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Maritime Command and Staff Trainer (MCAST)

Appendix J to SoW – Initial Reliability and Maintainability Case Report

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Defence Equipment & Support

Document History

The amendment and review record shows all the amendment and review dates for this document.

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Approved by

Name	Signature	Appointment	Date
██████████	██████████	████████████████████	29 Mar 23

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Contents

1.0	Introduction	5
1.1	Purpose	5
1.2	Single Statement of User Need	5
2.0	Objective	5
3.0	R&M Strategy	5
4.0	Use Profile.....	6
5.0	Operating Environment	6
6.0	Summary of R&M Needs.....	6
6.1	Availability	6
6.2	Reliability	7
6.3	Maintainability	7
6.4	Testability.....	7
7.0	Failure Modes	7
8.0	Support Between Training.....	8
9.0	Storage.....	8
10.0	Software	8
11.0	Operators and Maintainers	8
12.0	Assumptions.....	8
13.0	Risks	9
14.0	Tenderer's R&M Case Report / R&M Plan	9
15.0	Recommendation	9
16.0	Project Documentation	10
17.0	Abbreviations and Acronyms.....	11
18.0	References.....	12

1.0 Introduction

1.1 Purpose

- 1.1.1 The purpose of a Reliability and Maintainability (R&M) Initial Case is to create a reasoned, auditable submission to support the intention that the Maritime Command and Staff Trainer (MCAST) acquisition will perform sufficiently to meet the availability requirements of the customer. It is produced by the Authority to provide context to the Authority's requirements and to provide a platform for the Contractor to demonstrate that the System will meet at least the required availability levels in-service.
- 1.1.2 This R&M Initial Case forms part of the Invitation to Negotiate (ITN) package for the Contract. On receipt of this document the Tenderer will supply a draft R&M Case Report in accordance with Part 3 of Defence Standard (Def Stan) 00-042: Reliability and Maintainability Assurance Activity [1] and a draft R&M Plan in accordance with Def Stan 00-040: Reliability and Maintainability [2], to the Authority.

1.2 Single Statement of User Need

- 1.2.1 The Single Statement of User Need (SSUN) for MCAST is:

Commander Fleet Operational Standards and Training requires support to deliver synthetic training, assurance and validation exercises in order to prepare Maritime Battle Staff to meet their operational readiness requirements.

- 1.2.2 An enduring and steady state capability for Battle Staff Command and Control (C2) Collective Training (CT), Exercising, Mission Rehearsal and Assurance currently does not exist in the Royal Navy (RN) to enable Tier 2 Formation-level and above Force Generation. The Maritime Composite Training System (MCTS) has been used to support ad-hoc requirements, but it does not fulfil the RN endorsed Battle Staff requirements nor the delivery of Formation level warfighting at scale and preparation for operations to support the enduring requirements for an increasingly Maritime Task Group (MTG) focussed RN.
- 1.2.3 MCAST is an RN synthetic training capability that will provide a Maritime Battle Staff (MBS) C2 training capability for the 2-star Commander Strike Force (CSF), the 1-star Carrier and Littoral Strike Groups (CSG and LSG), Littoral Response Group (LRG) and Mine Warfare Battle Staff (MWBS). MCAST will be used for CT at the Tier 1, 2 and 2+ level for both teamwork and taskwork, and potentially, Tier 1 CT for Head Quarters (HQ) pillars or warfare groups. It could also be used to provide pre-deployment training to other fixed location MBS for operational duties. MCAST could also support mission rehearsal and experimentation of Maritime Warfare Centre (MWC) developed tactical procedures and processes. The intent is for MCAST to be linked to the wider defence synthetic training environment. Adherence to Defence Modelling and Simulation Coherence (DMaSC) principles will enhance coherence and interoperability, enable efficiencies, and facilitate integration with other synthetic environments. Links to North Atlantic Treaty Organisation (NATO), other international partners and, potentially, component level organisations are expected to follow.

2.0 Objective

- 2.1 The objective of this document is to provide Tenderers with a summary of requirements relating to availability, reliability, and maintainability along with expected conditions of operation.

3.0 R&M Strategy

- 3.1 MCAST shall follow the risk-based progressive assurance approach to R&M in accordance with Def Stan 00-042. This document is therefore the first component of the R&M Case Report.
- 3.2 The Contractor shall conduct all preventative and corrective maintenance as part of the service provided, which is a Capability Service (Off Balance Sheet) support solution. The Contractor shall, during development and in-service, maintain an R&M Case Report that provides the evidence that

the service will meet, and continues in-service to meet, the Authority's availability requirements as recorded at Section 6.1 Availability.

- 3.3 Availability requirements shall be included in discussion during the Tender Clarification process; final agreed availability figures shall be recorded in an updated version of the draft R&M Case Report at Contract Commencement.

4.0 Use Profile

- 4.1 MCAST shall be used during Business Hours, unless additional times are requested by the Authority and agreed at Contract Award. The System shall be used at nominated training establishments with the capability to deploy to other training locations as instructed by the Authority.
- 4.2 Spare capacity shall be available for short-notice Exercises that may be of one day or half day duration.

5.0 Operating Environment

- 5.1 MCAST shall be used in an indoor training environment.

6.0 Summary of R&M Needs

6.1 Availability

- 6.1.1 As recorded at Def Stan 00-049: Ministry of Defence (MOD) Guide to R&M Terminology Used in Requirements [3], International Electrotechnical Commission (IEC) 60050-192 defines availability as:

- a. The availability of an item is the ability to be in a state to perform as required. This is further defined for a given instant (Instantaneous availability), or over a given time interval (mean availability).
- b. Intrinsic/inherent availability is the value determined when maintenance and operational conditions are assumed to be ideal.

- 6.1.2 MCAST availability requirements are as follows:

- a. The Exercise service shall be available for delivery of all planned Exercises as recorded in the Exercise Calendar. Spare capacity shall be available for short-notice Exercises that may be of one day or half day duration. Exercise availability shall be provided throughout Business Hours except during national holiday periods. Time is allowed for planned maintenance activities during each year of up to two weeks.
- b. The overall availability of the Exercise service shall be 95% of the remaining Business Days per year (equivalent to 234 days per year).
- c. During Exercises the system shall be available for the full working day without interruptions of more than 15 minutes or more than 3 interruptions in a day, achieving 98% availability. A day that is interrupted by failure of the Exercise system in excess of these figures shall not be counted as Available for the purposes of this requirement.
- d. Exercises shall not be interrupted by maintenance activity, software updates, or single point failures. Any such interruptions count against the measures of Availability and Reliability within the KPIs. This shall be through design of the Exercise systems and management of the Exercise arrangements, including having fallback arrangements and spare components to hand at the Exercise venue.

- 6.1.3 MCAST availability figures shall be reported via performance reports which will feed the system service management dashboard which will include the Performance Tracker in order to measure availability against the expected KPIs. These dashboards will be viewable as a webservice and will evolve as requirements and the programme progresses. [REDACTED]

6.2 Reliability

- 6.2.1 As recorded at Def Stan 00-049 [3], IEC 60050-192 defines reliability as follows:
- Reliability as a performance measure is the probability of performing as required for the time interval under given conditions.
 - Reliability of an item is the ability to perform as required, without failure, for a given time interval under given conditions.
- 6.2.2 Reliability is a key driver for a high system availability requirement that is measured with processes explained in Paragraph 6.1.3. Reliability data shall be provided to allow the Authority to identify that the proposed system's composition will meet a high level of in-service availability. Appropriate reliability test and trial data shall be documented progressively within the Contractor's R&M Case Report.
- 6.2.3 Single Point of Failure: The system shall be designed such that the number of components that could be the cause of a single point failure is minimised. Where such components exist, the Contractor shall provide appropriate mitigation.

6.3 Maintainability

- 6.3.1 As recorded at Def Stan 00-049 [3], IEC 60050-192 defines maintainability as follows:
- Maintainability as a measure is the probability that a given maintenance action, performed under stated conditions and using specified procedures and resources, can be completed within the stated time interval.
 - Maintainability of an item is the ability to be retained in, or restored to a state to perform as required, under given conditions of use and maintenance.
- 6.3.2 Maintainability refers to how well the System is designed to limit downtime due to preventive and corrective maintenance activity.
- 6.3.3 All maintenance action shall be carried out by the Contractor as part of the Contract scope. The Contractor shall plan down time for maintenance to avoid dates when Exercises are planned within the Exercise Calendar. A two-week period will be included in the Exercise Calendar each year for major maintenance activities. Where practicable, other maintenance activities and upgrades are to be planned to occur outside of Business Hours, to reduce impacts on the training managers and training participants.

6.4 Testability

- 6.4.1 If applicable, the Contractor shall, in their R&M Plan and R&M Case, identify how any Built In Test Equipment shall be available to users to identify any system faults.

7.0 Failure Modes

- 7.1 Failure is defined as 'a loss of ability to perform as required'.
- 7.2 This document uses two categories of failure:
- Major:** A Major Failure is any loss of System capability which results in an interruption to training that occurs more than 3 times, or for a total duration of more than 15 minutes, in one training day and/or prevents the achievement of Training Objectives. The downtime shall contribute to the unavailability time for the System.
 - Minor:** When there is no effect on the delivery of training/no impact to the achievement of Training Objectives but a repair/maintenance activity must be undertaken. This excludes scheduled

maintenance but includes those actions which are necessary to correct faults identified during scheduled maintenance, and any faults identified during any stage of the program which impede functionality. Downtime for a minor failure will not count to un-availability time but shall be recorded.

- 7.3 Any agreed changes to failure definitions shall be documented within the R&M Case Report at Contract Commencement.

8.0 Support Between Training

- 8.1 The Contractor shall be provided with the Exercise Calendar for MCAST delivery. This shall provide the Contractor with the opportunity to schedule any maintenance and support activities without interruptions to training.

9.0 Storage

- 9.1 The Contractor shall be responsible for storing all equipment between the major exercises and transporting components between storage and exercise locations.
- 9.2 Where short term storage is agreed to be carried out at the Authority's locations, for example where there is a short gap between exercises, suitable protective packaging shall be provided by the Contractor to prevent system or component degradation whilst in storage.

10.0 Software

- 10.1 Software plays an important part in this project and so reference should be made to Annex D in Part 3 of Def Stan 00-042 [1].
- 10.2 The effects of software restart or reboot times (if applicable) on any System's recovery to a fully operational state following a corrective or preventative maintenance activity shall be stated within the Tenderer's R&M Case Report. Whether software reset or reboot is included (or intended to be included) within the accepted or mandated repair time windows shall require documenting within the Tenderer's R&M Case Report.

11.0 Operators and Maintainers

- 11.1 The MCAST system shall be maintained by the Contractor; the Authority shall not provide personnel to maintain the System.
- 11.2 Authority personnel are not expected to manage the live MCAST service. They will participate in its delivery as members of the White Force and as Trainers and the Training Audience.
- a. White Force members are likely to be:
- (1) A team of experts who facilitate training including exercise management, technical liaison and role players for both friendly and opposing forces.
 - (2) Those who organise and run large-scale live training exercises.
 - (3) A team of operators who simulate other participating units.
 - (4) Umpires or evaluators.
 - (5) Those undertaking the role of opposing forces.

12.0 Assumptions

- 12.1 The assumptions below contribute to the fulfilment of the System Requirements Document (SRD). A list of assumptions is as follows:
- a. MCAST shall be hosted at various Authority establishments using existing infrastructure throughout the duration of the Contract. Infrastructure includes the supply of electrical power and building

heating and ventilation, unless alternative arrangements are agreed within an Exercise Specification. Failure of Authority-provided electrical power does not count as a service failure, it is a failure of Government Furnished Assets.

- b. MCAST shall access the appropriate Authority networks to allow training to be conducted.
- c. MCAST will utilise existing network infrastructure to deliver the service.
- d. The Authority shall provide support to the Contractor, in a governance role for the following disciplines:
 - (1) Engineering.
 - (2) Safety and Environment.
 - (3) Human Factors Integration.
 - (4) Integrated Logistic Support.

13.0 Risks

13.1 Risks associated with R&M are as follows:

- a. Failure to meet required availability levels.
- b. Network connectivity.
- c. Limited time opportunities for maintenance between training packages.
- d. Software supportability.

14.0 Tenderer's R&M Case Report / R&M Plan

14.1 Tenderers shall produce an R&M Case Report and an R&M Plan. The difference between an R&M Case Report and an R&M Plan is as follows:

- a. **R&M Case Report.** The draft R&M Case Report, provided as part of the ITN response, shall provide evidence of the suitability of the proposed solution, based on past or current use.
 - (1) The draft R&M Case Report provided by the selected supplier, shall develop into the Contractual R&M Case Report; a progressively expanding body of evidence used to create an argument for the claims that the availability requirements have been or shall be met. The R&M Case Report shall be produced in accordance with Part 3 of Def Stan 00-042: Reliability and Maintainability Assurance Activity - R&M Case [1].
- b. **R&M Plan.** The draft R&M Plan provides a programme of R&M activities the Tenderer will undertake to ensure the proposed solution fully meets the Authority's availability requirements in the future and that integration activities will not result in any degradation of performance in any of the systems subject to integration.
 - (1) The R&M plan shall identify the Tenderer's approach to ensuring that the R&M programme is in accordance with:
 - i. Def Stan 00-040.
 - ii. Def Stan 00-042.
 - iii. Def Stan 00-045.

15.0 Recommendation

15.1 The information within this document is provided to allow the Tenderers to prepare a response in accordance with Def Stan 00-040 [2]. This shall include the delivery of a draft R&M Plan and a draft R&M Case Report.

16.0 Project Documentation

- 16.1 This document refers to a number of plans, statements, standards and requirements. In the event that there is a disparity, omission or contradiction between the provided or referenced documents, it is to be reported to the Authority as part of the Clarification Question process.

17.0 Abbreviations and Acronyms

Abbreviation / Acronym	Definition
C2	Command and Control
CSF	Commander Strike Force
CSG	Carrier Strike Group
CT	Collective Training
Def Stan	Defence Standard
DMaSC	Defence Modelling and Simulation Coherence
HQ	Head Quarters
IEC	International Electrotechnical Commission
ITN	Invitation to Negotiate
KPI	Key Performance Indicator
LRG	Littoral Response Group
LSG	Littoral Strike Group
MBS	Maritime Battle Staff
MCAST	Maritime Command and Staff Trainer
MCTS	Maritime Composite Training System
MOD	Ministry of Defence
MTG	Maritime Task Group
MWBS	Mine Warfare Battle Staff
MWC	Maritime Warfare Centre
NATO	North Atlantic Treaty Organisation
R&M	Reliability and Maintainability
RN	Royal Navy
SoW	Statement of Work
SRD	System Requirements Document
SSUN	Single Statement of User Need

18.0 References

- 1 MOD Defence Standard 00-042 Part 03, Reliability and Maintainability Assurance Activity Part 03: R&M Case, Issue 6, 28 Jun 2021.
- 2 MOD Defence Standard 00-040 Part 01, Reliability and Maintainability Part: 01 : Management Responsibilities and Requirements for Programmes and Plans, Issue 9, 28 Jun 2022.
- 3 MOD Defence Standard 00-049, MOD Guide to R&M Terminology Used in Requirements, Issue 5, 28 Oct 2021.