



DEFENCE EQUIPMENT & SUPPORT

ARTILLERY SYSTEMS DELIVERY TEAM

**GROUND BASED SURVEILLANCE RADAR (GBSR)
RELIABILITY AND MAINTAINABILITY CASE REPORT**

Contract Number: 701547527

FINAL

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ACRONYMS & ABBREVIATIONS

Abbreviation	Definition
A _i	Inherent Availability
A _o	Operational Availability
BFD	Battlefield Day
BFM	Battlefield Mission
CADMID	Concept Assessment Demonstration In-Service Disposal
CES	Complete Equipment Schedule
CONEMP	Concept of Employment
DE&S	Defence Equipment & Support
DEF STAN/Def Stan	Defence Standard
FBC	Full Business Case
FOC	Full Operating Capability
FOS	Fall of Shot
GBSR	Ground Based Surveillance Radar
ILS	Integrated Logistic Support
ILSP	Integrated Logistic Support Plan
ISC	Incident Sentencing Committee
KiD	Knowledge in Defence
KUR	Key User Requirement
LSC	Logistic Support Committee
&M MOD/MoD	Ministry of Defence
MSTAR	Man-Portable Surveillance Target Acquisition Radar
MTBF	Mean Time Between Failure
MTI	Moving Target Indicator
OSD	Out of Service Date
R&M	Reliability and Maintainability (also includes Availability, Durability, Testability etc)
R&M WG	R&M Working Group
SQEP	Suitably Qualified and Experienced Person
SRD	System Requirement Document
SSUN	Single Statement of User Need
TOR	Terms of Reference
URD	User Requirement Document

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Abbreviation	Definition
WG	Working Group

REFERENCES

1	Defence Standard 00-040 Part 1 issue 8
2	GBSR URD V1.8 dated 01 Dec 2020
3	GBSR SRD V1.0 dated
4	Defence Standard 00-044 Issue 2
5	Defence Standard 00-042 Part 3 Issue 5
6	GBSR CONEMP
7	Defence Standard 00-042 Part 7 Issue 2
8	Defence Standard 00-049 Issue 4
9	DSTL GBS CONUSE V2.0 dated
10	MSTAR GBSR PMP V1.0 dated
11	GBSR ILSP V1.0 dated

1. Introduction

1.1 The aim of this Initial R&M Case for the Ground Based Surveillance Radar project (hereafter called GBSR) is to create a reasoned, auditable submission to support the contention that the equipment being acquired by the Customer will satisfy the Reliability and Maintainability (R&M) requirements for which it is being procured. The R&M Case and subsequent Reports will provide an audit trail of the system engineering considerations and decisions from requirements through to evidence of compliance, i.e. progressive assurance. This Initial R&M Case has been produced by the Authority to provide context to the R&M requirements and to demonstrate that the GBSR R&M requirements are realistic and achievable.

1.2 The R&M Case and subsequent Reports should provide stakeholders with an overview of the system's R&M achievement during the previous agreed period of time together with a list those R&M related issues which currently compromises its capability. Together with sufficient appropriate evidence and arguments within the R&M Case Report should also enable stakeholders to make informed decisions on how to address any such shortfalls.

1.3 This document applies to the Assessment phase of the GBSR Project and is to be used to guide the Contractor in their R&M activities and to support the GBSR Full Business Case (FBC) for approval.

2. System Description

[REDACTED]

3. The Single Statement of User Need (SSUN)

[REDACTED]

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4. Current Capability Shortfalls

4.1 Man-Portable Surveillance Target Acquisition Radar (MSTAR) Mk 1 entered service in Oct 1989 to meet requirement GSR 3938 and replaced the then obsolete ZB-298. It has been through numerous upgrades, the last being a Mid-Life Improvement, which commenced in 1999 on a rolling programme until 2004, with [REDACTED] complete systems. This brought the system to its current Mk IV status. [REDACTED]

4.2 The GBSR project will address the obsolescence issue with the current in-service MSTAR fleet.

5. Mission Profile

[REDACTED]

6. Operating Environment

[REDACTED]

7. Requirements

7.1 Summary of System Requirements

- a. See Annex A and GBSR SRD (Reference 3)

7.2 Availability Requirements

The Inherent Availability (Ai) required for each GBSR unit, including all CES items, is Threshold (minimum) training availability of [REDACTED]% and a war fighting availability of [REDACTED]% whilst Objective training availability of [REDACTED]% and a war fighting availability of [REDACTED]% over a BFM ([REDACTED] hours).

7.3 Reliability Requirements of the GBSR equipment:

- a. Mission reliability: [REDACTED]
- b. Basic reliability: [REDACTED]

7.4 Testability Requirements

The maintainer requires the ability to test LRUs using Automatic Test Equipment. Def Stan 66-031 Requirements for Electronic and Electrical Test and Measurement Equipment, Part 8: Requirements for Automatic Test Systems utilising an Open System Architecture

7.5 Maintenance & Maintainability Requirements

The contractor shall supply a Maintenance Plan, summarised in the R&M Case with details of:

- a. Levels of Maintenance including
- b. Skills required
- c. People required
- d. Special tools
- e. Mean active corrective repair time
- f. Maximum repair time
- g. Planned maintenance activities and schedule
- h. Lines of Maintenance including
- i. Facility requirements
- j. Skill required

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8. Failure Definitions

8.1 The following failure criteria shall be applied to all GBSR capabilities:

- a. Mission Critical Failure is any incident which would prevent GBSR from safely and successfully completing a Battle-Field Mission (BFM).
- b. Basic Failure or maintenance related failure is defined as any unsatisfactory equipment condition which requires unscheduled intervention to restore the equipment to its design and performance build standard. It excludes scheduled maintenance but includes those actions which necessary to correct faults identified during scheduled maintenance.
- c. Any Mission Failure which require unscheduled maintenance intervention shall also be counted as a Basic Failure.
- d. Discounted Failures are failures resulting from misuse, accident, human error or maintenance which is not in accordance with defined schedules.
- e. Classification of Failures, and Incident Sentencing should be carried out in accordance with Def Stan 00-044 (reference 4).

9. Durability Requirements

9.1 Planned Out of Service date for this equipment is [REDACTED]

10. Risks

10.1 The R&M related risks shall be identified and summarised in the R&M Case. The contractor is to include these risks, and their proposed mitigation, within their master Risk, Opportunity Management Plan (POMP) and the R&M documentation provided in response to this document. They shall also highlight any additional risks they identify relating to their solution and it's adoption by the Authority.

11. Software

11.1 Whilst no specific software requirements have been defined for the system, evidence to show that a robust software development process will be required in all R&M Case reports. Justification through evidence of software development on previous programmes should be provided along with information relevant to this programme showing that similar trends are being experienced. Any assumptions made in relation to the reliability of software in R&M models shall be fully documented.

11.2 The presence of any software or firmware in the control systems means there could be non-mechanical failures. The system failure definitions are therefore assumed to include any software elements.

12. Assumptions

12.1 In the absence of definitive data in the early stages of the programme, a number of assumptions underpin the planning for GBSR and are captured in the Authority's Master Data and Assumptions List (MDAL) maintained by the ArtySys MSTAR DT.

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13. Recommendations

13.1 An R&M Working Group (R&M WG) for GBSR should be conducted as part of the 6-monthly Logistic Support Committee (LSC) meetings with all stakeholder's present. The outputs from this R&M WG will provide the required R&M outputs and deliverables required for FBC approval. Upon contract award, the R&M strategy will be for the R&M WG meetings to continue to be conducted as part of LSC meetings and will ensure progressive R&M assurance is provided in a form that can be demonstrated through the project life-cycle.

13.2 Terms of Reference for an R&M Working Group are enclosed at Annex B.

13.3 The information included within this document is sufficient to allow a Contractor to prepare a response iaw Def Stan 00-040 Part 1 (reference 1) and 00-042 Part 3 (reference 5) which details how they intend to fulfil the requirements within it. This must include the delivery of a draft R&M Case and draft R&M Plan as part of their tender response.

13.4 It is therefore recommended that this document is now sufficiently detailed to form part of the documentation pack for the GBSR contract.

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ANNEX A - AR&M System Requirements

[REDACTED]

ANNEX B - Terms of Reference for R&M Panel (and subsequent RWG)

Working Group	Reliability and Maintainability Panel
General	<p>The Authority definition of a project R&M Panel is; “A group of knowledgeable people operating as a team to deal with R&M at particular stages in a project.”</p> <p>Defence Standard 00-40 (Reliability and Maintainability, Part 1, Management Responsibilities and Requirements for Programmes and Plans) states that; “The Project Manager shall establish an R&M project committee or working group. This group should include representation from R&M stakeholders including specialist advisors, the equipment Sponsor, and, as required, project Integrated Logistic Support, contracts, QA, R&D advisors and the contractor’s design and engineering staff.</p> <p>The Terms of Reference for the R&M Panel and level of attendance will change through the CADMID cycle. The Panel is concerned with ensuring that all appropriate stakeholders are involved in the R&M process. As such the attendance is tailored to the programme phases.</p>
Responsibility	<p>The R&M Panel is responsible for providing the body of expertise to assist the Authority on the following;</p> <ul style="list-style-type: none"> Providing a forum for R&M issue resolution, provide specialist advice and support relating to Specific R&M issues as appropriate. Providing advice to the Project Manager and the Sponsor on any proposed amendments to project timescales or requirements/ targets subject to contract and cost factors, and to discuss the potential in-Service effects of those amendments. Monitoring R&M risks. Reviewing the progression of the R&M programme through the assessment of progress meetings and R&M Case Reports. Providing briefs through the organisational reporting structure as appropriate. Ratifying recommendations of the Incident Sentencing Committee (ISC) and acting as arbitrator where agreement cannot be reached. To agree an assessment of achieved R&M levels for acceptance purposes. To assess the results of Maintainability Demonstrations, Reliability Qualification and In-service Reliability and Maintainability Demonstrations,

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	<p>where these are called for as part of the equipment acquisition strategy.</p> <p>R&M is managed through the R&M Panel, which also reports to the Logistic Support Committee (LSC) and the Capability Integration Working Group.</p>
Chairmanship	The Chairmanship and lead for the R&M Panel will be provided by the Authority, nominally the Project Manager
Membership	<p>Membership will be called from the Authority, Prime Contractor and Sub-Contractors as required. The R&M Panel will nominally consist of the members as listed below. Additional attendees may be invited at the discretion of either the MoD or the contractor.</p> <p style="padding-left: 40px;">D Eqpt CD CSS Requirements Manager ILS Manager Trials Manager R&M Manager/Engineers (Secretary) R&M Advisor. DE&S SpDir R&M Technical Advisor and Assurer. Industry (Project related), Engineering and R&M Representatives. Other attendees - as invited by the Chairman.</p>
Meeting Frequency	<p>The R&M Panel will meet regularly to review progress. Meetings are to be arranged as required</p> <p>The R&M Panel can be convened via Ad-Hoc by either party if a specific issue needs to be resolved in a short timescale subject to the availability of members of both parties.</p>
Reporting	<p>The R&M Panel will report, via the Chairman, to the LSC and the Capability Integration Working Group, CIWG.</p> <p>Draft Minutes are to be provided by the secretary within five working days of the meeting. Comments on the draft minutes are to be returned to the Secretary within a further five working days or a nil return may be assumed. On receipt, final minutes will be issued. Minutes and the current action log will also be issued with the next R&M Panel calling notice and circulated to attendees and members.</p>
Standard Agenda Items	<p>The agenda for each meeting will include, but not necessarily be limited to, the following:</p> <p style="padding-left: 40px;">Chairman's Welcome / Introduction Minutes of Last Meeting Actions Arising Status of Risks and Issues Programme Overview and Schedule AOB Date & Place of next meeting</p>

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Issues and Actions	<p>Items that relate to Reliability, Maintainability, Testability or Durability that are of concern to the involved parties are to be raised as individual issues.</p> <p>The R&M Panel shall recognise an issue by formally including it as a minute item. Once minuted it will be included in the combined Actions and Issues Register, this will be a live document and will take the form of an Appendix attached to each set of minutes.</p> <p>Each issue will be provided with a unique sequential number, brief description, owner (person who raised the item), an action and nominated actionee, target date for completion, progress report, and a closure summary when completed.</p>
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**ANNEX C - RELIABILITY AND MAINTAINABILITY TERMS AND DEFINITIONS
FOR THIS PROJECT**

Inherent Availability (A_i)

The Inherent Availability (A_i) shall be calculated using the following formula:

$$A_i = \frac{\text{Uptime}}{\text{Uptime} + \text{Downtime}} \times 100\%$$

Where:

- a. **Uptime** is defined as the total time period that the System is available for operational or training events.
- b. **Downtime** is defined as the total time when the System is not available for operational or training events; i.e., the total time taken from defect notification to defect rectification.