Board of Supervisors Memorandum

October 18, 2016

Vector Space Systems Inc. Rocket Manufacturing Center in the County's Aerospace, Defense and Technology Business and Research Park

Introduction

The County has been in active discussions with Vector Space Systems, Inc. (also known as Project Omni) to locate its worldwide headquarters in the County-owned Aerospace, Defense and Technology Business and Research Park. Vector's headquarters design on 15 acres includes 36,000 square feet for administrative/office space; a 40,000 square foot manufacturing facility; the capability to double the manufacturing facility's size in the future; and space to maneuver containers and large vehicles.

Line of Business

Vector Space combines inexpensive launch technology developed by Garvey Space Systems with a virtual micro satellite concept called Galactic Sky to connect space startups and innovators with affordable and reliable launch enabling platforms and vehicles at a price point not previously possible. The Galactic Sky concept will use software-defined satellites to change the space segment from its fixed function hardware to a simpler software development environment. A series of Galactic Sky satellites will concurrently run strategic applications developed by Vector and timesharing customers in a virtual satellite mode.

Vector launch vehicles are designed to rely on industrial-class facilities, parts and processes, manufacturing techniques, transport and handling. This reduces costs, simplifies handling and eases supply chain management. This business model will revolutionize space access to a new generation of innovators and entrepreneurs and make space capabilities relevant and accessible to a larger market several orders of magnitude larger than the present.

Company Profile

Vector Space Systems was formed as a Delaware Corporation in early 2016 and acquired Garvey Spacecraft Corporation (GSC), its Intellectual Property, assets and team as the Vector company was formed. GSC has been in business since 2002 and was formed after Jim Cantrell and John Garvey, two of Vector's Founders, served on the founding team of SpaceX. GSC developed and flew a number of successful small rockets and earned nearly $10 million in government research and development contracts during this time. With the GSC acquisition, Vector acquired an "instant team" that also owned the launch vehicle designs, Intellectual Property, and tested launch vehicle hardware, as well as the major subsystems that were already developed. This technical head start allows the company to achieve initial operational capability by 2018 at a rate two to three times faster than

traditional launch vehicle development efforts. Thus far, Vector has a signed backlog of $130 million for near-term launches.

Proposed Worldwide Headquarters

Vector Space plans to construct an approximate 40,000 square foot manufacturing facility, as well as 36,000 square feet of office space, followed by an approximate 40,000 square foot expansion within two years of completion of the first phase. They anticipate employing 200 fulltime employees with the first phase of the manufacturing facility completion and will reach this level of employment within 24 to 36 months. Their average annual salary is in excess of $70,000.

Vector Space has been in discussions with the County regarding acquiring, through a market ground lease, approximately 15 acres of the County's Aerospace, Defense and Technology Business and Research Park. As you will recall, the County acquired this property to buffer Raytheon from incompatible urban land uses. Raytheon has been consulted regarding the compatibility of Vector Space and the desired location, agrees Vector Space is a compatible related industry, and welcomes Vector's entry into the Aerospace, Defense and Technology Business and Research Park.

Joining World View, Vector Space becomes the second aerospace/space-related employer to locate in this Park.

Vector Space has recently asked for permission to utilize the County's recently constructed SpacePort Tucson for promotional photography related to their launch vehicle product. Such occurred on September 28, 2016, and I have attached several of the photographs taken during this activity (Attachment 1).

Also attached is an October 6, 2016 letter that includes their investor presentation (Attachment 2). These documents provide more information regarding Vector Space, their products and plans. Vector Space has also worked with Sun Corridor Inc., the Arizona Commerce Authority and the City of Tucson to obtain appropriate and eligible incentives regarding their manufacturing expansion in Tucson and location of their worldwide headquarters. It should be noted that vehicle launches will not occur in Tucson. The documents attached identify Vector's present launch capabilities in Alaska, current NASA facilities, and offshore launch facilities.

The Case for Choosing Pima County

While the underlying technology was developed in southern California, the cost to manufacture in California is prohibitive. Vector's CEO, Jim Cantrell, is a Tucson resident with experience

developing race cars and other products locally. The space exploration industry is very focused and communicates actively across multiple disciplines. The location of World View in the County's Aerospace, Defense and Technology Business and Research Park was an attraction, along with nearby Raytheon and the availability of excellent technology and academic support from The University of Arizona in multiple disciplines used by Vector. Since launch sites are dictated by the type of mission and orbit, Vector will launch from multiple sites in the United States and potentially from barges in the Pacific Ocean. The availability of rail container service through the Port of Tucson and, in the longer term from rail sidings near the Park, was an important factor. The manufacturing facility model is relatively straightforward and could be located a one of the launch sites; but the availability of known suppliers, capabilities and local relationships in the Tucson region were all positive factors in Vector's decision.

Recommendation

I recommend the Board of Supervisors approve entering into negotiations for a concept where the County will enter into a 15- to 25-year lease with either Vector Space Systems, Inc. or a developer who will construct and lease the facility to Vector. Such a lease would be a straight market rate ground lease covering all of the County's development costs, with a straight-line amortization over the period of the lease. The negotiated lease would be presented to the Board of Supervisors for final approval.

Respectfully submitted,

C.H. Huckelberry
County Administrator

CHH/mjk – October 12, 2016

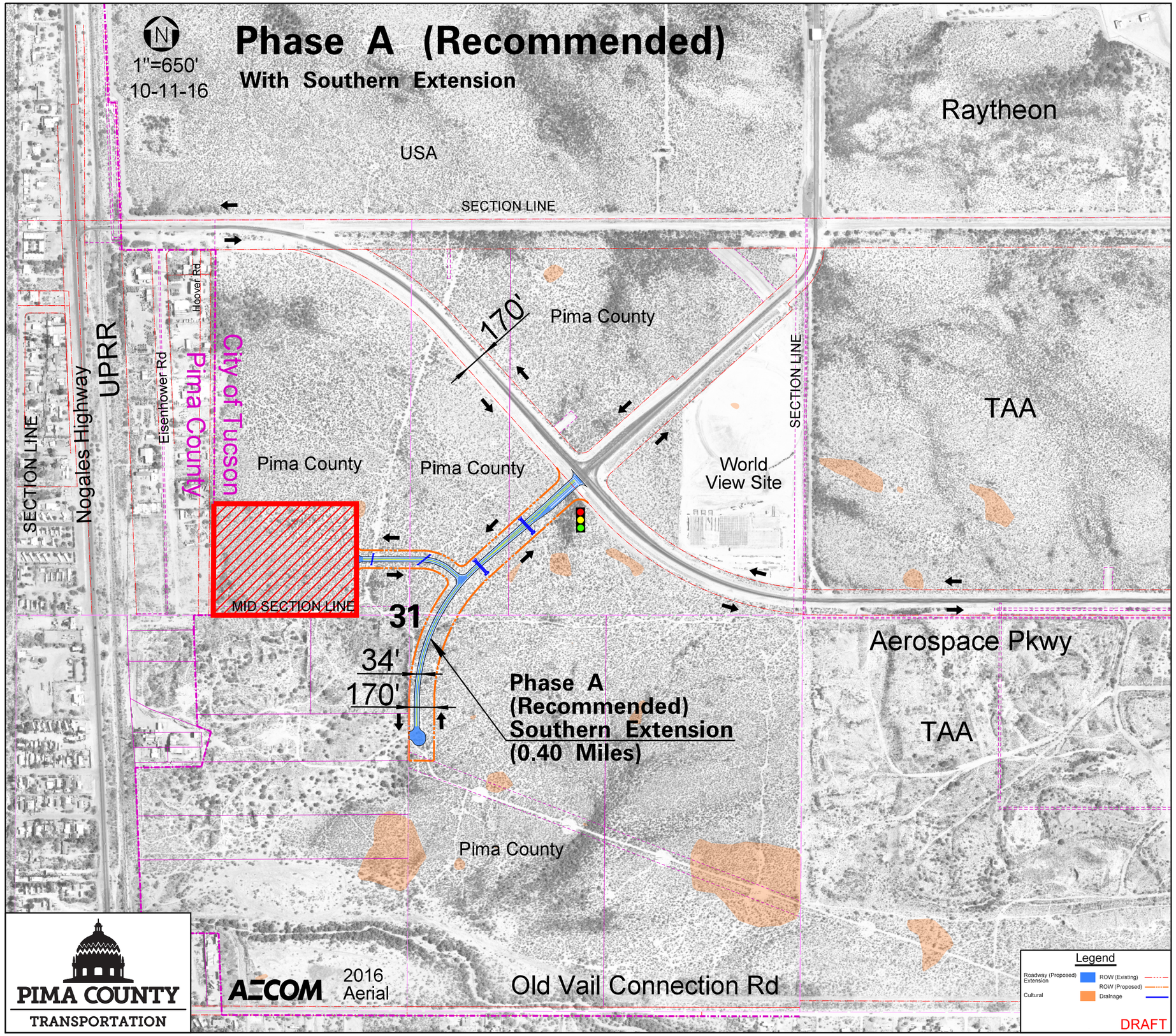
Attachments

c: John Bernal, Deputy County Administrator for Public Works
Tom Burke, Deputy County Administrator for Administration
Jan Lesher, Deputy County Administrator for Community and Health Services
Nanette Slusser, Assistant County Administrator for Policy, Public Works
Ellen Wheeler, Assistant County Administrator
Dr. John Moffatt, Director, Economic Development
Patrick Cavanaugh, Deputy Director, Economic Development

Phase A (Recommended)

With Southern Extension

1"=650'
10-11-16



ATTACHMENT 1

NASA

VECTOR SPACE

ATTACHMENT 2

Vector Space Systems
824 E. 16th Street
Tucson Arizona, 85719 USA
888.346.7779
VectorSpaceSystems.com

Vector Space
Innovate, Build, Fly

October 6, 2016

Mr. Chuck Huckleberry
County Administrator
Pima County
130 West Congress, 10th Floor
Tucson, AZ 85701

Dear Mr. Administrator:

Vector Space Systems Inc. is pleased and excited to submit our attached Business Plan and Financial Forecast plus additional key information as outlined in this letter for your perusal regarding Project Omni and the County proposed Lease for the location of a new building slated for construction at the County Aerospace, Defense and Technology Business and Research Park.

Vector Space Systems appreciates the proposed lease alternative building construction and financing options and comprehensive support from Pima County, the City of Tucson and Arizona Commerce Authority including incentives that will provide the company and its investors the opportunity to expand our global corporate headquarters and manufacturing facility here in the region. To further assist the various agencies with the proposed Lease plan and incentive review, the company herein provides information under each section below plus the attached PowerPoint slide deck that goes into substantial detail about our company and market opportunity.

Company Overview

Vector Space Systems believes that through innovating, building and flying frequently, we can accelerate the pace of innovation in commercial and government space technology. Vector serves the micro and nano-satellite markets with a responsive launch capability that allows micro-sat developers to innovate their space systems without worrying about the launch. Our launch vehicle, under development for several years, will offer frequent access to space in much the same way airlines offer passenger service to destinations of choice for commercial space development companies and organizations.

Vector's founders were on the founding team of SpaceX and are industry veterans with experience building companies such as Sea Launch, Orbital Sciences, Virgin Galactic, Skybox, Garvey Spacecraft Corporation and industry experience from NASA, CNES, and McDonnell Douglas.

With the acquisition of Garvey Spacecraft Company in early 2016, a leading aerospace research and development company focusing on cost-effective development of advanced space technologies and launch vehicle systems, Vector Space Systems gained overnight expertise and market prowess to disrupt and transform the commercial space launch systems market. Garvey Spacecraft engineers have spent over 15 years working on rocket systems miniaturization and development that provides a competitive advantage for Vector Space Systems going forward.

Company Capitalization and Financial Highlights

Vector Space Systems got started in 2015 and received its initial funding in 2016 and raised $1 million of capital from a select group of angel investors whose individual experiences helped guide us during the integration and development phase of the company.

The company is currently closing on a Preferred Seed Round of up to $1.5 million which will be used to fund operations and prototype development during the last quarter of 2016 and into 2017. The investor makeup with the closing of the Seed Round and current round includes investors who have conducted deep due diligence on the company, the Business Plan and full market potential.

Upon the successful competition of the current Preferred Seed Round milestone, an additional $10 million is authorized by the Board of Directors in an A Round to build-out the manufacturing capability, and prepare for the first space test flight in 2018.

Current Contracts and Backlog

- $2.5M In 2016 Contracts & Revenue
- $20M in Proposals Underway
- $92M In Backlog (Launch)
- Additional $130M Backlog in Negotiation

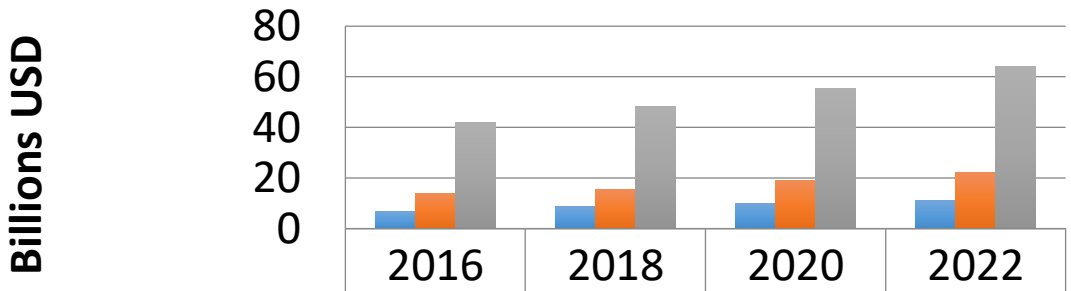
Company Investment Capital Plan

We estimate our CAPEX expenditure, not including the real assets, to be about $10M within 2 years and about $1-3M per year in replacement CAPEX over the period of the lease with a CAGR of 10% due to launch rate growth. The envisaged requirements for the corporate headquarters and manufacturing facility includes $9M in company invested capital and company financing. Total CAPEX during the 15 year period is approximately $50M.

Vector Space Systems current and planned facilities capital expenses break down into three principal areas: manufacturing equipment, integration and test equipment, and launch / recovery equipment. All of these capital expenditures are used for research, development, testing and manufacturing of rocket launch systems. Other capital expenditures are also for the most part not particularly specialized or custom equipment, like the launch system which has already been developed and acquired. In addition, we estimate well over $1M in capital equipment for FF&E for the new corporate headquarters and manufacturing building.

Commercial Rocket Payload Demand

Vector Space Systems is entering a well over $1B plus market. Please see the "Vector Total Addressable Market" analysis below by product line and overall.



	2016	2018	2020	2022
Launch	6.8	8.6	10.1	11
Satellites	13.9	15.3	19.1	22
Data Analytics	42.0	48.3	55.5	63.9

Employment Projections, Average Income and Job Growth Requirements

Based on our revenue projections and customer demand for our various product lines, the company is on track to meet or exceed the employment figures outlined below:

- Approximately 200 full-time jobs within 24 to 36 months.
- Median income in excess of $70,000.
- Coverage of over 80% of health care insurance costs for all employees
- Training and development to be offered as required to employees

Supply Chain Considerations

With over $1.5 million raised and spent to date by Vector, the company has already had a significant impact on the region. Direct supply chain contracting for mission-critical requirements from regional companies will impact the regional economy positively. Going forward, our core company values guide us to 'stay local' when it comes to additional supply chain opportunities.

In addition to direct supply chain spend in the state, significant additional economic spend is already happening as a result of Vector Space Systems operations in Arizona and will accelerate as the business grows faster. Our employees and families will be active consumers including purchasing homes and spending money in the local economy. Many business partners, vendors, investors and other visitors have flown in to Tucson from across the world to visit Vector Space Systems, providing yet more spend in the local economy.

We strongly believe that based on our revenue forecasting and demonstrated demand for products, services and unique approach for the rocket launch systems market, the return on investment to Pima County for the Proposed Lease/Purchase building will be very positive over the long term.

Attached please find a comprehensive company PowerPoint slide deck with detailed information regarding our forecasted revenue, expenses and long term projections. Vector Space Systems looks forward to a strong and fruitful relationship with Pima County, the City of Tucson, the State of Arizona and other stakeholders in the region.

Please call me directly at 520.204.4082 if you have any questions or would like any additional information for Project Omni implementation.

Sincerely Yours,

/s/
Jim Cantrell
Chief Executive Officer

CC: Arizona Commerce Authority, Sun Corridor, Inc., City of Tucson

Vector Space

Innovate, Build, Fly

Investor Presentation

October 4, 2016

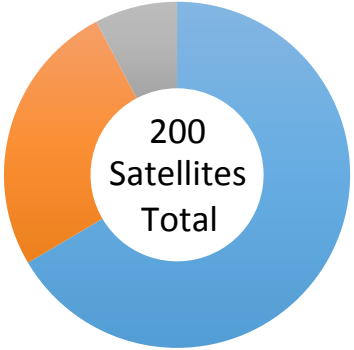
Vector Space
Innovate, Build, Fly

Frequent & Rapid Space Access

Innovate, Build, Fly

Micro Satellite Insurgency

2015

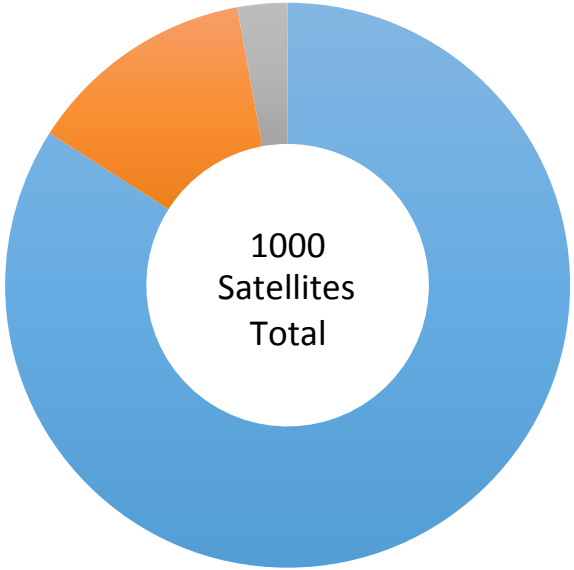


Microsats

Smallsats

GEOsats

2022



Vector Space

Innovate, Build, Fly

Traditional Satellite

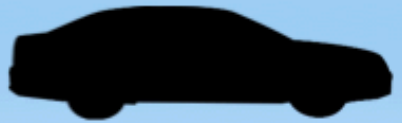
Cost

$$$$$$

>100 Million USD

Average Launch Mass

1650 kg



Development Time

4 Years

2015: 40 Satellites 2020: 60 Satellites

Micro Satellite

Cost

$

0.1-1 Million USD

Average Launch Mass

20 kg

Development Time

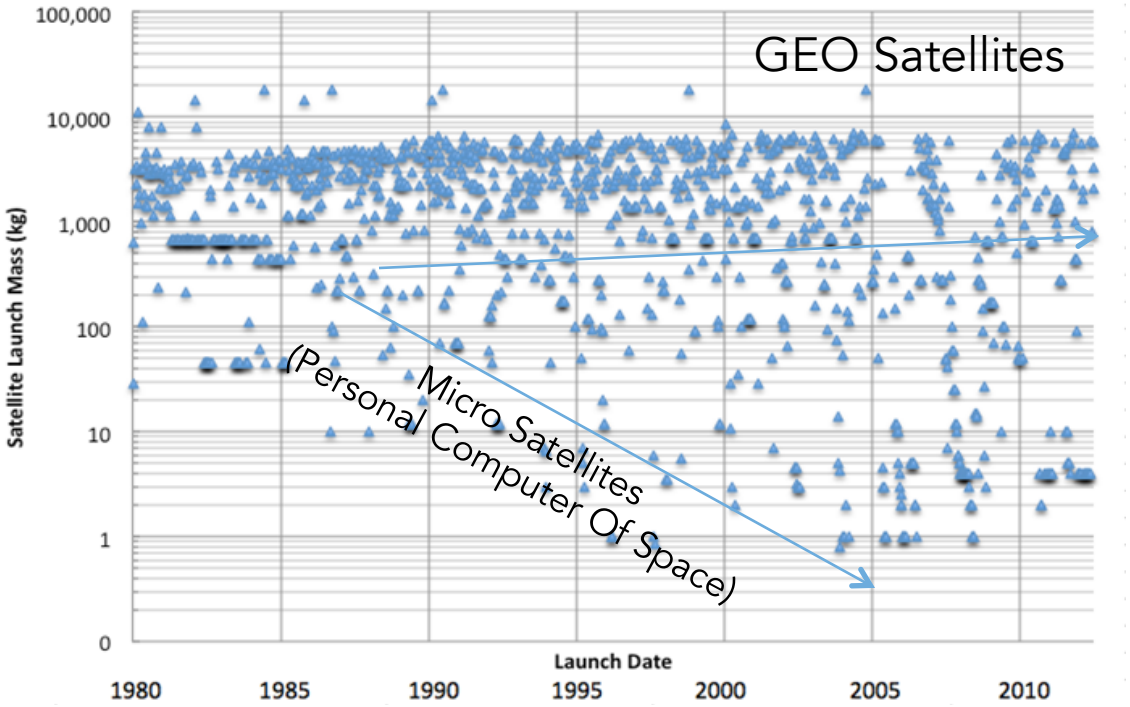
< 1 Year

2015: 175 Satellites 2020: 675 Satellites

Vector Space

Innovate, Build, Fly

Micro-Satellites Are The New PC



2001

2016

*Source: UCS Satellite Database

Vector Space
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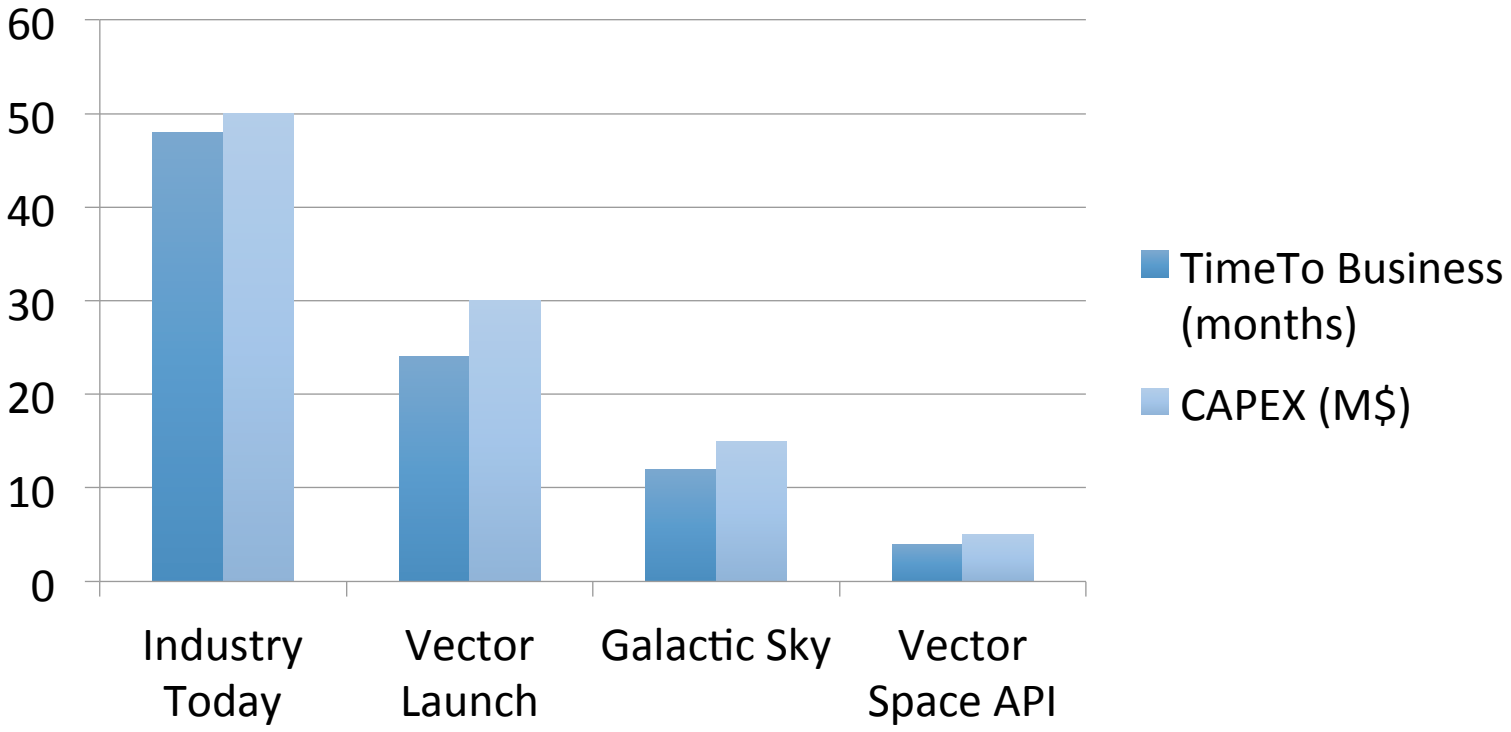
Vision: Empower Innovation

Phase I	Phase II	Phase III
Launch Vehicle	Galactic Sky	Space API
Dedicated Vector Micro Launchers Vector-R 50kg Vector-H 100 kg	DynoSat Satellite Design Tool Virtual Machine STK	Software Defined Satellites Space Software Application

Vector Space
Innovate, Build, Fly

Business Model: Rapid Deployment



Vector Space
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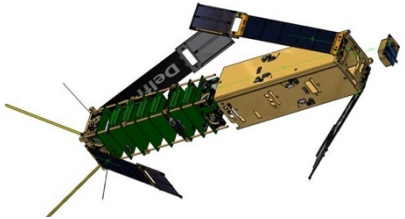
Vector Owns End-To-End System

- Product 1: Vector Launch Vehicles
  - Vector-R 50 kg to orbit $1.5M - $2.5M
  - Vector-H 100 kg at $3.0M - $4.0M
- Product 2: Galactic Sky Satellites
  - Software Defined Satellite Toolkit
  - Virtual Machine based Galactic OS / Tools
  - DynoSat Satellite Design Tool
  - Vector Built Micro Satellites with Galactic Sky
- Product 3: Galactic Sky Space API
  - Satellite As Software App
  - Users Develop Software App
  - Vector core applications running on constellation

Vector Launch
Innovate, Build, Fly

Galactic Sky
Software Defined Satellites



Vector Space
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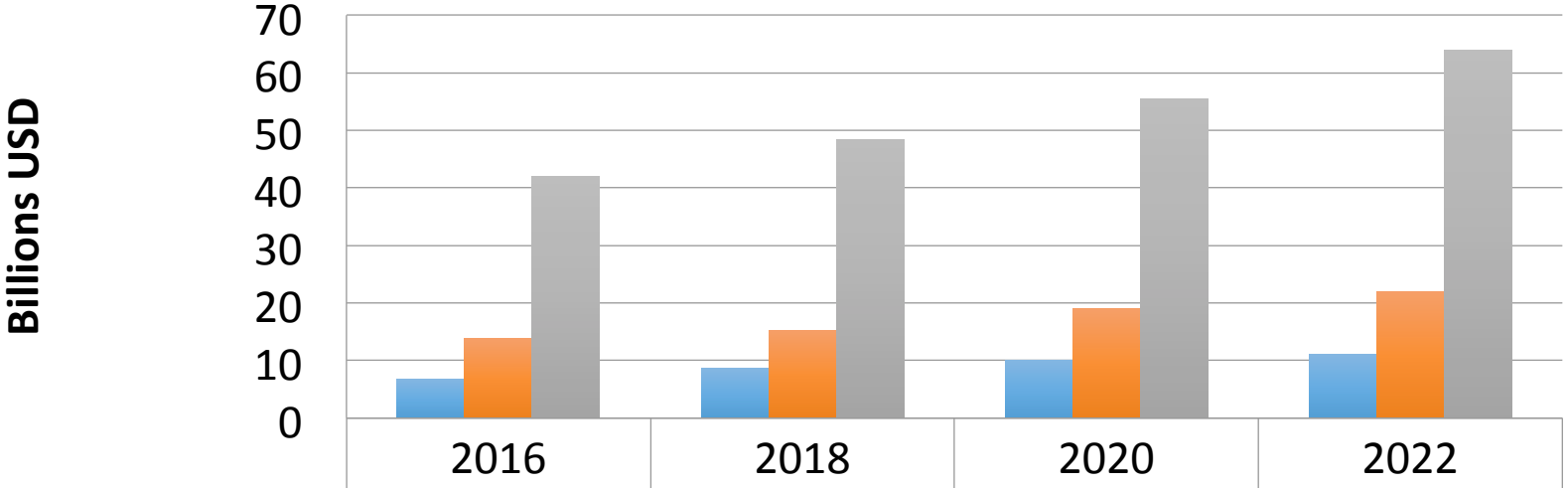
Vector Total Addressable Markets



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Vector Space
Innovate, Build, Fly

Experienced Management

Jim Cantrell
CEO
SpaceX, Skybox, StratSpace, Moon Express, JPL, CNES

John Garvey
CTO
McDonnell Douglas, Sea Launch, Garvey Spacecraft Corp., DCX

Ken Sunshine
CFO
Orbital Sciences, Virgin Galactic, Moon Express, MDA

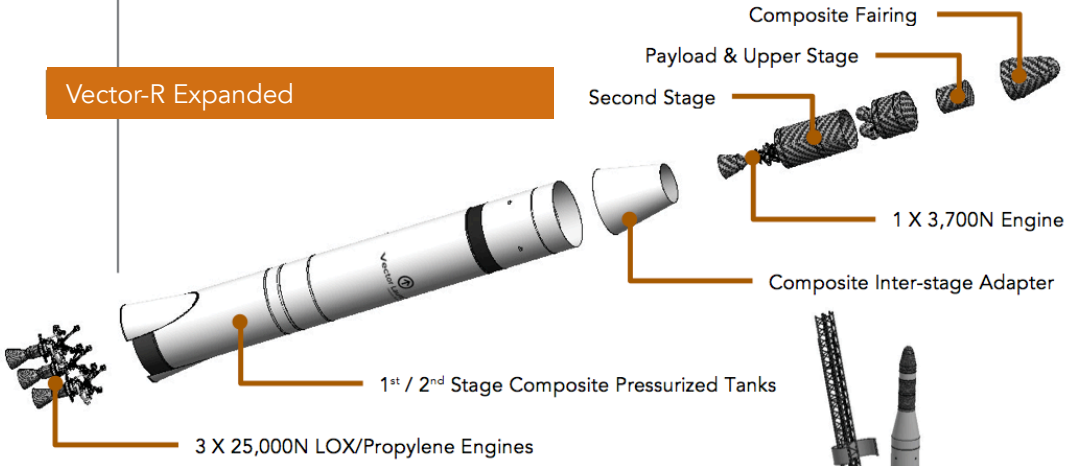
Vector Space
Innovate, Build, Fly

Results To Date

- ✓ $2.5M In 2016 Contracts & Revenue
- ✓ $19.5M in Proposals In Evaluation
- ✓ $81.7M In Signed Backlog (Launch)
- ✓ Additional $130M Backlog in Negotiation
- ✓ 11 Patents on Propulsion, Sats & Software
- ✓ FIRST VECTOR-R FLIGHT SET FOR 2017

Vector Space
Innovate, Build, Fly

Vector-R Expanded



Transport To Launch Site

Transportable Launch Erector

Vehicle Summary

- Overall length 12 meters
- First stage diameter 1.2 meters
- Gross Lift Off Weight (GLOW): 5000 kg
- Pressurized fuel feed systems
- No explosive ordinance
- Autonomous flight termination

Vector Space
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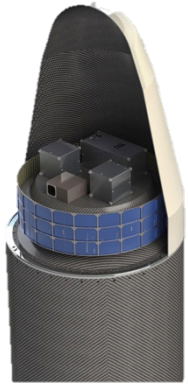
Vector Launch Family

	Vector-R	Vector-H
Mass to Orbit[1]	50 kg	100 kg
Height	12 meters	16 meters
Cost[2]	$1.5M	$3.0M
Cost w/ 3rd stage	$2.0M	$3.5M
Flight Rate / Year	100	25
Reusable 1st stage	Yes	Yes
Availability	2018	2019
Competitor	None	Electron

Vector-R Vector-H



- Optional Electric 3rd Stage for extended altitude
- Makes small launcher equivalent of much larger launcher

[1]To a 250 km 28 degree orbit
[2]Base price. On demand launch +$1M

Vector Space
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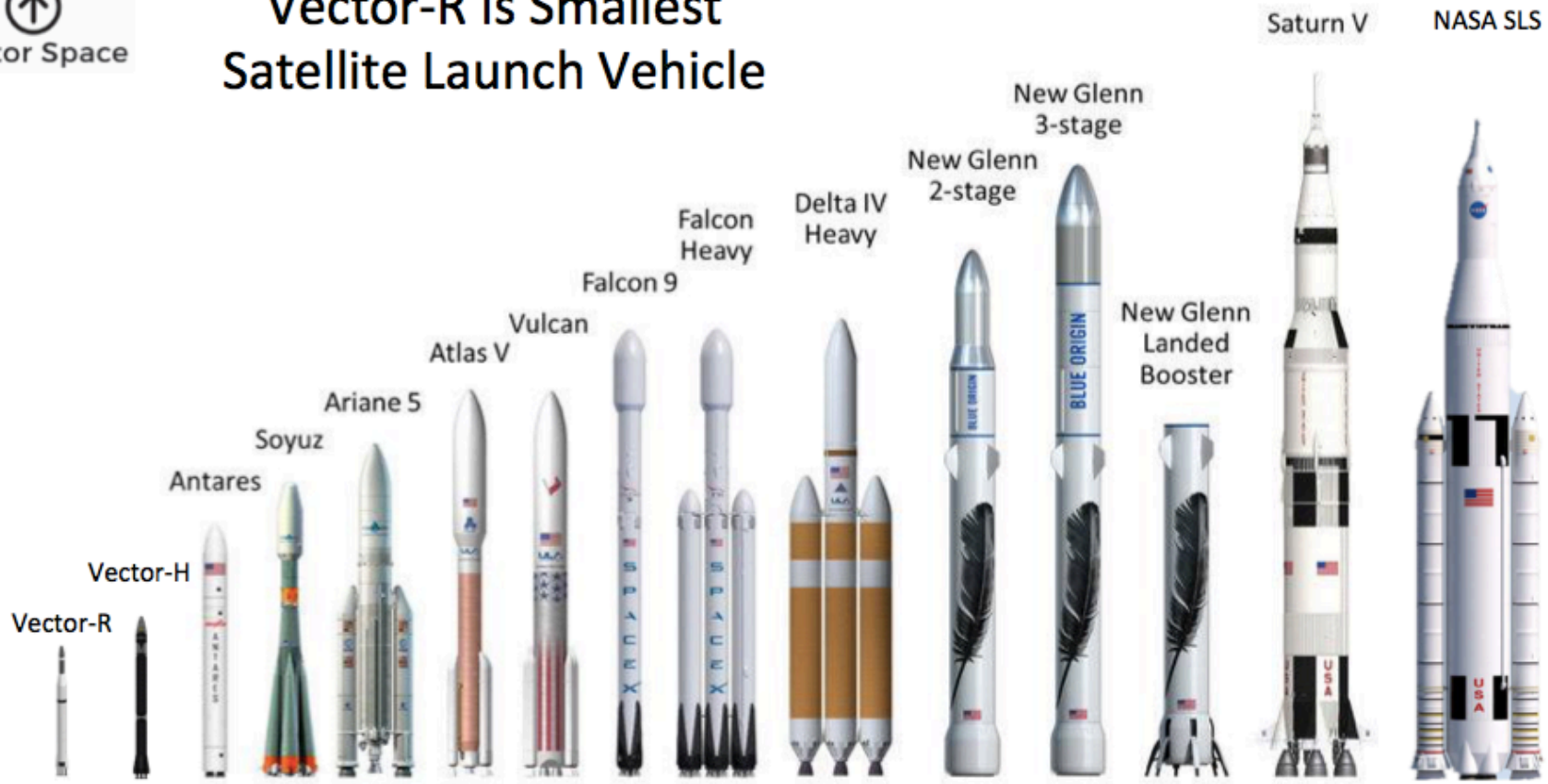
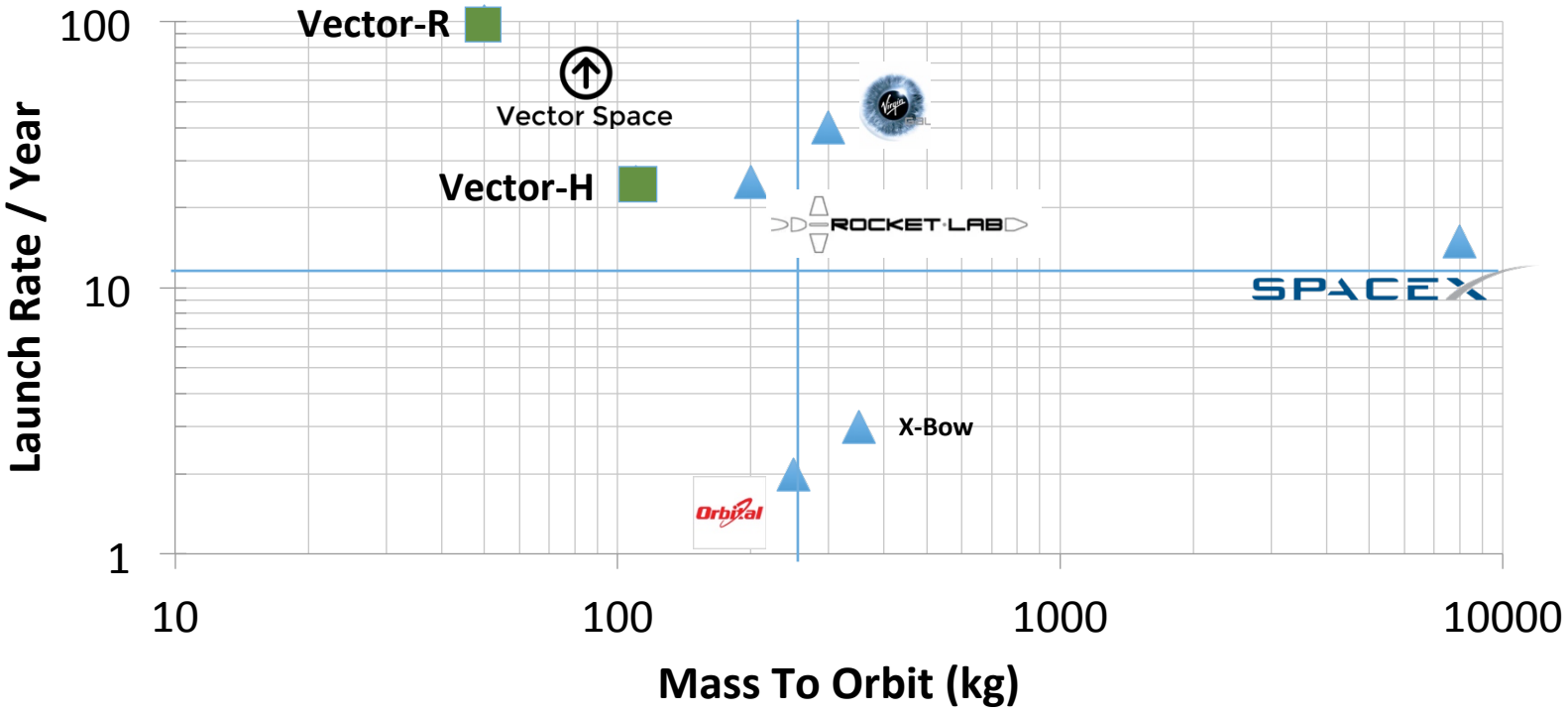
Vector Space

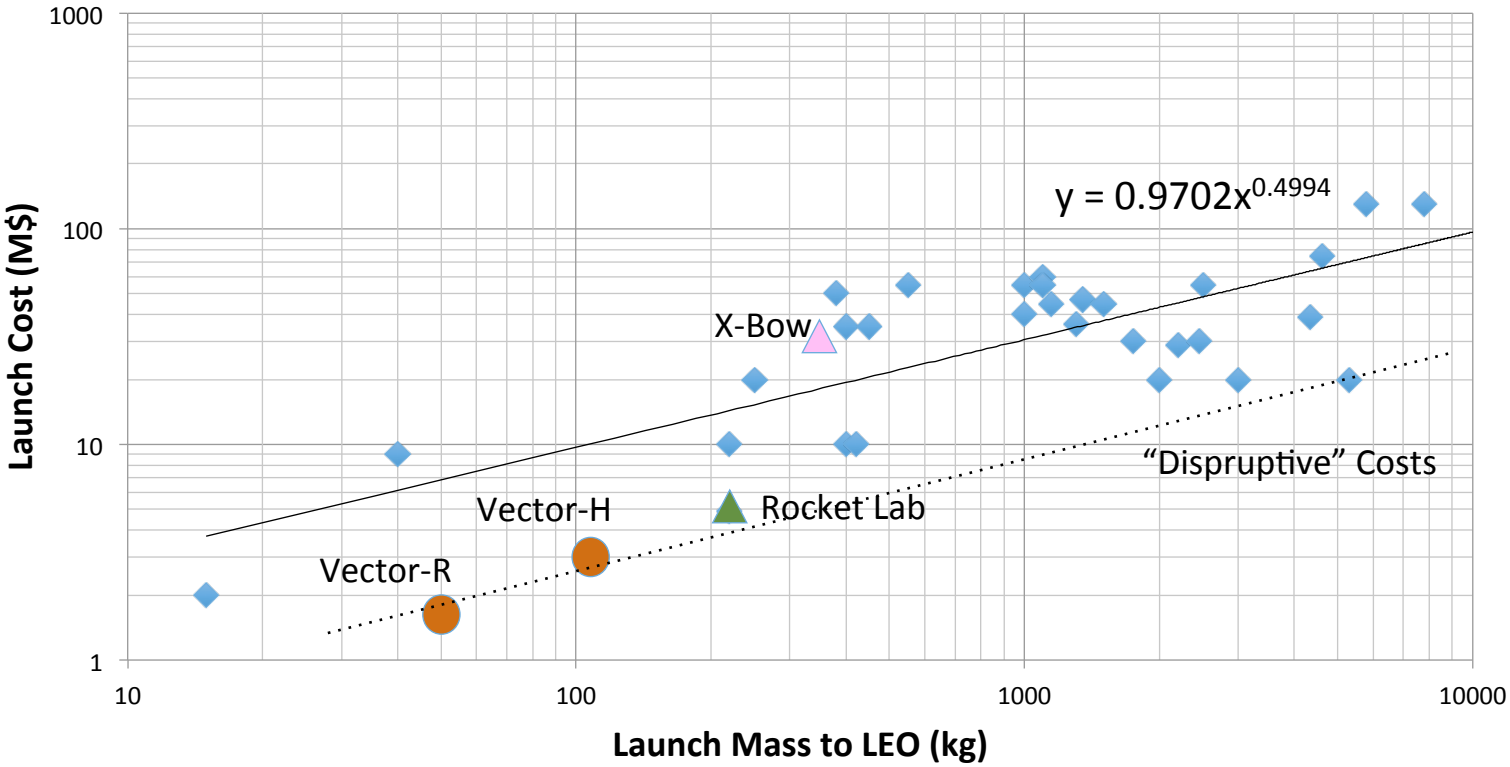
Vector-R Is Smallest Satellite Launch Vehicle



Vector Unique Positioning



Vector Lowest Priced Single Launch



Vector Space
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VECTOR-R

50 kg to LEO
Weekly launch
1.5-2.5 M$
Lead: 3 mo.
Alaska, CCAFS

ELECTRON

150 kg to LEO
Monthly launch
5 M$
Lead: 24 mo.
NZ Launch

VECTOR-H

100 kg to LEO
25 launches/yr
3 M$
Lead: 3 mo.
Alaska, CCAFS

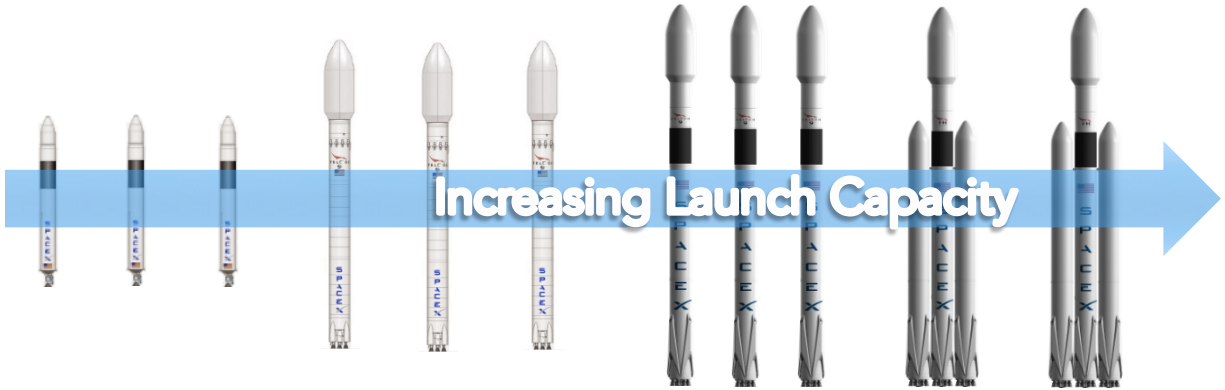
FALCON 9X

8000 kg to LEO
10 Launches/yr
75 M$
Lead: 36 mo.
US launch

Vector Space
Innovate, Build, Fly

Unique Monetization Strategy

Traditional



Primary Challenges

- High CAPEX
- Large Scales
- High Costs

Vector

Primary Challenges

- Range Flow
- Manufacturing

Vector Space

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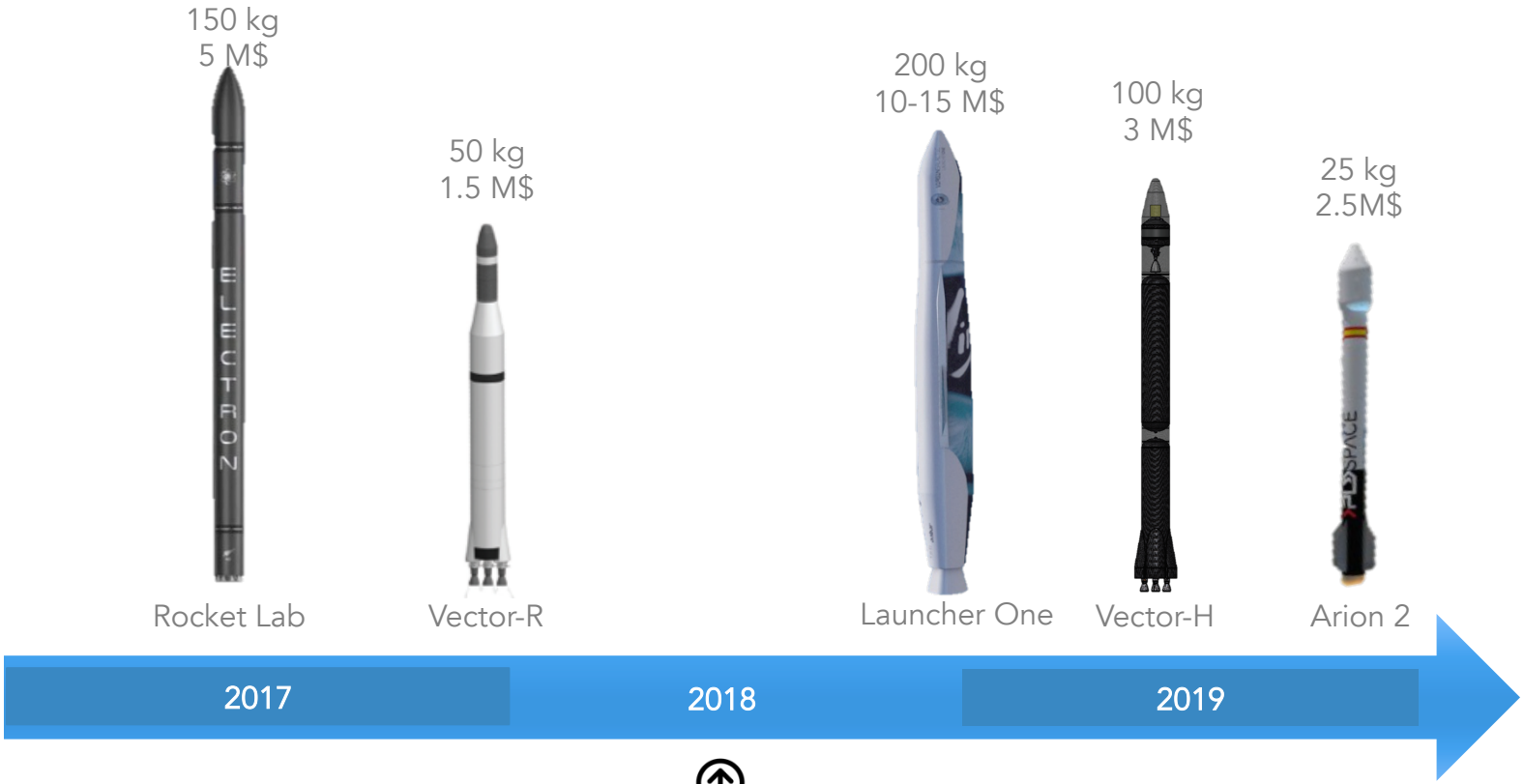
First Launch – First To Market



Vector Space
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Financial

- ✓ $2.5M Seed Rounds 2016
- ✓ $2.6M In New Contracts and 2016 Revenue
- ✓ Launch Manifest
  - ✓ 41 Firm Launches Signed
  - ✓ $81.7M In Backlog (Launch/Platform)
  - ✓ Additional $130M backlog in Negotiation
- ✓ Acquired Garvey Spacecraft Corp. (15 years Prior R&D worth $20M)
- ✓ A Round close anticipated Q4 2016

Vector Space
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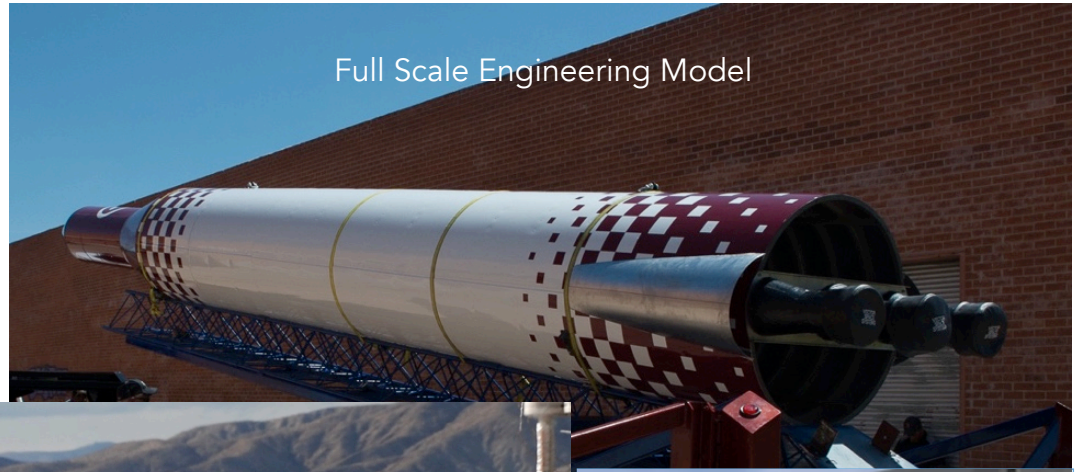
Technical Progress



1st Stage 5000 lbf. Engine Test

2nd Stage Engine (500 lbf.) Test

P-20 Flight Test

Mobile Transporter Erector Launcher

Vector Space
Innovate, Build, Fly

Facilities/Site

- Discussions underway with launch sites / Regulatory authorities
  - Alaska launch range coming under contract
  - NASA offering several launch pads
  - FAA regulatory process underway
  - Barge ops pathfinder September 2016
- Pima County (Tucson) In negotiation to build Vector factory in Aero Park near Raytheon
  - Bonds/Capitalization/Permitting
  - Long term lease
- Facility build out in Huntington Beach begins once A round closed

Vector Space
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Vector-R Flight Manifest

Pacific Spaceport Complex Alaska (PSCA)

First Vector R Flight 2017

Open

Cape Canaveral Air Force Station (CCAFS)

Sold

2017 2018 2019 2020

Vector Space
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Press To Date

Activity	Results	
Press Releases / Announcements	• SpaceX Founding Team Launches Vector Space Systems to Redefine Space Commerce • Vector Space Systems Completes Successful Test of Second Stage Engine in Advance of First Sub-Orbital Test Flight • Vector Space Completes 3D Printed Rocket Engine Test in Mojave • Vector Space Systems Completes Acquisition of Garvey Spacecraft Corporation to Enhance Micro Satellite Launch Capabilities	
Press Briefings	• Motley Fool – Richard Smith • Forbes – Alex Knapp • Quartz – Tim Fernholz • Washington Post – Christian Davenport • New Space Global – David Bullock • Aviation Week – Graham Warwick • Business Insider – Ali Sundermier • NY Observer – Robin Seemangal	• Vice/Motherboard – Jason Koebler • ABC News – Alyssa Newcomb • CNET – Luke Lancaster • Entrepreneur – Marty Jerome • BBC Live – Andrew Castle • Quartz – Michael Coren • TechCrunch – Devin Coldewey • Ars Technica – Eric Berger • CNN – Jackie Wattles
Coverage Secured	• Motley Fool • Popular Science • Aviation Week • Business Insider • TechCrunch	• Fast Company • CNET • BBC Live • Ars Technica • Business Insider

Action Plan

Seed Funding
- Reduce key risks
- Engine testing
- Thruster chambers
- Vehicle design
- Range safety initiative
- Pathfinder launch
- LOI's

Design/Manufacturing
- Team building
- Engine completion
- Flight software/Avionics
- Vehicle prototypes
- Regulatory approvals
- Manufacturing Facilities
- Sales activities

Initial Operations
- Low rate production
- In house tank fab.
- Test launches Alaska
- Florida launch facility
- Enterprise software
- Recovery systems
- Sales activities

Operational Launch
- Full rate production of 50-100 per year
- Vector 2.0 SLV
- Electric Upper Stages
- Extended vertical integration in sats

2016 | 2017 | 2018 | 2019

Seed Rounds 2M$ (Q2/316)
- 1st /2nd stage engine test
- Pathfinder launch EF-1,2
- S1 Propulsion Qual.
- Vehicle design complete
- Vehicle prototype

Series A 10M$ (Q416)
- S2 Propulsion Qual.
- S2/S1 Engine Prod.
- Tucson Factory
- Vector-R EFT-1 Flight

Series B 25M$ (Q4 2017)
- Limited production
- Vector-R EFT-2,3,4
- Vector-R Operational
- Vector-R OF-1,2,3

Self Funding (2019)
- Vector-H EFT-1
- 12 / year 2019
- 48 / year 2020
- Satellite Platforms
- Space API

Vector Space
Innovate, Build, Fly

Thank You !

Vector Space

Innovate, Build, Fly