



Phoenix Launch Systems, Inc. Business Plan

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Overview

Phoenix Launch Systems, Inc. (DUNS # 117025293) is a space transportation services company incorporated in the State of Florida that is dedicated to developing responsive launch solutions and products for the nanosatellite industry.

What We Offer

Our business strategy relies on three core components - launch services, Cubesat hardware, and software - which allow us to provide a true turnkey, end-to-end space utilization solution. Realization of our vision relies on successful development of the Phoenix Cubesat-class launch vehicle.

The Phoenix 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.

Phoenix 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 qualified. We have further matured the innovation to create Phoenix Launch Systems’ proprietary propellant blend.

The first stage is designed for reusability using boostback, powered descent and vertical landing. Completely mobile and self-contained, Phoenix 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 Phoenix launch vehicle is dependent on highly-reliable low-cost systems. We are developing an autonomous flight termination system utilizing NASA’s reference AFTU and the Air Force CASS framework. The base hardware design is complete and version 1 of the software is 90% complete. The vehicle will employ avionics and 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.

To expand the flight regime of our propellant technology, we have engaged with ARES Institute, Inc. to fly an experimental “green” Cubesat propulsion system on a 1U Cubesat. We are in possession of a complete (sans solar panels and radio) 1U from Pumpkin, Inc. We are using the NASA Operational Simulator for Small Satellites (NOS3) and Core Flight System in this effort.

Business Case

The lowest price for a dedicated launch is quoted by (former) Vector Launch as being 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-50kg 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 have subsequently crept up in size to mitigate those issues. There still is no viable dedicated Cubesat launch system and we see this as a failure in the current state-of-the-art.

Successful commercialization of a sub-50kg 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 \$750,000 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

• Establish Founding Management	Complete
• Test of subscale engine	Complete
• Trailblazer preliminary design review	Complete
• Trailblazer full-scale engineering model	Complete
• Trailblazer engine design completion	Complete
• Trailblazer engine manufacturing	Complete
• Acquire full in-house propulsion test facilities	In Progress
• Launch of Cubesat web store	In Progress
• Trailblazer engine test regime	In Progress
• Cubesat communication system product launch	In Progress
• Phoenix LV propulsion system development	In Progress
• Airframe filament winding technology development	In Progress
• Begin Phoenix production facility outfitting	Quarter 1
• Begin Trailblazer first vehicle fabrication	Quarter 2
• Phoenix second stage vacuum engine test fire	Quarter 3
• Trailblazer launch ground systems complete	Quarter 4
• Trailblazer first flight	Quarter 4
• Trailblazer operation begins, first customer sales	Quarter 5
• Phoenix first stage full test fire	Quarter 5
• Begin production of first Phoenix vehicle	Quarter 7
• Avionics certification	Quarter 10
• Flight Safety System USAF certification	Quarter 11

- Phoenix first flight Quarter 12
- Phoenix operations begin, first customer Quarter 15
- Company reaches operational profitability Quarter 16

(Quarter 1 represents the first quarter of operations from the third quarter of 2020)

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

Phoenix Launch Systems, 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.

Phoenix utilizes a proprietary low cost non-toxic and environmentally-friendly propellant that we have fully developed. Completely mobile, Phoenix 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.

Phoenix Launch Systems, 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 Cubesat components, including our green propulsion system and software licensing. This represents our early Minimum Viable Products and will enable the company to be financially self-sufficient during the remainder of R&D of the Phoenix launch vehicle through 2022. Additionally, we plan to offer suborbital flight services utilizing our suborbital R&D vehicles which will generate revenue as commercial microgravity platforms.

Once Phoenix is operational, we project nominal sales figures through 2024 with steady growth and reaching full commercial capability by the year 2024. Our target price to LEO is \$750,000 per launch which translates to a \$34K/kg cost and 40% profit margin. Our nominal launch market share at full maturity will be a minimum of 50 launches annually, scalable to 200. This will enable us to reach break-even and profitability in Year 5 with adequate capital investment in infrastructure and operations.

Executive Team

Matthew Travis (CEO) - Mr. Travis is the Former COO at Aphelion Orbitals, Inc. from 2016 through the end of 2018 and an 18-year space industry veteran based near Kennedy Space Center. Mr. Travis studied Aero/Astro Engineering and CS at the University of Illinois in Urbana-Champaign. He also serves on the Executive Board of non-profit ARES Institute, Inc. where he facilitates space-related STEM partnerships.

Members of the Phoenix Launch Systems 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 \$10M. This will allow us to grow and complete qualification of the main propulsion system, AFTU and avionics. Broadly, 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 Tables Redacted)