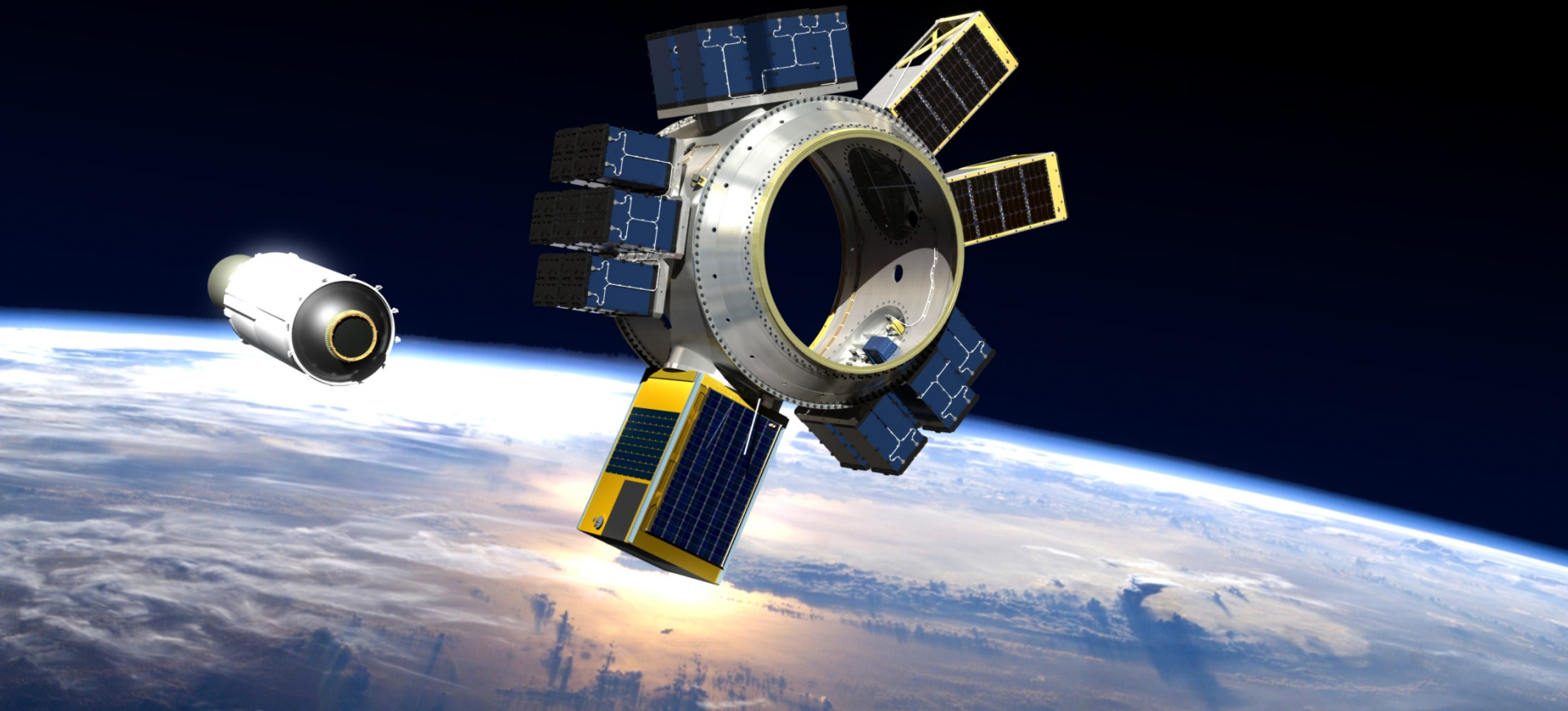


# Deploying 87 Satellites in One Launch: Design Trades Completed for the 2015 SHERPA Flight Hardware



Authors: Kaitlyn Kelley, Mitch Elson, Jason Andrews

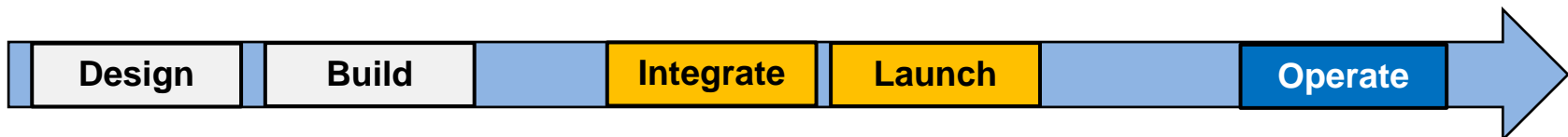
- Spaceflight Industries integrates multiple companies into a single entity with three lines of business
  - Spaceflight Systems: Formerly Andrews Space – Founded in 1999 and producer of small high performance spacecraft and components
  - Spaceflight Services: Founded in 2010 to provide launch services to the emerging SmallSat community
  - Spaceflight Networks: Created in 2014 to provide communication services to the emerging SmallSat community

SPACEFLIGHT 

Systems

Services

Networks

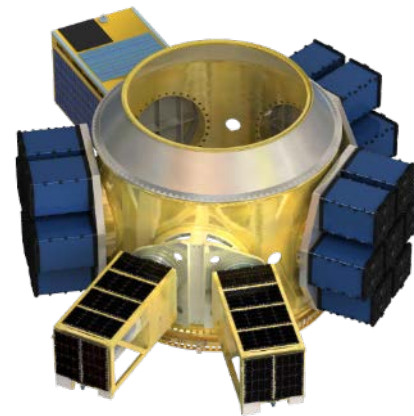


## Spaceflight's Mission is To Provide Cost Effective, Routine Access to Space

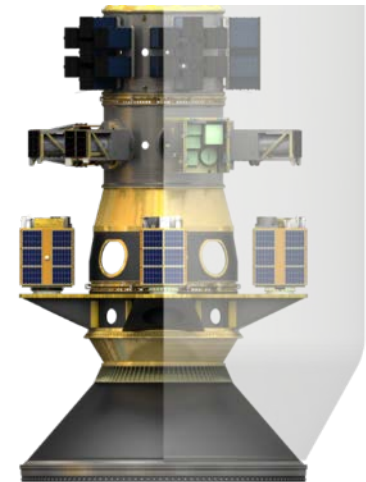
- Spaceflight provides turnkey launch solutions to enable the emerging NanoSat / MicroSat / SmallSat market
- Spaceflight has orbited 77 spacecraft
- We have another 136+ on contract to launch in the coming months / years
- First SHERPA mission manifested on a SpaceX F9 for Q1 2016 with 87 payloads on board
- Dedicated cluster missions begin in Q3 2017 to LEO, 2018 for GTO
- Dedicated small launch vehicle capability available starting early 2017



First payloads orbited in 2013



SHERPA rideshare accommodations and in-orbit delivery starting in 2015



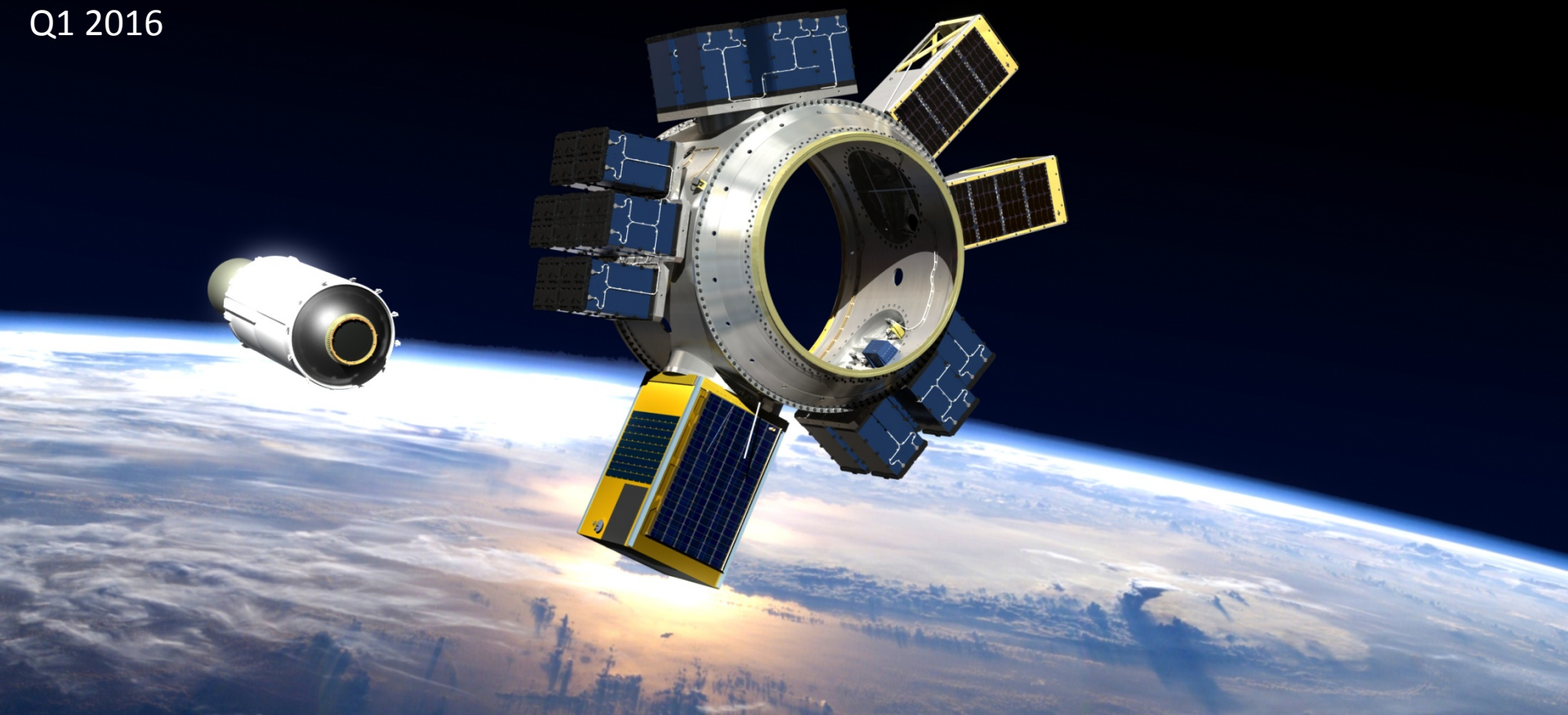
Commercial rideshare cluster missions starting in 2017

## Launch Vehicle

SpaceX Falcon9v1.1  
Vandenberg AFB, CA  
Q1 2016

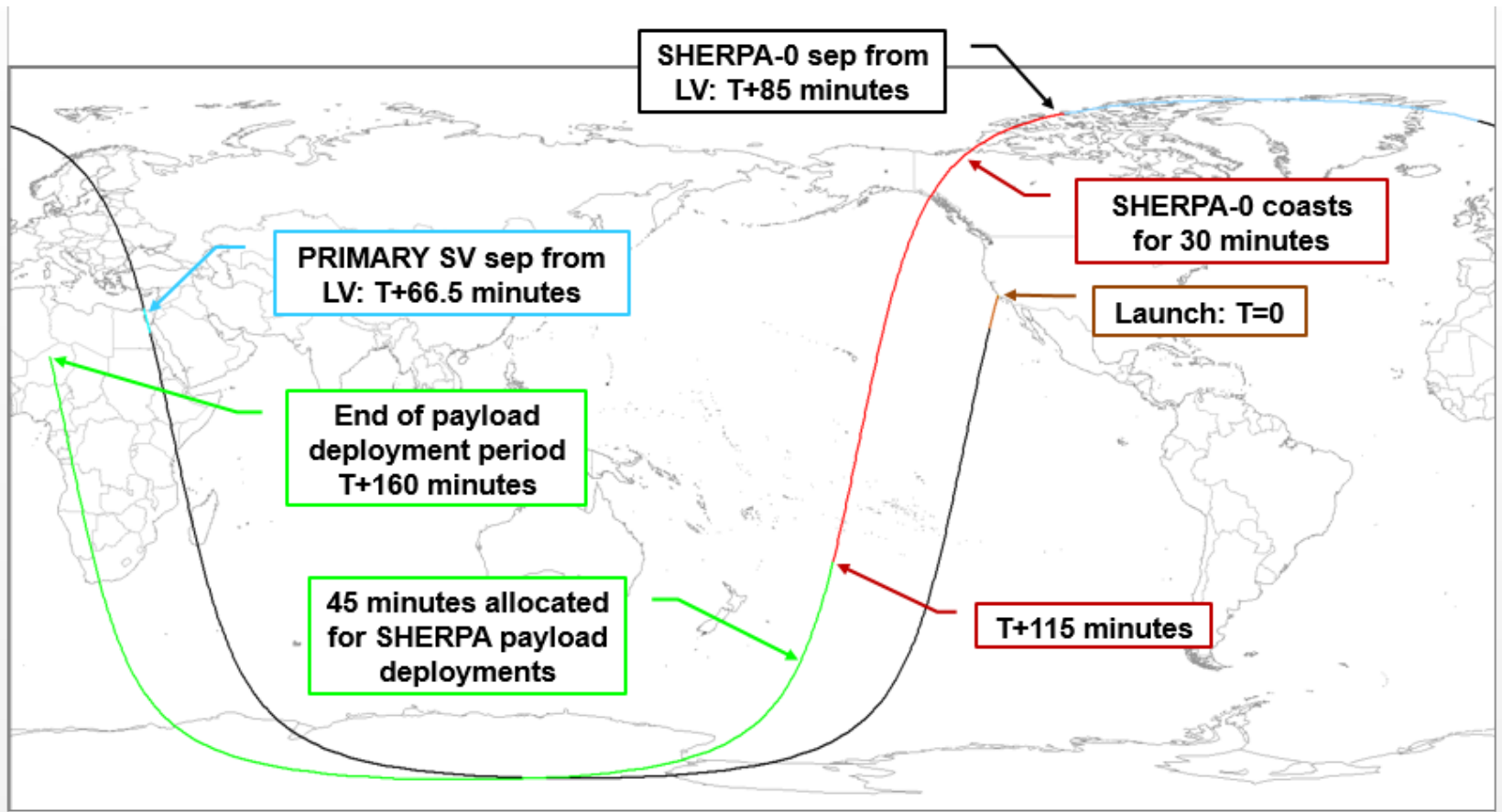
## ORBIT

LEO, 450 km x 720 km, 97.4°  
10:30 LT DN

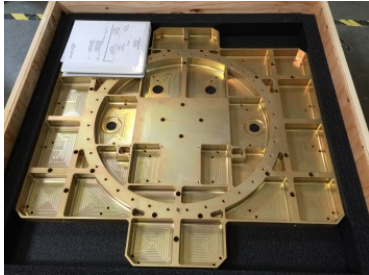




- SHERPA is deployed as a free flyer and then separates the payloads
- Total mission duration is 16 hours with multiple telemetry downlinks planned



- SHERPA is based on a five port ESPA Grande ring and uses standard adapters configured to accommodate a wide range of payloads sizes and configurations



## QuadPack Plate

Accommodates seven ISIS Quadpacks allowing each plate to hold 28 3U spacecraft



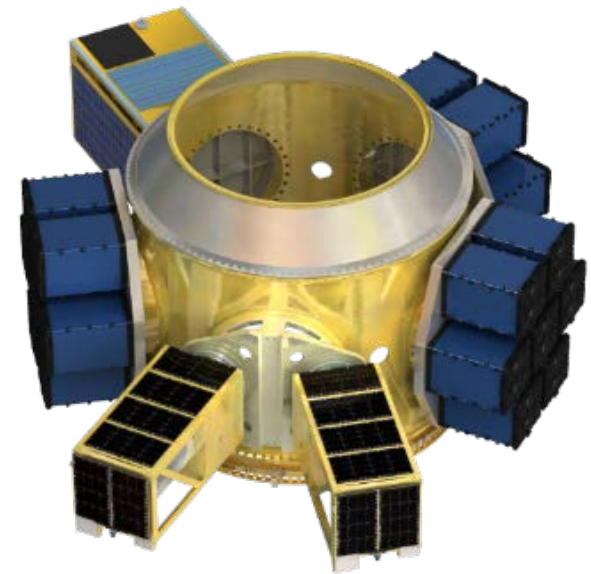
## Dual Port Adapter

Supports 11.732" and 8" Separation Systems for two spacecraft up to 80 kg



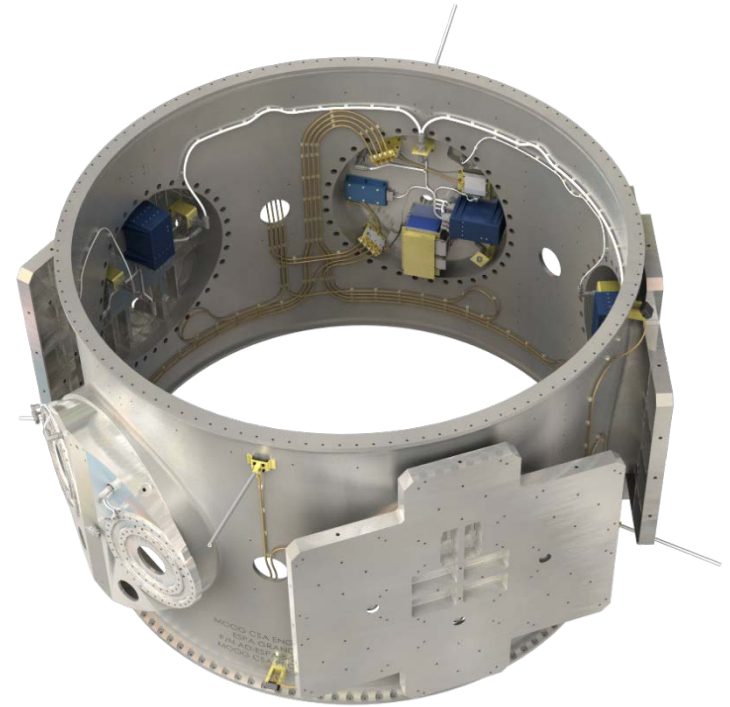
## Radial Port Adapter

Supports 15" and 11.732" Separation Systems for spacecraft up to 180 kg

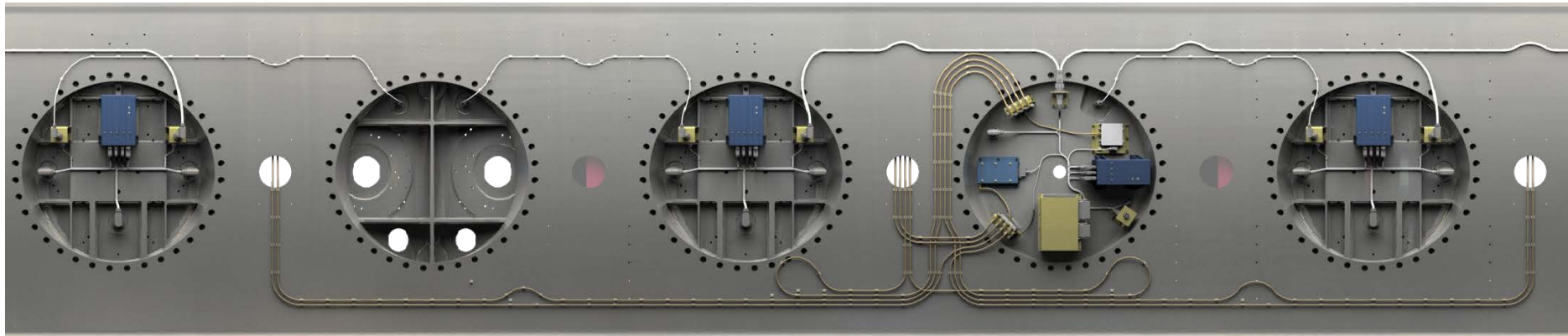


87 Total Spacecraft

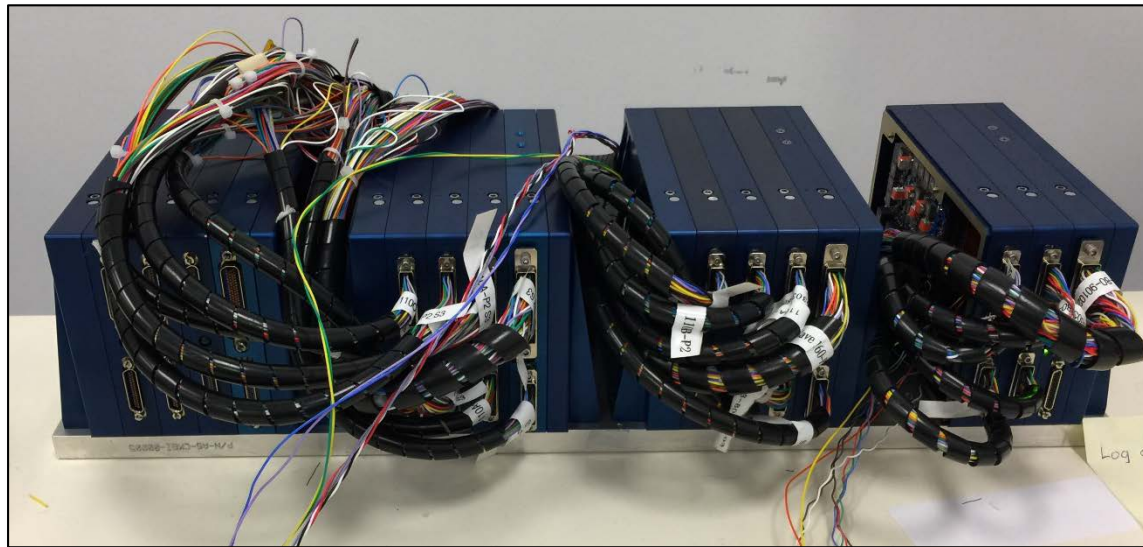
- SHERPA is designed to fly as a stand alone system that is separated from the Launch Vehicle prior to initiation and completing the dispensing of the secondary spacecraft.
- The avionics consist of a battery, flight computer, radio and GPS system that relays telemetry data through Spaceflight Networks providing confirmation of separation and state vectors to the customer.



Internal view of the SHERPA Ports with the avionics system displayed.

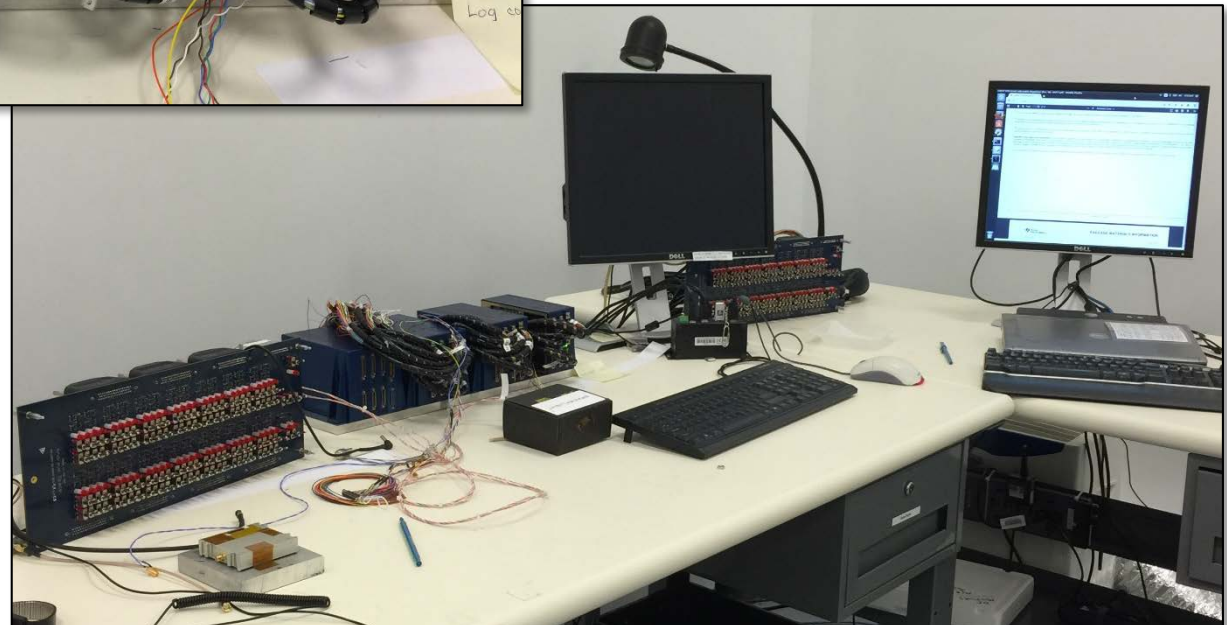


- We have conducted extensive deployment testing using the SHERPA flat sat



SHERPA Avionics Stack

SHERPA Flat Sat



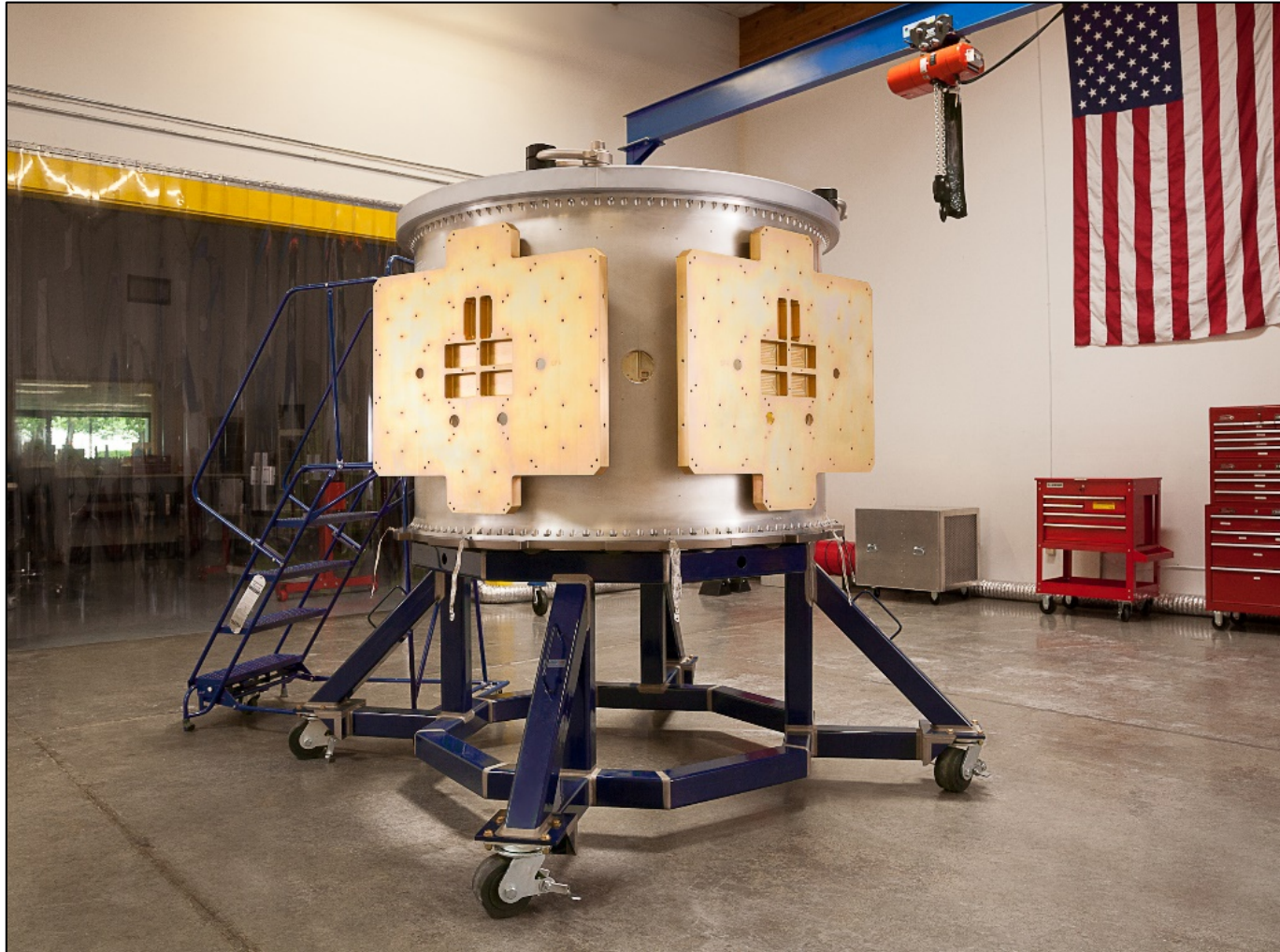


- We have completed fit check with the Falcon 9 Payload Adapter



SHERPA Ring and Ruag Separation Mechanism

- All adapters are in house and fit checks are completed





- Flight unit is in final integration

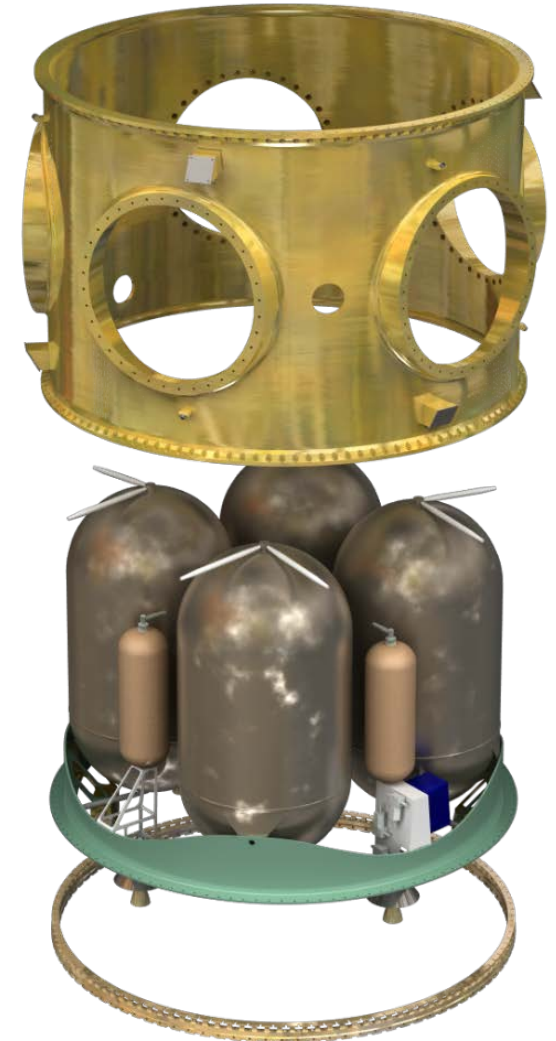
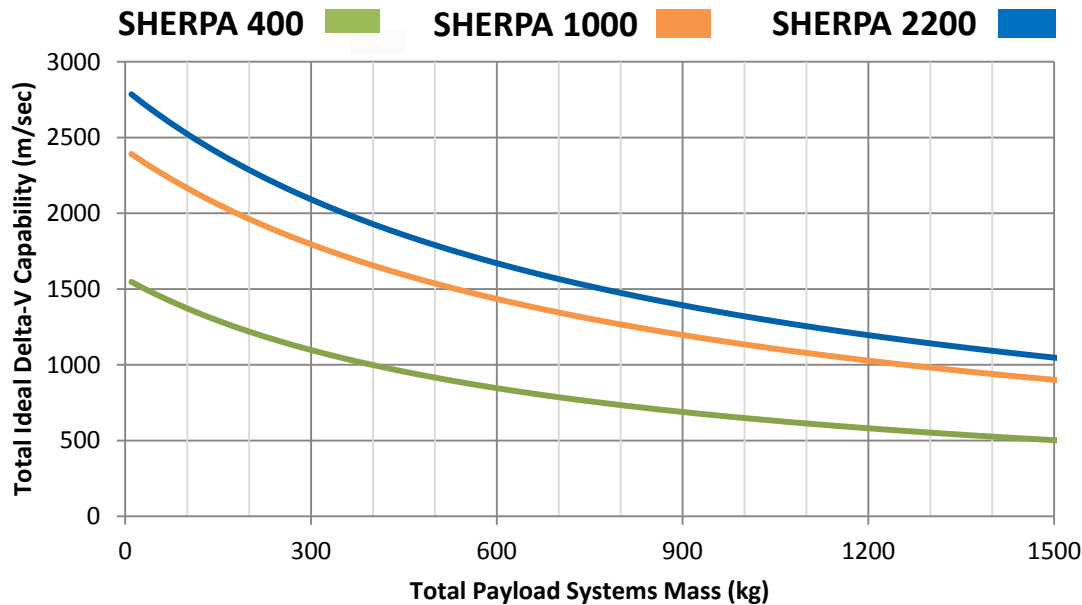


- Payload integration with SHERPA will occur in Spaceflight's clean room located in Seattle, WA





- Spaceflight is working with vendors to incorporate a modular propulsion system to meet a wide range of missions in LEO, GEO and beyond.



- SHERPA and its modularity enables dedicated rideshare missions
  - Spaceflight has booked multiple payloads for a dedicated rideshare mission to 10:30 SSO in 2017 with future missions in 2018 and beyond.
  - Launch vehicle contract negotiations are in late stages for these missions.

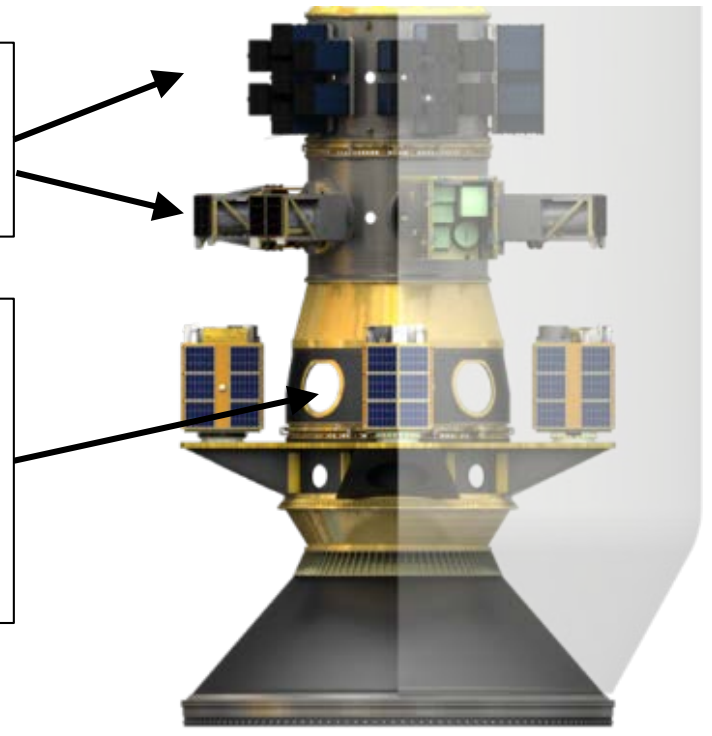
575km SSO 10:30 LTDN

**Auxiliary Satellites – Economy Class:**

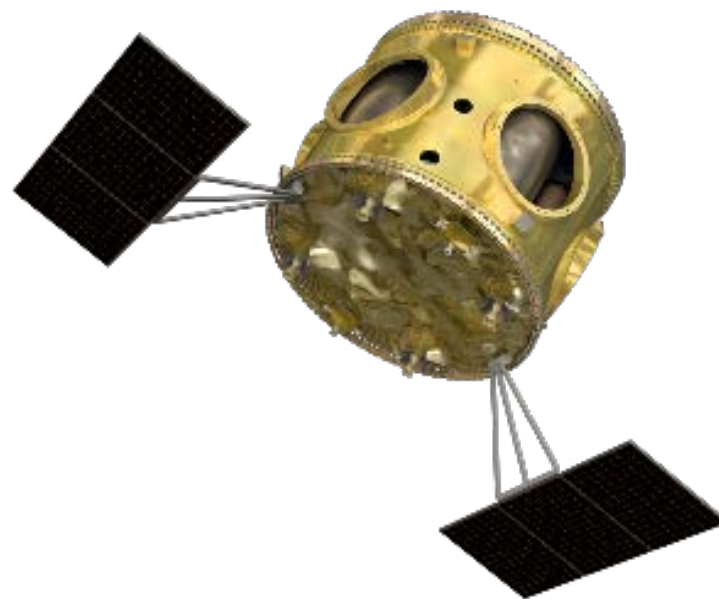
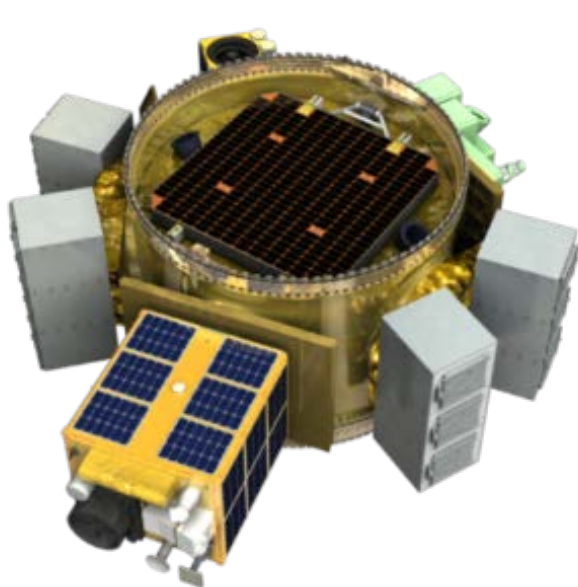
- Integrated to Spaceflight’s SHERPA in-space tug
- Max Mass – 300 kg per Port

**Co-Lead Customer – Microsatellite – First Class:**

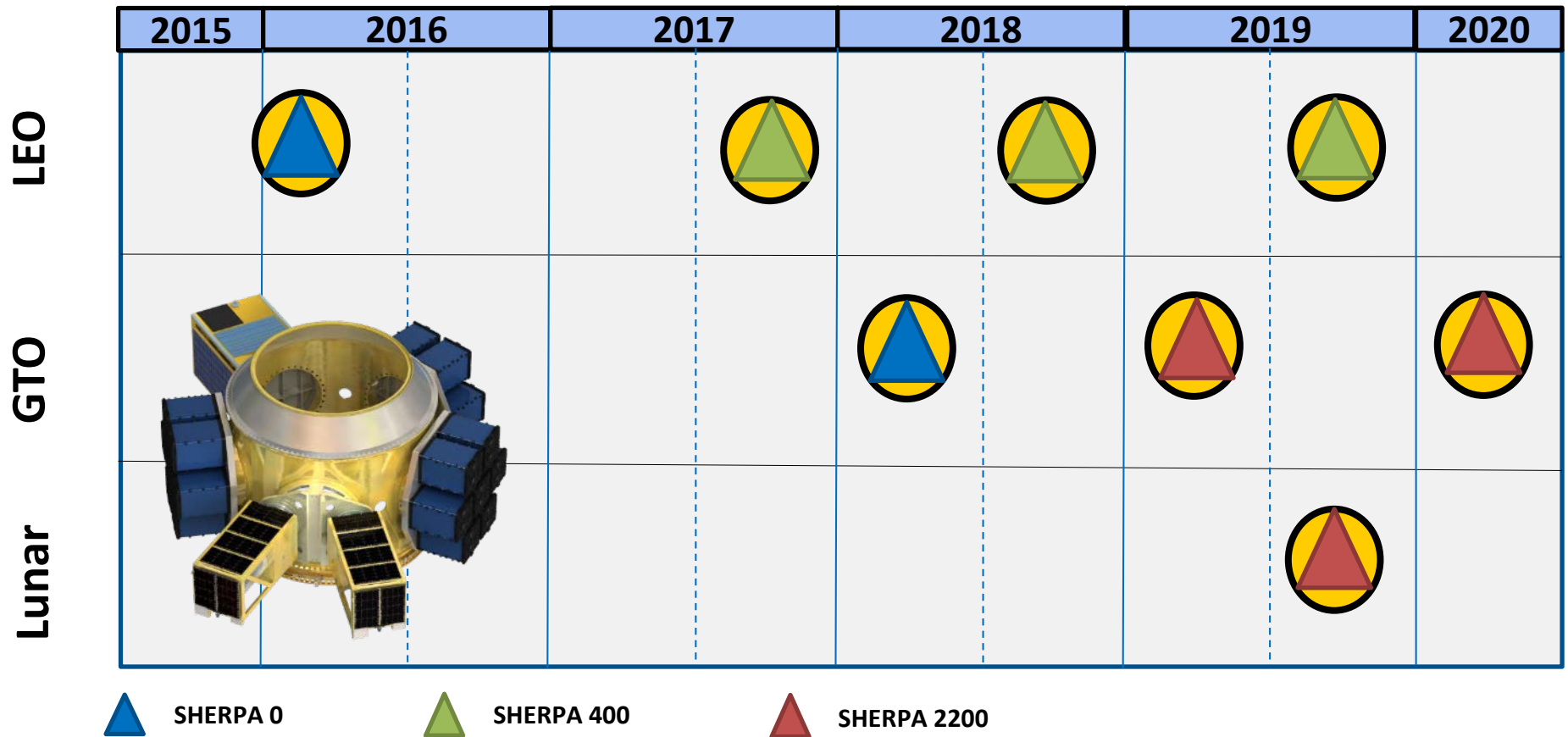
- Integrated within Dual Payload Carrier or on top of stack
- Determines launch campaign schedule & orbit  
Orbits to LEO, GTO, and TLI



- Further SHERPA upgrades are underway to enable free flying missions of up to three years duration to support hosted payloads
  - 10:30 SSO hosted payload opportunities available at least once a year
  - Leverages Spaceflight Networks for frequent communication opportunities and payload data throughput



- This SHERPA mission is the building block for many exciting Spaceflight missions in the coming years







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

