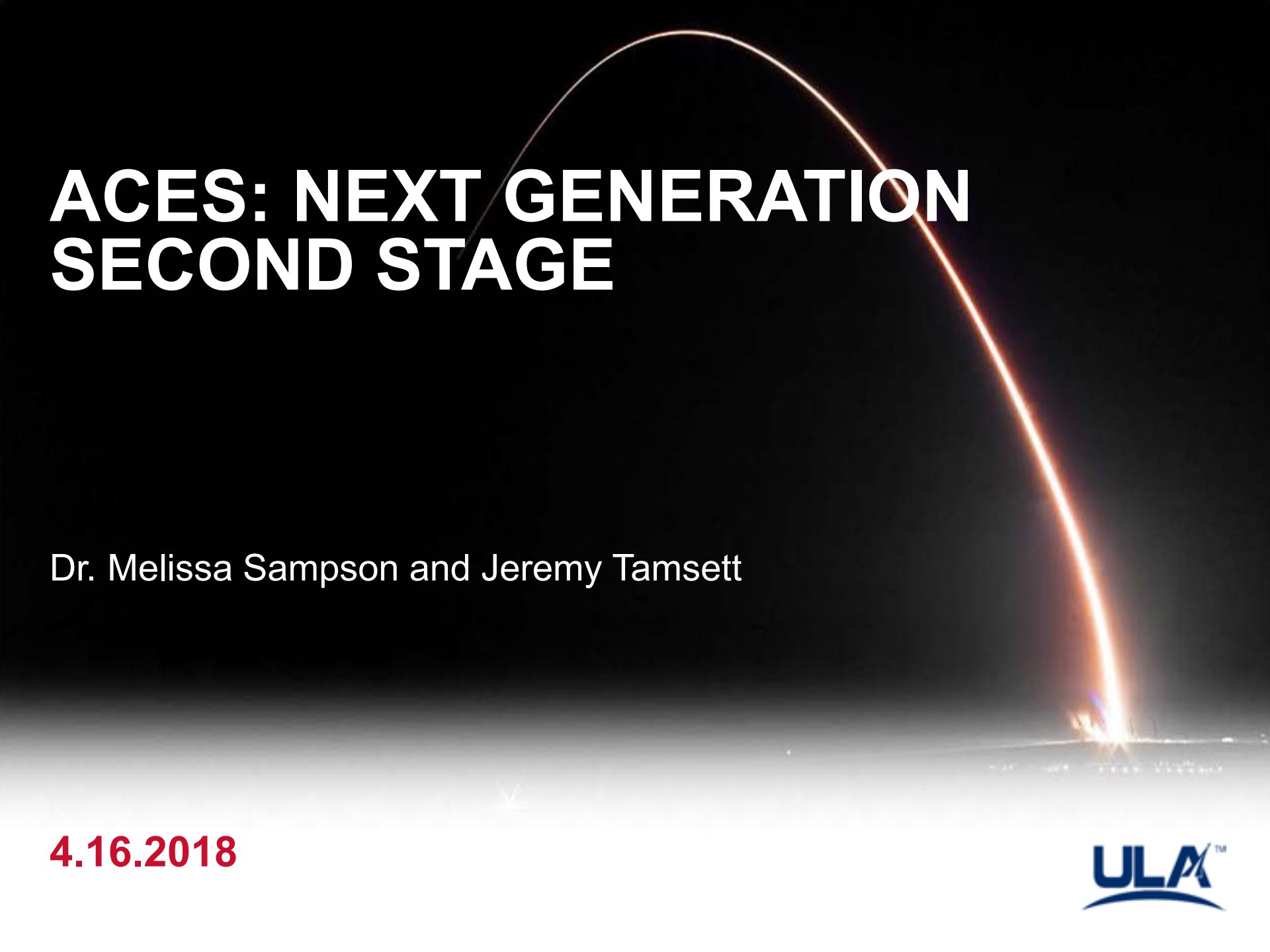
ACES: NEXT GENERATION SECOND STAGE



Dr. Melissa Sampson and Jeremy Tamsett

4.16.2018

MISSION SUCCESS…126 AND COUNTING!

ULA's Vision: Harness the Potential of Space for Humanity

Atlas V

Delta IV

2017 LAUNCH HIGHLIGHTS VIDEO

https://www.youtube.com/watch?v=NosGNAk64jA

WHO DO WE SERVE

National Security Space

Global Positioning System (GPS)

Intelligence, Surveillance and Reconnaissance

Commercial Space

Earth Imagery

Commercial Communication

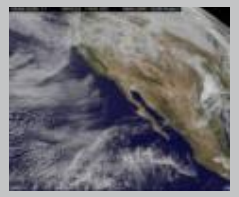
Civil Space

Robotic Exploration and Science

Mars Science Laboratory

Pluto New Horizons

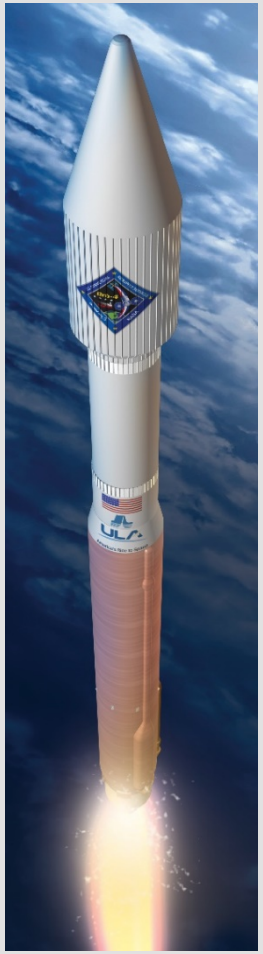
Increasing Our Knowledge of the Earth and Its Climate



Geostationary Operational Environmental Satellite (GOES)

Cloudsat

Human Launch

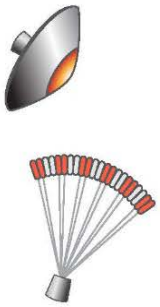
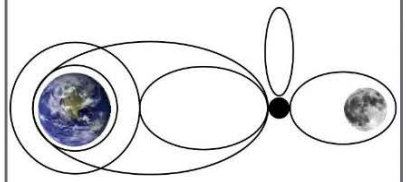


Cargo

Crew

Vulcan ACES Enhances Traditional Mission

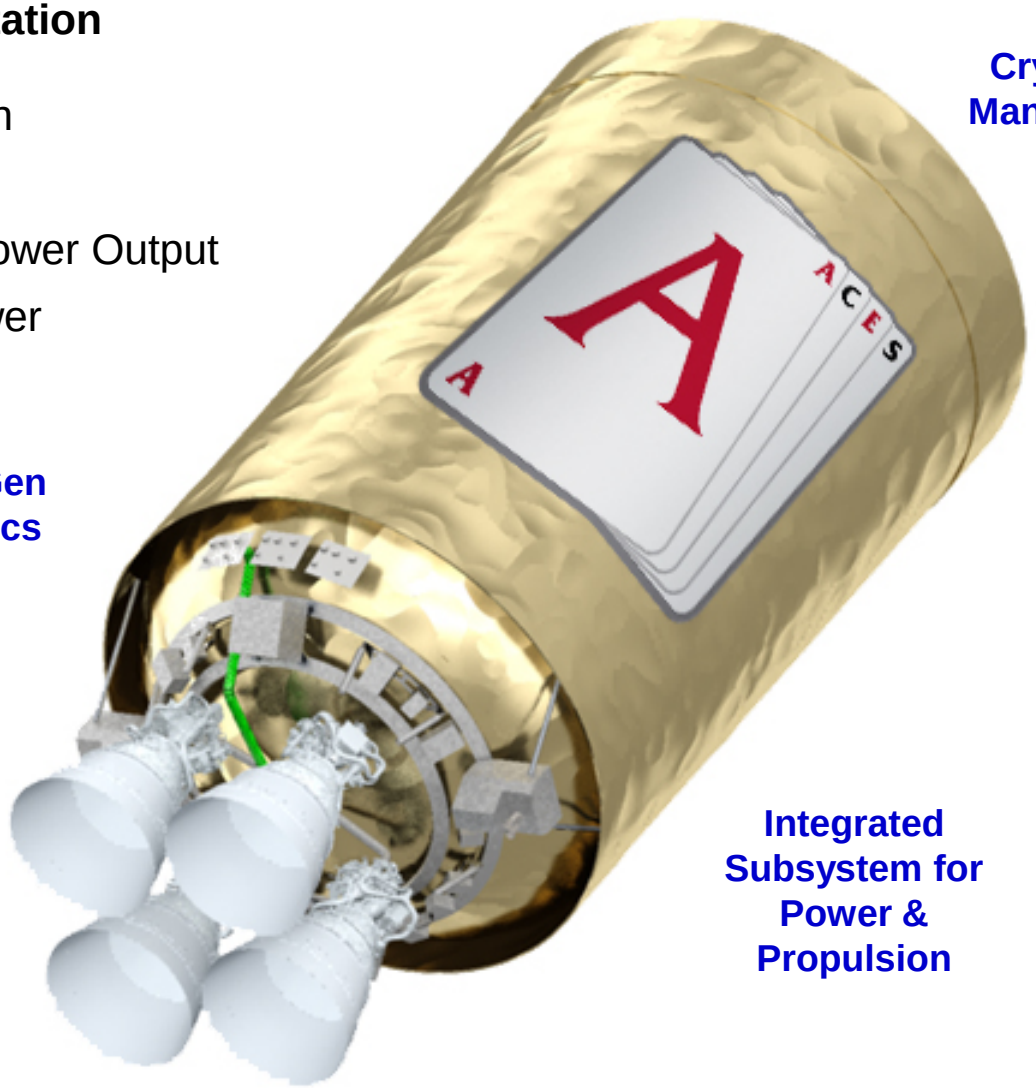
ULA ROADMAP

	CURRENT	STEP ONE	STEP TWO	STEP THREE	STEP FOUR		STEP FIVE
	2018	2020	2023	2023	2024		2024+
ATLAS V	20t Class  0-5x	RD-180 Engine Retired					
DELTA IV	30t Class  Delta IV Medium Retired	30t Class 	Delta IV Heavy Retired				
VULCAN CENTAUR/ACES		**Vulcan Centaur** 25t Class  2-6x	**Vulcan Centaur** 35t Class  2-6x Single Core Heavy Capability	**Vulcan ACES**  2-6x Enhanced On-orbit Capability	**SMART Reuse** 	**Distributed Lift, Propellant Transfer** 	**In CisLunar Space Transport and Refueling** 

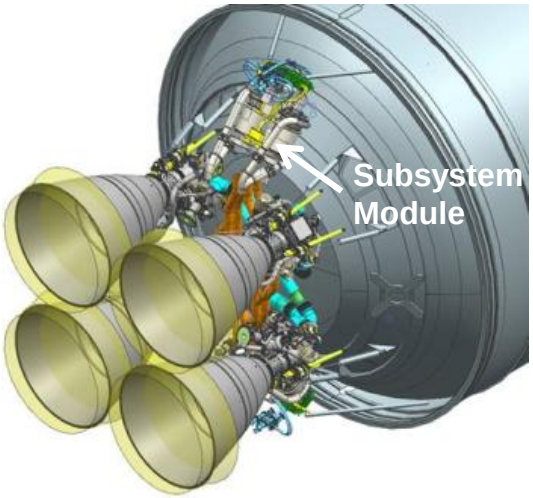
ACES – REVOLUTIONARY NEW CAPABILITY

Flexible In-Space Transportation

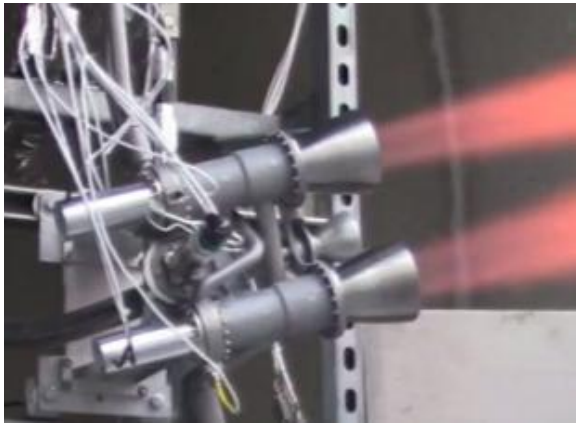
- Extended Mission Duration
- High Maneuverability
- Unprecedented Electric Power Output
  - Provides Payload Power

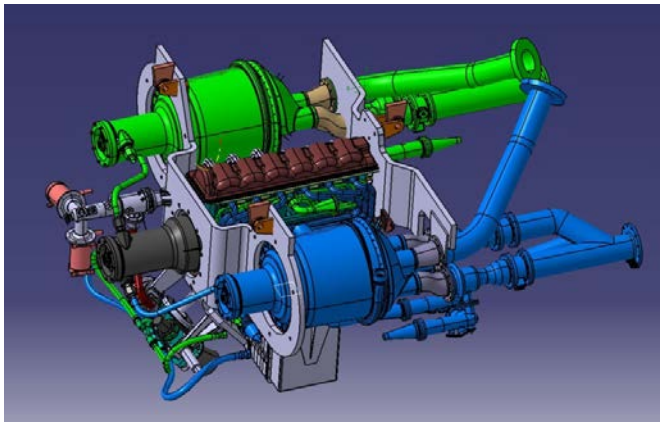


ACES TECHNOLOGY – INTEGRATED SUBSYSTEM FOR POWER & PROPULSION



- Powers Subsystems with “Waste” Propellants
  - Generate Electricity **(NO** Main Batteries)
  - Supplies H2/O2 ACS Thrusters **(NO** Hydrazine)
  - Provides autogenous pressurization **(NO** Helium)





POTENTIAL MISSION APPLICATIONS

Extended Satellite Life Through Optimized Orbit Delivery

- Conserve Fuel for the Mission
- Speed to Orbit

Enables New Space Architectures

- Cislunar Economy
- National Security
- Commercial

Autonomous Flight Design Combined with Ability to Control from Ground

ENABLING MORE…

Enhanced Mission Value through ACES

- Commercial
  - Optimized Orbit Delivery
  - Cislunar Transportation Enabler
  - **Other?**

- National Security
  - Superior Delivery Through Duration and Power
  - Supports SWC/SEV, National Defense Strategy, & USSTRATCOM Priorities
  - **Other?**

- Civil
  - Science, Research, and Exploration Enhancement
  - **Other?**

ACES is an Economic Enabler for National Security, Commercial, & Civil Arenas