SPACEX

DRAGON | **DragonLab™**
Fast track to flight.
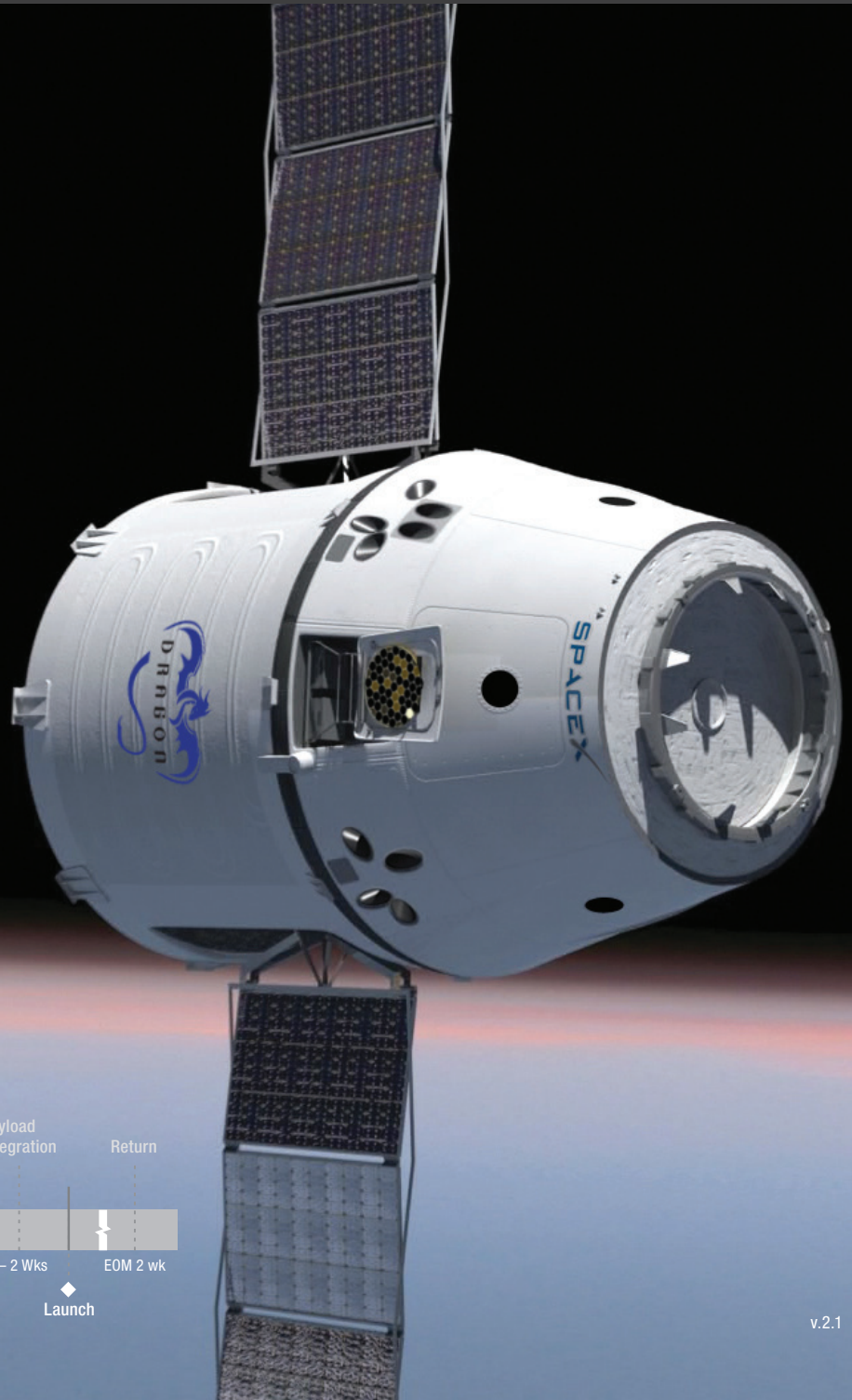
OVERALL DRAGON™ CAPABILITIES

Dragon is a free-flying, reusable spacecraft capable of hosting pressurized and unpressurized payloads. Subsystems include propulsion, power, thermal control, environmental control, avionics, communications, thermal protection, flight software, guidance, navigation & control, entry, descent & landing, and recovery.

USES

- Highly Responsive payload hosting
- Sensors/apertures up to 3.5m diameter
- Instruments and sensor testing
- Spacecraft deployment
- Space physics and relativity experiments
- Radiation effects research
- Microgravity research
- Life science and biotech studies
- Earth sciences and observations
- Materials and space environments research
- Rendezvous and inspection
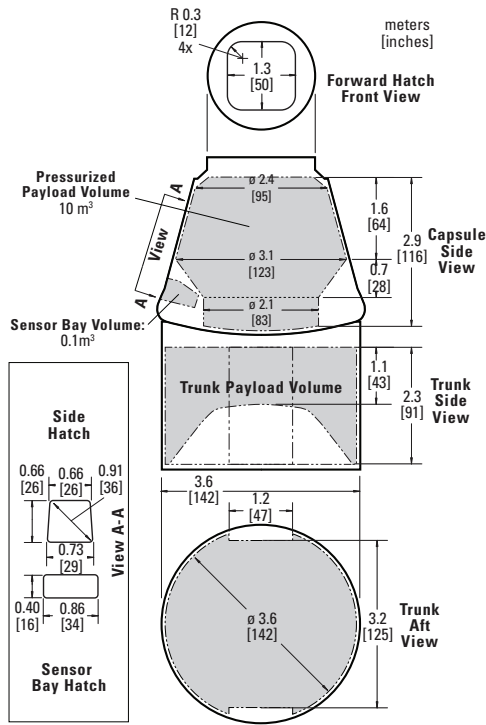- Robotic servicing

DRAGON SPACECRAFT SYSTEM

- Fully recoverable capsule
- Trunk jettisoned prior to reentry
- 6000 kg total combined up-mass capability
- Up to 3000 kg down mass
- Payload Volume:
  - 10 m^3 pressurized
  - 14 m^3 unpressurized
- Mission Duration: 1 week to 2 years
- Payload Integration timeline:
  - Nominal: L-14 days
  - Late-load: T-9 hours
- Payload Return:
  - Nominal: End-of-Mission + 14 days
  - Early Access: End-of-Mission + 6 hours

TYPICAL INTEGRATION TIMELINE

ATP	ICD	Fit Check	Payload Integration	Return
L: − 5 Mth	− 3 Mth	L-2 Mths − 2 Wks	◆ Launch	EOM 2 wk

v.2.1

Forward Hatch Front View

R 0.3
[12]
4x

1.3
[50]

meters
[inches]

Forward Hatch Front View

Pressurized Payload Volume 10 m³

ø 2.4 [95]

1.6 [64]

2.9 [116] **Capsule Side View**

ø 3.1 [123]

0.7 [28]

ø 2.1 [83]

Sensor Bay Volume: 0.1m³

Trunk Payload Volume

1.1 [43]

2.3 [91] **Trunk Side View**

3.6 [142]

1.2 [47]

ø 3.6 [142]

3.2 [125] **Trunk Aft View**

Side Hatch

0.66 [26]   0.66 [26]   0.91 [36]

0.73 [29]

0.40 [16]   0.86 [34]

Sensor Bay Hatch

View A-A

OPTIONAL TRUNK EXTENSION

Trunk Payload Volume

3.1 [122]

4.3 [170]

Trunk Side View

3.6 [142]

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For more information, please email us at **DragonLab@spacex.com.**

spacex.com

PAYLOAD SERVICES

MECHANICAL

- Specific mounting locations and environments are mission-unique
- **Pressure Vessel Interior** (pressurized, recoverable)
  - 10 m³ payload volume
  - Lab temp, pressure and RH
  - Typically Middeck Locker accommodations
  - Other mounting arrangements available
- **Sensor Bay** (unpressurized, recoverable)
  - Approx 0.1 m³ (4cu ft) volume
  - Hatch opens after orbit insertion; closes prior to reentry
  - Electrical pass-throughs into pressure vessel
- **Trunk** (unpressurized, non-recoverable)
  - 14 m³ payload volume
  - Optional trunk extension for a total of up to 4.3 m length, payload volume 34 m³

POWER

- 28 VDC & 120 VDC
- Up to 1500-2000 W average; up to 4000 W peak

THERMAL & ENVIRONMENTAL

(ref. NASA SSP 57000)

- Internal Temp: 10~46 °C
- Internal Humidity: 25~75% RH
- Internal Pressure: 13.9~14.9 psia
- Cleanliness: Visibly Clean–Sensitive (SN–C–0005)
- Pressurized: convective or cold-plate
- Unpressurized: cold-plates if required
- Payload random vibration environment:
  - Pressurized: 2.4 grms (> 100 lbm)
  - Unpressurized: 2.9 grms

TELEMETRY & COMMAND

- Payload RS-422 serial I/O, 1553, and Ethernet interfaces (all locations)
- IP addressable payload standard service
- Command uplink: 300 kbps
- Telemetry/data downlink: 300 Mbps (higher rates available)

SPACECRAFT SUBSYSTEMS

STRUCTURES AND MECHANISMS

- All Structures and Mechanisms are designed to be capable of supporting crew transportation, consistent with all relevant NASA standards and Factors of Safety
- 3 or 4 windows, 30 cm diameter
- Sensor Bay Hatch: deployable/retractable hatch mechanism which opens on orbit and closes prior to reentry
- Capsule/Trunk fluid & electrical interconnects

PROPULSION

- 12-18 Draco thrusters
- NTO/MMH hypergolic propellants
- Up to 2 fault tolerant

AVIONICS

- Dual/Quad fault tolerant Flight Computers
- Multiple generic Remote Input/Output (RIO) modules with customized complements of Personality Modules

FLIGHT SOFTWARE

- VxWorks platform
- Resides in both Flight Computers and Remote Input/Output modules
- Extensive flight heritage

COMMUNICATIONS

- Fault tolerant S-band telemetry & video transmitters
- Onboard compression & command encryption/ decryption
- Links via TDRSS and ground stations

POWER

- 2 articulated solar arrays
- Unregulated 28V main bus
- 4 redundant Lithium-Polymer batteries

GUIDANCE, NAVIGATION & CONTROL (GNC)

- Inertial Measurement Units, GPS & Star Trackers
- **Specifications:**
  - Attitude Determination: < 0.004° w.r.t. inertial frame
  - Attitude Control: < 0.012°/axis during station-keep
  - Attitude Rate: <0.02°/sec/axis during station-keep

ENVIRONMENTAL CONTROL (PRESSURE VESSEL)

- Active control of pressure & pressurization rates
- Humidity monitoring
- Air circulation and temp control

THERMAL CONTROL SYSTEM (TCS)

- Two fully redundant and independent Pumped Fluid Loops
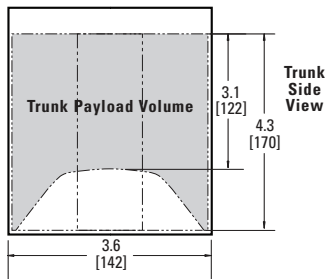- Radiator mounted to trunk structure

THERMAL PROTECTION (TPS)

- PICA-X primary heatshield
- Large design margins

ENTRY, DESCENT & LANDING (EDL) & RECOVERY

- Water splashdown under parachutes (off CA coast)
- Redundant Drogue and Main parachutes
- GPS/Iridium locator beacons
- Ship recovery