



ORBIT

NATIONAL SYSTEMS



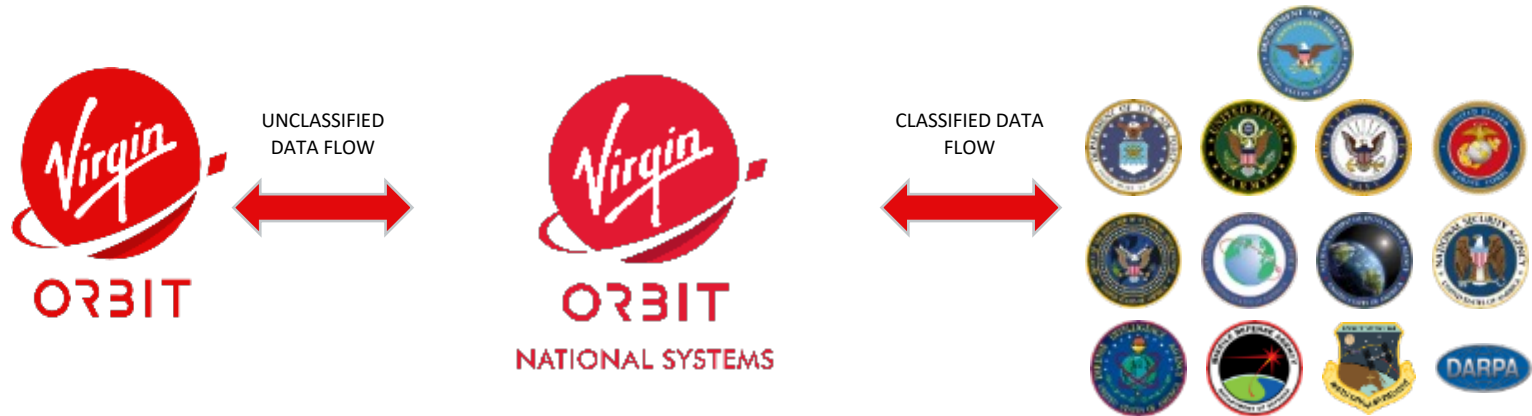
# Small Payload Ride Share Symposium

*14 September 2022*  
*Marc Cordova*

# Virgin Orbit National Systems:

## SERVING NATIONAL SECURITY SPACE

- Virgin Orbit National Systems established to interface with the USG to for National Security Space (NSS) and to accommodate special programs
- Extensive expertise with Defense, Intelligence Community, space control, Operations interface, and acquisition at all levels
- Serves as primary interface with the NSS community and ensures that classified information is protected



# The LauncherOne Rocket

- **Stages:** Two stage
- **Launch Method:** Air-launch (747-400)
- **Propellant:** LOX/RP-1
- **Weight:** 57,000 lbm
- **Length:** 70 feet
- **Fairing:** 1.25 m
- Further Enhancements Anticipated



**Runtime:** 3min  
**Vacuum Thrust:** 77,000 lbf

**NEWTONTHREE**

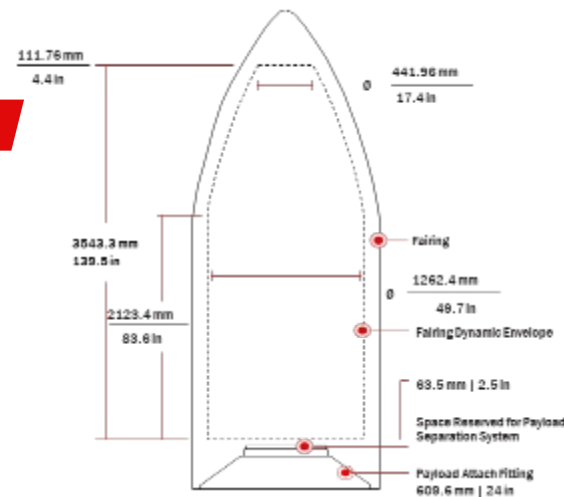


**NEWTONFOUR**

**Runtime:** 6min  
**Vacuum Thrust:** 5,000 lbf  
**Engine Starts:** 3



**Payload**



# Mission Recaps

## NASA VCLS

17 Jan 2021

**Orbit:**  
500km at 60.7°

**Launch Site:** Mojave, CA

**Payload:**  
10 Cubesats

**Launch Date:**  
17 Jan 2021



## STP-27VPA

30 June 2021

**Orbit:**  
500km at 60.7°

**Launch Site:** Mojave, CA

**Payload:**  
7 Cubesats

**Launch Date:**  
30 June 2021



## STP-27VPB

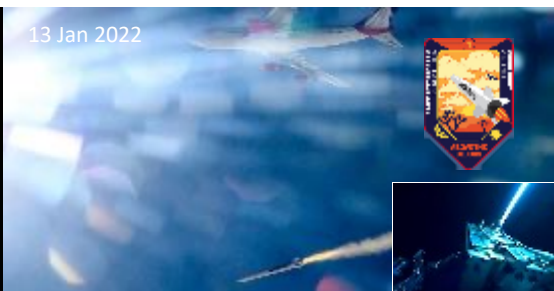
13 Jan 2022

**Orbit:**  
500km at 45°

**Launch Site:** Mojave, CA

**Payload:**  
7 Cubesats

**Launch Date:**  
13 Jan 2022



## STP-28A

1 July 2022

**Orbit:**  
500km at 45°

**Launch Site:** Mojave, CA

**Payload:**  
7 Cubesats

**Launch Date:**  
1 July 2022



## Mission Accomplishments

✓ **Flight Safety:** Proven Autonomous Flight Safety System

✓ **Stage 1 Engine:** In-air Ignition and Steady State Operation

✓ **Aerodynamics and GNC:** Controlled Ascent Flight

✓ **Separation:** 100% Success Stage and Fairing Separation

✓ **Stage 2 Engine:** Ignition, Steady State Operation and Relight

✓ **Mission:** Pin-Point Orbital Insertion  
100% Confirmed Payload Deployment



# Rocket 7 / Flight 6

## MISSION STATS

- **Altitude:** 555km  $\pm$  15 km
- **Inclination:** SSO  $\pm$  0.15 deg
- **Launch Site:** Newquay, Cornwall UK
- **Payload:** 9 satellites
- **Countries Represented:** US, UK, Poland, Oman
- **ILC:** 29 October 2022 (NET)
- **Manifest:**
  - CADET 2 x 6U
  - STP 2 x 6U
  - Catapult 1 x 6U
  - SatRev 1 x 3U
  - SatRev/Oman 1 x 3U
  - Space Forge 1 x 3U
  - Rhea 1 x 3U







# Fully Transportable System Eliminates the Need for Extensive Ground Infrastructure



LauncherOne easily transportable on public roads using standard trailer

Equipment to mate LauncherOne to CosmicGirl



Fully fuels and prepares LauncherOne for flight

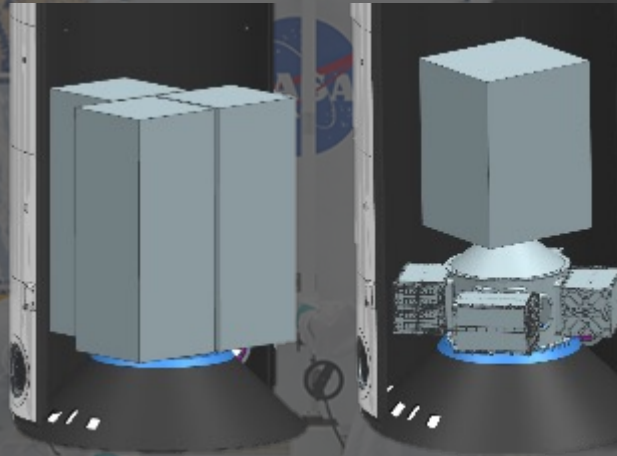
No permanent infrastructure required beyond concrete pad and runway



# Multiple Payload Configurations



*2x ESPA Class*



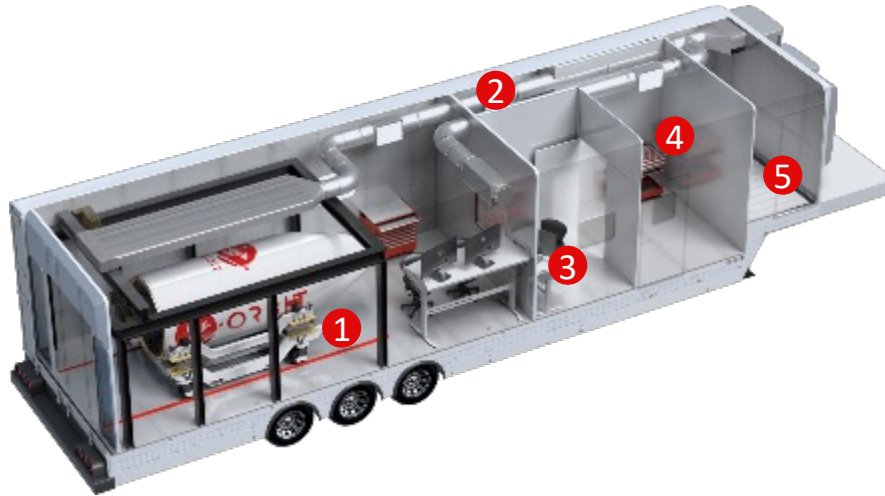
*Primary Rideshare*



*Multi-Manifest Rideshare*



# Mobile Payload Trailer



## Image Key

1. Cleanroom
2. Gown Room
3. EGSE Control Room
4. Break Room
5. Mechanical Room

## Cleanroom

- ISO 8 Cleanliness level
- RH: 45-60%
- Temperature: 65-75° F
- 2 ground bars
- Wrist strap check station

## Trailer Features

- CCTV
- Secure access
- Air Ride
- Ground bar
- Wi-Fi and Ethernet
- 53' l x 12' w x 13.5' h



Payload Mate On Wing

# THANK YOU



**ANY TIME**  
**ANYWHERE**  
**UNWARNED**



# FUTURE SPACE ORDER OF BATTLE

## HYBRID COMPLEXITY

### Warfighter Orchestration Spectrum



#### Commercial/Small Sat

- Mission capability when/where needed
- No need for Gov integration of SV/launch
- Small sat provides defense in depth at relatively low \$
- Ingest directly into BMC2

#### Mid-Tier

- Complicated BMC2 orchestration of integrated constellations
- Significant cost
- Dedicated and complicated operations
- Cross platform fusion

#### Exquisite

- Most complex integration of SV and launch
- Highest cost
- Protection measures for HVA
- Highest mission capability/highest adversary target

Comm Integration; Data to End State

Government integrator; complex orchestration

**Commercial Can Provide Rapid Capability at Low Cost with Low Integration Overhead**



# VIRGIN ORBIT FACTORY - LONG BEACH, CA

