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Relativity Space: Orbiting Around Wonder, Relentlessness, Humanity, and Audacity

> *"We are trying to expand the capabilities of humanity, both on Earth and in space […] just spreading the seeds of humanity across space, which I think is insanely cool."*
>
> *- Natalie Estrella*

When Natalie Estrella first joined Relativity Space as only the 19th employee, the startup was still operating in stealth mode. Despite the company not having a recruiting team at first, Estrella quickly began building what she calls "a culture of recruiting," believing that "we have a product but our product is also the people who are making the product."

In a few short years, Relativity Space has grown to over 200 employees and raised $686 million towards its vision of "building humanity's multiplanetary future." How did Relativity Space's values and audacious mission drive its culture and people practices?

The Problem: Revolutionizing How Rockets are Built and Flown

Born in Plano, Texas, Relativity Space co-founder Tim Ellis was the oldest of three children. Growing up, he often excelled in mathematics and science, but displayed a high level of creativity talent by building spaceships with Legos. As he grew older, Ellis also began developing an interest in filmmaking, often making short films with friends with action themes. This interest ultimately led to him to enroll at the University of Southern California (USC) with an initial plan to study screenwriting. However, this changed after joining the USC Rocket Propulsion Lab. After taking a trip with the Lab team to the Mojave Desert to witness a test firing, Ellis was mesmerized by the experience, and switched his major to Aerospace Engineering.[2]

Around that time, he met Jordan Noone, another student in the USC Rocket Propulsion Lab, with whom he launched the first student-designed and student-built rocket into space. Ellis would

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eventually partake in three consecutive internships at space company Blue Origin, before earning his master's degree in Aerospace Engineering from USC. He soon joined the company full time and served as a propulsion development engineer. While at Blue Origin, Ellis ended up creating the company's first metal 3-D printing program. When commenting on his drive to make this, he said, "I spent nights and weekends working on this program because it wasn't my main job and no one asked me to do it. But I was just very possessed with this idea that 3-D printing was going to be the future of rocket manufacturing."[1]

Noone, after interning at Blue Origin for one summer, would graduate from USC with a bachelor's degree in Aerospace Engineering and work for SpaceX as an In-Space Propulsion Development Engineer. Just like Ellis, Noone also received a great amount of exposure to 3-D-printing when he worked on the Dragon 2 capsule that NASA would use to carry crew to the International Space Station. A core part of the capsule consisted of its 3-D-printed SuperDraco engine, designed to help jet astronauts away from the Falcon 9 rocket in case of an emergency. This work experience gave Noone his first exposure to an engineered, fully-functional 3-D-printed product.

The Solution: 3-D Printing Rockets

Both fascinated with the concept of 3-D printing, the two would regularly talk about their experiences over the phone outside of work. Eventually, Ellis told Noone that he wanted to start his own company to start 3-D printing rockets, with the first objective being to create the world's largest 3-D printer. The two decided to quit their jobs from their respective companies in December of 2015 to focus on the goal of building their own 3-D printer and revolutionizing 3-D-printing.

Together, the two founded Relativity Space in 2015, with Tim Ellis as the CEO, and Jordan Noone as the CTO. Under Tim's leadership, Relativity Space created the largest robotic metal 3-D printer in the world. However, revolutionizing how rockets are built and flown is not the only thing on their mission list.[1] Their long-term goal is to upgrade humanity's industrial base on Earth and on Mars by using metal 3-D printing technology, artificial intelligence, and autonomous robotics.[2]

Vision, Mission, and Values

The vision of "building humanity's multiplanetary future" is what attracts people to Relativity Space; the leadership is what keeps them there. The roadmap to this vision is marked by multiple milestones and goals. The accomplishments of these goals are delineated by various missions on a team basis. Employees of Relativity Space noted founder and CEO Tim Ellis is particularly skilled at balancing vision and mission, and engaging different stakeholders.

> "[Tim is good at] managing the balance between having a very bold vision that needs to be communicated to investors [and] being able to convey why it's exciting with them versus managing inside where there's very technical people who want the vision, but they also need to know, 'But how does my job tie into that?' So he does a very good job of bridging that divide."[3]

To understand Relativity Space's mission, one must first understand their core competency. Brandon Pearce, Vice President of Avionics and Integrated Software, emphasized their focus is on 3-D printing: "That's our bread and butter. So, if we don't focus on that, we will not be successful." He gives the example that to develop better performing rockets, one approach could be to understand the mold and use of carbon composites, as they are lighter and stronger. But in terms of core competency, this approach would be a waste of effort and resources as "that's not our long-term solution. Instead we're staying focused on 3D printing, getting good at that and seeing how to apply it across the organization so that we can stay focused." Being deliberate about the

mission and exactly what they are trying to accomplish helps keep company goals clear and team efforts directed.

At Relativity Space, "spreading the seeds of humanity in space," as Lead Technical Recruiter Natalie Estrella put it, is not the only goal. As the company has grown, going from just 2 to over 230 people, it has strived to build a team and culture that embodies four core values: audacity, humanity, relentlessness, and wonder.

These four values were all deliberately picked to reflect the company and its North Star vision. Originally, the startup had upwards of 10 core tenets. Over time, these were re-thought and re-done in order to simplify the company's overarching vision and reflect their true values and mission. Pearce gave his perspective on company direction in regards to those core values:

> "Those are our key values in that if you can say that you're meeting those values, then that means that we're going in the right direction. We can fine tune things along the way, but at least, you know you're going in the right direction."

In keeping with the values, Relativity Space employees are audacious enough to break the norms of space technology, humane in how they build one another up and aim to impact society, relentless in their pursuit of getting a rocket to launch, and curious about space or additive manufacturing.

A "Culture of Recruiting" Built Around Relativity's Core Values

The leadership at Relativity Space is very deliberate about their technology development, but also deliberate about engineering their culture. Pearce argued:

> "We don't want culture to happen to us. If culture happens to you, then you get moldy dishes. If you have deliberate culture, you have yogurt or beer. We want to be very deliberate about our culture and make sure that we're very clear about what we're trying to do. We're sharing that vision with the rest of the company and getting feedback from them."

Estrella noted that every team, subteam, and even individuals had their own culture, but the unifying, founding traits and aspirations of these cultures were the same four values. As a result, Estrella's "culture of recruiting" simply came to reflect these four core values of the company. According to Estrella, "every new person is going to bring something new to the culture," so Relativity Space is "committed to finding people who exhibit those core values."

Recruiting for Values and with Values. All employees undergo recruiter training. In addition, one of the four questions asked during formal check-ins, which occur every two months, is: "How are you promoting a culture of recruiting at Relativity Space?" In the words of Estrella, "everyone is basically a recruiter" and is encouraged to attend career fairs, post about opportunities on LinkedIn, or otherwise reach out to potential candidates. This company-wide dedication to recruiting demonstrates the importance of the core values, on which Relativity Space does not compromise. By involving all employees, the system of recruiting also makes everyone more passionate about helping to foster those values. After all, since "everyone is basically a recruiter," all employees have the responsibility of relentlessly building a positive culture. Correspondingly, audacity, humanity, relentlessness, and wonder not only comprise the core tenants of the company, but also the overall recruiting process.

Audacity and wonder. Although on-sites are now over Zoom due to the COVID-19 pandemic, part of the purpose of the on-site was to build excitement and wonder, another one of the Relativity Space's core tenants. Under normal circumstances, candidates are given a tour of the

facilities and machines, including the headline-making Stargate, the largest metal printer in the world, which can print an impressive 97% of a rocket. Hearing or researching about Stargate, or any groundbreaking machine, can never compare to seeing it in person, and (if a candidate is lucky) even seeing it in action. The machine is now engrained in space history and to be within a relatively small group given the opportunity to see it is inspiring. Estrella stressed that the "cost of a bad hire is high...you're typically causing a lot of damage to the team… those are all damages you need to fix really quickly." After all, as Estrella emphasized, the people are the product, and those people cannot compromise Relativity's positive, growth-minded culture.

Humanity. Humanity is especially apparent. Despite the challenges of catering to a "homogenous" industry, as Estrella puts it, Relativity Space showcases its humanity through its commitment to diversity and inclusion. It targets underrepresented minorities by recruiting at historically black universities and hosting panels with groups within the National Society of Black Engineers and Society of Women Engineers. Moreover, recruiter training has modules on diversity and inclusion, which reminds all employees that "people are typically a bit more comfortable with others who are very much like them" and that each candidate's experience is unique because all candidates themselves are unique. Estrella noted that "even from the very beginning of this company, people have craved diversity" to deliver great results. "It's not just for show," emphasizes Estrella.

After applying, candidates who make it to the next round have a phone interview with their recruiter. This recruiter takes and supports them through the entirety of the interview process, which not only avoids a clunky experience but also fosters trust and a strong bond between the recruiter and the candidate.

Relentlessness. If candidates pass the first interview, they are invited to two technical, one-on-one phone screenings. Should candidates make it past these two interviews, they are invited to a 30-minute panel interview with potential future colleagues. All the while, the recruiter assigned to a particular candidate checks in with the candidate periodically, relentlessly ensuring that the overall experience is positive and building up the candidate's enthusiasm. For example, right before the panel presentation, the recruiter calls the candidate, expressing their own excitement and providing guidance and information about the presentation. They give details on what the presentation should look like, who will participate in the panel, and other helpful advice.

Even if the candidate does not pass a particular round, the recruiter usually emails the candidate with detailed feedback on what and how they were assessed, which motivates them to work on their weaknesses and try again later, thus embodying relentlessness. Conversely, all candidates who make it through the entire process receive both a pre-offer and offer call. Throughout the process, the candidate can see that their recruiter is personally invested in their success and passionate about Relativity Space, which makes them all the more so.

Cultural Infrastructure: Interviewing, Onboarding, and Decision-Making Processes with Values

These values continue growing from a new hire's very first day. The expectation for a new hire is "someone who can take projects from start to end." They are to be relentless and autonomous in their projects, curious and driven in their pursuits to learn and grow, humane in how they interact with their peers and goals, and audacious enough to challenge the status quo.

Recruiting, team structure, and integration processes all seek to incorporate these values while interviewing onboarding new members and placing them into teams.

Interviewing with Humanity. Estrella spoke about the structure of the interview process that helps Relativity Space find great people.

> "From the very beginning, we had a very structured way of interviewing people by really planning out what questions are we going to ask them, what kind of topics do we need to cover, what core competencies does each interviewer needs to cover? It's very structured [...] what really sets us apart is that we do have a big focus on structured interviewing as well as the overall candidate experience."

These interviewing practices were borne out of CEO Ellis's and CTO Noone's time at Y Combinator, when they had just formed the startup and secured $620,000 seed funding from Mark Cuban and Y Combinator. It is there that they learned how to interview well and "suss out great talent" according to Estrella. The structured interview helps to get a comprehensive understanding of an employee's strengths and weaknesses, mindset, and helps to better understand how good of a fit they would be at Relativity Space.

Through structured interviews, which "[benchmark] everyone in the same way...by using the same questions," recruiters such as Estrella avoid bias and make it easy to assess an individual's strengths or weaknesses in comparison to other candidates. For example, one thing Estrella fought to change was a question for all panelists: "How jazzed are you about this candidate?" She realized that the wording of the question and the way it had panelists give their ratings as a numeric score prioritized "gut feel versus actual technical capability [which] opens yourself up to a lot more bias... we got rid of that."

Onboarding to Understand Values. As part of their onboarding, new employees can spend a few weeks shadowing other colleagues, from onsites to calls to meetings. During this time, they also meet with a manager/mentor once every week to discuss three essential questions: "What do you want to achieve? What are your long-term goals? What are some quick wins in the first 30 days and then 60, 90 days?" It is a longer onboarding process than at other space firms, but Relativity Space views it as a critical investment of time so the new employee understands the guiding values, mission, and culture.

Decisionmaking with Relentless Efficiency. Efficiency is one of the primary goals of the leadership as Relativity Space sits at the crossroads of space and innovation. Pearce mentioned "We don't have to show a 100% thrust right now. We can show 80% thrust, but that will show that most of the systems are working well together." It is important for the leadership to show real progress externally while also internally bringing together different sub-team missions into one overall mission. By doing this, Pearce explains, "we actually hit our milestones early and thereby 1) inspire the rest of the company to show, 'Yeah, we can do these things and we could do them faster than we thought.' but also showing the rest of the world that we're making real progress."

Interpersonal communication also remains an important aspect of efficiency. Pearce pointed out the key difference between how other companies look for efficiency and how Relativity Space finds efficiency:

> "When you have a lot of different companies working on different deliverables, each of them is looking for a local optimization. When you're all on the same team and trying to develop together, you look for more of a global optimization."

Relativity's leadership seeks to bring about this "global optimization" of the company as a whole by unifying its teams around a common North Star vision and progressing towards it as a team in lockstep through their business practices, including vertical integration, their team structure, and their values and culture.

Values in the Workplace: Clear Communication, Teamwork, and Trust

On their website, Relativity Space advertises “Raw Material to Flight in 60 Days.” Given this almost impossible-sounding advertisement, it is the collaborative, accountable team dynamic that keeps this young startup moving forward.

Clear Communication. Pearce emphasized the idea that team members should not be tackling the challenges alone; they need to work well together, be approachable, as well as be respectful to each other: “If you communicate clearly, you are able to help when your teammates need it.” With this emphasis on teamwork, and the enormous technical challenge of the goals of Relativity Space, inter-team communication becomes mission-critical to finishing projects.

A team metric of success is the ability to inform ahead of time if a deadline could not be met. “I’m not saying the day before the deadline,” Pearce specified, “and a team is saying that their project is going to take another month. If it’s a month before the deadline and they're saying that it will take an extra month, then that’s different.” If a deadline needs to be pushed back, it is the responsibility of the team members to let their managers know as soon as they know.

The humanity aspect is especially important when it comes to working with others, because to work together team members must be respectful of one another, even when they don’t want to. “I'll work with people when I have to, but know that I don't play well with others. So give me something I can work on independently;” Pearce highlighted this not as an instance of a bad employee, but as an instance of clear communication and respect. And while it may be insulting for a VP to hear that someone will not work with you, and may even merit a restructuring of teams in other companies, Relativity Space’s emphasis on humanity allows for people to have different working styles and for teams adaptable and effective using their own modus operandi. As long as perspectives can be communicated clearly and respectfully, adjustments for productivity can always be made. “We are all in this together” says Pearce.

Managing Audacious Innovation (and Problems) with Teamwork and Trust. Teamwork is what holds the process together. Pearce trusts his employees to do their job, just as well as he trusts them when they say they’re encountering problems and need time. The management perspective in the presence of problems as Pearce states is, “if they tell me they’re having problems and seeing those risks, then those become my problems and my risks, and I will help them solve them.” The managers cannot be afraid to get their hands dirty and practice their humanity by helping whenever possible. In turn, the employees cannot be afraid to be accountable and forthright. This teamwork process is ongoing and relies upon dynamic trust between managers and employees.

A similar process is in place to deal with engineering risks in innovation. With Relativity Space being an absolutely disruptive startup 3D printing rockets, part of their dedication to audacity involves trying new things and taking novel approaches to solving problems. So it comes as no surprise that Research & Development (R&D) is one of the main activities at Relativity Space. Yet, innovative thinking and new approaches come with the caveat that they may work or fail spectacularly. Project managers are always kept in the loop whenever new methods are being tested. When asked about dealing with uncertainty in this space, Pearce reiterated the same management perspective:

> “If someone tells me beforehand that something may not work, but that there's high benefits for trying it, then I’ll tell them, great! I understand the risk. You try what you want to try. If it works, we'll take the advantage. If it doesn't work, we'll try something else."

The similarity of their risk management approach to that of their problem-solving approach underscores the teamwork and trust that unites management with their individual teams. From the success rate of R&D, to timeline of individual tasks, to encountered problems and risks, as well as how to deal with them, the teams all work within the larger context of the company's goals and mission.

Balancing Speed with Humanity

The senior leadership has declared that the humanity of teams must be considered when goals are being formed. One of the responsibilities of senior leadership, as Pearce puts it, is to ask the question, "How is this milestone impacting the teams? How are we addressing their humanity and taking that into account when we're saying that they should push hard to achieve this? And if we're not saying that, we should pause for a moment and make sure we are." No one disputes the pioneer that Relativity Space is in the aerospace industry with their novel 3-D rocket printing technique. However, working at the boundaries of the known and the unknown often takes a toll on their workers and teams, as they are always at Square 1 in any new task. When critical milestones have to be met, there can be additional pressure for performance.

In anticipation of such pressure, one of the leadership's top priorities is to prevent burn out and make sure their people know, "This is a marathon, not a sprint." As a startup, it is the obvious goal of the company and leadership to make sure tasks are progressing and work is being done quickly and effectively, but not at the expense of humanity and sustainability of their work. Pearce put it as simply as, "if you're sprinting right now, that's not going to be sustainable, you're going to burn out and then you're going to leave and then we'll be worse off." To ensure this possibility does not become reality, the company has put into practice a number of strategies including regular low-anxiety feedback systems, weekly check-ins, and interpersonal relationships. In addition, other channels of communication make transparent the progress of teams and looming challenges in the context of their larger mission.

Feedback Systems. At the individual level, employees have access to a reliable feedback system for personal progress: check-ins with their managers and assigned Vice Presidents to evaluate their progress. Vice President Pearce told us, "With new employees, I have a weekly check-in. And then people who are in my org, but not reporting to me, I do a monthly check-in." For regular employees, Vice Presidents give feedback and evaluations as frequently as once every two months, and weekly for fresh hires and interns.

Good feedback is transparent and direct. If employees are doing a great job, they will know from their managers and vice versa. Feedback is also casual and warm, in the sense it is constructive and empathetic, with the goal always about facilitating improvement above all else.

Those who are not meeting expectations or underperforming are not put on a performance plan or fired right away. Managers will be upfront and outline everything that could be improved as well as how it may be improved – all the while listening and being empathetic to employee concerns as fellow colleagues. They assure disciplinary action will not be taken right away, but that it may be later down the road if expectations continue to not be met. And conversely, for those exceeding expectations, managers and other coworkers will recognize their contributions and offer praise during such meetings. In fact, for those employees exceeding expectations, managers may even tell them to level off the work in favor of a good work-life balance.

Employee progress will continue to be monitored, and if they consistently do the best work, employees receive considerable leverage in terms of the direction of their work and are put on track to receive the commensurate promotions. Regular feedback "gives me very good understanding of where they're at, what they're struggling with, what they're succeeding at, so that I'm not guessing" explains Pearce.

Motivating Teams with "Why"

CEO Tim Ellis and others from the senior leadership make sure that there are regular "all-hands" meetings in which the challenging yet rewarding mission is well understood. "People need to understand why we are doing what we are, in the way we are doing it," Pearce noted, "because if people don't understand that, then by its very nature, one, they'll be working on the wrong thing, but they're also being less incentivized to keep working hard because they don't actually know why it matters." As humans we seek to make sense of the world. Making concrete the motivations behind goals and tasks is immensely important for people to unite behind a common goal, to be productive at the tasks, and in the most human way, to make sense of why they do the hard work they are doing.

The kind of work Relativity Space is doing only helps and encourages such motivations. Employees of Relativity Space love what they do. Estrella describes her team's motivation for working at Relativity Space as "we are trying to expand the capabilities of humanity, both on earth and in space [...] just spreading the seeds of humanity across space, which I think is insanely cool." Pearce also honed in on this motivation, saying "what we're doing is really cool and we're doing something that's very hard and then trying to do it in a particularly difficult way. So we're building rockets, but we're really 3-D printing them. Who the [expletive] does that. So, this is a truly amazing opportunity to do some very cool stuff." While other space companies consistently believe in the mission of making it to Mars, their vision seems to end there. Ellis, however, decides to take it a few steps further by asking what is to be done once humans actually get to Mars. Relativity Space is aiming to not just make it about getting all the way to Mars, but doing something meaningful once they get there. The sheer size of that goal and its impact fuels considerable team motivation and cohesiveness.

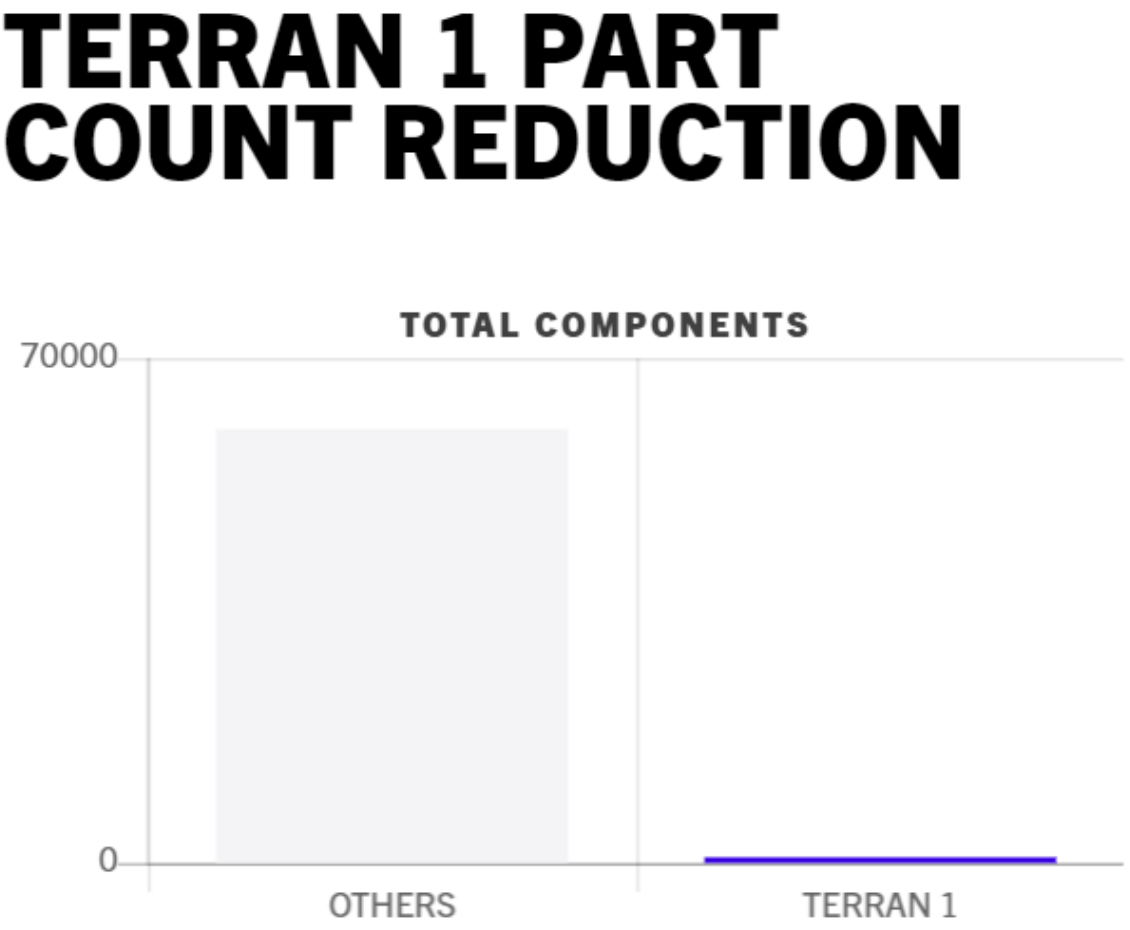
Building a Community for Humanity and With Humanity

Ellis also seeks to unite the wider public and the investing public behind a clear vision so that people who may not have the technical background to understand the business could join in the community. Ellis sought to demystify the vision and simply explain: "This is what we're doing. This is how it's different from what other companies are doing. And this is why that difference is important."

One notable characteristic of Relativity Space is that it makes a point to collaborate with other companies in the industry. "Not every company sees it that way," Pearce points out. "There are people out there that want to win [...] From their standpoint it's all about dominating an industry." However, Relativity Space is more than willing to go out and partner with other space technology firms to serve their North Star vision. Pearce emphasized, "It's not just about getting to Mars, it is actually being able to do something meaningful once we get there [...] We don't have to do it ourselves. We have to do it as part of a larger community. It's about furthering the industry, and furthering the experience."

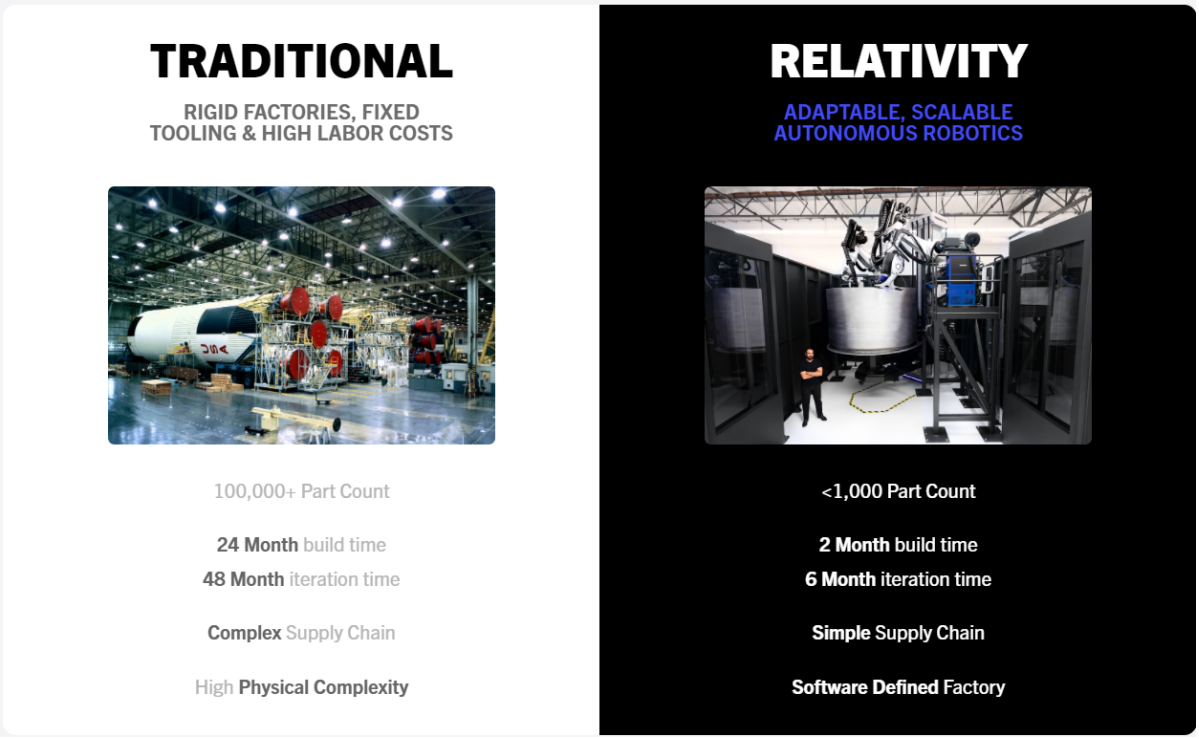
Relativity Space's North Star vision guides it in solving problems and innovating trusted teams in accordance with their core tenets. By creating novel approaches and partnering with space industry organizations, Relativity Space seek out new solutions for and with humanity.

Exhibit 1 Comparing Terran 1 with Other Rockets



"Terran" *Relativity Space*, https://www.relativityspace.com/terran. Accessed 14 Nov. 2020. https://www.relativityspace.com/terran

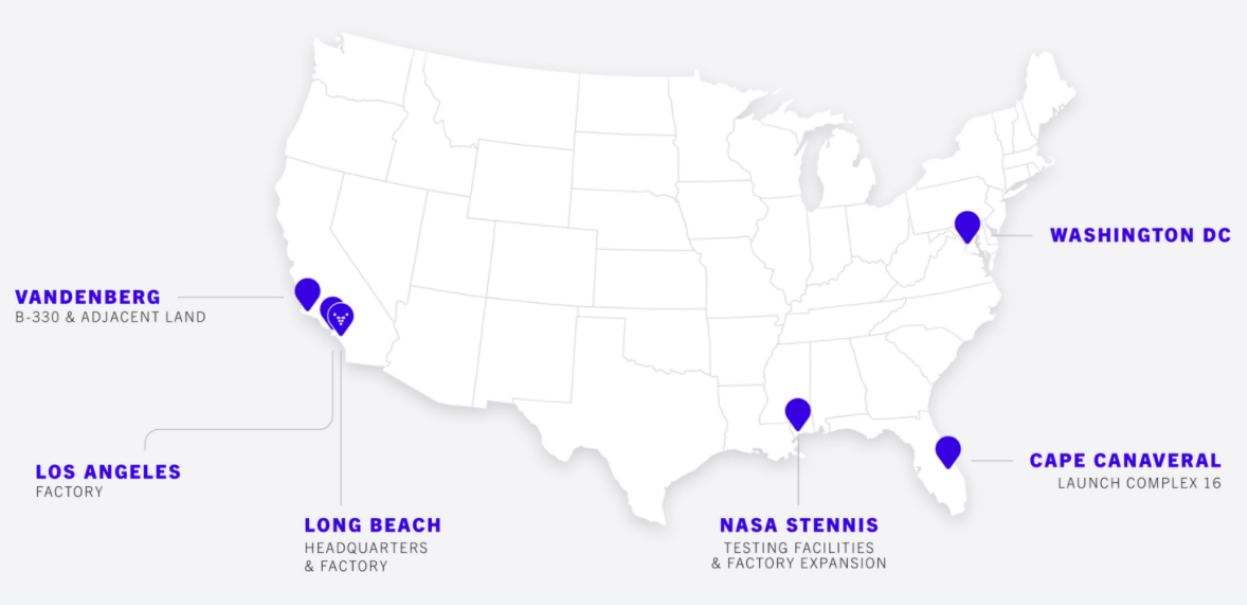
Exhibit 2 Comparing Relativity Space with Traditional Rocket Building Companies



"Stargate" *Relativity Space*, https://www.relativityspace.com/stargate. Accessed 14 Nov. 2020.

https://www.relativityspace.com/stargate

Exhibit 3 Relativity Space Facilities Across the United States



"Infrastructure." *Relativity Space*, https://www.relativityspace.com/infrastructure. Accessed 14 Nov. 2020.

https://www.relativityspace.com/infrastructure

Endnotes

[1] Guttierez, Ignacio. "'We're Going to 3-D Print the First Rocket Made on Mars.'" *USC Viterbi | School of Engineering* (blog), August 23, 2019. https://viterbischool.usc.edu/news/2019/08/were-going-to-3-d-print-the-first-rocket-made-on-mars/.

[2] Masunaga, Samantha. "Entrepreneur Seeks to Boldly Go Where No One Has Gone before: 3-D Printing Nearly an Entire Rocket." Los Angeles Times, April 27, 2018. https://www.latimes.com/business/la-fi-rocket-tim-ellis-relativity-20180427-story.html.

[3] Research interviews with Relativity Space Lead Technical Recruiter Natalie Estrella and Vice President of Avionics and Integrated Software Brandon Pearce, Fall 2020