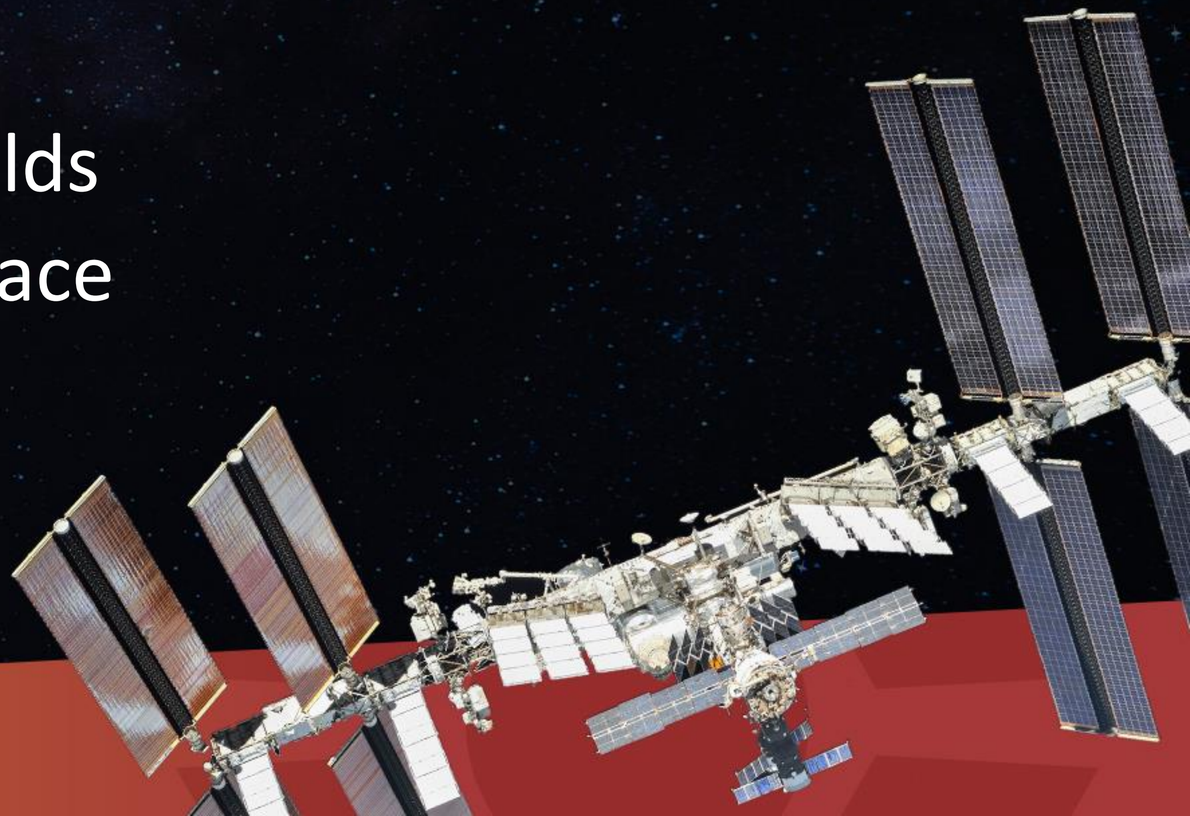
ISSRDC

SIERRA SPACE

# Dream Chaser Rideshare

Ken Shields
Sierra Space



AIRBUS
Technical Session Sponsor

# Company Overview

## A DIFFERENTIATED SPACE LEADER

A top-tier vertically integrated space-tech company revolutionizing the space industry and disrupting terrestrial industrial markets.

### EARTHSPACE SYSTEMS

Revolutionary spaceplane with global commercial runway access for spaceflight operations

First business-ready commercial space station to harness the foundational tech of microgravity

### SPACE APPLICATIONS

Differentiated technology for critical satellite and spacecraft systems

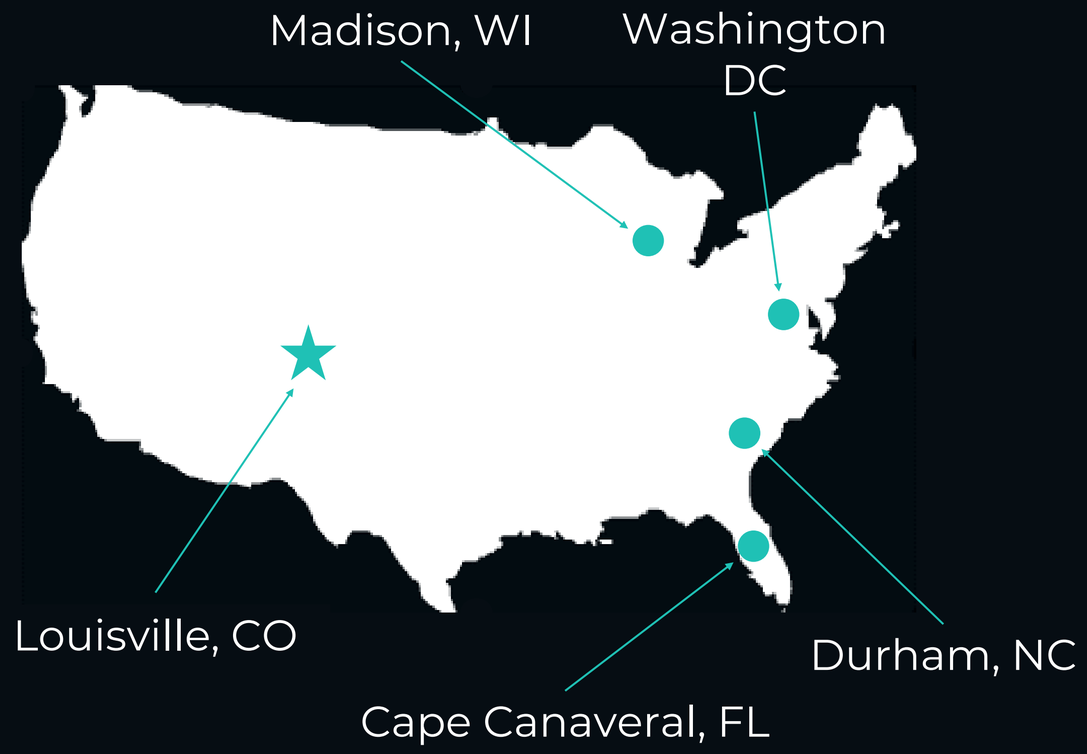
Next generation defense prime in classified space

## BY THE NUMBERS

| | | |
|---|---|---|
| **$4.3B** Active Contracts with >$400M in National Security | **70** Active Customers | **$1.7B** Series A & B ($5.3B Valuation) |
| **75** Patents, Pending Applications and Trade Secrets | **2,000 \| 425** Team Members \| Advanced Degrees | **950,000** Square Feet of Terrestrial Infrastructure |
| **2** Mission Control Rooms | **28** Acre Rocket Engine Test Site | **2** Centers in Support of National Security |
| **500** Space Missions Enabled by Sierra Space | **49** Interplanetary Missions | **6 \| 30** Years Developing Dream Chaser® \| Years Enabling Space Missions |

# Sierra Space US Presence

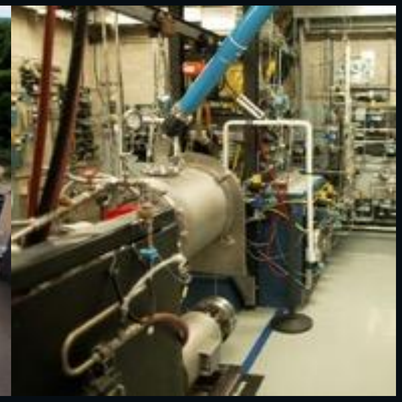
## Infrastructure in place to scale





Mission Control
Louisville, Colorado

Vehicle Development
Louisville, Colorado



Rocket Engine Development & Test
North Freedom, WI

Electromechanical
Durham, NC

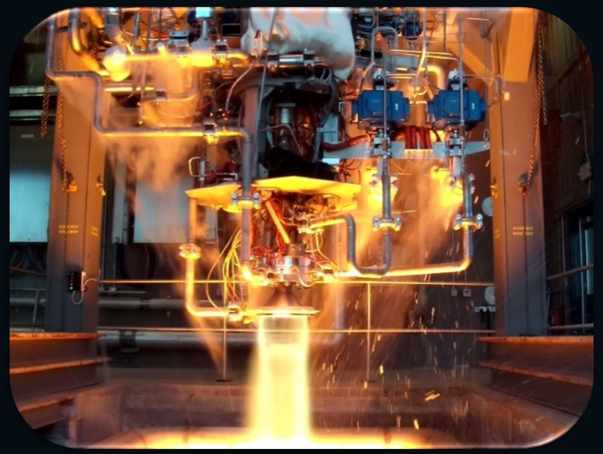
LIFE Support & Propulsion
Madison, WI

Power & Avionics
Louisville, Colorado

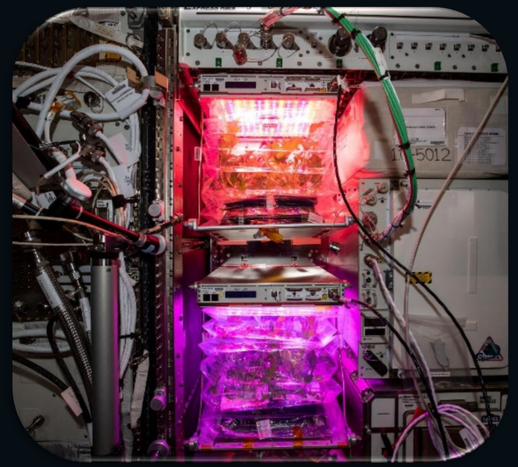
Launch Operations
KSC, Florida

# Subsystems and Components

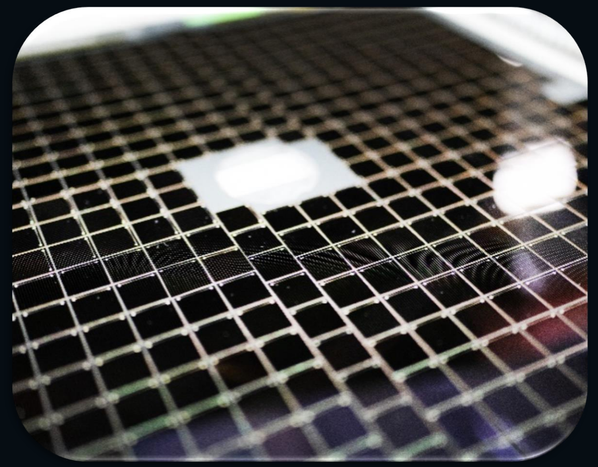
## Propulsion Systems



## Environmental Control Systems



## Power Systems & Mechanisms



## Powering Aerospace Customers

BLUE ORIGIN
GENERAL ATOMICS
JOHNS HOPKINS APPLIED PHYSICS LABORATORY
JPL
L3HARRIS™
LOCKHEED MARTIN
MAXAR
NORTHROP GRUMMAN
Raytheon Technologies
REDWIRE
TERRAN ORBITAL™
SIERRA SPACE

# Uniquely Positioned to Build the Future Space Infrastructure

Human Landing System

Lunar Gateway

Gateway Logistics Services

Human Landing System

Future Free Flying Destination

Point-to-Point Earth Space Flight

Destination Pathfinder

Orbital Fueling Services

Low-G Payload Return to Runway

Ghost Return Services

Dream Chaser Free-Flying Science Platform

Orbital Servicing Swarms

Orbital Reef

Object Capture

Lunar Infrastructure

LIFE Habitat for Deep Space Exploration

Orbital Transfer Services

LOW EARTH ORBIT (LEO)

LUNAR

DEEP SPACE

# DREAM CHASER®

## REVOLUTIONIZING SPACE TRAVEL

# Dream Chaser System Overview

**$3B** Active NASA Contract for Cargo to ISS

**15+** Missions per Spaceplane – Highly Reusable, Runway Capable

**6+** Tons Cargo Capacity

**2024** First Cargo Mission to ISS later in 2024

**2nd** Spaceplane Under Construction
Provides Numerous Mission Flexibility

## Post Insertion

*Hours*

- Solar array deploy
- Dream Chaser wing deploy
- Critical systems checkout

## Ascent

*Minutes*

- Liftoff
- Fairing jettison
- Spacecraft separation

## Pre-Launch

*Weeks*

- Unpressurized payload installation on Shooting Star
- Pressurized payload installation including late load within 24 hours of launch
- Launch vehicle fairing encapsulation with access to cargo available
- Power, command, and data available if needed

## Launch Prep

*One Day*

- Spacecraft power on
- Go/No go for launch
- Spacecraft to internal power

## Post-Landing

*Hours to Days*

- Dream Chaser recovery and power down
- Pressurized payload and time-sensitive cargo retrieval within hours of landing


## Entry, Descent, and Landing

*Minutes*

## Shooting Star and Unpressurized Payload Disposal

*Minutes*

## ISS Operations

*Days to Months (Mission dependent)*

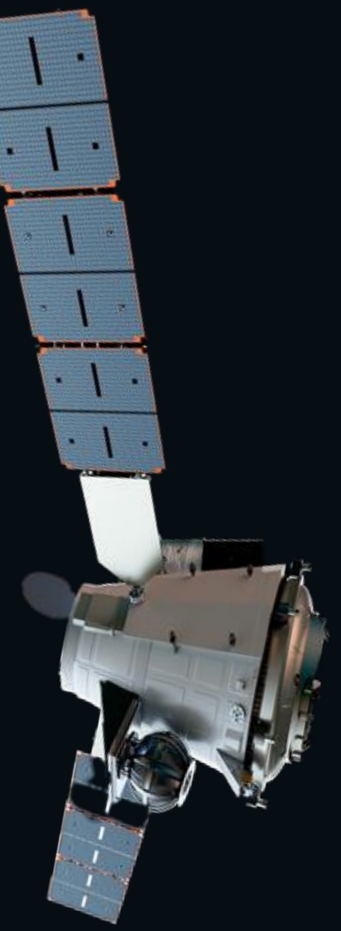
- Mission activities

## Payload Deploy and Dream Chaser Deorbit

*Hours*

- Optional Dream Chaser reboost for payload deploy
- Deorbit burn, Shooting Star separation

# Rideshare Overview



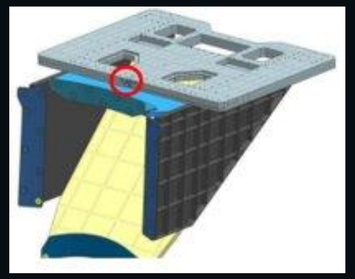
**ConOps**

- **ISS Rideshare:**
  - Deployment may happen prior to ISS (first 3 days of mission) or post-ISS (after 30-75 days berthed)
  - Altitude from 330 – 450 km, inclination 51.6°
- **For non-ISS missions:**
  - Deployment specifics are dependent on the individual mission
  - Altitude up to 450 km, inclination 28.5 - 51.6°

**Interfaces**

- Deployable mechanism to be built by payload-provider to interface with one of the mounting options
  - Optionally, deployment mechanism can be provided by Sierra Space
- Dream Chaser team will perform deployment activity (e.g. commanding, monitoring)
- Flush mounted multi-use interface plate for hosted payloads

**Flush Mount Interface Plate**

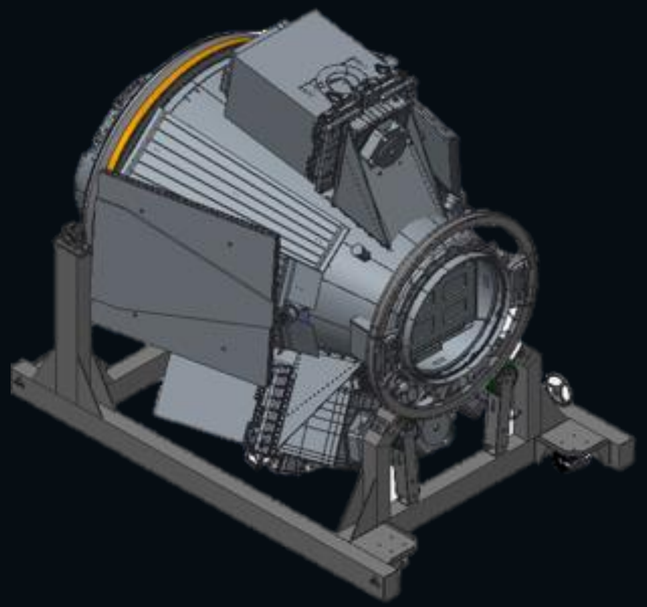


**QwkSep 15 Low-Shock Separation System**

**QwkSep 24 Low-Shock Separation System**

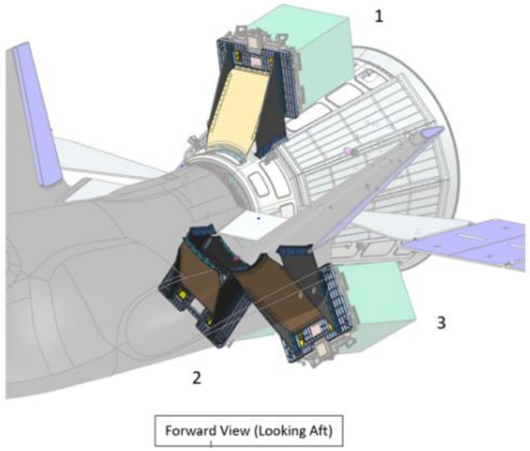
# Payload Integration ConOps

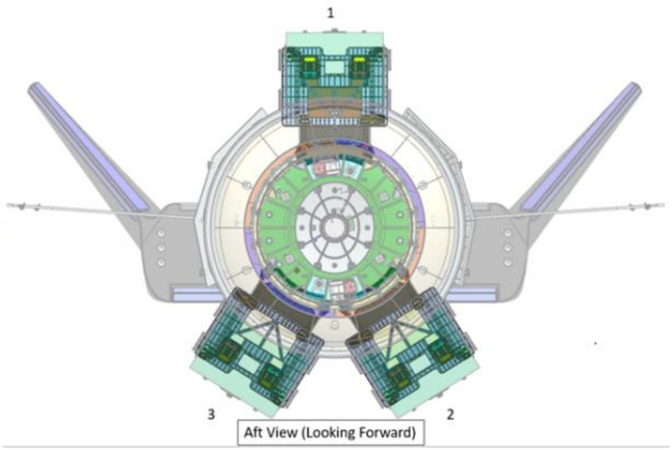
- Payloads are delivered to KSC at ~1 month before launch for installation at the Space Station Processing Facility (SSPF)
- Access for Remove Before Flight items is available within 7 days of launch, once within the fairing and stacked with the Launch Vehicle
- Once installed, the following resources are available:



| Resource | Nominal | During Transportation Between Facilities |
|---|---|---|
| Power | 300 W 120 Vdc; Provided via ground power resource to support operations as needed | None |
| Data | When powered, health and status data are available once per day; limited to 0.1 Hz post-encapsulation | None |
| Commanding | Provided if needed when the spacecraft is powered. Once at the launch pad, no commanding available. | None |
| Temperature and Humidity Control | Pre-VIF: 60 °F (15.56 °C) to 80 °F (26.67 °C)<br>VIF and after: 50 °F (10°C) to 80 °F (26.67 °C)<br>Pre-VIF: 25% to 75% relative humidity<br>VIF and after: 0% to 75% relative humidity | 50 °F (10.0 °C) to 89 °F (31.6 °C)<br>0% to 75% relative humidity |
| Air Purge | Provided if needed pre-encapsulation and then continuous 5K class post-encapsulation. At L-4 hours, switches to 5k class GN2. | Varies between 100k purge to visibly clean |

# Mounting Locations

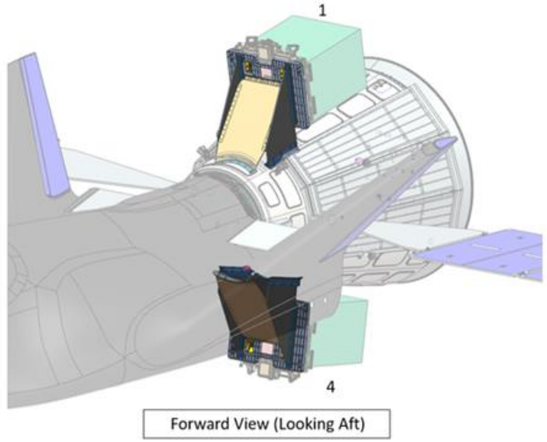


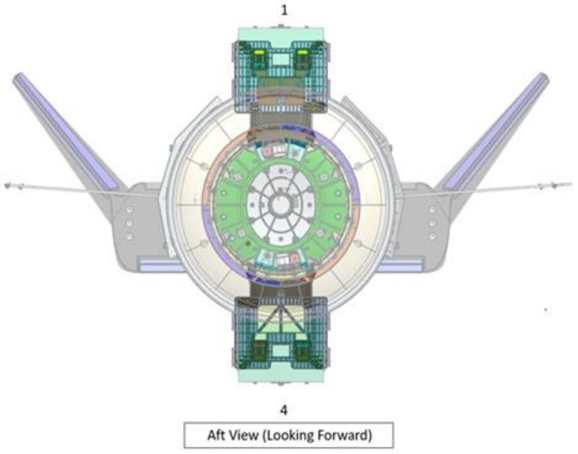




*Configuration 1*

The CM can be arranged to support several different configurations of payloads using four locations. Locations 1, 2, and 3 are shown left. Locations 1 and 4 are shown below.

A payload complement may consist of up to **three unpressurized payloads**. The maximum total unpressurized cargo complement is **3,307 lbs. (1,500 kg)**.




*Configuration 2*

# Orbit Options

| Orbit Altitude Profile | Inclination | Expected Duration |
|---|---|---|
| 333 km (LV Separation) | 51.65° | 3 to 12 hours |
| 333 to 420 km | 51.65° | Up to 2 days |
| 420 km (ISS) | 51.65° | Up to 75 days |
| 420 to 450 km* | 51.65° | Up to 1 day |
| 420 km (Deorbit) | 51.65° | Up to 1 day |

**Optional for deployments, circular and elliptical orbits available*

# Interfaces

| Interface Type | Volume Envelope (Inches) | Mass Capability (Kg) | Power (Watts) | Supported Satellite Class |
|---|---|---|---|---|
| Flush Mount | 83 x 44 x 58 x 41 (L x W x H1 x H2) | 500 | 100 W average power<br>333 W peak power for up to 2 cumulative hours | Up to ESPA Grande |
| 90° Standoff | 48 x 56 x 44 x 38 (L x W x H1 x H2) | 500 | | Up to ESPA Grande |
| QwkSep® 15 | 83 x 44 x 58 x 41 (L x W x H1 x H2) | 181 | | ESPA Class |
| QwkSep® 24 | 83 x 44 x 58 x 41 (L x W x H1 x H2) | 300 | | ESPA Grande Class |

*Note: Separation System volume envelopes include separation ring with a 2” height*

# Example Timeline

| Event | Date |
|---|---|
| Integration Kickoff | L-20 months |
| Vehicle Baseline Review (VBR) | L-18 months |
| Payload Data Delivery | L-16 months |
| Draft ICD | L-14 months |
| Mission Integration Review (MIR) | L-12 months |
| Final ICD | L-10 months |
| Unpressurized Integration Review (UIR) | L-10 months |
| Payload Data Delivery | L-8 months |
| Flight Operations Review (FOR) | L-6 months |
| Cargo Integration Review (CIR) | L-3 months |
| Payload Installation | L-60-40 days |
| Flight Readiness Review (FRR) | L-4 days |
| Launch Vehicle Readiness Review (LRR) | L-2 days |
| Post-Mission Review | End of Mission (EOM) +30 days |

**Thank you CASIS, AIAA, NASA and Sponsors**

SIERRA™ SPACE

DREAMS WORTH CHASING™

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