Athena Launch Services
RideShare Opportunities
Small Sat Conference Workshop
13 August 2012
Announcing the Athena RideShare Missions - a bold attempt to change the way space launch services are purchased

• This is the way of the future
• We need to start now to reach critical mass for liftoff

Our future plans include:

• **ANNUAL** fall flights from KLC
• Additional flights from CCAFS for low inclination orbits per market demand

Athena’s RideShare changes the space launch paradigm
The Future Requires Low Cost Access to Space

- Buying a rocket for every mission is too expensive
- There needs to be a cost effective approach to space access
  - The laws of physics don’t change
  - Launch costs are not going to significantly decrease
- However, we have tailored the business model for launch services to better suit rideshare customer needs
- Athena Launch Services plans to offer -
  - Annual RideShare missions
  - Payload opportunities that meet customer price points

Low cost access to space is possible
How does Athena RideShare Work?

• Annual Athena IIc launches are planned each Fall – starting in 2014
• Multi-manifest mission so each rideshare satellites can fly at an affordable price ~$10M per slot
• Launch from Kodiak into a 70 degree – sun synch inclination, 400 – 800 km orbit(s)
• Accommodations for 4 - 9 rideshare satellites
• Frequent flyers will get a discount on future RideShare flights
• P-POD opportunities are available starting at $300K
• There are no “primary” or “secondary” payloads – everyone rides in the Athena bus, and we drive
The Lockheed Martin and ATK Athena Team

• Lockheed Martin and ATK came together to offer Small Launch services by:
  • Capitalizing on the complementary capabilities of each company
  • Competing for DoD, NASA, NRO and other government payloads
  • Creating a “badgeless” team to lower overall labor costs

Our team has over 60 years of successful space launches
Athena IIc Launch Vehicle

- 92" Payload Fairing
- Orbit Adjust Module
- Upper Interstage
- Multi-Payload Adapter
- CASTOR 30 ESBM
- CASTOR 120 2nd Stage
- Lower Interstage
- CASTOR 120 1st Stage

ATK

LOCKHEED MARTIN
Athena IIc High Inclination Performance

RideShare Performance
Kodiak Launch Center – RideShare Mission Site
## Athena Performance Accuracies

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Nominal</th>
<th>Tolerance</th>
<th>Result Achieved</th>
<th>Error</th>
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<tr>
<td>SSTI-LEWIS (Athena I), 22 August 1997 (note 1)</td>
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<td>Apogee</td>
<td>300 km</td>
<td>+/- 10 km</td>
<td>300.8 km</td>
<td>0.8 km</td>
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<tr>
<td>Perigee</td>
<td>300 km</td>
<td>+10/- 83 km</td>
<td>300.1 km</td>
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<tr>
<td>Inclination</td>
<td>97.550°</td>
<td>+/- 0.1°</td>
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<td>Lunar Prospector (Athena II), 06 January 1998 (note 2)</td>
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<tr>
<td>Apogee</td>
<td>201.3 km</td>
<td>+/- 10 km</td>
<td>201.8 km</td>
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<tr>
<td>Perigee</td>
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<td>+/- 10 km</td>
<td>152.7 km</td>
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<td>Inclination</td>
<td>29.186°</td>
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<td>ROCSAT-1 (Athena I), 26 January 1999 (note 3)</td>
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<tr>
<td>Apogee</td>
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<td>+/- 50 km</td>
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<td>Inclination</td>
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<td>+/- 10 km</td>
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<td>Inclination</td>
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<td>+/- 0.06°</td>
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<td>IKONOS-2 (Athena II), 24 September 1999 (note 4)</td>
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<td>Apogee</td>
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<td>Inclination</td>
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<td>+/- 0.06°</td>
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<td>Kodiak Star (Athena I), 29 September 2001 (note 4)</td>
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<td>Apogee (Orb #2)</td>
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<td>+4.4 km</td>
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<tr>
<td>Perigee (Orb #2)</td>
<td>470 km</td>
<td>+/- 30 km</td>
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<td>-4.5 km</td>
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<td>Inclination (Orb #2)</td>
<td>67.05°</td>
<td>NA</td>
<td>67.065°</td>
<td>+0.015°</td>
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Note 1: Source - Ground track data from NASA Goddard Space Flight Facility
Note 2: Source - Ground track data from Ascension Island Tracking Station
Note 3: Source - Ground track data from Cheyenne Mountain Operations Center
Note 4: Source - Ground track data from Cheyenne Mountain Operations Center
OAM Summary Information: Standard Capability

- **OAM Mass (6-tank)**
  - As-Built Mass: 776 kg
  - As-Flies Mass: 712 kg
    - Inert: 358 kg
    - Propellant: 354 kg

- **Standard (6-tank) OAM:**
  - Delta-V = 1460 m/s
  - Avg. Isp: 2157 N-s/kg
    - Usable Propellant: 350 kg
    - Initial Mass: 712 kg
    - Final Mass: 362 kg
Athena’s Proven Multiple Payload Capability

- Athena’s Multiple Payload Capability Demonstrated on the Kodiak Star Mission
  - Three Satellites to 800km
  - One Satellite to 500km
What are the RideShare Mass & Payload Dimensions?

Satellite Mass = 110kg – 440kg
Satellite Envelope = 86 cm x 91cm x 71cm
Sample Athena RideShare Payload Configurations

1x (Ø78” x 100” x 15 deg) Envelope

3 x Envelope

3 x Envelope
**Sample Athena RideShare Payload Configurations**

- Single large
- 3 x Small
- 3 x ESPA
- 3 x Envelope
What are the RideShare Services?

- Standard Services:
  - Full Mission Integration Experience
    - Unique ICD w/ Requirement Verification Matrix
    - Complete CDRL Analyses & Reports
  - Processing Facility – KLC PPF (Shared)
  - SoftRide load attenuation
  - 15”, 12” or 8” MLB Separation System
  - 2 PLF Access Doors
  - Environmentally Conditioned PLF (Encapsulation thru Launch)
  - Release Signal/Discrete
  - Highly Accurate Orbit Injection
  - Post Flight Report
What are the Ride Share Services?

- Mission Enhancement Services:
  - Premium Payload Status
    - Optimum Orbit Injection Parameters
    - First Separation Event
  - Security Enhancement
  - Satellite Fueling
  - Unique Satellite Interface/Separation System
  - Additional/Unique PLF Access Doors
  - Payload Fairing Purges/Spot Cooling
  - Enhanced Cleanliness Services
  - Video monitoring
How Much do RideShare Missions Cost?

- **SmallSats (per slot):**
  - 2014-15 Price: ~$10M
  - Frequent Flyer Discount
    - $0.5M for 2nd flight, $1M for 3+ flights

- **P-PODs (CubeSats):**
  - 2014-15 Price: $300K
  - Frequent Flyer Discount
    - $25K for 2nd flight, $50K for 3+ flights
What is the Standard Athena RideShare Pricing?

Phase 1: Compatibility Assessment
- Refundable Deposit $350K

Phase 2: Mission Integration
- Milestone Payment 1 L-24 $3.15M
- Milestone Payment 2 L-18 $2.0M
- Milestone Payment 3 L-12 $2.0M
- Milestone Payment 4 L-6 $1.5M
- Milestone Payment 5 L-3 $1.0M
2014 RideShare Mission Opportunity

- 6 Slots reserved for proprietary customer
  - Launch in Q4 2014
  - SSO @ 500km
  - Phase 1 NTL Oct 1st
- Performance Remaining
  - 300 kg – 400 kg
  - Upper-Deck only
    - 1, 2 or 3 positions available

Only 3 (max) slots available - Reserve your slot now!
2014 Athena RideShare Payload Configurations

- Single large (91x91x122)
- 2x Small (66x66x117, 51x51x81)
- 3 x Small
What the Athena RideShare Mission Offers

• Flying on an Athena RideShare Mission means:
  • A successful mission
  • A mission executed on time
  • A mission flown at a firm, low cost
  • An experienced and knowledgeable team

• Everyone wants a low cost on the day the contract is signed, and a high probability of success on the day of launch –
  • We’ll give you both

Reliability + Schedule Assurance + Affordability = Mission Success
Example Ride Share Schedule

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<th>Test and Spacecraft Environments Phase</th>
<th>Integration &amp; Launch Ops Phase</th>
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<td>Interface Control Document (ICD) (A008)</td>
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<td>Separation State Vector Report (A004)</td>
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<td>Final Report (A005). Customer Input: Comments to Draft (Contractor Draft Submittal + 30d)</td>
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<td><strong>STP SV Period I Integration Schedule</strong></td>
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<td><strong>Launch Operations</strong></td>
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<td>Launch Vehicle (LV) Stack, Checkout, and Test</td>
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<td>SV &amp; LV Integration, Integrated System Test (IST)</td>
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