Using Micro Rovers as Space Explorers

Dr. Robert O. Ambrose
NASA JSC
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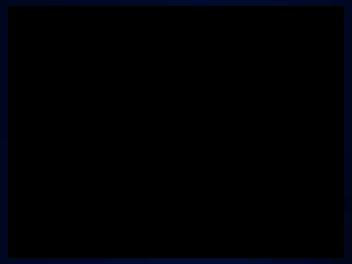
National Robotics Initiative (NRI)

NSF, NASA, NIH, USDA

President Obama, June 2011

Recent NASA Robots

- **Mars Science Lab**
- **ATHLETE**
- **Centaur**
- **Robonaut**



Exploration Strategy

- **Explore**
  - **To investigate systematically**
  - **To search or travel into for discovery**

- **Strategy:**
  - **Selecting the best tactics for victory**
  - **Using all the forces of a nation to execute an approved plan**

Space Explorations Tactics

- **Look through a telescope**

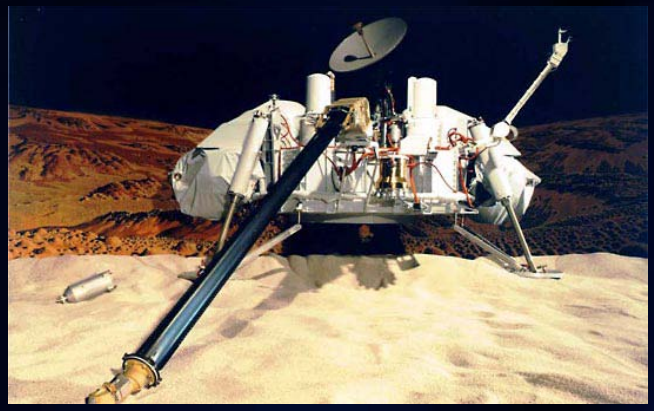
- **Orbit a body with sensors**

- **Land robots on a body**

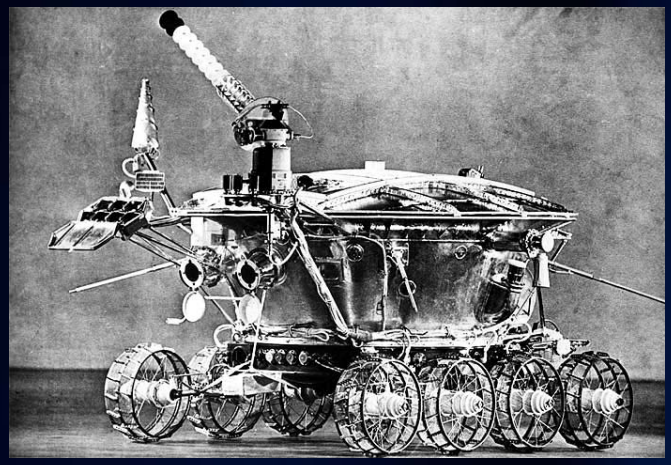
- **Go there**

Tactics for Landing and Exploring

- **Land with an Arm**
  - **Surveyor**
  - **Viking**
  - **Phoenix**



- **Land with a Rover**
  - **Lunokhod**
  - **Sojourner**
  - **Spirit & Opportunity**



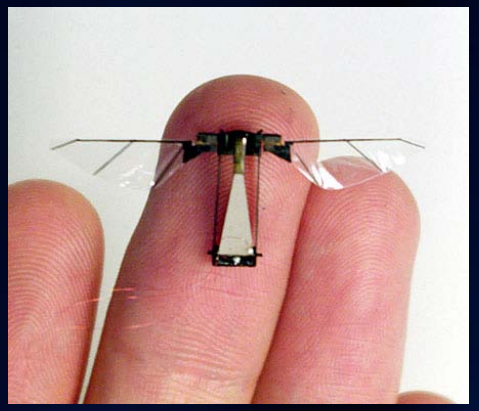
Hybrids: Rovers with Arms

What Are Some Other Tactics?

- **Land with an Arm**
- **Land with a Rover**
- **Land with a Free Flyer**
- **Land with Micro Rovers**
- **Land and Launch Rovers**

Free Flyer Tactics

- **Provide Bird's Eye View**
- **Project Comm for Rovers**
- **Deploy Sensors/Instruments**
- **Collect Samples**



Micro Rover Tactics

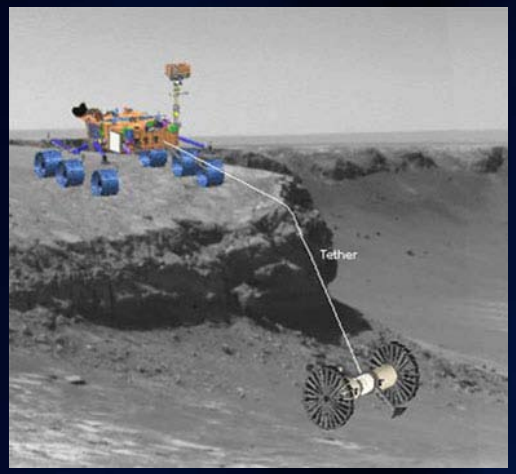
- **Deploy from Lander/Rover**
- **Descend into Craters**
- **Rappel down cliffs**
- **Use tether for retrieval**

Launcher Tactics

- **Launch from Lander/Rover**
- **Film during fly over**
- **Position comm or beacons**
- **Fire sensors/instruments**
- **Deliver micro rovers**

NASA Prototyping

- **Free Flyer**
  - **Working with the Army**
  - **Launch and Recapture**
- **AXLE**
  - **Deployed from ATHLETE**
  - **Tethered for Retreieval**
- **ROBO Cannon**



Cannon Performance Goals

- **Launcher Range**
  - **100m (Earth)**
  - **1km (Moon)**
  - **Escape (Asteroid)**
- **Shell Specs**
  - **1 Kg**
  - **90mm Diameter**
  - **280mm Length**

Shell Design Contest

- **Contest Plans**
  - **Announcement in Summer of 2012**
  - **Students test shells summer of 2013**
- **Shell Options**
  - **Small robots**
  - **Sensors and instruments**
  - **Communication devices**

- **You bring it, we'll fling it**

Questions ?