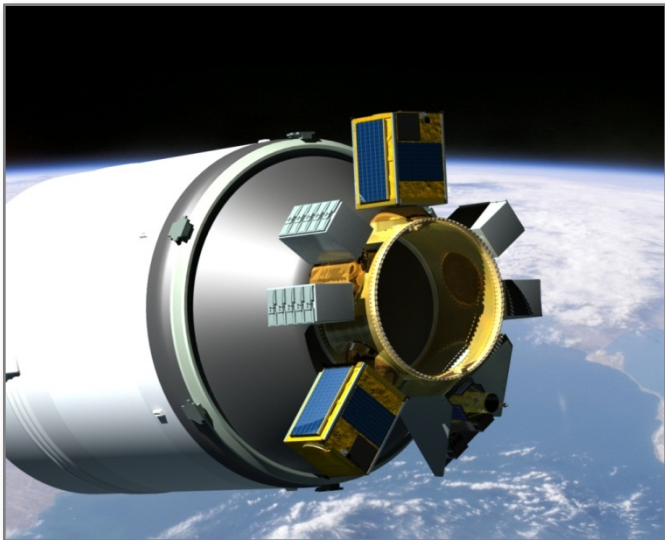




# Cal Poly CubeSat Workshop 2014



866.204.1707  
[www.spaceflightservices.com](http://www.spaceflightservices.com)  
[info@spaceflightservices.com](mailto:info@spaceflightservices.com)  
 @spaceflightinc

## Spaceflight Inc.

Frequent, cost effective, and routine access to space for deployed & hosted payloads

### Launch Services

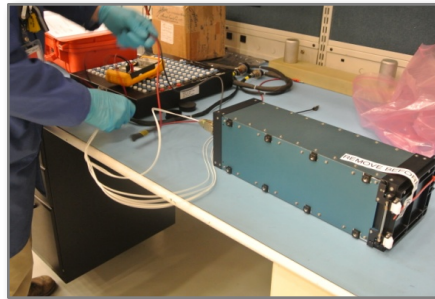
Provide satellite customers with a wide variety of launch opportunities

H1 2015	400 km circular, 51.6°
H2 2015	425 X 725 km elliptical, SSO
H2 2015	GTO/GSO/LLO
H2 2015	1500 x 39000 km, 61°
H2 2015	600-830 km circular, SSO
H2 2015	400 km circular, 51.6°
H2 2015	500 x 27000 km, 63.4°
H1 2016	500-600 km circular, SSO
H2 2016	500-600 km circular, 63.4°
H2 2016	1500 x 39000 km, 61°
H2 2016	600-830 km circular, SSO
H1 2017	600 km circular, 52°
H1 2017	500-600 km circular, SSO
H1 2017	500-600 km circular, 63.4°
H1 2017	500-600 km circular, 44°
H1 2017	600 x 60000 km, 52°

Contract for launch services

### Engineering Services

Guide the launch campaign



Prepare payloads for Flight

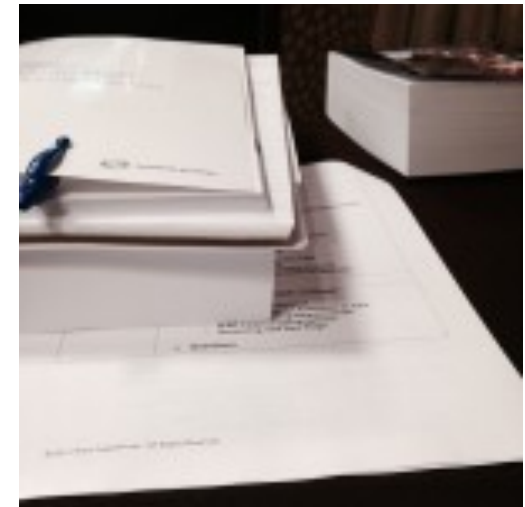


Integrate with the launch vehicle

### Legal Services

Provide ITAR and Export/Import expertise

Guide FCC and NOAA licensing

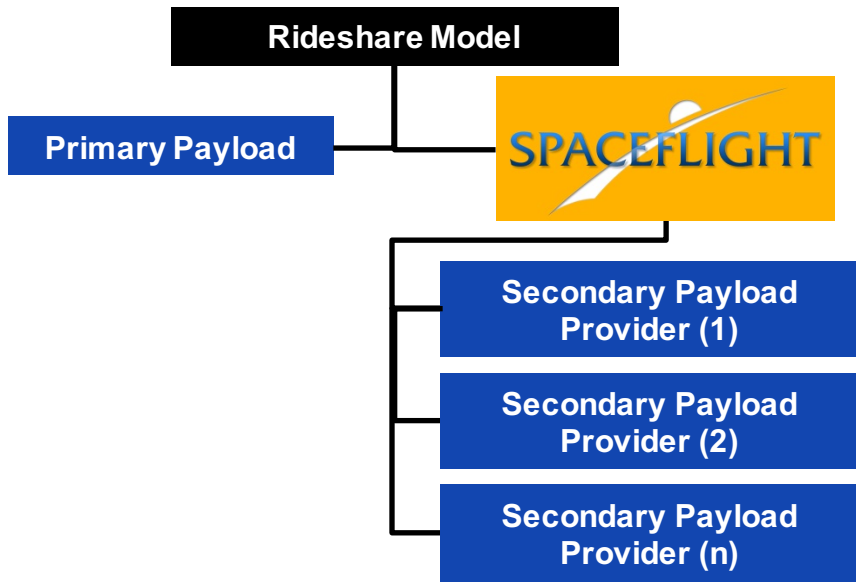


Support spacecraft registration

## Our Model

Arrange launch opportunities for secondary payloads by contracting directly with the Launch Service Providers (LSP) and Secondary Payload Providers

### Rideshare Model



### Access to Launch Vehicles



## Benefits for Satellite Developers

- Established relationships with broad launch market
- Fully arranged launch, from contract to orbit
- Experienced party representing customer as single point of contact
- Experienced payload integrators with existing dispensers and interfaces

## Benefits for Launch Service Providers

- Spaceflight provides broad access to small satellite payload market
- Experienced party as representative of ALL secondary payloads (negotiation with single party)
- Standardized interface control, documentation, test reports



## Antares A-One 2013

Customer	Launch Provider	Size	Payload	Deployer	Launch Date
Planet Labs	Orbital Sciences	3U	Dove 1	ISIPOD	04/19/2013
NASA Ames	Orbital Sciences	1U (3x)	PhoneSats	ISIPOD	04/19/2013
<b>Total Launched:</b>		<b>4</b>			

Launched  
To Date:

36



## Soyuz April 2013

Customer	Launch Provider	Size	Payload	Deployer	Launch Date
Planet Labs	Roscosmos	3U	Dove 2	ISIPOD	04/19/2013
<b>Total Launched:</b>		<b>1</b>			



## Dnepr November 2013

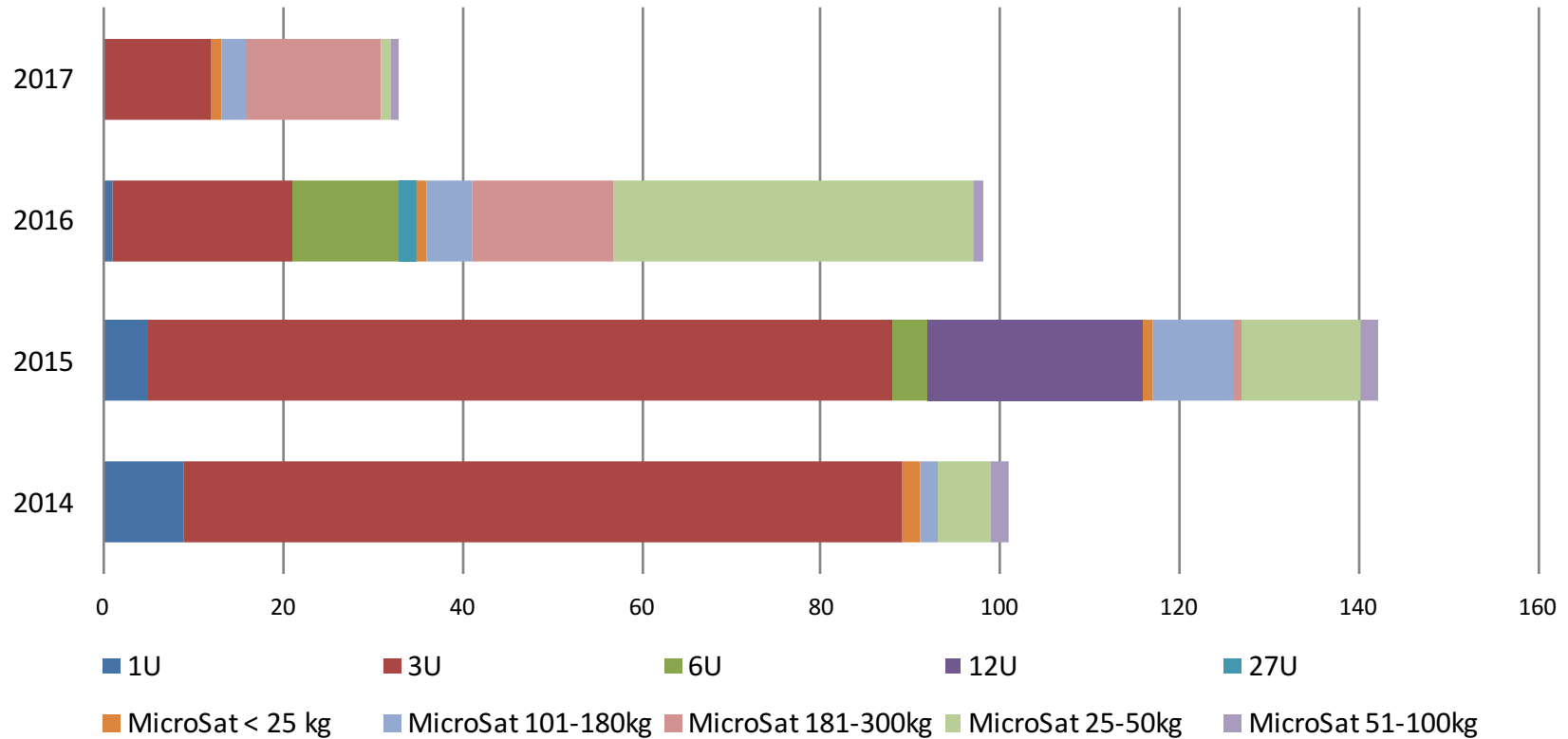
Customer	Launch Provider	Size	Payload	Deployer	Launch Date
Planet Labs	Kosmostras	3U	Dove 3	ISIPOD	01/21/2013
<b>Total Launched</b>		<b>1</b>			



## Cygnus / ISS January 2014

Customer	Launch Provider	Size	Payload	Deployer	Launch Date
Planet Labs	NanoRacks/ISS	3U (28x)	Flock 1	NanoRacks	01/09/2014
University of Peru	NanoRacks/ISS	1U	UAP-SAT	NanoRacks	01/09/2014
Southern Stars	NanoRacks/ISS	1U	SkyCube	NanoRacks	01/09/2014
<b>Total Launched</b>		<b>30</b>			

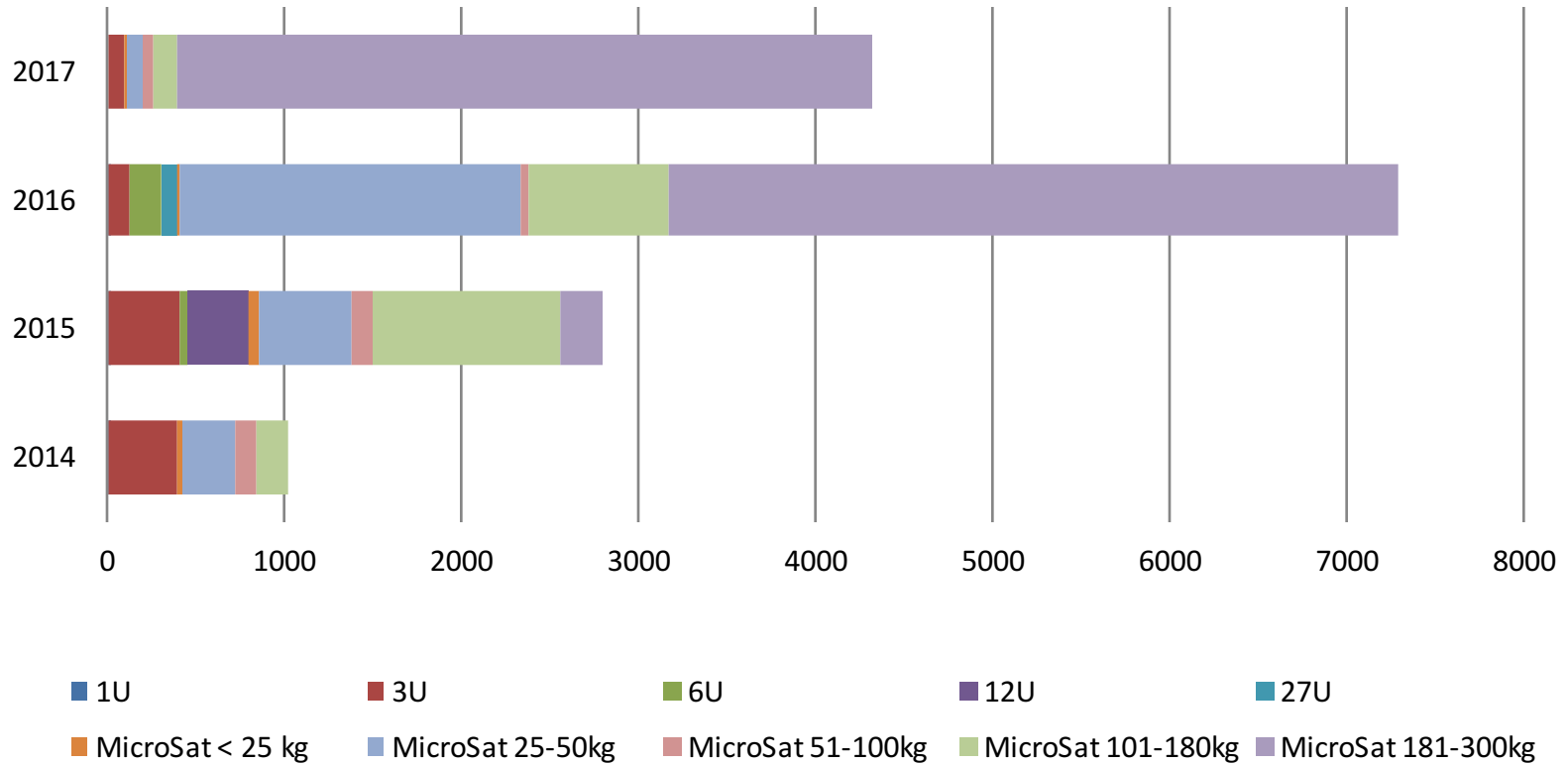
## # of Spacecraft Launch Demand by Form Factor (2014-2017)



**CubeSat trend is toward larger 3U to gain greater performance**

\*Data Set is from Spaceflight's Proprietary Market Intelligence Database

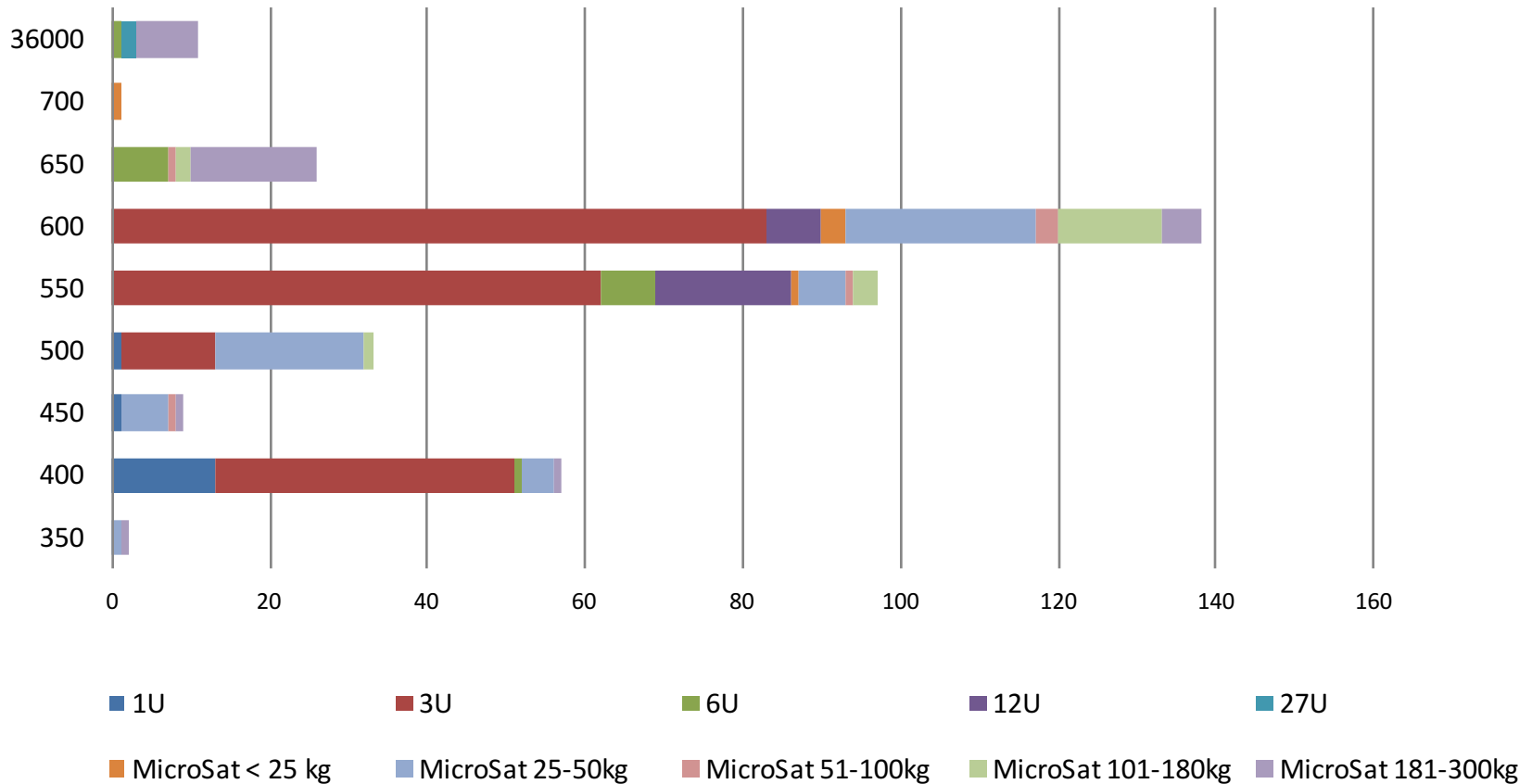
## Spacecraft Launch Demand by Form Factor and Mass (2014-2017)



**Larger smallsats Open Up Capacity on LSPs, makes life easier for CubeSats to obtain access on launch vehicles**

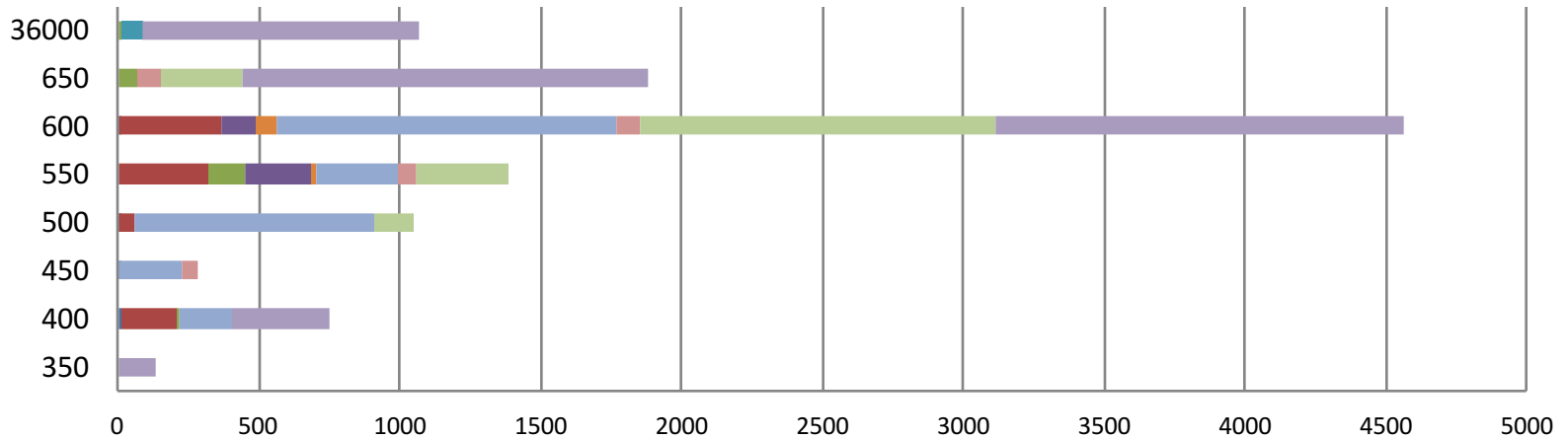
\*Data Set is from Spaceflight's Proprietary Market Intelligence Database

## # Spacecraft Launch Demand By Form Factor and Altitude Preference

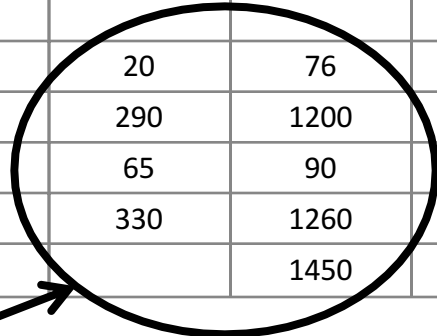


**Supply of 600km Flights – Dnepr, Soyuz, PSLV**  
**Supply of 400km Flights – ISS CRS**

### Spacecraft Launch Demand by Form Factor, Altitude, and Mass



	350	400	450	500	550	600	650	36000
1U		15.5	2	1		5		
3U		191		59	323	365		
6U		10			130		70	10
12U					228	120		
27U								80
MicroSat < 25 kg					20	76		
MicroSat 25-50kg		185	225	850	290	1200		
MicroSat 51-100kg			60		65	90	85	
MicroSat 101-180kg				142	330	1260	290	
MicroSat 181-300kg	130	350				1450	1440	980



**CubeSats Can Ride the Coat Tails**



**SHERPA is a hosted payload and in-space transportation solution that supports orbit raising and maneuvering of secondary payloads in low earth orbit, geosynchronous orbit placement, low lunar orbit insertion, and interplanetary capability.**

### Custom ESPA Ring

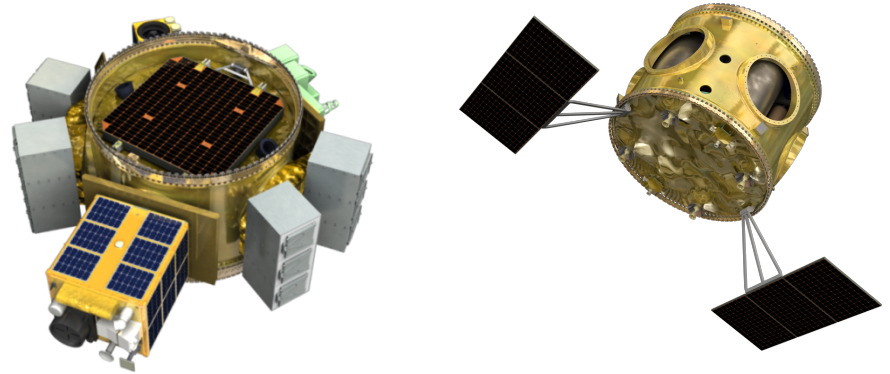
- Five 24 inch ports
- Supports up to five 300 kg – 120 x 100 x 140 payloads

### Avionics Deck

- Power, communication, pointing, and payload interfaces

### Propulsion Deck

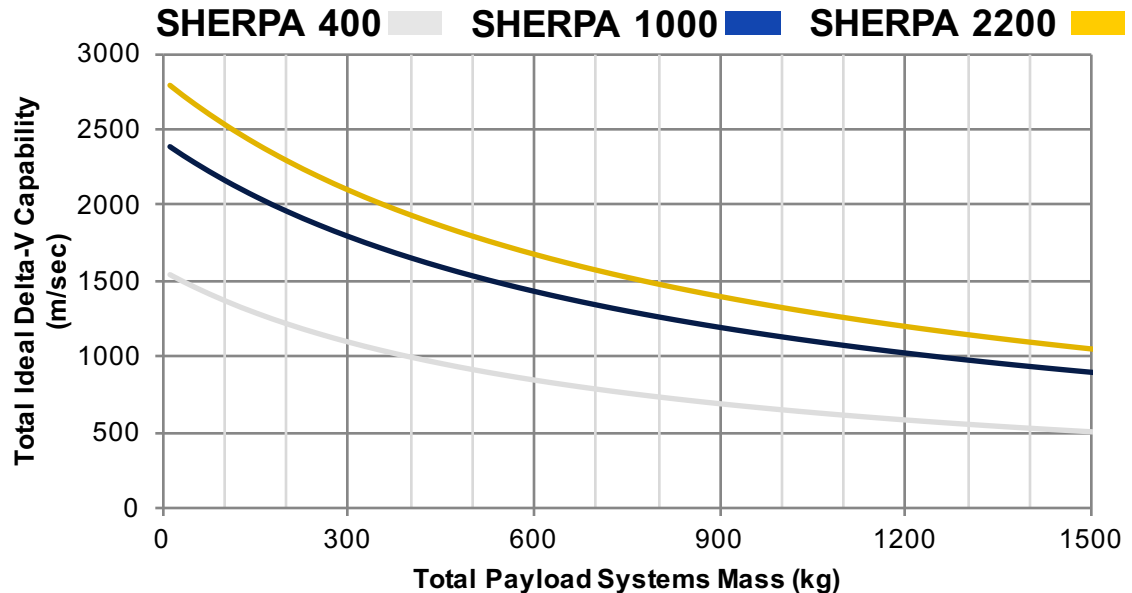
- Propellant and Pressurant tanks
- Primary thrusters

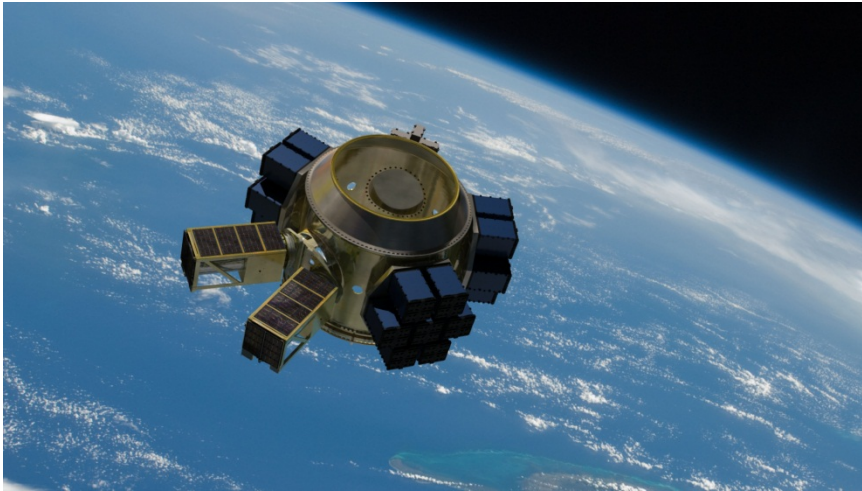


### SHERPA Performance

Vehicle	Propellant System
SHERPA 400	2 Tank Monopropellant
SHERPA 1000	4 Tank Monopropellant
SHERPA 2200	4 Tank Bipropellant

Mission Duration	3 Years Max
Power per Payload	50 W Orbit Avg Power
Payload Downlink	Up to 100 Mbps
Attitude Knowledge / Accuracy	< 15 arcsec / < 50 arcsec
RAM Capacity for Payload Data	4 GB





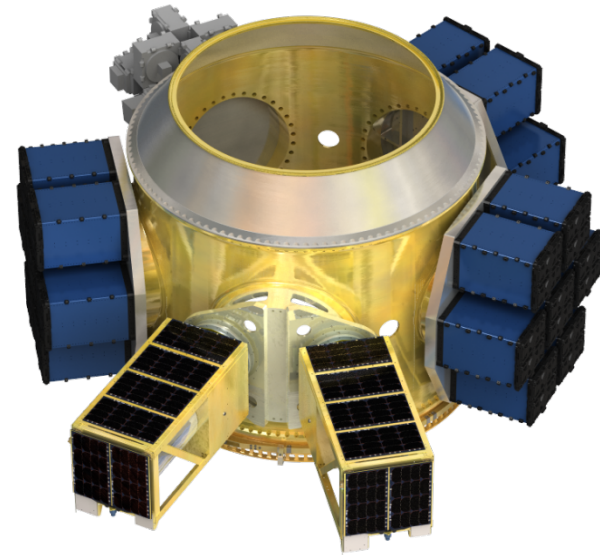
**Inaugural flight on U.S. based Launch Vehicle  
Q3 2015 - 450 X 720km 98 Degrees 10:30 LTDN**

**Up to 1000 kilograms of Secondary Payloads**

**Each SHERPA port is capable of supporting  
28 3U**

**Customers range from CubeSats to 150kg  
microsats**

**Limited Capacity Available!**  
**Discounted Pricing Available**  
**Contact us after the presentation if interested**



Spaceflight is the **ONLY** rideshare provider to offer public commercial pricing

Payload Type	Containerized Payloads				MicroSat Class		
	1U	3U	6U	12U	50 kg	180 kg	300 kg
Length (max) cm	10.0	34.0	36.6	36.6	80	100	125
Height (max) cm	10.0	10.0	10.0	22.6	40	60	80
Width (max) cm	10.0	10.0	22.6	22.6	40	60	80
<b>Mass (max) kg</b>	<b>1.0</b>	<b>5.0</b>	<b>10.0</b>	<b>20.0</b>	<b>50</b>	<b>180</b>	<b>300</b>
Price – Orbital (LEO)	\$125k	\$325k	\$595k	\$995k	\$1,750k	\$4,950k	\$6,950k
Price – Orbital (GTO)	\$250k	\$650k	\$995k	\$1,950k	\$3,250k	\$7,950k	\$9,960k
Price – Orbital (GSO / LLO)	\$490k	\$995k	\$1,990k	\$3,250k	\$6,500k	\$15,900k	\$19,900k

Commercial pricing based on payload size and mass

Launches for payloads ranging from CubeSats to MicroSats

Mission pricing for Low Earth Orbit to Low Lunar Orbit

\*\*\* Discounts available for launching multiple spacecraft

## Non Standard Options:

Constellation Deployment

Privacy Shroud for Security/Confidential Payloads

SHERPA Orbit Maneuvering:

- Altitude and Inclination
- In Space Transportation to the Moon, Mars, and Beyond

## Spaceflight offers full-service space access solutions for small satellites!

### **We find you the optimal launch**

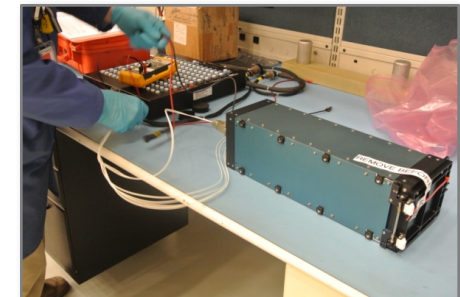
Access to nearly all launch service providers across the globe provides many launch options on a number of launch vehicles.

Secondary payload aggregation is key to finding the right orbit and at the right price



### **We support your launch campaign**

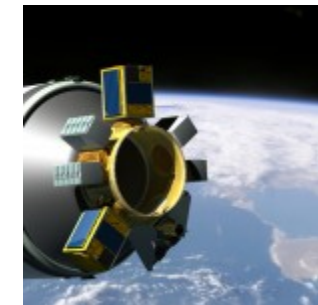
Our staff of experienced engineers and legal counsel is at your disposal to ensure your satellite has a seamless launch campaign - from providing design guidance and testing support to navigating regulatory compliance and ITAR.



### **We integrate your satellite to the launch vehicle**

Spaceflight is launch vehicle and deployment hardware agnostic. We use the best deployment mechanisms that meet your mission requirements.

Spaceflight physically mates your satellite to the launch vehicle and conducts tests to ensure safe and successful deployment on orbit.





**Adam Hadaller**  
**Mission Manager**

[www.spaceflightservices.com](http://www.spaceflightservices.com)

 @ SpaceflightInc

