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DEPARTMENT OF DEFENSE HANDBOOK

SYSTEM REQUIREMENTS DOCUMENT GUIDANCE

This handbook is for guidance only.
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FOREWORD

1. This handbook is approved for use by all Departments and Agencies of the Department of Defense (DoD).

2. This handbook was prepared solely for Government personnel and associated support contract staff. Therefore, many of the links herein require .gov or .mil access using a Common Access Card (CAC). Please report any broken links.

3. This handbook was initially prepared through the Continuous Capability Planning Integrated Product Team (CCP IPT) under the Develop and Sustain Warfighting Systems (D&SWS) Process, Acquisition Improvement Plan (AIP) 2.1: Requirements Maturation Core Process. This core process is part of Secretary of the Air Force (SECAF) and Chief of Staff of the Air Force (CSAF) directed transformation effort to define Air Force core processes within the AF Smart Operations for the 21st Century (AFSO21) program. This document has been updated as a DoD handbook for use by all programs.

4. Comments, suggestions, or questions on this document should be addressed to ASC/ENRS, 2145 Monahan Way, Wright-Patterson AFB OH 45433-7017, or emailed to Engineering.Standards@wpafb.af.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.daps.dla.mil.

EXECUTIVE SUMMARY

A guidance document/handbook or template for developing a System/Subsystem Requirements Document (SRD) never existed prior to MIL-HDBK-520. It was the Department of Defense (DoD) best practice to use the System/Subsystem Specification (SSS) Data Item Description (DID) and MIL-STD-961 as a reference point for establishing an SRD and subsequent system and subsystem specifications. When published, the Joint Services Specification Guides (JSSGs) also served as a convenient template for an SRD at the system or subsystem level.

Data Item Description (DID) DI-IPSC-81431, System/Subsystem Specification and MIL-STD-961, Defense and Program-Unique Specifications Format and Content, coupled with several different Systems Engineering (SE) guides referenced herein, formed the framework for this System Requirements Document (SRD) handbook. DID DI-IPSC-81431 is still in use by the United States Navy (USN) and if used in conjunction with this handbook should be updated for systems/subsystems specification guidance. Since Acquisition Reform of the early 1990's, DoD Programs have relied upon industry best practices and contractor formatted specification documents that continue to reflect the intent of DI-IPSC-81431 and MIL-STD-961. These two documents were chosen as the baseline for this handbook as they were the stalwarts of the DoD specification process. The latest DID version requires updating to be used on modern contracts.

This SRD handbook includes a generic SRD template and format useable by any program in any phase. It is meant to be used as a guide to translate warfighter capabilities or other user/customer performance requirements into acquisition requirements, for example, requirements for a system or subsystem in any program Milestone (MS) or phase. The handbook focus is on requirements analysis as related to SRD development and is not intended to be a complete Systems Engineering Handbook or a repository for system requirements. Reference documents were used extensively in creating this handbook and were updated herein to current DoD policy and processes. Please refer to these references for further reading. One drawback to citing reference documents is that references change over time and could be a challenge to keep current. With regulations and instructions, the latest release should always be followed. However, advantages outweigh drawbacks and reference documents provide detailed background for anyone desiring a more in-depth research into the subject. This handbook will be reviewed periodically for updates and will attempt to remain current.

A dedicated team of SE professionals across the AF assisted in drafting and editing the first edition of this handbook and a wider DoD group of professionals was responsible for this updated version. While it was originally prepared in an AF centric manner, the principles documented herein are equally applicable for any DoD program and this version is no longer AF centric. I welcome your comments and suggestions for future improvement.

//SIGNED//
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SRD Guidance Handbook Principal Author

CHANGE HISTORY

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TABLE OF CONTENTS

PARAGRAPH **PAGE**

TABLES

APPENDIX SECTION

1. SCOPE

1.1 Scope.

This handbook contains guidance for preparation of a System Requirements Document (SRD) using established Systems Engineering (SE) processes. It contains a generic SRD template with guidance and standard SRD format. It is meant to be used as a guide to translate warfighter capabilities into acquisition requirements for a system or subsystem in any program Milestone (MS) or phase. The SE processes and principles found in this guidance are equally applicable to any DoD program/project. This handbook is for guidance only and cannot be cited as a requirement.

2. APPLICABLE DOCUMENTS

2.1 General.

The documents listed below are not necessarily all of the documents referenced herein, but are those needed to understand the information provided by this handbook.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks.

The following specifications, standards, and handbooks form a part of this document to the extent specified herein.

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-961	Defense and Program Unique Specifications Format and Content
MIL-STD-881	Work Breakdown Structures for Defense Materiel Items

DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-61	Configuration Management Guidance

(Copies of these documents are available online at https://assist.daps.dla.mil/quicksearch/ or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government documents, drawings, and publications.

The following other Government documents, drawings, and publications form a part of this document to the extent specified herein.

CHAIRMAN OF THE JOINT CHIEFS OF STAFF

CJCSI 3170.01	Joint Capabilities Integration and Development System
JCIDS Manual	Manual for the Joint Capabilities Integration and Development System

(Copies of these documents are available online at
https://acc.dau.mil/communitybrowser.aspx?id=267116 or
http://www.dtic.mil/cjcs_directives/cjcs/instructions.htm.)

DATA ITEM DESCRIPTION (DID)

DI-IPSC-81431 System/Subsystem Specification (SSS)

(Copies of this document are available online at https://assist.daps.dla.mil/quicksearch/ or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

DEFENSE ACQUISITION UNIVERSITY (DAU)

Defense Acquisition Guidebook (DAG)

Glossary of Defense Acquisition Acronyms and Terms

Systems Engineering Fundamentals

(Copies of these documents are available from the Defense Acquisition University Press, Ft Belvoir VA, 22060-5565 or on line at https://dag.dau.mil/Pages/Default.aspx for the DAG, https://dap.dau.mil/glossary/Pages/Default.aspx for the Glossary and http://www.dau.mil/pubs/pdf/SEFGuide%2001-01.pdf or http://www.dau.mil/pubs/gdbks/sys_eng_fund.asp for Systems Engineering Fundamentals.)

NATIONAL ACADEMIES PRESS

Pre-Milestone A and Early-Phase Systems Engineering: A Retrospective Review and Benefits for Future Air Force Systems Acquisition

(Copies of this document are available on line at http://www.acq.osd.mil/se/pg/spec-studies.html or http://www.nap.edu/catalog/12065.html.)

U.S. GOVERNMENT PRINTING OFFICE

Public Law 111-23 Weapon Systems Acquisition Reform Act of 2009

(Copies of this document are available from the U.S. Government Bookstore, 710 North Capitol St. N.W., Washington D.C. 20401 or on line at http://www.gpo.gov/fdsys/pkg/PLAW-111publ23/content-detail.html.)

DEPARTMENT OF DEFENSE ISSUANCES

DoDD 5000.01	The Defense Acquisition System
DoDD 5230.24	Distribution Statements on Technical Documents
DoDD 5230.25	Withholding of Unclassified Technical Data from Public Disclosure
DoDD 8320.02	Data Sharing in a Net-Centric Department of Defense
DoDD 8500.01	Information Assurance (IA)
DoDI 5000.02	Operation of the Defense Acquisition System
DoDI 8500.2	Information Assurance (IA) Implementation
DoD 5200.1-R	Information Security Program
DoD 5200.1-PH	DoD Guide to Marking Classified Documents

(Copies of these documents are available online at http://www.dtic.mil/whs/directives/.)

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

NASA/SP-2007-6105 NASA Systems Engineering Handbook

(Copies of this document are available on line at http://ntrs.nasa.gov/search.jsp or from NASA Center for AeroSpace Information, 7115 Standard Drive, Hanover MD 21076-1320.)

3. DEFINITIONS.

The following definitions and acronyms are applicable to this handbook.

3.1 Allocated Baseline.

Documentation that designates the Configuration Items (CIs) making up a system and then allocates the system function and performance requirements across the CIs (hence the term—allocated baseline). It includes all functional and interface characteristics that are allocated from those of a higher-level CI or from the system itself, derived requirements, interface requirements with other CIs, design restraints and the verification required to demonstrate the achievement of specified functional and interface characteristics. The performance of each CI in the allocated baseline is described in its item performance specification (DAU Glossary).

3.2 Architecture.

Structure of components, their relationships and the principles and guidelines governing their design and evolution over time (JCIDS Manual).

3.3 Attribute.

A quantitative or qualitative characteristic of an element or its actions (CJCSI 3170.01).

3.4 Capabilities Based Assessment (CBA).

The CBA is the Joint Capabilities Integration and Development System (JCIDS) analysis process. It defines the mission, identifies capabilities required, determines attributes/standards of the capabilities, identifies gaps, assesses operational risk associated with the gaps, prioritizes gaps, identifies and assesses potential non-materiel solutions and provides recommendations for addressing the gaps (CJCSI 3170.01).

3.5 Capability.

Ability to achieve a desired effect under specified standards and conditions through combinations of means and ways across doctrine, organization, training, materiel, leadership and education, personnel, and facilities (DOTMLPF) to perform a set of tasks to execute a specified course of action. It is defined by the warfighter and expressed in broad operational terms in an Initial Capabilities Document (ICD) or a joint DOTMLPF change recommendation. In the case of materiel proposals/documents, the definition will progressively evolve to DOTMLPF performance attributes identified in the capability development document (CDD) and the capability production document (CPD) (CJCSI 3170.01).

3.6 Capability Development Document (CDD).

A document that captures information necessary to develop a proposed program, normally using an evolutionary acquisition strategy. The CDD outlines an affordable increment of

militarily useful, logistically supportable and technically mature capability. The CDD may define multiple increments if there is sufficient definition of the performance attributes (key performance parameters (KPPs), key system attributes (KSAs), and other attributes) to allow approval of multiple increments (CJCSI 3170.01).

3.7 Capability need.

A capability identified through the CBA, required to being able to perform a task within specified conditions to a required level of performance (CJCSI 3170.01).

3.8 Capability Production Document (CPD).

A document that addresses production elements specific to a single increment of an acquisition program. The CPD defines an increment of militarily useful, logistically supportable, and technically mature capability that is ready for a production decision. The CPD defines a single increment of performance attributes (key performance parameters (KPPs), key system attributes (KSAs), and other attributes) to support a MS C decision. (CJCSI 3170.01).

3.9 Derived Requirements.

These arise from constraints, consideration of issues implied but not explicitly stated in the requirements baseline, factors introduced by the selected architecture, Information Assurance (IA) requirements and the design. Derived requirements are defined through requirements analysis as part of the overall Systems Engineering Process (SEP) and are part of the allocated baseline (DAU Glossary).

3.10 Family of Systems (FoS).

A set of systems that provide similar capabilities through different approaches to achieve similar or complementary effects. For instance, the warfighter may need the capability to track moving targets. The FoS that provides this capability could include unmanned or manned aerial vehicles with appropriate sensors, a space-based sensor platform or a special operations capability. Each can provide the ability to track moving targets but with differing characteristics of persistence, accuracy, timeliness, etc. (JCIDS Manual).

3.11 Function.

A task, action or activity performed to achieve a desired outcome (ASC Systems Engineering Guide). Action or actions that an item is designed to perform (MIL-HDBK-61).

3.12 Functional Baseline (FBL).

Documentation describing system/segment functional characteristics and the verification required to demonstrate the achievement of those specified functional characteristics. The system or segment specification establishes the functional baseline (Glossary of Defense Acquisition Acronyms and Terms).

3.13 Initial Capabilities Document (ICD).

Summarizes a CBA and justifies the requirement for a materiel or non-materiel approach or an approach that is a combination of materiel and non-materiel to satisfy specific capability gap(s). It identifies required capabilities and defines the capability gap(s) in terms of the functional area, the relevant range of military operations, desired effects, time, and doctrine, organization,

training, materiel, leadership and education, personnel and facilities (DOTMLPF) and policy implications and constraints. The ICD summarizes the results of DOTMLPF and policy analysis and the DOTMLPF approaches (materiel and non-materiel) that may deliver the required capability. The outcome of an ICD could be one or more joint DOTMLPF Change Recommendations (DCRs) or recommendations to pursue materiel solutions (CJCSI 3170.01).

3.14 Key Performance Parameters (KPP).

Those attributes or characteristics of a system that are considered critical or essential to development of an effective military capability and those attributes that make a significant contribution to characteristics of future joint force as defined in the Capstone Concept for Joint Operations. KPPs must be testable to enable feedback from test and evaluation efforts to the requirements process. KPPs are validated by the Joint Requirement Oversight Council (JROC) for JROC Interest documents, by the JCB for JCB Interest documents, and by the DOD component for Joint Integration, Joint Information, or Independent documents. CDD and CPD KPPs are included verbatim in the acquisition program baseline. (CJCSI 3170.01).

3.15 Key System Attribute (KSA).

An attribute or characteristic considered crucial to achieving a balanced solution/approach to a system, but not critical enough to be designated a KPP. KSAs provide decision makers with an additional level of capability performance characteristics below the KPP level and require a sponsor four-star, Defense Agency commander or Principal Staff Assistant to change (JCIDS Manual).

3.16 Measure of Effectiveness (MOE).

Measure designed to correspond to accomplishment of mission objectives and achievement of desired results. MOEs may be further divided into Measures of Performance (MOPs) and Measures of Suitability (MOSs) (Glossary of Defense Acquisition Acronyms and Terms).

3.17 Measure of Performance (MOP).

Measure of a system's performance expressed as speed, payload, range, time-on-station, frequency, or other distinctly quantifiable performance features. Several MOPs and/or Measures of Suitability (MOSs) may be related to the achievement of a particular Measure of Effectiveness (MOE) (Glossary of Defense Acquisition Acronyms and Terms).

3.18 Measure of Suitability (MOS).

Measure of an item's ability to be supported in its intended operational environment. MOSs typically relate to readiness or operational availability and, hence, reliability, maintainability, and the item's support structure. Several MOSs and/or Measures of Performance (MOP) may be related to the achievement of a particular Measure of Effectiveness (MOE) (Glossary of Defense Acquisition Acronyms and Terms).

3.19 Metadata.

Information describing the characteristics of data; data or information about data; or descriptive information about an entity's data, data activities, systems, and holdings. For example, discovery metadata is a type of metadata that allows data assets to be found using enterprise search capabilities (DoDD 8320.02).

3.20 Operational Requirements.

Top level system performance attributes or capabilities of the system or subsystem documented in the warfighter's capabilities documents.

3.21 Performance Requirements.

Requirements defining the extent to which a mission or function should be executed, generally measured in terms of quantity, quality, coverage, timeliness or readiness.

3.22 Regulatory Requirements.

Requirements directed by military regulations and other governmental agencies (DoDI 5000.02).

3.23 Requirements Analysis.

Requirements Analysis encompasses definition and refinement of system, subsystem, and lower-level functional and performance requirements and interfaces to facilitate the Architecture Design process. Requirements Analysis needs to provide measurable and verifiable requirements. Requirements being developed by the materiel developer balance requirements to include performance, functional and technical constraints and both life-cycle costs and development cycle time (DAG, https://dag.dau.mil).

3.24 Requirements Management.

Requirements Management provides traceability back to user-defined capabilities as documented through either the Joint Capabilities Integration and Development System or other user-defined source, and to other sources of requirements. Requirements traceability is one function of requirements management. As the systems engineering process proceeds, requirements are developed to increasing lower levels of the design. Requirements traceability is conducted throughout the system life cycle and confirmed at each technical review. Traceability between requirements documents and other related technical planning documents, such as the Test and Evaluation Master Plan, is maintained through a relational data base, numbering standards or other methods that show relationships. A good requirements management system allows for traceability from the lowest level component all the way back to the user capability document or other source document from which it was derived (DAG, https://dag.dau.mil).

3.25 Statutory Requirements.

Requirements directed by public law (DoDI 5000.02).

3.26 Subsystem.

A grouping of items satisfying a logical group of functions within a particular system.

3.27 Synthesis.

Translation of input requirements (including performance, function, and interface) into possible solutions (resources and techniques) satisfying those inputs. Defines a physical architecture of people, product and process solutions for logical groupings of requirements (performance, function and interface) and then designs those solutions.

3.28 System.

An integrated composite of people, products and processes that provide a capability to satisfy a stated need or objective.

3.29 Systems Analysis and Control.

Imposition of structure and discipline into system evolution by: measuring progress based on demonstrated performance; identifying, developing and examining alternatives; making decisions based on cost, schedule, performance and risk to affect balanced results; documenting evolution and rationale; and controlling resulting configurations.

3.30 Systems Engineering (SE).

Systems engineering is an interdisciplinary approach and process encompassing the entire technical effort to evolve, verify and sustain an integrated and total life cycle balanced set of system, people, and process solutions that satisfy customer needs. Systems engineering is the integrating mechanism for the technical and technical management efforts related to the concept analysis, materiel solution analysis, engineering and manufacturing development, production and deployment, operations and support, disposal of, and user training for systems and their life cycle processes. (DAG, https://dag.dau.mil).

3.31 System of Systems (SoS).

A set or arrangement of interdependent systems that are related or connected to provide a given capability. The loss of any part of the system will degrade the performance or capabilities of the whole. An example of an SoS could be interdependent information systems. While individual systems within the SoS may be developed to satisfy the peculiar needs of a given warfighter group (like a specific Service or agency), the information they share is so important that the loss of a single system may deprive other systems of the data needed to achieve even minimal capabilities (Acquisition Community Connection https://acc.dau.mil/CommunityBrowser.aspx?id=54715).

3.32 Weapon Systems Acquisition Reform Act (WSARA).

The Weapon System Acquisition Reform Act (WSARA) of 2009, Public Law 111-23, May 22, 2009. Weapon Systems Acquisition Reform Act of 2009 One Hundred Eleventh Congress of the United States of America AT THE FIRST SESSION Begun and held at the City of Washington on Tuesday, the sixth day of January, two thousand and nine An Act To improve the organization and procedures of the Department of Defense for the acquisition of major weapon systems, and for other purposes. Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled (http://www.gpo.gov/fdsys/pkg/PLAW-111publ23/pdf/PLAW-111publ23.pdf)

3.33 Acronyms.

ABL	Allocated Baseline
AF	Air Force
AFROC	Air Force Requirements Oversight Council
AFRL	Air Force Research Laboratory
AFSO21	AF Smart Operations for the 21st Century

AIP	Acquisition Improvement Plan
AoA	Analysis of Alternatives
ASC	Aeronautical Systems Center
C2	Command and Control
CAC	Common Access Card
CBA	Capabilities-Based Assessment
CBP	Capabilities Based Planning
CCP	Continuous Capability Planning and Contract Change Proposal
CCTD	Concept Characterization and Technical Designation
CDD	Capability Development Document
CI	Configuration Item
CJCSI	Chairman of the Joint Chiefs of Staff Instruction
CoE	Concept of Employment
CONOPS	Concept of Operations
CPD	Capability Production Document
CRRA	Capabilities Review and Risk Assessment
CSAF	Chief of Staff of the Air Force
CWBS	Contract Work Breakdown Structure
DAG	Defense Acquisition Guidebook
DAU	Defense Acquisition University
DCR	DOTMLPF Change Recommendation
DID	Data Item Description
DoD	Department of Defense
DoDD	Department of Defense Directive
DoDI	Department of Defense Instruction
DOTMLPF	Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, and Facilities
DSP	Defense Standardization Program
D&SWS	Develop and Sustain Warfighting Systems
ECP	Engineering Change Proposal
ESOH	Environment, Safety, and Occupational Health
FBL	Functional Baseline
FoS	Family of Systems
IA	Information Assurance
ICD	Initial Capabilities Document

INCOSE	International Council on Systems Engineering
IPSC	Information Processing Standards for Computers
IPT	Integrated Product Team
IRS	Interface Requirements Specification
ISP	Information Support Plan
JACG	Joint Aeronautical Commander's Group
JCB	Joint Capabilities Board
JCD	Joint Capabilities Document (Obsolete)
JCIDS	Joint Capabilities Integration and Development System
JROC	Joint Requirements Oversight Council
JSSG	Joint Services Specification Guide
KPP	Key Performance Parameter
KSA	Key System Attribute
LRU	Line Replaceable Unit
MAJCOM	Major Command
MIL-HDBK	Military Handbook
MOE	Measure of Effectiveness
MOP	Measure of Performance
MOS	Measure of Suitability
MS	Milestone
NASA/SP	National Aeronautics and Space Administration/Special Publication
NRC	National Research Council
OFP	Operational Flight Program
POC	Point of Contact
PWBS	Program Work Breakdown Structure
RFP	Request for Proposal
RMT	Requirements Management Tools
SE	Systems Engineering
SECAF	Secretary of the Air Force
SE-WIPT	Systems Engineering-Working Level Integrated Product Team
SME	Subject Matter Expert
SOO	Statement of Objectives
SoS	System of Systems

SOW	Statement of Work
SRD	System Requirements Document
SSS	System/Subsystem Specification
T&E	Test and Evaluation
TEMP	Test and Evaluation Master Plan
TRD	Technical Requirements Document
USAF	United States Air Force
USN	United States Navy
WBS	Work Breakdown Structure
WLPT	Working-Level Integrated Product Team
WSARA	Weapon Systems Acquisition Reform Act

4. PURPOSE

4.1 Introduction.

This SRD handbook provides a bridge between warfighter and acquisition communities. It was developed to standardize and formalize the requirements analysis process used to translate warfighter capabilities into acquisition requirements using Data Item Description (DID) DI-IPSC-81431 and MIL-STD-961 as the framework. It is intended to guide a program Systems Engineering Team in preparation of an SRD for any DoD program during Request for Proposal (RFP) development, pre-contract award, Engineering Change Proposal (ECP) development after contract award, or any other application requiring translation of warfighter capabilities into acquisition requirements. It may be used by any DoD component or acquisition organization. Guidance is meant to be generic enough to be used in support of all program MSs and phases, and has been written to encompass system as well as subsystem development, modification, or update. A detailed template is provided to guide SRD development. This handbook offers maximum flexibility in creating an SRD and accommodates any given set of warfighter capabilities. Requirements analysis processes are applicable to any MSs or phases, and support early acquisition as well as mature programs undergoing modification or update. Development of an SRD is a critical Systems Engineering skill necessary to ensure warfighter capabilities are understood by the offeror/contractor and the resulting system/subsystem meets the warfighter's mission need.

4.2 SRD guidance applicability.

The SRD guidance in this handbook applies to any DoD program and also applies to applications previously using a Technical Requirements Document (TRD). Previously, there was no policy, standard or handbook to guide preparation of an SRD or a TRD. Both documents served the purpose of translating warfighter capabilities into acquisition requirements. This handbook provides guidance for development of a standardized SRD for all programs having to translate warfighter capabilities into acquisition requirements.

4.3 SRD purpose.

Used during source selection, an SRD is documents the warfighter's capabilities in contractual language. An SRD is prepared early during RFP development and is normally based upon a

capabilities document approved by a Service/Agency requirements authority and the Joint Requirements Oversight Council (JROC) (CJCSI 3170.01). It translates required warfighter capabilities into system/subsystem acquisition requirements addressing such concerns as performance; supportability; physical and functional integration; human system integration; security, test and evaluation; quality assurance; hardware; software; etc. The SRD will also be used on mature programs to add or modify current capabilities.

4.4 Functional baseline (FBL).

An SRD establishes the basis for an acquisition program FBL (see MIL-HDBK-61). It documents acquisition requirements translated from a warfighter capabilities document (CJCSI 3170.01) into an acquisition format used as a baseline for a system or subsystem specification typically prepared by an offeror/contractor. It communicates government system or subsystem requirements in a concise, measurable and understandable fashion. At contract award the SRD is replaced by a documented FBL in a contractor prepared system or subsystem specification. The generic SRD template in this handbook is written in a very broad fashion without documenting specific requirements. It was meant to be used to facilitate documentation of acquisition requirements for a range of systems or subsystems that can be passed to a contractor as part of an RFP or ECP. The generic SRD template accommodates any MS (for example, pre MS A, MS A, MS B, MS C) or program phase. As every program is unique with its own set of capabilities and requirements, so will each respective SRD be unique. There is no one single template or format suitable for all systems and subsystems hence a generic template was developed.

4.5 Early systems engineering (SE).

Throughout the acquisition process, SE provides the technical foundation for an acquisition program. Particularly in early stages of an acquisition, SE analysis and products are vital to a program office's ability to assess feasibility of addressing warfighter capabilities, technology needs of potential solutions, and robust estimates of cost, schedule, and risk, all leading to a predictable, disciplined acquisition. With increased emphasis in the Weapons Systems Acquisition Reform Act (WSARA) and the new DoDI 5000.02 on the Materiel Solution Analysis Phase (Enclosure 2, paragraph 4 of DoDI 5000.2) and the Technology Development Phase (Enclosure 2, paragraph 5 of DoDI 5000.2) there is a need for increased emphasis on SE during these activities. "The ability of U.S. military forces to field new weapon systems quickly and to contain their cost growth has declined significantly over the past few decades. There are many causes including increased complexity, funding instability, bureaucracy, and more diverse user demands, but a view that is gaining more acceptance is that better SE could help shorten development time." To investigate this assertion in more detail, the US Air Force asked the National Research Council (NRC) to examine the role that SE can play during the acquisition life cycle to address root causes of program failure especially during pre-milestone A and early program phases. This study assessed the relationship between SE and program outcome; examined the SE workforce and analyzed SE functions and guidelines. It includes a definition of the minimum set of SE processes that need to be accounted for during project development. The study report, *Pre-Milestone A and Early-Phase Systems Engineering: A Retrospective Review and Benefits for Future Air Force Acquisition,* National Research Council, 2008, The National Academies Press, can be accessed at The National Academies Press website[1].

1. Pre-Milestone A and Early-Phase Systems Engineering: A Retrospective Review and Benefits for Future Air Force Acquisition, National Research Council, 2008, The National Academies Press, http://www.nap.edu/catalog.php?record_id=12065

5. SRD DESCRIPTION

5.1 Requirements development.

A program office engineering team defines system or subsystem level functional and performance requirements derived from warfighter capabilities documents, Concept of Operations (CONOPS), Concept of Employment (CoE), Analysis of Alternatives (AoA), system-level performance metrics, mission threads/use cases, and usage environment, which are captured in a program's SRD. These requirements known as acquisition requirements or system/subsystem requirements because taken as an aggregate, they are written in acquisition/contractual terms and they define the entire system/subsystem performance characteristics. Further complicating the terminology used, these aggregate requirements are also now known as attributes.

5.2 Attributes.

The program office engineering team defines acquisition requirements in terms of system level attributes and associated constraints defined by the warfighter. Attributes are further broken out and prioritized as Key Performance Parameters (KPPs) and Key System Attributes (KSAs). Acquisition requirements are written using performance language. The SRD avoids describing a specific solution unless there is a compelling warfighter capabilities need. It should not preclude leasing, commercial, or non-developmental solutions. An SRD should not contain any programmatic or Statement of Work (SOW) or Statement of Objectives (SOO) language that belong in other sections of an RFP or ECP. During the subsequent source selection, these performance requirements, as documented in the offeror's draft system or subsystem specification, are evaluated for cost, performance, schedule, and risk of various candidate solutions resulting in a best value solution. Note: The Defense Acquisition Guidebook (DAG) uses the term "system performance specification" interchangeably with "system specification." System specification is used exclusively throughout this handbook.

5.3 Capabilities documents.

There are three Joint Capabilities Integration and Development System (JCIDS) capability documents used for materiel development: Initial Capabilities Document (ICD), Capability Development Document (CDD) and Capability Production Document (CPD). Details on use, content and format of JCIDS documents are located in CJCSI 3170.01 and the JCIDS Manual. The Joint Capabilities Document (JCD) was rescinded by CJCSI 3170.01G but may still exist on some programs. Additionally, there are Service specific alternative means for documenting capabilities that are used in some situations, for example, system modification.

5.4 Warfighter attributes.

JCIDS capability documents, (for example, ICD, CDD, CPD) identify warfighter attributes in the form of Key Performance Parameters (KPPs), Key System Attributes (KSAs), and other Attributes. The JCIDS capability document lists each capability requirement, associated threshold, objective and rationale/analytical reference. Section 3 of the SRD documents these system capability attributes and associated thresholds and objectives. Section 4 of the SRD contains verification provisions for each requirement (attribute) implementing a verification methodology matrix documenting how each requirement is to be verified. Section 5 contains a requirements traceability matrix that traces SRD requirements up to warfighter capability documents and down to the lowest level hardware/software component that implements the requirement. The requirements traceability matrix will be completed by the offeror/contractor in the resulting SSS. Section 6 contains definitions and acronyms. Each SRD, KPP and KSA

should have an associated threshold and objective. Other attributes should include thresholds and objectives as applicable. SRDs will display applicable thresholds and objectives in each paragraph. Individual requirements should be uniquely identified and traceable and have a unique identifier and/or paragraph number. Automated tools used for traceability should be capable of supporting required metadata (see 10.1 through 10.3), including rationale and analytical references for each requirement. Metadata should be included for each requirement in an SRD, SSS and lower tiered specifications. If an automated tool is not used, rationale and analytical reference for each requirement should be manually documented as part of the requirements traceability matrix.

5.5 Contract award.

At contract award, the program's FBL is documented in a contractually binding approved system or subsystem specification which now defines requirements an acquisition program intends to achieve. When an SRD is replaced by a performance specification the thresholds and objectives contained in the SRD must be replaced in the specification by the actual performance values the contractor is going to deliver. These performance values may be expressed as min or max values, as a range of values, etc. However they are expressed, they must be in terms that can be verified by analysis, demonstration, examination, or test. For a mature program, an SRD provides the basis of FBL modifications documented in an approved system or subsystem specification. The system or subsystem specification forms a basis for Test and Evaluation (T&E) of the resultant system or subsystem. Refer to MIL-HDBK-61 for a detailed description of an FBL and allocated baseline (ABL). The SRD is typically written at Work Breakdown Structure (WBS) Level I per MIL-HDBK-881 whether prepared for a system or subsystem. The SRD is not a design specification; it contains only top level performance requirements for a system or subsystem. While written at WBS Level I, a system-level SRD includes lower WBS elements that have system level requirements, for example, allocation of system/subsystem reliability requirements.

6. APPROVAL

6.1 Signatures and coordination.

Program Manager and Program Chief Engineer sign the SRD certifying the performance requirements contained within. It is recommended that the MAJCOM coordinate on the SRD.

7. SRD PREPARATION INTRODUCTION

7.1 SRD preparation.

Preparation of an SRD requires a thorough understanding of the requirements analysis process. Requirements analysis is an iterative SE process used to understand warfighter capabilities and translate those capabilities into acquisition requirements. With this understanding, and the generic SRD template, an acquisition program office engineering team will be able to create an SRD that is easily translatable into a system or subsystem specification by an offeror or contractor.

7.1.1 Defining acquisition requirements.

An acquisition program office engineering team employs requirements analysis iteratively throughout an SRD development effort to define acquisition requirements for the weapon system to achieve a complete, balanced system design. The FBL, as documented in a SSS,

captures the performance description in terms of performance requirements and verification methods for each element of a system or subsystem.

7.1.2 Core SE process.

Requirements analysis is a core SE process that begins with definition of a warfighter's capabilities. The acquisition community should be involved during development of the warfighter's capabilities documents and the warfighter should be a participant on the SRD development team. This collaboration ensures complete understanding of the warfighters capabilities and capabilities/requirements will be developed using characteristics of good requirements listed in 8.4.

8. REQUIREMENTS ANALYSIS PROCESS

8.1 Introduction.

This section is derived from the requirements analysis process described in the DAG and Chapter 4 of the DAU Systems Engineering Fundamentals. Requirements Analysis encompasses the definition and refinement of system, subsystem, and lower-level functional and performance requirements and interfaces to facilitate the Architecture Design process. Requirements Analysis needs to provide measurable and verifiable requirements. Requirements should avoid specifying technological implementations. The requirements being developed by the materiel developer should balance requirements to include performance, functional and technical constraints, and both life-cycle costs and development cycle time.

8.2 Process inputs.

Typical inputs to the SE requirements analysis process (Chapter 4, DAU Systems Engineering Fundamentals) include but are not limited to: warfighter needs, objectives and operational requirements in the form of capabilities, missions, Measures of Effectiveness/Measures of Suitability/Measures of Performance (MOE/MOS/MOP), environments, KPPs, KSAs, other attributes, technology base, output requirements from prior application of SE processes, program decision requirements, suitability requirements and project constraints. Warfighter capabilities relate directly to desired performance characteristics of the system. They are stated in terms of life-cycle warfighter capabilities needs and objectives for the system/subsystem and relate to how well the system/subsystem will work in its intended environment over its service life (Chapter 4, DAU Systems Engineering Fundamentals).

Input requirements should be comprehensive and defined for both system products and system processes such as development, manufacturing, verification, deployment, operations, support, training and disposal (eight primary functions).

8.2.1 Constraints.

Constraints are conditions that exist because of limitations imposed by cost, schedule, external interfaces, project support, need for standardization/commonality, technology, or life cycle support systems. Constraints limit development teams' design opportunities and should be used selectively.

8.2.2 System technical requirements.

System technical requirements are a primary focus in the SRD process because the primary objective is to transform the warfighter's capabilities into acquisition requirements used to contract for the system design and development. System and subsystem design and

development are based upon these system technical requirements within a definitive set of constraints and policy. All requirements should be verified to ensure they meet both performance and constraints.

8.3 Types of technical requirements.

Technical requirements define system attributes and are categorized in several ways. The following are common categories of requirements that relate to technical management. A warfighter's capabilities can be in the form of functional, performance, operational or design requirements. These requirements are analyzed using requirements analysis and are further refined by the acquisition team into acquisition requirements documented in the SRD (Chapter 4, DAU Systems Engineering Fundamentals).

8.3.1 Warfighter capabilities.

Warfighter capabilities are capability statements and assumptions that define system or subsystem expectations and needs in terms of needed performance, mission objectives, environment, constraints, MOEs, MOSs and MOPs (Chapter 14, DAU Systems Engineering Fundamentals). Capabilities are prioritized as KPPs, KSAs and Attributes.

8.3.2 Functional requirement.

A functional requirement is a necessary task, action or activity required to be accomplished. Functional (what has to be done) requirements identified in requirements analysis will be used as the top level functions for requirements analysis at a lower WBS level.

8.3.3 Performance requirements.

Extent to which a mission or function should be executed; generally measured in terms of quantity, quality, coverage, timeliness or readiness. During requirements analysis, performance (how well it has to be done) requirements will be interactively developed across all identified functions based on system life cycle factors; and characterized in terms of degree of certainty in their estimate, degree of criticality to system success and relationship to other requirements.

8.3.4 Design requirements.

"Build to," "code to" and "buy to" requirements for products, and "how to execute" requirements for processes, expressed in technical data packages and technical manuals, warfighter's capabilities documents or the SRD. Design requirements should be used judiciously at the system/subsystem level to avoid placing undue constraints on the design team.

8.3.5 Derived requirements.

Implied or transformed requirements broken out from higher-level requirements, for example, a requirement for long range or high speed may result in a derived design requirement for low weight and/or drag.

8.3.6 Allocated requirements.

Allocated requirements are assigned to a specific system or subsystem element, regardless of level of indenture, without being decomposed into their lower level components.

8.3.7 Acquisition requirements.

System requirements are derived from the warfighter's capabilities and written in performance terms that further define system or subsystem attributes using the requirements analysis process. Acquisition requirements, prioritized by KPPs, KSAs and attributes, may use design,

derived and allocated requirements to further define required system attributes. Acquisition requirements are documented in the SRD and facilitate communication of the warfighter's capabilities to a contractor or offeror in contractual terms, i.e., each requirement is in its own paragraph and contains a "shall" statement. Once the contractor or offeror further refine acquisition requirements, they become contractually documented in a system or subsystem specification.

8.3.8 Specific design solution.

In special circumstances where there is need for commonality across a System of Systems (SoS) or Family of Systems (FoS) a specific design solution may be necessary. Justification of a specific solution should be provided by the warfighter community and documented in the approved acquisition strategy.

8.4 Characteristics of good requirements.

Good requirements have certain common characteristics that should be strictly adhered to (Chapter 4, DAU Systems Engineering Fundamentals). Characteristics of good requirements include the following:

a. A requirement is achievable. It specifically reflects thresholds and/or objectives for which a solution is technically realistic at costs considered affordable.

b. A requirement is verifiable. It is not to be defined by ambiguous words, for example, excessive, sufficient, resistant, minimal, etc. Expected performance and functional utility is expressed in a manner that allows verification to be objective, preferably quantitatively measureable.

c. A requirement is unambiguous. It has only one possible meaning so it is uniquely testable and verifiable.

d. A requirement is complete. It contains all information needed to interpret and verify the requirement including environmental and/or operational conditions relevant to the requirement.

e. A requirement is written in performance terms. It is expressed in terms of need, not solution, i.e., it addresses "why" and "what" of a need, not how to do it.

f. A requirement is consistent with other requirements. Conflicts are to be resolved up front prior to release of an RFP or ECP.

g. A requirement is appropriate for the level of system hierarchy. It is not too detailed that it constrains solutions for the current level of design, for example, detailed requirements relating to components would not normally be in a system-level specification.

8.5 Requirements analysis

Requirements analysis (Chapter 4, Systems Engineering Fundamentals) begins in support of the warfighter's capabilities development. Requirements analysis involves defining warfighter capabilities needs and objectives in the context of planned warfighter use, environments, constraints, and identified system characteristics which are then used to develop acquisition requirements documented in an SRD. Any prior analyses are reviewed and updated, refining

mission and environment definitions to support system definition (for example, other system items, performance requirements for identified functions) and verify that people, product, and process solutions (from synthesis) can satisfy the warfighter capabilities needs. Requirements analysis is conducted iteratively with requirements analysis to optimize performance requirements for identified functions, and to verify that synthesized solutions can satisfy warfighter capabilities needs.

8.5.1 Requirements analysis purpose.

The purpose of requirements analysis is to:

a. Develop warfighter capabilities and objectives;

b. Define initial performance capabilities and objectives and refine them into acquisition requirements;

c. Identify and define constraints that limit solutions; and

d. Define functional and performance requirements based on warfighter provided MOEs/MOSs/MOPs.

8.5.2 Requirements analysis result.

In general, requirements analysis should result in a clear understanding of:

a. Functions: what the system has to do;

b. Performance: how well the functions and resultant system or subsystem have to perform;

c. Interfaces: environment in which the system or subsystem will perform; and

d. Other requirements and constraints.

8.5.3 Design basis.

Understanding that comes from requirements analysis establishes a basis for functional and physical designs to follow. Good requirements analysis is fundamental to successful design definition. Requirements analysis is a highly iterative process and is used by the warfighter to create capabilities documents, by an acquisition program office to define acquisition requirements as documented in an SRD, and by developing organization (for example, offeror, contractor) that produces system/subsystem requirements that form an FBL consisting of all necessary derived and allocated requirements used to design and develop a system/subsystem.

9. ROLE OF INTEGRATED TEAMS

Warfighters typically have operational expertise with particular weapon systems but not acquisition experience, whereas acquisition program office staff members are not necessarily well versed in operational aspects. Typically, a warfighter's capabilities need is neither clearly nor completely expressed in a way directly usable by developers. Teamwork between warfighter and acquisition communities is necessary to understand the problem, analyze capability needs, and prepare acquisition requirements. Warfighters often find it easier to describe a system that attempts to solve a problem rather than to describe the problem itself.

Although these “solutions” may be workable to some extent, an optimum solution is obtained through a proper technical development effort that balances warfighter mission objectives, functions, MOEs/MOSs/MOPs, and constraints. An integrated approach (Chapter 4, DAU Systems Engineering Fundamentals) to capability need and acquisition requirements development will balance the analysis of requirements by providing understanding and accommodation between the warfighter and acquisition communities.

9.1 Early Systems Engineering (SE).

Throughout the acquisition process, systems engineering provides the technical foundation for the acquisition program. Particularly in the early stages of an acquisition, systems engineering analysis and products are vital to the early program office's ability to assess appropriately the feasibility of addressing user needs, technology needs of potential solutions, and robust estimates of cost schedule and risk, all leading to predictable, disciplined acquisition. With the increased emphasis in the new DoD Instruction 5000.02 on Materiel Solution Analysis and Technology Development, there is the need for increased emphasis on systems engineering during these phases. A white paper discussing these issues can be accessed at the AT&L (SE) web site (DAG, Chapter 4).

9.2 Early SE effort.

Systems Engineering (SE) conducted during the early, pre-MS A, stages of concept development is referred to as early SE, whether for a new program start or for modifications/upgrades to a legacy system. Capabilities Based Assessment (CBA)/JCIDS scope and trade-space characterization of early SE efforts typically will occur concurrently. The using or sponsoring major command (MAJCOM) owns the CBA/JCIDS process, and leads team efforts supported by acquiring commands (or Laboratories) to identify any capability shortfalls. (JCIDS Manual, CJCSI3170.01).

9.3 Systems Engineering Working Level IPT (SE-WIPT).

Systems engineering is typically implemented through multidisciplinary teams of subject matter experts (SMEs) (often formally chartered as an Integrated Product Team (IPT)) and through an SE-WIPT. SE-WIPTs generally start up during early SE efforts, and continue past MDD and through instantiation of a program office (Defense Acquisition Guidebook). The SE-WIPT translates warfighter-defined capabilities into acquisition requirements consistent with cost, schedule, and performance constraints (see DoDD 5000.01, and Chapter 11, Defense Acquisition Guidebook discussions of Knowledge-Based Acquisition).

9.3.1 Team interaction.

There should be active participation by the acquisition community early in development of any warfighter, or other user, capabilities requiring a materiel solution. The acquisition community should involve active participation of the warfighter, or other user, community in requirements analysis that result in an SRD. It is expected that all other required functional organizations will participate in the development of the warfighter, or other user, capabilities and SRD. The following paragraphs describe roles played by warfighter and acquisition communities in early SE processes. An SRD will be prepared any time warfighter capabilities are translated into acquisition requirements in order to facilitate a contractual relationship with a development organization.

9.3.2 Leadership transfer.

During pre-program initiation activities, the users (MAJCOMs) are responsible for CBA/JCIDS efforts, requirements maturation, MDD and AoA execution, while early SE efforts for potential

materiel solutions are conducted by the acquisition community. A co-relationship should exist between the using command, the acquiring command and Service laboratory organizations providing support, as formulated in service instructions/charters. At MDD, the MAJCOM is responsible for seeking MDA approval and authorization to enter into the acquisition life-cycle. If the MDA directs an AoA be prepared, the effort is led by the MAJCOM. A co-relationship should exist between the using command, the acquiring command and Service laboratory organizations providing support as formulated in service instructions/charters (JCIDS Manual, CJCSI3170.01).

9.3.3 Requirements determination/validation.

Requirements determination/validation is a disciplined process starting with warfighter capabilities needs and shortfalls coming out of the JCIDS and Capabilities Review and Risk Assessment (CRRA) process. It involves all operational, command and supporting stakeholders; and results in materiel solutions being identified, designed and delivered to meet stated capability needs and shortfalls with speed and credibility.

10. REQUIREMENTS MANAGEMENT

Requirements management (Defense Acquisition Guidebook) is an important support activity to the warfighter capabilities, the SRD and subsequent system/subsystem development: providing configuration control, documentation of decisions, and traceability of all requirements to ensure the pedigree of each requirement. Requirements management provides traceability back to warfighter-defined capabilities as documented through either a JCIDS capabilities document or other warfighter-defined source, and to other sources of requirements.

10.1 Requirements traceability

As the SE process proceeds, requirements are developed to increasing lower levels of design. Requirements traceability is conducted throughout the system life cycle and confirmed at each technical review. Traceability between requirements documents and other related technical planning documents, such as the Test and Evaluation Master Plan (TEMP), should be maintained through a relational data base, numbering standards, or other methods that show relationships and associated metadata, for example, who, what, when, why (DoDD 8320.02). A good requirements management system should allow for traceability from the lowest level component all the way back to the warfighter capability document or other source document from which it was derived. Traceability should be maintained from the SRD to applicable higher level documentation and provides baseline traceability for the resultant system or subsystem specification. After contract award, the SRD is replaced by a system or subsystem specification that is traceable to applicable higher level documentation and required test & verification methodologies and lower level specifications. The program manager should institute requirements management to do the following:

a. Maintain traceability of all requirements and associated test and verification methodologies from capabilities needs through design and test, down to the lowest system/subsystem component throughout the entire life cycle,

b. Document derived requirements and approved changes to requirements, and

c. Record all metadata including rationale for derived requirements and changes.

10.2 Capturing requirements.

At the time requirements are written, it is important to capture requirements statements along with metadata associated with each requirement (DoDD 8320.02). Metadata is supporting information necessary to help clarify and link requirements, for example, date created, date changed, point of contact (POC), approval authority, etc. Method of verification should also be thought through and captured for each requirement when developed. Verification method includes test, inspection, analysis, and demonstration. New or derived requirements uncovered during determination of the verification method should be documented. An example is requiring an additional test port to give visibility to an internal signal during integration and test. If a requirement cannot be verified, then either it should not be a requirement or the requirement statement needs to be rewritten. For example, the requirement to “minimize noise” is vague and cannot be verified. If the requirement is restated as “the noise level of the component X shall remain under Y decibels” then it is clearly verifiable. Examples of the types of metadata are provided in TABLE I.

10.3 Requirements management tools (RMT).

With ever increasing system complexity there is an increased need for RMTs with ever increasing capabilities. Modern RMTs should ensure requirements traceability and document rationale and heritage of each requirement using metadata. Underlying analysis supporting trade study results and subsequent rationale for any requirement should be retained in the RMT. The analysis should include all relevant conditions and data that would enable analysis re-creation if necessary. Metadata is crucial to convey and track the lineage of requirements passed to offerors/contractors. The International Council on Systems Engineering (INCOSE) has reviewed many of the RMTs available and has compiled the results on their RMT survey webpage, http://www.incose.org/ProductsPubs/products/rmsurvey.aspx.

TABLE I. Sample Requirements Metadata. 1/

Item	Function
Requirement ID	Provides a unique numbering system for sorting and tracking.
Rationale	Provides additional information to help clarify the intent of the requirements at the time they were written. (See "Rationale" box below on what should be captured.)
Traced from	Captures the bidirectional traceability between parent requirements and lower level (derived) requirements and the relationships between requirements.
Owner	Person or group responsible for writing, managing, and/or approving changes to this requirement.
Verification method	Captures the method of verification (test, inspection, analysis, demonstration) and should be determined as the requirements are developed.
Verification lead	Person or group assigned responsibility for verifying the requirement.
Verification level	Specifies the level in the hierarchy at which the requirements will be verified (e.g., system, subsystem, element).

Rationale

The rationale should be kept up to date and include the following information:

- **Reason for the Requirement:** Often the reason for the requirement is not obvious, and it may be lost if not recorded as the requirement is being documented. The reason may point to a constraint or concept of operations. If there is a clear parent requirement or trade study that explains the reason, then reference it.
- **Document Assumptions:** If a requirement was written assuming the completion of a technology development program or a successful technology mission, document the assumption.
- **Document Relationships:** The relationships with the product's expected operations (e.g., expectations about how stakeholders will use a product). This may be done with a link to the ConOps.
- **Document Design Constraints:** Imposed by the results from decisions made as the design evolves. If the requirement states a method of implementation, the rationale should state why the decision was made to limit the solution to this one method of implementation.

1/ NASA/SP-2007-610

11. NOTES

11.1 Intended use.

This handbook is guidance for the preparation of System/Subsystems Requirements Documents using established Systems Engineering processes. It is meant to be used as a guide to translate warfighter Capability Based Requirements into acquisition requirements for a system or subsystem in any program Milestone or phase.

11.2 Subject term (key word) listing.

Acquisition requirements
Capability requirements
Generic
Performance requirements
Requirements analysis
Systems engineering
Template

11.3 Changes from previous issue.

Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

APPENDIX A

System Requirements Document (SRD) Generic Template Guidance

A.1 SCOPE

This section is divided into the following subparagraphs:

A.1.1 System or subsystem identification.

This paragraph contains a full identification of the system or subsystem and associated software to which this document applies, including as applicable, identification number(s), title(s), abbreviation(s), and release number(s) where known.

A.1.2 System or subsystem overview.

This paragraph briefly states the purpose of the system or subsystem and associated software to which this document applies. It describes the general nature of the system or subsystem and software; summarizes the history of system development, operation, and maintenance; identifies project sponsor, acquirer, warfighter, developer, and support agencies; identifies the current and planned operating sites; and lists other relevant documents.

A.1.3 Document overview.

This paragraph summarizes purpose and contents of this document and describes any security or privacy considerations associated with its use.

A.2 APPLICABLE DOCUMENTS

This section lists number and title of all documents referenced herein. This section also identifies the source for documents.

A.2.1 General.

Provide overview of documentation section. This statement should be placed in all SRD documents and resulting specifications: “The documents listed in this section are specified in sections 3, 4, or 5 of this SRD (or resulting specification). This section does not include documents cited in other sections of this SRD (or resulting specification) or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this SRD (or resulting specification), whether or not they are listed.”

A.2.2 Government documents.

List applicable Government documents.

A.2.2.1 Specifications, standards, and handbooks.

List Government specifications, standards, and handbooks. This statement should be placed in all SRD documents and resulting specifications: “The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.”

INTERNATIONAL STANDARDIZATION AGREEMENTS

FEDERAL SPECIFICATIONS

FEDERAL STANDARDS

COMMERCIAL ITEM DESCRIPTIONS

DEPARTMENT OF DEFENSE SPECIFICATIONS

DEPARTMENT OF DEFENSE STANDARDS

DEPARTMENT OF DEFENSE HANDBOOKS

(Copies of these documents are available online at https://assist.daps.dla.mil/quicksearch/ or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

A.2.2.2 Other Government documents, drawings, and publications.
List other Government documents, drawings, and publications. This statement should be placed in all SRD documents and resulting specifications: "The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract."

(A parenthetical source statement should follow each individual document or each group of related documents providing the name and address of the source. If possible, an Internet source for viewing or obtaining the documents should be provided.)

A.2.3 Non-Government publications.
List non-Government publications. This statement should be placed in all SRD documents and resulting specifications: "The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract."

(A parenthetical source statement should follow each respective issuing non-Government standards organization listing of documents, providing the name and address of the source. If possible, an Internet source for viewing or obtaining the documents should be provided.)

A.2.4 Order of precedence.
This statement should be placed in all SRD documents and resulting specifications: "Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein (except for related specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained." [The parenthetical phrase "(except for related specification sheets)" is omitted from the paragraph for specifications that do not have related specification sheets.]

A.3 SYSTEM OR SUBSYSTEM REQUIREMENTS

This section identifies basic system or subsystem requirements needed by the warfighter. This section is divided into the following paragraphs to specify system or subsystem requirements, for example, those characteristics of the system or subsystem that are conditions for its acceptance. Each requirement should be assigned a project-unique identifier (to support testing and traceability), and should be stated in such a way that an objective verification can be defined for it. Project unique identifiers should use the Program Work Breakdown Structure (PWBS) pre-contract award and the Contract Work Breakdown Structure (CWBS) post-contract award. Each requirement should be annotated with associated verification method(s) (see A.4) and, for subsystems, traceability to system requirements (see A.5.2), if not provided in those sections. The degree of detail to be provided is guided by the following rule: Include those characteristics of the system or subsystem that are conditions for system or subsystem acceptance; defer to design descriptions those characteristics an acquirer is willing to leave up to the developer. If there are no requirements in a given paragraph, the paragraph should so state. If a given requirement fits into more than one paragraph, it may be stated once and referenced from the other paragraphs.

Each SRD, KPP and KSA should have an associated threshold and objective. Attributes should include thresholds and objectives as applicable.

The symbols used are:

T	Threshold - Minimum requirement level.
O	Objective - Desired requirement level.
T=O	Threshold and Objective are the same requirement level. No effort will be expended to exceed the Threshold requirement.

Key Performance Parameters (KPPs) and Key System Attributes (KSAs) are indentified in the body of section 3 of the SRD or resulting specification and provided in a tabular format ranked in order of importance in Appendix A.

A.3.1 Required states and modes.

If a system or subsystem is required to operate in more than one state or mode having requirements distinct from other states or modes, this paragraph identifies and defines each state and mode. Examples of states and modes include: idle, ready, active, training, degraded, emergency, backup, wartime, peacetime. The distinction between states and modes is arbitrary. A system or subsystem may be described in terms of states only, modes only, states within modes, modes within states, or any other scheme that is useful. If no states or modes are required, this paragraph should so state, without the need to create artificial distinctions. If states and/or modes are required, each requirement or group of requirements in the SRD or resulting specification should be correlated to the states and modes. The correlation may be indicated by a table or other method in this paragraph, in an appendix referenced from this paragraph or by annotation of the requirements in the paragraphs where they appear.

A.3.2 System or subsystem functional requirements.

This paragraph is divided into subparagraphs to itemize requirements associated with each system or subsystem function. A "function" is defined as a group of related requirements, for example, avionics subsystem requirements.

A.3.2.X System or subsystem function.
This paragraph (beginning with 3.2.2 in the SRD or resulting specification) itemizes requirements associated with each system or subsystem function. If the function can be more clearly specified by dividing it into constituent functions, for example, avionics can be broken down into mission/operational definition, characteristics, design and construction, characteristics of subordinate elements, etc., the constituent functions should be specified in subparagraphs.

A.3.3 System external interface requirements.
This paragraph is divided into subparagraphs to specify requirements for the system's or subsystem's external interfaces. This paragraph may reference one or more Interface Requirements Specifications (IRSs) or other documents containing these requirements.

A.3.3.1 Interface identification and diagrams.
This paragraph identifies required external system or subsystem interfaces. Identification of each interface includes a project unique identifier and designates interfacing entities (systems, configuration items, warfighter's, etc.) by name, number, version, and documentation references, as applicable. The identification states which entities have fixed interface characteristics (and therefore impose interface requirements on interfacing entities) and which are being developed or modified (thus having interface requirements imposed on them). One or more interface diagrams are provided to depict the interfaces.

A.3.3.X Project-unique identifier of interface.
This paragraph (beginning with 3.3.2 in the SRD or resulting specification) identifies a system or subsystem external interface by project-unique identifier, identifies interfacing entities and is divided into subparagraphs as needed to state requirements imposed on the system or subsystem to achieve the interface. Interface characteristics of other entities involved in the interface are stated as assumptions or as "When [the entity not covered] does this, the system shall .... ," not as requirements on the other entities. This paragraph may reference other documents (for example, data dictionaries, standards for communication protocols, and standards for warfighter interfaces) in place of stating the information here. Requirements include the following, as applicable, presented in any order suited to the requirements, and notes any differences in these characteristics from the point of view of the interfacing entities (for example, different expectations about size, frequency, or other characteristics of data elements): NOTE: Detailed external interface elements may not be known during SRD development, in which case external interface requirements will be in broader, performance terms. Also, external interfaces will be described in more detail in the architecture diagrams and Information Support Plan (ISP). In many instances, interface requirements are known in great detail as they are associated with current operational systems. Net Ready KPP requirements are also addressed herein.

a. Priority the system assigns to the interface.

b. Requirements on type of interface (for example, real-time data transfer, storage-and retrieval of data, etc.) to be implemented.

c. Provide required commercial or Government external interface standards for data information transfer.

d. Provide required external communication links.

A.3.4 System internal interface requirements.

This paragraph specifies requirements imposed on interfaces internal to the system or subsystem. If all internal interfaces are left to the design or to requirement specifications for system or subsystem components, this fact is so stated.

A.3.5 System internal data requirements.

This paragraph specifies requirements imposed on data internal to the system or subsystem. Included are requirements on databases and data files to be included in the system. If all decisions about internal data are left to the design or to requirements specifications for system or subsystem components, this fact is so stated.

A.3.6 Adaptation requirements.

This paragraph specifies requirements concerning installation-dependent data that the system or subsystem is required to provide (for example, site dependent latitude and longitude) and operational parameters that the system is required to use that may vary according to operational needs (for example, parameters indicating operation-dependent targeting constants or data recording).

A.3.7 Environmental, Safety, and Operational Health (ESOH) requirements.

This paragraph specifies system or subsystem requirements concerned with preventing or minimizing unintended hazards to personnel, property, and the physical environment. Examples include restricting use of hazardous materials; mitigating the potential for system failures or mishaps, including critical software failures; classifying explosives for purposes of shipping, handling, and storing; abort/escape provisions from enclosures; gas detection and warning devices; grounding of electrical systems; decontamination; mitigating noise and other emission hazards; and explosion proofing. This paragraph includes system or subsystem requirements for nuclear components, including, as applicable, requirements for component design, prevention of inadvertent detonation, and compliance with nuclear safety rules. Criteria related to ESOH regulatory compliance requirements associated with the operation and maintenance of the system throughout its life cycle are also included.

A.3.8 Security and privacy requirements.

This section specifies system or subsystem requirements concerned with maintaining security and privacy. The requirements include, as applicable, security/privacy environment in which the system or subsystem should operate, type and degree of security or privacy to be provided, security/privacy risks the system or subsystem should withstand, required safeguards to reduce those risks, security/privacy policy, security/privacy accountability the system or subsystem provides, and criteria for security/privacy certification/accreditation. Paragraphs should be included for IA requirements in accordance with DoDD 8500.01 and DoDI 8500.2 as required.

A.3.9 System environment requirements.

This paragraph specifies requirements regarding the environment in which the system or subsystem operates. Examples for a hardware-software system include environmental conditions that the system or subsystem withstands during transportation, storage, and operation, for example, conditions in the natural environment (wind, rain, temperature, geographic location), induced environment (motion, shock, noise, electromagnetic radiation), and environments due to enemy action (explosions, radiation).

A.3.10 Computer resource requirements.
This paragraph is divided into the following subparagraphs. Depending upon the nature of the system or subsystem, computer resources covered in these subparagraphs may constitute the environment or components of the system or subsystem.

A.3.10.1 Computer hardware requirements.
This paragraph specifies requirements regarding computer hardware that is used by, or incorporated into, the system or subsystem. Requirements may include equipment types, numbers of each type, size and capacity. Characteristics of processors, memory devices, input/output devices, auxiliary storage, communications/network equipment and other equipment may be required.

A.3.10.2 Computer hardware resource utilization requirements.
This paragraph specifies the requirements on the system's or subsystem's computer hardware resource utilization, for example, maximum allowable use of processor capacity, memory capacity, input/output device capacity, auxiliary storage device capacity, and communications/network equipment capacity. Requirements (stated, for example, as percentages of the capacity of each computer hardware resource) include conditions under which the resource utilization is to be measured.

A.3.10.3 Computer software requirements.
This paragraph specifies requirements regarding computer software that is used by, or incorporated into, the system or subsystem. Examples include operating systems, database management systems, communications/network software, utility software, input and equipment simulators, test software, and manufacturing software. The correct nomenclature, version, and documentation references of each such software item are provided.

A.3.10.4 Computer communications requirements.
This paragraph specifies additional requirements concerning computer communications that is used by, or incorporated into, the system or subsystem. Examples include geographic locations to be linked, configuration and network topology, transmission techniques, data transfer rates, gateways, required system use times, type and volume of data to be transmitted/received, time boundaries for transmission/reception/response, peak volumes of data and diagnostic features.

A.3.11 System quality factors.
This paragraph specifies requirements pertaining to system or subsystem quality factors. Examples include quantitative requirements concerning system functionality (ability to perform required functions), reliability (ability to perform with correct, consistent results, for example, mean time between failure for equipment), maintainability (ability to be easily serviced, repaired, or corrected), availability (ability to be accessed and operated when needed), flexibility (ability to be easily adapted to changing requirements), portability of software (ability to be easily modified for a new environment), reusability (ability to be used in multiple applications), testability (ability to be easily and thoroughly tested), usability (ability to be easily learned and used), and other attributes.

A.3.12 Design and construction constraints.
This paragraph specifies requirements that constrain design and construction of the system or subsystem. For hardware-software systems, this paragraph includes physical requirements imposed on the system or subsystem. These requirements may be specified by reference to

appropriate commercial or military standards and specifications. Examples include requirements concerning:

a. Use of a particular system or subsystem architecture or requirements on the architecture, for example, required subsystems, use of standard, military, or existing components, or use of Government furnished property (equipment, information, or software).

b. Use of particular design or construction standards, use of particular data standards, use of a particular programming language, use of existing software; workmanship requirements and production techniques.

c. Physical characteristics of the system or subsystem (such as weight limits, dimensional limits, color, protective coatings), interchangeability of parts; ability to be transported from one location to another, ability to be carried or set up by one or a given number of people.

d. Materials that may and may not be used, requirements on handling and disposal of toxic materials, limits on electromagnetic radiation and hazardous emissions that the system is permitted to generate.

e. Use of nameplates, part marking, serial and lot number marking, and other identifying markings.

f. Flexibility and expandability should be provided to support anticipated areas of growth or changes in technology, threat, or mission.

g. Include manufacturing requirements and constraints associated with producing the system or subsystem.

A.3.13 Personnel-related requirements.
This paragraph specifies the system or subsystem requirements included to accommodate the number, skill levels, duty cycles, training needs, or other information about the personnel who will use or support the system. Examples include requirements for the number of workstations to be provided and for built-in help and training features. Also included are human factors engineering requirements imposed on the system or subsystem. These requirements include, as applicable, considerations for capabilities and limitations of humans, foreseeable human errors under both normal and extreme conditions, and specific areas where effects of human error would be particularly serious. Examples include requirements for adjustable-height workstations, color and duration of error messages, physical placement of critical indicators or buttons, and use of auditory signals.

A.3.14 Training-related requirements.
This paragraph specifies the system or subsystem requirements pertaining to training. Examples include training devices and training materials to be included in the system.

A.3.15 Logistics-related requirements.
This paragraph specifies the system requirements concerned with logistics considerations. These considerations may include: system maintenance, software support, system

transportation modes, supply-system requirements, impact on existing facilities and impact on existing equipment.

A.3.16 Other requirements.
This paragraph specifies additional system or subsystem requirements not covered in the previous paragraphs. Examples include requirements for system or subsystem documentation, for example, specifications, drawings, technical manuals, test plans and procedures, and installation instruction data, if not covered in other contractual documents.

A.3.17 Packaging requirements.
This section specifies the requirements for packaging, labeling and handling the system or subsystem and its components. Applicable military specifications and standards may be referenced if appropriate.

A.3.18 Statutory, regulatory, and certification requirements.

A.3.18.1 Statutory requirements.
This paragraph specifies, if applicable, statutory requirements for the system or subsystem.

A.3.18.2 Regulatory requirements.
This paragraph specifies, if applicable, regulatory requirements for the system or subsystem.

A.3.18.3 Certification requirements.
This paragraph specifies, if applicable, certification requirements for the system or subsystem.

A.3.19 Precedence and criticality of requirements.
This paragraph specifies, if applicable, order of precedence, criticality, or assigned weights indicating relative importance of requirements in this specification. Examples include identifying those requirements deemed critical to safety, to security, or to privacy for purposes of singling them out for special treatment. If all requirements have equal weight, this paragraph so states. Key Performance Parameters (KPPs) and Key System Attributes (KSAs) are identified in the body of section 3 of the SRD or resulting specification and provided in a tabular format ranked in order of importance.

A.3.20 Demilitarization and disposal.
Demilitarization and disposal at the end of a life-cycle include activities necessary to ensure disposal of decommissioned, destroyed or irreparable system components meets applicable regulations, directives and Environmental, Safety, and Occupational Health (ESOH) constraints.

A.4 VERIFICATION PROVISIONS

This section defines a set of verification methods and specifies for each requirement in section 3 of the SRD or resulting specification the method(s) to be used to ensure the requirement has been met. A matrix is used to present verification information for every requirement and is documented in an SRD appendix. The SRD contains verification methods desired by the Government. A contractor may offer alternative verification methods with associated justification.

A.4.1 Verification methods.

A.4.1.1 Demonstration.
Operation of the system, subsystem or a part of the system that relies on observable, functional operation, not requiring use of instrumentation, special test equipment or subsequent analysis.

A.4.1.2 Test.
Operation of the system, subsystem or a part of the system using instrumentation or other special test equipment to collect data for later analysis.

A.4.1.3 Analysis.
Processing of accumulated data obtained from other qualification methods. Examples are reduction interpolation or extrapolation of test results.

A.4.1.4 Inspection.
Visual examination of system components, documentation, etc.

A.4.1.5 Special verification methods.
Special verification methods for the system or subsystem, for example, special tools, techniques, procedures, facilities, acceptance limits, use of standard samples, preproduction or periodic production samples, pilot models or pilot lots.

A.5 REQUIREMENTS TRACEABILITY
For a system level SRD, this paragraph includes traceability requirements to a warfighter Capability Document and down to applicable subsystems. For a subsystem level SRD, this paragraph includes traceability to the system specification and down to applicable line replaceable units (LRUs), including software Operational Flight Programs (OFPs) or equivalent. Use of automated tools is highly encouraged and tools that maintain detailed artifacts of each requirement are preferred.

A.5.1 Traceability to capability document or system specification.
This paragraph contains a description of the traceability to a Capability Document, for example ICD or CDD, or System Specification. It also defines associated attributes that an automated tool should capture to document each requirement.

A.5.2 Traceability to subsystems requirements.
This paragraph contains a description of traceability to a subsystem or lower tiered requirement document. It also defines associated attributes that an automated tool should capture to document each requirement.

A.6 NOTES.
This section does not contain any requirements. Section 6 contains information of a general of explanatory nature. Such information may assist in determining the applicability of the SRD or resulting specification.

A.6.1 Definitions and acronyms.
List definitions in alphabetical order in section 6. A parenthetical phrase referring to the applicable paragraph in section 6 will follow the terms to indicate the existence of a definition, for example “(see 6._._)”. When a standard definition exists, the definition should be quoted

word for word and the source cited. A complete list of acronyms may also be included in section 6 of the SRD or resulting specification.

A.7 APPENDIXES

A.7.1 Appendix A: Key Performance Parameters (KPP)/Key System Attributes (KSA).

This appendix contains tabularized KPPs, and KSAs, if applicable, listed in prioritized order.

A.7.2 Appendix B: Requirements Traceability Matrices.

This appendix contains tabularized requirements traceability to the source documentation and to the next lower tier documentation where known. If not known, pre-contract award, lower tier traceability is to be included in the resultant system or subsystem specification.

A.7.3 Appendix C: Verification Matrices.

This appendix contains tabularized verification method for every system or subsystem requirement. If not known, pre-contract award, the verification method is to be included in the resultant system or subsystem specification.

APPENDIX B

System Requirements Document (SRD) Format and Generic Template

B.1 PAGE LAYOUT GUIDANCE.

Use the following page layout guidance in preparing an SRD.

a. Cover Page: No page number shown on Cover Page, apply correct Distribution Statement (DoDD 5230-34) and Classification (see DoDD 5230.35).

b. Backside of Cover Page: Show page numbers between the cover and the first section, numbering consecutively in the bottom center of each page, with lower-case Roman numerals. - “This Page is Intentionally Blank”.

c. Change History: Page Number iii.

d. Backside of Change History Page: Page Number iv - “This Page is Intentionally Blank”.

e. Contents: Page Number v.

f. 1. Scope: Page Number 1, Start page 1, SCOPE on a right hand page, insert preceding blank page when necessary.

g. Number pages consecutively, ensure Classification Markings, if applicable, appear Top and Bottom, Front and Back of every page (DoD 5200.1R and DoD 5200.1-PH).

CLASSIFICATION MARKING (if applicable)

SYSTEM REQUIREMENTS DOCUMENT

SYSTEM NAME
and NOMENCLATURE (if available)

Day Month Year (Ex: 01 January 2011)
Status (Draft or Final)

Prepared for:

Office or Customer
Military Base, State

Prepared by:

Company or Individual Name
Street Address
Mail Stop
City, State (2 ltr abbreviation) Zip Code

***Under:* (Where applicable)**
Contract XXX (Where applicable)
CDRL Item XXX (Where applicable)

Authenticated by:

_____
First Name MI. Last Name
Chief or Lead Engineer
Day Month Year (Ex: 01 January 2011)

Approved by:

_____
First Name MI. Last Name
Program Manager
Day Month Year (Ex: 01 January 2011)

DISTRIBUTION STATEMENT-Ensure Proper Distribution Statement is Applied to Cover Page

CLASSIFICATION MARKING (if applicable)

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CHANGE HISTORY

Change	Version	Date

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TABLE OF CONTENTS

CONCLUDING MATERIAL

Custodians:
Army – AR
Navy - SH
Air Force - 11

Preparing Activity:
Air Force - 11

Project No. SESS-2011-006

Review activities:
Army – AT, AV, MI
Navy - AS
Air Force – 13, 44, 71

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://assist.daps.dla.mil.