

CALIFORNIA SPACE ENTERPRISE ANALOG FACILITIES FOR EXPLORATION HARDWARE VALIDATION TESTS VALIDATION AND TRAINING.

California Space Authority

Andrea Seastrand, Nick Pelster, Matthew Everingham, Ray Wells

Introduction: The California space enterprise community now has a plan to achieve the vision of California leading the world in all aspects of space exploration and development, a goal which no other state and few nations can reach, and which has great significance for California and its citizens. According to the plan, Representing 31% of the \$55 billion U.S. space market and currently supporting over 265,000 jobs, California's high-tech public and private space enterprise community is spread throughout every county in the state. California space enterprise is actively involved in activities that include sub-orbital, orbital, lunar, planetary or deep space systems, operations, or related services, including supporting activities such as technology development; manufacturing; operation of ground systems, ranges and test sites; virtual space enterprise activities; space-related education, workforce development and training and governmental support.

The California Space Enterprise Strategic Plan will be implemented by the space enterprise community through a collaborative effort to execute objectives and projects that align to the five key strategic initiatives:

- *Business Development, Retention and Growth*
 - Provide a positive, supportive business climate and space enterprise environment, addressing obstacles to and opportunities for California space enterprise competitiveness
- *California Space Industrial Base Vitality*
 - Sustain and enhance California's space-related manufacturing and supplier network and its supporting infrastructure
- *Science, Research and Technology Development*
 - Foster and support space-related science, research, technology development and innovation
- *Education and Workforce Development*
 - Enhance space-related education and ensure appropriate 21st century space workforce
- *Public and Policymaker Awareness*
 - Educate the general public and California policymakers - local, State and Federal - about the benefits, scope and needs of California space enterprise

CSA has identified over 1,500 companies with space activities in the state and major space assets including three NASA facilities, numerous space-related military bases and space product manufacturing and operations sites, as well as a network of world-class universities. Californians' everyday lives are supported by space activities and technologies in a myriad of ways.

The strong statewide space enterprise will create even more high-paying jobs in California, attract and retain talent that catalyzes growth, inspire our youth, attract and retain space business, enhance the many benefits Californians enjoy as a result of space activities and solidify space as California's competitive frontier.

California's creativity, spirit of innovation and space systems engineering expertise have been essential in ensuring U.S. space mission success on the battlefield, on the moon, in earth orbit, on the International Space Station and in the future, on Mars.

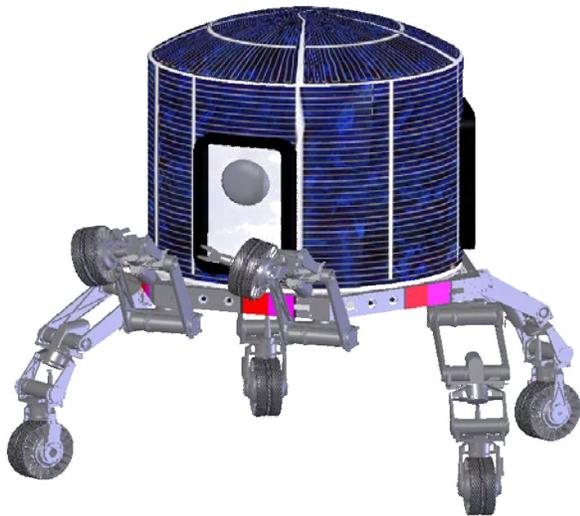
Background: With diverse geography, a variety of aerospace resources, and robust infrastructure, California is well-suited to host terrestrial analog sites supporting lunar and planetary exploration initiatives. Home of three NASA centers (Ames, Dryden and JPL), the largest combination of military test ranges (China Lake, Edwards, Vandenberg, and others), and 19% of the nation's aerospace industry, California can deliver a capability that is unsurpassed to meet all objectives. The California Space Authority (CSA) can lead a team government and industry partners to provide a capability exceeding what is available from any single entity in the nation.

CSA, with its unique role as advocate for California space enterprise, will solicit interest from the aerospace community and will secure participation from space enterprise partners to bring the combined capability of California's aerospace resources to bear to meet the nation's requirements for terrestrial analog sites. Each one of the partners will be selected based upon their unique strengths and abilities to contribute to the overall solution. The entities involved in the project will be networked together with existing well-knit communications and transportation resources to

deliver a realistic environment to posture the United States for the challenges that lie ahead in lunar and planetary exploration endeavors.

The country has a great challenge ahead in preparing for future lunar and planetary exploration. There is no better way to prepare for this challenge than to leverage the nation's largest aerospace investment with the natural geographic variety and the proven infrastructure of the great State of California.

Location: The California Program is intended to be broad, including simulation, technology demonstration, research, and education. The facility will be a distributed one, in which the simulation facilities will be a principal component. A permanent location will be selected in 2007, following a survey of available locations and appropriate coordination with the California Industrial Aerospace and University community with regard to competencies and skills matters. Funding for the procurement of capital equipment will be sought from private sources; however, initial simulations of robotic field experiments can take place at a temporary site as soon as next summer.



NASA- JPL Mobile Habitat Robotic System

California simulation capabilities: For robotic field simulations, various locations will be selected in addition to those existing at Jet Propulsion Laboratory, NASA-Ames, and NASA-Dryden that will allow equipment to be tested over many kilometers of range and over slopes of 30-60 degrees, including small craters. Infrastructure capabilities will include a solar power system and communications links. Investigators

will be expected to provide their own documentation equipment.

Over the first three years of California Infrastructure buildup, a simulated lunar outpost will be designed and implemented. The outpost will include lunar habitats, life support, power, communications, ISRU processing and other principal systems of an early lunar outpost. The initial facility will be sized for 6 crew members; as funding allows, additional facilities may be added to represent a full lunar base.

Education: One of California's programmatic objectives is education at all levels. The California Cultural and Historic Endowment (CCHE) has awarded a planning grant in the amount of \$150,000 to the California Space Education and Workforce Institute (CSEWI) for the California Space Center, which is to be built in Santa Barbara County on 66 acres outside the front gate of Vandenberg Air Force Base. The CSEWI is a non-profit organization dedicated to education and workforce issues of the space enterprise community. This grant award represents the first step in making the center a reality in that it provides funding for environmental surveys and architectural planning. The California Space Center is envisioned to be a world-class facility that tells the inspirational story of California's significant contributions to space enterprise, including national security, homeland security, communications and Earth observation which can be expanded to cover Space Explorations. The Center will feature an historic rocket park, a launch viewing amphitheater, and educational facilities on the Air Force base. A long-term lease for the 66 acre site at Vandenberg AFB has been requested.

In order to better prepare the country for the further lunar exploration, the California Space Education and Workforce Institute is also working with NASA to implement NASA Centennial Challenges. The Regolith Excavation challenge scheduled for May 2007 demonstrates the institutes commitment to supporting NASA and using the opportunity to provide educational outreach.

Summary: By 2011, a fully developed California human outpost simulation facility is envisioned, in time to begin to develop capabilities for the Vision for Space Exploration's projects planned for the mid to late 2010's. A vigorous program of simulation and education for lunar outpost operators, both on the Moon and on Earth, will become a centerpiece of the facility and the space exploration program at the California universities and educational institutions.