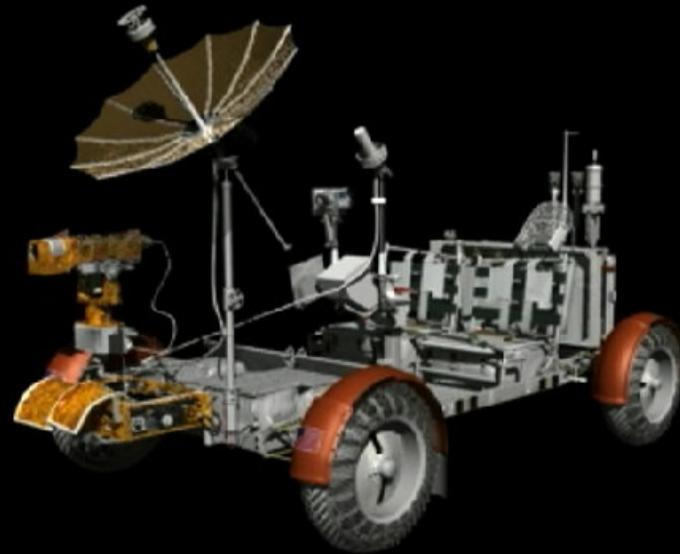
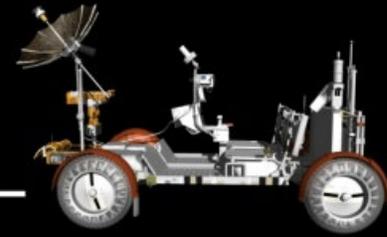




*LU*nar *RO*Ving Adventure - *LU*ROVA "Edutainment" Simulation





Report of the

President's Commission on

Implementation of United States Space Exploration Policy

*A Journey to Inspire,
Innovate, and Discover*

June 2004



Moon, Mars and Beyond ...

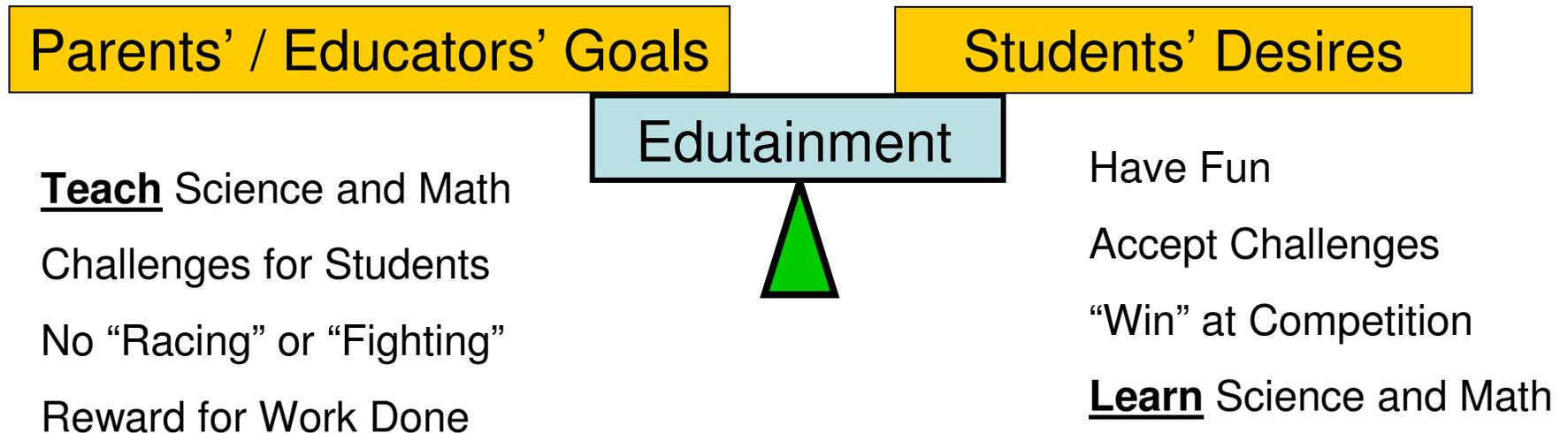
President's Space Exploration Commission Highlighted Added Value of Space "video and simulation games...potential for educational pursuits is enormous"



"The Commission believes that great opportunities exist to engage the public through cutting edge multi-media products. Moving images are to today's students what books were to students in generations past. Movies can **bring technical space subjects to life for people who have no interest at all in mathematics or science**. From IMAX films to Hollywood blockbusters, millions of space enthusiasts look to big screen (and subsequent video distribution) for the latest in space "stories." The techniques employed by the film industry, applied to actual space science, can result in dynamic narratives that **inspire and educate people**.

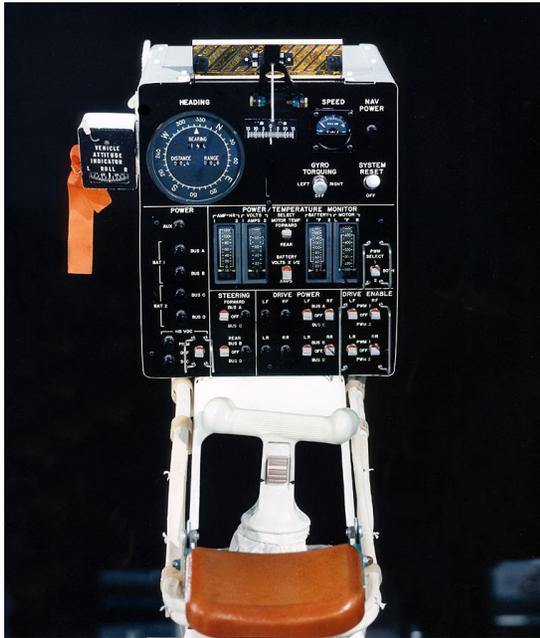
Similarly, video and **simulation games** are not only a multi-billion dollar industry, they are proving to be **effective as learning devices for people of all ages**. Space flight simulators have long been used at various NASA centers, but only recently have similar programs been incorporated into smaller, hand-held "amusement" versions and made available for public use. The potential for converting hobbies and amusements to more educational pursuits is enormous. **NASA could collaborate with video game producers to create live-action learning modules** that give players the chance to experiment with orbital mechanics, the principles of spaceflight, and other space-related subjects. A new model for public engagement, which seeks broad grass roots support through coordinated efforts of government, industry, and non-profit institutions, uses professional communicators to formulate its messages, and incorporates **exciting multi-media products to infuse space exploration into our culture as never before**. Thus, such an effort is well aligned with the goals of the space exploration vision itself, which seeks to vastly expand our presence in space." (page 46)

A Balancing Act

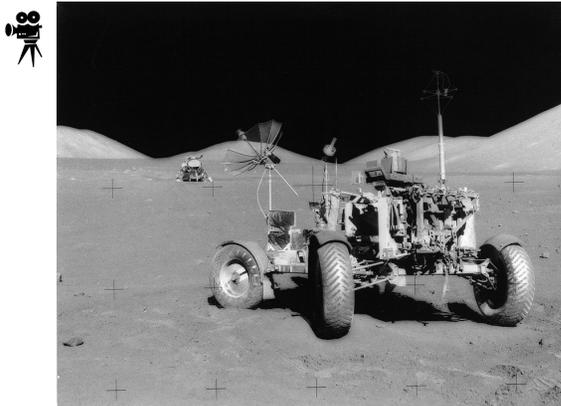


Lunar Roving Adventures “LUROVA” Being Developed for Students

- Interactive 3D “Edutainment” Simulation Responds to President’s Space Policy Commission Recommendation
- Student Plans / Performs Rover Exploration Traverses
 - Views Driving, Position, Speed, and Temperature Results
 - Based on Actual Thermal Model from Apollo LRV Missions
- Displays to Mimic Operation of LRV Hand Controller, Power and Navigation Systems on Display Console, and Moon Terrain While Driving and Parked



LRV Control and Display Console and Hand Controller



LUROVA Simulates Apollo Rover

LUROVA for “Virtual Worlds”

Apollo Lunar Roving Vehicle (LRV)

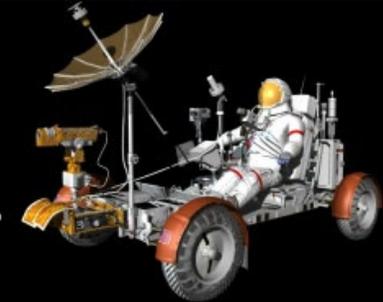


Astronaut and LRV

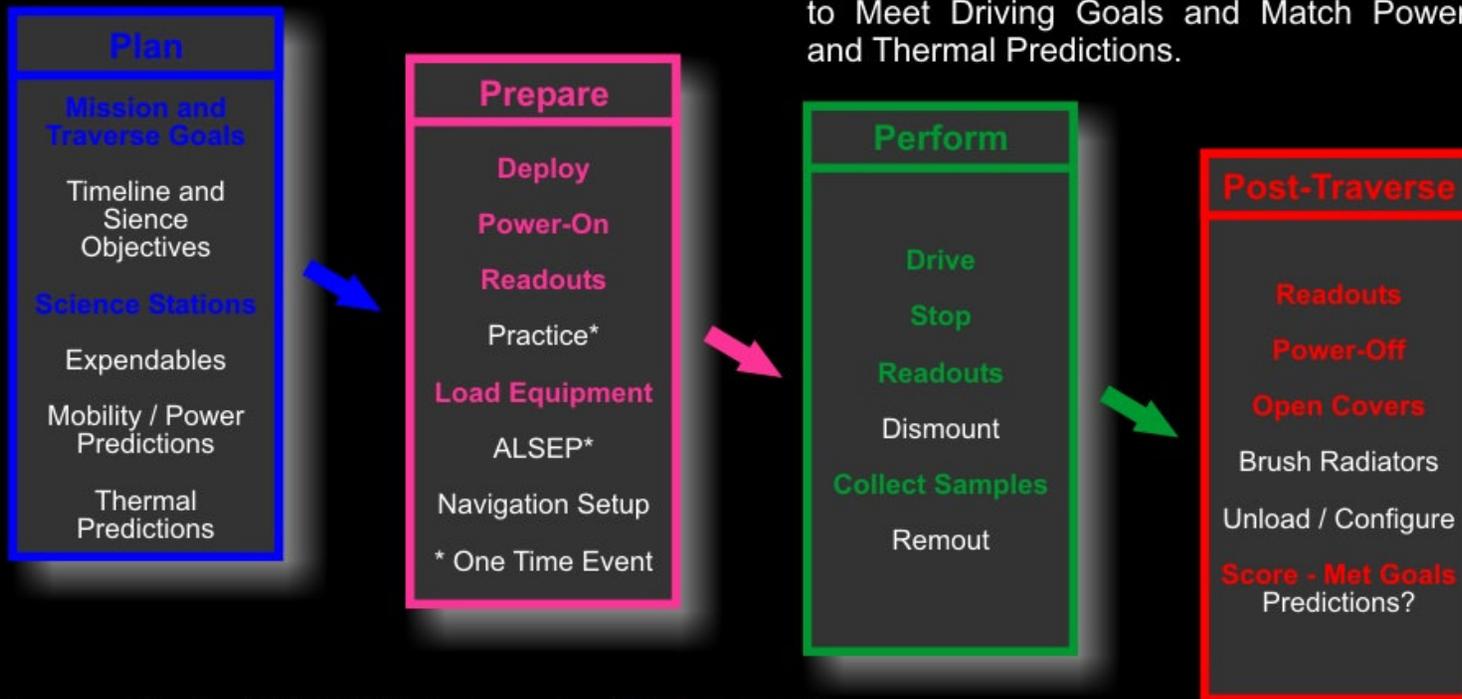


LUnar ROVing Adventure - LUROVA

"Edutainment" Simulation

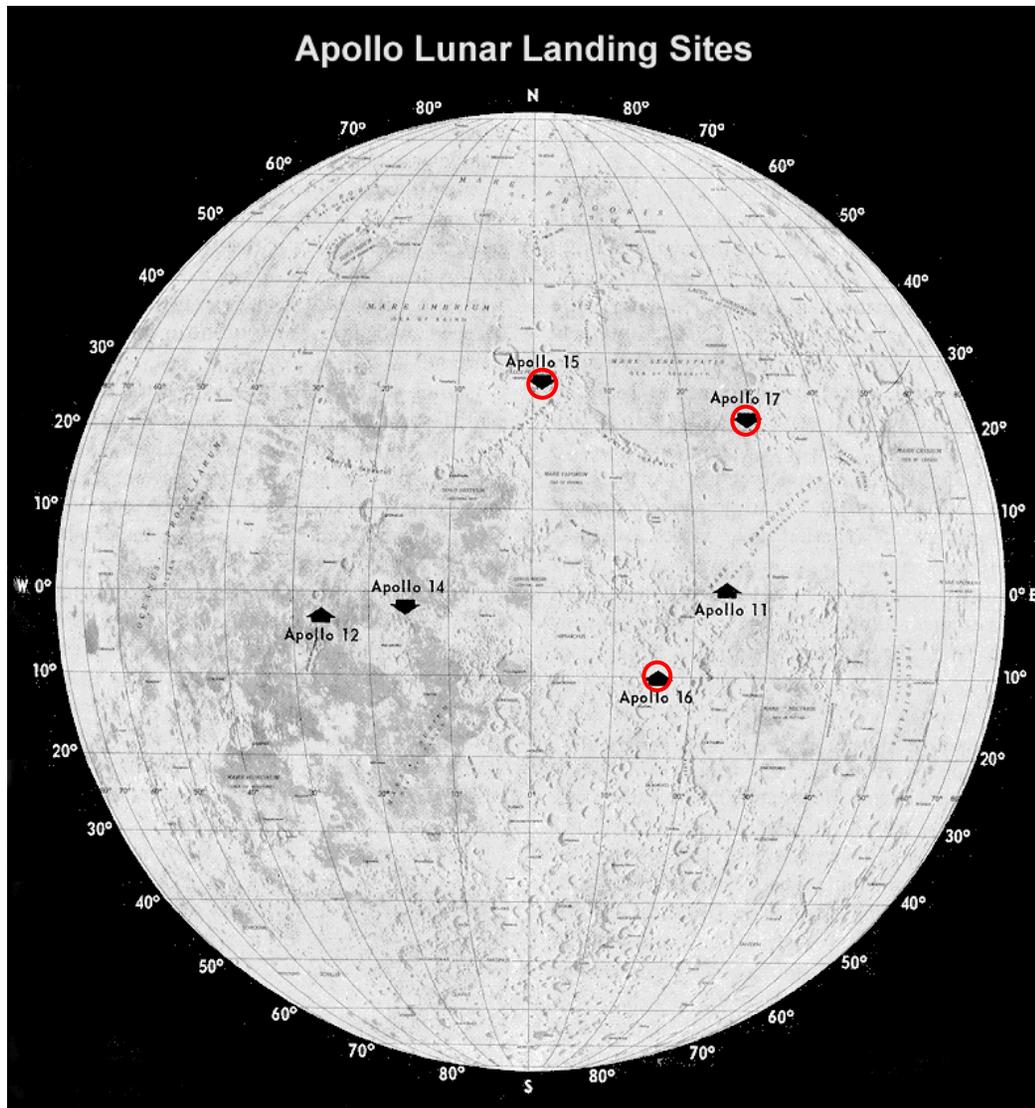


Adventurer **Plans**, **Prepares**, and **Performs** Science Traverses to Meet Mission Goals. **Post-Traverse** Score is Based on Ability to Meet Driving Goals and Match Power and Thermal Predictions.



Present "Active" LUROVA Features Are "Highlighted"
 ALSEP = Apollo Lunar Surface Experiments Package.

Plan – Adventurer Begins With Landing Site and Goals

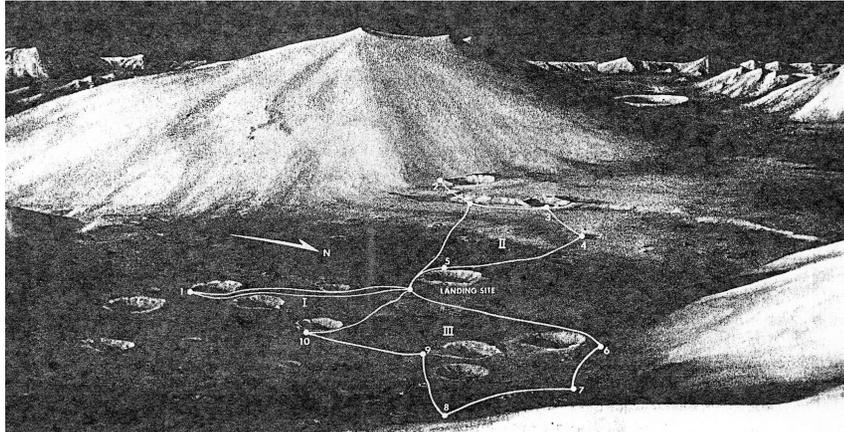


**Exploration Site Assigned by
“Mission Control” or
Selected by Student
Adventurer**

○ Historical Apollo Rovers

**Potential for Cancelled
Apollo 18 “Dual Mode”
Robotic Rover Mission**

Plan - Adventurer Designs Traverses To Meet Mission Goals And Makes Predictions



Planning Tasks

Exploration Goals

EVA* Timeline

Science Stops

Mobility & Power Predictions

Thermal Predictions

Driving and Science Stops

no.	name	head	dist	time	LMhead	LMdist	LMtime	ETS
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								

Totals:
stations: 111 distance: NM time: hrs min

move selected: delete selected!

edit selected station:
No.: 11 activity:
name: minutes save
ETS: save

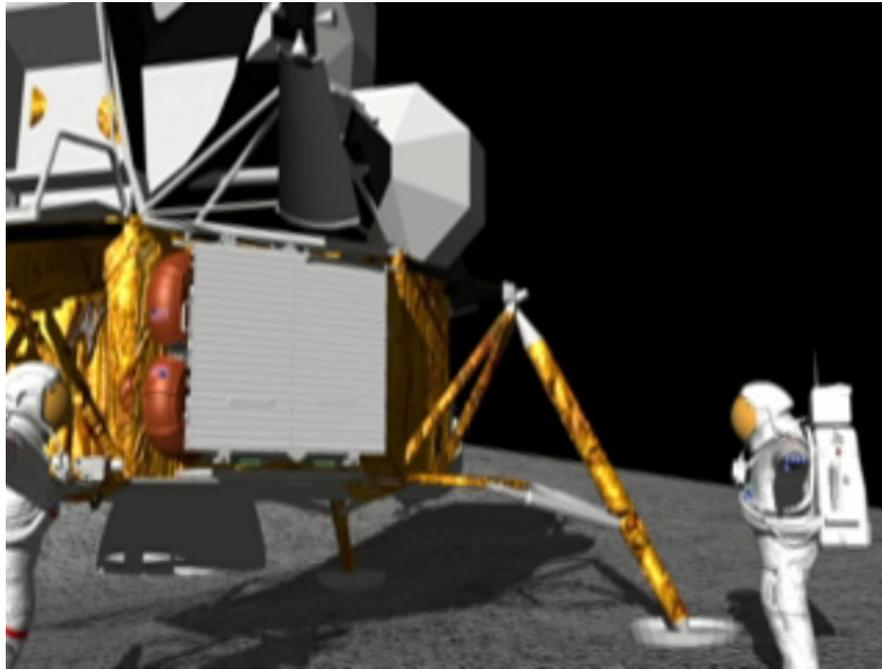
save plan load plan show 3D terrain! show height diagram! exit

LUROVA for "Virtual Worlds"

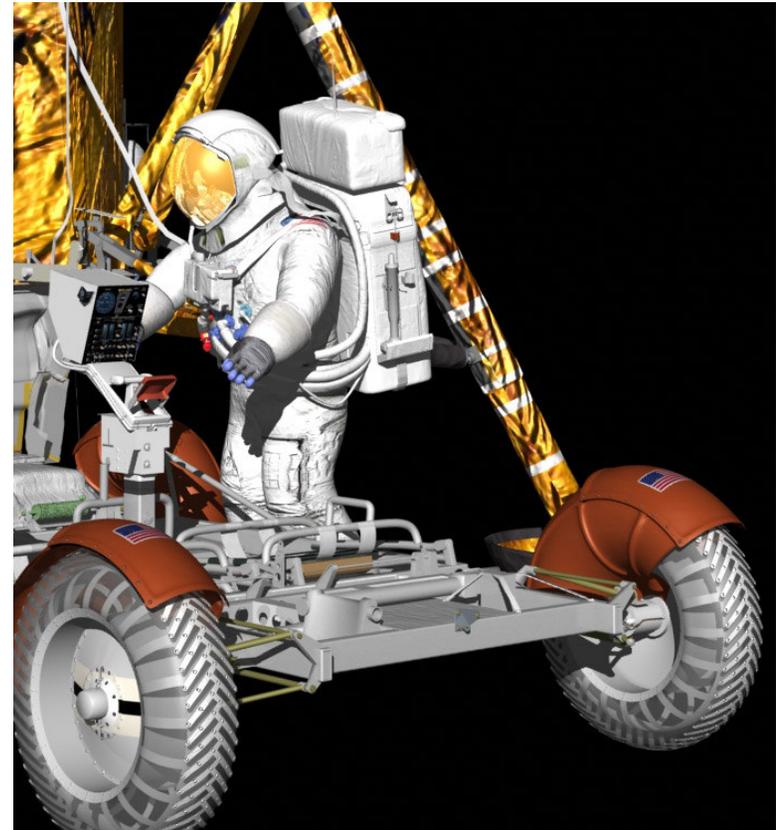
* EVA = Extra Vehicular Activity

Prepare - Adventurer Unfolds LUROVA from Lunar Module (LM)

9/18

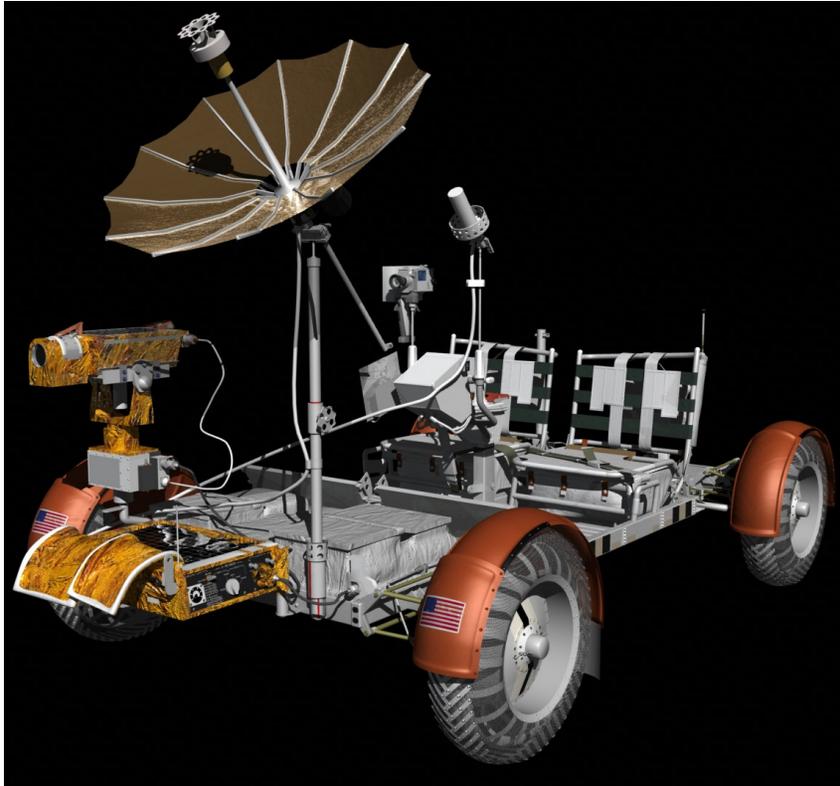


LUROVA Ready for Adventurer to Unfold from LM

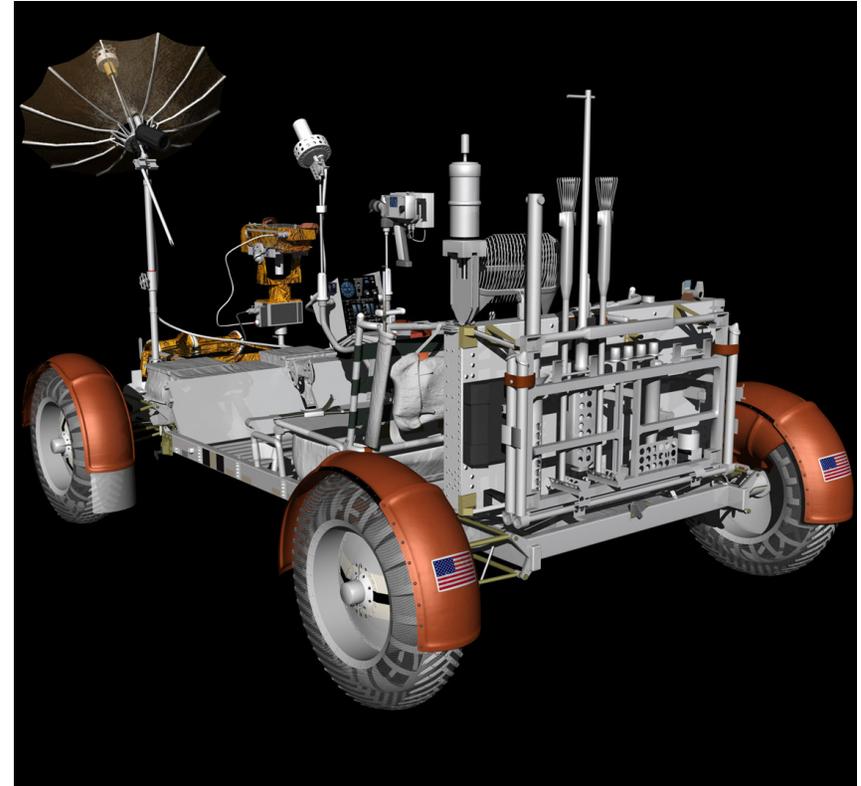


LUROVA Ready for Adventurer to Load Science Equipment

Prepare - Adventurer Configures LUROVA for Planned Traverse



**Front End – Communications
Equipment**



**Back End – Science Experiment
Equipment**

Perform - Adventurer Uses Display Console, Navigation System, and Hand Controller to Drive LUROVA



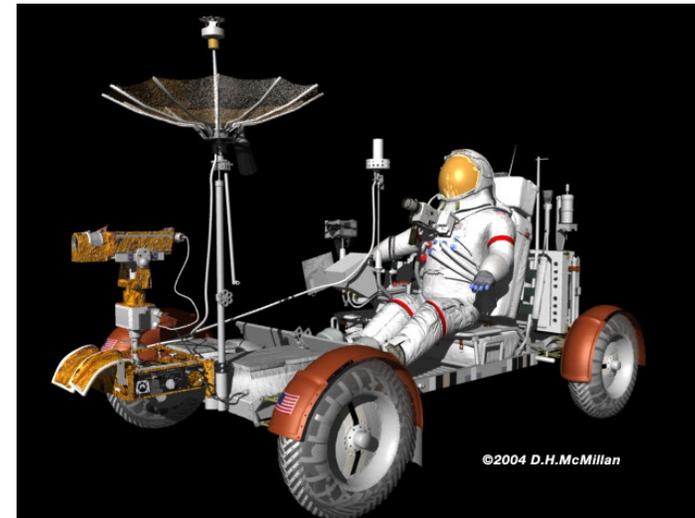
Sun Shadow Device is Deployed for Initialization of Navigation System



Heading and Speed Change on Interactive Console While Driving

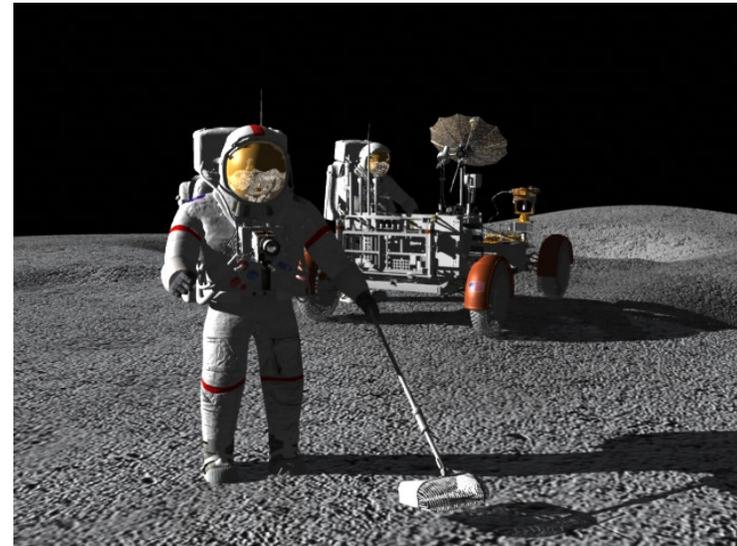
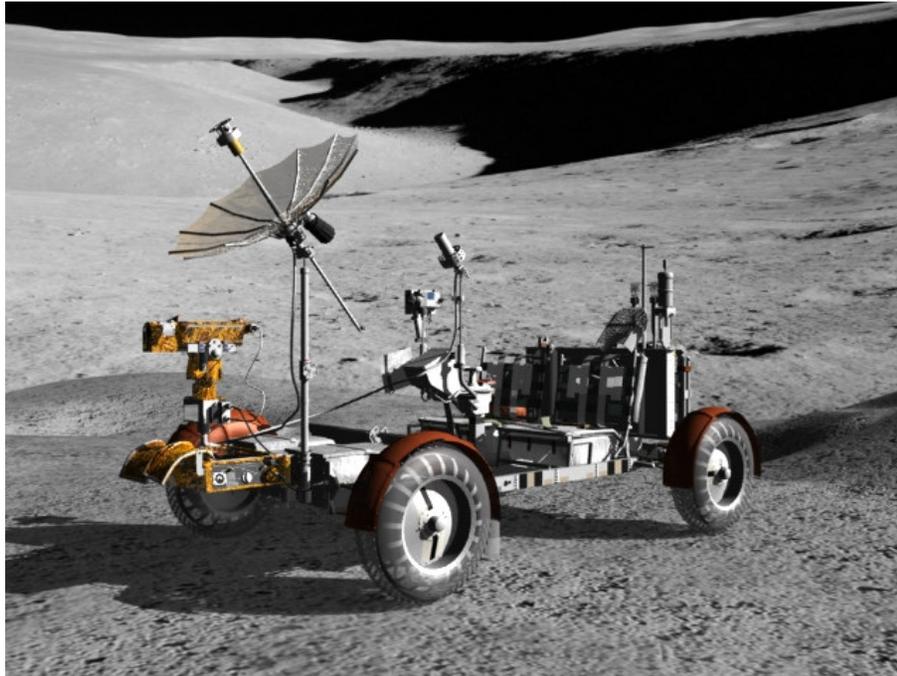


LUROVA for "Virtual Worlds"



Student Drives LUROVA Using Hand Controller

Perform - Adventurer Parks LUROVA at Science Stops and Conducts Experiments



Collecting Lunar Regolith Samples

Tasks at Science Stops

Read Power, Navigation, Temperatures

Dismount LUROVA

Explore and Collect Samples

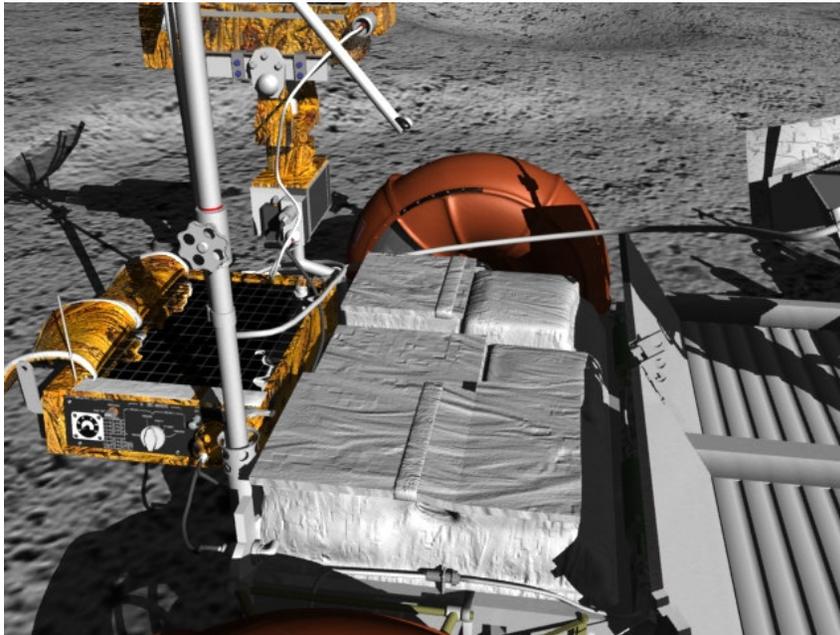
Remount LUROVA



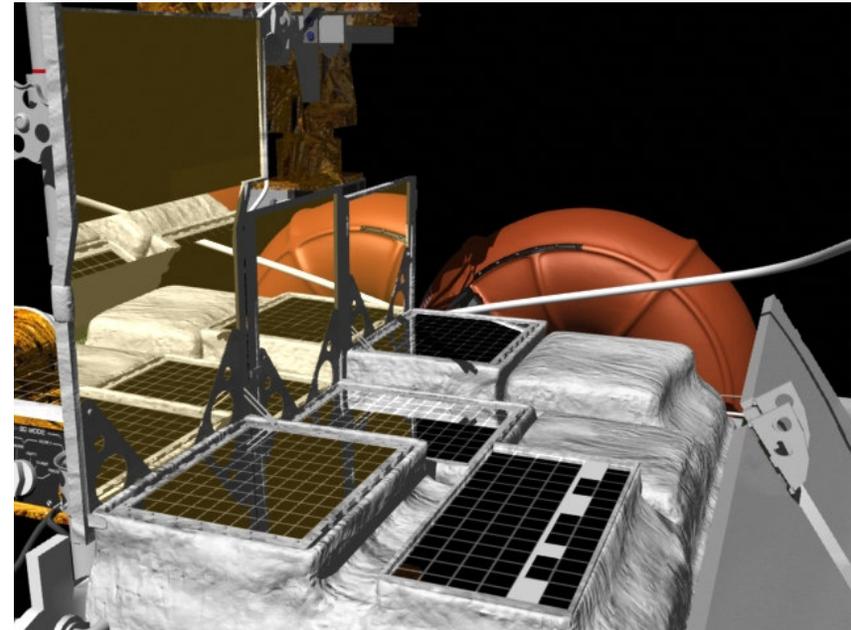
Return to the LM for Post Traverse Scoring

LUROVA for "Virtual Worlds"

Post Traverse – Back at the LM, Adventurer Opens LUROVA Dust Covers Over Space Radiators



Covers Closed



Covers Opened

Post Traverse Tasks

Readouts and Power-Off

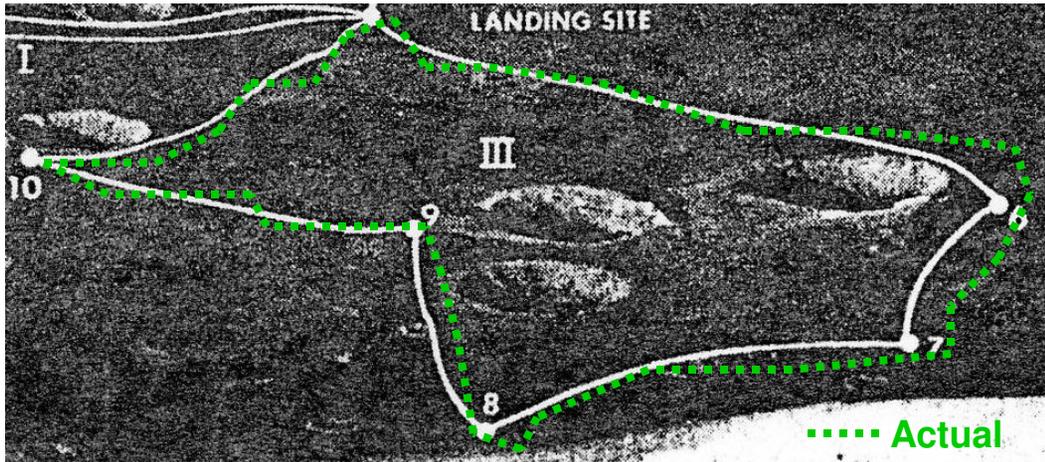
Unload / Configure

Open Covers and Brush Radiators

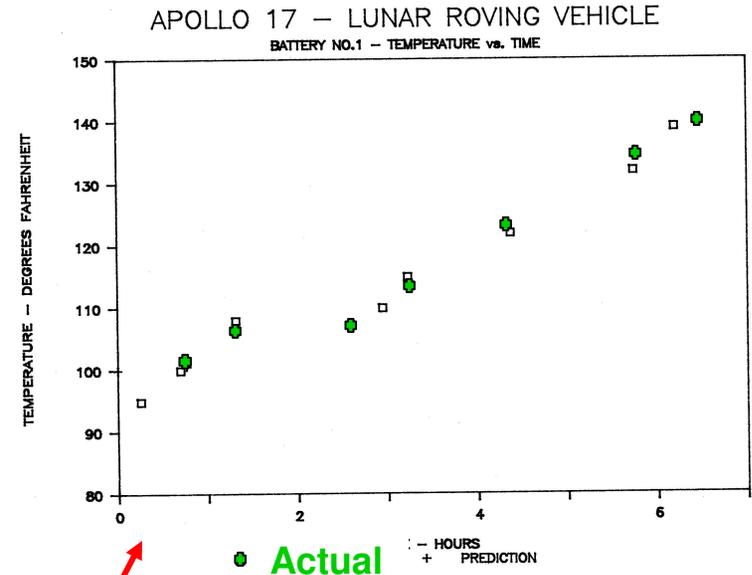
LM Ingress

Met Goals / Predictions?

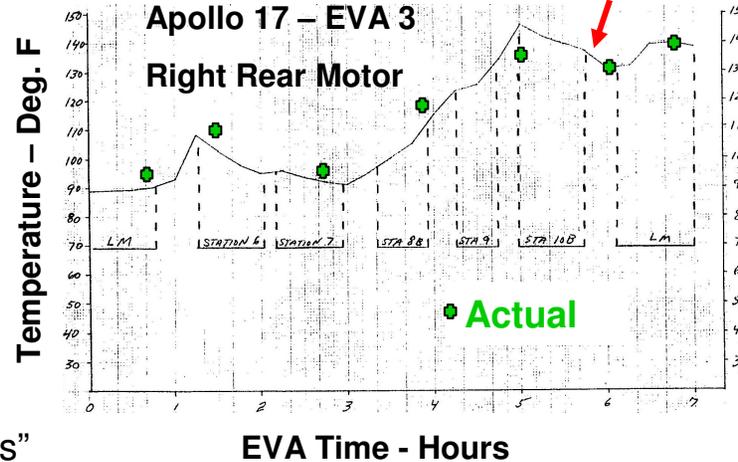
Post Traverse - Adventurer Is Scored On Meeting Mission Goals And Predictions



Score Partially Based on Matching Planned Driving Traverse and Sample Collection Goals

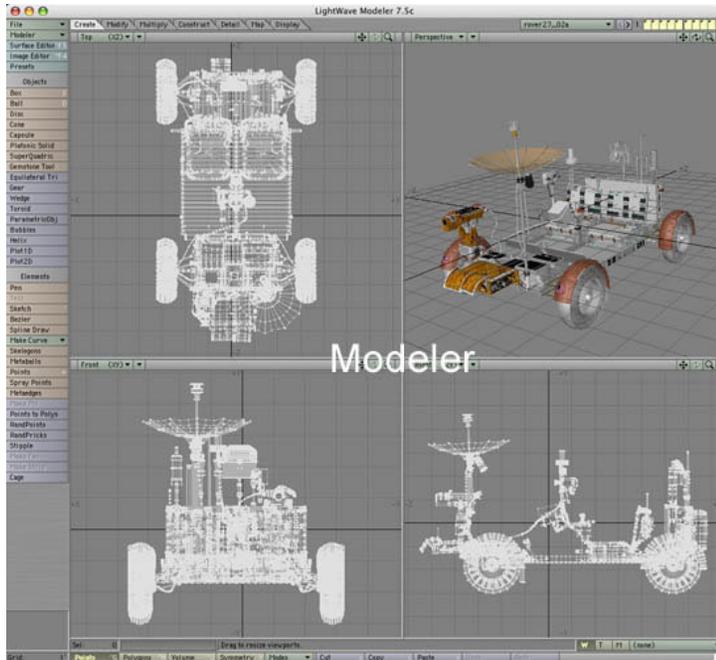


Score Also Based on Matching Power and Thermal Predictions



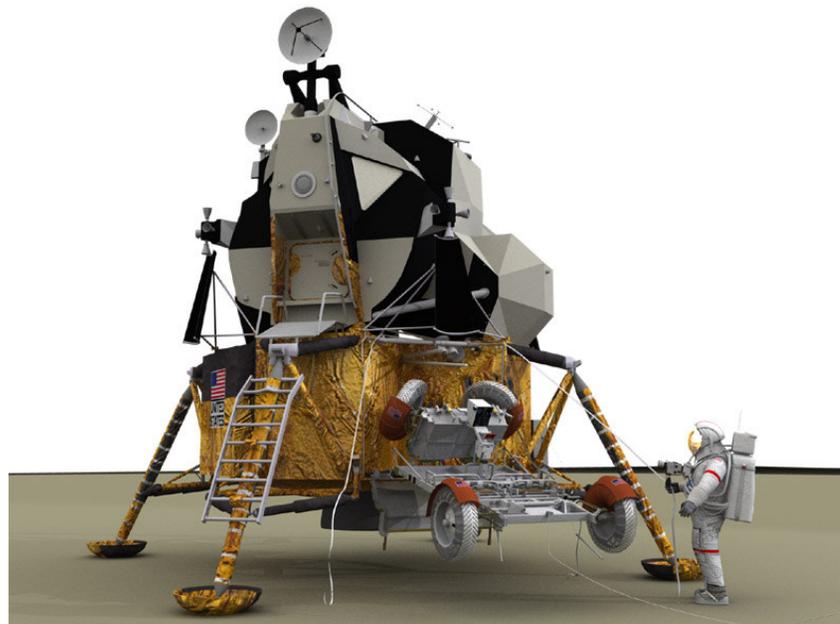
LUROVA – Path Forward

- Share Ideas at “Virtual Worlds” Workshop
- Obtain Sponsorship for Further Development
- Expand on Initial “Lightwave” Models
- Integrate Terrain, 1/6 Gravity Driving Models
- “Beta” Testing in Schools

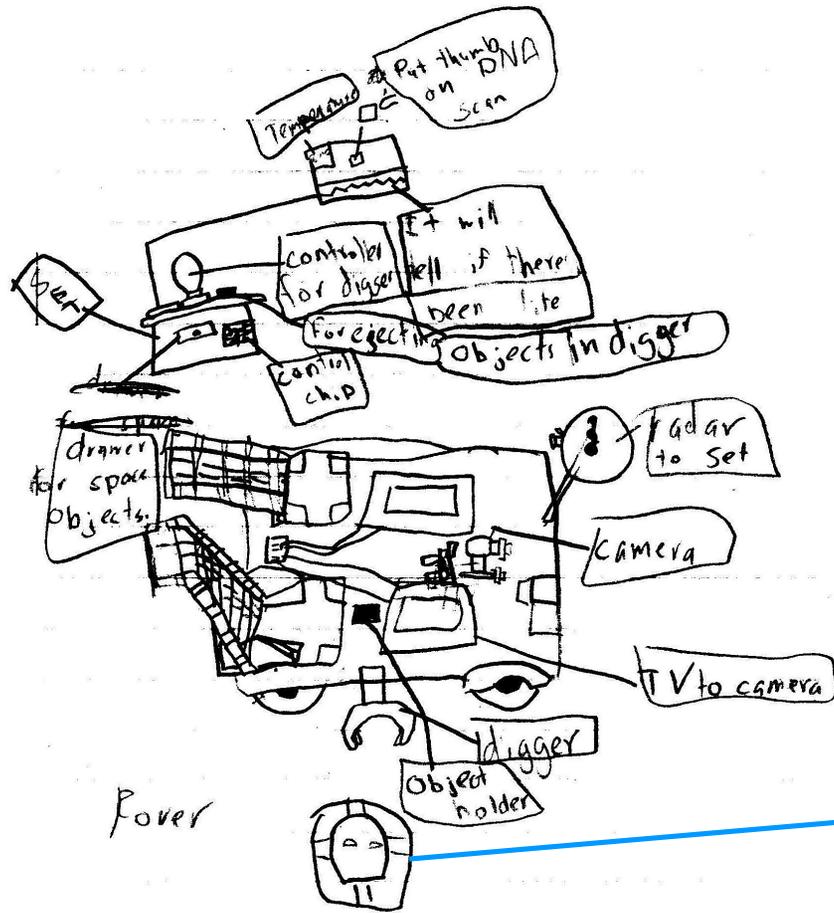


**LUROVA Models
Using “Lightwave”
Rendering Engine**

LUROVA for “Virtual Worlds”



Kids are Amazing!



Rover Concept by
Huntsville 3rd Grade
Elementary Student –
01/28/05

