Advanced Manufacturing Implementation Plan
(Volume I)

Emerging Concept for the Army of 2025 and Beyond
CSA’s Guiding Concept

39th Chief of Staff of the Army
Initial Message to the Army

We have the most skilled, ethical, and combat hardened Army in our Nation’s history. No matter where we are around the world, America’s Soldiers are displaying courage, commitment and character. We are demonstrating unparalleled competence and agility. And no matter the challenge, no matter how complex the environment, or how dangerous the situation, our Soldiers fight and win.

I am honored to lead this remarkable team.

I have three priorities:

#1. **Readiness:** (Current Fight) Our fundamental task is like no other – it is to win in the unforgiving crucible of ground combat. We must ensure the Army remains ready as the world’s premier combat force. Readiness for ground combat is – and will remain – the U.S. Army’s #1 priority. We will always be ready to fight today, and we will always prepare to fight tomorrow. Our most valued assets, indeed, the Nation’s most valued assets, are our Soldiers and our solemn commitment must always be to never send them into harm’s way untrained, poorly led, undermanned, or with less than the best equipment we can provide. Readiness is #1, and there is no other #1.

#2. **Future Army:** (Future Fight) We will do what it takes to build an agile, adaptive Army of the future. We need to listen and learn – first from the Army itself, from other services, from our interagency partners, but also from the private sector, and even from our critics. Developing a lethal, professional and technically competent force requires an openness to new ideas and new ways of doing things in an increasingly complex world. We will change and adapt.

#3. **Take Care of the Troops:** (Always) Every day we must keep foremost in our minds our Soldiers, Civilians, and their Families. Our collective strength depends on our people – their mental and physical resilience is at our core. We must always treat each other with respect and lead with integrity. Our Soldiers are the crown jewels of the Nation; we must love them, protect them, and always keep faith with them.

I am honored and proud to serve with you. Thank you for your service and commitment to a cause larger than yourselves.

**Army Strong!**

MARK A. MILLEY
General, United States Army
39th Chief of Staff of the Army
Foreword

Once reserved for concept modeling and rapid prototyping, additive manufacturing has expanded....
Every day, new and innovative applications are emerging for the production of end-use parts and final
products. More and more, production challenges involving three-dimensional objects can be solved
faster, better, and in many instances, at lower cost, using Additive Manufacturing technology.¹

Evidence presented in our cost-benefit analysis supports the introduction of additive Manufacturing
(aM) technology to the Army’s Supply and Maintenance processes. The Army accomplishes this by
establishing Part Production, Refurbishment, and Improvement (PPRI) as close to the point-of-need as feasible in order to extend the operational reach of commanders at all levels, augmenting, not replacing, the current supply chain and enhancing our ability to conduct field maintenance.

The Army has been using aM for two decades to refurbish worn parts, create custom tools, and produce 3D visualizations for surgery rehearsals. We can aggressively exploit our manufacturing experience by placing 1) large scale systems in our depots and labs 2) medium scale systems at the Brigade level and 3) small mobile systems with our Brigade Combat Teams.

As we mature this concept, the manufacturing processes we depend on will not be jettisoned nor will manufacturing standards and specifications; however, we will have to invest in infrastructure that underpins and enables aM if we are truly going to embrace this technology. That underpinning is Advanced Manufacturing (AM). It includes ...

...the insertion of new technology, improved processes, and management methods to improve the manufacturing of products.²

World competitors are investing heavily in AM. Prudence demands the Army invest in this technology to shape an outcome suited for the Army of 2025 and Beyond.

Aundre F. Piggee
Lieutenant General, GS,
Deputy Chief of Staff, G-4

² Advanced Manufacturing Industry Study, National Defense University, 2002
Executive Summary

This plan describes where the Army will take manufacturing, as a complement to maintenance, over the next ten years. It describes the capability we intend to build as the nation’s executive agent for logistics on the battlefield, and provides a level of detail necessary to enable the resourcing of Advanced Manufacturing to accomplish the CSA’s vision for supporting the current and future fight.

It advocates for adaptability and flexibility of manufacturing and maintenance processes that will enable design and production as close to the point of need as feasible. We intend to create a thriving AM infrastructure, plan for broad acceptance and use of AM, and implement process change in manageable increments.

By 2025, the Army creates an Army Advanced Manufacturing Center (AAMC) capable of supporting operations at the point of need in order to reduce cost and time to sustain, while maintaining or improving existing capabilities.

The AAMC builds upon the existing maintenance and supply structure by:

1) Identifying **problematic** parts to facilitate their creation through Regional Manufacturing Centers (RMCs) capable of either contracting the production of new parts or using organic manufacturing to restore existing parts to “better than new condition.”

2) Providing DLA suitable substitutes of **certified** parts created by RMCs.

3) Sourcing parts identified as **urgent** due to high priority mission requirements.

The AAMC is **physically and virtually** staffed with supply, maintenance, engineering, communication, distribution, legal, and manufacturing experts that manage **part production, refurbishment, and improvement** (PPRI) based on emerging demand patterns. Implied in its mission, the AAMC creates a production advocate for the maintenance community that is linked directly to the Defense Logistics Agency (DLA) and Regional Manufacturers.

As never before, Commanders, supported by their maintenance teams, will enjoy the ability to drive part production and ensure they are armed with a capability for rapid prototyping, tool production, and critical mission support in order to extend operational reach.
Table of Contents

Definitions ..................................................................................................................................................... 6
Plan Purpose ................................................................................................................................................. 6
Implementation Guidance ............................................................................................................................ 8
Mission, Vision, and Operational Scope ....................................................................................................... 9
Concept of Operations for Manufacturing and Maintenance ................................................................. 10
Assumptions ................................................................................................................................................ 11
Task Summary ............................................................................................................................................. 12
   Organization ........................................................................................................................................ 12
   Experimentation ..................................................................................................................................... 12
   Policy ................................................................................................................................................... 12
Data ......................................................................................................................................................... 13
   Data Procurement ............................................................................................................................... 14
Production ............................................................................................................................................... 15
Implementation Teams ....................................................................................................................................... 16
   Technology ........................................................................................................................................ 16
   Policy ................................................................................................................................................ 16
   Requirements ..................................................................................................................................... 16
Lines of Effort and Timeline ........................................................................................................................ 16
   Spiral One ........................................................................................................................................ 16
   Spiral Two .......................................................................................................................................... 17
   Spiral Three ....................................................................................................................................... 18
Funding and Resources ............................................................................................................................... 18
Plan Management ....................................................................................................................................... 20
   Governance ..................................................................................................................................... 20
   Update Process ................................................................................................................................. 20
Figures ....................................................................................................................................................... 21
Glossary ....................................................................................................................................................... 22
Definitions

**Additive Manufacturing (aM):** Process of joining materials to make objects from 3-D model data, usually layer upon layer, as opposed to subtractive manufacturing methodologies. (Source: ASTM International)

**Advanced Manufacturing (AM):** Activities that depend on the use and coordination of information, automation, computation, software, sensing, and networking, and/or make use of cutting edge materials and emerging capabilities enabled by the physical and biological sciences. Involves both new ways to manufacture existing products and the manufacture of new products emerging from new advanced technologies. (Source: President’s Council of Advisors on Science & Technology)

**Conventional manufacturing (CM):** Manufacturing process other than additive manufacturing. Generally involves controlled subtractive processes of cutting, shaping, or otherwise transforming raw materials into a finished item or components for a finished item.

Comments on manufacturing definitions: Additive manufacturing is a subset of advanced manufacturing. Additive manufacturing includes several families of technologies which could be used for various applications, including production of end items or components; repair or refurbishment of items; or creating supporting items such as tooling to enable conventional manufacturing.

Plan Purpose

**Readiness:** This plan intends to 1) inform all Soldiers where we will take manufacturing, as a complement to maintenance, over the next ten years 2) inform Combatant Commanders and the Defense Logistics Agency (DLA) of the capability we intend to build as the nation’s executive agent for logistics on the battlefield, and 3) provide our civilian leadership, both in the service and on capitol hill, a level of detail necessary to enable the resourcing of Advanced Manufacturing to accomplish the CSA’s vision for supporting the current and future fight.

**Future Army:** Derived from strategic guidance, this plan intends to effect process and policy changes to enable the creation of an AM framework with standard processes that endure, thrive, and enable the production, improvement, or refurbishment of military parts and equipment. It advocates for adaptability and flexibility of manufacturing and maintenance processes that will enable design and production as close to the point of need as feasible. *It requires an openness to new ideas and a new way of doing things...*
Figure 1 depicts the relationships between this plan, strategic guidance, capabilities development processes, and resource allocation.
Implementing a thriving AM infrastructure. Plan for broad acceptance and use of AM. Implement process change in manageable increments. Consider the following initiatives in support of the mission assigned:

- Organize AM structure and build an Investment Strategy using the POM cycle
- Conduct limited user experiments (LUE) to inform requirements determination
- Amend policies to enable AM and work with stakeholders to accelerate the capability
- Obtain technical data packages (TDP) to establish a data repository for selected AM parts
- Select parts best suited for production and inclusion in sustainment portfolios

**Implementation Breakdown**

<table>
<thead>
<tr>
<th>LOE #1: Organization</th>
<th>LOE #2: Experimentation</th>
<th>LOE #3: Policy</th>
<th>LOE #4: Data</th>
<th>LOE #5: Production</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conduct Cost-Benefit Analysis</td>
<td>Support PdM SKTO’s AM experiment</td>
<td>Recommend AM interim policy</td>
<td>Analyze MIL-STD-31000A (TDP)</td>
<td>ID parts using LMI/DTA tool</td>
</tr>
<tr>
<td>Identify AM Partners</td>
<td>TLSC Europe – Maint LUE</td>
<td>Draft AR 750-1 Changes</td>
<td>Provide Data Refer to G-66</td>
<td>Prioritize part production</td>
</tr>
<tr>
<td>Identify Cost Elements</td>
<td>Use results to inform policy change</td>
<td>Incorporate Lessons from LUE into policy</td>
<td>Meet with LOGSA to discuss repository</td>
<td>Capture cert/qual processes (AITEC)</td>
</tr>
<tr>
<td>Organize the effort</td>
<td>Recommend future experiments as req’d</td>
<td>Modify Policy: 700-90 &amp; 750-1</td>
<td>Incorporate 3-D files into digital library</td>
<td>Produce and refurbish parts</td>
</tr>
</tbody>
</table>

**Figure 2**

Figure 2 depicts lines of effort (LOE) with the associated breakdown of specific initiatives. Initiatives support the mission assigned which is described in the next section. Figure 9 depicts the timeline associated with each initiative.
Mission: By 2025, create an Army Advanced Manufacturing Center (AAMC) capable of supporting operations at the point of need in order to reduce cost and time to sustain, while maintaining or improving existing capabilities.

Vision: The AAMC connects the AM community virtually and physically as depicted below.

Operational Scope: The AAMC builds upon the existing maintenance and supply structure by:

1) Identifying problematic parts to facilitate their creation through Regional Manufacturing Centers (RMCs) capable of either contracting the production of new parts or using organic manufacturing to restore existing parts to “better than new condition.”
2) Providing DLA suitable substitutes of certified parts created by RMCs.
3) Sourcing parts identified as urgent due to high priority mission requirements.
Concept of Operations for Manufacturing and Maintenance

The AAMC is physically and virtually staffed with supply, maintenance, engineering, communication, distribution, legal, and manufacturing experts that manage part production, refurbishment, and improvement (PPRI) based on emerging demand patterns. Implied in its mission, the AAMC (Figure 4) creates a production advocate for the maintenance community that is linked directly to the Defense Logistics Agency (DLA) and Regional Manufacturers. Maintainers will enjoy the ability to drive part production and ensure they are armed with a capability for rapid prototyping, tool production, and critical mission support.

Regional manufacturing capacity leverages National Network for Manufacturing Innovation (NNMI) partnerships (Gov/Indust/Academia) in addition to traditional manufacturing. NNMI institutes include America Makes, Digital Manufacturing & Design Innovation Institute (DMDII), Lightweight Innovations for Tomorrow (LIFT), Power America – Wide Bandgap Semiconductors, Institute for Advanced Composites Manufacturing Innovation (IACMI), American Institute for Manufacturing Photonics (AIM Photonics), Flexible Hybrid Electronics, Smart Manufacturing, and Revolutionary Fibers and Textiles.
Assumptions

- Cyber-secure networks allow for the transfer and storage of digital data necessary for AM
- Program Managers (PMs) are incentivized to acquire 3-D Technical Data Packages
- Logistics Support Activity (LOGSA) supports an eSourcing Hub to maintain 3-D file libraries
- Depots, Labs, and Arsenals, in cooperation with Engineering Support Activities (ESA), qualify AM processes for part production by machine type
- Army Test and Evaluation Command (ATEC) and ESAs certify AM parts as suitable substitutes
Advanced Manufacturing Implementation Plan

Task Summary

Organization
A formal program of record (POR) for AM allows the Army to adequately resource the AM initiative. It also eliminates duplication of effort and maintains alignment between strategy, production and maintenance capacity. It transforms the ad hoc approach to AM into a formal organizational approach to support manufacturing and maintenance at the point of need. Experimentation by the requirements team not only accelerates use of AM but also informs decisions on when to initiate an ICD/CDD, etc.

Experimentation
LUEs are especially helpful to the acceleration of AM because they support acquisition and fielding decisions. Early user experiments employ representative users during the technology demonstration phase of the acquisition process. LUEs are undertaken to gain an understanding of the materiel concept, support planning for training and logistics, identification of interoperability problems, and future testing requirements. CASCOM conducts an LUE providing three AM machines to Brigade Support Battalions (BSB) and one AM machine to the Ordnance school. Theater Logistics Support Center – Europe (TLSC-E) performs another LUE in concert with the 21st Theater Sustainment Command (TSC) supporting Operation Atlantic Resolve. Both efforts legitimately accelerate the use of AM.

Policy
Policy requires simultaneous change in three areas; Army Acquisition Policy (AR 70-1), Industrial Base Process (AR 700-90), and Material Maintenance (AR 750-1). The Army G-4 works with the Army Secretariat responsible for Acquisition Policy and Logistics (SAAL-ZL) to effect changes (Figure 5) in the acquisition policy and makes changes to Industrial Base Process and Material Maintenance policies managed by the HQDA G-44(M).

Figure 5
Data

MIL-STD-31000A\(^4\) defines TDPs and includes descriptions of level, type, element, metadata and supplementary technical data that are required to enable the model based enterprise (MBE). Program Managers (PMs) can now procure data packages (Figure 6) that can be used throughout the entire product lifecycle although current practice does not incentivize PMs to procure data for the lifecycle of a system. Product Lifecycle Management (PLM), as a process, is a key enabler for not only data storage but also distribution to downstream manufacturers, sustainment managers, and maintenance providers.

![Figure 6 (TDP Relationships)](image)

The Product Lifecycle Management (PLM) process should be thought of as a design tool to store the Master TDP so it can be distributed in a secure and controlled manner to reduce risk of downstream error and allow access to the product definition\(^5\) by supply chain providers. In addition to the need to share engineering data, sourcing information must be available to the supply chain requiring the development of an electronic sourcing (e-sourcing) hub during procurement shown in Figure 7.

---

\(^4\) 26 Feb 2013, Supersedes MIL-STD-31000 of 5 Nov 2009

Data Procurement

The eSourcing concept is necessary to enable AM and ties directly into the type of TDP a PM chooses to buy for the lifecycle of any system. eSourcing is a critical part of the communications architecture supporting AM. In addition to being a secure means of data exchange, an e-sourcing hub enables collaborators to annotate, mark-up, and iterate on design specifications and contract terms using only a Web browser and leaving a centrally archived audit trail of all interactions. The result is a fully enabled MBE that benefits everyone in the procurement process. As AM requirements are formalized the G-46 and the G-6 mature the architecture in concert with the Defense Information Systems Agency (DISA).

MBE benefits include:

- Enables real-time rather than ad-hoc collaboration
- Leverages standardized processes to establish permissions and roles
- Allocates collaboration tasks
- Establishes project timelines and commitments
- Tracks and monitors project outcomes

---

6 Concept taken from discussion with Mitzi and Roy Whittenburg on 4 Feb 2016
Production

Discussions between the Defense Logistics Agency (DLA) and the services regarding AM occur regularly to determine what parts are best suited for production at the point of need. In fact, in the last three years, DLA contracting efforts produced a part selection tool the military services could use to determine parts that were suitable for production. Suitability was determined based on a number of criteria, but mainly relied on size and material composition to determine an aggregate production possibility of 43,000 parts out of an inventory of 5 million stocked parts.

Importantly, the operational scope of this plan includes using organic manufacturing to restore existing parts to “better than new condition” in addition to the production of new parts using design tools innate to AM software. In fact, refurbishing parts is the most cost effective use of AM. Figure 8 (Info courtesy of Benet Labs) shows one example of how cost effective it is to refurbish parts instead of purchasing them new from the Original Equipment Manufacturer (OEM). **Implementation includes both production and refurbishment.**

![Part Refurbishment](image)

**Figure 8**
Implementation Teams

The AM IPT (Integrated Process Team) is divided into three implementation teams focusing on specific segments of AM operations. The three implementation teams developed the tasks defined which incorporates five lines of effort (LOE). Team composition follows:

Technology—Co-leads: AMC HQ and RDECOM. This team is responsible for issues that impact overall materials and processes, technology improvements, knowledge base, and AM technology transfer.

Policy—Co-leads: G-44(M) and ASA(ALT). This team integrates all tasks developed by the other two teams. It is responsible for issues and processes concerning acquisition of technical data as it applies to AM practices, government and contracted regional manufacturing centers, and support operations, including Theater Logistics Support Centers (TLSC) and DLA support operations.

Requirements—Co-leads: CASCOM and CECOM LRC. This team is responsible for issues and processes concerning doctrine, communications, Army Warfighting Challenge analyses, DOTMLPF-P solutions, and training.

Lines of Effort and Timeline

Spiral One

The following LOEs have been identified for implementation during the first spiral (FYs 2018–2020) based on Senior Leader guidance. Updates to leadership will be provided by the implementation teams at semi-annual AM Synchronization meetings and at the Annual AM Summit.

1. Organization – Policy Team
   1.1. Pursue Collaborative Management Methodology. NLT: 30 September 17
   1.1.1. Finalize Army, DLA, and AM budget analyses (with assistance of the Components) to break down funding into comparable elements, identify areas to champion investment in specific AM capabilities, and reduce redundant or duplicative efforts. NLT: 31 March 2018
   1.1.1.1. Finalize synchronization of FY 2020 program objective memorandum (POM) changes. NLT: 31 March 2018
   1.1.2. Review architecture and standards to promote effective scalability and interoperability when identifying systems, AM equipment, and software to be deployed. NLT: 30 September 2018
   1.1.3. Identify skillsets required for AAMC. NLT: 30 June 2017
   1.1.3.1. Identify existing AM efforts across Army entities. NLT: 30 April 2017
   1.1.3.2. Map SMEs to specific responsibilities required for holistic organization, management and coordination of AM efforts across the enterprise. NLT: 30 July 2017

2. Experimentation – Requirements Team
   2.1. Initiate experimentation within two select Brigade Support Battalions and the Ordnance schoolhouse. NLT: 30 Sep 2017
   2.2. Initiate experimentation with Theater Logistics Support Center – Europe (TLSC-E) as they support Operations in Theater such as Atlantic Resolve. NLT: 31 July 2017
   2.3. Validate methodology for experimentation with select Program Managers. NLT: 30 June 2017
2.3.1. Measure and report the baseline “as is” for repair processes using the MWMSS to assist in defining the benefits/impacts/ROI of the addition of AM technologies to existing business processes. NLT: 31 Oct 2017
2.4. Ensure that information assurance requirements at wholesale locations are met in a timely manner to allow for testing of equipment and operation of reengineered business processes. NLT: 31 Dec 2017
2.5. Conduct follow on experimentation to determine the discrete actions for Spiral Two. NLT: 31 March 2018

3. Policy – Policy Team
3.1. Obtain approval for an Interim Policy for limited use and experimentation of AM. NLT: 28 Feb 2017
3.2. Review and draft changes to Army Materiel Maintenance Policy (AR 750-1). NLT: 31 Aug 2017
3.3. Review and draft changes to Army Industrial Base Policy (AR 700-90). NLT: 31 Aug 2017
3.4. Review MIL-STD-31000A to ensure the TDP requirements listed are consistent with Army Acquisition Policy (AR 70-1). Draft changes necessary. NLT: 30 June 2017

4. Data – Technology Team
4.1. Define the digital workflow (data exchanges) architecture associated with the production, movement and workload volume of materiel from a maintenance location, to the AAMC, to a production facility, to a container and consolidation point, to an aerial port of embarkation, and to a vendor direct delivery to the theater. NLT: 30 June 2017
4.2. Determine requirements for storing 3-D files. NLT: 30 June 2017
4.3. Conduct 2D to 3D file conversion using existing TDPs maintained by DLA to produce an assembly made of two different metals. NLT: 30 June 2017
4.4. Include an analysis for potential reverse engineering of legacy parts to determine capabilities necessary to expedite production of needed parts (scanning capability). NLT: 31 January 2018

5. Production – Technology Team
5.1. Codify the part certification process. NLT: 30 Jun 2017
5.2. Codify the manufacturing process qualification procedures. NLT: 30 Jun 2017
5.3. Produce five repair parts, approved for use in ground systems. NLT: 31 Dec 2018
5.3.1. Refurbish three repair parts, approved for use in any system. NLT: 31 Dec 2018
5.4. Produce one assembly, made of at least two different metals containing corrosive tendencies that cannot be made using traditional manufacturing. NLT: 30 June 2019
5.5. Identify and catalogue regional manufacturing capabilities that can be used by the AAMC to produce and refurbish parts. NLT: 31 Aug 2017

Spiral Two
Spiral Two (FYs 2021–2023) will be comprised of additional discrete tasks based on results from Spiral One and consideration of the tasks provided by the implementation teams. The goal of Spiral Two will be to expand the use of AM within supply and maintenance operations to enable additional business benefits realized in Spiral One. Spiral Two will include delivery of design and resourcing plans for the physical AM organizational enablers (AAMC, RMCs, and supporting infrastructure). Detailed timelines for this spiral will be provided by the implementation teams by 31 August 2017 as part of the AM Synchronization IPT meetings and in subsequent editions of this document.
Spiral Three

Spiral Three (FYs 2024–2026) will be comprised of new tasks that build on knowledge/experience gained from Spirals One and Two, and consideration of the tasks provided by the implementation teams. Detailed timelines for this spiral will be provided by the implementation teams at the regularly scheduled AM Synchronization IPT meetings and in subsequent editions of this document.

### Task Timeline

<table>
<thead>
<tr>
<th>Lines of Effort</th>
<th>4QFY17</th>
<th>1QFY18</th>
<th>2QFY18</th>
<th>3QFY18</th>
<th>4QFY18</th>
<th>1QFY19</th>
<th>2QFY19</th>
<th>3QFY19</th>
<th>4QFY19</th>
<th>1QFY20</th>
<th>2QFY20</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1: Organization</td>
<td>Publish Cost-Benefit Analysis</td>
<td>Identify AM Partnerships</td>
<td>ID POM Cost Elements</td>
<td>Identify structure required for IAME</td>
<td>Organize Physical AAME</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#2: Experimentation</td>
<td>PM Ammos Meeting</td>
<td>Validate Methodology with PMs</td>
<td>Collect Data</td>
<td>Conduct Follow on Experiment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Participate in AM IPT meetings with CASCOM and TLS-Europe</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#3: Policy</td>
<td>Participate in G-44(M) AM Engagement Meetings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Draft interim AM Policy</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>WG briefs to G-44(M)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Draft AR 750-1 Policy Changes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Draft AR 750-2 Policy Changes</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Approve Policy Change</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#4: Data</td>
<td>Analyze Acquisition Language</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Compare MIL-STD-3100A to AR 70-1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Present to G-46, LOSMA, G-6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Begin Limited 2-D File Conversion</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Brief Enterprise Integration Council</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>#5: Production</td>
<td>Review Part Selection Tool</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Conduct Part Refurbishment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Certify Certification/Qualification Process</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Produce &amp; Refresh Parts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>ID Regional Manufacturing Centers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Completed</td>
<td>Projected</td>
<td>Pending</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 9**

### Funding and Resources

Each task requires a commitment of funding and personnel resources. Stakeholders will commit necessary resources to accomplish tasks in this plan at their respective sites. That commitment must be accomplished within current annual budgets and personnel resources, as outlined in each organization’s POM. Each task dictates a different level of effort and funding. In turn, resource requirements will be influenced by several factors, including task scope; length, number, and grade of personnel (both
internal and contractor support); travel; and training costs. Some tasks may also entail facility, hardware, software, communications, and maintenance costs.

It is essential that the senior leaders identify the resources and work within their organizations to make those resources available to implement their respective tasks. The consensus among the senior leadership was that the primary challenge would be successfully synchronizing programmed AM dollars to achieve the vision set out in the AM CONOPS.

The total amounts projected during this period for AM requirements are listed below, however, they are subject to reprioritization within the organizations. AM stakeholders are encouraged to work to limit reprioritization of this important AM enabler.

<table>
<thead>
<tr>
<th></th>
<th>LOE 1 (Org)</th>
<th>LOE 2 (Exper)</th>
<th>LOE 3 (Policy)</th>
<th>LOE 4 (Data)</th>
<th>LOE 5 (Prod)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FY 2018: 2M</td>
<td>.1 M</td>
<td>.4 M</td>
<td>.05 M</td>
<td>.6 M</td>
<td>.85 M</td>
</tr>
<tr>
<td>FY 2019: 3M</td>
<td>.3 M</td>
<td>.6 M</td>
<td>.05 M</td>
<td>1 M</td>
<td>1.05 M</td>
</tr>
<tr>
<td>FY 2020: 9M</td>
<td>1 M</td>
<td>1.4 M</td>
<td>.15 M</td>
<td>3.6 M</td>
<td>2.85 M</td>
</tr>
<tr>
<td>FY 2021: 11M</td>
<td>1.6 M</td>
<td>1.75 M</td>
<td>.25 M</td>
<td>4.4 M</td>
<td>3 M</td>
</tr>
<tr>
<td>FY 2022: 12M</td>
<td>1.2 M</td>
<td>1.8 M</td>
<td>.2 M</td>
<td>4.8 M</td>
<td>4 M</td>
</tr>
<tr>
<td>FY 2023: 18M</td>
<td>.85 M</td>
<td>2.6 M</td>
<td>.15 M</td>
<td>7.4 M</td>
<td>7 M</td>
</tr>
<tr>
<td>Total: 55M</td>
<td>5.05 M</td>
<td>8.55 M</td>
<td>.85 M</td>
<td>21.8 M</td>
<td>18.75</td>
</tr>
</tbody>
</table>

This funding is associated with the first iteration of this document. The goal is to maintain an accurate picture of future funding with each revision and to share that information with stakeholders to leverage the investment results of others and avoid duplicative spending.
Plan Management

Governance

The HQDA G-4, Logistics Innovation Agency, has responsibility for this plan. The G-4 and the Deputy Assistant Secretary of the Army for Acquisition, Logistics, and Technology, Research and Technology (DASA R&T) co-host the annual AM Summit meetings to provide oversight of AM implementation. The chair for the AM IPT is the Chief, Depot & Arsenal Division, HQAMC and the AM Implementation Teams are chaired by RDECOM, G4/ASA(ALT), and CASCOM in the areas of technology, policy, and requirements respectively.

HQDA G-4 executes its mission as the Army AM lead by coordinating with its partners to improve collaborative planning and execution in support of AM operations. Its partners include those listed in Figure 10.

![Figure 10 - Governance Structure](image)

Update Process

This plan is updated annually, using a sequence of volumes to make changes known. Each of the team leaders will present their progress, results, and any unresolved issues on a regular basis to the AM Implementation IPT. These presentations should provide an accurate assessment of each team’s efforts and will become the basis for presentations made to the more senior oversight officials.
Figures

Figure 1 – Doctrine Alignment

Figure 2 – Implementation Breakdown

Figure 3 – AM Vision

Figure 4 – Proposed AAMC Organization

Figure 5 – Policy Change

Figure 6 – TDP Relationships

Figure 7 – e-Sourcing Concept

Figure 8 – Refurbishment Example

Figure 9 – Timeline

Figure 10 – Governance Structure
The glossary contains acronyms and terms with Army or joint definitions. Those definitions marked by an asterisk (*) indicate a new term or one defined differently than in current doctrine, regulations, or hierarchical concepts.

2D – Two Dimensional – Having elements organized in terms of a flat surface, especially emphasizing the vertical and horizontal character of the picture plane

3D – Three Dimension – Having, or seeming to have, the dimension of depth as well as width and height

*AAMC – Army Advanced Manufacturing Center – Entity organized both virtually and physically to accelerate the adoption of Advanced Manufacturing. Organization has the responsibility for all aspects of coordinating the production, improvement, and refurbishment of parts. Implied in the mission to produce, improve, and refurbish parts is everything a flag level staff will consider from legal protection, cyber security, part certification, process qualification, standards creation, specification creation, transportation, contracting, equipping, communication, data architecture, etc.

AIM Photonics - American Institute for Manufacturing Photonics

AM - Advanced Manufacturing - Activities that depend on the use and coordination of information, automation, computation, software, sensing, and networking, and/or make use of cutting edge materials and emerging capabilities enabled by the physical and biological sciences. Involves both new ways to manufacture existing products and the manufacture of new products emerging from new advanced technologies. Advanced Manufacturing provides structure to enable Additive Manufacturing.

aM – Additive Manufacturing - Process of joining materials to make objects from 3-D model data, usually layer upon layer, as opposed to subtractive manufacturing methodologies. (Source: ASTM International)

AMC – Army Materiel Command

AMMO - Ammunition

AR – Army Regulation

ASA (ALT) – Assistant Secretary of the Army (Acquisition, Logistics, Technology)

ATEC – Army Test and Evaluation Command

BSB – Brigade Support Battalion

CAD – Computer Aided Design

CASCOM – Combined Arms Support Command

CECOM LRC – Communications – Electronics Command: Logistics and Readiness Center
Cert - Certification
CSA – Chief of Staff of the Army
DASA(R&T) – Deputy Assistant Secretary of the Army (Research & Technology)
DLA – Defense Logistics Agency
DMDII - Digital Manufacturing & Design Innovation Institute
DoD – Department of Defense
DOTMLPF – Doctrine, Organization, Training, Materiel, Leadership and Education, Personnel, Facilities
ERP – Enterprise Resource Planning
ESA – Engineering Support Activities
FORSCOM – United States Forces Command
G-4 – Assistant Chief of Staff for Logistics
G-44(M) - Assistant Chief of Staff for Logistics (Maintenance Focus)
G-46 - Assistant Chief of Staff for Logistics (Information Management Focus)
G-6 - Assistant Chief of Staff for Information Management
HQDA – Headquarters, Department of the Army
IACMI - Institute for Advanced Composites Manufacturing Innovation
ID - Identify
IPT – Integrated Process Team
LIFT - Lightweight Innovations for Tomorrow
LMI – Logistics Management Institute (Non-profit)
LOE – Lines of Effort
LOGSA – Logistics Support Activity
LUE – Limited User Experiment
MBE – Model Based Enterprise
MES – Manufacturing Execution System
MIL-STD – Military Standard

MRP – Material Resource Planning

NNMI - National Network for Manufacturing Innovation

OEM – Original Equipment Manufacturer

PdM SKOT – Product Manager, Sets, Kits, Outfits, and Tools

PLM – Product Lifecycle Management

PM – Program Manager

POM – Program Objective Memorandum

POR – Program of Record

QUAL – Qualification

RDECOM – Army Research, Development and Engineering Command

REF – Rapid Equipping Force

*RMC – Regional Manufacturing Center

SAAL-ZL – Office code for the Office of the Assistant Secretary of the Army, Acquisition Policy & Logistics

TDP - Technical Data Package - A technical description of an item adequate for supporting an acquisition strategy, production, engineering, and logistics support (LS). The description defines the required design configuration and procedures to ensure adequacy of item performance. It consists of all applicable TD such as drawings, associated lists, specifications, standards, performance requirements, quality assurance (QA) provisions, and packaging details.

TLSC – Theater Logistics Support Center

TRADOC – Training and Doctrine Command

TSC – Theater Support Command