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SECRETARY OF THE AIR FORCE**



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Acquisition / Logistics

USE OF ADDITIVE MANUFACTURING

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This supplement implements Department of Defense (DoD) Instruction (DoDI) 5000.93, *Use of Additive Manufacturing in the DoD*, and Air Force Policy Directive (AFPD) 63-1/20-1, *Integrated Life Cycle Management* by providing guidance which enables safe adoption of additive manufacturing (AM) and provides Department of the Air Force (DAF) guidance for middle tier acquisition. The DoDI is printed word-for-word in regular font without editorial review. Department of the Air Force supplementary material is printed in bold font and indicated by “(Added)(DAF)”. This publication applies to all civilian employees and uniformed members of the Regular Air Force, Air Force Reserve, the Air National Guard, the United States Space Force and those who are contractually obligated to comply with DAF publications. This publication may be supplemented at any level, but all supplements must be routed to the Office of Primary Responsibility (OPR) listed above for coordination prior to certification and approval. Refer recommended changes and questions about this publication to the OPR using the DAF Form 847, *Recommendation for Change of Publication*; route DAF Forms 847 from the field through the appropriate chain of command. The authorities to waive wing or unit level requirements that are outside of the acquisition execution chain in this publication are identified with a Tier (“Tier 0, 1, 2, 3”) number following the compliance statement. See Department of the Air Force Instruction (DAFI) 90-160, *Publications and Forms Management*, for a description of the authorities associated with the Tier numbers. Submit requests for waivers through the chain of command to the appropriate Tier waiver approval authority, or alternately, to the requestor’s commander for non-tiered, non-acquisition execution compliance items. Mandates to the acquisition execution chain as described in Air Force Instruction (AFI) 63-101/20-101, *Integrated Life Cycle Management*, are not elevated through the organizational chain of authority; therefore, tiering in accordance with DAFI 90-160 is not applied and the waiver authority is as specified. Ensure all records generated as a result of processes prescribed in this publication adhere to Air Force Instruction 33-322, *Records Management and Information Governance Program*, and are disposed in accordance with the Air Force Records Disposition Schedule, which is located in the Air Force Records Information Management System.

SUMMARY OF CHANGES

This interim change addresses the inclusion and accountability of additive repair (AR) processes and equipment. Additions and updates have been made to sections 3.1.b and multiple paragraphs in 3.9.



DoD INSTRUCTION 5000.93 USE OF ADDITIVE MANUFACTURING IN THE DoD

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Purpose: In accordance with the authority in DoD Directive 5137.02, this issuance establishes policy, assigns responsibilities, and details procedures regarding the implementation and use of additive manufacturing (AM) within the DoD.

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SECTION 1: GENERAL ISSUANCE INFORMATION

1.1. APPLICABILITY.

This issuance applies to OSD, the Military Departments, the Office of the Chairman of the Joint Chiefs of Staff and the Joint Staff, the Combatant Commands (CCMDs), the Office of Inspector General of the Department of Defense, the Defense Agencies, the DoD Field Activities, and all other organizational entities within the DoD.

1.2. POLICY.

The DoD will:

- a. Seek to use AM to support joint force commanders and CCMD theater requirements, transform maintenance operations and supply chains, increase logistics resiliency, and improve self-sustainment and readiness for the Military Services.
- b. Apply AM, as appropriate, to enhance the DoD's industrial base, including small businesses, in order to advance weapon systems capabilities and sustainment.
- c. Ensure that AM plans, programs, and requirements are adequately resourced.
- d. Educate, train, and, when appropriate, certify applicable DoD workforce members in AM.
- e. Ensure that DoD cyber-physical infrastructure and processes are secure and capable of supporting the use of AM across the life cycle of weapons systems.
- f. Develop and adopt new AM technologies where beneficial to weapon system operational capability or sustainment.
- g. Align AM activities across the DoD to speed up the cost-effective use of AM.
- h. Collaborate and share best practices across the AM community.
- i. Protect DoD investments in AM technology development from proliferation to near-peer and strategic competitors and carry out DoD Instruction (DoDI) 2040.02 and U.S. export control laws and regulations.

1.3. SUMMARY OF CHANGE 1.

This change removes the duplicate entries for responsibilities in Paragraph 2.3., specifically, Paragraphs 2.3.i and 2.3.n. Paragraph 2.3.n. deleted and Paragraph 2.3.o. re-lettered to Paragraph 2.3.n.

SECTION 2: RESPONSIBILITIES

2.1. UNDER SECRETARY OF DEFENSE FOR RESEARCH AND ENGINEERING (USD(R&E)).

The USD(R&E):

- a. Develops and maintains DoD AM policy and monitors DoD AM policy implementation across the DoD.
- b. Provides resources for research, development, test, and evaluation (RDT&E); science; and technology initiatives in AM and aligns investments in organizations with DoD AM priorities.
- c. Designates a lead individual for AM to chair the joint additive manufacturing working group (JAMWG), a joint-DoD AM forum to collaborate, share best practices, and prioritize joint efforts necessary to advance and carry out AM, under the oversight of the Joint Defense Manufacturing Council (JDMC), a senior DoD leadership council focused on manufacturing.
- d. Supports research and development–focused public-private partnerships and collaboration on AM across the DoD, other U.S. Government agencies, coalition partners, industry, and academia.
- e. Engages with the acquisition and sustainment enterprise to ensure that AM capabilities and processes are adequately considered during the design and engineering phases of weapon systems acquisition and that AM-produced parts are adequately documented to support sustainment.
- f. Incorporates AM in developing digital engineering policy and guidance.
- g. Defines, in conjunction with the Military Departments and the Defense Logistics Agency (DLA), a common DoD AM data framework, including AM data management best practices to enable AM data to be securely shared across the DoD.
- h. Leads the creation of research and education opportunities to advance the state of the art and skill sets of the AM community including supporting the development of an AM body of knowledge.
- i. Facilitates the creation of common training and workforce development best practices for AM across the DoD in alignment with industry best practices.
- j. Incorporates AM technical and business information into training as necessary and ensures that applicable workforce members are educated, trained, and, where appropriate, certified in AM across the research and engineering enterprise.
- k. Facilitates consistency in AM qualification and certification methodologies across the Military Departments and the use of an aligned risk management approach to provide rapid and competent support to speed up AM efforts across the DoD.

l. Oversees and coordinates the development and use of common standards and specifications for AM processes and materials in accordance with DoD Manual (DoDM) 4120.24 and Section 12(d) of Public Law 104-113.

m. Supports assessments focused on DoD technology priorities and establishing a technically advanced, capable, and resilient AM supply chain.

n. Develops common metrics regarding AM implementation progress and outcomes, in coordination with the Military Departments and collects data on defined metrics as necessary in accordance with Volume 1 of DoD Manual 8910.01.

o. Coordinates with the Under Secretary of Defense for Policy and the Under Secretary of Defense for Acquisition and Sustainment (USD(A&S)) on issues concerning exporting AM systems and cooperation with foreign partners.

p. Develops and maintains AM cybersecurity test and evaluation policy and guidance.

2.2. DOD CHIEF INFORMATION OFFICER (CIO).

The DoD CIO develops cybersecurity requirements and standards; issues guidance for managing the DoD enterprise information environment mission area portfolio, which is the common integrated information computing and communication environment of the global information grid; and assigns responsibilities for portfolio management to support AM implementation as necessary.

2.3. USD(A&S).

The USD(A&S):

a. Provides resources to carry out USD(A&S) responsibilities and seeks to ensure acquisition and sustainment programs are positioned to carry out DoD AM principles and practices.

b. Maintains responsibility for updating existing policies and guidance to support the establishment, interoperability, and security of AM in acquisition and sustainment.

c. Incorporates AM considerations into guidance and training and ensures that the applicable workforce members are educated, trained, and, where appropriate, certified in AM within the acquisition and sustainment enterprise.

d. Directs, as appropriate, the use of common standards and specifications for AM acquisition and sustainment through policy and guidance in accordance with DoDM 4120.24 and Section 12(d) of Public Law 104-113.

e. Assesses domestic industrial manufacturing capability for both AM equipment and AM materials and incorporates the consideration of AM capacity and capability within acquisition and sustainment policy and guidance, including supply-chain management, to ensure adequate and uninterrupted AM capacity in support of military operations as required.

- f. Promotes the use of AM to achieve weapon system performance and sustainment requirements during acquisition, when appropriate, and coordinates with the research and engineering enterprise and sustainment organizations across the DoD.
- g. Directs the Defense Acquisition University to provide AM-related training, including intellectual property (IP) and licensing courses, for all levels of acquisition certifications.
- h. Establishes and maintains a database of negotiated prices and associated license rights for specific AM data categories.
- i. Supports the USD(R&E), in conjunction with the Military Departments and DLA, in developing and using a common DoD AM data framework, including AM data management best practices, to enable securely sharing AM data across the DoD.
- j. Incorporates AM into IP policies and guidance and provides advice, assistance, and support to DoD programs on AM IP aspects, in accordance with DoDI 5010.44.
- k. Leads efforts to ensure that sustainment business processes adequately address AM-related issues and challenges in sustainment policy and guidance.
- l. Leads collaboration concerning AM efforts across the acquisition and sustainment enterprise and participates in the JAMWG.
- m. Engages with the acquisition and RDT&E communities to ensure that AM capabilities and processes are adequately considered and resourced and parts designed for AM production are adequately documented to support sustainment.
- n. Supports establishing a capable and resilient AM supply chain.

2.4. DIRECTOR, DLA.

Under the authority, direction, and control of the USD(A&S), through the Assistant Secretary of Defense for Sustainment, in alignment with Military Department requirements and in conjunction with appropriate Military Service organizations, the Director, DLA:

- a. Establishes processes and procedures for:
 - (1) Integrating AM into the supply chain, including the safe handling and distribution of AM raw materials.
 - (2) Ensuring that supplier-generated AM data is provided by the DLA to appropriate DoD organizations.
- b. Designates a DLA lead for AM efforts who participates in the JAMWG and joint-DoD AM collaborative activities.
- c. Supports the USD(R&E), in conjunction with the Military Departments, in developing and Responsibilities

using a common DoD AM data framework, including AM data management best practices, to enable securely sharing AM data across the DoD.

d. Develops, maintains, and hosts the joint AM model exchange (JAMMEX), a portal to share approved AM data sets and other secure, interoperable data management capabilities based on the common DoD AM data framework that enables DoD entities to securely access and share, buy, or acquire license rights in AM data as required pursuant to DoD Administrative Instruction 15 and DoDI 5015.02. The DLA follows existing cybersecurity processes to secure and appropriately test AM data and management systems described in this subsection.

e. Leads the development of processes and guidance for using common data requirements and acceptance criteria to enable integrating AM parts, machines, and consumables into the DoD supply chain in accordance with military standard (MIL-STD)-31000 and other relevant standards.

f. Enables integration of AM capabilities into supply-chain information technology architecture and supporting business systems and processes by identifying best practices and modifying systems and processes as necessary.

g. Maintains and distributes information on contractors, vendors, and other sources that have, under contract, successfully delivered AM parts and raw AM material to the Department, including data on DLA-managed AM parts and raw material.

h. Supports the Office of the USD(R&E) in defining common metrics regarding AM implementation progress and outcomes and establishes processes to track and report data once metrics are defined as necessary in accordance with Volume 1 of DoDM 8910.01.

i. Develops or revises implementation plans pursuant to this policy and in coordination with the JDMC and JAMWG.

2.5. SECRETARIES OF THE MILITARY DEPARTMENTS AND DIRECTORS OF THE DEFENSE AGENCIES AND DOD FIELD ACTIVITIES WITH AM REQUIREMENTS.

The Secretaries of the Military Departments and Directors of the Defense Agencies and DoD Field Activities with AM requirements:

a. Review and develop organization-level sustainment plans throughout all phases of a weapon system life cycle that include using AM to produce parts in a contingency or combat environment, as appropriate.

b. Provide resources to support AM requirements and implementation.

c. Designate an organizational lead for AM efforts who participate in the JAMWG and joint-DoD AM collaborative activities.

d. Advance and sustain AM by establishing organizational constructs to create internal accountability and governance for AM activities.

- e. Establish and maintain the necessary digital, cyber-physical, and overall cyber infrastructure to support AM and resource cybersecurity threat testing of these systems on a periodic basis.
- f. Support the development and direct the use of the USD(R&E)-developed AM data framework, including AM data management best practices and DLA-provided data management capability, to securely share AM data across the DoD.
- g. Maintain responsibility for organizational-level use of AM in compliance with all laws, regulations, and policies regarding IP, rights in data, and computer software.
- h. Establish organization-specific research and education opportunities to advance the AM state of the art and the AM community's skill sets as necessary and to support jointly coordinated efforts with the USD(R&E).
- i. Provide oversight to ensure that the workforce engaged in AM is adequately educated, trained, and, where appropriate, certified on AM processes and documentation.
- j. Provide oversight to ensure that AM parts comply with organization-level processes and that cognizant authorities complete the appropriate level of qualification, certification, and risk evaluation.
- k. Direct the use of consistent qualification and certification criteria and methodologies ensuring that approval authorities take a disciplined risk management approach that provides rapid and competent support to speed up AM efforts across the DoD.
- l. Direct the use of common AM specifications and standards, with exceptions only, and incorporate data from approved AM parts and technology into specifications, standards, and data packages in accordance with DoDM 4120.24 and Section 12(d) of Public Law 104-113.
- m. Collaborate with the Director, DLA to integrate AM into appropriate supply-chain processes.
- n. Enable integration of AM capabilities into enterprise architecture and supporting business systems and processes.
- o. Support the Office of the USD(R&E) defined common metrics regarding AM implementation progress and outcomes and establish processes to track and report data on defined metrics as necessary in accordance with Volume 1 of DoDM 8910.01.
- p. Maintain records of all AM-produced end-items put into operational use per established inventory configuration management policies and records management pursuant to DoDI 5015.02.
- q. Develop or revise implementation plans pursuant to this policy and in coordination with the JDMC and JAMWG.

2.6. CHAIRMAN OF THE JOINT CHIEFS OF STAFF.

The Chairman of the Joint Chiefs of Staff designates an organizational lead for AM efforts who:

- a. Participates in the JAMWG and joint-DoD AM collaboration activities to advance AM technology and innovation within the joint force in partnership with the OSD.
- b. Works with Service Acquisition Executives to determine the suitability of AM lines of effort within life-cycle sustainment plans tied to joint programs.
- c. Supports AM workforce recruitment and development.
- d. Assists the Military Departments in assessing AM to support executing theater sustainment plans within the CCMDs and, where appropriate, works with the manufacturing innovation institutes to promote the use of AM within organic operations.

2.7. (Added)(DAF) Assistant Secretary of the Air Force for Acquisition, Technology and Logistics (SAF/AQ) shall

- a. (Added)(DAF) Designate an AM Department lead.
- b. (Added)(DAF) Provide oversight and review of AM policy, procedures and guidelines for enterprise implementation.
- c. (Added)(DAF) Represent DAF in joint-DoD advanced manufacturing forums.
- d. (Added)(DAF) Integrate AM capabilities into the Department of the Air Force enterprise architecture, acquisition processes, weapon systems design and all phases of life cycle management of weapon systems.
- e. (Added)(DAF) Promote research and education opportunities to enhance the skillsets of the AM community and keep pace with emerging technologies.
- f. (Added)(DAF) Ensure that AM can be supported by the digital and cyber infrastructure.
- g. (Added)(DAF) Ensure standardization of AM components and configuration management policy.
- h. (Added)(DAF) Ensure consistency in qualification and certification methodologies, and that approval authorities take a disciplined risk management approach per Air Force Pamphlet (AFPAM) 90-803, *Risk Management (RM) Guidelines and Tools* that provides rapid, agile, and competent support to accelerate AM efforts across the DAF.

2.8. (Added)(DAF) Deputy Chief of Staff, Logistics, Engineering and Force Protection (AF/A4) shall:

- a. (Added)(DAF) Develop AM policy and promote initiatives to enhance training effectiveness of AM, AR and fabrication maintenance, in accordance with AFI 36-2650, *Maintenance Training* and DAFI 36-2670, *Total Force Development*.**
- b. (Added)(DAF) Integrate AM into appropriate supply chain processes and ensure that technical data and demand feedback is systematically provided to appropriate DoD supply organizations.**
- c. (Added)(DAF) Ensure the logistics workforce is adequately educated, trained, and certified on AM processes and documentation.**
- d. (Added)(DAF) Provide strategic guidance for accountability of AM and AR support equipment and manufactured assets.**
- e. (Added)(DAF) Identify defense logistics management standard updates as processes mature, to ensure demand is captured by the applicable inventory control point.**
- f. (Added)(DAF). Establish criteria for prioritizing technical order (TO) authorized and program manager approved AM utilization that optimizes aircraft mission capability.**

2.9. (Added)(DAF) Commander, Air Force Materiel Command (AFMC/CC) shall:

- a. (Added)(DAF) Function as the lead command for DAF oversight and enterprise integration of activities with DAF AM (capacity and capability) supporting the following: system (including nuclear) life cycle management and acquisition; research and development; sustainment and logistics; developmental test and evaluation; and installation and mission support capabilities.**
- b. (Added)(DAF) Provide DAF enterprise AM management integrated life cycle engineering and technical support to major commands (MAJCOMs), field commands (FLDCOMs) program managers (PMs), product group managers (PGMs), and other offices for research and development, design, test, redesign, analysis and sustainment of assets associated with AM.**
- c. (Added)(DAF) Support cross-cutting technologies and solutions in AM for DAF air and space assets at all maintenance levels.**
- d. (Added)(DAF) Participate in joint-DoD advanced manufacturing collaborative activities.**
- e. (Added)(DAF) Maintain expert technical support from AFLCMC Structural Management offices, Air Force Sustainment Center's Innovation Center, Advanced Technology and Training Centers and AF Research Lab System Support Division.**
- f. (Added)(DAF) Establish a DAF Advanced Manufacturing Program Office within the Air Force Life Cycle Management Center Rapid Sustainment Office (AFLCMC/RO).**

2.10. (Added)(DAF) MAJCOM, FLDCOM Commanders and Director, Air National Guard shall:

- a. (Added)(DAF) Assign functional manager(s) for AM disciplines.**
- b. (Added)(DAF) Support enterprise integrated life cycle oversight of AM and implementation of processes to enhance AM fabrication and maintenance effectiveness.**
- c. (Added)(DAF) Develop and issue implementation guidance to units for AM training and certification requirements that align with Advanced Manufacturing Program Office.**
- d. (Added)(DAF) Ensure MAJCOM and FLDCOM support contracts for maintenance activities include provisions for certified personnel in accordance with TO 34A-1-1, *Additive Manufacturing Qualifications of Technicians, Machines and Facilities* or industry equivalent.**
- e. (Added)(DAF) Account for and process locally manufactured AM parts in accordance with DAFI 21-101, *Aircraft and Equipment Maintenance Management*, AFI 23-101, *Materiel Management Policy*, and AFMAN 23-122, *Materiel Management Procedures*.**

2.11. (Added)(DAF) Program Executive Officers (PEOs). PEOs shall ensure aircraft and aerospace equipment program managers are aware of and trained in DAF AM options that are available as an integral part of life cycle management. (T-1)

2.12. (Added)(DAF) Program managers (PMs), product group managers (PGMs) and product support managers (PSMs) shall:

- a. (Added)(DAF) Approve all AM parts under their configuration control after review by the chief engineer in accordance with AFI 63-101/20-101, *Integrated Life Cycle Management* (T-1)**
- b. (Added)(DAF) Ensure the workforce engaged in the acquisition and/or manufacturing of AM materials is trained on AM processes and documentation. (T-1)**
- c. (Added)(DAF) Develop AM supply chain performance metrics (e.g. lead time, cost, service/quality, or assets metrics to evaluate performance) and methods to evaluate performance. (T-1)**
- d. (Added)(DAF) Coordinate with and/or inform stakeholder MAJCOMs and FLDCOMs regarding system facilities, tooling, equipment, test, technical data, and training requirements impacting the AM disciplines addressed in this publication. (T-1)**
- e. (Added)(DAF) Ensure PM and PGM initiated contract support requirements for AM personnel contain provisions for certified personnel in accordance with TO 34A-1-1 and DAFI 21-101 or industry equivalent, as applicable. (T-1)**
- f. (Added)(DAF) Develop and implement technician/artisan certification and**

recertification standards applicable to AM in accordance with TO 34A-1-1 or industry equivalent. (T-1)

SECTION 3: PROCEDURES AND GUIDANCE

3.1. AM IN ACQUISITION.

The Military Departments, Defense Agencies, and DoD Field Activities with AM requirements will:

a. Consider AM as part of the acquisition process, in particular the impact that AM may have on weapons systems design and how contracts or other agreements will address the availability of AM parts and data during maintenance and sustainment.

b. Ensure that contracts incorporate and specify data requirements sufficient to enable AM, when appropriate, including an AM data management plan, as applicable.

(1) Ensure that when contractors provide specific AM data, such data is provided in a digital, machine-readable format that DoD personnel with compatible software can access, that such data is entered into authoritative digital data repositories when required, and that these repositories can connect to the secure DLA-provided common data management capability.

(2) Ensure that AM data requirements include testing requirements and acceptance or rejection criteria.

(3) (Added)(DAF) Ensure that AM requirements and technologies are assessed for technology readiness levels, manufacturing readiness levels and impact to airworthiness of the weapon systems (ref. Airworthiness Bulletin (AWB)-101).

c. Acquire only the AM data and associated license rights necessary to satisfy agency needs in accordance with to Subparts 227.71 and 227.72 of the Defense Federal Acquisition Regulation Supplement and DoDI 5010.44.

d. Ensure that contracts include language requiring the identification of parts that are, or could be, produced using AM in the bill of materials, configuration management documentation, and other relevant AM data.

3.2. RESEARCH AND ENGINEERING.

The OSD, Military Departments, Defense Agencies, and DoD Field Activities with AM requirements will:

a. Take a risk-informed approach to AM and have policies that define the level of qualification, certification, risk evaluation, and approval authority required to use an AM part. AM risk definitions will be common across the DoD.

b. Align AM qualification procedures and acceptance criteria with common standards,

specifications, and practices, with exceptions only in accordance with DoDM 4120.24 and Section 12(d) of Public Law 104-113.

c. Carry out material and process characterization research that increases reliability of AM process and part quality to speed up the qualification and certification processes.

d. Ensure that AM-produced or -acquired parts comply with established quality control criteria and parts management procedures, as appropriate.

e. **(Added)(DAF) Leverage organic and industrial resources for material testing processes and studies; development of methods and equipment; and life cycle management planning.**

f. **(Added)(DAF) Develop, implement, and standardize AM procedures and processes, including digital engineering, to enhance fabrication and maintenance effectiveness.**

g. **(Added)(DAF) Evaluate, as requested by MAJCOMs, FLDCOMs, PMs and PGMs, materials, processes, facilities and equipment requirement for AM.**

h. **(Added)(DAF) Assess the viability of emerging material and repair technologies in AM and AR disciplines and provide assistance with transition to new and existing systems, to include participation in field-tests as requested by PMs and PGMs on material and process technologies.**

3.3. AM INTEGRATION INTO THE SUPPLY CHAIN.

The OSD, Military Departments, Defense Agencies, and DoD Field Activities with AM requirements will:

a. Use approved sources of AM parts to improve supply-chain processes and procedures in support of materiel readiness requirements. The Military Departments will capture AM part production and demand for AM items and report necessary data to the appropriate supply organizations.

b. Leverage existing AM capabilities within organic operations, as appropriate, and establish processes and procedures that support quickly manufacturing AM parts consistent with demand urgency.

c. Ensure that maintenance activities consider and evaluate AM's technical and economic practicality to sustain equipment and support warfighter readiness in tooling, molds, and fixtures needed for other non-AM manufacturing processes and direct part manufacturing of end-use items or replacement parts, where the technology is appropriate based on materials, process capabilities, and use case.

d. Monitor usage, performance, and effectiveness of suppliers' AM implementation, coordinate reviews and share data on DLA-managed items.

e. Comply with item-unique identification parts marking in accordance with DoDI 8320.04, when applicable, during procurement of AM parts and local manufacturing of AM parts, particularly as it concerns direct parts marking.

f. Leverage U.S. Government, industry, and academia expertise to establish a capable and resilient AM supply chain.

g. Collaborate with the DLA to integrate AM into appropriate supply-chain processes and:

(1) Ensure that AM part data and AM demand information are systematically provided by the Military Departments to the DLA and appropriate DoD supply organizations and shared across the DoD by the DLA as necessary.

(2) Respond to AM part-sourcing requests.

(3) Incorporate AM into supply-chain information technology and supporting business system processes.

(4) Use JAMMEX and other interoperable data management capabilities based on the common DoD AM data framework that enable DoD entities to securely access and share, buy, or license AM data, as required. DoD organizations that need to share approved AM data across organizations will adopt JAMMEX.

(5) Develop common AM data standards and requirements and AM part acceptance criteria that enable AM integration into the supply chain.

(6) Document and maintain a list of sources that have successfully delivered AM parts and raw AM material.

(7) Standardize a common method of updating catalogue information for AM parts in conjunction with the Defense Logistics Information Services in accordance with DoDM 4100.39.

h. Define common metrics regarding AM implementation progress and outcomes and install processes to track and report AM metrics data, as necessary, in accordance with Volume 1 of DoDM 8910.01.

3.4. DATA MANAGEMENT.

The OSD, Military Departments, Defense Agencies, and DoD Field Activities with AM requirements will:

a. Ensure that activities using AM follow all laws, regulations, policies, and relevant contract clauses regarding access to data and rights in technical data, computer software, and other IP in accordance with DoDI 5010.44.

b. Leverage the resources of the DoD IP cadre as described in DoDI 5010.44.

c. Use a common data package standard and format, as appropriate for AM, in accordance with MIL-STD-31000, International Organization for Standardization/American Society for Testing and Materials 52915:2020 and accepted non-U.S. Governmental standards.

d. Advance AM methods by enabling the use of a model-based engineering manufacturing tool suite consistent with the DoD digital engineering strategy and organizational digital engineering implementation plans.

e. Develop, use, and support JAMMEX and other secure, interoperable data management capabilities, based on the common DoD AM data framework, that are connected to authoritative data repositories and systems within each organization pursuant to DoDI 5015.02. The interoperable data management capability will enable DoD entities to securely access and share, buy, or license AM data as required, using common data management best practices and proper configuration controls.

3.5. DATA AND EQUIPMENT SECURITY.

The OSD, DoD CIO, Military Departments, Defense Agencies, and DoD Field Activities with AM requirements will:

a. Provide safe and secure interoperable digital business information and data systems, including, but not limited to, JAMMEX to support use of AM across the entire life cycle that enables sharing and exchange of data between DoD and its suppliers, including small businesses.

b. Follow existing cybersecurity processes and policies for AM data systems and equipment in accordance with to DoDIs 8500.01, 5000.02T, 5000.82, and 5200.44 and identify, propose, and engage with appropriate authorities to carry out changes in these processes and policies as needed to enable AM.

c. Perform periodic collaborative mission-based cyber risk assessments on AM-relevant digital business information and data systems to inform recurring cybersecurity threat testing including AM users, network managers, and defenders, AM developers, and the organizations that AM interfaces with or supports.

d. Institute processes for AM-relevant digital business information and data systems to prevent data loss, find and lessen significant exploitable vulnerabilities, and detect cyber adversary activities and recover from them.

3.6. SPECIFICATIONS AND STANDARDS.

The OSD, Military Departments, Defense Agencies, and DoD Field Activities with AM requirements will:

a. Use AM-related non-U.S. Government specifications and standards to the greatest extent practical, in accordance with DoDM 4120.24 and Section 12(d) of Public Law 104-113.

- b. Absent existing non-U.S. Government AM specifications or standards, resource participation by DoD personnel in developing such specifications or standards via non-U.S. Government standards organizations.
- c. Use, develop, and share DoD AM specifications and standards in accordance with DoDI 4120.24 when it is not practical to use non-U.S. Government AM specifications and standards.
- d. **(Added)(DAF) Support development and/or revision of standards, procedures and processes, also advise in the acquisition, processing, and interpretation of data.**
- e. **(Added)(DAF) Promote standardization and interoperability of equipment, data systems and software programs associated with AM.**

3.7. TRAINING AND EDUCATION.

The OSD, Military Departments, Defense Agencies, and DoD Field Activities with AM requirements will:

- a. Provide training and certification, as necessary, to applicable workforce personnel who use AM or have AM-related responsibilities in the DoD, including managers, engineers, designers, operators, maintainers, and acquisition professionals.
- b. Contribute to the development of the AM body of knowledge and align DoD training with industry-recognized stackable credentials that support trainees' career development.
- c. Create research and education opportunities to advance the state of the art and skill sets of the AM community within the DoD.
- d. **(Added)(DAF Ensure currency, applicability, completeness and designation of DAF managers for Technical Order (TO) 34A-1-1, *Additive Manufacturing Qualification of Technicians, Machines and Facilities*, TO 34A-2-1, *Metals Additive Manufacturing General Procedures and Process Controls*, and TO 34A-3-1, *Polymers Additive Manufacturing General Procedures and Process Controls* for guidance.**
- e. **(Added)(DAF) Support DAF career field managers, MAJCOM and FLDCOM functional managers, Air Education and Training Command training managers, utilization and training workshops, and career development course writers for education and training of Air Force Specialty Codes (AFSC) 2A7XX and other AFSCs, as required.**

3.8. COLLABORATION.

The OSD, Military Departments, Defense Agencies, and DoD Field Activities with AM requirements will actively collaborate, and share AM best practices through the JAMWG and JDMC.

3.9. (Added)(DAF) DAF GUIDANCE.

(Added)(DAF) The Commander, Air Force Material Command (AFMC)/CC will:

a. (Added)(DAF) Provide safety-related inputs associated with AM to DAF Occupational Safety and Health, Air Force Safety Center (AFSEC/SEG) to be included within DAF guidance and standards, e.g., Air Force Manual (AFMAN) 91-203, *Air Force Occupational Safety, Fire and Health Standards*.

b. (Added)(DAF) Coordinate with Environmental Safety & Occupational Health (ESOH) offices of primary responsibility (OPRs) to assist users in meeting applicable ESOH requirements.

c. (Added)(DAF) Coordinate safety-related incidents and mishap investigations inputs with DAF Flight Safety (AFSEC/SEF), Space Safety, and Weapon Safety IAW 91-204, *Safety Investigations and Reports*.

d. (Added)(DAF) Establish a Department of the Air Force Advanced Manufacturing Program Office within the Air Force Life Cycle Management Center Rapid Sustainment Office (AFLCMC/RO) to scale organic capability and serve as the DAF's focal point for the application of AM and AR in matters related to acquisition and sustainment.

(Added)(DAF) MAJCOM, FLDCOM Commanders and Director, Air National Guard will:

e. (Added)(DAF) Provide hands-on training for the practical application of AM equipment and process by work center personnel who have completed formal training and are qualified as trainers for on-the-job training (OJT) in accordance with TO 34A-1-1. All OJT shall be documented in accordance with DAFI 36-2670, *Total Force Development*, DAFI 21-101, *Aircraft and Equipment Maintenance Management*, AFMCI 21- 100, *Depot Maintenance Management*, and other local directives.

f. (Added)(DAF) Plan, program and budget resources to provide technical AM management support for MAJCOM and FLDCOM-specific/unique programs and requirements. This will include writing performance and readiness requirements that highlight potential gains from advanced methods and materials, as appropriate.

g. (Added)(DAF) Account for all AM printers, also known as 3-D printers, in an Accountable Property System of Record in accordance with DoDI 5000.64 DAFI 23-111. (T-0). AM printers with an acquisition cost below \$50K will require the unit commander's written approval to accompany the property records. AM printers with acquisition cost \$50K or greater require AFLCMC/RO oversight and approval. If AM printers process DoD information, these devices must be accredited per AFI 17-101, *Risk Management Framework (RMF) for Air Force Information Technology (IT)*.

h. (Added)(DAF) Account for all AR equipment, commonly referred to as cold spray and directed energy deposition in an Accountable Property System of Record in accordance with DoDI 5000.64 DAFI 23-111. (T-1). The Accountable Property System of Record is the

Defense Property Accountability System. Procurement of AR equipment will require AFLCMC/RO oversight and approval. (T-0).

(Added)(DAF) The Advanced Manufacturing Program Office will:

i. (Added)(DAF) Scale organic capability and serve as the DAF's focal point for application of AM and AR in matters related to acquisition and sustainment.

j. (Added)(DAF) Execute four major functions: technology assessment; airworthiness certification support; product support management; and deployment across the enterprise.

k. (Added)(DAF) Scale organic capability across Air Logistics Centers and field locations for both metal and polymer AM and AR technologies. Locations and technology insertion will be based on assigned weapons systems and equipment, AM part demand, and Program Office adoption of AM.

l. (Added)(DAF) Coordinate with AM stakeholders and supporting organizations to develop and publish an AM strategy, implementation plan and roadmap.

m. (Added)(DAF) Evaluate opportunities to improve readiness through the implementation of timely and cost-effective solutions.

n. (Added)(DAF) Plan, program, and budget for AM requirements based on DAF strategy, implementation plan and roadmap.

o. (Added)(DAF) Participate in joint-DoD advanced manufacturing collaborative activities.

p. (Added)(DAF) Provide formal AM training in accordance with TO 34A-1-1.

GLOSSARY

G.1. ACRONYMS.

ACRONYM	MEANING
(Added)(DAF) AF/A4	Logistics, Engineering and Force Protection
(Added)(DAF) AFI	Air Force Instruction
(Added)(DAF) AFLCMC	Air Force Life Cycle Management Center
(Added)(DAF) AFLCMC/RO	Rapid Sustainment Office
(Added)(DAF) AFMAN	Air Force Manual
(Added)(DAF) AFMC	Air Force Material Command
(Added)(DAF) AFPAM	Air Force Pamphlet
(Added)(DAF) AFSC	Air Force Specialty Code
AM	additive manufacturing
(Added)(DAF) AR	additive repair
(Added)(DAF) AWB	Airworthiness Bulletin
CCMD	Combatant Command
CIO	Chief information officer
(Added)(DAF) DAF	Department of the Air Force
DLA	Defense Logistics Agency
DoD	Department of Defense
DoDI	DOD Instruction
DoDM	DoD Manual
(Added)(DAF) ESOH	Environmental Safety & Occupational Health
(Added)(DAF) FLDCOM	field command
IP	intellectual property
JAMMEX	joint additive manufacturing model exchange
JAMWG	joint additive manufacturing working group
JDMC	joint defense manufacturing council
(Added)(DAF) MAJCOM	major command
MIL-STD	military standard
(Added)(DAF) OPR	office of primary responsibility
(Added)(DAF) OJT	on-the-job-training program

(Added)(DAF) PEO	executive officer product
(Added)(DAF) PGM	group manager program
(Added)(DAF) PM	program manager
(Added)(DAF) PSM	manager product support
(Added)(DAF) RM	manager risk management
RDT&E	research, development, test, and evaluation
(Added)(DAF) SAF/AQ	Secretary of the Air Force for Acquisition, Technology and Logistics
(Added)(DAF) SAF/AQR	Deputy Assistant Secretary of the Air Force for Science, Technology and Engineering
(Added)(DAF) TO	technical order
USD(A&S)	Under Secretary of Defense for Acquisition and Sustainment
USD(R&E)	Under Secretary of Defense for Research and Engineering

G.2. DEFINITIONS.

These terms and their definitions are for the purpose of this issuance.

TERM

DEFINITION

acquisition and sustainment enterprise

The people, organizations, facilities, processes, and technology that support DoD acquisition and sustainment operations.

**(Added)(DAF)
additive repair**

Repair, refurbishment and restorative processes aimed at returning the value of a product during its lifecycle. Common processes include Cold Spray and Directed Energy Deposition.

AM

A process of joining materials to make parts from three-dimensional model data, usually layer by layer, also known as three-dimensional printing.

AM community

People and organizations, including the DoD, and other Federal agencies, as well as industry and academia as appropriate, that share interests in AM and exchange ideas and thoughts about AM and its applications.

AM data

Technical data and other data necessary to design, produce,

test, or procure AM items or parts which may include models, engineering design data, associated lists, specifications, standards, performance requirements, quality assurance provisions, software documentations, and packaging details.

AM requirements

When an organization needs to use AM to prototype, performs RDT&E, and make items or when the organization has a supporting role in the education, logistical, operational, or technical aspects regarding the use of AM across the DoD or its suppliers.

body of knowledge

A complete set of concepts, terms, and activities that make up a professional domain as defined by the relevant education organization or professional association.

computer software

Computer programs, source code, source code lists, object code lists, design details, algorithms, processes, flow charts, formulas, and related material that enable the software to be reproduced, recreated, or recompiled. Computer software does not include computer databases or computer software documentation.

data framework

A set of guidelines, standards, or systems that provide definitions and common approaches to digital data management throughout research, development, acquisition, and sustainment.

data package

A collection of information that provides an authoritative technical description of an item that is clear, complete, accurate, and in a format adequate for its intended use. In accordance with MIL-STD-31000, data packages are an item's authoritative technical description. The technical description provided in a data package supports an item's acquisition, production, inspection, engineering, and management. The technical description defines the required design configuration or performance requirements and procedures necessary to ensure adequacy of item performance. It consists of applicable data such as models, engineering design data, associated lists, specifications, standards, performance requirements, quality assurance provisions, software documentation, and packaging details.

direct parts marking	A process to permanently mark parts with product information including serial numbers, part numbers, date codes, and barcodes. This allows marked parts to be tracked through their full life cycle.
Enterprise information environment mission area	A portfolio of work and responsibilities related to the DoD common integrated information computing and communication environment of the global information grid. The foundational infrastructure for information systems and technology within the DoD.
Interoperable data management capability	The ability for different DoD organization data systems to effectively operate together in order to exchange, provide, and accept data, information, and services.
(Added)(DAF) Inventory Control Point	An organizational unit or activity within the DoD materiel management system that is assigned the primary responsibility for the materiel management of a group of items either for a particular Military Service or for the Department of Defense as a whole.
IP	Information, products, or services protected by law as intangible property, including data (e.g., technical data, computer software), technical know-how, inventions, creative works of expression, and trade names.
JAMWG	The Office of the USD(R&E)–led group of action officers and subject matter experts from across the DoD that identifies common issues, shares best practices, and develops joint solutions where appropriate.
joint AM model exchange	An interoperable data-sharing tool and repository provided by the DLA used to make approved AM data accessible by the OSD, Military Departments, Defense Agencies, and DoD Field Activities with AM requirements.

joint defense manufacturing council	A group of senior leaders from across the Military Departments and Defense Agencies, co-chaired by senior executives in the Office of the USD(R&E) and Office of the USD(A&S), to coordinate manufacturing investments and activities, address common manufacturing issues, and oversee the JAMWG.
manufacturing innovation institutes	Government-supported consortia focused on technology areas that connect member organizations, work on major research and development collaboration projects, and train people on advanced manufacturing skills.
model-based engineering	An approach to maintaining authoritative data based on digital computer models rather than documents that is managed in a data-rich environment, beginning in the conceptual design phase and continuing throughout development, engineering, acquisition, and sustainment of weapons systems.
organic	Assigned to and forming an essential part of a military organization as listed in its table of organization for the Army, Air Force, and Marine Corps and are assigned to the operating forces for the Navy.
research and engineering enterprise	The people, organizations, facilities, processes, and technologies that support DoD research and engineering activities.
stackable credentials	A sequence of credentials that accumulate over time to build up an individual's qualifications. Typically, stackable credentials help individuals move up a career ladder or along a career pathway to different and potentially higher-paying jobs.
technical data	Recorded information, regardless of the form or method of the recording, of a scientific or technical nature, including computer software documentation. The term does not include computer software or data incidental to contract administration, such as financial or management information.

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(Added)(DAF) TO 34A-2-1, *Metals Additive Manufacturing General Procedures and Process Controls*, 5 September 2021

(Added)(DAF) TO 34A-3-1, *Polymers Additive Manufacturing General Procedures and Process Controls*, 28 August 2021

(Added)(DAF) *Prescribed Forms*
None

(Added)(DAF) *Adopted Forms*
DAF Form 847, *Recommendation for Change of Publication*
AF Form 679, *Air Force Publication Compliance Item Waiver Request/Approval*