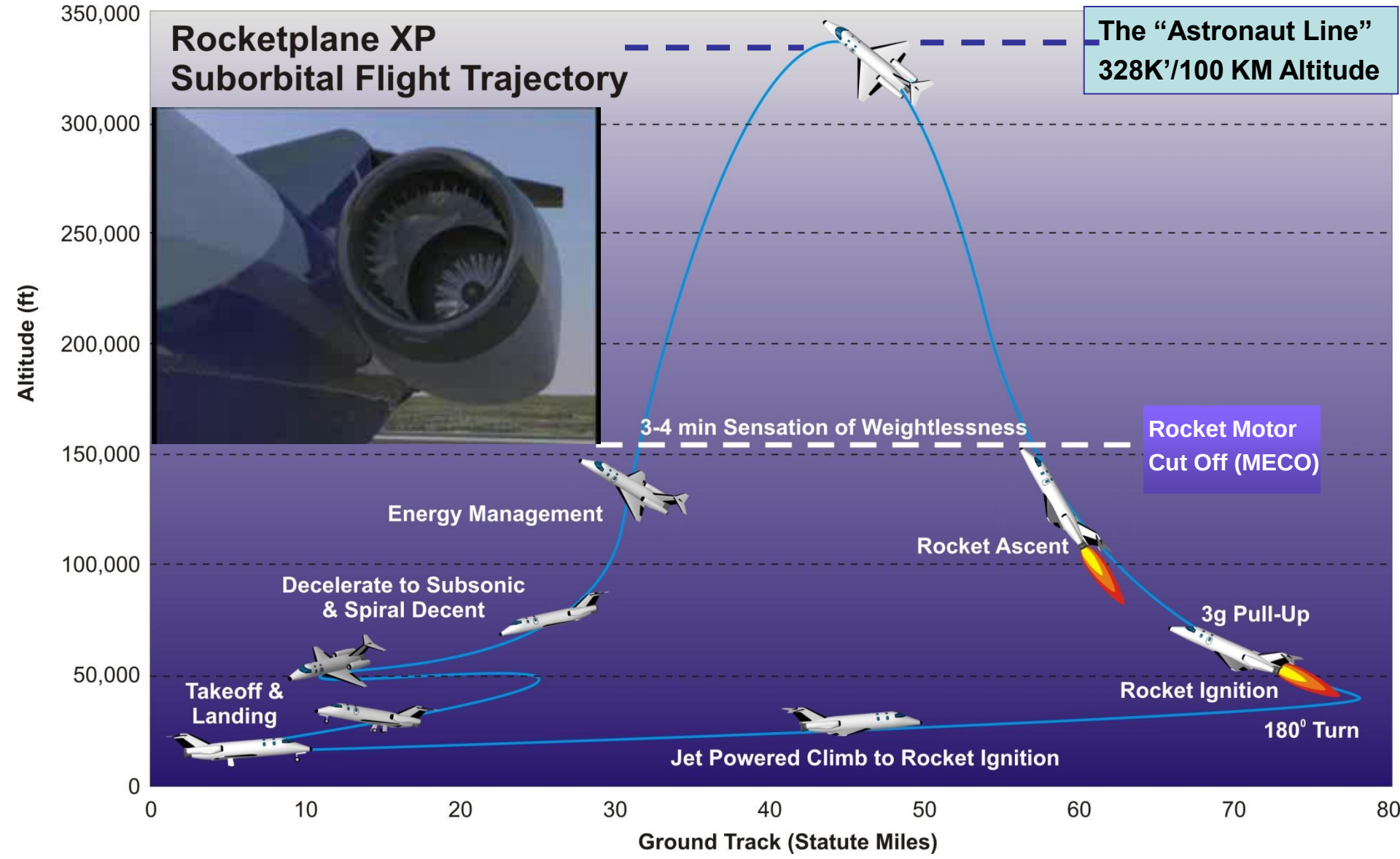
EMERGING COMMERCIAL SUBORBITAL CAPABILITIES WORKSHOP

NASA Goddard Space Flight Center

September 7, 2011

The Rocketplane Flight Profile



Oklahoma Spaceport

ROCKETPLANE GLOBAL

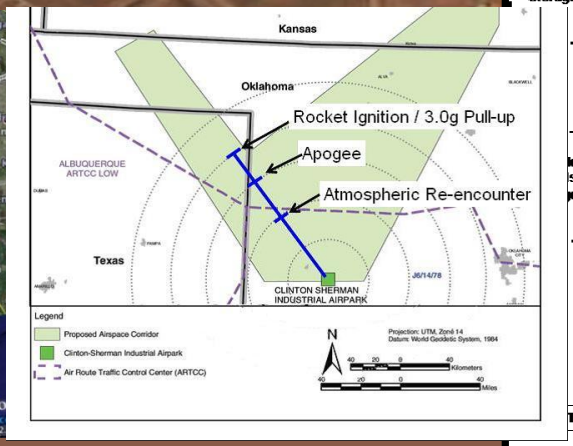
- *2,700 acres of inland property,168 square-mile Spaceport Territory.*
- *13,500 foot runway.*
- *On-site medical facility with pharmacy and a crash and rescue unit.*
- *300 VFR flying days per year.*

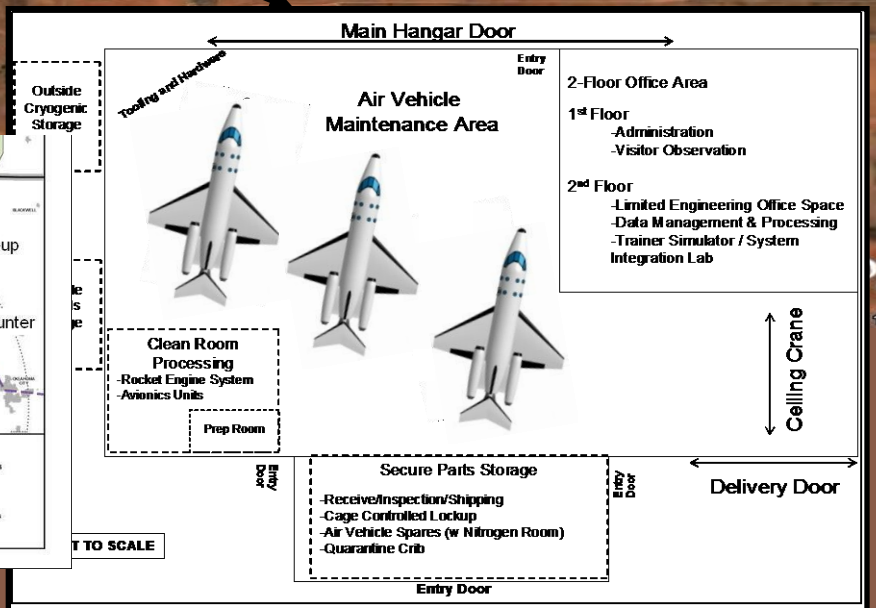
OSIDA Mission Control

Rocketplane Hangar

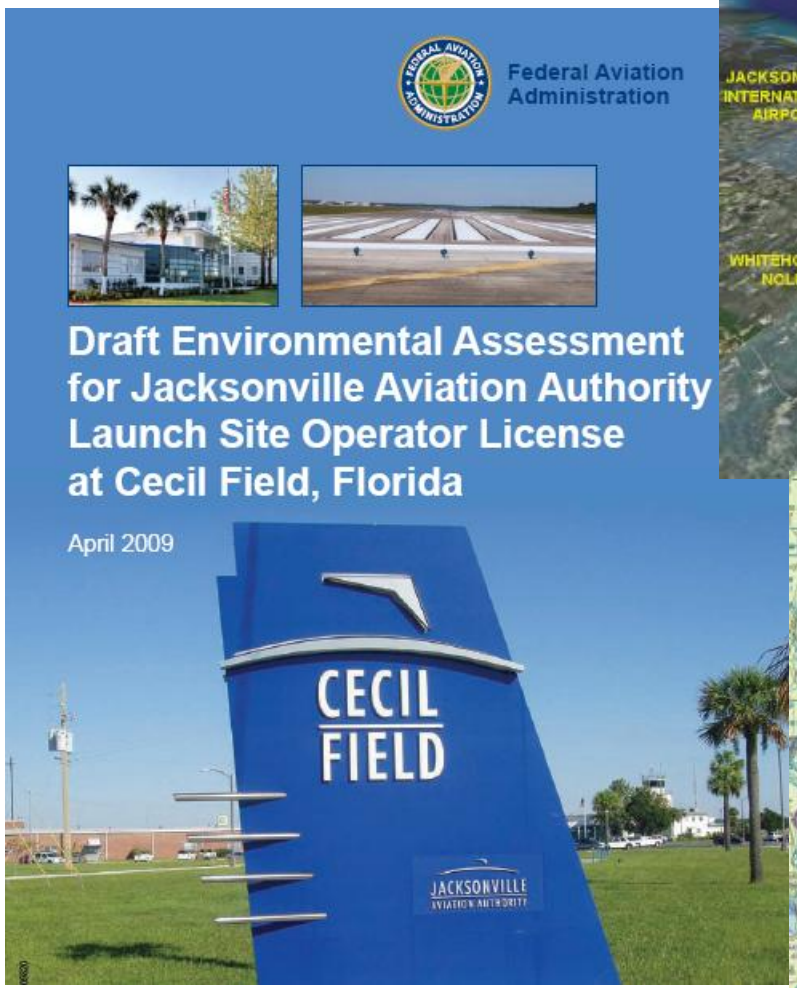
Telemetry Antenna Tower

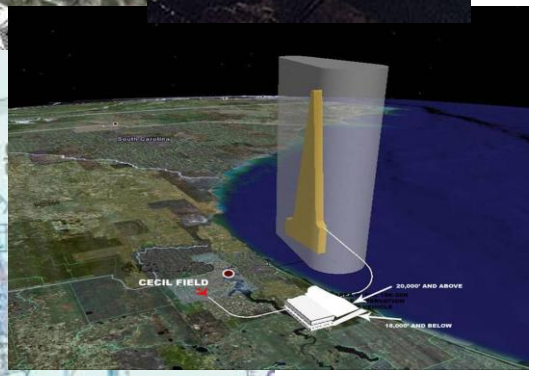
Planned Rocket Engine Test Site



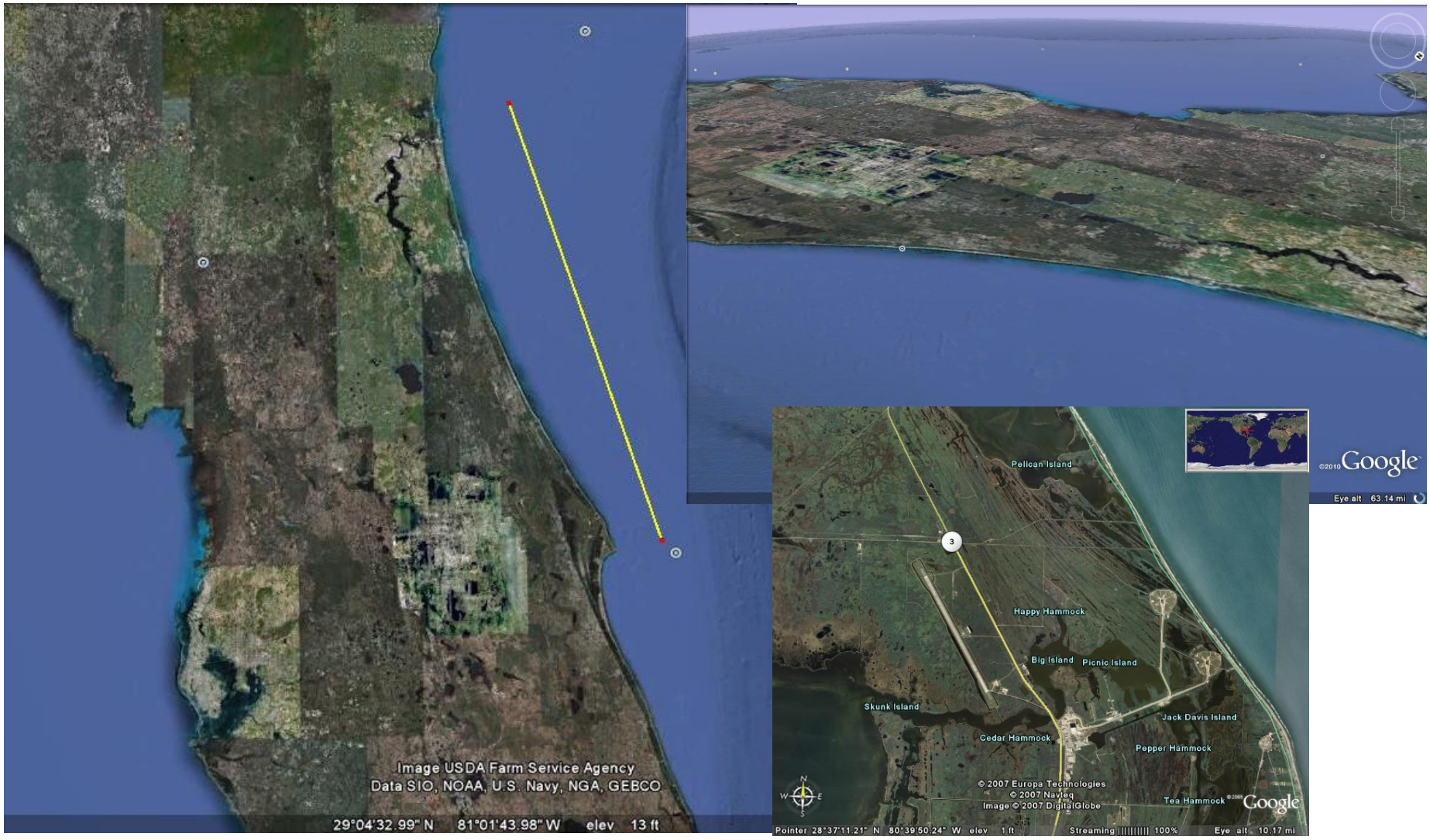


Spaceport Florida-JAX FAA/AST License

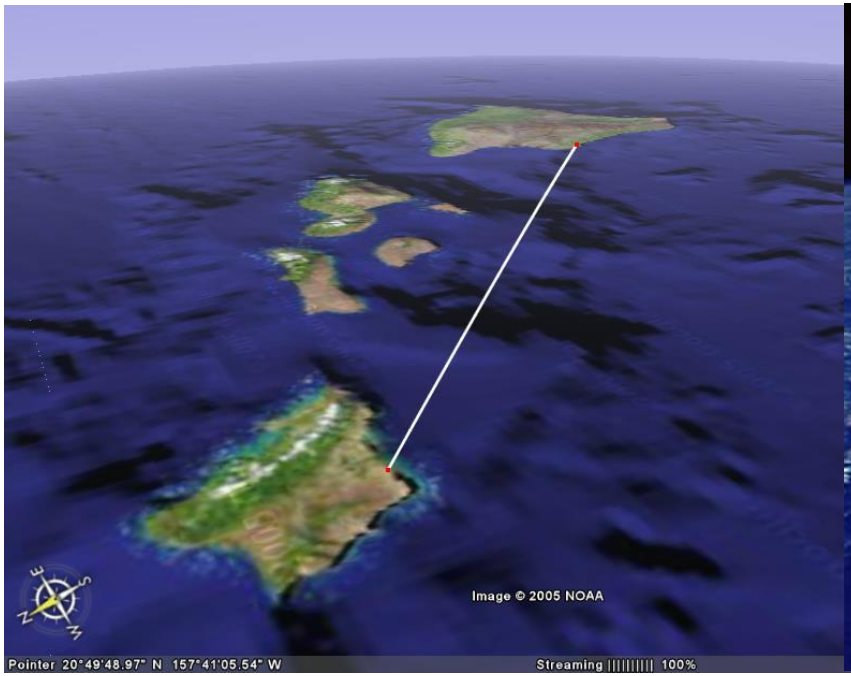




Florida P2P Testbed Corridor



SPACEPORT HAWAII



- A Rocketplane XP Suborbital flight operations base with related space-themed tourist attraction developments
- Prototype business model for global spaceport projects at major tourist destinations around the world
- Use of existing airport infrastructure & resort lodging

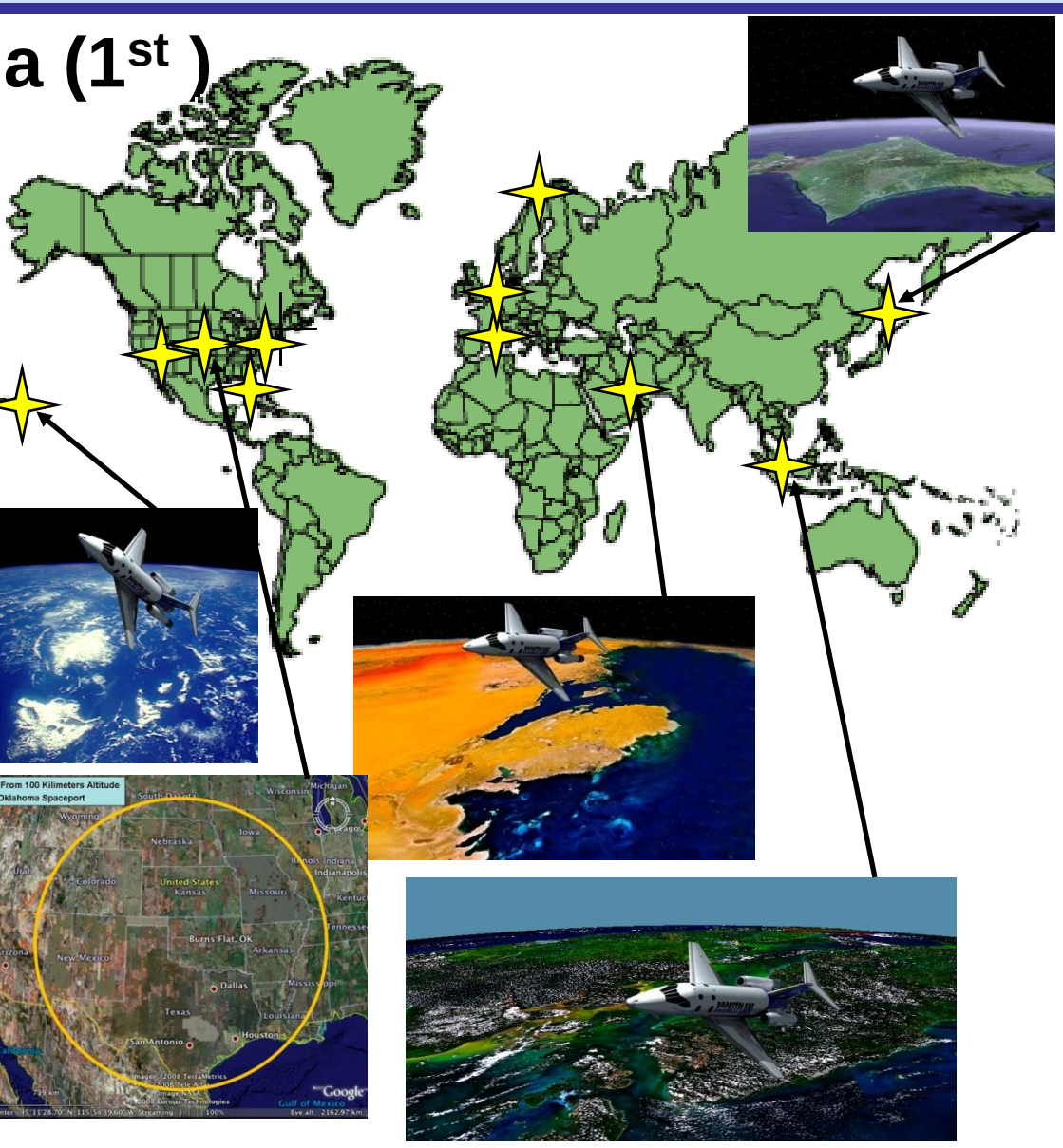
Spaceport Hawaii Flight Corridor

- First proposed FAA licensed point-to-point space flight route
- Establishes Hawaii as a global hub for future Mach 10 trans-Pacific flights

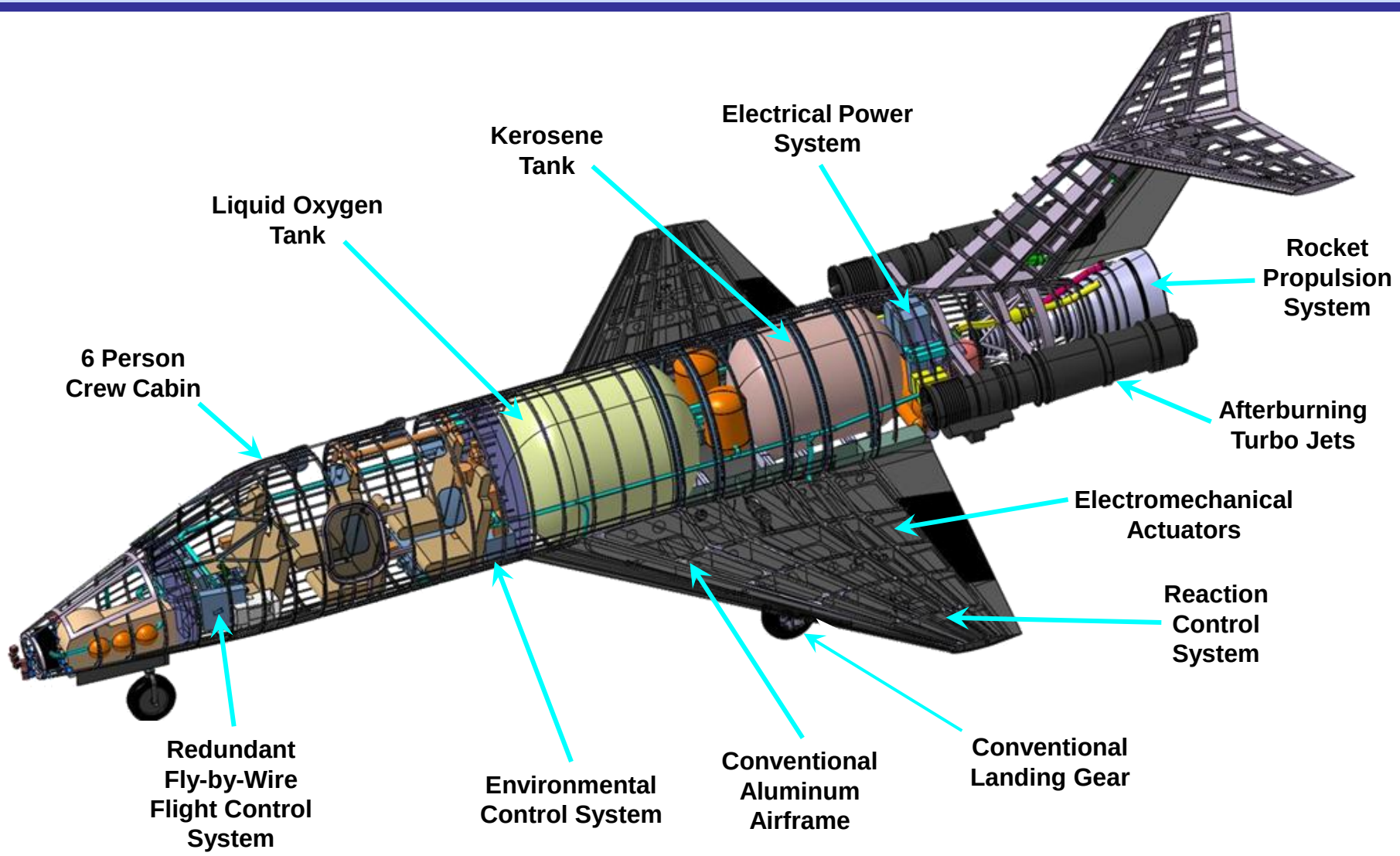
A Developing Global Spaceport Network

ROCKETPLANE GLOBAL

- **Spaceport Oklahoma (1st)**
  - Licensed Spaceport
  - Flight Test and Manufacturing
  - Continued 2-3 ship operations
  - Lack of Amenities
  - Lack of Population Base
- **2nd RG Spaceport**
  - Spaceport Florida
- **3rd RG Spaceport**
  - Spaceport Hawaii
- **Future Potentials**
  - Spaceport Spain
  - EU Spaceport Lelystad NL
  - Hokkaido Spaceport
  - Swedish Spaceport
  - Virginia Spaceport
  - Singapore Spaceport
  - UAE Spaceport

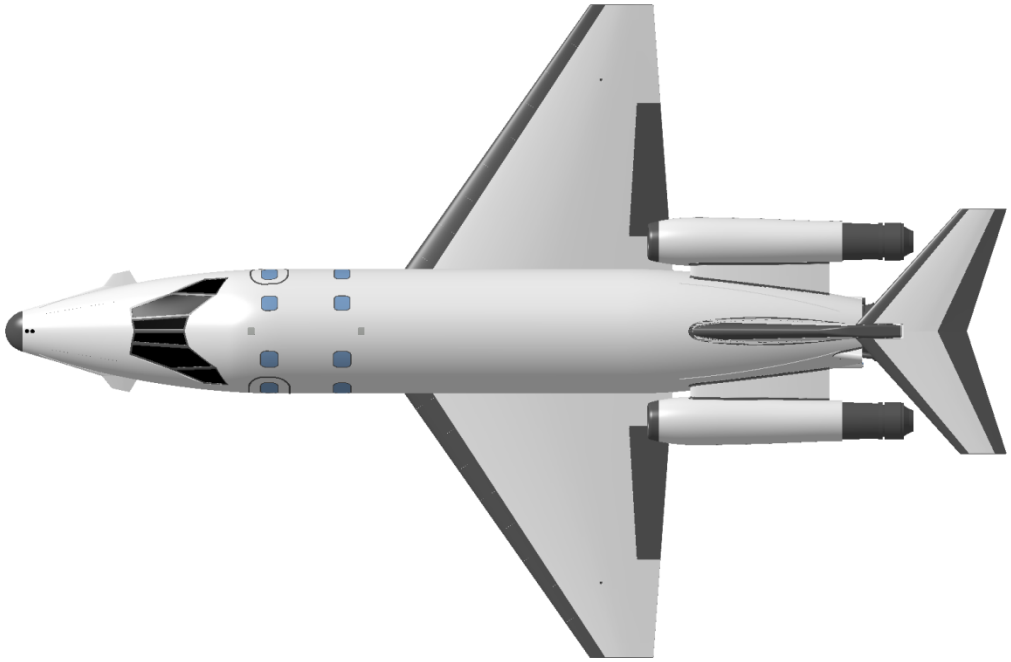


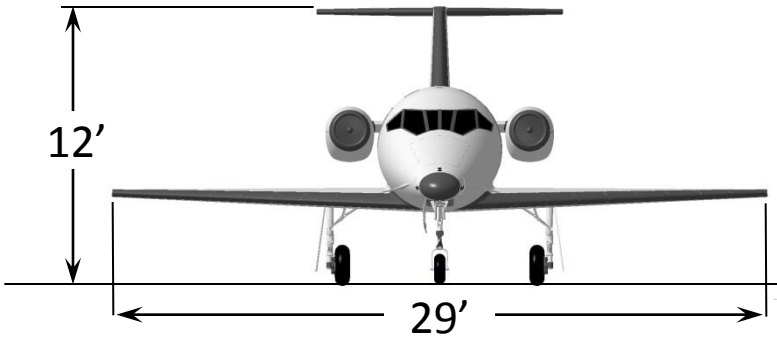
XP Systems Overview

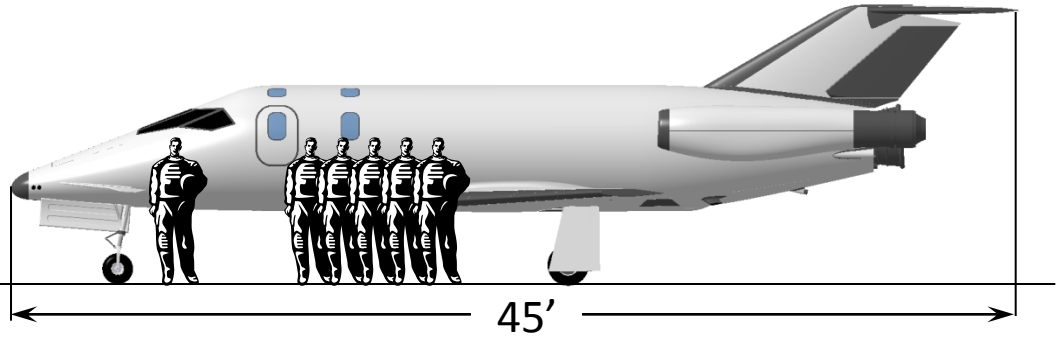


XP Specifications

Cockpit Crew	1
Seating Capacity	5
Seat Pitch	36 in (0.91 m)
Takeoff Field Length	9200 ft (2800 m)
Landing Field Length	4300 ft (1300 m)
Max. Altitude	340,000 ft (104 km)
Mission Time (μG Time)	45 min (3+ min)
Jet Engine Type	GE J-85 w/ AB
Rocket Engine Type	Polaris AR-36

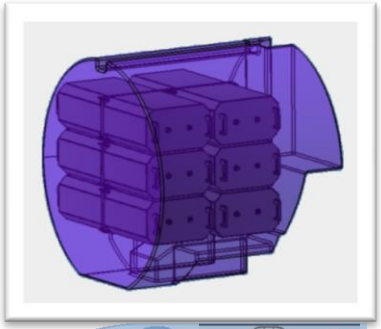


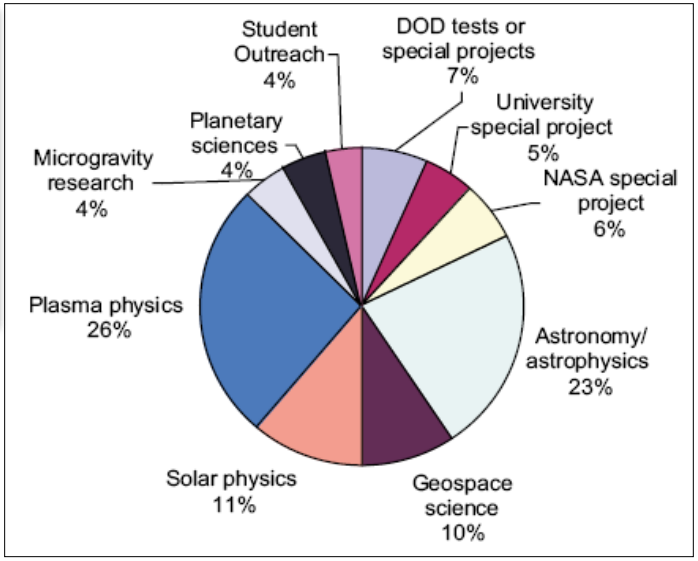


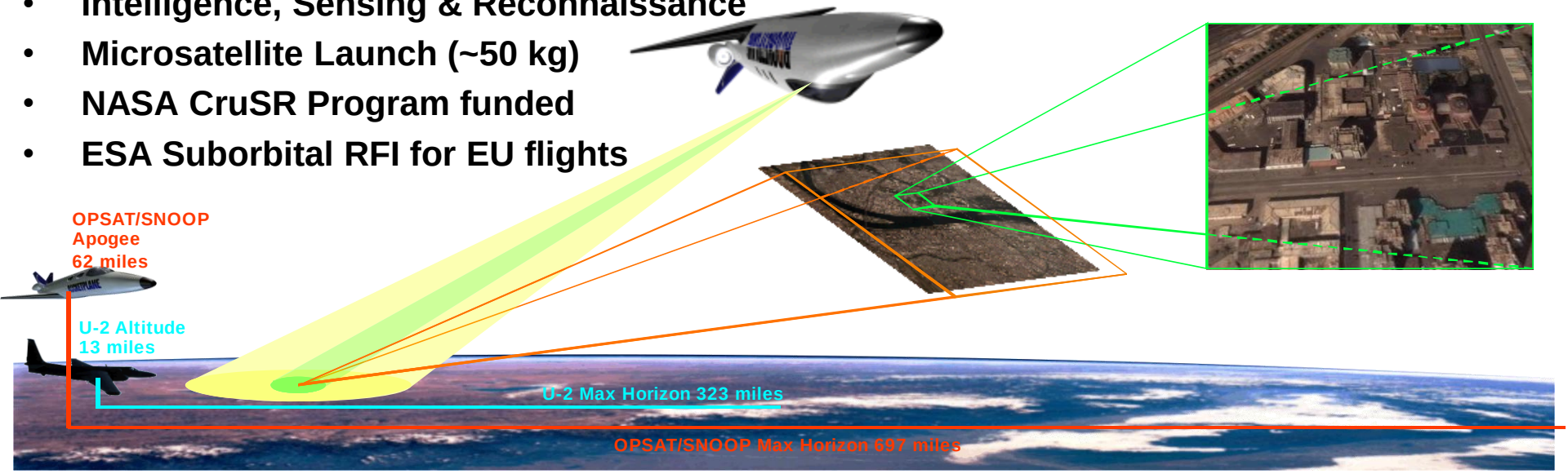


Other Suborbital Markets Growing

- **Suborbital Microgravity Research**
  - high-altitude atmospheric science
  - ISS payload testing & qualification
  - astronomical research
  - plasma physics
  - solar physics
  - geo-space science
- **Remote Sensing**
- **Component Research**
- **Intelligence, Sensing & Reconnaissance**
- **Microsatellite Launch (~50 kg)**
- **NASA CruSR Program funded**
- **ESA Suborbital RFI for EU flights**







On-board Payload Specialist

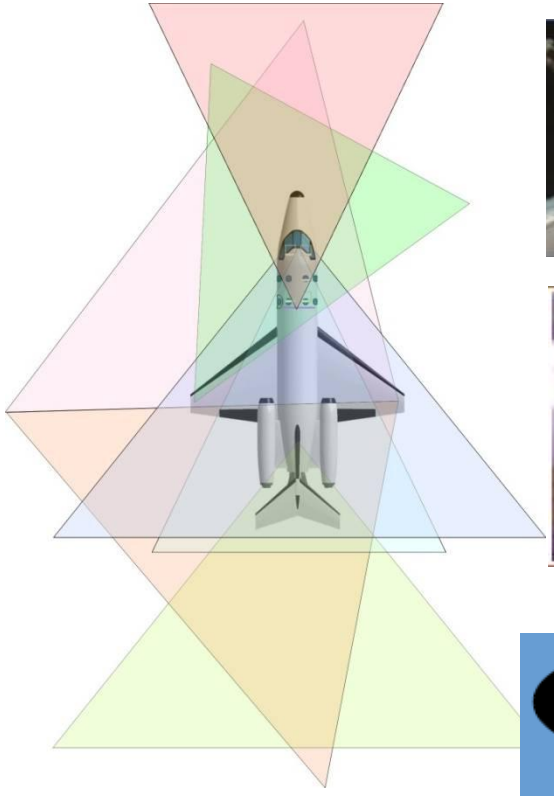
- **Payloads can be autonomous, tele-operated, or directly operated from front right seat “Science Officer” station**
- **Ethernet / PC based payload data & control interface**

On-board HD Camera System

- **XP Camera Uses**
  - **Flight Test (Visual and IR (Heat) Capable)**
  - **Hi-Res Science and Reconnaissance Missions**
  - **Passenger "SPACE VISION"**

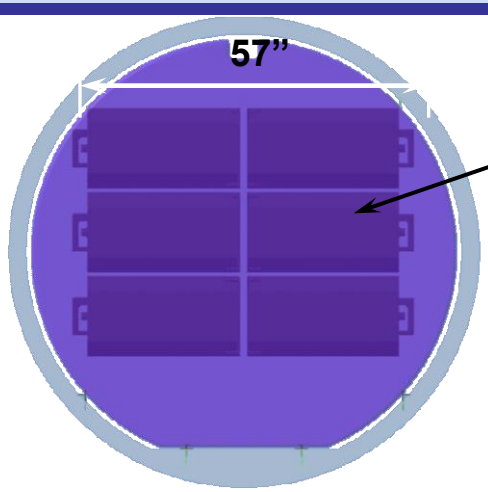
Cameras

- **XP Has 8-Camera System**
  - **Part of Data Acquisition System (DAS)**
  - **5+ Lenses Available for Tailored Views, Even "Fish-eye"**
  - **Full Resolution Video Compressed and Stored on Board**
  - **Variable Frame Rate & Resolution Transmitted to Ground**
  - **Full Resolution Streamed to Passenger Monitors - "SPACE VISION"**

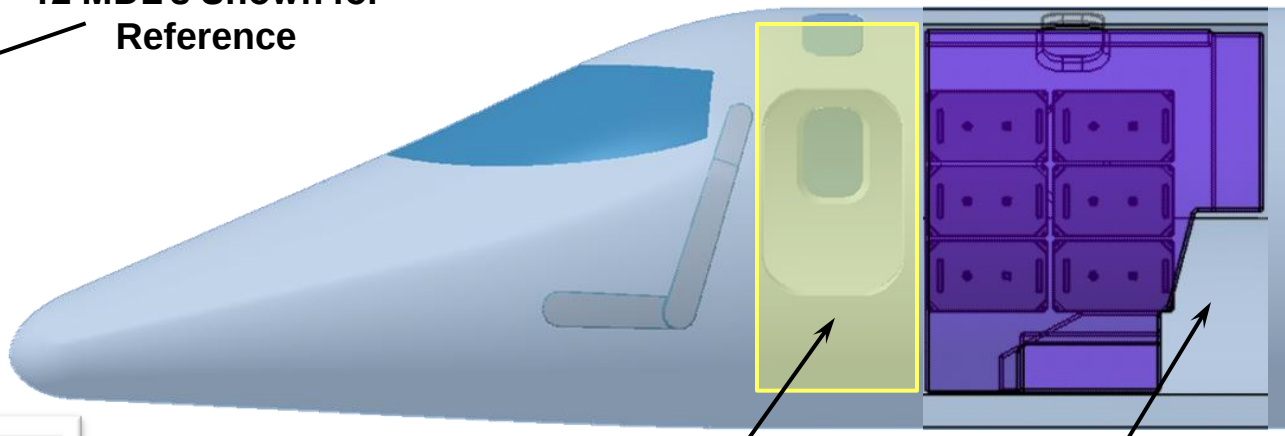


- **Flight Proven Hardware Flown on Shuttle, Multiple NASA and DoD Missions**

XP Science Payload Capability

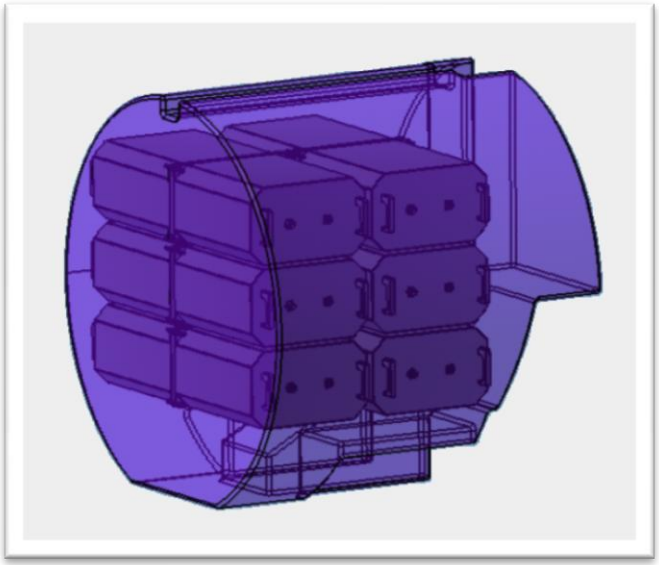


12 MDL’s Shown for Reference



Ingress/Egress Stayout Zone

Volume Reserved for Avionics & ECLSS Systems



Payload Envelope Volume: ~60 ft^3

Maximum Payload Weight: 1,015 lbs.

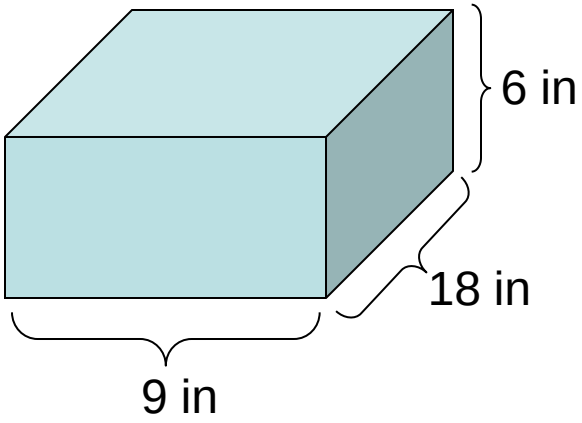
- MDL packaging shown for reference. Actual packaging will vary.
- Additional payload volume available in co-pilot seat location (approximately the size of a double MDL)
- Maximum payload weight includes rack weight

NASA KSC FastRack Program

- GOAL **– bring suborbital microgravity research activity to KSC**
- **Modular System**
  - 1 FastRack = 1 passenger seat
- **Prototype Completed**
- **Flight Testing August 2009**
  - Zero G Parabolic
  - High G Structural Qualification
- **Available for all suborbital vehicle operators to use**
- **Space Life Sciences Lab payload integration support facilities available**

The Basic Unit: The GIZMO

(**G**eneral **I**nvestigation **Z**ero-gravity **M**ission **O**bject)



Dimensions: 6 in. high x 9 in. wide x 18 in. deep

Max mass: ~ 9 lbs

Max power available: tbd

Max data available: tbd

Late access: minutes for XP

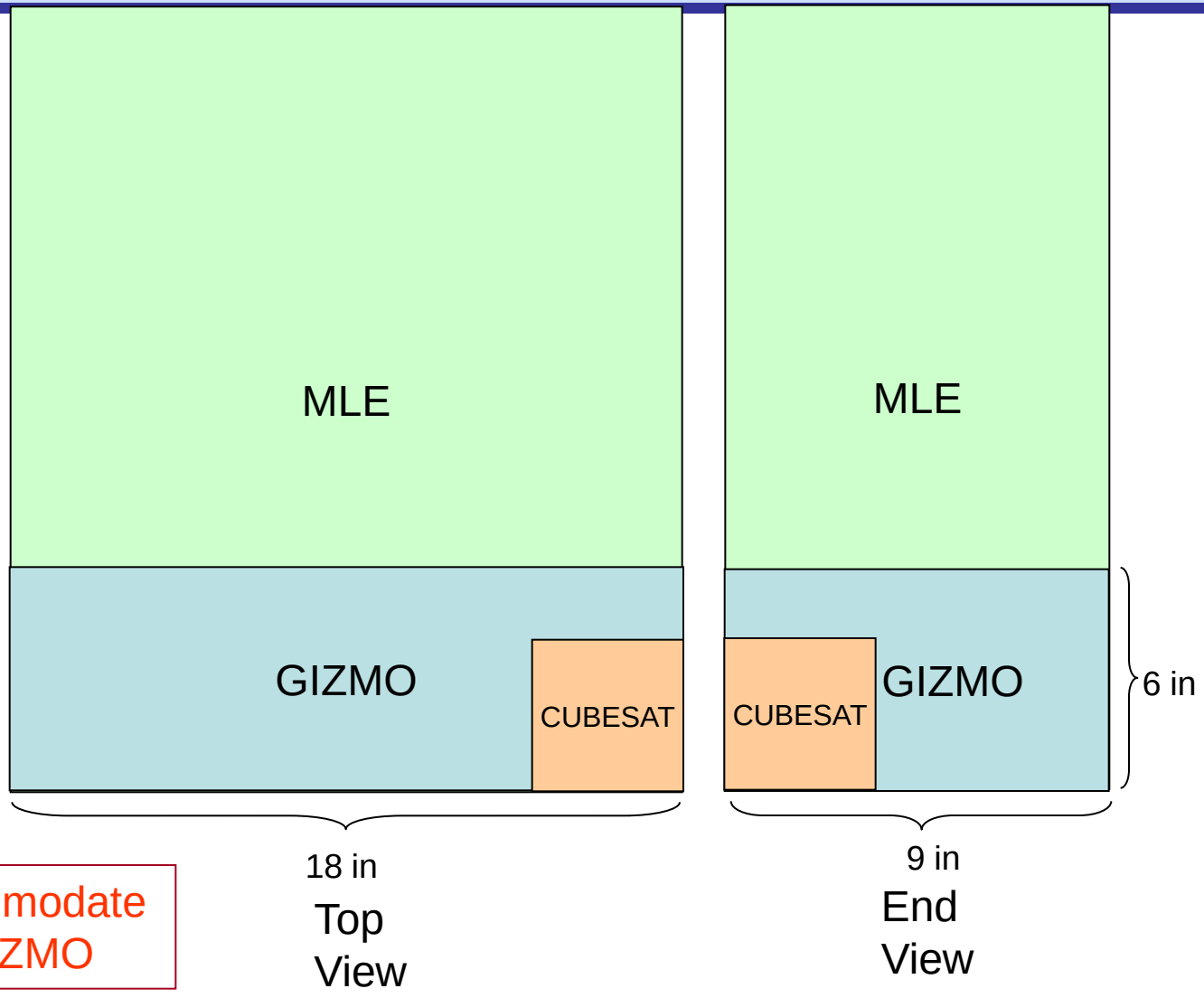
Early access: minutes for XP

XP Cabin Environment: 70 Deg F, 8 to 10 psi

How Big is a GIZMO?

~ one quarter of a middeck locker

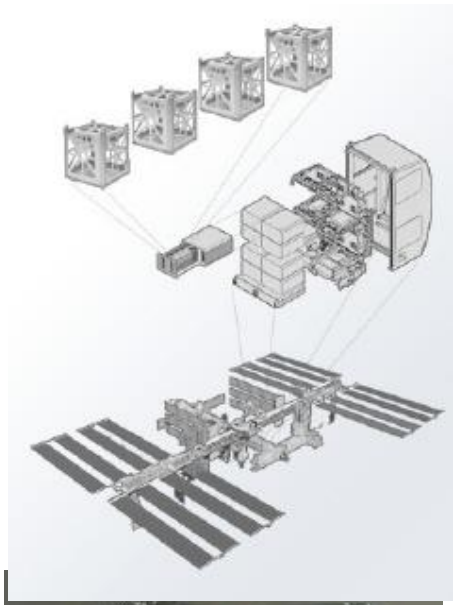
~ 15 CubeSats

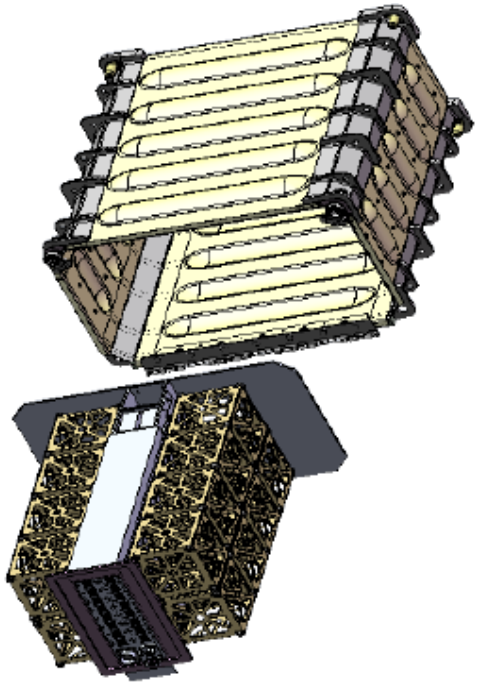


Carrier can accommodate multiples of the GIZMO

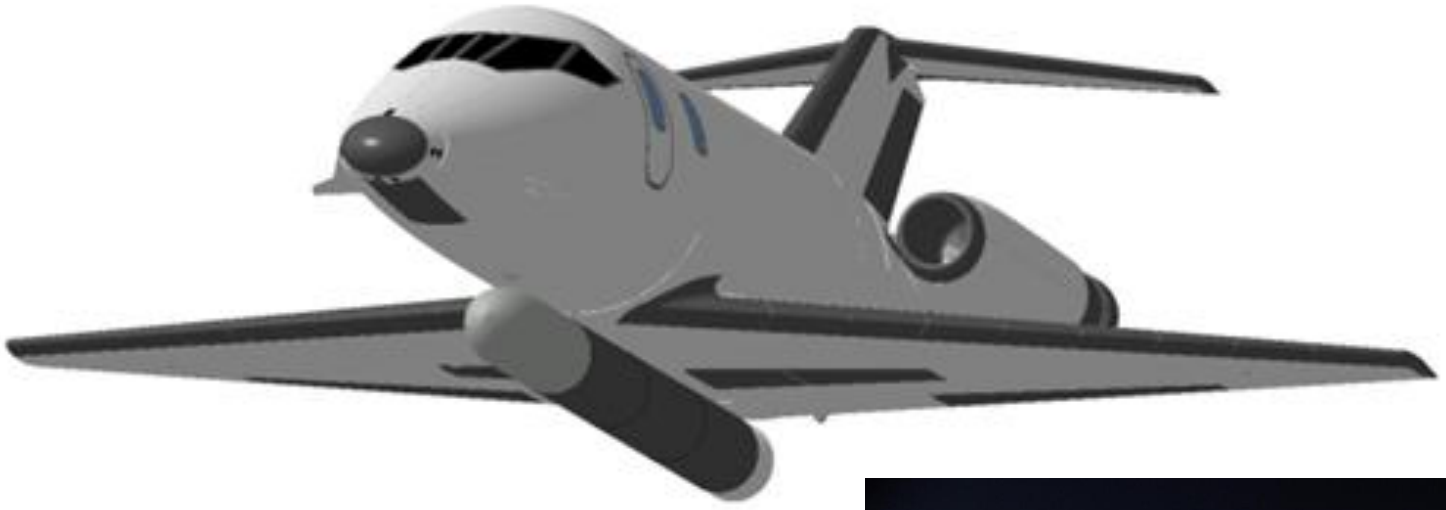
The NanoRacks System

- **ISS Express Rack locker subdivided into 16 standard 10 cm^3 / 1 kg CubeSat modules**
- **Up to 8 modules can be combined into a single research payload**
- **USB Plug & Play standard interface**
- **Provides “upward mobility” from 3 minute suborbital to long duration orbital microgravity access on ISS**





The XP External Payload Station



- **Up to 2,000 lbs external payload**
- **Common payload interface mounting rail**
- **Expendable upper stage rocket for small satellite launch services**
- **External sensor pod for remote sensing missions**

Rocketplane Strategic Vision

Rocketplane envisions a family of follow-on vehicles

- **Larger vehicles with missions similar to XP likely next step for commercial operations.**
- **Point-To-Point commercial operations next step after sub-orbital tourism. Early P2P routes (150-300 miles) provide operational experience**