Approved for public release:
AFLCMC-2021-0056

RAPID SUSTAINMENT OFFICE

Annual Report
2020

RSO

CONTENTS

2020

2020 was a year unlike any other. COVID-19 forced everyone — including government organizations and businesses — to find innovative new ways to forge ahead with their day-to-day lives and responsibilities. In the face of unprecedented challenges, the Air Force Rapid Sustainment Office (RSO) seamlessly adapted, postponing most travel engagements and switching to 100% remote/virtual work in order to carry out its mission. This Annual Report is a testament to the RSO's dedication and drive to transform the operations and sustainment enterprise vital to the world's most advanced Air Force.

01

OVERVIEW

The RSO was established with a sustainment-centric focus to leverage both mature and emerging technologies to dramatically improve USAF readiness and warfighter capabilities. Organized with a non-traditional Air Force construct based on agile principles and a short chain of command, we pioneer innovative, cost-effective sustainment technologies and tools that keep the Air Force fleet flying.

MISSION

TRANSFORM THE OPERATIONS AND SUSTAINMENT ENTERPRISE VITAL TO THE WORLD'S MOST ADVANCED AIR FORCE.

OBJECTIVE

INCREASE MISSION READINESS BY IDENTIFYING, APPLYING, AND SCALING PROVEN SOLUTIONS AT THE SPEED OF RELEVANCE TO ADVANCE THE OPERATION AND SUSTAINMENT OF THE UNITED STATES AIR FORCE.

OUR IMPACT

The RSO works with partners across both private and public sectors to bring the most advanced technology to the Air Force's sustainment enterprise. Some of our partners include: Defense Innovation Network (DIN), AF Ventures, Army, Navy, and U.S. Marine Corps.

600+ ORGANIZATIONS

The RSO now works with over 600 organizations in the Air Force, a 1400% increase over 2019.

1530 TAILS

In 2020, RSO more than doubled the number of tails with RSO technology onboard, across 27 platforms.

50 STATES

The RSO expanded from 25 to all 50 states, working with USAF customers, partners, and private contractors to deliver sustainment solutions to the end user.

15X MULTIPLIER

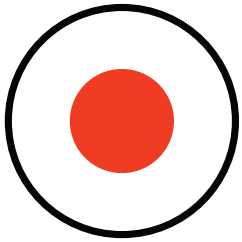
The RSO is working to ensure Air Force budgets go further and work harder. Selective investment in companies with advanced R&D across the RSO's six focus areas has led directly to a 15x multiplier on every dollar invested.

92% EVENT SATISFACTION RATING

4,284 people registered for the RSO's inaugural Advanced Manufacturing Olympics. 92% of attendees stated that they were satisfied with the event's ground-breaking demos, technical challenges, and networking and collaboration opportunities.

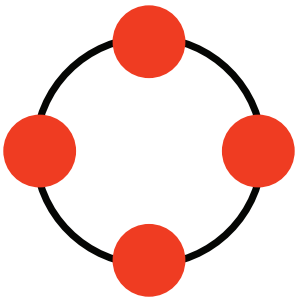
OUR PROCESS

Our approach is a three-step process with distinct but overlapping phases. It ensures that potential solutions are prototyped quickly, 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 an outsized impact on increasing readiness and decreasing costs.



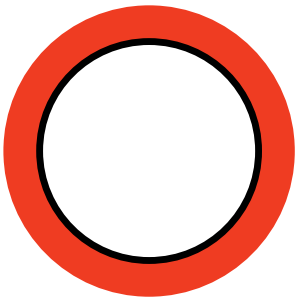
IDENTIFY

Identify, assess, and develop mature and emerging technologies from across both public and private sectors.



APPLY

Rapidly prototype and field solutions in order to validate their utility in an Air Force environment.



SCALE

Deploy the technologies and processes that successfully decrease cost and/or increase readiness across the Air Force enterprise.

02

TECHNOLOGY FOCUS AREAS

ARTIFICIAL INTELLIGENCE & MACHINE LEARNING

Overview

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

CBM+

The Condition-Based Maintenance Plus (CBM+) program is RSO's AI-powered solution for the maintenance needs of the entire Air Force. We're able to improve maintenance data quality and evaluate large sets of aircraft sensor data in order to predict and prevent component failures before they happen. CBM+ already saves thousands of maintenance hours each year.

Accomplishments

- Fielded CBM+ to over 1,000 aircraft in USAF fleet
- Trained over 500 maintainers on CBM+
- Removed over 300 parts before they failed
- Saved 5,000 hours of troubleshooting time
- Launched data analysis on 12 new platforms
- Fielded CBM+ on 4 new platforms – F-15, B-52, AC/MC-130, and C-17

2021 Opportunities

- Scale CBM+ to 22 total platforms
- Explore and invest in CBM+ tools and enablers

ADVANCED MANUFACTURING

Overview

The RSO Advanced Manufacturing (AM) program office works to identify, develop, transition, and scale AM technology to the entire Air Force. The AM program office will leverage both emerging and mature technology to reduce operations and support costs and improve readiness.

Accomplishments

- Delivered 1,547 AM metal and polymer parts (59% increase to 2019 total)
- Deployed 229 parts on various airframes (50% increase to 2019 total)
- Delivered 229 Technical Data Packages (76% increase to 2019 total)
- Awarded contract to develop design concept and prototype of AM scaling solution
- Hosted first Air Force Advanced Manufacturing Olympics event with 4,200+ registrants

2021 Opportunities

- Finalize AM prototyping efforts and downselect; obtain approval on field solution
- Conduct government selection process for AM gatekeepers supporting selected scaling solutions
- Deploy AM technology solutions across the enterprise; establish fielding plan for post-AMO contract awards
- Increase demand signal and throughput for TDP development

AUTOMATION AND 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

- Initiated laser and sensor package update for F-16 maintenance at Hill AFB, reducing in-process time and resulting in 33% throughput capacity improvement
- Expanded laser de-coating system efforts to other weapons platforms targeting F-35 JSF, F-22, A-10, and others
- Launched electrical fighter tug program to reduce noise and air pollution

2021 Opportunities

- Approve handheld laser coating removal capability for aircraft use
- Develop robotic laser coating removal capabilities for wide-body aircraft systems
- Integrate AI/ML advancements into current coating processes
- Introduce robotic rapid prototyping for sheet metal forming

DATA & DIGITAL ENVIRONMENTS

Overview

We are standardizing maintenance and sustainment data collection to serve as a connector of data sources across the U.S. 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

- Deployed 5 Robotic Process Automation (RPA) efforts deployed, utilizing 15 robots, to the 1st SOW at Hurlburt Field, saving over 600 Airmen hours on flight-crew authorizations and over 2,000 Airmen hours on range scheduling.
- Successfully demonstrated an MVP with the 58 AMXG (Kirtland AFB), incorporating two maintenance procedures in the Digital Maintenance Execution System. Effort showcases functional usage of digitally parsed Tech Orders.

2021 Opportunities

- Apply RPA towards Government Purchase Card Process — 3 Robots — TBD Awaiting Deployment
- Apply RPA to MICAP Data Visualization at Scott AFB
- Expand 58 AMXG MVP across 19 AF and AETC units and support for 57th Wing at Nellis AFB

AUGMENTED REALITY/ 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

- Created the new AR/VR Product Team
- Established long-term strategic vision for AR/VR integration
- Successfully demonstrated AR/VR technologies for both maintenance training and operations on B-1 and CV-22 platforms

2021 Opportunities

- Design ruggedized flight line headsets
- Introduce scalable and adaptable support equipment
- Integrate audio into AR environments
- Develop a framework for IIOT connectivity and integration
- Apply machine vision to data logging
- Introduce recognition AI to safety assistance/working

RAPID & AUSTERE MAINTENANCE ENVIRONMENTS

Overview

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

Accomplishments

- Solar Powered Expeditionary Canopy System successfully deployed during operation "Rapid Lizard," meeting the requirements for being off generator power continuously for 5+ days
- In-line solar panel/battery supply system compatible with existing mil-spec generators provides supply resiliency in austere locations and contested environments while reducing logistical footprint and fuel cost
- Wireless mesh radio network successfully deployed at 60 MXG (Travis AFB) providing WiFi flight line connectivity and access to GO81 to support maintenance of C-5M, C-17, and KC-10

2021 Opportunities

- Enhance current Solar Powered Expeditionary Canopy Systems to meet contingency response team requirements in support of AFSPC
- Develop rapidly constructed maintenance structures for aircraft shelter for PACAF
- Expand application of wireless mesh-radio to AFSOC
- Develop expeditionary and deployable structures to support corrosion control

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OUR ACCOMPLISHMENTS

KEY ACCOMPLISHMENTS

The RSO identifies emerging technologies, applies and validates them through rapid prototyping, then deploys and scales the successful 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. In 2020, the RSO identified 132 promising technologies and advanced 35 to the Apply phase, representing an 85% and 170% increase year-over-year, respectively.

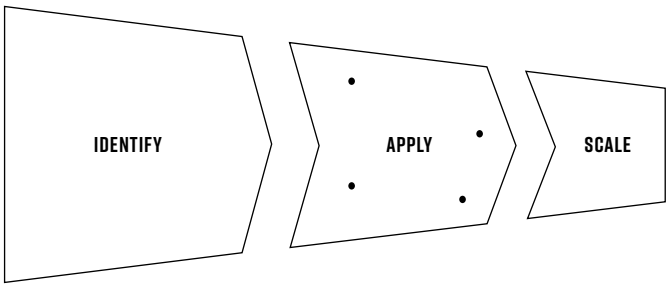
DECEMBER 2018

Identify (0)

Apply (4)

1 AI/ML - CBM+
2 Advanced Manufacturing
1 Automation + Robotics

Scale (0)



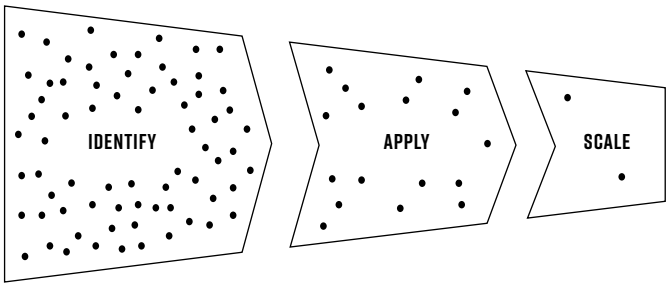
DECEMBER 2019

Identify (70)

Apply (17)

1 AI/ML - CBM+
5 Advanced Manufacturing
0 Automation + Robotics
4 Augmented + Virtual Reality
2 Rapid + Austere Environments
5 Digital + Data Environments

Scale (2)



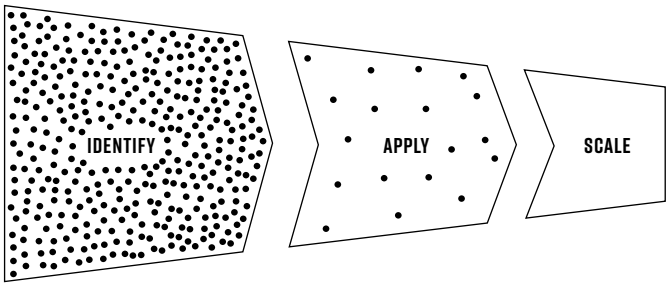
2020 RSO PORTFOLIO

Identify (358)

Apply (18)

1 AI/ML - CBM+
5 Advanced Manufacturing
4 Automation + Robotics
2 Augmented + Virtual Reality
4 Rapid + Austere Environments
3 Digital + Data Environments

Scale (0)



KEY ACCOMPLISHMENTS

Strategy and Implementation

15X OUTSIDE INVESTMENT

Harnessed by RSO

Funding

SECURED AND AWARDED

15 new Apply efforts

Innovation Funnel

85% INCREASE

In Apply projects

Technology Areas

SCALING IN PROGRESS

Following overwhelming demand signal

Organization

SECRETARY OF THE AIR FORCE APPROVED

RSO is now a permanent Air Force office

SCALE PROGRAMS

Advanced Manufacturing

Condition Based Maintenance Plus (CBM+)

2020 Advanced Manufacturing Olympics

12K

Views on one presentation

4284

Registrations

92%

Event satisfaction rating

22M

Social media impressions

AMO 2020

The RSO successfully held its inaugural Advanced Manufacturing Olympics (AMO) in October 2020 with a total of 4,284 registered participants. This groundbreaking four-day virtual event included 239 technical challenge team members, 62 vendors, and 23 judges from industry, academia, and government. 11 universities were also represented.

The objective of AMO was to quickly identify technology and process solutions to existing pain points by leveraging five technical challenge competitions. The technical challenges were designed to promote collaboration and increase awareness of RSO scaling efforts among the broader manufacturing ecosystem.

The RSO AM team developed a contracting strategy to quickly on-board technology solutions to scale AM across the Air Force sustainment enterprise; anticipating awards beginning in 2QFY21. AMO served a vital role in accelerating the AM innovation pipeline, specifically the Identify phase. Post-AMO, the AM program office is focused on accelerating the Apply & Scale phases of the pipeline.

All AMO videos are hosted on the AFRSO website. Everything from the technical challenges to panel discussions to keynote speakers are available for viewing in 30–60 minute segments:

https://www.afrso.com/advanced-manufacturing-olympics/video-hub

AMO 2020 TECHNICAL CHALLENGE WINNERS

TDP RELAY

Accurately recreate a 3D printed part from an existing Technical Data Package using innovative techniques, all while demonstrating accuracy, skill, and completeness.

The Winners:

Gold: MakerGear

Silver: W.M. Keck Center for 3D Innovations at UTEP

Bronze: Electroimpact

BOX OF PARTS

Accurately re-engineer a part without an existing plan, ultimately identifying hands-free scanning for rapid and accurate reverse engineering capabilities.

The Winners:

Gold: NIAR at Wichita State University

Silver: Aero Design, LLC

Bronze: 3D Printing Colorado

MATERIAL HURDLES

Identify and demonstrate new developments in aluminum, polymer, and combination or hybrid technologies. Test the strength of materials, ingenuity of design, and ease of use of proposed solutions in order to ultimately identify new aluminum materials.

The Winners:

Gold: Castheon, Inc.

Silver: University of Waterloo and The Barnes Global Advisors, LLC

Bronze: Elementum 3D, Inc.

AMO 2020 TECHNICAL CHALLENGE WINNERS

APPROVAL SPRINTS

Identify innovative strategies for rapid design, qualification, and deployment of sustainment solutions which leverage new manufacturing materials, processes, and components to bring radical change to Air Force certification methods and timelines.

The Winners:

Gold: Stress Engineering Services, Inc., Origin, & nTopology, Inc.

Silver: Stratasys

Bronze: NIAR at Wichita State University

SUPPLY CHAIN MARATHON

Develop the use of novel advanced manufacturing concepts coupled with innovative Supply Chain Management (SCM) approaches in order to propose the best basing strategy that satisfies the most warfighter requirements, and delivers parts on-time and on-schedule.

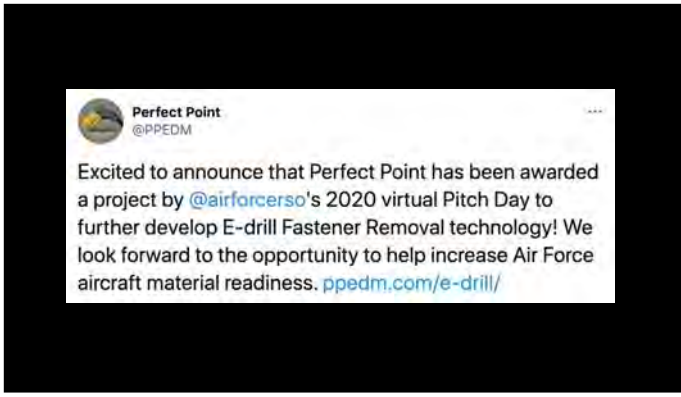
The Winners:

Gold: SIMBA Chain

Silver: Stratasys

Bronze: Boeing Global Services

CONGRATULATIONS TO ALL AMO 2020 TECHNICAL CHALLENGE MEDALISTS! THANK YOU FOR YOUR HARD WORK AND COMMITMENT.



PITCH DAY OVERVIEW

Overview

The RSO successfully hosted two Pitch Days in 2020. After a comprehensive 45-day down-select process, companies were invited to present their solutions to the RSO team and 15 companies were awarded prototype contracts.

Months (Phase I idea to $1M Phase II Apply effort)

3-4

Companies Proposed

2,200

Phase 1 SBIR Contracts

132
Companies responded

28
Contracts awarded

Prototype Contracts Value

$18M

Pitch Days 2021

Building on 2020 successes, the RSO is planning two Pitch Days in 2021 — one SBIR 20.3 Phase II Pitch Day and one Defense Industrial Base Open Pitch Day.

PITCH DAY AWARDED COMPANIES

ADVANCED MANUFACTURING

VivSoft Technologies, LLC	VivSoft Technologies's solution allows 3D printing stakeholders to collaborate and fix issues using a secure workflow that supports integrations between service requests, procurement workflows, and predictive maintenance.
Keystone Synergistic Enterprises, LLC	Keystone's solution will provide whole-part metrology-grade measurements, including sharp edges, in one digital model. It improves throughput and lowers sustainment costs for maintenance, repair, and operation of F-22 and F-35 engines.
Optomec, Inc	Optomec will adapt their current commercially available laser cladding system to cost effectively meet the USAF requirements for the automated repair of engine components.
NextGen Balancing Technologies, LLC	NextGen Balancing Technologies will develop and implement improved fixturing technology that increases the accuracy and repeatability of rotor balancing.

AUTOMATION AND ROBOTICS

Paragon Robotics	Paragon Robotics will replace traditional tester cabling used to connect an aircraft's avionics system with a dedicated tester device with wireless tester links. It will provide significant benefits to the Air Force, including substantial sustainment cost reductions and safety improvements due to the elimination of trip hazards.
TeraMetrix	TeraMetrix's effort will result in a 50% cost reduction and ruggedization of their TeraHertz scanner, which is used to measure complex paint coating stacks on 5 th-generation aircraft.
Perfect Point	Perfect Point's patented handheld tool harnesses the power of Electro Discharge Machining. It removes aircraft and engine fasteners at less than half the cost of traditional methods, in a fraction of the time required, and with a damage rate of less than 0.1%.
Wilder Systems	Wilder Systems' manufacturing robot (AMR) automates the most labor-intensive and error-prone processes regarding rivet drill out by using high-precision lasers and computer vision to locate rivets. It's accurate within thousandths of an inch, without deviation from center.

AUGMENTED REALITY / VIRTUAL REALITY

ARCS Aviation ARCS Aviation will integrate a terahertz scanner and augmented reality glasses to measure the thickness of paint on metal surfaces using electromagnetic waves. It will then report results and provide a heat map to show paint thickness.

DATA & DIGITAL ENVIRONMENTS

Traxyl Traxyl's FiberTrax technology is a low-profile cable bonded to ground surfaces which essentially "paints" fiber-optic communication lines directly onto pavement of flight lines in high-traffic areas exposed to heavy aircraft operating at maximum tire pressures.

RAPID & AUSTERE MAINTENANCE ENVIRONMENTS

C360 C360 will create an immersive, real-time, and one-to-one engagement with visual imagery by integrating a stereoscopic camera system with an Explosive Ordnance Device team's robot vision system.

Huckworthy Huckworthy will develop a self-healing wireless mesh network that can operate outside anywhere on the flight line, giving the operator Wi-Fi and wired access to a Layer 2 IP network. These communications will allow airmen to use laptops, databases, live collaborative communications tools, and live reporting tools during maintenance on the flight line.

Asylon Asylon's truly autonomous drone system can be rapidly deployed in both CONUS and austere locations for coordinated installation security.

Pvilion Pvilion will adapt prototypes of its highly mobile, rapidly assembled Autonomous Structure system, HEXT. It's a proprietary folding and unfolding system coupled with a lightweight compact frame fully integrated into the structure of tactical shelters to support USAF and USSF personnel and equipment for electronic warfare, additive manufacturing and expeditionary benefits.

Green Magic Homes Green Magic Homes will deliver a rapidly deployable hurricane resistant structure that can be deployed to austere locations to support low observable coating repairs and various other maintenance actions.

04

2021 SIGNIFICANT EVENTS

2021 SIGNIFICANT EVENTS

CBM+ User's Summit

June 2021 | Nellis Air Force Base, Nevada

This Government-only event invites CBM+ stakeholders to participate in valuable knowledge sharing presentations, training sessions, and discussions to share success stories, best practices, and lessons learned, promoting unity and collaboration across the DoD CBM+ community.

Pitch Days

July 2021 | SBIR 20.3 Phase II Pitch Day | Hangar 01

2021 | DIB Open Pitch Day | Hangar 01

To ensure the RSO sources the most advanced technology, the organization plans to host Pitch Days for startups and commercial companies across the country. Building on 2020 successes, the RSO is planning two additional Pitch Days in 2021.

Launch of RSO Sustainment Lighthouse

All of 2021

Launching standup of the Air Force's first sustainment Lighthouse, integrating numerous innovative Industry 4.0 technologies into a single location to generate transformative performance improvements from the synergy between solutions.

Advanced Manufacturing Gatekeeper Selection

TBD 2021 | Virtual

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To contact the RSO please e-mail:
AFLCMC.RSO.workflow@us.af.mil