

Using Micro Rovers as Space Explorers



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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

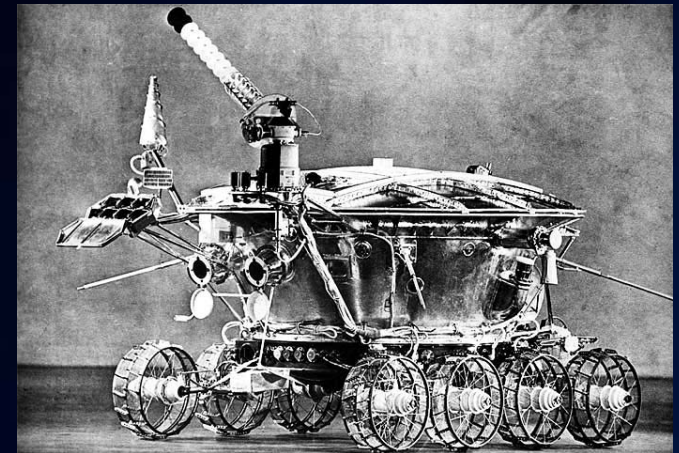
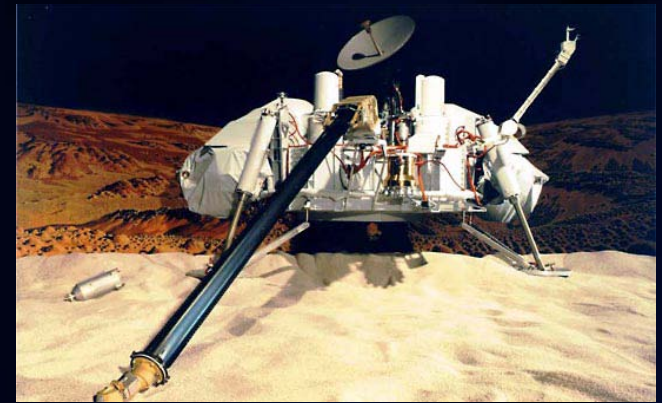
- **Look through a telescope**
- **Orbit a body with sensors**
- **Land robots on a body**
- **Go there**



Tactics for Landing and Exploring

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

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



Hybrids: Rovers with Arms

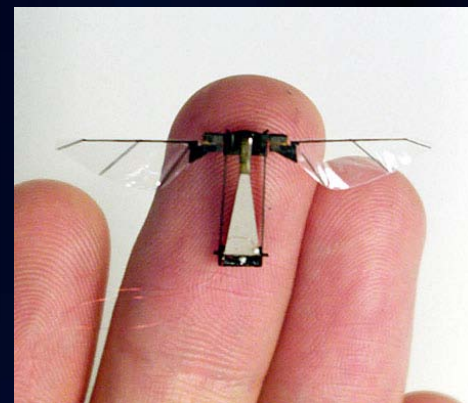


What Are Some Other Tactics?

- **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



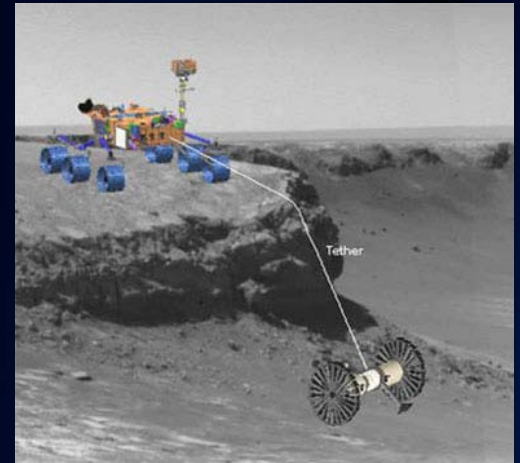
Launcher Tactics

- **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 Retrieval
- **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 ?

