

# UNCLOUD THE FUTURE: A VISIONARY SERIES SPONSORED BY



**COLE NIELSEN**

**FOUNDER**

**ORBITAL  
COMPOSITES**

Cole founded Orbital Composites in 2014 to advance ISAM technologies. A graduate of Embry-Riddle Aeronautical University, he earned degrees in Engineering Physics and Computational Mathematics in 2011. With six patents related to ISAM, his innovations drive Orbital's focus on cutting-edge additive manufacturing for challenging applications, including continuous fibers, carbon-carbon, wire harnesses, high-gain antennas, rocket nozzles, and advanced shielding for radiation and re-entry. Orbital Composites is pioneering solutions for the most demanding aerospace and industrial needs.

## **FUTURE FORGED IN SPACE: COLE NIELSEN'S VISION FOR REDEFINING TOMORROW'S TECHNOLOGY**

In the ever-expanding realm of space innovation, Cole Nielsen, Co-Founder and CTO of Orbital Composites, stands at the frontier of transforming the fabric of how we think about manufacturing, sustainability, and technological advancement. This chapter delves into Cole's far-reaching vision for the future of space-based technologies and how his leadership is revolutionizing 3D printing, additive manufacturing, and sustainability in Earth-based industries and the burgeoning in-space economy. Supported by partnerships with organizations like Axiom Space and the U.S. Space Force, Cole Nielsen's work is not just an evolution of technology—it is the blueprint for a new industrial age beyond Earth's atmosphere.



## **VISIONARY BEGINNINGS**

From the start of the interview, it became clear that Cole Nielsen doesn't think small. When asked about the direction his company is taking, he immediately launched into a discussion that pushed beyond conventional limits. "How far out do we really want to get?" he asked, suggesting that the very concept of innovation must stretch beyond the short-term, quick-hit mentality often prevalent in tech. Nielsen views his work not in terms of a decade but in terms of centuries, with ideas such as turning the moon into a giant computer or mining asteroids for raw materials becoming real possibilities.

This mindset is emblematic of the type of leadership and visionary thought that defines Orbital Composites. The company, which specializes in using additive manufacturing techniques to create structures for aerospace and defense, pushes the limits of what can be achieved with modern technology. Their goal is not just to build drones but factories that will produce them sustainably and scalable.

## **THE FACTORY OF THE FUTURE**

A critical theme throughout the interview was the idea that traditional manufacturing models must evolve. Orbital Composites isn't content with merely developing new products; they are focused on creating the means of production that will allow for scalable and efficient manufacturing in space. Nielsen said, "The flying car doesn't exist, not because we don't have prototypes, but because the flying car factory has never been built."

In this same way, he views the future of space-based manufacturing. Orbital Composites is already working on small, portable factories that can be launched into space to build drones and other materials directly in orbit. These self-sufficient systems, powered by innovations in 3D printing technology, promise to change how we think about production by minimizing the need for Earth-based resources and labor.

## **SUSTAINABILITY AND SPACE: A CLOSED LOOP ECOSYSTEM**

One of the most compelling aspects of Nielsen's vision is his focus on sustainability, not just as a buzzword but as a practical necessity for the future of space exploration. According to Nielsen, space exploration requires us to rethink the entire lifecycle of materials. "If I print something with 100 pounds of material, I should be able to reprint with 98 pounds when I'm done," he explained.

This idea of continuous reuse and recycling is key to making space exploration economically viable. It represents a broader philosophy that could reshape how we think about resource use on Earth. Nielsen envisions a future where once-used materials are repurposed endlessly, cutting down on waste and opening up new possibilities for sustainability.

Moreover, this vision ties into the concept of "space stewardship"—or, as Nielsen playfully calls it, "space piracy." By reclaiming and repurposing defunct satellites and other space debris, Orbital Composites is exploring ways to clean up space while simultaneously building new infrastructure from recycled materials



## **PARTNERSHIPS THAT PROPEL INNOVATION**

Orbital Composites has made significant strides by partnering with key players in the aerospace and defense industries, including NASA and the U.S. Space Force. These partnerships allow the company to pursue bold innovations, from satellite repair robots to 3D-printed antennas.

One such project involves working with Axiom Space to develop private space stations. Nielsen explained that the company's expertise in 3D printing and additive manufacturing has the potential to drastically reduce the cost and time needed to build critical components in space. These collaborations fuel Orbital Composites' growth and position the company as a leader in shaping the future of space infrastructure.

## **SPACE-BASED SOLAR POWER AND THE ENERGY REVOLUTION**

Another of the groundbreaking innovations Nielsen discussed during the interview was the potential for space-based solar power. Still, in its infancy, this technology could one day provide limitless clean energy to Earth, drastically reducing our reliance on fossil fuels. Orbital Composites is already working on technologies to support this future, such as developing advanced solar power collectors and transmission systems.

Nielsen's vision extends beyond Earth, seeing space as the ultimate frontier for resource acquisition. He envisions a future where humanity mines asteroids for raw materials like carbon and aluminum—materials that could be used to print new tools, machinery, and even entire structures in space. In this way, Orbital Composites' work is advancing space exploration and pioneering new energy production methods that could help solve some of humanity's biggest challenges.

## **THE QUANTUM LEAP: COMPUTING IN SPACE**

A particularly thought-provoking section of the interview revolved around the future of computing. Nielsen discussed the potential for quantum computing systems housed on the moon, where they could operate with minimal energy requirements and no need for cooling, thanks to the vacuum of space. "Turn the moon into a giant computer," Nielsen suggested, explaining that the unique properties of space make it an ideal location for large-scale computing infrastructure.

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This vision of a moon-based data center underscores Nielsen's broader belief that space is not just a place for exploration but a new frontier for industry, technology, and infrastructure development. He predicts that space-based computing could become vital to managing data, running AI systems, and powering the global economy within the next few decades

## CHALLENGES AND THE ROAD AHEAD

Despite the incredible promise of these technologies, Nielsen is clear-eyed about the challenges that remain. The path forward is complex, from the technical difficulties of 3D printing in space to the logistical hurdles of launching factories into orbit. However, it's precisely this kind of complexity that drives innovators like Nielsen and companies like Orbital Composites to push the boundaries of what's possible.

Reflecting on his journey, Nielsen thinks that he has positioned Orbital Composites as a leader in space-based manufacturing. Nielsen's focus is not merely on making the next big technological leap but on fundamentally transforming how we approach industrialization in space—something that will have profound implications for both space exploration and terrestrial industries in the future.

## DISRUPTING TRADITIONAL MANUFACTURING: THE FACTORY OF THE FUTURE

One of the most revolutionary aspects of Orbital Composites' work is its emphasis on additive manufacturing, specifically 3D printing, for space applications. Nielsen sees this as a way to reduce costs and complexity in space missions and as a transformative shift redefining what factories can be. "It's harder to build the factory than it is to build the products the factory produces," Nielsen explains, emphasizing that the goal isn't just to design machines but to create new ways of constructing complex technologies.

For example, while many companies focus on building drones, Orbital Composites has honed in on creating drone factories—self-sufficient, automated manufacturing systems that can operate in space. By mastering materials such as carbon fiber, copper, and plastics, Nielsen and his team are paving the way for these technologies.



to function in extreme environments, like space, where traditional factories would be impossible.

Orbital Composites is also looking at how to extend this factory-first mindset to other sectors, including the U.S. Space Force, where the company is working on drone systems funded by the military. These drones could serve defense and commercial sectors, with advanced capabilities to manufacture components for satellites, spacecraft, or future lunar bases.

## SPACE-BASED SUSTAINABILITY: A NEW INDUSTRIAL MODEL

A defining theme in Cole Nielsen's vision is sustainability—not just on Earth, but in space. "If we could design a circular economic system in space, we would fundamentally change how we think about resources," Nielsen asserts. Orbital Composites is actively working toward this by developing technology that recycles materials in space, reusing them to create new structures or repair satellites, thereby reducing the need to launch new resources from Earth.





This innovation would allow smartphones to connect directly to satellites, bypassing traditional cellular networks and providing connectivity in even the world's most remote areas. For Nielsen, the implications of this technology are vast, not just for consumers but for businesses and governments that rely on robust communication infrastructures.

Nielsen also passionately discusses the future of robotics and artificial intelligence in space. He believes that combining AI-driven manufacturing and autonomous robotics will create fully automated factories in space.

These factories will be capable of building everything from satellites to space stations, significantly reducing the costs and risks associated with space exploration.

## **ENGAGING HIS TEAM: THINKING BEYOND TRADITIONAL ENGINEERING PRACTICES**

At Orbital Composites, Cole Nielsen fosters an environment where thinking outside the box is not just encouraged—it's essential.

This closed-loop system would mimic the cycles of nature, where nothing is wasted and everything is reused. For example, Nielsen describes how continuous fiber technology allows his team to create materials that can be re-spooled and reused, significantly reducing waste. This is critical not only for long-term space missions, such as those aiming for Mars, but also for maintaining and repairing space infrastructure like satellites and space stations.

Additionally, by utilizing dead satellites and other space debris as raw materials, Orbital Composites sets the stage for what Nielsen calls “space stewardship.” He jokes about space piracy—reclaiming these defunct satellites and turning them into new resources— but the underlying message is clear: the future of space manufacturing will depend on how well we manage and repurpose existing resources

## **COLLABORATION WITH GLOBAL SPACE AGENCIES AND INDUSTRIES**

One of the most remarkable aspects of Cole Nielsen's leadership is his ability to foster collaborations across industries and continents. For instance, his work with Axiom Space is focused on developing private space stations, a critical step in creating a sustainable in-space economy. These space stations are not merely scientific outposts but are envisioned as commercial hubs for manufacturing, research, and energy production.

Nielsen's collaborations with the U.S. Space Force further underscore his company's strategic importance in defense. By leveraging advanced manufacturing techniques for drone production and satellite components, Orbital Composites is helping to secure a foothold in the rapidly growing space defense industry.

Yet, despite these high-profile partnerships, Nielsen remains grounded in his mission to push boundaries. His focus on open-source collaboration within the space and materials science communities highlights his commitment to sharing knowledge and ensuring that Orbital Composites' innovations benefit the broader technological ecosystem.

## **A GLIMPSE INTO THE FUTURE: KEY TRENDS IN SPACE INNOVATION**

Nielsen's response was as expansive as his work when asked about the future. He sees the next generation of space-based technologies evolving around several key trends. One of the most significant is the shift toward space-based solar power, a technology that could revolutionize energy production on Earth. By placing solar collectors in space, where they can continuously generate power without the interference of Earth's atmosphere, Nielsen envisions a future where energy can be beamed back to Earth, providing a clean, nearly limitless power source

Another key trend Nielsen is excited about is satellite-to-smartphone technology, which can potentially disrupt global communication systems

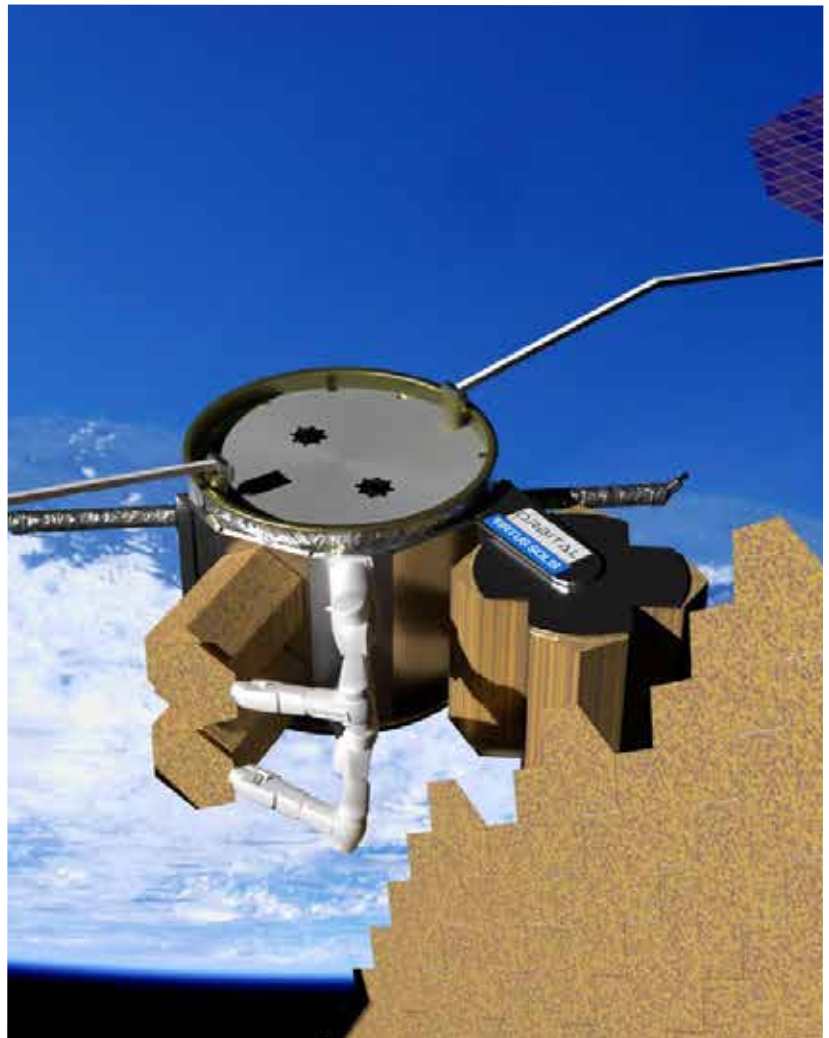
Nielsen explains that traditional engineering practices often limit creativity, and his goal is to break through these barriers. "If every company in the world had to take back whatever they make," Nielsen states, "you would have a very different scenario." This mindset is foundational to the innovative culture he cultivates within his team, where the challenge is not just to create new technologies but to rethink the entire lifecycle of a product from conception to deconstruction.

Nielsen encourages his engineers, some as young as 17, to view materials, manufacturing processes, and even failures as integral parts of discovery. His approach involves having his team build something, then take it apart and build it again—constantly refining and learning from each iteration. "Every step forward we take is built on a hundred small failures," Nielsen explains, emphasizing that embracing failure is key to finding breakthroughs. By challenging traditional methods and adopting a fresh framework for thinking, his team is unafraid to experiment and innovate, which has led to Orbital Composites' most significant advancements

The freedom to explore unconventional ideas is balanced with a deep understanding of practicality. Nielsen constantly reminds his team that while creativity is essential, the final product must still meet the rigorous functionality and profitability demands of Earth-based and space applications.

## **LESSONS FROM THE "BRAIN TRUST": BALANCING VISION WITH BUSINESS ACUMEN**

Cole Nielsen's early exposure to technology and innovation came from his formative years in the Silicon Valley ecosystem. As a teenager, he was part of a group he fondly refers to as the "Brain Trust"—a collection of young innovators who had the rare opportunity to be mentored by some of the brightest minds of the early tech revolution. In the 1990s and early 2000s, Silicon Valley was a hotbed of groundbreaking innovation, particularly in developing the internet, software platforms, and telecommunications. For Nielsen and his peers, it was a transformative experience.



"We were like sponges," Nielsen recalls in the interview, "absorbing everything from these pioneers who were literally building the internet, cloud computing, and the earliest forms of AI. They weren't just teaching us how to build things—they were teaching us how to think about the future".

These mentors weren't just seasoned professionals; they were the very people who laid the groundwork for much of today's technological infrastructure. They had a vision not just for the products they were building but for how those technologies could shape society. "I remember meeting people who had worked on the ARPANET, and they were talking about this idea of a global network of computers," Nielsen says. "At the time, it sounded like science fiction. But there they were, showing us the very blueprints of what would become the internet as we know it today".

One of the key lessons Nielsen learned from these mentors was the importance of creating groundbreaking technologies and ensuring he reaped the financial rewards of his work.

“I saw these innovators who were brilliant in their vision and their ability to bring these technologies to the world, but many of them never saw the full financial rewards of their efforts,” he explains. “That was a wake-up call for me. It wasn’t enough to just be innovative—I had to educate myself on how to turn those innovations into a profitable business so I wouldn’t fall into the same trap.” Watching these pioneers navigate the complex world of technology and business inspired Nielsen to approach his career with both visionary thinking and practical business acumen

The Brain Trust was not just a theoretical exercise in imagining the future but a hands-on education in entrepreneurship. “We were given access to cutting-edge technologies, and we were pushed to figure out how to apply them in commercially viable ways,” Nielsen recalls. “It wasn’t enough to invent something cool—we had to understand how to build a business around it.”

One of Nielsen’s favorite stories from that time involves a mentor who worked on one of the earliest forms of cloud computing. “He sat us down and said,



‘This is going to change the world—people are going to access computing power over the internet, and it’s going to make software more powerful than we ever imagined.’ At the time, it seemed impossible, but the guy was right. Watching that idea become a multi-billion-dollar industry was like a masterclass in innovation and execution.

This combination of visionary thinking and business savvy is something Nielsen carries with him to this day. His experience in the Brain Trust shaped his understanding of how to take big, bold ideas and turn them into sustainable ventures—a skill that has been crucial in the success of Orbital Composites. “You can have the most innovative technology in the world, but if you can’t run a business around it, that technology will never see the light of day,” he reflects.

Silicon Valley wasn’t just a place for innovation—it was a culture of mentorship, collaboration, and relentless pursuit of the future. Here, Nielsen learned the power of thinking big and the importance of grounding those ideas in a practical framework.

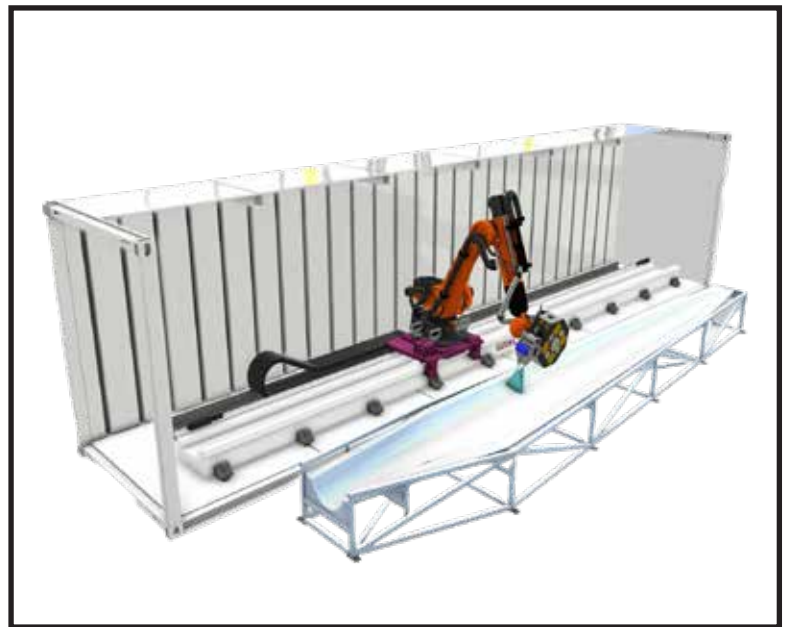
“Those early experiences were critical in helping me understand that innovation is only half the battle. The other half is figuring out how to make it work in the real world, and that’s where most visionary ideas fall short. You need both to succeed,” Nielsen says.

## **ENTREPRENEURIAL INSIGHTS: A ROADMAP FOR THE FUTURE**

Cole Nielsen’s entrepreneurial philosophy is rooted in his belief that true innovation comes from challenging existing paradigms. “If you’re not asking how to get 10 times more than you’ve ever had, you’re not really a startup,” he explains. His relentless drive for more efficiency, innovation, and impact is at the heart of his leadership style.

In Nielsen’s view, entrepreneurship is not just about creating a great product or service; it’s about creating an entirely new market or redefining an existing one. For him, the entrepreneurial journey combines risk-taking, creativity, and a willingness to embrace uncertainty. He encourages other entrepreneurs to push the boundaries of what is possible, even if it means venturing into uncharted territory. This is especially true in the space industry, where the risks are high, but the potential rewards are astronomical.

Nielsen’s advice for aspiring entrepreneurs is simple: “Start by solving a problem that no one else is willing to touch, and then figure out how to turn that solution into a sustainable business model.” He believes the future belongs to those willing to think big and take bold actions, and he encourages others to pursue their visions with tenacity and passion.



## **CHALLENGES OF A VISIONARY: OVERCOMING THE OBSTACLES OF INNOVATION**

Despite his many successes, Cole Nielsen has faced significant challenges as a visionary tech innovator. One of the most critical hurdles has been navigating the complexities of working in an industry where technology often outpaces market readiness. “We’re building things that won’t be fully appreciated for another 10 or 20 years,” he notes. This has required a delicate balance between pushing the envelope and ensuring that the company remains profitable in the present.

Another challenge has been managing the enormous capital required for space-based projects. While Orbital Composites has secured multiple contracts with organizations like NASA and the U.S. Space Force, Nielsen admits that raising funds for highly speculative ventures can be difficult. “Investors want to see results, but the kind of results we’re working towards don’t happen overnight,” he explains. His solution has focused on building strategic partnerships and diversifying revenue streams, allowing Orbital Composites to remain agile while pursuing long-term goals.

Nielsen also candidly discusses the personal challenges of being a visionary in a field as demanding as space technology. The pressure to constantly innovate, lead a growing team, and manage complex projects can be overwhelming.

However, he draws strength from his passion for space exploration and his belief that the work he and his team are doing will have a lasting impact on humanity's future.

## FIVE PREDICTIONS FOR THE NEXT 10-20 YEARS

When asked about his predictions for the future, Cole Nielsen offers a bold and thought-provoking vision for the next two decades. Here are his top five predictions:

- 1. Space-Based Manufacturing Will Become Commonplace:** Nielsen believes that in the next 10 to 20 years, space-based manufacturing will transition from a niche industry to a standard practice. Companies will no longer be constrained by the limitations of Earth-based factories, and products ranging from satellites to medical equipment will be manufactured in space.
- 2. Asteroid Mining Will Revolutionize Resource Management:** The concept of asteroid mining, which is currently in its infancy, will take off in the next two decades. Nielsen predicts that asteroid mining will provide Earth with a nearly limitless supply of valuable resources like rare metals and minerals, reducing the environmental strain of terrestrial mining and potentially crashing the market prices of these elements.
- 3. Satellite-to-Smartphone Technology Will Disrupt Telecommunications:** Nielsen foresees a significant shift in global telecommunications, with satellite-to-smartphone technology eliminating the need for traditional cellular networks. This advancement will make connectivity available to even the world's most remote regions, fundamentally changing communication.
- 4. Quantum Computing Will Integrate with Space-Based Systems:** Quantum computing, already a burgeoning field, will integrate with space-based systems to handle the enormous computational loads required for space exploration and AI-driven tasks. Nielsen predicts that within 20 years, quantum communication will reduce latency to near-zero, enabling instantaneous data transfer between Earth and space.
- 5. Space Will Become the New Frontier for Energy Production:** Space-based solar power will become a key player in global energy markets. By placing solar panels in orbit, humanity can harness the sun's energy without interfering with Earth's atmosphere, providing a clean and nearly infinite energy source. Nielsen envisions entire cities being powered by space-based energy systems within the next 20 years.



Cole Nielsen's work at Orbital Composites is a testament to the power of visionary thinking and entrepreneurial spirit. Through his leadership, Orbital Composites is shaping the future of space-based manufacturing and redefining how we think about sustainability, resource management, and innovation. His predictions for the next 10-20 years highlight the transformative potential of space technology, and his journey offers invaluable lessons for aspiring entrepreneurs and seasoned leaders alike. As Nielsen continues to push the boundaries of what is possible, his impact on the future of technology and space exploration will be felt for generations to come.