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THE SPACE WARFIGHTING ENVIRONMENT 2040

Framing the Future for the Joint Warfighter

PREPARED BY:

U.S. Space Command, Joint Forces Development and Training (J7), Joint Warfighting Development Division, Future Concepts Branch.

MAJOR CONTRIBUTORS:

This document is the product of ongoing dialogue and collaboration led by U.S. Space Command J7, in partnership with the Military Services, Combatant Commands, and various defense agencies. Their collective expertise and insights have been instrumental in shaping the content and recommendations within this publication.

POINTS OF CONTACT:

For any questions or requests regarding this document, please contact the project managers within U.S. Space Command's J7 Future Concepts Branch. Contact details can be obtained through the U.S. Space Command J7 office.

REFERENCES:

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FOREWORD

Since the establishment of U.S. Space Command, our mission has been clear: to ensure the Joint Force can fight and win anytime, anywhere—even in space. Protecting warfighters begins with thinking like warfighters, grounding our strategy in operational realities and recognizing that every decision in space carries direct consequences for forces operating on land, at sea, in the air, and across cyberspace.

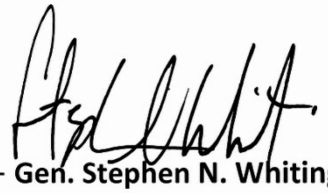
U.S. Space Command remains the world's foremost military space power. To sustain that position in a contested domain, we must strengthen both our capabilities and our capacity. Through these enhancements, we will secure the enduring advantage needed to deter and, if necessary, defeat any adversary seeking to wage war in space, safeguarding the Homeland and protecting the Joint Force and our allies and partners.

Space is not merely a domain above the Kármán line. It is a cross-domain system powered by constant data flow and connectivity. Satellites alone do not deliver effects; the interconnected effect chain does: ground-to-space, space-to-space, and space-to-ground. Operational advantage depends on the seamless movement of trusted information and effects through the spacecraft, links, and ground nodes that enable the Joint Force to sense, communicate, decide, and act. Adversaries will contest every part of that chain, often targeting the flow of information as readily as the hardware itself. To preserve operational advantage, we must prioritize resilience and decision dominance across the entire effect chain.

The expanding commercial space ecosystem is not a threat to avoid but a capability to integrate. Industry brings innovation, launch cadence, and distributed infrastructure that can enhance resilience and surge capacity. We must build partnerships and standards that enable secure, dual-use collaboration while preserving mission assurance.

Every acquisition, design, and operational decision must start with the warfighter—who they are, what they need, and how they train and develop to fight in a contested environment. In the past, advantage often came from technological superiority in individual systems. By 2040, advantage will depend on the Joint Force's ability to sustain trusted space-enabled effects despite disruption, degradation, and attack. Preserving that advantage requires architectures and force design that are resilient, integrated, and adaptable under pressure, enabling the Joint Force to maneuver decisively within the space domain, maintain initiative, and reinforce unity of effort across the full effect chain.

U.S. Space Command operates in, from, and through space to preserve our freedom of action in the ultimate high ground. There is never a day without space: it powers our economy, secures our Homeland, and defines our way of life. As we look to 2040 and beyond, our charge is clear—understand this operating environment, protect it, and ensure U.S., allied, and partnered warfighters continue to fight and win, anywhere, anytime, always with space.



— Gen. Stephen N. Whiting

Commander, U.S. Space Command

INTRODUCTION

The Space Warfighting Environment (SWE) 2040 serves as the Joint Force's guide for understanding and shaping the future of space warfare. It provides commanders, planners, warfighters, and decision-makers with a clear view of the forces transforming the domain, as well as the trends, challenges, and opportunities shaping space operations by 2040 and beyond.

Every concept in this document—technical, commercial, operational, and strategic—is presented through a single lens: sharpening the Joint Warfighter's edge so the force can outpace, outmaneuver, and out-think any opponent.

The *SWE 2040* is not a prediction. It is a framework for adapting to uncertainty, harnessing opportunity, and securing decisive advantage in the domain that underwrites the Joint Force's ability to sense, communicate, navigate, strike, and survive.

The *SWE 2040* complements the U.S. Space Force's *Future Operating Environment 2040* and *Objective Force 2040* by translating broad environmental and force-development concepts into a warfighter-centered operational framework for the Joint Force. Together, these documents form a complementary body of work: the U.S. Space Force's *Future Operating Environment 2040* defines the environment; the *Objective Force 2040* defines the force; and U.S. Space Command's *SWE 2040* defines how the Joint Force experiences, fights, and wins within it.

This document marks the first installment in U.S. Space Command's *Space Trilogy*, a cohesive body of work that frames the future of space operations for the Joint Force:

- ***The SWE 2040*** defines the trends, context, and implications shaping the future competitive environment.
- ***The Space Futures Series*** provides modular, issue-driven analysis focused on emerging challenges and problem sets.
- ***The Space Warfighting Concept*** guides how the Joint Force and U.S. Space Command fight and win in space.

This trilogy is designed for warfighters. It ensures we do more than react to disruptive change. By understanding the forces defining the future of space, we can make better decisions today, build the right capabilities, and maintain the initiative across all domains. This is not about dominating space; it is about preserving peace through strength and ensuring that the Joint Force prevails.

As the Commander has stated, "Without space-based capabilities, the Joint Force cannot shoot, cannot move, and cannot communicate the way they need to at the speed and scale necessary to win on the modern battlefield." The *SWE 2040* provides the foundation for sustaining that superiority and ensuring our forces remain a step ahead—always ready, always resilient, and always lethal.

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“At some point in the future, we’re going to look back and say, ‘How did we do it without space?’”

— President Donald J. Trump
July 18, 2017

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FRAMING THE FUTURE FIGHT

The Space Warfighting Environment (SWE) 2040 is the Joint Force's guide to understanding and shaping the future of space warfighting. It outlines the forces transforming the domain and provides a framework for how the Joint Force preserves trusted space-enabled effects, sustains operational advantage, and maneuvers through disruption in a contested environment. This document does not predict the future; it prepares the Joint Force to command it.

Space enables the Joint Force to see, connect, decide, and act at speed. As activity accelerates and competitors adapt, the stakes for space superiority grow. Every warfighter depends on effects that move through an interconnected pathway—ground-to-space, space-to-space, and space-to-ground. Strengthening this chain is essential to preserving advantage in 2040 and beyond.

WHY 2040 MATTERS

By 2040, space will be more crowded, contested, and central to military operations. Innovation cycles that once took decades now occur within a single operational cycle, driven by commercial actors, allies, partners, and competitors. Advantage will belong to forces that can adapt, maneuver, and sustain trusted effects under pressure. Technology will evolve, but the warfighter's needs will not: to see, connect, decide, and act with trust and tempo. These constants anchor this document.

THE ENVIRONMENT THE JOINT FORCE WILL FIGHT IN

Competitors are mobilizing with intention. China is massing launch, autonomy, sensing, and maneuver to impose tempo and saturate decision cycles. Russia weaponizes ambiguity—jamming, spoofing, cyber intrusion, and information manipulation that fracture trust and slow decisions. Other actors focus narrowly on cyber, jamming, and vulnerable portions of the effect chain to generate asymmetric leverage.

Meanwhile, the U.S. commercial and academic enterprise, along with allies and partners, continues to accelerate innovation, expand resilience, and increase surge capacity. These actors are not vendors or adjuncts; they are teammates in competition whose speed, creativity, and shared commitment amplify U.S. spacepower.

Several forces will define the warfighter's reality by 2040 and beyond:

- Proliferated dual-use spacecraft that absorb and regenerate under attack.
- Advanced materials technology that will redefine stealth and deception.
- Direct-to-device connectivity that keeps the tactical edge connected.
- Optical and laser links that move data quietly and securely.
- Artificial intelligence (AI)-enabled networks that reroute and self-heal faster than adversaries can disrupt.
- Distributed, mobile, coalition-ready ground nodes that remove single points of failure.
- In-space servicing and maneuver that turn orbit into a dynamic network.
- Quantum developments that reshape trust, timing, and secure communication.

EXECUTIVE SUMMARY

- Stewardship challenges—debris, traffic management, and norms that shape freedom of action.

Each of these trends carries risks and opportunities. Together, they define the operating environment in which the Joint Force must be prepared to fight.

SIGNALS IN THE GRAY

Not all change is obvious. Subtle signals, cislunar expansion, quantum stability milestones, AI-enabled kill meshes, and shifts in commercial markets offer early glimpses of futures that may redefine the domain. The *SWE 2040* equips the Joint Force to recognize and shape these signals before they harden into strategic realities.

WHAT THE JOINT FORCE MUST DO

Success in 2040 requires the Joint Force to:

- Train for contested space as the baseline, not the exception.
- Coordinate, synchronize, and, when appropriate, integrate allied, national, and commercial partners across architectures and organizational structures to strengthen collective spacepower.
- Harden the entire effect chain.
- Shift acquisition toward speed, iteration, resilience, and effects-based design.
- Build architectures that bend, reroute, and regenerate under pressure.
- Align authorities, organizations, talent management, information-sharing, and classifications with the realities of modern competition.
- Above all, we must give the warfighter the clarity, confidence, and speed they need to win.

These imperatives demand a Joint Force that can adapt rapidly, integrate deeply, maneuver through disruption, and act decisively across domains while preserving operational initiative under persistent contest.

THE RESPONSIBILITY AHEAD

The opportunities emerging across the space domain—commercial innovation, dual-use technologies, expanding allied architectures, and new spacefaring nations—require more than awareness; they demand a framework that converts opportunity into advantage.

U.S. Space Command's *Space Trilogy* provides that structure: the *SWE 2040* defines the environment, the *Space Futures Series* examines emerging problems, and *the Space Warfighting Concept* translates insights into how the Joint Force will fight and win. Together, they turn possibility into purposeful action.

The *SWE 2040* is not a survey of trends; it is a call to act to preserve trusted space-enabled effects, maintain operational advantage, and shape the domain before conflict begins.

There is never a day without space, and the future will be shaped by those who protect its promise. The opportunities ahead demand a domain so resilient and responsive that the Joint Force never doubts the strength of the spacepower they rely on.

“The exploration of space will go ahead, whether we join in it or not... and no nation which expects to be the leader of other nations can expect to stay behind in this race for space.”

— President John F. Kennedy
May 25, 1961

THE SPACE FUTURE: ROAD TO 2040

SHAPING THE FRONTIER

The space future is not a threat to fear. It is a frontier to shape.

As we look toward 2040 and beyond, our greatest advantage will come not from anticipating what might go wrong but from *imagining what could go right*.

By 2040, space will reflect acceleration and interdependence. Launch systems, sensors, and data networks are advancing at different rates. Some capabilities—autonomous spacecraft operations, proliferated low-Earth-orbit constellations, and AI for command and control (C2)—are evolving rapidly and compressing decision cycles. Others, such as policy, space behavioral norms, and the integration of commercial and military architectures, will mature more gradually. Understanding these different rates of change is essential to preserving freedom of action and sustaining competitive advantage.

THE SHRINKING DISTANCE BETWEEN DISCOVERY AND EFFECT

History shows how quickly discovery becomes operational. The Global Positioning System (GPS) took more than two decades from concept in 1973 to full operational capability in 1995 to become the foundation of modern precision warfare. In contrast, global broadband constellations, such as Starlink, moved from design in 2015 to worldwide service by 2021, a span of only six years. Reusable launch systems followed the same pattern. NASA's Space Shuttle took about twelve years to move from program start in 1969 to its first flight in 1981. SpaceX, by comparison, achieved the first landing of a reusable orbital booster in roughly four years and operational re-flight within six. What once evolved over a generation now changes within a single operational cycle. This compression of innovation defines the environment we must prepare for through 2040 and beyond.

PREPARATION, NOT PREDICTION

The purpose of looking toward 2040 is not prediction but preparation.

We study the future to understand possibilities to make better decisions now. Our goal is not to forecast events but to reduce the risk of surprise. When we analyze potential space futures, we create options that preserve strategic advantage in peace and decisive advantage in conflict. Futures work is not speculative; it is preventive and fundamental to readiness.

Every advance, technical, commercial, or conceptual, must strengthen the warfighter's advantage. The purpose of foresight is not abstraction; it is to ensure tomorrow's warfighter is better protected, better connected, and always a step ahead.

"There is no longer any debate that space is a warfighting domain. That said, there has never been a war in space, and we don't want a war to start in space or to extend into space. And war in space is not inevitable, but we must apply our best thinking to be ready."

— Gen. Stephen N. Whiting, April 8, 2025

THE SPACE FUTURE: ROAD TO 2040

AN EXPANDING SPACE ENVIRONMENT

Commercialization and the global space economy are increasing capacity, diversity, and resilience. Congestion in orbit often signals instability, yet it also demonstrates vitality: more capability, more innovation, and more partners committed to keeping the domain safe and usable. Emerging practices in orbital traffic management, debris removal, and servicing can preserve deterrence and enable rapid recovery in the event of a space conflict.

Industry does not shape the future alone. We do not fight alone. Partnerships with commercial innovators extend our capacity, but partnerships with our allied and coalition warfighters strengthen it.

Spacepower is inherently cooperative; no nation can maintain security in isolation. Through shared awareness, combined training, and interoperable tactics, techniques, and procedures, our allies and partners expand the reach and resilience of the Joint Force.

Their knowledge, experience, and creativity form an edge no adversary can match. Building and strengthening those bonds isn't a supplement to space strategy; it is space strategy.

U.S. and Allied space partners strengthen cooperation during Operation Olympic Defender.

OPPORTUNITY AND COMPETITION

Opportunity and competition grow together. The same conditions that drive innovation also invite confrontation. Our competitors see the same momentum, the same commercial energy, the same allied and partner cooperation, and the same technological acceleration we do. And they are already working to turn those forces to their advantage and against ours.

Yes, there is an opportunity in 2040 and beyond. But others see that opportunity too—and they are already acting on it. The future will favor those who shape it first. U.S. Space Command must be the one to do it.

COMPETING FOR SPACE ADVANTAGE

THE IMMUTABLES

No domain erases human nature—it only reveals it.

Space has not changed *why* we compete, only *how*. The same enduring imperatives drive every actor, state, venture capitalist, or coalition: to survive, to endure as a nation, to preserve their population, to gain advantage, to control resources, to extend reach, and to secure key terrain.

Survival is the most primal and unifying driver of all competition. It defines the instincts of nations, the calculations of industry, and the innovation of startups. Every act of deterrence and risk stems from this single truth—the need to persist.

Yet beneath politics and policy, space competition is still governed by physics. To see, move, and act across vast distances demands range, energy, and power—not only in the political sense of influence, but in the literal ability to generate and project force, data, and maneuver. These are the true currencies of advantage in a domain defined by distance, vacuum, and velocity.

What changes is not these constants, but our ability to exploit them. Technology gives us new means to generate energy, transmit power, and overcome range, but it cannot rewrite the laws that govern them. Those who understand these limits and innovate within them will define the next era of space advantage.

Astronaut Eugene A. Cernan, Apollo 17 Commander, salutes the American flag.

THE MANY WAYS TO COMPETE

Competition in space does not look the same for every actor. Each nation approaches space through its own doctrine, culture, and concept of survival, and those differences will shape the character of future conflict as much as technology itself.

Some seek mass and economy of force, others pursue disruption and denial, and others signal space capability to secure autonomy. How a nation chooses to employ spacepower is an expression of what it values, what it fears, and how it intends to fight.

For the U.S., this means the future space operating environment will not be uniform. Competitors will challenge us in different ways: through scale, deception, perseverance, and asymmetric effects that exploit the seams of our dependence on space. Commercial integration, allied and coalition partnerships, and technological superiority will always be central to U.S. space advantage—but how we apply them, with whom, and at what moment will differ across competitors and conflicts.

COMPETING FOR SPACE ADVANTAGE

DIFFERENT NATIONS, DIFFERENT FIGHTS

The Joint Force must prepare for competitors who will not mirror our doctrine, our ethics, or our risk tolerance. To understand the competitive environment ahead, the Joint Force must consider not only major space powers but also the outlier states whose uneven investments across the effect chain can produce unexpected influence. These nations, whether emerging, asymmetric, or strategically autonomous, offer early signals of the operating conditions we may face in 2040 and beyond.

CHINA: MASSING FOR DOMINANCE

"To explore the vast cosmos, develop the space industry and build China into a space power is our eternal dream."

—Xi Jinping, President of the People's Republic of China, January 28, 2022

China's approach to spacepower is defined by mass—mass production, mass launch, mass deployment, and the massing of effects across domains. This is the product of a system in which China's largest civilian and military space contractors are state-owned, deeply integrated, and organized for Military-Civil Fusion.

Every major space initiative, industrial investment, and commercial innovation feeds into a dual-use pipeline designed to accelerate military advantage. As the world's dominant manufacturing and production power, China can convert strategic direction into operational capability at a scale and speed no competitor can match.

Over the past decade, China has more than doubled its annual launch rate and rapidly expanded its on-orbit fleet. These are not scientific one-offs; they are satellites that enhance China's ability to see, communicate, navigate, target, and coordinate military operations across all domains.

China is building a space architecture designed to support joint operations at scale, turning information into action faster and with greater resilience. This combination of industrial depth and accelerated deployment gives China momentum, allowing it to field new systems quickly, replace losses rapidly, and impose a tempo that challenges U.S. planning, operations, and decision cycles.

China's behavior demonstrates the speed and intensity with which it intends to compete. It integrates launch, on-orbit operations, intelligence collection, cyber operations, and electronic warfare under unified organizational structures.

It has fielded and operationalized a growing suite of counterspace capabilities, designed to disrupt, degrade, and hold U.S. and allied space architectures at risk; expanded mobile and sea-based launch platforms to increase survivability and responsiveness; and integrated cyber, electronic warfare, and information operations as core components of modern warfare.

Its military strategy centers on informatized warfare—rapid information flow, precision targeting, and seamless cross-domain integration to generate coordinated effects.

China is also experimenting with autonomy at an unprecedented rate. Maritime swarming, multi-thousand-drone

formations, and the use of quadrupedal robotic systems in amphibious training all signal China's trajectory: a force designed to mass effects**,** extend operational reach, and increase the combat effectiveness of maneuver forces.

While individual technological demonstrations may not yet be decisive, the pace and scale of experimentation show how quickly China intends to operationalize mass, autonomy, and hyperconnectivity in future conflicts.

The quadrupedal "robot wolf" showcased in recent PLA training is one example: by 2040 and beyond, such systems could carry ammunition, sensors, or supplies; support sustained operations with minimal resupply; and free human teams to focus on firepower and decision dominance.

For the U.S., the significance is not the novelty of any single system—it is that China is launching more, weaponizing more, and iterating faster. It no longer depends on technological cyberespionage to close gaps; it is now producing and fielding capabilities at scale, creating operational resilience simply through volume.

China seeks to shape a battlespace where it can mass effects at decisive points faster than the U.S. can respond, challenging assumptions of space superiority and decision dominance.

Where China seeks advantage through mass and tempo, Russia pursues it through ambiguity and disruption.

RUSSIA: ENGINEERING THE FOG OF WAR

Russia's space strategy begins with a simple premise: the force that cannot see clearly cannot act decisively.

Constrained by economic limits, industrial decline, and the long-term effects of sanctions, Russia lacks the capacity to compete through speed or scale.

Instead, Russia invests in tools that blur the operational picture—jamming, spoofing, cyber intrusion, and information manipulation designed to fracture awareness and trust. These tools allow Russia to shape a fight long before a shot is fired, influencing how commanders perceive the environment and how quickly they can respond.

Russia continues to anchor its identity in its historic role as a leading nuclear and space power. Yet since the collapse of the Soviet Union, the gap between its ambitions and its means has widened. Unable to build or launch at the pace of modern competitors, Russia continues to pursue space modernization but increasingly relies on neutralizing others' advantages.

Its 2021 direct-ascent anti-satellite test (ASAT), often cited for the debris it created, was more importantly a deliberate signal: Russia retains both the political will and the technical capability to hold U.S. spacecraft at risk, injecting instability into the space domain at a time of its choosing.

Reports emerging in 2024 further elevated concerns that Russia may be exploring the deployment of nuclear weapons in space, a development that would represent a

profound escalation in the threat to the space operating environment.

As the ultimate counterspace weapon, the use of a nuclear weapon in space would be broad, indiscriminate, and violent, capable of destroying orbital systems across vast regions of space and generating cascading failures across the effect chain simultaneously.

The consequences would not remain confined to orbit; the widespread destruction of space-enabled capabilities could paralyze both military operations and civilian systems across the land, maritime, air, and cyberspace domains.

While the deployment of nuclear weapons in space would represent an extreme escalation, it reflects the same underlying strategic logic that shapes Russia's broader approach to competition: imposing disproportionate risk by targeting the systems and dependencies upon which the Joint Force relies.

Russia's most impactful space capabilities, however, are not in orbit—they reside in vulnerable portions of the effect chain, where the U.S. is most exposed, and Russia is most experienced.

Russia fields one of the world's most mature and combat-tested electronic warfare systems. Its electronic warfare forces can jam GPS, spoof satellite signals, disrupt UAV control links, degrade communications, blind sensors, and interfere with the C2 systems on which the Joint Force depends. These are not theoretical capabilities; they are used at scale in Ukraine, where Russia has repeatedly eroded the integrity of the information environment in real time.

Cyber operations serve as a parallel line of effort. As revealed through the Sandworm campaigns, Russia conducts long-term infiltration, pre-positioning, and timed disruption against critical networks.

This same logic applies to space: probing ground stations, targeting commercial partners, corrupting data flows, manipulating supply chains, and undermining trust in space-enabled services. Russia does not need to destroy satellites if it can corrupt the information they provide or compromise the systems that depend on them.

Russia's behavior in Ukraine also offers a preview of how it views a future space conflict. Smartphones became sensors; metadata became artillery cues; civilian apps became battlespace terrain. Russia weaponized everyday digital infrastructure, turning the information layer itself into a domain of contest. The same principle applies in space: shape the information, and you shape the fight.

Looking toward 2040, Russia is unlikely to match China's industrial momentum or launch cadence. Still, it will remain an unpredictable and disruptive actor, advancing mobile counterspace concepts, refining electronic warfare forces, expanding cyber capabilities, and exploiting ambiguity to create decision latency for U.S. commanders.

Russia's real challenge lies not in matching U.S. capability, but in complicating decision-making at the exact moment a decision is required. In competition through conflict, where opportunities are fleeting and windows of action narrow, even brief delays or confusion can have outsized operational consequences.

Russia creates decision dilemmas not through mass, but through manipulation—distorting the battlespace, eroding situational awareness, and inducing hesitation at decisive moments.

Its objective is to deny the U.S. the clarity and confidence required to act at speed. Understanding this strategy of engineered uncertainty is essential to preparing the Joint Warfighter for any competitor that seeks advantage through the deliberate manipulation of the information that enables space superiority.

Russia's strategy shows how a nation constrained in one part of the effect chain can still impose risk by concentrating elsewhere. But the competition landscape is broader than just the major powers. Across the world, nations pursue space advantage for different motives, at varying speeds, and through different parts of the effect chain. Recognizing this uneven landscape is critical for understanding both risks and opportunities.

EMERGING SPACE POWERS: ADVANTAGE IN UNEVEN CAPABILITY

No two nations follow the same path to achieve space advantage. Some focus on launch and satellites; others emphasize the links, infrastructure, and pathways that enable the broader effect chain. At any stage of development, gains across ground-to-space, space-to-space, and space-to-ground architectures can translate into meaningful operational leverage. A nation may lag in spacecraft development yet lead in cyber, jamming, or data processing. Another may excel commercially or scientifically, shifting global norms or markets. Neglect in one area of the effect chain does not imply irrelevance. Nations that appear modest may hold unexpected influence; strengths in one part of the effect chain can shape the space operating environment, while advantages across the entire effect chain can reshape it. Uneven capability does not diminish relevance—on the contrary, it is becoming the defining feature of competition.

OPPORTUNITIES: A BROADENING LANDSCAPE OF SPACEFARING NATIONS

As space becomes more accessible, a widening network of nations is shaping the domain in ways that reflect their unique strengths, priorities, and requirements.

Many like-minded spacefaring states, some of whom were not traditionally viewed as major military powers, are advancing rapidly. Poland is shifting from a consumer to a contributor, increasing its scientific research activity and expanding industrial investment through growing participation in European Space Agency programs.

Norway, as a high-latitude space actor, brings niche but strategically relevant capabilities and recently reinforced its alignment with U.S. and allied norms through ratification of the Artemis Accords.

The United Arab Emirates continues to accelerate regional space innovation through sustained national investment and ambitious exploration programs, including the Emirates Mars Mission and emerging lunar initiatives.

Luxembourg shapes the commercial space landscape by advancing forward-leaning legal and regulatory frameworks for space resources and private enterprise, influencing how global commercial activity evolves in the domain.

These examples do not indicate specific policy or partnership direction. They highlight a broader trend: the landscape of capable, space-engaged nations is expanding, and their contributions, whether scientific, commercial, legal, or technological, will increasingly influence how the operating environment evolves by 2040 and beyond. This growth diversifies the space environment and creates new avenues for cooperation, stability, and shared stewardship of the domain.

As this network expands, larger and more strategically autonomous nations are also accelerating their space activities, reshaping regional balances and global expectations. These actors do not fit neatly into traditional categories; instead, they follow their own paths, driven by national priorities and evolving interests. Their growing capabilities exemplify how uneven investments, applied with scale and intent, can generate influence that extends far beyond the technical sophistication of any single part of the effect chain.

India is a leading example of this dynamic. Rooted in strategic autonomy and supported by a mature spacecraft program, India is expanding its presence across dual-use, commercial, and scientific sectors. It has long demonstrated spacecraft proficiency and is now deepening investments in link and ground capabilities shaped by regional pressures and a rapidly growing commercial system. While pursuing its own national objectives, India's interests increasingly converge with those of the U.S. on transparency, stability, and responsible space activity.

India's trajectory reflects how uneven capability, applied at scale and with deliberate purpose, can shape norms, influence regional dynamics, and strengthen the broader space environment. As one of the world's most capable emerging space powers, India represents a significant opportunity for the U.S. to deepen cooperation where strategic interests align, demonstrating how expanding capacity among autonomous nations can broaden, rather than narrow, the avenues for collaboration in a complex domain.

DISRUPTORS: TARGETED INVESTMENT AND ASYMMETRIC INFLUENCE

Yet the same dynamic that creates new opportunities for cooperation also enables states to generate challenges through targeted, asymmetric investment. Not all emerging space powers expand their capabilities to contribute to stability; some focus narrowly on areas of the effect chain that allow them to disrupt, deny, or complicate operations. The growing diversity of investment patterns, whether aimed at contribution or disruption, shows how uneven capability can either strengthen collective advantage or create strategic friction.

Iran

Iran illustrates how targeted investment across portions of the effect chain can create disproportionate influence. While its launch and spacecraft capabilities remain limited, Iran has directed resources toward cyber and electronic warfare systems designed to disrupt communications, navigation, and precision weapons. These focused investments allow Iran to generate asymmetric leverage that exceeds what its on-orbit presence suggests.

COMPETING FOR SPACE ADVANTAGE

Recent operations further demonstrate how a medium military power can threaten U.S. and allied operations. Unlike previous conflicts in Iraq, Afghanistan, or Libya, Iran deliberately targets U.S. space-enabling infrastructure from the opening phases of conflict.

In 2025, Iran's strike against the Modernized Enterprise Terminal radome at Al Udeid Air Base in Qatar reinforced this reality. Rather than broadly attacking the installation, Iran targeted infrastructure supporting U.S. communications and space-enabled operations, demonstrating an understanding of the critical nodes underpinning Joint Force power.

The Modernized Enterprise Terminal, housed within the radome, provides satellite communications support to Joint Force warfighters.

A geodisc radome at Al Udeid Air Base before destruction during the June 2025 Iranian missile attack.

This approach continued during OPERATION EPIC FURY, where Iranian forces contested the electromagnetic spectrum while targeting radar systems, communication nodes, missile warning architecture, and other fixed infrastructure supporting U.S. operations across U.S. Central Command's area of responsibility. Using over-the-horizon ballistic missiles and one-way attack drones, Iran demonstrated that future conflicts will extend across both the physical and informational layers of the space-enabled operating environment.

Iran's attacks reflected a deliberate understanding of the effect chain: degrading the Joint Force's ability to see, communicate, decide, and act can generate operational advantage even without dominant on-orbit capability.

OPERATION EPIC FURY demonstrated how adversaries increasingly combine physical strikes, electromagnetic effects, and commercially enabled targeting data to create operational advantage. Iran's reported use of commercially sourced, AI-enhanced satellite imagery, including imagery provided through Chinese commercial entities, to improve targeting against U.S. positions reflects how commercially accessible imagery, automated analysis, and publicly available data are eroding precision-strike advantages once held primarily by major powers. This transformation is not conceptual—it is already reshaping modern conflict.

This reflects a broader shift in the operating environment: adversaries no longer need to independently build exquisite sovereign space architectures to generate meaningful military effects. Through commercial partnerships, foreign-enabled capabilities,

and automated analysis, competitors can pool resources to impose disproportionate operational risk at significantly lower cost and investment.

These developments represent the operationalization of many trends projected throughout this environment. As these capabilities continue to evolve, they will compress decision cycles, expand targeting capacity, and intensify the cognitive burden placed on commanders and warfighters operating in contested environments.

OPERATION EPIC FURY reinforces this reality: ubiquitous intelligence, surveillance, and reconnaissance (ISR), commercially enabled targeting, and automated analysis are collapsing the distinction between rear areas and contested spaces. Future adversaries will increasingly surveil, characterize, and target fixed infrastructure long before conflict formally begins.

North Korea

North Korea reflects a similar pattern, shaped more by regime survival than by technological competition. Despite limited digital infrastructure, it has cultivated a sophisticated cyber force and pursued missile-linked space activity. North Korea demonstrates that a nation does not need a large or advanced space program to affect the domain—only the willingness to concentrate resources on areas of the effect chain where disruption is feasible and strategically meaningful.

These patterns of opportunity, autonomy, and disruption show that nations are shaping the space domain in ways that no longer cleanly map to traditional categories of allies, competitors, or threats. Instead, their influence stems from where and how they invest across the broader effect chain, and from how those choices intersect with national priorities, commercial expansion, and regional dynamics.

Taken together, these examples underscore a key insight: nations evolve at different rates, prioritize different parts of the effect chain, and influence the space domain in different ways and at different times. Some accelerate capability through scientific or commercial innovation; others leverage strategic autonomy to shape regional balances; still others pursue disruption through concentrated investment in the critical portions of the effect chain.

For the Joint Force, the implication is clear: understanding the future operating environment requires more than tracking full-spectrum space programs. It demands attention to how uneven capability, whether constructive or disruptive, creates new sources of leverage, influence, partnership potential, and risk. Recognizing where these capabilities emerge, how they are applied, and where interests converge or diverge will be essential to anticipating how competition unfolds.

This wider appreciation of emerging state actors sets the stage for the next dimension of competition: commercial space.

Competition is no longer driven solely by state actors. The commercial sector is moving at speed, with creativity and scale, reshaping what is possible in the space domain. Industry, venture-backed startups, and non-traditional actors are now driving the technologies, services, and infrastructures that will define the Joint Force's freedom of action. For the U.S., this is not just an advantage—it is *the* advantage. Commercial momentum is a

force we can harness, a source of innovation we can elevate, and a strategic opportunity we cannot afford to overlook.

PRIVATE INDUSTRY: THE NEW ENGINES OF SPACEPOWER

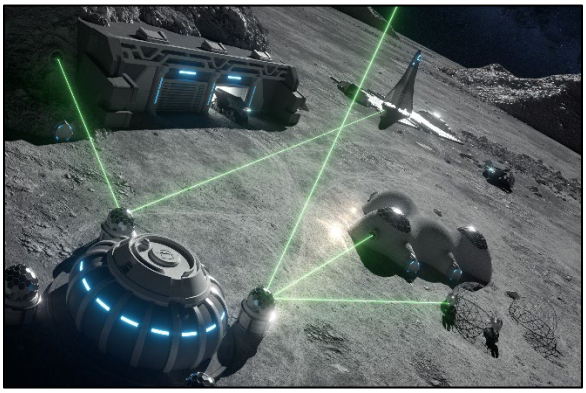
"For 25 years, we approached space with a certain amount of derring-do. It was the last frontier, and we would be its first pioneers. Space seemed like a vast, black desert, but now we're ready to make the desert bloom. I'm talking about opening space up to business, to private enterprise; opening space up to commerce and experimentation, and development. Why? To improve the quality of life on Earth."

– President Ronald W. Reagan, July 21, 1984

Spacepower is no longer shaped solely by governments. Falling launch costs and expanding access to on-orbit services are accelerating this shift, enabling more nations, companies, and research institutions to participate directly in space. An expanding innovation environment: commercial industry, venture-backed startups, non-space corporations, and academia are now driving the next wave of transformative capability.

The global space economy is projected to reach $1.8 trillion by 2035, but the significance lies not in the number itself but in the trajectory of growth. Space-enabled technologies already influence how we live, move, and connect. By 2040, they will be the engine behind advancements across logistics, agriculture, retail, energy, disaster response, and countless other sectors.

Breakthrough development is no longer confined to government labs. It is expanding across private enterprises, university research hubs, and venture capitalists, all of which are accelerating progress in advanced materials, autonomous systems, AI, in-space manufacturing, dual-use technologies, and emerging on-orbit data centers designed to support the growing computational and energy demands of AI.



Engineers and visionaries from Lockheed Martin Corporation unveil their "Destination Space 2050" vision.

These orbital infrastructures may eventually rival or exceed today's proliferated communications constellations in both scale and strategic significance. These spillover effects, where space and terrestrial innovations continually reinforce one another, are reshaping global markets.

GPS was only the beginning. By 2040, the boundary between national power and commercial innovation will be nearly indistinguishable.

In this environment, space advantage will depend less on who can build the largest rocket and more on who can harness the speed, creativity, and diversity of this

innovative landscape. Here, the U.S. holds a natural edge. No competitor can match the momentum of American industry, academia, and entrepreneurial culture. Together, they innovate at a pace traditional programs of record cannot match.

Advantage does not emerge on its own. We must pursue it deliberately. The Joint Force cannot continue to see commercial and academic actors as vendors who hand over products at the end of a contract. They are *partners.*

Partners in competition, co-investors in national power, with as much at stake in U.S. success as we do. This mindset shift is not optional; it is essential. When we treat commercial and academic actors as true partners, we expand our magazine depth, accelerate capability development, and unlock access to technologies that can be fielded, refreshed, and iterated far faster than traditional models allow.

Their speed becomes our speed. Their ingenuity becomes our advantage. When integrated effectively, this partnership is a force multiplier—adding resilience, redundancy, and adaptability across the broader effect chain in ways that government alone cannot achieve.

For the warfighter, this is decisive. The emerging innovation environment is not peripheral to U.S. spacepower—it is central to it. It is momentum we must harness, a source of strength we must elevate, and the foundation for the competitive advantage we intend to carry into 2040 and beyond.

As private industry accelerates innovation and deepens U.S. capabilities, an equally important dimension of competition is unfolding: the contest to shape the space environment in which these capabilities operate.

Speed and innovation grant an advantage, but access and stability determine whether that advantage can be exercised. This is where stewardship and the future of space debris emerge to define the strategic arena.

SPACE DEBRIS: STEWARDSHIP IS SOVEREIGNTY

The traditional view of space debris is simple: it is a hazard. It threatens satellites, complicates operations, and introduces catastrophic risk. But by 2040, space debris must be understood not only as a danger to be managed, but as a strategic constant, a defining feature of the space operating environment, and a persistent field of competition.

Debris is no longer an anomaly; it is the new "weather" of space. The question is no longer whether debris exists or how dangerous it is—we know it's real and a problem. The real question is: who will lead in defining how we operate through it?

A Japanese orbital-servicing pioneer captured the first close-up image of space debris.

When automobiles first appeared, roads were unpaved, tires were fragile, and a

single nail could end a journey. Over time, innovation made transportation safer and more resilient: better roads, stronger materials, and more reliable systems.

The same evolution is now unfolding in space. As the global space economy approaches $1.8 trillion by 2035, its trajectory reveals a powerful truth: debris has not halted growth—it has accelerated innovation. Space traffic management, active debris remediation, maneuver-enhancing technologies, and design approaches that reduce vulnerability are emerging because the environment demands it.

Whoever leads in stewardship, sustainability, and space traffic management will shape how everyone else operates. Controlling access means controlling advantage. Stewardship becomes a form of influence: it defines freedom of action, freedom of maneuver, acceptable behavior, and operational norms.

As debris grows, so does the threat. A single fragment no bigger than a pencil eraser can close at speeds more than 15,000 miles per hour faster than a 5.56 round leaving the barrel, turning the smallest object into a high-energy impactor with battlefield-level lethality. In this environment, nations will look for leadership. The U.S. must continue to set the standards for how the world launches, maneuvers, and recovers in space, because if we do not, others will.

Stewardship also strengthens our partnerships. The same actors driving innovation: commercial industry, academia, allies, and coalition space partners, depend on stability in the space environment and in the economic conditions that support research, investment, and growth. When the U.S. models responsible behavior, protects access to space, and establishes predictable norms and "rules of the road," we generate the pull that draws others toward us.

Stability becomes influence. Stewardship becomes strength. By shaping the environment in ways that promote safety, sustainability, and opportunity, we position ourselves as the partner of choice for nations and industries seeking a secure and prosperous space future.

For the Joint Force, reframing debris as a competitive domain means shifting from avoidance to mastery. It means developing concepts, partnerships, and capabilities that allow U.S. forces to operate confidently in increasingly congested orbits. It means leveraging private industry, allies, and emerging space partners, just as we rely on shipping lanes and air corridors.

Debris is here today, but it will not always remain the same. How we respond now will determine whether it stays a vulnerability or becomes a strategic lever. The nations that build, maintain, and govern the "orbital roads" of 2040 will influence the future of access, maneuver, and competition. Those who lead stewardship will help shape the space operating environment and the norms and expectations that preserve space superiority.

But leadership in the space environment also depends on how well we prepare ourselves—how we align, modernize, and strengthen the systems that underpin our advantage.

STRENGTHENING OUR INTERNAL ADVANTAGE

COMPETING FOR SPACE ADVANTAGE

Competition in space is shaped not only by external forces but also by the systems, structures, and practices we build for ourselves. As the Joint Force looks toward 2040, one of the most significant opportunities before us is improving how we align internally to match the speed and integration the environment requires.

Today's classification models, authorities, and legacy processes were built for a different era. They have served us well, but they now struggle to keep pace with our allies, partners, commercial innovators, academic institutions, and Joint teammates who increasingly underpin our future advantage.

Information that could accelerate shared understanding or operational coordination often moves more slowly than the environment demands. In an age when our closest partners operate similar sensors, analyze the same data, and fly many identical spacecraft, holding information too tightly can narrow our collective field of view. This is an opportunity to modernize, to align, and to unlock the full strength of the partnerships already central to our mission.

Gen. Stephen N. Whiting, Commander of U.S. Space Command, greets Lt. Gen. Gunter Schneider, Director-General for Military Strategy and Operations.

Our competitors move information, technology, and innovation with fewer internal seams. To remain ahead, we must ensure that the structures designed to protect our advantage also enable it.

Looking forward, the Joint Force has an opportunity to reexamine how we manage information, define "need to know," and design data-sharing pathways with trusted partners who expand resilience, increase capacity, and strengthen our operational edge.

We can evolve in ways that protect proprietary commercial data while keeping it usable, that ensure allied and partnered insights flow with minimal friction, and that prevent well-intentioned safeguards from inadvertently slowing the pace of innovation and integration.

Our challenge is not a lack of capability; it is ensuring that our internal processes keep pace with the environment's momentum.

The future will belong to those who share, integrate, and act with agility. If we want to lead in 2040, we must align the mechanisms that empower collaboration across the Joint Force and with the broader system we rely upon.

This is about elevating our ambition, modernizing our frameworks, strengthening our partnerships, and building a Joint Force that can collaborate at the speed the space domain demands. Our partners are ready. Our opportunities are clear. And our advantage will grow as we move forward together.

SETTING THE CONDITIONS FOR THE JOINT WARFIGHTER

Competition in space is not a contest of platforms; it is a contest of understanding.

COMPETING FOR SPACE ADVANTAGE

Space advantage does not come from any single capability, but from how the Joint Force internalizes the realities of the space operating environment: technological, physical, political, and human.

By 2040, this environment will be defined by massed architectures, forces maneuvering through congested and contested orbits and locales; commercial–military technologies that deliver capability at speed; and a global network of partners whose contributions continue to expand.

It will be shaped by norms still forming, authorities that must evolve, and information flowing at machine tempo, demanding rapid integration of effects across every domain.

Understanding this environment frames the architectures we design, the partnerships we cultivate, and the authorities we align with to remain effective in 2040 and beyond.

Understanding the space operating environment is not enough. The Joint Warfighter must be able to fight, adapt, and prevail within this environment.

That requires a force able to operate through congestion and disruption; leverage commercial speed and both allied and partner integration; and regenerate space capabilities quickly.

It requires decision-advantage at tempo, where windows are measured in seconds, and a force strengthened, not constrained, by partners and the systems we build around them.

Preparing for this future is not abstract; it requires the kind of disciplined imagination that enables us to identify opportunities, anticipate risks, and posture the Joint Force with intent. It shapes how we prepare for an operating environment that will be increasingly crowded, contested, interconnected, and essential to every mission.

U.S. spacepower will remain decisive not because our systems are the most exquisite, but because we understand the environment better, integrate across it faster, and act with greater purpose and clarity.

“Lethality is our calling card and victory our only acceptable end state.”

— Secretary of War Pete Hegseth
September 30, 2025

WHY SPACE TRENDS MATTER TO THE JOINT WARFIGHTER

The future of space is changing rapidly, but the warfighter is not. Across every era of conflict, the same human constants endure: the need to *sense* what is happening around us, to *connect* with others, to *communicate* intent, to *coordinate* action, and to *decide* under pressure.

These needs are not technological. They are the instincts of a social species that fights, survives, and succeeds only through shared understanding and collective action.

By 2040, those human requirements will still anchor the Joint Force. What will change is *how* they are fulfilled. The distances will be greater. The timelines will be shorter. The volume of information will be heavier. And the technologies that meet those timeless needs will increasingly depend on systems operating seamlessly from ground-to-space, space-to-space, and space-to-ground.

Space has become the backbone of modern military operations: the invisible architecture that carries the warfighter's most basic requirements across continents, oceans, and domains.

Capt. Kevin Louis, commanding officer, USS Frank E. Petersen Jr. (DDG 121), speaks with Gen. Stephen Whiting, U.S. Space Command Commander.

When space is contested, degraded, or denied, the Joint Force is not simply inconvenienced—it is placed at risk. It threatens the warfighter's ability to clearly see the operational environment, maintain trust in positioning, navigation, and timing (PNT), communicate with teammates, and make decisions with confidence.

As adversaries field capabilities designed to fracture connectivity, obscure truth, disrupt timing, and overwhelm awareness, the Joint Force will face increasing pressure on every one of these human constants.

Contested satellite communications will attempt to isolate units and sever the connective tissue that binds dispersed formations. Jamming and spoofing of PNT signals will threaten the warfighter's ability to maneuver with precision or synchronize effects. Space-based sensing and domain awareness will be challenged by proliferation, maneuver, and deception, all aimed at compressing decision timelines to their breaking point.

By 2040, advanced missile threats will compress decision timelines to seconds, increasing the importance of resilient, integrated architectures capable of sustaining trusted sensing, tracking, and communication across ground-to-space, space-to-space, and space-to-ground operations simultaneously. Yet the same trends compressing decision timelines also create opportunities to strengthen, not weaken, warfighter advantage.

Commercial partnerships open pathways to resilient, multi-path communications architectures that can route around disruption rather than collapse under it.

Mesh networks and hybrid orbits create new ways to maintain connection under fire.

Alternative and hardened timing sources can restore trust when GPS is contested.

Predictive Space Domain Awareness powered by AI can shift the Joint Force from merely reacting to anticipating, enabling faster, more confident decisions even in complex, multi-domain environments.

These space trends matter because they directly shape the warfighter's most intrinsic needs; they define how effectively the Joint Warfighter will be able to sense the environment, stay connected, communicate intent, coordinate action, and make clear decisions when it matters most.

The human constant will not change by 2040, but the environment that enables it will. The Joint Force must understand how space trends are reshaping the very foundation of warfighter effectiveness, and act now to ensure those timeless human needs remain met, even in a contested, congested, and competitive domain.

THE EFFECT CHAIN: WHERE WARFIGHTER ADVANTAGE IS WON OR LOST

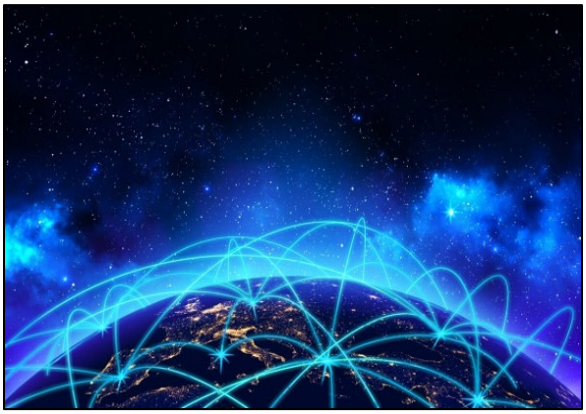
Every space-enabled effect that reaches a warfighter moves through the full effect chain: ground-to-space, space-to-space, and space-to-ground.

These effects are enabled through interconnected spacecraft, links, networks, and ground infrastructure that together create, transport, and deliver operational advantage.

If any part of the effect chain is disrupted, the warfighter feels it immediately—delayed awareness, broken connectivity, degraded timing, disrupted decisions, and a loss of trust in what they see.

In the future operating environment, where tempo accelerates and complexity grows, understanding this chain is essential to understanding where power and vulnerability truly reside.

The effect chain offers a clear framework for interpreting how emerging trends shape the Joint Force's ability to sense, connect, communicate, coordinate, and decide. But the chain is not a simple linear path. In practice, it behaves like an ecosystem, interdependent, adaptive, and continually reshaping itself.



A depiction of the operational effect chain across ground-to-space, space-to-space, and space-to-ground.

A breakthrough in satellite resilience strengthens one part of the effect chain, but it also alters how information and effects move across the rest of it.

Commercial proliferation does not merely expand the link; it forces new approaches to data trust, routing, and multi-orbit maneuver.

AI flows across the entire chain, enhancing sensing in space, optimizing data transport

through the link, and accelerating fusion, analytics, and decision support on the ground.

Within this system, every trend has dual consequences. Each one opens opportunities that can expand warfighter advantage if we harness them holistically.

Yet each also creates new seams, places where a competitor can impose cost, confusion, or delay. Adversaries will search for the weak points. The Joint Force must understand those same points to reinforce them, close them, or redesign them entirely.

This is why U.S. Space Command must organize its understanding of the future space operating environment around the effect chain, not as a technical construct, but because it represents the real-world journey of a space-enabled effect as it reaches the warfighter. It is through this chain that battlefield awareness is gained, timing is trusted, fires are synchronized, and decisions are made at the speed the fight will demand. And it is through this chain that disruption travels just as quickly.

Viewing the future through this lens allows us to see the operating environment as the warfighter experiences it. Effects travel through the chain; so do opportunity and risk. And the trends that follow in this chapter each influence one or more parts of that chain, shaping how effectively and confidently the Joint Force can operate in 2040 and beyond.

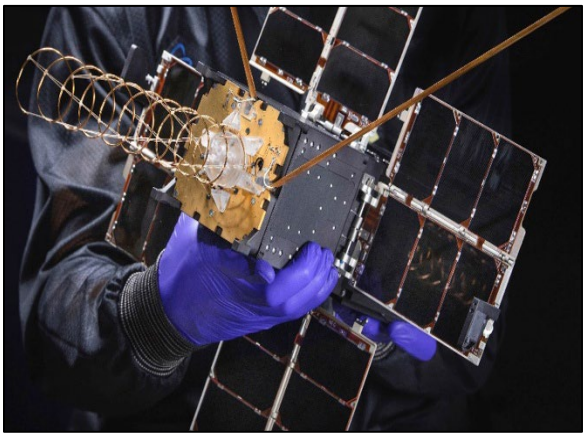
ON-ORBIT ARCHITECTURES: WHAT ORBIT MUST DELIVER FOR WARFIGHTERS

The warfighter is not concerned with what platform delivers the effect they depend on, nor should they be. What matters is that the capability reaches them reliably and predictably, even under fire.

For the Joint Force of 2040 and beyond, this requires an on-orbit architecture that is survivable, maneuverable, replaceable, and deeply integrated with commercial partners who now hold a decisive share of the world's orbital infrastructure.

A spacecraft's value emerges only insofar as it enables effects across the broader ground-to-space, space-to-space, and space-to-ground chain—moving data, withstanding stress, and delivering operational advantage to the warfighters, systems, and missions that depend on it.

Future trends above 100 km altitude show a marked trajectory: space architectures will proliferate, be networked, and increasingly become dual-use. But these trends matter, not because they change what satellites are, but because they change what warfighters can *do*.



The U.S. Army Space and Missile Defense Command deployed a joint capability CubeSat into orbit.

As space proliferates across LEO, MEO, GEO, cislunar orbits, and the Lagrange points, the on-orbit portion of the effect

chain will shift from a small number of exquisite platforms to an adaptive, resilient network of many. This transformation is driven by the deployment of smaller, more cost-effective satellites, which inherently introduce greater resilience, complicate adversary targeting, and ensure persistent effects—even under sustained attack.

Furthermore, the move toward these new architectures introduces novel orbital configurations that leverage gravitational forces for enhanced efficiency and unique operational advantages. These configurations introduce elements that go beyond our current understanding of space operations, particularly in terms of emergent behaviors that arise from such complex, dynamic systems.

A constellation built this way does not break all at once; it bends, reroutes, regenerates, and continues to deliver intelligence, PNT, and communications when the Joint Force needs them most.

This shift is not about satellites; it is about mission assurance. The mastery and application of novel orbits are a strategic imperative for ensuring the resilience of U.S. space capabilities, deterring conflict, and ensuring space superiority. It gives U.S. Space Command the ability to rapidly replace capability, reconstitute under pressure, sustain effects, and maneuver without regret in ways a small number of high-value assets never could.

At the same time, dual-use commercial capability is no longer optional; it is foundational. The commercial sector now routinely develops and operates space systems that offer capabilities traditionally associated with national security missions: imagery, communications, sensing, launch, and increasingly sophisticated data services.

By 2040, commercial spacecraft will form a critical part of the effect chain, providing data and services that flow directly to analysts, commanders, and operators at every echelon. These systems are not "nice-to-have" enablers; they will be frontline contributors to ISR, targeting support, communications resilience, and battle damage assessments.

This access, however, cuts both ways. "Space as a service" models will be available to anyone who can pay, giving competitors opportunities to leverage commercial imagery, communications, and data services to offset U.S. advantage. This dual-access environment makes integration, trust, contracting mechanisms, and joint training on commercial architectures not simply beneficial but mandatory.

The next evolution comes from on-orbit maneuver and sustainment. In a future where satellites can rendezvous, refuel, repair, or replace components in space, on-orbit architectures become dynamic rather than fixed.

This unlocks new advantages: repositioning ISR or PNT assets to meet emerging needs, restoring sensors damaged by debris or interference, and extending the useful life of critical systems beyond the limits of fuel alone. These capabilities also reshape the competitive environment. Competitors will pursue their own proximity operations and co-orbiting tactics to impose risk or uncertainty. The side that can maneuver persistently and at scale will set the operational rhythm in orbit.

Taken together, these trends redefine what orbit must deliver: survivability through numbers, mobility through sustained propulsion and servicing, replaceability through commercial capacity, and resilience through hybrid architectures that do not rely on any single platform or partner.

These operational imperatives are designed to preserve trusted space effects under persistent contest. Yet some emerging threats could do far more than disrupt individual systems or constellations; they could fundamentally alter the operating environment itself in ways that cascade across all domains. The most extreme manifestation of this risk would be the use of a nuclear weapon in space.

Historical testing during the Cold War demonstrated that high-altitude nuclear detonations can generate electromagnetic pulse effects, artificial radiation belts, and persistent radiation capable of degrading or destroying spacecraft across vast orbital regions far beyond the initial detonation point.

A nuclear bomb detonates in space on July 9, 1962.

In a densely populated 2040 environment, these effects could trigger cascading satellite failures, widespread debris generation, and collision chains that degrade access, maneuver, and survivability throughout the space domain for years.

A nuclear detonation in space could leave entire orbital regions contaminated, unstable, and effectively inaccessible long after the initial attack.

Even replacement spacecraft launched after the detonation could remain vulnerable to persistent radiation effects created by the detonation itself, causing systems to degrade or fail long after the initial detonation, further delaying the reconstitution of space-enabled capabilities.

The consequences would not remain confined to orbit. A nuclear detonation in space could simultaneously disrupt the communications, navigation, sensing, timing, logistics, financial systems, and critical infrastructure that modern militaries and societies rely upon every day.

Research and past testing have shown that electromagnetic pulse effects from high-altitude detonations can disable or destroy terrestrial electrical infrastructure far from the detonation site, including critical transformers and power distribution systems.

These realities reinforce the need to treat survivability, maneuver, resilience, and rapid reconstitution as foundational requirements for preserving warfighter advantage in a domain where disruption may extend far beyond the immediate target.

Spacepower is no longer measured solely by the number of satellites placed in orbit. It emerges from the resilience, integration, and survivability of the interconnected

systems that enable the Joint Force to fight, decide, and maneuver.

Proliferated spacecraft architectures help ensure communications continue despite jamming, dazzling, or localized attack. Dual-use space assets provide alternate imagery, redundancy, and broader sensing in a battlespace defined by denial and deception. Dynamic spacecraft maneuver allows essential coverage to be repositioned, restored, or expanded where and when the Joint Force needs it most.

To ensure future advantage, U.S. Space Command must plan with this mindset, leveraging commercial partners, integrating dual-use systems, enabling rapid replacement, and building constellations that endure the first strike and adapt to the second.

THE EFFECT CHAIN IN TRANSIT: THE LIFELINE CONNECTING ORBIT TO WARFIGHTER

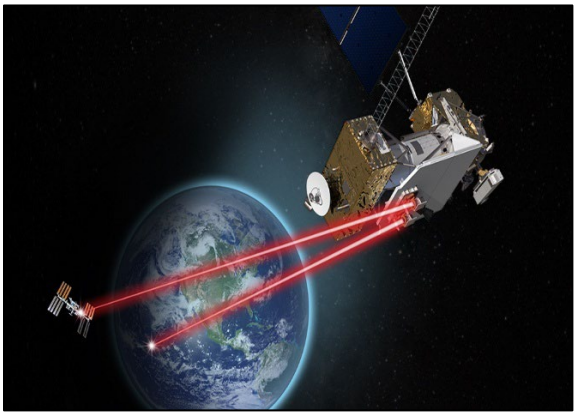
If the link fails, the space effect never reaches the warfighter. No other part of the effect chain has as immediate an impact.

The pathways that move data across space, through the atmosphere, and into the hands of warfighters are the lifelines that determine whether the Joint Force can sense, communicate, decide, and act.

Even the most advanced spacecraft, the most exquisite sensors, and the most capable ground nodes have no value if the link is jammed, broken, spoofed, or delayed. By 2040, disruption across this portion of the effect chain will carry consequences that the warfighter feels in real time.

The link underpins the entire effect chain. Ground-to-space, space-to-space, and space-to-ground operations all depend on the uninterrupted movement of trusted data, timing, and communications. Without it, sensing cannot inform decisions, decisions cannot synchronize action, and space-enabled effects cannot reach the warfighter.

Future trends point toward an environment where the link becomes faster, harder to detect, more resilient, and more autonomous, but also more contested.



Laser communications relay.

Laser communications and laser inter-satellite links will form high-capacity mesh networks in orbit, routing data around disruptions without relying on a single ground node.

Narrow, directed optical pathways will be far more difficult for adversaries to detect, intercept, or jam, creating a quieter and more protected communications environment for C2, targeting data, and ISR. For the Joint Force, this means reduced latency, higher trust, and the ability to maintain kill chains even when traditional links are under attack.

But speed and survivability are only part of the story. The connections that carry

information across the effect chain will increasingly bypass legacy infrastructure entirely. The proliferation of direct-to-device communications will connect everyday handhelds, vehicles, and sensors directly to satellites. This will be transformational for distributed, disaggregated forces who must operate at the tactical edge with little or no ground-based communications support.

When fiber is cut, towers are down, and critical C2 nodes are targeted, direct-to-device connections will allow frontline units to receive the information they need to maneuver, communicate, and survive. In a future defined by fragmentation and contested logistics, this represents a profound shift in how the Joint Force maintains continuity.

Yet the most significant challenge will come from deliberate interference. By 2040, jamming, spoofing, and spectrum congestion will be persistent features of conflict. Adversaries will target the links that carry our PNT, communications, and sensing data to fracture situational awareness and degrade trust.

A jammed link can delay fires. A spoofed signal can mislead aircraft or unmanned systems into lethal airspace. A congested spectrum can slow communications at precisely the moment when speed defines survival. The warfighter will experience these effects directly, not as technical anomalies, but as moments of uncertainty in life-or-death situations. This is why the next leap in resilience will not come from hardware alone but from autonomy.

A Marine setting up a communications antenna.

AI will play a decisive role in routing data, predicting disruptions, and reconfiguring networks in real time. AI will anticipate link blockages due to terrain or weather, detect jamming attempts, identify congestion patterns, and reroute traffic to healthier pathways, often before the user even notices a degradation.

It will perform predictive maintenance, detect failing components, and autonomously reconfigure network segments to maintain continuity. This is self-healing connectivity at operational scale, and it is essential because the warfighter cannot afford to wait minutes or hours for a network to recover. They will need the effect now.

At the same time, the year 2040 will also bring new risks to encryption and timing. Quantum computing threatens to break today's cryptographic standards, making quantum-resistant encryption imperative for every secure link that touches national security.

Meanwhile, traditional GPS signals will be jammed and spoofed at a frequency far greater than today. Ensuring resilient PNT, through diversified timing sources, protected signals, and hybrid architectures,

will be foundational to preserving freedom of maneuver, precision fires, and synchronized effects across all domains.

Taken together, these trends redefine what the connective layer must deliver: low-latency, high-resilience pathways; jam-resistant communications; self-healing networks; trusted timing; protected data; and the ability to connect forces at the tactical edge without relying on vulnerable infrastructure.

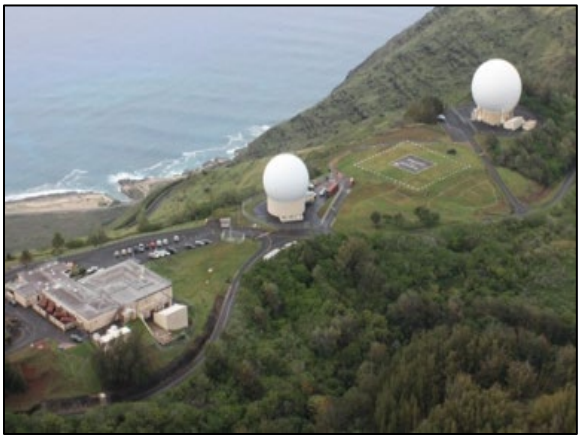
These connective pathways are the heartbeat of the effect chain. It is the point where advantage becomes real or evaporates. To ensure warfighter confidence, U.S. Space Command must plan for a future in which links are contested from the first minute of conflict, in which autonomy preserves continuity, and in which no single disruption can sever the connection between orbit and the warfighters who depend on it.

The warfighter will never ask whether the data came through a laser link, a direct-to-device connection, an AI-optimized mesh network, or a quantum-resistant, encrypted signal. They will ask if it arrived on time, uncorrupted, and under fire.

GROUND INFRASTRUCTURE: PHYSICAL ANCHOR OF SPACEPOWER

Ground nodes are the physical anchor of spacepower, the point where space effects become usable information, trusted timing, or actionable intelligence for the Joint Force. They are also the most exposed part of the effect chain.

Ground systems sit on sovereign territory, in coalition environments, commercial facilities, austere forward locations, and even on the lunar surface.



Radomes by the sea.

They can be targeted physically, electronically, and digitally. Because the warfighter experiences the success or failure of the entire space enterprise through these nodes, their survivability, mobility, and resilience will be essential to space superiority in 2040.

Static ground nodes, once the norm, will become liabilities. They represent single points of failure that adversaries can attack through cyber intrusion, directed energy, precision fires, or sabotage. In a future where space effects must persist through the first strike, fixed infrastructure will be targeted early and often.

The Joint Force must move beyond an architecture built around immobile gateways and instead adopt a distributed, mobile ground layer that complicates targeting, absorbs disruption, and preserves continuity of operations.

A proliferated ground network will transform the final tactical mile from a vulnerability into an asset, with nodes that can move, hide, and reconstitute.

This shift also requires a change in how we view C2. Future C2 cannot depend on a handful of hardened centers. It must be distributed, cloud-enabled, coalition-ready, and seamlessly integrated with commercial partners.

Cloud-native C2 introduces risk; adversaries can hide malicious activity within legitimate network traffic, but it also creates opportunities for resilient, scalable, self-healing infrastructure.

Leveraging commercial cloud architectures, zero-trust cybersecurity, and continuous authentication ensures that the fight can continue even when systems are under coordinated digital assault. Warfighters cannot spend their time fighting the network; the network must be built to fight for them.

Commercial integration will accelerate across the ground enterprise. Where governments once owned bespoke systems, the future will rely on shared operating floors, partner processing centers, and contracts that enable rapid failover to commercial services. This is not simply about efficiency; it is about survival.

When a forward unit experiences satellite communications interference, the ability to route traffic through a commercial LEO constellation, a lunar-orbit constellation, or even a Lagrange point may be the difference between mission success and isolation.

When a ground node is compromised, commercial processing and downlink options maintain intelligence continuity without waiting for military-only assets to recover.

The Joint Force must train for this reality: warfighters, commercial partners, allies, and coalition partners working side-by-side to deliver effects at the speed the fight demands.

Automation will also play a decisive role. By 2040, routine satellite operations, health checks, station keeping, anomaly resolution, and traffic management will be primarily handled by automated systems. This shift is not about removing humans from the loop; it is about freeing warfighters to focus on warfighting tasks rather than technical chores.

When automated networks detect disruptions, predict failures, or reroute data before a human notices a problem, the Joint Force gains time, arguably the most valuable commodity in contested operations.

Automated orchestration across the ground layer will enable self-healing networks that keep PNT, communications, and intelligence flowing to forces who cannot afford delay.

All of this leads to one conclusion: ground infrastructure shapes how spacepower is felt in the fight. It is where timing becomes trusted, where imagery becomes insight, where communications become coordination, and where operators translate space effects into action. But it is also where adversaries will concentrate their efforts—cyber exploitation, physical disruption, misinformation campaigns, and attacks on commercial dependencies.

To preserve advantage, ground infrastructure must evolve into a resilient, mobile, distributed network, one that blends military, commercial, and coalition capabilities; one that shifts C2 from static to

adaptive; and one that allows warfighters to focus on winning the fight rather than fighting the network.

WHAT THE JOINT FORCE MUST DO

As a whole, these trends demand that the Joint Force think differently about how we fight, train, communicate, and command.

Space is no longer a supporting function that sits off to the side of the fight; it is a domain where competition is continuous and intensifies the moment conflict begins.

Yet even as technology accelerates, the fundamental requirements remain unchanged. Every mission depends on four enduring needs: awareness, secure connectivity, decision advantage, and operational tempo. Everything U.S. Space Command and its partners do from this point forward must protect and strengthen those human constants.

Preserving those human constants in a contested and continuously competitive environment will require far more than static architectures or isolated resilience measures. The Joint Force must be able to sustain trusted space-enabled effects while maneuvering through disruption, degradation, and attack.

Resilience is foundational, but only if it enables sustained space maneuver and dynamic space operations that preserve freedom of action for the Joint Force. This is *maneuver warfare* within the space domain.

U.S. Space Command must be able to reposition capability, sustain effects under persistent attack, rapidly recover from disruption, and continue delivering trusted space-enabled effects without creating operational pauses for the Joint Force.

Maneuver within the space domain is far more complex than simply moving a satellite from one location to another; every maneuver carries operational consequences that can affect coverage, timing, communications, sensing, and mission continuity across the effect chain.

The objective is to preserve operational effectiveness and freedom of action while setting favorable conditions for the Joint Force.

In a domain defined by compression, disruption, and contested access, the side that can maneuver persistently across the effect chain, physically, digitally, cognitively, and organizationally, will retain the initiative and shape future operations.

Achieving this level of operational agility begins with training. Contested space can no longer be treated as a niche scenario. Warfighters must rehearse what happens when links are jammed, PNT is degraded, ISR is delayed, and the network fractures.

They must know how to navigate without GPS, communicate through disruption, and sustain combat effectiveness even when denied access to the space-enabled systems they have relied on for decades.

This is not regression. It is resilience. It ensures the warfighter can continue the mission when adversaries target the ground-to-space, space-to-space, and space-to-ground portions of the effect chain first.

Sustained maneuver warfare also requires architectures built to integrate allies and

commercial partners from the start, not bolt them on after systems are already fielded. Commercial providers already deliver unique capabilities, while allies and coalition partners bring access, geography, and operational reach.

A coalition space team from the U.S. Space Force, the Colombian Air Force, and the Ecuadorian Air Force deploys an ISR sensor.

Future ground stations, data gateways, satellites, and C2 frameworks must be built for interchangeability, rapid integration, and burden-sharing from their inception. This will require solving classification challenges, rethinking proprietary data rules, and enabling common standards.

The payoff is a resilient, diverse, multi-vector architecture that no adversary can collapse with a single strike.

Operational tempo will determine whether the Joint Force can sustain advantage in a 2040 fight. The Joint Force cannot approach future conflict with decision cycles, acquisition timelines, or force generation models designed for a different era. The Department has already initiated significant acquisition reforms intended to accelerate capability development, streamline processes, and expand collaboration with commercial industry. The challenge now is ensuring these reforms are faithfully executed in ways that deliver real operational capability to the warfighter on tactically relevant timelines.

This requires an effects-driven approach that prioritizes adaptability, rapid iteration, and sustained integration across the Joint Force while avoiding the high cost of duplicative effort. Early collaboration with commercial industry, academia, and coalition partners will remain essential because the future operating environment will be shaped by those who can integrate capability, innovation, and operational adaptation faster than their competitors.

Speed, adaptation, and maneuver are only possible if the underlying connective tissue of the Joint Force can survive persistent disruption and attack.

Maneuver warfare within the space domain also depends on hardening the connective tissue of the effect chain.

Links must be built to survive jamming, spoofing, and congestion through optical pathways, adaptive routing, and self-healing networks.

On-orbit architectures must also be able to maneuver, reconstitute, and sustain effects under persistent contest, ensuring the Joint Force can continue to operate even as adversaries attempt to disrupt or degrade space-enabled capabilities.

Ground nodes must be protected physically, electronically, and digitally, with redundancy, distribution, mobility, and zero-trust cyber principles as core design features.

An image taken in orbit has no value if it cannot be received. Target-quality data means nothing if interference blocks it. A

commander may have seconds to act; losing the link means losing the decision. Together, these efforts are not simply about building resilient architectures; they are about enabling maneuver warfare within the space domain and preserving the Joint Force's ability to seize and retain the initiative under persistent contest.

These operational imperatives frame what must be protected; the trends that follow reveal how the environment around them is beginning to shift.

Trends provide the contours of what comes next. They show where change is gathering momentum and where the Joint Force must adjust to preserve advantage. But the future is never shaped by trends alone. We can already detect subtle, ambiguous, and easy-to-overlook signals that can alter the operating environment in ways that matter deeply to the Joint Force. Understanding those early movements requires a different lens.

THE WATCHLIST: SIGNALS IN THE GRAY

WHERE THE FUTURE BEGINS

The future space operating environment is not shaped only by the trends we can already articulate with confidence. It is also shaped by what is beginning to stir at the edges of the domain: subtle movements in competitor behavior, unexpected breakthroughs in technology, commercial market shifts, new competitors appearing seemingly overnight, and strategic choices by other nations that hint at ambitions not yet declared. These shifts do not arrive fully formed.

Yet, these early indicators often precede the most consequential changes: a single test event, a curious investment pattern, an unexplained orbital maneuver, a breakthrough that seems minor until its implications cascade. This is the unfinished part of the future—the part that sits just beyond the horizon of current plans, but close enough to influence the battlespace the Joint Force will depend on.

These are the signals in the gray zone: emerging areas whose trajectories are not yet defined, but whose pull on the future is unmistakable. Understanding them before they harden into strategic realities is essential to securing space superiority.

PATTERNS BENEATH EMERGING SIGNALS

Signals do not behave the same way across all emerging areas. Some move slowly for years, then accelerate abruptly. Others appear in isolated breakthroughs that later reshape entire domains. Some require full architectures, hardware, software, timing, and behaviors to evolve together. Others begin in narrow technical advances that later alter operating norms.

These patterns come into sharper focus when viewed through the emerging areas that matter most to the Joint Force, such as cislunar expansion, quantum technologies, and AI-enabled autonomy. Each reveals itself in different ways. Their signals emerge at different speeds, rely on different immutables, and affect the warfighter at various points in the effect chain. Treating them as if they unfold along the same trajectory risks misunderstanding what they mean, when they matter, and how they combine.

They also do not evolve in isolation. Each of these areas is a distinct domain in its own right—and those domains influence one another. Advances in AI and machine learning can accelerate quantum hardware development through new materials and design discoveries. Quantum computing, in turn, promises leaps in computational power that could transform the scale and speed of AI model training. Cislunar activity shapes where architectures are built and where sensing, mobility, and logistics are positioned, thereby affecting how quantum- and AI-enabled systems are deployed and employed. These are interconnected domains, each bending the trajectory of the others.

An AI-powered robotic technology assistant.

To understand the future operating environment, these signals must be read on their own terms—where they begin, how quickly they move, what constraints shape them, and how their impacts propagate across spacecraft, links, and ground—and in terms of how they reinforce and accelerate one another. Only then can we begin to see where advantage may actually form.

FIRST-MOVER ADVANTAGE IN CISLUNAR SPACE

Cislunar space—the region between Earth, the Moon, and beyond—and the gravitational corridors that link them, is no longer an academic curiosity. It is becoming a domain of active pursuit by nations, commercial enterprises, researchers, and industrial actors who recognize its strategic potential.

China has outlined plans for human lunar missions and robotic resource infrastructure by mid-century; India, Japan, Europe, and multiple commercial ventures are moving with equal ambition.

Universities and laboratories are exploring propulsion, navigation, and the use of local lunar resources to enable sustained presence.

What makes cislunar relevant now is not speculation about future conflict, but the terrain itself. The space between Earth, the Moon, and the Lagrange points contains areas of gravitational stability, maneuver corridors, and vantage points where presence confers positional advantage.

These locations shape how assets move, how they observe, and how they maintain persistence with minimal energy. In any domain, control of key terrain shapes freedom of action; in space, there is no difference.

CAPSTONE, a microwave oven-sized CubeSat, will fly in cislunar space.

As activity grows, the most consequential question becomes one of first-mover advantage. The first actor to thoroughly map this environment, understand its natural chokepoints, establish mobility pathways, and define behavioral norms will shape the foundation upon which all others must operate.

First movers don't just arrive early; they shape the assumptions that guide everyone else. They influence how architectures are built, how routes are chosen, how resources are accessed, and what "normal" looks like. And as cislunar activity accelerates through competitor timelines, commercial ambitions, scientific breakthroughs, and evolving national strategies, those early choices will set the constraints and freedoms that define the wider space environment for decades.

Its trajectory is not yet settled, but its pull is unmistakable. In a region governed by physics and opportunity, early positioning is not simply advantageous—it is decisive.

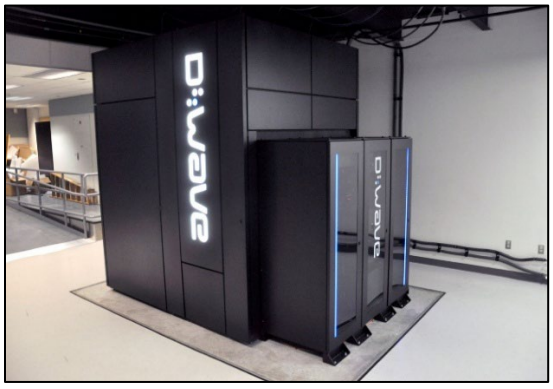
THE WATCHLIST: SIGNALS IN THE GRAY

THE QUANTUM HORIZON

Quantum technologies are often described as a single breakthrough waiting to emerge. In reality, quantum is an evolving field composed of multiple interconnected capabilities centered around three core pillars: quantum computing, quantum communication, and quantum sensing. Each advances on a different scientific and engineering timeline, depends on a different immutable, and carries distinct implications for the warfighter.

This makes quantum signals difficult to read. Focusing only on quantum computing, the most publicized and most misunderstood, misses the signals emerging in communication and sensing. Judging progress by growth alone overlooks the more profound shift underway: the move toward stability. Stability, not scale, is what determines whether quantum transitions from research to operational employment.

Signals of that transition are forming. International bodies are elevating quantum science. Governments are preparing post-quantum security standards. Public and private investment is shifting from exploration to acceleration. Industries and research institutions are forming clusters that link discovery to deployment.



Quantum computer located in the NASA Advanced Supercomputing (NAS) facility.

Quantum communication and sensing are moving beyond early experimentation. Governments are integrating them into pilot programs. Researchers are demonstrating systems that persist long enough and reliably enough to approach operational relevance. These developments are not isolated scientific milestones; collectively, they signal that quantum capabilities may soon shape architectures, timing, and the security assumptions that underpin future space operations.

Its implications arrive quickly. Quantum-resilient communication and sensing offer endurance in contested environments, but moving to post-quantum security is far from a simple update.

Legacy systems cannot plug into quantum-safe architectures, and a complete transition may take a decade or more—meaning the timeline for action begins well before the technology fully matures. The signal is clear: we cannot wait for quantum to arrive before preparing for its impact.

Conversations, planning, and early architectural choices made now will determine whether the Joint Force shapes the quantum era or must adapt to it under pressure as secure connectivity shifts.

THE CONVERGENCE OF AI AND AUTONOMY

AI is often understood through the lens of today's tools, better analytics, faster processing, and helpful automation. But that is not what AI represents in 2040 and beyond. Its significance is not in what it improves, but in what it reorganizes: the structure of sensing, the tempo of operations, and the pattern of decisions that emerge under pressure.

THE WATCHLIST: SIGNALS IN THE GRAY

AI-enabled operations break from the traditional C2 cycle: collect, process, decide, distribute. AI starts to reshape that structure. It connects sensors, platforms, weapons, and decision-makers into networks that learn continuously and work together. AI doesn't add a new system; it transforms how the entire fight connects and moves.

These highly integrated, resilient, and survivable networks, often described as kill meshes, do not behave like traditional networks. They can redistribute sensing, regenerate pathways when nodes are disrupted, and maintain tempo even under pressure. Disrupting one node does not collapse the whole; the mesh simply reorganizes. This resilience creates operational opportunity, but it also introduces new forms of complexity for commanders and warfighters.

AI-enabled kill meshes do not simply accelerate decision-making; they change its scale. Instead of a single sequential decision, commanders may face multiple, concurrent decisions, each with operational consequences, emerging within cycles measured in seconds.

AI-generated illustration of integrated AI-enabled joint warfighting systems.

The Joint Force has no precedent or training model for this environment. AI introduces a form of cognitive and temporal pressure that current C2 structures were not designed to absorb.

AI's signals appear not as a single breakthrough, but as distributed improvements, advances in sensing, coordination, timing, and adaptation that become meaningful only when they connect. Individually, they seem narrow. Together, they reveal an environment shaped less by hierarchy and more by continuous integration and adaptation.

These signals mark the edges of a future beginning to take shape. They show where momentum is building, where assumptions are shifting, and how choices made today will echo far beyond 2040. The path ahead is not predetermined; what matters is how we choose to move within it and the opportunities it unlocks for the Joint Force.

As AI reshapes the scale and tempo of military decisions, the human element becomes even more decisive. The Joint Force must be prepared not only to use AI, but to reorganize around it.

ADAPTIVE TALENT FOR ACCELERATED DECISION CYCLES

As decision cycles accelerate and AI-enabled systems shape the tempo of operations, the Joint Force will require more than technical specialists; it will require organizations capable of employing talent with agility.

Some of the expertise needed for 2040 already resides within our ranks, yet current structures often prevent these skills from being aligned, reconfigured, or shifted as missions evolve. Talent is not our shortage—alignment is.

THE WATCHLIST: SIGNALS IN THE GRAY

To preserve advantage, the Joint Force must be able to realign entire teams, branches, or divisions across functional boundaries when operational needs change. This requires not only permission but a culture that encourages such movement rather than fears it.

At the same time, new specialized skillsets will be essential to fill emerging gaps in data science, engineering, advanced analytics, and human–machine teaming. We must harness and mobilize the talent we already have, and augment it with new expertise where gaps exist.

Future advantage will depend on combining both: drawing on internal expertise and integrating new specialists as the environment demands. The greater risk is not talent gaps—it is talent trapped in static structures.

The Joint Force must reduce stovepipes, enable functional convergence, and create modular, mission-tailored teams capable of forming, dissolving, or integrating at the speed of the environment. This is not merely a staffing concern; it is an organizational-design imperative essential to preserving space superiority in 2040 and beyond.

OPPORTUNITIES BEYOND

A CALL TO THE JOINT FORCE

Space has always tested human imagination. Today, it tests our unity, discipline, and commitment to a mission larger than any single organization or era. The *SWE 2040* is a responsibility that demands a clear purpose and shared resolve.

Technology will evolve, and domains will continue to converge, but what the Joint Force requires from space endures: awareness, assurance, and the ability to act with speed and purpose. These immutable needs must guide every choice we make and every capability we pursue. The Joint Force turns to U.S. Space Command for protection and defense, stemming from our three moral responsibilities:

- We are obligated to provide space effects to the nation, Joint Force, and our allies and partners, across all levels of conflict.
- We must protect and defend our systems against evolving threats, ensuring resilience.
- We must safeguard our Homeland, the Joint Force, and our allies and partners from space-enabled attacks, preserving our strategic advantage and ensuring peace and stability.

Meeting these needs requires more than individual effort. Our strength comes from the principle that has carried American arms through every era of uncertainty: *we are stronger together*.

In space, partnership is a combat multiplier. Commercial innovators, academic pioneers, allies and coalition partners, industry leaders, and the Joint Force all move with greater power when they move together.

We do more than harden architectures—we strengthen collective resolve, bound by shared purpose and shared consequence.

This unity is essential when we recognize that every individual, whether in uniform or as a civilian, is a sentinel of space. From the ground forces relying on GPS, to aviators depending on a resilient link, to space professionals monitoring GEO tracks—every member of the Joint Force, at every level, is connected to this domain. We are all responsible for ensuring its security, integrity, and sustainability, because the entire Joint Force relies on space to operate and succeed.

And while space evolves rapidly, meaningful change often unfolds on a human timeline. We urge the Joint Force to act with speed, while recognizing that transformation requires time, investment, and a generation committed to the cause. Progress is built by those who design our framework, defend our networks, write our concepts, educate the next generation of warfighters, and choose to leave the domain stronger than they found it. We must build faster, think sharper, collaborate more effectively, and steward space with the seriousness it demands.

Space is a domain where American ingenuity, coalition strength, and Joint Force discipline create stability amid uncertainty. We are the ones who ensure the warfighter sees clearly, connects securely, decides confidently, and acts with purpose. We must also inspire the next generation to turn responsibility into an advantage—and an advantage into opportunity. The future will belong to those who shape it because there is **never a day without space**.