter 10 for reliability calculation procedures.

To compute MTTR

1. Activate the Product tree view.
2. From the Calculation menu, select the desired computation method.

RAM Commander redisplay the Product tree view with updated values for MTTR and Mct.
Maintainability Calculation

Quick Mode

When calculating in quick mode, RAM Commander computes MTTR and Mct using the entire product tree and recalculates items changed since the previous calculation.

To calculate MTTR and Mct in Quick mode
1. Activate the Product tree view.
2. Change the Current Analysis, if necessary, using the corresponding icon on the Product tree view button bar.
3. Choose OK.
4. From the Calculation menu, choose Quick.

Note There is an option of automatic recalculation when defining the project properties to ensure that the RAM Commander output is based on the latest updated data (See – Adding a new project Chapter 8).

Recalculate All

This function is the same as Quick Mode, but it also recalculates Mct for all items with the latest data from the maintainability library.

To calculate MTTR and Mct in Recalculate All mode
1. Activate the Product tree view.
2. Select the Current Analysis using the Product tree view button bar.
3. From the Calculation menu, choose Recalculate All.
RAM Commander computes MTTR and Mct using the items and libraries current data. These results appear in the Product tree view.

**Methods of Mct max Calculation**

RAM Commander implements the advanced approach to the $M_{ct_{\text{max}}}$ calculation in the maintainability module.

**To select Mct max calculation method**

1. Open the Product tree view.
2. From the **Project** menu, choose **Configuration**.
3. Select the Mct max calculation method from the combo list.
4. Choose **OK**

The MIL-HDBK-472 applies the lognormal distribution to the repair times in the standard deviation calculation not taking in the account the item’s failure rates.

As many users have noticed, the results were sometimes paradoxical. RAM Commander allows the user to perform Mct max calculation
based on various repair times distribution assumptions. Users may now choose one of the following methods of the Mct max calculation:

1 **MIL-HDBK-472 (Lognormal Distribution):**

\[
\sigma_{\text{lnT}} = \sqrt{\frac{\sum_{i=1}^{N} Qty_i (\ln \text{Mct}_i)^2 - \left( \sum_{i=1}^{N} Qty_i \ln \text{Mct}_i \right)^2}{\sum_{i=1}^{N} Qty_i - 1}}
\]

\[
\text{Mct}_{\text{max}} = \exp(\ln \text{MTTR} + Z(p) \times \sigma_{\text{lnT}})
\]

2 **Weighted Lognormal Distribution**

This is similar to the MIL-HDBK-472 based on lognormal distribution, but takes into account the failure rates in the standard deviation calculation:

\[
\sigma_{\text{lnT}} = \sqrt{\frac{\sum_{i=1}^{N} \lambda_i (\ln \text{Mct}_i)^2 - \left( \sum_{i=1}^{N} \lambda_i \times \ln \text{Mct}_i \right)^2}{\sum_{i=1}^{N} \lambda_i - 1}}
\]

\[
\text{Mct}_{\text{max}} = \exp\left(\sum_{i=1}^{N} \frac{\lambda_i \times \ln \text{Mct}_i}{\sum_{i=1}^{N} \lambda_i}\right) + Z(p) \times \sigma_{\text{lnT}}
\]

3 **Normal Distribution**
The standard deviation calculation is based on the hypothesis of the repair times’ normal distribution:

\[
\sigma_T = \sqrt{\frac{\sum_{i=1}^{N} \lambda_i (Mct_i)^2}{\sum_{i=1}^{N} \lambda_i} - \left(\frac{\sum_{i=1}^{N} \lambda_i \cdot Mct_i}{\sum_{i=1}^{N} \lambda_i}\right)^2}
\]

4 Empirical Distribution

Does not use any distribution assumption and is based on the predicted repair times. The implementation algorithm consists of several steps:

\[
Mct_{max} = \frac{\sum_{i=1}^{N} \lambda_i \cdot Mct_i}{\sum_{i=1}^{N} \lambda_i} + Z(p) \cdot \sigma_T
\]

A histogram of \( Mct_i \) and corresponding \( p_i \) is built, where

\[
p_i = \frac{\lambda_i}{\sum_{i=1}^{N} \lambda_i}
\]

cumulative (\( Mct_i \) in ascending order) distribution histogram is used to define the confidence level (CL) for each value of \( Mct \):

\[
\sum_{i=1}^{k} p_i \cdot 100\% = CL_i
\]
$Mct_{\text{max}}$ is calculated by the linear interpolation of $Mct_k$ i.e. if the required value of $CL$ (usually 90% or 95%) falls between $CL_k$ and $CL_{k+1}$, then

$$Mct_{\text{max}} = \frac{Mct_k (CL_{k+1} - CL) + Mct_{k+1} (CL - CL_k)}{CL_{k+1} - CL_k}$$

**Maintainability Allocation**

You can use RAM Commander to perform top-to-bottom maintainability allocation. When allocating maintainability, use the following fields in the Tree Maintainability dialog box:

- **MTTRa** allocated (required) MTTR of an item
- **Complexity for Mct(a)** weighing factor for item’s children
- **Mct(a)** intended for maintainability allocation

See Appendix H (page 494) for a theoretical discussion of how RAM Commander allocates maintainability to each child of a parent.

**To perform maintainability allocation**

1. Activate the Product tree view.
2. From the Calculation menu, choose Allocation.
3. Choose All Tree Down to start the allocation from the current item downwards
   - OR -
   - choose Current Level to allocate the current item only one level down.

RAM Commander calculates the allocated Mct values.
Copying Maintainability Tasks Data

RAM Commander provides you with a convenient method to copy component maintainability data to existing items. This feature is used in the Maintainability Analysis module for Met calculation when different items have the same maintainability tasks.

To copy maintainability tasks data to other items

1. Open the source and target Product tree views, or two views from the same product.
2. Activate the target Product tree view.
3. In the target window, select the items to which you want to copy maintainability data by highlighting it and using Windows conventions.
4. Activate the source Product tree view and select the item from which you want to copy maintainability data.
5. From the Tree menu, choose Copy Processor Data. Select the target project in the Select Target dialog box and choose OK.

RAM Commander copies the component data to the target window.

Maintainability Libraries

RAM Commander provides a library facility to store standard times, tasks, and Maintenance data (Skills, Support and Test Equipment, and Materials).

Standard Times Library

The Standard Times Library contains all the standard connection types and associated maintenance times detailed in MIL-STD-472, Procedure 5. The system manager uses the Standard Times Library to update existing connection types and corresponding interchange times. Other users can only view the standard times.
To access the Standard Times Library

1. Select maintainability mode.
2. From the Library menu, choose Standard Times Library.

The Standard Times Library window opens.

Only the system manager can edit, add or delete information in the Standard times library.

You can generate a report of the Standard times library by choosing Report from the Maintainability - Standard Times Library dialog box.

To add or edit a record in the Standard Times Library

1. From the Maintainability - Standard Times Library dialog box, choose Edit or Add.
2. In the Standard Times dialog box, enter the new time and description.
3. Choose OK.

RAM Commander updates the Standard Times Library list.
To delete a record in the Standard Times Library

1. Select the record you wish to delete.
2. Choose **Delete** from the Maintainability - Standard Times Library dialog box.

**Caution** Take care when updating the standard times library. There is no undo facility to easily return the library to its previous state.

**Standard Tasks Library**

Only the system manager can define standard tasks for use in maintainability analysis. Each Standard Task consists of many standard times.

**To access the Standard Tasks Library**

1. Activate the Product tree view.
2. Select Maintainability mode as the current processor.
3. From the **Library** menu, choose **Standard Tasks Library**.

The Tasks Library Manager window opens.
Only the system manager can edit, add or delete data in the Standard tasks library.

You can generate a report of the Standard tasks library by choosing Report from the Tasks Library Manager dialog box.

**To add a new task to the Standard Tasks Library**

1. From the Tasks Library Manager dialog box, choose **Add Task**.
2. Enter a description in the Task Description dialog box. Choose **OK**.
3. To add a new action or connection, choose **Append** or **Insert**.
4. In the Action/Connection dialog box, do the following:

![Action/Connection Definition](image)

5. Choose a connection from the Standard connections list box
   - OR -
   Enter a name in the Action/Connection field.
6. Enter a quantity.
7. To use a time different than the default, enter it in the Time field.
8. Choose **OK**.
RAM Commander redisplays the Tasks Library Manager dialog box with the new action or connection appearing at the end.

**To delete a task from the Standard Tasks Library**

**Caution** Take care when deleting tasks from the standard tasks library. There is no undo facility to easily return the library to its previous state.

1. From the Tasks Library Manager dialog box, select a task from the Task Description list box.
2. Choose **Delete Task**.

You can edit tasks within the Standard Tasks Library by creating new operations or deleting and editing existing ones.

**To edit a task in the Standard Tasks Library**

1. In the Tasks Library Manager dialog box, select a task from the Task Description list box.
2. Do one of the following:
   - To add a new action/connection, choose **Append** or **Insert**. Enter information in the Action/Connection dialog box using steps 3-7 of the procedure on page 350.
   - To edit or replace an existing action/connection, select it and choose **Edit**. Enter information in the Action/Connection dialog box using steps 3-7 of the procedure on page 350.
   - To delete an existing action/connection, select it and choose **Delete**.

After each add, edit or delete, RAM Commander redisplays the Tasks Library Manager dialog box using the new data.
Standard Tasks/Times Library Reports
You can generate on-screen and hard copy reports of all standard tasks and standard times.

To generate a standard tasks/times library report
1. Activate the Product tree view.
2. Select Maintainability as the current processor.
3. From the Library menu, choose Standard Tasks library or Standard Times library.
4. In the dialog box, choose Report.
RAM Commander displays a window list containing a report of all the standard tasks or standard times. Use the report management utilities described in Chapter 11 to scroll, edit and print the report.

Maintenance Library
The Maintenance Library contains lists of Skills, Support and Test Equipment, and Materials, which are used during maintenance tasks data input. Maintenance library allows definition of cost for each skill labor hour, equipment usage hour and a unit of materials. Then in Maintenance Analysis you will be able to get maintenance cost evaluation.

To access the Maintenance Library
1. Select maintainability mode.
2. From the Library menu, choose Maintenance Library.
The Standard Times Library window opens.
Use the tab sheets above to switch between tables.

To add a new line, just write the data into the empty table line with asterisk in the leftmost column.

To delete a line, right-click on the line and choose Delete from the pop-up menu.

**Maintainability Reports**

RAM Commander provides several maintainability calculation options. You can perform abbreviated or full calculations. You can allocate maintainability factors to component parts for an assembly’s given maintainability.
Only tree reports are available in maintainability mode.

**To create a tree report**

1. Activate the Product tree view.
2. Select Maintainability mode.
3. Navigate to any level in the product tree.
4. From the Reports menu, choose **Standard Kit**; the Report Selection dialog box opens.

Maintainability estimates appear in this column of the Product tree view.
5 Select the report Type (see below) and the applicable Include items options. (Note how the fields in the Report Selection dialog box change accordingly.)

6 To limit the report to a certain number of levels from the starting level, enter that number in the Depth from start item field.

7 Under ‘Report items replaced in’ select Organizational, Intermediate and/or Depot. (eg. If Depot is selected, then only those items whose level of replace is defined as ‘Depot’ will be included in the report table.)

8 Select ‘Go under Hybrid’ so that the sub-items of any hybrid in the tree will be displayed in the report.

9 Choose OK.

RAM Commander generates and displays the report in a report window.

You can print the report by selecting Print from the Report menu or click on the printer icon. The Windows print dialog box opens. Make the selections appropriate for your printer and choose OK.

To close a report window, double-click on its control button.

**Maintainability Report Type**

<table>
<thead>
<tr>
<th>Report Group</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tree diagram</td>
<td>Tree structure</td>
</tr>
<tr>
<td>Maintainability information</td>
<td>ID, PN, RefDes, Qty, F.R.[FIT], Mct[hrs], MLH.</td>
</tr>
<tr>
<td>Level of replace information</td>
<td>ID, PN, RefDes, NHA, Qty, Mct[hrs].</td>
</tr>
<tr>
<td>Maintainability data</td>
<td>ID, PN, RefDes, Qty, maintenance tasks, F.R.[FIT], Mct[hrs], MLH.</td>
</tr>
</tbody>
</table>
### Report Group Description

**MEA (Maintenance Engineering Analysis):**

**Configuration control**
ID, reference designator, Qty, Mct, MLH

**Maintenance tasks**
Maint. Task, Task Description, Mp, Total Time, Task Source, Description, Qty, T[min].

**Maintenance tasks analysis – Information**
Item, Maint.Task, required skills, equipment and materials for each task

**Maintenance tasks analysis – Skills summary**
Calculation of Total Labour Hours per year for each skill type, according to system usage scenario.

**Maintenance tasks analysis – STE summary**
Calculation of Total Labour Hours per year for each equipment type, according to system usage scenario.

**Maintenance tasks analysis – Materials summary**
Calculation of material consumption for maintenance tasks per year for each material, according to system usage scenario.
RCM (Reliability Centered Maintenance) module

RCM utilizes a systematic approach to understand how equipment fails, and what maintenance tasks can be done to minimize failures and maximize reliability. RCM also provides the foundation for understanding why certain maintenance tasks are performed and the justification for eliminating unnecessary Preventive Maintenance (PM) activities. It is the optimal mix between the Corrective, Preventive, and Condition-Based maintenance. RCM is a function-oriented approach which considers mission importance, environment, safety, security, economics and regulation requirements.

The RCM analysis process involves 7 main steps, each one of the steps is supported by the RCM module of RAM Commander:

2. Significant Functions identification:

![Functional Significance Determination Logic Diagram]

3. FMECA analysis, Failure Effects Categorization:

![Failure Effect Categorization - Consequences Logic Diagram]
4. Preventive Maintenance strategy decision:

![Preventive Maintenance Decision Diagram]

5. Preventive Maintenance definition and frequency optimization:

![Preventive Maintenance Definition and Frequency Optimization Diagram]
Summary

In this chapter you learned about RAM Commander’s extensive maintainability prediction tools. Using these tools, you can conduct a detailed analysis on the length of time for repairing or replacing a system and calculating such parameters as MTTR and Mct.