Blue Origin
Research & Education Missions:
An Overview

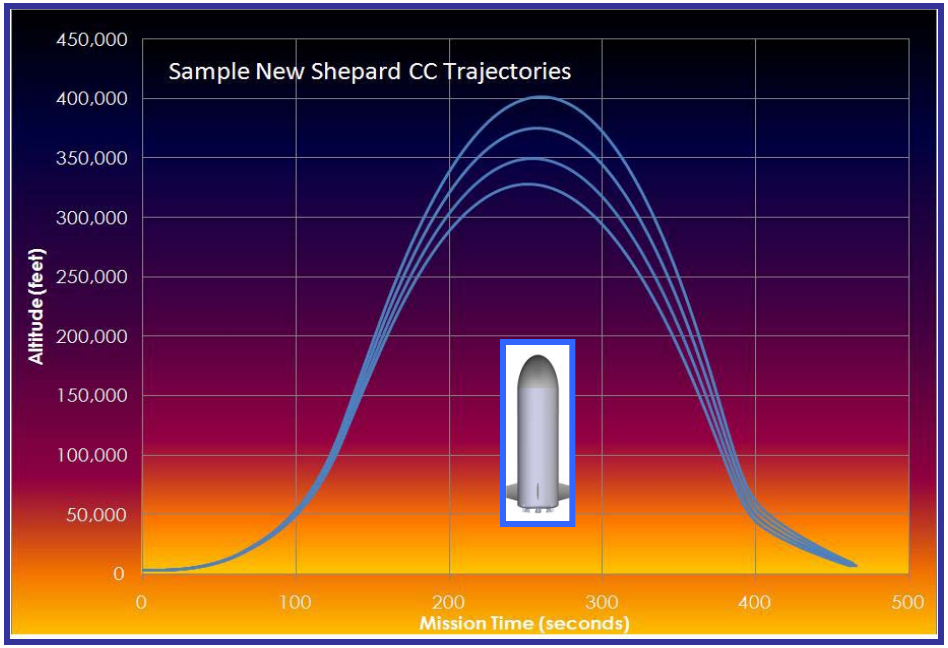
Alan Stern/16 October 2010

Blue Origin is an aerospace company building a suborbital vehicle for research and space tourism.

Blue Origin is based outside Seattle in Kent, Washington.

Blue Origin is developing the *New Shepard* suborbital capsule to routinely fly multiple astronauts into suborbital space at competitive prices.

***New Shepard* vehicle will provide frequent opportunities for researchers to fly experiments into space & the microgravity environment.**



Suborbital Flight testing of Low-Altitude *Goddard* Vehicle

Attribute	*New Shepard* Vehicle Capability
Crew/Payload Capacity	3 or more astronauts and/or racks
Experiment Mass	120 kg per position (including rack)
Windows	One per crew position
Power	28 VDC provided
In-Flight Communications	Recorded voice, and low-data rate link for experiment TM and control
Data Recording	Post-flight download of trajectory parameter measurements
Microgravity Levels	<0.003 Gs in Coast
Pointing Accuracy	±5° per axis during coast
Turning Capability	Yes

Significant REM Advantages Of *New Shepard* Suborbital Program

- **Higher Launch Rates:** Up to 52 flights/year allows fast response learning curves for experimenters & frequent observation opportunities.

- **Launch Affordability**: Much lower cost access to space than $2M-class standard NASA sounding rockets.

- **Experiment Affordability**: Simpler integration flow than Shuttle or robotic rockets—more like Zero-G aircraft. Simpler, lower cost, higher reliability operations afforded by flying a human operator in space with the experiment.

- **Direct and frequent access to the "ignorosphere."**

- **Gentler Ascent and Entry than Sounding Rockets.**
  - *New Sheppard* vehicle's ascent and entry G-loads are less than half that of a standard Black Brandt or Taurus-Orion flight.
  - Opens important new applications, such as recovering fragile samples.

Investigation Types	Example Applications
Remote Sensing	Atmospheric science Solar and Earth observations
In-Situ Science	Atmospheric sampling Magnetospheric measurements Ionospheric measurements
In-Cabin Science	Physiology Gravitational biology Microgravity physics
Instrument Test/Demonstrations	Gain flight experience Raise TRLs
Education & Public Outreach (EPO)	Science demos Interviews Reality programming Science fair experiments

- Blue Origin plans to fly 3 ‘beta’ research groups to develop and improve its service to researchers.

- We are actively working with these pathfinder groups now in developing our:
  - Cabin Payload System
  - Payload Users Guide
  - *REMConfig* Software
  - ICD, Safety, LSI, etc. processes

- Goals: Create a more efficient, and user-friendly experience for future researchers, learn lessons to apply to operational era, better understand REM-associated processes.

Blue's REM Pathfinder Payloads

Three-Dimensional Critical Wetting Experiment in Microgravity

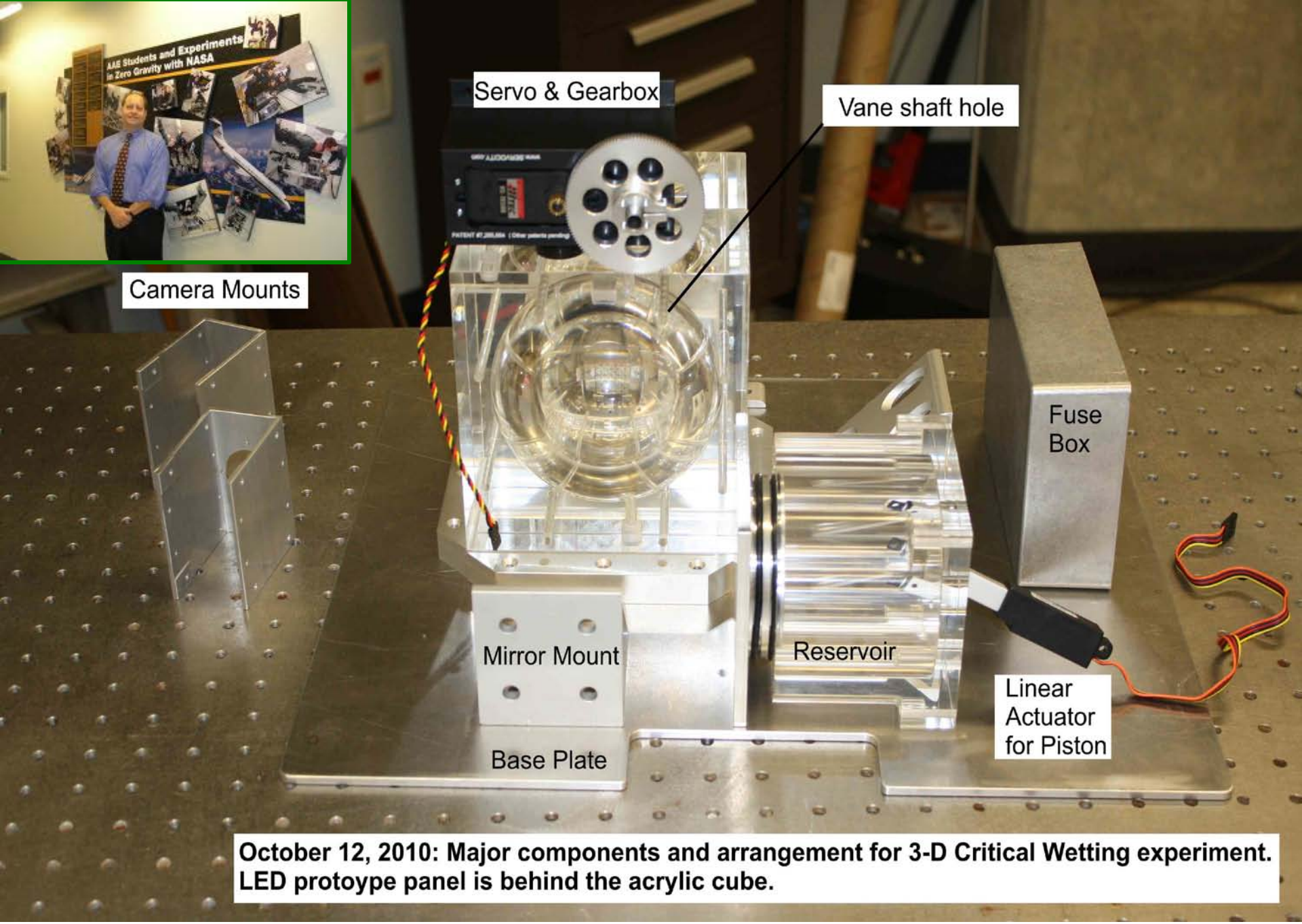
- **PI: Steven Collicott, Ph.D., Purdue University, Indiana**
- **Funded by: The National Science Foundation**

MEDEA: Microgravity Experiment on Dust Environments in Astrophysics

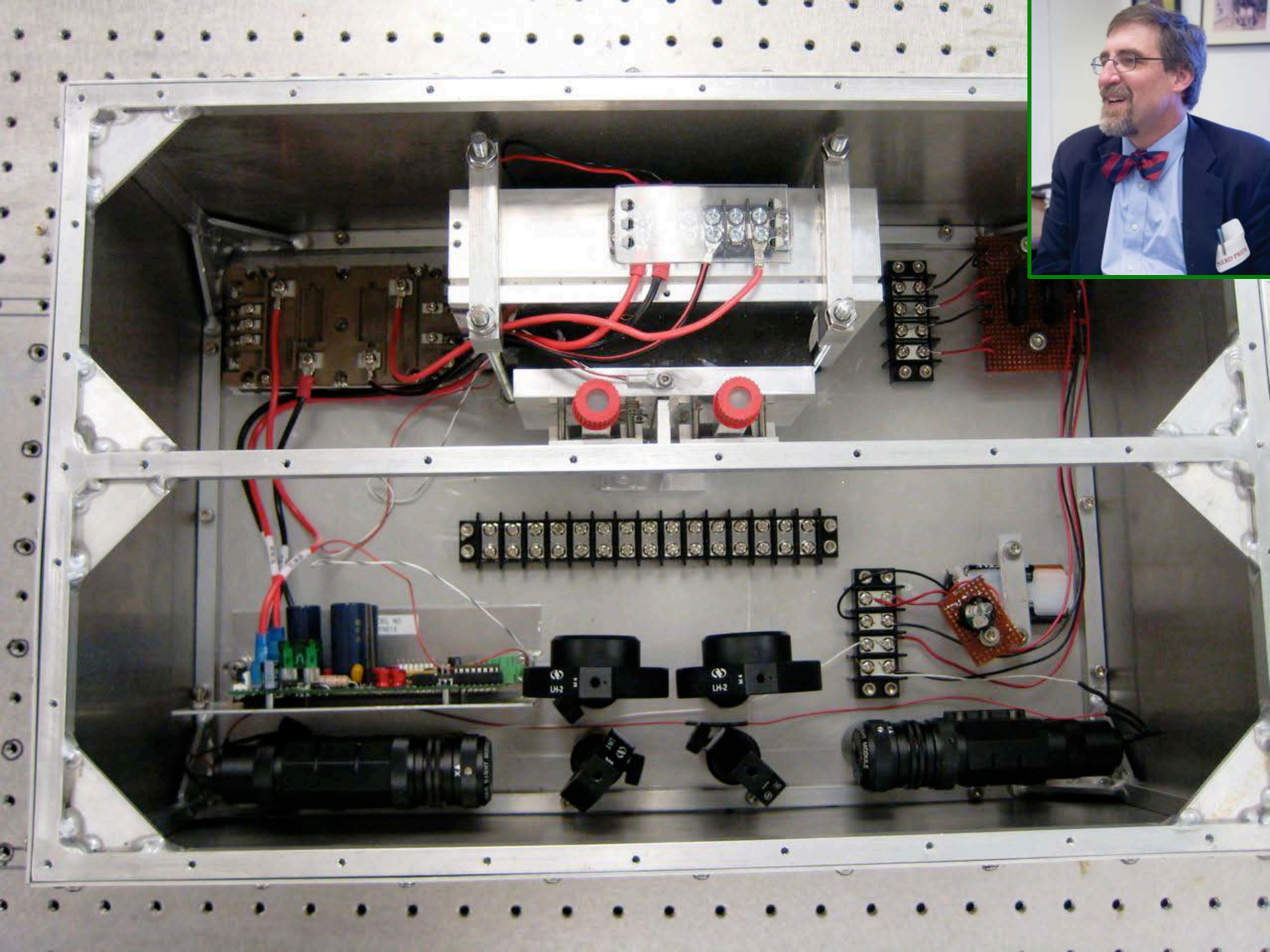
- **PI: Joshua Colwell, Ph.D., University of Central Florida**
- **Co investigators:**
  - **Daniel Durda, Ph.D., Southwest Research Institute, Colorado**
  - **Professor Jürgen Blum, Instiut für Geophysik und extraterrestrische Physik Technische Universität, Braunschweig, Germany**

EITIC: Effective Interfacial Tension Induced Convection

- **PIs:**
  - **John Pojman, Ph.D., Louisiana State University**
  - **Patrick Bunton, Ph.D., Jewell College, Missouri**



October 12, 2010: Major components and arrangement for 3-D Critical Wetting experiment. LED protoype panel is behind the acrylic cube.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What Can These New Capabilities Do for Space Grant?

- How can we enable new science, new teaching opportunities, and new student experiences by flying frequently, and at low cost?
- What could you do with small payloads? Large payloads?
- How can we further lower costs by reducing automation and flying researchers on flights?

Think about this new, 21st-century way of conducting in-space experiments and demonstrations, and tell us what vehicle characteristics and accommodations you need.