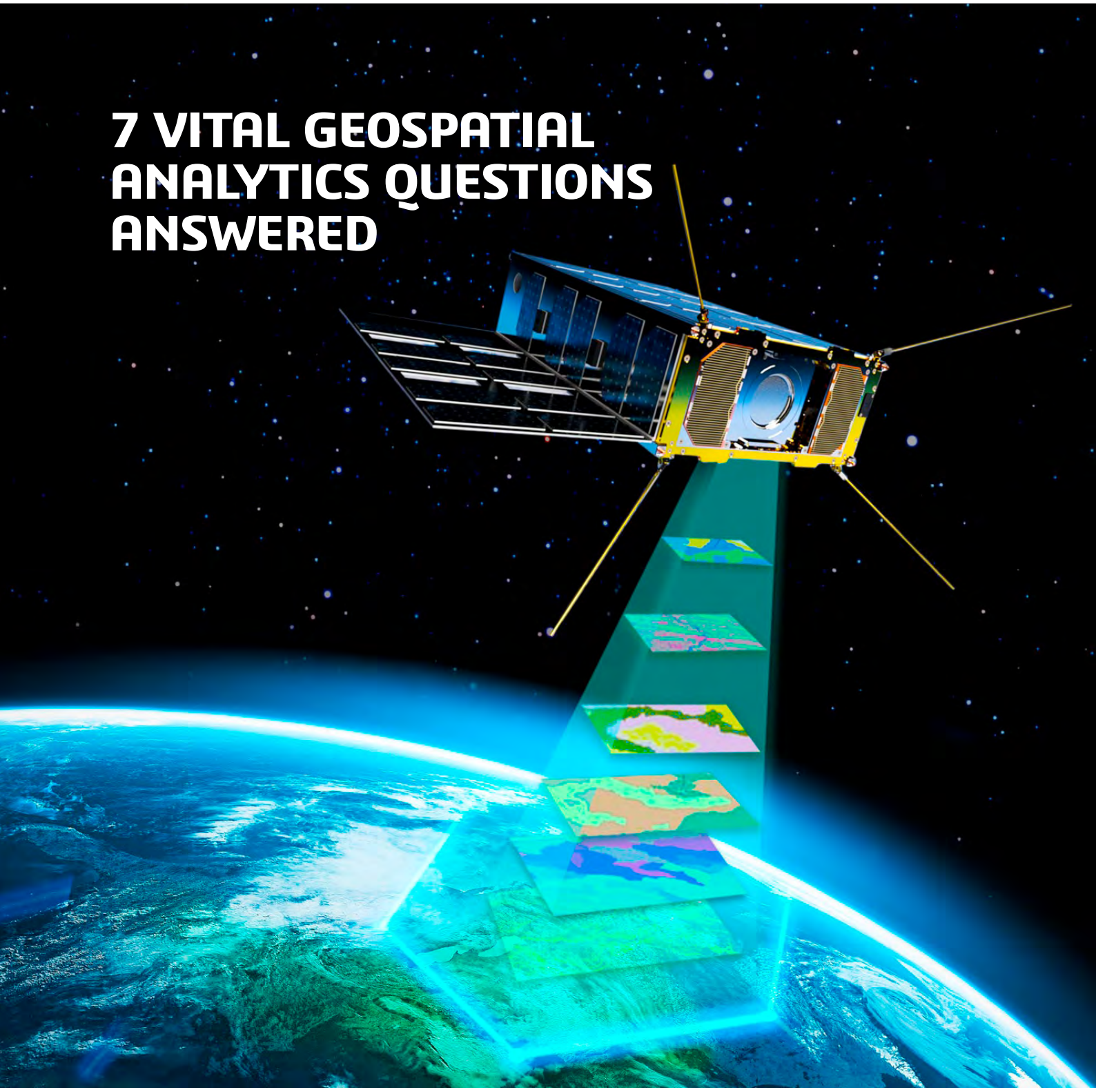
AEROSPACE
& DEFENSE

7 VITAL GEOSPATIAL ANALYTICS QUESTIONS ANSWERED



DASSAULT SYSTEMES

1 How have the recent changes in the space industry driven growth and interest in the geospatial analytics market?

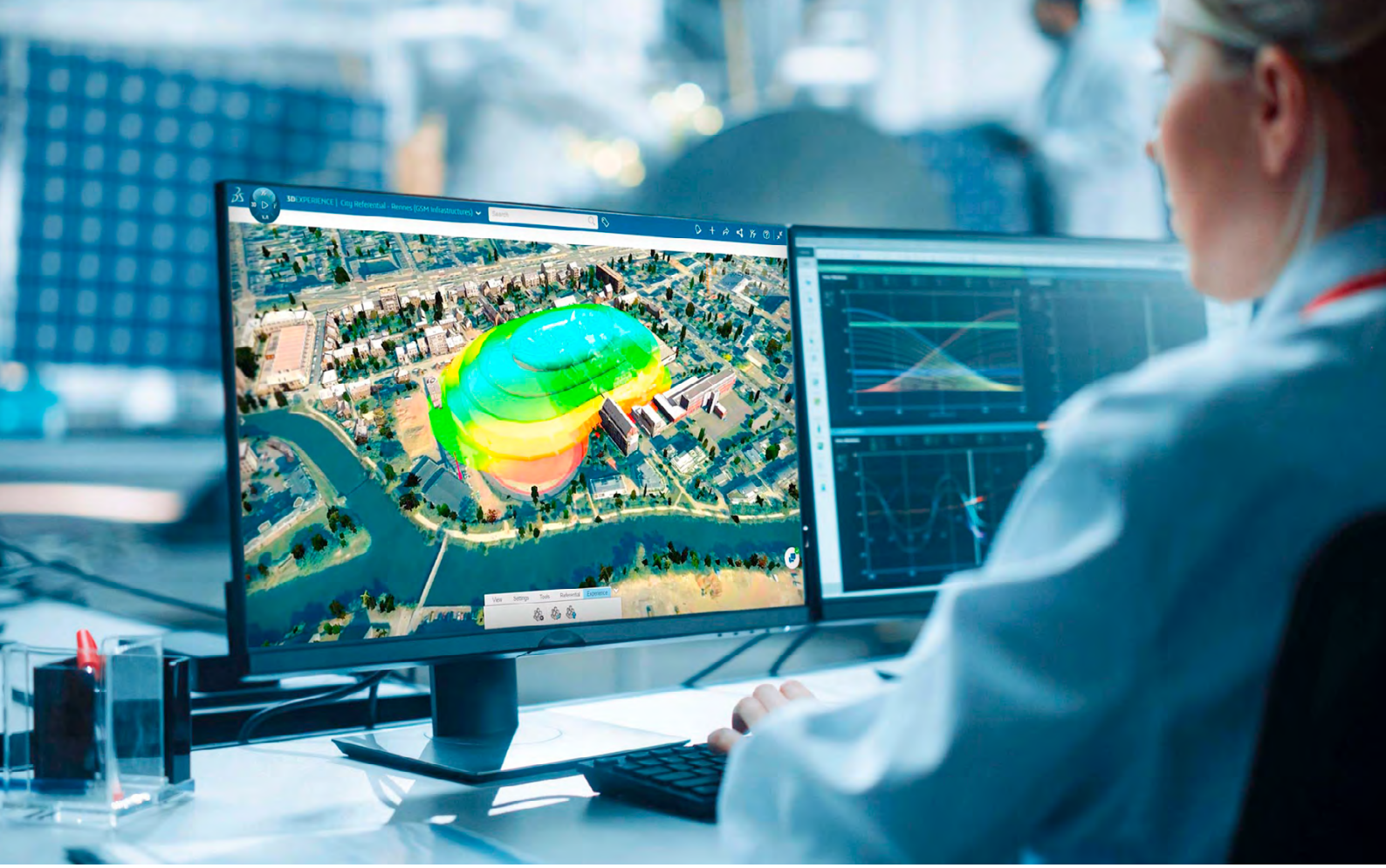
Launching a spacecraft today is four to ten times cheaper than it was ten years ago, depending on the launch vehicle comparison. Barriers to entry have lowered and estimates are that there will be **ten or more times the number of operational satellites in orbit by 2030** – more than 58,000. This is an overwhelming number of active spacecraft, especially considering the **exponential increase in Earth observation (EO) data** – a mission supported by over half of these spacecraft.

This **data deluge** pushes the space economy into a major data economy player. Artificial intelligence and machine learning **reveal new insights** from this massive amount of data collected by the EO constellations. We can unlock new understandings of our environment, society and systems, and discover their impact through data analysis. Dassault Systèmes tools empower innovation in rocketry, satellite design, satellite manufacturing and integration of information across enterprises to enable success in a very competitive space market. We can improve systems and lifecycles across multiple industries to create sustainable systems and processes at scale.

2 What type of data do satellites capture and what do they tell?

Geospatial data references a specific geographical area, along with the objects and events in that area. Depending on who you are talking to, **geospatial analytics has various definitions**. Generally, it is an intersection of data acquisition, data engineering, data science, statistics, visual information, research and analysis. In short, geospatial analytics derives meaningful information from Earth observation data to make complex relationships visible. This idea is to **make the data understandable for users to leverage**.

Earth observation satellite data includes electro-optical, synthetic aperture radar and thermal observations, among other capabilities. Today we are seeing more data collected from space than ever before. Combining data with coordinate references on the Earth reveals a new level of insight. When it is linked with complementary information, such as historical data and data from sources other than space, new insights into the systems observed and examined are revealed.



3 Where and how are geospatial data used?

Geospatial analytics reveal insights into complex system relationships to improve business and organizational processes – and even life on Earth. Smart mobility, disaster management, urban planning and development, air quality management, conservation of our environment and smart agriculture are all examples of areas that will benefit from these data insights. To improve your business and processes by leaps and bounds, you can **use this data to create a virtual twin of products, systems, systems-of-systems and even the Earth**.

Simulation with the virtual twin can provide further insights and predictions on **how systems react as data changes**. Combined with the **3D**EXPERIENCE® platform, the virtual twin provides targeted insights when applied to areas such as logistics, environmental change and system performance. These techniques and procedures can also be used for in-space analytics as the space industry continues to expand to create sustainability in space.

4 How can the **3D**EXPERIENCE platform and Virtual Twin Experience enhance geospatial analytics?

Satellite technology advancements have contributed to the exponential growth in geospatial data. Once launched successfully to operate in orbit, Earth observation satellites transmit massive amounts of data back to Earth for processing and analysis. The use and integration of digital twins are rapidly growing across multiple industries.

Dassault Systèmes' Virtual Twin Experience offers an even more immersive experience – integrating digital products, systems and interactions based on variables and user input in a physics-based environment. **The virtual twin builds an environment to interact with digital twins in their simulated real-world environment to determine possible outcomes**. This is based on changes to the digital twin, interaction with other digital twins, or changes in the virtual environment. The **3D**EXPERIENCE platform helps manage the geospatial analytics data deluge using physics-based virtual twin, collaboration, data science and simulation to make complex system relationships visible and drive changes in the right direction.

5 How does the Virtual Twin Experience simulate and predict scenarios to drive changes?

Organizations gain actionable, visually represented insights by leveraging the Virtual Twin Experience, the **3D**EXPERIENCE platform and other input sources such as the space data marketplace. In a virtual twin environment, you can interact with the product providing the geospatial analytics, the data collected, and the visualization created from the processed and analyzed data. **It becomes possible to dive deep into all aspects of your ecosystem**. The collection source – such as a satellite or subsystem – shows how the system of collection sources interacts with multiple satellites and constellations. The collected data now renders your situation and reveals information that would be nearly impossible to gain from rows and columns of data.

Simulation with the virtual twin can enable an organization to see possible outcomes and drive the change needed. In the collaborative environment of the **3D**EXPERIENCE platform, these data insights also feed next-generation product development and process evolution with applications integrated across the platform like SOLIDWORKS, CATIA, SIMULIA, NETVIBES and DELMIA.

6 What impact do the virtual twin and geospatial analytics have on global commercial operations and activities?

Many areas across logistics, health, disaster management, urban planning, agriculture, climate change, defense, supply chains and others benefit from the Virtual Twin Experience. It helps you **visualize, model and simulate the entire environment of a sophisticated system**. The virtual twin relies on a lot of data and we have that deluge of data now coming from the boom in Earth observation systems. Pick an area like some of those mentioned earlier, run simulations on the virtual model and **explore how the product or environment will behave** when assembled, operated, or subject to a range of events. Simulation of an environmental disaster around a specific area allows construction companies to adapt their initial design, materials and architecture to potential environmental threats – or help civil authorities prepare for disaster response. It could also be about logistics optimization for a shipping company or farm field optimization for an agricultural company.

The potential of these simulations is limited only by our imagination. We can gain vast amounts of new information on products, business operations and even our planet. **New data will continuously update the virtual twin** from 'as made' initially to what you have learned. Tests and simulations help virtually optimize and validate the design, materials and processes – making your entire lifecycle more sustainable.

7 What's next for the space industry with the Virtual Twin Experience as a catalyst for innovation?

The space ecosystem, marked by a continuing shift toward greater private participation and commercialization, is on the cusp of groundbreaking innovation. As more and more industry players unleash the power of the virtual twin, further insights will be revealed with continuous data improvement to spark even more innovations. These innovations will advance multiple industries and how we use space to improve business, nature and our lives on Earth.

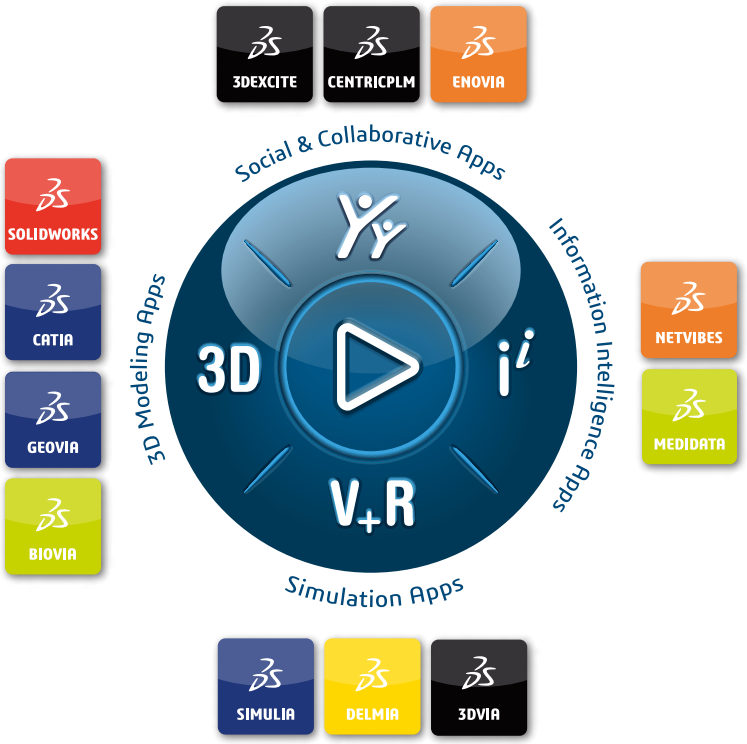
Techniques and procedures developed from this new generation of geospatial analytics capabilities will be able to extend application areas to in-space analytics. This **help manages the space environment sustainably** as humans and economies extend into the traditional usable orbits, cislunar space, the moon and beyond. **Space mission areas like ISAM (In-Space Service, Assembly and Manufacturing), space habitats, cislunar and lunar development, and continued space exploration will continue to advance**.

Being the **3D**EXPERIENCE company for over 40 years, Dassault Systèmes empowers pioneers in the space industry to achieve success through the Virtual Twin Experience, the **3D**EXPERIENCE platform and an extensive portfolio of brands, solutions and processes.

INDUSTRY EXPERT

Jason Roberson,
Industry Value Expert,
Aerospace & Defense,
Dassault Systèmes

Roberson is part of the Dassault Systèmes Aerospace & Defense strategy and innovation team developing solutions to empower and enable the global space industry. His primary focus is on North American space and defense industries. With decades of experience, he brings deep space knowledge, international policy updates and critical data insights from space-based resources to industry players and governments.



Our **3D**EXPERIENCE® platform powers our brand applications, serving 11 industries, and provides a rich portfolio of industry solution experiences.

Dassault Systèmes, the **3DEXPERIENCE** Company, is a catalyst for human progress. We provide business and people with collaborative virtual environments to imagine sustainable innovations. By creating 'virtual experience twins' of the real world with our **3DEXPERIENCE** platform and applications, our customers push the boundaries of innovation, learning and production.

Dassault Systèmes' 20,000 employees are bringing value to more than 270,000 customers of all sizes, in all industries, in more than 140 countries. For more information, visit **www.3ds.com**.

Europe/Middle East/Africa
Dassault Systèmes
10, rue Marcel Dassault
CS 40501
78946 Vélizy-Villacoublay Cedex
France

Asia-Pacific
Dassault Systèmes K.K.
ThinkPark Tower
2-1-1 Osaki, Shinagawa-ku,
Tokyo 141-6020
Japan

Americas
Dassault Systèmes
175 Wyman Street
Waltham, Massachusetts
02451-1223
USA

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