



RAPID SUSTAINMENT OFFICE

Annual Report
2022

RSO



CONTENTS

04 RSO
Overview

05 Vision &
Objective

06 Our
Impact

07 Our
Process

08 Technology
Focus Areas

17 Our
Accomplishments

21 Looking
Ahead



2022

During 2022, the Air Force Rapid Sustainment Office (RSO) experienced a surge in activity, as it propelled forward with its sustainment mission. A gradual return to normalcy from fewer pandemic restrictions presented a flurry of in-person sustainment and maintenance technology demonstrations, nationwide conferences, and visits to our Hangar-01 headquarters from multiple distinguished Air Force senior leaders. The RSO also hosted its first Industry Day event, inviting small and large businesses to present technologies and tools that could potentially impact Air Force sustainment. This Annual Report highlights our innovation advancements and accomplishments during a vigorous and successful 2022.

01

OVERVIEW

The RSO was established with a sustainment-centric focus to leverage mature, new, emerging, and disruptive technologies to dramatically improve Air Force readiness. Organized with a non-traditional Air Force construct based on agile principles and a short chain of command, we pioneer the acquisition and development of innovative and cost-effective sustainment technologies and tools for the betterment of the sustainment enterprise. The RSO is located near Wright-Patterson AFB, with a robust presence in the Air Force Life Cycle Management Center's (AFLCMC) Advanced Technology & Training Centers (Dayton, OH and Warner Robins, GA).

VISION

**TRANSFORM THE ACQUISITION APPROACH
AND SUSTAINMENT ENTERPRISE VITAL TO THE
WORLD'S MOST ADVANCED AIR FORCE**

OBJECTIVE

**THROUGH AGILE ACQUISITION PROCESSES,
INCREASE MISSION READINESS AND CAPABILITIES
BY IDENTIFYING, APPLYING AND SCALING
TECHNOLOGY AND INNOVATIVE SOLUTIONS TO
ADVANCE AND MODERNIZE SUSTAINMENT
OPERATIONS OF THE UNITED STATES AIR FORCE**

OUR IMPACT

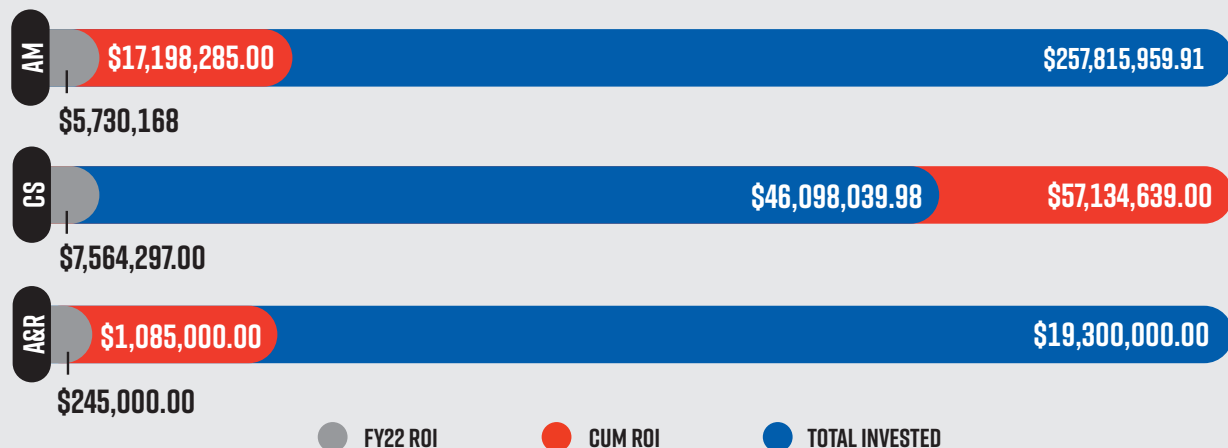
RSO RETURN ON INVESTMENT (ROI)

The Rapid Sustainment Office is exceeding ROI expectation timing from the original RSO organizational stand-up and permanence document dated only in 2020.

With the most significant short-term ROI in FY22 coming from Automation & Robotics, the most compelling long-term ROI is projected to come from Advanced Manufacturing. AM is projected to enhance USAF mission capabilities and re-imagine USAF supply chain, improving USAF readiness and providing a strategic advantage to the sustainment community.

ASSUMPTIONS/METHODOLOGY:

- AM completed 35 parts in FY22 that resulted in the net ROI.
- AM completed a Cold Spray repair on the F-15 AMAD, an A-10 fixed rear scope, and at least 35 parts on a B-1.
- AM ROI is lower due to program office's inability to catalog additively manufactured parts as "qualified for production" within the organic industrial base. The lack of published qualification standards limits the ability to qualify commercial sources of supply.
- ROI is calculated comparing purchase cost of the part via FEDLOG/DLA vs. cost to produce part via AM at AF depot locations.
- The justification to produce such parts using AM is that it creates an additional source of supply and can diminish or eliminate future supply chain gaps.
- A&R numbers only include investments and ROI on the Robotic Laser Coating Removal system.
- A&R ROI is lower due to the low utilization rates. If used to full capacity, ROI would increase.



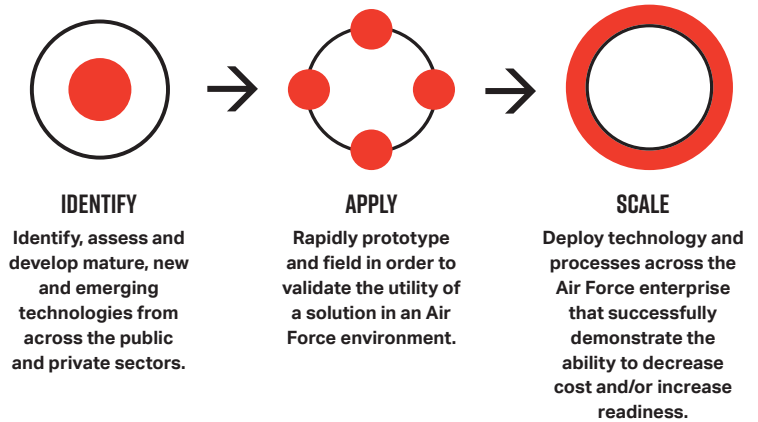
The RSO works with partners across the private and public sectors to bring the most advanced technology to the Air Force's sustainment enterprise. Some of our partners include: Headquarters Air Force, Air Force Sustainment Center, Air Force Research Laboratory, Major Commands, Federal Aviation Administration, Defense Innovation Unit, and the Defense Logistics Agency.

200+ BUSINESS DEVELOPMENT CALLS

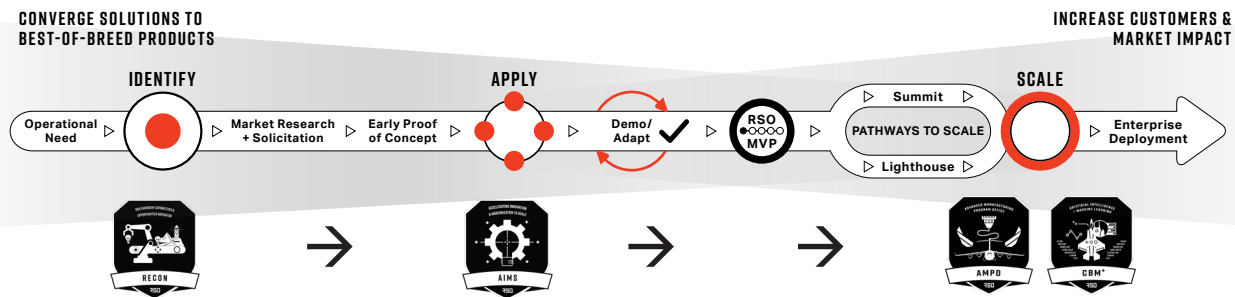
The RSO established the RSO Emergent Capabilities and Opportunities Navigator (RECON) team to accomplish critical Tech Scouting functions, including but not limited to small and large businesses and venture capital firm outreach, monitoring internal and external technology landscapes, and strategic planning and partnering. In 2022, RECON spearheaded the inaugural RSO Industry Day to scout potential sustainment solutions in support of approximately 600 USAF organizations across all MAJCOMs to leverage Air Force operational imperatives.

OUR PROCESS

Our approach is a three-step process with distinct but overlapping phases to ensure potential solutions are prototyped and tested quickly and optimized for success at scale. The RSO is focused on a set of six core technology areas where emerging and commercial technology solutions have outsized impact on increasing readiness and decreasing costs.



TECHNOLOGY MANAGEMENT PLAN



RSO PATHWAYS TO SCALE - LIGHTHOUSE UPDATE

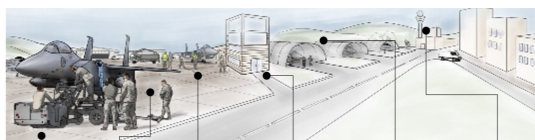
LIGHTHOUSE RSO

During 2022, the second year of the Lighthouse project, the team continued toward its goal of achieving authority to operate status for the Lighthouse Integration Technology Engine (LITE) which will evolve technology

capabilities, accomplish additional technology integrations, and transition Lighthouse capabilities from test to production environments for real-world user testing. The Lighthouse Team continued to develop and add functionality to the LITE platform, building out integration capabilities and an automated application programming interface proxy deployment framework making the platform a more scalable system. Test integrations using LITE were accomplished with several systems, including the Integrated Maintenance Data System, the Aircraft Infrastructure Readiness System

Lighthouse = Site Optimization

Integrated approach with a focus on optimizing a location to gain maximum benefits from multiple new and emerging technologies



Artificial Intelligence (CBM+) AR/VR Automation & Robotics Data & Digital Environments Agile Manufacturing Rapid/Austere MX Environments

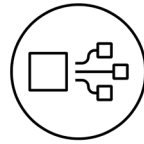
(digital flightline maintenance management tool), the Maintenance Augmented Reality System, (augmented reality work assistance), Predictive Analytics and Decision Assistant (condition based maintenance application), the TCMAX tool control system, and SnapOn tool organization technologies. The team completed standup of Snap-On Automated Tool Control hardware, including Smart Toolboxes and Smart Lockers, with the 57th Maintenance Group at Nellis AFB completing vendor training.

02

TECHNOLOGY FOCUS AREAS



Artificial Intelligence & Machine Learning
Advanced Manufacturing
Automation & Robotics
Data & Digital Environments
Augmented & Virtual Reality
Rapid & Austere Maintenance Environments



ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

We apply machine learning and artificial intelligence to optimize fleet maintenance, increase aircraft availability, and minimize aircraft downtime.

Our most prominent use of AI is our Condition Based Maintenance Plus (CBM+) program. Employing AI has enabled us to improve maintenance data quality and evaluate large sets of aircraft sensor data and maintenance history to predict component failures. These applications enable our CBM+ program to save thousands of maintenance hours every year.



CBM+

Accomplishments

- Deployed the CBM+ enterprise toolkit, Predictive Analytics and Decision Assistant (PANDA), into the Air Force's Cloud One production environment
- Achieved Authority to Operate (ATO) for PANDA
- Iteratively deployed new PANDA capabilities and features, across 3 major software releases, to over 700 Air Force users
- Delivered CBM+ forecasts and alerts to over 3200 aircraft across 16 weapon system platforms
- Enabled 500+ predictive maintenance actions with RSO-deployed forecasts and alerts
- Deployed Sensor Based Algorithm (SBA) capability in PANDA for B-1B
- Hosted CBM+ Stakeholders Summit with over 250 attendees
- Awarded a data science/engineered analytics contract to expand PANDA's enhanced Reliability Centered Maintenance (eRCM) application

2023 Opportunities

- Drive Air Force Enterprise "all-in" on CBM+ to optimize readiness impact
- Institutionalize and codify CBM+ enterprise strategies and solutions
- Expand application of CBM+ technology, tools, and process to new weapon system platforms



ADVANCED MANUFACTURING



Overview

The Department of the Air Force 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 across the Department of the Air Force to ensure continuous Warfighter advantage and readiness anytime, anywhere in the world

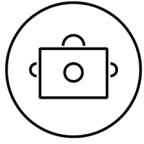
Accomplishments

- Complete initial material characterization for:
 - ULTEM 9085 and Antero 800NA on the Stratasys F900/450MC
 - AlSi10Mg and 17-4PH on the EOS M290
 - CoCrMo on both the EOS M290 and GE M2 Series 5

- Submitted two materials, ULTEM 9085 and Antero 800NA, through the Technology Assessment Process (TAP) and received one Safe-Use Determination circular from the AFLCMC Engineering Directorate on ULTEM 9085
- Delivered 44 Technical Data Packages and 12 Repair Data Packages to Program Offices for approval of procedures to use AM for part development
- Published DAF Implementation Plan data 20 January 2022, which will update annually
- Executed two technical interchange meetings hosting over 290 attendees across 60 different organizations.
- Awarded contracts for the development of the Cloud One-based Product Lifecycle Management, referred to as AGORA to explore the Next Generation Printing (Velo3D) and Laser-Assisted Cold Spray (ES3) capabilities and to establish metal printing at the Ogden Air Logistics Complex (OO-ALC) at Hill AFB, UT in order to establish a traceable advanced manufacturing data management system and the baseline infrastructure across the program supporting the needs of the Air Force
- Transitioned printers to the field:
 - Two EOS M290s (OC-ALC, Tinker AFB & OO-ALC, Hill AFB)
 - Three Stratasys 450MC (Dover AFB, Westover ARB, and Robins AFB)
 - One EOS M100 (USAF)
- Published annual training schedule and provided training to advance AM processes - 99 via online delivery, 27 in residence field level operators in order to advance AM capabilities across the CONUS/OCONUS
- Delivered four new training courses addressing scanning and modeling, material behavior, and fatigue analysis knowledge gaps in order to increase the engineering knowledge across AFLCMC and break down cultural barriers

2023 Opportunities

- Complete initial material characterization for:
 - F357 AL and NA718 Material Characterization on the EOS M290 and GE M2 Series 5
 - SS415 and NA718 on the Velo3D Sapphire
- Publish DAF 63-149 revision to incorporate repair activities under the AMPO umbrella
- Transition printers to priority #1-10 on the finalized printer priority location list
- Launch the AGORA product lifecycle management minimum viable product in Cloud One
- Award contracts to address Mobile Cold Spray (CS), Squadron-level Printing Capabilities, AM Equivalencies, Integrated Digital Engineering, Integrally Bladed Rotor Repairs, and Metal Printing Capabilities
- Continue to utilize the Commercial Solutions Offering to apply Congressional Add funding to form one or more partnerships with Industry to advance CS capabilities and achieve organic repair throughout the Air Force
- Deliver introductory-level CS training courses to facilitate the organic growth of its capabilities
- Facilitate Annual AMPO Technical Interchange Meeting and stakeholder engagements



AUTOMATION & ROBOTICS

Overview

The RSO applies 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.

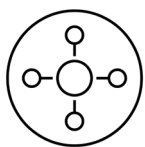
Accomplishments

- Expanded laser de-coating system efforts to additional substrate and primer types that will improve flow time by increasing areas of coverage and expanding aircraft eligible for automated de-coating operations
- Initiated robotic rapid prototyping for sheet metal forming as a potential replacement for costly and high maintenance tooling processes currently in use with a potential annual savings of more than \$2.5M per installation and part production that eliminates multiple months from the sustainment process
- Developed improved handheld Electro Discharge Machining tool for removing non-aluminum fasteners for faster and less costly repair work with a potential savings of over 200K hours per year, returning \$11M annually when fully deployed

2023 Opportunities

- Develop robotic Integrated Bladed Rotor (IBR) scrubbing for repair maintenance cost and time savings
- Replace/upgrade robotic radome de-paint and paint capabilities for improved workload through-put
- Expand robotic match drilling of aircraft replacement skins and other on-aircraft component parts
- Develop an electronic inspection tool to further aid the removal of fasteners via an Electro Discharge Machining tool previously developed
- Receive approval for on-aircraft use of parts produced with a robotic metal sheet forming cell and begin scale activity of the technology





DATA & DIGITAL ENVIRONMENTS

Overview

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.

Accomplishments

Used the FiberTRAX system to install fiber optic cable on the surface of the apron at two Nellis AFB air maintenance units (AMUs)

- Enabled hardline NIPRNet access at the Lightning AMU, providing connectivity to the F-35 Maintenance Information System ALICE
- Provided the future capability to wirelessly connect to NIPRNet at the Strike AMU
- Delivered Small Business developed Smart Tool Cabinet to support sections at Nellis and MacDill AFB
 - Reduced checkout time for tools across the AMU

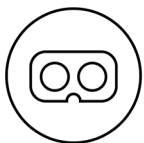




- Delivered a wireless 1553 bus reader to the AFLCMC Agile Combat Support Directorate
 - Enabled innovative aircraft diagnostic data transfer solutions
- Developed a prototype AI driven Work Unit Code (WUC) look up tool
 - Increases maintenance documentation data integrity by reducing the amount of effort required to access the appropriate WUC for a given situation
- Delivered a prototype of a system that enables a digital workflow for flight line maintenance management
 - Began an effort to field the system at Kirtland and Holloman Air Force Bases, which will demonstrate the ability for the system to save maintainers' time while improving the quality of maintenance data documentation
 - Built a prototype of digital 781 forms that are integrated with the IMDS Maintenance Information System which will enable data documentation at the point of maintenance, saving time and reducing data entry errors
 - Demonstrated integration with an Augmented Reality system which will help maintainers gain experience faster and reduce errors while accomplishing complex and rarely executed tasks
- Transitioned RPAOne to the PEO-BES RPA Center of Excellence
 - Enabled the development and maintenance of manpower saving automation tools for the Enterprise

2023 Opportunities

- Deliver mature AI solutions for rapidly accessing accurate data to improve maintenance data documentation
- Identify and implement new digital tools to improve flight line maintenance operations processes



AUGMENTED & VIRTUAL REALITY

Overview

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.

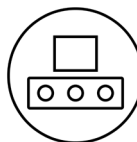
Accomplishments

- Completed Maintenance Augmented Reality System (MARS) SBIR Phase II contract, successfully achieving Minimum Viable Product (MVP) for AR work assistance tool for operational flightline and depot maintenance
- Demonstrated Paint ScannAR in live wet paint environment, accomplishing MVP and completing SBIR Phase II effort
- Awarded SBIR Phase II contract to RedShred to extract, interpret, and translate TO data to enable the seamless creation of AR work modules

2023 Opportunities

Further development of:

- Authority to Operate for the MARS
- PKI/CAC authentication and auditing
- Data capture for MARS on flightline to assess system performance and expand AR content library
- Further development of Content Transformation Pipeline to provide Airmen with low-code/no-code tools to create, edit, and sustain AR content



RAPID & AUSTERE MAINTENANCE ENVIRONMENTS

Overview

The RSO provides Airmen with effective tools, leveraging modern, cross-cutting technologies to reduce the Air Force's logistical footprint and enhance mission capability. We are working toward becoming the Air Force's leading office for rapidly implementing emerging and solution-oriented technologies in austere environments.

Accomplishments

- Achieved exceeded performance for the Solar Powered Integrated Structure (SPIS) during its deployment to four operational exercises. Currently, the SPIS is under evaluation through Defense Logistics Agency COTS Program to stock-list
- Continued development of the Hands-Off Expeditionary Tent (HEXT) for deployment at the JBER ACE exercise Polar Force 22-4 to support F-22 sortie generation
- Developed the Trac9 Advanced Deployment Aircraft Maintenance Structure (ADAMS), providing a mobile aircraft maintenance structure capable of handling low observable coatings that can be powered via traditional or generator power sources. The entire structure is easily packed for transport and rapid deployment to provide a readymade aircraft maintenance structure in remote and austere locations

2023 Opportunities

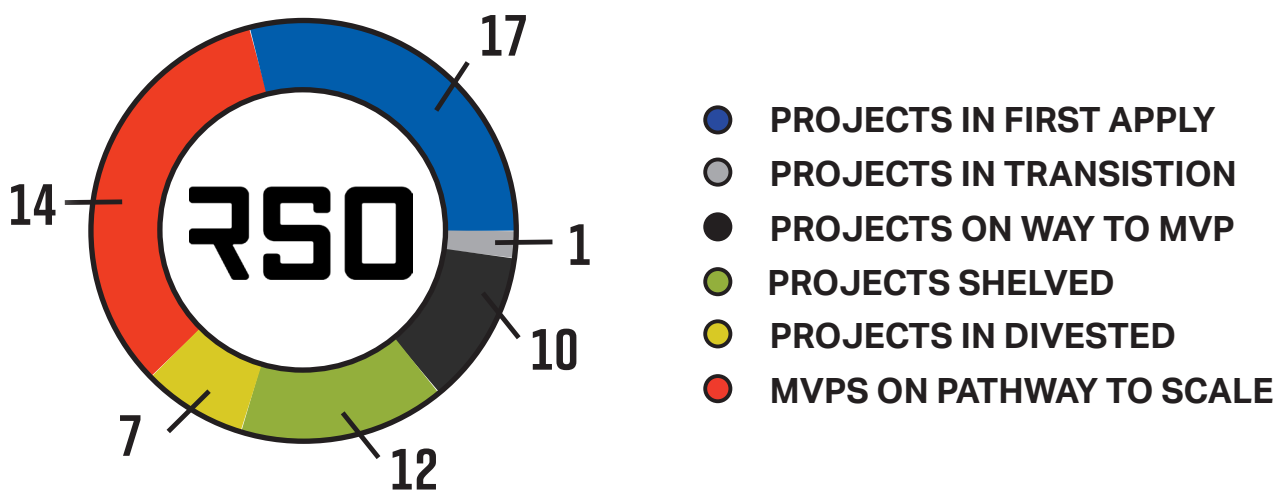
- Standup Agile Combat Technologies team that is focused on forward-deployed, agile combat employment enabling solutions to better prepare for near peer conflict
- Develop expeditionary and deployable structures to support corrosion control
- Develop rapidly deployable maintenance hangars for LO coating repairs
- Advance power generation capabilities to support operations in austere locations

03

OUR ACCOMPLISHMENTS

KEY ACCOMPLISHMENTS

The RSO identifies emerging technologies, applies and validates through rapid prototyping, then deploys and scales the technologies over time. Moving technology from one phase to another is an impressive feat that showcases the RSO's ability to rapidly deploy emerging technologies. Six AIMS projects were awarded SBIR Phase III Contracts in 2022.



2022 SIGNIFICANT EVENTS AND ADVANCEMENTS

General Arnold W. Bunch, Jr., USAF, Ret., then Commander of the Air Force Materiel Command, visits the RSO for an immersion and facility tour

JANUARY 2022



Air Force Chief of Staff, General Charles Q. Brown, Jr., visits the RSO for an immersion and facility tour

MARCH 2022

The RSO CBM+ Program Office hosts its annual Stakeholder Summit at Nellis AFB NV

MAY 2022



Chief Master Sergeant of the Air Force, Joanne S. Bass, visits the RSO for an immersion and facility tour

JUNE 2022



The RSO Product Management Team becomes the Accelerating Innovation & Modernization to Scale (AIMS) Team

JULY 2022





The RSO AMPO and AFLCMC Engineering and Technical Management Services Directorate publish the first Safe Use Determination (SUD) circular for a 3D-printed high-performance polymer, ULTEM 9085, allowing Air Force platforms to accelerate the design, test, and application of ULTEM 9085 3D-printed parts

JULY 2022

Honorable Andrew P. Hunter, Assistant Secretary of the Air Force for Acquisition, Technology, and Logistics, visits the RSO for an immersion and facility tour

AUGUST 2022



The RSO hosts Air Force Materiel Command's Spark Tank Final

OCTOBER 2022

The RSO AMPO holds its annual Advanced Manufacturing Technical Interchange Meeting

NOVEMBER 2022



The RSO hosts its inaugural Industry Day at Hangar-01

DECEMBER 2022



04

LOOKING AHEAD: 2023 SIGNIFICANT EVENTS



2023 SIGNIFICANT EVENTS

Augmented & Virtual Reality Enterprise Working Group

February 2023 | [Virtual](#)

The largest working group in the Air Force for AR/VR tech where we discuss many of the biggest projects going on for two days.

Logistics Officer Association Symposium

March 2023 | [St. Louis, MO](#)

A yearly premier event dedicated to enabling interactive exchanges among logistics, acquisition, and technology professionals from across the Department of Defense, defense industry and academia.

CBM⁺ Acquisition Stakeholder Summit

May 2023 | [Nellis AFB](#)

This Government-only event invites CBM⁺ stakeholders in the Acquisition, Engineering, and Supply Chain areas to participate in valuable presentations, training sessions, and discussions to share successes, best practices and techniques, and lessons learned, promoting unity and collaboration across the DoD CBM⁺ community.

CBM⁺ Maintenance Operations Stakeholder Summit

October 2023 | [Nellis AFB](#)

This Government-only event invites CBM⁺ stakeholders in the Maintenance Operations areas to participate in valuable presentations, training sessions, and discussions to share successes, best practices and techniques, and lessons learned, promoting unity and collaboration across the DoD CBM⁺ community.

Advanced Manufacturing Program Office (AMPO) Technical Interchange Meeting

November 2023 | [Dayton, OH](#)

This technical interchange meeting brings together the Air Force Advanced Manufacturing community to share advancements, exchange ideas and foster cooperation and collaboration among program offices, and learn more from experts in Advanced Manufacturing and Cold Spray technologies.



To contact the RSO, please email:
AFLCMC.RSO.workflow@us.af.mil