SpaceLoft: Re-usable Launch Vehicle Familiarization

NASA Goddard Space Flight Center

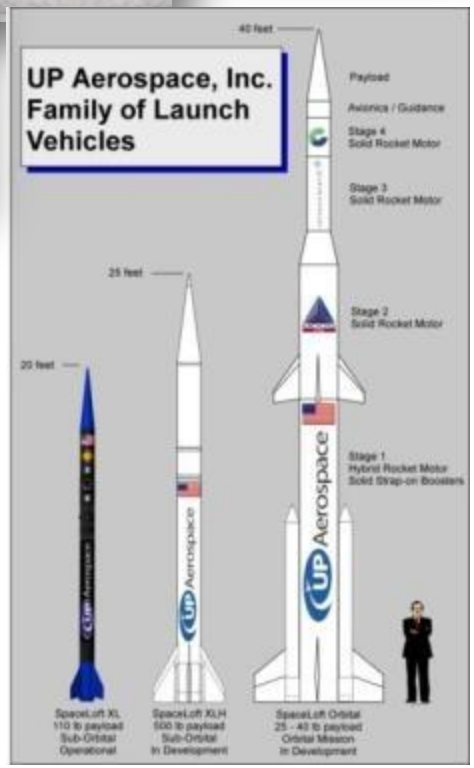
September 7, 2011

Jerry Larson, Founder and President

Company Overview

Space Launch Services Provider

- Founded in 1998
- Incorporated in 2004
- Launch technology development
- Launch operations



www.upaerospace.com

UP Aerospace

Contracted Launch Operations Past Performance

Lockheed Martin Space Systems

- 3 launch campaigns for their technology demonstrator

MOOG

- “Black Watch” autonomous rocket plane

Department of Defense ORS Office

- 5 payloads flown on SpaceLoft

US Air Force

- 2 payloads flown on SpaceLoft

NASA (New Mexico Space Grant)

- Summer of Innovation educational program launch


Lockheed Martin Launch


Moog Launch


SPACE NEWS

Lockheed Test Flies Experimental Space Plane

SpaceLoft Launch System

Payload Bay
36 kg payload mass
172,070 cubic centimeters
25.4 cm max diameter
242 cm max length

Recovery Section
- Avionics
- Parachutes
- Tracking and Telemetry
- De-spin system

Booster
- Solid rocket motor
- Fin assembly

- ***354 kg gross liftoff weight***
- ***6.1 meters tall***

- Single-stage solid rocket motor
- Reusable launch vehicle (88%)
- Unguided / fin-stabilized
- Yo-Yo De-Spin System
- FAA / WSMR approved
- Redundant avionics / ordnance functions
- C-Band Tracking
- S-Band Telemetry

- Payload environment testing and integration in partnership with Schafer Corporation

SL-1
Sept 2006

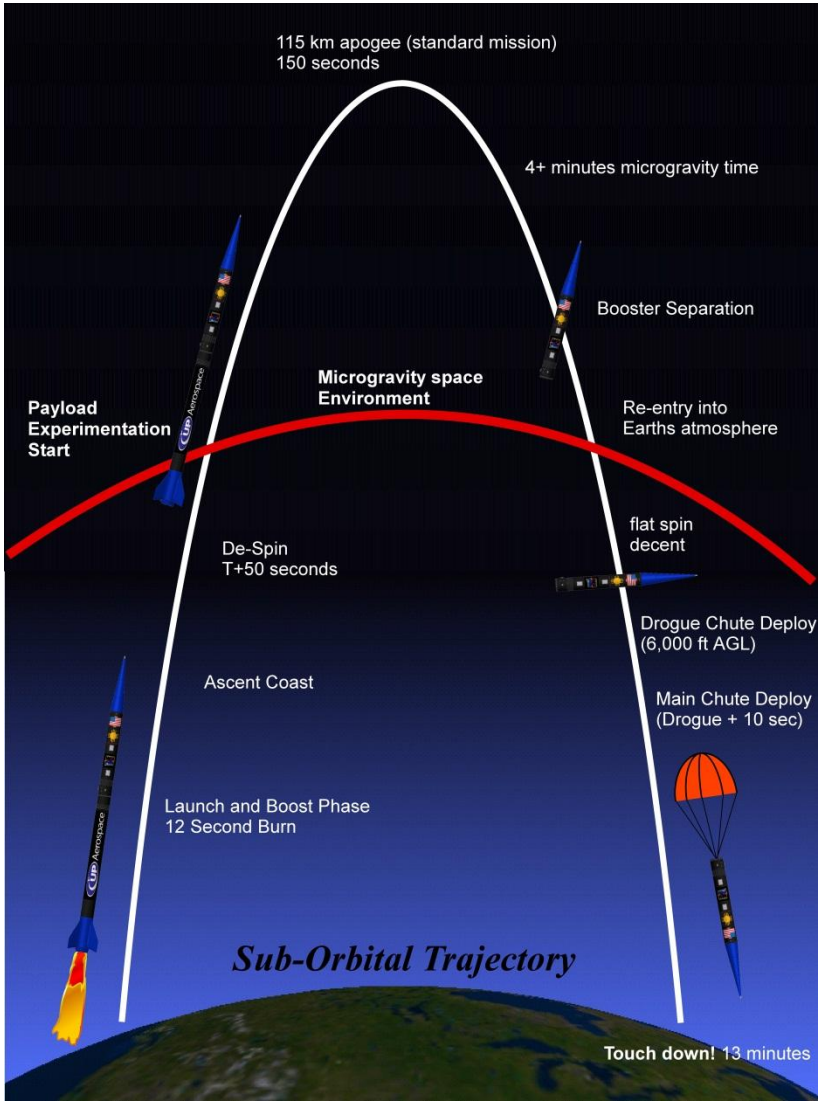
SL-2
April 2007

SL-3
May 2009

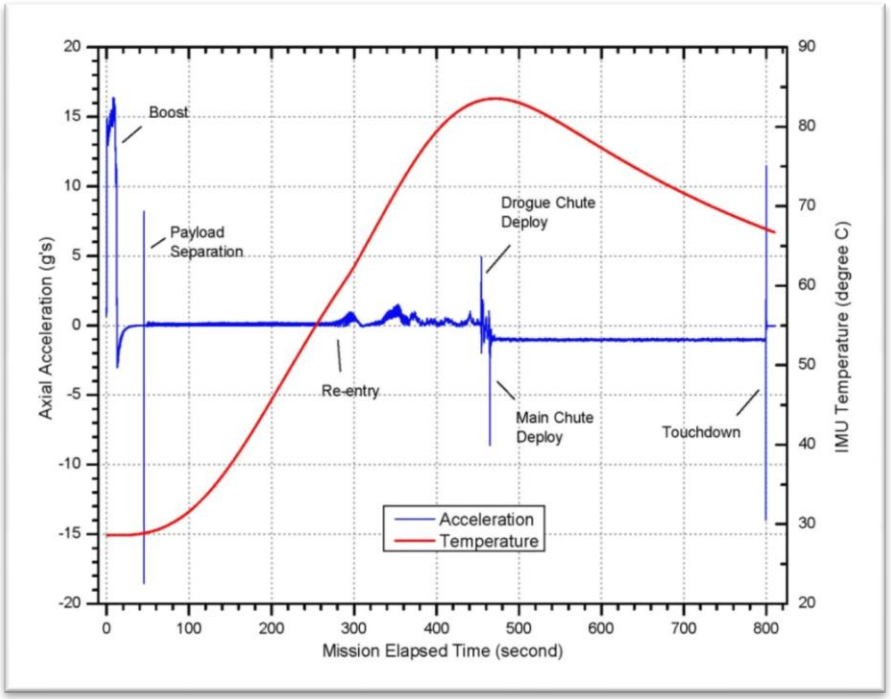
SL-4
May 2010

SL-5
May 2011

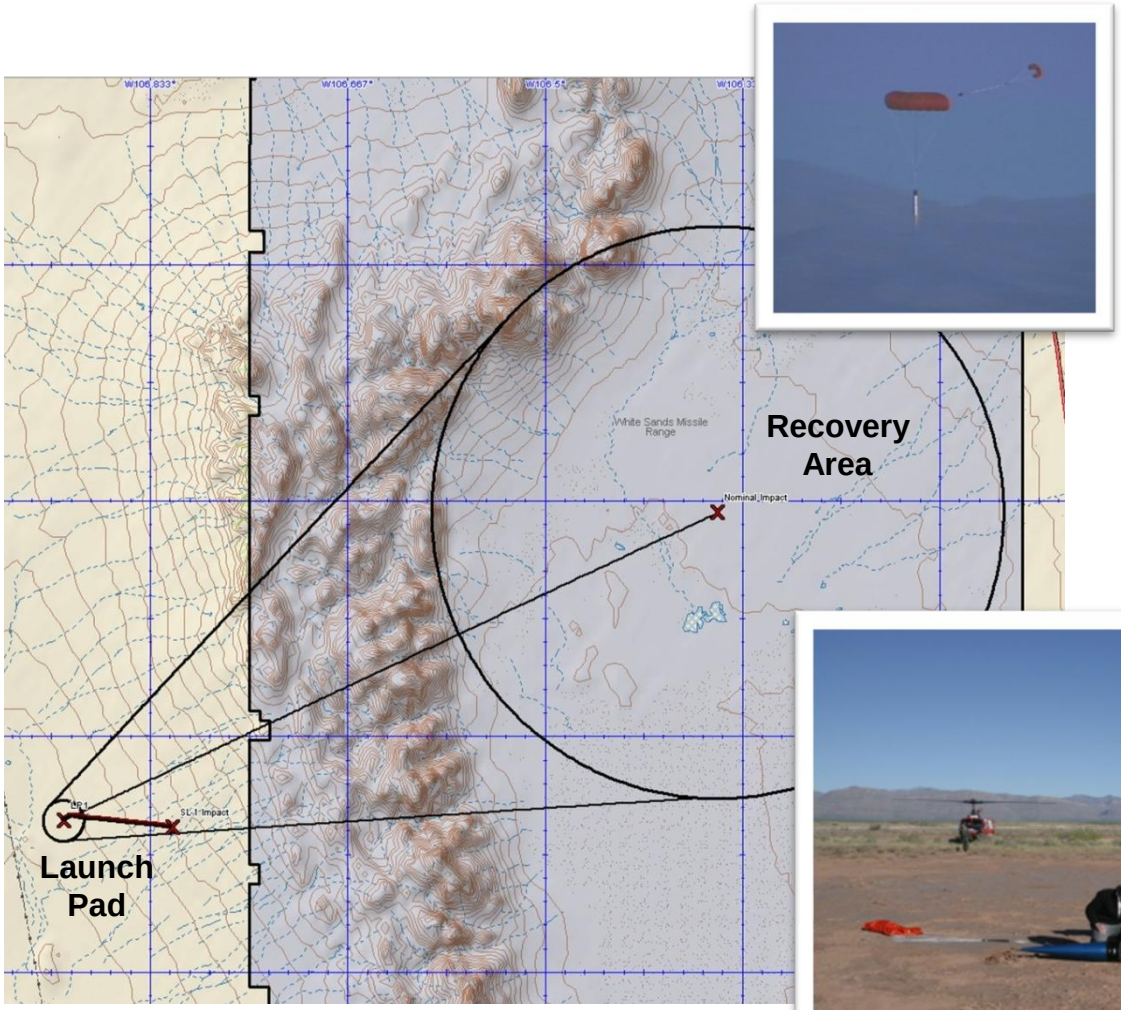
SpaceLoft Sub-Orbital Flight Profile



- 95-160 km altitude
- Recovery on White Sands Missile Range
- 4+ minutes of microgravity time
- Boost: 16 g's peak acceleration
- Touch down: 10 - 12 g's



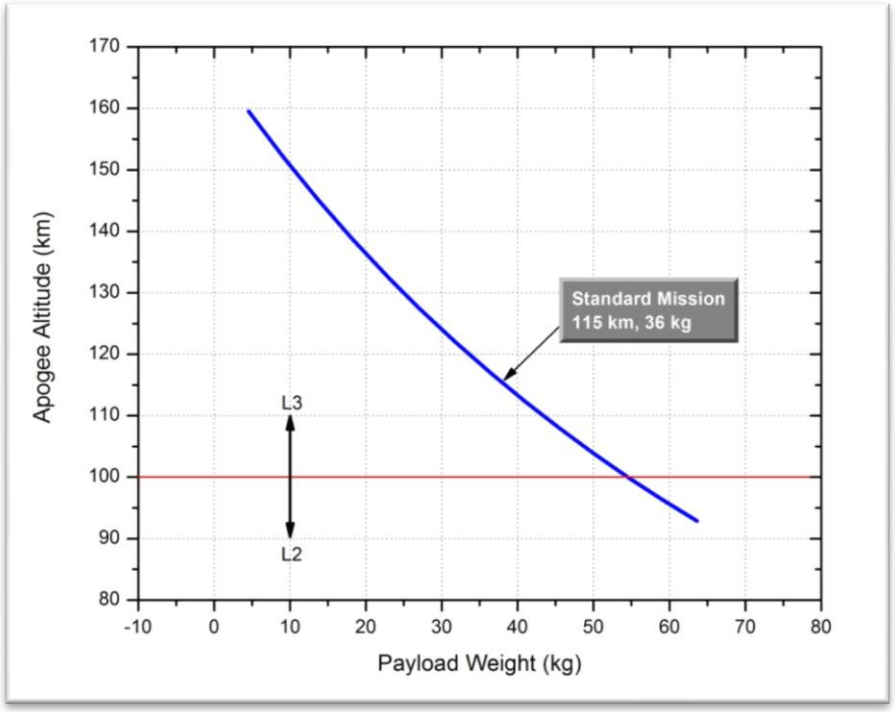
Payload Recovery Operations



- 25 mile down range aim point
- Parachute on land recovery
- Payload returned to launch site via helicopter 2 hours after launch

SpaceLoft Performance

- Standard Mission
  - 115 km Standard Mission
  - 36 kg
  - 4+ minutes microgravity
- 25 Cube-Sat Capable

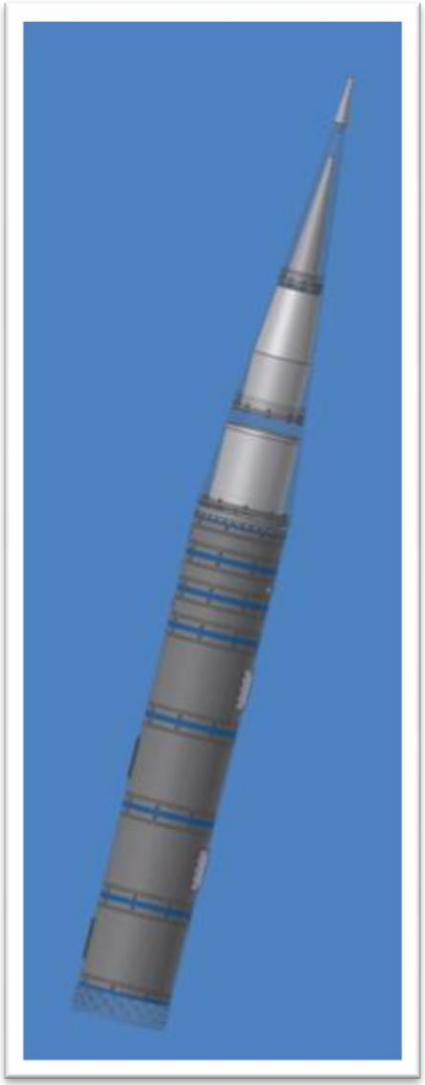


Modular Payload System

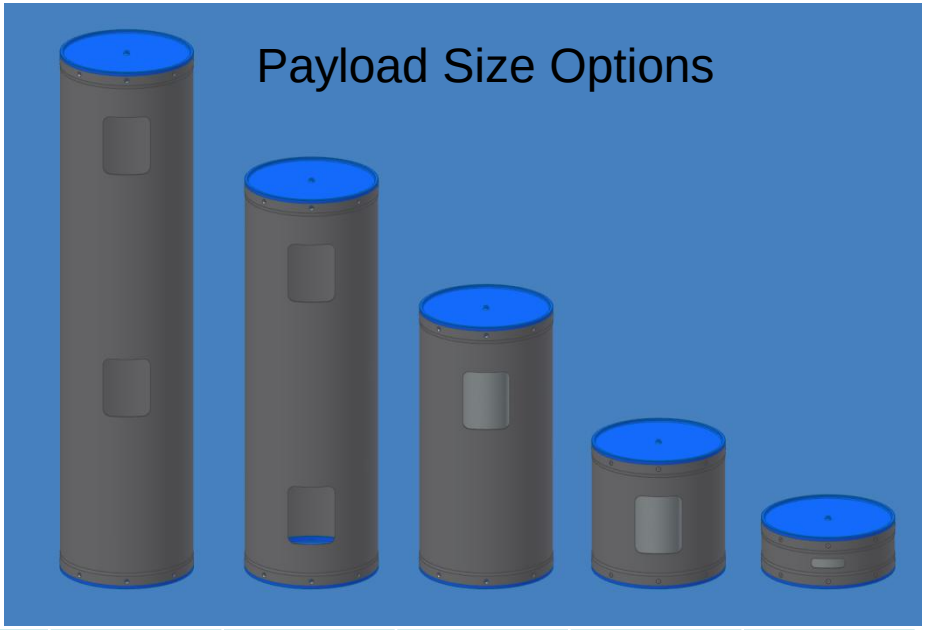
- Payloads loaded into vehicle day before launch (½ hr)
- Different priced module sizes
- Payload Integration independent launch vehicle
- Access to space openings

Payload Transportation System (PTS)

Patent Pending



Modular Payload System Containers



	PTS40	PTS30	PTS20	PTS10	PTS4
# access ports	4	3	2	1	1
Payload Mass (lbs)	40	30	20	10	4
Total height (inches)	40	30	20	10	4

May 20, 2011 launch payload PTS set

Payload System Options

Power Module

- Customized power solutions
  - 3.7 to 32 VDC and either regulated or unregulated outputs
  - up to 4 separate voltages to power independent payloads
- Space flown and tested battery systems

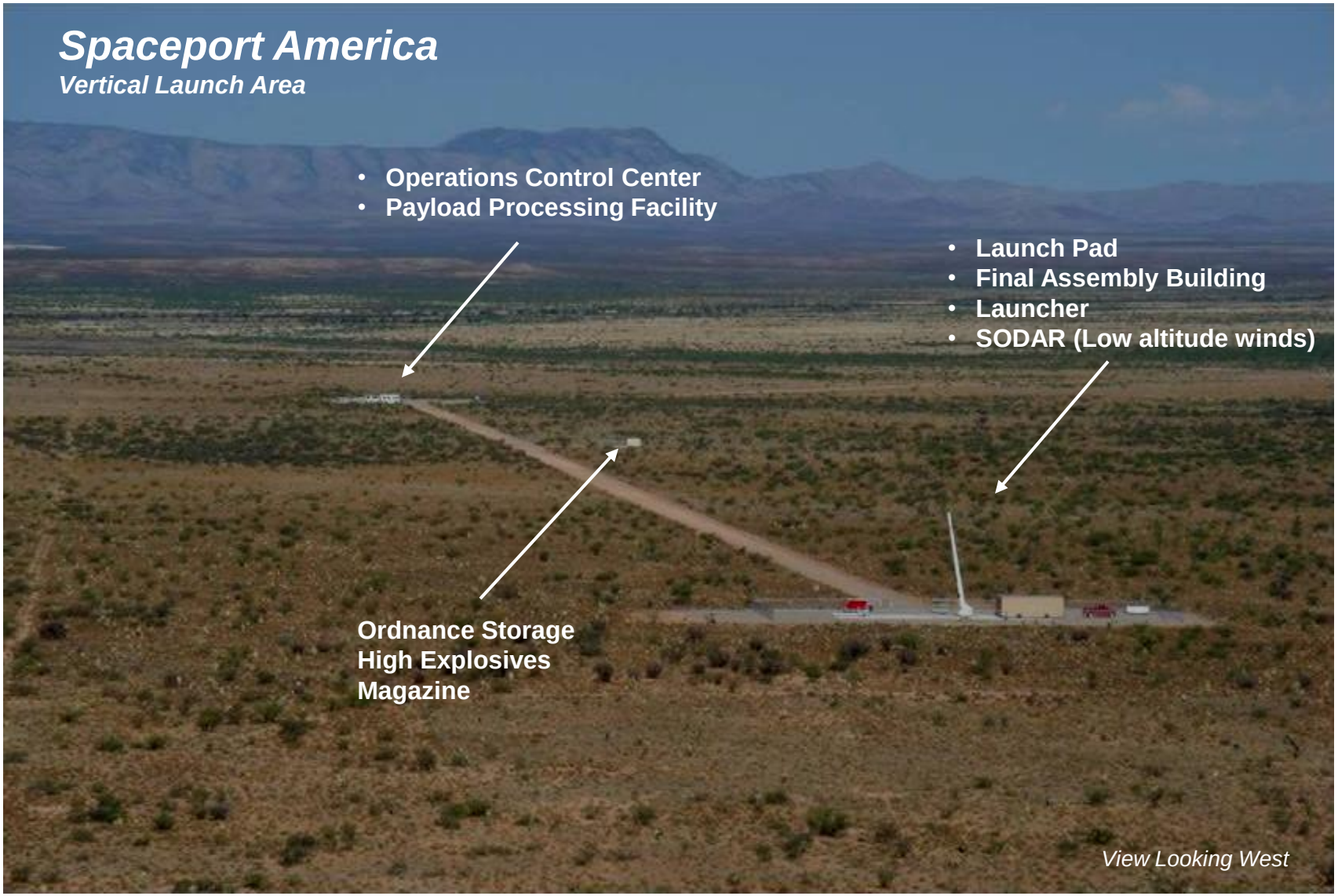
Command Module

- Up to 4 discrete signals to up to 4 separate payloads
  - payload pre and post separation
  - de-spin system completion
  - microgravity threshold achieved
  - time from liftoff

Launch Site Facilities

- 10 year lease agreement with Spaceport America
- Dedicated launch site infrastructure
- White Sands Missile Range (WSMR) support options
  - RADAR
  - Recovery
  - Video Tracking
  - C-Band Transponder Testing
    - WSRM Beacon Lab
    - Vertical testing
    - Day of Launch verification

Launch Site


Spaceport America
Vertical Launch Area
• Operations Control Center
• Payload Processing Facility
• Launch Pad
• Final Assembly Building
• Launcher
• SODAR (Low altitude winds)
Ordnance Storage
High Explosives
Magazine
View Looking West

Launch Pad and Final Assembly Facility

- 35’x 15’ x 10’ Roll-Back Design
- Lighting, heat and air conditioning
- Explosion code electrical
- Static discharge touch pad
- ESD wrist strap grounding
- RF testing side windows

Launch Control Area

- **Onsite power**
- **Air conditioned**
- **Computer network**
- **Wireless internet**
- **Restrooms**
- **Helicopter landing site**
- **Operations Control Center (OCC)**
  - 9 Launch Crew stations
  - Launch control communication
  - Winds monitoring station
  - Video
- **Payload Processing Facility (PPF)**
  - ESD Grounding
  - Payload telemetry monitoring
  - Portable clean room option (ISO Class 3)
  - Launch control comm

In-Development (SpaceLoft)

- **Attitude Control Pointing**
  - Reaction wheels system
  - 3-axis
- **PTS “lite”**
  - Lower weight
  - Lower cost reusable system
- **Alternate flight azimuth missions**
  - Lower cost
  - Doesn’t require WSMR support
- **GPS based tracking system**

What Customers Say about SpaceLoft

Dr. Peter Wegner, Director, DoD ORS Office

“The rocket exceeded performance expectations in microgravity and characterized the flight of the rocket from launch to weightless environment in space, reentry and touchdown; a significant step for smaller scale access to space”

“I applaud the launch and payload teams and am pleased that the ORS payload provided yet another demonstration of our enablers of rapid spacecraft build, integration, test and launch.”

ALBUQUERQUE, N.M.--(BUSINESS WIRE)--