Meeting Name	AMMO Workshop – Day 1
Meeting Date	June 23, 2020

Plenary Introductions
The information below provides an overview the workshop's opening remarks and the goals for the workshop working groups.

Opening Remarks:

- The DoD Additive Manufacturing (AM) policy is developed is in the final stages of approval.
- A number of AM initiatives are in progress within the Defense Logistics Agency (DLA) to establish a common dictionary and processes across the DoD.
- The DoD is continuing efforts (e.g., partnership with ManTech) to improve part quality within the aviation space.
- To continue Digital Tread development, Joint Additive Manufacturing Model Exchange (JAMMEX) is established. This will enable the DoD the share 3D models used for AM across the various Military Services (MILSVCs).

AM Guidebook

- Goal: Create a resource (e.g., Guidebook) to assist implementation of AM across the DoD AM lifecycle.
- The breakout session is composed of four sub-groups:
    - Acquisition and Contracting
    - Research and Engineering/Specification and Standards
    - Technical Data Management
    - Collaboration, Communication and Policy Implementation
- These groups will work to identify topics to include in the guidebook, compare the topics to current DoD policies, develop statements to illustrate the impact of the topics on AM in the DoD, establish a guidebook framework, and draft language to begin guidebook development.

AM Cyber

- Goal: Review current AM cybersecurity progress, planned contracts for studies, and state of the industry to date to develop AM cybersecurity policies and best practices.
- The breakout session will consist of five working group sessions covering the topics with respect the cybersecurity: Government and Industry Perspectives, Internal Control System Overlays, and Next Steps to advance and encourage cybersecurity efforts.

AM Data Management

- Goal: Continue to mature AM data standards by sharing pedigreed material and engineering data across the DoD.
- The breakout session will be broken up into two sub-groups to identify common dictionary terminology and explore how the DoD can continue establishing connectivity to existing AM databases.

AM Workforce Development

- Goal: Identify and define roles specific to AM across the DoD enterprise and industrial defense base.
- The breakout session will consist of five sub-groups:
  - Acquisition Coded Professionals
  - DoD Technicians
  - DoD Engineers
  - DoD Management/Leadership
  - Industry
- These working groups will work to identify the AM roles that exist, map the results to the existing AM body of knowledge and update the AM body of knowledge to reflect progress made.

AM Metrics

- Goal: Develop a common set of prioritized metrics to capture the value of AM organized around measures of effectiveness, capability maturity, and performance.
- The breakouts session will consist of three sub-groups:
  - Measures of Effectiveness
  - Measures of Capability Maturity
  - Measures of Performance
- Each group will work to identify potential inputs (e.g., required data) and process for each metric identified. This information will be leveraged to determine each metric's feasibility and value with respect to AM.

AM Part Risk Categorization + TDP Procurement in Sustainment

- Goal: Identify commonalities across the various Military Departments (MILDEPs) AM risk categorization, criticality processes, and Technical Data Packages (TDPs) to standardize AM part development.
- Day 1 will focus on risk categorization and criticality. An overview of the difference military departments risk categorization processes will be provided followed by a digital survey exercise to identify inputs that should be considered as MILSVC process analysis continues.
- Day 2 will focus on MILDEP TDP's. Receiving an overview of current AM standards in development and MILDEP AM use cases will allow for recommended courses of action (COAs) and inputs to be identified to support this effort.

AM Part Risk Categorization Breakout Session:

Once the plenary concluded, the breakout sessions were initiated. The results from the AM Part Risk Categorization working group are below. Refer to the documents uploaded to APAN for greater detail (includes takeaways and survey questions/results). Contact Tony Delgado (Luis.Delgado@dla.mil) if support is needed to locate these documents.

Risk Categorization:

An overview of the MILDEP risk categorization processes was provided. Takeaways from the discussion along with each MILDEP are provided below.

Takeaways:

- There are differences in how services quantify and group parts to be produced using AM.
- AM is more than a method to quickly produce parts to meet customer needs. Broader decisions outside of a part's technical, safety, and performance need to be considered when assessing a part AM capability (e.g., business decisions such as shipping and manufacturer labor costs).
- Adoption of tools to assess a part's risk categorization is evolving. Standardizing these processes will provide greater confidence in the data and requirements placed in these tools.
- To increase confidence in producing a part using AM, both AM part's quality and use need to be balanced.
- Industry's perspective: the higher a part's criticality the greater technical and material requirements are needed to produce the part using AM. The difference in data requirements will make it challenging to standardize processes across the MILDEPs.

Air Force:

- Assessment methodology focuses on determining a part's suitability score. This score will help determine if a part is produced through AM.
    - Chosen parts are aligned to one of seven general categories that focus on the safety, structural impact, and performance expectations of the part. This information is entered into a part screening tool to compute a parts suitability score.
- Process requests come from multiple locations (e.g., fleet to engineers).
- The chief engineer within the program office has the authority to approve parts produced through AM.

United States Marine Corps (USMC):

- Readiness drives part production using AM means.
- The 05 commander has primary authority to produce a part using AM.
- The Air and Marines Operations Center (AMOC):
    - Facilitates the qualification and approval of AM parts.
    - Support the commanders identifying where parts are in the approval/triage process.
    - Industry's perspectives:
        - Sees this organization as a "reverse engineering and manufacturing group" due to their knowledge in AM such as, material availability and part-performance.
        - Sees this group helping keep risk low for substitute AM parts.

Naval Sea Systems Command (NAVSEA):

- The NAVSEA 5100.12-M Risk Matrix is leveraged to help determine if a part can be produced through AM.

Naval Air Systems Command (NAVAIR):

- AM parts come from many sources (bottom-up: fleet; top-down: engineers).

- A vendor's qualifications are taken into consideration when assessing a part's AM risk. The vendor requirements increase, from minimal to high, as the part's consequence of failure rises.

Criticality:
The goal of the session was to understand the approaches taken to estimate the change in criticality when a traditional part is substituted for an AM part. The Military Standard (MIL-STD)-1629A for criticality was reviewed followed by a series of questions to understand the inputs to consider when determining a part's criticality. Using the Poll Everywhere survey tool, these inputs were captured. The key takeaways from this conversation are below.

- Opinions differ as to whether a parts criticality can change when a traditional part is substituted for an AM part. Reasons for criticality variation were based on the following views:
    - Criticality is independent of the manufacturing method to produce the part.
    - The addition of a non-traditional part could change the primary failure mode of the system, thus the overall part's criticality. It is important to better understand the new failure mode to determine if a part's severity, thus criticality, does change.
- Terminology to assess criticality is not standardized.
- The manufacturing method will likely not change a part's severity. If severity changes it will be due to the part's asset classification and performance requirements.

Themes:
To develop a standardized process for AM, this portion of the workshop looked to identify the inputs that should be considered. Developing themes/buckets to group these inputs, the Poll Everywhere survey tool was used to capture the results. The key takeaways from the discussion are below.

- The TDP outlines the technical data to produce an AM part. This document should be taken into consideration when determining if a part can be additively manufactured.
- Material properties are an important technical data input to consider because a material's properties can change based on the process applied to it (e.g., Heat Treatment)
- The Machine's serial number and possible defects produced using the machine should be documented. This will help pinpoint machines within the AM supply chain that need to be updated to ensure an AM part meets design specifications.
- Readiness degrader indication is a key supply chain consideration for part to be additively manufactured.
- Information ownership of a TDP is important to ensure all the necessary data is known for a given part across industry and the DoD (e.g., a part's Original Equipment Manufacturer (OEM) data might not be reflected in the TDP).
- Acquisition Manufacturing Code (AMC) is an important legal input for considering a part for AM. It helps identify the organization (e.g., OEM) that can produce the part.

- Small business engagement is more frequent when the full TDP for a part is available.
- The difference between Intellectual Property (IP) and proprietary data still needs to be defined.
- Requests from the fleet are the most important and application/tools are the least important to identify the need for a part to be produced. Factors that contributing to this are:
    - urgency – provides real-time signals as to what is needed by the fleet.
    - There is uncertainty as to how current data is within applications.
- The Source, Maintenance, and Recoverability (SMR) code is a critical supply chain data input considered for NAVSEA. The SMR code indicates if the part needs to be repaired or replaced.
- There is little data regarding fatigue testing (e.g., cyclical loading) of additively manufactured parts due to its novelty within the DoD.
- The timespan an AM part will be deployed is a key Application Data input to consider (e.g., the AM part is a temporary replacement for a traditionally additively manufactured part).

<u>AM Guidebook:</u>
The guidebook is discussed during both days of the workshop. The goal these sessions are to identify the categories and topics that will support AM Guidebook development. The key takeaways from the discussion held on June 23, 2020 are below.

- No additional categories were added outside of the ones provided.
- The "AM TDP for Supplier to Bid/Quote" is a key topic for the AM Part Sourcing Requests category. The topic refers to a part's availability to be produced by vendors outside the government or original OEM.
- The difference between AM Machine, AM Power, and AM process topics are outstanding.
- The topic of "lot traceability" refers to the ability to trace apart from powder to implementation (end-to-end traceability).
- Clarification of inputs:
    - Qualification Standard for the Exchange of Product (STP) refers to environmental testing.
    - The "transfer of qualified procedure documents" refers to the transfer of procedures across facilities.