

DATA ITEM DESCRIPTION

Title: Reliability-Centered Maintenance (RCM) Analysis Information Phase Report

Number: DI-PSSS-82115

Approval Date: 20170327

AMSC Number: N9788

Limitation: N/A

DTIC Applicable: No

GIDEP Applicable: No

Preparing Activity: MC

Project Number: PSSS-2017-013

Applicable Forms: RCM analysis information worksheet (Figure 1)

Use/Relationship:

The RCM Analysis Information Phase Report records the detailed information generated by an RCM Review Group supporting the Marine Corps Systems Command (MCSC) RCM analysis of a system or asset and supports the performance of the first four steps of the RCM process.

This Data Item Description (DID) provides guidance pertaining to the format, content, and intended purpose for the information generated from the work task described in the contract SOW.

This DID is related to DI-PSSS-82116, RCM Analysis Decision Phase Report and DI-PSSS-82114, RCM Analysis Report.

Requirements:

1. Reference documents. The applicable issue of the documents cited herein, including their approval dates and dates of any applicable amendments, notices, and revisions, shall be as specified in the contract.
2. Format. This report shall be in the format reflected in Figure 1 of this DID, and shall be delivered in the electronic format specified in the contract.

DI-PSSS-82115

1. System/ Sub-System									
2. Revision:					Date:				
RCM ANALYSIS INFORMATION WORKSHEET							3. Facilitator:		Date:
							4. Auditor:		Date:
5. F			FUNCTION (F)					5. Function Statement	
5. F	6. FF		FUNCTIONAL FAILURE (FF)					6. Functional Failure	
5. F	6. FF	7. FM	7. Failure Mode (FM)	8. P	9. C	10. D	11. RPN	12. Failure Effects	
1			FUNCTION					<i>(Block corresponding to Function Statement 1)</i>	
1	A		FUNCTIONAL FAILURE					<i>(Block corresponding to Functional Failure 1A)</i>	
1	A	1	<i>(Failure Mode 1A1)</i>	<i>P</i> #	<i>C</i> #	<i>D</i> #	<i>FM</i> <i>1A1</i> <i>RPN #</i>	<i>(Block corresponding to the Failure Effects resulting from Failure Mode 1A1)</i>	
1	A	2	<i>(Failure Mode 1A2)</i>	<i>P</i> #	<i>C</i> #	<i>D</i> #	<i>FM</i> <i>1A2</i> <i>RPN #</i>	<i>(Block corresponding to the Failure Effects resulting from Failure Mode 1A2)</i>	
1	B		FUNCTIONAL FAILURE					<i>(Functional Failure 1B)</i>	
1	B	1	<i>(Failure Mode 1B1)</i>	<i>P</i> #	<i>C</i> #	<i>D</i> #	<i>FM</i> <i>1B1</i> <i>RPN</i>		
2			FUNCTION					<i>(Function Statement 2)</i>	
2	A		FUNCTIONAL FAILURE					<i>(Functional Failure 2A)</i>	
2	A	1	<i>(Failure Mode 2A1)</i>	<i>P</i> #	<i>C</i> #	<i>D</i> #	<i>FM</i> <i>2A1</i> <i>RPN</i>	<i>(Block corresponding to the Failure Effect resulting from Failure Mode 2A1)</i>	

FIGURE 1. MCSC RCM analysis information worksheet.

DI-PSSS-82115

3. Content. This report shall include as a minimum the information specified in the sample form of Figure 1 of this DID, and shall document, in complete details, each element addressing the first four steps of the RCM process in accordance with the SAE JA1011 standard and SAE JA1012 guide. (Copies of SAE JA1011 and SAE JA1012 are available online at www.sae.org.)

3.1 Block 1. System/ Sub-System. Identify the nomenclature of the system/ sub-system under analysis.

3.2 Block 2. Revision. Enter Original, A, B, or C, sequentially and the date.

3.3 Block 3. Facilitator. Enter the name of the certified RCM Facilitator and the date.

3.4 Block 4. Auditor. Reserved for the Government RCM Auditor.

3.5 Block 5. Function. “All the primary and secondary functions of the asset/system shall be identified” (SAE JA1011, 5.1.2). Functions (F) are numbered and describe, in precise detail, what the asset/system is expected to do, how well, and when.

3.6 Block 6. Functional Failure. Functional failures describe both total and partial failure of a system; these describe the “state in which a physical asset or system is unable to perform a specific function to a desired level of performance” (SAE JA1011, 3.15). “All the failed states associated with each function shall be identified” (SAE JA1011, 5.2.1). Functional Failures (FF) are identified by a letter (A-Z). The total failure is always identified first (letter “A”).

3.7 Block 7. Failure Mode. “All failure modes reasonably likely to cause a functional failure shall be identified” (SAE JA1011, 5.3.1). Failure Modes (FM) are numbered and describe the physical or non-physical cause of the failure. Failure Mode (FM) 1A1 designates the first failure mode for functional failure 1A. Enter the sequential number of the failure mode and then the failure mode itself.

The alphanumeric value assigned to each failure mode in the RCM Analysis Information Phase report is used in the RCM Decision Report to associate a decision with the corresponding failure mode.

3.8 Risk Assessment. The information captured in Block 8 through Block 11 may not be compiled until all seven steps of the RCM process are performed. The information corresponding to steps five, six and seven of the RCM process is recorded in the RCM Analysis Decision Phase Report (DI-PSSS-82116).

3.8.1 Block 8. Risk Assessment - Probability. Enter the numerical value (1-5) corresponding to the Probability (P) of occurrence associated with each failure mode. The probability of a failure mode identifies the probability the failure mode will occur, as opposed to the probability the event will have safety implications. The probability that a failure mode may result in safety consequences is addressed in Block 12. RCM Review Groups shall employ the MCSC RCM Failure Mode Probability Matrix (Figure 2) derived from the DoD/DAU risk management guide and MIL-STD-882E to assess the probability of each failure mode. Non-physical failure modes shall be assigned a “N/A” probability value.

DI-PSSS-82115

PROBABILITY		
5	Frequent – Failure is almost inevitable	1:10 – 1:100
4	Reasonably Probable – Repeated Failures	1:100 – 1:10,000
3	Occasional Failures	1:10,000 – 1:100,000
2	Remote – Relatively Few Failures	1:100,000 – 1:1,000,000
1	Extremely Unlikely	>1:1,000,000

FIGURE 2. MCSC RCM failure mode probability matrix.

3.8.2 Block 9. Risk Assessment - Consequence. Enter the numerical value (1-5) corresponding to the Consequences (C) or severity associated with each failure mode. RCM Review Groups shall employ the MCSC RCM Failure Mode Consequence Matrix (Figure 3) to assess the consequences of each failure mode. RCM Review Groups may modify “Other than Safety” ranking criteria to accommodate specific analysis considerations. Non-physical failure modes shall be assigned a “N/A” consequence value unless they may result in safety consequences, in which case the value corresponding to the assigned Risk Assessment Code (RAC) shall be identified in the consequence block. RAC codes are addressed in Block 12.

CONSEQUENCE		
	SAFETY ONLY	OTHER THAN SAFETY
5 Catastrophic	Loss of Life <i>RAC-I</i>	Evacuate to Depot “S” Level
4 Very Serious	Long Term Disability RAC II	Field “F” Level repair at Intermediate Maintenance Facility
3 Serious	Short Term Disability <i>RAC-III</i>	Organizational Level repair > 1 Hr
2 Significant	Requires Medical Attention - <i>RAC-IV</i>	Organizational Level repair < 1 Hr
1 Minor	-	Crew Correctable/ Unscheduled. Maintenance. No Mission Impact

FIGURE 3. MCSC RCM failure mode consequence matrix.

3.8.3 Block 10. Risk Assessment – Detectability. Enter the numerical value (1-5) corresponding to the Detectability (D) associated with each failure mode. The detectability of a failure mode identifies the likelihood the failure mode will be detected before the worst consequences materialize. RCM Review Groups shall employ the MCSC RCM Failure Mode Detectability Matrix (Figure 4) to assess the detectability of each failure mode. Non-physical failure modes shall be assigned a “N/A” detectability value.

DI-PSSS-82115

DETECTABILITY	
5	Remote likelihood of detection & correction. HIDDEN Failure
4	Low likelihood of detection & correction. Only detectable under one specific condition.
3	Moderate likelihood of detection & correction. May not be detectable under multiple conditions.
2	High likelihood of detection & correction. May not be detected under one condition
1	Almost certain to be detected. Almost immediately detectable by the operating crew.

FIGURE 4. MCSC RCM failure mode detectability matrix.3.8.4 Block 11. Risk Assessment – Risk Priority Number (RPN).

a. Risk Priority Number Value. Enter the RPN numerical value derived from the equation $P \times C \times D$. The RPN provides RCM Review Groups with a mean to quantify risks and rank failure modes and consequences based on their findings. Non-physical failure modes shall be assigned a “N/A” RPN value, unless they may result in safety consequences, in which case the RAC alpha roman numeral identified in Block 12 shall also be indicated in the Block 11.

b. Color Coding. The RPN block corresponding to a failure mode assigned a RAC in Block 11 and Block 12 shall be color-coded in accordance with the current edition of MIL-STD-882, Risk Assessment Matrix.

3.9 Block 12. Failure Effect. Enter the details of the effects associated with each failure mode. “Failure effects shall include all the information needed to support the evaluation of the consequences of the failure” (SAE JA1012, 9.2) including any evidence that the failure is occurring, any impact to safety or environment, any secondary damage resulting from the failure, and identify the Time to Diagnose (TTD) the failure mode, who is responsible for the diagnosis, Time to Repair (TTR) the failure mode and any secondary damage, who is responsible for the repair, and what is repaired. Failure effects resulting from failure modes with safety implications shall include a Risk Assessment Code (RAC). RCM Review Groups shall employ the MCSC RCM RAC Severity Category Matrix (Figure 5) and the MCSC RCM RAC Probability Matrix (Figure 6) derived from the DoD/DAU risk management guide and MIL-STD-882E to assign a Risk Assessment Code.

DI-PSSS-82115

RAC SEVERITY CATEGORIES		
Description	Severity Category	Mishap Result Criteria
Catastrophic	I	Could result in one or more of the following: death, permanent total disability.
Critical	II	Could result in one or more of the following: permanent partial disability, injuries or occupational illness that may result in hospitalization of at least three personnel.
Marginal	III	Could result in one or more of the following: injury or occupational illness resulting in one or more lost work day(s).
Negligible	IV	Could result in one or more of the following: injury or occupational illness not resulting in a lost work day.

FIGURE 5. Marine Corps RCM RAC severity category matrix.

PROBABILITY LEVELS			
Description	Level		
Frequent	A	The most serious safety consequences are certain and inevitable. Continuously experienced	1:10 – 1:100
Probable	B	The most serious safety consequences will occur frequently.	1:100 – 1:10,000
Occasional	C	The most serious safety consequences are likely to occur occasionally.	1:10,000 – 1:100,000
Remote	D	The most serious safety consequences are unlikely, but can reasonably be expected to occur.	1:100,000 – 1:1,000,000
Improbable	E	The most serious safety consequences are extremely unlikely to occur, but possible.	> 1:1,000,000
Eliminated	F	Incapable of occurrence. This level is used when potential hazards are identified and later eliminated.	-

FIGURE 6. Marine Corps RCM RAC probability matrix.

End of DI-PSSS-82115