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“Getting CubeSat Missions to Orbit Over the Next Decade”

CubeSat Workshop 2014

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NASA



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What do we do within LSP for CubeSats?

We Manifest...Integrate...and Launch... CubeSats from the CubeSat Launch Initiative list for NASA

To date we have launched 32 CubeSats

With 6 additional CubeSat Missions scheduled for launch in 2014





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ELaNa Missions Manifest 2009



ELaNa Missions Manifest

LV Provider	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	
NASA 	LSP ELaNa I March 4, 2011 Glory – Taurus 3 CubeSats ELaNa III Oct 28, 2011 NPP – DII 5 CubeSats			ELaNa V Apr 18, 2014 CRS#3 – F9 5 CubeSats	ELaNa X Nov 5, 2014 SMAP – DII 3 CubeSats	ELaNa Aug, 2016 GOLauncher 2 3 Carriers	ELaNa NLT 2 nd Q 2017 2JPSS-1 – DII 3 Carriers	ELaNa 1stQ 2017 ICESat II – DII 3 Carriers
	ISS				ELaNa VIII Oct 2014 ORB-3 1 CubeSats	ELaNa IX NET Apr 2015 ORB-4 3 CubeSats		
NRO 		ELaNa VI Sept 13, 2012 NROL-36– DII 4 CubeSats		ELaNa II Dec 5, 2013 NROL-39 – AV 4 CubeSats		ELaNa XI NET Apr 2015 AFSPC-5 4 CubeSats	ELaNa XII NET Aug 2015 NROL-55 – AV 2 CubeSats	
ORS 				ELaNa IV NET 11/19/13 ORS-3 11CubeSats	ELaNa VII NET Oct 2014 ORS-4 2 CubeSats			
Commercial					ELaNa 2015 CubeSats	ELaNa 2016 CubeSats	ELaNa 2017 CubeSats	

Manifested

In Work

Launched	Manifested	Un-Assigned
32	17	51



Developments

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Atlas V		Delta IV	Delta II	Taurus XL	Athena	Falcon 9	
Common	ABC CuL-Lite	Common	2 nd Stg Struts Section	Aft End 3 rd Stg	Aft End	CRS	Fairing
Studied	Flown	Studied	Flown	Flown	Studied	Flown	

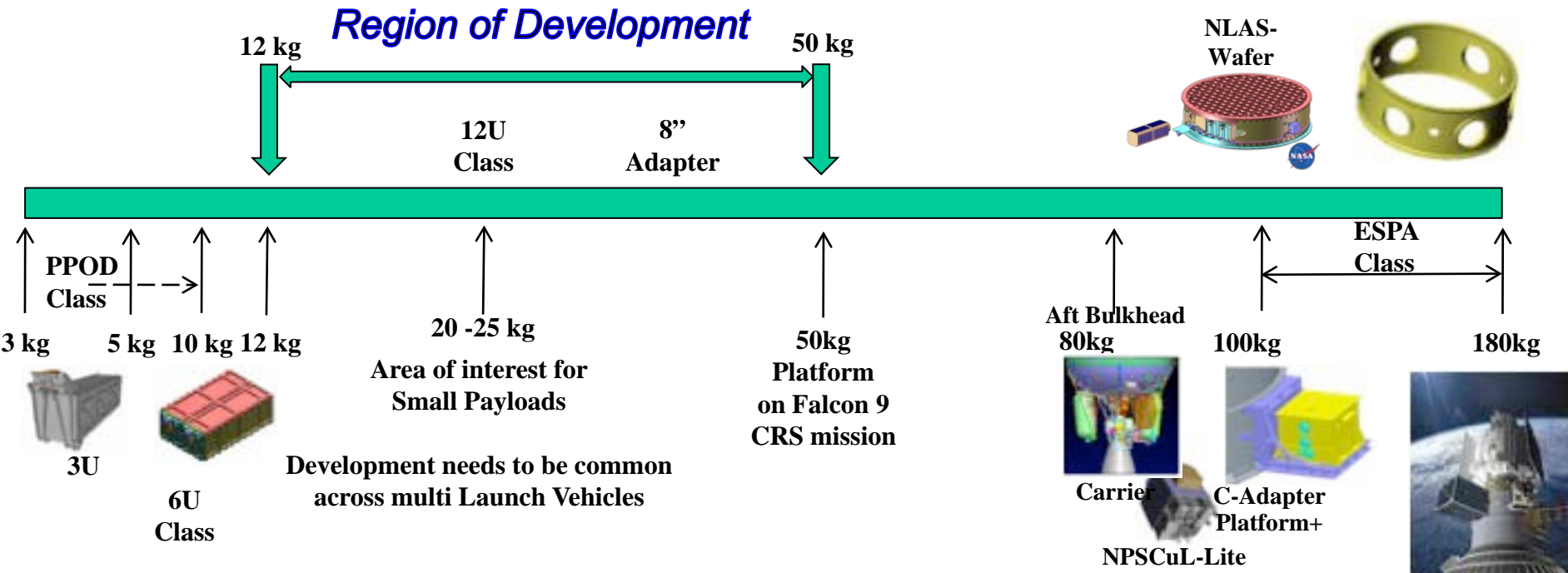




Small Payload Capabilities



- LSP considers rideshare or small/secondary payloads as those payloads in the 1kg to 180 kg range
 - Payloads above 150kg could fly as a small payload on a commercial launch vehicle
- The diagram below shows the current capabilities that have flown or is scheduled to fly in the near future.





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CubeSat NanoLaunch

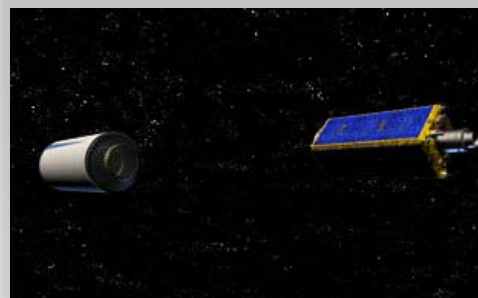


- Launch Services Program awarded a services contract to Generation Orbit for a CubeSat Launch.
- Requirement: 15kg (3-3U) to 425km (orbit inclination between 0°-98°)
 - Launch Date NET August 2016
 - Provides for dedicated STEM initiative with multiple contracted P-POD launches
 - Dedicated Nano Launch Vehicle
 - High Risk Tolerant Approach
 - No “first flight” requirement
 - ICD & Mission Success Criteria
 - LSP insight through milestone reviews
 - FAA Licensed Launch

GO Launcher 2



100 lb
Orbital



MicroSats
NanoSats
CubeSats



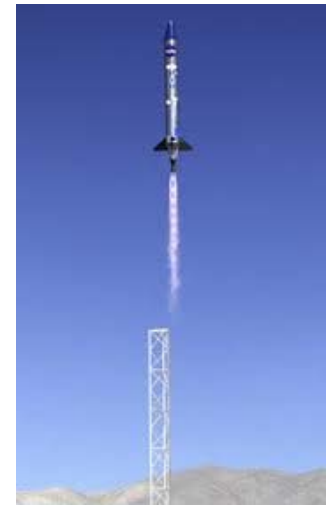
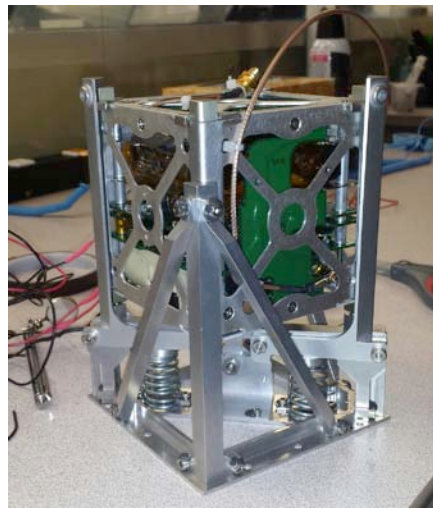
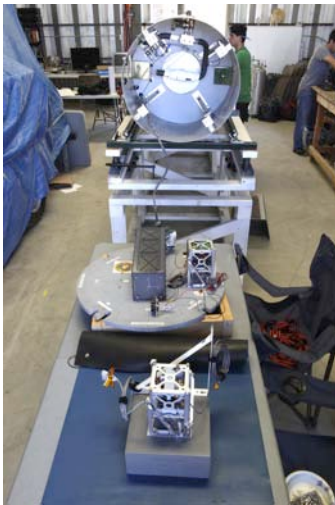
Developments



- **MOOG/CSA ESPA Six U carrier**



- **Tyvak - Nano Launch Carrier System will reduce the mass of the cubesat carrier system for use on future Nano Launch Vehicles**





SBIR NanoLaunch Technologies



- **Six contractors have completed their 2012 Enhanced Phase I SBIRs in the NanoLauncher technology subtopic**
 - **Tyvak Nano-Satellite Systems LLC**
 - » *Flexible Low Cost Avionics for NanoSatellite Launch Vehicle Control and GPS Metric Tracking*
 - **Millennium Engineering and Integration Company**
 - » *Automated Flight Safety Inference Engine (AFSIE) System*
 - **Garvey Spacecraft Corporation**
 - » *Incremental Evolution of a 10/250 NLV into a 20/450 NMSLV*
 - **Ventions, LLC**
 - » *Regeneratively-Cooled, Pump-Fed Propulsion Technology for Nano / Micro Satellite Launch Vehicles*
 - **Tethers Unlimited, Inc.**
 - » *SWIFT-nanoLV Avionics Platform*
 - **Invocon, Inc.**
 - » *Wireless Intra-vehicle Communication System (WICS)*



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Questions