Fly with us

to deep space

and back...

Alpha CubeSat

The Mission

The first mission of the Alpha CubeSat heritage will set an operational precedent for nanosatellites through: technology demonstration, deep space communication, launch & deployment, maneuvering, and lunar orbit. Success will occur through a combination of competition and cooperation.

The Alpha CubeSat Team is out to win the NASA Cube Quest Challenge. The Cube Quest Challenge, sponsored by NASA's Space Technology Mission Directorate Centennial Challenge Program, offers a total of $5 million to teams that meet the challenge objectives of designing, building, and delivering flight-qualified, small satellites capable of advanced operations near and beyond the moon.

> Alpha CubeSat will secure cheap and on demand access to space. With the use of new launch and deployment methods, the door for other nanosatellites' access to orbit will be blown open!

Alpha CubeSat will demonstrate innovative satellite instrumentation while following progressive, low-energy trajectories to reach a deep space altitude of 4 million km (about 10x farther than the moon!) before returning to the moon and establishing a strategic resonance orbit.
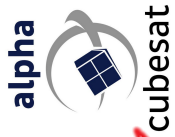
Design freedom and launch options afford an intrepidity lacking in new satellite missions: the courage to prove never flown before instruments, demonstrate efficient experimental orbits, and develop new launch opportunities for future cubesats.

Innovative trajectories and orbits will provide high definition access of the moon's surface as well as backup communication provisions for independent space missions.

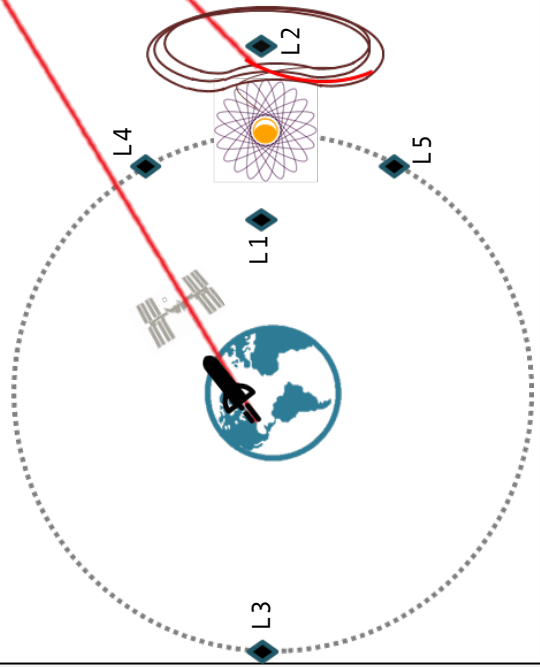Xtraordinary Innovative Space Partnerships, Inc. (XISP-Inc) is the founding sponsor of Alpha CubeSat.

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The Trajectory

alpha cubesat

Deep Space Derby

4,000,000 km from the Earth

Lunar Derby

L2 halo orbit deceleration

transitions to Lunar resonance orbit

Notional alternate minimal energy

trajectory for Alpha CubeSat

Not to scale

L1

L2

L3

L4

L5

Alpha CubeSat Design

6 U CubeSat — 10cm, 20cm, 30cm
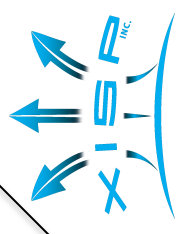
STRUCTURE

6U (10cm x 20cm x 30cm) CubeSat with deployable solar arrays. Nominal Mass 14 kg as constrained by NASA CubeQuest Challenge requirements.

COMMUNICATIONS

Ka Band is the frequency baseline for communications and should provide certainty with data acquisition during flight. The use of a new Ka Band nanosatellite transceiver will be one example of new technology to be demonstrated onboard Alpha CubeSat.

PROPULSION

A combination of low-thrust-long-duration and high-thrust-short-duration propulsion systems will be used by Alpha CubeSat after deep space trajectory insertion. A combination of Ion, electric, chemical, and thermal thrusters will be used to provide low-thrust-long-duration propulsion capabilities. In addition, the use of a high-thrust-short-duration propulsion system is baselined for high thrust trajectory maneuvers if required. An in-line hybrid Nitrous Oxide and Acrylic/Paraffin propulsion system and use of the International Space Station (ISS) in-situ resources are the leading alternatives at this time.

THERMAL

Alpha CubeSat will spend most of its life after leaving LEO in full sun. To manage thermal changes- likely scenarios include the need to turn the transmitter on often enough to help keep the satellite warm and to turn it off/throttle when it is in danger of overheating. Passive systems such as shading, coloring, selective placement of system/subsystem components as well as some active deployment of shades and louvers are being designed into the system.
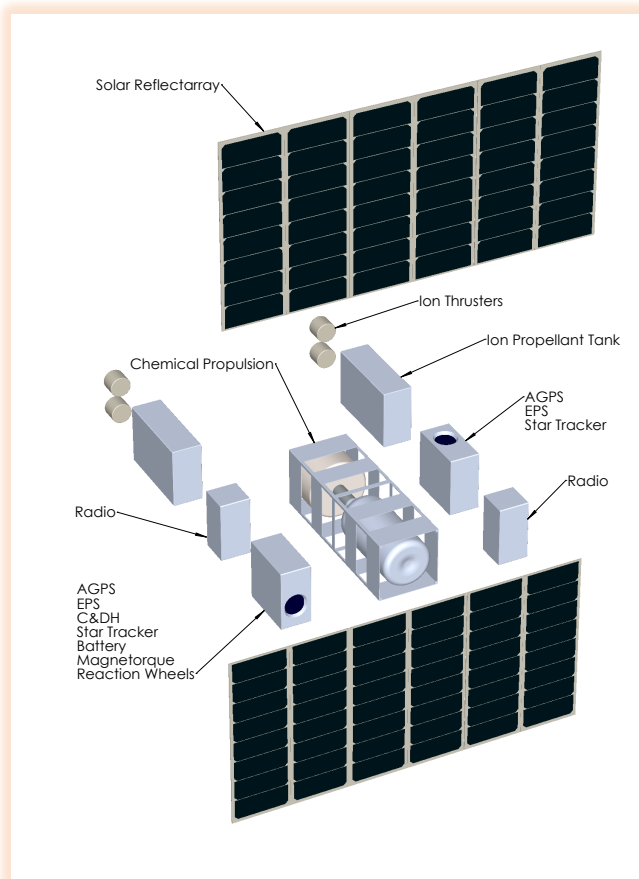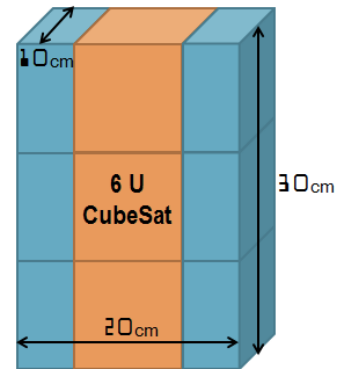
To learn more details about our design contact us at info@alphacubesat.com or call (301)-509-0848.

Alpha CubeSat Flight

LAUNCH and DEPLOYMENT

The largest number of launch opportunities for CubeSats would be afforded by being manifested as ISS commercial cargo.

Baseline: Soft Pack Pressurized International Space Station (ISS) Cargo & ISS IntraVehicular Activity (IVA) Japanese Experiments Module (JEM) airlock transition to ExtraVehicular Robotic (EVR) Low Earth Orbit to Deep Space and CIs-Lunar Trajectory Insertion.

Alternate 1: EVR Deployed Unpressurized ISS Cargo & ISS logistics storage (JEM back porch) to EVR Low Earth Orbit to Deep Space and Cis-Lunar Trajectory Insertion.

Alternate 2: Leverage the expanding fleet of expendable launch vehicles such as secondary payload on SpaceX's Falcon 9, OrbitalATK's Antares, ULA's Atlas/Delta/Vulcan, or NASA's SLS Secondary Cargo & the Payload Planetary Services Systems release mechanism.
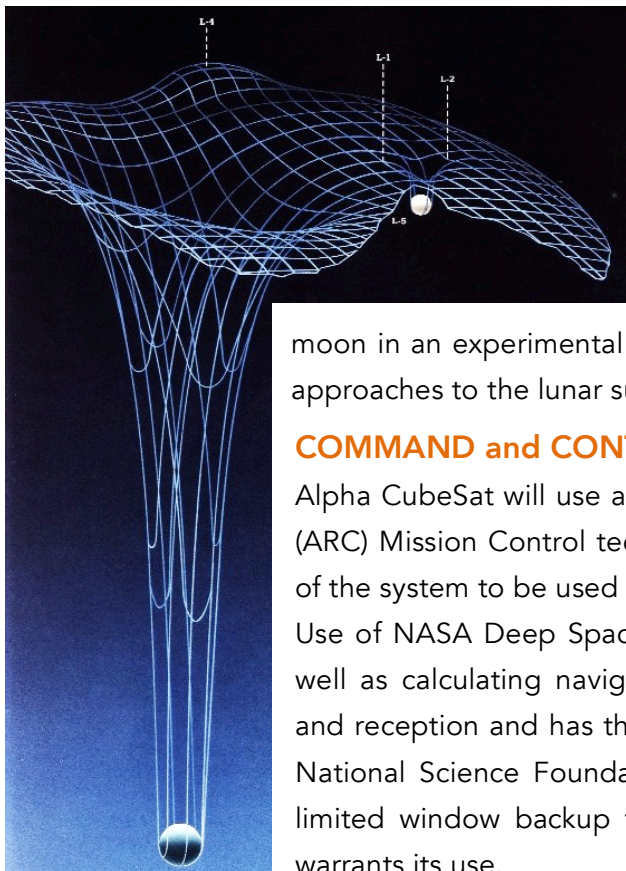
TRAJECTORIES

Inspired by Dr. Edward Belbruno and the late Dr. Robert Farquhar's trajectories for the ISEE-3 spacecraft, Alpha CubeSat will fly to an altitude of 4 million km using minimal fuel and taking advantage of the Earth-Moon gravity wells and Lagrange points. The ultimate goal is to orbit the moon in an experimental resonance orbit that will provide 50+ years of close approaches to the lunar surface with minimal orbital maintenance!

COMMAND and CONTROL

Alpha CubeSat will use an augmented set of the NASA Ames Research Center (ARC) Mission Control technologies suite enabling a near realtime state model of the system to be used to manage all command, telemetry, and data streams. Use of NASA Deep Space Network (DSN) is baselined for all transmissions as well as calculating navigation elements. DSN supports Ka band transmission and reception and has the largest number of readily available ground stations. National Science Foundation's Arecibo Observatory has been identified as a limited window backup facility in the event of an emergency condition that warrants its use.

To learn more details about our concept of operations contact us at info@alphacubesat.com or call (301)-509-0848.
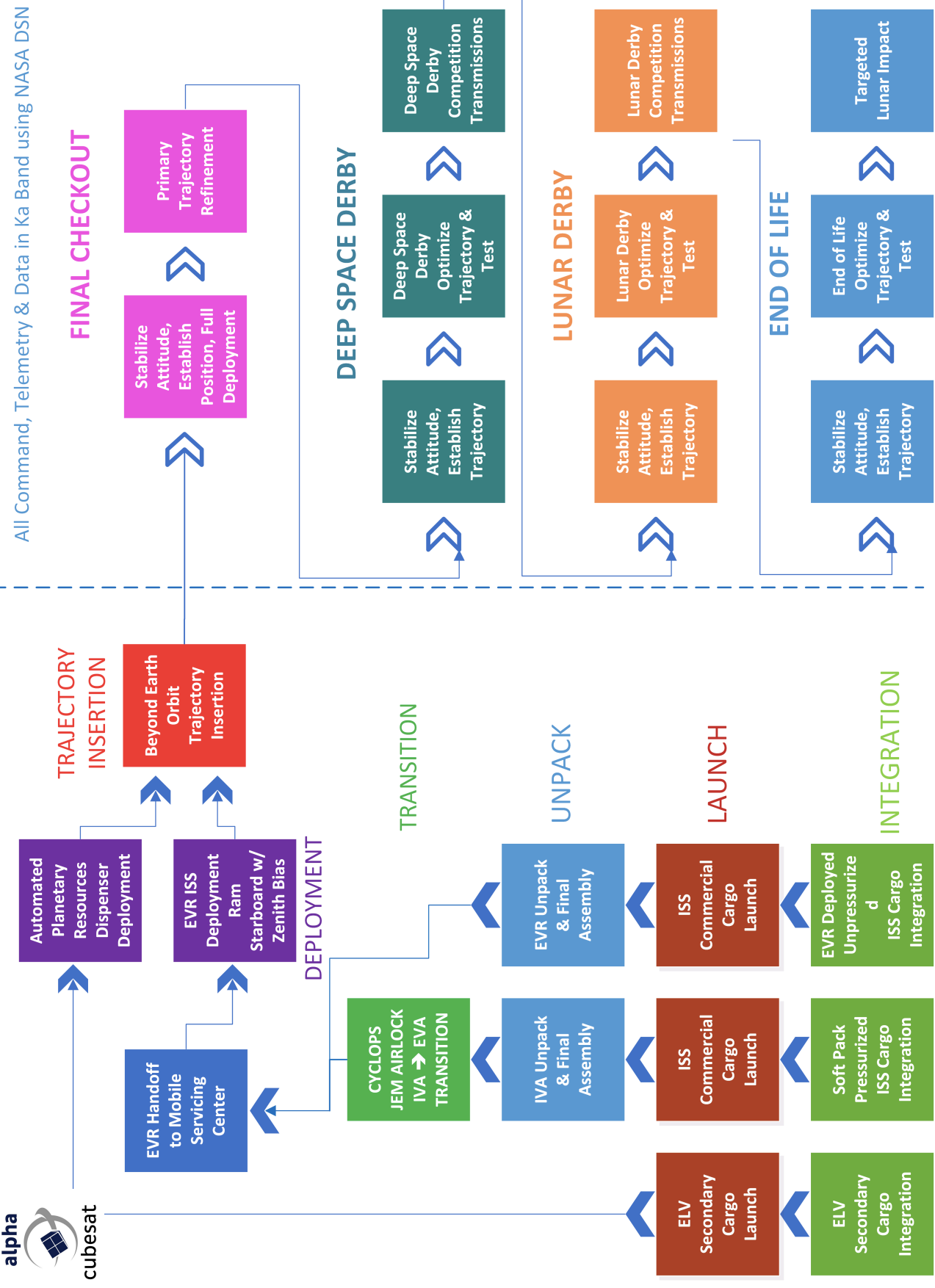
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Alpha CubeSat Concept of Operations

Spacecraft Operations

All Command, Telemetry & Data in Ka Band using NASA DSN

FINAL CHECKOUT

- Stabilize Attitude, Establish Position, Full Deployment
- Primary Trajectory Refinement

DEEP SPACE DERBY

- Stabilize Attitude, Establish Trajectory
- Deep Space Derby Optimize Trajectory & Test
- Deep Space Derby Competition Transmissions

LUNAR DERBY

- Stabilize Attitude, Establish Trajectory
- Lunar Derby Optimize Trajectory & Test
- Lunar Derby Competition Transmissions

END OF LIFE

- Stabilize Attitude, Establish Trajectory
- End of Life Optimize Trajectory & Test
- Targeted Lunar Impact

Launch Service Provider Operations

TRAJECTORY INSERTION

- Beyond Earth Orbit Trajectory Insertion

DEPLOYMENT

- Automated Planetary Resources Dispenser Deployment
- EVR ISS Deployment Ram Starboard w/ Zenith Bias
- EVR Handoff to Mobile Servicing Center

TRANSITION

- CYCLOPS JEM AIRLOCK IVA ➜ EVA TRANSITION

UNPACK

- EVR Unpack & Final Assembly
- IVA Unpack & Final Assembly

LAUNCH

- ISS Commercial Cargo Launch
- ISS Commercial Cargo Launch
- ELV Secondary Cargo Launch

INTEGRATION

- EVR Deployed Unpressurized ISS Cargo Integration
- Soft Pack Pressurized ISS Cargo Integration
- ELV Secondary Cargo Integration

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6

The Future

1. Alpha Cubesat launches.
2. The cost of access to space for nanosatellites will dramatically decrease.
3. New nanosatellites will begin to lay the groundwork for space and terrestrial information beaming.

Space based information beaming will mean:

Immediate data transfers will be directed by satellites in low earth orbit. Consistent Earth-wide WiFi beamed from satellites will connect many struggling communities to opportunities for improving their life.

Nanosatellites can provide deep space mission communication support for independent missions by lending bandwidth for sending data packets or beaming power between spacecraft.

Creating jobs in struggling communities with Ground Station Development: space based solar power beaming technology will require Antennas on the Earth to receive energy transmissions.

Clean Energy! Space Based Solar Power will produce no toxic byproducts during operation. Growing economies that are dependent on fossil fuels will drastically decrease their carbon footprint.

Fostering international cooperation for our collective further advancement by demonstrating new technologies and advancing science.

Safety, health, and educational opportunities dramatically increase in struggling communities with affordable space access.

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Call for Participants

Join Team Alpha CubeSat!

Alpha CubeSat will create a market for affordable space access. Our high visibility, cost effective, resource-rich platform will enable access to ISS and NASA ground center laboratories as well as close flyby's of the moon and deep space communication demonstrations. The result of flying Alpha CubeSat will set a new precedent for ease of integration and ease of launch for new space technologies.

Is your company looking for first flight opportunities for new technologies? Join our technology demonstration platform that will enjoy wide international exposure between 2017-2019.

Participate! Fly your instruments on Alpha CubeSat and leverage the value of the spacecraft by utilizing our existing design to support your technology demonstration.

Contact us today!

Email info@alphacubesat.com or call Gary Barnhard at (301)-509-0848

Partners and Payloads

Join us as a Partner!

We are looking for subsystems or components to fly on Alpha CubeSat for the cost of the equipment.
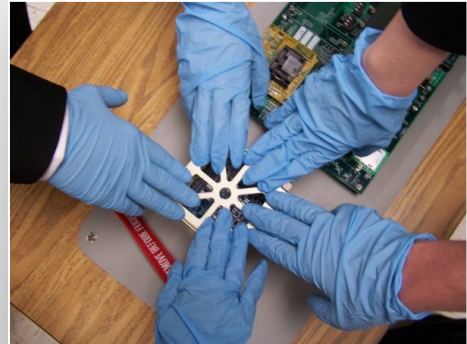
Join Xtraordinary Innovative Space Partnerships, Inc as a partner and provide an essential component to the mission success of Alpha CubeSat.

Join us as a Customer!

Provide a technology demonstrating payload to fly on Alpha CubeSat.

We are offering access to the deep space environment extending out past 4 million km as well as an opportunity for long duration, repeated high definition data acquisition of the moon.

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Team Alpha CubeSat

Our team includes engineers with over 150 years of collective experience on the development of successfully flown spacecrafts.
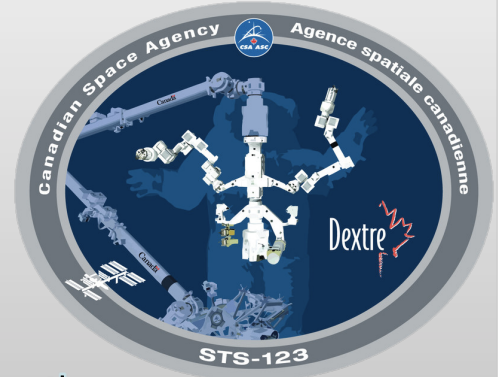
Team Alpha CubeSat brings together an extraordinary combination of proven systems engineering talent, specialized discipline skills, and a shared commitment to build a mission of enduring value. Name a leading NASA contractor and it is guaranteed we have experience there!

The engineers on Team Alpha Cubesat have worked at leading space companies and on numerous rocket and satellite programs highlighted by the mission patches on this page. The following missions have flown with direct involvement from an Alpha CubeSat team member: NASA Galileo spacecraft; JPL Microwave limb Sounder on the Upper Atmosphere Research Satellite; Boeing 376 spin-stabilized spacecraft; body-stabilized Boeing 702 spacecraft; GOES N 601 Geostationary Operational Environmental Satellite; the International Space Station.

Our specialist advisors range from orbital mechanics to virtual reality experts - telecom and satcom innovators to presidents/founders/CEOs of prestigious space consultancies and leading asteroid mining companies.

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Team Alpha CubeSat

FOUNDING SPONSOR:

Xtraordinary Innovative Space Partnerships, Inc. (XISP-Inc)

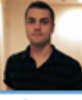|	
Team Lead CEO/Systems Engineering — **Gary Barnhard**	Engineer - Propulsion Systems — **Ethan Chew**
Engineer – Structures & Mechanisms — **John Tascione**	Engineer – CAD / Systems Integration — **Mike Doty**
Engineer - Guidance, Navigation, & Control — **Brian Martin**	Engineer – Thermal Systems — **Eric Gustafson**
Engineer - Radiation & Shielding — **TJ Mckinney**	Engineer – Propulsion Systems — **Eric Shear**
Multimedia Production — **Jamie Pulliam**	Engineer – Attitude Control — **Justin Siples**
Engineer - Structures & Mechanisms — **Anastasia Ford**	Contract Specialist Documentation — **Joseph Rauscher**

COMMERCIAL TEAMMATES:

Barnhard Associates, LLC
Deep Space Industries, Inc.

NON-PROFIT TEAMMATES/SPONSORS:

Space Development Foundation
National Space Society

ADVISORS:

|	
Advisor Communication Systems — **Pat Barthelow**	Advisor Propulsion Systems — **Craig Foulds**
Advisor Trajectory Consultant — **Ed BelBruno**	Advisor Communications Systems — **Aaron Harper**
Advisor Astrophysics — **Eric Dahlstrom**	Advisor STK & Orbital Dynamics — **Chris Cassell**
Advisor Lunar Science Liaison — **David Dunlop**	Advisor Mechanical Systems — **James DiCorcia**

INTERNATIONAL LIAISONS:

Int. Liaison Systems Engineering — **Daniel Faber**	Int. Liaison Commercial Collaboration — **Joe Hatoum**
Int. Liaison Electrtical Engineering — **Isaac Desouza**	Int. Liaison Attitude Control Systems / CAD — **Matteo Borri**

ALLIED BUSINESS RESOURCES:

General Counsel: Copilevitz & Canter, LLP
Intellectual Property Counsel: Tucker & Ellis, LLP
Accounting: May & Barnhard, PC   **Insurance:** Kurek Insurance Associates, Inc.
Banking: Capital Bank, Maryland   **Internet Service Provider:** Xisp.net

Launching in 2018
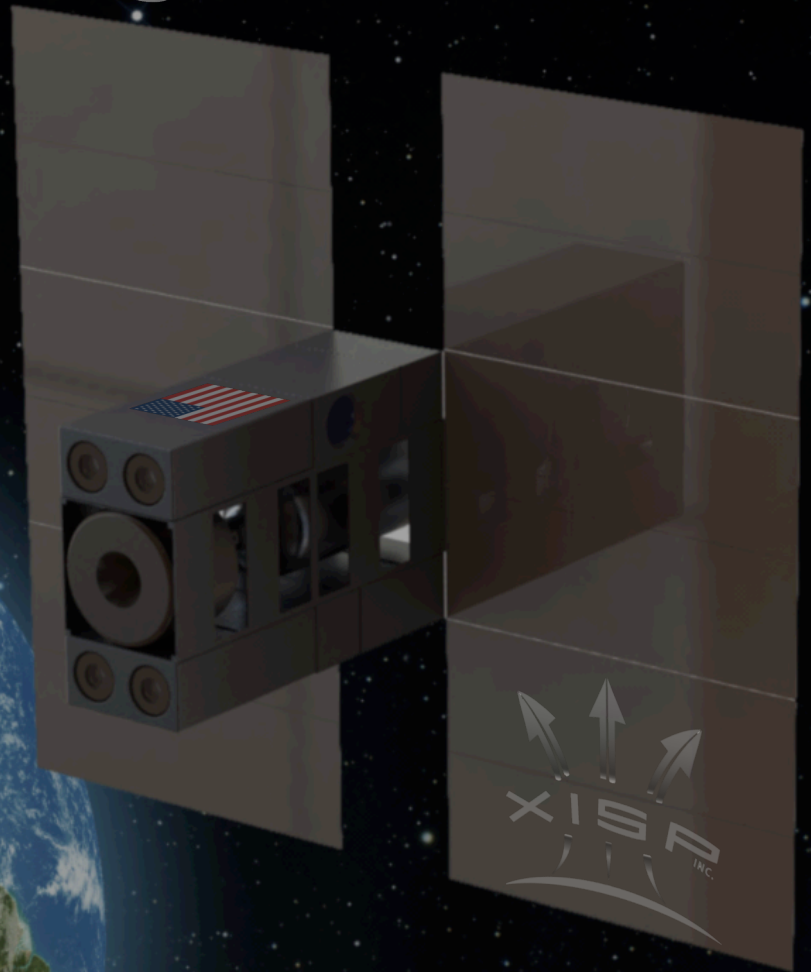
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Don't wait for the future, help us build it!