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AIAA Modeling and Simulation Technologies

Why We Explore Constellation Modeling and Simulation

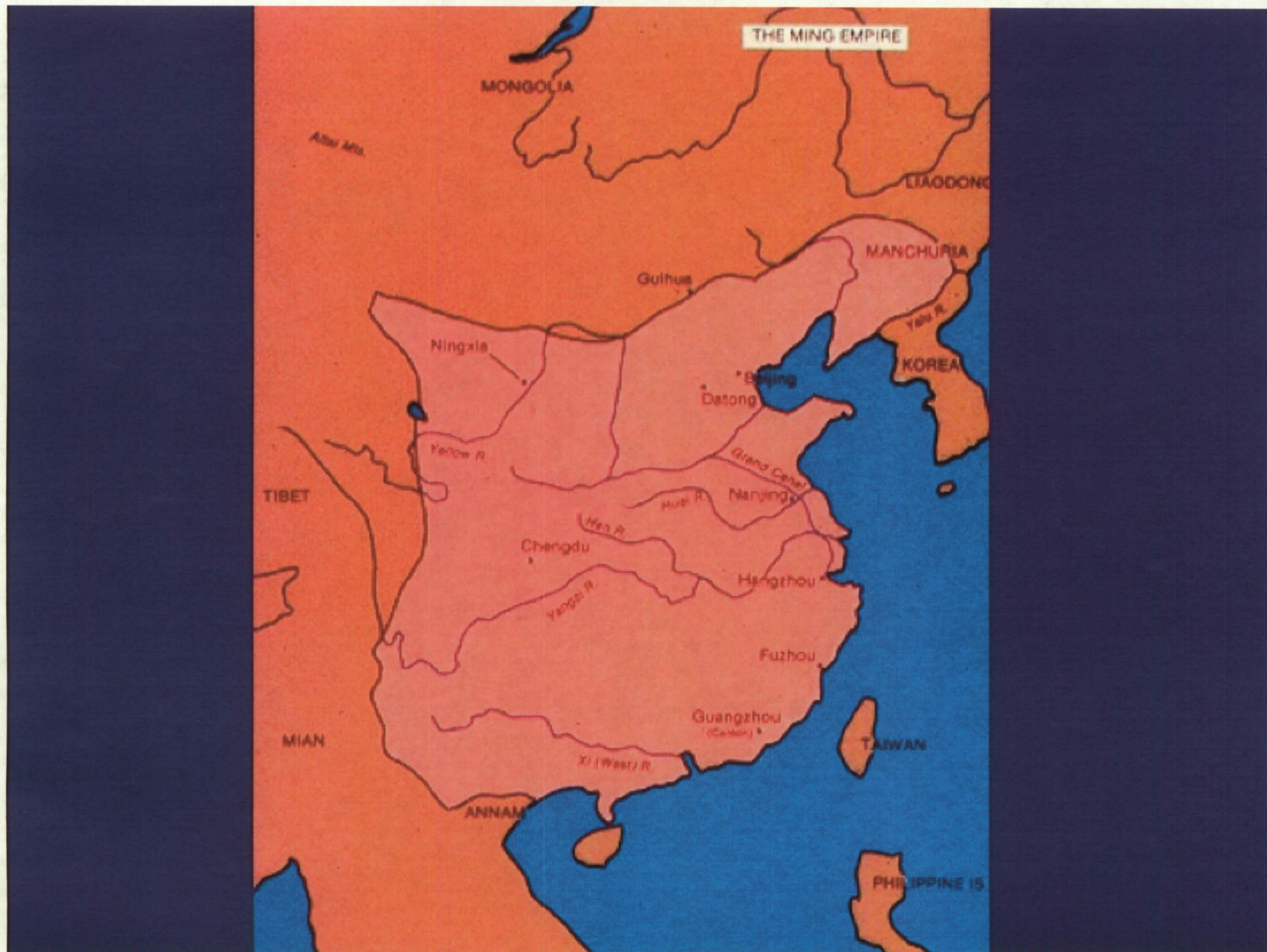
Mike Conroy
KSC IT-C, CxPO SE&I MSDA DPV
mike.conroy@nasa.gov



Mike Conroy

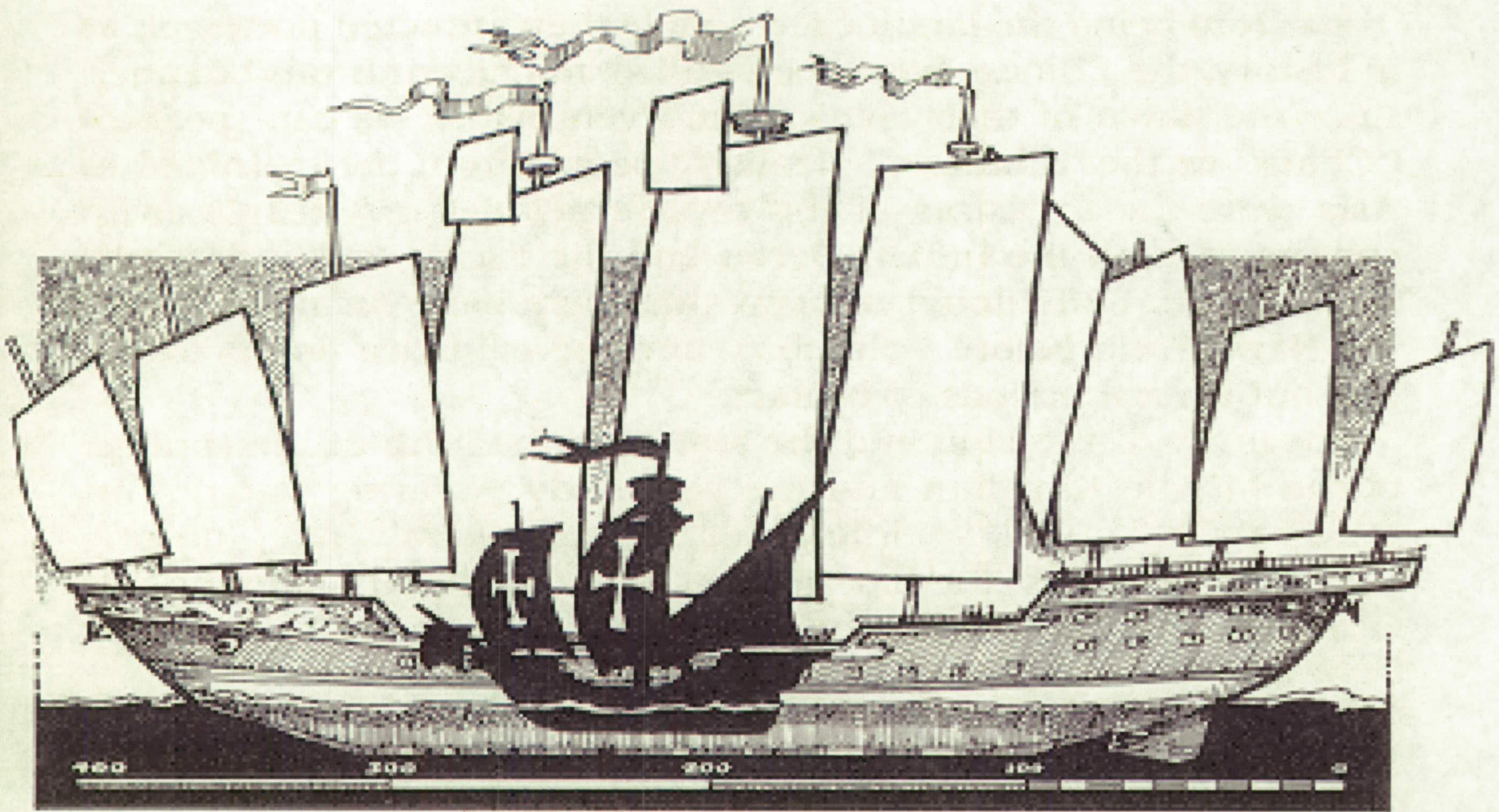
- Born in Orlando, my father was born in Orlando
- Started working for NASA in the late 1960's, Apollo 8 I believe
 - These pictures are from Apollo 14 in 1971
 - Had to finish school before they would give me a badge though











*Zheng He's treasure ship (four hundred feet) and Columbus's St. Maria (eighty-five feet).
(Illustration by Jan Adkins, 1993.)*



A detailed model of a traditional Chinese junk boat, featuring a dark blue hull and numerous tall, rectangular, light-colored sails. The boat is shown from a side profile, highlighting its distinctive structure and the arrangement of its sails.

A MINING TREASURE SHIP
Perhaps 400 ft (122 m) long
and 70 ft (21 m) wide

VALDO DA SILVA S.
SAO CARLOS
Alameda da F. da Republica
12.11.1961

24 1930 Loft Erickson re-sheds
landfall in Newfound Island.

ALL 8000

Ca 1000 Floating compass

and many Chinese

1990s Chinese junkies
sell off Pleasant Gulf
and Mad Bull assets.

6 JULY-1933
Zhang Ha's fleet continued the emperor's version of shuttle diplomacy, visiting ambassadors to back allies, countries after stages of several years, while bringing other foreign dignitaries back to China.

7 **ADRIAN**
The last voyage, in Africa's South coast, with a side trip to Mozambique, marked the end of Zheng He's golden age of exploration and of Zheng He's life. He presumably died on route home and was buried at sea.

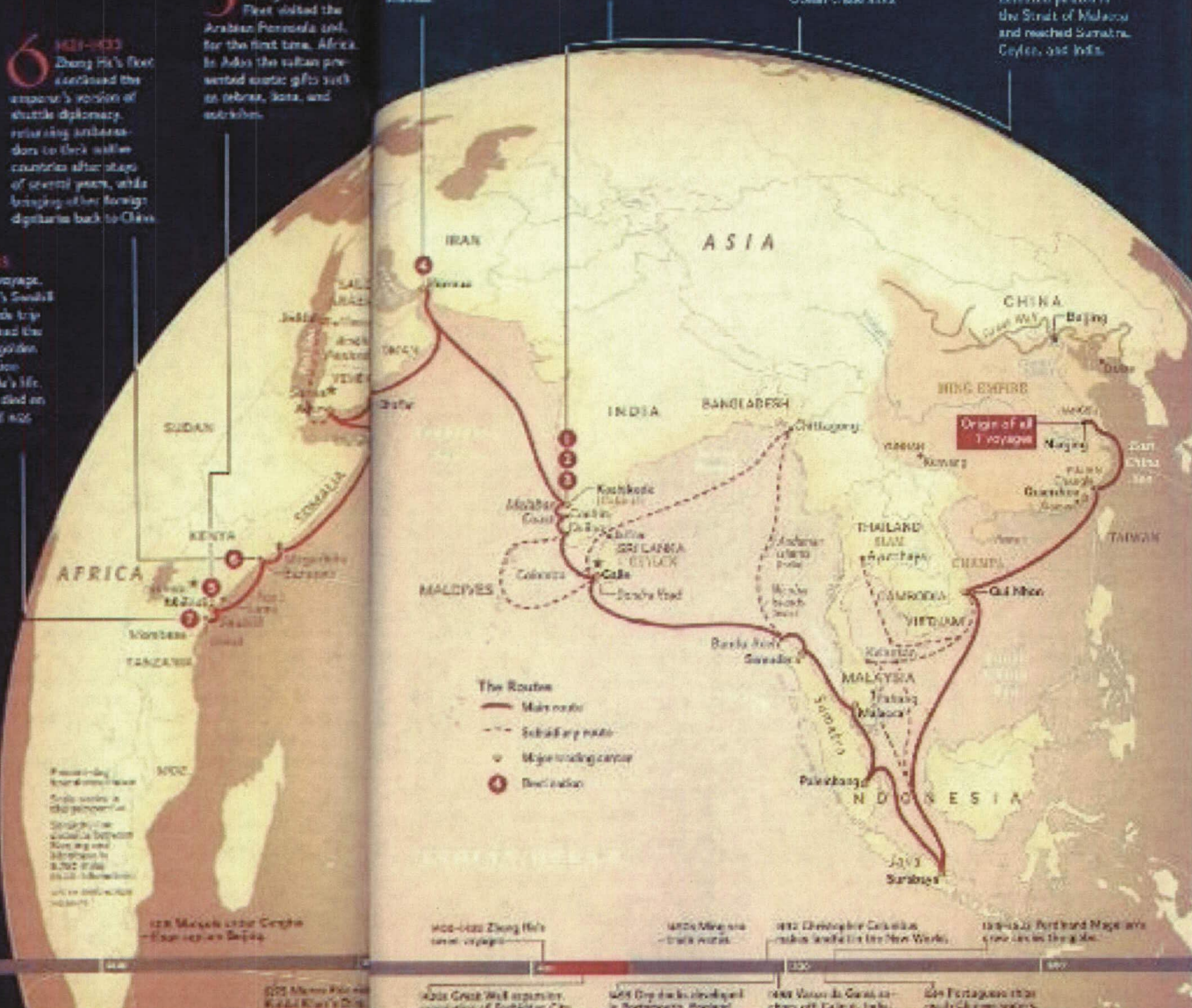
5 **Zheng's Treasure**
Fleet visited the Arabian Peninsula 104, for the first time. Africa is added the various presented exotic gifts such as pebbles, koto, and ostriches.

4 1403-1415
In this voyage I
wake the first
to travel beyond India
and cross the Arabian
Sea, an estimated 10
thousand were tribute
and ships to China,
underscoring the Ming
emperor's influence
at sea.

3 1405-1410 Although notable for the imperial fleet's only major foreign land battle, the voyage was also marked by Minglin Zhang's offering of gifts to a Buddhist temple, one of many examples of his reverence.

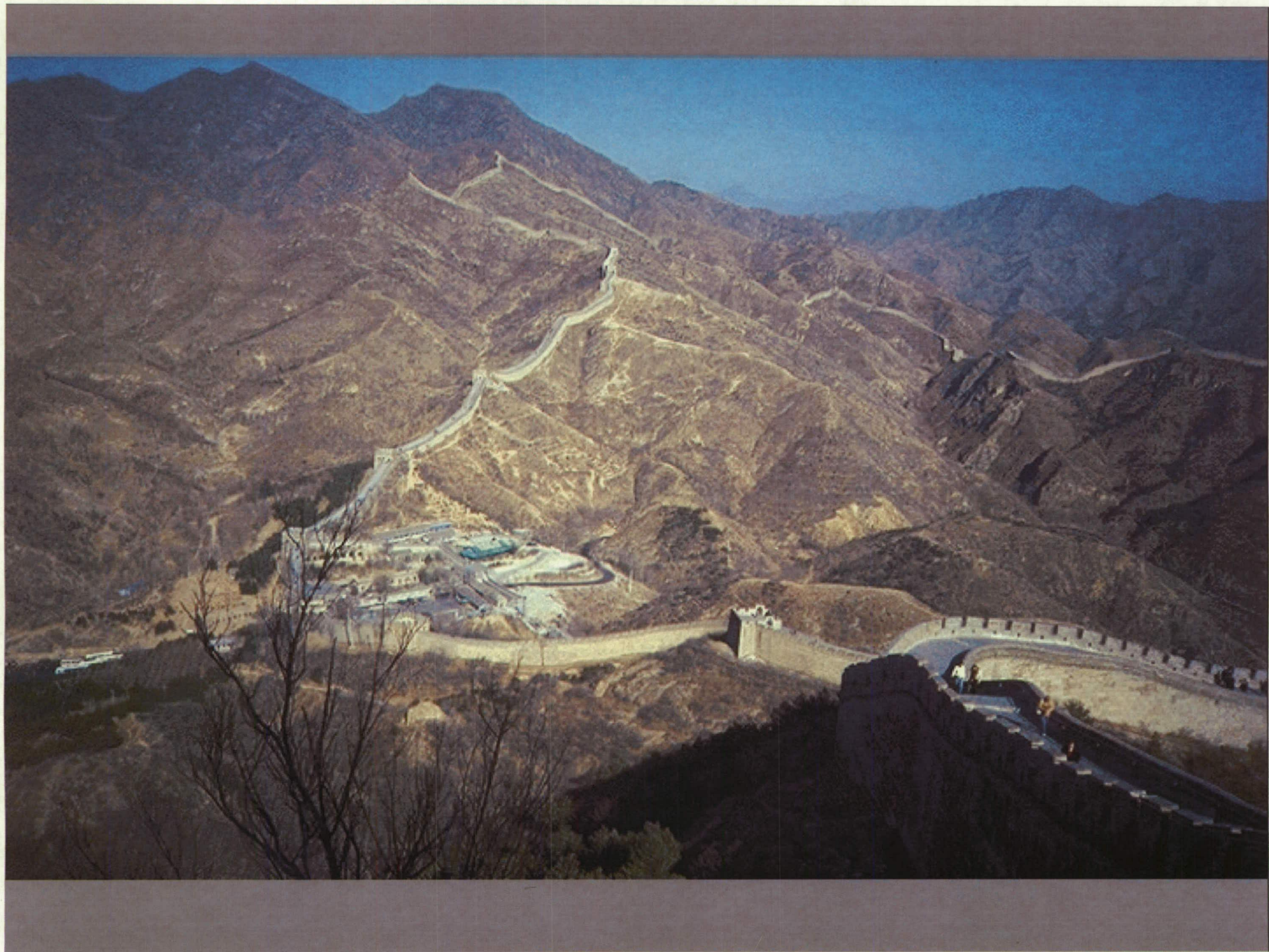
2 1407-1408 The fleet returned to reign ambassadors from Sumatra, India, and elsewhere who had traveled to China on the first voyage. The expeditions firmly established the Ming dynasty's Indian Ocean trade links.

1 1492-1493
307 ships
27,670 men
In July the fleet left
hanging with sails,
powder, and space
for trade. This well-
armed floating city
defeated pirates in
the Strait of Malacca
and reached Sumatra,
Ceylon, and India.













Let's Look at the Moon

What do we do when we get there....

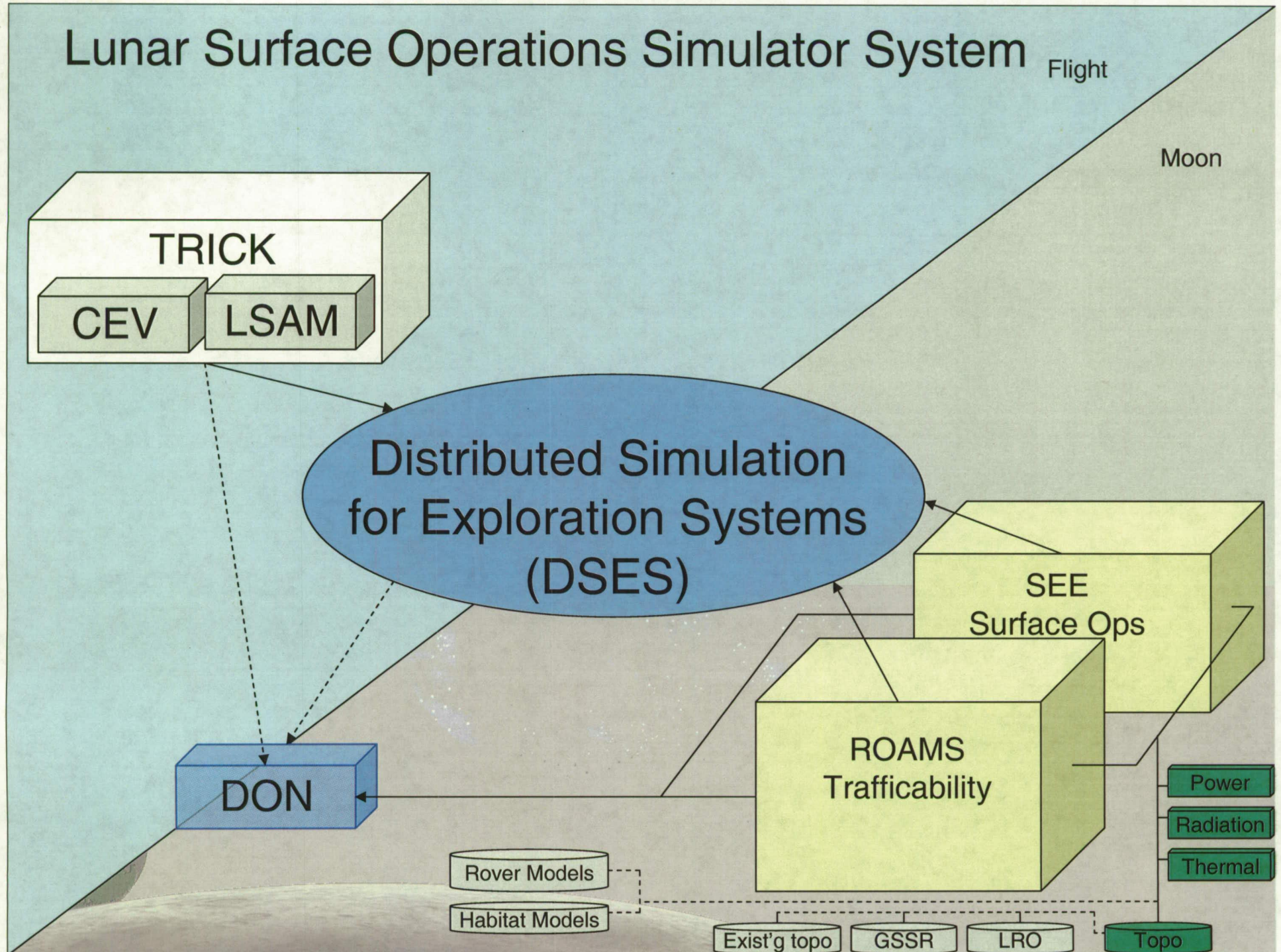
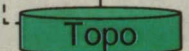
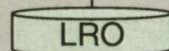
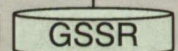
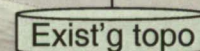
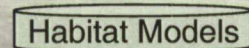
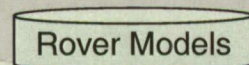
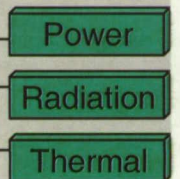
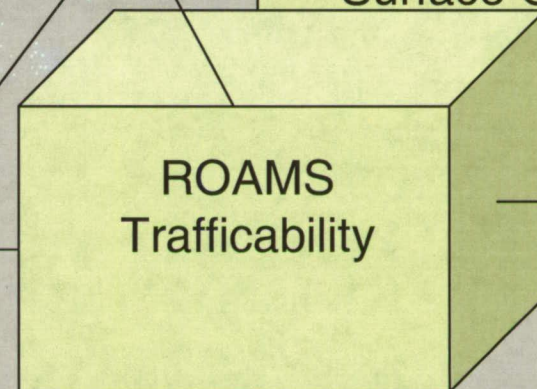
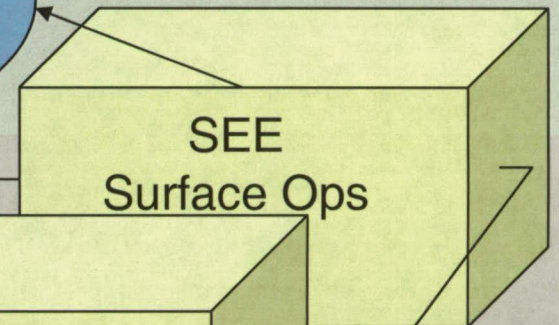
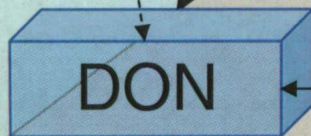
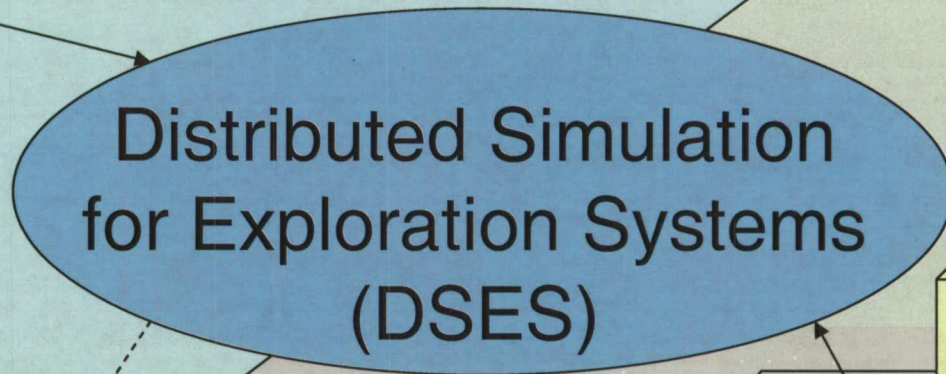
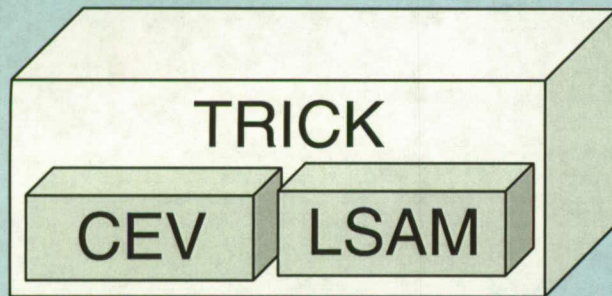
Compliments of Steve Wall, JPL



Lunar Surface Operations Simulator System

Flight

Moon



LSOS In Context: LSOS Tool Role

Example Use Case: Evaluating region for landing or operations based on lighting conditions for a selected time frame and macro-level terrain features

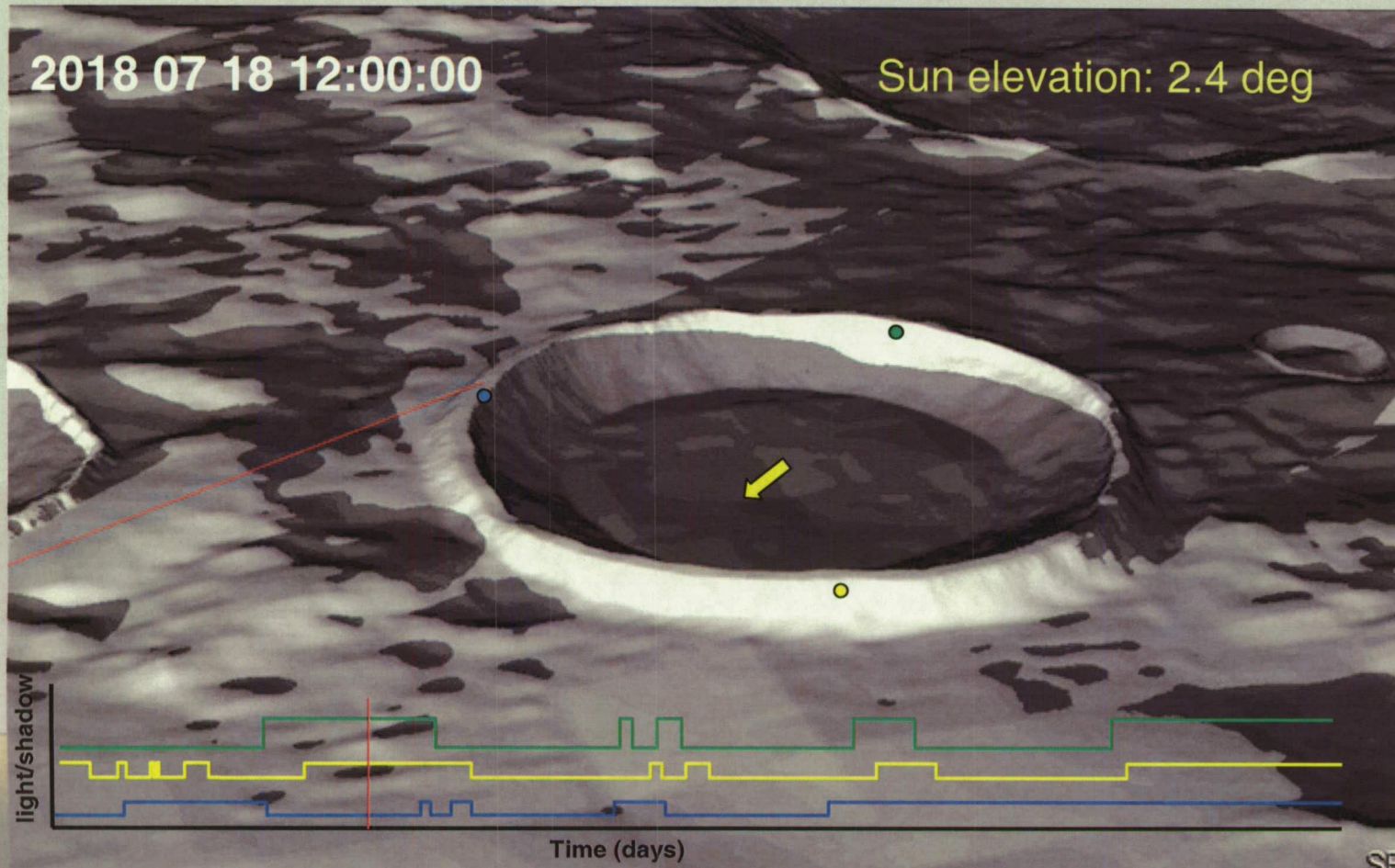
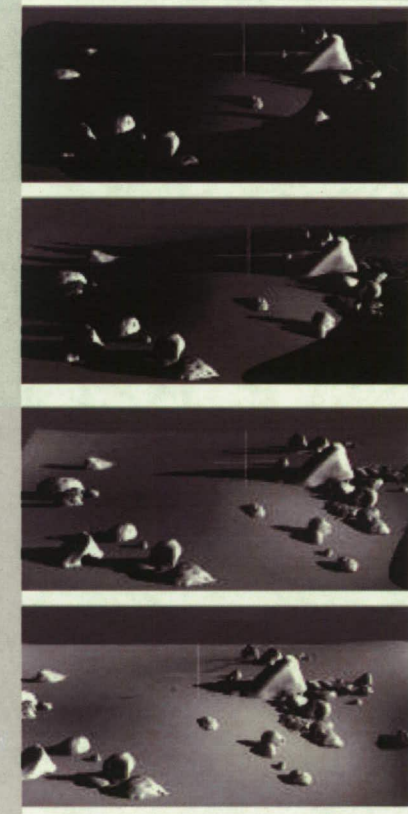


Image: A mockup of a shadow analysis which can be done using the SEE. Points on the surface mesh can be selected for shadowing analysis. A graph shows periods of dark and light. The red vertical line in the graph corresponds to the current frame of the visualization.

LSOS In Context: LSOS Tool Role

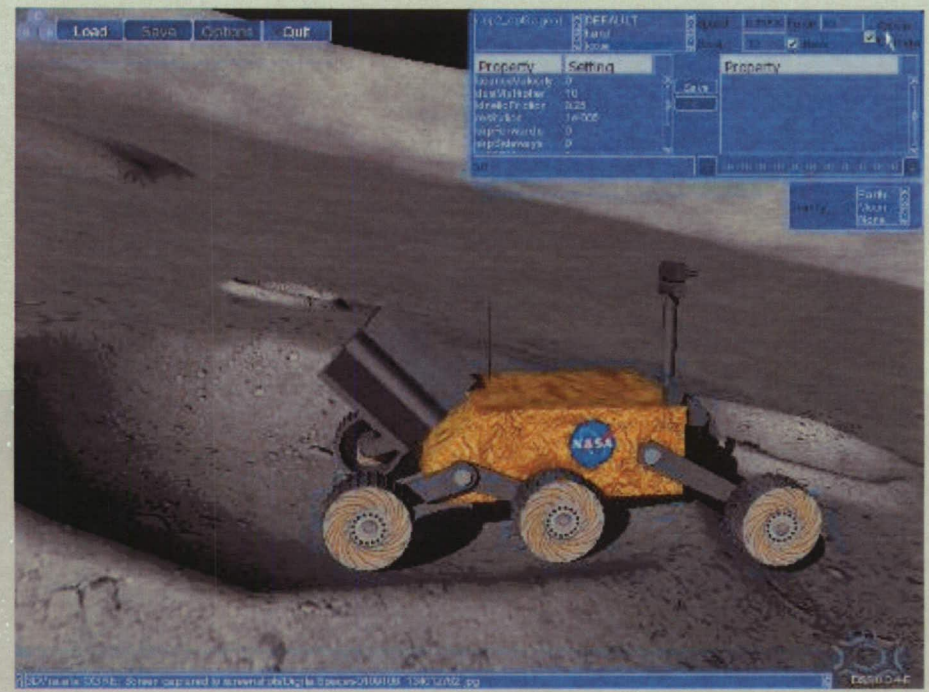
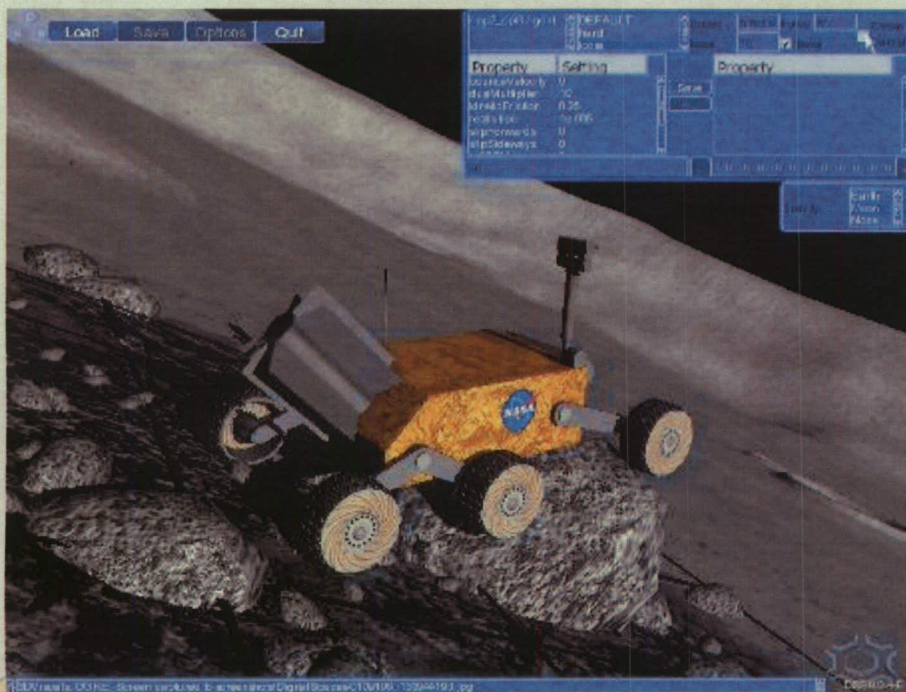
Example Use Case: Evaluating lighting conditions at a desired landing site at a selected time using fine terrain details (e.g. rocks and boulders)



Images: Screenshots from the Shadow Rendering Benchmark Tool developed by the LaRC LSOS team.

LSOS In Context: LSOS Tool Role

Example Use Case: “Trafficability analysis”. Determining the feasibility/resource requirements for a rover excursion over a selected terrain.



Images: Screenshots from the Digital Spaces rover simulator.

LSOS In Context: LSOS Tool Role

Example Use Case: Sortie and super-sortie analysis including subsystems and environment (e.g. radiation)

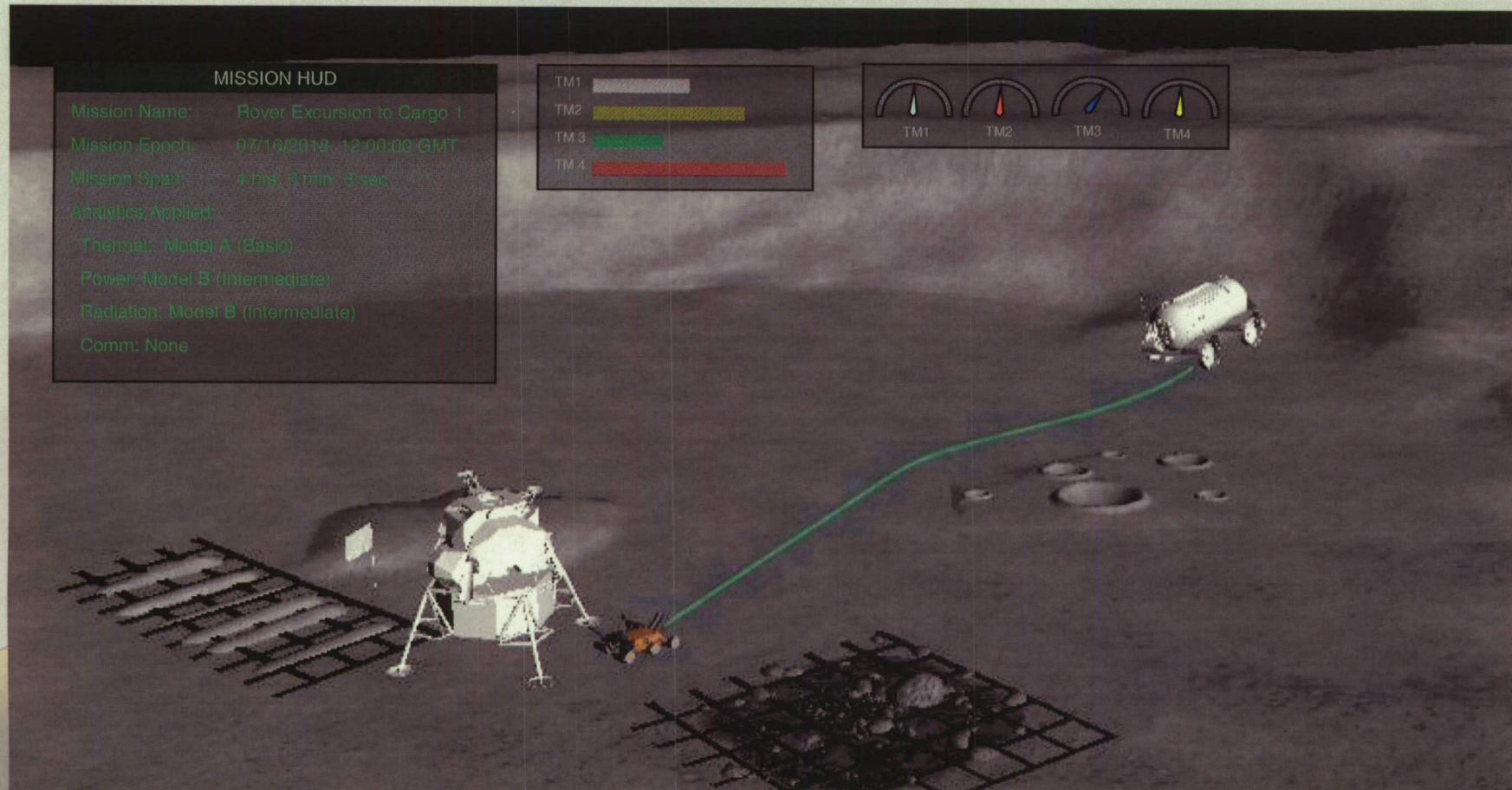
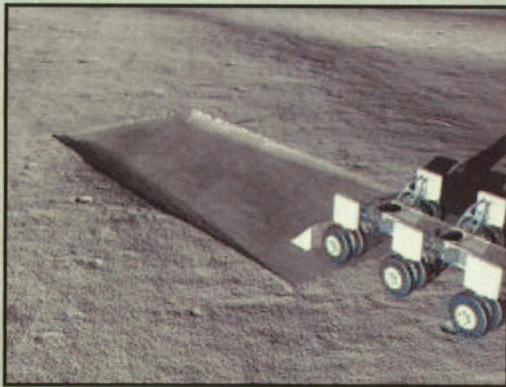


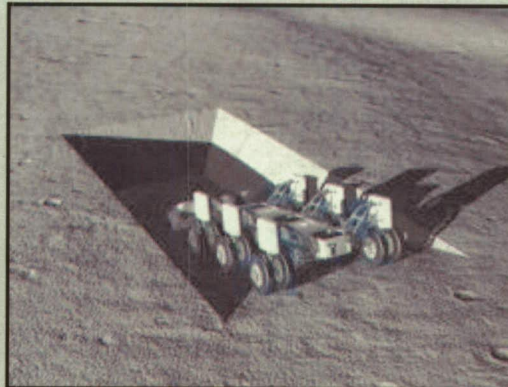
Image: A notional screenshot from the LSOS user interface: a rover excursion between two ground assets.

LSOS In Context: LSOS Tool Role

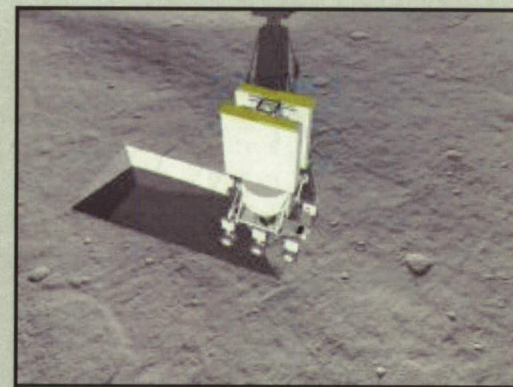
Example Use Case: Deployment and Operation of Equipment



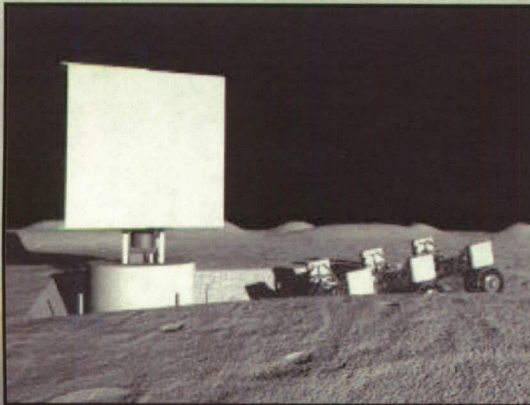
1. Digger prepares area



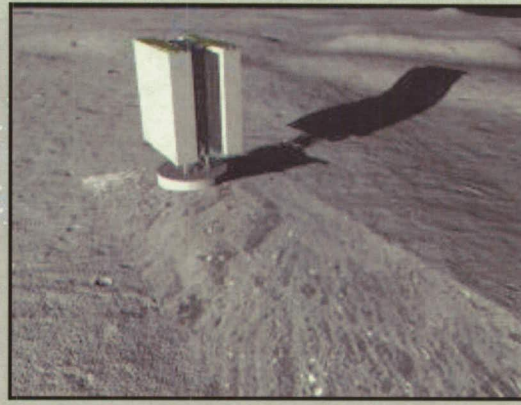
2. Trench depth is reached



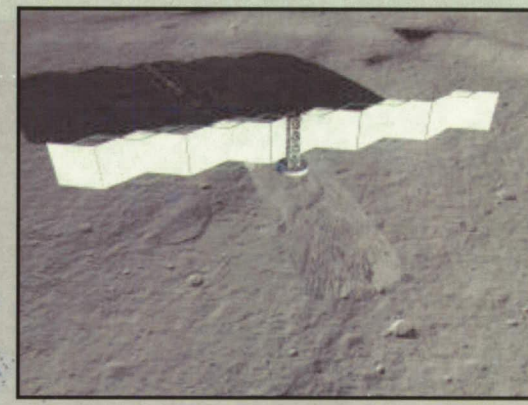
3. Assembly moved into place



4. Digger replaces regolith



5. Lower assembly is buried



6. Panels deployed

Images: Stills from a rendered animation in work by the LaRC SACD Multimedia Lab



"Earth is the cradle of mankind.
But one cannot live in the cradle
forever."

Konstantin E. Tsiolkovsky

