

Analog Missions on the slopes of Mauna Kea

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PISCES



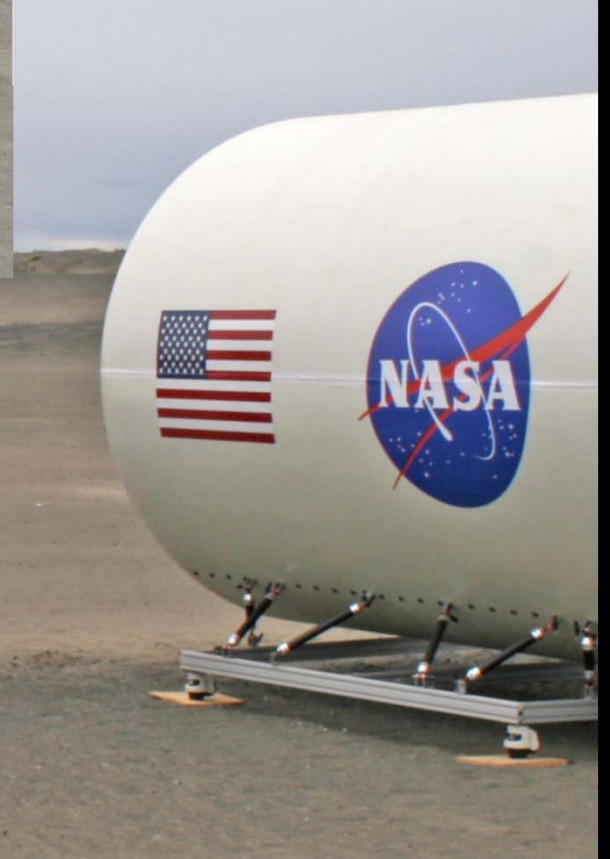
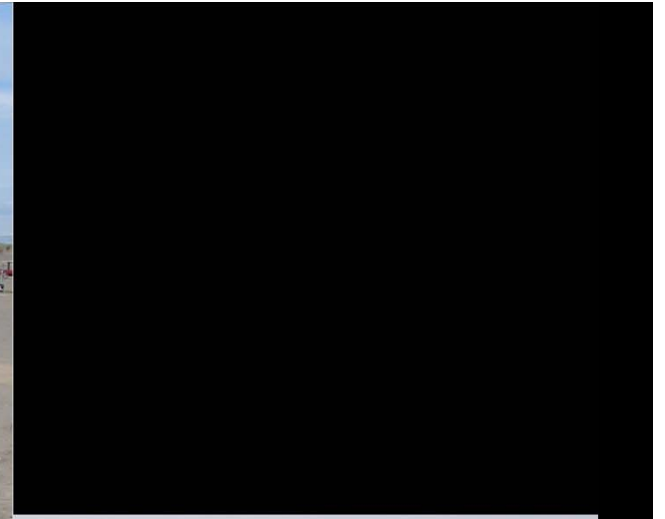
Pacific International
Space Center for
Exploration Systems

Goal

Getting back to the farm









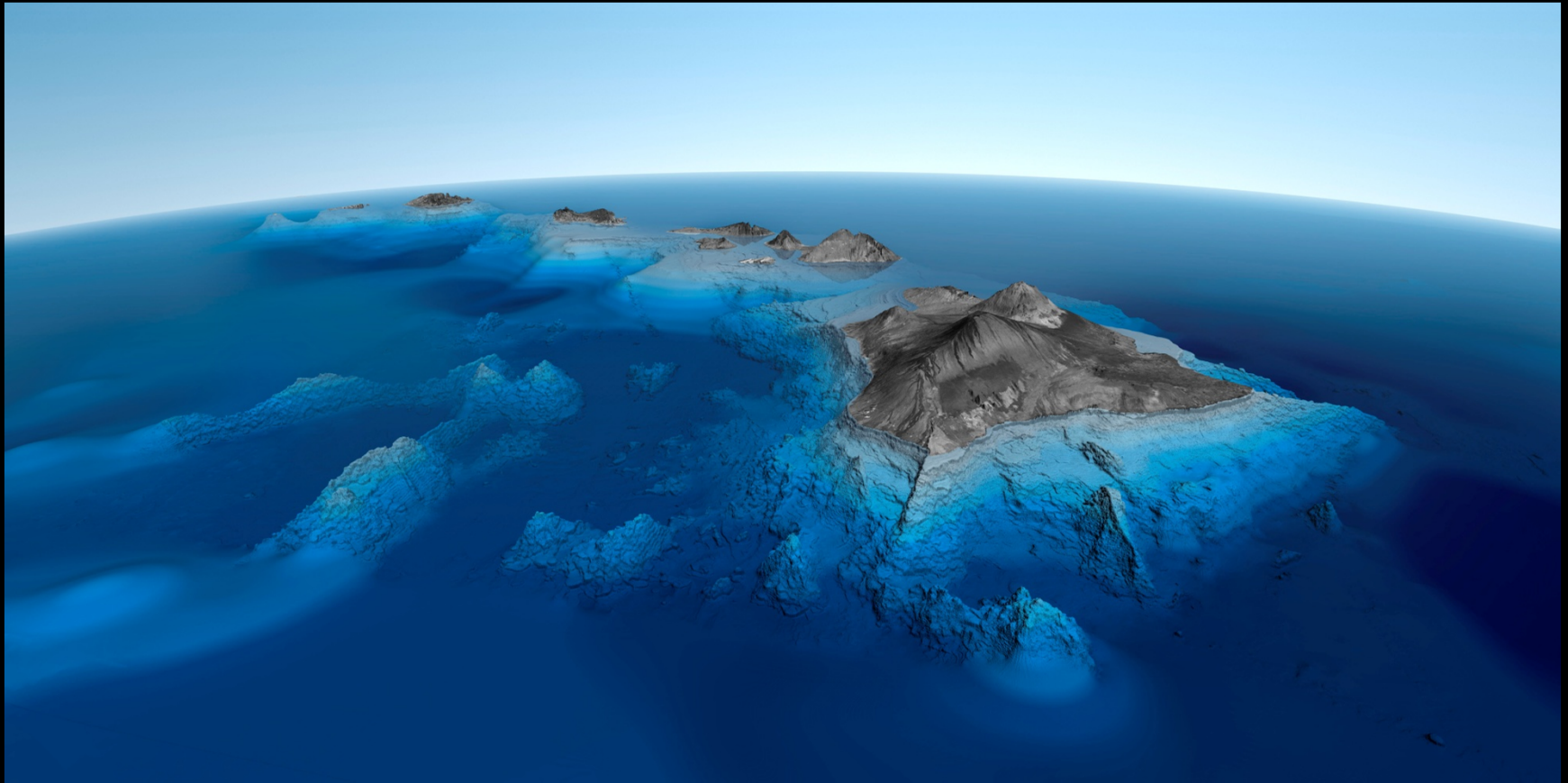


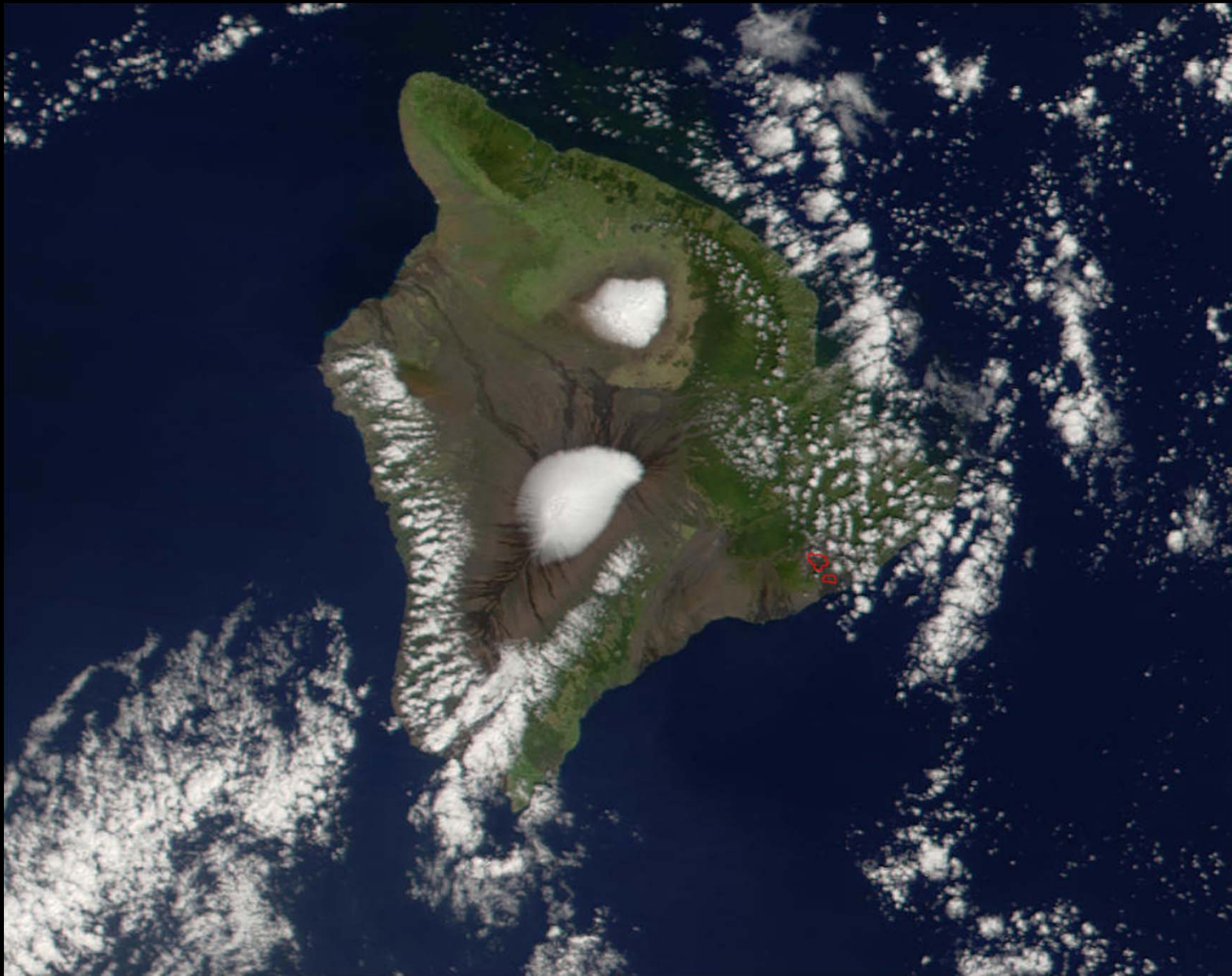
Pacific International
Space Center for
Exploration Systems

Bringing Space Exploration Down to Earth

in Hawai'i

Hawaiian Islands





Mauna a Wau Kea



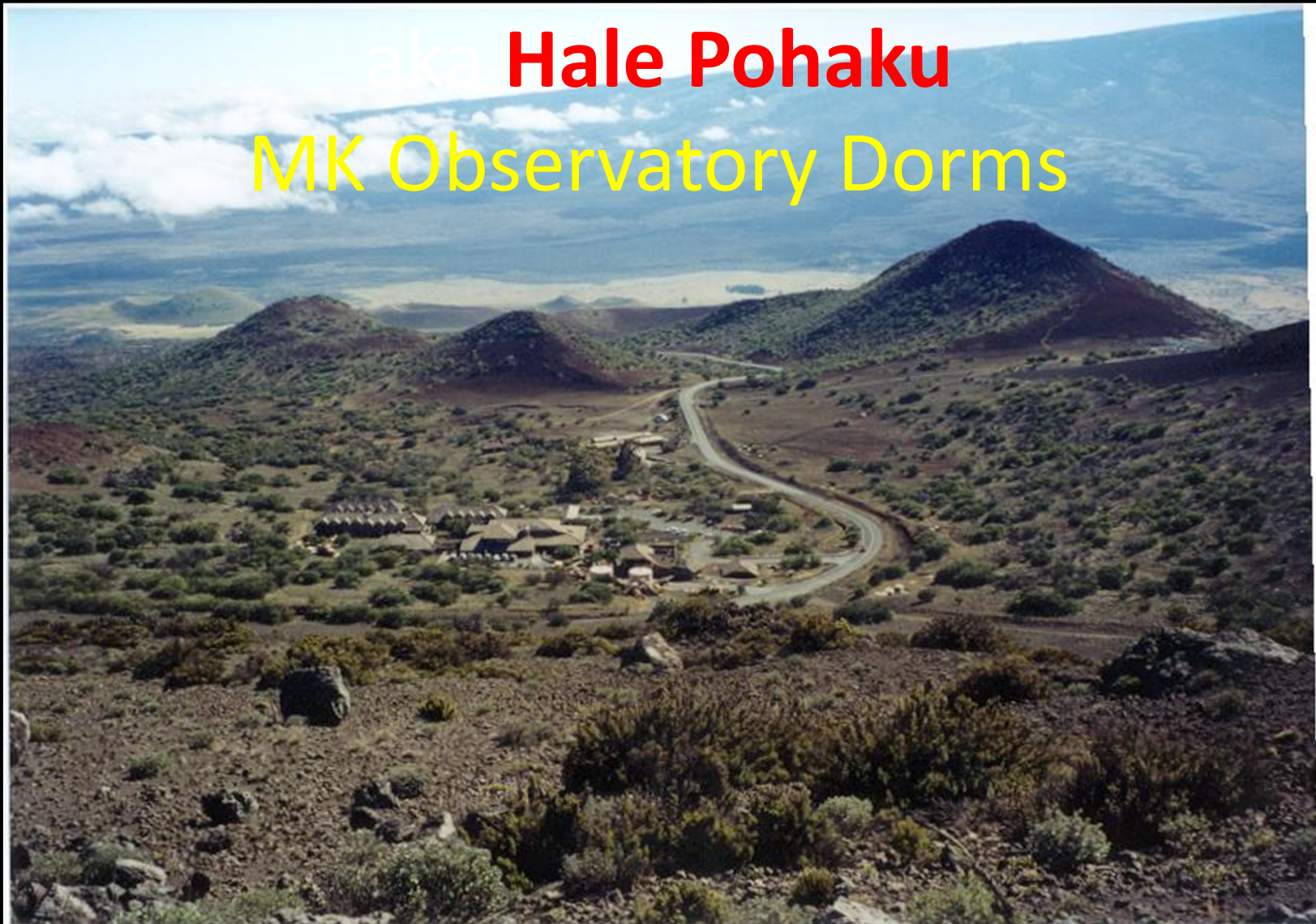
© George Kourounis



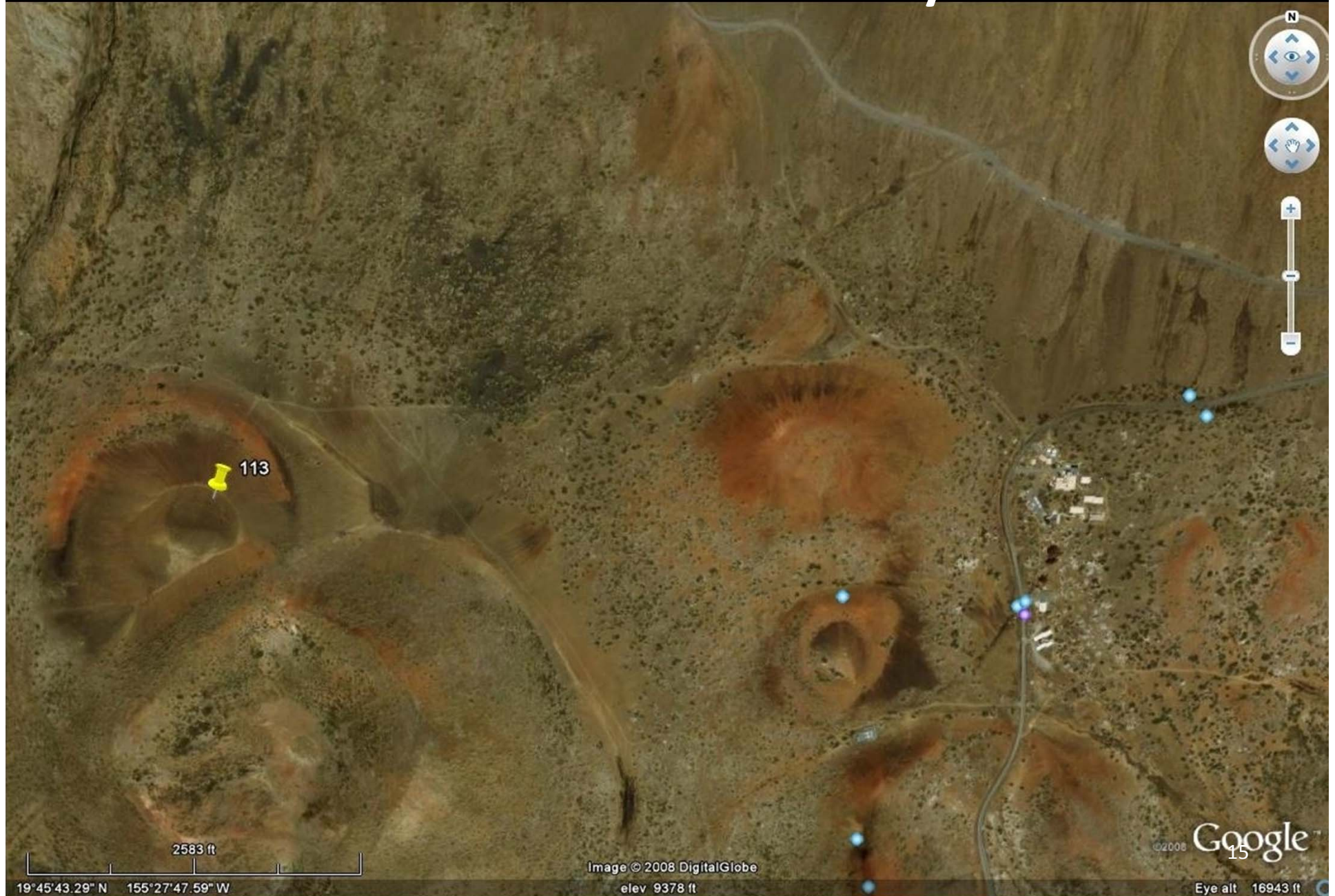


Ellison S. Onizuka Center for International Astronomy

aka **Hale Pohaku**
MK Observatory Dorms



Pu`u Haiwahine Valley









18 9:15PM



November 2008
Combined ISRU Field Test

Pennsylvania Air National Guard



Crammed to the gills!







HIANG – Hawaii Air National Guard

Airport logistics



Pohakuloa Training Area – US Army

Transport – Hilo to Hale Pohaku



U-Haul to the rescue



Conan's Transport – Hilo to Hale Pohaku



“You want me to put what, where?!?!”



Gases and Cryogenics



“Jus like dat, brah!”



Special Handling Required



Just another day at the office



Workshops



Pit stop



UHH Group Photo



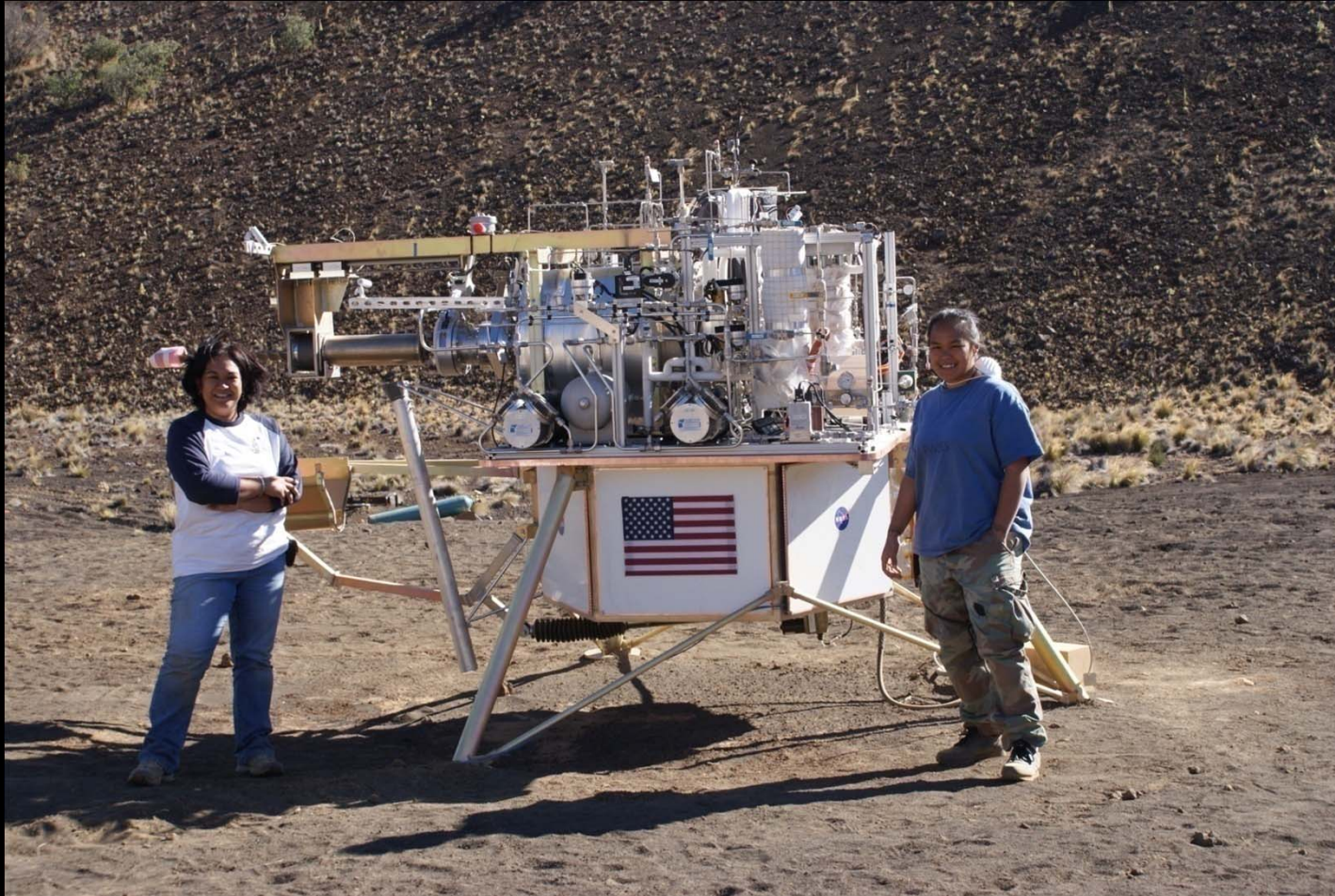
SCARAB with Norcat Drill on Tweels



Das Mole - DLR



PILOT



Processed
Regolith

(just as it looked
when it erupted)



No tephra was harmed in this experiment!



ROxygen in tent



“I thought you said this was small!”



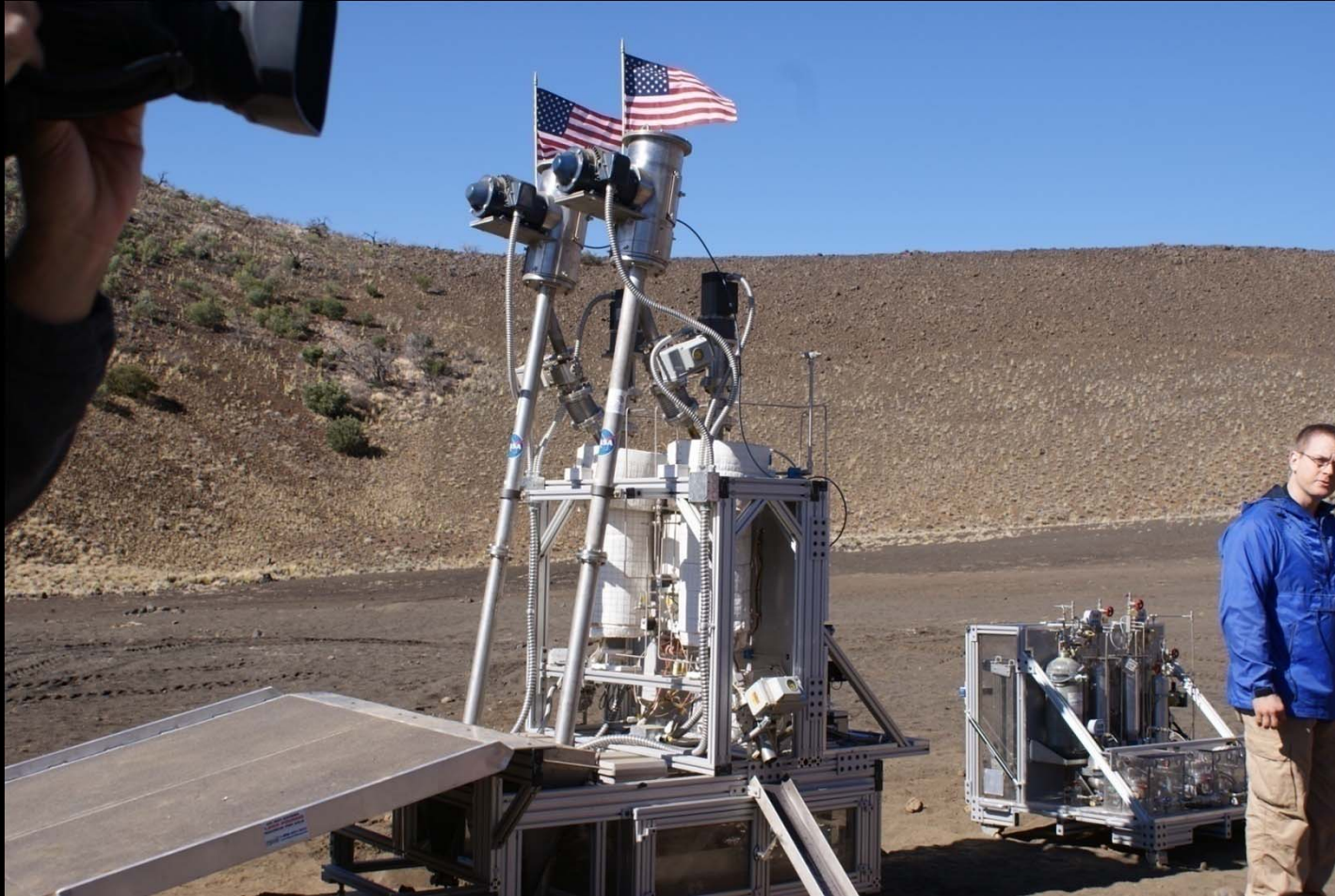
CRATOS at work (the little dump truck that could)



Lockheed Martin's Bucket Wheel



ROxygen



SCARAB on the slopes



These...



...go here



But first, it starts here



Some might fine sieving



Now to **bake** out the moisture



at a Bakery!



Ready for the roll in oven



Workforce Training – Bakery Experience for Astronomy & Computer Science Majors



Into the delivery truck



Public Outreach @ `Imiloa Science Center, Hilo



NGE – Next Generation Explorer



Re-palletizing



Ready for the C-130



Clean up time



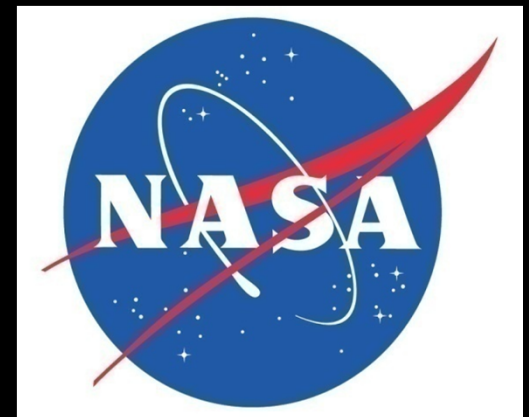
Removing road bed



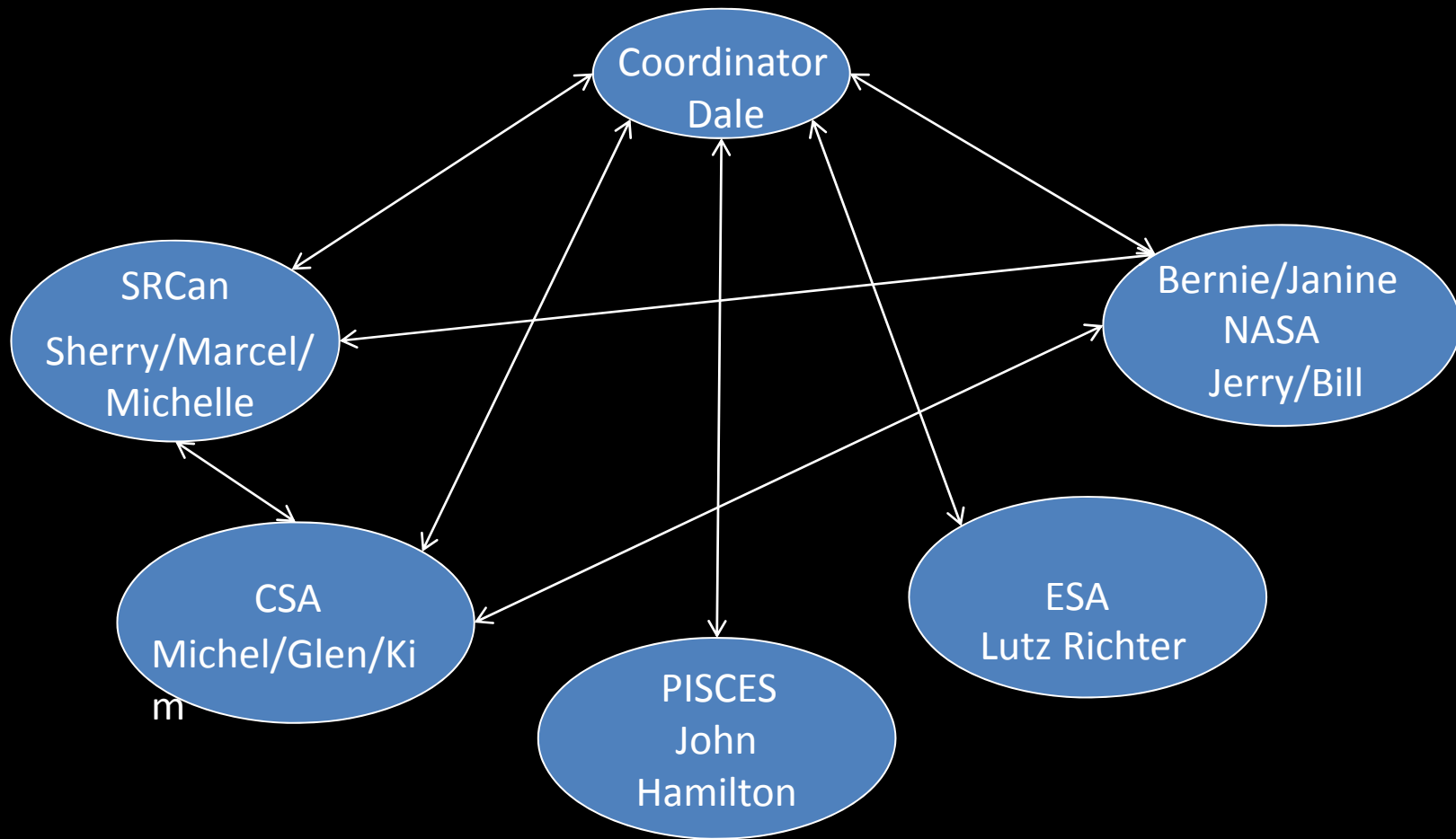
Pau Hana Hawaiian Style!



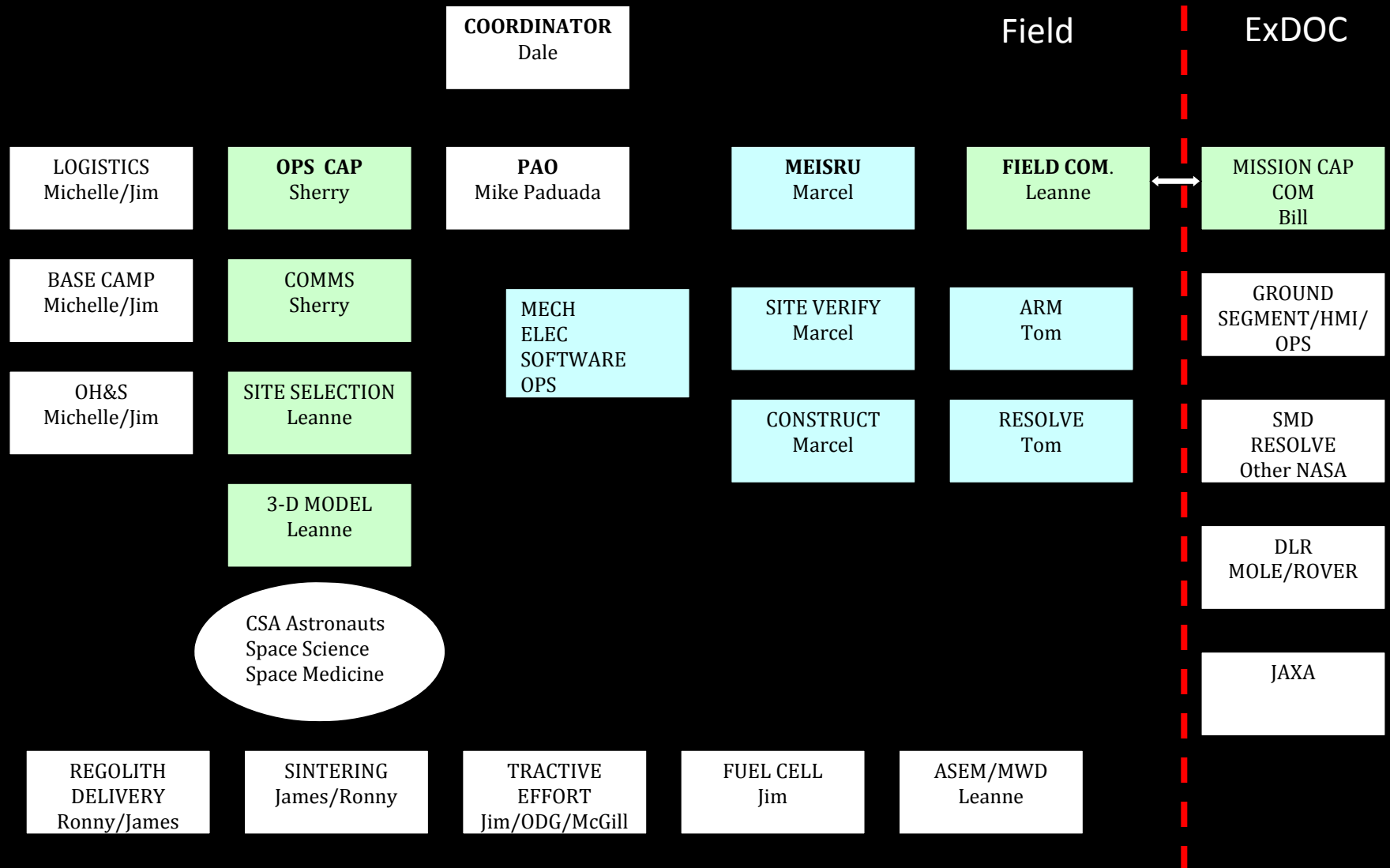
ISRU Systems
Field Test Deployment
January 23 to February 14, 2010



Deployment Overview



Deployment Overview



Ka Mahina



Cultural Considerations



Now where did I leave my phone?



First Things First









Stuff



It takes a village



Sat coms



Honda Powered



Cordon Bleu Chef at work!



Enjoying Chef's labors



Canadian Centaur



Got gas?



Transport to site



Lost tourists blocking access road



Robot Factory

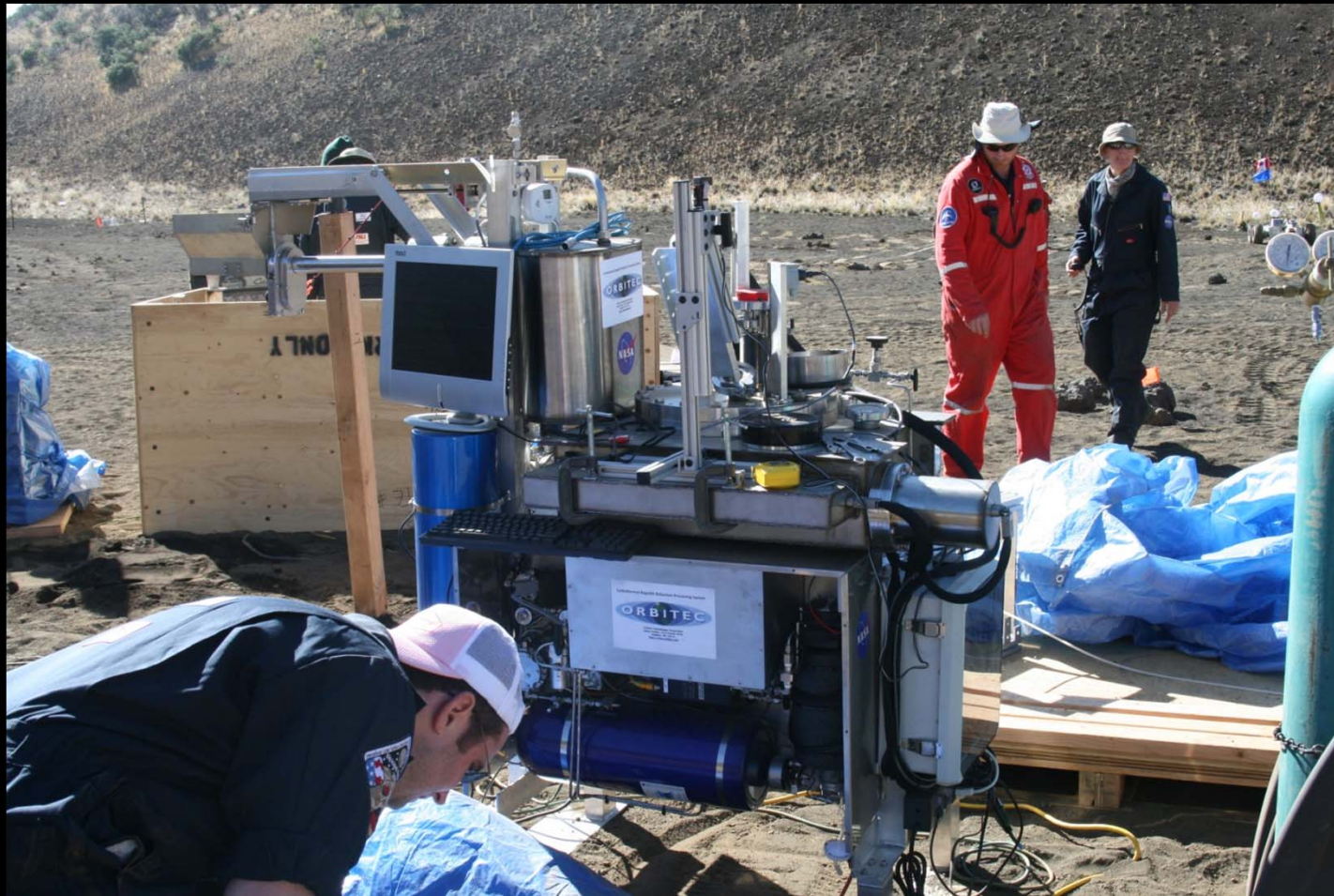




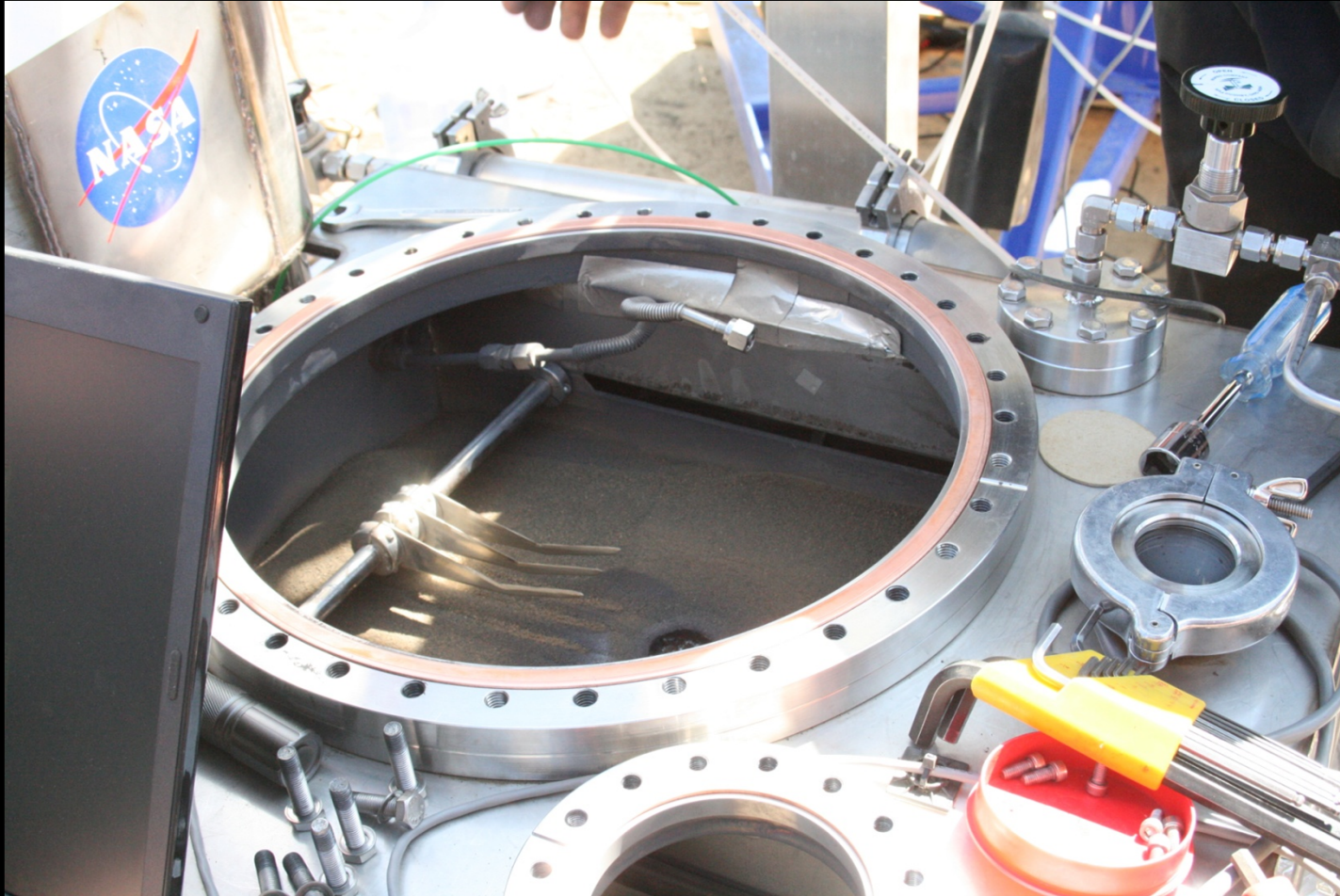
Set the controls for the heart of the Sun!



Orbitec Carbothermal



The chamber



Office with a view



Sam learns to drive Canadian style



Happy Hour



2010 Camp





Astrobiologists



Na wahine `o PISCES and the Astronaut



Everyone pitches in!





Even the little
things count!

Executive Business Suit





Just another day on the robot farm





Resolve redux



How many NASA guys does it take to move a tent?



UHH Marine Bio Major at work



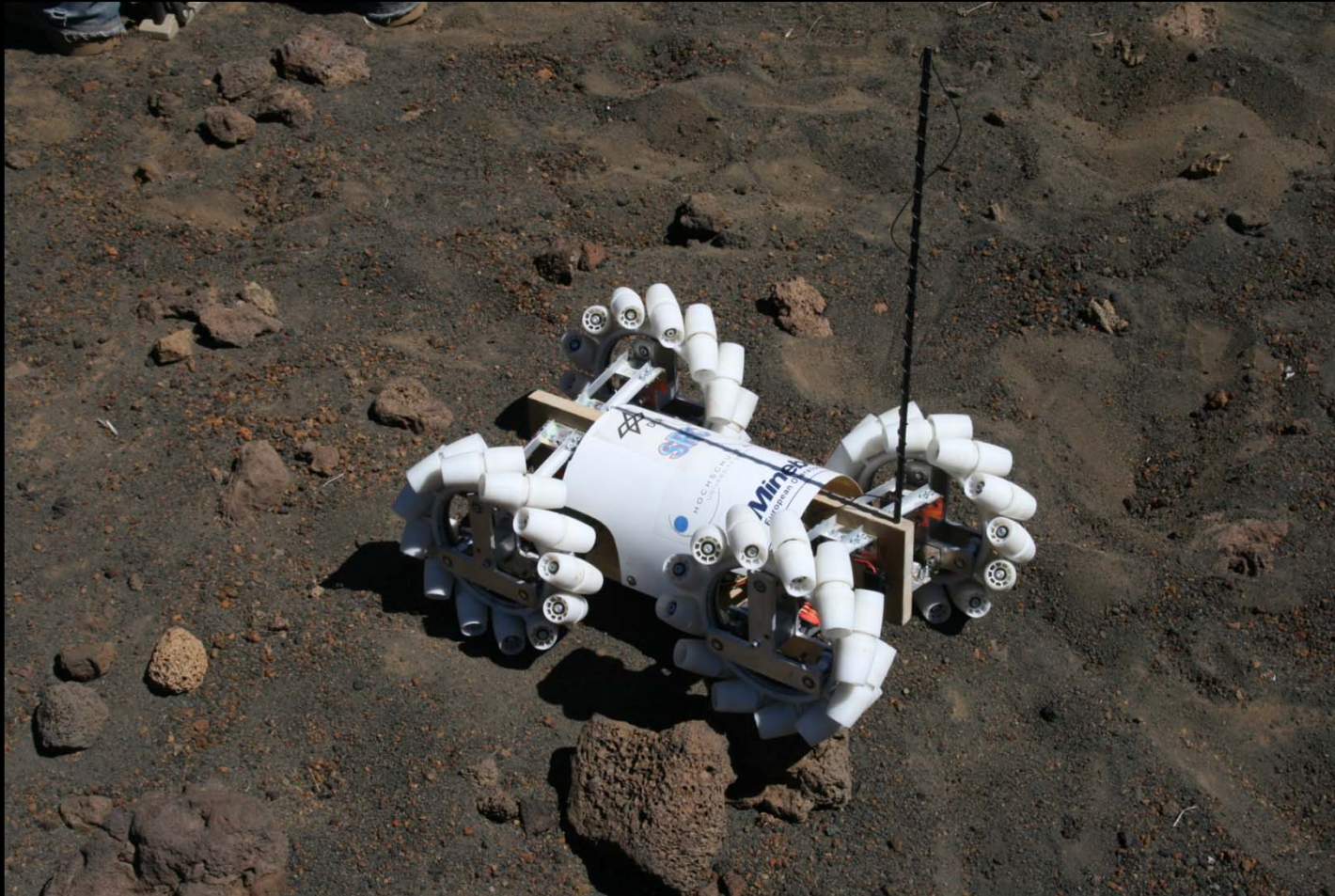


A UHH
Astronomy
Major learns
which end of a
shovel to look
through

Tele-Medicine



DLR mini-bot



A real (big) crater



ARGO to the rescue (again)



Hill climb (manual assist)





The little robot
that could

VIPs



Fuel cells





Autonomous Robot tag





DUST to THRUST!













Going home



Robot luggage



Fatigue



It all fit where?



Going home to Canada





Clean up



Fuel cell return



Off to FedEx!



Hilo International



Rebuild the pallets @ Civil Air Patrol ITO



Weighing each pallet



Excess luggage sucks!



Loading the C-130



3rd International Hawaii Analogue Field Test **Overview**

Field Dates: June, 2012

Location: Mauna Kea , Hawaii

Mission Key Personnel

- Jerry Sanders/Bill Larson, NASA
- Martin Picard, CSA
- John Hamilton/Univ. of Hawaii-Hilo

Top-Level Field Mission Objectives:

1. Science/Resource Characterization

- A. Perform robotic lunar polar ice/volatile characterization mission
- B. Perform robotic science/resource/site characterization mission with multiple rovers centers

2. In-Situ Resource Utilization

- A. Perform integrated Mars Water/Fuel demonstration on robotic lander mockup
- B. Perform enhanced collaborative robotic site preparation tasks over previous analogue tests
- C. *Option:* Trash processing to make fuel

3. System Integration & Servicing

- A. Integrate Fluid and Electrical Systems for Surface and Transportation Elements (Tied to 2A); Cryogenic Fluid Management, & Propulsion
- B. *Option:* Evaluate servicing & robotic maintenance techniques

4. Human Medical Tele-Operations

- A. XX
- B. XX

5. Astronaut Field Test Involvement

- A. Human-capable rover mobility testing
- B. Field science training

6. Mission Support and Operations

- A. Utilize mission representative communications infrastructure and remote operations procedures



"Apollo Valley"



Pu'u haiwahini

*"We leave as we came, and God willing, as we shall return,
with peace and hope for all mankind."*

— Eugene Cernan, Commander of
the last Apollo mission

