

# Aphelion Aerospace, Inc.

## Executive Summary

<http://www.aphelionaerospace.com>

[matthew.travis@aphelionaerospace.com](mailto:matthew.travis@aphelionaerospace.com) ~ 321.289.0872

Aphelion Aerospace, Inc. (DUNS # 074595993) is a space mission services company incorporated in the State of Colorado that is dedicated to developing complete responsive launch and on-orbit solutions and products for the nanosatellite industry.

### What We Offer

Our business strategy relies on launch services, hardware systems, partnerships and software - which allow us to provide a true turnkey, end-to-end space utilization solution. We call this holistic approach to reducing the barriers to space access "Space-as-a-Service".

Realization of our vision relies on successful development of the Helios Cubesat-class launch vehicle. The Helios nanolaunch system is a three-stage vertical launch vehicle with liquid propulsion in the first two stages and a solid propellant third stage. The design utilizes identical propellants in the first two stages and a common engine design with nozzles optimized for altitude in a "plug cluster" aerospike configuration.

Helios utilizes a unique hydrogen peroxide-based hypergolic propellant that eliminates the need for a separate catalyst bed or ignition system and also is non-toxic, non-carcinogenic and emits environmentally friendly exhaust products. This propellant family has been fully developed and hot-fire tested. We have further matured the innovation to create Aphelion Aerospace' proprietary propellant blend.

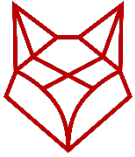
The first stage is designed for reusability using boostback, powered descent and vertical landing. Completely mobile and self-contained, Helios will have no reliance on fixed infrastructure, launch pad or on-site processing facilities. The vehicle may be fueled within an hour of launch and able to launch on short notice (<2 days) after arrival at the launch site. Once loaded, it may remain fully fueled for days to weeks.

Design of the Helios launch vehicle is dependent on highly-reliable low-cost systems. We are developing an autonomous flight termination system using NASA's reference AFTU and the Air Force CASS framework. Our avionics system is licensed from NASA's Affordable Vehicle Avionics for nanolaunchers. The base hardware design is complete and version 1 of the software is 90% complete. The vehicle will employ attitude thrusters being developed in-house from COTS components. Manufacturing will be performed in a light industrial facility using cost-effective commercial grade equipment. Our goal is to build the DC-3 of space transportation, not the F-16.

### Business Case

The lowest price for a dedicated nanosatellite launch is in the range of \$1.5M to \$3M. The launch price for a 6U Cubesat is quoted by Spaceflight, Inc. to start at \$545,000 (2017). SpaceX's dedicated rideshare pricing starts at \$1M. Commercial applications also call for reliable turnaround time and launch-on-demand for these small spacecraft. When the design and engineering lifecycle of a Cubesat can be sometimes less than 1 year, launch cost and availability becomes a significant challenge for otherwise low-cost missions.

The business case for a sub-100kg launch vehicle has been made many times in the past decade. Yet scaling down launch vehicle parameters and costs, particularly those associated with handling and operations, has posed a huge challenge. When traditional low density cryogenic propellants are utilized, the vehicle volume and manufacturing cost is already substantial for a Cubesat launcher and a modest increase in size could significantly improve profitability. Past attempts



# Aphelion Aerospace, Inc.

## Executive Summary

<http://www.aphelionaerospace.com>

[matthew.travis@aphelionaerospace.com](mailto:matthew.travis@aphelionaerospace.com) ~ 321.289.0872

have subsequently crept up in size to mitigate those issues. There still is no operational dedicated Cubesat launch system and we see this as a failure in the current state-of-the-art.

Successful commercialization of a sub-100kg launcher is contingent upon minimizing vehicle fabrication and operational costs and maximizing flight rate. It is necessary to reduce vehicle size for both technical and manufacturing reasons in order to truly utilize COTS manufacturing processes. Past studies demonstrate that the low-cost and simplicity of smaller launch vehicle production allows costs to scale down very well compared to other, larger, smallsat class vehicles. Additionally, the use of a storable, nontoxic hypergolic propellant enables simplified, safer ground handling and higher system reliability.

We see potential applications of our propulsion system in launch systems other than our suborbital and orbital vehicles and also potentially for in-space propulsion utilization. Our propellant has the potential to serve a critical role in the satellite industry's desire to eliminate the toxic hypergolic propellants that have been standard for decades.

By leveraging our low-cost, high-reliability philosophy and designs, we will be able to target our launch price point as low as \$950,000 for a fully manifested launch of Cubesats up to 6U in size. We will be able to accommodate 1, 2 or 3U spacecraft on the vehicle. We will be at the low end of the price curve and will continually implement improvements to maximize our cost efficiencies.

### Completed and Future Milestones

#### COMPLETE -

1. Establish Founding Management and Advisors
2. Assembly of mobile propulsion test stand (MTS)
3. Rev. 1 Full-scale Main Engine test fire
4. Helios 3rd Stage sub-scale motor test fire
5. First mission service customer LOI's

#### YEAR 1 -

1. Manufacturing/assembly facility outfitting
2. Cubesat system design
3. Begin Trailblazer first vehicle fabrication
4. Helios Integrated CDR
5. Revenue from hardware sales
6. Trailblazer launch ground systems complete

#### YEAR 2 -

1. Trailblazer first flight
2. Helios 1st stage engine acceptance testing
3. Helios second stage vacuum engine test fire
4. Helios first stage full test fire
5. Trailblazer first customer sales
6. Avionics development



# Aphelion Aerospace, Inc.

## Executive Summary

<http://www.aphelionaerospace.com>

[matthew.travis@aphelionaerospace.com](mailto:matthew.travis@aphelionaerospace.com) ~ 321.289.0872

7. Flight Safety System development
8. Helios propulsion development & testing
9. Begin production of first Helios vehicle
10. Avionics certification
11. Flight Safety System certification

### YEAR 3 -

1. Helios first stage suborbital flight

### YEAR 4 -

2. Helios first orbital launch
3. Helios operations begin

### YEAR 5 -

1. Company reaches operational profitability

## Market Overview

The micro and nanosatellite market has experienced rapid growth over the past decade and is becoming the fastest growing segment in the space sector. The number of spacecraft launched averaged 51% YoY growth between 2005 and 2014. The 2020 SpaceWorks Nano/Microsatellite Forecast estimates up to 2400 nano- and micro-satellites will require launch from now through 2023. The nanosatellite and microsatellite market segment is projected to value at USD 2.5 billion in 2020, up from USD 889.5 million in 2015.

Of the projected launches, Earth observation accounts for 45%, technology development and scientific missions take another 35%, communications are 19% and novel applications are 2%. These are our primary segments. Potential clients include government agencies such as DARPA and NASA, civilian entities like Planet and Spire and the non-profit/academic sector.

## Target Market

Our launch service provides a number of key competencies: dedicated launch, custom orbital insertion, low cost, and a very short lead time. We target the following use customer types:

- Commercial customers desiring rapid, guaranteed launch;
- Clients requiring deployment and maintaining large nanosatellite constellations;
- Missions demanding specific orbits which are inaccessible through rideshare;
- Time-sensitive missions which require quick turnaround and specific trajectories;
- Spacecraft that need to be powered on and/or monitored real-time before deployment;
- Clients desiring to launch spacecraft with irregular volume and mass envelopes.

## Competitive Advantage



# Aphelion Aerospace, Inc.

## Executive Summary

<http://www.aphelionaerospace.com>

[matthew.travis@aphelionaerospace.com](mailto:matthew.travis@aphelionaerospace.com) ~ 321.289.0872

Aphelion Aerospace, Inc. pursues an innovative launch service business model that provides unprecedented cost-effectiveness, schedule certainty and mission flexibility to the customer. It features full price disclosure and services sold in a manner similar to airline ticketing. Regularly scheduled launches and one-month lead time to launch reduce lifecycle costs while customized orbits and on-demand launch capability fill a need that is not served by existing small launch vehicle.

Helios utilizes a proprietary low cost non-toxic and environmentally-friendly propellant that we have fully developed. Completely mobile, Helios will have no reliance on fixed infrastructure, launch pad or on-site processing facilities and able to launch on short notice (<2 days) after arrival at the launch site.

Aphelion Aerospace, Inc. pursues an innovative launch service business model:

- Our launch services are sold in a manner similar to airline ticketing;
- Regularly scheduled launches are provided to defined orbital inclinations;
- Customized flight plans and orbits may be accommodated;
- 30 days from Cubesat acceptance to launch;
- “Gas and go” on-demand capability for dedicated launches on short notice;
- Full up-front price disclosure and guaranteed pricing.

## Sales Projections

During the next three years, we plan to create cash flow from sales of our launch vehicle and hardware system components, including our green propulsion system, avionics, flight safety system and software licensing. This represents our early Minimum Viable Products and will enable the company to be financially viable during the remainder of R&D of the Helios launch vehicle through 2023. Additionally, we plan to offer suborbital flight services utilizing our suborbital R&D vehicles which will generate revenue as commercial microgravity platforms.

Once Helios is operational, we project nominal sales figures from Year 3 with steady growth and reaching full commercial capability by Year 5. Our target price to LEO is \$950,000 per launch which translates to a \$19K/kg cost for 50kg of payloads. Our nominal launch market share at full maturity will be a minimum of 50 launches annually, scalable to 200. We will be able to reach break-even and profitability in Year 5 with adequate capital investment in infrastructure and operations.

## Executive Team

### Miguel Ayala, CEO

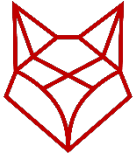
20 years as engineer & leader in high-profile government & commercial space programs including Lockheed Martin Orion spacecraft & A2100 satellites, NASA Space Shuttle Boosters, Firefly Alpha rocket, ULA Vulcan rocket, Boeing.

### Matthew Travis, Founder / COO

30+ years as leading entrepreneur & engineer, member of the elite programming team that developed the original web browser, with numerous contributions to the NASA Space Shuttle Orbiter, Atlas, & Delta launch vehicles.

### Frederick Richard

Vice-President, Launch Systems



# Aphelion Aerospace, Inc.

## Executive Summary

<http://www.aphelionaerospace.com>

[matthew.travis@aphelionaerospace.com](mailto:matthew.travis@aphelionaerospace.com) ~ 321.289.0872

Veteran U.S. Air Force non-commissioned officer, Blue Origin Engine Integration Engineer Lead for New Shepard & New Glenn engines. SpaceX Launch Integration Technician, SpaceX Dragon and Crew Dragon Ground Operations Technician with nearly 12 years of federal military and aviation experience. USAF Dedicated Crew Chief, Nellis AFB.

Members of the Aphelion Aerospace team include our strategic partners ARES Institute, Inc., our team of engineers and the support of industry vendors and partners. We are currently assembling an Advisory Board comprised of space industry and venture capital veterans and experts.

### **Funding Strategy**

We are currently seeking to supplement internal funding and product sales with one or more investments up to \$15M. This will allow us to grow and complete qualification of the main propulsion system, AFTU and avionics. We will be able to complete buildout of our manufacturing process, finalize design of the launch vehicle and position the company for an additional funding round in following years.

***(Financial Section – REDACTED)***