Commercial Space Research Opportunities

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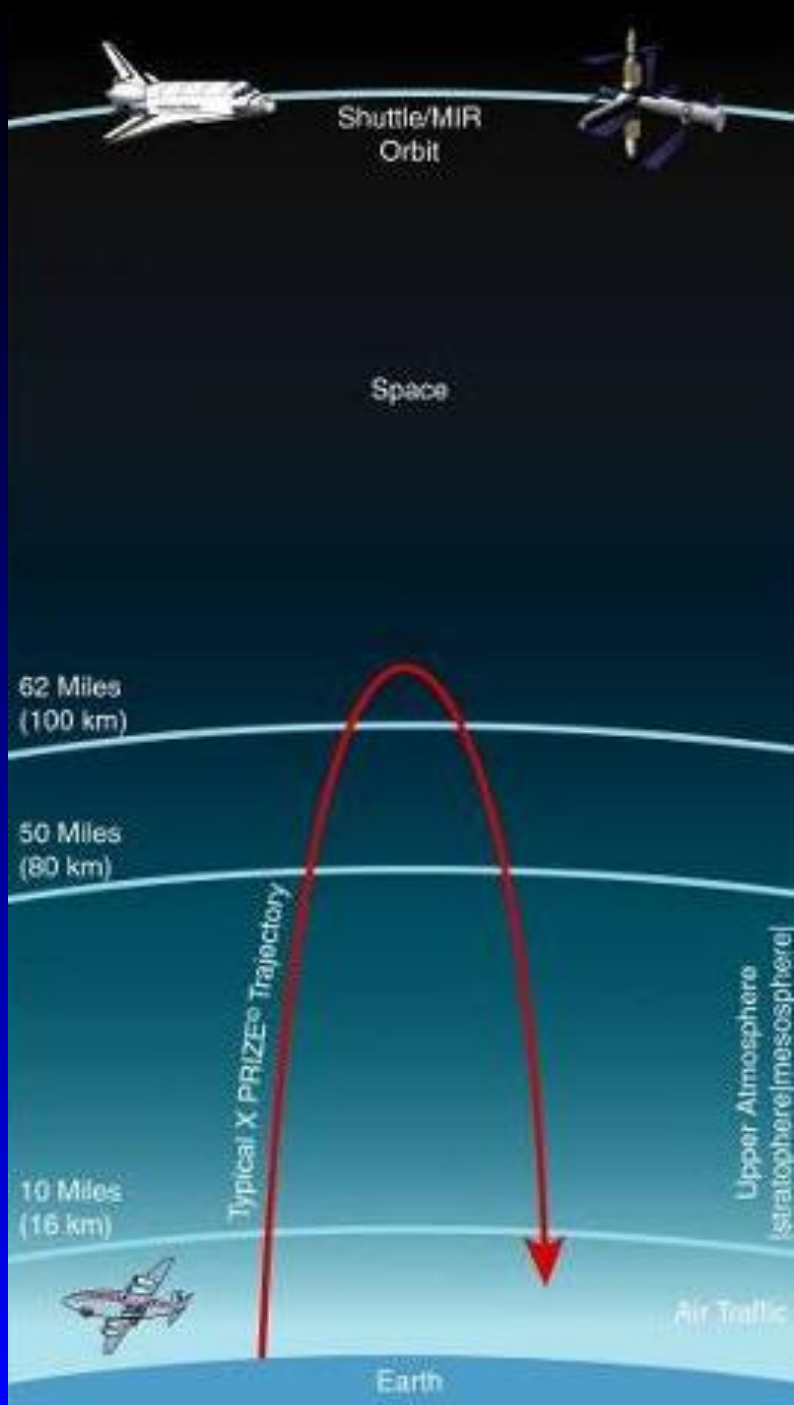
Scope of Opportunities

- **Commercial access to ISS**
  - SpaceX, Orbital
- **Commercial free-flyers**
  - SpaceX DragonLab, Bigelow
  - Excalibur Almaz
- **Suborbital**
  - Crewed: Virgin Galactic, Blue Origin, XCOR
  - Uncrewed: Armadillo, Masten, sounding rockets
- **Atmospheric**
  - Rockets: Armadillo, Masten
  - Aircraft: ZERO-G, F-104, WhiteKnightTwo
  - Other: Red Bull Stratos
- **Ground assets**
  - NASTAR, spaceports, international equivalents



Next-Generation
Suborbital
Researchers
Conference

18-20 Feb 2010 Boulder, CO

SwRI CSF USRA

Co-chaired Life Sciences sessions with MVL alum Mark Shelhamer, JHU

Sutton J. P. *

National Space Biomedical Research Institute and Space Life Science Research

Young L. R. *

Life Science Opportunities in Suborbital Flight

Black F. O. * Shelhamer M.

Potential Life Science Projects for Sub-Orbital Flights: Bridging the Gap Between Applied and Basic Research

Clark J. B. * Pilmanis A. A. Murray D. H. Turney M. Bayne C. G. Bagian J. P.

Medical Support for a Manned Stratospheric Balloon and Freefall Parachute Flight Test Program

Cuttino C. M. *

Medical Considerations for Suborbital Spaceflight Operations

Komatireddy R. * Casey S. C. Wiskerchen M. Damle A. Schmidt M. A. Reiter B.

The Development of a Novel Infrastructure for Biomedical Monitoring of Space Participants

Charles J. B. * Richard E. E.

Acquisition of a Biomedical Database of Acute Responses to Space Flight During Commercial Personal Sub-Orbital Flights

Karmali F. * Shelhamer M.

An Agenda for Sensorimotor Research in Sub-Orbital Flight

Wall C. *

Use of Suborbital Flight to Elucidate the Role of Tonic Otolith Stimulation Due to Gravity in Balance Testing and Orientation Tasks

Zeffiro T. * Zhang Q. Strangman G.

Brain Hemodynamic Changes Measured With Near-Infrared Spectroscopy During Altered Gravity

Goodwin T. J. * Albrecht T. B. Schmidt M. A. Goodacre R. Sharina I. Murad F.

3-D Human Tissues as Surrogates for Research into Human Cellular Genomics, Proteomics, and Metabolomics During Suborbital Space Flight

Todd P. * Kurk M. A. Vellinger J. C. Boling R. E. II

Dynamic Microscopy in Suborbital Flight

Hurlbert K. M. *

Environmental Control and Life Support for Human Space Vehicles – Micro/Partial-Gravity Testing Needs

Chappell S. P. * Norcross J. R. Gernhardt M. L.

Results and Lessons Learned from Performance Testing of Humans in Spacesuits in Simulated Reduced Gravity

Key areas of suborbital interest

1. Fundamental gravitational research (ASGSB, NSBRI)
   - Typically basic research in humans, animals, cells, plants
2. Bioastronautics (HRP, ISGP, AsMA, NSBRI)
   - More applied research, often for NASA exploration needs
   - Key opportunities in sensorimotor and cardiopulmonary
3. Medical operations and human factors (HRP, HFES)
   - Flight testing and qualification of procedures and hardware
4. Medical research enabled by diverse flyers (NIH)
5. TRL maturation for orbital research hardware
6. Student engagement and training
7. Astrobiology