



Fully informing your critical business and research decisions



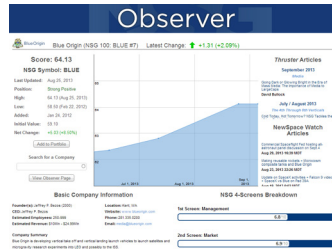
Those seeking global business and investment opportunities in the NewSpace industry have been significantly disadvantaged by the lack of a complete source for industry-specific expert information and analysis.

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 NewSpace 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](http://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 25,000 articles.

### The NSG Indices

NSG Analysts track over 600 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

RANK	COMPANY NAME	NSG SYMBOL	INITIAL VALUE	CURRENT VALUE	YTD CHANGE	YTD CHANGE (%)	NSG POSITION
1	SpaceX	SPXC	72.00	87.00	+15.00	+20.8%	Strong Positive
2	Orbital Sciences	OSAT	10.00	12.00	+2.00	+20.0%	Strong Positive
3	Blue Origin	BLOR	1.00	1.50	+0.50	+50.0%	Strong Positive
4	Virgin Galactic	VGAL	1.00	1.20	+0.20	+20.0%	Strong Positive
5	Planet Labs	PLAB	1.00	1.10	+0.10	+10.0%	Strong Positive
6	Amazon	AMZN	100.00	110.00	+10.00	+10.0%	Strong Positive
7	American Express	AXP	100.00	105.00	+5.00	+5.0%	Strong Positive
8	Facebook	FB	100.00	102.00	+2.00	+2.0%	Strong Positive
9	Google	GOOG	100.00	101.00	+1.00	+1.0%	Strong Positive
10	Apple	APPL	100.00	100.00	0.00	0.0%	Stable

Some Companies We Track



Some Investors We Follow



### Our Customers:

- **Investors:**
  - Angels / Venture Capital
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# THRUSTER

## Monthly Market Tracking Report



# Contents

I.	<b>LETTER FROM THE EDITOR</b>	
	The 2nd Vertical: No Longer the 1st Place Loser	4
	<b>RICHARD M. DAVID</b>	
II.	<b>LARGECAP REVIEW</b>	
	LargeCap Battles: And We Haven't Even Brought in the PTCs	13
	<b>DAVID BULLOCK</b>	
III.	<b>SMALLCAP REVIEW</b>	
	Today's LVPs' Impact on Tomorrow's Dedicated Small Payload Vehicles	16
	<b>CORY HARRIGAN</b>	
IV.	<b>OBSERVER SNAPSHOT</b>	
	Sierra Nevada Corp.	20
	Sequoia Space	21
V.	<b>NEWSPACE TIMELINE</b>	
	The Past Month in Review from NewSpace Watch	22
	<b>CLARK S. LINDSEY</b>	
VI.	<b>INDEX REVIEW</b>	
	<b>BENJAMIN STREVEY</b>	24
VII.	<b>SMALLSAT REVIEW</b>	
	First Law of <i>Launch</i> dynamics: You Can't Get Something for Nothing	28
	<b>JIGAR PATEL</b>	

VIII.	POINT-TO-POINT	
	CANADA:	
	Are Canadian Payloads “Thumbing a Ride” to Orbit?	31
	<b>CHUCK BLACK</b>	
	RUSSIA AND EASTERN EUROPE:	
	Where There is Established Space’s Loss, There is NewSpace’s Gain	34
	<b>ANDREW TYTARENKO</b>	
	WESTERN EUROPE:	
	2nd Vertical Opportunities Beyond Russia and the US	37
	<b>VIACHESLAV PRONSKYI</b>	
IX.	PUBLICLY TRADED COMPANIES	
	A Disruption in the Launch Paradigm	40
	<b>CLARK S. LINDSEY</b>	
X.	LEADERS OF NEWSPACE	
	First Mover: An Interview with NewSpace Trailblazer Andrew Beal	43
	<b>DAVID BULLOCK</b>	
XI.	FUTURE STARS	
	Rockets Fly High Down Under: An Interview with Rocket Lab’s Peter Beck	49
	<b>TARA HALT</b>	
XII.	EXIT STRATEGY / ESCAPE VELOCITY	
	The Background on Rockets: The Music One, That Is...	53
	<b>JAMES DOUGLAS</b>	
XIII.	GLOSSARY	

# LEADERS OF NEWSPACE

## First Mover: An Interview with NewSpace Trailblazer Andrew Beal



David Bullock



Andrew Beal, founder of Beal Aerospace

Andrew Beal made his billions by owning and operating banks and real estate in the greater southwestern part of the United States. With years of business experience, in 1997 he formed Beal Aerospace, arguably one of the first NewSpace companies. Like the #1 ranked NSG 100 SpaceX today, Beal Aerospace aimed to send commercial satellites into orbit by becoming a leading Launch Vehicle Provider. (Please see “[LargeCap Review](#)” in the March 2014 issue of *Thruster*.)

His company, which formed in Frisco, Texas, had over 200 people working for it at one time and through its work introduced a new kind of engine to the industry. Beal focused on a three-stage, 200-foot-tall rocket, powered by hydrogen peroxide and kerosene. The engine was one of the first that eliminated the need for a separate ignition system.

Perhaps more important than the technology that Beal Aerospace developed was the founder’s philosophy: i.e. that an entrepreneur could build and capitalize a launch vehicle company that cost-effectively profited from sending commercial payloads to space. (Please see “[Letter from the Editor](#)” in this issue of *Thruster*.)

For those unfamiliar with Beal’s work, today’s NewSpace leaders like Jeff Bezos, Elon Musk, and Richard Branson owe much to the man who laid it all on the line – i.e. his time, his money, and his reputation – to prove that the commercialization of launch can and should be done.

Thus, when the opportunity to interview one of the original launch vehicle mavericks became available, NewSpace Global editors seized on the opportunity. This issue of *Thruster* centers around the [2nd Vertical](#) (i.e. the Launch Vehicle Provider market), and we are proud to present our exclusive interview with this month’s “Leader of NewSpace”: Andrew Beal.

- 1. Thank you for participating in our annual Launch Vehicle Provider issue of *Thruster*. We define NewSpace as “an emerging global industry of private companies and entrepreneurs who primarily target commercial customers, are backed by risk capital seeking a return, and profit from innovative products or services developed in or for space.” Do you**

*“Elon’s a friend of mine, he’s a genius, and I have monitored his progress over the years... Governments have set out to do what [Elon Musk has] done and have been unable to achieve it.”*

**think this definition accurately reflects those companies seeking to commercialize space?**

It clearly reflects the spirit, whether there is some technical nuance or some company that may not fit that exact criteria they may still be still considered included. But I think the spirit is on point.

**2. A few months ago, NSG was first to report on the possibility of a company like Google or Facebook deploying 1600 satellites for either Earth observation and/or Internet capabilities. This sounds a lot like the target customer you were after with Beal Aerospace – i.e. large commercial satellite launch demand. Has the time come for a large publicly traded tech company to launch its own massive constellation?**

I honestly don’t understand the economics of such a constellation. I guess the fact that Bill Gates was considering Teledesic, and I guess there’s been enough intelligent people that have considered that it must make economic sense, but I frankly have never really looked at or thought of the economics of a massive LEO constellation.

**3. NSG’s Richard M. David, and Clark S. Lindsey, recently toured the McGregor, Texas SpaceX facility and were impressed by the scale of technologies tested there ranging from the Grasshopper to Falcon Heavy engines. How closely are you monitoring the progress made at that facility?**

Elon’s a friend of mine, he’s a genius, and I have monitored his progress over the years. Obviously, he’s accomplished an incredible feat. Governments have set out to do what he’s done but have

been unable to achieve it. So, I monitor a lot of his efforts in general, but I don’t specifically target the McGregor test facility. Although, it’s a great test facility and I’m glad that he’s getting good use out of it.

**4. In our monthly report we consistently cover real estate investing as it relates to the commercialization of space. Even though SpaceX has launch pads at the Cape and at Vandenberg, it is planning a private spaceport near Brownsville. Your proposal to build a spaceport on Sombrero Island ran into some local opposition. Did you ever consider a spaceport in the US? There would be less boost than at the lower latitudes but perhaps easier access and operations.**



**Right to left: NSG’s Richard M. David and Clark S. Lindsey with Baylor University’s Gerald Cleaver at the SpaceX testing facility in McGregor, Texas.**

Photo credit: NewSpace Global, LLC



**More than 50 years ago, Cordiner warned against a bureaucratic approach to the development of space.**

Of course we did. We looked at a number of options. We looked at Hawaii. The state was trying to propose a site on the southern tip of the big island. We looked at Florida and Canaveral. We loved it. We would have loved to work out of there. One of the big problems we had was that there were a lot of environmental issues down there. And frankly, I don't quite know how Elon and some of the other guys are getting around this – the problem is there's a lot of ammonium perchlorate in the groundwater in the soil and other chemicals. And as soon as you disturb that under the US law you could be responsible. The problem down there was that the environmental laws were inappropriate for that type of an operation. That added some complications, but additionally, as apparently Elon's running into – they've got thousands of people down there and everything costs so much money. That was the reason why we had decided to do on something on our own, kind of like

Elon is doing. We looked at south Texas. We actually concluded that it wouldn't work very well, because you really have to do only due east launches, and you could only do plane changes once you get to the other side of the Florida Coast, because then you're over a populated area at fairly slow speeds. Elon's a smart guy. He has many smart people working for him. I'm sure they've worked out some way to get around that. Maybe they're going to use the energy and do lots of plane changes as they reach the Coast. We decided it would be great for geosynchronous launches or due east launches, but for higher inclination launches, it really doesn't work well. So, we ruled out Texas for that reason. I think we underestimated the complexities of going to a foreign country. And frankly, it shouldn't be a hard thing to do. Guiana was very inviting. It had a 30,000 acre site that we could lease nominally. It's near the equator and then there's Sombrero Island. The opposition wasn't really that there weren't many environmental issues. I mean every time you try to do anything you have an environmentalist saying that you're doing something wrong.

5. **When we interviewed Steve Jurvetson, who is an early investor and board member at SpaceX, in our last issue of *Thruster*, he described the benefits of working with someone like Elon Musk. (Please see “[Leaders of NewSpace](#)” in the May 2014 issue of *Thruster*.) If you had a chance to work with someone like Elon on something that builds on SpaceX's progress and success, would you get involved and what would you want that venture to look like?**

*“I absolutely couldn't agree more with the words that [Cordiner] spoke 50 years ago. It's why Elon built a rocket for less than \$1Bln that's better than what NASA wanted to build for more than \$20Bln.”*

I don't think that I'd get involved with something today. Elon really accomplished what we set out to prove: that access to space can be done by a relatively small commercial company and at low cost. I just don't see that we have something to offer anymore. There are plenty of people with capital and now that Elon has proven that it can be done, I don't really see that I have a particular role. I loved our effort at the time. It was 20 years ago. I was in my young 40s, and it was a lot easier to get more enthusiastic about something like that. When you get older you don't want to spend 12 hours a day working on stuff. I think I'm past the stage of my career where doing a start-up like Elon did again would be that interesting to me.

**6. Ralph Cordiner, the former Chairman of the Board for General Electric, warned in 1961 that if Americans approach space "by the route of regimentation and government enterprise" it will take decades to undo this mistake. 50 years later, do you think Cordiner's words are being heard?**

*"NASA did a total 180 and decided to go support startup companies. And I think that's in part because of our shutdown."*

I'm not sure that they are because NASA is trying to fund its own large launch vehicle, when they really shouldn't be doing that. I absolutely couldn't agree more with the words that he spoke 50 years ago. It's why Elon built a rocket for less than \$1Bln that's better than what NASA wanted to build for more than \$20Bln. It's pretty hard to believe, but it's a fact. His failure rate will be better than the Space Shuttle, because of the redundancies and the engine out capabilities, and so forth.

**7. Your website states that competition from NASA-funded group initiatives caused the closing of Beal Aerospace and specifically you describe the difficulty a private company faced in competing with those subsidized by government monies. While SpaceX generates the majority of its revenue from commercial contracts today, its biggest customer is NASA.**

**Do you think the NASA of 2014 differs from that of 2000? How much has the Shuttle's retirement influenced this shift?**

180 degrees. Absolutely. Our shutdown was partially responsible for it. We created some significant successes. And we shut down at a time when George Bush was president and a number of Texas people in Congress in the Senate and the House that were very powerful. Our shutdown was what pushed NASA to support startup companies like ours. There was a night and day difference. The difference was, when we were in business, NASA was going to spend \$30Bln build-



**One of Beal Aerospace's engines undergoing a static test fire**



## “Suborbital space tourism I think will be huge... Virgin Galactic will do extremely well.”

ing a human-rated space shuttle that would compete for private commercial transport. Six years later they were awarding \$2Bln contracts to start-up companies if they could get something to the Space Station. NASA did a total 180 and they decided to go support start-up companies. And that's in part because of our shutdown. And the recognition of some members of Congress that no one would ever go on their own and build a launch system if NASA was going to go out and compete with them. While NASA still may build or subsidize systems that compete, that they made these multi-billion dollar contracts to start-up companies, which wasn't available in our time, we would have stayed in business if we could have procured a space station resupply contract for that kind of money. So absolutely, it's a 180.

**8. When you closed Beal Aerospace you cited subsidies to competing launch systems as a major factor. Even with subsidies, the EELVs turned out to be non-competitive on the world market for commercial satellite launches. In retrospect, do you believe that Beal Aerospace could have competed with Arianespace, ILS, etc.? Those entities also receive indirect subsidies, e.g. the Ariane V was developed by ESA.**

We always knew we were going to compete with EELVs. They never bothered us, and Arianespace and all the other quasi-subsidized entities. No one remembers this today, but back when we shut down, NASA had just gotten funding for the Space Launch Initiative, and they were going to build a fully reusable man-

rated system to get back and forth from space. And, Congress had just funded the first \$3 to \$5Bln of the program, and they were going to make that available for commercial launches. Even if they were to spend

a \$100Bln building it, their systems usually operate where you only have to pay the marginal operational cost per mission. How would we ever compete with something like that?

**9. Let's look into the future. What does the NewSpace industry look like in the next five years? How about the next 10 years?**

My crystal ball doesn't work real well. Elon and SpaceX will do tremendously well. It would be much harder for the next firm that would have to be going into business to compete with SpaceX. Where SpaceX was entering an industry with no one to compete with. That will slow down the next SpaceX a little bit. The reality is that whether we like to admit it or not, the government is still the elephant in the room, and they're spending the bulk of the money on what goes up into space. And, I don't know what the future of the Space Station is, but that has to be a big part of any service providers projected business. Commercial launches are great. And obviously if there's big constellations. I believe that government launches outweigh the com-



**Beal believes that markets like the 3rd Vertical will be greatly successful.**

mercial sector, dollar-wise substantially. That will all change, but I'm not quite actually sure what I will see with the future beyond satellite constellations and government programs. I hope there will be. I think it would be wonderful to build an orbiting hotel or mining asteroids, but those seem to be far out ideas, when you consider the cost involved. But suborbital space tourism – I think will be huge. And frankly it's real easy to do. It's just a fraction of the effort to put mass into orbit. Burt Rutan's deal with Richard Branson – Virgin Galactic will do extremely well. That will be a huge success for them. Some of the microgravity stuff that they could do sub-orbitally – but there are not big dollars in the science there. Suborbital space tourism – I actually don't view that as part of the space business, because everything happens in the atmosphere and then you coast for awhile and then it's exoatmospheric. I don't want to be belittling it all, but it's not what I think of as the space business, but it is. It's getting people high above Earth. That's readily doable and that will be a really cool experience for a lot of people.

*David Bullock is a Senior Editor with NewSpace Global and a frequent contributor to Thruster.*

## Companies Mentioned

### NSG 100



SPACEX

### NSG PTC

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AIRBUS

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