# [Redacted under exemptions set out by the Freedom of Information act]

SYSTEM REQUIREMENTS DOCUMENT (SRD)

File Ref: SEEC / AEOD / [REDACTED]
Version: v2.0
Dated: 12 Dec 22

# APPROVALS

| | Name | Date |
|---|---|---|
| Drafted by: | [Redacted under exemptions set out by the Freedom of Information act] | 12 Dec 22 |
| Authorised by: | [Redacted under exemptions set out by the Freedom of Information act] Engineering SEEC DT | |
| Agreed by: | [Redacted under exemptions set out by the Freedom of Information act], DEODS SP SO2 | |
| Acknowledged by: | [Redacted under exemptions set out by the Freedom of Information act] AH DEODS | |

# CHANGE HISTORY

| Version | Description | Date |
|---|---|---|
| 0.1 | First draft for initial review. | 11 Mar 22 |
| 0.2 | Second draft following SEEC & SO2 SP review. | 22 Mar 22 |
| 1.0 | Formal release following stakeholder review. | 31 Mar 22 |
| 1.1 | Proposed updates following structure change and generation of ITT | 12 Aug 22 |
| 1.3 | Proposed updates from SEEC Security SME | 28 Nov 22 |
| 2.0 | Formal release following stakeholder review. | 12 Dec 22 |
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# CONTENTS

# Part 1 – General Description

## Background

1. Project [REDACTED] will provide a Through Barrier Imaging System (TBIS) capability to replace [REDACTED]. The capability will be used by Explosive Ordnance Disposal (EOD) [REDACTED] operators during Improvised Explosive Device Disposal (IEDD) operations, solely Military Aid to Civil Authorities (MACA), within the UK.

2. A more detailed background can be found in the User Requirements Document (URD) [REF_01], Concept of Employment (CONEMP) [REF_02] and Project Mandate [REF_03].

3. The system as described is assumed to be a transmission X-Ray system which typically includes three main elements: generator, imager and viewer. It is acknowledged that some solutions may deviate from this traditional system element breakdown and these solutions will not be excluded.

## Aim

4. The aim of this System Requirements Document (SRD) is to provide the equipment level detail to enable the procurement of the deployable system and support solution to satisfy the needs articulated in the URD.

## Purpose

5. This SRD supports the CONEMP and URD by providing system level requirements to enable the procurement of the equipment. This SRD has been created to define the technical requirements for each function of the TBIS capability.

## [REDACTED] Boundary Diagram

6. Figure 1 depicts the elements of the [REDACTED] system alongside the wider environment in which it is to operate. The three elements of the [REDACTED] system – generator, imager and viewer – form the basis of the capability and enable it to meet its stated aims, whilst allowing flexibility for procurement and entry into service.

IMAGE [Redacted under exemptions set out by the Freedom of Information act]



Figure 1 – [REDACTED] System of Interest Boundary Diagram

## Operational Context

7. **Operating Environment.** The equipment is specifically for AMT operators carrying out EOD operations in the UK who are required to operate TBIS equipment in order to evaluate the threat from suspect or known devices. The CONEMP articulates in detail the operational context and environment in which the capability is required to be employed.

8. **Environmental conditions.** This capability will operate in UK MACA environments only. The conditions it is stored in and the conditions it is subjected to during transportation by land cannot degrade the system so that it is unusable at the desired point of deployment. [REDACTED]'s operational environment will be a controlled cordoned area within the UK. In addition, equipment survivability against Chemical, Biological, Radiological, Nuclear (CBRN) and natural environment threats must be matched to meet the level of hostile and natural environments likely to be encountered.

9. **Portability imperative.** The [REDACTED] system is required to be transported to the target by the operator and deployed on operations for immediate availability. Hence portability of the system is an important consideration alongside the robustness required for the induced mechanical environments associated with deployment on vehicles and general use on operations.

10. **Assumed Operational Thread.** Figure 2 below details the assumed operational thread of the [REDACTED] system deployed on a task.

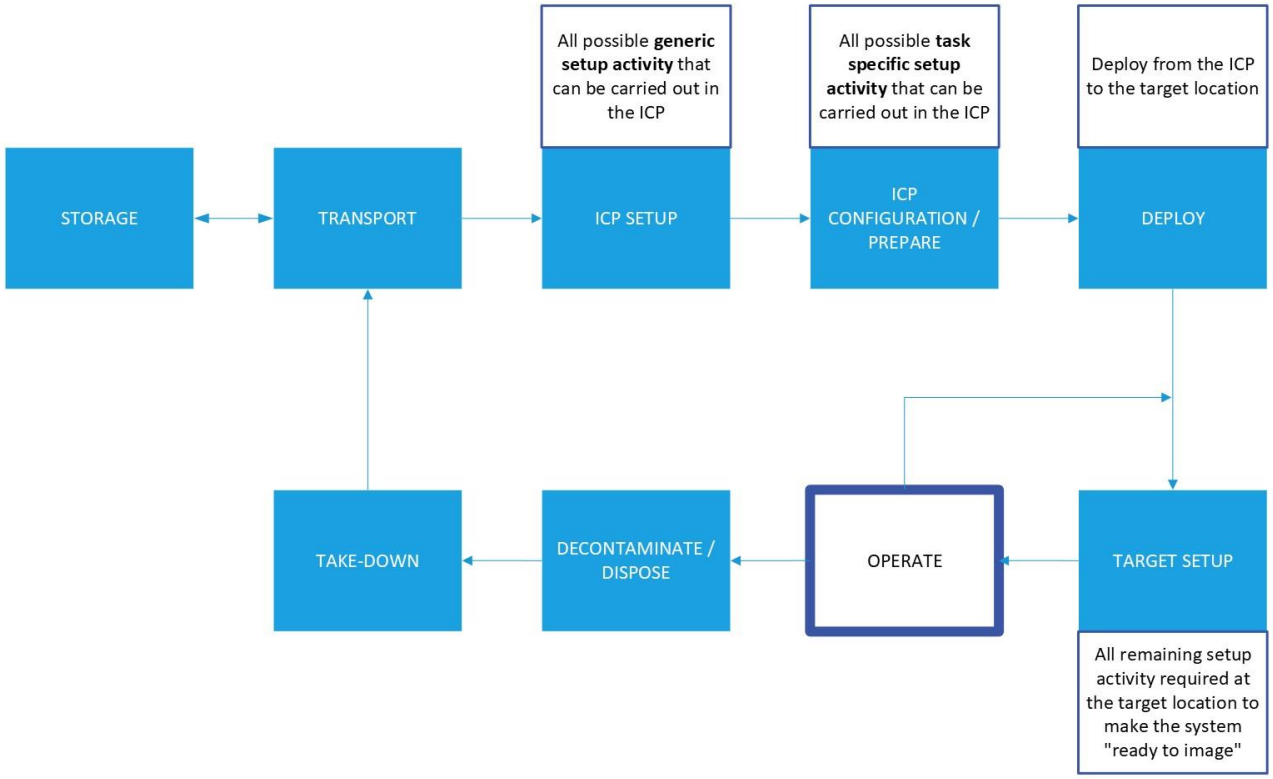


Figure 2 – [REDACTED] Assumed Operational Thread

The detail for the 'Operate' element of the thread is detailed separately in Figure 3, below.

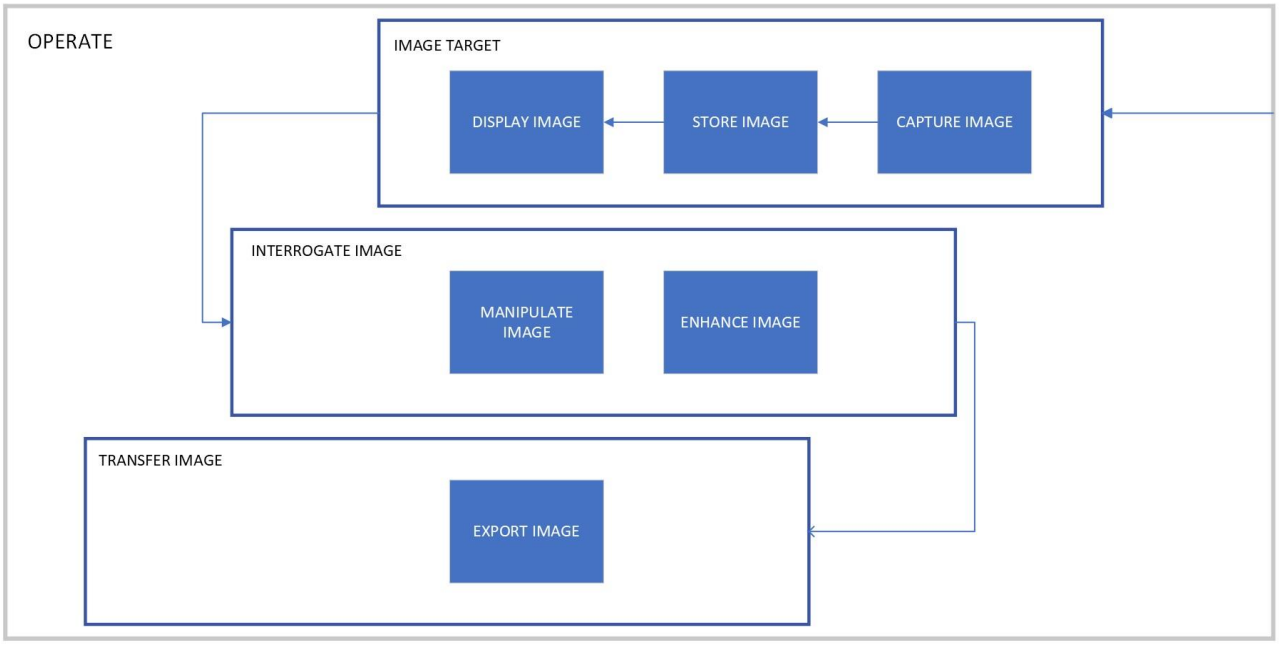


Figure 3 – [REDACTED] Assumed Operational Thread Detail for 'Operate'

These threads outline the high level functions that the [REDACTED] system is required to provide which are further detailed in Part 3.

## Dependencies

11. The [REDACTED] capability is dependent on the following equipment:

    a. Project REDACTED (1B & 1C) for UK MACA fielding.

    b. Precision alignment capabilities including REDACTED.

    c. X-Ray Toolkit.

    d. [Redacted under exemptions set out by the Freedom of Information act]

12. The Battlefield Mission (BFM) [REF_04] is required ahead of any verification and validation test activities to provide a repeatable consistent test procedure to prove requirements are met by the solution.

## Interoperability/Compatibility

13. [REDACTED] will operate alongside other systems therefore it shall be compatible as to not interfere with or be interfered by other systems and be able to operate in an EM environment in accordance with the [REDACTED] Electromagnetic Compatibility Control Plan [REF_05]

14. X-Ray Image data will be passed from the target to a safe area via the XHLC system. [REDACTED] must allow the quick and efficient transfer of data between the two systems.

## Applicable Acquisition Strategy

15. DE&S aims to procure a Value for Money (VfM) solution on behalf of Army Headquarters, Defence EOD & Search (DEODS), for operation by the user groups as defined in the CONEMP.

16. It is assumed that the [REDACTED] solutions will be Commercial Off The Shelf (COTS) or COTS with modifications by the supplier. Therefore this SRD is written to allow evaluation of competitively tendered solutions.

## Required Planning Dates

17. Planning Assumption for Service Entry (PASE): [REDACTED], Optional Mid-Life Upgrade (MLU): [REDACTED], Out of Service Date (OSD): [REDACTED].

## Assumptions

18. The assumptions applicable to this project are recorded and maintained in the Master Data Assumption List (MDAL) [REF_06].

19. Specific assumptions used to create this SRD are as follows;

a. The [REDACTED] system will be a transmission x-ray system with three main elements – generator, imager and viewer.

b. The [REDACTED] technical requirements can be met by COTS solutions.

c. [REDACTED] will be operated broadly in line with the Operational Thread shown in Para 10.

d. [REDACTED] is not required to be functionally compatible with existing equipment.

e. [REDACTED] will replace the following equipment:

i. [REDACTED] (X-Ray Generator) OSD 2025.

ii. [REDACTED] (X-Ray Imaging Unit and Plates) OSD 2023.

20. The candidate systems will be compared using a defined target set and assessed against four quality criteria metrics, useful penetration, contrast sensitivity, basic spatial resolution and signal to noise ratio. The target set is to be defined and will feature in the test plan to follow.

21. **Quality Criteria Descriptions**.

a. **[Useful penetration]**: how much steel can a system image through and still observe a defined thickness of steel wire.

b. **[Contrast sensitivity]:** The system's ability to discriminate between two thicknesses of the same material. This is typically measured across a range of thicknesses.

c. **[Basic Spatial resolution]:** this relates to the pixel size and shows the smallest geometric feature that can be observed, measured using pairs of wires of decreasing thickness that are placed closer together. The best basic spatial resolution is where there is a 20% difference in contrast between the wires and the space between them, i.e. a definitive measurable gap between the two wires.

d. **[Signal to noise ratio]:** The sensitivity of the detector measured as the ratio between the average signal strength and the standard deviation of the individual grey levels of the pixels.

## Constraints & Limitations

22. Constraints and limitations have been captured within the SRs in the table shown in Part 3.

## Risks

23. **Change to Approach.** This SRD has been written with respect to the assumptions outlined above. If the procurement approach was to change then an update and re-issue of this document will be required.

## Acceptance strategy

24. The [REDACTED] Requirements and Acceptance Strategy (RAMS) [REF_07] and Integrated Test Evaluation & Acceptance Plan (ITEAP) [REF_08], will define the acceptance strategy as laid out in the [REDACTED] Engineering Management Plan (EMP) [REF_09].

## Security

25. The security requirements for [REDACTED] are defined within the Security Aspect Letter (SAL) [REF_10].

## Notes on System Requirement table

26. The following notes are to aid in reviewing the SR tables in parts 2 and 3 of this document see KiD [REF_11] for full details:

a. **ID:** A unique identifier for each system requirement;

b. **Linked UR:** The user requirement being met by the system requirement;

c. **Topic:** The nature of the system requirement in line with the operational thread;

d. **System Requirement:** The individual requirement statement;

e. **Justification:** Reason for inclusion;

f. **Priority:** Mandatory, Key System Requirements (KSR), Priorities 1, 2 and 3:

i. **Mandatory:** Must be met. (e.g. Legislative);

ii. **KSR:** Un-tradable without formal agreement from SRD owner;

iii. **Priority 1:** A high priority requirement. Trading will require reference back to the Capability Sponsor;

iv. **Priority 2:** A medium priority requirement. Trading will require reference back to the Requirements Manager but with endorsement of the Capability Sponsor;

v. **Priority 3:** A low priority requirement. Trading will require reference back to the Requirements Manager with endorsement of the Capability Working Group;

g. **Status:** Candidate, Traded, Transferred, or Cancelled;

h. **Threshold Measure of Performance (TMOP):** The minimum quantity or quality mark to be met;

i. **Objective Measure of Performance (OMOP):** The preferred standard to meet;

j. **Verification Category:** How the provision of requirement will be judged when delivered. For example, as described below, but not limited to.

| Verification Category/Method | Description |
|---|---|
| Analysis | Review of technical information typically associated to the design, manufacture, and supportability of the system.<br>Analysis activities may include;<br>Review of systems design data, drawings, technical specifications, calculations, plans, physical models, mock-ups, drawings, virtual computer generated objects or other forms of realisation (M&S). |
| Inspection | Formal scrutiny of a system solution at an appropriate level of detail or abstraction, to check for conformance with a requirement or specification.<br>Inspection activities may include;<br>Review of Existing Qualification Data (EQD) such as Test Reports, Technical data, Visual Inspections, Functional demonstrations, Safety Inspections, ILS data, R&M data. |
| Test | Formal tests that aim to confirm that the system performs as per the system requirement or specification.<br>Test activities may include;<br>Factory Acceptance Tests (FAT),<br>System Acceptance Test (SAT) and<br>User Acceptance Test (UAT)<br>Vehicle Trials, such as Static & Dynamic Trials. |

k. **Remarks:** Any other remarks that aid clarity and interpretation of the requirement.

# Part 2 – Key System Requirements

27. The KSR's below are derived from the Key User Requirements. The requirements are assessed as being Key to the achievement of the capability. They are deemed the most important components of the associated URs and are untradeable without approval. These KSRs will require endorsement by the Capability Integration Working Group (CIWG) chair and must be passed to the Approving Authorities (if after OBS) for comment if they are traded.

| ID | System Requirement | Status |
|---|---|---|
| SR-02 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |
| SR-03 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |
| SR-04 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |
| SR-05 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |
| SR-10 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |
| SR-11 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |
| SR-20 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |

[Redacted under exemptions set out by the Freedom of Information act]

| ID | System Requirement | Status |
|---|---|---|
| SR-21 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |
| SR-22 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |
| SR-25 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |
| SR-30 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |
| SR-31 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |
| SR-32 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |
| SR-33 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |
| SR-37 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |
| SR-59 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |

[Redacted under exemptions set out by the Freedom of Information act]

| ID | System Requirement | Status |
|---|---|---|
| SR-61 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |
| SR-68 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |
| SR-91 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |
| SR-92 | [Redacted under exemptions set out by the Freedom of Information act] | Candidate |

# Part 3 – System Requirements Table

28. 20221212-[REDACTED] SR Table-v2.0-OS [REF_12].

29. This section contains the full set of SRs applicable to [REDACTED]. SRs can be traded in accordance with their respective priorities. The total number of requirements for each priority is shown in the table below.

| Priority | Total |
|---|---|
| Key | 19 |
| Mandatory | 15 |
| 1 | 57 |
| 2 | 28 |
| 3 | 2 |

# Part 4 – Context Documents

| Reference | Short title | Version | Date | Reference/File ref | Owner |
|---|---|---|---|---|---|
| [REF_01] | [REDACTED] URD | v1.2 | 11 Aug 21 | SEEC/SEOD/[REDACTED] | SEEC DT – RM |
| [REF_02] | [REDACTED] Concept of Employment (CONEMP) | v0.1 | 24 Feb 21 | SEEC/SEOD/[REDACTED] | DEODS/HQ 29EOD&S Gp |
| [REF_03] | Project Mandate | v2.1 | 28 Feb 21 | SEEC/SEOD/[REDACTED] | DEODS – SO1 Cap |
| [REF_04] | Battlefield Mission (BFM) | v1.0 | 19 Jan 22 | SEEC/SEOD/[REDACTED] | DEODS/HQ 29EOD&S Gp |
| [REF_05] | FP ECM & REDACTED EMC Control Plan, Issue 1 | v1.0 | 01 April 22 | DSTL/DOC135902 | DSTL |
| [REF_06] | Master Data Assumption List (MDAL) | v0.1 | 11 Mar 22 | SEEC/SEOD/[REDACTED] | SEEC DT |
| [REF_07] | Requirement and Acceptance Strategy (RAMS) | TBD | TBD | TBD | SEEC DT |
| [REF_08] | Integrated Test Evaluation and Acceptance Plan (ITEAP) | v0.1 | 11 Mar 22 | SEEC/SEOD/[REDACTED] | SEEC DT - Eng |
| [REF_09] | Engineering Management Plan | v0.1 | 11 Mar 22 | SEEC/SEOD/[REDACTED] | SEEC DT - Eng |
| [REF_10] | Security Aspects Letter (SAL) | v1.0 | 20 Jul 21 | SEEC/SEOD/[REDACTED] | DEODS – SO2 SP |
| [REF_11] | Knowledge in Defence (KiD) | v1.0.34 | 01 Mar 22 | http://aof.uwh.diif.r.mil.uk/index.htm | MOD |
| [REF_12] | [REDACTED] SR Table | V2.0 | 12 Dec 22 | SEEC/SEOD/[REDACTED] | SEEC DT |

# Part 5 – Glossary

## Abbreviations

| Abbreviation | Definition |
|---|---|
| AESP | Army Equipment Support Publication |
| ALARP | As Low as Reasonably Practicable |
| AMT | Advanced Manual Techniques |
| BFM | Battlefield Mission |
| BPEO | Best Possible Environmental Option |
| BS | British Standard |
| CAD | Chemical Agent Decontamination |
| CBR | Chemical, Biological, Radiological |
| CBRN | Chemical, Biological, Radiological, Nuclear |
| CES | Complete Equipment Schedule |
| CONEMP | Concept of Employment |
| COTS | Commercial Off The Shelf |
| CIWG | Capability Integration Working Group |
| DE&S | Defence Equipment & Support |
| DEFCON | Defence Conditions |
| DEF STAN | Defence Standard |
| DEODS | Defence EOD & Search |
| DIAN | Defence Information Assurance Note |
| DSA | Defence Safety Authority |
| DSAT | Defence Systems Approach to Training |
| DSTL | Defence Science and Technology Laboratory |
| EM | Electro Magnetic |
| EMC | Electro Magnetic Compatibility |
| EMI | Electro Magnetic Interference |
| EMP | Engineering Management Plan |
| EOD | Explosive Ordnance Disposal |
| EQD | Existing Qualification Data |
| FAT | Factory Acceptance Test |
| FE@R | Force Elements at Readiness |
| FFBNW | Fitted For But Not With |
| FOC | Full Operational Capability |
| HFI | Human Factors Integration |
| HMI | Human Machine Interface |
| HQ | Headquarters |
| HW | Hardware |
| IAW | In Accordance With |
| ICP | Incident Control Point |
| IEDD | Improvised Explosive Device Disposal |

| Abbreviation | Definition |
|---|---|
| ILS | Integrated Logistics Support |
| IMDG | International Maritime Dangerous Goods |
| IOC | Initial Operational Capability |
| ISO | International Standards Organization |
| ITEAP | Integrated Test Evaluation & Acceptance Plan |
| JSP | Joint Service Publication |
| KSR | Key System Requirements |
| LRU | Line Replaceable Unit |
| LSA | Logistic Support Analysis |
| MACA | Military Aid to Civil Authorities |
| M&S | Modelling & Simulation |
| MDAL | Master Data Assumption List |
| MENA | Middle East and North Africa |
| MOD | Ministry of Defence |
| MoP | Measure of Performance |
| MPDS | Multi-Purpose Decontamination System |
| MTBF | Mean Time Between Failures |
| NATO | North Atlantic Treaty Organization |
| NSN | (NATO) Stock Number |
| OEM | Original Equipment Manufacturer |
| OMoP | Objective Measure of Performance |
| OSD | Out of Service Date |
| PPE | Personal Protective Equipment |
| RAMS | Requirements and Acceptance Strategy |
| RLN | Reduced Logistic Need |
| R&M | Reliability and Maintainability |
| S3 | Safe and Suitable for Service |
| SAT | System Acceptance Test |
| S&TE | Support & Test Equipment |
| SMS | Safety Management System |
| SPT&ME | Special Purpose Test and Measurement Equipment |
| SQEP | Suitable Qualified Experienced Professional |
| SR | System Requirement |
| SRD | System Requirements Document |
| SSA | Sub Saharan Africa |
| STANAG | Standardisation Agreement |
| STTE | Special Tools and Test Equipment |
| T3 | Train the Trainer |
| TAD | Target Audience Description |
| TBC | To Be Confirmed |
| TBD | To Be Determined |
| TBIS | Through Barrier Imaging System |

| Abbreviation | Definition |
|---|---|
| TMoP | Threshold Measure of Performance |
| UAT | User Acceptance Test |
| UK | United Kingdom |
| UII | Unique Item Identifier |
| UR | User Requirement |
| URD | User Requirement Document |
| VfM | Value for Money |
| WLC | Whole Life Costs |
| XHLC | Cross Hotline Communications |

## Definitions

| Term | Definition |
|---|---|
| ALARP | As Low As Reasonably Practicable. A risk is ALARP when it has been demonstrated that the cost of any further Risk Reduction, where the cost includes the loss of defence capability as well as financial or other resource costs, is grossly disproportionate to the benefit obtained from that Risk Reduction, as defined in Ministry of Defence, Defence Standard 00-56 Issue 4 Publication Dated 01 June 2007. Safety Management Requirements for Defence Systems. Part 1 Requirements. Annex A |
| Alert | Warn operator of an system event. |
| Automatically | Human is not involved in the process. |
| Battlefield Mission | A defined usage profile used to assess requirements and reliability of systems |
| Black-out mode | A mode where the system does not transmit on the specified spectrum. E.g. wireless black-out mode must deactivate the transmitter, not just not use it. |
| Contrast sensitivity | The system's ability to discriminate between two thicknesses of the same material. This is typically measured across a range of thicknesses. |
| Deactivate | Shall cease to function. |
| Deadzone | The area of an X-rayed target that cannot be captured by the imager due to the physical limitations. |
| Degradation | A gradual impairment of the ability to perform. Term often used prefixed with 'without' which means no loss of performance, functionality, reliability or service life |
| Generator | The element of the system that creates x-ray radiation. |
| Imager | The element of the system that produces the x-ray image from the x-rays received through the target |
| Target | An example of a typical item to be imaged. To be defined in the [REDACTED] ITEAP. |
| Level 1, 2, 3, 4 | Equipment Support Levels of repair, as defined in Def Stan 00-600. |
| Lifting Features | Features on a item that allow it to be lifted, by a person or by a device. |
| Maintainable | The ability (of an item) to be retained in, or restored to a state in which it can perform as required, under given conditions of use and maintenance. |
| Maintainer | Person performing maintenance tasks or activities. |
| Official | The majority of information that is created or processed by the public sector. This includes routine business operations and services, some of which could have damaging consequences if lost, stolen or disclosed inappropriately, but are not subject to a heightened risk profile. This includes the information relating to the routine operation of Defence, as defined in JSP 440 Part 2 - Leaflet 9 |
| Official Sensitive | As [Official] with the addition that consequence of compromise would cause significant harm, as defined in JSP 440 Part 2 - Leaflet 9 |
| Operable | The ability for the system to be used by the appropriate persons. |
| Operated | Used in the correct manner. |
| Operator | The person operating any part of the system. |
| Operational configuration | The system set up ready for use. |
| Operational State | The functional condition of the system at a point in time. e.g. Off, Fault, Power Up. |

| Term | Definition |
|---|---|
| Operational Mode | The functional boundary that has been set by the operator e.g. automatic/override. |
| Ready to Image | All necessary system components required at the target location to successfully capture an image are set up and do not require the operator to return to the target location in order to initiate image capture. The system will be 'ready to image' when the only required operator action is Initiation of image capture (initiation of image capture shall only require a single user action, e.g. button press or mouse click) |
| Recover | To regain lost system functionality. |
| Report | Data that the system can be interrogated to obtain. |
| Routine Maintenance | Scheduled maintenance activities carried out to prevent system failures |
| Signal to noise ratio | The sensitivity of the detector measured as the ratio between the average signal strength and the standard deviation of the individual grey levels of the pixels. |
| Spacial frequency | This relates to the smallest feature detectable by the system, which may be smaller than a pixel. This is measured using a convergent line gauge and can be done by eye or using a graphical plot of the intensity across the gauge to find the point where an operator cannot see the 5 peaks created by the 5 convergent lines. |
| Spacial resolution | Related to the pixel size and shows the smallest geometric feature that can be observed, measured using pairs of wires of decreasing thickness that are placed closer together. The best basic spatial resolution is where there is a 20% difference in contrast between the wires and the space between them, i.e. a definitive measurable gap between the two wires. |
| Storage | The ability to capture energy for subsequent use. |
| System | The elements that make up [REDACTED], arranged in order to deliver against the requirements |
| System Failure | Any incident which would prevent the system from completing a Duty Cycle without interruption, as defined in Ministry of Defence Defence Standard 00-42 Part 3 Issue 4 Publication Date 17 June 2011. Reliability and Maintainability. Assurance Guide. Part 3 R&M Case. |
| Target Audience Description | The persons identified who will operate and maintain the system. |
| Transport configuration | The system set up to be transported. This may be in packaging or otherwise protected. |
| Useful Penetration | A measure of how much steel a system can image through and still observe a defined thickness of steel wire. |
| Viewer | The element of the system that allows the operator to view the x-rays captured by the imager. |