

The 7 steps of RCM

An RCM process identifies the following items in sequence:

- 1) **Functions** – the desired capability of the system, how well it is to perform, and under what circumstances
- 2) **Functional failures** – the failed state of the system (when the system falls outside the desired performance parameters)
- 3) **Failure modes** – the specific condition causing a functional failure
- 4) **Failure effects** – the description of what happens when each failure mode occurs
- 5) **Failure consequences** – the description of how the loss of function matters
- 6) **Maintenance tasks and intervals** – the description of the applicable and effective tasks, if any, performed to predict, prevent, or find failures
- 7) **Other logical actions** – including but not limited to run-to-failure, engineering redesigns, and changes/additions to operating procedures or technical manuals

Additional References

Army/Marine Corps/Commercial –
SAE JA1011/1012

Naval Sea Systems – MIL-P-24534A

Naval Air Systems – NAVAIR 00-25-403

Air Force (engines) – AFI 21-104

For information on RCM in the DoD visit
www.acq.osd.mil/log/mppr

or call (703)697-7980

Reliability
Centered
Maintenance

RCM



What is RCM?

RCM is a logical, structured process used to determine the optimal failure management strategies for any system, based upon system reliability characteristics and the intended operating context. RCM defines what must be done for a system to achieve the desired levels of safety, environmental soundness, and operational readiness, at best cost. RCM is to be applied continuously throughout the life cycle of any system.

What can it do?

RCM can reduce maintenance costs and reduce work requirements while ensuring a system's reliability. RCM will identify the most technically appropriate and effective maintenance task or other action. RCM is an enabler for Condition Based Maintenance Plus (CBM+).

What is it based on?

RCM develops logical decisions based on the following precepts:

The objective of maintenance is to preserve an item's function(s).

RCM seeks to manage the consequences of failure – not to prevent all failures.

RCM is driven first by safety. When safety is not an issue, maintenance must be justified on the ability to complete the mission and finally, on economic grounds.

RCM acknowledges that at best, maintenance can sustain the system to its inherent level of reliability within the operating context.

RCM uses design, operations, maintenance, logistics, and cost data, to improve operating capability, design and maintenance.

RCM is a continuous process that requires sustainment throughout the life cycle.



CH-47

T-45



Navy

Air

On board oxygen generating system (OBOGS) interval extension, repackaged to 112 day interval.

Springbox life limit revision, saving several shipsets per aircraft

Corrosion trend analysis allows repackaging maintenance (reduced ~7500 MMH/yr)

Phase deck repackaging (increased readiness with ~20K MMH reduction)

Shipboard

Fleet maintenance manhours reduced by nearly 50% since 1997 through the implementation of RCM-based Maintenance Effectiveness Reviews (MERs)

RCM (MIL-P-24534A) procedures are required for the development of ALL shipboard maintenance procedures

Shipboard Maintenance



F-15

Reliability Centered Maintenance



Air Force

RCM used for in-service analysis on the F-15

Improved overall reliability while reducing the maintenance burden

Analysis completed on Environmental Control, Fuel, Landing Gear, Flight Control, Oxygen, and Canopy Systems

538 recommended changes with projected cost avoidance of \$21M/yr (~450K manhours)

EFV



Marines

The EFV is an armored amphibious vehicle capable of seamlessly transporting Marines from Naval ships located beyond the visual horizon to inland objectives.

RCM data used in development of diagnostics and prognostics plan

RCM "Failure Effects" data used for development of Manual Troubleshooting Procedures

RCM analysis performed during initial system design phase proved 96% accuracy in failure mode prediction once vehicle was put into service



Timeline



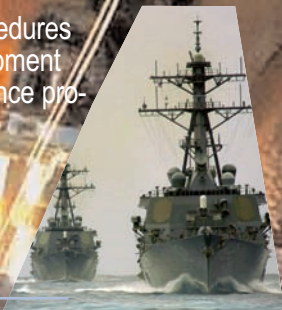
Army

Number of scheduled maintenance tasks reduced by 79%

Maintenance manhours reduced by 50% for scheduled maintenance tasks

Over 300 default strategies identified

RCM applied to an electronic system: T55-GA-714A Engine's Full Authority Digital Electronic Control (FADEC) system



1970s - A precursor process to RCM begins with the commercial airlines known as the Maintenance Steering Group logic. Subsequently, the DoD sponsors the initial development of RCM.

1980s - The DoD further develops and implements RCM. Commercial industry adopts the process.

1990s - As cost benefits are realized, commercial industry becomes the champion for RCM. Commercial standards are created.

2000s - Aging and wear increases the maintenance burden of DoD systems and fuels a resurgence for RCM in the DoD.