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Launching into Uncharted Space [Entire Talk]

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February 27, 2013

Video URL: http://ecorner.stanford.edu/videos/3095/Launching-into-Uncharted-Space-Entire-Talk

The co-founders of Skybox Imaging, Dan Berkenstock, Julian Mann, John Fenwick and Ching-Yu Hu, realized early on they had one thing in common: they don't take no for an answer. Here the team of Stanford alumni explain their passion to disrupt the satellite imaging industry and share engaging tales of launching their unique venture.

Transcript

Hi, and thanks for the warm welcome. My name is Dan Berkenstock. I was a PHD student here in aeronautics and astronautics from 2004 to 2009-ish. I got a little confusing at the end there, yeah. Not quite sure what's happening. Just for quick intros, we knows we got Ching-Yu Hu. Hi. Another cofounder who is in MS&E we've got John Fenwick, who is in the business school and we've got Julian Mann. Before we get started, maybe just a little bit of sort of know your audience. So how many people here today are engineers? Good, alright, good.

How many people are in the business school? All right. Represent. Represent, yeah, here you go, John, not bad, not bad. How many people are here today because they want to start a company? That's good. If Skybox doesn't work, we got a lot of backup options to go to find here. There you go. And finally before the announcement went out for this ETL lecture, how many people had ever heard of Skybox Imaging? That's what I expected, not very many. So, we're excited to be here today to tell you a little bit more about our company in large part because people don't really know us yet. We've been at this thing for a little while. But we're still in kind of a soft stealth mode as we get up into the launch of our first products in satellites later this year.

So to tell you a little bit more and kind of get everybody at the speed before we get into the fun stuff, we at Skybox Imaging have been around for about four years. We incorporated in 2009. We raised $91 million, that's kind of a lot of money, it feels like for a company that most people haven't heard of. We've got six months to the launch of our first satellite, SkySat-1. We've got a pretty awesome team. We started off by hiring all of our best friends from Stanford and we just kind of kept going from there and at this point we've got people that have worked on really a very interesting variety of space missions and big data companies here in Silicon Valley. And our vision at Skybox is, we'll talk about a lot more today is to dramatically increase the overall size of what we like to call the overhead monitoring market. So how are we going to do that? Well, at Skybox we build satellites that are about the size of a small refrigerator and are built using commercial off-the-shelf electronics open source software and really all the other tricks of the trade that have made Silicon Valley scalable, commoditized hardware, agile development, all these types of things. Now in order to really create that new market of tomorrow, we want to be able to monitor tens or even hundreds of thousands of locations on earth on a daily basis. The only way to do that is to put up lots of satellites.

The only way to put up lots of satellites is to put up very low cost satellites. We've spend the last four years designing very low cost satellites. They can still provide images that are attractive to the market of today as we create the market of tomorrow. And these images look like this. So you could see an airplane, you can see a shipping container, you can see a car, you can

see railroad cars, you can see really objects of the scale that move around, the surface of our earth on a daily basis and heavily inform economic activity and then also the security of nations around our planet. You can't see a license plate, you can't see a person, and you really can't even tell oh, it's John's car versus Julian's car versus Ching-Yu's car. I know John has a car, so that probably makes it easier. In addition, by taking advantage of sort of the Silicon Valley approach to building satellites, we've got a pretty interesting side benefit that our satellites don't just produce imagery, they produce video as well. And so we'll be marketing the world's first high-resolution video from space that we hope will help people in a much better insight on a daily basis and how things are happening across our world. What's exciting to us though is not just the imagery, it's not just the video, it's being able to sort of move beyond what you might see in Google Maps or Bing Maps today, being able to provide the data.

The answer to the question, not just the picture of the parking lot, but an answer for how many cars are within it and how does that compare to what happened last week, last month, last year, and how do we roll that up on a global scale? So that for the first time we really can put an information source in the hands of consumers, businesses and governments around the world that can dramatically increase their ability to make efficient profitable and safe decisions as they go about their daily lives. So that's the elevator pitch. For those of you who are taking 273, I know you're all practicing elevator pitches. When we took 273, they actually made us get in an elevator with someone on the first floor of Terman and give them the elevator pitch by the time we got to the fourth floor. So, now that we've had four years to hone it, we've been able to spend a lot of time perfecting that, but what I think is really interesting for us is all the tough lessons that we've learned as we got inside the building, decided that we were actually going to build a company called Skybox Imaging, which today is over 80 people has invested tens of millions of dollars, has developed a significant amount of technology and quite frankly still hasn't proven itself. Still has a very long way to go in the cycle of really being able to make it happen. So we will start off with kind of the actual back story on Skybox, which isn't on our website and doesn't go in the slides. In 2007, I was in my three year, four-ish year of my PhD, when Google actually announced something called the Google Lunar X PRIZE. So this was a $20 million prize for a commercial team that could land a rover on the surface of the moon, could drive around take pictures and send back the data. Now having spent a lot of time in what we call The Hurt Locker, any Astro students here? We got a couple.

So this was actually the old Hurt Locker, I got to dating myself now. But we had a bunch of people that really were in our friends circle and had either worked on cube sets, which are breadbox size satellites that use commercial electronics and approach was that was invented here at Stanford about a decade ago to dramatically reduce the price point of doing business in space. We also had people that were good at software, they were good at mechanical design, that were good at optics, that were good at ironically program management in some cases. And in looking around, it seems like this might be something we could do at Stanford. Stanford won the DARPA Grand Challenge a couple of years before and this seemed like sort of a moon shot of a follow on program. We had 40 students that were all gung-ho in making this happen, we were thinking about initial high-level designs and we would being able to take this approach that had been sort of developed and flush down over the last decade to both cube sets and applying that same design approach to a moon mission. Unfortunately, as I'm sure many of you remember the winter of 2007-2008, wasn't really the best time to try and get new initiatives started, that were going to cost tens of millions of dollars. The complete economy collapsed out from under us and some of the soft offers that we'd had for potential financing for this thing dissipated over night. So, I think we've learned one of the most important lessons at that point that we've carried with us over the last four years now and that's really about a rugged determination, even after the universe told us no, by letting - creating the worst financial crisis in nearly 100 years and we said ourselves look, we're at Stanford, where all these amazing companies are founded, Sand Hill Road where the venture capitalists are, is a mile and a half away. We have this really unique group of people that have this idea of how do we take sort of the things that have made commercial success in Silicon Valley and made it scalable and cost effective and inject that into aerospace for the first time.

And so we just started pulling on that thread. We started out as a technology looking for a market, which I'm sure is a common theme in number of these lectures and we had a technical paper at a conference we came back, we got one introduction to one venture capitalist, we walked into his office with four awful slides and sort of prototype of what we thought a satellite could eventually look like and he said, this is pretty cool, but you guys have no idea what you're talking about. There is this class MS&E273, go take it. And that was some of the best advice we ever got. So we came back to Stanford for that school year. We took MS&E273, we had the opportunity to get inside the building to really to make use of the fact that we were still Stanford students. It's amazing the response you get from people when you called a value added reseller of satellite imagery, in Anchorage, Alaska and tell them oh, hi my name is Dan. I'm a Stanford student, we're work on a project. Can I get 10 minutes of your time? Right and so we started out, it's kind of pushing, pushing, pushing and trying to understand the market of today, developing out the business plan, putting together a pitch and then we never really talked about it. But somehow we all just knew deep down, that we were going to go on and incorporate and we're going to try and make this thing a reality.

And so after the class finished, January I think 15th, we worked with the attorney we had met in the class to put in place the documentation to actually have a registered company. And at that point, you go on, you buy the Go Daddy domain, you get our email address set up, you put that signature line in there and you send yourself an email. And it's like the coolest thing ever,

I've just got an email from myself at my own company, right. And it felt like a company at the time which is funny, because it wasn't a company at all, it was just four of us hanging out in John's living room with his cats, that scratched everything including Ching-Yu's face and Julian's arms and all of MacBook Pros, right. And so from there it felt like a company. We had our Monday morning meetings. We still have Monday morning meetings today, there are more people at them, but we set our action items, we went after trying to do them and try to improve our story and we started looking around for introductions to people that might be interested in financing something as different as an enterprise that involved satellites, right. And so as I'm sure many of you have already seen and know, Stanford has an amazing set of resources to help get you out there and actually talk to people that can make these things reality. And so we spent, for 6.5 months, we spent at least two days a week doing three pitches a day to over 50 different venture capital firms. I had more lattes at Coupa Cafe than I will ever be able to detox out of my system for the rest of my life.

And we get to the third pitch of the day and we'd obviously so slaphappy that we - it's be like be throwing a football back and forth. We'd all deliver each others lines, right. And we just honed it and worked it and pushed it and called more customers and met more people and asked for more introductions. And eventually we got introduced to Vinod Khosla and we went and gave a pitch at Khosla Ventures, which after a lot of digging and in fact checking turned into a $3 million Series A, which allowed us to move out of John's living room into what we thought was an amazing 2,100 square foot office that had a nice sort of machine shop in the back with carpet on the ground and a conference room, but which felt like a real company. And from there we learned - we began learning about not just how you sell the company, but how you build the company. And one of the most telling points on that was as we walked in for our first Board of Directors meeting about three days after we closed the Series A. With that, I'm going to turn it over to Mr. Mann here. 241 00:13:12,310 --> 00:13:13,044 Thanks, Dan. So I'm Julian as was already said.

And I was getting my co-term in aeronautics and astronautics here when I met Dan and John and I was in particular working in the space systems development lab, which has been building these cube sets as Dan mentioned. And we were really at the stage then we were starting to apply to more and more sophisticated science missions. And when I was thinking about that, I was trying to figure out how to control the satellites with my iPhone. And so I also spent about a year working at NASA on the man's space program and it was really in that experience that I realized oh my god, this technology that we have in the lab has the ability to disrupt this massive, massive industry. But we have to figure out a way of getting it, a way from the academic research grant world and into the serious investment world that will allow us to accelerate the development. And so for me that was when after a little false start, chasing some government research, small business kind of opportunities, reconnected with Dan and John and Skybox became a reality, but back to the first board meeting. So, there we're sitting in our - in the closet of an office that we have at the time and I was the CTO at the time and being the good aerospace engineer that I was. I knew that it was my job to convey that we had a credible plan for going from concept to satellite on orbit. And that obviously means having a schedule and more importantly especially if you're an aerospace engineer, it means having a Gantt Chart. So I was sitting there in Excel, making a Gantt Chart, I think I had really great line titles like 1.1, 1.2, 2.2, 275 00:14:55,869 --> 00:14:55,969 I think there was a date - timeline across the bottom of the chart, but I'm not confident of that.

There were definitely no ... I think it was bi-annual. No dates within the chart, maybe some like variable with colored lines. And we get into the board meeting and I put up this chart and I started explaining it and I may have gotten two or three sentences in before my first instruction, which was go buy a copy of Microsoft Project and learn how to use it and go buy this very specific book on budget and schedule management and read it cover-to-cover and why don't you come back next month and we will try this again. So the lesson to the board meeting is, whatever you're doing, you're doing it wrong. Figure it out, improve, keep going. We walked out of the board meeting and ultimately we probably did better than we could have and realized now we have to go hire some people. We are trying to build the satellite, we're going to need at least like 10 or 15 engineers to make this whole thing work. And they're going to need to be from a number of different engineering disciplines. And it turns out through the process of raising the Series A, investors would often ask us, can you give us some examples of the types of people that you're going to go hire.

So we would go to our friends in the grad school and say hey, can you lend us your resume, we just need an example of the type of person, just so we can get across the finish line. We are not trying to convince you to like leave your PhD, the cushy corporate job you just got, but then suddenly you're sitting there with this long list of positions that you need to fill and of course we just immediately turn around and started turning up the heat on them to actually jump ship and come join the team. And apparently we must have done something right, because as Dan already mentioned about the first 10 people we hired were all our friends from school. So, turns out hiring your friends when you need to hire fast, sometimes actually works. Another thing that I think often about in those early days, as I'm sure many people in this room have heard the term product market fit and iterating your technology to market. And I couldn't agree more with the necessity to do that. I add one small piece to that maxim which is rapidly iterate your technology to market, but don't kill your team in the process. And so right as we finished up the Series A financing, we had this reference point design for the satellite. Really it was back of the envelope conceptual design saying this might be feasible. And at the time the satellite was going to produce 2, 2.5 meter resolution not quite the quality that Dan showed up on the pictures on the slides a few minutes ago, but reasonably good.

But we got out there and we started really talking to people and we found is we probably need something a little better. We probably need to get closer down to one meter resolution. And so we began this four, five month process where every two or three days Dan would walk in the office and say all right, like we need to figure out how to get just like 5% more performance out of the system. And we were just churning out new designs, new designs, new designs, running this kind of analysis, that kind of analysis and we proceeded and satellite kept growing and growing and growing and one day Dan walks in and he had the look on his face that I knew man we need 5% more out of the systems, so I grab and took him into the conference room, which was like in the middle of the window of this office. And said Dan, I understand what you're doing, I can take it, but Mike, our VP of satellite systems is going to have a heart attack if you ask for 5% more from the system one more time. And I'm pretty sure that was the last time the system grab. So just don't kill the team in the process of trying to do. Global optimization by watching people's forehead veins. The next thing I'd like to talk about is the importance of flirting. And I don't mean in the romantic sense.

The technology at Skybox is really based upon the convergence of sort of these two technology pillars. This satellite miniaturization and the now exceedingly buzz word big data that has been swirling around the valley for the last few years. But we knew as we were looking at this, that as we launch more and more satellites the volume of data that we were going to have to be storing and processing and making accessible to our users was going to be increasing incredibly rapidly. On the same type of growth curve as Facebook photo stores. And we knew that doing that was going to require a lot of engineering and ingenuity if we were going to do it in anyway differently from the traditional guys, which spend hundreds of millions of dollars on legacy infrastructure to do this. And our network was pretty, pretty heavily skewed towards the aerospace side, so we knew we had to find some other people. And turned out that Dan's wife's friend from work's husband was a big data software guy and so we started talking to him very early on, come by the office for a beer, let's help us figure out maybe like what do we need to do to think about storing this, how do we think about like backhauling all this data from places like Norway and Fairbanks, Alaska and that proceeded for a year. The meetings went from once every two months to once every three weeks and certainly a year later it's like, all right, you need to join our team to actually lead up this effort. And that didn't just happened once. That happened all the time and it didn't just happened with hiring, it happened with VCs, the first VC that Dan mentioned that we pitched before we took 273, didn't participate in the Series A, but became a lead investor in the Series B.

So you really never know what relationships you're going to build early that are going to bear fruit and my biggest lesson learned from that is think about what skills in assistance and partnerships and support you're going to need not just today, but tomorrow and start investing in those relationships early, because when you do they will pay huge dividends. And my sort of parting thought here is on the fact that all it really takes is a simple idea. And with Skybox, its really easy to sort of get stuck thinking about the fact that we're doing things like building satellites and buying rockets and doing all the stuff around the world. But ultimately the core idea behind Skybox was really, really simple. We were building satellites that looked and felt like PCs in a satellite world where everybody else was building mainframes. And as we started going out and telling people that story, we realized that there is a big opportunity when you dramatically reduce the cost of something and increase its accessibility, this is a pattern that breeds interesting results. And so we just kept pulling on that thread. I think Dan already used that term once. And so all it takes is a simple idea and if you chase that simple idea and you dream big, and any time anybody tells you that your idea is stupid and you shouldn't do it, you completely ignore them, because you know that what you're doing is absolutely essential and going to change the world then you have a real possibility of doing it, keep pursuing it. Hey guys, I'm John, and I'm going to provide some corollaries to what Julian has mentioned.

But first a bit of a back story. My part at the Skybox story starts with the dream and you guys might guess what that dream is, but actually I dream as a kid all I ever wanted to be was a fighter pilot. I watch Top Gun and Iron Eagle over and over and over again, that's all I wanted to do. So I went to the Air Force Academy, I studied my rear end off and got to the point where I was ready to do it. I'm all set, I'm going to go be a fighter pilot, life is going to be good. There is one problem is that my eyesight was pretty poor, so I had laser eye surgery, of course that's what you do and that surgery failed and the three subsequent surgeries trying to fix the damage that was caused that first surgery, made it so I could drive, but never get in a cockpit. So here I was air force officer that couldn't fly. What was I to do? And so that's how I got into the satellite business. I was kind of have to fly a desk, a mahogany desk, it might as well be doing satellite stuff. And so I got to the point where I learned how to build and fly really large massive satellites for the government.

In fact my last job in the Air Force was, I was the guy who went to Capitol Hill and I look senators and congressmen in the eyes and said we got to keep building more big massive satellites. Those mainframe ones that Julian referenced, but to be honest my heart wasn't really in it. It wasn't really creative or innovative. It was just a lot more of the same. So I decided I need a little bit of a breather from the military industrial complex. So I wrote my business school applications essays to the GSB here and they were just littered with references about how I wanted to start a small satellite company. It sounded really good, it read awesome. But to be honest, my heart wasn't really in it. I didn't - I just thought that was a pipe dream. I was all set to go often, go chase mobile apps or whatever else was out here in the Silicon Valley.

I thought I was going to leave this satellite world behind. And it was only after a number of beers, and a number of doodles

on a cocktail napkin with Julian and Dan and see why where I kind of back into it and said you know what, there is a way to do this differently. And so that's - that's what got me here as part of this team and what I would like to relay is two lessons as we've got going that add some sort of pragmatic reality to what we were trying to do. Julian says all it takes is a big idea. I would argue that big edacious, really hairy goal is necessary, but for getting a business going it's not sufficient. You have to find that near-term path to revenue to make the company tick, to make investors happy, to make it all work. And just a few stories that we learn that lesson the hard way. Right after we incorporated, got our email address as Dan described, the first thing we did, we put on our ties and we flew right to Wall Street and we went open the door to a hedge fund and said, guess what we're doing? We're going to do near real time overhead monitoring from above, everywhere. It's going to be awesome. And then we slid the paper across the desk and just said, just sign here, we're going to go, we're going to be partners right and as you might surmise, there was no deal to be had.

Those guys looked us and said yeah, that's cute and all, but come back to us when you're real. Come back to us when you have real data. Well, it turns out, that's a real challenge. We're going to get real data from a satellite that was still years away from being reality. So we looked at ourselves and looked each other and said what we do, how do we provide interim proof points in a business where the real milestone is putting things in space at large cost. It turns out Skybox is a lot more like medical device company or a semiconductor chip fab and that you put a gazillion dollars in before you get $1 out and before you have that alpha product. I mean, we're four years in, we still don't have a product and we're working towards it. So we put our heads together and came up with okay, we're engineers, so we busted out our laptops and started to write in MATLAB, made ourselves some simulated imagery, help that up the customers. It didn't do much. So then we said okay, we buy up all the satellite imagery that we can find today and hold that up to customers.

And so it will - just imagine, close your eyes, that instead of six months old, this is one hour old. Instead of a still picture it's video and instead of being two grand it's going to be 20 bucks. It got a little bit of the juices flowing in the customers, but still wasn't enough. So finally we said screw it, and we went and bought a Learjet and drilled a hole in the bottom and put a camera to be able to fully replicate what we're going to see from space. Well that helped actually quite a bit. And it was pretty fun in the process. And so in doing so, as we finally got out and engage with a bunch of customers we realized that the people that were going to work with us initially weren't those hedge funds, it was a bridge too far. It turns out that the folks that were most interested had the most pain today that we could help solve where international organizations and governments that didn't really want to go through the hassle of putting up, designing and flying space craft themselves, they just wanted to borrow time on our first or second space craft as it flew over their territory. And that was for us, it was a big shock. We didn't appreciate that fully until having gone through the process of identifying and creating that proxy product.

That's the first lesson from - takeaway from us. The second one is that at the start-up we always were completely resource constrained. Each one of us was trying to do 10 different jobs and getting swamped in all of them. And going out there to do a research about where the customers were and the like, was just a real challenge with this satellite imagery, it's useful for billions of different applications. But picking that subset that is most important for us, especially in the near-term was a real challenge. So we decided to focus on those set of customers that were so excited about what we were doing, they were willing to educate us about how they were going to use it along the way. And at the start, those first few customers, those early adopters, we found to be so valuable, we gave them a sweetheart deal. They've got their hooks into us, but it's okay because we're learning a ton about what they need and it's really informing our product development process. And the second thing that we've done is from the get go we've really focused on building a platform whereby people can access our data on a self-serve basis. Now I know platform in Silicon Valley is a total buzz word and everyone says it, but it turns out we need to do it, just to be although expose this - all the third-parties to be able to figure out, where is the killer app in this type of data stream? We haven't figured it out yet, but we think by letting everyone play in this sandbox that great things will come out of it.

And so with that, I'd like to just close my piece by saying that Skybox, the challenge for us in making this big idea a reality is that we're trying to put a lot of things together. We're designing and manufacturing spacecraft. We're launching and flying them. We're putting together a huge data infrastructure. We're doing crazy image processing algorithms. And a UI to be able to have folks play with the data. So it's really - Skybox is more like five or six start-ups in one. So CY I'll pass it over to you to talk about how we take those five start-ups and turn it into something real. Sounds good. Thanks, John.

Well first off, it's great to be here. I was listening to ETL lectures two years before even I applied to Stanford, which was in 2005. So this is just incredibly humbling to be back here to share stories from Stanford to a space start-up. And unlike the other three, I'm the only non-rocket scientist of the team. I went to Berkeley undergrad, studied Statistics and Operational Research. Came directly here for my Masters in Management Science and Engineering and I met Dan, John, and Julian in MSE 273. And for those of you who haven't taken it, you work in teams of four and they teach you the basics of how to build a tech start-up. And this was my last quarter at Stanford and my worst calamity was to waste my last few months at Stanford just working on a normal project of mediocre aspirations. And so I knew going into the class that I didn't want to work with a talented team, but I just wanted to work with the best. And so on first day, the class was oversubscribed and the professor said, you have to raise your hand and say something in order to stay in it.

And many of the students started raising their hands and saying - brainstorming ideas around iPhone apps and mobile, social and local ideas. And the three boys were sitting in the back and I remember Dan rose his hand and said "Hi, I Dan. I'm going to launch a constellation of breadbox-sized satellites to analyze the earth in real time." And he said it so emphatically I was just shocked. And John, later says "I'm going to create a company to deliver pizzas via helicopter" and the class erupted in laughter and I thought to myself 'well, that's a really cheeky comment, but you have to be smart to be cheeky.' And so passion is a really infectious thing, is what you'll find and I felt that all the way at the front of room where I was sitting. And after the first class adjourned I literally ran up to them, and I said "Hi, I'm Ching-Yu, I'd like to be part of your team" and to which they said "who are you?" I think it was more "I'm Ching-Yu, I'm going to be part of your team." Yeah, there was an imperative in there. And I've always been a really soft spoken and kind of a reserved person. And to this day I'm just so shocked that I was so bold; it was so utterly shameless to actually go up to these guys and pretty much take no for an answer. And it was until later that I realized that actually all four of us are really good at not taking no for an answer. And so after we left Stanford, we spent a couple of glorious months in John's living room, and when we got funded, I mean we were just so fired up to just do whatever it took to take a graded business plan into an actual business. And so, one of the things that we really learned when we moved into that - a windowless office that Dan was talking about, with termites falling on our customers, we learned how to be scrappy and reveled in it.

Most of the furniture that we got was from the cheapest office liquidation sales that we could find on Craigslist; we found a free eight-foot conference table that we spent the better half of an afternoon trying to shuttle down a parking lot on a skateboard. Our refrigerator came from one of the dorms here in Stanford that had rainbow color mold that Dan and I cleaned out. When we went to conferences, we would call them and say "we're Stanford grads and we can't afford this $3,000 ticket. Can we get it for $50?" And most of the time we would get discounts like that and generally speaking, you'll just be surprised what you'll get when you just ask. And one of the things that we learned was when you have a company with a really, really big vision, it really helps to kind of surpass road blocks just to learn how to adopt a very healthy disrespect for seemingly impossible tasks. And for us like nothing was too big. We needed regulatory licenses to launch satellites, and so we called our attorneys, we talked to our advisors, figured out how to do it and went out and got it done. We need an optical payload and so we were able to convince one of the world's leading providers of high performance optics to design and build the payload for the constellation. We needed market validation for financing and we went out and cold called 350 customers and showed traction where we could. And people always ask us if the four of us had drama or we fought, and the fact is we were just too busy.

We just - and John, remember when you had a swine flu? He still came to work when he had swine flu. We had to put a tape around his desk so, no one would get too close to him. It was like biohazard tape. Pretty much. Stay home if you had swine flu by the way. It wasn't worth it. And one of the challenges that we faced has been learning how to scale the culture. When it was just 12 of us in a small Palo Alto office, we always had a pulse on what was going on, just by the sheer number of hours that we spent together in very confined spaces. And I was the only girl and 13 guys. But how do you think about scale and transparency and collaboration and creativity when you're now 85 people, and you have new engineers and new executives and new advisors and you've never worked with any of them before? And one of the things that we realized was that we had an opportunity to completely change what it meant to be an aerospace company.

So traditional aerospace, they're very risk averse and they're very bureaucratic and they're largely beholden to meeting the specs of the U.S. government. And at Skybox we like to say we're bringing the Silicon Valley approach to aerospace, and we're building satellites like Silicon Valley companies build agile software. And we're always leading the latest and greatest technologies and just iterating really fast. And one of the ways we've tried to reinforce that culture is just to hire people that are just from very diverse backgrounds, give them an environment to innovate that's kind of unencumbered of traditional aerospace. And so if you walk through our office, you'll walk through our engineering bullpen and you'll see aerospace engineers that are working on space qualified hardware. And they're sitting next to software engineers that are building out data mining and computer algorithms. And from the engineering bullpen to our class 10,000 clean room, where our system engineers are integrating components on our two satellites, you might trip over a dog get hit by a NERF gun. And another thing that we were really focused on was learning how to scale our transparency, it was really important to us. And so every Sunday night Dan sends out an email to the entire team outlining the five challenges, five goals, and accomplishments for the past and following week.

On Mondays we have our all hands where we celebrate anniversaries for all our employees, introduce new ones and give updates across the departments. And after each board meeting we actually brief the entire board package to the entire team. And so it was really important that we're briefing the board exactly what we were briefing the employees. And so everybody knows what our key milestones, our challenges, our risks, even our cash position. And we're moving so fast that we can't afford to have restricted information flow. So we always err on a full disclosure. And finally, if you look at the people at Skybox, we've just been really, really fortunate just to have just an amazing collection of people from RF engineers to UI software engineers. And if you look at why they actually joined Skybox, it wasn't because of pay. I mean some of our employees uprooted their kids from high schools to relocate across the country. They dropped out of their PhDs.

And we really were able to hire people on the basis that we would provide them a very unique, once in a life time journey to revolutionize the way that businesses make decisions and people view the world. We were able to hire people based on the fact that we could give engineers the opportunity to build software and hardware and then infrastructure to build something that actually goes into space, it moves at 7,000 miles per hour and beams down a terabyte of data per day. And I think we're just getting started and we still have a very long way to go to prove ourselves. I think that the four of us will look back in about 10 years and we'll really judge how well we've done based on how we've scaled our culture. And I think if we get that right everything else will follow. And so with that I'll hand it back to Dan. All right, wow, that's how we're going to follow up Ching-Yu. I think in conclusion one of the biggest lessons for us and really what kind of all these lessons adds up to is that it's a - it is not a specific point or milestone, this really is a journey. If you make the decision to leave the walls of Stanford and go out and actually try and create a company, you have to be open to the journey of growing from being an entrepreneur to an executive, to an operator, to someone that is out in the field and is doing it. And that is a hard transition.

And it doesn't take days or weeks or months, it takes years. And it takes really a dogged determination to continue challenging yourself and the people around you and on one hand to, as Ching-Yu said, not be - not let people tell you no for an answer, but at the same time knowing when to be open to changing your own assumptions, the way you look at the world, the way you look at the people around you and the way that you look at yourself. And so I'd like to think that we are four good examples of people that have made the first few steps on that journey. We still have a long way to go, absolutely. But Skybox for us it has been a journey of a life time already and our emails are just our first names @skybox.com. If you're interested in joining us or working on data analysis or trying to get outside of the walls of Stanford, and getting a little bit more of a taste of what we're doing, please reach out to us. We come and do these things, because we want to meet more people, we want to get our names out there, and like Julian put it we're always looking for the next person that's going to move the needle for Skybox in the future. So please reach out to us and come find us. With that, we will open it up for questions. Ching-Yu, do you want to pick who asks questions? All right.

Fire away. What were the legal challenges for putting your satellites into space? John. John. John. We talked about the pitch, this was the question that John always answered in the series A pitch that came up every single one of the 150 pitches that we did. Yeah, and to refresh my memory you said the legal challenges? Yes. Oh yeah. So it turns out space is fairly heavily regulated, funny that. We need to get a license from the U.S. government in order to be able to sell pictures commercially from space.

And now the beauty of that license is, space is treated kind of like Antarctica, it's free for everybody. We have restrictions as to who we can sell to. There are few countries and a few individuals, bad people, that we can't sell to. But we do have the ability to sell our imagery to most places on earth and take pictures of most places on earth. And it's funny that Stanford, especially the business school talks about, being - creating global businesses, well Skybox just by its very nature, we're global. We're also global in terms of how we put our satellites into space. Our first satellite will launch on a converted Russian nuclear missile out on the border of Russia and Kazakhstan. And how they do this is they literally take the warheads out and they put our satellite in and a drill with four bolts they go 'zzz, zzz, zzz, zzz' and off we go. And so there are also tons of challenges, a lot of paperwork to get to that. An amazing amount of paperwork to get to that.

Yeah, and speaking of the paperwork, working with the U.S. government to make sure that our regulators are comfortable with us taking relatively advanced technology over there for that has also been a big challenge for us. So what that means is I've spent a lot of time in D.C. over the last four years. Yes, in the back. You mentioned near real time, what barriers are there to getting it real time? Or do you see there being a realtime equivalent to Google Earth or Google Maps in the future one day? I think that's a great question. What is the sort of future of satellite imagery? How real time can this actually be? Part of that is a little bit like Google sitting back in 1996 saying, how big can the internet be? I mean the simple idea was we 'want to index the internet.' And they probably had no idea at the time just how far that simple idea could take them. And I think in our case the timeliness of the imagery is a direct function of the number of satellites you have, right. So that's why we're building lots of smaller satellites, because we want to get to that timeliness. And, in reality we could take that a very long way.

For us the tipping point, really what we see as a line in the sand, is having enough satellites up that we're able to offer relatively high confidence to customers that we could get them daily data; something they can use to make a decision every day. And that's really the North Star that we're aiming at right now. But how much farther could this go beyond that, we'll all just have to wait and see together. Yes, in the back. How much is your - the weight of your payload and do you see your weight and payload increasing or decreasing? And what's the largest line item cost, is it the launch cost? So actually, it turns out that satellites and satellite launches are expensive, even when you're trying to do a lower cost version of them. One of the things that's been important for us at Skybox is to reduce costs while not sacrificing competence and quality. And so we follow very stringent, very industry standard procedures when it comes to the validation and the testing and deployment of our satellites. And so our current payload may increase a little bit over time, but the size of that payload drives the quality of the image that you see here. And so really we are focused on putting up more satellites so that we can drive that timeliness versus putting up bigger satellites so that we can see better pictures. Yes? I'm just wondering, because you mentioned that the engineers really

have to do basically everything altogether, so I'm wondering if you - if the company can actually create an environment for the other companies elsewhere to actually compete and reduce the price or to compete to produce some of the accessories or whatever, hardware, for you so that you don't really have to do everything by yourself? Ching-Yu, do you want to take that one? No, Julian you can take the...

So I think if I understand the question correctly, it was can we create an environment where we allow other companies to compete on building pieces of our technology, pieces of our platform and by effect reducing our internal costs? And the answer is absolutely. We already do take advantage of best of breed commercially available technologies when they're available; and if we have to build something ourselves, we do. At the same time people have often asked us even when we were raising money, what are you guys going to do when someone else can build a satellite at a lower cost than you can? And my answer has consistently been 'we'll buy it from them'. Because ultimately for us we view Skybox will be a success when we are the access point for providing people the information that they need based upon the imagery and other data that we collect. and if there's a lower cost way to do it with someone else's satellite, whether it means bringing in UAVs or balloons or cell phone cameras, ultimately it's all about providing somebody the answer to the question that they have, not necessarily about Skybox being the one that owns this specific piece of the technology in that entire stack. Yes? Yeah, so how do you view competition from the aerial imaging based on airplanes and helicopters, which are much lower cost, much faster to deploy? You said you drilled a Learjet hole..?. Yeah, we did drill a hole in the bottom of a Learjet, that was funny. Yeah the question was, how do we view potential competition from other collection sensors, from UAVs, from airplanes and the like. And I think this is kind of a follow on to what Julian just said. I mean, we really don't view ourselves as having competitors.

I mean it sounds kind of cliche but we see this as a partner industry. We realize that these applications of tomorrow will not be created based on Skybox data alone; they'll require data from other satellites, they'll require data from airplanes, they'll require data from the ground. And in some cases getting data from a UAV that you can pop-up locally, can loiter in real time, and combining that with some of our information is going to be the best way to solve the problem. If you're trying to get new information on what's happening in a very distant part of the world it becomes very hard to send a UAV there and having that global satellite that's constantly coming overhead everywhere on earth is going to be the way to solve that. So for us it's about the data integration in the end and how do we allow everyone's data to kind of come together and to be used in a way that solves these big questions in a way we can't today. Yes..? How many satellites gives you daily data, and how much does it cost to get one up in the sky? So we're a little quiet still, publicly, on what it costs and the truth of the matter is that it's slightly variable on how many satellites we need to actually to be able to kind of guarantee that daily revisit. Roughly speaking six satellites of our size have the opportunity to see anywhere on earth once a day, but then you think about places that are cloudy; these satellites come over at the same time every day, because they're in what's called the sun-synchronous orbit. So, San Francisco it can be a little hard to collect at 9:30 in the morning. So, when you put more of these satellites, in instead of six you say you have 12, or 18 or 24, and you're able to come over it different times a day then you have the ability to shoot around clouds more and you also have the ability to service multiple customers that all have competing needs in the same region. So, that's the order of scale that, getting back to that kind of current North Star we're pointing towards.

Can you give a picture of some of the applications for this? I mean clearly it's very broad. If you want to have a funny conversation with somebody like sit them down in an office, like John was saying with the headphones, and say 'okay, guess what? You can see anywhere on the earth at any time, what do you do with it?' Right? And for most people that's a pretty big - that's a pretty big leap from that concept to what they do on their daily basis sitting at their computer terminal, right. And so, there are kind of different classes of applications that really excite us. And I think that number one, environmentally, being able to understand kind of broadly across the planet what's happening with crops, with water, with forestry, with things that impact life for all of us here on earth, but also have a major impact on supply chains that require natural resources and on the prices of things like commodities. I mean I think that's a very interesting sort of rich data source that's not well understood today. The other kind of general class of problems for us is what we call asset monitoring; just being able to say 'well, I'm the manager here in the United States that's responsible for something that's being built in a factory overseas.' How do I audit them? How do I understand what's actually happening. Somebody told me there's a factory there, but is there, are there trucks outside of it, are there actually things happening there that would indicate that they're making the parts that I asked them to make? I can get on a plane and fly over there. Maybe I can call somebody on the phone. Or I can say show me what's been going on in the last week. So those are the types of things that the specifics of which industry and which type of information, I mean, you can break those into a million different pieces.

But those kind of general ideas are the ones that really excite us. And also, I'd just add a little bit to Dan's comment. One of the things that we're really excited about are the applications for humanitarian. I mean imagine having real time video over anywhere on earth right after an earthquake. So you'll be able to deploy relief agencies optimally. You can't do that today with existing satellites because of the timeliness, is not there. And we'll definitely be looking out for that next year. Yes, in the front? 1032 00:51:23,320 --> 00:51:25,829 Hi. I was wondering about the different controlling interest in the company. Do you guys as founders still have a controlling interest? And if not how do you deal with the bureaucracy and the different controlling interest while you still retain innovation? I think part of that question boils back down to that kind of journey that I talked about, and

being willing to kind of accept events as they unfold, because they're going to be different for every company.

Fundamentally, it is tough to go out and build a very capital intensive business. It requires a lot of everything; a lot of people, a lot of money, a lot of different types of expertise, a lot of parties at the table. We're strong believers that in doing that creates a much larger opportunity as well and that's what gets us excited. But I always urge people to really think about, if you're going to go start a company, really think about what you want your life to be like the next five years. Is it more important for you to have - be with your social circle kind of working in an environment that you completely control but might be a much smaller idea? Or are you really excited by going after the big swing, the big idea, even if there's going to be other things that come along with that that you're going to have to grow up and get used to. And for us the opportunity, that once in a lifetime opportunity that people, that we've been fortunate enough that people have given us to go out there and really try and do something big was well worth it. Dan, I'll just throw one additional piece on that, that I like to tell people, which is sort of the numerical concept of controlling interest is in a lot of ways a fallacy, because as soon as you bring on outside investors it doesn't matter if you're somehow able to do it and only sold them 2% of the company, you now have outside investors and you no longer have a complete controlling interest; you have to be working around the table and figuring out ways to bring everybody's opinions and decisions to bear. Yes, in the front. My question is how did you fund the company before getting your series A? You had to get an airplane and make and hole and take those pictures to get the data and to get that initial funding. So how were you able to bootstrap that first part? Credit cards.

Savings accounts. Yeah, credit cards. The Learjet was after the series A. The Learjet was after that, yeah. None of us have a credit line like that. Do not have that credit card. Black card. Yeah. Did you add credit cards, and how many did each of you hold? No. I didn't add any credit cards.

Did you guys? No. We actually didn't spend that much, I mean to be quite honest. For us we were buying tickets to D.C. and back. 1095 00:54:11,070 --> 00:54:12,219 We were taking the red eye. So we weren't staying in hotels. And we were sleeping on couches. Yeah, John would rent us a 20-foot long Buwick LeSabre that costs $8 a day to rent or something like that. We'd stay in the $30 a night hotel. Three to a room.

Three to a room. I wasn't in the same room. She wasn't in the same room, that's true. That's a good point. It's important for the historical record. Yes? So did you guys face any sort of opposition from like inflamed privacy advocates? And if so how did you I guess reposition Skybox when you're talking to people about it? So we really haven't to-date. And I think a big reason to that has to do with what Dan was talking about earlier in that at the resolution that we're at, there's really a certain level of inherent anonymity. We're not looking at people's license plates, you're not going to get accidentally caught walking out of the front door of your house. It's more about understanding the slower movements of larger objects that indicate macroeconomic or macro security trends. And I think the other piece is well, as it gets to the application side stuff that Ching-Yu was talking about, in that the public's widest exposure to satellite imagery I think other than Google Earth, which is really old and static but as far as public's exposure to new satellite imagery, is when there's an earthquake in Haiti or there is a nuclear reactor and tsunami in Japan and suddenly we're using this data to understand impact to human life, come up with security plans, come up with response plans.

And it becomes in some ways a lot easier to allay certain concerns and you say 'look at the amazing things that we'll be able to enable for humanity with a greater access to this data.' Yeah and I think that's - really a lot of that comes down to resolution. We have purposely chosen to pursue a business that really does not have the sort of image resolution to be able to go down to that micro level. We want to be about the macro level. And in a world where there's street view, in a world where there's the Twitter real time feed, in a world where there's Facebook, we feel that we're actually - we're not going down to that sort of same level that gets to some of those privacy concerns. Last question. Make it a good one, Ching-Yu! All right, here. Can you talk little more about what it was like working with each other in the beginning like three male and one female. You guys clearly feed off of each other's energy right now but what it was like in the very beginning and how has that kind of culture and dynamics evolved over time? Ching-Yu I think that one's all you. Yeah, yeah. It's been glorious, it really has.

I mean I was just so lucky that these guys actually let me be part of the team. And the form has really - worked really well together. We're extremely different people, we have different personalities, different temperaments and we all do very different things, but are just able to get a lot of things done. And we were fortunate because we had that dating period in the class, where you figure out really quickly, do you want to travel around the world with these guys and spend long hours with them? Do they raise your thinking, do they elevate your thought? And for me it was absolutely, yes. I'm sure you will agree that this was absolutely fascinating. Join me in thanking this wonderful team. Thank you. Thank you.