2nd IAA Symposium on

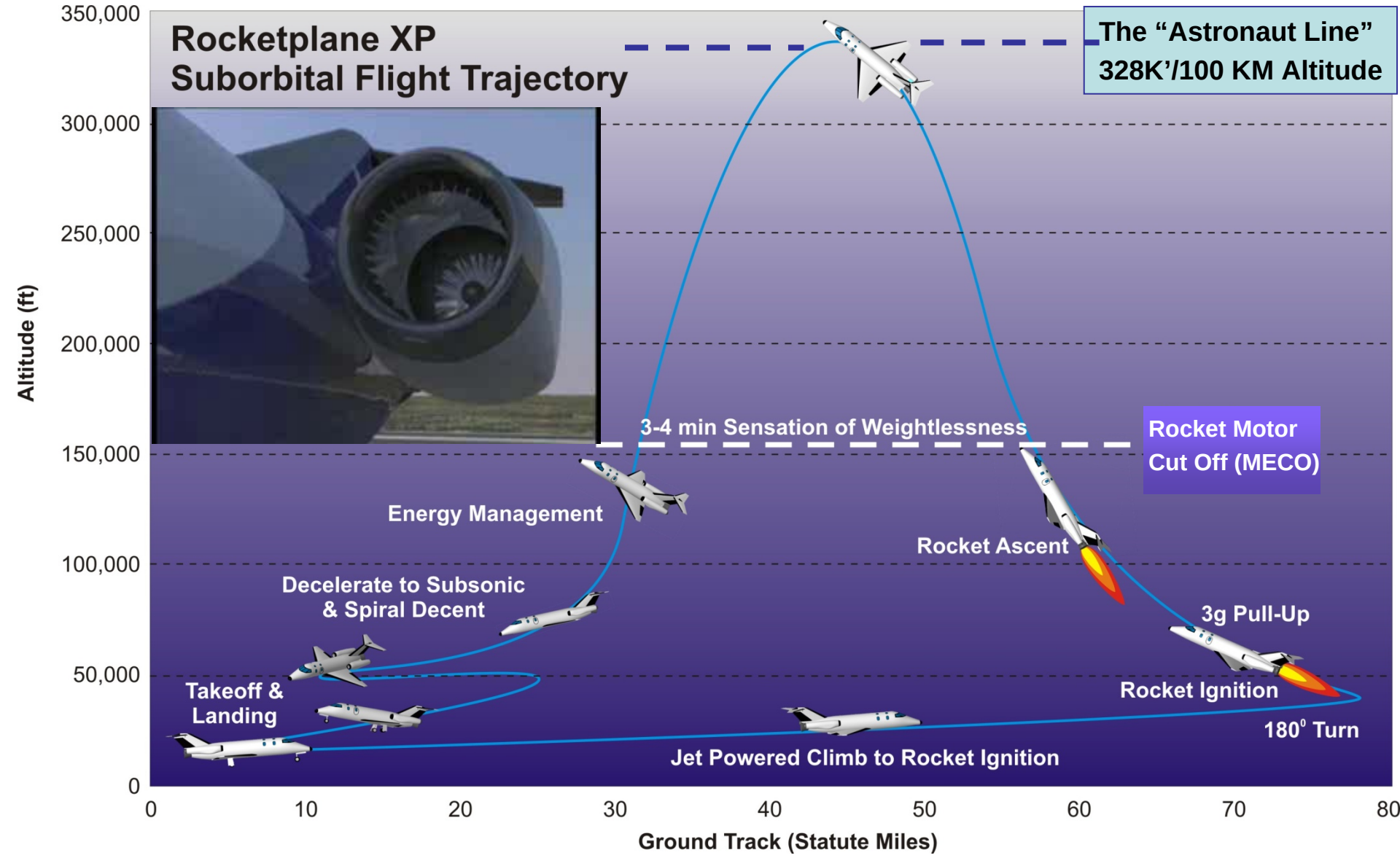
Private Human Access to Space

Spaceplanes, Spaceports and the Transition to a Global Aerospace Transportation System

June 1, 2011

–So . . . where are the Space Clippers?

The Rocketplane Flight Profile



Oklahoma Spaceport

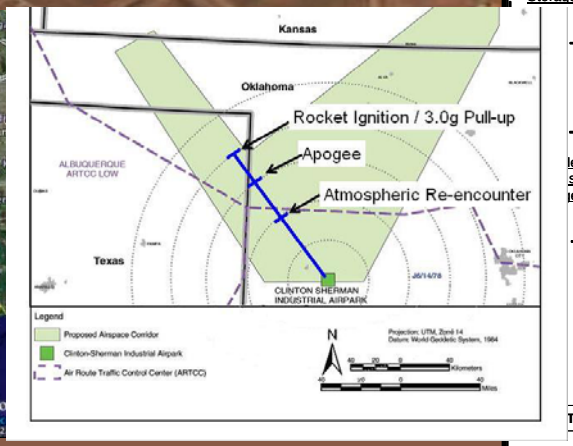
- *2,700 acres of inland property,168 square-mile Spaceport Territory.*
- *13,500 foot runway.*
- *On-site medical facility with pharmacy and a crash and rescue unit.*
- *300 VFR flying days per year.*

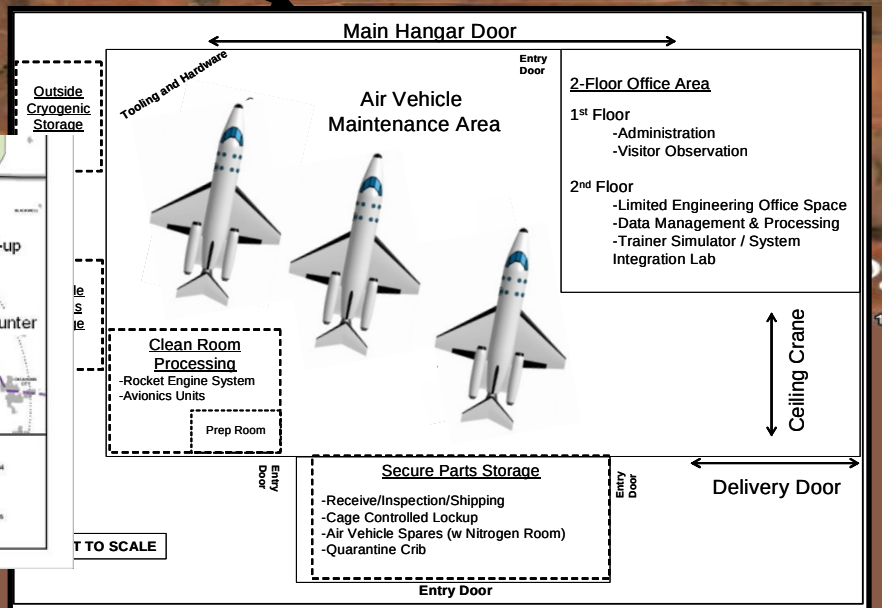
OSIDA
Mission Control

Rocketplane
Hangar

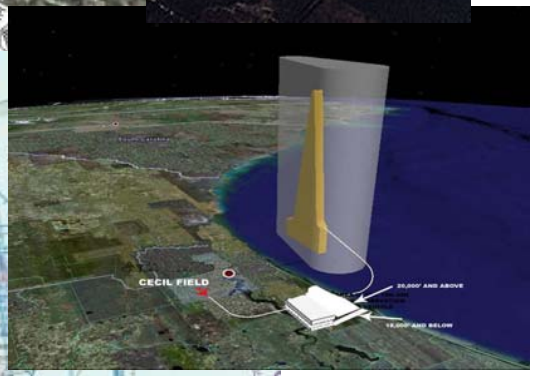
Telemetry
Antenna
Tower

Planned Rocket
Engine Test Site

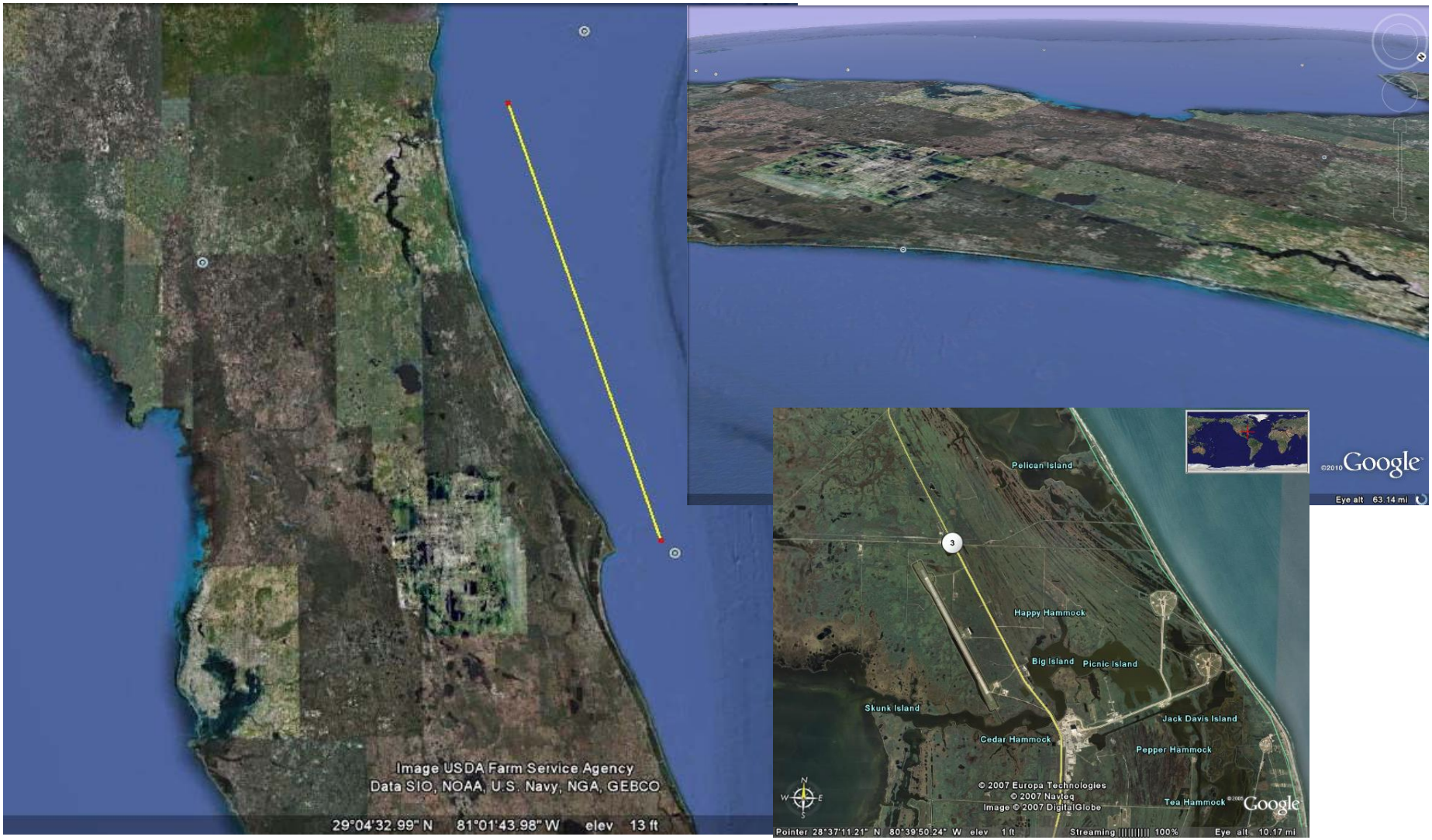




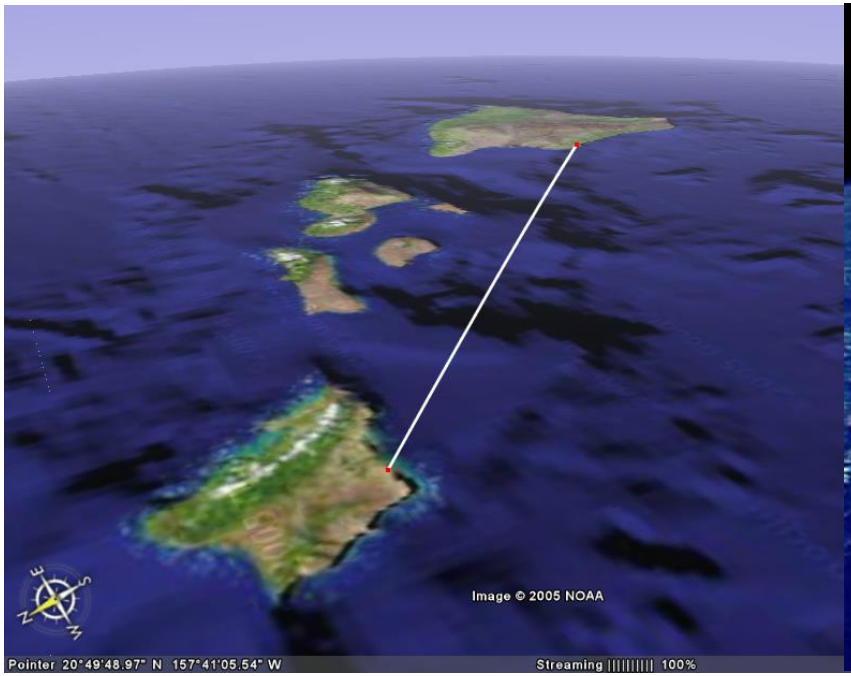
Spaceport Florida-JAX FAA/AST License



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

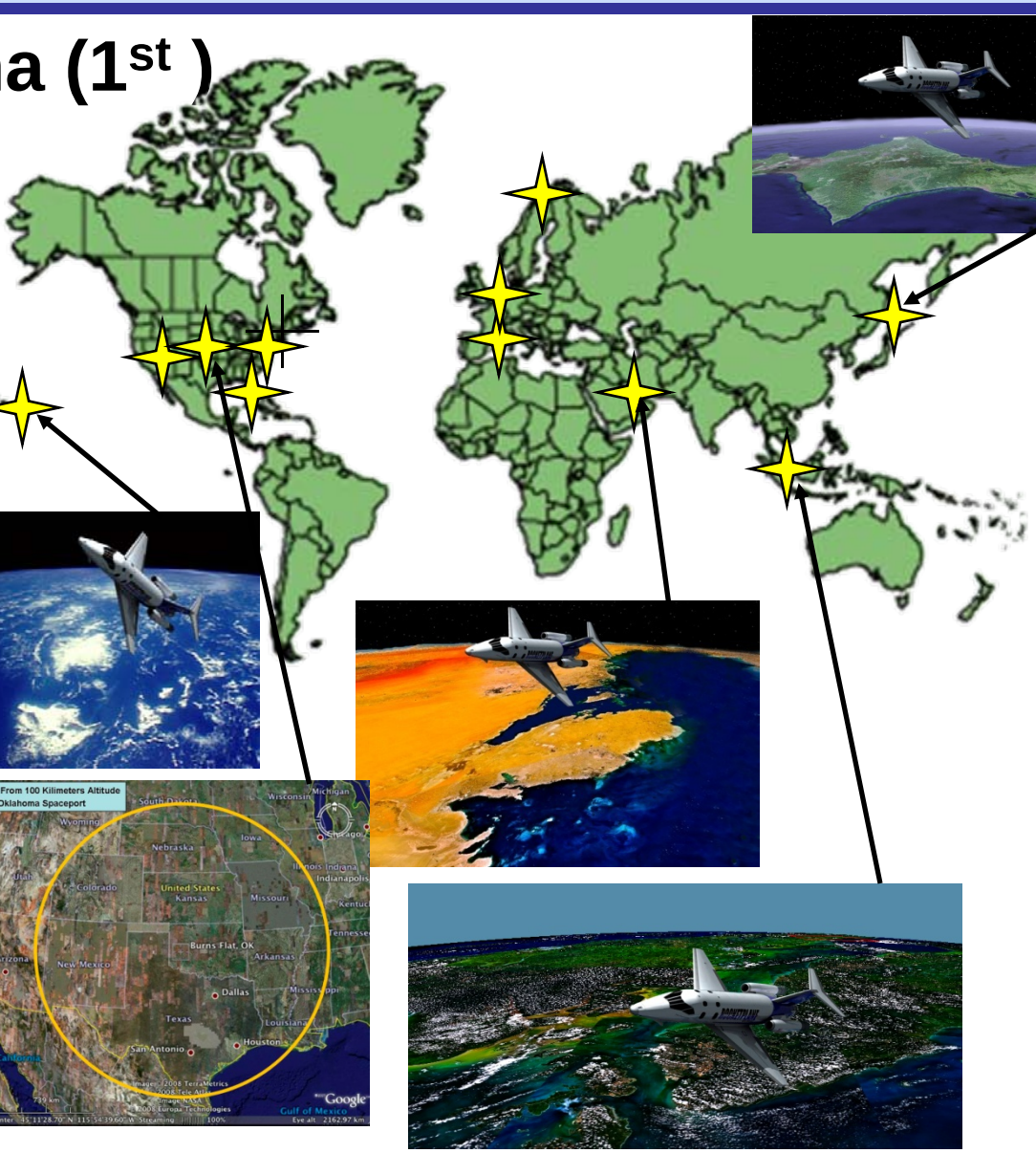
Spaceport Hawaii Flight Corridor

- 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

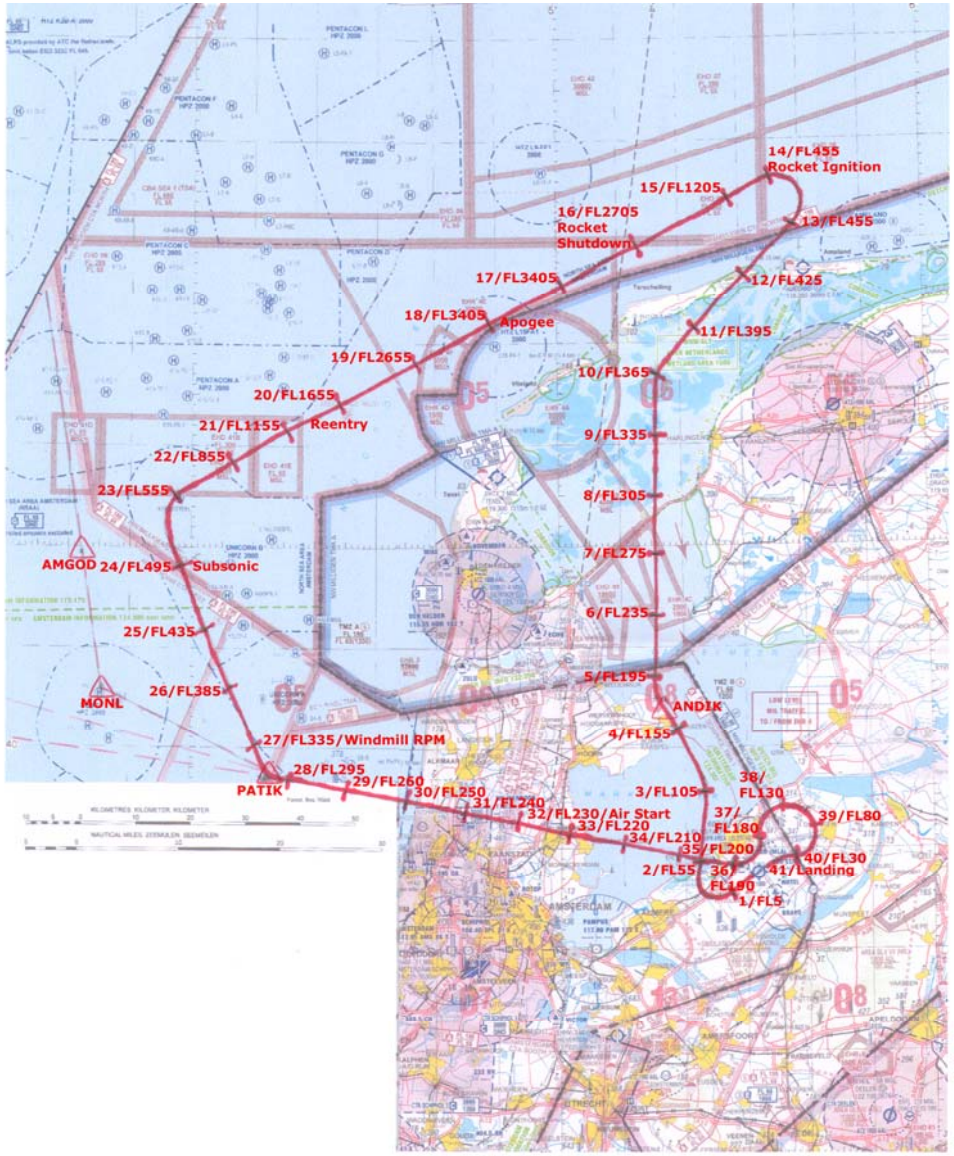
ROCKETPLANE GLOBAL

- **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



EU Spaceport Lelystad/NL

- Dual use GA airport + Spaceport
- Becomes a major regional tourist attraction
- Leverages billions in existing tourism & culture investments
- Co-located with NL National Aerospace Museum
- Use of North Sea military restricted areas for spaceflight

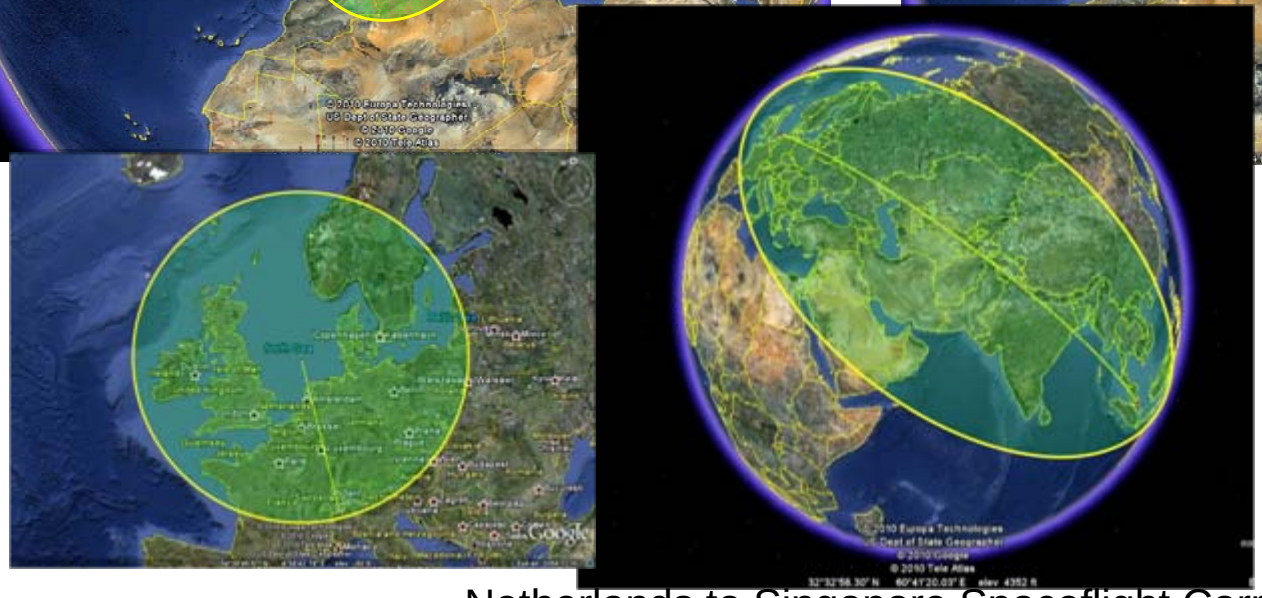


First EU Suborbital International Passenger and Cargo Hub

ROCKETPLANE GLOBAL

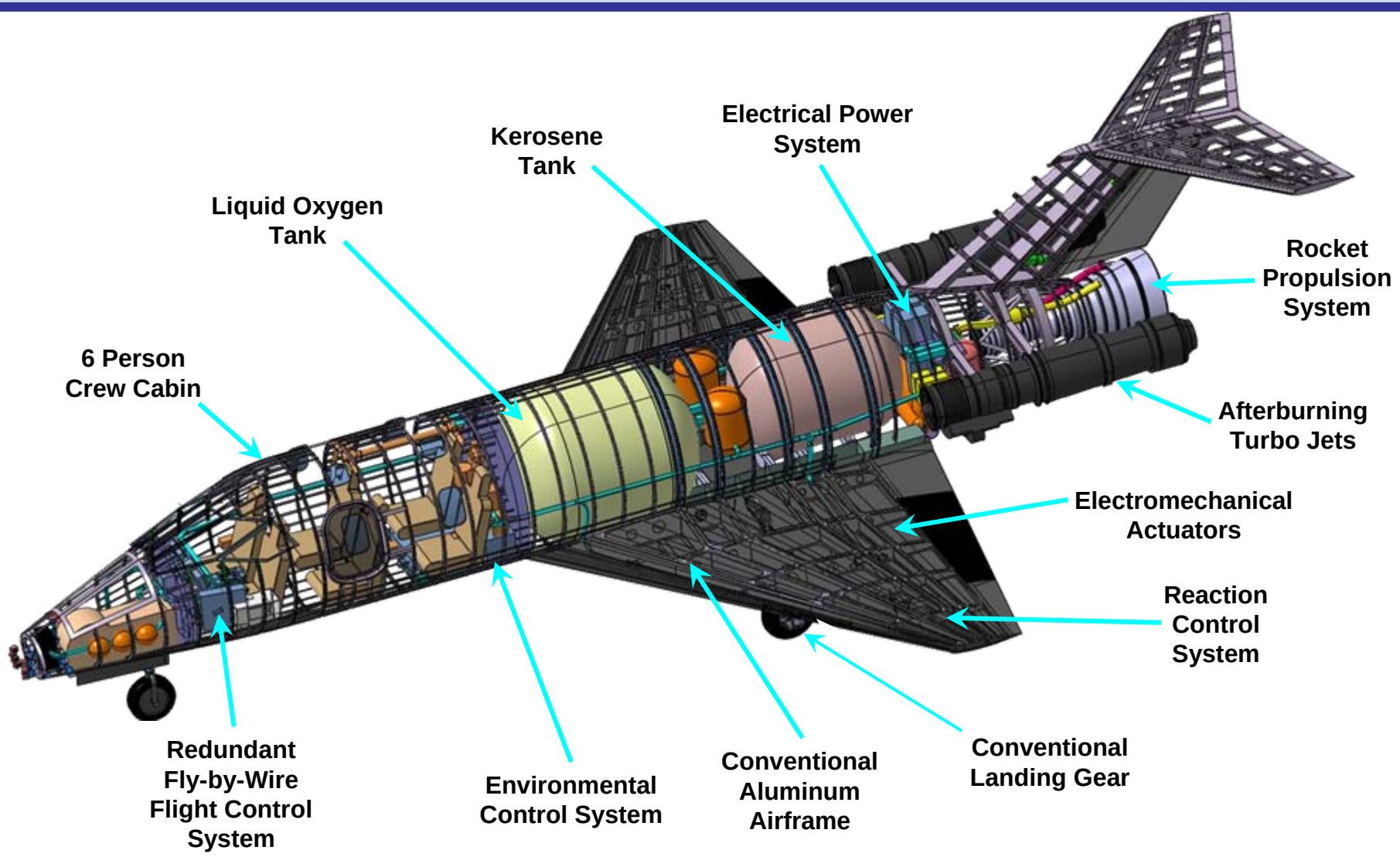
Netherlands to Spain Spaceflight Corridor

Netherlands to Doha Spaceflight Corridor



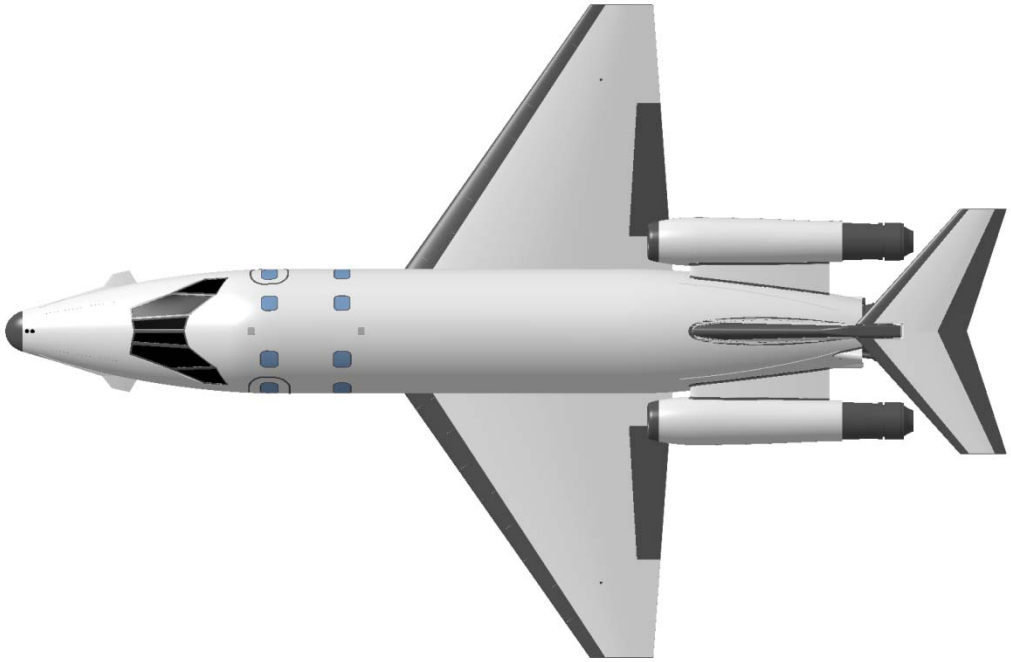
Netherlands to Singapore Spaceflight Corridor

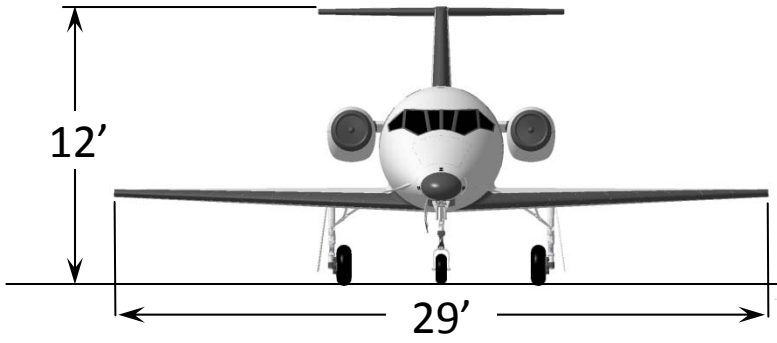
XP Systems Overview

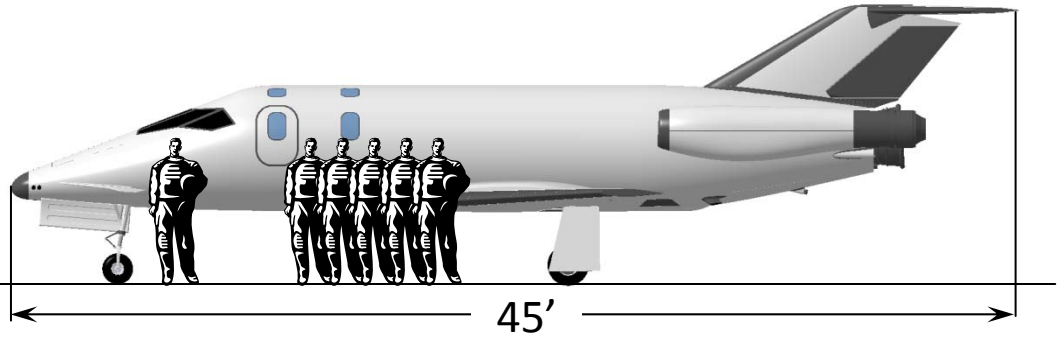


XP Specifications

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





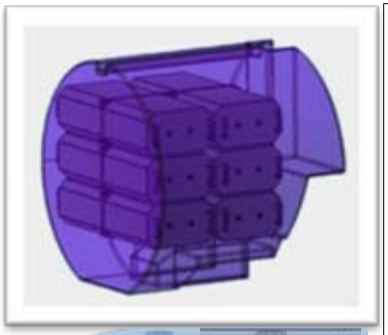


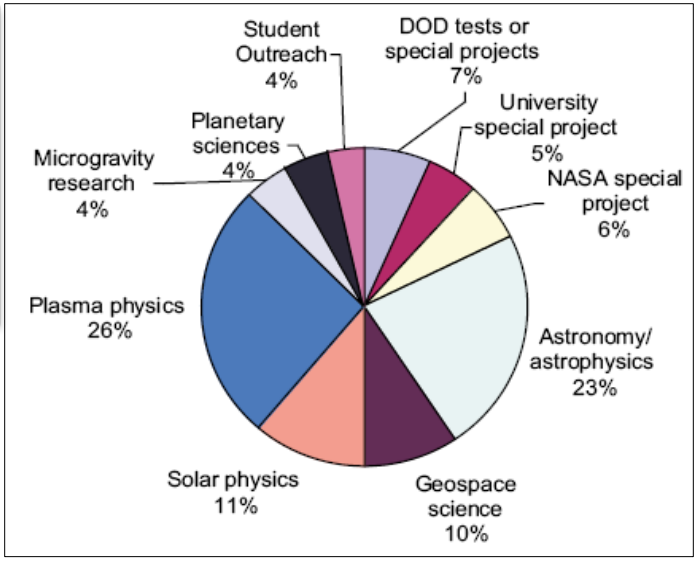
Flight Station & Crew Cabin

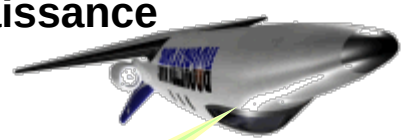
Other Suborbital Markets Growing

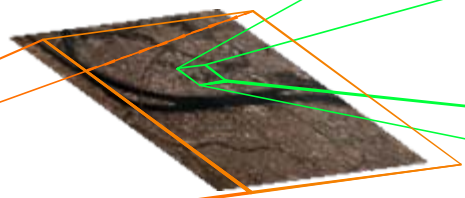
ROCKETPLANE GLOBAL

- **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 out now**

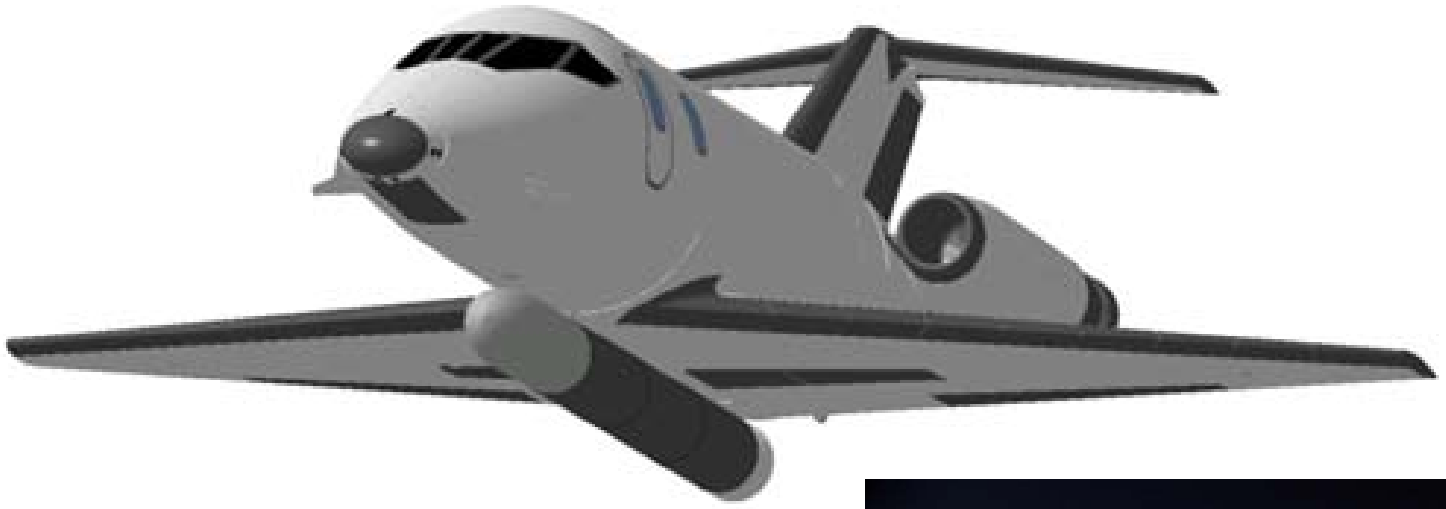








The XP External Payload Station

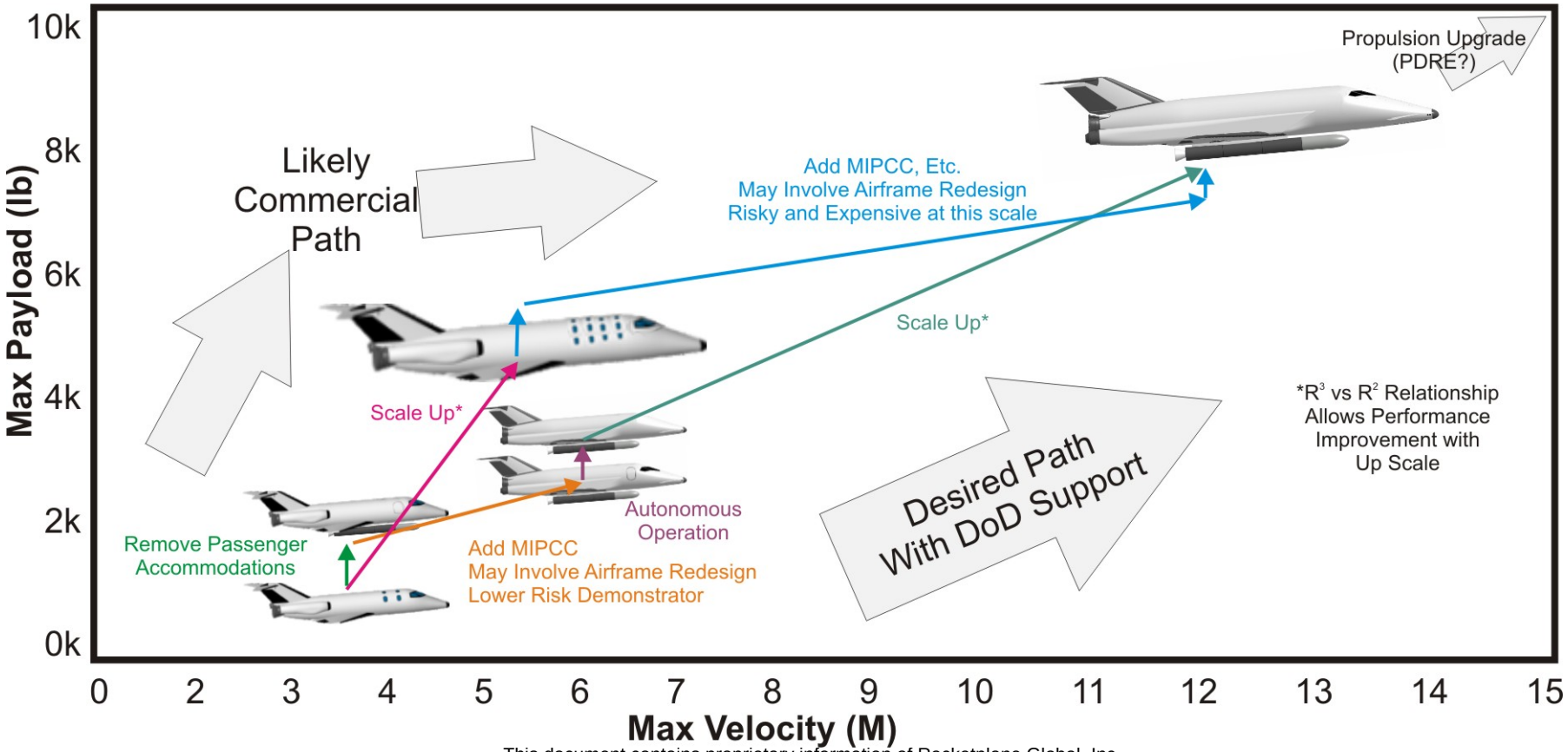


- **Up to 2,000 lbs external payload**
- **Common payload interface mounting rail**
- **Expendable upper stage rocket for small satellite launch services**
- **External sensor pod for remote sensing missions**

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**



Licensing vs. Certification

- **FAA/AST adopted “Fly at your own risk” regulatory model WITH informed consent and signed waivers of liability**
- **Launch licensing protects public safety but NOT space flight participants**
- **Legislation designed to allow new industry to grow and learn BEFORE moving to higher regulatory standards**
- **Flexible Guidelines promote safety without undue regulatory burden**

Certification Cost Example

- **Embraer Phenom 300 vs. Learjet 25**

- Cruise Speed: 834 km/h Mach 0.78
- Range: 3,650 km
- Passengers: 9 (+1 crew)
- Ceiling: 13,715 m
- Climb Rate: 20.2 m/sec
- Year Certified: 2009
- Price: ~ $8,000,000

- Cruise Speed: 859 km/h Mach 0.81
- Range: 2,853 km
- Passengers: 8 (+2 crew)
- Ceiling: 13,715 m
- Climb Rate: 30.7 m/sec
- Year Certified: 1967
- Price: ~ $500,000

Phenom 300 Certification Costs

- **Quote from Embraer Press Release**
  - "The overall certification campaign involved five aircraft that performed more than 1,200 flight test hours, certifying the aircraft for RVSM (Reduced Vertical Separation Minimum), day and night IFR (Instrument Flight Rules) operations, and flying into known and forecasted icing conditions. In addition, there were full-scale static and fatigue tests, and rigs were used for environmental, avionics, and electrical systems."
- **400 engineers working for 3 years +**
- **Total investment ~ $1 billion**

Conclusion

- **Thousands of hours of suborbital flight time BEFORE revenue is a non-starter**
  - Most US developers are planning hundreds of hours for flight testing full envelope expansion
- **FAA/AST "FAYORWIC" regime likely to be extended until 2020**
- **By then, there WILL be thousands of hours of accumulated suborbital flight time including flights in crowded EU airspace**
- **FAA/AST Experimental Permit + Commercial Launch Licensing provides a bridge to a future global harmonized aerospace regulatory system**