



EXECUTIVE CHAMBERS
HONOLULU

NEIL ABERCROMBIE
GOVERNOR

July 1, 2014

GOV. MSG. NO. 1272

The Honorable Donna Mercado Kim,
President
and Members of the Senate
Twenty-Seventh State Legislature
State Capitol, Room 409
Honolulu, Hawaii 96813

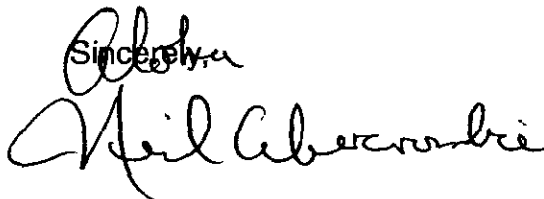
The Honorable Joseph M. Souki,
Speaker and Members of the
House of Representatives
Twenty-Seventh State Legislature
State Capitol, Room 431
Honolulu, Hawaii 96813

Dear President Kim, Speaker Souki, and Members of the Legislature:

This is to inform you that on July 1, 2014, the following bill was signed into law:

HB2152 HD1 SD2 CD1

RELATING TO THE PACIFIC INTERNATIONAL
SPACE CENTER FOR EXPLORATION SYSTEMS
ACT 169 (14)

Sincerely,


NEIL ABERCROMBIE
Governor, State of Hawaii

Approved by the Governor
JUL 1 2014
on
HOUSE OF REPRESENTATIVES
TWENTY-SEVENTH LEGISLATURE, 2014
STATE OF HAWAII

ACT 169
H.B. NO. 2152
H.D. 1
S.D. 2
C.D. 1

A BILL FOR AN ACT

RELATING TO THE PACIFIC INTERNATIONAL SPACE CENTER FOR
EXPLORATION SYSTEMS.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAII:

1 SECTION 1. The legislature finds that the Pacific
2 international space center for exploration systems stimulates
3 economic growth for the State, promoting the establishment and
4 growth of new sustainable and green industries, associated jobs,
5 workforce development, internships, and science, technology,
6 engineering, and mathematics education programs. The Pacific
7 international space center for exploration systems has generated
8 significant interest in applied research and development for
9 planetary surface systems technologies, with participation from
10 the public and private sectors, as well as international
11 organizations. The Pacific international space center for
12 exploration systems is advancing these technologies using the
13 world-class, basaltic planetary analog test sites uniquely found
14 in the State.

15 The legislature further finds that research and development
16 in areas of planetary sustainability and resource utilization
17 continue to demonstrate considerable potential for advancing

HB2152 CD1 HMS 2014-3507



1 dual-use technologies that can assist the State in becoming
2 increasingly self-sufficient in renewable energy, broadband
3 communications, advanced manufacturing, and other critical areas
4 for development, as well as provide multiple opportunities for
5 economic and workforce development through strategic
6 partnerships with public and private research and development
7 groups worldwide. Accordingly, the Pacific international space
8 center for exploration systems will continue to explore and
9 pursue research and development programs for planetary surface
10 system technologies in five strategic areas.

11 The first area to be developed is the fabrication of
12 basaltic-based construction materials as an alternative to
13 cement. Three-dimensional printing is being developed and
14 utilized to support a broad range of applications in
15 architecture, civil engineering, robotics, and aerospace. The
16 Pacific international space center for exploration systems'
17 research in basaltic concrete and construction has the potential
18 for advancing multiple technologies in additive manufacturing
19 for rapid prototyping, parts production, and construction using
20 three-dimensional printing with novel materials.

21 For example, cement is the traditional "glue" that holds
22 aggregates together to form concrete. Cement production is an



1 energy-intensive process that accounts for approximately five to
2 seven per cent of global carbon dioxide. Production generates
3 high environmental and economic costs, as the State pays a
4 premium for cement and imports over three hundred thousand
5 metric tons per year to meet demand.

6 The Pacific international space center for exploration
7 systems can help reduce cement imports and costs by conducting
8 applied research that can characterize and advance alternative
9 binder technologies, using indigenous and "waste" byproducts of
10 the State, to produce basalt-based construction materials for
11 building homes, highways, and other structures statewide, in
12 partnership with the University of Hawaii, National Aeronautics
13 and Space Administration, and industry. Funding allocated
14 through this Act will be used to perform applied research in
15 three-dimensional printing of fabricated parts using the State's
16 basalt fines, as well as researching the use of basalt material
17 for construction.

18 The second area to be developed is in-situ resource use and
19 integrated resource extraction technologies. A key requirement
20 for space exploration is the ability to "live off the land"
21 using indigenous resources found on planetary surfaces. The
22 Pacific international space center for exploration systems has



1 acquired a planetary rover on long-term loan from Ontario Drive
2 and Gear in Canada to enable the development, testing, and
3 validation of integrated resource extraction technologies. The
4 goal is to develop and demonstrate end-to-end technologies
5 associated with "dust to thrust" capabilities of extracting
6 oxygen from Hawaii basalts, filtering the water, separating the
7 water into hydrogen and oxygen, pumping gases into a hydrogen
8 fueling station, and transferring gases from the refueling
9 station into gas cylinders on the rover. This will expand the
10 State's role as a premier site for the development, testing, and
11 validation of planetary surface system technologies. Funding
12 allocated through this Act will be used to design, develop, and
13 test an integrated Pacific international space center for
14 exploration systems in-situ resource utilization test facility
15 with robotics, fuel cells, oxygen extraction, hydrogen storage,
16 and aerial and hopper technologies. Funds will also support
17 modification of equipment from the National Aeronautics and
18 Space Administration, as well as the transportation of equipment
19 and selected industry partners to the State for program
20 integration.

21 The third area to be developed is the planetary analog test
22 site. The island of Hawaii's unique geology enables the Pacific



1 international space center for exploration systems to provide a
2 world-class test site with terrain that closely simulates the
3 surface of the moon and Mars. Since 2007, this site has been
4 used to support robotic and other technology testing and
5 validation by the National Aeronautics and Space Administration,
6 private industry, and international space agencies. Funding
7 allocated through this Act will be used to provide the
8 additional power, mechanical systems, and communications
9 infrastructure required to enable technology testing and
10 validation requirements for future robotic and human missions to
11 the moon and Mars, which in turn will secure the State's role as
12 a global leader in the development of planetary surface system
13 technologies.

14 The fourth area to be developed is the secondary school
15 lunar surface flight experiment. The moon and Mars present
16 difficult challenges to exploration, chief among them being
17 dust. Surface dust consists mostly of a powder that is abrasive
18 and clings stubbornly to surfaces including solar arrays,
19 radiators, viewports, and spacesuits. During the Apollo
20 missions, three days of exposure to the lunar environment
21 rendered some parts of the spacesuit unusable. There also is
22 evidence suggesting this dust may be electrostatically charged.



1 The National Aeronautics and Space Administration's Kennedy
2 Space Center has made remarkable breakthroughs in technologies
3 to counter the dust issue. The technique employed, through an
4 electric grid, has been shown to lift and transport particles
5 using electrostatic forces. This technology, while working well
6 in the laboratory, has never been applied to space applications
7 on the moon.

8 The Pacific international space center for exploration
9 systems, in partnership with the National Aeronautics and Space
10 Administration's Kennedy Space Center, NanoRacks, and three
11 Hawaii high schools, will plan, design, develop, and test a
12 dust-removal experiment to be flown on a 2015 Google Lunar
13 XPrize mission to the lunar surface. The Pacific international
14 space center for exploration systems has secured a grant from a
15 Google Lunar XPrize team to cover the transportation cost to the
16 lunar surface, valued at \$3,200,000. Funding allocated through
17 this Act will be used to design, develop, test, and evaluate
18 flight hardware.

19 The fifth and final area to be developed is the
20 international robotics mining competition. The National
21 Aeronautics and Space Administration lunabotics challenge has
22 been among the most successful college robotics competitions.



1 Attracting the best and brightest from around the world, this
2 event is held annually at the Kennedy Space Center and combines
3 all the hallmarks of science, technology, education, and
4 mathematics education, space exploration, and teamwork,
5 embracing a "failure is not an option" attitude.

6 The National Aeronautics and Space Administration has
7 refocused this event as a national competition for college teams
8 targeting Mars. There is a demand for a global competition with
9 college engineers and space science students. The Pacific
10 international space center for exploration systems is working
11 with international aerospace contacts to foster regional
12 competitions modeled on the National Aeronautics and Space
13 Administration lunabotics challenge. Funding allocated through
14 this Act will be used to facilitate and coordinate an
15 international robotics competition in the State during the
16 summer of 2014.

17 The purpose of this Act is to appropriate funds to the
18 Pacific international space center for exploration systems for
19 general and administrative tasks and to assist in the execution
20 of the five planetary surface systems initiatives that will
21 advance the State's leadership in aerospace and for general and
22 administrative tasks.



1 SECTION 2. There is appropriated out of the general
2 revenues of the State of Hawaii the sum of \$500,000 or so much
3 thereof as may be necessary for fiscal year 2014-2015 for the
4 purpose of executing the Pacific international space center for
5 exploration systems' five planetary surface systems initiatives
6 described in section 1 of this Act and for the center's general
7 and administrative tasks.

8 The sum appropriated shall be expended by the Pacific
9 international space center for exploration systems for the
10 purposes of this Act.

11 SECTION 3. This Act shall take effect on July 1, 2014.

APPROVED this 1 day of JUL , 2014



GOVERNOR OF THE STATE OF HAWAII

