



Department of Defense INSTRUCTION

NUMBER 4650.01

January 9, 2009

Incorporating Change 1, October 17, 2017

DoD CIO

SUBJECT: Policy and Procedures for Management and Use of the Electromagnetic Spectrum

References: See Enclosure 1

1. PURPOSE. This Instruction:

a. Reissues DoD Directive (DoDD) 4650.1 (Reference (a)) as a DoD Instruction in accordance with the guidance in DoD Instruction (DoDI) 5025.01 (Reference (b)) and the authority in DoDD 5144.02 (Reference (c)).

b. Establishes policy, assigns responsibilities, and provides instructions for management and use of the electromagnetic spectrum in accordance with Reference (c).

c. Implements section 305 and chapter 8 of title 47, United States Code (Reference (d)); Office of Management and Budget (OMB) Circular A-11, Part 2, Sec. 33.4 (Reference (e)); and the Manual of Regulations and Procedures for Radio Frequency Management (Reference (f)).

2. APPLICABILITY. This Instruction applies to:

a. OSD, the Military Departments, the Office of the Chairman of the Joint Chiefs of Staff and the Joint Staff, the Combatant Commands, the Office of the Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities within the Department of Defense (hereafter referred to collectively as the "DoD Components").

b. The United States Coast Guard. The United States Coast Guard will adhere to DoD requirements, standards, and policies in this instruction in accordance with the direction in Paragraph 4a of the Memorandum of Agreement Between the Department of Defense and the Department of Homeland Security (Reference (p)).

3. DEFINITIONS. See Glossary.

4. POLICY. It is DoD policy that:

a. The electromagnetic spectrum (hereafter referred to as “spectrum”) is a critical resource, and access to the spectrum is vital to the support of military operations. Proper management and use of the spectrum available to the Department of Defense shall be an integral part of military planning, research, development, testing, and operations involving spectrum-dependent (S-D) systems.

b. Spectrum policy and spectrum management functions shall be guided by the following core principles:

(1) Ensure the U.S. warfighter has sufficient spectrum access to support military capabilities.

(2) Support a U.S. spectrum policy that balances national and economic security, with national security as the first priority.

(3) Use the spectrum as efficiently and effectively as practical to provide the greatest overall benefit to warfighting capability.

(4) Pursue spectrum-efficient technologies to support the increasing warfighter demand for spectrum access and encourage development of S-D systems that can operate in diverse electromagnetic environments (EMEs).

(5) Actively support U.S. policies and interests in international spectrum bodies and in international and bilateral negotiations for spectrum allocation and use.

c. DoD Components shall comply with U.S. (Reference (f)) and host nation (HN) spectrum regulations and obtain applicable authorizations before operating S-D systems.

d. DoD Components shall obtain U.S. Government (USG) certification of spectrum support, as required by Reference (f), prior to authorization to operate for experimental testing, developmental testing, or operations of S-D systems in the United States and its possessions (US&P). As required by Reference (e), USG certification of spectrum support shall be obtained prior to submission of cost estimates (i.e., prior to Defense Acquisition System Milestone B (Reference (i))) for development or procurement of major S-D systems and for all space and satellite systems. In addition, some HNs require their own certification before providing authorization to operate.

e. For all S-D systems, DoD Components shall determine if there will be sufficient spectrum to support operation of the system during its life cycle. In order to affect design and procurement decisions, DoD Components shall:

(1) Identify spectrum-related risks as early as possible via spectrum supportability risk assessments.

(2) Review these assessments at acquisition milestones.

(3) Manage the risks throughout the system's lifecycle.

f. To facilitate planning, DoD Components shall ensure current and complete technical performance (parametric) data on S-D systems is captured in DoD spectrum management databases.

g. In accordance with Reference (f), DoD Components shall consider sharing the spectrum with other Federal agencies and with commercial spectrum users. Sharing of spectrum shall be accomplished:

(1) Without degradation to the DoD mission.

(2) In a manner that provides current and future DoD users with sufficient regulatory protection.

(3) With minimal risk that such sharing will result in loss of access to the spectrum necessary to perform the DoD mission.

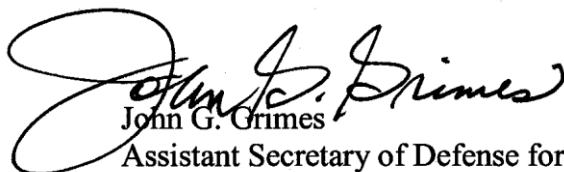
5. RESPONSIBILITIES. See Enclosure 2.

6. PROCEDURES. See Enclosure 3.

7. RELEASABILITY. **Cleared for public release.** This instruction is available on the Directives Division Website at <http://www.esd.whs.mil/DD/>.

8. SUMMARY OF CHANGE 1. The changes to this issuance are administrative and update organizational titles and references for accuracy.

9. EFFECTIVE DATE. This Instruction is effective January 9, 2009.



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Enclosures

1. References
2. Responsibilities
3. Procedures

Glossary

ENCLOSURE 1

REFERENCES

- (a) DoD Directive 4650.1, "Policy for Management and Use of the Electromagnetic Spectrum," June 8, 2004 (hereby canceled)
- (b) DoD Instruction 5025.01, "DoD Issuances Program," August 1, 2016, as amended
- (c) DoD Directive 5144.02, "DoD Chief Information Officer (DoD CIO)," November 21, 2014, as amended
- (d) Section 305 and Chapter 8 of title 47, United States Code
- (e) Part 2, Section 33.4 of Office of Management and Budget Circular A-11, "Preparing and Submitting Budget Estimates," as amended
- (f) National Telecommunications and Information Administration, "Manual of Regulations and Procedures for Federal Radio Frequency Management," as amended
- (g) DoD Instruction 3222.03, "DoD Electromagnetic Environmental Effects (E3) Program," August 25, 2014, as amended
- (h) DoD Directive 5000.01, "The Defense Acquisition System," May 12, 2003, as amended
- (i) DoD Instruction 5000.2, "Operation of the Defense Acquisition System," December 2, 2008
- (j) National Security Space Acquisition Policy 03-01, "Guidance for DoD Space System Acquisition Process," December 27, 2004
- (k) DoD Directive 5100.01, "Functions of the Department of Defense and Its Major Components," December 21, 2010
- (l) International Telecommunication Union (ITU) Radio Regulations, as amended
- (m) DoD Directive 5100.03, "Support of the Headquarters of Combatant and Subordinate Unified Commands," February 9, 2011, as amended
- (n) DoD Instruction 8330.01, "Interoperability of Information Technology (IT), Including National Security Systems (NSS)," May 21, 2014, as amended
- (o) Office of the Chairman of the Joint Chiefs of Staff, "DoD Dictionary of Military and Associated Terms," as amended
- (p) Memorandum of Agreement between the Department of Defense and The Department of Homeland Security Regarding Department of Defense and U.S. Coast Guard Cooperation on Cybersecurity and Cyberspace Operations, January 19, 2017

ENCLOSURE 2

RESPONSIBILITIES

1. DoD CHIEF INFORMATION OFFICER (DoD CIO). The DoD CIO, as the Principal Staff Assistant on spectrum matters within the Department of Defense, nationally, and internationally, and in addition to the responsibilities in paragraph 5 of this enclosure, shall:

a. Establish policy, oversee its implementation, and provide direction and guidance for all DoD matters related to the electromagnetic spectrum in accordance with Reference (c).

b. Provide direction and guidance for DoD implementation of USG spectrum management policies (References (d) and (f)) and applicable international spectrum management policies.

c. Provide, in coordination with the Under Secretary of Defense for Intelligence, guidance with respect to spectrum management and use by intelligence, surveillance and reconnaissance sites, platforms, and activities.

d. Provide direction for the development of DoD positions for, and DoD participation in, international and regional spectrum forums, including national, regional, and international preparatory activities for the International Telecommunication Union World Radio Communication Conferences.

2. DIRECTOR, DEFENSE INFORMATION SYSTEM AGENCY (DISA). The Director, DISA, under the authority, direction, and control of the DoD CIO and in addition to the responsibilities in paragraph 5 of this enclosure, shall:

a. Provide for the development of integrated spectrum plans and long-term strategies to address current and future needs for DoD spectrum access.

b. Provide spectrum management support to the DoD CIO, the Chairman of the Joint Chiefs of Staff, Combatant Commanders (CCDRs), Secretaries of Military Departments, and Directors of Defense Agencies.

c. Provide support to the DoD CIO on national and international spectrum issues and in the pursuit of emerging spectrum technologies in DoD acquisitions.

d. Establish and maintain a capability to perform required electromagnetic compatibility (EMC) analyses and studies to support effective use of spectrum-dependent systems in EMEs and accomplish national security and military objectives in accordance with DoDI 3222.03 (Reference (g)).

e. Develop and maintain a Defense Spectrum Management Architecture, a key component of the Global Information Grid Architecture.

f. Develop, maintain, and enhance DoD joint standard spectrum management information systems and components, to include DoD spectrum management-related databases and analytical tools and capabilities.

g. Provide, when requested or authorized by the DoD CIO, representation to non-IRAC national and/or international spectrum-related forums.

h. Provide members to Military Command, Control, Communications and Computers Executive Board (MC4EB) and its panels and working groups.

3. UNDER SECRETARY OF DEFENSE FOR ACQUISITION, TECHNOLOGY, AND LOGISTICS (USD(AT&L)). The USD(AT&L), in addition to the responsibilities in paragraph 5 of this enclosure, shall:

a. As the DoD Acquisition Executive, ensure the policies outlined in section 4 of the front matter of this Instruction are:

(1) Incorporated into the DoD 5000 series acquisition documents (DoDD 5000.01 and DoDI 5000.2 (References (h) and (i)) and National Security Space Acquisition Policy 03-01 (Reference (j))).

(2) Adequately addressed during system acquisitions.

b. Promote innovative, spectrum-efficient technologies to optimize use and effectiveness of available spectrum resources in all acquisitions including advanced concept development, international cooperative programs, and evolutionary acquisitions.

4. DIRECTOR, OPERATIONAL TEST AND EVALUATION (DOT&E). The DOT&E, in addition to the responsibilities in paragraph 5 of this enclosure, shall ensure spectrum requirements are considered during evaluations and assessments of acquisition programs under test and evaluation oversight.

5. HEADS OF THE DoD COMPONENTS. The Heads of the DoD Components shall:

a. Implement applicable provisions of References (e), (f), and (g) regarding spectrum management.

b. Develop procedures to implement the policies in section 4 of the front matter of this Instruction to include:

(1) Procedures to obtain USG and HN government authorization to operate S-D systems.

(2) Procedures to obtain USG and HN certification of spectrum support.

(3) Procedures to determine if there will be sufficient spectrum to support operation of the S-D system during its life cycle.

(4) Procedures to identify and mitigate, as early as possible, spectrum supportability risks using spectrum supportability risk assessments.

(5) Procedures to ensure current and complete technical performance (parametric) data on their S-D systems are captured in DoD spectrum management databases.

c. Promote the use of innovative spectrum-efficient technologies and development of systems that can operate in diverse EMEs.

d. Use DoD joint standard spectrum management information systems, databases, analytical tools and information exchange formats; and develop, maintain, and enhance spectrum-related analytical tools to support unique Component capabilities.

6. SECRETARIES OF THE MILITARY DEPARTMENTS. The Secretaries of the Military Departments, in addition to the responsibilities in paragraph 5 of this enclosure, shall:

a. Implement spectrum management policies in accordance with this and other applicable DoD issuances by issuing guidance within their respective Military Departments.

b. Provide representatives to the Interdepartment Radio Advisory Committee (IRAC) and its substructure, per Reference (f), to represent respective departmental interests.

c. Provide, when requested or authorized by the DoD CIO, representation at non-IRAC national and/or international spectrum-related forums.

d. Ensure their respective Department's spectrum management interests are represented on the MC4EB and its panels and working groups.

e. Develop and maintain a cadre of qualified spectrum management personnel to support planning and warfighting efforts.

7. CHAIRMAN OF THE JOINT CHIEFS OF STAFF. The Chairman of the Joint Chiefs of Staff, in addition to the responsibilities in paragraph 5 of this enclosure, shall:

a. Represent the interests of the CCDRs related to spectrum management matters per DoDD 5100.01 (Reference (k)).

b. Authorize the Chair of the MC4EB to recommend spectrum management policies and procedures to the DoD CIO.

c. Provide, on behalf of the CCDRs and in coordination with DoD CIO, operational direction related to spectrum management matters to the Director, DISA.

ENCLOSURE 3

PROCEDURES

1. USG AND HN REQUIREMENTS

a. USG Certification of Spectrum Support

(1) Certification of spectrum support shall be obtained as required (Reference f) prior to authorization to operate for experimental testing (Stage 2), developmental testing (Stage 3), or operations (Stage 4) of S-D systems. (See Chapter 10 of Reference (f) for descriptions of the Stages of Certification.) Electronic attack systems, while S-D, are excluded from this requirement within the US&P (Reference (f)), but are not excluded from other requirements in this Instruction.

(2) DoD Components shall request certification of spectrum support using procedures in References (f).

(3) Additionally, as required by Reference (e), this certification must be completed prior to submission of cost estimates for development or procurement of major S-D systems and for all space and satellite systems.

(4) Additional coordination is required for satellite systems per References (f) and (l). Information required for requesting either an exemption from the International Telecommunication Union (ITU) registration or advanced publication, coordination, and notification of a particular space system must be submitted to the National Telecommunications and Information Administration (NTIA).

b. HN Certification of Spectrum Support. DoD Components shall request HN certification of spectrum support for S-D systems using procedures established CCDR agreements with HNs. Requirements for certification vary by HN.

c. USG Authorization to Operate (Frequency Assignment)

(1) DoD Components shall request authorization to operate S-D systems in the US&P using procedures in Reference (f).

(2) Military Departments shall support Combatant Commands' requests for authorization to operate as outlined in DoDD 5100.3 (Reference (m)).

d. HN Authorization to Operate (Frequency Assignment). DoD Components shall request HN authorization to operate S-D systems using procedures established in CCDR agreements with HNs. Requirements for authorizations to operate vary by HN.

2. SPECTRUM SUPPORTABILITY RISK ASSESSMENTS (SSRAs)

a. DoD Components' S-D system developers shall identify and mitigate regulatory, technical, and operational spectrum supportability risks using suggested tasks in the appendix to this enclosure. DoD Components' S-D system developers shall increase the detail of these risk assessments as the S-D system's design matures.

b. DoD Components' S-D system developers shall assess the risk for harmful interference with other S-D systems and/or harmful radiation-related effects. At a minimum, electromagnetic interference (EMI) and electromagnetic compatibility assessments shall be made (Reference (g)).

c. DoD Components' S-D system developers shall manage spectrum supportability risks with other developmental risks through systems engineering processes (Reference (i)).

d. DoD Components' S-D system developers are encouraged to initiate the SSRA in order to help identify regulatory, technical, and operational risks while completing the appropriate stage of certification of spectrum support.

e. Complex "family of systems" or "system-of-systems" may require more than one SSRA.

3. ACQUISITION OVERSIGHT OF SPECTRUM SUPPORTABILITY RISKS

a. Prior to acquisition milestones, DoD Components' S-D system developers shall provide their SSRAs to their Chief Information Officers (CIOs) or another office designated by their Component Head.

b. DoD Component CIOs or other designated office shall review the SSRAs and provide recommendations to inform Milestone Decision Authority decisions (see Table 1).

c. In addition, DoD Components' S-D system developers shall update their SSRAs prior to requesting authorization to operate (for other than testing) in the United States or in HNs.

d. For information technology and national security systems subject to DoDI 8330.01 (Reference (n)), DoD Components shall include SSRAs in the Information Support Plan in accordance with that DoDI.

Table 1. Acquisition Oversight of Spectrum Supportability Risks

DEFENSE ACQUISITION SYSTEM PHASE	MATERIEL SOLUTION ANALYSIS	TECHNOLOGY DEVELOPMENT	ENGINEERING AND MANUFACTURING DEVELOPMENT AND DEMONSTRATION	PRODUCTION AND DEPLOYMENT	OPERATIONS AND SUPPORT
EVENT	MS A	MS B	MS C	REQUEST AUTHORIZATION TO OPERATE - OTHER THAN TESTING	
REQUIRED USG STAGE OF CERTIFICATION OF SPECTRUM SUPPORT FOR EACH EVENT	Stage 1: Conceptual	Stage 2: Experimental	Stage 3: Developmental	Stage 4: Operational	
REQUIRED SSRA COMPONENTS FOR EACH EVENT (SEE APPENDIX TO THIS ENCLOSURE FOR DESCRIPTIONS)	Initial Regulatory SSRA		Detailed Regulatory SSRA	Updated Regulatory SSRA	
		Initial Technical SSRA	Detailed Technical SSRA	Updated Technical SSRA	
		Initial Operational SSRA		Updated Operational SSRA	

4. S-D SYSTEM TECHNICAL DATA. S-D system technical data is required for tactical military planning, USG spectrum usage planning, and as input to radio frequency propagation and interference assessment tools.

a. DoD Components shall provide current and complete technical performance (parametric) data on their S-D systems to DISA throughout the system's lifecycle in accordance with MC4EB procedures.

b. DISA shall establish and maintain data standards and data collection procedures in coordination with DoD Components.

Appendix

Spectrum Supportability Risk Assessments - Suggested Tasks

APPENDIX TO ENCLOSURE 3SPECTRUM SUPPORTABILITY RISK ASSESSMENTS – SUGGESTED TASKS.Table 2. SSRA Suggested Tasks

	Regulatory
Initial Regulatory SSRA Tasks	<ul style="list-style-type: none"> • Determine countries for likely operational deployment within each CCDR area of responsibility. • Determine the internationally recognized radio service of all S-D sub-systems. • Identify portions of the system’s tuning range supported by each HN’s table of frequency allocation. • Determine the relative regulatory status, for example, co-primary or secondary, assigned to the radio service by the HN’s table of frequency allocations. • Obtain international comments on U.S. military systems of the same radio service and with similar technical characteristics submitted for HN spectrum certification (available via the DoD Host-Nation Worldwide Database Online). • Identify other U.S. military, U.S. civil, and non-U.S. co-band and adjacent-band and harmonically-related systems likely to be co-site or in close proximity by querying DoD system databases or the appropriate NTIA database. • Identify risks and develop recommendations for mitigation of regulatory issues.
Detailed Regulatory SSRA Tasks	<ul style="list-style-type: none"> • Address MC4EB, NTIA and other guidance resulting from the certification of spectrum support process. • Consult with the DoD Component spectrum management office regarding changes to U.S. Federal or civil telecommunication regulations impacting the system’s frequency bands. • Determine if the system meets appropriate military, U.S. national, and international spectrum standards for radiated bandwidth and transmitter characteristics. • Quantify the impacts of any changes to USG or international spectrum regulations or technical sharing criteria. • Identify risks and develop recommendations for mitigation of regulatory issues.
Updated Regulatory SSRA Tasks	<ul style="list-style-type: none"> • Address MC4EB, NTIA and other guidance resulting from the certification of spectrum support process. • Consult with the DoD Component spectrum management office regarding changes to U.S. Federal or civil telecommunication regulations impacting the system’s frequency bands. • Identify risks and develop recommendations for mitigation of regulatory issues.
	Technical
Initial Technical SSRA Tasks	<ul style="list-style-type: none"> • Determine candidate technologies and their technical parameters: <ul style="list-style-type: none"> ○ Application: fixed, transportable, mobile ○ Host platform (dismounted soldier, airborne, tactical operations center, etc.) ○ Frequency range of operation

	<ul style="list-style-type: none"> ○ Required data throughput ○ Receiver selectivity ○ Receiver criteria required for desired operation ○ Required radiated bandwidth ○ Transmitter power output ○ Antenna performance characteristics ○ Anticipated HNs for deployment ● Perform an initial EMC analysis to identify electromagnetic interactions that require further study. The analysis should use, as a minimum, technical parameters for the candidate system and the technical parameters of S-D systems expected to be in the candidate's operational environment. ● Evaluate the initial system parameters with respect to U.S. and appropriate international spectrum standards; develop plans to address non-compliant systems. ● Identify risks and develop recommendations for mitigation of technical issues.
Detailed Technical SSRA Tasks	<ul style="list-style-type: none"> ● Evaluate system's performance and effect on other S-D system that operates co-frequency or adjacent frequency expected to be found in the intended operational environment. ● Determine the acceptable received interference level between the system being analyzed and other spectrum-dependent systems to ensure neither is significantly degraded and that coexistence is feasible. ● Use measured performance of the system's receiver, transmitter, antenna, and appropriate propagation models whenever feasible. ● Use propagation models developed specifically for mobile communications systems to determine any potential link degradation and blockage due to atmospheric conditions or terrain and building obstructions within intended deployments areas. ● Consider overall system performance to include link availability, with and without interference, while taking into account the effects of the environment (e.g., considering path loss, rain attenuation, humidity, climate, temperature, and water and oxygen absorption). ● For non-communications systems (radar, passive sensors, etc.), determine the appropriate operational degradation as a function of the level of received environmental and co-site interference. ● Quantify intra-platform EMC among co-sited emitters and receivers for complex "system-of-systems" platforms in terms of the possibility and influence of: <ul style="list-style-type: none"> ○ Inter-modulation ○ Transmitter Harmonic Interference ○ Transmitter Spurious Output Interference ○ Transmitter Noise Interference ○ Receiver Desensitization Interference ● Compare the measured system parameters with U.S. national and appropriate international spectrum standards. ● Generate technical recommendations regarding mitigating potential interference by implementing channelization plans, advanced narrow-beam antennas,

	<p>(active, spot and contoured-beam, etc.), as well as use of passive radio frequency components (filters, diplexers, couplers, etc.).</p> <ul style="list-style-type: none"> • Identify risks and develop recommendations for mitigation of technical issues.
Updated Technical SSRA Tasks	<ul style="list-style-type: none"> • Quantify impact of changes to the operational “signals-in-space” radio frequency parameters to co-site EMC and E3. • Identify risks and develop recommendations for mitigation of technical issues.
	Operational
Initial Operational SSRA Tasks	<ul style="list-style-type: none"> • Determine the expected complement of S-D systems anticipated to be in the system’s operating environment. The system should operate without experiencing or causing interference as part of the DoD response to conventional and non-conventional (disaster relief) missions. • Perform a more extensive EMC analysis quantifying the potential interference between the candidate system and the S-D systems used by other DoD units in the operational environment. Express the results in operational terms, e.g., the frequency-distance separation requirements between a transmitter and a receiver that must be maintained to achieve compatibility. • Identify risks and develop recommendations for mitigation of technical issues.
Updated Operational SSRA Tasks	<ul style="list-style-type: none"> • Refine the expected complement of S-D systems anticipated to be in the system’s operating environments. • Refine the EMC analysis quantifying the mutual interference between the candidate system and the S-D systems used by other DoD units in the operational environment. • Identify risks and develop recommendations for mitigation of technical issues.

GLOSSARY

PART I. ABBREVIATIONS AND ACRONYMS

CIO	chief information officer
CCDR	Combatant Commander
DISA	Defense Information Systems Agency
DoD CIO	DoD Chief Information Officer
DoDD	Department of Defense Directive
DoDI	Department of Defense Instruction
E3	electromagnetic environmental effects
EMC	electromagnetic compatibility
EME	electromagnetic environment
EMI	electromagnetic interference
HN	host nation
IRAC	Interdepartment Radio Advisory Committee
ISP	Information Support Plan
ITU	International Telecommunication Union
MC4EB	Military Command, Control, Communications, and Computers Executive Board
MILDEP	Military Department
NTIA	National Telecommunications and Information Administration
OMB	Office of Management and Budget
S-D	spectrum-dependent
SSRA	spectrum supportability risk assessment
USG	United States Government
US&P	United States and its possessions

PART II. DEFINITIONS

Unless otherwise noted, these terms and their definitions are for the purpose of this Instruction.

EMC. Defined in the DoD Dictionary of Military and Associated Terms (Reference (o)).

EME. Defined in Reference (o).

E3. Defined in Reference (o).

electromagnetic spectrum. Defined in Reference (o). The terms “electromagnetic spectrum” and “spectrum” are synonymous.

certification of spectrum support. Certification by the NTIA that a candidate system conforms to the US&P spectrum allocation scheme. Requirements for obtaining spectrum support for new telecommunications systems or major modifications of an existing system are found in Chapter 10 of Reference (f). Some HNs have similar certifications but requirements vary.

HN. Defined in Reference (o).

S-D systems. All electronic systems, subsystems, devices, and/or equipment that depend on the use of the spectrum to properly accomplish their function(s) without regard to how they were acquired (full acquisition, rapid acquisition, Joint Concept Technology Demonstration, etc.) or procured (commercial off-the-shelf, government off-the-shelf, non-developmental items, etc.).

SSRA. Risk assessment performed by DoD Components for all S-D systems to identify risks as early as possible and affect design and procurement decisions. These risks are reviewed at acquisition milestones and are managed throughout the system’s lifecycle.