AFLCMC/RO

RAPID SUSTAINMENT OFFICE

Quarterly Report

April - June 2023

RAPID SUSTAINMENT OFFICE RSO

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CONTENTS

PURPOSE

ACCELERATE DELIVERY OF CRITICAL OPERATIONAL SOLUTIONS TO THE DEPARTMENT OF THE AIR FORCE SUSTAINMENT ENTERPRISE

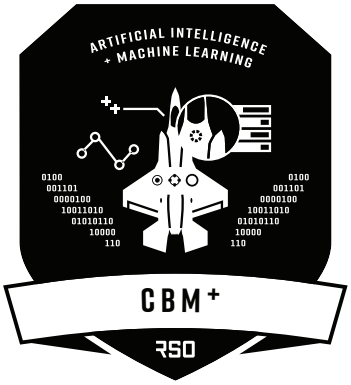
MISSION

OPTIMIZE WARFIGHTER READINESS BY EXPLOITING TECHNOLOGIES TO REVOLUTIONIZE SUSTAINMENT OPERATIONS

VISION

TO BE THE PREEMINENT DEPARTMENT OF DEFENSE SOLUTIONISTS THAT CHALLENGE CONVENTIONAL MINDSETS, PUSH THE BOUNDARIES OF INNOVATION, AND GENERATE CONCEPTS THAT SOLVE PROBLEMS AT THE SPEED OF USER NEED

RSO TECHNOLOGY FOCUS AREAS



Artificial Intelligence & Machine Learning (AI/ML)

We apply AI and ML to optimize fleet maintenance, increase aircraft availability, and minimize aircraft downtime.

Our most prominent application of AI is within our **Condition Based Maintenance Plus (CBM+) Program Office**. This technology employs AI that enables us to improve maintenance data quality and evaluate large sets of aircraft sensor data and maintenance history to predict component failures. These applications empower our CBM+ program office to save thousands of maintenance hours every year.

Advanced Manufacturing

The RSO's **Advanced Manufacturing Program Office (AMPO)** scales organic capability and serves as the Air Force's focal point for the application of AM in matters related to acquisition and sustainment.

The AMPO executes four major functions:

- Technology Assessment
- Airworthiness Certification Support
- Product Support Management
- Deployment Across the Enterprise

Vision

Empowering supply chain management and scaling AM capabilities across the Department of the Air Force to ensure continuous Warfighter advantage and readiness anytime, anywhere in the world.

Accelerating Innovation and Modernization to Scale (AIMS)

The AIMS Team drives and leads the rapid adoption of sustainment-centric technologies to improve readiness and positively impact costs, be that in-garrison, or in both a contested and non-contested deployed environment, while exploiting modern tools to increase expertise, eliminate waste, enhance situational awareness, and produce and restore mission-critical materiel for the Air Force.

The AIMS Team discovers, develops, matures, and modernizes sustainment technologies within the following focus areas:

AUTOMATION & ROBOTICS

We apply automation and robotics to eliminate maintenance tasks that are repetitive, labor-intensive, or hazardous, making it possible to accomplish these tasks safely and efficiently with a high degree of accuracy.

DATA & DIGITAL ENVIRONMENTS

We standardize maintenance and sustainment data collection to serve as a connector of data sources across the Air Force. Our process is to collect the data, identify what's useful, turn it into a functional format, and then leverage it to inform smart and proactive decisions.

AUGMENTED & VIRTUAL REALITY

Augmented and Virtual Reality (AR/VR) technology creates an immersive environment for Airmen to train and execute more efficiently and effectively. The immersive access to digital resources allows the Air Force to predict, analyze, and solve problems faster, leading to a decrease in sustainment costs and increase in Airmen readiness. The AR/VR Product Team aims to continuously collaborate with users, characterize problems, and design and scale turn-key technological solutions that benefit the entire sustainment enterprise.

RAPID & AUSTERE MAINTENANCE ENVIRONMENTS

We provide Airmen with effective tools, leveraging modern, cross-cutting technologies to reduce the Air Force's ogistical footprint in conjunction with enhancing mission capability and readiness. We are focused on rapidly implementing emerging and solution-oriented sustainment technologies and modernization within austere environments.

KEY ENGAGEMENTS

19-20 APRIL 2023
Military Aviation Logistics and Maintenance Symposium, Atlanta, GA

2-4 MAY 2023
CBM+ Acquisition Stakeholder Summit, Nellis AFB

13-14 JUNE 2023
Maintenance Augmented Reality System (MARS) Module Testing, Nellis AFB

27-29 JUNE 2023
Product Support Manager Forum, Wright-Patterson AFB

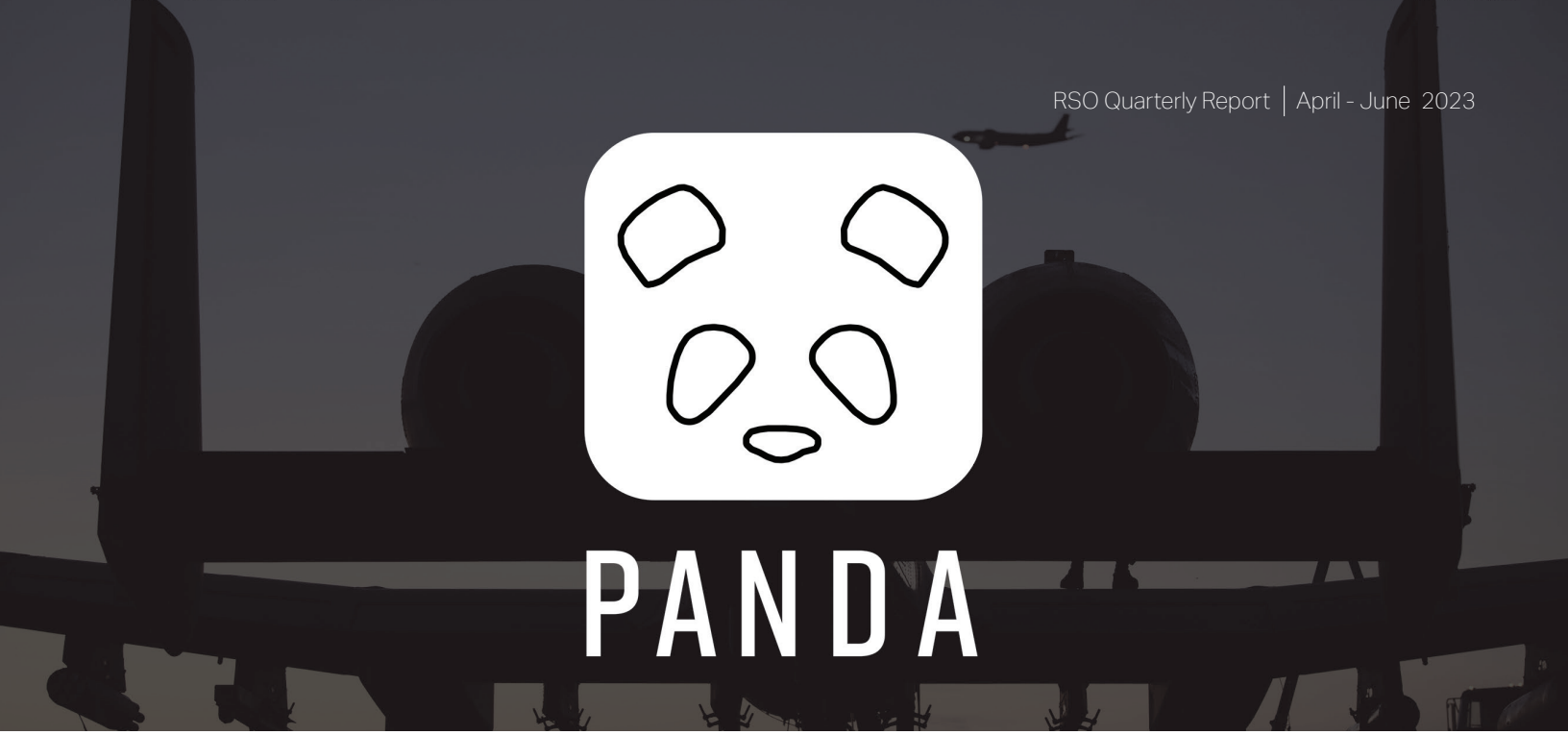
10-14 | 19-20 | 24-26 | 2-4 | 16-19 | 13-14 | 25-26 | 27-29

10-14 APRIL 2023
GE Additive Design Workshop, Cincinnati, OH

24-26 APRIL 2023
First Lighthouse Test Sortie, Nellis AFB

16-19 MAY 2023
AFMC Commander's Accelerated Initiatives Office Training Symposium, Wright-Patterson AFB

25-26 JUNE 2023
CBM+ C-130J Modern All-In Kickoff, Robins AFB



RSO SPOTLIGHT

PANDA DESIGNATED AS AIR FORCE SYSTEM OF RECORD

The RSO CBM+ Program Office's Predictive Analytics and Decision Assistant (PANDA) leverages artificial intelligence software to transform logistics data into actionable predictive maintenance alerts. The Air Force has designated PANDA as the System of Record for CBM+ and predictive maintenance, the first such designation for the RSO.

Developed by the RSO and partner, C3.ai, PANDA is an artificial intelligence software toolkit that delivers integrated and interoperable tools, technologies, and information infrastructures to facilitate CBM+ collaboration across multiple functional and organizational boundaries. It maximizes the use of common equipment and technologies to capture, store, analyze, and forward CBM+ predictive maintenance data. PANDA has rapidly expanded to the maintenance operations of 16 aircraft platform communities across all nine Air Force Major Commands. PANDA routinely generates over 30,000 predictive maintenance recommendations and sensor-based alerts detecting impending component failure.

"PANDA being designated as the Air Force's system of record for CBM+ is a monumental achievement for the RSO and Air Force CBM+ enterprise," said Chris Damani, RSO CBM+ Program Office Chief. "Alignment to one technology solution unites the sustainment enterprise to one tool and brings focus, dedication, and prioritization of resources to PANDA allowing for further expansion, optimization, and impact to mission readiness."

The RSO CBM+ Program Office is the Air Force's CBM+ Center of Excellence leading the implementation and execution of CBM+ across the Air Force. The office will now lead and manage all Air Force CBM+ initiatives interested in integration into the PANDA platform, which is expandable to all Air Force materiel categories, including aircraft, missiles, and support equipment and vehicles.

QUARTER HIGHLIGHTS

RSO WELCOMES NEW DPEO - APRIL 2023

Mr. James Lawrence became the RSO's third Deputy Program Executive Officer. He came to us from the Air Force Installation and Mission Support Center and has a plethora of acquisition program management and leadership experience. Lawrence states he is excited to join the RSO to help lead and shape its critical sustainment mission.

"Sustainment operations underpin our nation's ability to execute in a contested environment," adds Lawrence. "It's the RSO's responsibility to accelerate disruptive solutions to enable that capability for our warfighter."

CBM+ ACQUISITION STAKEHOLDER SUMMIT - MAY 2023

The RSO CBM+ Program Office hosted the first of two 2023 Stakeholder Summits, May 2-4, 2023, at Nellis AFB. The successful 2 ½-day event brought together CBM+ stakeholders in the Acquisition, Engineering, and Supply Chain areas. The Summit's theme was "CBM+ and Mission Generation Under Attack," which built upon the imperative emphasized during the Logistics Officer Association Symposium held in March 2023.

The Stakeholder Summit included multiple avenues for information exchange of successes, best practices and techniques, and lessons learned, promoting unity and collaboration across the Department of Defense CBM+ community.

The CBM+ Program Office will host a second Summit for the Maintenance community in October 2023.

AMPO SUCCESSFULLY DEMOS COLD SPRAY REPAIR - JUNE 2023

The RSO AMPO recently completed a successful cold spray demo on a non-service C-130 at Robins Air Force Base, GA. This additive surface repair technology uses particle deposition of metallic powder to repair worn, damaged or corroded components.

Battle damage was simulated on two areas of the aircraft. Working alongside the Aircraft Battle Damage Repair (ABDR) Unit of the Warner Robins Air Logistics Complex's 402nd Expeditionary Depot Maintenance Flight and the University of Dayton Research Institute, the team used an aluminum blended powder to rapidly repair the areas in under 10 minutes.

This demo will help advance utilizing cold spray repair for Air Force ABDR scenarios.

BEFORE

AFTER

BEFORE

AFTER

NOTABLE TEAM ACCOMPLISHMENTS

Advanced Manufacturing Program Office (AMPO)

- AlSi10Mg Safe Use Document (SUD) was finalized on 27 June 2023. The document *SUD Circular 23-01 for the use of Additively Manufactured Aluminum Alloy AlSi10Mg in Non-Structural, Non-Critical Applications* reports, "There is sufficient data to support the use of additively manufactured (AM) AlSi10Mg components in non-structural, non-critical applications."
- The AMPO submitted two AM metals to the Technology Assessment Process (TAP) for review.
- The team awarded four Commercial Solutions Openings (CSO) this quarter:
  1. An award to GE Additive will address design, development, manufacture and testing of jet engine metal additive heat exchangers (AM HX) and transition of metal AM HX production to a USAF Air Logistic Complex. This project addresses difficulties in procuring engine heat exchanger components for legacy engines.
  2. Eaton Corporation was awarded a new contract to demonstrate, integrate and transition process technologies and techniques extending USAF capability to perform production cold spray repairs of aircraft components.
  3. Woodward FST was awarded a contract to advance AM equivalencies, optimizing the cost, improving the efficiency of AM processes, and establishing an innovative methodology demonstrating equivalencies between assets and published data, agnostic of the designated printer. This will enable the reduction or elimination of machine specific materials' specifications, enable parts to be printed at multiple locations and on different machines and expand the potential suite of metal AM equipment by establishing a common materials dataset and evaluation methodology for Air Force use.
  4. The SEEKR contract was awarded to Expansia under CSO Call 0010 to leverage existing investments to enhance analytics tools and conduct airframe comparison analysis to identify part candidates for additive manufacturing and different repair techniques. The team has met with the System Program Office Engineer for the B-1, B-52, KC-135, and E-3 to gather data for further part analysis.
- The team completed the first edition of the new Cold Spray Design Rule Book, outlining common practices and lessons learned; Publication can be accessed from the AMPO.
- The Always Generating Operationally Ready Aircraft (AGORA) Team submitted a Risk Management Framework Authority to Operation (ATO) package for government review to receive a recommendation for an Authority to Operate (ATO) and deploy to Cloud One Production by end of summer 2023. The AMPO expects to kick off roadshow activities to the field by late fall 2023.
- The team expects to receive an ATO and to deploy the Part Assessment & Cost Tool (PACT) to Cloud One Production by end of August 2023.
- The AM Innovation Hub application is rapidly approaching completion, and the team expects to leverage an existing ATO by fall 2023.

SUPPORTING HAF/A4'S PROVIDED "ABILITY-TO" STATEMENT:

- Counteract parts obsolescence issues by capitalizing on a network of advanced manufacturing & repair technologies/tools/equipment, reverse engineering capabilities, and advanced non-destructive inspection techniques, provided at the point of mission generation and throughout the supply chain (e.g. additive manufacturing, 3D printing, cold spray, composite materials/repairs, etc.)

SUPPORTING SECRETARY OF THE AIR FORCE'S OPERATIONAL IMPERATIVES:

#5 Defining optimized resilient basing, sustainment, and communications in a contested environment

Condition Based Maintenance Plus (CBM+)

- Memorandum for Record signed by HAF/A4L and SAF/AQD codifying Predictive Analytics and Decision Assistant (PANDA) as the Air Force System of Record for CBM+ and Predictive Maintenance
- Deployed PANDA release 4.1
- Obtained CBM+ Enterprise Integration Governance Council approval to pursue C-130J as the Modern All-In platform
- CBM+ Strategic Implementation Plan with current guidance and approved by HAF/A4L and SAF/AQD

SUPPORTING HAF/A4'S PROVIDED "ABILITY-TO" STATEMENTS:

- Capitalize on analytical/decision tools, to include ingesting existing, untapped data resident on/in weapon systems, to better understand and predict aircraft, munitions, and equipment condition during operation, and prior to induction into major inspection/maintenance
- Modernize and digitize maintenance processes

Accelerating Innovation & Modernization to Scale (AIMS)

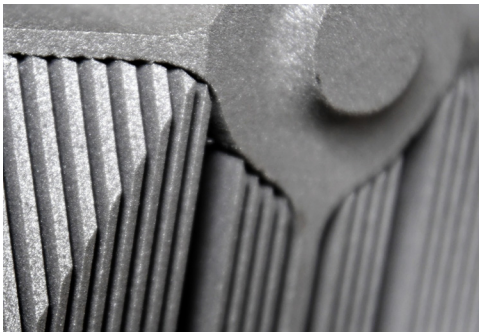
- Lighthouse Team – Conducted a successful Maintenance Evaluation Team event at Nellis AFB, demonstrating capability to the Strike Aircraft Maintenance Unit maintainers for feedback. Capabilities presented included new Lighthouse Integration Technology Engine (LITE) and Aircraft Infrastructure Readiness System (AIRS) features.
- Augmented & Virtual Reality Team – Verified and tested the efficacy of augmented reality maintenance modules for F-15E main landing gear nitrogen servicing and routine engine oil servicing. This testing allowed the team to capture 10 data points for both modules that show preliminary benefits of using the Maintenance Augmented Reality System (MARS), reducing total task time and required SME interventions compared to baseline data.

SUPPORTING HAF/A4'S PROVIDED "ABILITY-TO" STATEMENTS:

- Have a common operating picture and push information across multiple "battlespaces" from enterprise logistics/ sustainment to integrated base defense
- Reduce the materiel footprint required to establish an operational foothold and generate missions by developing modernized, modular, flexible, multi-capable and interoperable support equipment
- Train and experience our workforce faster and more effectively to bring their proficiency levels higher, sooner (e.g. Virtual Training, AR/VR)
- Optimize sortie generation and operational logistics capability & capacity through automation, robotics, etc.
- Distribute and provide secure, on-demand, and mobile access to information (tech date, forms, mission data, engineering documents, schematics, and tech orders) and logistics systems at the point of use
- Leverage and capitalize on accurate maintenance and logistics information from the field and depot that will allow the sustainment enterprise to more effectively plan activities to reduce downtime and increase aircraft and materiel availability
- Modernize and digitize maintenance processes

SUPPORTING SECRETARY OF THE AIR FORCE'S OPERATIONAL IMPERATIVES:

#5 Defining optimized resilient basing, sustainment, and communications in a contested environment
#7 Readiness of the Department of the Air Force to Transition to a Wartime Posture Against a Peer Competitor



BY THE NUMBERS

As of July 2023

AMPO

Total parts delivered

4,681

Individual AM part numbers delivered

467

Total AM parts flying

311

Individual AM part numbers flying

174

Completed Technical Data Packages

343

Completed repair data packages

43

CBM+

Aircraft platforms fielded

16

C-5, KC-135, C-130, C-17, B-1, B-2, B-52, AC/MC-130, F-15, RC-135, HH-60, F-16, A-10, EC/HC-130, CV-22, U-2

Aircraft actively monitored across the USAF

3,110

eRCM removals since implementation (April 2019)

1233

Sensor Based Algorithm maintenance alerts issued resulting in **365** scheduled maintenance actions completed since implementation (October 2018)

576

Active users registered in PANDA

775

Aircraft platforms transistioned to the Predictive Analytics and Decision Assistant (PANDA)

16

B-1, F-15, B-2, B-52, KC-135, C-5, C-130, AC/MC-130, EC/HC-130, F-16, C-17, A-10, RC-135, HH-60, CV-22, U-2

Primary features delivered as part of PANDA release 4.1 (15 May 2023)

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COMPANY HIGHLIGHTS

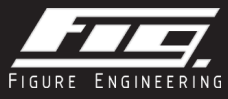
This report highlights three companies in support of our Pathways to scale pipeline phase

Aerobotix specializes in the creation of cutting-edge automated robotic solutions for high-value, high-precision components, aircraft, and vehicles. Aerobotix has more than 130 robotic systems installed in the U.S. and abroad, providing exceptional results and savings.

Perfect Point is changing the way structural maintenance is performed in the 21st century, providing a faster, safer, and better method of removing hard-metal fasteners in airframe structures and engines. Their E-Drill yields 20x productivity improvements, drives first-pass quality, reduces the cost of consumables, increases throughput ,and protects workers. The E-Drill is the only tool using Electo-Discharge Machining technology in a hand-held device. This hand tool utilizes this force-less process to remove hard-metal fasteners in mere seconds.

Machina Labs combines the latest advances in artificial intelligence and robotics to deliver finished metal products in days – not months or years – and gives customers unprecedented time to market and competitive advantage. Robotic sheet forming is the first process enabled by Machina's patented manufacturing platform. Using material- and geometry-agnostic technology, the platform outperforms traditional sheet forming methods that rely on custom molds or dies.

PARTNERSHIPS

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