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DATA ITEM DESCRIPTION

1. TITLE	2. IDENTIFICATION NUMBER
CAPABILITY SYSTEMS REQUIREMENTS SPECIFICATION (CapSyRS)	PPA-005671-2 11 November 2020

3. DESCRIPTION/PURPOSE OF THE CapSyRS

The Capability Systems Requirements Specification (CapSyRS), specifies the essentially solution-free requirements to be satisfied by a capability system (capability solution), and optionally the requirements for evidence that each requirement has been so satisfied (verification requirements). The CapSyRS may also specify goals.

The CapSyRS drives, and is the single biggest influence on, successful capability development. A good CapSyRS ensures that an agreed capability gap is defined sufficiently well to satisfy the criterion that "any capability solution that satisfies the CapSyRS will satisfy the need, operationally and in all other respects".

4. APPLICATION/INTERRELATIONSHIP

The CapSyRS may be supported by a Concept of Employment (CONEMP), and subsequently a Concept of Use (CONUSE)/Operational Concept Description (OCD), for the same system as that specified by the CapSyRS. Each of these documents is a description of intended use, the CONEMP being brief and at a high level of abstraction, prepared *by* users, and the CONUSE/OCD being more detailed, and prepared *for* users.

The CapSyRS may be accompanied by a Verification Requirements Specification (VRS) for the same capability system. The VRS specifies the evidence required by the relevant stakeholders in the capability system that their requirements on the capability system have been satisfied.

The CapSyRS drives development of the capability, including an Operational Solution Description (OSD), also known as a Concept of Operations (CONOPS)

5. PREPARATION GUIDELINES

5.1 General Instructions

The term "document" in this DID means data and its medium, regardless of the manner in which the data are recorded.

5.2 Content Requirements

Content requirements begin on page 4. The numbers shown designate the paragraph numbers to be used in the document. Each such number is understood to have the prefix "5.2" within this DID. For example, the paragraph numbered 1.1 is understood to be paragraph 5.2.1.1 within this DID.

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6. SOURCE

5. PREPARATION GUIDELINES *continued*

5.3 Acronyms

Acronyms used in this document shall be interpreted as follows:

CapSyRS Capability Systems Requirements Specification

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DID Data Item Description

OCD Operational Concept Description

OSD Operational Solution Description

VRS Verification Requirements Specification

5.4 Abbreviations

Abbreviations used in this document shall be interpreted as follows:

CONEMP Concept of Employment

CONUSE Concept of Use

SI International System of Units

5.5 Foreword

This Data Item Description (DID) for a Capability System Requirements Specification (CapSyRS) is intended to provide guidance and instruction on the preparation of a CapSyRS for any capability to be subject to capability development, whether involving acquisition or by other means (e.g. creation or modification of a capability by redeployment of existing assets and human resources).

The CapSyRS specifies the solution-free requirements to be satisfied by any acceptable capability solution, on a life-cycle basis. The CapSyRS may also specify goals to be pursued during capability development.

The CapSyRS is the single most important artefact in capability development. Creation, capture and specification of the information content of the CapSyRS should be done with the utmost care, and with appropriate skills applied, to avoid problems such as:

- capability solutions that do not satisfy the needs of the enterprise at all, or fall significantly short of satisfying the needs;
- avoidable inaccuracies in cost estimation; and
- delays and cost increases due to contract changes, or the need to undertake supplementary procurements, as a consequence of defining elements that do not contribute to a solution for the capability that is actually needed.

Hereinafter, the term “capability system” is used to refer to the capability that is the subject of the CapSyRS.

The CapSyRS is used mainly by:

- project sponsors and their superiors, for governance matters, including review of investment proposals;
- capability developers, to record the characteristics required of any solution for it to be acceptable to relevant stakeholders (i.e., users of the capability and other stakeholders who are legitimate owners of requirements on the capability);
- capability developers, to record significant characteristics desired of any solution by relevant stakeholders;
- capability developers, to communicate the capability system problem definition to other stakeholders;
- sponsors of the intended capability, to understand the detail of the capability being sought;
- intended users of the capability, to validate the problem definition as corresponding to their needs;
- intended users of the capability and their superiors, as input to evolution of doctrine/business rules;
- capability developers, to drive capability development;
- capability system design verifiers, as the definitive reference for design verification;
- capability system verifiers, as the definitive reference for capability system verification;
- relevant regulatory agencies, in carrying out their responsibilities; and
- developers and suppliers of solution elements, as a primary reference for validation of work products forming a part of the capability solution.

The CapSyRS is not a specification of requirements on military (or other) hardware. Such items will commonly form a part of the solution to provide the required capability.

5.6 CapSyRS Requirements

Content requirements begin on page 4. The numbers shown designate the paragraph numbers to be used in the document.

TABLE OF CONTENTS

1. INTRODUCTION AND SCOPE

This section may be divided into the following paragraphs where the volume and content of relevant information justify sub-paragraphing.

1.1 Identification

This paragraph should contain a full identification of the capability system to which the document applies. It should make a short, clear, direct statement of the scope of content of the CapSyRS.

1.2 Intended Use

This paragraph should briefly state the intended users and uses of the capability system to which the document applies, referring to a Concept of Use (CONUSE), OCD or comparable description for more detail, where such a document exists.

1.3 Background

This paragraph, if used, may summarise the history of capability system development, operation, and redevelopment (if any); and identify, as relevant, the project sponsor and other stakeholders.

1.4 Capability System Overview

This paragraph, if used, should identify, if applicable, any current and planned operating sites of parts of the capability system, and list any major subsystems, e.g. materiel items, which are required by 4, and which have capability system end-use significance. This paragraph should not reflect anticipated solution, only requirements and intended use.

1.5 Document Overview and Use

This paragraph, if used, should summarise the purpose and contents of this document and should describe any security or privacy considerations associated with its use.

2. APPLICABLE AND OTHER REFERENCED DOCUMENTS

This section should be divided into the following paragraphs, if applicable, and should list the number, title, revision, and date of each document referenced in the requirements specification. This section should also identify the source of each document not available through normal channels.

2.1 Applicable Documents

This paragraph should list each document that is invoked in whole or in part within 4. as containing requirements information. The paragraph should contain any applicable rules for establishing precedence in the event of conflict of requirements between 4. and the applicable documents, and between applicable documents. The paragraph should also contain, where applicable, rules for establishing the applicable issue number of documents invoked in 4., and identify any applicable security classification.

2.2 Other Referenced Documents

This paragraph should list each document which is referenced in the CapSyRS but which is not invoked in whole or in part by 4. as containing requirements information.

3. DEFINITIONS, ACRONYMS AND ABBREVIATIONS

This section should be divided into the following paragraphs.

3.1 Definitions

This paragraph should list alphabetically and define each word or term used in 4. for which reliance on dictionary definitions is not appropriate. As a guide, terms which are not likely to be in the vocabulary of the intended users of the CapSyRS, terms which have multiple dictionary meanings but only a single CapSyRS meaning, technical terms and terms which are used with special meanings should be defined in this paragraph.

The following definitions, or similar, should be incorporated into this section:

a. **Shall** expresses a characteristic which is to be present in the capability solution which is the subject of the specification, i.e. "shall" expresses a binding requirement.
b. **Should** expresses a target or goal to be pursued, but not necessarily achieved.
c. **May** expresses permissive guidance.
d. **Will** expresses a declaration of intent on the part of a party, usually the sponsoring or user organisation. "Will" does not express a requirement. "Will" may also be used in cases where the simple future tense is required, for example, "The capability will be subsequently upgraded". Any statement that employs the term "will", if used in 4., should be present as a note so as to be clearly distinguishable from requirements. “Will” may also express simple futurity.

3.2 Acronyms

This section should list alphabetically each acronym used in the document, together with the acronym’s expanded meaning.

3.3 Abbreviations

This section should list alphabetically each abbreviation used in the document, together with the abbreviation’s expanded meaning, except that abbreviations within the International System of Units (SI) need not be listed.

4. REQUIREMENTS

This section should be divided into the following paragraphs to specify the capability system requirements, that is, those characteristics of the capability system that are required to be present in the final capability solution. Each requirement should be assigned a project-unique identifier to support verification and traceability, and should be stated in such a way that an objective, finite and cost-effective verification activity and pass criterion can be defined for it.

If there are no requirements corresponding to a given paragraph of the DID, the DID paragraph may be deleted in the specification and other paragraph numbers adjusted accordingly. Alternatively, “Not used.” may be inserted under the paragraph heading. If a given requirement fits into more than one paragraph (this should not normally occur), the requirement should be stated once and referenced from the other paragraph(s). Duplication of requirements should be avoided.

The degree of detail to be incorporated in specifying requirements should be guided by the following principle: include those characteristics of the capability system that are necessary for the capability system to satisfy its intended use and the needs of other stakeholders; defer to capability development those characteristics that the user or other stakeholder is willing to leave up to the capability development/programme/project organization.

In determining characteristics necessary to satisfy intended use, the criterion which should be used is the level of risk associated with satisfaction of the following ideal: "that any capability system solution which is developed which satisfies the requirements in 4 will satisfy the need". The level of acceptable risk with respect to attainment of this ideal should be determined as a prerequisite to preparation of the CapSyRS. Such a level of acceptable risk will usually be "low".

4.1 Identification of External Interfaces

This paragraph should identify required external interfaces of the capability system. The identification of each interface should include a project-unique identifier for the interface - the name of the interface may serve this purpose.

A diagram that depicts the interfaces may be included for information, with interfaces shown which correspond to the specified interfaces. The context diagram is a suitable form of representation for this purpose. If used, a context diagram should be conceptual in nature.

Note that paragraph 4.5 rather than this paragraph should be used to specify any requirements applicable to each external interface identified in this paragraph.

4.2 Identification of States and Modes

If the capability system is required to exist or operate in more than one state or mode having requirements distinct from those in other states or modes, this paragraph should identify each such state and mode which is permitted or required. Examples of states include; ready, deployed, decommissioned. Example of modes include surveillance mode, defence mode, attack mode. A capability system may be described in terms of states only, modes only, modes within states, or any other scheme that is useful. Sub-modes may be defined for a given mode, although this would be unusual for a capability system.

A capability system may be specified without use of states and modes.

A states and modes schema which has states at the highest level of requirements organisation, and normally mutually exclusive of other states, together with modes within states, modes not necessarily being mutually exclusive of other modes and being able to exist in multiple states, has been found to be useful for the specification of capability systems of many types.

If no states or modes are required, this paragraph should be omitted or should so state, without creating artificial distinctions. If states or modes or both are required, each requirement in the requirements specification that relates to a state or mode should be correlated to that state or mode in the statement of that requirement, but not in this paragraph.

Any statements about the applicability of requirements in general to the states and modes identified in this paragraph should be included in this paragraph.

4.3 Capability System Function and Performance Requirements

This paragraph should be divided into subparagraphs to specify each function required to be performed by the capability system, together with associated required performance. Each requirement may reference as necessary any external interfaces, states or modes identified in 4.1 or 0.

4.3.1 (Capability System) Function

This paragraph (numbered 4.3.1 to 4.3.x with one function per paragraph, together with any further sub-paragraphing) should identify a required capability system function and should specify the corresponding requirement or requirements. The word “Function” should appear in each leaf subparagraph heading. The requirements should specify required behaviour of the capability system and should include, for each function, applicable initiating and terminating conditions, applicable performance parameters and values, such as response times, throughput times, capacities (how much/how many), including allowable deviations based on operating conditions. The requirements should include, as applicable, required behaviour under unexpected, un-allowed or “out of bounds” conditions. Each functional requirement should also state the conditions during which the specified function is to be performed, such as state, mode in state, or requirement-specific environmental conditions.

Functional and performance requirements may be organised in a structure of section, paragraphs, subparagraphs, etc. Requirements should be placed only in the leaf subparagraphs.

The word “Mode” may be used in a paragraph heading.

If the requirement is a requirement of a subordinate element of the capability system rather than of the capability system overall, the requirement should be placed in 4.10.2. and not in this paragraph.

4.4 Relationships Between States and Modes

This paragraph, if states and modes are used, should specify the required relationships between the various states and modes, including default states and modes, temporal relationships, the conditions that are required to cause state and mode transitions and the external response(s) that the capability system is required to produce as a reflection of each required transition having taken place. Prohibitions on transitions and any permissive guidance (“may”) statements are also specified here.

The paragraph should state in the order matching 4.2, as applicable, and for example:

a. Default State (the state in which the capability system commences)
b. State A<>State B, followed by transition and response requirements, including any prohibitions of transitions and permissive guidance (may) statements
c. State A<>State C, etc.
d. Default Mode(s) in State A (the mode(s) in which the capability system is to commence upon entering State A, or if there is to be no default mode(s), the corresponding requirement to this effect)

e. Mode A in State A<>Mode A in State B, followed by transition and response requirements, including any prohibitions of transitions and permissive guidance (may) statements
f. Mode A in State A<>Mode A in State C, etc.
g. Mode A in State A<>Mode B in State A, etc.
h. Mode B in State A<>Mode C in State A, etc.
i. Default Sub-mode of Mode A
j. Sub-mode A of Mode A in State A<> Sub-mode B of Mode A in State A
k. Default Mode(s) in State B, etc.

4.5 Capability System External Interface Requirements

This paragraph should be divided into subparagraphs to specify the requirements, if any, for each of the capability system's required external interfaces, including user interfaces, listed in 4.1. This paragraph may reference one or more Interface Requirements Specifications (IRSs) or other documents containing these requirements, which may be either annexes to the capability system requirements specification or (more commonly) separate documents.

Subparagraphs should be arranged in alphabetical order in accordance with the names of the interfaces.

Where an interface is inherently simple, its specification should be contained rather than referenced in this paragraph.

Any requirements related to the interface that are functional in nature should be incorporated in 4.3 and not in this paragraph, unless understandability would be enhanced by placing such requirements in this paragraph, e.g. specification of a communications protocol. Where functional requirements are placed in a subparagraph of 4.5, a corresponding paragraph should be placed in 4.3 pointing to these requirements.

Any requirements that specify the consumption or usage of externally supplied resources should be incorporated in 4.7 and not in this paragraph.

External interface requirements should be specified only to the degree necessary to bound the capability solution.

An external interface may also be specified in terms of achieving physical and defined functional interoperability with one or more interfacing external capability system(s).

4.6 Capability System Environmental Requirements

This paragraph should specify in the subparagraphs below, the requirements, if any, regarding the environment in which the capability system must meet other requirements as specified in the remainder of the Requirements section.

Examples include the environmental conditions that the capability system must withstand during use, such as conditions in the natural environment (wind, rain, temperature, humidity, driven dust, geographic location, ambient light level, ionospheric conditions), and for military capability systems, environments due to enemy action or threat (e.g. explosion, radiation).

This paragraph should also specify the requirements, if any, which limit the effect that the capability system is to have on the external environment. Examples include limits on the electromagnetic radiation or carbon footprint that the capability system is permitted to generate.

If the requirement is a requirement of a subordinate element of the capability system rather than of the capability system overall, the requirement should be placed in 4.10.2 and not in this paragraph.

4.6.1 Classes of Environment

This paragraph, if used, should make an informative statement identifying the classes of environment, with reference to which environmental requirements are specified, e.g. Pre-deployment Environment, Deployed Environment. Classes of environment should be listed in order of the time sequence in which they are encountered, where this applies, otherwise listed alphabetically.

4.6.2 XYZ Environment

This paragraph should specify, in a format appropriate to the information, the external environmental parameters, if any, within which the capability system is to meet all other requirements, with any stated exceptions. The paragraph must make clear the degree to which the possible parameter environmental combinations apply simultaneously for the class of environment, i.e. environmental envelope(s).

This paragraph should also specify, in a format appropriate to the information, limits on unwanted outputs from the capability system into the enveloping environment.

Subsequent paragraphs should be written for any other classes of environment.

Subject to any formatting needs related to requirements traceability, the requirements information may be presented in text, tables, or other suitable format.

4.7 External Resource Utilisation Requirements

This paragraph should specify the requirements, if any, regarding the consumption or utilisation by the capability system of externally provided resources. Examples are constraints on consumption of externally provided power or fuel.

Paragraphs should be arranged in alphabetical order in accordance with the name of the resource.

If the resource requirement is a requirement on a subordinate element of the capability system rather than of the capability system overall, the requirement should be placed in 4.10.2. and not in this paragraph.

4.8 Capability System Physical Requirements

This paragraph should specify the requirements, if any, which represent constraints on the physical (properties of matter) characteristics of the capability system as a whole. An example physical requirement is a limit on geographic extent. Physical requirements for capability systems are rare.

Paragraphs should be arranged in alphabetical order in accordance with the names of the physical properties.

If a physical requirement is a physical requirement of a subordinate element of the capability system rather than of the capability system overall, the requirement should be placed in 4.10.2. and not in this paragraph.

Interface requirements which are physical in nature should be incorporated in 4.5 and not in this paragraph.

4.9 Other Capability System Qualities

This paragraph should specify the requirements, if any, pertaining to other qualities required of the capability system as a whole. Example other capability system qualities include:

a. availability (the ability to be used as intended when needed);
b. expandability (the ability to be easily modified in response to potential areas of growth in needed capability);
c. flexibility (the ability to be easily adapted to changes in mission, threat, or technology);
d. information security (the degree to which the capability solution protects security-classified information);
e. interoperability (the ease of interfacing and/or interoperation with external capability systems in general, including allied systems, as applicable. Interfacing with specific external capability systems should be specified in 4.1 and 4.5);
f. investment cost;
g. mission reliability (the probability of mission success); and
h. sustainment cost.

Paragraphs should be arranged in alphabetical order in accordance with the names of the qualities.

Any requirement, related to other capability system qualities, and which is functional in character, should be incorporated in 4.3 and not in this paragraph.

Any requirement for other capability system qualities which is a requirement of a subordinate element of the capability system rather than of the capability system overall should be placed in 4.10.2 and not in this paragraph.

Note that the information content of the requirement governs whether it is of “Other Qualities” type, not its purpose. For example, a function for the purpose of security is functional requirement and is placed in 4.3.

4.10 Design and Construction Requirements

This paragraph should specify any requirements that *direct* aspects of the design and construction of the capability system (build it *internally* in this way, or don’t build it *internally* this way). This paragraph, if used, should be divided into the following subparagraphs.

4.10.1 General Design and Construction Requirements

This paragraph should specify any general aspects of design and construction that apply as requirements capability system wide. Examples include requirements concerning:

a. use of a particular capability system architecture, or requirements on the architecture, such as required subsystems or materiel items;
b. use of existing assets or organisational elements in the capability solution;
c. use of particular design or construction standards, such as conformance to an enterprise data dictionary.

Paragraphs should be arranged in alphabetical order in accordance with the names of the aspects or properties that are the subject of requirements.

4.10.2 Characteristics of Subordinate Elements

This paragraph should be divided into subparagraphs, one paragraph for each subordinate element (element that is *required* to be a part of the solution) for which there are corresponding requirements, using paragraphing 4.10.2.x where x corresponds to the subordinate element.

Paragraphs should be arranged in alphabetical order in accordance with the names of the subordinate elements.

For physical capability system elements, each element should be specified, to the extent justified by the reasons for directing capability solution, using the paragraph and subparagraph names and content corresponding to 4.1 to 4.10.1 inclusive, as applicable. For elements of other types, e.g. software, materials, manuals, the corresponding structure of the Requirements section from an appropriate corresponding DID for that type of element should be used.

If logistics support devices and logistic support materials are required to be included as part of the capability system (as contrasted with simply requiring mission reliability, and availability or readiness of the capability), any requirements on such devices or materials should be specified in this paragraph.

Only those characteristics that the stakeholders *require* be implemented by the above subordinate elements should be specified in this paragraph. Note that by specifying the existence or characteristics of subordinate elements, the stakeholder assumes responsibility for aspects of capability system design and could preclude better or more cost-effective solutions. Care should therefore be exercised in taking on this responsibility.

5. VERIFICATION REQUIREMENTS (OPTIONAL)

This section, if used, should define for each requirement in 4. the requirement (or otherwise) for qualities of evidence that the capability system requirement has been met, The section *may* also state the method(s) to be used to evidence that the requirement has been met, although a list of verification methods rarely constitutes an adequate set of verification requirements. Verification methods, if specified, may include:

a. Test - the operation of the capability system, or a part of the capability system, using instrumentation or other special test equipment to collect data for later evaluation;
b. Demonstration - the operation of the capability system, or a part of the capability system, that relies on observable functional operation not requiring the use of instrumentation, special test equipment, or subsequent analysis;
c. Analysis - the processing of accumulated data, sometimes obtained from other verification methods. Examples are reduction, interpolation, or extrapolation of test results;
d. Inspection - the visual examination of capability system components, documentation, etc.;
e. Analogy - the use of evidence from verification of an analogous capability system, for example the capability system before upgrade; and
f. Certification - a declaration by the capability developer.

Alternatively, the VERIFICATION REQUIREMENTS may be placed in a separate document and (optionally) referred to in 6 NOTES.

A Table format for specification of verification requirements is often suitable, with columns:

a. identifier for capability system requirement;
b. subject area;
c. verification requirement;
d. identifier for verification requirement;

not necessarily in that order.

6. NOTES

This section, if used, should contain any general information that aids in understanding or using the CapSyRS (e.g. background information, rationale).

This section may include the following paragraphs, as applicable.

6.1 Concept of Use (CONUSE)

This paragraph, if used, should contain or reference a description of who the users of the capability system are intended to be, what it is intended or expected that each user will use the capability system for, how it is intended or expected that each user will use the capability system for each intended use, and under what conditions it is intended or expected that the capability system will be used.

This paragraph will not be applicable if a Concept of Use (CONUSE) as a separate document is referenced from the SCOPE section of the CapSyRS.

6.2 Requirements Traceability

This paragraph, if used, should contain:

a. data which details traceability from each capability system requirement in the CapSyRS, to the higher physical level requirement(s) it addresses, such as in the defence force or government policy documents or doctrine. Alternatively, this traceability may be provided by annotating each requirement in 4.; or as an alternative to inclusion in the CapSyRS:
b. reference to the document which contains corresponding requirements traceability information.

Note: Higher physical level requirements are requirements on a larger element of defence infrastructure, or on the defence administration itself, for which the capability system which is the subject of the requirements specification is a part of the solution.

6.3 List of Safety Requirements

This paragraph, if used, should list the capability system requirements, specified in 4. and concerned with preventing or minimising unintended hazards to personnel and property.

Alternatively, safety requirements may be annotated as such in 4.

Safety requirements are typically listed only if they are subject to special actions, for example, increased verification as to their satisfaction, or regulatory procedure.

6.4 List of Information Security Requirements

This paragraph, if used, should list the capability system requirements, specified in 4. and concerned with maintaining information security, viz. confidentiality and integrity of information.

Alternatively, information security requirements may be annotated as such in 4.

Information security requirements are typically listed only if they are subject to special actions, for example, increased verification as to their satisfaction, or regulatory procedure.

6.5 Criticality of Requirements

This paragraph, if used, should specify the criticality, or assigned weights, indicating the relative importance of the requirements in the specification. An example is identification of those requirements deemed critical to mission, or to safety, or to security, for purposes of singling them out for special treatment, e.g. a higher level of independent verification and validation.

6.6 Value Model

Where goals are expressed, this paragraph should state the relative importance of the difference between the minimum standard and the goal, for each goal, as related to the value perceptions of the relevant stakeholders in the capability system, together with how the value changes between the minimum standard and the goal. Alternatively, this paragraph may reference an external value model, typically a data file accessed via value modelling computer software such as Equity or Logical Decisions.

A. ANNEXES

Annexes may be used to provide information published separately for convenience in document maintenance or use (e.g., charts, databases). As applicable, each annex should be referenced in the main body of the document where the data would normally have been provided. Annexes may be bound or prepared digitally as separate documents for ease in use. Annexes should be lettered alphabetically (A, B, etc.).

Appendices may be used to annexes. Appendices should be numbered numerically (1, 2, etc.).