Company Overview

2021

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About Micro Aerospace Solutions

Established in 2000 on Florida's Space Coast, MAS is a business leader in providing low cost small satellite solutions. We specialize in engineering services and products including communications, electrical, mechanical, propulsion and software systems with an eye towards human-centered design.

We are a proven leader in space systems, thruster design, propulsion systems, attitude control, command & data handling, and communications systems for small spacecraft. Additionally, we offer spacecraft and electrical system circuit board design providing layouts for microcontroller systems, environmental control, navigation & tracking, imaging systems, scientific sensors & display systems. Our diverse customer base spans across the globe yielding solid partnerships with prominent academic institutions, multiple government agencies and leading aerospace companies.
“We Provide Low Cost Innovative Small Satellite Solutions”

- Small business established in 2000
- Headquartered in Melbourne, FL
- Near NASA KSC
- Offering testing facilities in both FL & CA
- CASIS Implementation Partner

Propulsion Systems

Avionics, Software & Communications

Prototype Development & Testing

Space R&D
**Propulsion Systems**

Our propulsion systems include warm gas, hydrogen peroxide and hydrazine solutions tailored to the CubeSat (3U to 27U) satellite and small launch vehicle market. We also provide propulsion R&D services for a variety of systems such as gels, aerospikes, unique bi-props and hybrids.

**Communications Systems**

Micro Aerospace Solutions is developing Ka- and Ku-band transceiver systems to allow data to be transmitted to and from small satellites at high data rates (>1Gbps). These products are small size and low-power yet highly capable products for this growing market.

**Avionics, Software & Electronics**

We take commercial off the shelf (COTS) electronics and apply them to space applications. We have developed Inertial Measurement Units for NASA, Air Force and MDA flight systems. Our software process is NASA/CMMI compliant.
Micro Aerospace Solutions is developing a Small Satellite Innovative Manufacturing Capability on Florida’s historic Space Coast.

Business Strategy

Continuous Improvement for Growth, Low overhead, space connections and partnerships.

Micro Aerospace Solutions Core Business Functions

- Propulsion Systems
- Avionics, Software & Communications
- Prototype Development & Testing
- Space R&D

Small Satellite Manufacturing
Business Edge

Offering a diverse portfolio of “Low Cost” multi-domain capabilities

• ISO9001:2008 Compliant
• ITAR Compliant
• 7150.2A/ CMMI Level II Compliant
• NASA Mission Critical Software Compliant
• SATOP Best Performing Silver Star Partner
• High performance Lean Six Sigma Business Foundation
• Global presence & customer base
• Six Sigma Lean
Our propulsion system expertise involves designing, developing and testing propulsion systems.

We have experience interfacing with vendors for system components including valve, electronics and machine shop suppliers to ensure timely system development.

MAS offers patentable propulsion system technologies.
Tridyne Propulsion

MAS designed, developed, built a unique tridyne warm gas propulsion system for small satellites

- 0.050N to 20 N Warm Gas Thrusters
- Same ease of use and safety as cold gas
- Twice ISP of cold gas (140 sec)
- Uses a catalyst to generate hot gas
- Low power
- Prototype systems in testing
- Flight certification testing to start
- Smallsat/Cubesat and launch vehicle applications
Hydrogen Peroxide Propulsion

MAS designed, developed, built a variety of monoprop hydrogen peroxide and bi-prop hydrogen peroxide/kerosene propulsion systems

• 0.050N to 2000 N hydrogen peroxide-based systems
• Our bi-prop systems decompose hydrogen peroxide when it passes over the catalyst generating high temperature water vapor and oxygen
• The temperature of this decomposition is high enough that the RP-1 autoignites.
• Provides a very simple bi-propellant propulsion system with performance over 300 seconds in a vacuum.
Other Propulsion Systems

- Other systems include hydrazine, cold-gas and gel-based systems
- We can test and develop a variety of propulsion systems including micropropulsion and launch vehicle aerospike systems
Avionics, Software & Communications

- Design, built, tested and flown radiation tolerant, low-cost electronics for space applications
- Microcontroller systems, control systems, imaging systems, scientific sensors and display systems
- Implement radiation mitigation techniques to allow commercial electronics to be used in space applications
- Developed nanosat steerable antenna systems
- Ku/Ka, X and S-band small satellite transceivers
- Designed electronics systems for military space applications
NASA Certified Flight & Ground Software Development

- Micro Aerospace Solutions is compliant with all NASA mission critical software requirements including NPR 7150.2A, NASA-STD 8719.13, and NASA-STD 8739.8
- PRCU verified ISS EXPRESS Rack interfaces for ISS experiments
- Flight and ground control and command software
- Tablet-based decision support systems for space & scientific exploration
- Developed software for Zero-G airplane flight experiments
MAS Inertial Sensors

- Flight heritage
- Low power
- Flexible and configurable
- Inertial sensors (gyros and accelerometers)
- Capable of controlling triggered events (time, acceleration, etc.)
- Space-rated GPS integrated package available
- Serial output to computer or transmitter
MAS IMU Product Line

- Micro Aerospace Solutions has developed MEMS-based inertial sensor technology into inertial measurement units (IMUs) for small satellite attitude detection systems.

- Developed the MASIMU01, MEMS-based inertial measurement unit which flew in space on the University of Texas’ FASTRAC microsatellite for the Air Force Research Lab (AFRL).

- Continued product line with flight systems since then on smallsats and military system.

- Developed specialized units for a variety of aerospace applications.

- ITAR Compliant Licensed for Export.
MDA Attitude Detection and Telemetry System

- Provide pressure, temperature inertial data on a target device
- Design, develop, build and test pyro system controller and telemetry processing system
- Send data to ground using an S-Band link
- Suborbital trajectory flown at ~200km peak altitude
- Work with MDA and foreign ally to receive data at ground station in country
- Completed certification and test program using MAS facilities
- Successful flight in 2016
Small Satellite Communications

- Ku/Ka-band communications system product being developed will enable high speed (Gbps) communication from cubesats
- Ku/Ka transponder and transceiver systems
- Deployable and steerable small satellite antenna technology

“MAS has developed technology that will revolutionize communications for the small satellite and cubsat community”

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Transponder</th>
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<tr>
<td>Tx Frequency</td>
<td>18.7 - 20.7</td>
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</tr>
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<td>Rx Frequency</td>
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Propulsion System Testing

- Design, built and tested a variety of propulsion system technologies
- Gel-based systems
- Hydrazine and tridyne catalyst development
- Compatibility testing
Space System Testing

- EMI/EMC Testing
- Vibration Testing
- Thermal-vacuum testing
- GPS simulator testing
Micro-scale Fluorescent Activated Cell Sorter (FACS)

Developed technology for growth of human tissue in space

Flew microbial growth experiments on cubesats
International Space Station Experiments

Plant growth experiments
- Engineering design, software development and testing for multiple plant growth experiments that have flown on ISS

NASA Ames Bioculture System
- Developed flight software and provided engineering support for human cell incubator flight experiment. Continuing sustaining engineering (multiple flights)

University of Florida Electrodeposition
- Developing experiment optical and electronics systems and flight software.
- Providing testing and Engineering support

Metal 3D printing in space
- Providing electrical system design and software development services as well as testing and verification
Advanced Manufacturing

1. High Precision Components, Assemblies and Complex Structures used in Aviation, Aerospace, Deep Space, Defense, Heavy Engineering and Nuclear Engineering: Radar Cooling Assemblies, Compressor Rotor-Stator blades (with 4 axis and 5 axis machining), Titanium based center piece and rotating swashplates for helicopters.

2. Manufacturing of specialized optics for Defense and Space Application such as Multi-Fold Lenses, Metal Mirrors, Optical Reflectors, Diffractive Gratings and Antennas.

3. Specialized Machinery for Metal Additive Manufacturing with Tooling of Carbide, High Speed Steel, Polycrystalline Diamond, Cubic Boron Nitride.

4. We have established a robust interdisciplinary team with “decades” worth of space engineering and manufacturing experience and with access to advanced aerospace engineering facilities for designing, fabricating and characterizing 3D printed components and assemblies used in space propulsion.
Advanced Manufacturing

The timeline, budget and the project goals would govern the number of engineering development iterations because it accounts for the porosity, grain sizes-distribution, the fracture mechanics and residual stresses of the 3D printed structures.

Currently we are developing a semi-automated Metal 3D Printer to operate in low gravity environments to be used on board the manned and unmanned space vehicles.

In the coming future, we would leverage our capabilities for commercial space activities such as mining (including drilling machinery), materials processing (including milling, grinding), Chemical Engineering (such as crystallization, recycling) and Metallurgy Process Operations (such as extraction).
The Future

Small Satellite Manufacturing

• Developing manufacturing capabilities strategically located on Florida’s Space Coast to manufacture small satellites and related systems to meet the growing needs of New Space
• In communication with Space Florida about their synthetic leasing for manufacturing in Florida program

Planning for the Future: Innovation & Growth
Outreach

Micro Aerospace Solutions is committed to investing in the next generation of young thinkers, scientists & engineers. We partner & support various organizations, schools and universities by providing opportunities through funding, internships and mentoring. We invest in future generations to fuel the passion for science!
Summary

• Micro Aerospace Solutions is celebrating 20 years of diversified engineering experience & capabilities with specialized expertise in the space domain
• We provide low-cost solutions backed with our years of space experience and access to unique space coast engineering and test assets
• We pride ourselves in the ability to solve complex challenges
• We deliver innovative solutions to enable our customers to efficiently propel their products to market