



Commercial Suborbital Spaceflight and Its Relevance to Responsive Space

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Results You Can Trust

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- The challenge of responsive launch
- The rise of the suborbital industry
- Demand for commercial suborbital spaceflight
- Its relevance to responsive space

- How to develop responsive launch systems?
- Two approaches:
 - » “launch on demand”
 - Dedicated vehicles standing by for rapid call-up
 - Responsive, but not necessarily affordable
 - » “high demand”
 - High enough flight rate that responsiveness is required for routine operations
 - No *orbital* markets show this level of demand at present time



Commercial Suborbital Spaceflight

- Emerging interest for commercial suborbital launches
- Success of SpaceShipOne and X Prize last year
 - » Over two dozen entrants in competition
 - » Many teams still in existence today
- New vehicles and new markets, including public space travel (space tourism)
- But just how big are these markets?



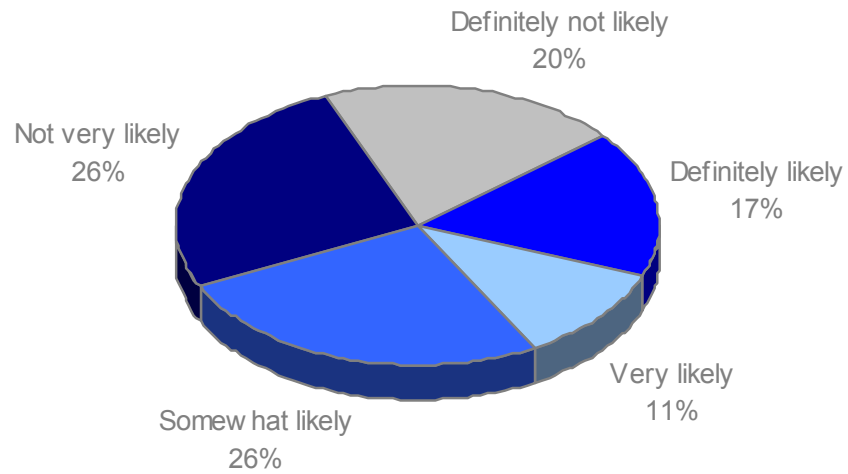
Gauging the Size of the Space Tourism Market

- *Space Tourism Market Study* developed by Futron in 2002
- Based on Zogby International survey of 450 high net worth individuals
- Respondents surveyed on:
 - » Interest in suborbital space tourism
 - » Willingness to pay
 - » Fitness levels
 - » Perceptions of risk
- Two scenarios used: “optimistic” and “realistic”

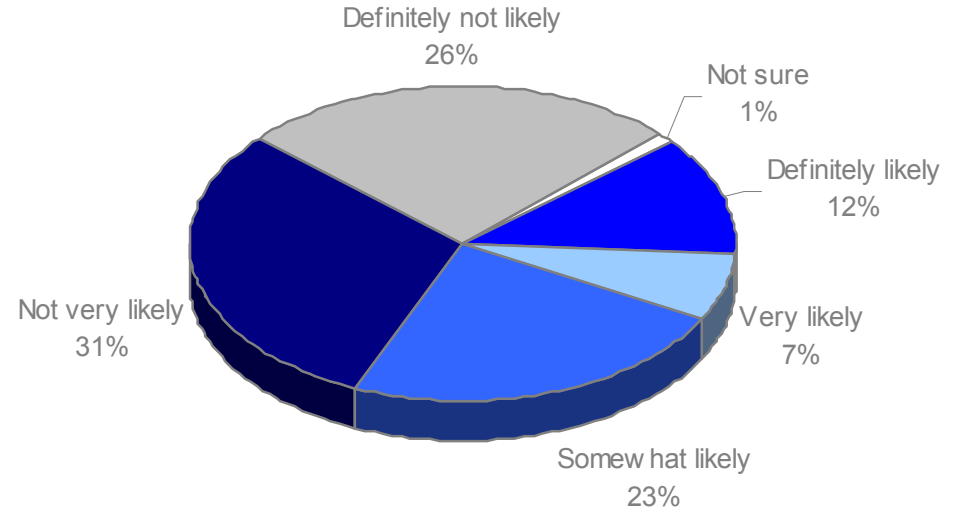


Levels of Interest in Suborbital Space Tourism

Opimistic Scenario



Realistic Scenario



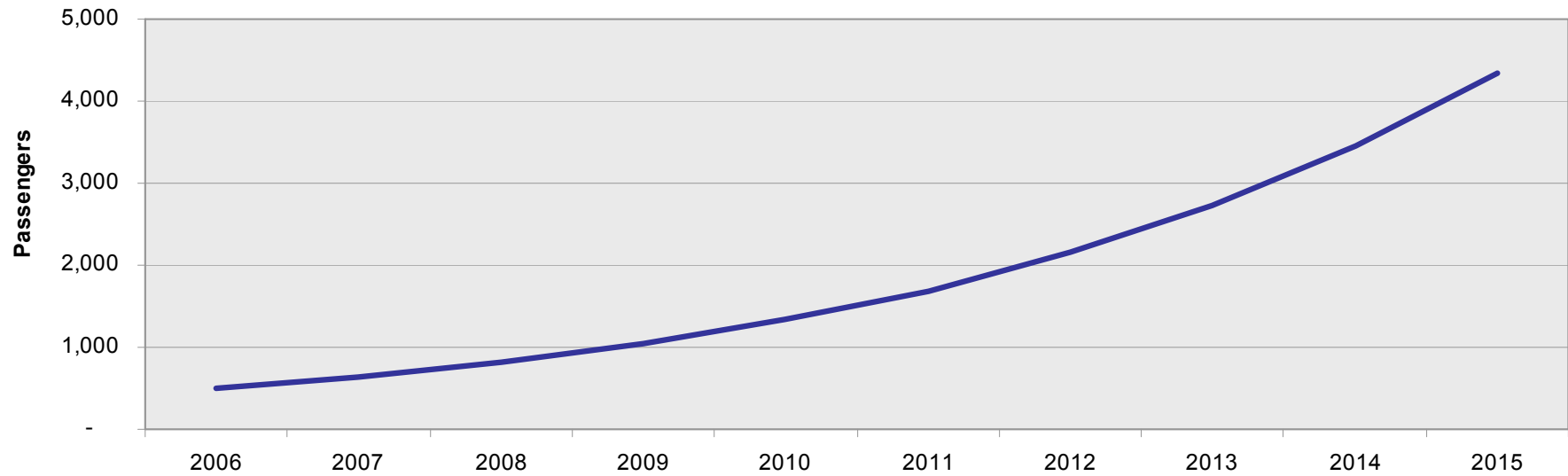


Modeling Public Space Travel Demand

- Survey results used to develop model of demand for suborbital space flights
- Starting with pool of all people with high net worth, people removed based on:
 - » Lack of interest
 - » Unwillingness to pay at reasonable price points
 - » Low fitness
 - » “Pioneering” discount
- Model market diffusion using S-curve, using 2006 as start year

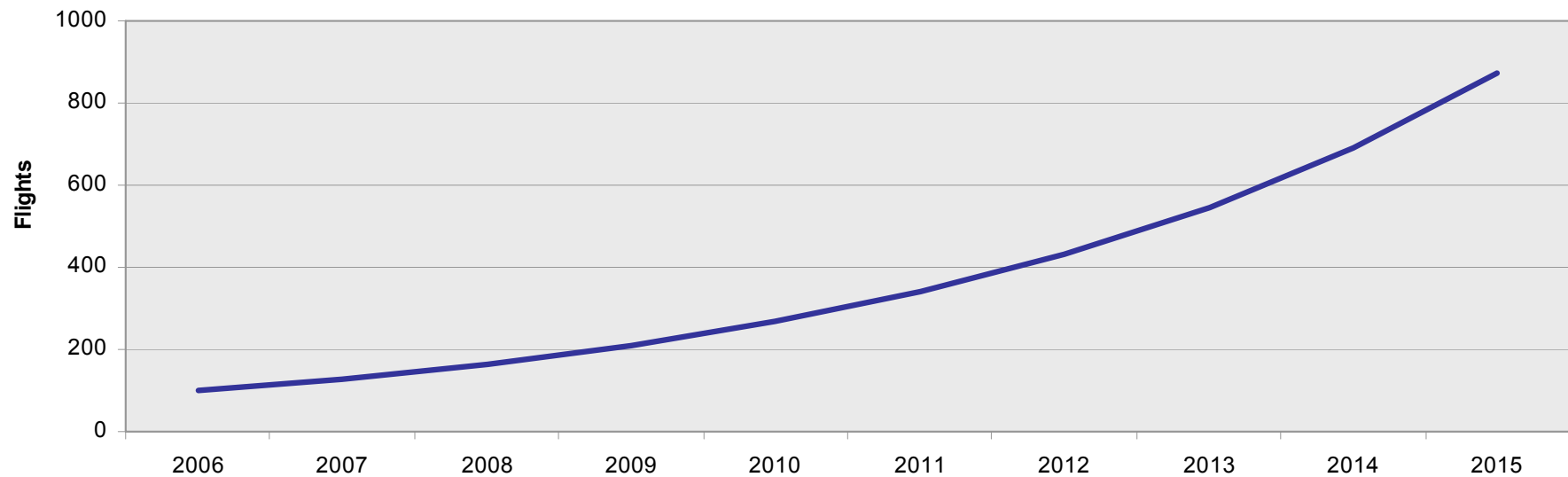


Passenger Demand





Flight Demand



- Based on assumption of five passengers/flight



- Space tourism is not the only market:
 - » Space science/high altitude research
 - » Microgravity research/hardware qualification
 - » Microsatellite launch
 - » Media, advertising, sponsorship
 - » Remote sensing
- These markets not quantified to the same degree as space tourism yet
 - » Some of these may not drive additional launch demand, serving as secondary payloads on other suborbital flights

- Suborbital vehicles may be able to play a direct role in responsive space operations
- Reconnaissance
 - » Suborbital vehicles can “pop up” to obtain theater-wide imagery
 - » Better resolution, less predictable than orbiting satellites
 - » No overflight issues associated with aircraft/UAVs
- Microsatellite launch
 - » Use suborbital vehicle as (reusable) first stage for small launch system
 - » Potential for responsive, cheap launch (like RASCAL)



- Commercial suborbital spaceflight may also provide “lessons learned” that can be applied to responsive space
- Example 1: standardized payloads
 - » Suborbital tourist payloads are standard: people
 - » Makes interface, integration issues simpler, faster
- Example 2: “aircraft-like” operations
 - » Suborbital vehicles designed to turn around in days using teams of dozens

- Responsive launch operations present challenges to the launch community
- However, they are not in it alone: commercial suborbital spaceflight also requires responsiveness to meet demand
- Suborbital developers can provide key insights and lessons learned for responsive space operations