Introduction to RCM in the Defence Sector

Overview

This course is designed to provide the delegate with an appreciation of the Reliability Centered Maintenance (RCM) process and the underlying principles. The fundamental principles are established and then built upon using a combination of advanced presentation techniques, informal delegate instructor interaction and formal scripted syndicate and individual exercises.

The course begins by overviewing the aims of RCM and its historical origins. The subsequent modules consider the failure process and what can be achieved utilising this knowledge. An examination of the different maintenance solutions available when assessing suitable and applicable Preventive Maintenance tasks and the determination of task frequencies follows. In order to present a complete explanation of the RCM process its related topics, for example, Packaging, Age Exploration, Zonal Analysis and Resource identification are also addressed.

The course concludes by considering the management aspects of a full RCM programme and a discussion on the various methods by which RCM can be implemented.

Target Audience

The course is designed principally to provide the delegate with an appreciation of RCM in the defence sector. It is aimed at Government Defence organisations and Defence Contractor personnel. The course will also benefit anyone working within an RCM environment who needs a working understanding of the RCM process in order to function effectively and efficiently.

It would also benefit Integrated Logistic Support (ILS) / Logistic Support Analysis (LSA) Managers and Practitioners who need a broad understanding of the key processes carried out as part of an integrated programme. Typically this may include Logistic Support Analysis (LSA), Reliability , Safety, Technical Data, Supply Support and Human Factors Managers and personnel.

Objectives and Utility

On completion of this training course the delegate will appreciate the need for and the scope of RCM. They will have gained an understanding of the technical and management issues pertinent to a RCM programme.

The delegate will benefit professionally from the knowledge which has been given.

The sponsoring organisation gains personnel who are confident, competent and who are more knowledgeable on the RCM aspects of an ILS programme as a whole. The individual is better equipped for their role and they will have undergone a degree of personal development through the expansion of their knowledge base.

The Training Process

The course establishes the basic principles of RCM, and overviews various defence standards. The course addresses technical aspects of RCM enabling the delegate to appreciate the principles, identifies some of the key technical difficulties involved and overviews what can be achieved by the implementation of a full RCM process as part of an ILS programme.

The course is supplemented by practical and syndicate exercises in order to reinforce the training and to facilitate retention. The exercises are based on a defence specific system in order to ensure that they are as realistic and effective as is practically possible.

Course Programme

Day 01 - AM

102-T-D Introduction - Maintenance & RCM Defined

This module introduces the course format. It covers the definition and requirements for maintenance, and establishes what RCM is and states how the basic methodology has been adopted for different equipment. A brief history of the development of RCM is included.

104-T-D Reliability & the Failure Process

This module defines Failure and generates understanding of the way In which equipment fails and the consequences of a particular failure. Understanding this aspect is fundamental to the correct application of RCM.

Failure terms are explained, i.e. Failure Rate, Mean Time Between Failures (MTBF) etc.

105-T-D Significant Item (SI) Selection

This module overviews the process of Significant Item (SI) selection and its impact on the analysis process. Traditionally RCM is intended to be carried out at a high indenture level, this is explained.

106-T-D Failure Modes, Effects and Criticality Analysis (FMECA)

In order for the Analyst to fully appreciate the reason for and the requirements of a Failure Modes and Effects Analysis (FMEA) and Criticality Analysis (CA) it is necessary to fully understand the principles behind these techniques. The process of carrying out a FMECA can be split into two distinct operations, i.e., compiling a FMEA and then attaching a CA to these results. When combined they form a FMECA. This module identifies the details of an FMECA in relation to the nature of failure, introduces a structured method of data recording and shows the delegate how to interpret this information once collected. After all, information is of little use if it is ignored or misinterpreted.

Once relevant information has been documented and assessed it may be necessary to grade this in order to focus the analysis in areas of greatest need. A Criticality Matrix can be used for this task. The module introduces this Matrix and shows how it can be used to prioritise the analysis process.

Day 01 - PM

119-T-D Types of Maintenance Tasks

This module lists and overviews the types and characteristics of RCM Preventive Maintenance task and explains the meaning of key Preventive Maintenance terminology.

108-T-D Task Selection

The aim of RCM is to develop the most suitable maintenance plan that results in optimised cost and usage of resources.

The RCM process drives the Analyst to look at ways in which Preventive Maintenance can be used to avoid or reduce the consequences of failure and also to identify ways ahead when no suitable maintenance can be found. RCM allows for Default Logic to be used when there is insufficient data or there is uncertainty. This allows a safe, if conservative, route to be taken whilst these uncertainties are resolved.

RCM uses the logic tree (Algorithm) principle to direct the Analyst towards the selection of suitable Preventive Maintenance tasks in strict order of preference depending upon the failure consequences. This logic identifies three basic types of Preventive Maintenance tasks:

1. On Condition (OC).
2. Hard Time (HT).
3. Failure Finding (FF).

The Analyst will be able to select the correct type of task from the list above and establish a suitable task frequency based upon the criteria laid down for each task type. Many of the principles of task frequency relate back to the age reliability graphs discussed earlier in the course.

RCM also relates back to the design process, the urgency of redesign being driven by, not only, the consequences of the potential failure but also the life cycle phase of development for new equipment. These factors are discussed during this module.

110-T-D Age Exploration and Default Logic

The process of applying Default Logic identifies candidates which may benefit from further investigation or more information which is found to be lacking. The process which is able to do this is called Age Exploration (AE).

AE, therefore, becomes an essential part of any well managed Preventive Maintenance programme. It identifies and supplies information used to revisit the RCM analysis in order to determine the applicability of individual Preventive Maintenance tasks and the effectiveness of others.

In the case of new equipment, AE provides information which is used to adjust initial conservative OC task intervals or to assess the applicability and effectiveness of HT tasks.

When applied to existing equipment AE provides information to evaluate existing maintenance tasks, thereby optimising the Preventive Maintenance programme.

AE can also be used to justify product modifications, risk assessments or determine failure causes. It is able to accomplish these tasks by gathering age reliability data from operational life and field data. It provides a framework for the systematic gathering, collecting and analysing of age reliability data.

109-T-D Structurally Significant Items (SSI)

One of the first things to consider before carrying out any analysis of structure is to determine what is meant by the term structure. It is the load carrying elements of equipment.

When interpreting loads that the structure must withstand, again these can be many and varied. Designs must therefore reflect the nature of loads and be capable of withstanding any load that the equipment is likely to encounter as part of its operational parameters.
Scheduled maintenance within the structural scenario is aimed at locating and correcting any deterioration that would impair the load bearing capability of the equipment or element.

When relating to structure the ultimate effects of a functional failure of a key element is that it has a direct effect upon operating or crew safety. The point of focus when assessing SSIs is therefore, not if a task is necessary but more - What task? and - What frequency?

All items of structure are subject to the age-related processes of fatigue and corrosion but as these processes interact with each other and are not entirely predictable, it is necessary to take a look at the failure characteristics of structure before deciding whether Preventive Maintenance is suitable. These issues are overviewed during this module.

111-T-D General Condition Monitoring

Zonal Analysis was initially established in the aviation industry to provide a vehicle for allowing an on-going monitoring programme to be established which will complement the formal Preventive Maintenance programme and allow seemingly insignificant items and structure to receive Preventive Maintenance. This process is now being adopted formally on other equipment as a complimentary discipline to RCM.

This module briefly overviews the ways in which zones are defined in terms of physical boundaries, how these zones are rated and how these ratings can be used to establish suitable zonal examination plans.

112-T-D RCM Management Issues

This module is designed to overview the problems associated with producing the RCM derived task recommendations in a workable Preventive Maintenance programme and looks at the finer points of management relating to the RCM effort. This covers:

Packaging.
Quality assurance and auditing.
Different methods of application.
Available data and its importance.
Some of the benefits of RCM.

If RCM is to be the success it should be, it is vital that the project is properly controlled. This must start at the very first approaches to RCM and continue right through the analysis and subsequent implementation of the maintenance programme.

Achieving a satisfactory outcome of RCM requires time and effort, however, if applied correctly the benefits far outweigh the cost of its application. Most organisations require a return on their investment very quickly and indeed some view RCM as a vehicle for reduction in the cost of scheduled maintenance almost instantaneously. This is by no means guaranteed, although if the current maintenance is based around the old principle of scheduled restoration or discard the benefits should be almost immediate and wide ranging. Properly implemented RCM will certainly reap benefits for an organisation because it will develop a scheduled maintenance programme which will be focused and optimised for the equipment in its operating context. This should have the advantage of reducing the overall cost of maintenance, preventive and corrective.

An RCM derived maintenance schedule also enables the organisation to plan ahead with more confidence, an example could be the simple planning for the provision of spares used during scheduled maintenance. This aspect not only ensures that spares are available when required but also a relevant stock holding is established to ensure an acceptable level of availability.

These issues are overviewed during this module.

124-T-D **RCM & Integrated Logistic Support (ILS)**

This module allows the delegate to understand what RCM achieves in an ILS Programme and maps RCM activities into a Def. Stan. 00-60 Programme.

122-T-D **RCM Summary and Conclusion**

Brief summary of key points of course.