

Debt as Catalyst

Making Hard Tech
Less Hard

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ATEL
Ventures, Inc.®



HARD TECH - A DEFINITION:

Technology that requires big breakthroughs and has a high barrier of entry.

Introduction by Dean Cash, Chairman and CEO, ATEL Capital Group, Inc.



Since we began providing venture debt 25 years ago, with the creation of our subsidiary ATEL Ventures, it has been our great privilege to witness, meet and partner with countless inspirational individuals, whose talent and tenacity have led them to found and grow businesses that have gone on to great success, and in some cases to transform whole industries. We are proud to have played a small part in these successes.

As most involved in the startup world know all too well, a vision, talent and tenacity are not necessarily enough to ensure success. It comes down to capital and the execution of a sound business plan, with many potentially game-changing ventures sadly failing due to a deficiency of one or both.

Any startup carries risk, but this is especially true with capital-intensive ventures that seek to disrupt sectors such as transport and mobility, healthcare, agriculture, materials science and space tech... all those areas that require significant upfront investments in machinery, tools and equipment. These ventures often either struggle to raise the necessary capital or run out of runway before they achieve critical mass.

In many cases these are the very businesses that we most need to succeed: they have the potential to improve connectivity, health outcomes, food security, sustainability and more.

Hard tech startups push the boundaries of possibility, but the future of hard tech innovation is far from certain. We have published this paper to stimulate a discussion about how the venture funding ecosystem can collaborate to maximize these businesses' chances of success.

We believe in the power of hard tech to reshape industries, improve lives, and drive progress. At ATEL Ventures, our commitment to this belief is not just philosophical; it is practical and financial.

Venture debt is more than just a financial instrument, it is a catalyst, providing the capital that visionary founders and their groundbreaking companies need to grow.

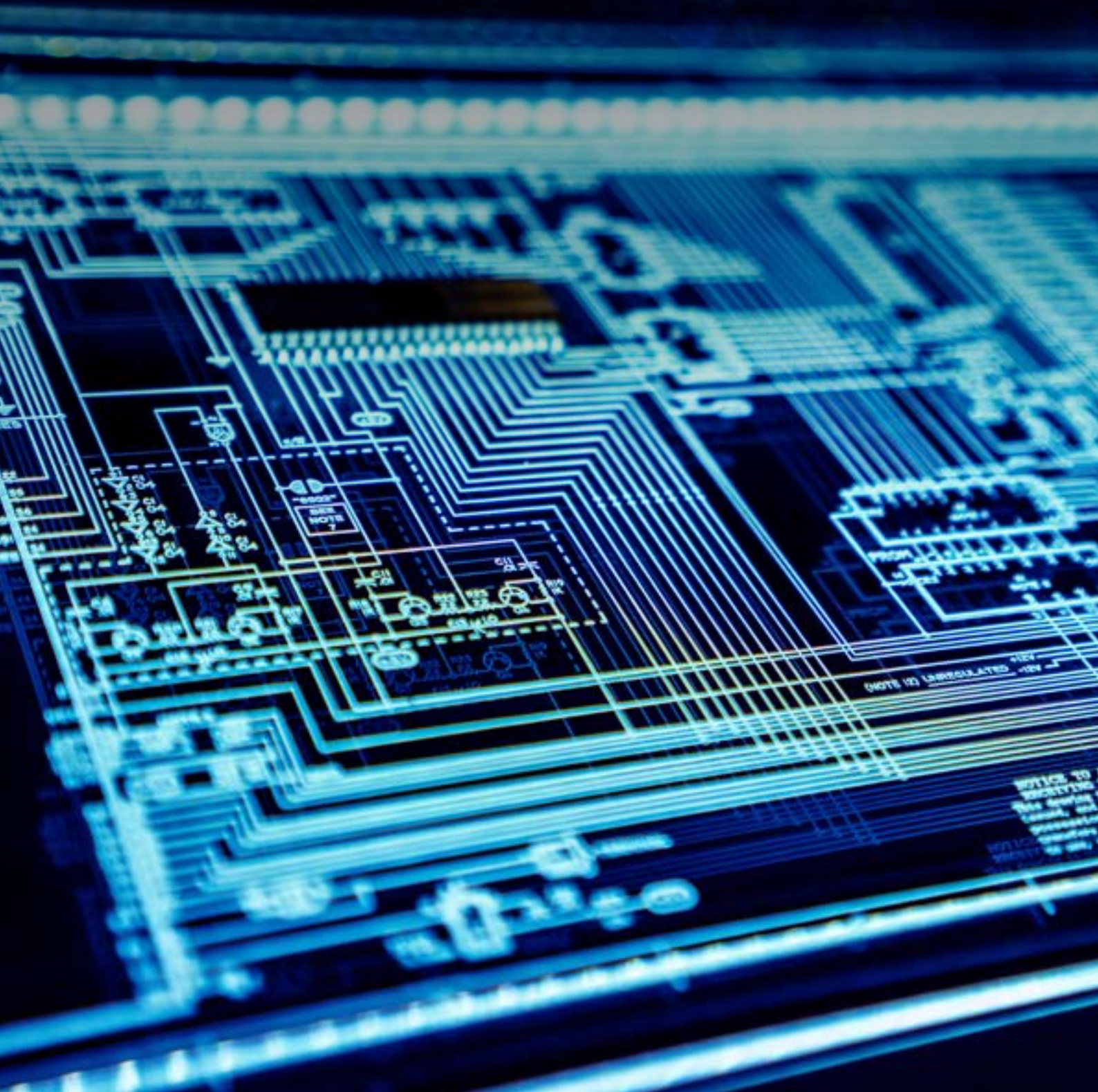
We are excited that our financing of hard tech innovations will continue to drive progress and improve lives, and welcome others who share our vision to join us.

Dean Cash

Executive summary

- The U.S. remains a global engine for innovation, with more startups than any other country. It is a challenging environment for startups, and 9 out of 10 fail.
- The environment is especially difficult for founders of hard tech ventures, who face the headwinds not only of the capital- and time-intensive nature of their work, but also investor wariness, a lack of the necessary specialist expertise, regulatory obstacles and more.
- The world needs hard tech founders as their innovations aim to solve some of the most pressing challenges facing society today, including: global connectivity, human health, industrial sustainability, transportation, food security, sustainability.
- While some founders resist the idea of taking on the obligation of debt, venture debt can be a highly effective non-dilutive catalyst at every stage of a company's growth.
- Increasing the number of successful hard tech startups through the utilization of creative venture debt financing solutions maximizes their chances of success and their potential benefits to society.

The Landscape



The Landscape

While not yet universally used, 'hard tech' is a term that is gaining currency: the startup accelerator, Y Combinator recently announced its desire to invest more in hard tech startups, specifically in areas including space, manufacturing and defense.¹ Meanwhile, industry, government and academia are coming together to form hard tech hubs like mHUB² in Chicago, a dedicated space for hard tech startups, entrepreneurs, manufacturers, investors and industry leaders, whose goal is "accelerating the commercialization of hard tech".

The term 'hard tech' has been defined in different ways over time, to the frustration of many founders and venture investors alike, however in recent years a clearer definition has emerged:

Technology that requires big breakthroughs and has a high barrier of entry.

While many hard tech startups are focused on industries or challenges that require physical engineered solutions, such as robotics, clean energy, space tech and biotechnology, they may also be engaged in developments in materials science or chemistry.

Spanning a range of sectors, these ventures are characterized by their reliance on tangible product development, significant research and development efforts, and a path to market that often involves navigating rigorous regulatory environments.



Hard Tech is... Hard

The capital-intensive nature of hard tech ventures makes them unattractive to many venture capital firms: they require an enormous amount of capital in the early stages while the necessary machinery and equipment is being acquired, adapted or built from scratch; and the time from concept to minimum viable product (let alone full commercialization) can often be years-long. This is especially true of FOAK (or 'First Of A Kind') ventures charting truly frontier territories.

Most VC firms lack the stomach for this, especially in the current climate, where expectations of getting to a cash-positive position quickly are much greater than they were in recent years.

The accepted wisdom is that the failure rate for all startups is 90%. With the high cost of hard tech, the consequences of failure are extreme and the thought of being part of this group is unpalatable to many investors and entrepreneurs alike.

According to data compiled by Pitchbook and the National Venture Capital Association (NVCA)³, there are approximately 55,000 venture-backed startups in the U.S., more than any other country in the world. How many of these could be classified as 'hard tech' startups? No reliable data is available, but it is safe to say hard tech is a small percentage of the total, probably less than 5%.

Hard tech founders are certainly a much rarer breed than software founders, and they are applying their ingenuity to many of the world's most pressing challenges.

Hard Tech Challenges



Machinery, tools and equipment

Hard tech startups are extremely capital-intensive in the early stages. For example, building satellites requires sizable premises, specialized equipment and custom-designed machine tools.



Time to market

Whether biotech, space tech or materials science, the path from concept to prototype to market-ready product can be a long one, and even then the startup may fail.



Specialist expertise

These challenges are often exacerbated by a lack of available talent. Indeed, given the cutting-edge nature of the work in which many hard tech ventures are engaged, the expertise may not yet exist at all. Founders must seek out and recruit like-minded individuals who are prepared to dedicate years of their lives to a mission that has a high likelihood of failure.



Regulatory hurdles

Many hard tech founders are engaged in developing solutions in highly regulated industries, such as biotechnology or energy. As they near market-readiness, it is not uncommon for them to butt up against the challenge of regulatory regimes that move at a much slower pace than startups.

Astranis: An eight-year countdown

Astranis is a space startup that builds small and low-cost telecommunications satellites to provide internet access in remote regions.

The company has raised more than \$500M through a combination of venture rounds and debt financing, and is valued at over \$1.5B.

It's been a long journey. The San Francisco company was founded in 2015 and launched its first satellite in 2023.

Co-founder and CEO, John Gedmark reflected on the early challenges, including securing premises, developing new technology (the company's MicroGEO satellite is a fraction the size of a traditional geosynchronous satellite), and attracting the necessary talent, not to mention navigating lengthy and complex procurement processes with the U.S. and foreign governments:

"The toughest [time] was probably the last year or so as we were really getting close to launch, but the launch got delayed. That happened several times, so this [launch] has been a long time coming."



The World Needs Hard Tech Founders Now



The World Needs Hard Tech Founders Now

More than a decade ago, Marc Andreessen of Andreessen Horowitz famously coined the phrase, “Software is eating the world”.⁴ This turned out to be prophetic, with software innovations transforming almost every area of our lives and revolutionizing many industries.

As we seek to solve the world’s most pressing challenges, even the best software can take us only so far. Many of those challenges require the application of other scientific and engineering disciplines, and the design, building and testing of physical solutions, in the lab and in the field:



Global connectivity: Data from the International Telecommunication Union ([ITU](#))⁵, suggest that around one-third of the earth’s population, or 2.6 billion people, are without internet access, and all of the benefits that accrue from that, in terms of access to education, information and more.

Many hard tech startups are working on the development and deployment of Low Earth Orbit (LEO) satellites to enhance internet access and communication capabilities worldwide. In Germany, Isar Aerospace is developing a fully reusable launch rocket for small and medium-sized satellites, to create easier access to space for global customers.



Healthcare advancements: Advances in this field are not the sole preserve of major pharmaceutical and biotechnology companies. Breakthroughs in medical devices and biotechnology that promise to revolutionize treatment protocols and patient care are also being made by venture-backed startups.

Hexagon Bio is one example. This Series B biotech startup uses data science, genomics and synthetic biology to mine small molecules and turn them into therapeutics to combat human diseases that have evaded traditional approaches.



Industrial sustainability: In the U.S. and many other parts of the world, startups are leading the way in developing new technologies aimed at improving the sustainability of large scale industrial processes, including in the energy and construction sectors.

One example is Enerkem, a Canadian startup whose technology transforms waste into transportation biofuels, renewable chemicals, and other products.



Food security and sustainability: Many startups are bringing their innovative thinking to the agricultural sector, with the introduction of technologies that enable the year-round cultivation of fresh produce in urban environments, while simultaneously reducing the environmental footprint of traditional farming methods, increasing yields and minimizing water usage.

California startup, Trace Genomics provides genetic insights into soil, helping farmers optimize their agricultural practices for better crop yield; and New York's Bowery Farming has developed a proprietary system that enables it to operate a network of indoor vertical farms, growing food closer to those who consume it.



Transportation and urban mobility: While electric vehicles (EVs) and autonomous vehicles (AVs) may attract all the attention, many startups are developing hardware solutions powered by the Internet of Things (IoT) and artificial intelligence (AI) that will enable vehicles to 'talk' to each other and the road infrastructure around them, improving capacity and safety on our roads.

Mitra Chem is one company innovating to make the mass-market electrification of transport a reality, through the commercialization of iron-based cathode materials.

It is the ingenuity of startups that is blazing the trail and the need for them has never been greater.

Debt as Catalyst



Debt as Catalyst

The need to borrow is a reality for capital-intensive hard tech ventures. Despite being less understood than equity financing, venture debt can be a powerful part of the financing mix at every stage of a startup's life:

Early Stage:

Fueling Innovation Without Dilution

In the embryonic phase startups are fueled by innovation and potential. Venture debt steps in as a non-dilutive financing option that allows founders to preserve equity while securing essential capital. This enables startups to accelerate product development, expand their team and reach critical milestones without relinquishing ownership. By leveraging venture debt alongside equity, early-stage startups maintain greater control over their destiny while laying a solid foundation for future growth.

Growth Stage:

Increasing Expansion Opportunities

As hard tech startups gain traction and scale their operations, their appetite for additional capital increases dramatically. At this stage, venture debt complements equity funding by providing non-dilutive flexible capital injections needed for growth and scale.

Expansion Stage:

Optimizing Cash Flow and Efficiency

During the expansion phase, startups face the dual challenge of scaling rapidly while managing cash flow effectively. Venture debt can be a strategic tool for optimizing financial resources and extending runway. Leveraging debt financing between equity rounds enables startups to maintain operational momentum and capitalize on growth opportunities.

Late Stage:

Diversifying Capital Structure for Long-Term Sustainability

Later stage companies can also benefit from venture debt. As startups mature into established enterprises diversifying the capital structure becomes paramount for long-term sustainability. Venture debt offers a complementary source of capital alongside equity, enhancing financial flexibility. Whether funding strategic acquisitions or pursuing international expansion venture debt empowers later stage ventures to navigate complex growth challenges while optimizing shareholder value.

Venture Debt in Action

LuxWall

LuxWall is a Michigan-based manufacturer of vacuum-insulated glass that improves the energy efficiency of buildings and homes by reducing building energy draw and lowering heating and cooling losses.

After an initial seed round in 2021, the company raised \$33M of Series A financing in 2023, attracting investments from leading funds including Breakthrough Ventures, Khosla Ventures and the Danish firm, 2150. The company also took on debt financing, specifically to fund an expansion of its manufacturing capabilities.

Twist Bioscience

At the other end of the spectrum, Twist Bioscience is a publicly traded bioscience company with a valuation of more than \$2B, but that was not always the case.

Dr. Emily Leproust was pursuing a successful career at Agilent Technologies and had several patents to her name in the field of DNA synthesis, but she had greater ambitions and in 2013 she founded Twist Bioscience.

“The science side is great because you get to study big problems and use imagination and creativity and hard work to overcome them,” Leproust says, “But going to the entrepreneurial side is the opportunity to do even more to make the world a better place.”

Leproust’s chosen field is capital- and resource-intensive, and achieving meaningful results can take time; it is the very definition of hard tech.

Over the course of several funding rounds, Twist secured investments from the likes of ARCH Venture Partners, Illumina and Biomatics Capital Partners. Leproust and her team also made astute use of debt financing, using it to invest in the company’s technology.

Twist Bioscience went public in October 2018, with a valuation of \$372.4M. Its valuation today is over \$2B.

The background of the image is a server room. It features multiple rows of server racks that recede into the distance, creating a strong sense of perspective. The lighting is a vibrant blue, with numerous bright points of light emanating from the racks, some of which have a starburst effect. The overall atmosphere is high-tech and digital. In the top right corner, there is a diagonal grey wedge shape that partially overlaps the blue background.

Borrowing Against a Better Future

Borrowing Against a Better Future

No investor or lender enters into a financial arrangement with a startup believing the venture will fail. The reality is that 90% of startups fail. Venture capitalists take huge risks because the potential rewards when they back a successful venture can be enormous.

There are other societal rewards that benefit us all when hard tech ventures are successful:

- a more globally connected world with greater access to information, education and commercial opportunities;
- a healthier society with enhanced abilities to diagnose and treat a range of conditions;
- more sustainable industries, enabling us to continue to grow our economies without unduly harming the environment;
- the ability to feed a planet of 10 billion people;
- smart transport infrastructure fit for the 21st and 22nd centuries.

Many hard tech ventures will fail but those with great promise should be given every opportunity to succeed. Innovative financing solutions are necessary to incentivize all concerned including founders, investors and venture lenders.



References

¹ [TechCrunch: "The hard tech renaissance accelerates as YC spotlights space, manufacturing and defense", Feb 16, 2024](#)

² [mHUB](#)

³ [Pitchbook-NVCA Monitor, Q1 2024](#)

⁴ [Andreesen Horowitz](#)

⁵ [International Telecommunication Union \(ITU\)](#)



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