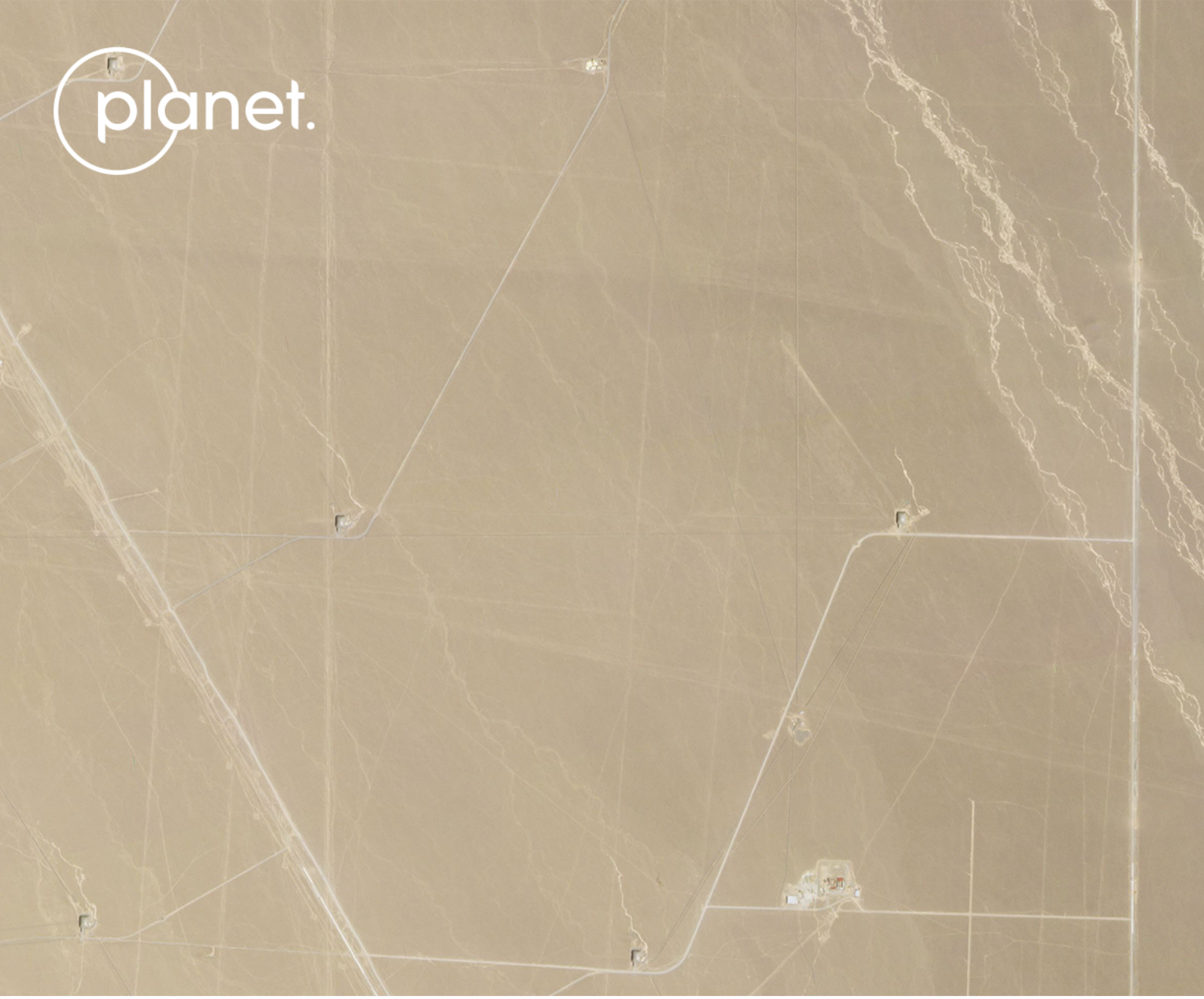

Missile silo construction, Gansu Province, China | June 9, 2021

FUTURE TRENDS IN NEW SPACE
AUTOMATED TIP & CUE

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INTRODUCTION

Space-based remote sensing and satellite systems offer one of the greatest tools available for monitoring and understanding change on a global scale. Governments are increasingly reliant on space systems as an essential asset to protect and advance national interests and are looking to incorporate capacity and new technologies from commercial space companies to help satisfy mission requirements.

In the new space ecosystem, there are several fundamental government needs driving the development of technologies and products, all of which are important to integrate into next-generation collection and processing solutions. At Planet, we are continually looking to the future and how our satellite technology and data can address salient challenges faced by commercial and government customers alike. This White Paper highlights key challenges facing space architectures today and identifies new trends within the commercial space sector that are emerging as a result.

GLOBAL COVERAGE

Geospatial Intelligence (GEOINT) is derived from the analysis of imagery, information, and data associated with particular times and locations on Earth. For applications ranging from humanitarian aid and disaster relief to the building and maintaining of accurate maps and object databases, collecting GEOINT on a global scale is necessary. Traditional satellite systems have focused on the extraction of precision information at a limited set of known locations. To provide better responsiveness to a broader set of emerging activities, the future of commercial space seeks to leverage the efficiencies of mass manufacturing and production to augment traditional collection with complementary data at a global scale.

PERSISTENT MONITORING AND RAPID REVISIT

One of the challenges associated with producing reliable GEOINT is in the continually evolving nature of the Earth's features, structures, and characteristic signatures. This challenge is often associated with activity-based intelligence (ABI): an analysis methodology that integrates data from multiple sources to discover relevant patterns and determine and characterize change. Monitoring and extracting valuable insights at the speed of change often requires persistent and rapid revisit capability. With the ability to effectively capture dynamic signatures and targets, future space architectures can begin to discover and establish critical associations and interdependencies across regional areas of interest. Commercial space organizations are turning to increased use of larger numbers of smaller satellite systems to provide the collection frequency needed to maintain pace with rapidly unfolding events and activities.

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INCREASED RESOLUTION

Much of the activity on Earth is associated with the movement and dynamics of individuals and groups. To accurately understand and derive insights from changes of this nature, successful space architectures require systems with variable and increasingly capable spatial, spectral, and temporal resolution. Increased spatial resolution facilitates detailed target mensuration and map generation. Better spectral resolution provides insight into material composition and into other observables beyond the visible spectrum. High temporal resolution offers multi-look imagery for characterizing object dynamics and overcoming the challenges of target occlusion.

COLLECTION DIVERSITY

Space-based remote sensing systems are frequently subject to unfavorable environmental conditions such as precipitation, cloud cover, haze, and low-light. This motivates a balanced collection architecture that incorporates a multitude of collection systems with orthogonal limitations and complementary characteristics. Commercial space organizations are responding by developing future satellite systems and mixed constellations with multiple sensors and payloads that integrate electro-optical (EO), synthetic aperture RADAR (SAR), and even hyperspectral imaging (HSI) capabilities.

THE WAY FORWARD WITH TIP AND CUE

Across the fundamental remote sensing needs of governments, the commercial space sector plays a pivotal role in collecting imagery data to augment reconnaissance systems being built and operated by government entities. Due to the sheer size of the planet and the frequency with which change occurs, it is impractical to build individual satellite systems that are simultaneously capable of satisfying all customer needs and, further, to do so effectively at scale. One of the emerging trends within space architectures that helps address this limitation is the introduction of orchestrated collection and automated tip and cue processes that operate across diverse satellite constellations.

A tip and cue approach to global monitoring first identifies possible issues, meaningful change, or unusual activity within an area of interest. This is done with a high frequency monitoring solution but at a minimally required level of precision and fidelity. Once identified, a satellite system with higher resolution and a diversity of sensing capabilities can be tasked to validate and get a closer look at the activity or change in question. This approach permits varying classes of satellite systems to be optimized for broad area coverage and rapid revisit while other, separate systems, are optimized to achieve increased resolution and collection diversity. This provides insights or ‘tips’ to customers to gather more information and to task or ‘cue’ their own reconnaissance systems to see if the threat really exists.

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In the future, we see a layered space architecture that leverages new capabilities from commercial vendors to offer rapidly adaptable data collection in support of activity-based intelligence for understanding patterns of life. As an industry, we're not there yet, but at Planet, we see this as the future. All of the characteristics we have described of new space architectures must work together. And that will only happen as different layers of satellites are equipped for tip and cue workflows. In other words, we need systems with a first layer that interrogates the situation, using automated analytics, and then guides the other layers in the constellation with "cues" as to where to look, and what phenomenology to use to gather more detailed information.

The commercial sector can play an essential role in helping governments monitor activities around the world. As we said in the beginning, the world is vast, but new space capabilities and tip and cue can help us better understand global change and be a catalyst for more informed and transparent decision-making.

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