"Growth in Small Launchers in the Commercial Space Industry"

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ELaNa Mission Manager
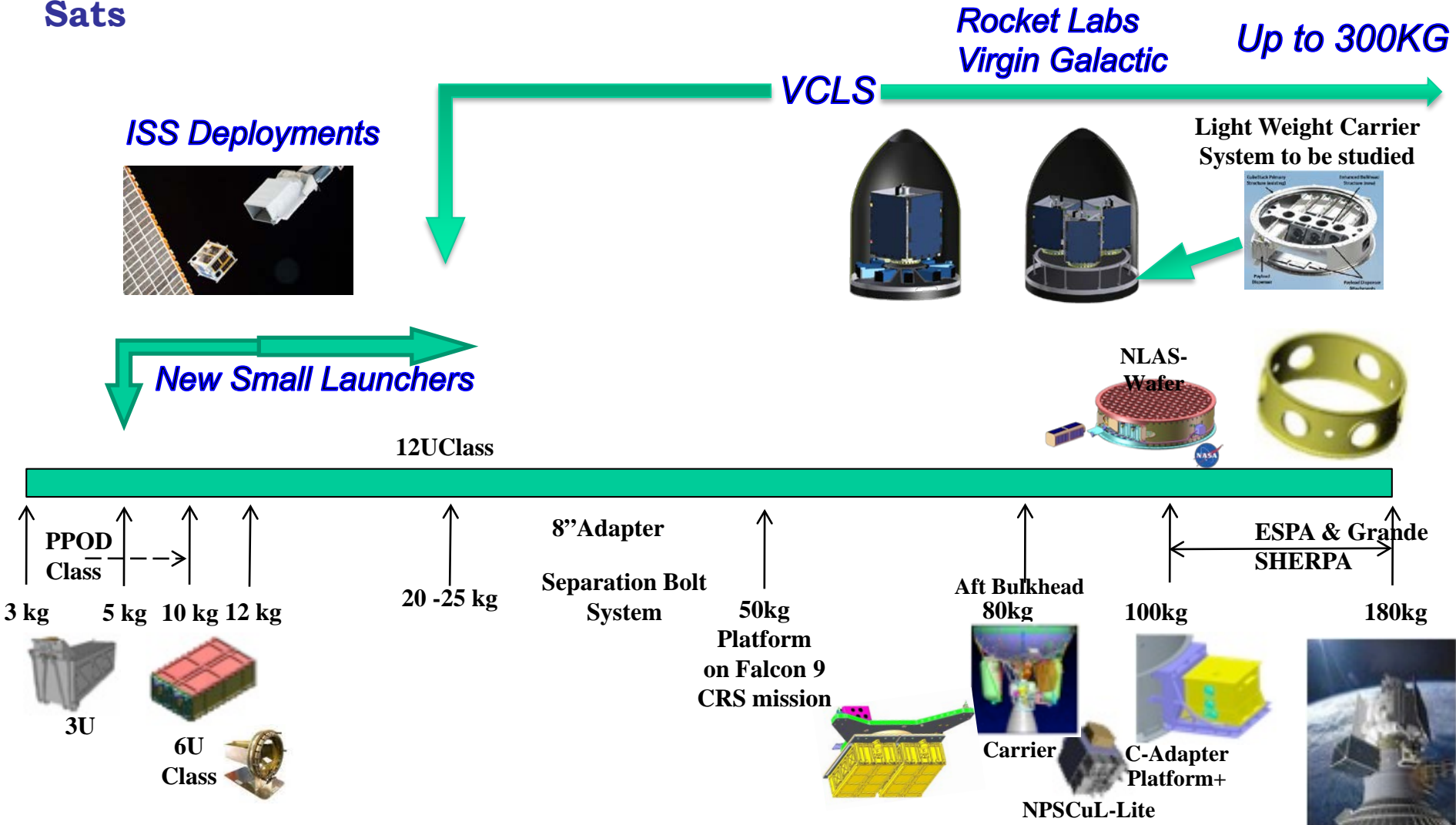
Launch Services Program
NASA

Small Payload Capabilities

The diagram below shows expected capabilities in launching Small Sats

Rocket Labs
Virgin Galactic

Up to 300KG

VCLS

ISS Deployments

Light Weight Carrier System to be studied

New Small Launchers

NLAS- Wafer

12UClass

PPOD Class

8"Adapter

Separation Bolt System

ESPA & Grande SHERPA

3 kg   **5 kg**   **10 kg 12 kg**   **20 -25 kg**   **50kg Platform on Falcon 9 CRS mission**   **Aft Bulkhead 80kg**   **100kg**   **180kg**

3U

6U Class

Carrier

C-Adapter Platform+

NPSCuL-Lite

CubeSat Missions Manifest

LV Provider	FY 2018		FY 2019	FY 2020
NASA	MarCO 5/5/18 InSight (AV) 2*	ELaNa XVIII 9/12/18 ICESat-2 (DII) 4**	TROPICS 3 Missions NET Aug 2019 TBD 1*	MMO Missions July 17, 2020 TBD *
NASA ISS	ELaNa XXIII 5/1/18 OA-9 9*	ELaNa XXI NET Sept. 2018 TBD 9*		
ORS/STP	ELaNa XV 4/30/18 STP-2 3*			
Commercial	ELaNa XIX 3/1/2018 VCLS (RL) 14***	ELaNa XX 2018 (U/R) VCLS (VG) 11**	ELaNa XXIV NET Sept. 2018 TBD 7*	

SPL Manifested   **ELaNa Manifested**   **In Work**

* # CubeSat Missions   ** Number includes 1 non-CLSI CubeSat Mission

*** Number includes 3 non-CLSI CubeSat Mission

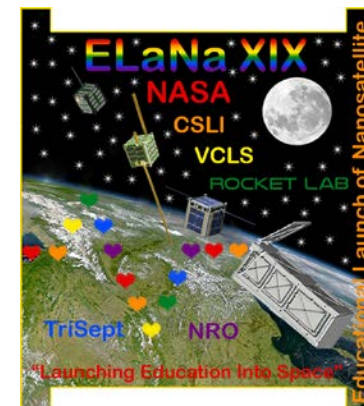| Launched	CSLI Manifested	CSLI Un-Assigned
59	51	35

VCLS

Rocket Labs will launch ELaNa XIX for NASA with 14 CubeSat Missions as primary payloads NET Mar 2018

> **Completed PDR, CDR and QDR**

Virgin Galactic will provide a Launch services for ELaNa XX NET Aug 2018. Mission

> **Completed PDR and CDR and working to QDR in 2018**

**LSP is evaluating the potential use of the VCLS class vehicles for future NASA missions**

- **Rocket Lab is a US Company headquartered in Huntington Beach, California**
  - **Primary Vehicle is the *Electron* – a dedicated microsatellite launcher capable of placing 150 kg to 500km SSO**
- **Rocket Lab is contracted for the LSP ELaNa XIX Mission**
  - **14 CubeSats to 85 deg @ 500km**
    - **3U and 6U, Tyvak & PSC Deployers**
  - **Manifested as Flight 4; Vehicle is in Final Assembly**
- **First flight, "*It's a Test*", conducted in May 2017**
  - **Achieved majority of mission objectives, including 2nd stage ignition and fairing separation, but failed to reach orbit due to launch range anomaly**
- **Second flight, "*Still Testing*" currently in launch campaign**
  - **Attempted launch in Dec 2017, scrubbed**
  - **Next attempt in Jan 2018**
    - **Flying (3) Commercial Spacecraft in Rocket Lab *Maxwell* Dispensers**
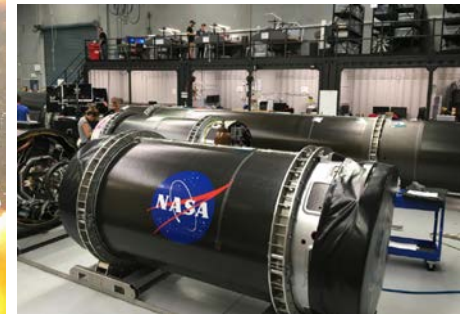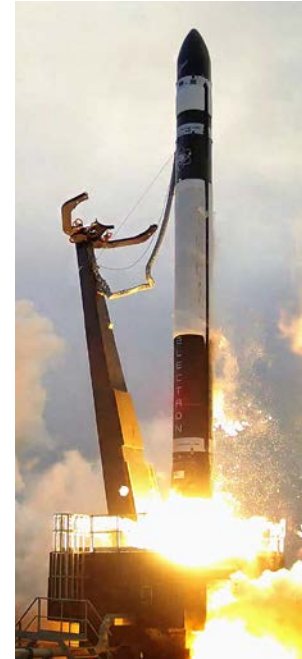
- **Educational Launch of Nanosatellites XX (ELaNa-XX)**

  - **Flying 13 Cubesats for a total of 29U**
    - **43kg of payload mass**

  - **Uses an Xtenti built FANTM-Inverse CubeSat adapter and FANTM-Rail Dispenser systems**

  - **Mission Orbit: 90 deg x 500 km circular**

Current Manifest		
Payload Name	**Customer**	**Size**
CACTUS-1	Capitol Technology University, Laurel, Md	3U
ALBus	NASA Glenn Research Center, Cleveland, Ohio	3U
PolarCube	University of Colorado at Boulder, Boulder, Colo.	3U
Cape-3	University of Louisiana Lafayette, La.	1U
Q-PACE	University of Central Florida, Orlando, Fla.	3U
MiTEE	University of Michigan, Ann Arbor, Mich.	3U
RadFXSat-2	Vanderbilt University, Nashville, Tenn	1U
PICS	Brigham Young University, Provo, Utah	2 x 1U
INCA	New Mexico State University, Las Cruces, N.M	3U
MicroMas-2b	Massachusetts Institute of Technology, Lexington, Mass	3U
EXOCUBE	California Polytechnic University, San Louis Obispo, Calif.	3U
TechEdSat-7	NASA Ames Research Center, Moffett, Calif.	2U