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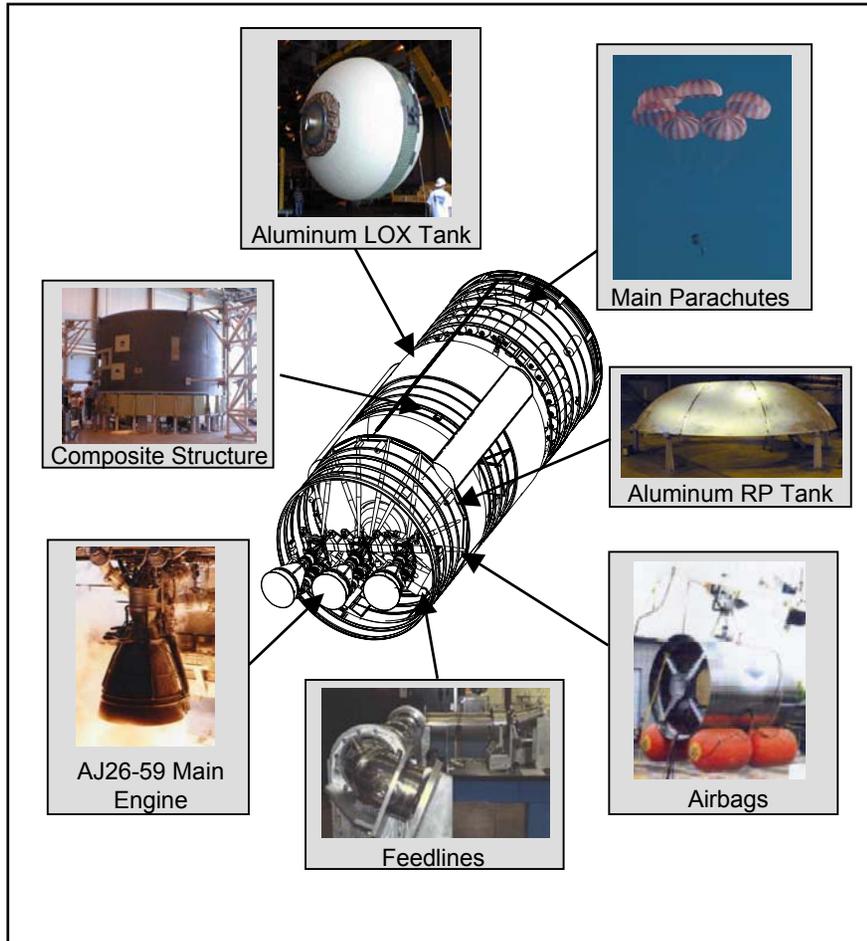
2003 Small Payload Rideshare Conference

**Kennedy Space Center
June 10 – 11, 2003**

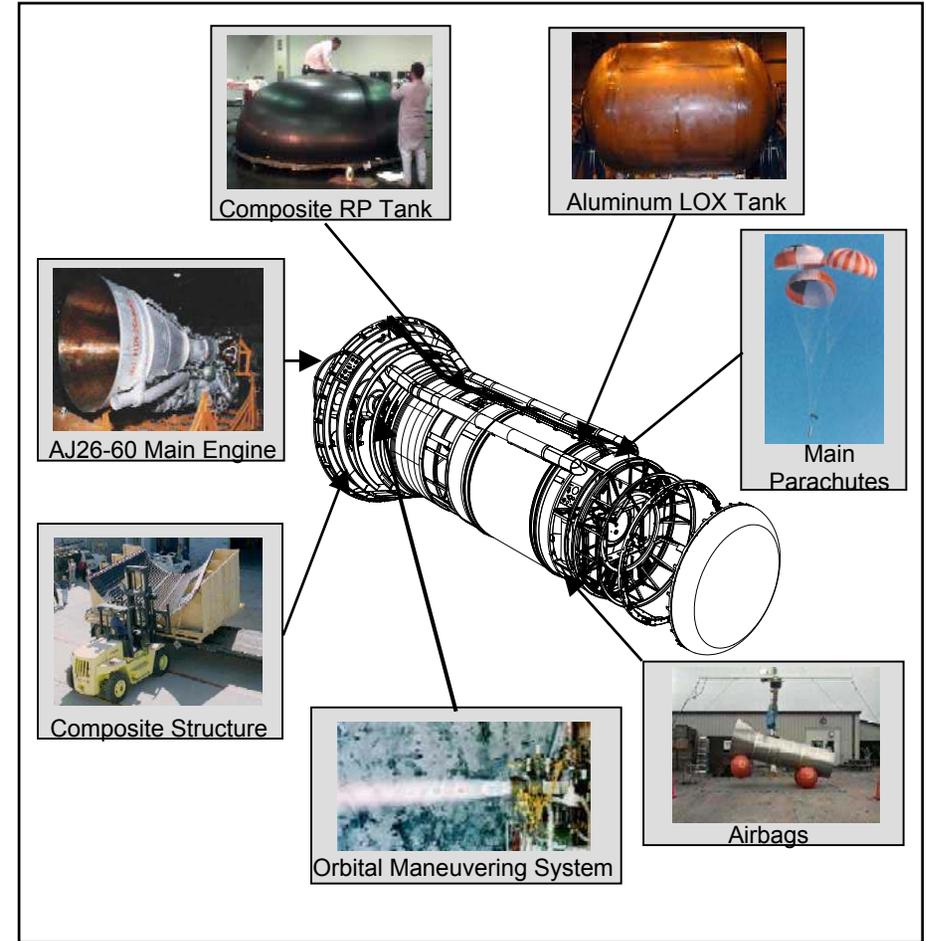
**Debra Facktor Lepore
Director of Marketing**

K-1 Vehicle Fabrication 75% Complete

The Future Is Reusable Aerospace Vehicles



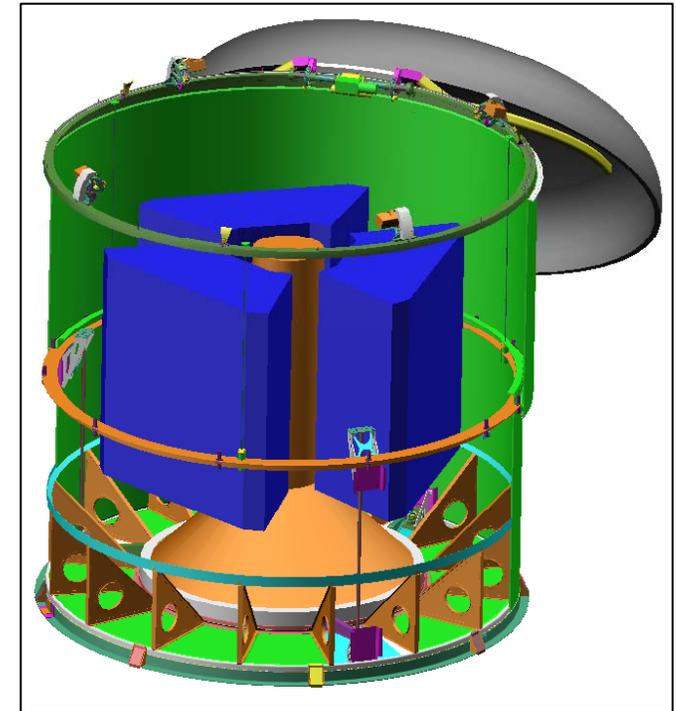
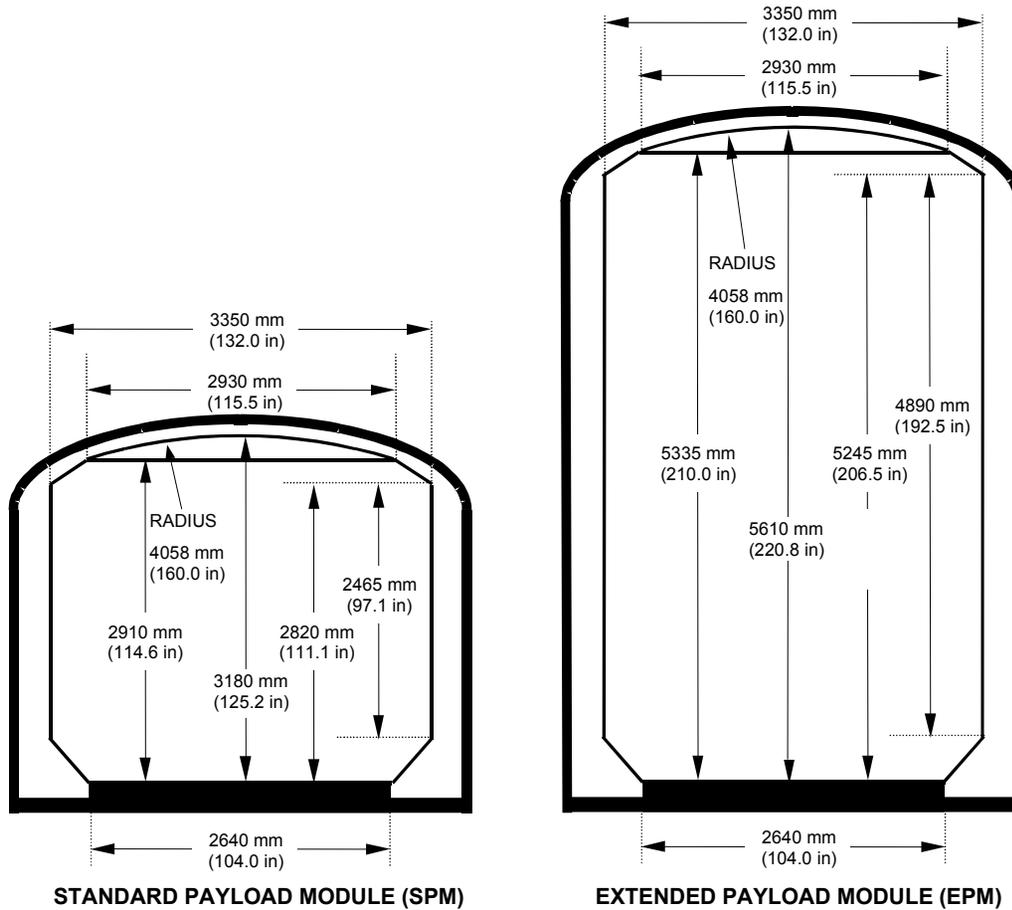
K-1 First Stage ("Launch Assist Platform")



K-1 Second Stage ("Orbital Vehicle")

K-1 Payload Modules

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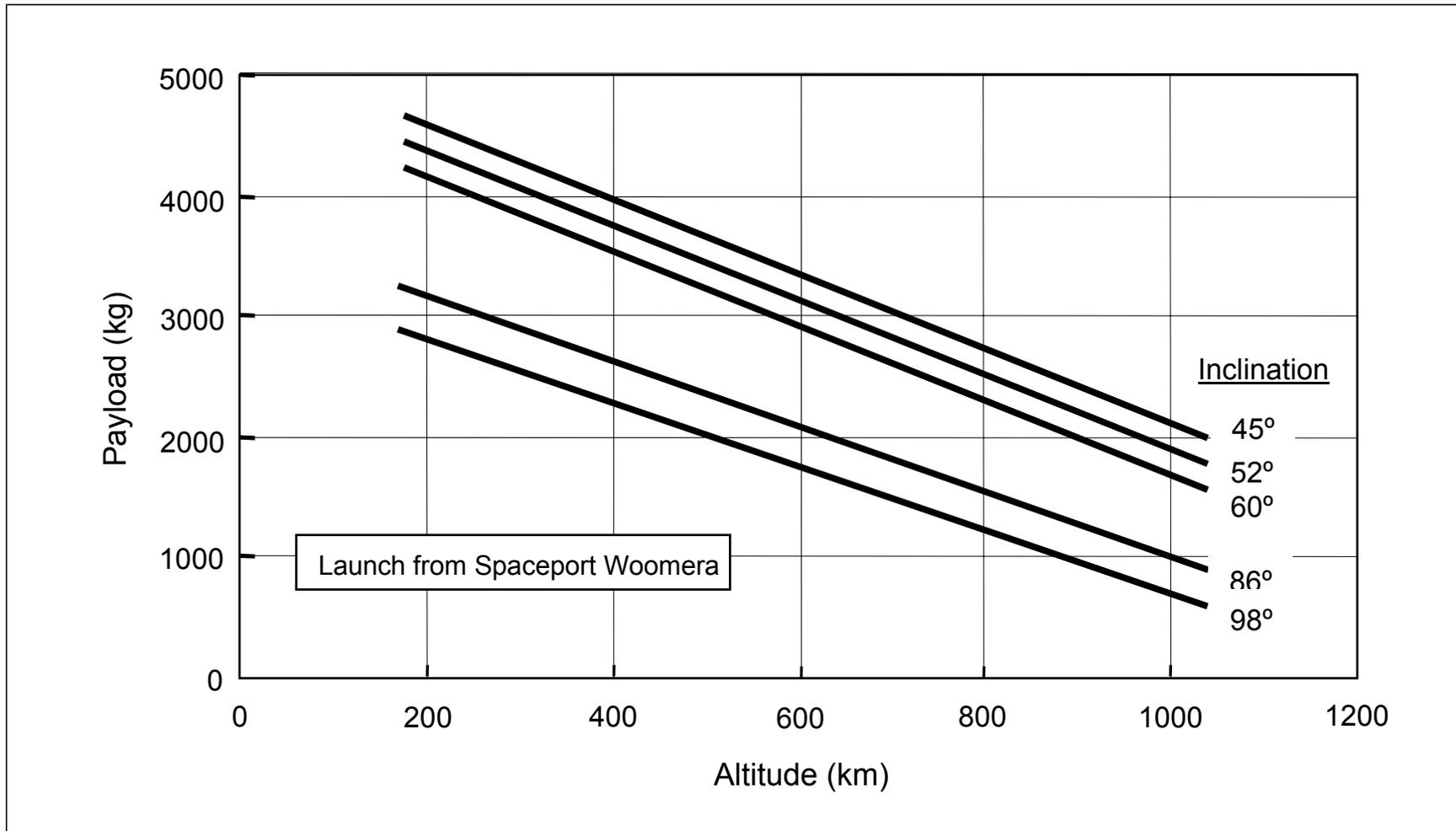


**K-1 PAYLOAD MODULE
SHOWN WITH
MULTIPLE SATELLITES**

Interchangeable Payload Modules and Cargo Module
Enable Customer and Market Flexibility

LEO Performance Standard Payload Module

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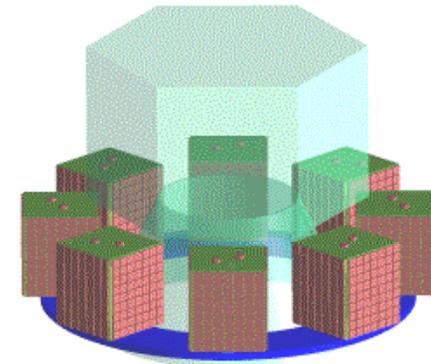


Multiple Small Satellite Delivery

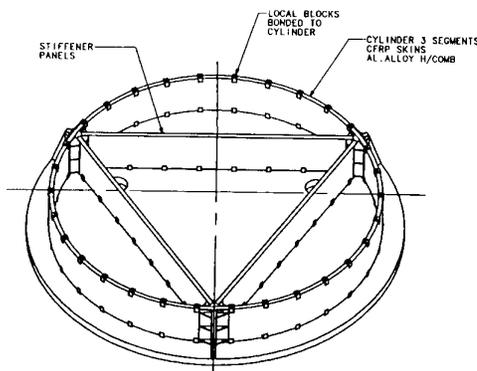
The Future Is Reusable Aerospace Vehicles

- K-1 approach for small satellite missions
 - Use reusable multiple payload adapters (MPAS) with standard interfaces and envelopes (designed by Astrium and derived from Ariane)
 - Carry multiple small satellite customers to common “popular” orbits on regular, dedicated flights

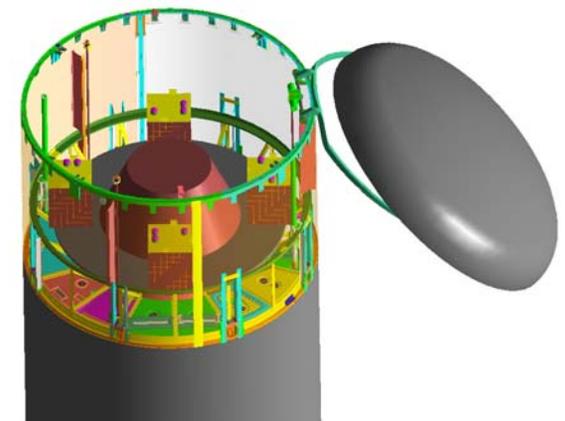
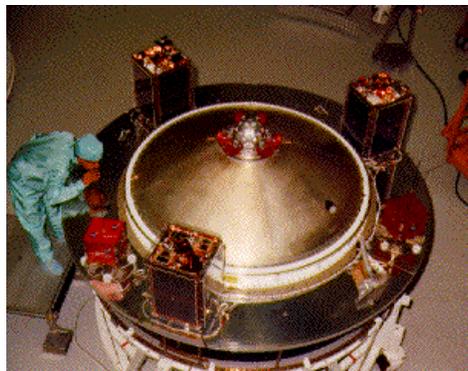
- Examples
 - Up to 3 minisatellites (<500 kg each) on dedicated flight
 - Up to 8 microsattellites (<125 kg each) plus primary



8 Microsatellites with Primary Payload



K-1 MPAS Modeled after Ariane 4 Adapter



4 Microsatellites in K-1 Standard Payload Module



NASA SLI Flight Demonstrator Contract Enables Full Flight Regime on K-1 for Testing Experiments

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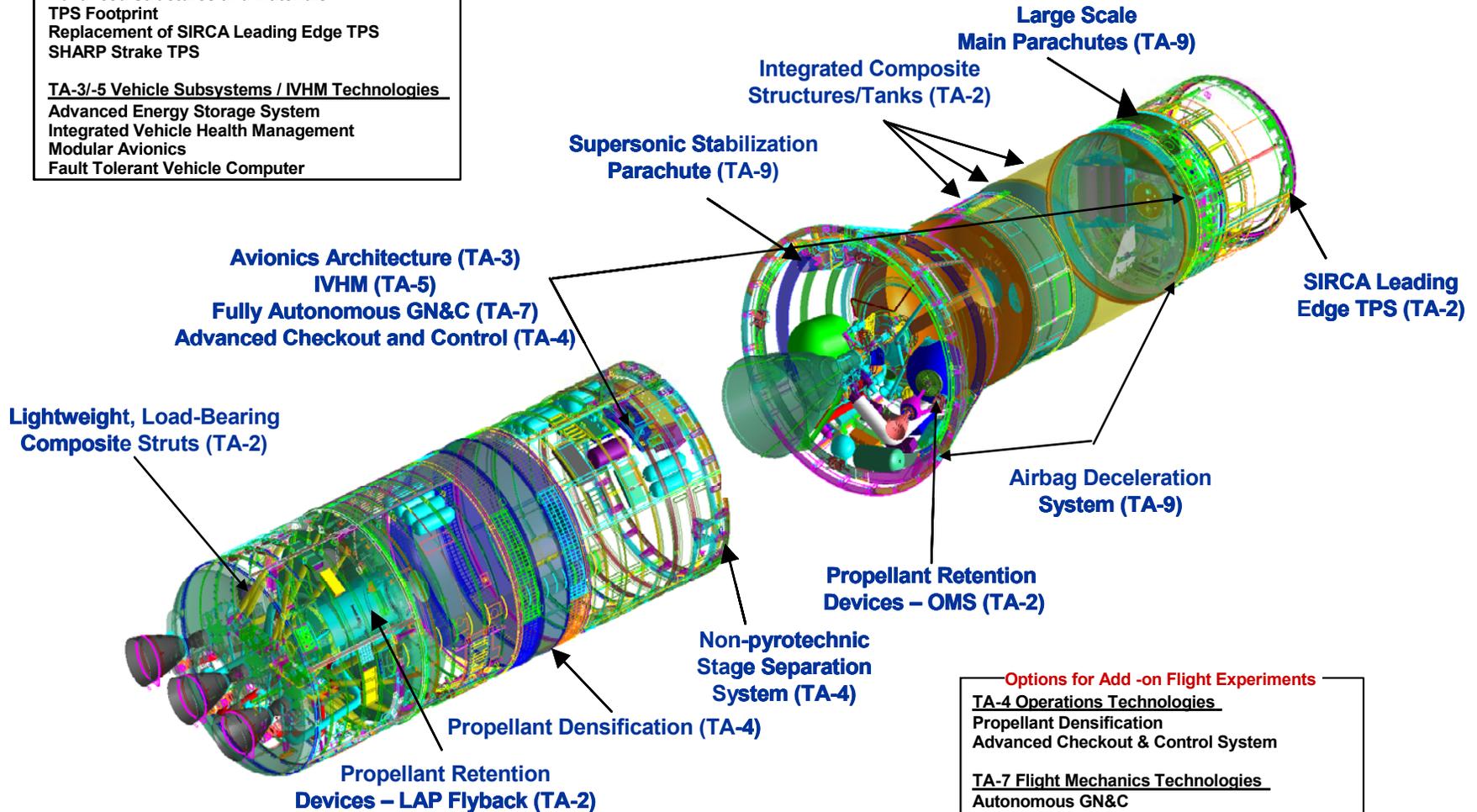
Options for Add -on Flight Experiments

TA-2 Airframe Technologies

- Advanced Metallic TPS
- Advanced Structures and Materials
- TPS Footprint
- Replacement of SIRCA Leading Edge TPS
- SHARP Strake TPS

TA-3/5 Vehicle Subsystems / IVHM Technologies

- Advanced Energy Storage System
- Integrated Vehicle Health Management
- Modular Avionics
- Fault Tolerant Vehicle Computer



Options for Add -on Flight Experiments

TA-4 Operations Technologies

- Propellant Densification
- Advanced Checkout & Control System

TA-7 Flight Mechanics Technologies

- Autonomous GN&C
- Autonomous Rendezvous & Proximity Ops

TA-9 NASA Unique Technologies

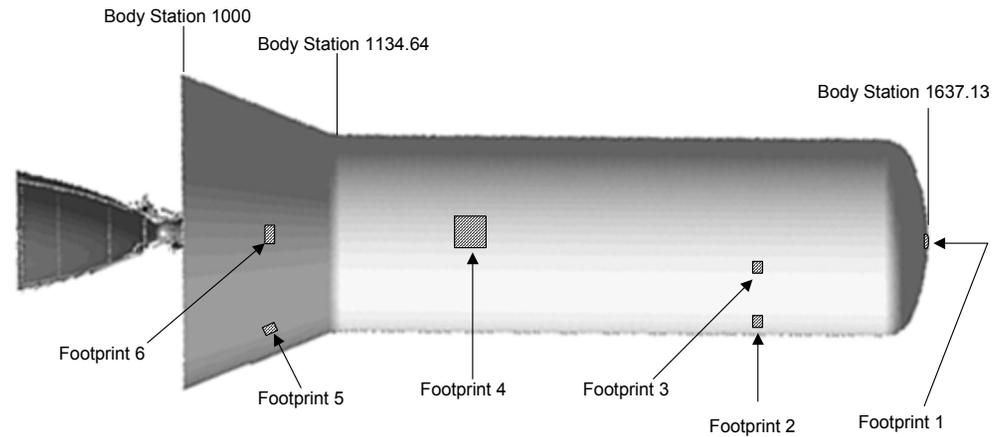
- Landing Systems

Rideshare Available on NASA Flights

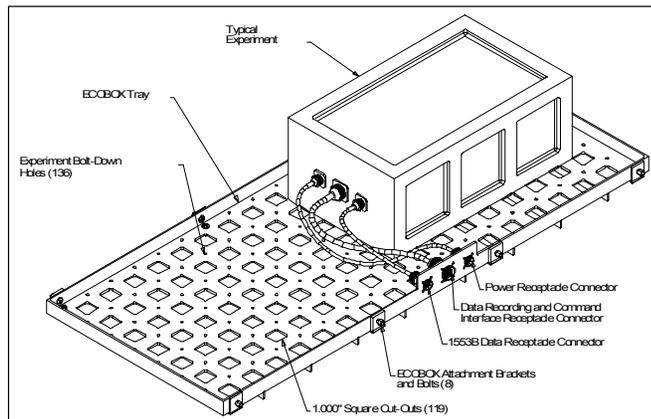
Experiments are Exposed to Full Flight Environment

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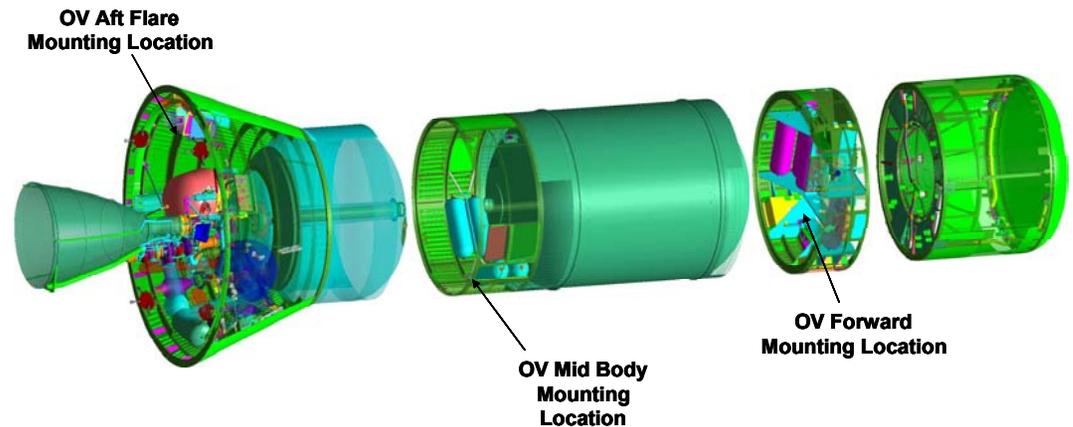
- Variety of experiment locations
- Standard experiment interfaces and integration approach



Externally Mounted (Passive) for TPS and Advanced Materials



Experiment Containment Box (ECOBBOX)



Internally Mounted (Active) for Avionics and Microgravity

K-1 Microgravity Missions

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K-1 Second Stage (OV)

- 22 hour (10^{-5} g) microgravity
- Fills niche between sounding rockets and Shuttle/ISS



K-1 First Stage (LAP)

- 150 second (10^{-4} g) microgravity
- Comparable to sounding rockets



Scientific Experiments Need Access to Space,
Especially those Planned for Shuttle Research Missions

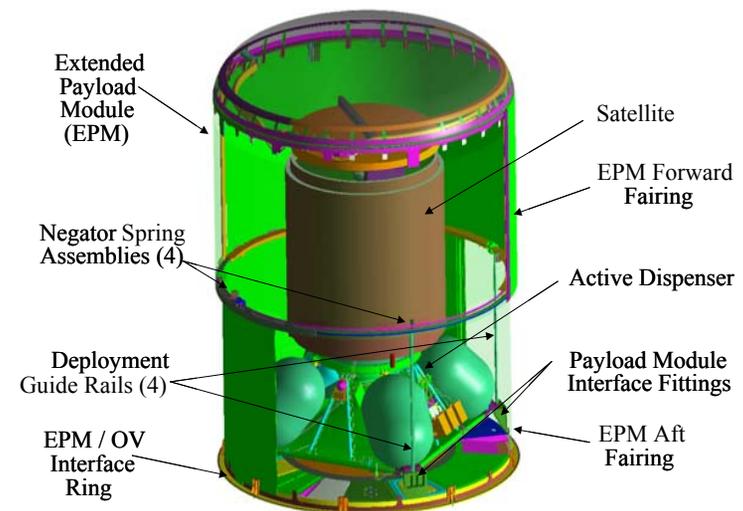
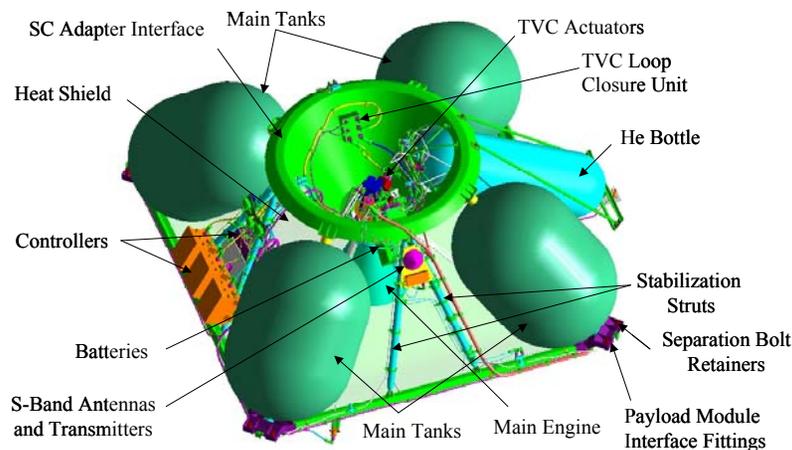
K-1 Active Dispenser for High Energy Missions

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- Active Dispenser expands K-1 performance beyond Low Earth Orbit
 - Medium earth orbits
 - Geosynchronous transfer orbits
 - Interplanetary
- Aimed at small GEO satellites (~1,570 kg to GTO)
- Same operational flexibility as low earth orbit missions
- Preliminary design complete



Target Market is Boeing 376 Class

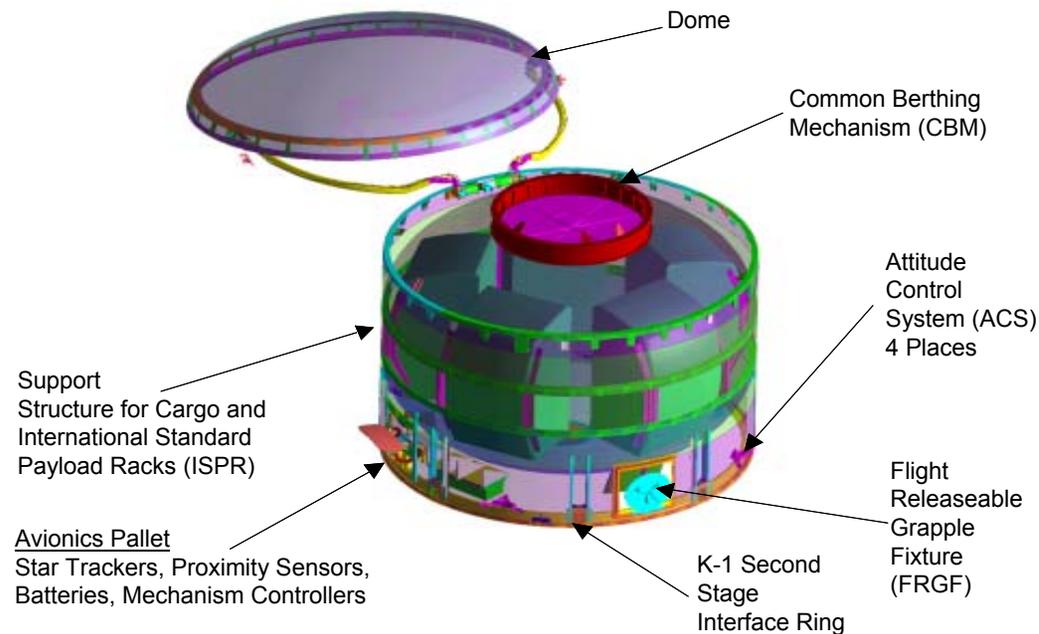
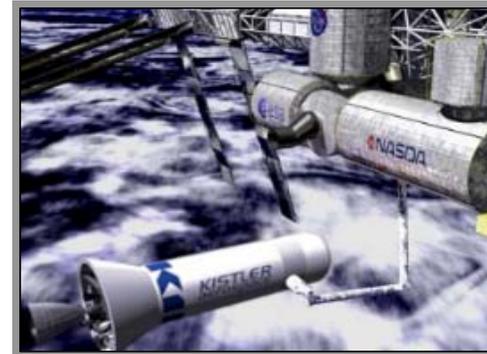


Active Dispenser Mounts inside EPM

K-1 Resupply and Boost Missions to ISS

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- 3200 kg cargo delivered
- 900 kg cargo recovered
- 30 m³ of cargo volume
- Up to 40 km reboost
- Berth to U.S. node

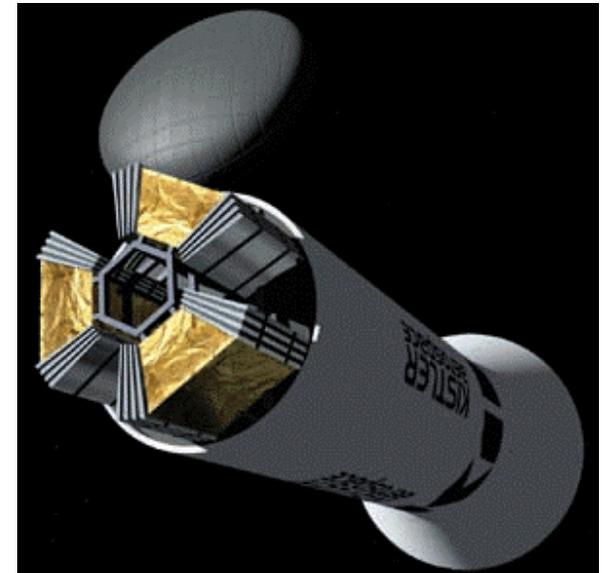


K-1 Inherent Reusability Gives the U.S. Another Capability to Recover Cargo

“Ticket-to-Orbit” Concept

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- Regularly scheduled departures for small satellites to popular orbits
- Traditional Launch Services → Charter Aviation Business Model
- “Ticket-to-Orbit” → Airline Business Model
- Sell “tickets” for slots on dispenser (e.g., MPAS)
- Benefits
 - Share the price among multiple customers
 - Eliminate worry of finding rideshare
 - Promote advance planning through regulars
 - Expand small satellite ridesharing opportunities





For more information...

The Future Is Reusable Aerospace Vehicles

**K-1 VEHICLE
PAYLOAD USER'S GUIDE**

May 2001

**K-1 VEHICLE TA-10 FLIGHT
EXPERIMENT DESIGN AND
REQUIREMENTS DOCUMENT**

May 2003

Available at www.kistleraerospace.com