

# Ellington Spaceport

*July 2013*



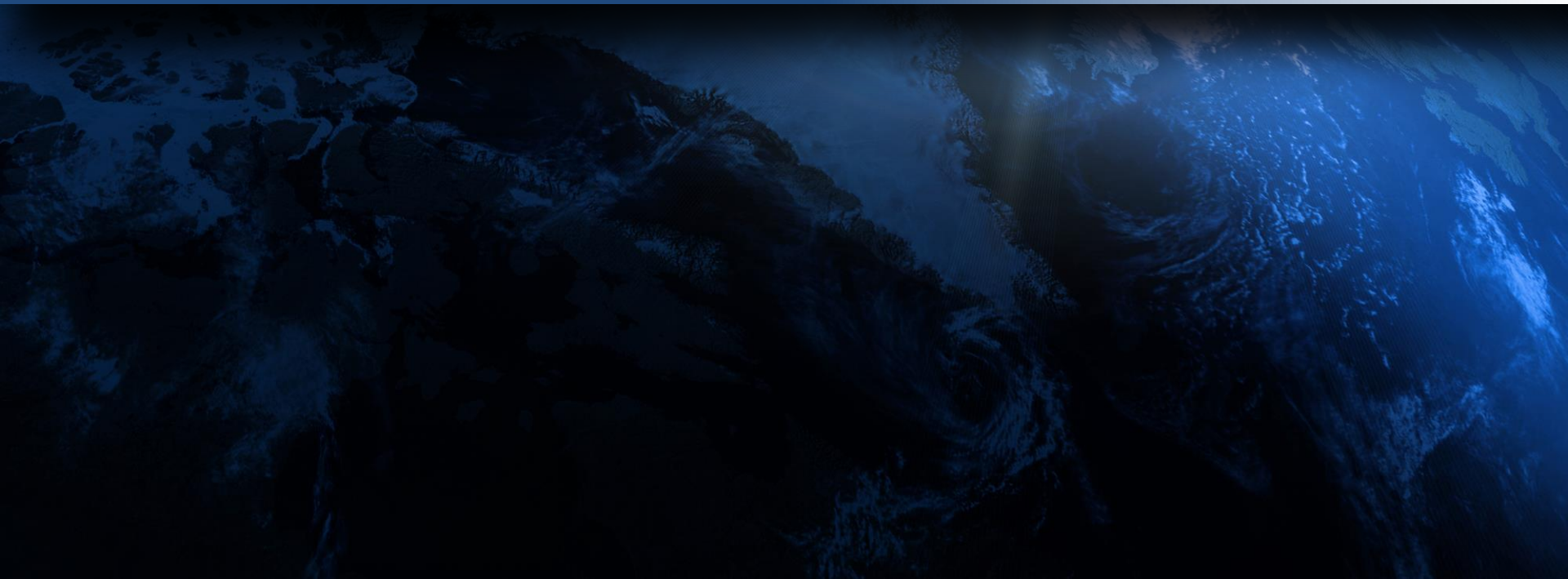
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## The Vision for Commercial Spaceflight in Houston



# Why Build A Commercial Spaceport?





# The Rapid Growth of the Aviation Industry Stunned the World

1903

First Flight



1907

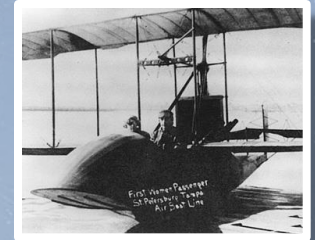
First Commercial Flight

1914

First passenger airline service

1927

Houston's W.T. Carter Field opens



1937

City of Houston purchases W.T. Carter, renames it Houston Municipal Airport (now Hobby)

1940

By the '40s, most major municipalities on the planet have aviation support capabilities



By 2012, the global commercial airline industry reached a value of \$711 Billion

# 100 years later, the Commercial Spaceflight Industry is growing at the same pace.

2004

First private manned spaceflight



2011

World's first purpose-built commercial spaceport opens (Spaceport America)



2012

NASA signs contract with Bigelow Aerospace  
To provide commercial inflatable module to the ISS



2013

SpaceShip Two breaks the sound barrier in tests

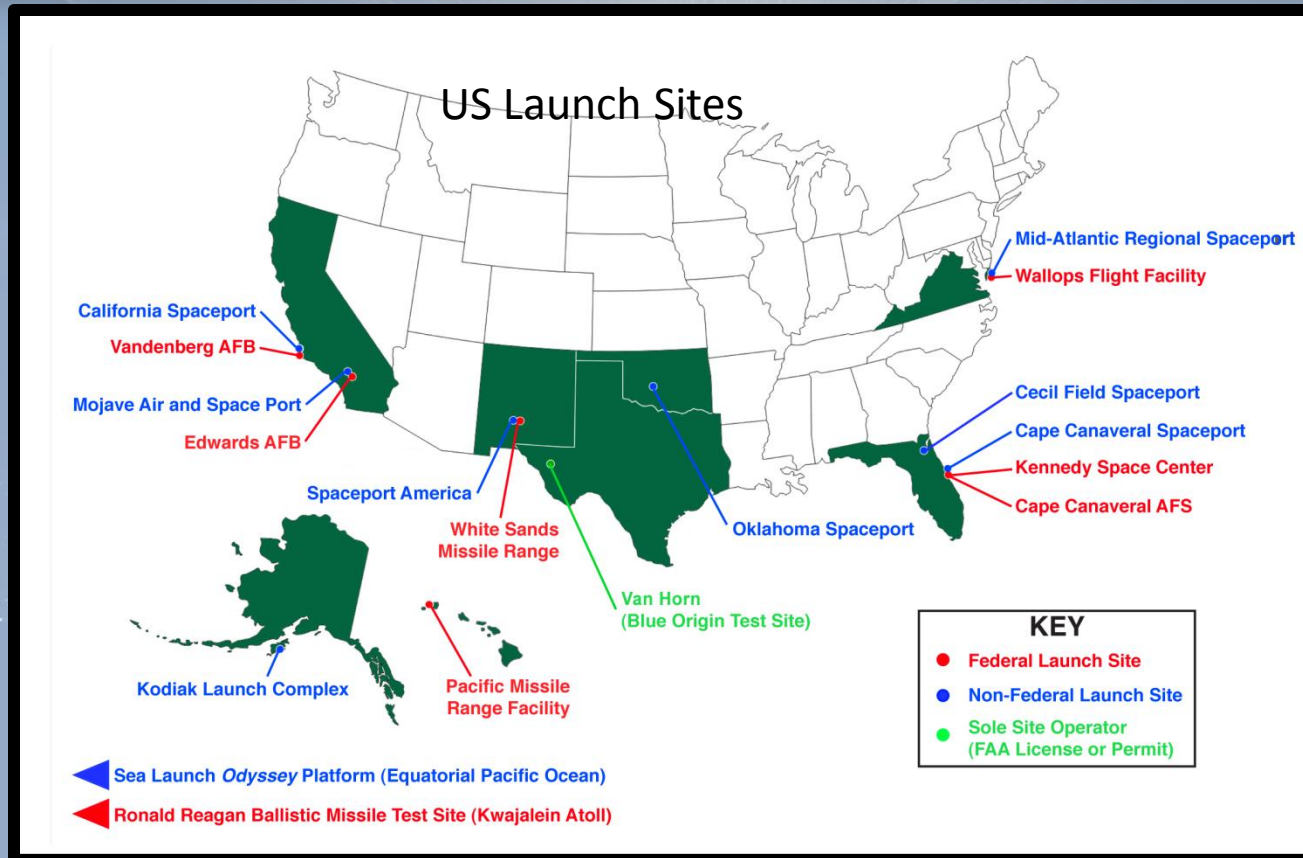


2014

First commercial Space Flights expected

Today, there are over 25 vehicles being developed for commercial spaceflight

To meet this growing demand, a Spaceport infrastructure has begun to develop.



To date, 8 commercial spaceports have been licensed by the FAA/AST





Why Houston?



# Why Houston?

- We started looking at the viability of a Houston spaceport almost 2 years ago.
- We commissioned in-depth studies with industry experts. Specifically, we looked at things like:
  - Technical Feasibility
  - Market Assessment
  - Competitive Assessment
  - User Needs Assessment
  - Demand Forecast
  - Business Case
- Our findings revealed that Houston can be a major contender in commercial spaceflight.
  - There simply is no other large urban market with major aerospace presence with the capability to host a spaceport.
- This is a **HUGE** opportunity for Houston to take the lead in Commercial Aerospace in the next 10-20 years.

Houston had an aviation infrastructure in place within 25 years of the world's first airplane flight. As an aerospace hub, we must do the same for Commercial Spaceflight....

# Our Spaceport Vision

- The Houston Airport System (HAS) has a vision to support spaceport operations for horizontally launched Reusable Launch Vehicles (RLVs) from Ellington Airport (EFD).
- We envision that EFD could be a focal point for *aerospace innovation* – a regional center for a cluster of aerospace entities acting as incubators for aerospace innovation and growth.
- Key aerospace engineering activities could include:
  - Component and composite development and fabrication
  - Space vehicle assembly
- Commercial activities could include:
  - Zero-gravity scientific and medical experiments,
  - Microsatellites
  - Astronaut training and development
  - Space tourism

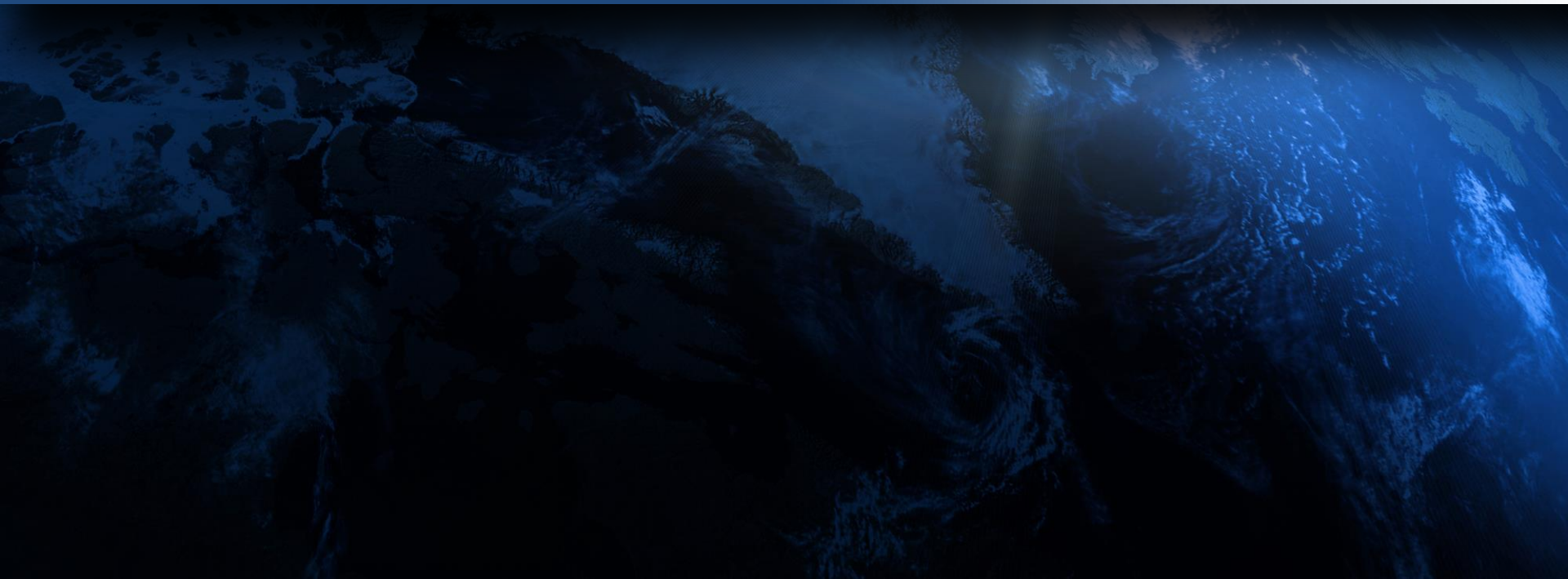


# Houston has distinct advantages that none of the current 8 licensed spaceports can offer.

- Houston is a major metropolitan travel and business center.
- Johnson Space Center and other NASA facilities, coupled with a large subcontractor community of over 80 aerospace companies, provide significant access to an existing, robust aerospace community.
- Houston's "boom" economy is attractive to potential spaceport tenants/suppliers/vendors.
- Proximity to the Gulf of Mexico makes Houston an ideal location for Reusable Launch Vehicles.
- International accessibility and geographic proximity to Latin America greatly increase potential opportunities in the Greater Houston area.



# What Would A Spaceport at Ellington Look Like?





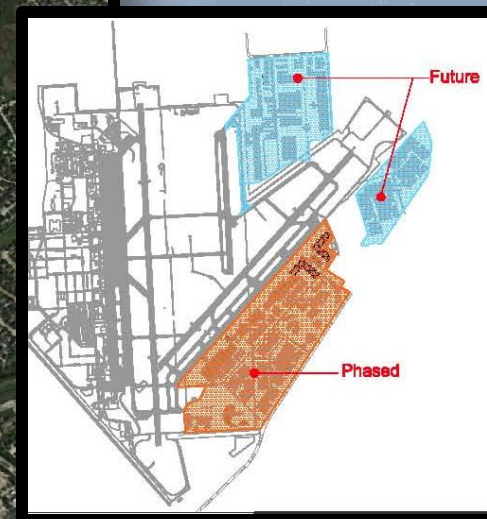
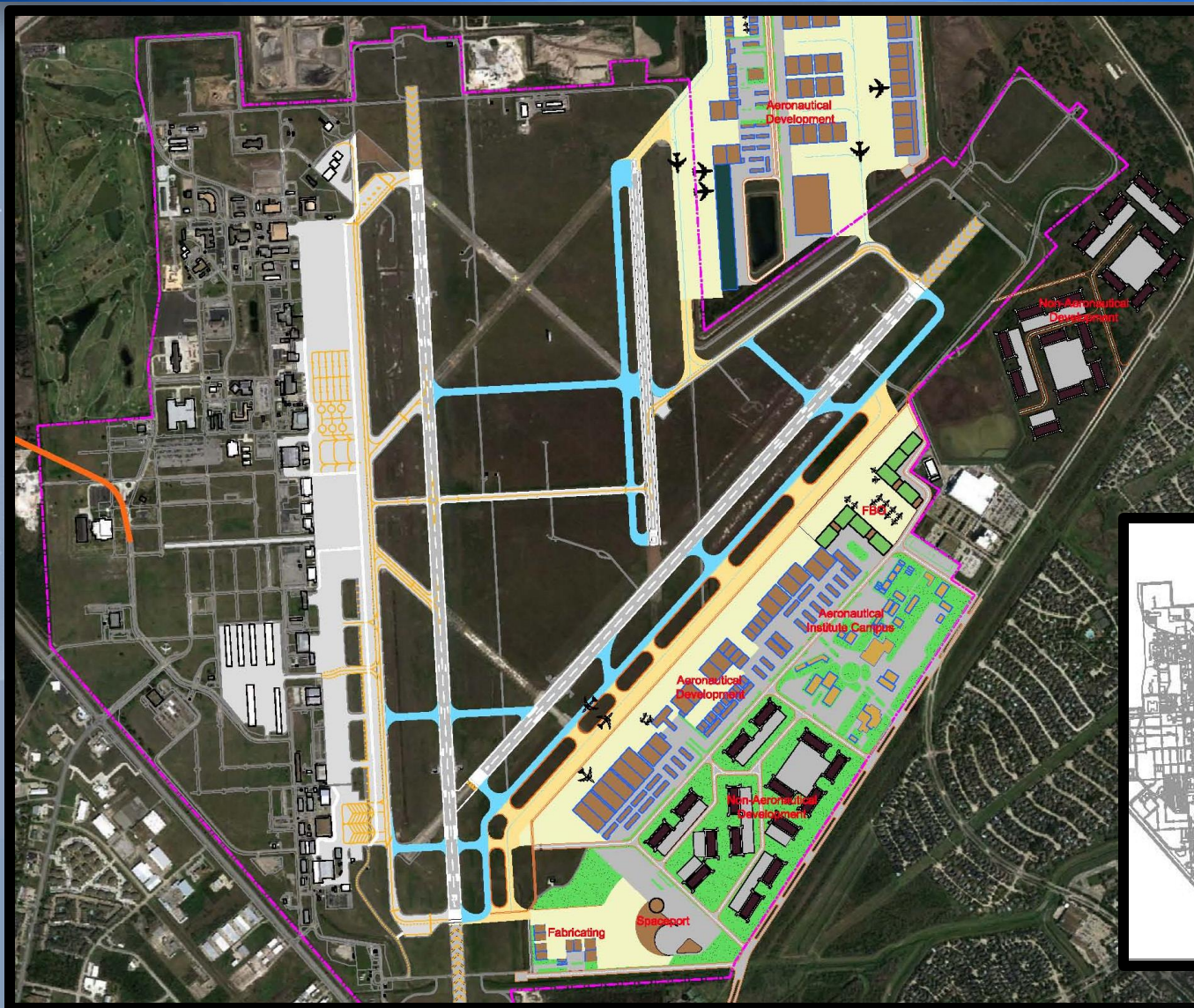
# Ellington's Development Area





# EFD Spaceport – Preliminary Land Use Plan\*

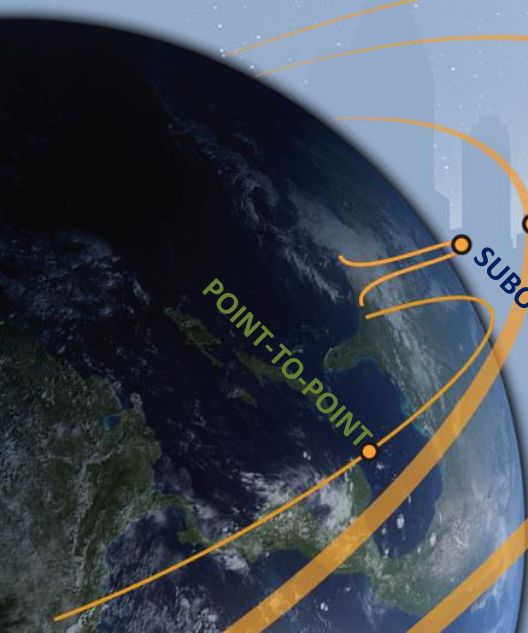
\*For discussion Purposes Only





# We Conducted a Study to Determine Which Vehicles Can Launch from Ellington:

- We examined markets based on orbit:
  - Suborbital
  - Low Earth Orbit (LEO)
  - Medium Earth Orbit (MEO)
  - Geosynchronous Earth Orbit (GEO)
  - Beyond Earth orbit (BEO)
- There are some restrictions on spaceport operations (i.e., no vertical launches)



POINT-TO-POINT

SUBORBITAL ≈ 100 km

LEO ≈ 300–2,000 km

MEO ≈ 2,000–35,786 km

GEO ≈ 42,164 km

BEO

# We determined Ellington has the potential to support the following:

**Suborbital:** There are several suborbital winged vehicles under development.



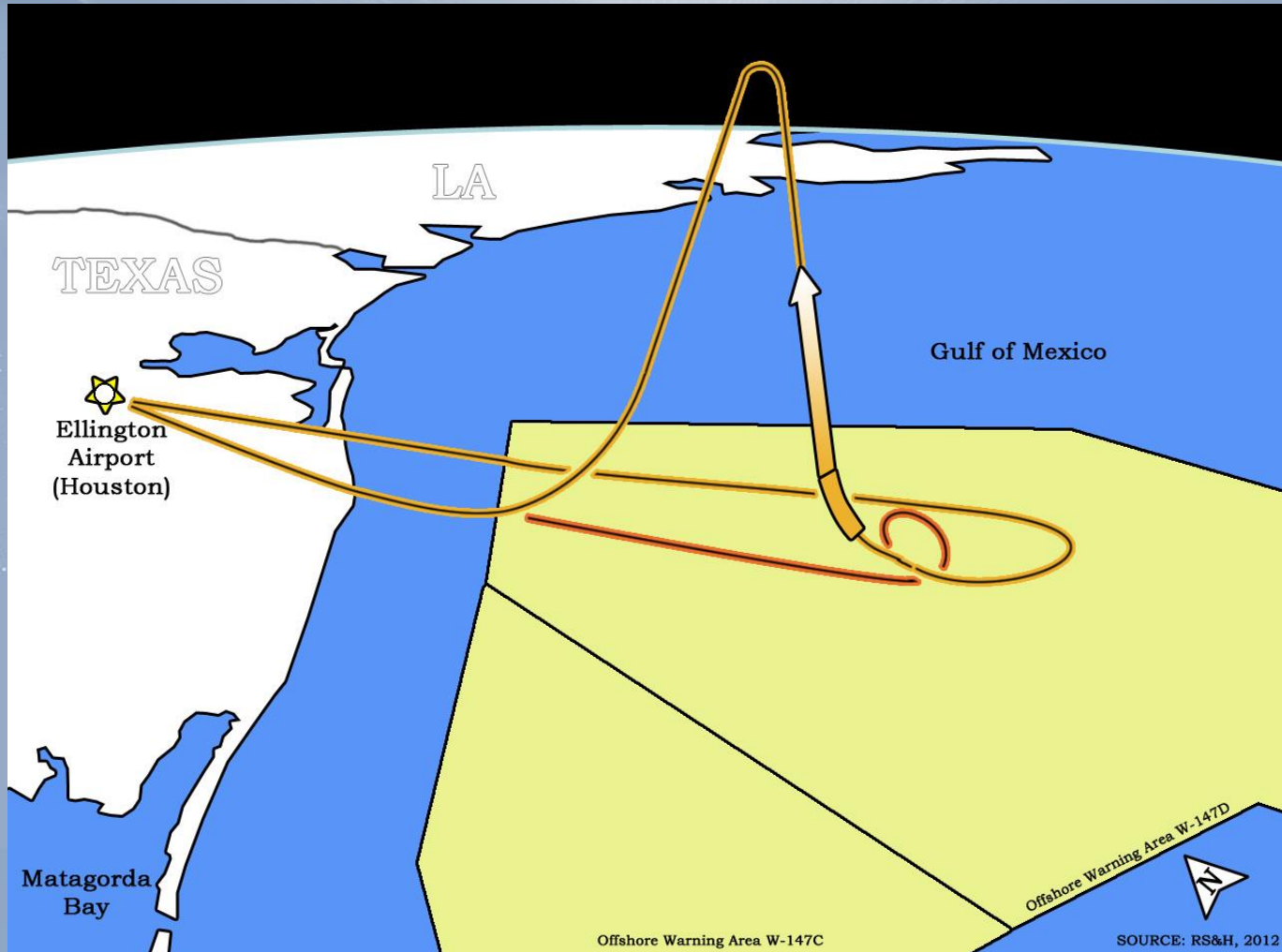
**Orbital:** One air-launch system is operating today and several are under development.



**Point-to-Point:** As this technology begins to mature in the next 20 years, it's a crucial piece of the expanding commercial spaceflight market and therefore it's critical for EFD to prepare now to support Point-to-Point.



# Ellington's Location Permits Aviation-Style Launch Vehicle Operations



# Current Launch Service Operators

We Benchmarked Potential Types of Launch Service Operators:

Stratolaunch  
Systems

Virgin Galactic

Orbital  
Sciences

Generation  
Orbit

Rocket  
Crafters

The Spaceship Company (Scaled Composites)



Stratolaunch

Launcher One

Space Ship 2

Pegasus XL

Lynx Mark II

Lynx Mark III

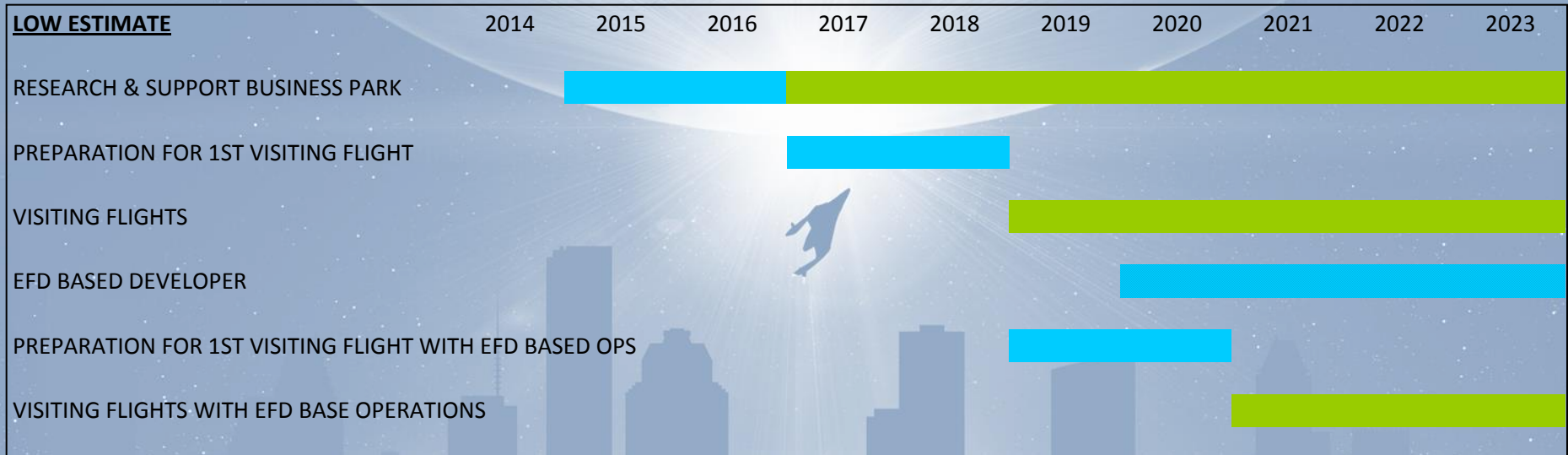
GO Launcher 2

Sidereus


Mapping the benchmarked suppliers' operation plans reveals that the following system types may eventually be licensed to operate out of Ellington Spaceport:

- Large carrier aircraft
- Medium size boosters with hybrid propulsion systems -
- Small boosters with solid propulsion systems
- Space tourism spacecraft with hybrid propulsion systems

# Possible Activity Timelines



 = Infrastructure Development

 = Operations

 = EFD Spacecraft Developer



## To Sum Up:

- The Commercial Spaceflight industry is growing rapidly and presents huge opportunities for the future.
- Houston, with its distinct advantages, has the potential to become a major player in this industry by preparing ourselves early.
- Leveraging our existing (and unique) space community can foster a large developmental, fabrication and assembly presence alongside spaceflight operations.
- It's critical that we go forward with spaceport planning (preparedness meets opportunity)

*Case in point: planning at Spaceport America began in late 1980s-early 1990s, and took until 2005 for a commercial industry to emerge to meet a market demand; (likewise, point-to-point is still 20 years away but planning should begin now)*

Spaceports located in populated, international business centers will emerge globally over the next 30 years. Houston is in a very strong position to be one of the first of these to emerge.

# Next Steps

We're conducting the following initiatives to lay the foundation for the development of the Spaceport:

- FAA/AST Spaceport License
- Ellington Master Plan Public Hearings
- Hosting Commercial Spaceflight Federation Meetings
- Continuing Spaceport Business Development
- Partnering with Rice University in an Aerospace Lecture Series
- Working on Collaboration Plan with NASA/Johnson Space Center
- Creating Partnerships with Universities such as Rice University, University of Houston, Texas Southern University, Embry Riddle University, Texas A&M and others



Questions?

