Those seeking global business and investment opportunities in the NewSpace industry have been significantly disadvantaged by the lack of a complete source for industry-specific expert information and analysis. Today, their source is NewSpace Global.

**Products**

**Observer**
Observer is a company-by-company database of information and analysis. Available for every company on the NSG 100 and NSG OTB, Observer integrates with Thruster, NewSpace Watch, and the NSG Indices to offer a one-stop shop for information on NewSpace companies.

**Thruster**
Thruster, NSG’s monthly market tracking report, details the important events and other business activity in the commercial space industry, including:

- Leading Investors in NewSpace
- Exclusive Interviews with NewSpace Leaders
- Publicly Traded Companies in NewSpace
- Large / SmallCap Review
- Real Estate
- Technologies “Scaled” to Space
- Space-Derived Technologies Used on Earth
- Public Policy
- Point-to-Point: Western Europe, Asia, Canada, Russia and Eastern Europe, Brazil

**NewSpace Watch**
NewSpace Watch (www.newspacewatch.com) reports daily on the latest events, technical progress, company announcements, conferences, investment activity, and other developments in the NewSpace industry.

NewSpace Watch is read regularly by industry leaders, academics, government agents, investors, students, and enthusiasts. Its legacy goes back over a decade and contains over 21,000 articles.

**The NSG Indices**
NSG Analysts track over 500 privately and publicly held companies across the following three live indices:

- **NSG 100**: Top 100 privately held companies in NewSpace
- **NSG OTB**: Privately held “On the Bubble” companies
- **NSG PTC**: Top “Publicly Traded Companies” in NewSpace
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LETTER FROM THE EDITOR

Death of a Salesman-hating Engineer: The Evolving Relationship of Academia and NewSpace

My Uncle Jack did not get along with bankers or lawyers – frankly, anyone in a suit or who subscribed to the Wall Street Journal. He was Sikorsky’s apprentice, an Apollo 13 project engineer and probably said 13 words to me in the three decades I knew him before he passed away. He preferred building things – especially things that had never been built before.

But his professional peak happened in a different era where 4% of the national budget in the US was allocated to getting Americans to the moon. That was a time when the privatization of space was merely an abstract concept delivered by proponents (like the CEO of General Electric, Ralph J. Cordiner) who argued on the losing end of an ideological debate. That was also an era where 4th Screen questions dominated the discourse: i.e. can we build a rocket capable of getting to space? Can a human survive launch? Can a human survive for prolonged periods in space? While astrophysicists like Tsiolkovsky, Oberth and perhaps even Archimedes millennia before likely believed we could achieve these remarkable things, the question of building viable, profitable, sustainable businesses to do them took a distant backseat to proving technical viability. In other words, the mentality of this era looked like an inverted NSG 4 Screens (Please see Figure I.)

Despite the likelihood of my Uncle Jack’s ashes turning in their Pacific Ocean grave, the democratization of space depends on understanding that so often the leaders and financial sources who make up the Industry are vastly more important than the actual technologies designed and built. (Please see “Letter from the Editor” in the February 2013 issue of Thruster.)

For this reason, NSG Analysts use the NSG 4 Screens – with Management, Market, Capitalization and then Technology assessed in that order – to determine the viability and growth potential of over 350 privately held companies worldwide. (Please see “Index Review” in this issue of Thruster.) It is likewise by no coincidence that the leading NSG 100 companies reflect this fundamental analysis.

Today, we stand at the precipice of an industry ready for explosive growth. At the center of that growth is a relatively new approach to visions that transcend the Kármán line: the commercialization of space. It is critical, however, that the great minds who populate university campuses throughout the world, un-

[Technology] → [Capital] → [Market] → [Management]

Figure 1: Space in the Apollo era was a bit turned around.
“It will be through killer apps invented by small, agile organizations that space will soon become the context for the kind of commercial growth other sectors of the economy have seen.”

– Mason Peck, CTO of NASA, Professor at Cornell

understand why the inverted 4 Screens is not durable. Or, to explain in terms that an engineer may appreciate: the inverted 4 Screens will inevitably fall victim to the 1st Law of Thermodynamics.

Standout Universities Supporting NewSpace

Luckily, as we indicate throughout NSG’s second annual “University” issue of Thruster, there are academic pioneers – professors, deans, research librarians, student group presidents – who are actively educating their students to become leaders in the “next great innovation economy,” as one Silicon Valley veteran calls the NewSpace industry.

One such trailblazer is Mason Peck, who is NASA’s Chief Technologist but also works as an associate professor at Cornell University. Prior to his work at NASA, Mason led a team of inventive students at Cornell that developed the novel Sprite “chipsat” technology. (Please see “Future Stars” in the October 2012 issue of Thruster.) “It will be through killer apps invented by small, agile organizations,” Peck told NSG, “that space will soon become the context for the kind of commercial growth other sectors of the economy have seen.” Although SpaceX’s upcoming Falcon-9 v1.1 launch from Vandenberg, California will carry two identical nanosatellites (~54kg total) built by Peck’s “CUSat” team, Peck’s interest in bringing Cornell student built payloads to space and launched by an NSG-tracked 2nd Vertical company has dated back several years. “A version of CUSat was ready to launch back in 2008 (in fact, on the Falcon-1, 3rd attempt), and the project has come close to being launched several times since then on other launch vehicles.” Peck believes that for students to obtain experience working (and analyzing) technologies that have achieved actual space heritage the costs and availability of launch vehicles capable of sending such payloads to orbit must improve: “the most profound challenge in space technology that faces the nation is access to orbit.” (Please see “LargeCap Review” in the October 2012 issue of Thruster.)

Peck’s experience in developing SmallSats at Cornell helps support his efforts as CTO of NASA. For instance, NASA recently announced at the SmallSat conference in Logan, Utah, 13 university teams have been selected to novel spacecraft. As Clark Lindsey,
NewSpace Watch’s Managing Editor indicates, “While these projects are non-commercial, the technologies developed could impact commercial satellites.”

One of the victorious teams is led by Glenn Lightsey, an aerospace engineering professor at the University of Texas at Austin (UT) and CEO of NSG 100 Austin Satellite Design. Lightsey, like Peck, has spent years working with students on smaller payloads like CubeSats. (Please see “SmallSat Review” in this issue of Thruster.) By focusing on small satellites, Lightsey, who is also the Founder and Director of the Texas Spacecraft Lab, can create an environment for students “structured the same as a startup company would be,” as Lightsey explained to NSG. In addition to providing students with this hands-on experience, he also emphasizes that “there are several degree programs and majors that incorporate space commercialization into their curricula... It occurs not only within aerospace engineering, but also in the business school and the LBJ school of public affairs. I think there is interest in starting a more coordinated program.” Austin is known as a very entrepreneurial city and the university has attracted executives from several NSG-tracked companies (e.g. SpaceX, Golden Spike, Blue Origin, etc.) to recruit on campus.

It is hardly a coincidence that companies like SET and BLUE with facilities in Texas, are beginning to build relationships with local universities like UT. Although Armadillo Aerospace recently announced its “hibernation”, other 1st Tier NSG 100s like XCOR, with operations in Midland, and Houston-based NanoRacks continue to grow roots in the Lone Star state. (Please see “Index Review” in the September 2013 issue of Thruster.) For this reason, it is no surprise that Rice University, also located in Houston, launched a new graduate degree program this semester that targets professionals seeking positions within the industry. To understand why Rice University launched the program, we spoke to both Dr. David Alexander, who is the Space Studies Track Director and runs the Rice Space Institute, and Dr. Dagmar Beck, Director of the Professional Science and Engineering Master’s Programs at the Wiess School of Natural Science. According to Alexander, Rice has historically been well connected to the NASA although it has been “episodic in recent years”; therefore, he and Dr. Beck organized the new professional graduate program to “to establish strong connections with NASA and Johnson Space Center and the local aerospace community and [with] more involvement from students.” The goals of the program are beyond the classroom – as Alexander believes it can “provide connections and internships with aerospace industry in Houston.” Beck also adds that the program is by design flexible and interdisciplinary: “not just physics or mechanical engineering but also opportunities with other backgrounds.” Beck also indicated that in line with future leaders of the industry needing skills beyond the 4th Screen, many of the degrees – such as the dual MBA and Space Science program – are designed in a way to address the fact that “more people need tech and management communications skills.”

Lightsey (right) immerses his students in a start-up-like environment.
Ultimately, Alexander sees Rice University filling a critical need to enable students to work for NSG-tracked companies: “If companies came and talked to the students, they’d see the sheer enthusiasm for space exploration and for new ideas like SpaceX, XCOR, and Blue Origin.” Alexander, who is clearly versed in what several leading NewSpace LargeCaps are doing added: that companies like “Virgin Galactic with its work on advanced composites” can support and be supported by a university like Rice with its frontline and often low-cost research on lightweight but strong materials.

Like Rice University, other schools are looking to enable their students to grasp the fundamentals of entrepreneurship within the commercialization of space. For instance, Dr. Jeffrey Forrest, Chair & Professor, Aviation & Aerospace Science at Metropolitan State University of Denver, which recently joined the Commercial Spaceflight Federation (CSF), told NSG that while the university has historically focused on aviation rather than the commercialization of space, things may be changing. The proposed Front Range spaceport in Denver has likely been one influence. (Please see “Spaceland” in the October 2012 issue of Thruster.) Forrest points out that the university can leverage its “45 years of specializing in aviation to show our students the commonalities in the development of aviation with space development” and, in particular “with special focus on commercial space development.”

As with Forrest, Dr. Thomas Zurbuchen, is a keen on providing his students with the skills necessary to become leaders in the NewSpace industry. Zurbuchen, who is a professor of Space Science and Aerospace Engineering at the University of Michigan believes, “In many ways, NewSpace is the most exciting part for our students right now.” This, he adds, comes from the point of view of “the oldest aerospace engineering department in the country.” (They are celebrating their 100th anniversary this year.)

However, in addition to providing his students with hands on experience, Zurbuchen, who also works as an Associate Dean for Entrepreneurship at UM, emphasizes that it is the responsibility of academics to “marry entrepreneurship and the sciences.” Zurbuchen adds that UM is “proud of having a very deep technical education but as we go forward and especially in a new industry that seeks to reinvent itself there are a series of skills that are critical that are transcending the standard technical dimensions: entrepreneurial thinking, innovation...a grasp of business basics is critical.” This type of balanced approach is apparently getting the attention of several NewSpace companies seeking talent. Zurbuchen said “the top five companies have stopped by...just last week I connected a new SmallSat company to our student body. You name them, they’ve been here or have connections here.”
Educating Bezos 2.0

Jeff Bezos, CEO of BLUE, told The Miami Herald that while in High School, he wanted to “build space hotels, amusement parks, yachts and colonies for two or three million people orbiting around the earth.” Bezos, went on to study physics in college but cut his entrepreneurial teeth in the “School of Hard Knocks” with Amazon. Had Bezos grown up in a era like today, perhaps he would have found academic programs that combined his two passions of astrophysics and business. Based on interviews with academic leaders like Peck, Alexander, Beck, Lightsey, Zurbuchen and Forrest, a paradigm is shifting. Many of the steps necessary to produce balanced future leaders of the industry is upon us.

This month’s issue of Thruster explores the dynamic relationship between academia and the commercialization of space. We hope you enjoy our second annual “University” issue and as always look forward to receiving your feedback.

Regards,

Richard M. David
CEO, NewSpace Global
Special Announcements

- This month’s issue features two exclusive interviews: Lance Erickson (Professor at Embry-Riddle Aeronautical University and Head of the Commercial Space Operations program) and Ariane Cornell (Co-President of the Harvard Business School Aerospace & Aviation club). (Please see “Leaders of NewSpace” and “Future Stars” in this issue of Thruster.) In addition, NSG contributors interviewed several industry experts, including Sean Casey (Co-Founder of the Silicon Valley Space Center), Michael Paul (Team Leader of the Penn State Lunar Lions), Mikhail Kokorich (CEO of Dauria Aerospace), Jeff Manber (CEO of NanoRacks), Nan Macari (Engineering Talent Pipeline Manager at Caterpillar, Inc.), Eric Reiners (Manager, Automation Systems at Caterpillar, Inc.), David Alexander (Space Studies Track Director and head of the Rice University Space Institute), Dagmar Beck (Director of the Professional Science and Engineering Master’s Programs at the Wiess School at Rice University), Glenn Lightsey (Professor of Aerospace Engineering at the University of Texas at Austin and CEO of Austin Satellite Design), Mason Peck (Chief Technologist at NASA and aerospace engineering professor at Cornell University), David Gerson (President of the Stanford Student Space Initiative), Thomas Zurbuchen (Professor of Space Science and Aerospace Engineering and Associate Dean for Entrepreneurship at the University of Michigan), William Pomerantz (Vice President Special Projects at Virgin Galactic), Jeffrey Forrest (Chair & Professor of Aviation & Aerospace Science at Metropolitan State University of Denver), Heather Duckworth (Graduate of Caltech’s Aerospace Engineering Master’s program), Maarten Haneveer (Head of Public Relations for Project Stratos at Delft University), Maria Cecilia (Professor at Federal University of Minas Gerais), Paolo Gessini (Head of the Electric Propulsion Group at University of Brasilia and co-founder of Mars Space Ltd), James Casler (Professor at the University of North Dakota’s Space Studies Department), Jason Held (CEO at Saber Astronautics), Juan Pablo Salazar (Professor of aerospace engineering at Federal University of Santa Catarina), and Craig Underwood (Deputy Director of the Surrey Space Center).

- Live Event: NSG is also proud to announce we are the conference organizer for the upcoming “NewSpace Investor Conference” in Menlo Park, California on November 5. The event is co-sponsored by Raymond James and Milbank law firm. Steve Jurvetson, the legendary Silicon Valley investor, will be the event’s keynote speaker and the event will include panelists from many leading NewSpace companies including SpaceX, Orbital Sciences, Digital Globe, Skybox Imaging, Planet Labs, Made in Space, NanoRacks, Kymeta, Spaceflight Services, Clyde Space, XCOR, Virgin Galactic, The Climate Corporation and others.
• NSG Analysts now track nearly 500 companies. (Please see “Index Review” in this issue of Thruster.) To see these companies, please visit the NSG Indices page. As well, to view over 350 privately-held companies individual pages, please visit Observer. Observer is a company-by-company database of analysis and information for each company on the NSG 100 and NSG OTB

• Clark S. Lindsey, Managing Editor of NewSpace Watch, attended the 12th Annual Soirée Suisse at the Swiss Embassy in Washington DC on September 18; Franklin Moore will be photographing the upcoming Falcon-9 launch in Vandenberg, California; Richard M. David will be speaking at Embry-Riddle Aeronautical University as part of their Commercial Space Operations seminar series on September 25, at an upcoming New York Angels meeting on September 26 in New York, at the “Silicon Valley in Space: Building Interstellar Enterprises” event hosted by Silicon Valley Space Center and CASIS and at “Space Startups” in Paypal’s San Jose Headquarters both on October 17.

• In the next issue of Thruster we will be publishing our annual “Management” issue and will explore the most important 1st Screen of NewSpace.
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