U.S. Space Launch Market: Crisis or Opportunity?

Revolutionizing Access to Space

SPACEX

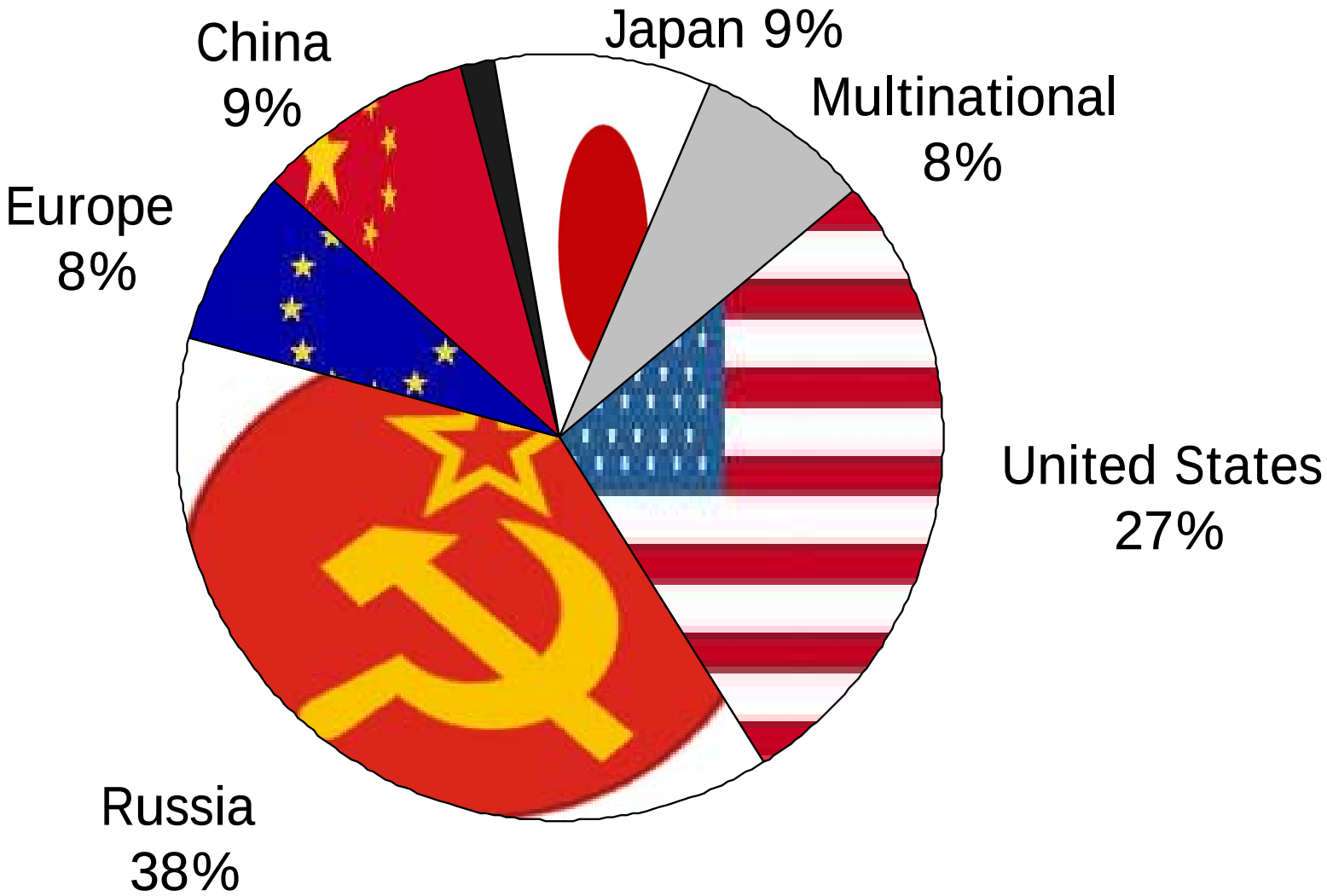
Space Exploration Technologies

Space Exploration Technologies Corporation
Spacex.com

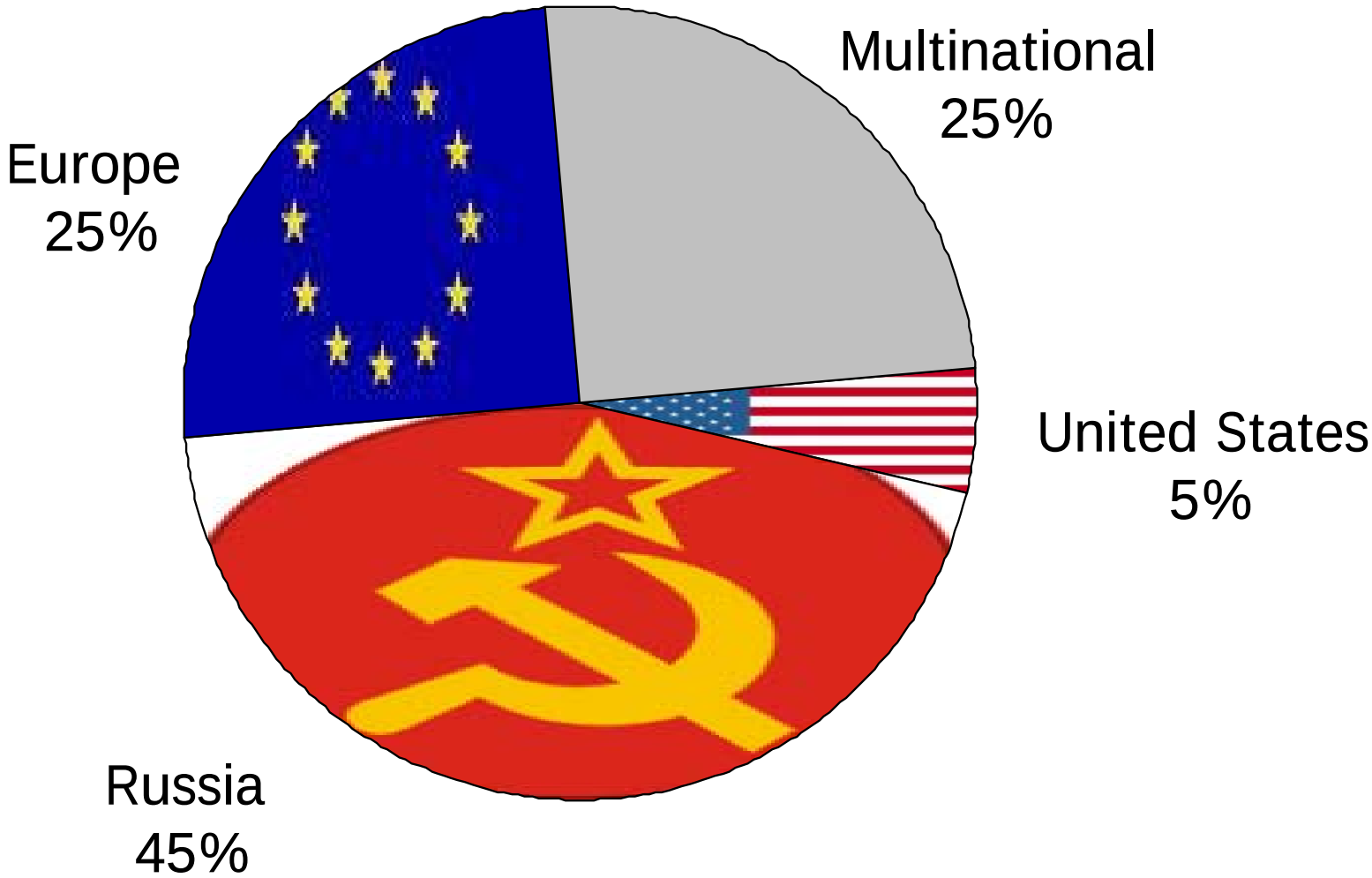
One of the more worrisome trends, from a U.S. perspective, has been the declining influence of American vehicles in the global commercial launch market. Once one of the dominant players in the marketplace, the market share of U.S.-manufactured vehicles has declined because of the introduction of new vehicles and new competitors, such as Russia, which can offer launches at lower prices and/or with greater performance than their American counterparts.

[The Declining Role in the U.S. Commercial Launch Industry, Futron, June 2005]

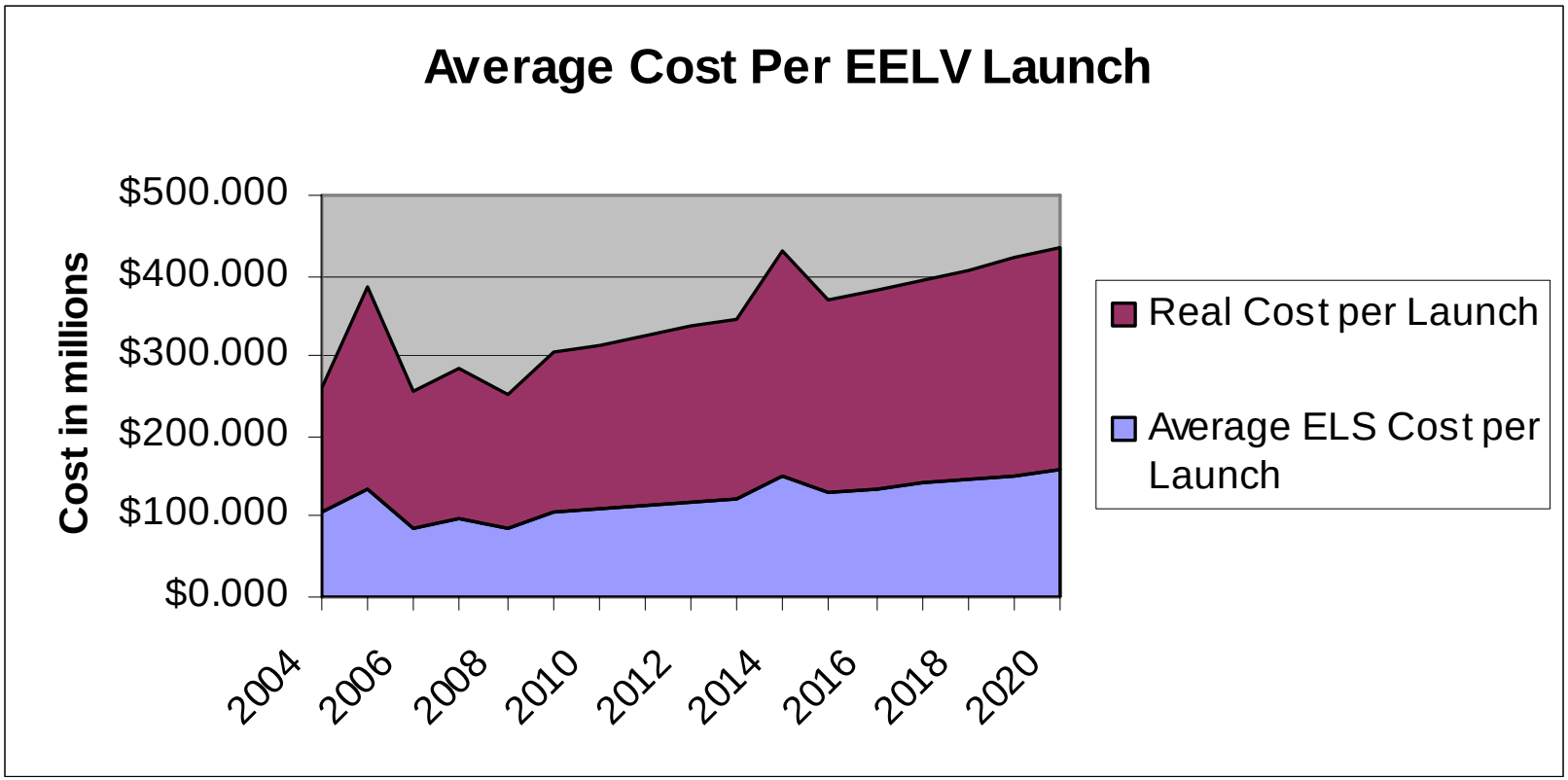
2006 Worldwide Launch Market Share



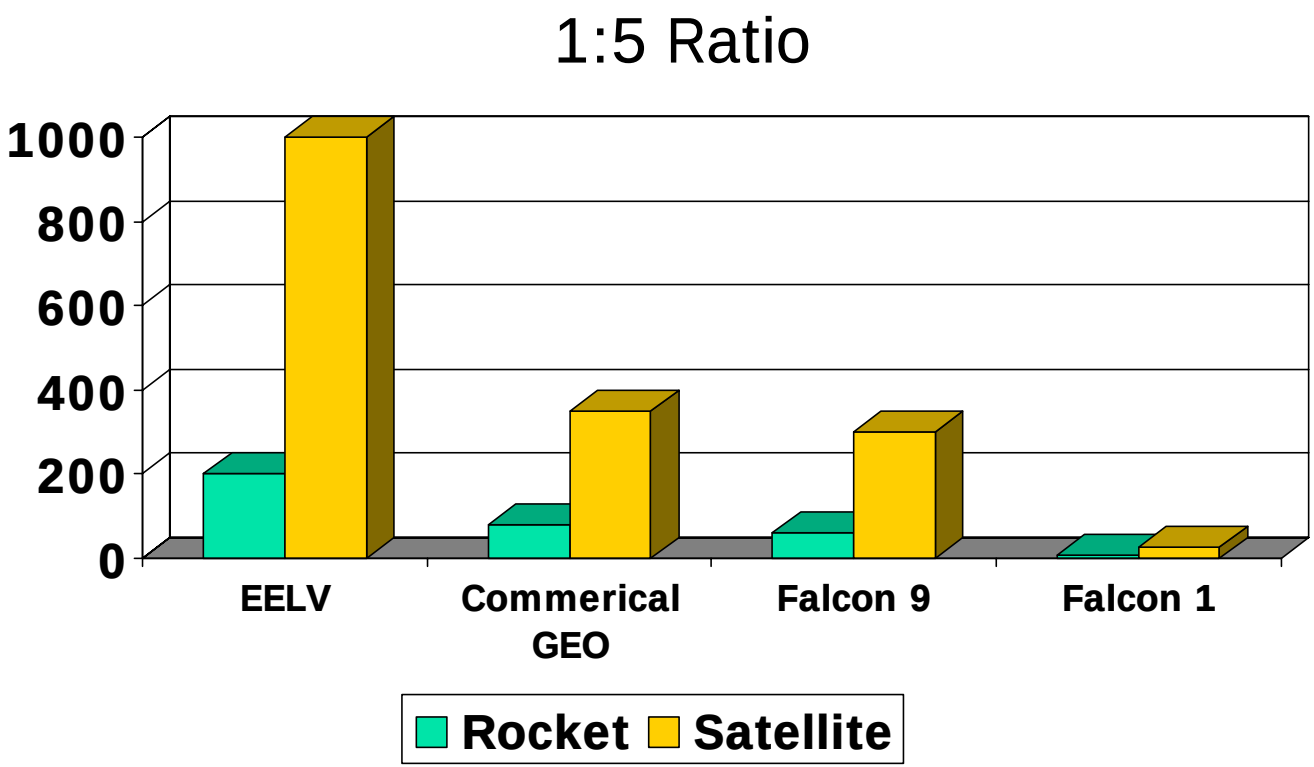
2006 Worldwide Commercial Launch Market Share



Cost of EELV budget

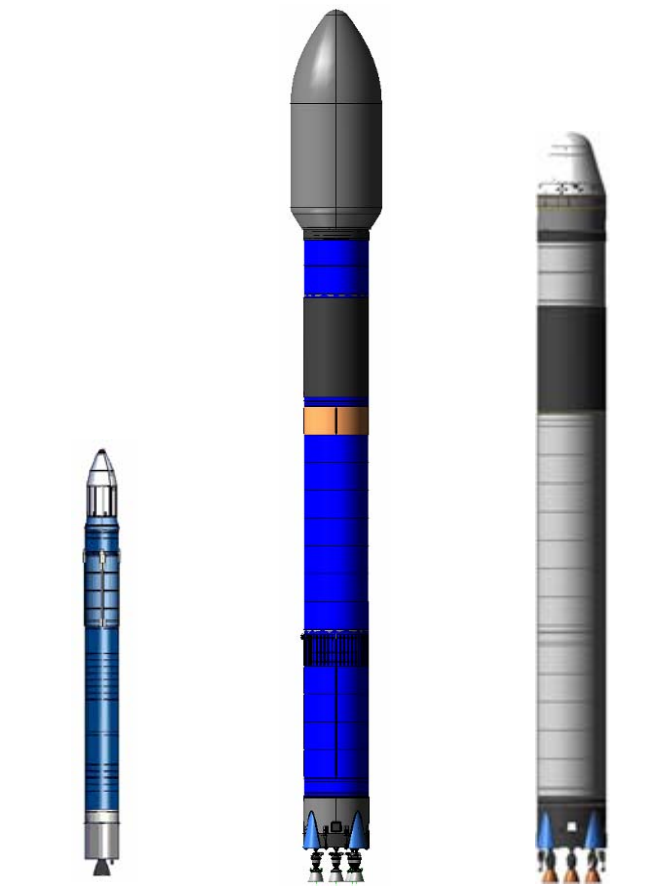


Impedance between launch and satellite cost



SpaceX Overview

- Founded in mid 2002 with the singular goal of providing high reliability, low cost space transportation
- Initial market is government & commercial satellites to minimize market risk
- Transition to human transportation once technology is proven
- Mode of operation – flat hierarchy, high engineer to manager ratio, rapid prototype iteration, best idea wins
- Over 300 employees
- Six buildings (100,000 sqft) of office and manufacturing space in Southern California—moving to 500,000 sqft in late summer
- 300 acre propulsion and structural test facility in Texas
- Launch complexes in Kwajalein, Vandenberg and the Cape



November 2002 – 25,000 sq ft

July 2007 – 500,000+ sq ft

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13 Launches on Manifest

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Customer	Launch	Vehicle	Departure Point
FALCON Demo Launch 1	Q1 2006 (launched)	Falcon 1	Kwajalein
FALCON Demo Launch 2	Q1 2007 (launched)	Falcon 1	Kwajalein
OSD/NRL Tacsat-1	Q4 2007	Falcon 1	Kwajalein
Malaysia Razaksat	Q1 2008	Falcon 1	Kwajalein
US Government	Q2 2008	Falcon 9	Cape
MDA Corp Cassiope	Q3 2008	Falcon 9	Cape
NASA COTS	Q3 2008	Falcon 9	Cape
NASA COTS	Q2 2009	Falcon 9	Cape
NASA COTS	Q3 2009	Falcon 9	Cape
MDA Corp Argo	Q3 2009	Falcon 1	Vandenberg
SpaceDev	Q4 2009	Falcon 1	Vandenberg
Bigelow Aerospace	Q4 2009	Falcon 9	Cape
Swedish Space Corp	Q1 2010	Falcon 1	Vandenberg

Plus $100 Million AF IDIQ Falcon I Contract

Demo Flight 2 Overview

Falcon 1 reached space!
(…but didn't stay there); 289km altitude; 5.1 km/s

Launched March 21, 2007 (local)

- **From: RTS, Omelek, Kwajalein Atoll**
- **Customer: DARPA/USAF**

Objectives:

- **Retire risk prior to 1st operational flight**
- **Collect flight data on the vehicle**
- **Validate ground systems**
- **Payload (secondary objective)**
- **All major flight events were successfully demonstrated except Payload Separation & Coast/Restart**
- **Vast majority of Mission Objectives (programmatic & technical) were achieved**
- **Fastest recycle ever demonstrated—supporting the Operational Responsive Space Initiative**

F9/Dragon Concept of Operations

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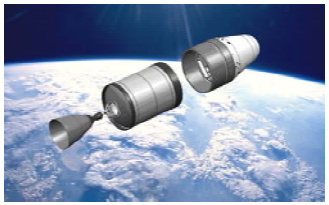
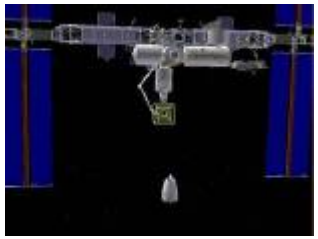
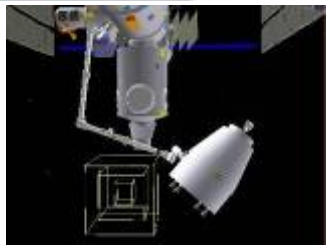
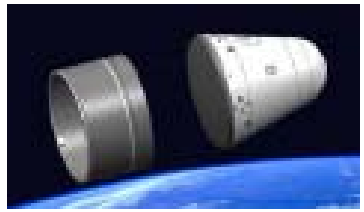


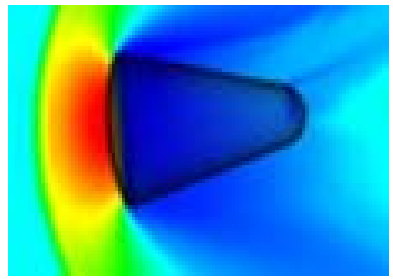




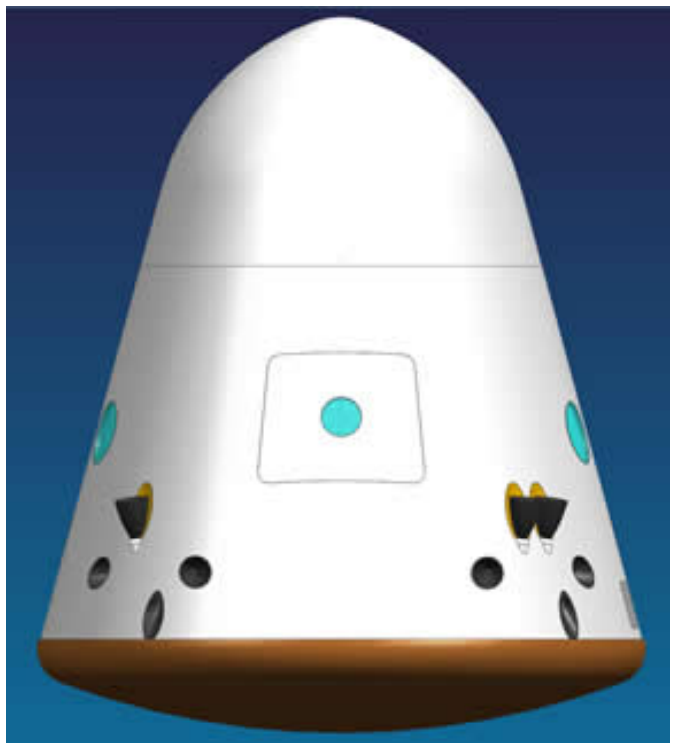


Up to 10 launches per year from Cape Canaveral

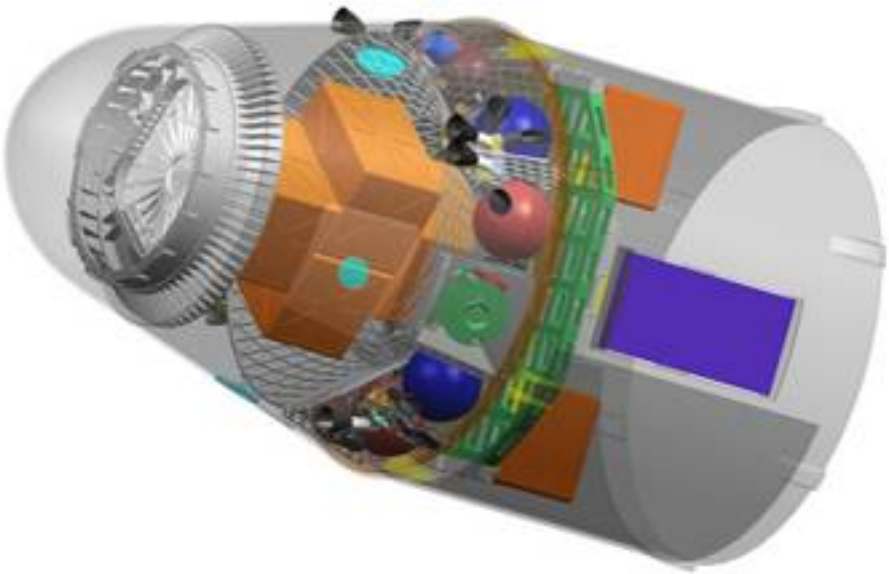
- Integration Flow
  - Cargo loaded into Dragon & trunk in facilities at launch pad
  - Dragon mated to trunk, whole assembly to booster
  - Transported to pad horizontally, then erected
  - Late-load of cargo (10% each type) and/or crew up to L-2 hours
- Launch
  - Injection into 185 x 300 km orbit, hold, trim & separate
  - Dragon phases to ISS & holds outside approach ellipsoid
  - ISS approach => capture & berth
- On-station dwell
  - 2~4 weeks cargo
  - 6 months crewed
- Depart ISS
  - Unberth & execute departure maneuver
  - De-orbit burn, jettison trunk, CAM & re-enter
- Landing
  - Water splash-down initially, transition to land long term
  - Ship recovery
  - Provision for early-access & crew medical facilities
- Crew and/or cargo returned to JSC



Dragon



Dragon



Falcon 9 Overview and Status

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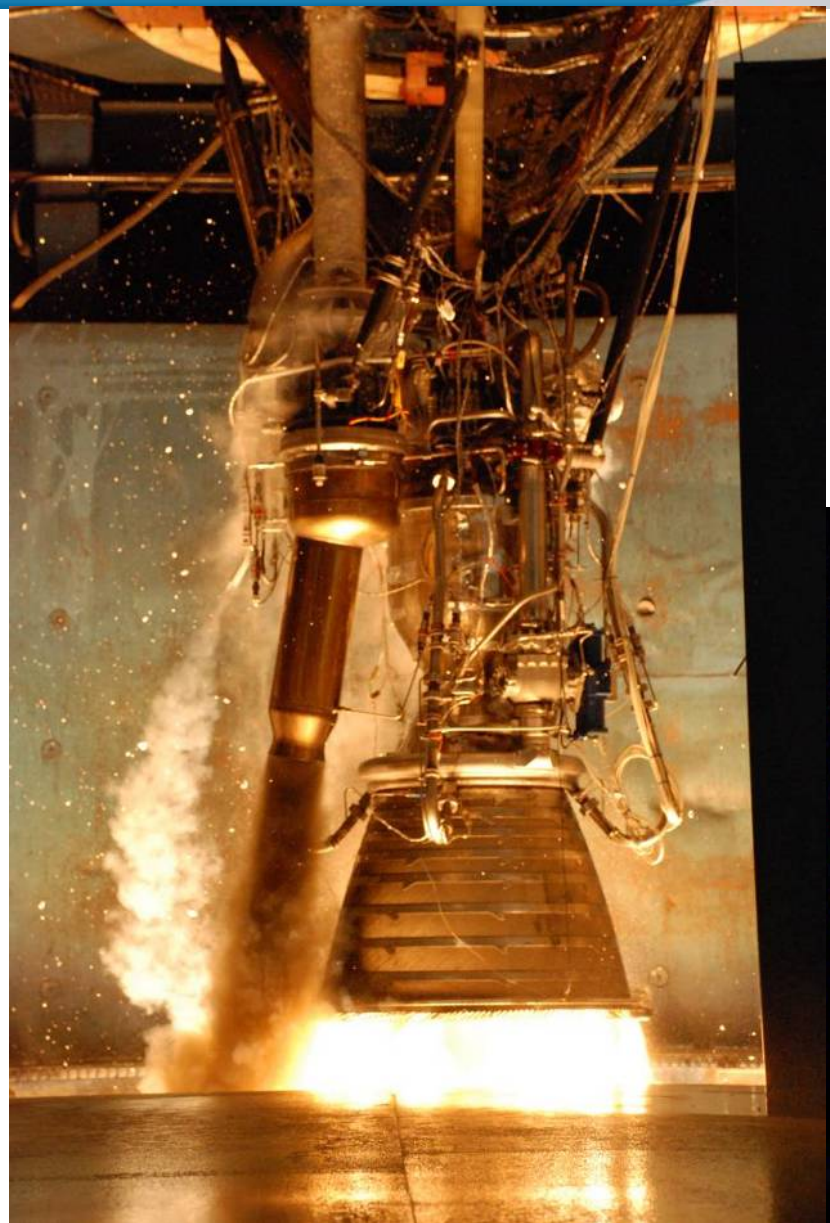


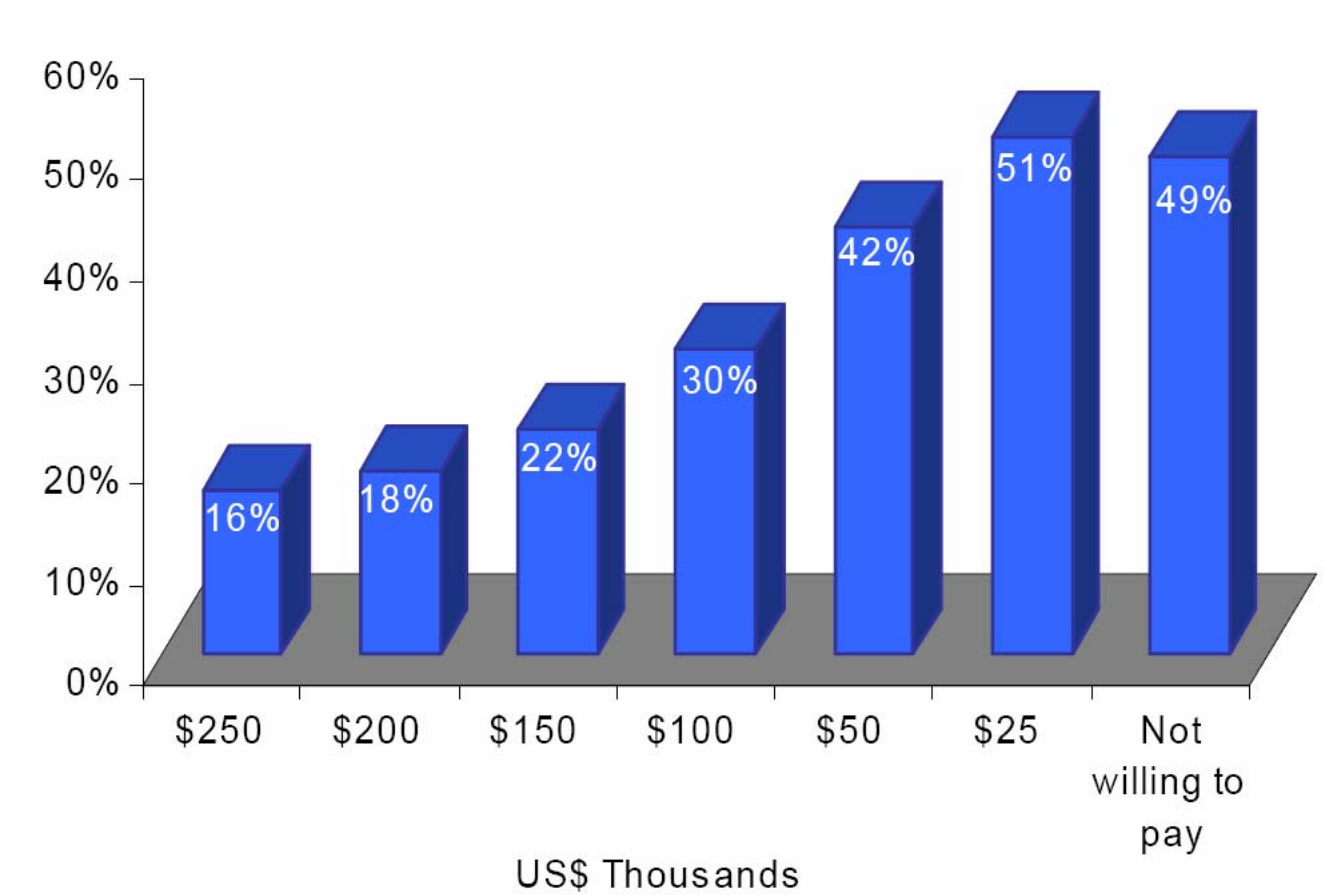
Performance is ten tons to LEO

$35 Million per flight all inclusive

Designed for reliability

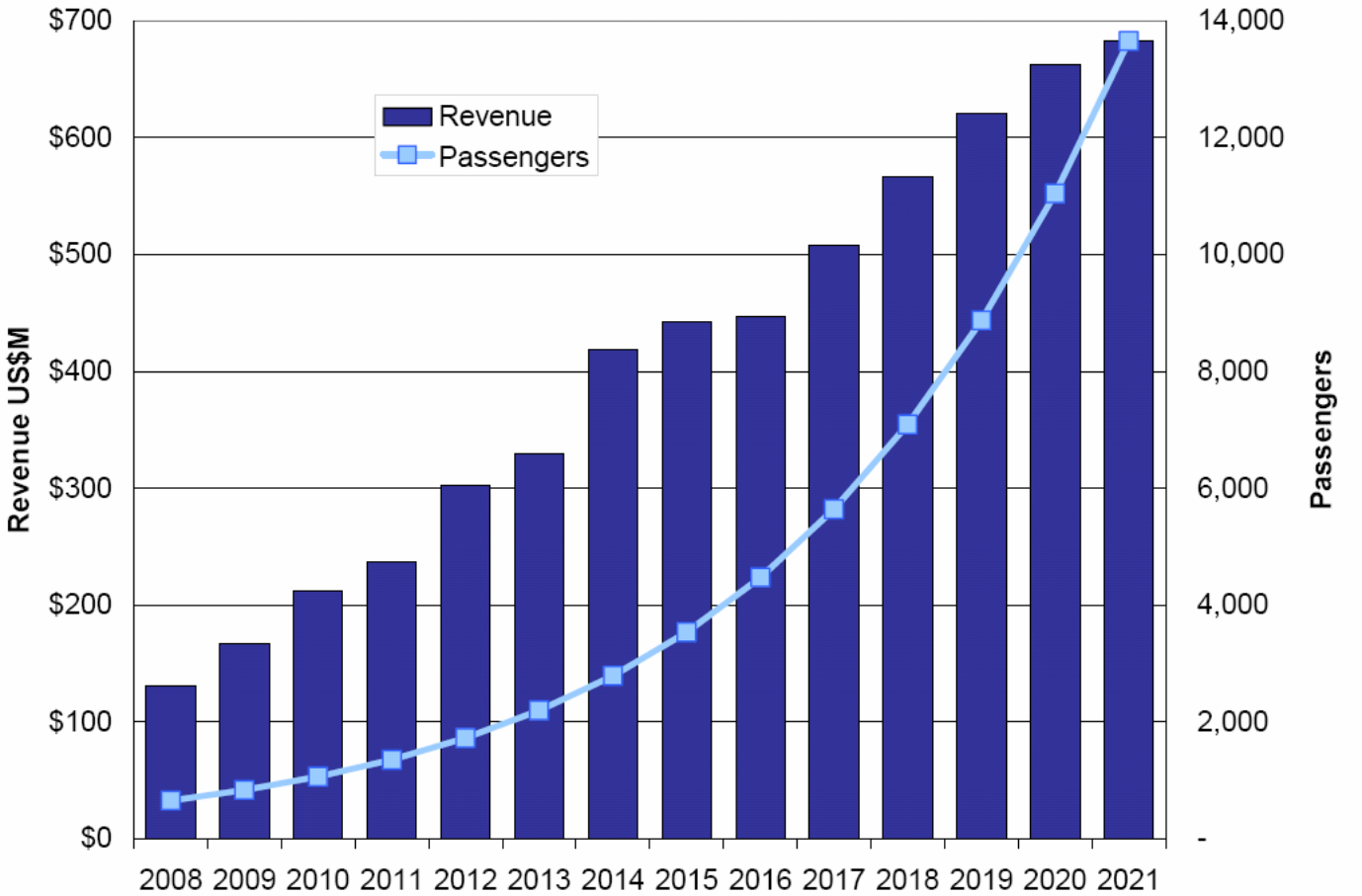
- NASA man-rating factors of safety
- Nine Merlin engines provide engine out reliability similar to Saturn I/Saturn V
- Upper stage also powered by a Merlin
- SpaceX engine production will exceed all US booster engine production combined

Space Tourism – Survey: Willingness to Pay by Price Point



Source: Futron (6/07/06)

2006 Passenger and Revenue Forecast



Source: Futron (6/07/06)

SpaceX Success Serves both National Security and US Economic Stability

- Reliable access to space is critical to national security and will become increasingly more critical to economic stability—commercial procurement supporting National security has deep roots
- Being able to augment capability on short-notice is increasingly important and requires a Responsive launch capability
- It is important for this nation to have domestic vehicles competitive on the international market (not through subsidies)
- It is important for the US to foster emerging providers by not shutting out competition