



MAY 2019

WHERE THE 21ST CENTURY BEGINS

July 20th marks the 50th anniversary of the historic Apollo landing: when Neil Armstrong first set foot upon the moon, with the whole world marvelling at mankind's progress. Yet in the intervening 50 years, fewer than 600 people have been in space. The timing could not be more apt therefore for a meeting of the CEPS' Club Espace on 26th June 2019 to discuss the future of space travel, orbiting around insights from the U.S. propulsion and human space flight company, Blue Origin. The firm, a venture started and funded by Amazon founder Jeff Bezos 19 years ago, is at the vanguard of efforts to fulfil the dreams of the "orphans of Apollo" who have been disappointed by the tailing off of interest in space missions in recent decades. The wide-ranging conversation took in issues such as the democratisation of space travel in the era of climate change, the future of satellites as an industry, the technological and economic challenges of space travel, and whether we should see space as a global concern or one of individual nation states.

THE VISION: A NEW PERCEPTION OF THE ROLE OF THE BLUE PLANET

Blue Origin: the vision is in the name. We imagine future when there are millions of people living and working in space. They will state that they are of blue origin, in other words, we're from planet Earth. Since space exploration began, we have sent probes to every single planet in our galaxy and the resounding conclusion is that our planet is the best one, by a considerable length optimal for our habitation. The vision of going to space is therefore oriented around protecting planet Earth as a residential planet, transposing heavy industry into space, and using the resources of the solar system to achieve the goal of leaving Earth for humans to simply inhabit, zoned for residential living. This aligns with our current and increasing concerns about climate change and the imperilled state of our ecosystems. In terms of using energy, since we will never be able to meet demand exponentially, even with renewables sources, the vision of space as a place where we produce and manufacture, all the while preserving our home planet as a protected place to live, is nothing if not logical. The environmental value of space travel is redoubled by the testimony of former astronauts, many of whom, working now within space transportation services, note that upon seeing Earth from space, one is instantly removed from the idea of belonging to a nation state, thinking instead in terms of belonging to the planet. It is also an awakening in terms of perceiving Earth's fragility. If more people experience this, it can only heighten ecological awareness and stimulate attempts to protect our planet. In terms of its own systems, Blue Origin is attempting to build as green a model as possible. With New Shepard, hydrogen technology is used and there is certainly a concern as to how to make processes as environmentally friendly as possible. The company intends to launch satellites that would monitor processes on Earth which would deepen our understanding of the environment and thus effect change.



“ *Making space flight more akin to air travel is the main objective, and the key word here is reusability.*

The dogged efforts of SpaceX and Blue Origin have put paid to once-pervasive cynicism about the idea of reusability in rockets.

Clay MOWRY

Vice President for global sales, marketing and customer experience – Blue Origin

DEMOCRATISING SPACE TRAVEL THROUGH REUSABILITY

Blue Origin began its life nineteen years ago, essentially as a think tank. Hardly surprising, given the amount of brain power that is required to tackle some of the most important challenges in the democratisation of space travel. The company has focused largely on the matter of how to solve the rocket equation: that of putting mass into orbit. Given that less than 2% of a rocket is the payload, solving it is imperative if we hope to see mass space transit become economically viable. Making space flight more akin to air travel is the main objective, and the key word here is reusability. The idea of jettisoning an airplane after a single use is, of course, absurd, and the same principle has to be applied in the domain of rocket launching. To make it feasible from an economic point of view, a rocket must be used ten or twelve times. Since Blue Origin, following Jeff Bezos's modus operandi, does not balk at ambitious goals, the company is designing rockets to fly 25 times, and their ultimate goal would go beyond that. The dogged efforts of SpaceX and Blue Origin have put paid to once-pervasive cynicism about the idea of reusability in rockets. Between the successful tests of New Shepard and SpaceX's Falcon 9, what once seemed an impossible aspiration has become undeniable fact. That being said, whilst reusability will be key to democratisation, flying humans is an entirely different experience to flying cargo, so hastiness is certainly not a virtue. Safety systems have to be tested repeatedly; there are abundant regulations in place. Blue Origin is currently working to assure the regulatory elements are in place to see its own people fly this year; Virgin will not fly paying customers until 2020. Caution, not speed, is of the essence.

A NATION-BY-NATION APPROACH OR A GLOBAL ONE?

The space industry is no longer the domain of the major powers, nor the preserve of governments, and this shift brings with it a range of questions. Should we replace a country-by-country approach with a pan-national one? China, which is currently pouring enormous resources in terms of money and manpower into its Hainan Island spaceport, with doubtless geopolitical goals, might favour the nation-by-nation approach. But what about elsewhere? One of the issues about collaboration remains that there are varying levels of enthusiasm about space from country to country. In Germany, for example, or the UK, where astronauts Alexander Gerst and Tim Peake are household names, there is public interest and people are passionate about space travel. This is not the case for many countries, however, with less historic involvement, and where it is the case, it does not necessarily always correlate with interest on a ministerial level. Although it may seem that companies remain firmly linked to their home territory (Blue Origin is the only American launch company to have an office in Europe), there is good reason to think that space offers opportunities for international cooperation. When it comes to satellite companies, such as Intelsat or SES, most do not think of themselves of belonging to



one nation: they will be serving at least a region if not the entire globe. There are currently 130 companies in the world, from New Zealand to Denmark, trying to build small launch vehicles. Whilst it is impossible to say whether all of these companies will succeed, what is certain is that developing space ventures no longer requires huge government investment. Which brings us to a point dividing countries – the differing perspectives on public-private partnerships and how space should be funded. Attitudes in the United States and in France for example, diverge on this issue. In the US there is generally a feeling that ventures will not work if there is government involved (and a perception that governments are difficult customers). In France, on the other hand, government involvement is construed as necessary – and it is often repeated that NASA's involvement in SpaceX is proof that private space companies must work with government agencies in order to progress. The reality is there must be a middle ground and remaining open to innovative partnerships will doubtless benefit all sides. The recently formed Luxembourg space agency, which will be a public-private partnership, is an example of this – along with reflecting European enthusiasm!

THE COMMERCIAL MARKET: IN A STATE OF FLUX

Alongside the technological and political challenges of advancing space travel, the commercial aspects also require discussion. To make space viable, companies have to evolve and to reconsider their business model. 90% of the commercial space market place has been generated by broadcast television and video distribution. The advent of streaming has, of course, changed all the model from point to multi-point delivery to a point to point model. Core revenue from video services is declining. This is not to say the industry is doomed – far from it. What needs to happen is evolution. It is imperative that companies evolve; if they do not they will fall by the wayside, as so many of the major automobile or analogue-era manufacturers did as they were unable to innovate and meet the challenges of a changing digital market place. The key to development is working out how to distribute broadband and data connectivity to people via satellite. There should be abundant demand for such a service given that there are so many places where fibre or 4G will not work and satellite is likely the only practical solution. The technological challenge is there of course, but so many challenges have been surmounted in the past (the transition from analogue to digital, SD to HD, to name but a few). Volume will be important and large satellite constellations such as Starlink or OneWeb are examples of the future. It is worth noting that the major players such as Thales and Airbus are attempting to address this market in an encouraging way, by considering smaller flexible payload packages. Furthermore, they are attempting, through strategic investment, to capture the spirit of the start-up ventures that are mushrooming across the world, in order to prioritise innovation and fresh thinking. It is also important to note that competition should not be seen as problematic. Rather than thinking of SpaceX and Blue Origin as mortal enemies pitted against one another, better to consider rivalry a healthy part of the market.

“ *The space industry is no longer the domain of the major powers, nor the preserve of governments, and this shift brings with it a range of questions.*

Remaining open to innovative partnerships will doubtless benefit all sides.

Clay MOWRY



“NEW SPACE” AND “OLD SPACE”

The term New Space seems to have drawn as much criticism as it has attention: many wonder if the current climate can really justify designating a new era in space exploration? Certainly one of the main problems hindering the progress of space travel historically has been an inability to attract engineers to the domain – and this is changing. It is clear to see that in France engineers are increasingly finding the prospect of working in space travel alluring and this will have a fundamental impact on the industry. The fact that many of the small start-up style ventures may find it hard to survive is not necessarily a sign that NewSpace is bound to fail – we could look to the example of a company like Firefly, which went into liquidation, but came back and is operating healthily. Companies like SpaceX are willing to take risks on new technologies that a company such as Arianespace will not. New technology will also assist the process – 3D printing could produce an entire rocket. Of course, New Space brings new challenges: large satellite constellations are likely to create problems of congestion and debris. We must also remember that whilst our planet is fragile, space itself is fragile. How to clear space of debris and dispose of it? Who will regulate it? Who will pay for it? Will it be a tax levied on all space operators? These are all questions that emerge in discussions about the future; but many are applying themselves to finding answers. Naturally, no one is in favour of seeing space congested with debris and companies like Airbus are already working on solutions, such as a satellite with a harpoon. It may bring to mind the whaling ships of yore, but it provides a fascinating model for how to combine historic engineering knowhow with the most modern challenges. Of course, the history of space flight is woven into the new. The next stop is the first stop - the moon. Blue Origins has its Blue Moon Lunar lander with BE-7 engine ready for this purpose.

The private space industry seems, in the 21st century, to be dominated by a small handful of billionaire businessmen: Richard Branson, Elon Musk, and Jeff Bezos. Yes, it is easy at first glance to dismiss these ventures as the toys of the fabulously wealthy, but our discussion indicated that democratised space travel is far from being a pipe dream. The fruitful conversation led to the conclusion that whilst they are certainly visionary, the companies which dominate in the US commercial space travel industry, be it Blue Origin or SpaceX, are serious about revolutionising space travel by deploying huge investment, efforts of brain power, and a sheer will to succeed, no matter how hard the challenges. Their efforts have created an entire movement passionate about space travel, a passion which is filtering into the mindset of all the major players in aerospace, engineering and tech firms – be it Silicon Valley style start-ups or the titans of manufacturing like Airbus. The future warrants optimism, not cynicism, not least because one belief underpinning the work of Blue Origin, is that space travel will be profitable. There is another compelling reason: the future of the blue planet may depend upon it.

Sara BIELECKI
rapporteur – CEPS