



European Space Policy Institute

The Rise of Private Actors in the Space Sector

Executive Summary

Prepared by the
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July 2017

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Introduction

“Old Space [...] is slow, bureaucratic, government-directed, and completely top-down. Old Space is NASA, cautious and halting, supervising every project down to the last thousand-dollar widget. Old Space is Boeing, Lockheed, and Northrop Grumman. Old Space coasts on the glory of the Apollo era and isn't entirely sure what to do next. NewSpace is the opposite of all that. It's wild. It's commercial, bootstrapping, imaginative, right up to the point of being delusional”¹

J. Achenbach, The Washington Post

Background and rationale for the study

Since the beginning of the space era, global space activity, both civil and military, has been essentially driven by governments and motivated by strategic, political and scientific objectives. Involving highly complex systems, state-of-the-art technologies and requiring considerable investment particularly related to the costs of access to space, barriers to entry for business in the space sector have been high. As a result, and with the noticeable exception of space launch services and satellite communication segments², space has been generally considered as an area not suitable for commercial venture and investment from private actors in space has been, so far, limited. In the U.S. and Europe, exploration and exploitation of space has fostered the development of a private industrial base competing on some market segments but space systems development, deployment and operations have remained highly dependent upon public funding.

Today, this *status quo* is being increasingly challenged. Various studies have demonstrated that public investment in space has enabled the emergence of a sizeable and dynamic market for space-based services and products and space capabilities are now widely considered as a key lever for multiple flagship economic, societal and environmental challenges. In this new context, a disruptive, commercially-driven, approach to space has emerged marked by ambitious announcements and endeavours aiming to engage in space markets with innovative schemes and business models. In this new ecosystem private actors are playing a more prominent role, pursuing the eventual goal of conducting space business independently from governments.

This new dynamic, usually referred to as *NewSpace*, encompasses a broad range of diverse, interrelated trends. Although no broadly accepted definition of *NewSpace* exist today, the following related trends can be isolated:

- **New entrants** in the space sector including large Information and Communications Technology (ICT) firms, start-ups and new business ventures;
- **Innovative industrial approaches** with announcements and initial developments of ambitious projects based on new processes;
- **Disruptive market solutions** offering, for example, integrated services, lower prices, reduced lead times, lower complexity or higher performance among other value proposition features;
- **Substantial private investment** from different sources and involving different funding mechanisms;
- **New industry verticals and space markets** targeting the provision of new space applications;

¹ J. Achenbach, “Which way to space? Flights of fancy may launch the industry’s future”, The Washington Post, Nov. 23rd 2013, <http://www.washingtonpost.com/sf/national/2013/11/23/which-way-to-space/>

² Note: Space telecommunication quickly became an area of interest for commercial business and gave rise to several private ventures and commercially-driven intergovernmental organisations that were eventually privatized during the liberalisation of the telecommunication sector at the beginning of the 21st century. Today the vast majority of the global space telecommunication sector is led by private satcom operators and based on a competitive international market for satellite and launch services procurement. In parallel, and building in particular on this open market, various private space launch service providers were founded including for example Sea Launch, International Launch Services (ILS) and Arianespace, among others.

- **Innovative public procurement and support schemes** involving new R&D funding mechanisms and costs/risks sharing arrangements between public and private partners.
- **Involvement of an increasing number of space-faring nations** investing in the acquisition of turnkey space capabilities or even in the development of a domestic space industrial base.

While the last trend is important for understanding the complete NewSpace ecosystem it can be considered as subsidiary with regards to the rise of private actors.



Figure 1: Key trends driving the New Space sectorial dynamic

Various research works have been undertaken to individually investigate the specific trends driving the rise of private actors observed recently in the space sector. Yet, so far, the results of this corpus of reports, papers and articles have not been compiled in a comprehensive overview of the different components of this emerging dynamic.

ESPI research activity

In this context, the Italian Space Agency (ASI) and the European Space Policy Institute (ESPI) decided to conduct such broad review in order to get a thorough understanding of the current state of play and eventually pave the way for future research.

With this general objective, the study aims to:

- Search and collect relevant information and data available publicly on the topic of the “rise of private actors in the space sector”
- Organise and consolidate this information into homogeneous and coherent themes
- Identify the main stakes and challenges for space policy actors
- Formulate recommendations for future space policy research

The scope of this study was intentionally kept broad and encompasses all trends, including political, financial, legal and technological trends, affecting, driving or resulting from the rise of private actors in the space sector. Given the nature of the new dynamic, the study focuses predominantly on

emerging private actors in the upstream part of the space value chain³. Finally, and from a geographical perspective, the study covers essentially the situation in the US and in Europe where the rise of private actors is principally taking place.

To achieve these objectives the research was conducted as a preparatory landscaping exercise focusing on the identification, collection and organisation of available information and data. The research was primarily based on public sources including research reports, conference papers, essays, newspaper articles but also relied on information and data from public institutions and commercial companies' communications.

Public information was complemented with stakeholders' interviews including NewSpace actors (start-ups, investors) and traditional space actors (space agencies, space-related institutions and industry).

As a result, the report provides a broad set of information and data on the rise of private actors in the space sector organized into different topics covering the various trends that have shaped the space sector during the last decade. The report, written in a descriptive fashion, concludes with recommendations for future analytical research on the topic.

Synthesis of findings and conclusions

Evidence of a more prominent role for private actors in the space sector

Information and data compiled in this report as a result of the fact-based review of the trends driving the rise of private actors on the space scene provide evidence that the space sector is currently undergoing a change in its structure and that the historical *status quo* is increasingly being challenged by new business-driven endeavours.

The vast majority of space activity today is still driven by governments with private industries acting as contractors for public programmes and relying massively on public funding. Notwithstanding, various trends observed recently show a growing investment by private actors in the sector and the emergence of a more business-oriented leadership. Should these trends persist, they would mark the beginning of a transition to progressively more commercially-driven space activity in particular in the U.S. and Europe and in some promising segments.

Among these trends this report investigated the following:

New entrants

- A significant number of companies have recently entered or emerged in the space sector. These new entrants usually fall in two categories:
- **Non-space companies** including in particular large ICT companies such as Google or Facebook eager to expand their activities and build on cross-fertilization between ICT and space applications;
- **New space companies** or start-ups leveraging private and/or public funding to initiate innovative business models and address new space markets or existing space markets with disruptive solutions.
- Such new entrants are challenging the historical approach adopted in the sector for space programmes with new processes, business models or solutions. Their emergence creates new opportunities but also new challenges for well-established industry players who are forced to adapt their strategy to take into account this new competition.

³ The space upstream value chain is defined here as the series of activities leading to the deployment, in-orbit, of space infrastructures. This includes in particular the design, development, production and launch of spacecraft.

Innovative industrial approaches

- A significant share of new commercial endeavours have affirmed their intention to implement new methods for the development and production of space systems as part of their innovative business models.
- These innovative approaches aim principally at cutting down costs with the underlying objective of creating the conditions either to disrupt existing markets with aggressive pricing for example, or to address new mass markets (see below "Market disruption solutions").
- New techniques and methods adopted by NewSpace players are numerous and include, for example, industrial organisation optimisation, supply chain rationalization and vertical integration, miniaturization, proven technologies re-use, economies of scale, production line automation and digitization, standardized architectures, use of COTS or underspecification with alternative risk mitigation methods (e.g. through replacement or in-orbit servicing).

Market disruption solutions

- A large number of NewSpace endeavours proactively target the development of solutions with the capacity to disrupt existing or forecast space markets. Looking forward to providing new solutions fitting better with existing or potential new customers needs, NewSpace companies tend to adopt disruption rather than optimisation as the backbone of their business strategy.
- These solutions are not necessarily based on new technologies but rather on revisited concepts giving way to an alternative innovation dynamic.
- Despite the plurality of solutions comprising the NewSpace landscape a few value proposition features can be isolated as typical of NewSpace solutions: integration/customization (i.e. adapted turnkey solutions), flexibility, availability (i.e. lead-time reduction), decomplexification or lower prices, among others.
- In general NewSpace endeavours address well-known shortcomings of the current space sector offer with promising solutions but the profitability and sustainability of the business models still has to be demonstrated.

Substantial private investment

- In the U.S. the value of private investment in space businesses has noticeably increased, in line with the growing number of new companies and start-ups. Various sources of investment exist including venture capital firms, business angels, private equity companies or banks, each with different investment mechanisms. On average, \$1.5 billion was invested annually in space start-ups during the period 2010-2015.
- Focused on the development of business ventures, private investment complements well the already large U.S. public budgets by addressing short-term industrial objectives and supporting start-up and scale-up phases.
- Compared to the €6.56 Billion consolidated European governmental budget in 2015, U.S. private funding is rather substantial. Dedicated to fostering the emergence and growth of commercial industry, U.S. private investment alone is higher than available European funds to support industry competitiveness and innovation, therefore creating a new pressure on the European space industry.

New industry verticals and space markets

- An important share of new entrants are developing business models around new industry verticals and space markets.
- In the downstream part of the value chain various promising new markets have been identified for business venture including, for example, global connectivity, geo-information services, space tourism or, in the longer-term, space mining. The provision of such new services requires specific systems which, in turn, impacts upstream activities with the development of specific solutions.
- Among the growing upstream verticals the skyrocketing number of small spacecraft launched into space, including for example cubesats or mega-constellations, has created a momentum for businesses interested in providing dedicated solutions (e.g. micro launchers, miniaturized systems, COTS).
- Promising areas for private endeavours are numerous and range from business development in existing markets to new long-term business opportunities. Even if the economic viability of these new markets remains uncertain today, the development of projects to address them has already created a new dynamic impacting the overall sector, including historical players.

Innovative public procurement and support schemes

- Public space policies implemented in recent years in particular in the U.S. have been instrumental in the emergence of the NewSpace ecosystem. It can be established that it is actually the successful combination of both effective public strategies and favorable business conditions that fostered the trends observed today.
- These public space policies included in particular the implementation of new public procurement schemes building on a more prominent role and investment from private actors contrasting with traditional cost-plus contracts. These new public procurement approaches enable, in addition to cost and risk sharing, a radical optimisation of industrial organisation by removing prescriptive constraints and leading, in general, to an improvement of cost-effectiveness.
- Among outstanding innovative schemes, the NASA's COTS programme, announced in 2006 to stimulate the development by private industry of launch vehicles capable of providing cargo and crew transportation services to the ISS after the retirement of the space shuttle, is considered to have been highly effective and to have paved the way for new collaborative schemes between private and public actors in the space sector.
- In this new context, most agencies started or continue to adapt their strategy and industrial policy to foster the emergence of private endeavours, build partnerships and readjust their roles and procurement models. Today, it can be predicted that the future of the NewSpace dynamic, although commercially driven, will also be highly dependent on the success of implementation of new public strategies.

The wide fact-based review of public information and data conducted in the frame of this research demonstrates the existence of a tangible NewSpace dynamic. The research also identifies the different components of this emerging ecosystem and highlights the complexity and the existing interrelations between the different drivers of the rise of private actors in the space sector. As a result it appears quite clearly that the NewSpace dynamic is rather intricate and cannot be summarized as a simple and sudden emergence of new space business endeavours. NewSpace actually encompasses various trends including technical, political and business trends, having contributed, together, to an increasingly more prominent role for private actors in the space sector.

Opportunities and challenges for the “traditional” space sector

Trends observed today are in line with, or even exceed, objectives pursued by commercialization strategies implemented in the U.S. during recent years aimed at giving to private actors a more leading role in space activities. Today the success of these strategies requires public actors to continue their effort and continuously adapt to the growing commercial dynamic. This is particularly true for Europe which, despite some outstanding initiatives, still lags well behind the U.S. in its capacity to trigger and embrace private business leadership. From an industrial perspective, the influence of NewSpace goes well beyond the sole NewSpace endeavours initiated recently. It actually also impacts the behaviour of historical commercial players (i.e. manufacturing industry, launch service providers and satellite operators) eager to seize the opportunities offered by this new trend but also carefully preparing for new and aggressive competition.

The current dynamic offers an interesting opportunity for governments to generate more ambitious partnerships with private businesses, contributing to the growth of the sector and to the amplification of the socio-economic impacts of space activities. As observed today the NewSpace ecosystem provides more favourable ground to share costs and risks between private and public actors given that a profitable business can be developed and that agencies can preserve their strategic position. Reconsidering traditional procurement mechanisms and constrains to explore new partnership schemes could also lead to a dramatic optimisation of cost-effectiveness in space programmes by loosening agencies top-down control over industrial processes. Relationships between public and private actors will likely progressively evolve. Overall, what may partially change in some segments is the role of public agencies, transitioning from a role of ordering customer and industrial base overseer to a position of sponsor and consumer of products and services developed independently by industry. The main challenge for decision-makers will then lay in reaching the appropriate balance to achieve the different strategic objectives and, in particular, overall governmental sovereignty and economic growth.

From a well-established, or “traditional”, private space industries standpoint, NewSpace represents both an opportunity and a challenge. As new areas and models for space business are pioneered by new companies, industries with long-standing know-how in the development, production, launch and operation of space systems still have an important role to play. By adapting their own model while protecting their competences, “traditional” actors, who still capture a majority of public and commercial markets, can also take a leading role in the emerging ecosystem. From this perspective various partnerships and projects have underlined the interest and capacity of historical actors to seize the opportunity of the NewSpace dynamic. Nevertheless the emergence of new private actors with ambitious strategies giving prevalence to market disruption is a non-negligible competitive threat. From this perspective the NewSpace ecosystem is a challenging dynamic for traditional space companies.

The USA, a fertile ecosystem for astropreneurship

The considerable difference between the dynamic observed in the U.S. and in Europe is striking. The U.S. appear to be in a pole position on the NewSpace scene with a vast majority of endeavours taking place there. Although it is important to note that NewSpace trends in Europe have not yet been appropriately investigated, available information and data suggest that the emergence of the new dynamic in Europe is slower and in general more cumbersome. Even though no conclusions can be drawn at this point, some elements can be highlighted as plausible causes for this situation:

- European initiatives to foster entrepreneurship and/or leveraging a more prominent role of private actors in space programmes are rather recent in comparison to the U.S.

- Socio-economic conditions and cultural behaviour in Europe is considered, in general and beyond the space sector, less prone to entrepreneurship.
- Leadership from highly esteemed space enthusiast tycoons likely fostered the emergence of other endeavours in the U.S.
- Private investment base is smaller in Europe
- European market fragmentation and lower demand (in particular on institutional space markets) affects the potential viability of business models

This being said, various success stories have recently emerged in different European countries positioning Europe as a good competitor to the U.S. on the NewSpace scene. Still, from a competition standpoint, the faster emergence and growth of new private actors in the U.S. is a rising threat for the historical European industry position on the global space scene as principal competitor for both space system and launch service supply.

Stakes are high and adjusting the European model to foster the emergence of NewSpace trends will likely become an essential condition to boost and even secure European industry competitiveness and innovation.

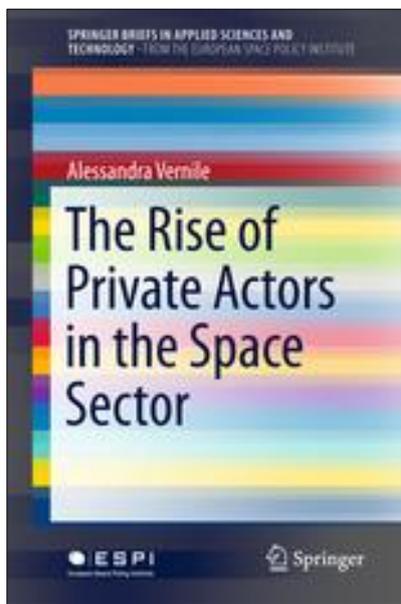
An uncertain future

The future of the rise of private actors observed today is rather uncertain. The permanence of current trends will depend essentially on two complementary components: business success and public sponsorship. Indeed, the profitability and sustainability of the various innovative business models initiated recently which have, so far, not been demonstrated, will be an essential element of the future of private investment in space and will determine whether the trends observed currently will actually endure. From this standpoint, and as pointed out earlier, the willingness and capacity of public agencies to adapt their model and support effectively the NewSpace ecosystem will be instrumental.

Way forward and future research

Following the findings of this preliminary research work, ESPI intends to investigate the topics:

- **NewSpace in Europe:** Available data and information on NewSpace trends are mostly focused on the state of play in the U.S. and research on the situation in Europe has been, so far, very limited. Yet, in order to support future European space policies in this field it is essential to provide decision-makers with thorough insights on the emergence of NewSpace in Europe. For example, data on private investment in the European space sector for start-up and scale-up (value and evolution, sources and mechanisms of funding, drivers and obstacles) and data on new European space companies have not been investigated in a public report so far.
- **Space agencies model transformation:** Embracing the opportunity of a more leading private sector calls for a revaluation and adaptation, at least partially, of the public intervention model. NASA already made the first move in this direction. This transformation encompasses operational aspects such as programme management or procurement mechanisms as well as more strategic considerations such as industrial policy and governance. A high-level research on this topic would be required to provide an overview and a better understanding of the different considerations and implications of such transformation.
- **Contributions of private actors to public space programmes:** In a shorter-term and at a more programmatic level the emergence of private actors on unforeseen segments such as space exploration raises the question of the potential new forms of contribution of private actors to these programmes and of the conditions for successful public-private partnerships in these fields.



The Rise of Private Actors in the Space Sector

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Available for purchase online:

<https://www.springer.com/us/book/9783319738017>

Publisher	Springer International Publishing
DOI	10.1007/978-3-319-73802-4
eBook ISBN	978-3-319-73802-4
Softcover ISBN	978-3-319-73801-7

Executive summary available for download from the ESPI website:

www.espi.or.at

Title: The Rise of Private Actors in the Space Sector – Executive Summary
Published in: July 2017

Editor and publisher:
European Space Policy Institute, ESPI
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Mission Statement of ESPI - The European Space Policy Institute (ESPI) provides decision-makers with an informed view on mid- to long-term issues relevant to Europe's space activities. In this context, ESPI acts as an independent platform for developing positions and strategies.