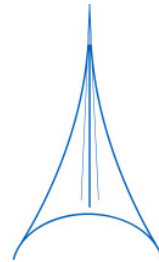




Space Access Technologies, LLC (Space Access)



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>>Cost Effective access to Space for Research & Education Payloads<<



- I. Space Access Technologies Overview**
- II. Space Access Partners**
- III. Space Access's Mission**
- IV. Space Access's Vision**
- V. Rideshare Enablers**
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- VII. Space Access Launch Opportunities**
Current Manifest; Manifest Milestones; and
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- VIII. Summary**



- **Space Access was created by the founders of**
 - Design_Net Engineering (DNet)--Gerry Murphy
 - TriSept Corporation (TSC)--Rob Spicer

⇒ In response to the space industry's need for more regular and cost effective access to space
- **Space Access is devoted to finding rapid response spaceflight opportunities for**
 - Science & Technology Payloads across DOD, NASA, University, and Commercial sectors



- ***DNet* specialize in avionics and provides cost effective, quality solutions in the areas of**
 - Systems, Electronic/Electrical, Mechanical, and Software Engineering services for government, commercial, public and private sector customers
- ***TSC* specialize in integration and operations, with areas of expertise in**
 - Systems & Software Engineering, Launch integration & Operations, Mission design & Flight operations, Custom software development, Network communications, and new technology research & development



- ***Cal Poly* focuses on facilitating the CubeSat community in finding practical, reliable, and cost-effective launch opportunities. In addition to providing**
 - A CubeSat standard physical layout and design guidelines;
 - A standard flight proven deployment system (P-POD);
 - Coordination of required documents & export licenses;
 - Integration & acceptance testing facilities with formalized schedules;
 - Telemetry information



- **Provide Regular, Cost Effective access to space for Research & Education Payloads via various U.S. Launch Vehicles (LV).**
- **The following LV's are either under MOU with Space Access or in negotiation**
 - Lockheed Martin LV: *Atlas 5*
 - Orbital LV via USAF STP and USURF: *Minotaur*
 - SpaceX LV: *Falcon 1*
 - ATK



- **Develop standard adapter structures for various LV's (the "RideShare Adapters" (RSAs)), that enable multi-payload manifesting or ridesharing**
- **RSA is expected to facilitate**
 - 1) efficient mission specific configuration,
 - 2) efficient integration of payloads,
 - 3) effective and rapid integration to launch vehicles

Promote more responsive and affordable access to space



- **Advancing Space Access’s “Vision” and Assuring Success requires several key enablers:**

- 1) The right launch vehicles:

- Small, rapid response, cost effective, rideshare “friendly”
- < \$10M for rideshares (dictated by \$ available)
- Launch from US ranges

- 2) Processes that support rideshare:

- **Manifest process that encourages rideshare & cost buy-down**
- Process for integrating several payloads per flight and completing the mission design in short order and for low cost
- **Processes for rapid accommodation of the resulting space vehicle by the LV**
- Streamlined range operations



- 3) **Rapidly Configurable “Rideshare Bus”** that:
 - Uses standardized components and interfaces
 - Has well defined *Processes* for rapid configuration / integration
 - Supports individual instruments with robust services
 - Supports other small S/C classes (e.g., ESPA, Nanosat, FalconSAT, RocketPod, CubeSat)
 - Allows ease of integration to the LV
 - Provides streamlined on-orbit operations
- 4) The right business partnerships
- 5) A political climate that supports commercial launch



- **Six classes of payloads (P/Ls) will be served:**
 - A) Stand-alone primary spacecraft buses up to ½ FALCON in weight/size (< 440lb (200kg) total; size < 48” (121.92cm) O.D. x 36” (91.44cm) height)
 - B) Components which need a S/C bus for support in orbit, up to 250 Watts for payload, up to 1 Mbps data
 - C) Nanosat-class secondary P/Ls (weight <66lb (30kg); size <18.7” (47.5cm) O.D. x 18.7” (47.5cm) height cylinder to fit CAPE mechanism)
 - D) FalconSAT-class secondary P/Ls (< 44lb (20kg); size <14” (35.56cm) cube)
 - E) RocketPod-class secondary P/Ls (weight <4.4lb (2kg); size <3.94” (10cm))
 - F) CubeSat-class secondary P/Ls (weight 1U: <2.2lb (1kg), 2U: < 4.4lb (2kg) or 3U: <6.6lb (3kg); size 1U: 3.94” (10cm) cube, 2U: 8.94” (22.7cm), or 3U: 13.29” (33.75cm) length rectangular prisms to fit P-POD mechanism)



- **Support for Sample return and user controlled operations are in negotiation**
- **Support for Microgravity (grav. Gradient), and 3-axis pointing, or slow spinner for free flyers**
- **Launches**
 - Ranges include: VAFB, Wallops, Kwajalein, Kodiak
 - LEO: low inclination, high inclination (incl. Sun-Sync) and GTO
 - Multiple deployments per launch as needed by customers
 - Deploy Primary P/L first → Deploy Secondary P/Ls in P-POD pairs per LV command
 - Ability to deploy CubeSats in sequence TBS by customers
 - On-orbit life of few months to many years TBS by customers
 - Optional ops support available



- **Launch goal of <12 months from manifest ATP (assuming P/L will meet schedule)**
- **Equitable cost sharing among all payloads—*you buy your fair share of the ride! Not based on weight alone***
- **Educational payloads on EVERY mission will assure frequent access that has recently been denied**



- **Upcoming Rideshare Opportunity**
 - SpaceX: Falcon 1 LV
 - Orbit: $h \sim 684.9$ km; $i \sim 9$ deg; $e < 0.005$
 - **Current Official Launch Date: July 31st 2007**
- **Rideshare Cost for this particular mission** (NOTE: prices may vary from mission to mission)
 - **\$45.5k*** per “1U” Academic CubeSat or
 - **\$100k*** per “3U” Academic CubeSat
 - * Prices include “Academic Discount”
- **Projected Delivery Date of CubeSats to Cal Poly for Integration with P-PODs:**
 - **Required by 1st April 2007 \Rightarrow 16 weeks Prior to Launch**
 - Cal Poly will be ready to start integrating Academic CubeSats by 1st March 2007



- **Services**
 - **Ground Tracking Support**
 - **Telemetry Support**
 - Malaysian Ground stations
 - Longitude: 101.57443 deg; Latitude: 3.09305 deg
 - Antennas: 2m Yagi (~140MHz); 70cm Yagi (~440MHz)
 - Availability: 14 links per day
 - 6 links per day required for Malaysia CubeSats
 - 8 links per day available for other CubeSats
 - Time in view: ~14.35min per pass
- **Cal Poly has a meeting scheduled with ATSB, Malaysia on May 12th to discuss shared ground station services (tracking & telemetry)**



- **Current Payload Manifest**

Payload Type	Available Slots	Status	Customer	
Primary ($< 200\text{kg}$)	1	✓ Taken	ATSB: RazakSAT	
Secondary Nanosat-class ($< 30\text{kg}$)	1	✓ In Negotiation	ATSB: nanosat Alternatives being considered	
Secondary CubeSat- class ($< 1\text{kg}$)	12 – 18* More mass may be available → so important to reserve slot to be considered *Total number of available slots dependent on launch margin	6 slots Taken	-ATSB Malaysia: 2 x 3U CubeSats (2 whole P-PODs)-- InnoSAT, CubeSAT (TBC) -Bahcesehir University Turkey: 1U CubeSat-- Aysem -Montana State University: 2U CubeSat-- Electra -University of Sydney: 1U CubeSat-- CASsat (TBC)	-Tethers Unlimited: 1-3 x 1U CubeSats-- SPEECH1, SPEECH2, SPEECH3 (TBC) -NCK University Taiwan: 2U & 1U CubeSats-- PACE, YamSat (TBC) -Boeing: 3U CubeSat -: -:



- **Manifest Milestones**

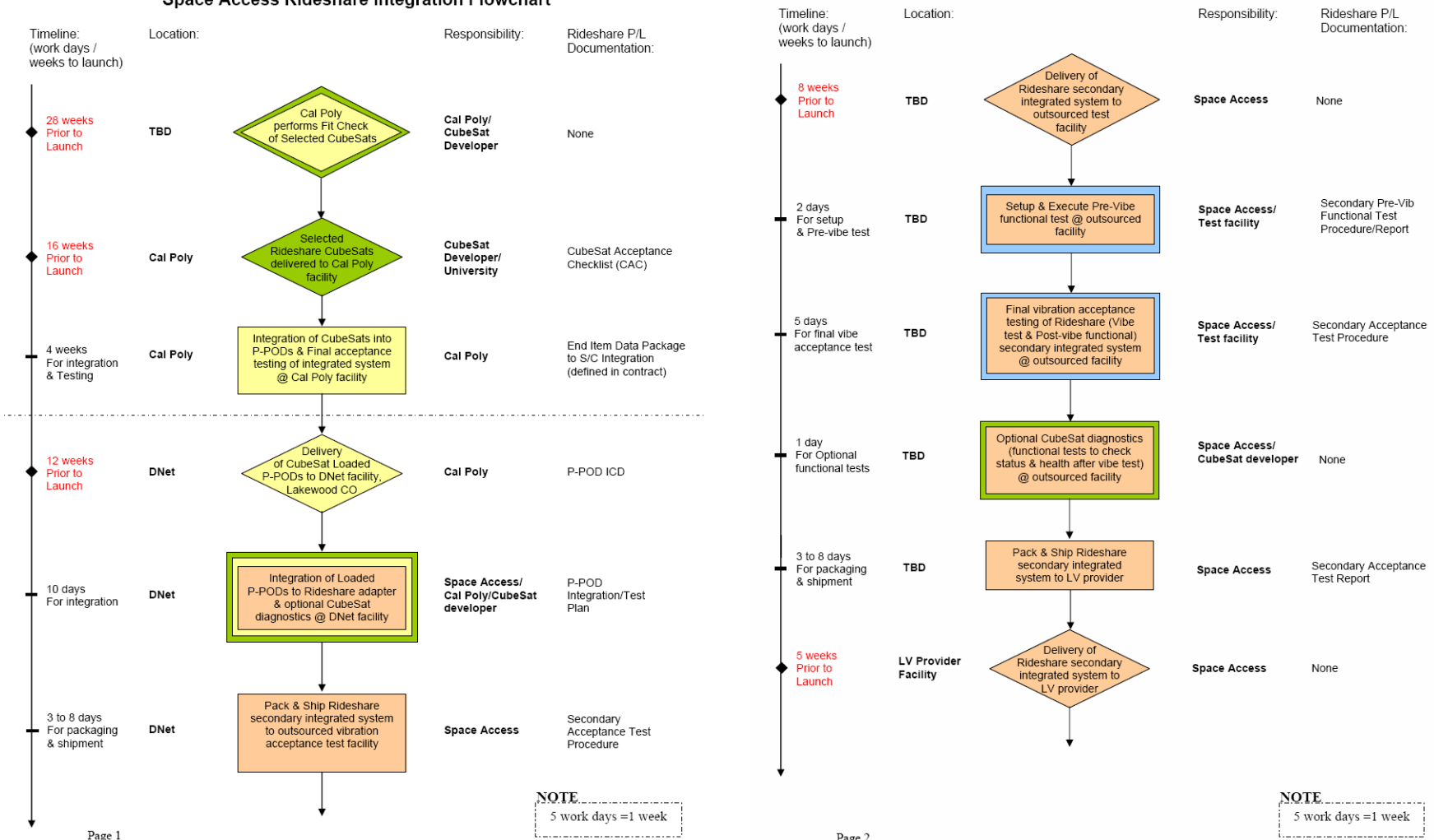
- **Complete Space Access’s “Request for Spaceflight Services” form (<http://www.access2space.com>)**
 - Space Access checks their rideshare manifest for availability & compatibility
- **Sign Official Space Access Contract for Desired Rideshare opportunity**
 - **Pay down payment to Space Access of \$25.5k per “1U” Academic CubeSat at time of contract sign-up**
 - **Pay remaining balance to Space Access of \$20k per “1U” Academic CubeSat at time of delivery**
- Failure to deliver CubeSat results in forfeiture of down payment



- **Manifest Milestones (cont.)**
 - **Projected Delivery Date of CubeSat integrated P-PODs to DNet for Integration with RSA:**
 - **Required by 1st May 2007 ⇒ 12 weeks Prior to Launch**
 - RSA adapter will be ready to accommodate & start integrating CubeSat integrated P-PODs by 1st April 2007
 - Alternative delivery date may be negotiated on a case-by-case basis
 - **Pay final balance to Space Access of rideshare cost per CubeSat at time of delivery to Cal Poly for integration into P-POD or by alternative scheduled payment milestone**

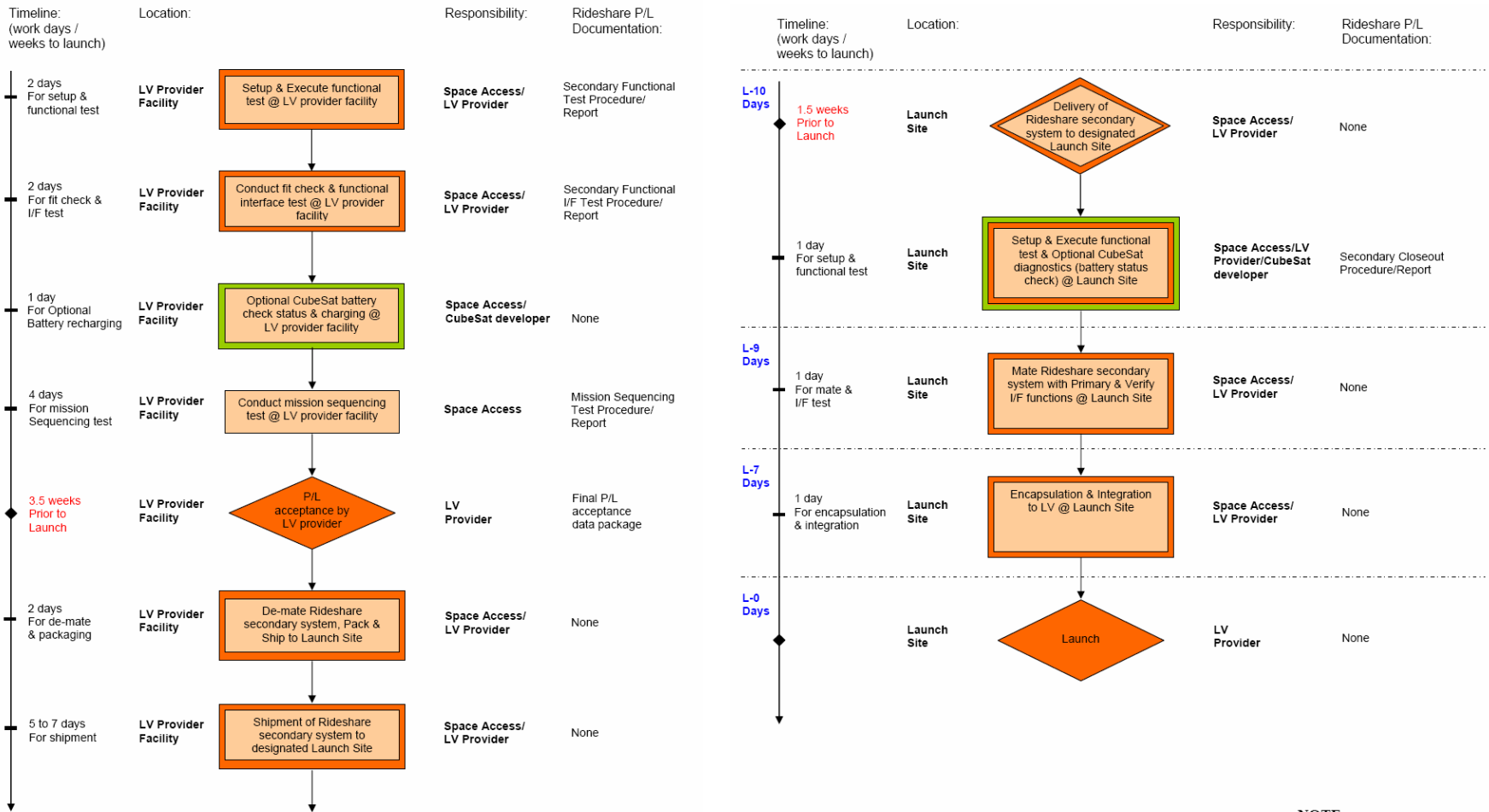
Space Access Rideshare Integration Flow

Space Access Rideshare Integration Flowchart



Launch Opportunities (cont.)

Space Access Rideshare Integration Flow



NOTE
5 work days = 1 week

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5 work days = 1 week



- **Space Access is working to combine the needs of the R&D community with those of education**
 - Education payloads will be Subsidized
- **Creating opportunities for small educational payloads is a matter of commitment**
- **Every rideshare mission we help broker will have an educational component**
- **Upcoming Rideshare Opportunity: SpaceX Falcon 1 LV**
 - Current Projected Launch Date: July 31st 2007
- **Rideshare Cost**
 - \$45.5k* per “1U” or \$100k* per “3U” Academic CubeSat
 - * Prices include “Academic Discount

Would you like a ride?