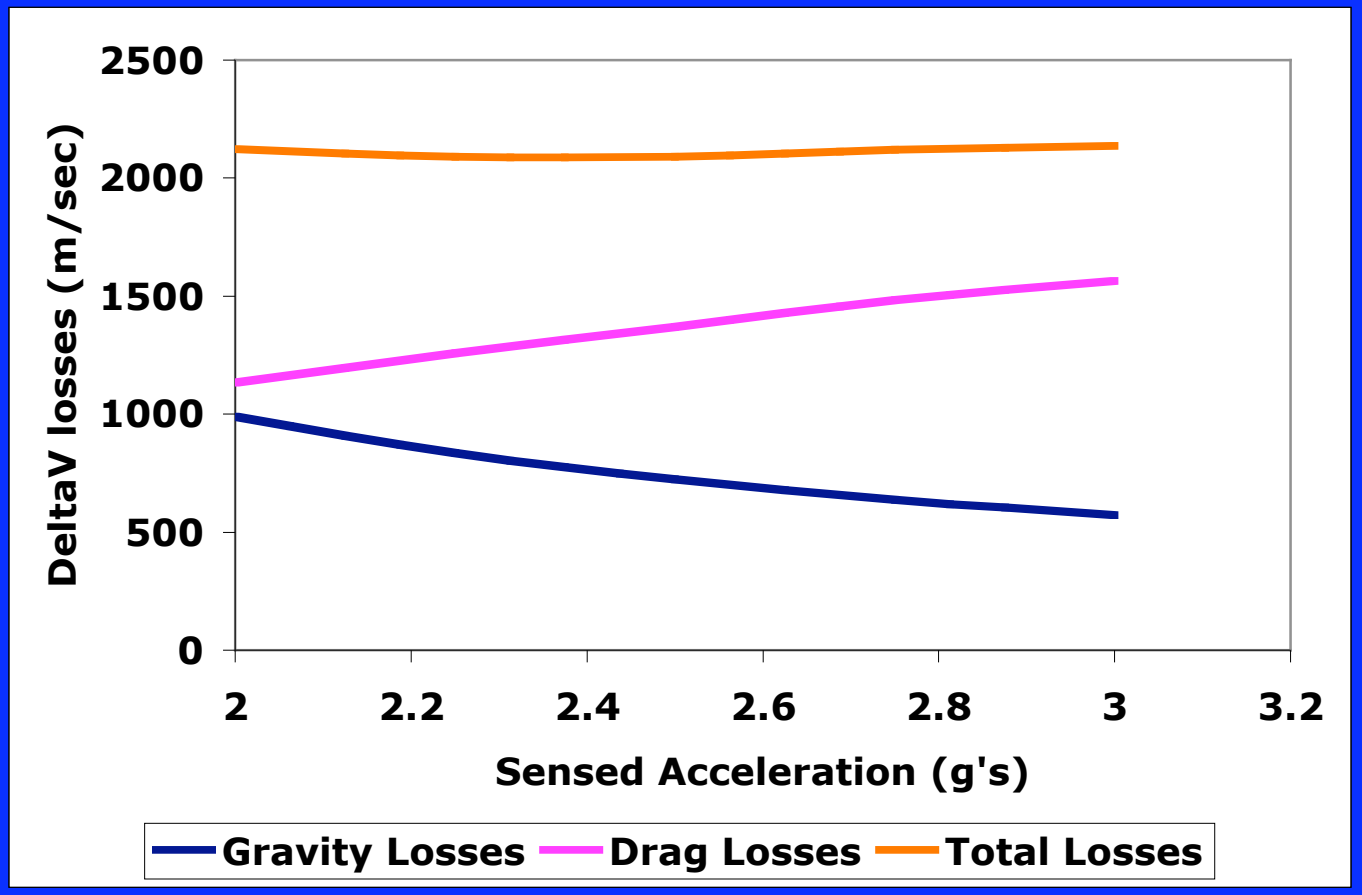
Case Study: The X-Prize

- Overview of requirements
- Underlying physics
- Competitors

X-Prize Rules (synopsis)

- Must be privately financed
- Have to launch with three people (one crew, two passengers) [For flight test purposes, passengers may be replaced by ballast]
- Must reach altitude of 100 km
- Must return to launch site
- Must make two flights within two weeks
- Must be "substantially reusable" (no more than 10% of non-propellant mass replaced between flights)

Minimum Vertical Trajectory - Losses



Advent Launch Services

- Sea launched, vertical rocket flight
- Recovery?
- Plans to scaling to commercial launch

ARCA (Romania)

- Vertical rocket launch
- Parachute recovery into water

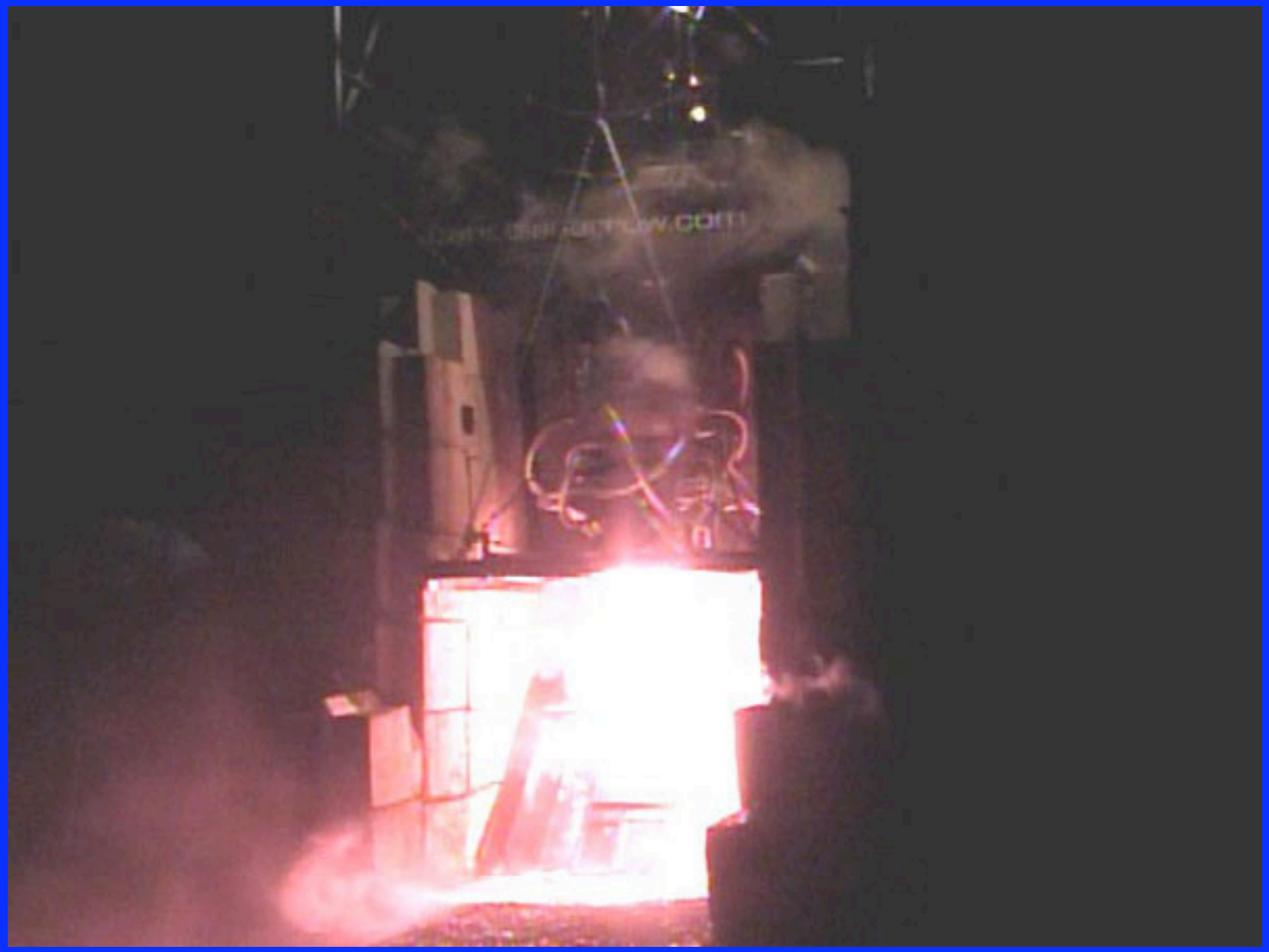
Armadillo Aerospace (Texas)

- Vertical rocket launch (H2O2 monopropellant)
- Parachute recovery onto land
- Sponsored by John Carmack ("Doom")

Arrow (Canada)

- Vertical rocket launch (LOX/alcohol and solids)
- Parachute landing into water
- Modeled on V-2 rocket
- Have performed full-power (57Klb thrust) static engine firings

Arrow 57Klb Thrust Static Test



Da Vinci (Canada)

- Launch from hot-air balloon
- Parachute landing

Da Vinci Prototype

Da Vinci Prototype

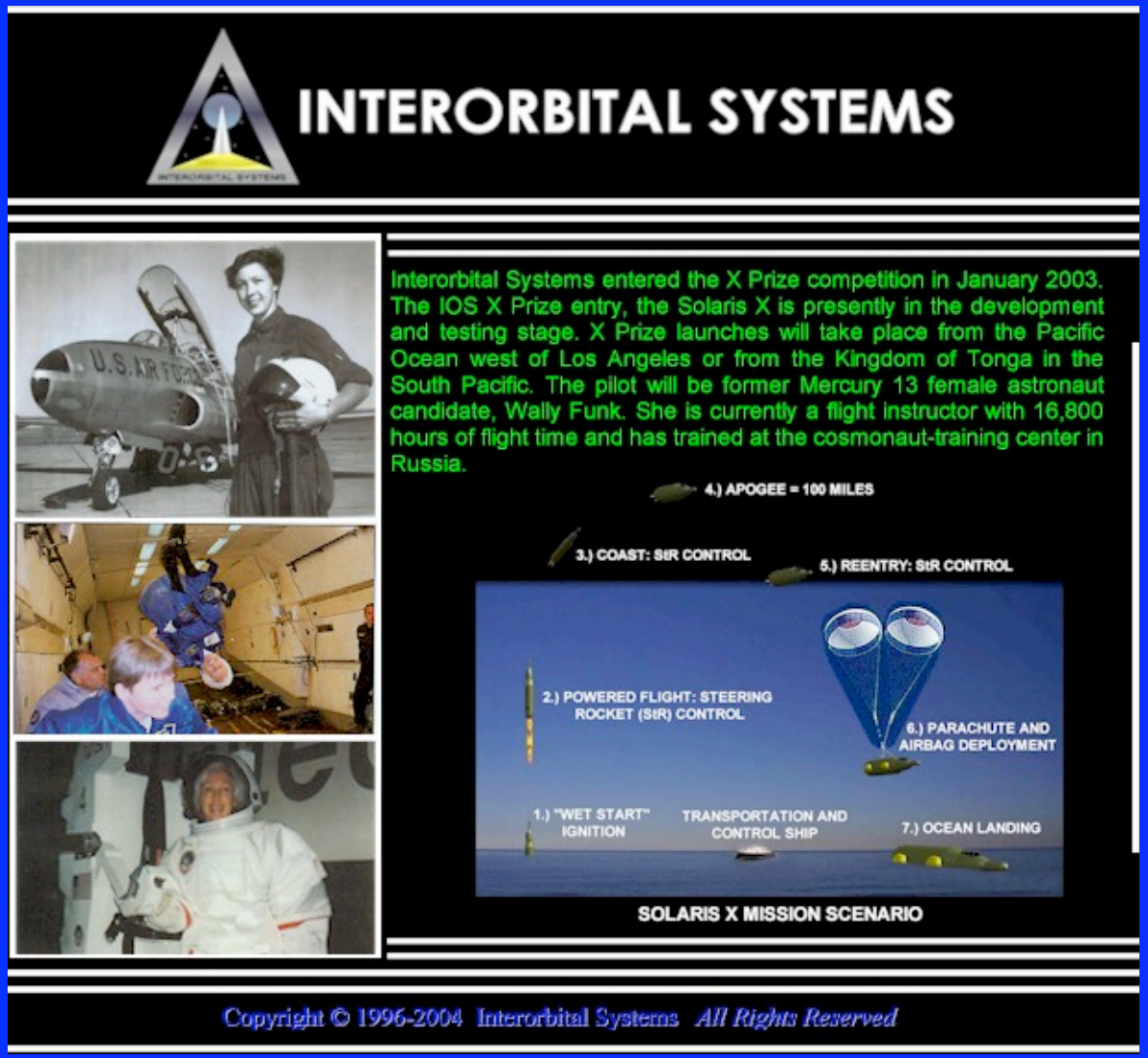
HARC (Alabama)

- Vertical launch from ocean-going barge
- Parachute landing

Interorbital Systems (California)

- Sea launch, vertical rocket
- Parachute landing

Interorbital Systems



Starchaser (England)

- LOX-kerosine vertical launch
- Parachute landing

Starchaser Thunderbird Vehicle Concept

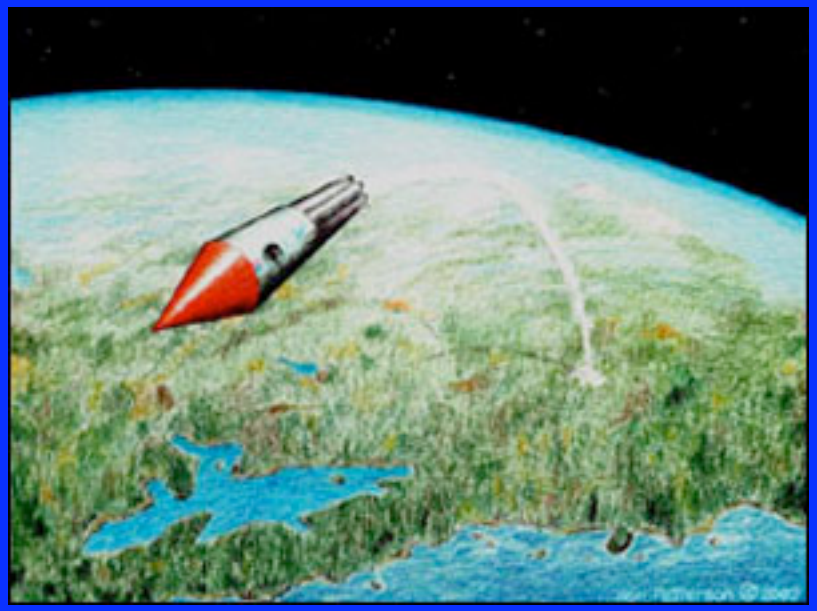
Gauchito (Argentina)

- Hybrid rocket, vertical launch
- Parachute recovery

Pioneer Rocketplane (California)

- Horizontal takeoff (turbojet engines)
- Rocket zoom
- Horizontal landing
- (Out of money)

Space Transport (Washington)



- Vertical rocket launch
- Parachute landing into water
- Static-tested 12Klb solid engine

Scaled Composites (Burt Rutan)

- Two-staged
  - Subsonic air-launched
  - Rocket-powered winged
- Supported by Paul Allen (Microsoft)
- Flown to 106Kft, Mach 1.6

SpaceShip One with Thermal Protection

"White Knight" Launch Aircraft

SpaceShip One

White Knight with SpaceShip One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Feathered Entry Configuration