

LATE

**George R. Ariyoshi**  
**999 Bishop Street, 23<sup>rd</sup> Floor**  
**Honolulu, HI 96813**

**March 27, 2013**

TESTIMONY IN SUPPORT OF SCR195 AND SR149 – RECOGNIZING  
COMMERCIAL SPACE TRANSPORTATION AS A STRATEGIC AND TIMELY  
GROWTH INDUSTRY FOR HAWAII AND REQUESTING THE STATE  
ADMINISTRATION TO TAKE PROACTIVE, COORDINATED, AND SUSTAINED  
ACTION TO FULLY REALIZE THE SIGNIFICANT SCIENTIFIC, EDUCATIONAL,  
AND COMMERCIAL BENEFITS THAT SPACE LAUNCH OPERATIONS AND  
RELATED AEROSPACE ENTERPRISE CAN BRING TO HAWAII.

Dear Members of the 27<sup>th</sup> State Legislature,

I strongly support the intent of this resolution to promote and enable the significant scientific, educational and commercial benefits space launch operations can bring to Hawaii.

Our state's strategic mid-Pacific/near-equatorial location, resident expertise in multiple aerospace-related technologies, and long-standing ties with space-faring nations throughout Asia and the Pacific, clearly afford strategic assets and capabilities that can be leveraged to realize humankind's full potential in space, and in so doing enable our State to engage as both a major contributor to and beneficiary of the global space enterprise.

In particular, these factors collectively make Hawaii an ideal site to support commercial space launches to both equatorial and polar orbits, and to do so in a manner that will enable safer and more cost-effective launch operations in comparison with other launch sites on the U.S. Mainland.

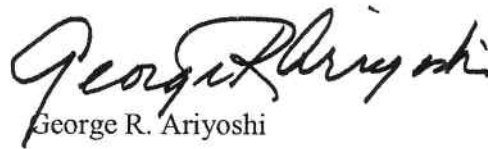
Commercial space launch activities will provide multiple opportunities to grow and diversify our local economy – for example, through the deployment of small satellites and scientific payloads that can assist with monitoring and managing both man-made and natural disasters, the launching of “spaceplanes” that will carry Hawaii tourists to the edge of space, and the development of space-based power systems that can capture sunlight as a renewable energy resource for both interplanetary spacecraft and Earth-based applications.

Furthermore, commercial space launch operations could attract significant federal and private sector investments that would provide high-paying and sustainable technology-based employment opportunities for local residents, as well as promote pioneering research and innovative industrial applications statewide - and in so doing inspire the next generation of scientists, engineers and entrepreneurs that will lead us to the future.

As such, I would urge you pass SCR195 and SR149, and would be happy to address any questions you may have concerning this recommendation. I can be reached by e-mail at [kyahiku@wik.com](mailto:kyahiku@wik.com) , by phone at (808) 544-6765 or by fax at (808) 544-8398.

Thank you for the opportunity to testify on these resolutions.

Aloha,



George R. Ariyoshi

GRA:khy

LATE



March 28, 2013

To: The Senate, Hawaii State Legislature

From: Elliot Holokauahi Pulham  
Chairman, Hawaii Aerospace Advisory Committee

Sub: SR149 and SCR195

As chairman of the Hawaii Aerospace Advisory Committee, it is my pleasure to offer testimony in support of SR149 and SCR195. Both resolutions offer support for the potential development of commercial space launch industries in Hawaii.

Before addressing the economic potential that the space launch industry might offer to Hawaii, I want to address environmental and cultural impacts; as a part-Hawaiian and native of Ka'u, these are important to me, as they are to many Hawaiians. In my 25-year career in the space industry, I have supported or observed more than twenty launches from the Kennedy Space Center and Cape Canaveral, Florida. I have seen first hand how launch operations, which require large, uninhabited safety zones, have actually helped to preserve and protect the natural environment of the 140,000 acre Merritt Island National Wildlife Refuge – including the Canaveral National Seashore, Indian River, and Mosquito Lagoon. This experience has taught me that well-run launch operations can be the lowest density, lowest impact use for environmentally sensitive areas. Accordingly, commercial launch operations are a much better fit for preserving the unique cultural, geologic and environmental assets of Hawaii than tourism, agriculture, retail or virtually any other use.

In terms of the potential economic benefit to Hawaii, I call your attention to two sets of data. The first has to do with wages paid in the space industry. As you can see from the following chart, from the Space Foundation's soon-to-be-released *The Space Report 2013*, the average compensation in the space industry is substantially higher than in other industries:

**EXHIBIT 4h. Top Five States by Space Industry Average Annual Salary, 2011**

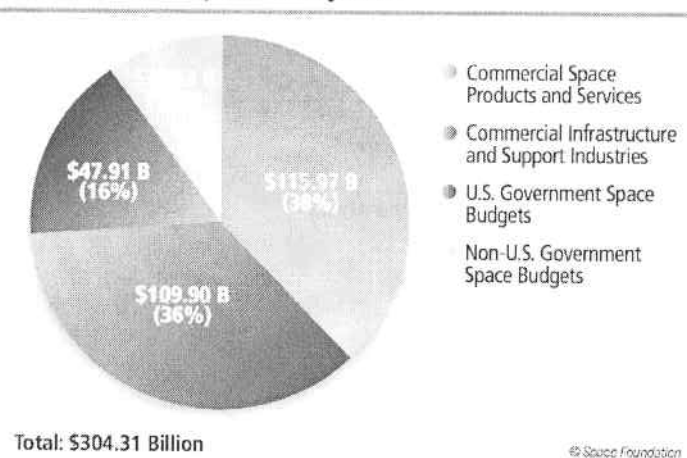
| State         | Space Industry Salary | Private Sector Salary | Salary Differential |
|---------------|-----------------------|-----------------------|---------------------|
| Massachusetts | \$129,293             | \$50,620              | 155%                |
| Colorado      | \$128,645             | \$49,245              | 161%                |
| Maryland      | \$115,825             | \$50,620              | 129%                |
| California    | \$113,752             | \$54,345              | 109%                |
| Virginia      | \$113,591             | \$50,261              | 126%                |

Source: Bureau of Labor Statistics Quarterly Census of Employment and Wages

In short, space industry wages range from 109% higher to 161% higher than the average, prevailing wages in any state. When you compare the nearly \$130,000 per year average space wages in Massachusetts and Colorado to the State of Hawaii's average wages of only \$37,020 – it is immediately apparent the phenomenal economic impact a vibrant space sector could have in creating jobs and prosperity for our keiki.

Second, I would like to address the market opportunity for Hawaii. As you will see in the following chart, also from *The Space Report 2013*, the global space economy was a \$304 billion marketplace in 2012:

**EXHIBIT 2c. Global Space Activity, 2012**



Within this \$304 billion industry is the launch business. In 2012 there were 78 orbital launch attempts (74 successes, 4 failures) that represented \$6.94 billion in activity. While this roughly \$7 billion total is a small fraction of the industry, it is a huge addressable market segment for Hawaii. Of particular importance:

- The launch business brings with it a number of adjacent, job-creating activities, including payload processing, payload and launch vehicle integration, data management, telemetry services, and so on. These are also high paying, space industry jobs.

- The forecast for the launch sector is very strong. As shown in the following two charts, average annual payload mass has grown almost 50% in the past five years, and the Space Foundation forecasts that 261 total launches will be required to orbit 449 satellites in the next nine years.

**EXHIBIT 3j. Number of Launches Attempted and Payload Mass Intended for Orbit by Country, 2007–2012**

|               | Launches  | Mass (kg)      | Launches  | Mass (kg)      | Launches  | Mass (kg)      | Launches  | Mass (kg)      | Launches  | Mass (kg)      | Launches  | Mass (kg)      | Launches   | Mass (kg)        |
|---------------|-----------|----------------|-----------|----------------|-----------|----------------|-----------|----------------|-----------|----------------|-----------|----------------|------------|------------------|
| China         | 10        | 26,007         | 11        | 30,613         | 6         | 16,388         | 15        | 37,990         | 19        | 64,907         | 19        | 48,448         | 80         | 224,353          |
| Europe        | 6         | 25,156         | 6         | 40,384         | 7         | 35,220         | 6         | 24,442         | 7         | 43,810         | 10        | 50,962         | 42         | 219,974          |
| India         | 3         | 3,185          | 3         | 2,294          | 2         | 1,336          | 3         | 4,187          | 3         | 3,576          | 2         | 2,650          | 16         | 17,228           |
| Multinational | 0         | 0              | 1         | 1,370          | 3         | 8,913          | 0         | 0              | 2         | 7,800          | 3         | 15,500         | 9          | 33,583           |
| Iran          | 0         | 0              | 1         | 45             | 1         | 26             | 0         | 0              | 1         | 15             | 3         | 150            | 6          | 236              |
| Israel        | 1         | 300            | 0         | 0              | 0         | 0              | 1         | 272            | 0         | 0              | 0         | 0              | 2          | 572              |
| Japan         | 2         | 4,085          | 1         | 2,000          | 3         | 19,838         | 2         | 2,300          | 3         | 18,600         | 2         | 18,400         | 13         | 65,223           |
| North Korea   | 0         | 0              | 0         | 0              | 1         | 500            | 0         | 0              | 0         | 0              | 2         | 200            | 3          | 700              |
| Russia        | 26        | 90,370         | 26        | 92,814         | 29        | 116,932        | 31        | 125,997        | 31        | 137,365        | 24        | 117,778        | 167        | 681,256          |
| South Korea   | 0         | 0              | 0         | 0              | 1         | 100            | 1         | 100            | 0         | 0              | 0         | 0              | 2          | 200              |
| United States | 20        | 78,665         | 20        | 206,186        | 25        | 112,136        | 15        | 100,383        | 18        | 96,799         | 13        | 72,124         | 111        | 666,293          |
| <b>Total</b>  | <b>68</b> | <b>227,768</b> | <b>69</b> | <b>375,706</b> | <b>78</b> | <b>311,389</b> | <b>74</b> | <b>295,671</b> | <b>84</b> | <b>336,376</b> | <b>78</b> | <b>326,212</b> | <b>451</b> | <b>1,909,618</b> |

Source: Space Foundation

**EXHIBIT 3c. Commercial Satellite and Launch Forecasts, 2013–2021**

| Category                | 2013      | 2014      | 2015      | 2016      | 2017      | 2018      | 2019      | 2020      | 2021      | Total      | Average     |
|-------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|-------------|
| GSO Forecast (COMSTAC)  | 21        | 20        | 23        | 21        | 20        | 20        | 20        | 22        | 22        | 189        | 21.0        |
| NGSO Forecast (FAA)     | 44        | 28        | 35        | 42        | 49        | 16        | 15        | 16        | 15        | 260        | 28.9        |
| <b>Total Satellites</b> | <b>65</b> | <b>48</b> | <b>58</b> | <b>63</b> | <b>69</b> | <b>36</b> | <b>35</b> | <b>38</b> | <b>37</b> | <b>449</b> | <b>49.9</b> |
| GSO Medium-to-Heavy     | 16        | 15        | 18        | 16        | 15        | 15        | 15        | 17        | 17        | 144        | 16.0        |
| NGSO Medium-to-Heavy    | 12        | 13        | 15        | 12        | 16        | 11        | 11        | 10        | 10        | 110        | 12.2        |
| NGSO Small              | 1         | 0         | 0         | 1         | 1         | 1         | 1         | 1         | 1         | 7          | 0.8         |
| <b>Total Launches</b>   | <b>29</b> | <b>28</b> | <b>33</b> | <b>29</b> | <b>32</b> | <b>27</b> | <b>26</b> | <b>29</b> | <b>28</b> | <b>261</b> | <b>29.0</b> |

Note: GSO – geostationary orbit; NGSO – non-geostationary orbit; COMSTAC – Commercial Space Transportation Advisory Committee; FAA – Federal Aviation Administration  
Source: FAA

The data are clear. Well-managed space launch represents an environmentally benign economic opportunity of vast potential for the State of Hawaii. Accordingly I heartily endorse SR149 and SCR195, and urge that the Senate pass these two important resolutions as a clear signal to industry that Hawaii is ready to play an important role in the exploration, development and utilization of the final frontier.

Me ka ha'aha'a,



Elliot Holokauahi Pulham  
Chairman, Hawaii Aerospace Advisory Committee

LATE

# Henk B. Rogers

Pu'u Wa'awa'a Ranch

March 31, 2013

Dear Members of the 27<sup>th</sup> Hawaii State Legislature,

I am pleased to provide testimony in strong support of SCR195 and SR149, which request our State administration to proactively explore and promote opportunities for commercial space launch operations in Hawaii.

I firmly believe that there is a very big future for mankind and, more specifically, for our nation in space exploration. It is only a matter of time before we once again set foot on the Moon and for the first time set foot on Mars. So where in this country will the next stage in the space program be based? Will it once again be Florida? Or will it be Hawaii? This is up to us.

We have a distinct and unique opportunity here. As NASA and the rest of the world once again turn their attention to the Moon and Mars, we can focus their attention on basing the activities of space exploration in Hawaii. We have the best terrain for realistic Mars and Moon base simulations since our islands are made of the same basic material (basalt/regolith). We are also the best location to launch from in the U.S. since we are closest to the equator of any U.S. state.

If we could convince space-faring nations to test planetary exploration in Hawaii and/or launch payloads from Hawaii, we would have a high tech sector in Hawaii equal to the military or tourism.

Please give this legislation your utmost attention. If we are able to bring commercial space transportation to Hawaii, it will be our legacy.

Sincerely Yours with Aloha,

A handwritten signature in black ink, appearing to read "Henk B. Rogers". The signature is stylized with a large, looped initial "H" and a long horizontal stroke extending to the right.

Henk B. Rogers  
Vice Chairman  
Pacific International Space Center for  
Exploration Systems

LATE

## International Ventures Associates

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5333 Potomac Avenue NW, Washington, D.C. 20016

March 29, 2013

Ref: Support of SCR 195 & SR 149 (Commercial Space Transportation)

Dear Members of the 27<sup>th</sup> State Legislature:

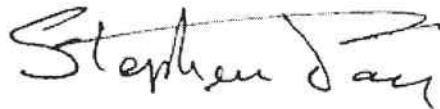
As a member of the Hawaii Aerospace Advisory Committee (HAAC), past chairman of the Japan/U.S. Science, Technology & Space Applications Programs (JUSTSAP), and former executive at COMSAT in Washington, D.C., I am pleased to provide testimony in strong support of these resolutions, which request the Hawaii State Administration to proactively explore and promote opportunities for commercial space launch operations in Hawaii.

Your State's strategic geographical location, resident expertise in a broad range of technology-related fields, and international partnerships with space-faring nations throughout the Asia-Pacific Region make Hawaii an ideal site from which to support commercial space launch activities, and to do so in a way that can couple with other industries to strengthen and diversify your local economy – especially toward developing an “arc of related technologies” statewide (analogous to the highly successful and ultimately transformational economic development models implemented in other metropolitan areas, including Pittsburgh, Austin, Rochester, and Silicon Valley).

These resolutions highlight timely opportunities to advance innovative economic development scenarios in Hawaii. Commercial space launch activities would both complement and enhance your State's technology-based industries, including DoD and private sector aerospace programs, your Pacific International Space Center for Exploration Systems (PISCES), and K-12/University STEM initiatives statewide – leading to higher paying jobs, expanded overseas investments, and increased competitive capabilities across many fields (e.g., broadband telecommunications, renewable energy, remote sensing, telerobotics – among others).

As such, I would urge you to adopt this most visionary “call to action”!

Sincerely,



Stephen M. D. Day  
Chief Executive Officer



March 31, 2013

To: Members of the 27th Hawaii State Legislature

Reference: HCR195/SR149 in support of commercial space launch operations from Hawaii

I am pleased to provide written testimony offering my personal endorsement of and strongest support for Resolutions HCR195/SR149 - requesting the State Administration to explore and promote commercial space launch operations from Hawaii.

As a member of the Board of Directors for Hawaii's Pacific International Space Center for Exploration Systems (PISCES), I have the honor of working with the great State of Hawaii, and its Office of Aerospace Development, in assisting with the implementation of the State's visionary initiatives to become a leader in international space endeavors.

In a remarkably short period of time, PISCES has flourished from simply an interesting concept to a program demonstrating an important and unique role that Hawaii can serve in furthering our Nation's goal to promote international collaboration in space, while also providing economic and social benefits to the State, as well as inspiring our youth to pursue STEM-related studies that will ultimately permit them to contribute to this goal in their future careers.

As the former Director of Advanced Programs at NASA, where I spent my career leading and sponsoring innovative advanced technology projects, programs and missions that have flown in space in support of human exploration and development of space, it is also clear to me that the shift to commercial space launch will play a critical new role for our national space program, as NASA again leads the world in bringing the private sector into the space launch domain that has been the purview of international space agencies for more than five decades.

I was fortunate to attend the recent launch of SpaceX's Falcon 9/Dragon International Space Station (ISS) cargo servicing mission from Kennedy Space Center's launch facilities at Cape Canaveral. This was the third of three successful missions by SpaceX to ISS, which collectively have demonstrated the efficacy of commercial space for Earth to Orbit launch operations, allowing NASA to focus on the more challenging task of developing the technologies and capabilities required to support human exploration far beyond low-Earth orbit – to the Moon, to asteroids, and eventually to Mars.

As other private sector companies also begin to field their maturing commercial launch systems, I believe this will provide an opportunity for Hawaii to become a leader in commercial space launch operations – leveraging its unique mid-Pacific, near-equatorial location that affords opportunities for all-azimuth launch operations, while providing enhanced performance by virtue of its lower launch latitude (as compared to competing US mainland launch sites).

By supporting these Resolutions, Hawaii will again demonstrate its commitment to being an international leader on the space frontier, which will provide significant economic and societal returns to the State of Hawaii, as well as to the future workforce it will inspire to pursue this vital work for Hawaii, for our Nation, and for the benefit of all humankind.

Respectfully,

Lewis L. Peach, Jr.  
Secretary, PISCES Board of Directors,  
Aerospace Consultant, and  
NASA Executive (retired)



# LATE TESTIMONY

**BUZZ ALDRIN**  
Astronaut

March 31, 2013

To: Members of the 27th Hawaii State Legislature

Reference: Buzz Aldrin's endorsement of HCR195/SR149 in support of commercial space launch operations from Hawaii

I am pleased to learn of Hawaii's commitment to further its emerging leadership in commercial space enterprise as called for in Resolutions HCR195 and SR149, and am delighted to offer my strongest possible endorsement of these proposals – which request your State Administration to explore and promote commercial space launch operations from Hawaii.

Much has changed in our Nation's space program since Neil Armstrong and I first stepped on the moon on July 20<sup>th</sup>, 1969. At that time, there were only a few space agencies around the world, and space launch was within reach of only a handful of nations.

Over the past four decades, our remarkable successes in space have enabled phenomenal advances in science, engineering, and healthcare, strengthened our national economy, and inspired intellectual interest in STEM-related studies that produced a highly educated technical workforce that continues to provide huge dividends from those early investments in space.

Having witnessed the benefits from America's leadership in space, today more than sixty nations are involved in space-related endeavors, as they also wish to emulate, and benefit from, these successes.

Members of the 27<sup>th</sup> Hawaii State Legislature

Buzz Aldrin

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With the new emphasis on commercial space, America is again providing pioneering leadership by engaging the private sector in new business opportunities that will undoubtedly pay even larger dividends than we have experienced in the past.

With its strong support of PISCES and innovative work on the International Lunar Research Park (ILRP) concept, Hawaii has already taken important steps toward becoming a key enabler for analog planetary research, as well as an incubator for innovation within the international space community.

By pursuing the recommendations proposed in SRC195 and SR149, Hawaii will leverage its unique mid-Pacific, near-equatorial location, significant aerospace infrastructure and expertise, and extensive ties with spacefaring nations throughout the Asia-Pacific region to become a leading launch services provider for the emerging commercial space launch sector. In doing so, it also will afford pioneering research, educational, and economic development opportunities for the people of Hawaii, which in turn will help inspire the next generation of scientists, engineers, educators and entrepreneurs that will pioneer the frontiers of space.

Thank you for the opportunity to testify on these resolutions.

Sincerely,

A handwritten signature in black ink that reads "Buzz Aldrin". The signature is written in a cursive style and is underlined with a single horizontal line.

Buzz Aldrin

Apollo XI

SENT VIA EMAIL

March 28, 2013

Senator Donovan M. Dela Cruz  
Chair, Committee on Economic Development, Government Operations and Housing  
Senator Will Espero  
Chair, Committee on Public Safety, Intergovernmental and Military Affairs  
Hearing on Senate Concurrent Resolutions 195 and 149  
State Capitol, Conference Room 016

Aloha Chairs Dela Cruz and Espero !

Enterprise Honolulu stands in strong support of both Senate Concurrent Resolutions 195 and 149.

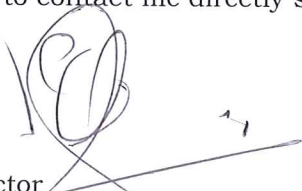
Commercial space transportation is a strategic and timely growth industry for Hawaii, with the potential to simultaneously expand existing sectors and diversify the economy, specifically in Tourism and STEM related fields.

As Hawai'i continues to improve and build upon our current economic condition – developing commercial benefits derived from next generation aerospace initiatives, provides a means to support an entrepreneurial ecosystem that helps Hawaii's businesses expand capacity and move toward long term health.

We ask for your legislative support with this important initiative.

Please feel free to contact me directly should you have any questions.

Sincerely,

  
Mark McGuffie  
Managing Director  
Enterprise Honolulu, Oahu Economic Development Board



ENTERPRISE  
HONOLULU

THE BUSINESS CLIMATE OF PARADISE