Airborne

Newspace Market Trends and Opportunities:

A closer look at the microlauncher market for smallsats

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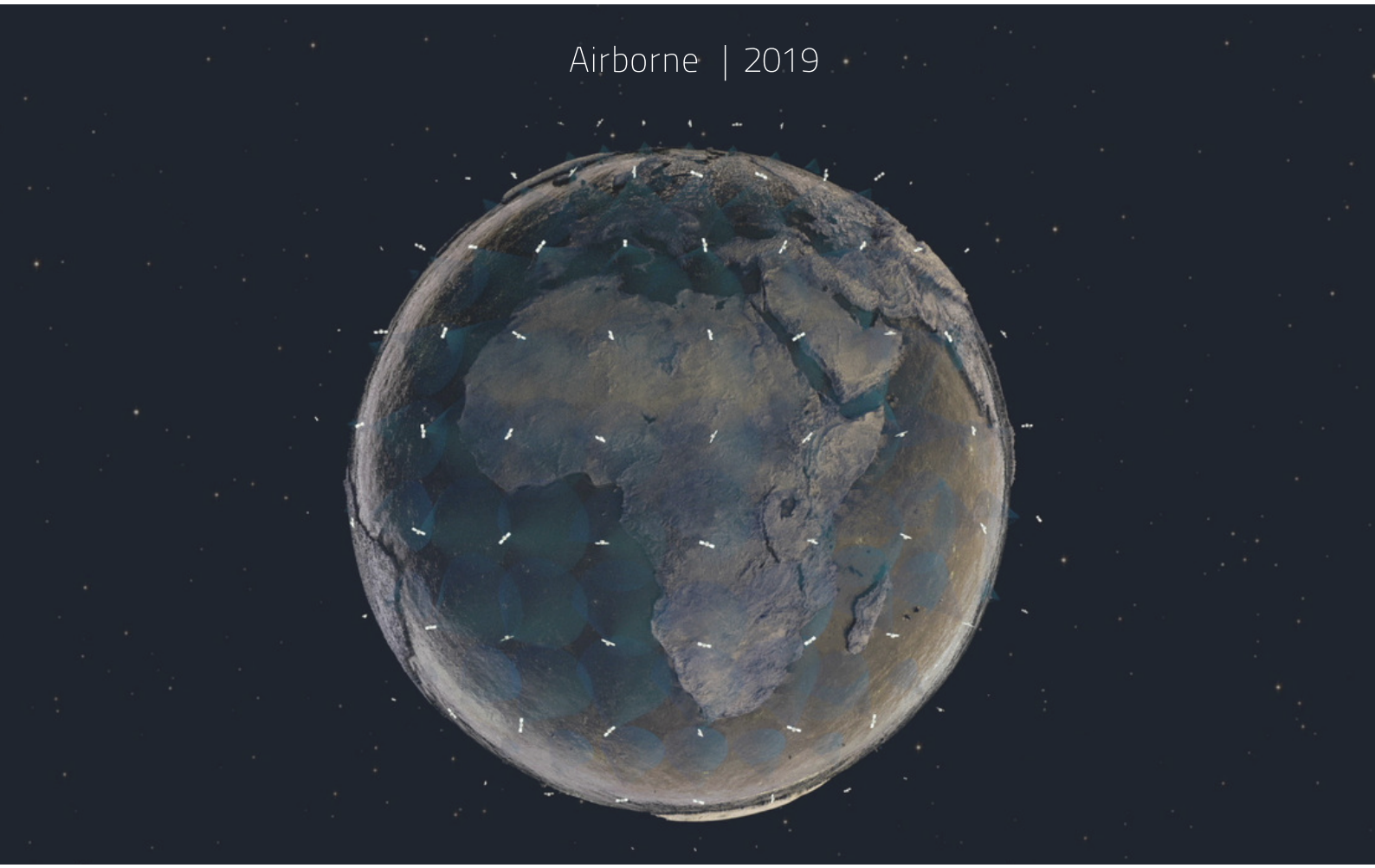

1. The commercial smallsat market

In the space market, there is an increasing demand for small satellites (under 500 kg). Market analysis forecasts that in the upcoming years several thousands of these small satellites (or smallsats) must find their way into Earth orbit.

According to the Northern Sky Research (NSR) report 'Small Satellite Markets 5th Edition' by 2027 the smallsat market will generate over $37 billion in revenues from smallsat manufacturing and launch services, with 6,500 smallsats set to launch during this time. Frost and Sullivan forecast in their Q3 2018 Quarterly Update an estimated launch demand for 11,746 small satellites by 2030.

The commercial microlauncher trend is unavoidable. Instead of seeing it as a threat, regard it as an enormous opportunity

Why smallsats are in such demand

Reasons for this small rocket demand can be found in the commercial market. Where the space industry used to be a battleground for superpowers with agencies sponsored by governments, commercial startups have joined the competition since 2000.

These commercial space (or 'newspace') companies are looking for ways to produce cheap and market-friendly products at a fast speed. For instance, multiple sectors are interested in obtaining more precise and frequent images of Earth: whether to facilitate repairing bridges or pipelines or to get accurate data for agricultural purposes. For all needed services to be accommodated, more satellites need to be in orbit, and thus more rockets need to be launched.

2. Market innovators: challenges to overcome

It seems the road to space is wide open with significant growth opportunities throughout the smallsat industry. But in order to really compete, the market must overcome its biggest bottlenecks.

Getting access to space

The current key bottleneck for any new satellite company is access to a launcher, which will carry its smallsat to space. Nowadays, companies that want to put a smallsat into orbit are offered spare space in a rocket launcher primarily reserved for bigger, costlier satellites. This means smallsats are dependent on piggyback rides from their bigger brothers – such as the Ariana, Vega, Falcon or Delta rockets.

This doesn't only come with high costs; it also means smallsat companies often need to wait for months to get a ride up. The same uncertainty goes for the drop off: smallsats get thrown out wherever the large rocket travels. This creates an extra logistical challenge for a smallsat, which has to cruise to the right orbit on its own propulsion. So for the smallsat market to really take off, it needs its own dedicated launching solutions.

The piggyback construction hinders the growth of the market segment. Thankfully, over the past five years the commercial market has seen an increase in the development of dedicated smallsat launchers (or 'microlaunchers'). One such example is Rocket Lab, who performed its first successful commercial launch, placing several small satellites into orbit and is now running a recurring launch service business for nanosatellites (or 'cubesats'). Various other American smallsat launch companies plan to perform their first launches into orbit in 2019, such as Firefly Aerospace, Virgin Orbit and Vector. Also Indian and Chinese companies are interested players in the small satellite market.

Obtaining the funds to launch

Despite the overall demand growth, funding remains one of the biggest challenges for the smallsat market. Investors are cautious due to high investment risks and products lifecycles. When it comes to government funding, a lot of money goes to the development of large rockets from the institutional market (ESA).

The Ariane 6, for example, has to compete with Elon Musk's very competitively priced Falcon Heavy. As a result, little remains for microlaunchers. So the challenge is to come up with a solution that disrupts in price and production speed and volume.

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Tackling borders and benchmarks

Another big challenge in the rocket market are borders and export regulations. Cross-border business can be difficult due to potential 'dual use': rockets can be deployed either peacefully or destructively. Because of this, countries want to protect their rocket technology.

The same goes for protecting benchmarks. You can already see with the solutions from Rocket Lab or Chinese initiatives that the benchmark is tight. You need not only build a technological outstanding solution, it must also be at extreme low price levels in order to be competitive. In our opinion, the solution doesn't lie in classical series production, but in automated production technology.

3. Sense of urgency: Europe versus the world

Where is Europe in all of this?
Attentive readers might have already noticed that most mentioned smallsat initiatives are from the US. In fact, the microlauncher market is primarily dominated by China and America, where Europe is lagging behind.

Reason for this can be found in, among other things, our investment culture and climate. In America it is more common for billionaires to stand up and say: I'm going to build rockets and will put in millions of startup capital. But in Europe we do not (yet?) have an Elon Musk, Jeff Bezos or Richard Branson. European banks, governments and private investors are much more cautious and conservative when it comes to venture capital investments.

An exception seem to be the United Kingdom. Sparked by national ambition – and possibly fired by Brexit - UKspace, the trade association for the UK's space industry, has published an ambitious growth plan for the sector that aims to double the worth of space industrial activities across the economy from £250 billion to £500 billion. The UK government has promised to make funding available to develop its own satellite launching capacity.

A logical next step, since the UK satellite market is a global player in the field of manufacturing smallsats. But where they can build satellites, they do not yet have the capacity to get them into orbit. By investing in this, the UK wants to complement its supply chain and compete on the global smallsat market.

From building blocks to integrated supply chains

This doesn't mean there aren't great initiatives happening in the rest of Europe. However, the challenge is that there are no integrated supply chains or parties taking the lead. Many companies provide building blocks, such as material expertise, a launch location or a satellite manufacturing site. With the UK giving priority to microlauncher developments, the rest of Europe has to get its game face on. And time is ticking: between now and two years results must be booked with initiatives taking off – not sky-high, but orbital!

With three companies developing dedicated microlaunchers, Spain seems closest to establishing itself as Europe's next space hub. Spanish launch company PLD Space has expressed the ambition to get on the same level as Rocket Lab within 1,5 years. In 2021 PLD wants to do a number of sub-orbital and orbital launch demonstrations and hopes to start commercial smallsat launches as a commercial service by 2023.

Get in the game!

Considering Europe's specific challenges and characteristics, the smartest and fastest way forward seems to be by working together. The European Commission recognises the importance of cooperation: by 2020 it will launch a program to see whether European investment banks and space companies can release up to €400 million to support newspace startups.

A promising solution is to start forming joint ventures. In Europe a lot of knowledge is spread over several companies and countries. By attracting venture capital private investors, joint venture partners can operate under one roof, or as a vertically integrated supply chain. This joint venture should, of course, have a purely peaceful goal and steer clear of military and nationalistic motives.

4. The future is automated

While the smallsat industry is a booming market, it does present big challenges. To keep up with the competition, innovative solutions must be deployed.

Why composites?

Advanced composites have many important benefits. They are lightweight, very stiff and very durable. The solution lies in composite technology, specifically to create sufficient payload capacity. A microlauncher cannot be too heavy. The higher a rocket must travel, the lighter it must be to deliver the payload in the right orbit. This is especially true for the upper stage of the rocket that has to go to orbit. Currently, many rockets are still made of metal. However, more companies are discovering the benefits of composites. For instance, Rocket Lab's Electron rocket has a carbon fibre composite structure. If we look at other initiatives in America, we see some hybrid solutions: a mix of metallic and composite materials.

Why automate?

Composites are typically expensive to manufacture and therefore unattractive for mass production. By automating, we can solve both of these issues. We can lower the cost and be ready for large scale manufacturing. Many composite parts for microlaunchers today are still produced manually. Understandably so, since most companies are still in the prototype and test phase, with small production runs.

But if these parties become successful, the production pace must increase for industrialisation to take place. Instead of a few per year, a microlauncher service will fly a few times per month, potentially up to once per week. This requires a significantly higher production rate. How do we then ensure competitive pricing? The answer is automation.

By automating your composites production, benefits include:

- Lower manufacturing costs
- Increase production rates
- Constant quality
- Full industrialisation

Optimising your design process

Automation initially scares off many companies, due to high costs. However, nowadays the investment does not have to be excessive. For example, Airborne offers low-CAPEX and flexible robotic solutions. Instead of large, expensive machines that can only do one or two things, we deploy standard robots and program them to execute multiple steps in a production process.

The biggest win for manufacturers currently lies in the smallsat design process. The earlier you can optimise your solution in the design phase (by design-for-automation), the better.

Attract the next round of investors by shifting from low rate production to manufacturing on full industrial scale

Composites solutions and automation examples

To give some examples, we provide 'off-the-shelf' solutions that can be customized if needed. These quick plug-and-play wins are mere examples of the kind of production steps you can automate:

- **Laminating**

Conventional launcher parts are still produced by cutting prepreg plies and putting them manually through a lay-up process on moulds. Imagine what automated tape laying (ATL), cutting & pick & place can do for your rocket factory 4.0.

- **Ply cutting, picking and sorting**

When thinking about thermoset composite production processes, prepreg plies are being cut and operators are picking the plies manually from the cutting table to start sorting them on another table in order to create a fully sorted stack of plies that can be used for the lay-up process. How about robotized ply cutting, picking and automated sorting?

- **Honeycomb potting or core filling**

Many honeycomb blanks for aircraft interiors, fan cowlings or structural components are being manually filled with core fillers or potting compounds in order to create local reinforcements. Why not automate this production step and use your workforce elsewhere in the production process for manufacturing processes that aren't straightforward to automate?

5. Where to start?

All effective changes start with a clear vision: the ambition to set up a factory and enough investor capital to make it possible. Together with our expert team, you can determine which automated solutions are needed.

Note that the structure must be designed in such a way that it can be produced by robots. This design process requires specific knowledge of composites material, designing and automated manufacturing. There are very few parties worldwide with this combined expertise. The next steps are the programming of the automated solution, the testing and finally the production ramp up.

The right business model for the right situation

In short, there are two business models to work with:

- Supply Chain model: Airborne (or another knowledgeable composites manufacturer) supplies microlauncher composite parts at the right cost and pace.
- Rocket Factory model: The automated solutions are installed at the customer's manufacturing site, enabling customers to produce microlaunchers in-house, at the right cost and pace.

The most competitive model is to place the automated manufacturing line at the customer site: this seems the best way to really make a competitive rocket. Did you know that SpaceX as well as Rocket Lab have most of their core production under one roof?

Most suppliers in the European launcher market still offer their services separately, resulting in a classical supply chain. The resulting difficulties in terms of logistics and quality, among other areas, won't disappear unless companies join forces to create a vertically integrated rocket factory concept.

6. How can we help?

At Airborne we believe that the most successful way to collaborate in this industry is to work together. The service of an experienced and trusted advisor can help companies move forward. We can complement the expertise of our customer with our own knowledge in composites and automation. Airborne can support microlauncher initiatives by offering advice in any stage and with off-the-shelf automated composite manufacturing solutions, such as:

- **Automated Laminating Cell**
- **Automated Pick & Place**
- **Automated Kitting & Sorting**
- **Automated Honeycomb Potting**

Golden combo: composites and automation

There are many companies that can automate and program robots. There are also many companies that can produce composites in a traditional (manual) way. But, there are only a few companies, like Airborne, that are knowledgeable in both composite production processes and automation.

Our proposition offers a disruption in price and production volume of composite spacecraft structures by applying smart automation, which means: low CAPEX, flexible, scalable and transferable robotic solutions.

By co-design, co-engineering and close cooperation, we achieve next generation, design-to-cost solutions and design-for-automation with our customers.

Shape your own future

Ultimately, we hope to have succeeded in emphasising the urgency that microlauncher manufacturers must look at ways to take their design and manufacturing to the next level. For Europe, time is ticking and we cannot afford to wait much longer. The biggest win for manufacturers currently lies in the design-to-manufacture process. The earlier you can optimise your solution in the design phase, the better. Looking at market demands and trends, it is key to focus on the long term opportunities. Simply to ensure that in the near future you too are part of the smallsat newspace-race.

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About Airborne

As a preferred supplier we design, develop, qualify and manufacture composite products for the most demanding applications. We develop and build machines with the capability to automate manufacturing of composites structures at competitive price levels for market leading customers worldwide. Our ambition is to build a leading physical and digital platform in composite automated manufacturing technologies for small to mid-size composite components. Airborne employs more than 125 highly skilled people. Customers include companies such as Airbus, Thales and ESA.

Innovation through collaboration

Airborne has been engineering and manufacturing composites for more than two decades. We are considered worldwide to be the most knowledgeable partner and supplier for high-end composites structures, as well as a true innovator.