



Prepared Statement of

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Chairman Palazzo, Ranking Member Edwards, Chairman Smith, and members of the subcommittee, thank you for giving me the opportunity to address the subcommittee this morning. My name is Stuart Witt, and I am the CEO and General Manager of the Mojave Air and Space Port, which is located in southeast Kern County, California.

Many of my tenants call Mojave the Silicon Valley of Commercial Spaceflight. I'm just proud to lead the nation's only private experimental flight test center, a place where Innovation Takes Flight.

Our topic today is America's commercial space industry, and my message to you from the high desert is that American engineers and entrepreneurs in Mojave and other places across the country are successfully revolutionizing America's future in space. This is a 100% good news story. What my Mojave tenants require from elected representatives in Washington is continued permission, and modest encouragement, rather than obstacles.

I personally want to thank committee members Takano, Rohrabacher and Chairman Smith who have visited Mojave on numerous occasions, witnessing firsthand the private sector innovations I'm addressing today.

Chairman Palazzo has requested my attention to four specific questions which I will answer in detail.

**Question 1. *Please summarize the work underway by commercial space companies at Mojave Air and Space Port.***

There is enormous interest in what we offer. Many ask me “how did you manage to attract the firms and growth in Mojave over the past twelve years, including orbital research, suborbital development and operations, and deep space propulsion, specifically demonstrated by entrepreneurs and high net worth investors?” My response is simple. In a word, we offer them “Permission”. We don’t advertise. We just deliver. Just as our tenants deliver. We set reasonable constraints, provide value added services to test operations, and allow the developers to conduct and manage their own programs... with remarkable results. What sounds incredibly simple is actually in practice somewhat complex and rigorous. But again, the results speak for themselves. I’m convinced that daily development activities by the commercial space entrepreneurs at Mojave and other locations in Washington State, Nevada, New Mexico, Florida, Maryland and Virginia and Texas to name a few will yield remarkable outcomes to the nation. The emerging industry has certainly captured the investment eye of the high net worth community.

Specifically, Mojave Air and Space Port has 19 rocket test sites and 17 firms engaged in commercial space research, development, ground and flight test and evaluation, leading to production of manned and unmanned space systems. A major focus of development work at Mojave is on basic and applications-driven R&D in advanced aerospace propulsion and power systems. Specific emphasis is centered on green, or non-toxic, liquid and hybrid rocket propulsion systems. Privately funded complete launch systems to orbit and sub-orbit, and components for such systems, are in development for commercial firms and government clients. But this work also has huge spin off potential beyond aerospace. For example, some of their discoveries are being applied to conventional internal combustion engine efficiency and are yielding demonstrated >20% MPG increases on current commonly in service production automobiles.

From this work, over 27 patents have been filed in the U.S. and over 50 abroad in just the last three years. Patent protection and respect of patent law (both in the U.S. and abroad) is a very important aspect of ensuring rapid and successful infusion of advanced technology in the commercial marketplace.

As many of you and your staffs have pointed out during your visits, “you can see the future from Mojave”. Current space-related developments include:

- 1) Reusable rocket development/Re-startable rocket development
- 2) Sub-orbital human rated tourist experience vehicle development x 2
- 3) Sub-orbital RLV piloted scientific payload system development x 2
- 4) Full scale LEO/GEO system delivery developments x 4
- 5) Subsystem component development and operations
- 6) Liquid and hybrid rocket engine/propulsion development
- 7) Vehicle control & monitor room development and deployment

Included in this technology portfolio, the Spaceport is the home of NOFBX™ green propulsion technology. NOFBX™ is one of the three competing technologies to eventually displace the current "gasoline" of the satellite community. (Europe has recently issued a 2016 ban on hydrazine due to its safe handling and disposal issues.) Due to its much higher performance than competing options, NOFBX™ technology has been selected for development for next generation, low cost, tactical launch systems like DARPA's Airborne Launch Assist (ALASA) program. NOFBX™ is also in development for a flight experiment on the International Space Station.

Commercial Space doesn't mean just aerospace. In the process of solving hard aerospace problems, inevitably new solutions for how to do things emerge that eventually find themselves into the commercial market place.

For example, SonicExhaust is a technology accidentally derived from developing extremely fuel efficient, extreme altitude unmanned aerial vehicle engine technology funded under DARPA. The SonicExhaust technology has been consistently demonstrating >20% improvement in fuel economy (miles per gallon) during extensive road test trials on standard size personal vehicles and has recently passed the California Air Resources Board (CARB) certification.

Likewise, composite material manufacturing solutions for endo- and exoatmospheric vehicles are in development by numerous firms at Mojave. What began under the watchful eye of Mr. Burt Rutan and the Rutan Aircraft

Factory in the 1970's has grown into a full industry with many spinoff firms designing and developing vehicles and components for current aircraft, new aircraft and spacecraft and subsystems. Spin-off firms designing coatings for fasteners which blend metallic and composites structures are in production at Mojave. Laser manufacturing processes have recently been accelerated by >100x from work initiated at the Spaceport enabling an emergent revolution in micro-fluidics and advanced optics much like circuit board lithography did for electronics. Ongoing work is going to accelerate these advanced manufacturing processes by another 100x. Ongoing work in next generation energy and power systems is in development at the Spaceport to reduce the U.S. demand on foreign energy supplies and help reduce the impact of emissions on the environment. Cost effective, advanced test beds and commercial test support for customers with new advanced development projects is also in development at the Spaceport.

To bring it down to a bottom line, Mojave now hosts 156 separate business contracts employing nearly 3,000 professionals. Annual aerospace revenue from rents and leases alone to our Air and Space Port District is \$3,076,000. Total client commerce at the Spaceport is well in excess of \$1B annually, not including commerce through our on-property rail yard supporting the renewable energy market.

## **Question 2. The potential future suborbital space market.**

First of all, as I point out above, Mojave is not just the home of three suborbital vehicle developers. All of these companies, plus others, are actively working on systems and major components for orbital launch, all the way up to EELV-class missions. Some are also pursuing capabilities for deep space exploration. Innovations coming out of Mojave are likely to stimulate significant growth in the more established orbital launch marketplace, as well as the new suborbital market.

In essence, if someone asked the question over two centuries years ago - "what can we do with steam"... We wouldn't know WHAT the future was but it would be logical to assume it had potential. Sub-Orbit is there and we have largely failed to utilize this band of the upper atmosphere, which we refer to as the "ignorisphere". It will be up to future generations to further develop "how and

why”– but it’s there and cannot be ignored. One near certain use will be for long range point to point intermediate or hypersonic human travel. These concepts are being explored in many corners of the globe now. Sub-orbit is there, it’s accessible, costs are coming down... future generations will fully exploit it for research, space access, tourism and point to point travel and other uses...who knows. Any futurist who tries to answer this question is nearly sure to underestimate the potential of the discoveries and their applications to increasing flight safety, efficiency and general quality of life on earth.

However, I would just restate what I said earlier: the emerging spaceflight industry has certainly captured the investment attention of the high net worth community. They believe there is potential.

### **Question 3. The challenges and opportunities faced by the suborbital space market.**

- a) This industry needs regulatory certainty. But the learning period restriction on unsubstantiated safety regulations expires in less than two years and the risk-sharing (indemnification) regime expires at the end of next month. That regulatory uncertainty is difficult for many companies. I ask Congress to make Indemnification permanent, and also extend the Learning Period to a full eight years of R&D and operational flights to provide regulatory certainty to firms developing passenger carrying vehicles.
- b) The Administration’s proposed changes to ITAR<sup>1</sup> pose a restriction to extending the peaceful exploration of space to a thirsty world market. As you may know, I have personally been to numerous friendly countries with long standing space exploration agreements with the United States who seek access to our emerging commercial space industry products. ITAR as it currently stands is more than a speed bump to expanding our markets off shore to countries seeking sub-orbit space tourism and sub-orbit scientific experiment access to space by developers currently operating at Mojave. I strongly urge this Congress to take action to identify and find meaningful

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<sup>1</sup> The State Department’s proposed revision to Category XV (“Spacecraft”) of the United States Munitions List explicitly places any human spaceflight vehicle, whether suborbital, orbital, deep space, or a habitat, under ITAR, whether or not it contains sensitive technology.

relief for the investments of XCOR and Virgin Galactic so their product line can be operated worldwide. Actions you take to provide such relief will assist all other domestic space systems providers and developers. The Kingdom of Sweden, through Spaceport Sweden, has been actively seeking access to US Space Sub-Orbit vendors to operate commercial flights through the aura-borealis from Northern Sweden but the obstacle continues to be ITAR. This specific issue was raised by Sweden during the President's recent visit to Stockholm.

**Question 4: Your thoughts on H. R. 3038, the Suborbital and Orbital Advancement and Regulatory Streamlining Act.**

I strongly support two elements of H.R. 3038 contained in Section 2. But the third element, contained in Section 3, is ambiguous and requires further discussion. From my 44 years as a professional aviator, test pilot and business executive it may take the FAA and industry into that mysterious land of unintended consequences and requires further review.

First, Section 2 of the bill allows companies to flight test a vehicle under a permit even after that class of vehicle has received a license. It's very important to allow companies to test each new copy of a spaceship they make, even if previous ones are operating commercially. And if a vehicle requires a repair, the operator should be able to test that repair under the flexible permit regime before returning to revenue flight under their license.

Second, companies should be able to get one stop shopping at FAA for a Single license or permit for all flights of their system, not just ones that launch a spacecraft into space. This will streamline paperwork and oversight business operations but will come with some geo-operations constraints under FAA AST, which I also support. Implementation of this provision under FAA/AST is proper for the industry and AST is the proper location within the FAA.

Section 3 of the bill may require further thought and discussion, especially depending on how this provision, or a modified form, is implemented. If implemented as proposed, Section 3 could have an adverse impact on the industry. Having said that, there is certainly a need for providing realistic training for passengers seeking a space experience in unusual attitudes and varying g-force load and a confined environment. Ways to provide this training include

centrifuge, aircraft of varying types and classroom or a combination of all. High performance former military aircraft have the potential of providing this training and may serve a highly beneficial purpose to aeronautically adapt people with no background or reference point on high g-force flight, confined space and potentially disruptive ride environments. The question arises as to whether this should be under "Informed Consent" space licensing or a new regime under FAA's aircraft side. I would be happy to provide further testimony as I further consider options to provide for proper aeronautical adaptability training.

Again, my opinion is that Section 3 under H.R. 3038 requires further review but that should not hold up passage of Section 2.