Stanford eCorner

Prepare to Launch [Entire Talk]

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When Capella Space's first prototype satellite launched in December 2018, it was the culmination of over three years of nonstop effort. Capella Space founder and CEO Payam Banazadeh explains how he fused experienced gained at the NASA Jet Propulsion Laboratory and Stanford's Management Science and Engineering masters program to build the satellite imaging company. As an early-stage CEO, he provides insights into the many risks and strategic decisions that precede product roll-out.

Transcript

- [Narrator] Who you are defines how you build.. - I thought a lot about how to make this a little more useful and if I were in your shoes, which I was, how this would have been a little more efficient.. So I'm not gonna talk about Capella, and I'm not gonna give you a marketing presentation on what the company does.. Look up, or come talk to me afterwards, happy to talk about it.. But how many of you know about Capella actually? Let me just, okay, that's actually pretty good.. I thought I would talk about, very quickly, maybe just over 10 minutes, of the first few months of starting the company and give you a glimpse of the stressful times and the uncertainties that existed every day in those first six months and then hopefully we can get into some Q&A and dive deeper into any other topics.. A little context on Capella, very quickly, we are trying to build an infrastructure around our planet in space, using satellites, in order to monitor our planet and observe changes.. Believe it or not this doesn't really, really exist.. I mean we have certain capabilities, but there are a bunch of gaps that, that requires in my, in our opinion, to be changed.. And the reason we started the company was this, how many of you remember MH370 which was a Malaysian flight going to China and it just disappeared? All right, I think this was around 2014, I was at Stanford and everyone was looking for this plane for multiple weeks..

I mean if you were watching the news outlets this is all that people were talking about across all the channels.. There were multiple governments, you know, superpowers, China and U.S.. and Russia, with all of their assets looking for one plane and it was not a small plane.. It was a triple seven with 280 passengers that just went missing and we couldn't find it.. And at that time we were thinking to ourselves, wow, why is that? Why is it that we couldn't monitor that area? And why is that on this one planet, that we call home, such a big plane could go missing and we have nothing that we could do about it.. And so we just started asking questions of why is that, what are we doing, and how are we doing it? And we thought it was really important.. We thought monitoring this one planet, and this one home that we have, is really, really important.. So we started taking classes at Stanford and we took a class called, Hacking For Defense, which was taught by Steve Blank, and it was all about customer discovery.. Our vision was we wanna live in a world where nothing goes missing, where we can monitor all these important places around the world and if something does go missing we can go back and we can look at it.. So in parallel, outside to the class, we were sort of doing technology development and conceptual feasibility of can we actually build a satellite that can do that, it could see through the clouds, can see at night time, could it be small enough that we could launch an array of them and build a business out of that..

We took a class with Steve Blank and it was all about customer discovery.. And the class, the question you're asking the class is, imagine you did build that, so what, who cares about that, what is the market, what are the opportunities, what's the business? And after 10 weeks of pretty, pretty tough challenges by Steve, we thought to ourselves that this would be interesting and there's a big opportunity in it.. So we went out and we decided to do fundraising and start the company.. And I, as I was kind of thinking about this talk I digged my notes and I found a whole bunch of pictures from three years ago.. This is actually a whiteboard that we, in Adventure Studio, GSV, and we were trying to figure out how much money we should raise.. And, you know, it's like it's super high level, it's super basic.. Looking back at it I'm kinda sort of embarrassed.. But we were like, you know what, if we raise 200K we have one objective and our objective is to essentially retire some of these risks and then go back to investors and say, you know, we did look at it, we're the right team and this is the right idea and we know, we know how to build this thing.. And the major things that we wanted to de-risk, and I think every startup that starts, these are the four pillars that every investor is gonna look at at the very beginning of the company.. One is the technology

risk, sorry for the handwriting..

One is a technology risk, right? Is your, is this technology actually feasible to be built? Are you dreaming of something that is feasible or not? And for that we wanted to use our summer, this was sort of a three-month period that we had, we wanted to use that summer and build a small little prototype of the hardware and fly it on a helicopter and demonstrate that we could actually build such, such a little prototype and execute on it.. Then there's the product risk.. Okay well for us the product and the technology was slightly different 'cause we had to launch these satellites, capture imagery, and then the imagery had to turn into a product.. Well, can you actually do that? Then there was the market risk.. Imagine you do have the tech, and you do have the right product, is this actually a big enough market for venture? A lot of businesses are not and that's totally fine, but is this a big enough market for venture? So we wanted to talk to a whole bunch of customers, get letters of interest, and show that if we did this people would be interested in consuming this type of imagery and information.. And there's the sort of company risk, or team risk, which is, is this the right team who's gonna be able to bring the technology together, execute on the market, and make, take this to the finish line.. And then at that point, like early on in the companies life, the company risk, the team risk, is all about the people.. And I had this one investor that told me, I am really not looking at the business model 'cause I know the business model's gonna change, everything that you're doing from now until the final product, how you get there is going to be vastly different then what you're proposing now.. I am looking to figure out if this team is the right team that when they hit the wall and, you know, when things don't work the way is intended to, does this team have the ability to sort of go around it? And so by trying to do this over summer, we raised about 200K.. We went out and we raised the 200K and we wanted to retire some of these risks..

We came back to the Venture Studio super excited, 200K in the bank account, never seen that big of money in my bank account, let's plan out the 10 weeks.. And again, like apologies for the handwriting and some of these are embarrassing when I look at it now.. We even had this, we had this little org chart up there and there are a bunch of C-level positions which doesn't really make sense, it was just three of us.. We were trying to really figure out how do we organize, and how do we split these responsibilities, and what are the things that we need to do over the next 10 weeks to get us to the finish line.. One big lesson I learned from this was nothing went as planned.. We needed more money, we needed more time, and none of these weeks actually end up working the way we planned it.. And our story, this entire 10 weeks was all about, wow, we wanted to do that this first week, we're in week zero and we are not able to make that happen what do we do now and how do we go around that? And we got the money, the first thing we did was we went to Fry's and we bought a whole bunch of electronics, and yes, Fry's do still exist, there's one in Palo Alto.. And we started breadboarding, that's my CTO right there in the corner who was trying to build a little breadboard and a little prototyping.. And our goal was to build this little prototype and fly it on a helicopter.. And so we spend the next sort of six to eight weeks trying to build that thing and it was incredibly difficult..

It doesn't look as complex as it should, but it was really, really hard.. And I remember this moment vividly.. This was probably one of my most stressful days of my life.. We were sort of at the very end of trying to put this thing on a helicopter.. We rented a helicopter for the day and it was, it was like 500 bucks a day, we had it for the entire day and, you know, when you have like only 200K, that's a lot of money.. We showed up there and we wanted just one final test before we put it up on the helicopter and the thing wasn't turning on.. And so it was like, oh my god this is, and every single problem, you gotta, you gotta like put, every single problem was an existential problem.. You know 'cause it was like, okay, well I have a limited amount of time, I'm gonna run out of money if we don't take it to that finish line then we're done, like there's not, well what are we gonna do? Finally got it working, put it on the helicopter, flew this thing and realized, oh snap, actually a helicopter is not the right way of doing it because it's bouncing so much and the pilot can't really hold it steady and the images are not gonna look that great.. And this was literally like one week before we had our deadline to meet with investors and show them that we were the right team and we had, you know, de-risked and retired all these other things that we had been bragging about for 10 weeks.. And so we were super scrappy and we went with a Cessna and we had this super sketchy box at the bottom that we wanted to strap around the wings of the Cessna and put our instrument in there and fly it..

No one in their right mind wanted to do that.. And we went to every single airport within a hundred miles of here and we wouldn't, like no one wanted to do that.. So we found this little tiny airport, bless their heart, love them to death, and the guy was like, yeah, I'll do it for you guys.. You know you look like students that are doing some cool stuff.. He did, we flew this thing.. We went up, we took our imagery, as we were coming down we kind of crash-landed.. The pilot wasn't really that good, (audience laughing) and it kind of explains why he was totally down to do this.. So we crash-landed, we were obviously okay, super stressful time.. And we ran out of the runway and then they had to call a pickup truck to come grab us.. This, I mean I hadn't thought about this for almost three years 'cause life has just been so fast, but the crazy thing isn't that we crashed, the crazy thing is we came back home, we looked at the data, we weren't really happy with the data, so we called the guy and we decided to go on the same plane the next day, (audience laughing) to do more collection..

And I didn't tell my mom and I think she's gonna watch this later, sorry.. Anyway so went back and we did the collection, it worked out, it was great.. I actually have a little video of me and my co-founder sitting in the pickup truck that's towing the plane and I thought it would be.. - [Man] Depends on our velocity and stuff quite easily.. - This is my CTO.. We're just showing here with the plane, totally broken, totally broken.. This pickup truck right here, that's how we do it at Capella.. - [Man] That's right, that's how we do at Capella.. - Yes.. Anyway we had a good time..

We did make it to the fundraising meeting and we were able to raise money and now it's three years later.. And I wanna show you a video of our first launch of our first satellite which happened in December, on December 4th.. We're a company, we're about 60 people now, our headquarter is in San Francisco.. We raised more than 50 million adventure from good investors around here.. And this was the moment where we launch our first satellite and we were seeing the rocket getting lifted up and our satellite getting deployed.. And if you worked on something like this for three years it is like your baby and it's very, very emotional for everyone who's involved.. Let's watch this.. We're at Apollo Space Headquarter in San Francisco and we built a satellite and our satellite is sitting on top of Falcon 9 in Vandenberg right now, it's about to launch.. - [Woman] Five, four, three, two, one.. (clapping) - Really looks like we made it through the hardest part for just getting there..

The next one's making initial contact.. - [Man] System, ENT.. (talking in background) - Got a beacon.. (clapping and cheering) (background talking) - We had our first contact with the satellite where we see the beacon and it shows that the solar panel has been deployed successfully, so that was a big, big first success.. All right, well things are a little easier, but the road is really, really, really bumpy because we are still super, super early stage, but it's been a fun ride and I'm excited to get into one more conversation about it.. - [Interviewer] Let's hear it for the successful launch people.. (clapping) You know it's an interesting thing about space in general, right? It's still one of these areas that can still capture the human imagination in a way that other things can't.. How did you fall in love with space? When was this, when did this happen for you? - I was, I got involved with this, the most nerdy, non-athletic program called, Astronomy Olympiad, and it has nothing to do with the Olympiad that you might think.. It's a bunch of high school kids who are passionate about stars and how universe and galaxies are formed and how they collide and how satellites go around.. And we would throw these star parties, and again, it has nothing to do with the party that you might imagine..

We would go in the middle of the desert with telescopes and we would look at the stars and try to map them and we would compete.. There was like serious competition between different high schools on who could remember, or recognize more names, and who had better equations figured out to solve problems.. And at some point I realized astronomy wasn't my best, I wasn't as sciencey, I was more of an engineer, so I switched into aerospace.. But I think it's not that hard to look at space and totally get, you know, fascinated, because there's so much that we don't know.. You know one of my favorite quotes is, somewhere out there, somewhere out there something incredible is happening and it's waiting to be discovered.. And we're so lucky to be able to be a part of that.. - It's funny that you talked about things that people don't know yet, and the piece of discovery.. What does the general public actually not understand about trying to create a business that involves being in space? I mean, what's different about that? - Well they say space is hard, and they really mean it.. You know, if 10 years ago you thought about starting a space business, it was just unthinkable, right? 'Cause you had to be a space agency of the government, or a country, and you had to build everything from scratch, right? You had to build your ground stations, and the net work, and the dishes, and you know, rockets were super limited and you had to build every single little piece that's gonna go into your satellite to take it up.. Now it's quite different..

I mean over the last seven years I would say there's an entire ecosystem built around space.. And I think the majority of the public hear about SpaceX which is fantastic, but there's so many companies that are attacking and grabbing different parts of the supply chain whether it's, you know, companies trying to build just pieces and parts that goes into the satellite.. Whether it's companies that are building dishes that then allows these satellite companies to receive data.. Whether it's companies that are doing storage, or analytics, or companies like us who are building the satellite and the payload itself, there are so many commercial companies out there where now as a commercial provider you can come in and you can specialize on just one piece without really needing to build everything else around it.. And that's creating this sort of massive movement that we're seeing on entrepreneurs jumping on the space opportunities.. And you couple that with the fact that space has been traditionally in sort of, in hands of governments and these agencies who are extremely risk adverse and as a result there are technologies that just never made it to that, to that sort of side of the fence.. We have some customers, we have some competitors, if you wanna order imagery from them you have to fax them.. Like you have to physically have a fax in 2019 and be able to fax them to get an image, right? And so the opportunity to do a thousand x improvement, as it happened already in software, hasn't happened yet in space.. And so I think that's attracting not only a lot of investments, but also a lot of entrepreneurs and people who have good ideas on how to do things slightly different.. And so I think it's changing, but, you know, the perception of how space has been over the last 10 years is gonna be drastically different 10 years from now too..

- That's really kind of encouraging 'cause you think about something as, even aerospace engineering, as even sort of this separate field.. A lot of people probably go, I'm not going to be able to do that, or hack that, so I'm gonna go do something else, but there's opportunities to be had there.. I mean you did your undergraduate in aerospace and you came here to Stanford and got a masters here in Management Science Engineering.. Being that you saw opportunities why Management Science and Engineering versus maybe an MBA or something like that? - Well so I didn't wanna do aerospace again so I actually came in as master student for aerospace and decided to switch to MS&E 'cause I thought, I had a pretty solid aerospace background and what I didn't understand is business and I didn't understand, you know, finance, and accounting, and fund raising, and what does it mean to start a company.. What is a company? I didn't know any of that stuff.. And I did think about GSV versus MS&E.. MS&E made a lot of sense to me mostly because it's such an open-ended program where you can build your own journey and you can take whatever classes that you think fits the specific needs that you have.. So I had a whole bunch of MS&E students who are deep into finance right now working at hedge funds and I have some that are deep into computer science and are product managers, and I have some that are doing supply chain and operations and then I have some other ones who started a company.. And all of them took the same degree, but the outcome of the degree was quite

different.. And so I like the sort of unstructured MS&E Program, it was also quite cheaper than an MBA..

So from a return of investment standpoint it made a lot of sense to me.. - We were the value-price offer, I'm very excited to hear that.. I'm sure our friends across the street.. - It still wasn't cheap, it wasn't a cheap degree, so.. - I mean we've had speakers come in here before who were alums and they talk about like a critical component of the Stanford experience is, okay, the courses are great, the faculty is great, you know, the environment's great, but like it's the side projects.. It's those little things that you carve the time out for where all the kind of collective passions smash into each other.. I mean, you took advantage of a bunch of different things here.. You mentioned Venture Studio earlier, you were also a fellow in our DFJ kind of master's program.. What did you get from those sorts of experiences that? - Yeah, I would say it's the side projects, all the classes and programs, as well as the people, right? I mean they're, as you're just walking across campus you just get inspired by meeting random people that are also doing really interesting stuff.. But the classes, specifically the DFJ and some of these other programs that I took, allowed me to kind of know the way for fundraising, specifically..

Allowed me to have more confidence as I'm talking to an investor because I knew what they were looking for and what the process is like.. And most importantly allowed me to create a network and connections to then when I actually did wanna raise money I had a few people that I could reach out and I had a bit of an experience on how to, how to do that.. And so I think, you know, and you'll hear this from the GSB MBA students, is one of the best bang for the buck that they get is they build a great network of people, right, and so when they leave Stanford they've got this sort of, almost like a family and core group, that they can reach out.. And I really tried to build the same thing, even though I wasn't part of GSB, and that was, you know, just take as many of the classes, meet as many of the people, and be able to build a foundation where I could, you know, I could not only give back, but also receive some if I needed to.. - It's interesting you kind of mentioned the community aspect of that being important.. And I mean in your career, you know, you had this opportunity, if I understood correctly, you know, you worked at NASA JPL, and you know, Jet Propulsion Lab down South, and it's an iconic place, you know, in this field.. What about that environment did you, you know, you spent enough time there to kinda know, what are things that existed in that world that have taken to Capella and maybe what's something, not that it's inherently good or bad, but you just decided that's not for us, that's for them? - Yeah so JPL is a magical place.. They built all the, all the essentially robots that we've ever sent into space.. The one that you guys might be familiar with is the Mars rover, the Curiosity rover that landed, I believe, in 2000 maybe 12.. Just magical place..

And I think, you know, I obviously learned a lot of aerospace there and processes and management, but what I took away the most was this mentality that anything is possible and it's just an engineering challenge.. And so if there's someone that wants something we can make it happen and that was so much of the mentality at JPL.. I mean for god sake, we built a rover that was one ton and we used this sky crane to literally put it down on the surface of Mars.. Right, like who imagines that and then who can actually build that? So I guess my entrepreneurial realty distortion came from JPL and that was really helpful.. I thought anything in the world is possible and you do need a little bit of, sort of, naive, ignorant thinking, when you're starting a company.. That's what I took away and there's stuff that I didn't take away, right? So JPL, what I didn't take away from there is this sense of perfectionism.. And anything that JPL builds needs to be perfect and it needs to work the first time and if it takes us 10 years and three billion dollar to do it, we will do it that way, but it will be a perfect product.. And I left that right there.. And so what we do at Capella is we try not to be perfect and we try to be quicker and we try to bring sort of this, what's been known in the software industry, as Agile software into Harper and Aerospace which is really, really difficult.. But, you know, what if the first one doesn't work the way that the ultimate product, you know, I'm gonna learn so much more through that process and it's gonna cost cheaper and it's gonna be faster..

And so that's something that kinda I left behind at JPL.. - I mean you had this experience, now three years in, you know, founding and founding with a team together is really interesting, but you're in this role as CEO as well.. What is actually the best part about being CEO 'cause everyone always uses the pictures of about how hard it is and difficult and challenging, but what something that's really like, that you thrive on that's exciting about that role and maybe something that's been, let's say, more surprising? - Um, the surprising and the challenging part is also at the same time really exciting part, is that usually only problems make it all the way to the top and so, you know, if a problem is solved you're probably not gonna hear from it, and the problems that do get to the top are problems that weren't able to get solved.. And so you're always on a day-to-day basis trying to solve problems that are really, really difficult, across multiple departments, and some of them are existential problems, especially as an early-stage startup company.. And on a daily basis you're trying to put out fire.. Of course as you're building the company you're becoming more stable, hopefully there's less of that, but I think, you know, as a CEO that's been one of the most stressful parts of the job.. And then just sort of, you know, share amount of responsibility that you feel, and I feel, towards my team.. Because when we started the company it was just me and my co-founder, it was just the two of us, right, we're doing this for ourselves and we'll see where it goes, who knows where it's gonna go.. But then now we're 60 people, and people have families, and some of them we recruited them from out of state and they moved here because of us, and so it's not just about me anymore, right? It's about people's careers and their beliefs, and their, you know, their confidence in us to make something happen with this and so that's pretty stressful.. I think what I love about the job the most is the ability to change..

I think one of the most important personalities of a founder or a CEO, in a fast growing startup, is ability to adapt and be able to change very frequently.. 'Cause, you know, the CEO of a 2% company, and a 10% and a 30% and 50 and then 100, it's gonna be a vastly different job and they're different responsibilities.. And if you're not able to adapt to the new rules and new

requirements and grow with the company then it's gonna be really difficult.. But I have sort of taken that at heart and it has changed me personally at a personal level, but it's changed me at a professional level and I really enjoyed kind of, you know, seeing that change over the last three years.. - [Interviewer] Do you find that that's something that you are, and your team is looking for, when you're hiring and stuff? Are you looking for that same adaptability and agility in the people that you bring in, or are you looking for other things to compliment that? - That's, yeah, it's critical.. I mean, you know, when we were a company of 10, right, the culture was different.. It was a lot more agile and, you know, the way we were just doing things there was no org chart, there was no handbook, there was no process, there was, we're just doing things as a team.. There was one credit card we were literally using as a team, okay, you need to order that, go for it, you know.. And as the company has changed and grown all those processes have changed because they were not scalable anymore.. And I think one of my important roles as a CEO is to reiterate to my team that change is okay..

And change is actually, not only okay, but highly desired.. And 'cause, you know, change is difficult, right? Like I mean if you're used to a certain, a certain way then all of a sudden, you know, everything is changing, then you're kind of panicked, you know what happened? And so I try to infuse that to the team, you know, every two weeks, every, all hands talking about how this did change and we used to do it that way, we're doing this way, but that's totally fine.. This is how it's supposed to be.. And I think if you're trying to join a startup you gotta enter the environment knowing that everything is gonna change very soon.. And so I've told people if something is not working today it will most likely be fixed three months from now so let's just work it out, let's just get together and talk about it, 'cause there's a bunch of stuff that gonna work here, right, I mean, so it's growing pains of, you know, building a, building a company that's growing really fast.. And so if you're not okay with change it's gonna be difficult and so we certainly look into that when we're hiring new people.. - You used this wonderful example earlier on in the presentation about the Malaysia air flight, and I imagine, you know, we've heard repeatedly from people about the things, the reasons that someone might go to work for a company, right, why this place versus this, where do you find your connection, your why, about that places mission.. What are some of the things either through the years where you were talking to perspective customers and things like that, what are some of the use cases you see from a social perspective that successfully being able to use this technology, getting enough satellites in space to build that kind of network of visibility, what are some other examples that you see in maybe different sectors of something of impact in that way? - Yeah, so I, I mean we're excited about a whole bunch of markets when it comes to building a sustainable business, entrance, finance, maritime, security, agriculture.. But when I step back and I think about some of the big problems that we're having here on Earth, as species, you know, you can't not realize that a lot of our problems are very global problems, right? I mean if you compare us to, you know, a thousand years ago, some African tribe in the Sahara Desert, they really didn't care about the politics of Asia, or conflicts in Middle East, or deforestation in Amazon.. In fact they probably didn't even know it existed, right, but now we're living in a world where an event happening in U.S., you know, policies of U.S., politics of Asia and the conflicts of Middle East and some of these other problems are highly connected and they influence everyone, they impact everyone..

And so it's a much more globalized world that we're living in.. And in such a globalized world our problems are also gonna be at a global level as opposed to sort of these isolated problems.. You know, nuclear challenge, technological advancement and how that's gonna affect us all.. And most importantly that's close to my heart is ecological, you know, climate change.. And so in a world where everything is so globalized I think we do need a capability as species to be able to look at the globe and understand when something happens across, you know, in Brazil, how does that actually impact Southeast Asia? When something does happen in North Pole how does that actually impact Europe, and be able to connect the dots and the links.. And building an infrastructure in space which by definition and by nature is a very global observation, I think it's gonna be really critical.. And if you just take sort of the climate change problem that we're gonna be facing, we know that there's gonna be more extreme weather, right, we know and we're seeing some of that already.. There's going to be more tornadoes, there's going to be more hurricanes, there's going to be rising water, oceans, there are gonna be people that are gonna be displaced, there's gonna be more migrations, there's going to be agriculture production issues, these are issues that we will have.. I mean even if we today tried to solve climate change some of these we're already seeing.. And so in that type of a world I think again it's really critical for us to have a non-terrestrial based, right, because those things are gonna get destroyed, capability in infrastructure where as things are happening in London, or in Houston, Texas, or in Singapore, we have eyes in the sky to monitor as it's happening to help people move, to understand the damages, and then ultimately be able to look at how our planet is changing over time..

So I think it's a capability that we should have at species, and we wanna be part of that.. - There's really kind of a very beautiful call to that.. It makes you think of sort of like the first pictures of Earth from space, right, you know, this sort of collective sense that was not available to people before because they didn't know it existed, or they didn't have it.. I mean, you're running a business as well here and commerce is a part of that.. How do you, when you go to like, go for customers in this space, what is sort of the strategies here.. I mean we've had folks who developed apps, or they've got other sorts of businesses of all different stripes that they affected on, what is the customer development process like in terms of like going out in your team, your B&E Team, how do you approach that? What did you have before that you still use now, those sorts of? - Yeah, it's, it's a, because we're building a capability that's never existed before, it means the market also doesn't exist for that, you know, capability.. And so we have the company's sales team sort of divided into business development for new markets, those are markets that don't really exist, but we believe that once the capability goes up there are a bunch of really interesting things we could do and then sort of sales to the market that does exist and use imagery and have been using.. And it turns out this market is mostly a government market, 'cause governments, you know, they're used to this stuff, they've got a

30-year headstart.. The first imaging satellite was launched a long time ago, IKONOS, and so they know how to use satellites and how to use imagery and they got a bunch of need to be able to look at a lot of areas.. And so this is more of a sales cycle, you know, we're coming with a new capability, but the requirements are well-defined customers, customers are there and it's a very traditional sales..

Whereas this new one, the business development is, is very much so, we're approaching it from bottoms up and tops down, so we're doing a, sort of a, very similar to what we did at Steve Blanks class, proper customer discovery where we go out and we talk to people, we try to really understand their problems.. And the typical questions we ask there is, you know, when you're talking to a CIO, a Chief Information Officer, or a CTO, you know, you ask questions like, what keeps you up at night? Like what are the things that, you know, if you had five million dollar of an R&D budget where would you spend it? And with, you know, through those conversations we're trying to figure out, what are like fundamental problems that these guys have and then we come back and we try to see if we can solve them.. And, you know, one big thing I learned from Steve's class was, you never bias the conversation, right, so you don't, you never show up and say, I've got this great capability would you use it, because then you've immediately biased them.. If they tell you their problem and it turns out that your solution could solve their problem, jack pot, right, 'cause now you've got a customer that didn't know that you had this, but they told you that that was the problem.. And so for the BD side on the new markets there's a lot of conversations in these different markets and we're quite organized about 'em and, you know, we go to agriculture and farmers and we try to categorize and go and try to create those markets.. But creating a new market is very difficult and it takes a long time.. 'Cause you gotta roll out the product, you gotta demo it, you gotta, you know, you gotta demonstrate that it's actually useful to them, it's gonna move the bottom line and then you've gotta figure out how you're gonna blend yourself into this workflow that they've had for many years.. And so it will take us awhile to get there, on the new markets, but we're super excited about a bunch of use-cases we've found, and meanwhile while we're doing that, we're gonna work with some of these existing markets which are mostly around governments.. - It's interesting, like you think about the comparisons between a small firm and a large firm in this space, and, you know, you think of traditional players and compensator, about probably these enormous research and development budgets and stuff.. How does Capella do research and development or are you just busy like we gotta get these first, however many it is, what's the total number for the network in the first sort of? - Ultimately 36..

- 36, is it just, dear god just get the first 36 up, or is it there is some space that's already kind of looking beyond that? - Yeah, that's a classic startup problem.. Like there are too many things that you wanna do, but you don't have all the resources to do it, so how do you, how do you put 'em on a list and rank them? But, you know, I think, you know, a couple things I think about a lot, one is when we talk about our sort of competitors, they're massive companies, big, you know, big ships.. One of our competitor, competitive advantage is that they're a big ship and it will take them a long time before they can actually do this.. And it will take them a lot of resources before they can change the, you know, the direction of the ship.. And we use that as a competitive advantage.. So the question is, how do we not, how do make sure we don't fall into the same trap and some other startup doesn't come in three years from now and say, you know what, these guys are a big ship, we've come up with this really new technology that's 10x better than them and we're gonna disrupt them.. So how do we not get disrupted? And I think if you're too focused on just your V1 product, then you're gonna miss the boat.. And so even though, you know, we've only launched one satellite, and we haven't rolled out all of the other satellites that we wanna do, we do spend, you know, five, 10% of what our resources, on thinking about the next iteration.. Whether it's, you know, the sales and the BD and the marketing team, talking to customers and kind of bringing all that feedback into, to Capella, and then we sort of analyze and say, okay, well we can't do this with this product, but it seems like we're getting a lot of feedback from this and we should add it to the next feature, or we're just having, you know, some interesting R&D that we're doing on our own and see where it goes.. I think it's really important to allocate a little bit of budget and resources on doing that early on, and build a culture of that, right? 'Cause I mean, you know, when we launch 36 satellite it's not like we're gonna be done and we just, we have to keep the engine going so I think it's really important..

But it's all about balance, right? How much of this you do versus that.. - I'm interested you're still getting kinda feedback as you go out to customers, there's new things that keep appearing, right, in that same frame.. I mean when you guys first sort of identified, you know, where the paying points where, I mean you did something sort of interesting that I'm gonna deep out of my technical depth here, so save me if I fall.. But the synthetic aperture radar technology has been around, how long had that technology been around? - For a long time, 40 years.. - 40 years? - Yep.. - So was it something that you saw sitting there on the shelf it's like, jeeze, why isn't nobody using this, or was it something about, no, it's just a lack of the continuous reliable imaging? What was the first kind of understanding that, the hint, the first strongest hint you got from those customers? - Yeah, it's always been around, as you said, for a long time and it's mostly been used as a military and government tool, right, because it's a, the way it works is it's radar-imaging system and so it can see through clouds, it can see at nighttime, so it's sort of a very reliable imaging system.. And honestly I, you know, the vision was we wanna build a consolation of 36 satellites in order to monitor places every hour, or better.. And in order to do that these satellites need to be really small.. And then the problems were, okay, well all these satellites are really big so how are we gonna make them small? And this is where sort of the, the delusional founder comes in, and the reality distortion comes in, and we're like well we'll, we think we can actually build a really big structure that can fit in a tiny little box, but then once it goes up in space it just, bomb, just deploys itself.. And people have probably thought about that for a long time, but no one believed themselves that that's possible and so we believed in ourselves and we thought we had it..

And so we saw an opportunity, I mean we did a whole bunch of design and we thought it was doable, but we thought that,

you know, it is totally doable and people are not doing it because they're afraid of the potential risk that are involved and the hard work that you gotta put in.. So far it's worked out, yeah.. - So let's open it up for the questions.. Anybody have questions for Payam? In the back.. - [Woman] So can you describe a little bit where exactly the IP in your company lies and how did you get to that? And then what's the (mumbles) comments on the cost, all satellites, right, (audio not picking up clearly).. - Maybe restate the question.. - Yeah, where does the IP lie in the company, in which part, and then why did we make a decision to build our satellites in-house, is that? So the IP at the very beginning of the company was mostly sketches and designs and how we're gonna do things.. I mean we didn't come out of the Stanford lab where we had our own IP.. We had a creative idea on how to package things and we thought that, you know, we could execute on that really nicely.. Three years later we have a whole bunch of IPs, right? We've built pretty much every single piece that goes into our satellite ourselves and so whether it's the antennae that we, you know, that deploys, or the electronics that goes in there, we built everything from scratch..

And the reason that we decided to build everything from scratch was the status quo out there wasn't really good enough and so we did go out there and we did just wanna buy a satellite and just put our little sensor on it, but it either was too big, or the performance wasn't really what we wanted, or it was too expensive.. And in some occasions we did work with some other partners to build specific parts of our satellite and we realized that working with vendors is really, really painful, especially as a startup that's trying to grow really fast in a very tight timeline and budget.. No one cares about this as much as you do.. And so at that point, you know, we decided to have sort of a vertical integration and build everything in-house and it's been, it's been a good decision so far because going back to sort of that feedback loop between customers, and bringing it back, we have probably iterated our satellite seven times over the last two years, just based on feedback from customers, right? I mean we had some hypothesis at the very beginning and we decided to build that satellite, but then once we started hiring more people and they were out and they were talking to customers we realized, oh, well actually if we did this then, you know, it would change our market by this much.. And then we went back literally to our lab and we made that modification, if we were working with some other partners, that would have been really difficult.. And then on top of that space launches, to get stuff in space, is very unreliable.. Our first satellite was supposed to launch November of 2017, it actually launched December of 2018.. So that was a 13-month delay for our satellite.. And if, and what we did was we were like, okay, we have an extra 13 months let's disassemble the satellite and upgrade it.. And if we couldn't do that then we would have been pretty much dead, right? I mean we were sitting and doing nothing, so..

- [Man] Your logo's really interesting and unique can you share the story behind it? - Oh god, do you want like the true story, or the marketing story? - [Man] It's quite unique quite frankly and it's attention grabbing and there's nothing out there like it.. - Yeah.. - [Man] Coming from an engineering background and to get to something that is, you know, quite extraordinary, I'd love to hear the story about it.. - Yeah so we hired this marketing firm and we paid them a lot of money and, we did, and, you know, there were kinda just like analyzing us and figuring out who are we, like what's our identity, what's our value? And they come us with this cliche, new perspective, we bring new perspective because we're doing things differently.. And then goats stand out because Capella in Latin means goats.. It also turns out Capella is a constellation, Capella is a constellation of stars and it used to look like a goat back in the day.. And goat is also a new perspective.. Like you don't find a space company that has a goat.. Just doesn't make sense.. And so we picked the goats..

The goat looks like a unicorn also and that was not intentional, that was we had someone design the goat and it was like a magical goat, but now it doesn't really look like a goat it's like a unicorn.. I mean like, people ask like, why did you pick a unicorn, I'm like no, no, no, it's a goat.. And so that, I mean that's the story behind the goat.. - [Man] Great job.. - To be clear Capella Space is not technically yet a unicorn? - Not at all, yet.. - I just wanted to clarify.. - Yeah.. - [Man] So when you're like building a company that has, even right now in the world that's something that doesn't exist, right? So the company, especially on some level, oh, I'm losing lines.. So how do you get people interested, or especially like investors, 'cause you're doing something completely crazy and how do you get around that? - Well it's a bit of an aspirational story that you have to tell.. I mean, it's a storytelling..

What you're doing at the very beginning of the company where you have no data points, is storytelling.. And what helped us a lot was when we took the, Hacking For Defense, class with Steve, we had a pretty good story.. 'Cause we had interviewed roughly 300 potential customers and Steve had made us write a blog about every single interview, right, so we would literally write a blog of the interview, what did we learn, who was it, and what did they say, and this was a private blog only to the team.. So when we went to do fundraising we gave them the blog, all right, so like go check out what these people are talking about.. Everyone is saying, you know, if you could build the capability where I can monitor anywhere in the world every hour this will change my operations, my industry, how I do things.. And so building the story, and the majority of it is just go out and talk to the customers, right, like, you know, the so what question is more important than the technology and then obviously the tech has to support it.. But going out and talking to customers and being able to build that story for the investors is really, really critical throughout your journey.. - [Woman] How do you stay quick and adaptable if you're also trying to do the all in-house vertical integration, and why is the balance of that so seemingly towards the latter? - I would argue that the only way to actually stay quick and adaptable is to have full control of a lot of your processes, and builds, and hardware, and everything that goes in-between.. 'Cause again, like we've had experience where, you know, vendors have other priorities, right, other people have other priorities, other customers, you know, someone else comes in three months in and, you know, they give them a better contract and now that becomes a priority.. And so having full control of your supply chain and having full control of your build, allows you to, if you do need to cut corners, to make that decision and cut corners, right, like, I mean, and we did that..

You know at some point we had to say, you know what we're not doing these two testings, or actually we're gonna patch this up because we don't have time, or, you know, those are the decisions that you make at a startup on a daily basis.. And so the more separation you have between where you could execute on that by having someone else working it out, the more difficult it is.. Now like down the road when you've got it figured out does it make sense to outsource certain portions of the company and the hardware build, maybe, and at that point it's an opics-copics question of, you know, where do you spend your capital, but I think early on we did make the right decision to keep things pretty close to us.. - You wanna pick out the last question? - God, that's tough, go for it.. - [Woman] Thanks, I'm really very curious (audio not picking up voice clearly) talk about over the course of your journey and also (audio not picking up voice clearly) from your initial vision.. - So points of uncertainty? A lot, I mean, there have definitely been lots of times where we were dependent on one test, or we were dependent on this one customer, or we were dependent on this one investor, or we were dependent on, you know, making, making three things happen at once otherwise this other thing wouldn't happen.. So many I can't really pick actually one.. And, you know, obviously as you grow the company you wanna have a less of those uncertain moments happening in your journey.. We had a lot of them early on.. I mean that first three months was, every day was uncertain..

Then we raised the seed round and it was a little less uncertain, but there was still a lot of uncertainty.. And even to this day, I mean, we're, you know, we raised more than 50 million, we're post B run, we're 60 people, there's still a risk, there's still, you know, uncertainty about how certain things are gonna fold out, but then having a plan B and a plan C and a plan D, and being able to navigate through those as they happen, is the critical important part.. You had a second question there? - [Woman] Just also on that line, have you had any kind of major uncertainties, like the actual vision itself besides just like encountering problem solving, a time where you were like, oh I don't know if that's on the right track at all? - You know the big vision hasn't changed much.. The big vision of providing a transparent, accessible global monitoring service and be able to open that across the world for many different applications hasn't changed.. Maybe how we get there has changed a little bit, right? And those are very tactical strategies that okay, we're gonna build three satellites first, then we're gonna do 12, then we're gonna, you know, put these on these, right? I mean those tactical things have certainly changed dramatically, but the end goal hasn't changed much.. (clapping) (digitized music)..