





## FastForward Study Group: Overview

Version A | 04 August 2009

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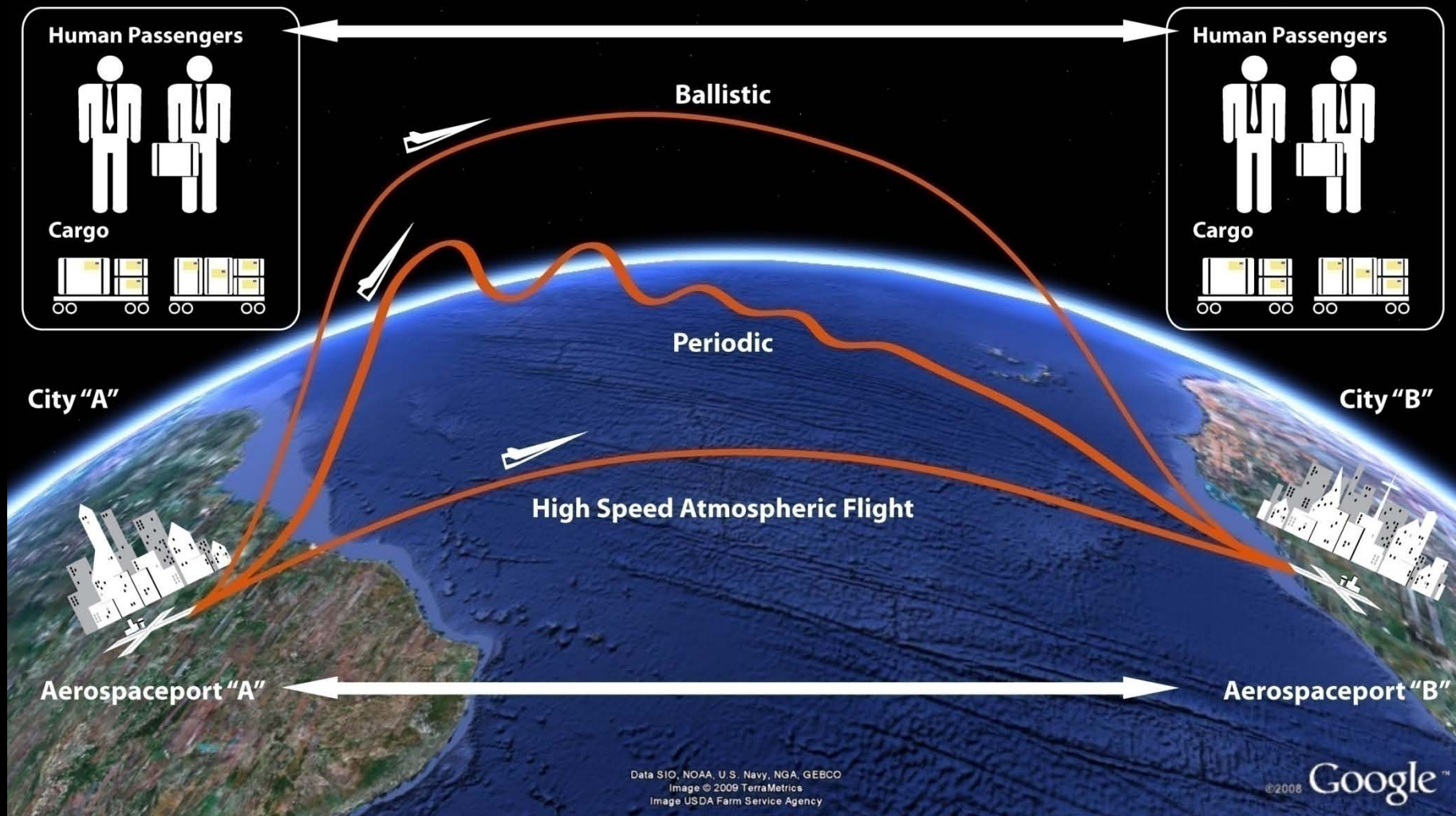
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## INTRODUCTION



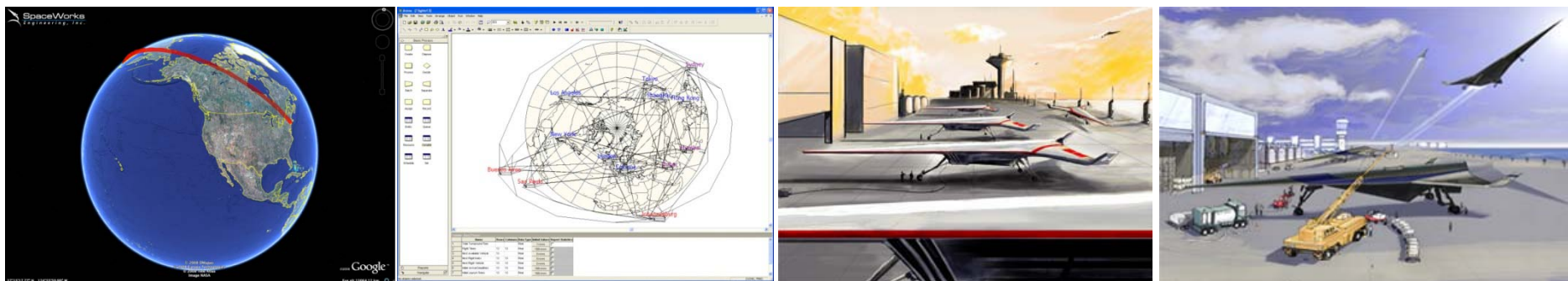
## Global High Speed Point-to-Point (PTP) Cargo/Passenger Travel



## The High Speed PTP Trade Space



- **FastForward is an ad-hoc study group** consisting of major aerospace contractors, emerging new space companies, spaceports, key federal government agencies, and academic representatives
  - All-volunteer effort formed in October 2008
  - 20 organizations represented (by invitation)
  - Hosted by SpaceWorks Commercial (Atlanta, GA USA)
- Our focus is on pre-competitive analysis and assessment of **future global high speed point-to-point passenger and cargo services**
- Our group produces technical papers and white papers on topics of PTP transportation for use by our members and the community at-large
- Members meet regularly by telecon, supports a range of conference and panels, and use virtual collaboration tools to conduct business and exchange ideas



## What is the FastForward Study Group?

Our focus is on pre-competitive analysis and assessment of future global high-speed point-to-point passenger and cargo services

1. **Market assessment and characterization of future high speed point-to-point service for passengers and cargo, including economic drivers**
2. **Identification of key regulatory and policy issues**
3. **Evaluation of candidate flight vehicle options and technology needs**
4. **Identification of challenges for emerging Aerospaceports in the U.S. and abroad**
5. **Identification of synergies with ongoing government investments in advanced flight programs**

## **Primary Study Goals**

- **Our goal is to better define the suborbital market and explore preferred options for providing services** (in a generic way -- i.e. flight frequencies, market size and price elasticity, preferred takeoff and landing destinations, required cargo capacity per flight, special handling requirements/limits)
  - This type of information is a necessary pre-competitive part of everyone's future business plan
  - Collaborative subgroups of members are performing preliminary technical and economic analyses that will benefit all members
  - All members contribute reference documents, background material, and knowledge that is openly shared with the rest of the study group
  - Outside experts and guest speakers provide information to all group members (e.g. shippers, regulatory officials, etc.)
- **Participation includes** access to the study's collaborative web site, email discussions, telecons, in-person meetings, etc.,
  - Google group (for discussion and file sharing, access by invitation only):  
<http://groups.google.com/group/fastforwardstudy>
  - Teleconference: hour long, every one to two months (hosted by SpaceWorks Commercial)
  - Semi-annual face-to-face team meetings
    - 04 February 2009: Washington, D.C. (half-day workshop)
    - 20 October 2009: Las Cruces, NM (half-day workshop)

## Outcomes and Expectations for Participation





Spaceport  
Associates



## FastForward Study Group: Participants



## Areas of Investigation

## **1. Hypersonic or Supersonic Service?**

- Is supersonic service sufficient to meet market requirements?
- Is exoatmospheric flight required?

## **2. Market Size and Characteristics**

- Who are the likely customers and what will they ship?
- What synergies exist between passenger and cargo service

## **3. Identification of Emerging Spaceport Challenges with respect to PTP Services**

- Subgroup of spaceport members prioritizing segment issues

## **4. Upcoming Study Products**

- White paper on PTP as a incremental stepping stone requiring commercial and government partnerships (Fall 2009)
- Technical papers and panel sessions at SPACE 2009, IAF 2009 (including results from modeling and simulation)
- Group workshop at ISPCS 2009 (Las Cruces, NM, USA)

### **Current FastForward Study Group Focus Areas**

Potential market approaches are quite diverse, with several candidate options potentially leading to successful business models

### Revenue Payload Options

- Passengers (tourists, business travelers, VIPs)
- Cargo (standard envelopes, freight, perishables)
- Mixed Pax/Freight Solutions (belly cargo)

### Destinations

- Domestic service (e.g. east coast-west coast U.S.)
- International/Global service (long distance transoceanic and transcontinental)
- Potential to use a network of emerging international aerospaceports

### Service Levels

- On-demand service (quick response flights taken when and where needed)
- Scheduled service (e.g. FedEx/UPS or airline type models)

## Potential High Speed PTP Market Approaches



- Tier 1 Cities (7). Chosen as the initial study set based on current express package market sizes.
- Tier 2 Cities (3). Emerging regions that would be best candidates to expand the delivery network.
- Tier 3 Cities (3). Additional regions to result in more global capabilities.

Sources:  
 -Olds, J., Charania, A., Webber, D., Wallace, J., Kelly, M., "Is the World Ready for High-Speed Intercontinental Package Delivery (Yet)?," IAC-08-D2.4.5, 59th International Astronautical Congress, Glasgow, Scotland, September 29 - October 3, 2008.

## Candidate Nodes in a Global PTP Cargo Delivery System

## Evolved Versions of Suborbital Personal Spaceflight Vehicles



Virgin Galactic SpaceShipTwo



RocketPlane Global XP



XCOR Lynx

## New Vehicles with Longer Range (Reusable or Expendable, Subsonic, Hypersonic)



Aerion SBJ (Supersonic Business Jet)



Supersonic Aerospace International,  
LLC (SAI) Quiet Supersonic Transport  
(QSST)



Gulfstream  
Supersonic Business Jet



Notional Hypersonic  
Vehicle (SEI)

## Sample Candidate Vehicles and Flight Concepts

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There is a **diverse set of preferred vehicle configurations** represented by FastForward team members, but all must meet key requirements

### **Economic Viability**

- What is the design market? Can it compete and make money?

### **Technical Readiness**

- What are key technologies (propulsion, airframe, controls)

### **Safety & Reliability**

- Can it achieve aircraft-like safety and reliability records?

### **Environmental Impacts**

- What about SST downfalls: noise, land overflight, emissions?

### **Regulatory & Legal**

- Can high-speed point-to-point overcome regulatory and legal hurdles: streamlined customs, liability, overflight of non-participatory countries, integration with ATC systems?

## **Key PTP Vehicle Selection Concerns**



## Future Aerospaceports That Might Serve PTP Markets

**Emerging Spaceports face a number of challenges that will need to be addressed if they are to become a part of the PTP network**

- 1. Establishing useful supersonic and hypersonic flight corridors (noise, safety, environmental impact, etc.)**
- 2. How to Improve Speed/Time to major city's centers?**
- 3. What are license requirements to operate regular (daily) flights?**
- 4. How to handle Customs (U.S. and international)?**
- 5. Establishing relative advantages over existing cargo airports?**
- 6. Relationships between international spaceports (forming a network)?**
- 7. Developing the ground facilities to service PTP vehicles**

**Key Spaceport Issues to Be Investigated**

## 1. ACCESS:

- Airspace Management & Integration with the National Airspace System (NAS)
- Establishing Flight Corridors (noise, safety, Ec calculations, environmental compliance, etc.)

## 2. COHERENT LEGAL & REGULATORY FRAMEWORK FOR INTL OPERATIONS:

- Operate under LICENSE and INFORMED CONSENT
- Affordable Underwriter Market: Insurability of Operations
- Cooperative Regulation (FAA, EASA, CAA, etc)
- Legal Operating Frameworks amongst Domestic & Intl Spaceports (Pt to Pt Network)

## 3. COMMON SPACEPORT PROCESSES AND PROCEDURES:

- Fuel Handling and Storage, Equipment, Hazardous Matl., NEPA, etc.
- Streamlined Customs Issues for Passenger & Cargo Operations (for international service), etc.

## 4. AVAILABILITY OF SPACEPORT LOCATIONS:

- Investment in Spaceport Infrastructure in Multiple Locations to Create and Effective Network

## 5. MANAGING MILITARY AND COMMERCIAL OPERATIONS WITHIN SPACEPORTS

## 6. POTENTIAL ITAR ISSUES

## 7. POINT TO POINT BUSINESS MODEL VALIDATION:

- Showing Relative Advantages of Point to Point & Spaceports over Existing Cargo/Passenger Airports
- Ability to Realize Time Savings from Pt to Pt (Reduce Travel Time from City Center to Spaceport)

**Initially Identified Top 7 Issues Facing Spaceports to Enable Point-to-Point Operations**

## **1. Cargo Market May Not Be Large Enough By Itself**

- SEI-C 2008 IAF paper --> Negative business case for initial sim assumptions
- Caveat: market survey was very weak and notional, improvements called for
- Caveat: limited city pairs and only “scheduled” service considered

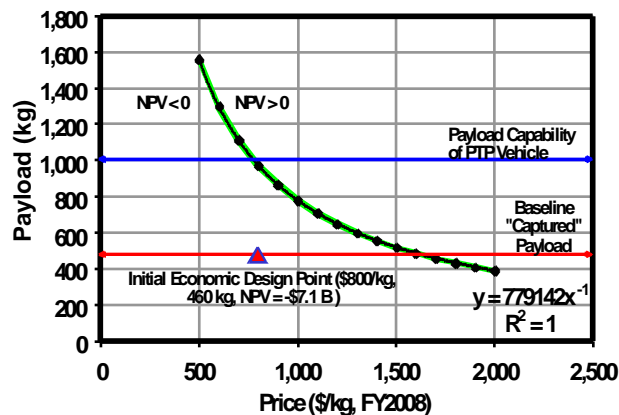
## **2. Passenger Market May Add Traffic, and Thus Lead to Economic Viability**

- Princeton Space Express Team --> Found positive NPV for combined market
- Caveat: issues raised on some traffic and production assumptions

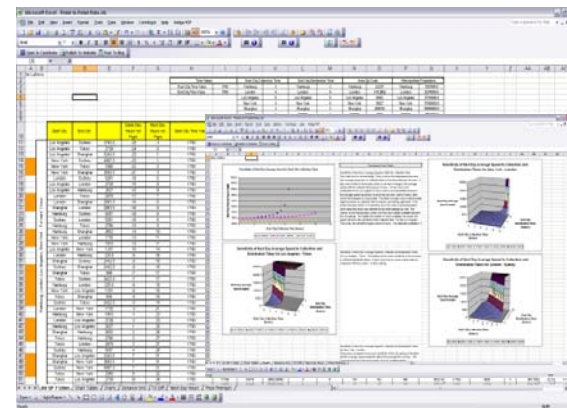
## **3. Supersonic Business Jet May Offer Advantages Over Hypersonic Vehicles on Some Routes**

- SEI-C Initial Findings --> SSBJ more competitive on routes it supports
- Caveat: didn’t consider a two-vehicle tiered market approach

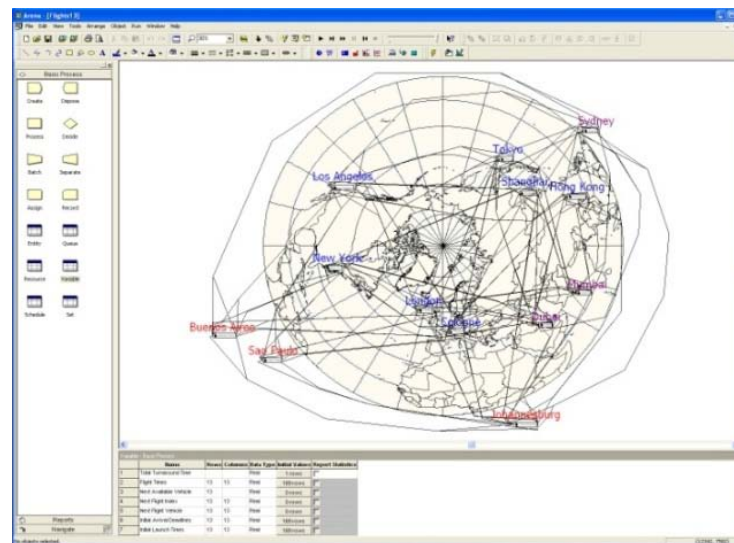
## **Lessons Learned So Far**



**Financial Analysis for  
Notional PTP Service**



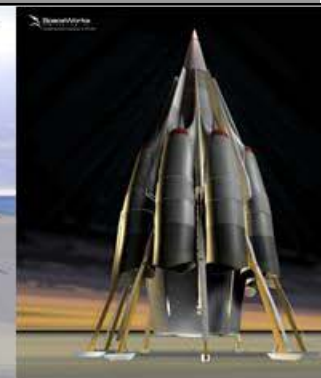
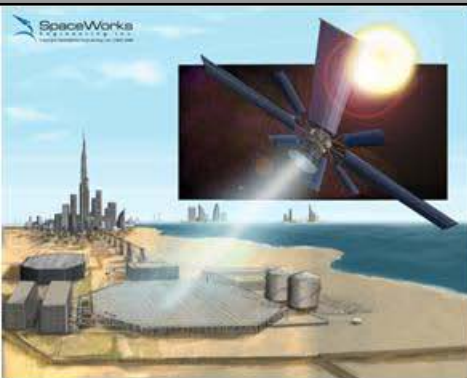
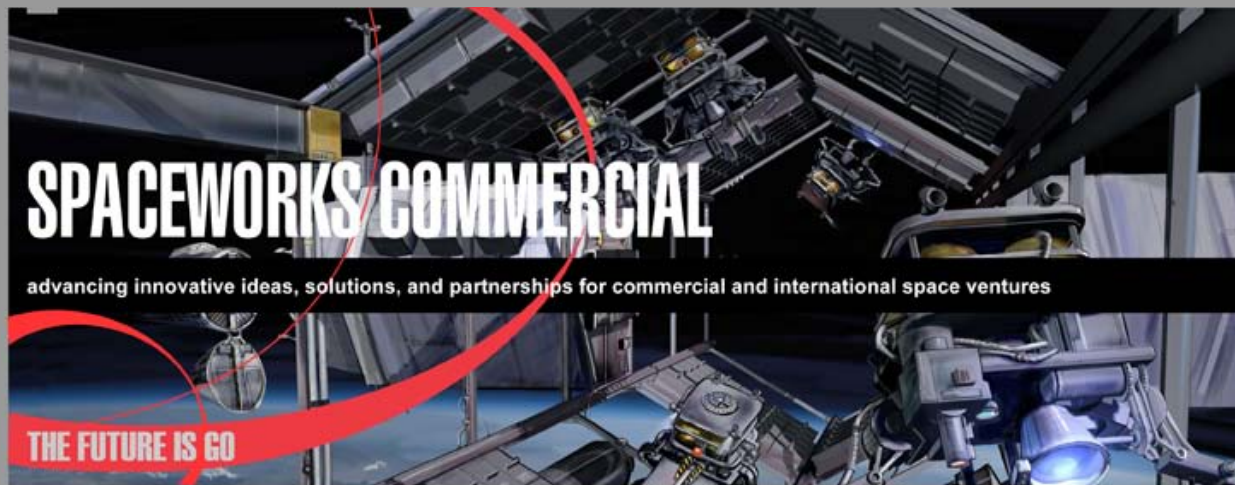
**GHoST Calculator of City Pair  
Vehicle Delivery Capabilities**



**Discrete Event Simulation Model of City Pair  
Delivery Time and Fleet Routing**

## Current SpaceWorks Commercial PTP Analysis Areas





**SpaceWorks Commercial** is a division of SpaceWorks Engineering, Inc. (SEI) of Atlanta, GA. **SpaceWorks Commercial** seeks to create value-added partnerships with the emerging entrepreneurial space community as well as international space industry leaders. Key goals of this division include advancing innovative solutions to challenges in space development, space-based energy, and high-speed flight. **SpaceWorks Commercial** also participates in popular space prizes.

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## Study Host Organization: SpaceWorks Commercial

