

VECTOR

RE V O L U T I O N A R Y S P A C E A C C E S S

**Launch Service Update
for
2019 Small Payload Rideshare Symposium
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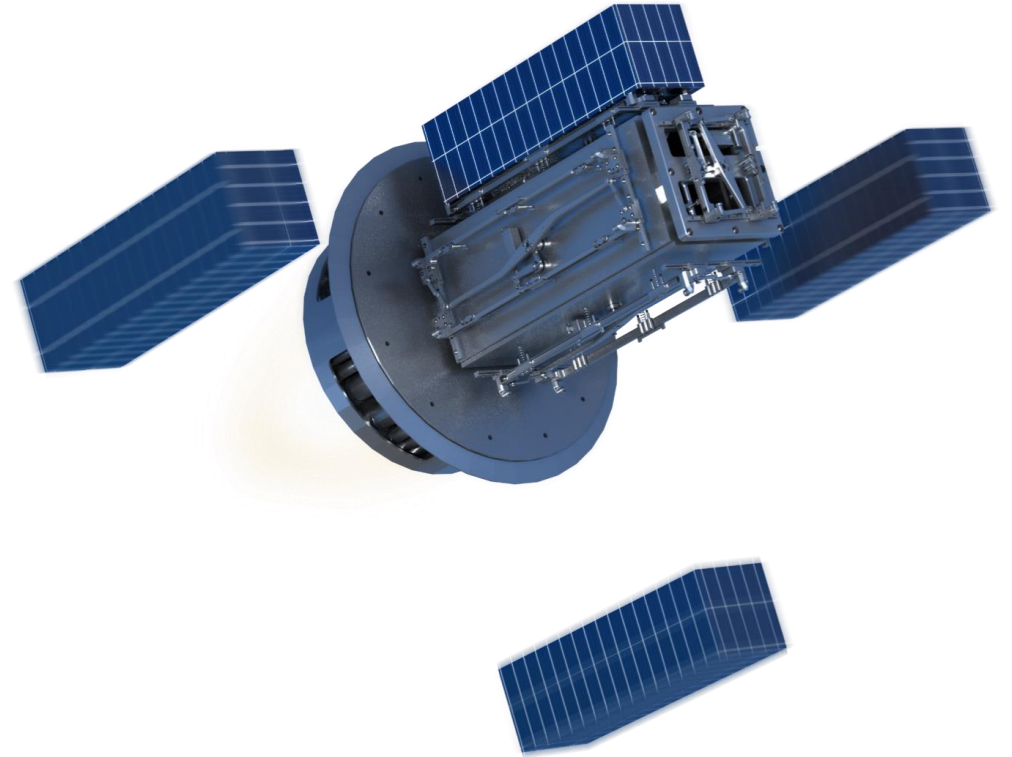
What Will Vector Provide

- ▶ **On demand launch services**
 - ▶ Dedicated launches to desired orbit and inclination
- ▶ **Revenue and mission-certainty**
 - ▶ Launch when you want, to where you want
- ▶ **Value delivery**
 - ▶ Service-focused team to ensure on time satellite delivery
 - ▶ Launch site flexibility to minimize logistics
- ▶ **Start-up program mentoring to reduce space procurement complexities**
 - ▶ US company that supports FCC & FAA requirements
- ▶ **Low cost**
 - ▶ Value price point to meet customers financial objectives



Cost Effective Approach

- ▶ **Strong heritage**
 - ▶ Baseline design includes over 20 suborbital launches (Garvey Space)
- ▶ **Multi-Mission capable**
 - ▶ Independent SVs or small constellations
- ▶ **Pyrotechnic-free & pressure vessel free**
 - ▶ Eliminates shock environment and safety risk
- ▶ **High availability**
 - ▶ Robust automotive-like production line methodology that builds reliable vehicles at rate



Cost Effective Approach (Continued)

- ▶ **Transporter-Erector-Launcher (TEL) for simplified operations**
 - ▶ Launch site flexibility
 - ▶ Demonstrated at multiple Spaceports
 - ▶ Minimal infrastructure investment
 - ▶ Single Mission Ops Center (MOC)
- ▶ **2-stage launch vehicle (3 engine configuration on 1st stage)**
 - ▶ LOX/propylene propellants
 - ▶ Densified / chilled propylene provides higher Isp
 - ▶ Soft cryogenic propellants are environmentally benign



Vector-R Testing

- ▶ **Continue to test propulsion systems for the Vector-R**
 - ▶ Single engine test stand at our Arizona Test Site (ATS)
 - ▶ Both LP-1 (stage 1) and LP-2 (stage 2) testing
 - ▶ Test occurs every few days, sometimes more frequently
- ▶ **Working to test fire our first all composite stage for the pending 1001 mission**
- ▶ **Successfully integrated the Stage 1 to our Vertical Test Stand at ATS**



PAYLOAD CONFIGURATIONS

Payload Configurations – Vector-R and Vector-H

V-R

Cubesats Mixed Payload
Vector Open Concept
CubeSat Deployer

Cubesats Multiple 3Us
Canisterized Deployer

Cubesats Multiple 6Us
Canisterized Deployer

Cubesats Two 12Us
Canisterized Deployer

Small Microsat
Clampband Deployer

The Vector-R rocket is shown with a vertical payload bay. Five configurations are detailed: 1) Mixed payload of blue and green cubesats. 2) Multiple 3Us of green cubesats. 3) Multiple 6Us of green cubesats. 4) Two 12Us of green cubesats. 5) A small microsat with blue solar panels. Each configuration includes a top-view icon.

V-H

Multiple 3Us
Vector Open Concept
CubeSat Deployer

Multiple Small Microsats
Clampband Deployer

Large Microsat
Custom Deployment Solution

The Vector-H rocket is shown with a vertical payload bay. Three configurations are detailed: 1) Multiple 3Us of blue cubesats. 2) Multiple small microsats in cylindrical containers. 3) A large microsat with various instruments. Each configuration includes a top-view icon.





- In early 2020, teams will receive notice of the first launch site just weeks prior to launch

- 18 teams prequalified by submitting applications to DARPA and FAA showing a viable solution for flexible and responsive launch
- Three teams met all requirements and deemed qualified to compete

 SPECIFICATIONS	 VECTOR	 STEALTH	 ORBIT
Height (ft/m)	55.4/16.9	To be announced	72.8/21.2
1 st Stage Diameter (ft/m)	4.6/1.4	To be announced	6/1.8
Number of Stages	2	To be announced	3 (1 st is carrier aircraft)
Thrust at Liftoff (ft-lbs/N)	16,860/75,000	To be announced	73,500/327,000
Propellant	LOX/Propylene	To be announced	LOX/RP-1
Payload Fairing Length (in/m) Diameter (in/m)	L 39.3/1 D 21.3/0.54	To be announced	L 139/3.5 D 49/1.3



Taking Orders for Dedicated Launch Service

	Vector-R	Vector-H
Conventional Launch Service:	\$1.5M	\$4.5M
<ul style="list-style-type: none"> ▪ Additional Services Available ▪ Constellation & Package Pricing Available 		
Destination & Performance:		
<ul style="list-style-type: none"> ▪ Sun Synchronous 500km 	33 kg	~200 kg
<ul style="list-style-type: none"> ▪ 38° inclination 500km 	53 kg	~260 kg

