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LATE TESTIMONY

Testifier's name with position/title and organization: Kim Binsted, Associate Professor, University of Hawaii

The Committee the comments are directed to: COMMITTEE ON ECONOMIC REVITALIZATION & BUSINESS

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In support of SB 165 S.D. 2 Aerospace Development

I support this bill in its entirety. My testimony will focus on Sections 3.7 ("Support for installation of the National Aeronautics and Space Administration's Habitat Demonstration Unit") and 3.8 ("Matching funds to be provided to the University of Hawaii to qualify for a grant from the Experimental Program to Stimulate Competitive Research").

Both of these elements are zero-risk means of bringing resources to Hawaii. The first brings a multi-million dollar space habitat, a fantastic platform for research and education, for the relatively tiny cost of shipping it here. The second brings up to $750,000 of federal funds to the state, if the grant proposal is successful – and costs the state nothing if it is not. Both elements stimulate the economy and advance aerospace research, education and commerce.

Analog research for planetary exploration

We are establishing a research program that uses a realistic planetary-surface habitat, in an analog environment, under strong operational conditions, to understand and address the risks of long-term human space exploration.

The NASA Human Research Program has identified a number of risks associated with long-term human space exploration (http://humanresearch.jsc.nasa.gov/elements/smo/hrp_evidence_book.asp). If we are to return to the Moon, or venture on to Mars, asteroids or other deep-space destinations, we will have to assess these risks, and develop reliable countermeasures. Although some of these risks are related to radiation or microgravity, many are common to isolated, confined and/or extreme environments here on Earth. These are called analog environments because they share a significant subset of the conditions astronauts will face in long-term space exploration. Hawaii has some very strong analog environments, which have the geological, operational and psychological characteristics of the environments astronauts will experience as they explore the solar system. Moreover, in comparison with other analogs (e.g. Devon Island in the Canadian High Arctic, or McMurdo Station in Antarctica), Hawaiian analogs are relatively accessible, and can support long-term research programs. NASA's Human Research Program recently conducted an assessment of analog sites around the world, and a site on the Island of Hawaii placed in the second tier (behind only the NEEMO underwater station and the International Space Station itself), and was the only highly-rated analog accessible for year-round studies.

Our first core study, already funded by the NASA Human Research Program, is focused on the food the astronauts will eat during long-term planetary exploration missions. To be valid, this study has to take place in a realistic operational analog, with the kind of workload, communications issues, psychological stresses, and so on, that an astronaut crew would face. So, we are planning to put a crew of six in a small habitat in a space analog environment in Hawaii, for four months in 2012/13. They will live and work under strict analog conditions, only venturing outside in simulated space suits, communicating with 'Earth' via channels disrupted by realistic latencies and drop-outs, etc.

This long-term analog mission is also an excellent opportunity for other human factors researchers. We are inviting a set of opportunistic research studies – from NASA, the Canadian Space Agency, the Japanese Space Agency, the European Space Agency, and academic institutions – to test their ideas in this environment. Potential topics include remote medicine, crew dynamics, communication technologies, psychological support strategies, and so on. Because there are a large number of identified risks that can only be studied under long-term controlled analog conditions, we hope to repeat this

simulated mission scenario regularly, so that all the necessary countermeasures can be explored, developed and thoroughly tested.

In order for this research program to be successful, we will need a realistic planetary surface habitat at an analog site here in Hawaii.

The NASA Habitat Demonstration Unit (HDU)

The NASA HDU is a prototype of a planetary surface habitat, developed by a team at NASA for exactly this kind of study. The current prototype has been used in short term tests (2-3 weeks) and is ready for long-duration testing. We hope to bring the HDU to Hawaii to be used as the habitat for the research program described above. The NASA HDU team supports these efforts (testimony to be provided separately).

Figure 1: The NASA Habitat Demonstration Unit at a test site in Arizona.

The HDU is portable (albeit bulky) and largely self-contained, so very low-impact. Although we have not yet selected a site, the criteria for site selection include that it be neither environmentally nor culturally sensitive.

Education, Public Outreach and Participatory Exploration

The research plan described above would use the habitat for 4-6 months out of the year, and approximately 2 months per year would be required for refitting and repairs. The remaining 4-6 months of the year, the habitat would be available for education, public outreach and participatory exploration. For example, K-12 student groups and community groups could visit the habitat at the analog site. Undergraduate students could participate in short-term simulations, and carry out research projects. The habitat could be used as a base for middle- and high-school robotics competitions. The possibilities are endless.

I have been involved in planetary exploration simulations in Utah and on Devon Island, and can attest to the inspiration that a real space analog can provide. For example, hundreds of students, teachers and citizen scientists have spent two-week 'rotations' at the Mars Desert Research Station in Utah, and have come away excited about science and space exploration, eager to share their experiences 'on Mars' with their communities.

The EPSCOR Program

NASA's EPSCOR grants are intended to encourage research in states which are typically underfunded by NASA's research programs. Hawaii is classified as an EPSCOR state, so may apply for these funds. Proposals are typically due in March, but because Hawaii may only submit two proposals in total, a pre-proposal process is necessary, with pre-proposal deadlines usually in late January. EPSCOR typically allows budgets up to $750,000 over three years, but requires a 50% match from non-federal funds (i.e.

$375,000, for a total maximum budget of $1.125 million). This match must be confirmed by the pre-proposal deadline, so the funds requested in this bill would be for the January 2012 deadline. The remainder of the match will be in-kind contributions.

We will propose a three-year research program (described above) based at an analog site on the Island of Hawaii. Because the state match will only be required if the proposal is successful, this is no-risk opportunity to bring research funds into the state.

Thank you for considering this testimony. If I can provide any more information in support of this bill, or if you have any follow-up questions, please do not hesitate to contact me.