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JSP 939
Defence Policy for Modelling & Simulation (M&S)

Part 2: Guidance

Foreword

As a key enabler, Modelling & Simulation (M&S) has wide application across the Defence enterprise, both in terms of cost benefits and providing a mechanism for satisfying challenging Defence requirements. It also provides environmental benefits over traditional options.

Better coordination of activity, guidance and acquisition are needed to enable Defence to derive the maximum benefit from investment in M&S. This JSP sets out appropriate direction, clear governance structures and suitable mechanisms to resolve issues and reduce risk, enabling the Front Line Commands (FLCs) to develop and deliver M&S-based solutions in a technically coherent manner.

Under the direction and guidance of the Defence Modelling and Simulation Office (DMSO), the aim is to provide a coherent framework of M&S enablers and resources, accessed through the Defence Simulation Centre (DSC), that are reusable, interoperable, reconfigurable and cost effective, not just across the Defence enterprise but also with our allies.

As the Defence 3* Military Capability Management Functional owner, I mandate compliance with this JSP, beginning with early engagement with the DMSO, through its DSC, to ensure success.

Lieutenant General Sir Robert Magowan KCB CBE RM
Deputy Chief of Defence Staff (Military Capability)
Functional Owner for Military Capability Management

Preface

How to use this JSP

1.   JSP 939 provides Defence Direction and Guidance for the acquisition, development and usage of M&S across Defence and its application areas. This JSP contains the policy and direction on M&S from a Defence Enterprise[1] perspective and guidance on the processes involved and best practice to apply to any M&S acquisition and development.

2.   The JSP is structured in two parts:

   a.   **Part 1 - Directive**, which provides the direction that must be followed in accordance with statute or policy mandated by Defence or on Defence by Central Government.

   b.   **Part 2 - Guidance**, which provides guidance and best practice that will assist the user to comply with the Directive(s) detailed in Part 1. Expanding on general M&S policy compliance advice, Part 2 is expected to evolve and include fresh sections that address specific application and focus areas of M&S that includes (but not limited to) the following:

   (1)   M&S Application Areas:

   (a)   Education & Training (E&T).

   (b)   Test & Evaluation (T&E).

   (c)   Defence Experimentation (DE) and Operational Analysis (OA).

   (d)   Multi Domain Operations (MDO) and Operational Decision Support.

   (e)   Acquisition

   (f)   Support Modelling and Analysis.

   (2)   M&S Focus Areas.

   (a)   Threat Models.

   (b)   Digital Twins.

   (c)   Wargaming.

   (d)   Artificial Intelligence (AI) and Machine Learning (ML).

   (e)   eXtended Reality (XR).

Coherence with other Policy and Guidance

3.   This JSP is designed to be compatible with the following Defence directives.

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[1] For the purposes of this document, an enterprise is defined as an organisation whether it is Defence as a whole or each of the single Services.

Related JSP	Title
JSP 440	The Defence Manual of Security
JSP 441	Information, Knowledge, Digital and Data in Defence
JSP 453	Digital Policies and Standards for Defence
JSP 465	Defence Geospatial Intelligence Policy
JSP 490	Defence Manual of Cryptography
JSP 745	Digital Publishing Policy
JSP 822	Defence Direction and Guidance for Training and Education
JSP 901	Technical Governance and Assurance of Capability
JSP 906	Defence Principles for Coherent Capability
JSP 920	MOD Standardization Management Policy
JSP 945	MOD Policy for Configuration Management

Training

4.   There is no specific requirement to undertake training in order to make use of this JSP; however, relevant educational courses to support the requirement for Suitably Qualified and Experienced Personnel (SQEP) are delivered by Cranfield University at the Defence Academy. Recommended courses include the following:

    a.   An Introduction to Defence Simulation (IDS).

    b.   Simulation Employment Training (SimET).

    c.   Masters in Defence Simulation & Modelling (MSc DSM).

5.   More details on these courses and other related courses can be found via the Defence Academy website at www.da.mod.uk.

Changes to this version of JSP 939

6.   The most significant change is the way that the JSP treats different M&S application areas. Past versions have primarily focused on Training and Education whereas this version recognises the broader role of M&S across a range of application areas and sets the conditions for wider adoption and coherence. Topics covered have been split into Application areas (the use cases for M&S) and M&S Focus areas (the tools and capabilities M&S uses) as listed above in para 2.

7.   Part 2 of JSP 939 provides guidance on how to apply the policy. The way this guidance is provided has been updated to make JSP 939 more accessible and useable to M&S users. A template has been created for each M&S application and focus area to provide tailored and specific advice and guidance on how to apply the policy. The intent is for these templates to developed and iterated as required and a work plan is in place to produce these regular updates to Part 2.

8.   The term DMaSC has been replaced with DMSO. The standing up of DMSO absorbed DMaSC and it took on the Defence Technical Authority for M&S role.

9.   Other changes include:

    a.   The acknowledgment of the Service Command Technical Authorities (SCTAs) as M&S focal points across Defence organisations. This sets the conditions for

potential future establishment of roles in areas not currently covered (e.g. DE&S, Dstl). Service Command Technical Authority posts may be renamed as Simulation Coherence Technical Authorities to reflect this change.

b.   Emphasis on the authority of DMSO and the SCTAs alone in determining compliance with policy and the escalation route through the DMaSGB and the MCB should it be required.

c.   The requirement for M&S programmes to use authoritative data (particularly Threat Data) as the default.

d.   The requirement for any digital models of Blue platforms/services/equipment developed as part of the procurement process to be provided to the Defence Simulation Centre so they can be made available for M&S purposes pan-Defence.

Further Advice and Feedback – Contacts

10.   The owner of this JSP is UKStratCom DMSO. For further information on any aspect of this guide, or to ask questions not answered within the subsequent sections, or to provide feedback on the content, please contact any of the following or any DMSO Service Command Technical Authority (SCTA) (if known):

Job title	Email	Telephone
DMSO Hd	UKStratCom-DMSO-Hd@mod.gov.uk	07967 885 097
DMSO Technical Authority (TA) Hd	UKStratCom-DMSO-TA-Hd@mod.gov.uk	07833 441 339
DMSO TA Group Mailbox	UKStratCom-DMSO-TA@mod.gov.uk	
Defence Simulation Centre Front Door	UKStratCom-DSC-Enquiries@mod.gov.uk	

Contents

Section 1: Aim and Objectives

Aim

1.   The aim of this JSP is to support the Defence objective to provide Value for Money (VfM) for M&S across the Defence Enterprise. This Part 2 is specifically designed to provide guidance to achieve JSP 939 compliant status for M&S systems.

2.   This JSP Part 2 is not designed to replace suitable M&S education.

Objectives

3.   This JSP is designed to deliver the following objectives:

a.   direct, ensure and assure the coherent development of M&S in support of Defence Outputs; and

b.   ensure Defence will have effective and technically coherent M&S based capabilities that are interoperable (where appropriate), reconfigurable, innovative and provide VfM at the Defence Enterprise level.

Scope

4.   This JSP sets out the technical governance and assurance framework to be applied as appropriate to M&S across Defence and its application areas. The role of the DMSO is to promote VfM at the Defence Enterprise level and build corporate knowledge supported by the DSC.

5.   This JSP applies to all uses of M&S. However, due to resource constraints, the initial focus is primarily on training capabilities and other specific M&S application areas as described in the Preface unless directed otherwise by the DMSO.

6.   M&S is a key enabler for Defence that is increasingly supporting a wide range of activities that include: decision making, training and education, mission rehearsal, acquisition, operational analysis, test and evaluation, and experimentation. Such disparate activities provide a challenge in the delivery of VfM in accordance with JSPs 901 and 906 and the exploitation of investment.

Document Structure

7.   JSP 939 Part 2 (this document) provides the guidance and best practice necessary to support the direction provided in Part 1.

Section 2: Background

Introduction

8.   This JSP has been developed to define the Defence Policy for M&S. As described in Part 1, a set of Defence Modelling and Simulation Office (DMSO) *Coherence Principles* have been designed to help provide coherence and governance for M&S enablers across the Defence Enterprise.

9.   These Coherence Principles are used by the appropriate DMSO Service Command Technical Authority (SCTA) to judge if the single JSP 939 rule has been met that states that Value for Money (VfM) at the Defence Enterprise Level is required for all M&S systems. For training purposes, the SCTAs will apply the policy rigidly for the delivery of such capability and yet remain open to alternative approaches to provide VfM for Defence (at the Enterprise level) in order not to stifle innovation. This open approach will still ensure that proprietary solutions are avoided.

10.   The DMSO Coherence Principles specify how compliance with the JSP 939 vision will be judged, providing coherency and consistency with improvements in efficiency and effectiveness for M&S enablers across Defence. These principles lay down how these M&S enablers are to be developed and assists decision makers at all levels in understanding the risk and impact of new, modified or enhanced M&S enablers.

11.   This JSP Part 2 provides guidance in ensuring maximum ability to interoperate between simulation systems, and between simulation systems and real systems (such as C4I), to enable force elements to train as they operate. It will also promote the sharing and re-use of assets across Defence in accordance with Systems of Systems Approach (SOSA) Principles as defined in JSP 906 - Defence Principles for Coherent Capability.

Background

12.   The guidance in this Part 2 has been developed to aid the understanding of the Part 1 Coherence Principles that will be applied by the DMSO SCTAs for JSP 939 compliance purposes.

13.   It should be noted that non-compliance with JSP 939 is the starting point for all M&S systems and it is the responsibility of the relevant SCTA alone, endorsed by the DMSO TA Hd, to declare compliance given sufficient evidence.

14.   Defence M&S Governance is owned by DCDS Mil Cap and promulgated through JSP 939. Where any issues with M&S coherence are identified, if they cannot be resolved by the SCTA(s), they will be referred to the DMSO TA Head for resolution. Beyond that the DMaSGB, and ultimately the Military Capability Board, are available for a decision in line with their mediation and arbitration processes.

15.   It is key that the relevant SCTA is directly involved, as early as possible, in the knowledge that no two systems are identical. It is to be noted therefore that the guidance provided in this document is for indicative purposes only.

Section 3: Typical SCTA Assurance General Programme/Project Questions

Background

16.   As described in Part 1 of the publication, for a system/service to be deemed JSP 939 compliant, it means that the relevant SCTA has assessed that the programme/project (Pg/Pj) offers VfM to Defence across the Enterprise; and that implicit in this is that until that time, the Pg/Pj is non-compliant.

17.   This is rooted in the determination to make efficient use of data / models / development effort already acquired and not solely due to a requirement to be able to connect (in a meaningful way) to other systems.

Overview

18.   Whereas there are coherence principles designed to be used as an aide memoir or yardstick when assessing compliance, these principles are applied pragmatically so as not to stifle innovation. However, the overarching aim of providing VfM for Defence at the enterprise level will always be sought.

19.   This pragmatic approach necessitates the SCTAs remaining approachable for enquiries relating to compliance or general advice. However, SCTAs will not answer specific Pg/Pj questions without the direct involvement of the appropriate the delivery team.

20.   Some typical questions or direction that the SCTA may raise in order to collect JSP 939 compliance evidence, that is subsequently recorded in a DMSO Capability Technical Assessment Report (CTAR) form, are as follows:

   a.   What is the official name of the capability change?

   b.   Provide a brief description of the capability change.

   c.   Who is the sponsor and the sponsoring organisation?

   d.   Who is/are the Pg/Pj Manager for the capability change?

   e.   At what stage in the CADMID lifecycle is the Pg/Pj?

   f.   What are the estimated dates of future key milestones?

   g.   Is JSP 939 Compliance included within the URD as a Mandated Requirement (see Section 5)?

   h.   Is JSP 939 Compliance included within the Pg/Pj Statement of Work?

   i.   Is the Pg/Pj Manager aware that 'responsibility rests with them to provide their SCTA with the set of interpreted evidence to demonstrate the degree of compliance with the identified rules and criteria' iaw JSP 939 Part 1?

Section 4: Example Use Cases against the Coherence Principles

Overview

21.   This section describes example use cases against each of the Coherence Principles. Under no circumstances is it to be treated as a tick-box exercise but it should be used as providing the sort of topics that a SCTA is likely to cover when determining JSP 939 compliance.

22.   Checks against the Coherence Principles are part of an iterative process, conducted at points agreed between the SCTA and the Pg/Pj manager to ensure that changes are incorporated and understood properly.

23.   To confirm, waivers can be issued by the SCTA against the Coherence Principles if any proposed deviation can be justified. The following paras in this section highlight this point with examples and provides further guidance as to what they SCTAs will be seeking when making compliance decisions.

24.   It should be noted that this guidance has been collated for the purpose of delivering and operating M&S capability (e.g. for training purposes), for other M&S applications that covers concept or even pre-concept work (e.g. for research purposes) then the SCTA has the authority to permit a less prescriptive approach issuing appropriate waivers.

Guidance for the Coherence Principles

25.   **Coherence Principle 1: Reuse Existing**. This principle states that any available existing systems, components, services, data and licences that meets the M&S requirement must be used as the default or 'Do Minimum' option

Purpose of Coherence Principle: To promote the exploitation of available M&S resources.

Guidance

•   To satisfy this principle, an option would be to compile a table of M&S systems, components, services, data and licences that are being proposed to be used for the Pg/Pj in question. A column to compare against any existing enterprise architecture (components of Gladiator/CTTP/Spartan) could be used.

•   Has the DSC Front Door been contacted to see what resources are available to reuse and exploit, possibly through the DSC Catalogue?

26.   **Coherence Principle 2: Procuring for Reuse**. Any new/modified/enhanced M&S components, services and data acquired by a project shall be made available for reuse via the DMSO M&S Catalogue in formats specified in Def Stan 03-50 where applicable and practicable.

Purpose of Coherence Principle: Ensuring that any M&S resources procured are exploitable.

Guidance

• Will there be any new/modified/enhanced components, services and/or data fed back into the DSC Catalogue at IOC, at FOC, during the length of the Pj/Pg for reuse purposes?

• Specifically in formats as per Def Stan 03-050, which refers to the DMSO M&S Standards Profile (DMSP).

• How will it be ensured that this happens? If elements are not able to be acquired with an enterprise licence, is there the ability in the contract for others to add licences in the future?

27. **Coherence Principle 3: M&S Standards**. Any M&S standards selected for use by the capability or technical solution change must be compliant with Def Stan 03-50.

Purpose of Coherence Principle: Ensures that M&S standards are chosen that support VfM for Defence at the Enterprise level.

Guidance

• State what M&S standards have been selected and confirm where they fit with Def Stan 03-050.

• What is being used that isn't a standard within the Def Stan and why?

• Include why it provides VfM at the Defence Enterprise level if it is not a Def-Stan standard.

• Confirm that none of the standards selected for use have been modified and that no proprietary solutions have been chosen.

28. **Coherence Principle 4: Enumerations**. All new and revised distributed simulation enumerations must comply with the DMSO Enumerations Policy and be registered with the Defence Simulation Centre (DSC).

Purpose of Coherence Principle: Essential for the interoperability between connected and interoperating M&S systems.

Guidance

• Confirm that there are official SISO enumerations used for all entities used in the Pg/Pj in accordance with the Policy for UK Enumerations for Distributed Simulation.

• What is the plan to create/add to the list of new enumerations if required?

29. **Coherence Principle 5: M&S Enterprise Architecture**. All M&S based capability must be developed in accordance with the DMSO Enterprise Architecture approach (both in terms of engineering approach to implementing the architecture and the agreed physical architecture itself) as advised and approved by the relevant SCTA.

Purpose of Coherence Principle: Supports M&S technical coherence across each of the domains.

Guidance

- There is a clear distinction between justifying the selection a Pg/Pj architecture that is different to nominated Service architecture where, for example:

    o   the existing architecture cannot satisfy (or reasonably made to satisfy) the essential user requirements; and

    o   the existing architecture can satisfy (or reasonably be made to satisfy) the essential user requirement, but a different system is seen as preferable (i.e. over-engineered in some aspect).

- How is the capability developing in accordance with Enterprise Architecture approach for the domain in question, e.g. for Air Pg/Pjs, is it following the Gladiator approach?

- How does the capability align with Gladiator/CTTP/Spartan? Compare components with relevant list of architecture Core Components.

- What has been put in place to ensure interoperability is possible?

- What training will be in place for the use of components by the end user (students/instructors/White Force/etc)?

- What engagement has occurred with Defence Digital if there is a requirement for their services?

- Dual-architected systems should be avoided wherever possible as it leads to increased complexity and through-life-costs.

30.   **Coherence Principle 6: Technical Documentation**. In order to support interoperability and reuse, suitable documentation must be made available for all M&S based Capabilities, this to include Interface Control Documents (ICDs), 3D model metadata, etc.

Purpose of Coherence Principle: Supports interoperability and connectivity between internal systems, other M&S systems and other non M&S systems (e.g. C2 systems).

Guidance

- Is there plan to include this requirement in the contract with the system supplier?

- How is this planned to occur?

- Is there a software support plan?

31.   **Coherence Principle 7: Synthetic Environment (SE) Data**. All are to attempt to source all M&S-based capability needs for SE Content Data via the DSC; this includes terrain data, 3D models, hydrographic data etc.

Purpose of Coherence Principle: Ensures that authoritative and coherent sources of (geo)spatial data are used.

Guidance

- What is being sourced from the DSC?

- If data it to be acquired from other sources:

  o Why?

  o Where is the Spatial Data Management Plan in place iaw JSP 465 Defence Geospatial Intelligence Policy?

  o Confirm that any new acquisition will be sharable across Defence.

32. **Coherence Principle 8: Research and Reports Exploitation**. All M&S related research and decision support activity, including any outputs, is to be registered with the DSC.

Purpose of Coherence Principle: Promotes the exploitation of such activity and helps reduce duplication.

Guidance

- What is the plan for registering any research or official reports with DSC?

- Before commissioning any such work, were checks made with the DSC against what exists already?

Section 5: M&S Requirements Statements

Overview

33.   This section specifically covers requirements statements for M&S systems / services / resources.

Mandated Statement

34.   There is a pre-prepared mandated requirement statement that calls for compliance with JSP 939. This statement is to be included in any URD covering the use of M&S. Details can be found at: [JSP 939 Mandated User Requirement (UR) for all M&S based capability, systems or services](#).

Other Example Requirements Statements

35.   It is emphasised that there is a common issue with example requirements being taken verbatim rather than a template, and there is no substitute for the engagement of a competent requirements manager to shape to the actual need. Of course, also key is to engage with the SCTA to derivate the UR/SRs properly.

36.   Below are examples of requirements statements, together with explanatory comments, for consideration to inform actual requirements in a URD or such documents:

   a.   **Requirement**: The service shall provide an Enterprise Wide Licence to allow other UK MoD users to freely access <said simulation or resource> via the Defence Simulation Centre.

   Comment: Covered by the mandated UR but it reinforces JSP 939 Coherence Principles 1 and 2.

   b.   **Requirement**: The system will be able to transfer scenarios across all other such Defence owned simulators.

   Comment: A more specific reuse and interoperability requirement statement but where there is currently a standards gap such as on this topic, such a requirement may be useful.

   c.   **Requirement**: The service shall provide updates to models, terrains, and ships dynamics.

   Comment: This requirement takes reuse further by identifying a need for updates to be considered and provided.

   d.   **Requirement**: The Service shall deliver updated and relevant documentation with any hardware or software changes for the duration of the service.

   Comment: Building upon Coherence Principle 6 that calls specifically for documentation to be delivered, this example requirement ensures that such documentation is maintained.

e.   **Requirement**: The system shall provide a network connection up to a programmable firewall device to enable interoperability and file transfer.

Comment: A pragmatic approach to further supporting interoperability in a secure manner.

f.   **Requirement**: The system shall enable future Composability and Extensibility of simulation sub-systems through the use of open standards / architecture.

Comment: This requirement provides further support towards the aim of utilising open, modular architecture.

Section 6: Typical DMSO/SCTA Assessment/Review and Direct Involvement Points

Overview

37.   This section describes the typical points in a system acquisition lifecycle where JSP 939 compliance assessment or review points will occur.

38.   At each of these review points, evidence against the Coherence Principles will be recorded in the CTAR form.

Typical Assessment or Review Points

39.   It should be noted that JSP technical assessments and reviews will not just include what components are selected but also how they are proposed to be used, considering such questions as from where source data will be obtained, in what formats/standards, what will be done with the outputs, etc. all as described in the Coherence Principles covered in Section 3.

40.   The following represent the typical points when a JSP compliance review or assessment will occur but it depends upon the size and complexity of the Pg/Pj:

    a.   **URD and SRD Reviews**. At the point where URDs and SRDs are compiled, the SCTA should be involved.

    b.   **ITN proposals**. SCTAs are to be involved at this point to check for JSP 939 compliance. Practical technical assessment of solutions is encouraged as such activities such as Invitation To Negotiate (ITN) which should not be a paper only exercise

    c.   **Preliminary Design Review (PDR)** is an initial technical assessment of a proposed design of a system to ensure that it meets requirements. A PDR is conducted before the start of detailed design work and is the first opportunity for the Defence to closely observe the proposed hardware and software design. SCTAs are to be involved to ensure that the proposal is compliant with JSP 939.

    d.   **Critical Design Review (CDR)** is a technical review to ensure that a system can proceed into build, demonstration, and test and can meet stated performance requirements within cost, schedule, and risk. A successful CDR is predicated upon a determination that the detailed design satisfies its requirements. As per PDRs, SCTAs are to be involved to ensure that the proposal is compliant with JSP 939.

    e.   **Engineering Acceptance**. Especially where no practical technical assessment has occurred as part of ITN proposals, engineering acceptance is encouraged to ensure that the system delivered meets that agreed in the previous stages as described above.

Other SCTA/DMSO Direct Involvement

41.   The following represents typical points where SCTA/DMSO could be directly involved with individual Pg/Pjs to promote JSP 939 coherence:

   a.   **Red Teaming**. DMSO, or any particular Pg/Pj itself, may elect to request the use of red teaming techniques to challenge thinking around proposed complex technical M&S approaches. Such an approach would inform any particular JSP 939 compliance assessment and assurance activity.

   b.   **Industry Engagement**. Any particular Pg/Pj may request the involvement of their SCTA for Industry engagement, for example Industry Days, to ensure clarity with JSP 939 compliance.

   c.   **Bid Proposal Evaluations**. As recognised M&S Experts, SCTAs may be requested to participate in any M&S bid proposals to exploit their knowledge and experience.

42.   Another good mechanism is close customer (SCTA) involvement through iterative development cycle practices (agile, spiral, etc) if appropriate. This provides customers with opportunity to review / shape / guide the solution between design review and acceptance. The risk of not doing so is industry making decisions the SCTA is unaware of and doesn't see until acceptance.

Section 7: The Use of M&S for Education and Training Purposes

Overview

43. This section is designed to provide guidance above and beyond the remainder of this Part 2 of JSP 939, aimed specifically for where M&S is to be used for E&T purposes.

JSP 822: Defence Direction and Guidance for Training and Education

44. JSP 822 is the authoritative policy that directs and guides Defence people to ensure that Defence Individual and Collective Learning is appropriate, efficient, effective and, most importantly, safe. Underpinning all training and education activities is the Defence Systems Approach to Training (DSAT). It is the system that must be used by those who are involved in the analysis, design, delivery, assurance, management and governance of Defence Learning.

45. M&S is a valid and growing methods and media option for the delivery of Training Objectives (TOs). Within the DSAT process, M&S should be considered at two stages:

   a. **Element 1 Analysis**. As part of the Training Options Analysis (TOA) within the overarching Training Needs Analysis (TNA). The TOA recommends potential training solution options that will deliver effective quality training for the identified tasks or competences as close to the required standard as possible (within resource constraints). A TOA is composed of three activities: a Fidelity Analysis, a Location/Environment analysis and a Methods & Media options analysis; M&S should be considered in each of these activities in order to establish whether it is a viable Training Option to be recommended in the TNA report.

   b. **Element 2 Design**. As part of the Selection of Methods & Media. This activity is a refinement of the Training Options Analysis (TOA) conducted in Element 1 (see 3 a. above) and considers in detail the appropriate and effective blend of Training Methods & Media that provide the most effective balance of performance, cost and time in enabling delivery of the Training Objectives. M&S should be considered as to whether it meets the criteria for a viable Methods and Media solution to enable the delivery of the training being designed.

46. Further detail on the TOA and Selection of Methods and Media can be found in JSP 822 Vol 2 in Ch 2 (Policy), Ch 3 (Element 1 Analysis Guidance) and Ch 4 (Element 2 Design Guidance) and in associated Defence Training Support Manuals.

47. The use of M&S for E&T should be evaluated and assured as part of the DSAT evaluation and assurance processes laid out in JSP 822 Vol 2 Ch 6 Assurance of Training (Evaluation) and Vol 5 Ch 2 Assurance of Training (Audit).

Section 8: The Use of M&S for Test and Evaluation Purposes

Overview

48.   This section is designed to provide guidance above and beyond the remainder of this Part 2 of JSP 939, aimed specifically for where M&S is used for Test & Evaluation (T&E) purposes or where T&E processes are applied to M&S systems.

49.   It is important to note that M&S for T&E purposes could be used to:

    a.   prove/assure/evaluate a real system of systems, system or subsystem, such as a missile seeker head; or

    b.   evaluate a simulation's ability to meet a specific requirement.

JSP 939 Compliance for using M&S for T&E Purposes

50.   There are no fundamental changes to the JSP 939 compliance 'Assess and Assure' process for the use of M&S for T&E purposes. The decision remains with the relevant SCTA as described in Part 1 of this JSP.

Using M&S for T&E Purposes

51.   Consideration should be given for the use of M&S-based T&E throughout the acquisition cycle, with delivery teams optimising Integrated Test and Acceptance (ITEA) plans to balance Physical/Live/Actual, M&S-based and Blended T&E to increase test fidelity. ITEA plans should not just focus on system acceptance against requirements, but determine a "progressive assurance" plan which delivers sufficient evidence of growing system maturity at key decision points, with the evidence at each point coming from appropriately planned Physical, M&S and Blended T&E.

52.   The level of physical testing should also be determined in conjunction with M&S. While M&S T&E can offer savings in programme time and cost, and can allow examination of corner cases in system performance that a live test cannot replicate, physical testing will almost always be required to confirm the model, and indeed the physical test should be designed to maximise model validation.

53.   It is key that any M&S used specifically for T&E is fit for purpose and appropriate for use, including both appropriate reliance on M&S results for mission assurance and safety, and factors such as scaling up or down from the original intent. In this respect, it is incumbent upon the user to manage any risk and uncertainty.

T&E to Evaluate M&S

54.   It is essential that any simulation training devices that require qualification and approval are evaluated in a well-defined, consistent and structured manner. For example, Regulatory Article (RA) 2375 for Aircrew training devices has been developed as described below.

Reference Information

55.   **Defence T&E**. Information about using Defence T&E facilities and getting involved in T&E transformation can be found here.

56.   **HM Treasury's Aqua Book: Guidance on Producing Quality Analysis.** It is the responsibility of the user to manage any risk associated with any M&S that is used for T&E purposes, ensuring that it is fit for purpose and appropriate for the use intended. Following the 'Review of quality assurance of government analytical models'[2], a cross-departmental working group on analytical quality assurance was established. The Aqua Book is one of their products and is a good practice guide to those working with analysis and analytical models.

57.   **RA 2375: Qualification, approval and use of Aircrew training devices**. This RA that covers the qualification and approval for Aircrew training devices used to prepare for, or substitute, live flying in UK military Air Systems can be found here.

58.   **RA 5812: Digital models and simulations supporting airworthiness related decision-making.** This RA (found here) covers the establishment of appropriate levels of Development and Assurance of M&S, advising the TAA to assess the M&S Criticality based on the M&S level of influence and the consequence of Airworthiness-related decisions based on the M&S outputs.

59.   **Defence Test and Evaluation (T&E) Lexicons**:

   a.   The Defence Science & Technology Lab (DSTL) has produced a T&E Lexicon that can be found by request to the Defence Simulation Centre (UKStratCom-DSC-Enquiries@mod.gov.uk).

   b.   The RAF's Air and Space Warfare Centre (ASWC) has produced a T&E Lexicon that can be found by request to the Defence Simulation Centre (UKStratCom-DSC-Enquiries@mod.gov.uk).

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[2] https://www.gov.uk/government/publications/review-of-quality-assurance-of-government-models.

Section 9: The Use of M&S for Defence Experimentation (DExp) and Operational Analysis (OA) Purposes

Overview

60.   This section is designed to provide guidance above and beyond the remainder of this Part 2 of JSP 939, aimed specifically for where M&S is used for Defence Experimentation (DExp) and Operational Analysis (OA) Purposes.

Definitions and Context

61.   DExp is defined as *'controlled and directed activities designed to discover new information about an idea or concept, test a hypothesis or validate a solution or choice in support of Force Development'*[3]. Furthermore DExp *'sits at the core of the Defence Force Development (DFD) process and is critical to building the evidence base that informs Force Development decisions…'*

62.   DExp therefore informs DFD decisions. An understanding of the decision's rationale enables the identification and appraisal of options. DFD is the overarching process by which Defence seeks to deliver effective and coherent Defence capabilities that are threat-informed, concept-driven, technology-enabled, policy-aware, resource-aligned and evidence-based.

63.   Operational Analysis is considered in this document as *'the scientific approach to the solution of problems in the management of complex systems that enables decision makers to make better decisions'*. The terms Operational Analysis and Operational Research are synonymous and both are used in Defence. The current use of OA in Defence has developed from the methods used successfully in World War II. OA enables the understanding and assessment of complex problems such as the linking of tactical actions to national objectives, developing optimised tactics and processes, assisting commanders in designing and synchronizing operations, and understanding the relative value offered by disparate capabilities.

Exercises & Collective Training

64.   Exercises are primarily undertaken for Collective Training (CT) but are also undertaken for DExp. Exercises are considered as a credible military environment whose purpose are supported by a specific 'Scenario' (incl. operating environment, threat, timeframe, mission/tasks). A 'Main Event List' (MEL) designed to stimulate the Force Elements to perform actions needed.

65.   DExp conflicts with CT when the Treatment, Threat, or Scenario is different from Current Force capability and practice.

66.   DExp is not usually compatible with CT under the following circumstances:

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[3] https://www.gov.uk/government/publications/defence-experimentation-for-force-development-handbook.

a.   the DExp activity is too low maturity for an informed discussion (e.g. draft experiment design available).

b.   the training scenarios are too benign.

c.   the training audience may not be sufficiently competent (for the Control or Treatment).

d.   alternative ways of operating can prevent CTOs/assessments from being achieved.

e.   objective data collection may be required; human performance data can be intrusive.

f.   the 'Training Effect' can mask the effect of Treatment(s).

g.   statistical tests require repetition and/or prior evaluation of 'between Force' variation.

DExp Techniques

67.   A variety of techniques should be used to build the evidence base. DExp should be fit-for-purpose (i.e. with confidence that the right activities have been performed commensurate with the decision,) and appropriate quality assurance applied. The following are examples of DExp techniques:

a.   Evidence Review or Literature Search.

b.   Historical Analysis (HA).

c.   M&S.

d.   Wargaming.

e.   Empirical / Observational Studies (E/OS).

f.   Training Data Exploitation (TDX).

g.   Warfighting Experiments (WFE, aka Collective Performance Experiments).

h.   Expert (Military or Technical) Judgement.

68.   DExp Techniques Notes:

a.   techniques often overlap (e.g. wargaming and M&S).

b.   techniques can be 'blended' (e.g. use of WFE data within a Metagame).

c.   each technique has inherent strengths and weaknesses which reflect the 'environments' they are used in or derived from.

Further Guidance

69.   A review of quality assurance of Government analytical models[4], conducted by Sir Nicholas Macpherson, Permanent Secretary to the Treasury, reported in 2013. Related to this work, the following publications have subsequently appeared that all need to be considered as appropriate:

   a.   The **HMT Aqua Book** - Guidance on producing quality analysis[5].

   b.   The **HMT Magenta Book** - Guidance on what to consider when designing an evaluation[6].

   c.   The **HMT Green Book** - Appraisal and evaluation in central government[7], guidance on how to appraise and evaluate policies, projects and programmes.

Further Information

70.   Should any further specific guidance be sought, please contact the DSC at the following email address: UKStratCom-DSC-Enquiries@mod.gov.uk.

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[4] https://www.gov.uk/government/publications/review-of-quality-assurance-of-government-models.
[5] https://www.gov.uk/government/publications/the-aqua-book-guidance-on-producing-quality-analysis-for-government.
[6] https://www.gov.uk/government/publications/the-magenta-book.
[7] https://www.gov.uk/government/publications/the-green-book-appraisal-and-evaluation-in-central-government.

Section 10: The Use of M&S for Defence MDO Purposes

Overview

71.   This section is designed to provide guidance above and beyond the remainder of this Part 2 of JSP 939, aimed specifically for where M&S is used for Muti-Domain Operations (MDOs) or Operational Decision Support (OpDS) purposes.

MDO Description

72.   MDOs are where every part of Defence works seamlessly together, along with the UK's allies and partners, to deliver a desired outcome and defend our nation. At its core, MDOs refers to the push to orchestrate military activities across all operating domains and environments.

73.   NATO takes a similar approach and it represents a pivotal shift in empowering the Alliance to strategically influence events, synchronise efforts and present formidable challenges to adversaries.

OpDS Definition

74.   OpDS is defined here as support to the decision-making process that takes place during military combat operations.

Guidance

75.   The use of M&S for MDO purposes allows 'what-if' scenarios to be run within a simulation. Although any outcomes are very challenging to validate, such activities can be used to inform military decisions. In this respect, M&S used for this purpose is considered no different to the way M&S is used for E&T purposes so this JSP applies appropriately.

76.   Guidance for M&S used for OpDS is also the same as that for E&T purposes.

Further Information

77.   Should any further specific guidance be sought, please contact the DSC at UKStratCom-DSC-Enquiries@mod.gov.uk.

Section 11: The Use of M&S for Defence Threat Modelling Purposes

Overview

78.   This section is designed to provide guidance above and beyond the remainder of this Part 2 of JSP 939, aimed specifically for where M&S is used for Threat Modelling purposes.

Threat Model Definition

79.   Threat Models are any representation of a threat actor's system, process or capability.

Authoritative Models and Data

80.   As described in Part 1 of this JSP, M&S developers and operators are expected to use Defence-approved authoritative models and/or data as the default option. Where this is not possible, a waiver is to be sought from the appropriate DMSO SCTA.

81.   Defence Intelligence (DI) are responsible for authoritative threat models (above Official Sensitive (OS)) that are built in coordination with foreign Intelligence Community partners. These models are developed:

   a.   at varying levels of fidelities from emulative representations to parametric data (these fidelities are further defined below).

   b.   across multiple warfighting domains including cross-domain systems.

   c.   across multiple levels of experimentation from component level models (e.g. a radar transmitter module) to large systems-of-systems (e.g. a fighter aircraft).

82.   Defence M&S activities requiring representation of threat systems above OS will coordinate with DI at the earliest opportunity to identify requirements and define an appropriate support plan.

Fidelity Definitions and Use Cases

83.   The following fidelity definitions have been agreed across the Five-Eyes Intelligence Communities and are advised for use in place of ambiguous terms like low, medium or high:

   a.   **Parametric**. Constructed by the input of the system-specific data into a set of generic algorithms.

   b.   **Analytic**. Majority of significant sub-systems behaviour are modelled by representative, system-specific algorithms within a generic model layout.

   c.   **Emulative**. Model layout reflects understanding of system design, with the majority of significant sub-systems behaviour modelled by representative, system-specific algorithms.

84.   A documented use case for any threat models/data helps to define the fidelity of the models/data to be supplied. Example use case areas are as shown in the figure below.
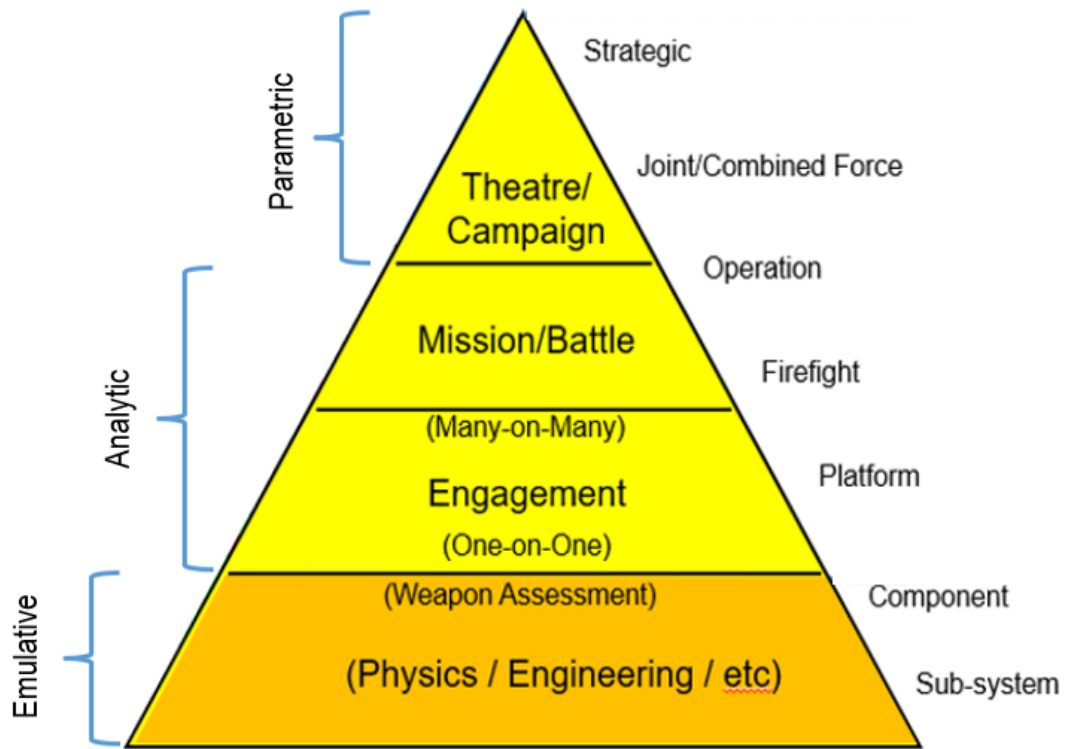

Figure 1 - Threat Models Fidelity Definitions against example Use Cases

Further Information

85.   Requests for DI M&S advice is to be made through the DSC in the first instance at UKStratCom-DSC-Enquiries@mod.gov.uk.

Section 12: The Use of M&S for Defence Digital Twin Purposes

Overview

86.   This section is designed to provide guidance above and beyond the remainder of this Part 2 of JSP 939, aimed specifically for where M&S is used for Digital Twin (DT) purposes.

Digital Twin Definition

87.   HM Government and the National Digital Twin Programme (NDTP) have an agreed definition for a DT that is supported by Defence. The full version of this definition can be obtained from the Defence Simulation Centre (DSC) (UKStratCom-DSC-Enquiries@mod.gov.uk).

88.   A simplified definition for a DT, derived from the full version, is:

'A digital representation of a real-world entity, environment or process that allows the inclusion of a two-way communication[8] flow into and out of the real world in a timeframe that is appropriate for the required decisions and assumptions. This means the digital twin mimics, in that timeframe and without statistical bias[9], its real-world counterpart in all relevant aspects within a validation envelope. A digital twin can be used to assess functionality, degradation and impact with a defined level of assurance. We say that a digital twin is tied to its real-world counterpart.'

Further Information

89.   While all models and simulations are representations/abstractions of a real world system, DTs are a specific advanced product that connects an instance of the represented system to its simulation.

90.   To realise any potential benefits, a DT must be developed for a clear, defined purpose. Many commercial offerings claiming to be DTs are in fact re-branded standard M&S and may not offer return on investment.

91.   DTs need to be assured and updated continuously, therefore funding and Intellectual Properties for continued development and support should be carefully considered and accounted for as an ongoing service cost.

92.   The NDTP[10] set out the Gemini principles to guide and enable a national DT. The NDTP will grow national capability to deliver digital twins, which will enable the delivery of measurable benefits.

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[8] In some applications/subject areas, data and information could be considered interchangeable terms, data here should be understood in its broadest context and information as data with context.
[9] Here bias is a statistical term. Without bias means that the parameters and outputs are represented by a distribution centred at the true value. Given the complexity of a digital twin, in this context, the definition can be relaxed to a distribution containing the true value within a stated percentile, in other words there is no substantial over or underestimate even if the uncertainty is high.
[10] National Digital Twin Programme (NDTP) principles.

93.   Should any further specific guidance be sought, please contact the DSC at the email address provided above.

Section 13: The Use of M&S for Defence Wargaming Purposes

Overview

94.   This section is designed to provide guidance above and beyond the remainder of this Part 2 of JSP 939, aimed specifically for where M&S is used for Threat Modelling purposes.

Wargaming Definition

95.   The Defence Modelling and Simulation Governance Board (DMaSGB) has directed that where available, NATO terminology definitions are to be used. With this in mind, NATO's Glossary of Terms[11] and the MOD's Wargaming Handbook[12] defines a Wargame as *'a simulation in which participants seek to achieve a specified objective given pre-established resources and constraints'*.

Scope

96.   The overall scope of this JSP applies to this section that states *'computer-based M&S that has the intention or potential to be networked or which uses models that might reasonably be re-used in, or used to support, other simulation systems'*.

Guidance

97.   The principal characteristic that distinguishes a computer-based M&S system being used in a Wargame as opposed one being used for Training or Experimentation purposes lies in the involvement of people, free to be able to make meaningful decisions without inappropriate constraints limiting their freedom of choices. This means that while those choices should conform to the scenario and doctrine used not be artificially constrained to the benefit of one side or another.

98.   With this in mind, most M&S system are designed to be used for wargaming but end up not being used in this manner for political reasons, resource constraints, a reluctance to permit players actions to take the event in an undesired direction (reducing the player decisions inappropriately) or simply a lack of imagination. It needs to be understood that for perfectly good training or experimentation reasons, it may be necessary to restrict players actions in order to achieve specific objectives, but these events are not considered as Wargames.

99.   A fundamental characteristic present in most Wargaming methods is that they tend to be used to for education or training purposes or used on operations to rapidly examine actions, events and courses of action that require a prompt response and can be implemented quickly and at low cost. If time pressure is absent, or resources are more plentiful, alternative methods could be more appropriate and may deliver higher quality results.

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[11] https://www.sto.nato.int/publications/Pages/ModellingandSimulationGlossary.aspx.
[12] https://www.gov.uk/government/publications/defence-wargaming-handbook.

100. Manual Wargaming (without the use of computer-based M&S) is often seen as a cheap and quick alternative to other methods, but it is still essential to understand that manual techniques still require research, design, personnel, resources and funding if they are to generate robust and reliable outputs. This is especially true if the Wargame has analytical objectives.

Further Information

101. Should any further specific guidance be sought, please contact the DSC at UKStratCom-DSC-Enquiries@mod.gov.uk.

Section 14: The Use of M&S for Defence Artificial Intelligence (AI) and Machine Learning (ML) Purposes

Overview

102. This section is designed to provide guidance above and beyond the remainder of this Part 2 of JSP 939, aimed specifically for where AI/ML is used alongside and with M&S.

103. Defence understands AI is a family of general-purpose technologies, any of which may enable machines to perform tasks normally requiring human or biological intelligence, especially when the machines learn from data how to do those tasks[13].

AI & ML Definition

104. Note that Machine Learning (ML) is a subset of AI but has become so prevalent that AI is often referred to as AI/ML. ML is not further characterised here as it is encompassed in the characterisation above.

AI Application

105. JSP 936 Dependable Artificial Intelligence (AI) in Defence applies for all Defence M&S uses.

106. In the context of M&S, AI/ML can be the model, be a component part of the M&S or be used to develop the M&S. Whatever its relationship to the M&S, it is imperative that the complex nature of the technology and its inherent unpredictability is understood and the risk associated with its use properly managed.

Further Information

107. Should any further specific guidance be sought, please contact the DSC at UKStratCom-DSC-Enquiries@mod.gov.uk.

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[13] MOD Glossary.

Section 15: The Use of M&S for Defence eXtended Reality (XR) Purposes

Overview

108. This section is designed to provide guidance above and beyond the remainder of this Part 2 of JSP 939, aimed specifically at where M&S is used for XR purposes.

XR Definition

109. For the purposes of this publication, 'XR' is an umbrella term used to describe immersive technologies[14], often to include haptics, interfaces, platforms and software.

110. In a little more detail for the purposes of this publication, XR can be described as comprising the following elements[15]:

  a. **Virtual Reality (VR)** that merges real and virtual worlds in a completely digital environment;

  b. **Augmented Reality (AR)** where the display of an otherwise real environment is augmented by means of virtual (computer graphic) objects; and

  c. **Mixed Reality (MR)** that is a particular subset of VR that involves the merging of real and virtual worlds which connects completely real environments to completely virtual ones.

Background

111. As per M&S itself, XR technology is used across Defence for many purposes providing potentially significant benefits, but it also comes with challenges. One of these challenges pertains to pan-Defence coherence and value for money as per the aims of JSP 939. The low pricing point for XR systems effectively makes them consumables that can exacerbate coherence issues.

112. Defence XR-based systems are still deemed as M&S and are required to comply with the policy defined in JSP 939.

Further Resources

113. Available on the Defence Learning Environment (DLE) via the Defence Gateway is the eXtended Reality for Training and Education (XR4TE) portal. This portal has been developed and designed to help provide guidance on how best to deploy XR in training and gather evidence relevant Training and Education (T&E) requirements. It includes:

  a. A **Decision Support Tool** that has been created to support the decision to use XR for specific training requirements; and

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[14] SERAPIS SSE52 DELTA Call Off Task WP3.2d XR Standards & Security Report dated 19 December 2023 [Document Reference: QTSL-820-2569 Issue 1.2].
[15] Paul Milgram and Fumio Kishino, A Taxonomy of Mixed Reality Visual Displays, Article in IEICE Transactions on Information and Systems, December 1994.

b.   A **Human Factors Advice Tool** that has been created to guide users and increase awareness of the Human Factors considerations around the adoption of XR systems for training.

114. The RAF have created a document entitled *'Extended Reality Technology for RAF Training'* designed to provide guidance for RAF personnel looking to employ XR systems in the provision of their units' current training. A copy of the latest version of this document can be provided upon request by the Defence Simulation Centre (DSC) (UKStratCom-DSC-Enquiries@mod.gov.uk).

Further XR Advice and Guidance

115. It is important to stress that XR may not necessarily be the ideal solution to meet the requirement. It is also true that the speed of change and advancement in this area continues to advance very quickly. Potential procurers are therefore encouraged to contact the DMSO Technical Authority Support Team (TAST) via the DSC (UKStratCom-DSC-Enquiries@mod.gov.uk) for the latest guidance.

Section 16: The Use of M&S for Defence Support Modelling Purposes

Overview

116. This section is designed to provide guidance above and beyond the remainder of this Part 2 of JSP 939, aimed specifically for where M&S is used for Support Modelling and Analysis purposes.

Aim

117. The aim of Support Modelling and Analysis (Sp M&A) is to provide enhanced evidence-based decision making to improve support to the frontline. This is achieved by:

   a.   demand planning of support;

   b.   optimisation of platform design;

   c.   in-service support decision-making; and

   d.   improvement of defence outputs and supply chain resilience.

Using M&S for Sp M&A purposes

118. It is key that any M&S and other modelling and analysis approaches specifically used for Sp M&A are fit for purpose and appropriate for use.

119. The depth and breadth of Sp M&A will be tailored to reflect the value, size and complexity of the equipment to be supported. Responsibility for tailoring will sit with the DE&S Head of Sp M&A.

120. The complexity of Sp M&A could potentially lead to modelling and simulation, digital twins and XR capabilities being utilised. In cases where these capabilities are utilised Sp M&A will follow JSP 939 guidance.

Support modelling and analysis to evaluate M&S

121. It is this essential that all Sp M&A activities and outputs are appropriately Verified and Validated (V&V'd) in accordance with HM Treasury's Aqua Book: *Guidance on Producing Quality Analysis* (see Further Information below).

122. The DE&S Head of Sp M&A together with the relevant approval's organisations will be responsible for ensuring that the appropriate level of the V&V'd is undertaken. Contact can be made via the email address: DESLSOC-SpSvcs-Modelling-Multi@mod.gov.uk.

Further Information

123. Sources of further information for the use of M&S for Support Modelling & Analysis purposes can be found at:

a.   The Team Defence Information (TDI) *Equipment Modelling Guide* provides details on how Sp M&A should be undertaken across the end-to-end equipment lifecycle. This guide is available on the team defence information website[16].

b.   HM Treasury's Aqua Book: *Guidance on Producing Quality Analysis*. This states that it is the responsibility of the user to manage any risks associated with any support modelling and analysis that is used, ensuring that it is fit for purpose and appropriate for the use intended[17]. This book is a good practise guide for those working with analysis and analytical models.

c.   The Sp M&A Framework, developed and approved in February 2024. This document highlights the current gaps in Sp M&A capabilities across MOD and identifies the steps to be taken to close these gaps. Management of the implementation of the framework sits with the UK MOD Strategic Command Head of Sp M&A (a copy of this framework is available on request from the Defence Simulation centre (DSC) by emailing UKStratCom-DSC-Enquiries@mod.gov.uk.

d.   The DEFCON 82 procedure that requires the Contractor to draw up, at the earliest possible moment and in accordance with such technical information and assistance as may be provided by the Authority, a list of spare parts which it considers will be sufficient in type and quantity to maintain the operational efficiency of the new or modified equipment during an initial period of use (such period being two years, unless otherwise stated in the Contract).

e.   The Support Solution Envelope available through the Defence Logistics Framework (DLF)[18].

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[16] Document Library | Team Defence Information.
[17] The Aqua Book: guidance on producing quality analysis (www.gov.uk).
[18] https://dlf.defencegateway.mod.uk/.

Section 17: The Use of M&S for Defence Acquisition Purposes

Overview

124. This section is designed to provide guidance above and beyond the remainder of this Part 2 of JSP 939, aimed specifically for where M&S is used for Acquisition purposes.

The Use of M&S across the Acquisition Lifecycle

125. In terms of M&S usage across the CADMID Acquisition Lifecycle, the following provides some non-exhaustive examples:

   a. **Pre-concept**. Exploring and comparing different system concepts and operational needs to develop initial requirements through capability modelling, wargaming, experimentation, etc.

   b. **Concept**. The analysis, de-risking and trade-off of requirements using physics-based simulations, Failure Mode and Effects Analysis, Monte Carlo Simulations and optimisation models.

   c. **Assessment**. Additional fidelity/detail requirements analysis, de-risking and trade-offs. The provision of evidence from virtual T&E inc Computer Aided Design/Manufacture (CAD/M), Computational Fluid Dynamics, Finite Element Analysis (FEA), control/safety models, In-the-Loop simulations and optimisation models. Possibly to include advanced M&S such as Digital Twins (see JSP 939 Part 2 Section 12 for more information).

   d. **Demonstration**. The provision of evidence from the same type of activities as described in Assessment above, focused on performance, integration and optimisation.

   e. **Manufacture**. Production planning, quality control and cost management through quality assurance models, CAM, training simulators and optimisation models.

   f. **In service**. Monitoring performance and designing upgrades and optimisations through The use of such things as Digital Twins (see JSP 939 Part 2 section 12 for more information) for asset management and Support Modelling & Analysis (see JSP 939 Part 2 Section 16 for more information).

   g. **Disposal**. Assessing environmental impact, decommissioning costs and reverse logistics opportunities using safety and optimisation models.

126. The above can all be cross-referenced across the various Defence Lines of Development (DLODs) and can be mapped to the appropriate phases/activities of a shortened/rapidly iterated CADMID lifecycle.

127. Principles for reuse apply between phases and across acquisition lifecycles where benefit is identified.

Knowledge in Defence (KiD)

128. The KiD is the primary bearer of policy and guidance governing acquisition and the delivery of Defence projects for all members of the UK MOD and its Industry partners. It has a section within it specifically focussing on M&S[19].

Commercial Considerations

129. Decisions taken on ownership of models and data across contractual boundaries should consider the value (proposed use and benefit to the MoD at cost), and programme/project cost constraints, as well as the need for effective data storage and management across all stages of the acquisition life-cycle.

130. The KiD also has specific guidance on M&S procurement within its Commercial Toolkit[20].

Further Information

131. For guidance on how to use M&S to accelerate acquisition, contact the Digital Engineering Centre (DEC) at: DESDX4D-Digital-Engineering@mod.gov.uk.

132. For guidance on capability modelling and mission engineering, contact the Battlespace Integration Centre (BIC) at: DESDX4D-battlespace-integration@mod.gov.uk.

133. For any other M&S guidance, please contact the DSC at the following email address: UKStratCom-DSC-Enquiries@mod.gov.uk.

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[19] https://www.kid.mod.uk/maincontent/business/mands/.
[20] https://www.kid.mod.uk/maincontent/business/mands/content/jsp939_comp.htm.

Annex A: The JSP 939 Coherence Principles with Evaluation Criteria

JSP 939 Coherence Principle 1: Reuse Existing. Any available existing systems, components, services, data and licences that meets the M&S requirement shall be used as the default or 'Do Minimum' option for consideration.	
Parent Principle(s)	P1: Unifying the Enterprise; P2: Driving business and operational effectiveness; P3: Minimising diversity; P4: Design for reuse; P5: Building with proven solutions; P6: Ensuring commonality of services across the Defence Enterprise; P7: Designing for flexible interoperability; P8: Adopting open standards; P9: Information as an Asset.
Rationale	This rule embodies 'service above self'. Decisions made from an enterprise-wide perspective have greater long-term value than decisions made from any particular organisation perspective. Maximum return on investment requires decision makers to adhere to enterprise-wide drivers, policies and priorities. No minority group will detract from the benefit of the whole.
	Some organisations may have to concede their own preferences for the greater benefit of the entire enterprise.
Policy References	JSP 906: Design Principles for the Acquisition of Capability
Subject Matter Expertise POCs	DSMO TA, SCTAs
Rule Requirements	PMs are to ensure that there are no other M&S based Systems available as listed in the DSC M&S Catalogue that can be used to satisfy their requirement.

JSP 939 Coherence Principle 2: Procuring for Reuse. Any new or modified or enhanced M&S components, services and data acquired shall be made available for reuse via the DSC M&S Catalogue in formats specified in Def Stan 03-050.	
Parent Principle(s)	P1: Unifying the Enterprise; P2: Driving business and operational effectiveness; P3: Minimising diversity; P4: Design for reuse; P5: Building with proven solutions; P6: Ensuring commonality of services across the Defence Enterprise; P7: Designing for flexible interoperability; P9: Information as an Asset.
Rationale	This rule embodies 'service above self'. Decisions made from an enterprise-wide perspective have greater long-term value than decisions made from any particular organisation perspective.
	Maximum return on investment requires decision makers to adhere to enterprise-wide drivers, policies and priorities. No minority group will detract from the benefit of the whole.
	Some organisations may have to concede their own preferences for the greater benefit of the entire enterprise.
Policy References	JSP 906: Design Principles for the Acquisition of Capability
Subject Matter Expertise POCs	DSMO TA, SCTAs
Rule Requirements	PMs are to ensure that there are no other M&S based Systems available as listed in the DSC M&S Catalogue that can be used to satisfy their requirement.

JSP 939 Coherence Principle 3: M&S Standards. Any M&S standards selected for use by the capability or technical solution change shall be compliant with Def Stan 03-050 Defence M&S Standards Profile (DMSP).	
Parent Principle(s)	P1: Unifying the Enterprise; P2: Driving business and operational effectiveness; P3: Minimising diversity; P4: Design for reuse; P5: Building with proven solutions; P6: Ensuring commonality of services across the Defence Enterprise; P7: Designing for flexible interoperability; P8: Adopting open standards; P9: Information as an Asset.
Rationale	This rule promotes both interoperability and reuse via the use of mandated and preferred
Policy References	JSP 906: Design Principles for the Acquisition of Capability
Subject Matter Expertise POCs	DSMO TA, SCTAs
Rule Requirements	PMs are to ensure that preference is given to components, services and data available as listed in the DMSO M&S Catalogue that can be used to satisfy their requirement. Any new, modified or enhanced M&S data or components must be procured with appropriate IPR that allows it to be reused across Defence.

JSP 939 Coherence Principle 4: Distributed Simulation Enumerations. All new and revised distributed simulation enumerations shall comply with the DMSO Distributed Simulation Enumerations Policy and be registered with the DSC.	
Parent Principle(s)	P1: Unifying the Enterprise; P3: Minimising diversity; P4: Design for reuse; P6: Ensuring commonality of services across the Defence Enterprise; P7: Designing for flexible interoperability; P8: Adopting open standards; P9: Information as an Asset.
Rationale	This rule promotes interoperability both internally to Defence and internationally with Allies. It ensures that the unique identifiers that are enumerations that are used for distributed simulation, are co-ordinated.
Policy References	JSP 906: Design Principles for the Acquisition of Capability
Subject Matter Expertise POCs	DSMO TA, SCTAs
Rule Requirements	PMs are to follow the Enumerations Policy for any new or modified 3D models to ensure coordination and coherence.

JSP 939 Coherence Principle 5: M&S Enterprise Architecture. All M&S-based capability must be developed in accordance with the existing Service architecture wherever possible. This will comply with the DMSO Enterprise Architecture approach (both in terms of engineering approach to implementing the architecture and the agreed physical architecture itself) as advised and approved by the relevant SCTA.

Rule Owner	DMSO
Parent Principle(s)	P1: Unifying the Enterprise; P2: Driving business and operational effectiveness; P3: Minimising diversity; P4: Design for reuse; P5: Building with proven solutions; P6: Ensuring commonality of services across the Defence Enterprise; P7: Designing for flexible interoperability; P8: Adopting open standards; P9: Information as an Asset.
Rationale	Conformity of development of M&S capability with the particular Enterprise Architecture for the domain in question will ensure that coherence and adherence to the identified parent principles is achieved.
Policy References	JSP 906: Design Principles for the Acquisition of Capability
Subject Matter Expertise POCs	DSMO TA, SCTAs
Rule Requirements	All M&S PMs are to consult with their SCTA to ensure that their capability complies and is coherent with their environment enterprise architecture.

JSP 939 Coherence Principle 6: Technical Documentation. Suitable documentation must be made available for all M&S-based capabilities; this includes Interface Control Documents (ICDs), 3D model metadata, design documentation, etc.	
Rule Owner	DMSO
Parent Principle(s)	P1: Unifying the Enterprise; P2: Driving business and operational effectiveness; P3: Minimising diversity; P4: Design for reuse.
Rationale	This rule ensures the visibility of technical solutions therefore promoting interoperability and system management.
Policy References	JSP 906: Design Principles for the Acquisition of Capability
Subject Matter Expertise POCs	DSMO TA, SCTAs
Rule Requirements	PMs are to ensure that all technical documentation is provided for all M&S-based capabilities.

JSP 939 Coherence Principle 7: Synthetic Environment (SE) Data. All are to attempt to source all M&S-based capability needs for SE content data via the DSC; this includes terrain data, 3D models, hydrographic data etc. If this is not achievable or followed for whatever reason, then the direction within JSP 465 Defence Geospatial Intelligence Policy applies and a Spatial Data Management Plan (SDMP) is to be created and approved.	
Rule Owner	DMSO
Parent Principle(s)	P1: Unifying the Enterprise; P2: Driving business and operational effectiveness; P3: Minimising diversity; P4: Design for reuse; P6: Ensuring commonality of services across the Defence Enterprise; P9: Information as an Asset.
Rationale	Obtaining SE data from the same source promotes both coherence and interoperability. It also allows the DSC to track Defence activities in this area.
	If this process is not followed, then pan-Defence coherence for (geo) spatial data must be achieved via following JSP 465 with the creation of a SDMP.
Policy References	JSP 906: Design Principles for the Acquisition of Capability
Subject Matter Expertise POCs	DSMO TA, SCTAs
Rule Requirements	PMs are to ensure that all geospatial data, 3D models, etc will be sourced via the DSC in the first instance.

JSP 939 Coherence Principle 8: Research and Reports Exploitation. All M&S-related research and decision support activity, including any outputs, is to be registered with the DSC.	
Rule Owner	DMSO
Parent Principle(s)	P1: Unifying the Enterprise; P3: Minimising diversity; P4: Design for reuse; P6: Ensuring commonality of services across the Defence Enterprise; P9: Information as an Asset.
Rationale	This rule is designed to help provide visibility and clarity of M&S related research and decision support activity to help exploitation, prevent duplication and avoid gaps in work.
Policy References	JSP 906: Design Principles for the Acquisition of Capability
Subject Matter Expertise POCs	DSMO TA, SCTAs
Rule Requirements	The DSC Catalogue will provide details of previous and ongoing M&S related research and decision support activity and where to find more information.