

National Aeronautics and  
Space Administration




# Launch Services

NASA Advisory Council – HEO Committee

Bradley Smith

November 20, 2023



**EARTH'S BRIDGE TO SPACE**

**LSP is the NASA representative to CLSRB for NASA Programs and Projects**

**Spacecraft Customers**

**AA**  
(NASA Administrator)  
Bill Nelson

**STMD**  
(Science Technology)  
James Reuter

**SMD**  
(Science Mission Directorate)  
Nicola Fox

**ESDMD**  
(Exploration Systems Development)  
James Free

**SOMD**  
(Space Operations)  
Kenneth Bowersox

**KSC**  
(Kennedy Space Center)  
Janet Petro

**NASA Centers**

- All Robotic Missions
- All Mission Classes

**Gateway**

**Artemis**

**HLS**

**LV Advisory**

**LSO**  
(Launch Services Office)  
Bradley Smith

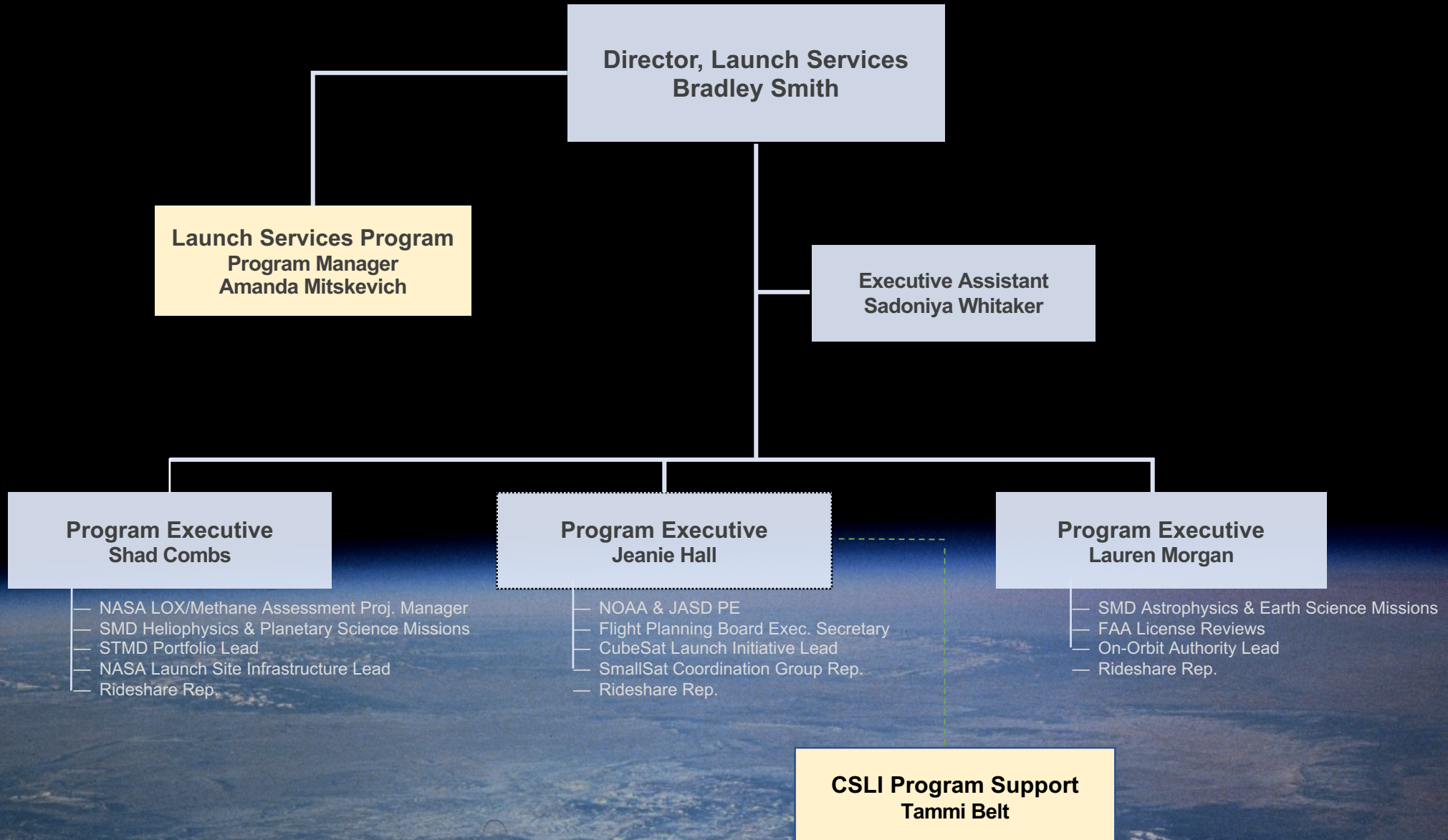
**SCAN**

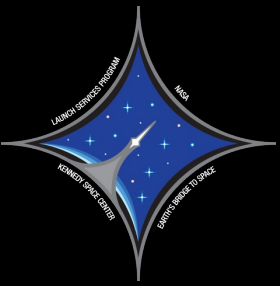
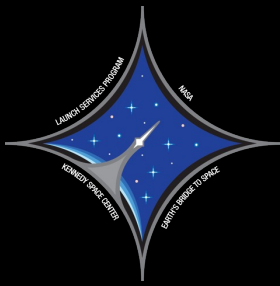
**CCP**

**CRS**

**LSP**  
(Launch Services Program)  
Amanda Mitskevich

**LSP provides LV and PPF full-service acquisition and mission assurance under NLS, reduced mission assurance and more commercial like practices for high-risk tolerant missions under VADR as well as advisory services**





# LSP Organizational Structure

**LAUNCH SERVICES PROGRAM**  
Amanda Mitskevich  
Albert Sierra

	<b>LAUNCH DIRECTOR</b> Tim Dunn	Launch Manifest Coordination
	<b>TECHNICAL INTEGRATION</b> Jorge Piquero	Risk Mgmt/Tech Policy & Business Development
	<b>VSFB PROGRAM REP</b> Mark Mertz	VSFB Resident Offices & Program Support Coord
	<b>PROGRAM PLANNING</b> Lisa Haber	Strategic Planning & Policy
	<b>PROGRAM BUSINESS</b> Brian Smith / Lety Gomez	Contracts & Budgeting

**Matrixed Organizations**

	<b>CHIEF ENGINEER</b> James Wood	<b>Technical Authority</b>
	<b>ENGINEERING</b> Bob Mott	
	<b>CHIEF SAFETY OFFICER</b> Joe Dant	
	<b>S &amp; MA</b> Jessica Williams	
	<b>PROCUREMENT</b> Terry Crowley	
	<b>RESOURCES</b> Josh Green	<b>Center Support</b>
	<b>CHIEF COUNSEL</b> Joe Batey	

	<b>FLIGHT PROJECTS</b> Diana Calero	<b>MISSION MANAGEMENT</b> Pre-Phase A–E
	<b>INFRASTRUCTURE MGMT</b> Ralph Mikulas	<b>GROUND SYSTEMS</b> Launch Site Comm & Telemetry
	<b>FLEET &amp; SYSTEMS MGMT</b> Denise Pham / Lori Ulrich	<b>FLEET</b> Integration Engineering Field Offices
	<b>FLIGHT ANALYSIS</b> Mike Carney	<b>FLIGHT DYNAMICS</b> Flight Structures and Environments

# The People of LSP

TURNOVER RATE TO  
DATE

**0.57%**

YEARS AS A NASA  
PROGRAM

**25**

EXPERIENCE



AVERAGE  
EXPERIENCE

**16.2 Years**

ADVANCED DEGREES

**45%**

RETIREMENT ELIGIBILITY

Retirement  
Eligible

**22%**

Eligible Within 5  
years

**11%**



# Resident Offices



**Vandenberg Space Force Base, California**



**ULA Denver, Colorado**



**SpaceX Hawthorne, California**



**ULA Decatur, Alabama**



**Northrop Grumman Chandler, Arizona**



**Launch Services Program KSC & CCSFS, Florida**





## Commercial Acquisition Expertise

- **NLS**
  - Insight & Approval
- **VADR**
  - Higher Risk Tolerance, Less Insight & Approval
- **SPOC**
  - Provides spacecraft processing services for both NASA-owned and NASA-Sponsored payloads
- **Advisory Services**



## Formalized Government Collaboration

- Memorandum of Understanding, March 2011
- Government Launch Executive Board (GLEB), Quarterly
- Current Launch Schedule Review Board (CLSRB)
- USSF-NASA-NRO Summit








## Program Management, Analysis, Engineering, Integration, & Launch Operations

- **Experience:** Technical, stable civilian workforce, mixed civil service & contractors, 20+ years average in launch
- **Consistency:** 102 primary missions + advisory + cubesats and secondaries
- **Flexibility:** Evolving expertise to meet new approaches
- **On Orbit:** Technical Assessment, Launch Mgmt. w/ "GO" for launch, 98+% Mission Success rate
- **On Time:** Mission Management, Risk Management
- **On Cost:** Success in Fixed Price Contract Management



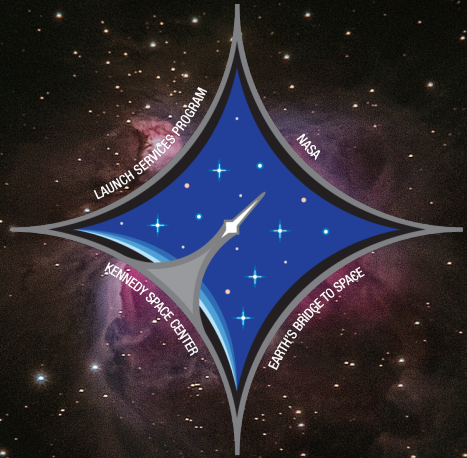
# Launch Services Program

## - Current Vehicle Fleet - High Mission Assurance-

				
NGIS Pegasus XL	SpaceX Falcon 9	SpaceX Falcon Heavy	ULA Vulcan	Blue Origin New Glenn

\*Not shown to scale

# LSP Primary Missions



102  
Launches  
Since 1998



# Latest Mission Launched - Psyche

- Psyche was successfully launched on Oct. 13, 2023, at 10:19 a.m. EDT from Launch Pad 39A aboard a SpaceX Falcon Heavy rocket.
- The achieved orbit was well within ICD requirements, based on spacecraft tracking data

Orbit Parameters <sup>1</sup>	ICD Requirement		Preflight Prediction <sup>2</sup>		Spacecraft Tracking Solution <sup>3</sup>		
	Target	Tolerance	Mean	3 Sigma	Value	Error	Accuracy (Sigma)
C3 (km <sup>2</sup> /s <sup>2</sup> )	34.0000	±0.25	34.0238	±0.0862	34.0024	-0.0214	-0.75
RLA (deg)	113.7047	±0.50	113.6918	±0.0474	113.7070	0.0152	0.96
DLA (deg)	28.0089	±0.25	28.0090	±0.0120	28.0151	0.0061	1.53

<sup>1</sup> Targets are defined conditions of the osculating departure hyperbola at the Targeting Interface Point (TIP) expressed in the EME2000 coordinate system

<sup>2</sup> Based on day and time of launch

<sup>3</sup> Assessed by spacecraft at TIP

- All orbit parameters were less than 1.6-sigma as compared to pre-flight accuracy predictions
- Due to the spacecraft targets, upper stage disposal was compliant with orbital debris policy via Earth-escape.





JOHN F. KENNEDY SPACE CENTER

# LSP Advanced Planning & Awarded Missions in Flow

Sources:

NASA Launch Services Manifest [Release: 7/07/2023]

Launch Manifest Waterfall [Release: 7/6/2023]

FPO Update [Release: 7/05/2023]

VADR CLIN 2 and CSLI missions not depicted.

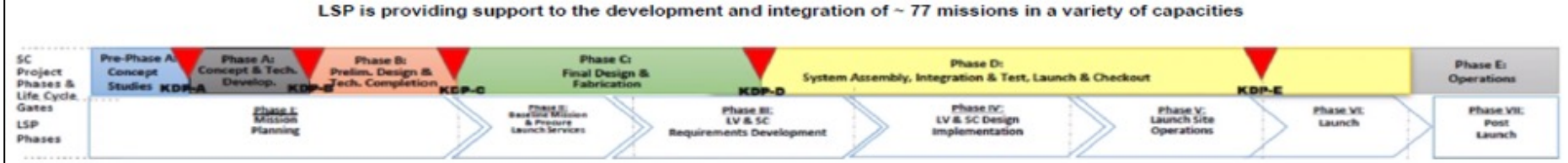
Version: External Release September 2023

All Pre-Award mission data is notional

LEGEND	
<span style="color: orange;">■</span>	APL
<span style="color: blue;">■</span>	GSFC
<span style="color: red;">■</span>	JPL
<span style="color: darkred;">■</span>	LaRC
<span style="color: green;">■</span>	MSFC
<span style="color: purple;">■</span>	JSC
<span style="color: yellow;">■</span>	GRC
<span style="color: brown;">■</span>	KSC
<span style="color: black;">■</span>	No Assigned NASA Center

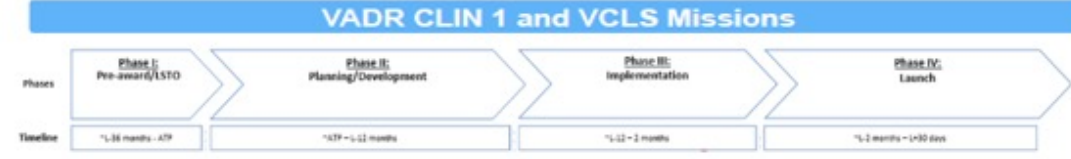
#C: #Cubesats
CCSFS: Cape Canaveral Space Force Station
AV: Atlas V
ER: Eastern Range
F9: Falcon 9 Full Thrust
FH: Falcon Heavy
GTO: Geostationary Transfer Orbit
HEO: Highly Elliptical Orbit
LEO: Low Earth Orbit
LV: Launch Vehicle
NET: No Earlier Than
NLS: NASA Launch Service
NLT: No Later Than
SSO: Sun Synch Orbit
TBD: To Be Determined
U/R: Under Review
VADR: Venture Class Dedicated and Rideshare
VSFB: Vandenberg Space Force Base
WR: Western Range



AOs	Ph II (NLS II Acq in work)
Astro Probe AO [ . ]	OSAM-1 [Class C, Med/Int LV, . 02/27/26]
DYNAMIC [ . NET 08/01/29]	
Earth Science Explorer AO [ . ]	
Helio 2022 (SMEX) AO [ . ]	
MIDEX 2021 (Astro) AO [Med LV, NLT 12/31/28]	Ph II (ATP - L-30m)
MIDEX 2021 (Astro) MO [Small LV/ISS, NLT 12/31/27]	Roman Space Telescope [Class A, FH, Cx39A, 10/31/26]
New Frontiers AO [ . ]	

NLS II Advanced Planning
AOS-Sky w/ HAWCsat (2nd) [Class C, SSO, Med/Int LV, 12/01/30]
AOS-Storm [Class C, SSO, Med/Int LV, 07/01/28]
COSI [Class D, LEO, Sm/Med LV, 04/01/27]
DAVINCI [Class B, Interplanetary, Med/Int LV, U/R 08/01/29]
Dragonfly [Class B, Interplanetary, Int/Hvy LV, NET 06/20/27]
ExoMars/RPM [ . Interplanetary, Int LV, 09/24/26]
GDC [Class C, Multiple, Med LV, 09/01/29]
GeoXO [Class B, Orbit TBD, Med/Int LV, 01/01/30]
HelloSwarm [Class C, Lunar, Med LV, 01/01/29]
JPSS-3 [Class B, LEO, Med/Int LV, 09/01/32]
JPSS-4 [Class B, LEO, Med/Int LV, 09/01/27]
LandSat Next [ . SSO, Med/Int LV, 12/01/30]
MAIA [Class C, SSO, TBD LV Class, NET 01/01/26]
Mars SRL [Class A, Interplanetary, Int/Hvy LV, NET 06/29/28]
MUSE [Class C, LEO, Sm/Med LV, 01/01/27]
NEO Surveyor [Class C, HEO, Med/Int LV, 09/13/27]
SBG [Class C, SSO, Med LV, 04/30/28]
SWFO L1-A [Class C, . Med/Int LV, 12/15/28]
SWFO L1-B [Class C, . Med/Int LV, 07/15/30]
USDV [Class A, LEO, Hvy LV, NLT 01/01/29]
VERITAS [Class B, Interplanetary, Heavy LV, NET 05/01/31]

Awarded NLS II, One Offs, and LSP Advisory Missions				
Ph III (L-30m - L-18m)	Ph IV (L-18m - L-3m)	Ph V (L-3m - L-10d)	Ph VI (L-10d - L)	Ph VII (L+3m)
HALO [ . FH, ER, NET 10/01/25]	Europa Clipper [Class A, FH, Cx39A, 10/10/24]			
IMAP w/ SWFO (2nd) +Carruthers (2nd) [Class C, F9, ER, 02/01/25]	GOES-U [Class B, FH, ER, 04/30/24]			
Sentinel 6-B [Class B, F9, WR, 11/24/25]	NISAR [Class C, GSLV, India, U/R 01/28/24]			
SPHEREx/PUNCH(2nd) [Class C, F9, WR, 02/28/25]	PACE [Class C, F9, ER, 01/09/24]			
	Psyche [Class B, FH, Cx39A, 10/05/23]			



VADR Acq in work	ATP - L-12mo	L-12m - L-2m	L-2m - L+1m
PREFIRE [Class D, VADR, . NET 04/01/24]	ESCAPADE [Class D, New Glenn, CCSFS, 08/06/24]	VCLS D2-FB (10C) [Class D, Alpha, WR, NET 10/16/23]	
TRACERS [Class D, VADR, . NET 04/01/25]	TSIS-2 [Class D, F9, CCSFS, 08/07/24]		

## Supporting Programs

Artemis/Gateway
Artemis-2 [ . SLS, Cx39B, 11/23/24]
Artemis-3 (HLS) [Hvy LV, SLS, Cx39B, 12/01/25]
ESPRIT [Hvy LV, . . 01/01/27]
Gateway (IHAB/US-HAB) [Hvy LV, SLS, . NET 01/01/27]
Gateway (Log Mod) [SpX Heavy LV, . . 11/01/27]
Gateway GERS [SpX Heavy LV, . . NET 11/01/28]
HLS [Hvy LV, Starship, . NET 01/01/25]

VADR Adv. Planning
ULTRASat [Class D, GTO, VADR, NET 08/01/26]
StarBurst [Class D, LEO, VADR, NET 01/01/25]
QuickSounder [Class D, LEO, VADR, 12/01/25]
PANDORA [Class D, SSO, VADR, NET 10/01/24]
INCUS [Class D, . VADR, 08/02/26]
CFM [Class D, LEO, VADR, NET 01/01/30]
ASPERA [Class D, SSO, VADR, NET 05/01/25]

# Emerging Launch Services Strategy

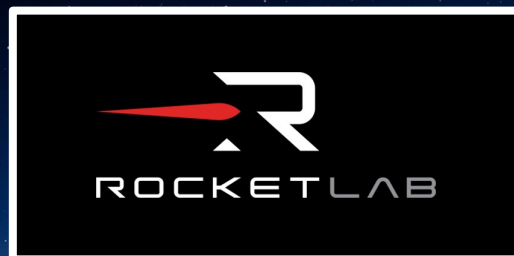
## VADR Overview

- Lower level of mission assurance and more commercial practices to achieve lower launch costs through FAA licensed launches (only applicable to Class D & higher risk tolerant missions. Not applicable for Class A-C)
- Includes capability to procure streamlined commercial CubeSat launch services
- Category 1 certification of launch vehicle available, not baseline
- First flight not required to bid
- Spacecraft (SC) readiness go/no-go for launch (only for Dedicated & Primary Rideshare)

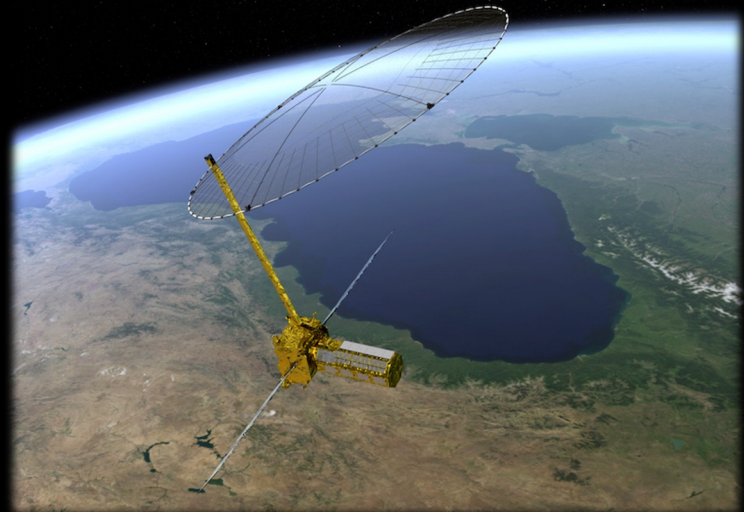
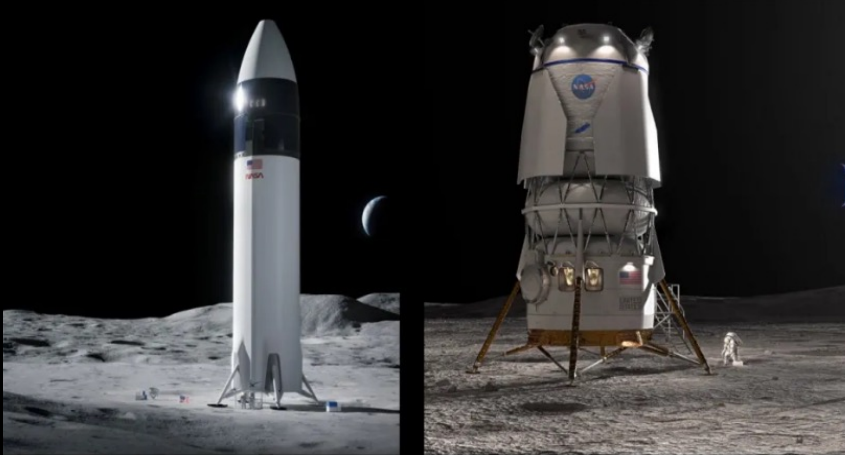
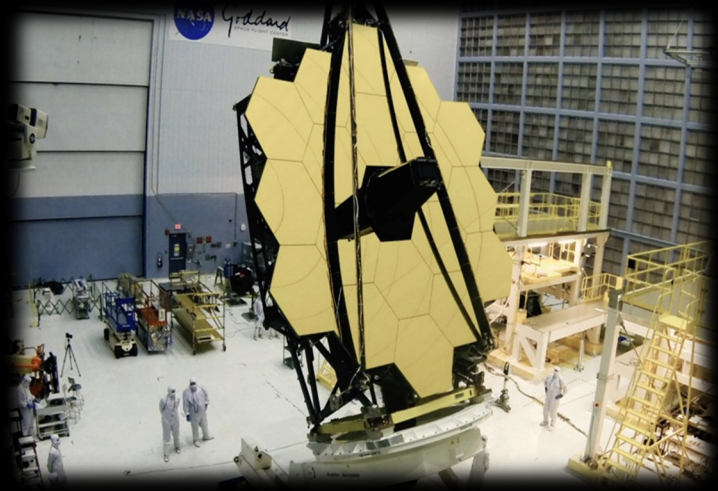
2015	<b>VCLS</b> (Venture Class Launch Service)
2020	<b>CAPSTONE</b> (Cislunar Autonomous Positioning System Technology Operations and Navigation Experiment)
2020	<b>VCLS Demo 2</b> (Venture Class Launch Service Demonstration 2)
2021	<b>TROPICS</b> (Time-Resolved Observations of Precipitation structure and storm Intensity with a Constellation of Smallsats)
2021	<b>VADR</b> (Venture Class Acquisitions of Dedicated & Rideshare)
2022-2023	<ul style="list-style-type: none"> <li>• <b>2022</b> <ul style="list-style-type: none"> <li>• TROPICS - Rocket lab</li> <li>• TSIS-2 - SpaceX</li> </ul> </li> <li>• <b>2023</b> <ul style="list-style-type: none"> <li>• PREFIRE– Rocket Lab</li> <li>• ESCAPEDE – Blue Origin</li> <li>• TRACERS – SpaceX</li> </ul> </li> <li>• <b>Streamlined CubeSat Launch Services awarded for multiple CubeSat missions</b></li> </ul>

# Launch Services Program

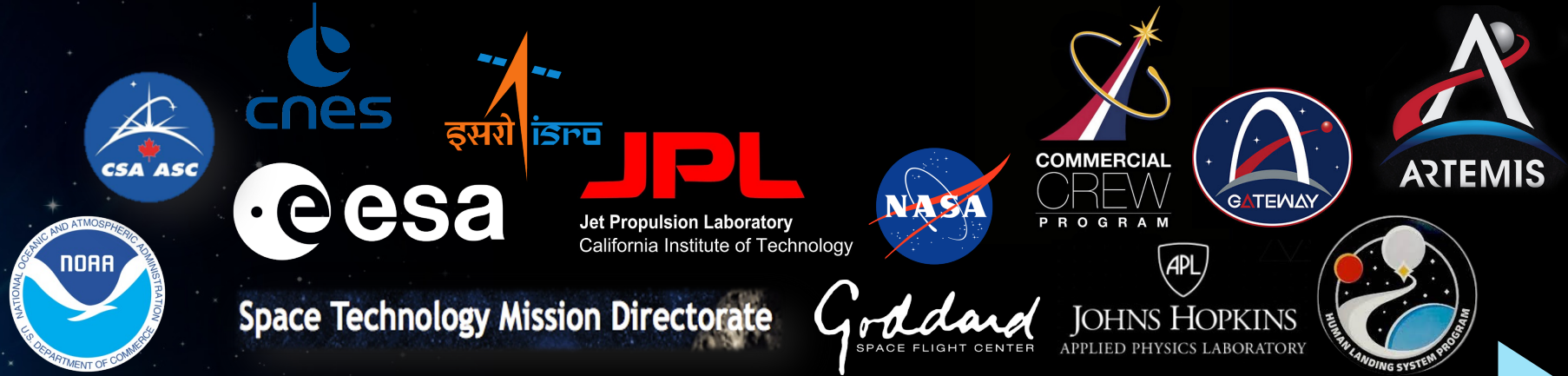
- Venture Class Launch Service Providers -



# Advisory

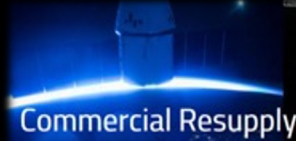


# LSP's Evolving Future



1998 - LAUNCH SERVICES PROGRAM CUSTOMERS - 2023

SCIENCE MISSION DIRECTORATE



Exploration Systems Development Mission Directorate



LAUNCH SERVICES PROGRAM

KENNEDY SPACE CENTER

EARTH'S BRIDGE TO SPACE



# CubeSat Launch Initiative

## Mission

NASA's CubeSat Launch Initiative (CSLI) is intended to expand U.S. interest in Science, Technology, Engineering, and Mathematics (STEM).

CSLI emphasizes education and provides launch opportunities to a variety of U.S. CubeSat developers and encourages participation by Minority Serving Institutions.

## Accomplishments to Date

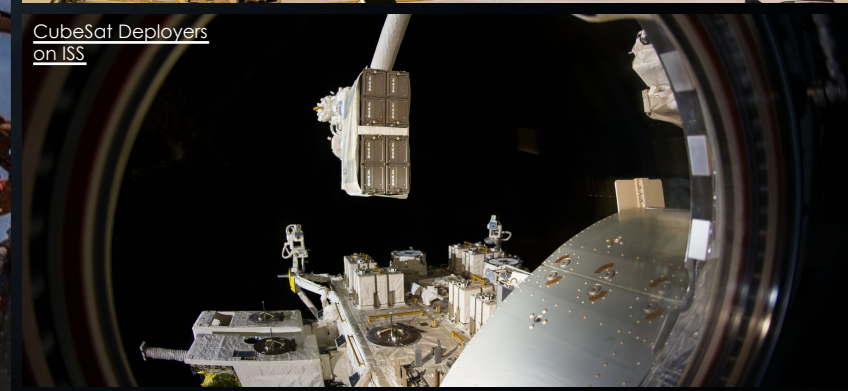
- 200+ CubeSat Projects selected from 100+ organizations from 40+ states, Washington DC and Puerto Rico
- 150+ CubeSats launched to date

## Looking forward to 2024

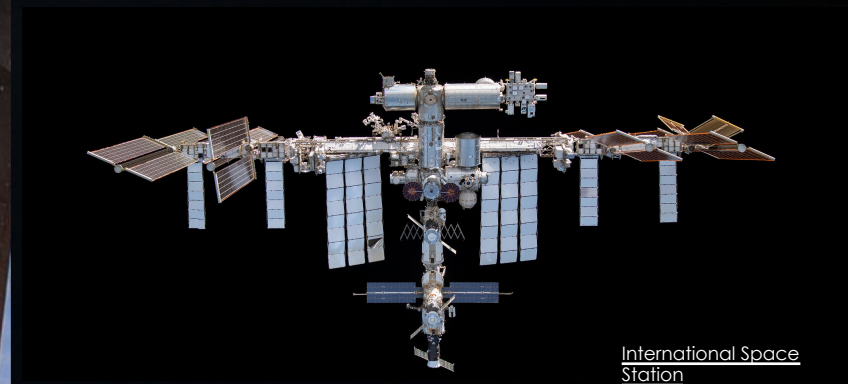
- 45+ Missions scheduled to launch in the next Calendar Year
- 20+ missions awaiting procurement



LightSail, Credit: The Planetary Society



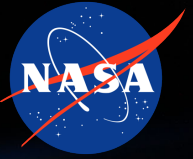
CubeSat Deployers on ISS



International Space Station

Image: ELaNu 19 Launch, Credit: Rocket Lab/Trevor Mahlmann





# Benefits to Education Orgs



1

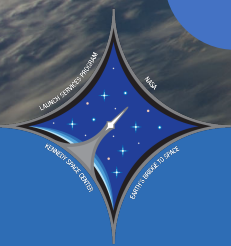
CSLI provides up to \$300k to cover launch and integration costs, thereby removing the financial barriers associated with launch.

2

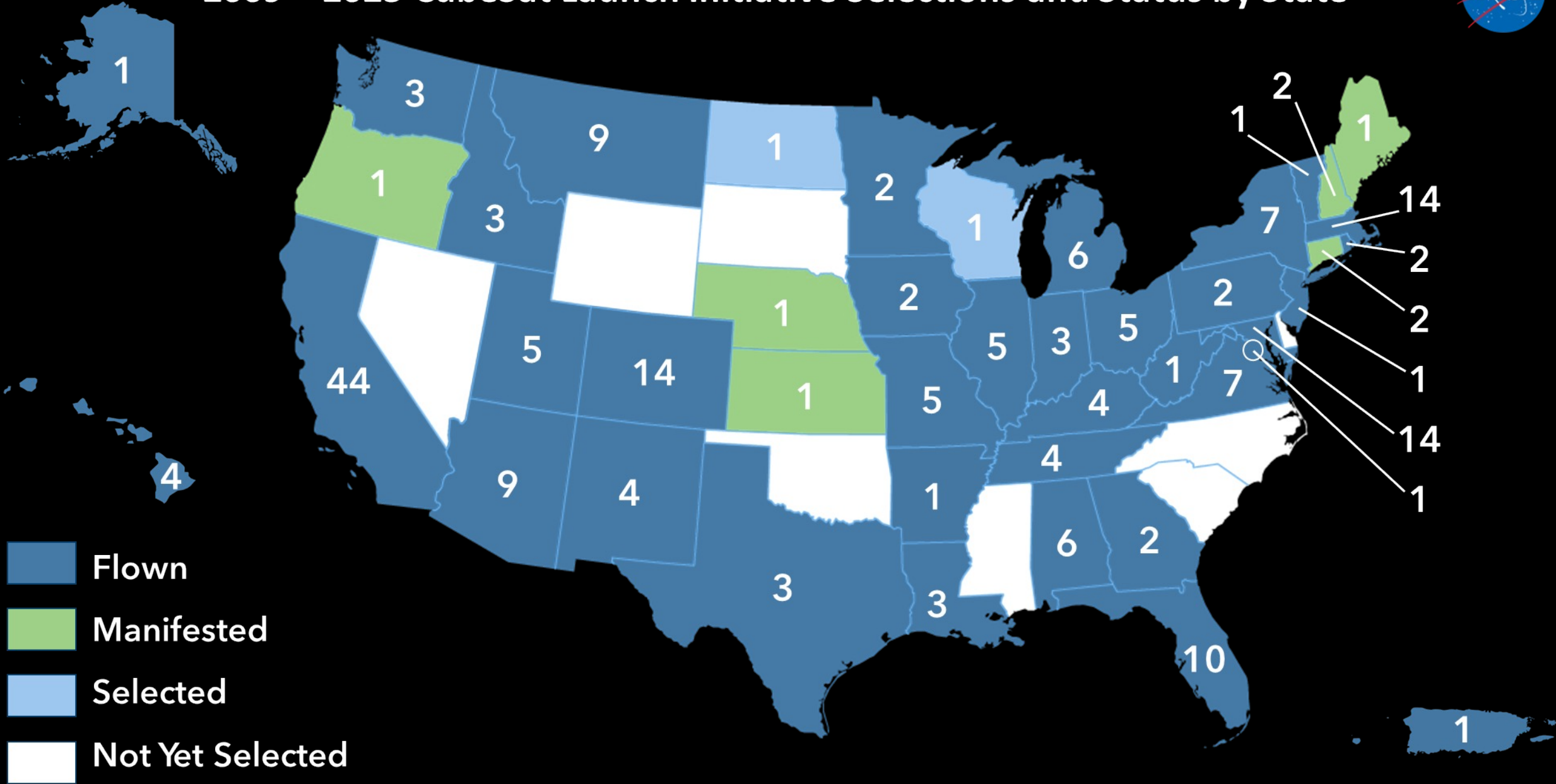
Enables students, teachers and faculty to obtain hands-on flight hardware development and operational experience

3

Provides mechanism to conduct scientific research and develop technologies in outer space



# 2009 – 2023 CubeSat Launch Initiative Selections and Status by State





# CSLI Inspires the Next Generation of Explorers

R. Pierce Smith, CACTUS-1 "For me the most rewarding part was building the payload - that's when I really started to get that sense of doing something really incredible."

"StangSat gave me early insight into the engineering process, confirming my interest in an engineering career. It also gave me the luxury of working a project to completion."

Ryan Izant, EQUISat "Brown Space Engineering played an extremely large role in my career development and is the main contributor to getting me to where I am today."



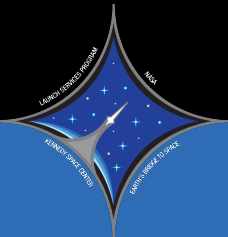
University of Hawaii -  
Neutron-1



Robertsville Middle  
School - RamSat



Brown University - EQUISat





# 2024 - What's Next?



- Launch : Jan 2024
- SpaceX Falcon 9
- Spacecraft shipment targeted for mid November
- LSP review of launch vehicle booster in work
- Launch campaign preparations in work

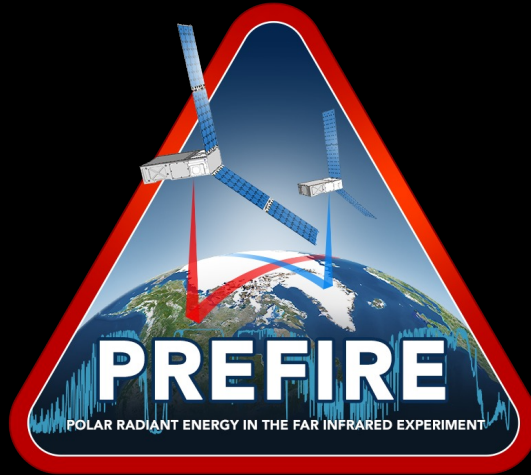


- Launch Date: April 2024
- SpaceX Falcon Heavy
- Spacecraft shipment currently targeted for early 2024
- Launch services analyses progressing



- Launch Date: Oct 2024
- SpaceX Falcon Heavy
- Pad and ground support facility readiness in work
- Launch services analyses progressing

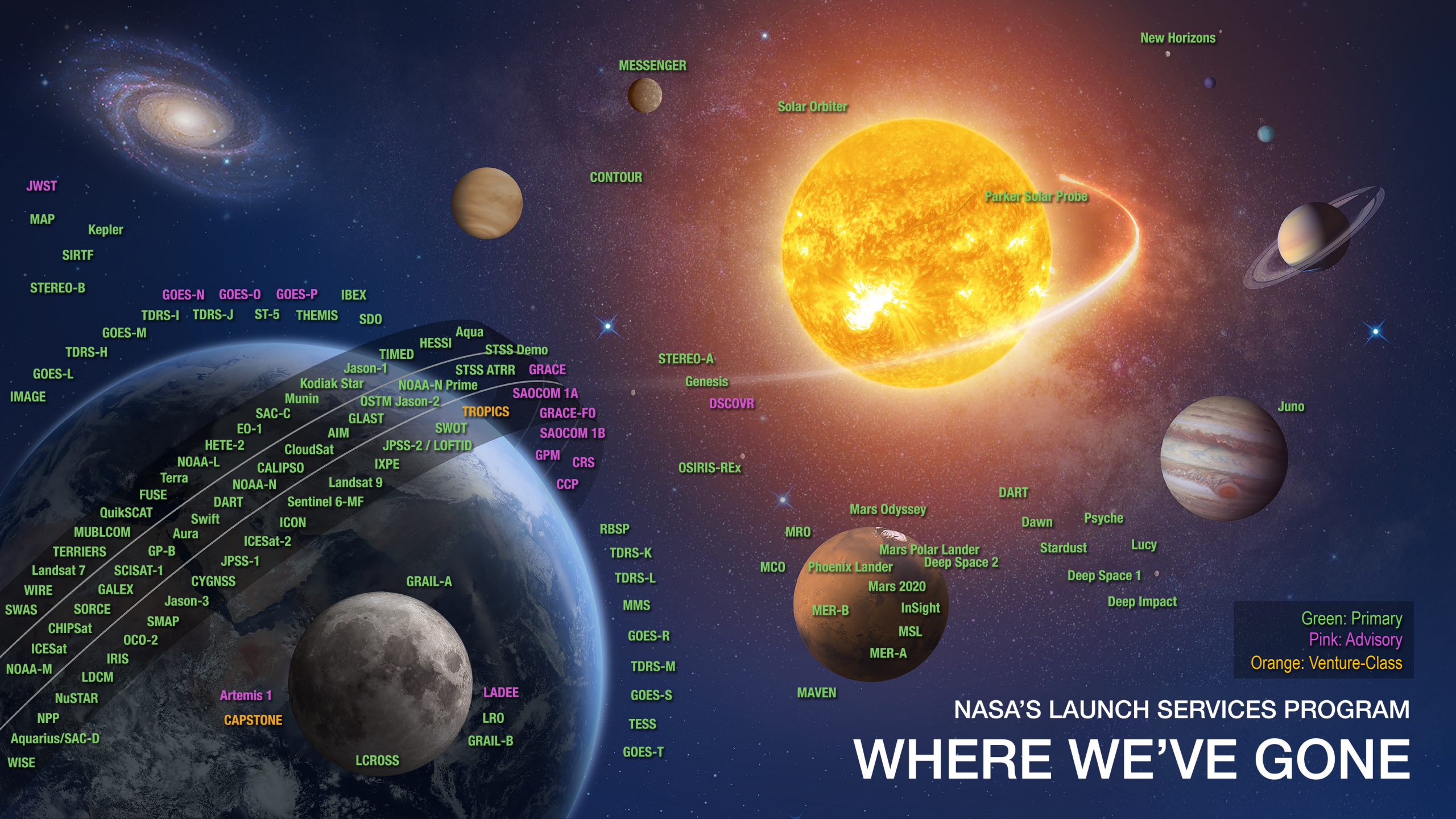
# 2024 - What's Next (VADR)?



- Launch Date:
  - PREFIRE 1 May 2024
  - PREFIRE 2 May 2024
- Rocket Lab Electron
- Launch services analyses progressing
- Spacecrafts targeted for transport to New Zealand in spring 2024



- Launch Date: Aug 2024
- Blue Origin New Glenn
- Launch services analyses progressing



JWST

MAP

Kepler

SIRTF

STEREO-B

GOES-N GOES-O GOES-P IBEX

TDRS-I TDRS-J ST-5 THEMIS SDO

GOES-M

TDRS-H

GOES-L

IMAGE

Aqua

TIMED HESSI STSS Demo

Jason-1

STSS ATRR GRACE

Kodiak Star NOAA-N Prime

Munin OSTM Jason-2

SAC-C

TROPICS

EO-1

GLAST

SAOCOM 1A

HETE-2

CloudSat

JPSS-2 / LOFTID

GRACE-FO

SAOCOM 1B

NOAA-L

CALIPSO

IXPE

GPM

CRS

Terra

NOAA-N

Landsat 9

CCP

FUSE

DART

Sentinel 6-MF

STEREO-A

Genesis

DSCOVR

OSIRIS-REX

Solar Orbiter

Parker Solar Probe

New Horizons

MESSENGER

CONTOUR

Juno

DART

Mars Odyssey

Dawn

Psyche

Stardust

Lucy

Deep Space 1

Deep Impact

MRO

Mars Polar Lander

Deep Space 2

Phoenix Lander

Mars 2020

MER-B

InSight

MSL

MER-A

MAVEN

RBSP

TDRS-K

TDRS-L

MMS

GOES-R

TDRS-M

GOES-S

TESS

GOES-T

Artemis 1

CAPSTONE

LADEE

LRO

GRAIL-B

GRAIL-A

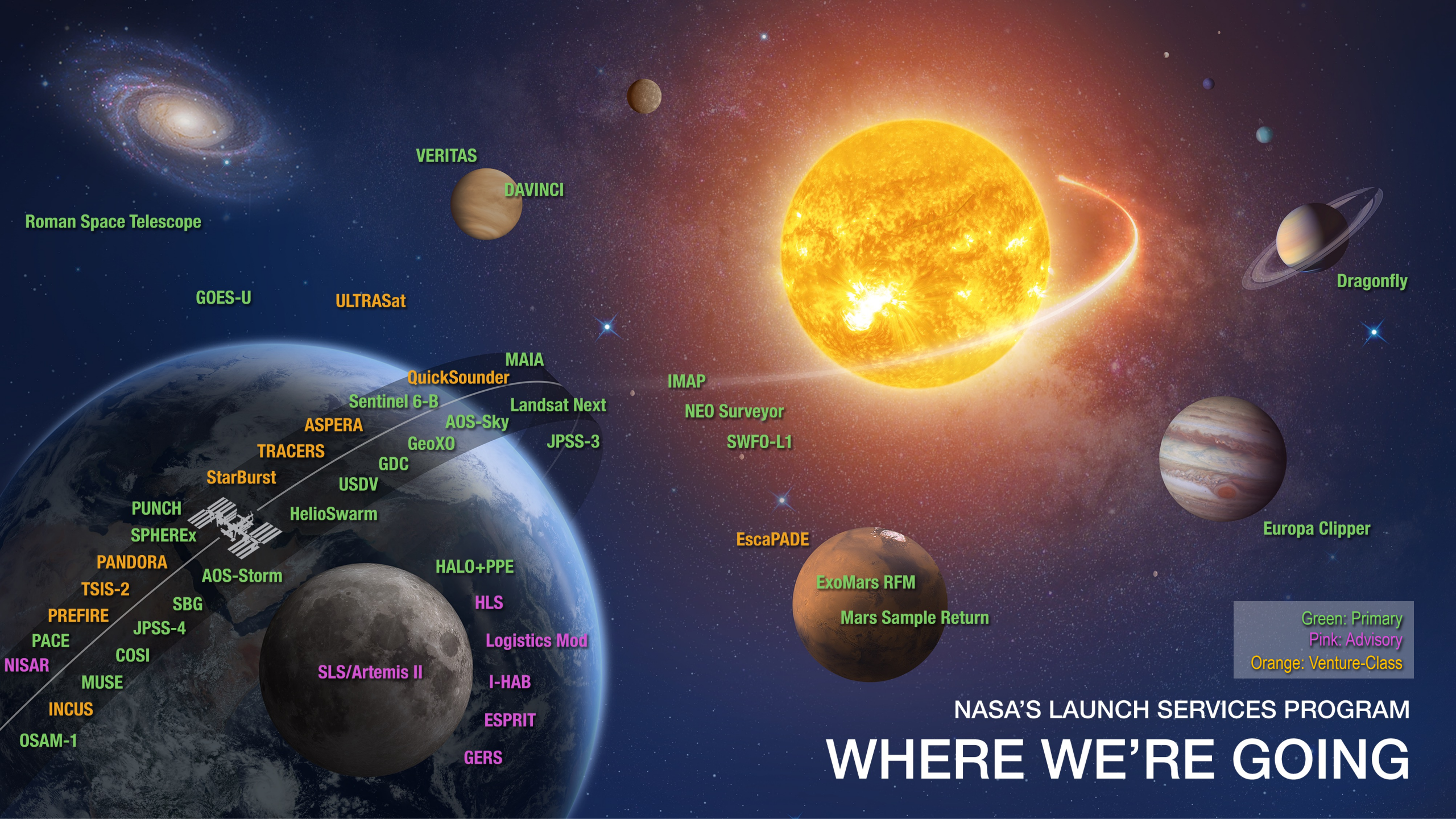
LCROSS

Aquarius/SAC-D

WISE

Green: Primary  
Pink: Advisory  
Orange: Venture-Class

# NASA'S LAUNCH SERVICES PROGRAM WHERE WE'VE GONE



Roman Space Telescope

VERITAS

DAVINCI

GOES-U

ULTRASat

Dragonfly

MAIA

QuickSounder

IMAP

NEO Surveyor

SWFO-L1

Europa Clipper

Sentinel 6-B

Landsat Next

ASPERA

AOS-Sky

GeoXO

JPSS-3

TRACERS

GDC

USDV

StarBurst

HelioSwarm

PUNCH

SPHEREx

EscaPADE

ExoMars RFM

Mars Sample Return

HALO+PPE

HLS

Logistics Mod

AOS-Storm

PANDORA

TSIS-2

SBG

PREFIRE

JPSS-4

PACE

COSI

MUSE

I-HAB

INCUS

ESPRIT

OSAM-1

SLS/Artemis II

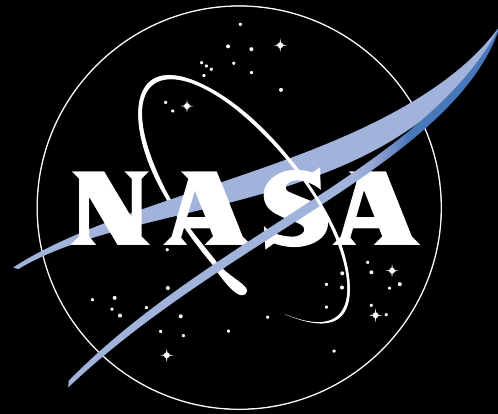
GERS

Green: Primary  
Pink: Advisory  
Orange: Venture-Class

NASA'S LAUNCH SERVICES PROGRAM

WHERE WE'RE GOING





Follow us on X  
[@NASASpaceOps](#)



Back-Up

1960

1970

1980

1990

2000

2010

2020

Beyond



NASA Science via Government



NASA Science and DoD via Commercial



DoD via Government



NASA Human via Government



NASA Cargo via Commercial

# Evolution of Spaceflight



NASA Human via Commercial



**MISSION**

Uniting customers, capabilities, and culture to explore space through unparalleled launch services

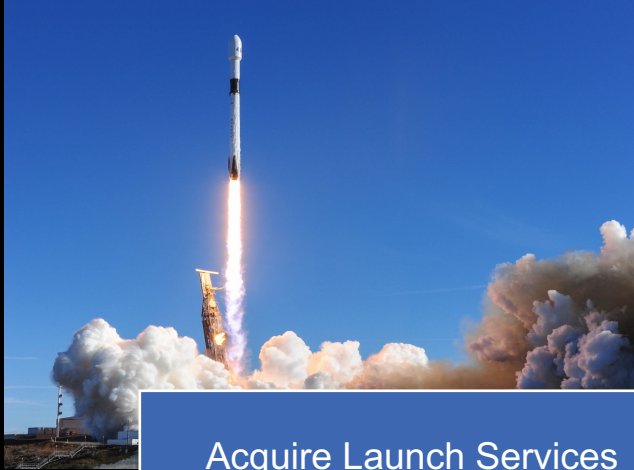
**VISION**

Science and discovery through unlimited access to the universe

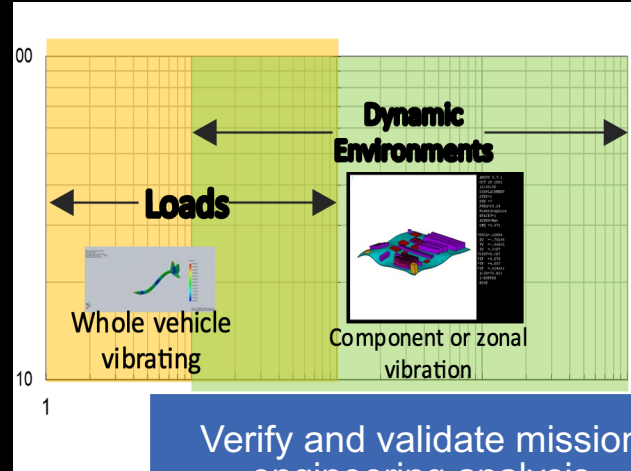
**GOALS**

Maximize mission success, Assure long-term launch services, Promote evolution of a US Commercial Space Launch Market, Continually enhance LSP's core capabilities

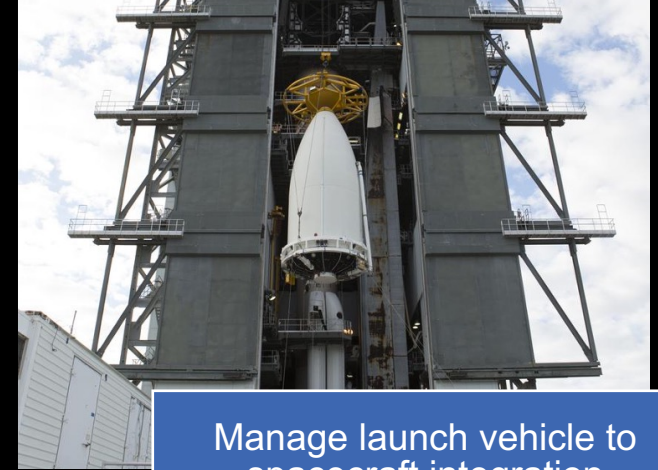
# Traditional LSP Roles and Responsibilities



Acquire Launch Services



Verify and validate mission engineering analysis



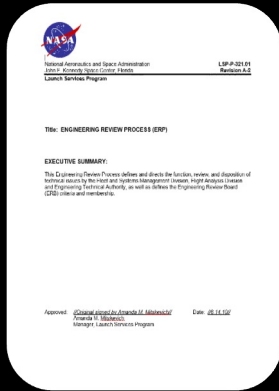
Manage launch vehicle to spacecraft integration



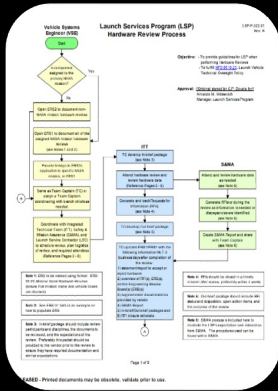
Certify launch systems for NASA use



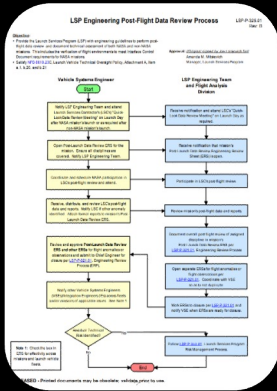
Provide insight and approval of production, integration, testing and processing



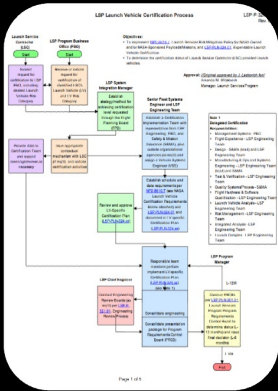
**Engineering Review Process**



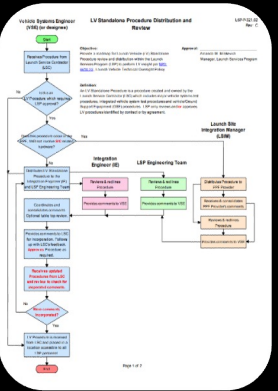
**LSP Hardware Review Process**



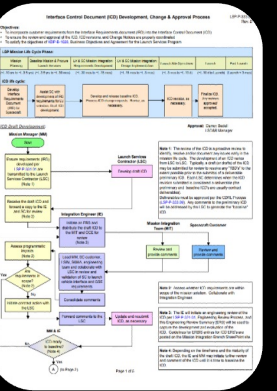
**Post-Flight Data Review Process**



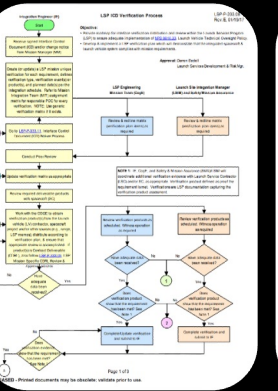
**Launch Vehicle Certification Process**



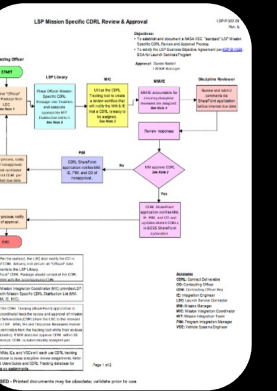
**LV Standalone Procedure Review**



**LSP ICD Process**



**LSP ICD Verification Process**



**LSP Mission Specific CDRL Review & Approval**

# Mission First

- Over 20 years of heritage of launch vehicle mission assurance in the “non-government-owned” launch vehicle world
- Adaptable to changing environments
  - New providers
  - Heritage customers with new requirements
  - New Agency customers using commercial launch vehicles, with different procurement approaches
- Full manifest of missions to execute “traditionally” and in advisory capacity