U.S. Space Force
Vision for a Digital Service

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As the only U.S. military Service to be established during the Information Age, the United States Space Force (USSF) has the unique opportunity to be "born digital." We will seize this opportunity. Space is a warfighting domain, and the threats we face cover great distances at tremendous speeds. We must embrace the Information Age tools at our disposal to ensure the domain is secure, stable, and accessible for our generation and the next. The USSF will become the world's first fully Digital Service. We will be *an interconnected, innovative, digitally dominant force*.

Becoming a Digital Service is more than just a generational opportunity; it is a warfighting imperative. This imperative is driven principally by two factors: (1) the nature of the threat and (2) the size of the Space Force. We know potential adversaries are developing a spectrum of threats at an alarming pace, directly challenging stability in space and the many benefits we enjoy as a spacefaring nation. To counter these threats, we must change the paradigm. We must act far more swiftly and decisively across all aspects of leadership, acquisition, engineering, intelligence, and operations in order to take up permanent residence inside the adversary's observe, orient, decide, act (OODA) loop. In addition, given the relatively small size of the USSF, accomplishing this goal will require us to amass a technologically adept, "digitally fluent" space cadre more proficient, efficient, and agile than any other force in history.

This forward-looking document begins by elaborating on the imperative driving us to be a Digital Service. It then describes an aspirational Vision of what it means to be a Digital Service, including introducing and defining key concepts forming the foundation of our collective digital fluency. This document also explains the four digital focus areas, their scope and importance, and how they relate. These focus areas provide a framework for implementation, which will shape a forthcoming roadmap for digital transformation.

Although I have entrusted our Technology and Innovation Office to lead the USSF digital transformation, it is not their responsibility alone. The fact is we are all pioneers of our nation's Space Force; it is incumbent on every one of us to forge ourselves into a Digital Service that welcomes **collaboration**, **boldness**, **continuous learning**, **diversity and inclusion**, and **adaptiveness**. Every Guardian, regardless of career field or background, should seize opportunities to adopt new technologies and migrate day-to-day activities into the "data space," as well as to encourage teammates where necessary on this journey.

This is our Vision for a Digital Service, and my call to action to every Guardian. Working together, we can make this Vision a reality. I am eager to see the incredible future we will create.

JOHN W. RAYMOND
General, USSF
Chief of Space Operations

WHY DIGITAL AND WHY NOW?

The fundamental reason for the creation of our Service dictates why we must be a Digital Service: the threat is real and imminent. At this moment, potential adversaries are working diligently to negate U.S. advantages in the space domain and are rapidly closing the gap. They are pressing to field space, counterspace, cyberspace, and electromagnetic spectrum (EMS) capabilities more quickly than we are and, in some cases, are on pace to surpass us. Given the vital role space capabilities play as part of the modern joint warfighting environment, this is an unacceptable risk to U.S. national security and economic prosperity.

"[Digital Modernization] will enable increased lethality for the Joint warfighter, empower new partnerships that will drive mission success, and implement new reforms enacted to improve capabilities across the information enterprise."
– DoD Digital Modernization Strategy (2019)

To combat this threat, we must act at once. We need to leverage information and data to accelerate our ability to develop, field, and operate joint space capabilities with unparalleled speed and ruthless proficiency. We must exploit digital solutions to thrive and adapt within a hostile, complex, and dynamic environment that is inherently more bound to—and driven by—technology than any other defense domain or mission set. The fact of the matter is that space is the only physical domain in which there are no humans in place to conduct military operations. Everything our operators experience about the domain is derived through the data received from space and our ability to rapidly analyze that data to our advantage. Given this operational reality, and the imperative we have to leverage data and information even more extensively to prevail in a highly contested and congested operating environment, the USSF will undergo a large-scale cultural and technical transformation by embracing modern technologies and methodologies to be a genuine Digital Service. The intent of this digital transformation is to enable us to recapture the initiative and maintain superiority in the domain our nation pioneered.

"Necessity is the mother of innovation. From a Space Force perspective of 16,000 personnel or fewer, we need to be light, lean, agile, and bold to unlock our potential."
– Lt Gen Stephen Whiting, Commander, SpOC

The size of the Space Force provides another compelling reason for digital transformation: to accomplish our expansive mission with a small, specialized Service, we must be extraordinarily proficient and lethally efficient. While some could regard the relative leanness of our Service as an obstacle to success, it may in fact be one of our greatest strengths. Though DoD space missions are typically multi-domain, they are routinely accomplished by relatively small cadres of highly specialized teams pushing the frontiers of what is technologically possible. In other words, the mission and people of the USSF are an ideal match for the Information Age, which is why we are uniquely postured to be "born digital." In addition, we have the opportunity to be highly selective in our recruitment, retention, and training, thereby ensuring we shape an elite, technologically adept, "digitally fluent" workforce. Ultimately, a lean, focused force is inherently more adaptable, uniquely enabling us to rapidly pivot and evolve in response to a highly dynamic landscape.

Digital Fluency: *The ability of a person at any level of the organization to effectively select and use the appropriate tools and technologies to interpret information, discover meaning, design content, construct knowledge, and communicate ideas in a digitally connected world.*[1]

[1] One purpose of this document is to help Guardians increase their digital fluency. As such, some core, digitally related terms are explained in call-out boxes like this, while other key terms are defined in the glossary.

By becoming a Digital Service, we have the potential to be more proficient, efficient, and agile. Through this digital transformation, we will foster an environment that incubates quick-turn, innovative solutions in every aspect of capability development. Combined with the right policies and processes, we will flatten bureaucracy and empower rapid, data-driven decision-making at all levels. Energized by cutting-edge training content and the right professional incentives, we will unleash the power of our elite workforce across a synergized enterprise. A Digital Space Force will not only generate wholesale competitive advantage and dictate the terms of any future space conflict, it will also allow us to serve as a model for our sister Services in terms of what is possible for any combat domain.

The need couldn't be clearer—*the USSF must move out swiftly and deliberately to become a Digital Service* as part of the historic opportunity to reform every aspect of our defense space enterprise. What that will look like and how it will fundamentally transform the way we do business is described in the remainder of this document. Ingrained within all of these efforts, it will be critical for us to ensure our Digital Service is secure in cyberspace and across the EMS.

We recognize this transformation will take time, and we will need to navigate a host of challenges to achieve our aims. While efforts are underway to improve the digital infrastructure we share with the U.S. Air Force (USAF), much work remains. We must leverage our industry and governmental partnerships to ensure the digital infrastructure we rely on can meet modern demands. In addition, we must undergo a *cultural* transformation in conjunction with our digital transformation efforts to nourish an environment that encourages boldness, transparency, continuous innovation, and calculated risk-taking balanced against potential opportunities. We will also need to rethink archaic policies and processes that inhibit our ability to adapt and innovate more rapidly than our adversaries. Overcoming these challenges will require an integrated plan connecting multiple ongoing and planned activities. The development of this plan is critical to our long-term success and will be addressed in a forthcoming roadmap.

DIGITAL SPACE FORCE VISION

Confronting the stark reality of the growing threat with a small cadre of dedicated Guardians makes the urgent need for digital transformation clear. The next question we must answer is, "What does it mean to be a Digital Service?" To align stakeholder understanding of our aspirational direction, it is crucial to present a unified concept of what a Digital Service looks like and the benefits it provides. Therefore, the intent of this section is to establish and explain the full scope of the Digital Space Force Vision.[2]

This Vision of a Digital Space Force is defined as: *an interconnected, innovative, digitally dominant force*. These three tenets are discussed below, to include how they interrelate and how they build successively toward a world-class fighting force that expertly and intuitively leverages digital technology in order to maintain space superiority.

[2] Not to be confused with an overarching USSF Vision.

Tenet 1: Interconnected

An interconnected force effectively and efficiently shares relevant information with a broad array of stakeholders in support of the mission. It necessarily encompasses both the people and the infrastructure needed to enable and foster unrestrained exchange of information and ideas.

Data-Centric: *Recognizing the power, promise, and primacy of data, data-centric means maximizing the extent to which personnel prioritize data (vs. products) to increase the speed, relevance, and effectiveness of information exchange, knowledge management, and decision-making.*

The foundation of an interconnected force is its digital infrastructure, which we must treat as a critical strategic asset if we are to be truly "data-centric." Our data networks must be bandwidth-rich while also being reliable throughout the spectrum of conflict and secure across multiple security levels. Our shared data repositories must also be visible and accessible to those who need it and secured against those who don't. With this robust digital infrastructure as a foundation, we will establish a trusted, understandable, **collaborative** environment that incorporates the user tools and applications to enable secure interaction with protected categories of data. Furthermore, the USSF must support a world in which we are no longer bound to a single physical location. This can give the USSF the flexibility to have Guardians operate virtually as "digital nomads," seamlessly supporting a variety of missions from a range of locations as part of an intrinsically mobile force. We must pursue site-agnostic solutions, enabling service-based, distributed functionality regardless of the mission supported or the protection requirements of the data involved. All of these elements must also be fully linked and interoperable.

"Technology, and how to use it, should be stitched in as part of every Guardian's DNA."
- Lt Gen Nina Armagno, USSF Director of Staff

Achieving pervasive interconnectivity will require more than just a potent digital environment—we must also address the people and culture side of the equation. We will establish and incentivize open, transparent communications across all stakeholders to achieve unity of effort across the force. Going forward, the default mindset for all Guardians must be biased toward collaboration via integrated solutions; everyone should strive to maintain the full picture and help others to achieve the same. This requires us to incubate a culture of forthright mutual trust both horizontally and vertically across the force; in this fast-paced, high-threat environment, we must continually keep in mind we are all on the same team.

Another important aspect of being an interconnected force is the breadth of the constituent connections. Targeted partnerships with industry can provide access to rapidly evolving technologies at the vanguard of what is possible. By enticing new and forward-thinking companies to work with the USSF and smartly increasing our usage of commercial data for mission activities, we can collectively achieve capabilities far surpassing those we could generate alone. Additionally, working with academic institutions will provide us opportunities for degrees and certifications meant to feed and develop a highly trained and specialized workforce as well as mechanisms for research and development collaboration. Further, pursuing and strengthening joint ventures with sister Services, U.S. agencies, and international allies can extend our reach and relevance, while offsetting the burden of transition costs. In building these partnerships, it will be critical to ensure we possess the appropriate data rights to promote flexibility and control. Ultimately, we know there is inherent strength, efficiency, and collective ingenuity in an interoperable digitally collaborative environment that extends to a

"We must become a Digital Service quickly and on a broad scale, and not only across our own enterprise, but also creating connections with allies and industry."
- Lt Gen John Shaw, Deputy Commander, USSPACECOM

broader community of stakeholders, and we will engage actively to build and bolster those partnerships for the benefit of all.

Tenet 2: Innovative

An innovative force routinely embraces new approaches and readily challenges the status quo as part of a deliberate commitment to continuously evolve, improve, and advance. In the context of a Digital Service, this innovation will necessarily involve the development and adoption of new technologies in order to more effectively confront uncertainty in a volatile, competitive environment. Empowering the workforce will be crucial to this facet of our Vision because Guardians will not only need to be equipped with the right skills to effectively innovate, they will also need the right support structures and encouragements to be willing to do so.

As part of a small, streamlined Service, every member must be a change agent, able to contribute **bold and imaginative solutions** to hard problems. In support of this ethos, **continuous learning** and personal growth will be our mantra. It will be incumbent upon all personnel to constantly expand their digital fluency and hone their skillsets to keep pace in this highly dynamic digital environment. Additionally, the USSF will bolster these values through timely and relevant learning activities that are eminently accessible via state-of-the-art modalities. Combined with the power of collaborative interconnections discussed above, Space Force professionals will be afforded training, education, and industry immersion opportunities related to current and emerging technologies in order to attain and maintain a collective predisposition for a "digital-first" mindset.

We will also need to attract and retain people with the appropriate technical aptitude and attitude from a multitude of sources to ensure we have the top digital talent and necessary range of perspectives. Capitalizing on the partnerships we forge as part of being interconnected, we will engage with and canvass less traditional sources to fulfill our recruitment objectives. We will onboard highly skilled and motivated technical experts across the community in the near term while simultaneously sowing the seeds for the development of a junior cadre of future leaders and innovators. Furthermore, the same technology that will enable us to be digital nomads will also activate a broader community of users. This will help us achieve **diversity** in thought and expertise as well as **inclusivity** of backgrounds and experiences to bring the best ideas to bear, inoculate against groupthink, and drive innovation.

Combined with our investments to prime a digitally fluent workforce, we must also cultivate the environment to unleash their potential. This will include equipping Guardians with the right toolsets to harness their skills. To **adaptively** respond to adversary threats, the USSF will position itself as an aggressive early adopter of cutting-edge, user-driven technologies, which represent the best capabilities industry has to offer. Another important aspect of this environment will be to acquire the appropriate data rights to ensure the USSF has the necessary leverage over its capabilities. Above all, delivering truly game-changing innovations will require Guardians to be empowered to *act* on their ideas. USSF members must be granted the psychological safety and professional incentives to be assertive and take risks when appropriate. To support this paradigm shift, we will modify our performance evaluation frameworks to recognize and value these traits. Further, we will challenge everyone to be a teacher and leader in this digital transformation and relentlessly drive decision-making down to the lowest practicable level. By fostering this culture, we will break free of legacy, passive mentalities and establish an environment of bottom-up, organic innovation to catalyze our digital transformation.

> **"I expect commanders and program managers to accept moderate risk associated with innovation and experimentation to build an agile force that better ensures our long-term competitive advantage in space."**
> – CSO Planning Guidance (2020)

Tenet 3: Digitally Dominant

A digitally dominant force translates its cumulative technical prowess into potent force-multiplying effects to develop, field, and operate capabilities more quickly and effectively than any potential adversary. To achieve lasting dominance will require us to instill and synthesize the interconnected and innovative elements already described into every aspect of how we do our job in support of the joint warfighting force.

The key to being digitally dominant will be our people. We must establish a properly resourced, fully empowered, digitally fluent workforce that is able—and incentivized—to champion innovation at every turn. Based on an affirming culture, streamlined business processes, and a robust Digital Engineering Ecosystem (DEE), Guardians will intuitively think and act in the "data space," fully equipped to address the dynamic challenges facing us. Ultimately, we must seek to enable all personnel to act as "intrapreneurs," embracing digital technology, driving innovation, and pushing boundaries in how processes and operations are executed throughout the organization.

Data Space: *A virtual environment—made accessible by technology and tools—for exchanging digital information between and among humans and machines with greater speed, robustness, and accuracy than is possible though conventional Industrial Age techniques.*

Having a digital-first mindset and being digitally dominant will require an extensive network of innovative, digitally fluent Space Force professionals who instinctively prioritize actionable knowledge over static products (e.g., reports, appraisals, graphs, briefing charts, etc.). In the legacy, product-centric paradigm, the predominant focus has been on the creation of isolated, stagnant deliverables that are necessarily imperfect, Industrial Age translations of information. Worse, these stale and disconnected products are often onerous to create and manage without providing commensurate value to the mission or decision-making process. The superior paradigm is to be data-centric. This approach will allow us to rapidly capture and exchange needed information and knowledge within the data space, to include generating streamlined, dynamic, synchronized outputs tied to mission-related actions and outcomes. Ultimately, our Digital Space Force will make data-driven decisions to field and operate groundbreaking, space capabilities at velocities that seem inconceivable today.

Through the pipeline of interconnected innovation described above, our Digital Service will be capable of rapidly acquiring, developing, and fielding game-changing capabilities and allowing us to leverage a streamlined workforce to outpace the threat. We will build and foster relationships with other military Services, U.S. agencies, international partners, academic and research institutions, and the commercial sector, enabling us to be both drivers and adopters of disruptive technology opportunities. Combining this broad-based digital collaboration with the organic capabilities of our tight-knit and technologically proficient force, we will become digitally dominant. Through this digital dominance, we will achieve the speed and agility needed to drive advantage over competitors and adversaries in order to maintain space superiority.

"By driving digital dominance in our engineering, workforce, headquarters, and operations, we will create a self-sustaining system of innovation."
– Maj Gen Kimberly Crider, Chief TIO (Acting)

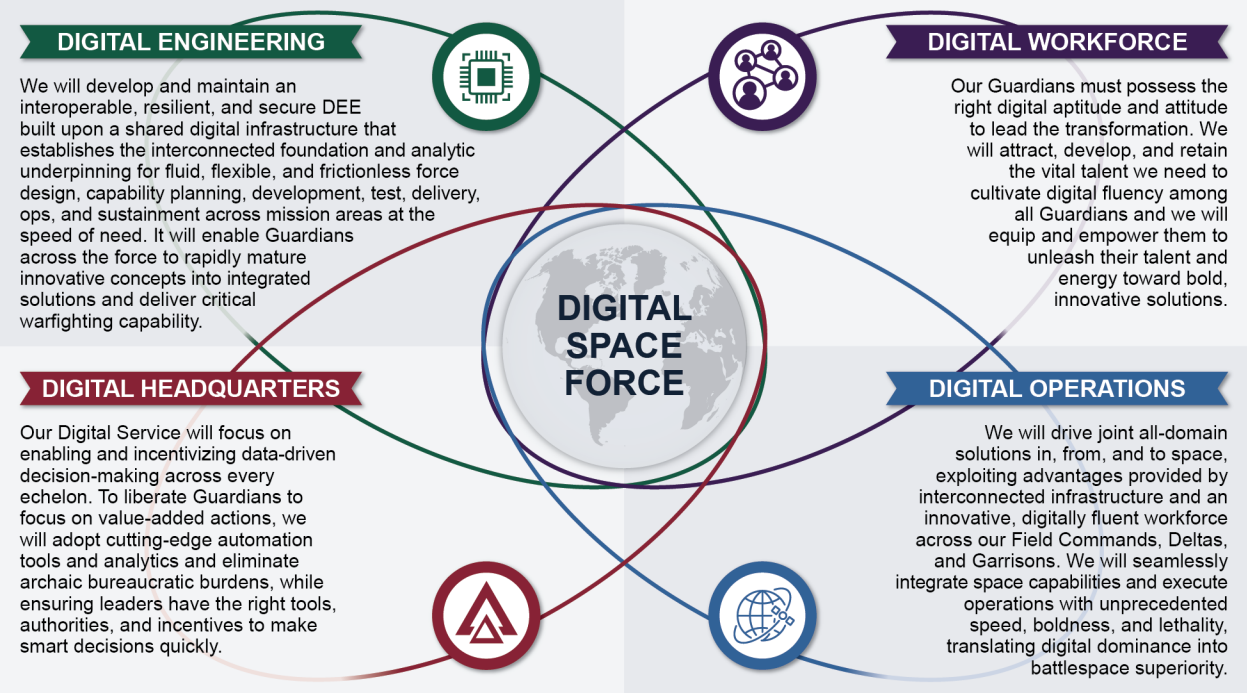
DIGITAL FOCUS AREAS

The CSO Planning Guidance (CPG) to the Space Force emphasizes the urgent need to "Create a Digital Service to Accelerate Innovation." In order to better understand the scope of the changes needed, as well as to establish a framework for implementing those changes, the CPG also identified four focus areas: Digital Engineering, Digital Workforce, Digital

Headquarters, and Digital Operations. Achieving the tenets of our Digital Service Vision—*interconnected*, *innovative*, and *digitally dominant*—will require us to make significant, coordinated investments within each of these focus areas. The long-term advantages of these investments are almost limitless, enabling us to confront and overcome the threat with a small, potent force. However, we will also gain a host of short-term benefits, including a smart pathway for standing up our new Service and a means to achieve efficiencies called out in the CPG, like a 15% enhancement to the amount of dwell time available for training of the workforce.

These focus areas cannot be fully achieved through insular approaches. The USSF will need to work with the broader Department of the Air Force functionals and USAF partners to accelerate investment priorities and revitalize our shared digital infrastructure to ensure it meets all mission needs. In accordance with the 2020 DoD Data Strategy, we will collaborate with the larger community to ensure the entire "tech stack" is designed, procured, and exercised with data and process interoperability as a core requirement from the start. We will also combine forces with innovative thought leaders across the DoD, academia, industry, and international partners who are embarking on their own digital transformations. Our forthcoming roadmap will contain specific implementation guidance, along with tangible investments and associated metrics, that address partnering opportunities and will be structured in accordance with these four focus areas.

It's important to be clear at the outset regarding the scope of each of these focus areas and how we expect them to contribute to the Digital Space Force Vision. The focus areas are inextricably linked; if we fail to fulfill the potential of any one focus area, we will fail to be a true Digital Service. The focus areas overlap, providing interdependent, synergistic contributions toward achieving a Digital Space Force. By driving digital dominance in all four focus areas, we will fulfill the Digital Space Force Vision and cement our superiority in the digital realm as part of our larger goal of space superiority.



DIGITAL ENGINEERING

Consistent with the 2018 DoD Digital Engineering (DE) Strategy, a key aim of DE is to manage the complexity of contemporary weapon system acquisition as well as accelerate and modernize the entire capability development lifecycle—from conception to deployment to operations and sustainment. Powered by authoritative sources of truth, incorporating big data approaches, utilizing techniques like model-based systems engineering, and anchored to a shared modeling and simulation (M&S) framework, we will manage requirements and testing from the warfighter to the developer and back again as a continuous, virtual *digital thread* within an overall tech stack. We will develop enterprise-level architectures that capture optimized force designs linked to threat models and desired warfighter effects while supporting broader DoD enterprise strategic intent, cooperation, and partnering efforts. We will adopt Agile practices to quickly create and field incremental solutions and establish DevSecOps factories to spur software development and incorporate security considerations from the outset. Instead of conducting milestone, artifact-based technical reviews with a narrow range of participants, we will enable targeted engagement by all stakeholders on an incremental and ongoing basis, while also ensuring the USSF maintains compliance with applicable laws and policies regarding key acquisition decision points. "Digital twins" will also be established to tie all of these elements together, enabling collaboration with mission partners as part of agile development and testing of capabilities as well as seamless transition to operations and ongoing sustainment.

> **Digital Twin:** *An integrated digital representation of an entity of interest that uses increasingly refined models, simulations, and data over time to inform decisions about that entity of interest.*

Improving and accelerating the capability lifecycle is heavily reliant on having a secure, revitalized, resilient digital infrastructure powered by a state-of-the-art, interoperable, low-latency network. On top of this foundational infrastructure, the USSF will establish the necessary tools, applications, and interfaces to allow users to produce and manipulate the data, models, and analysis, all of which comprise a fully federated Digital Engineering Ecosystem (DEE). This DEE will enable timely, reliable, and multi-level secure access from virtually anywhere while facilitating agile collaboration among Guardians for all mission-related activities across every focus area. In addition, ongoing investments will keep DEE performance relevant and secure through regular technology refreshes that keep pace with evolving capabilities and threats, ensuring Guardians always have modern and reliable technology at their fingertips. With this DEE in place, and in concert with ongoing efforts to streamline acquisition, the USSF can lead a revolution in capability development and delivery at operationally relevant speeds to stay ahead of the threat.

DIGITAL WORKFORCE

The Digital Workforce focus area consists of two complementary facets: aptitude and attitude. With respect to *aptitude*, we will implement a bold new *Guardian Strategy* to tap into and build upon each person's unique strengths to power interconnected high-performing teams. We will capitalize on the inherently selective nature of our small Service to attract and recruit technically proficient talent from all corners of the nation, and we will manage this talent within a fully integrated Digital Workforce. As part of our strategy to achieve and maintain digital fluency, we will ensure Guardians have timely access to tailored learning opportunities to sharpen and update their technology-related skillsets so they can intuitively prioritize data-centric solutions over product-centric processes. Supervisors will also be provided the necessary tools and insights to make smart and effective decisions regarding personnel hiring decisions, developmental opportunities, and career advancement. Finally, new career families, promotion frameworks, and alternate assessment approaches will also be instituted to establish expertise related to organic modeling, data science, and software

development (e.g., "Supra Coders") as well as an overarching culture of innovation that nurtures a digital-first mindset.

In terms of *attitude*, the USSF Digital Workforce will be both incentivized to collaborate and empowered to act. The natural inclination of every Space Force member—at every level—will be to share their knowledge and expertise with others so that, collectively, our Service can "punch above its weight." For example, Guardians will be encouraged to share information—while remaining cognizant of security requirements—not just within their respective missions, but also to the larger community of stakeholders to gain diverse viewpoints and promote enterprise perspectives. Most important of all, everyone across the Service will be empowered to take swift action commensurate with their level of responsibility. "Command by negation" will be the default stance in which Guardians are authorized and encouraged to act unless a higher echelon of command has explicitly reserved authority. We want to ensure the Digital Workforce is not unduly encumbered by bureaucratic processes that only impede the responsiveness and audacity of its actions. Ultimately, we must arm our workforce with the right skills to spark success while simultaneously creating the right environment for them to thrive—and then getting out of the way.

"I direct a default command style of 'command by negation' where subordinate echelons are expected to default to action except where a higher echelon has specifically reserved authority."
– CSO Planning Guidance (2020)

DIGITAL HEADQUARTERS

The idea of a Digital Headquarters does not refer to a location, but rather a function—it's the ability to make decisions effectively and efficiently at every echelon across the USSF. To make effective decisions, we will regard data as a strategic asset, harnessing it for digitally enabled management of uncertainty and to power agile, data-driven decision-making. Recognizing the cumbersome nature of traditional, document-based communications as imperfect, intermediate forms of communication, we will instead promote unvarnished collaboration to and among decision-makers directly in the data space. Meanwhile, the challenge of discerning pertinent information from a deluge of data will be overcome via immersive visualizations and customizable dashboards that are current and accessible anytime and anywhere. Finally, consistent with the fact that any true decision involves risk management, prioritization, and allocation of resources, we will implement concepts like digital readiness, digital capability portfolio management, and digital Program Objective Memorandum (POM) planning. These concepts will provide the analytical underpinning to support agile and informed operational risk management, operational readiness, investment planning, and cost-capability trades that ensure scarce resources and energy are applied to gain the greatest mission value and advantage for the USSF enterprise.

To enhance efficiency, we will establish the digital foundation to support rapid, data-driven decision-making as well as unburden our workforce from legacy staffing and coordination activities that either do not add value or can be better achieved through automation. First, we will eliminate or reinvent business processes and policies to strip away layers of bureaucracy so we can tee up decisions and supporting information to the right person at the right time. For the remaining value-added processes, we will exploit machine learning and augmentation where appropriate, allocating monotonous staffing activities to artificial intelligence (AI) routines or robotic process automation and thus freeing up Guardians to train, educate, and wargame as part of their drive to become a world-class fighting force. Further expediting our decision-making—and in accordance with the empowerment principle of our Digital Workforce—

Artificial Intelligence: *The ability of machines to perform tasks that normally require human intelligence.*

we will ensure that decision authorities are delegated to the lowest-level leaders and eradicate tendencies for micro-management. Ultimately, an effective and efficient Digital Headquarters will allow us to organize and channel formidable digital capabilities with unprecedented agility and efficiency.

DIGITAL OPERATIONS

Digital Operations represents the culmination of the three other focus areas. It is embedded with acquisition efforts via a robust DEE and pervasive digital threads, it is emboldened by the right professional incentives and a mandate to innovate, and it is empowered by deliberate delegation of authorities and unique developmental opportunities. We will take advantage of our advanced DEE and digital nomad propensity to conduct decentralized and optimized satellite operations for most any mission from a range of locations. We will advance digital operations by building combat development teams (CDTs) across our Field Command Deltas and Garrison installations, and we will equip these teams with the digital skills, tools, and resources needed to devise rapid, innovative, and integrated solutions for their most pressing pain points both now and within an evolving set of capabilities. For example, instead of multiple months of checkout and learning after launch, the use of shared digital twins and continuous stakeholder interchange will allow more rapid activation because system developers are apprised of current threats and potential tactics, techniques, and procedures (TTP) while operators can gain "hands-on" experience well before the system is even deployed. The value of the digital twin will persist after deployment as a powerful tool for anomaly resolution, enabling comprehensive troubleshooting while minimizing risk to operations. Finally, the use of a shared M&S infrastructure will allow operators to hone warfighting skills in realistic virtual training scenarios for foreseeable encounters, and our ingrained emphasis on adaptability and critical thinking will equip Guardians to respond smartly when things don't go as planned.

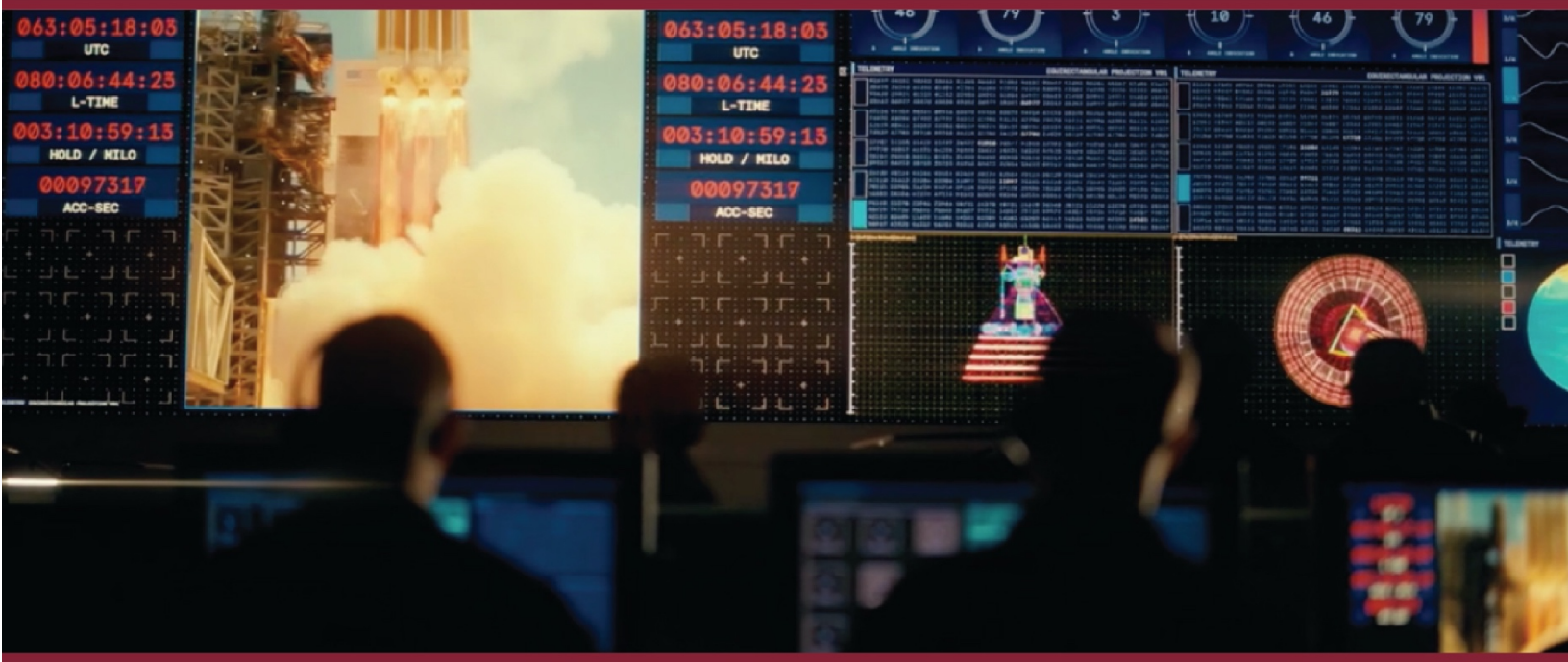
Combat Development Team: *CDTs are small, enduring teams at each Delta that provide rapid discovery and delivery of both materiel and non-materiel solutions in response to urgent and emerging operational needs.*

Making smart, quick, data-driven decisions is clearly vital to our Vision, but it takes on particular urgency in the realm of operations, where timelines are compressed and the repercussions of our actions are magnified into life-or-death consequences. Fundamentally, Guardians—at every level of war—must be organizationally empowered and digitally armed to fully focus on their mission, regardless of where it falls within the spectrum of conflict. Automation and machine learning will be particularly important to this objective, helping operators execute the joint "kill web" with a swiftness and lethality adversaries simply cannot match. This can be achieved with unprecedented accuracy and tempo through a sophisticated, data-infused user-defined operational picture that is capable of fusing and presenting multi-source intelligence as well as synchronizing with multi-domain C2 capabilities to deliver joint warfighting effects. In summary, Digital Operations collectively leverages the other focus areas to create a lethal space warfighting force that ensures our digital dominance translates to an ability to maintain space superiority.

DIGITAL VIGNETTE

Below is a hypothetical vignette that describes how a Digital Space Force of the not-too-distant future might exploit this new digital paradigm to confront a fast-emerging threat. The purpose of this vignette is to tangibly illustrate how the Digital focus areas synergistically contribute to realizing our Vision to be ***an interconnected, innovative, digitally dominant force***. Although the annotated timeline is abbreviated to focus on the capstone events, the scenario would be implausible without crucial foundational capabilities in place that enable this responsiveness.

> **"Adversary space and counter-space capabilities have advanced substantially; our ultimate objective is to first deter a war that begins in, or extends into space and second, should deterrence fail, we are prepared to fight and win."**
>
> – Gen James Dickinson
> Commander, USSPACECOM



A significant threat to the USSF enterprise has emerged and may soon become operational. In a fully mature Digital Space Force, the response might transpire as follows:

T - 0

An Emergent Threat Is Immediately Identified

- Fused intelligence from an AI engine identifies a potential new threat
- Key stakeholders across the joint community (e.g., intelligence, operators, planners, and C2 staff) are immediately alerted via automated notifications, and a high-priority workflow is initiated to assess threat impacts and develop applicable COAs

T + 5 MINUTES

A Contingency Response Scales Up Through Digital Collaboration

- The enterprise scheduling system evaluates availability for all stakeholders and establishes the optimal time to convene a virtual threat conference; it also automatically updates calendars for participants and establishes necessary collaborative communication capabilities across multiple security levels
- To enable agile enterprise assessments, space intelligence analysts and M&S experts rapidly develop threat models (reusing and revising analogous models of known threats across the DEE) to characterize how the new threat may adversely affect space warfighting capabilities
- Senior leaders are able to monitor status and issue requests for information into the workflow without the need for onerous staffing or briefings

A Virtual Threat Conference Enables Real-Time Interaction Within the Data Space

T + 2 HOURS

- During the conference, participants directly interrogate authoritative data sources via immersive virtual reality interfaces to simulate and assess threat implications based on blue vs. red interactive simulations
- Operations personnel iterate on kill web implications using realistic wargaming scenarios; these efforts inform development of COAs aimed at improving indication and warning (I&W) timelines in the near term
- Based on their unified assessment, threat conference participants develop—in real-time—a tiered agile COA strategy comprising both "fast twitch" operational responses with more sustainable options

Empowered Guardians Collectively Take Action

T + 12 HOURS

- Based on the USSF established culture of "command by negation" and bias for bold action, the COAs are immediately initiated; taskings go out to operations, intelligence agencies, and acquisition entities
- The DEE seamlessly enables real-time data exchange and visualization to the participants because it reliably supports effective, informed, collaborative decision-making

Short-Term Countermeasures and Long-Term Responses Are Explored and Executed

T + 36 HOURS

- Aided by robust joint wargaming simulations and integrated digital twins, satellite commanding software is updated and vetted to implement a series of TTP changes to extend I&W timelines
- Multiple program managers commit to cooperatively develop tactical C2 changes to formalize the TTP workarounds and repurpose existing components toward ad hoc satellite system countermeasures
- More integrated, proactive, and enduring solutions are simultaneously explored by industry, DoD and allied partners, and science and technology actors via the Service's interconnected paradigm

Digital Solutions Are Rapidly Developed and Tested

T + 5 DAYS

- Within an Agile DevSecOps environment, dynamic and secure software has been forged and validated across the enterprise to respond to the emerging threat; operational acceptance is assured as the new features have been successfully tested on a series of high-fidelity emulations of the target platforms
- Operations personnel are engaged at each stage of testing and operational check-out, gaining all necessary proficiencies before the new capability is even formally deployed

Enduring Responses are Put into Place

T + 6 TO 28 DAYS

- As longer-term investments are established, the engineering community uses federated models to assess the ramifications to existing technical baselines, as well as potential ripple effects across the enterprise regarding requirements, cost, schedule, and risk for all capability development activities
- Given the critical need—and facilitated by streamlined data exchanges, re-use of data components, spring-loaded contract relationships, and adoption of rapid acquisition authorities—contracting officers have the flexibility to provide interim authority to proceed to multiple vendors

From initial identification of the new threat to the implementation of near-term workarounds and targeted investments in more robust approaches, it has been less than one month. The immediate threat has been neutralized and sustainable solutions are underway, which will be incorporated into the baseline of all future space systems and effectively render the new threat obsolete before it can even be fully deployed.

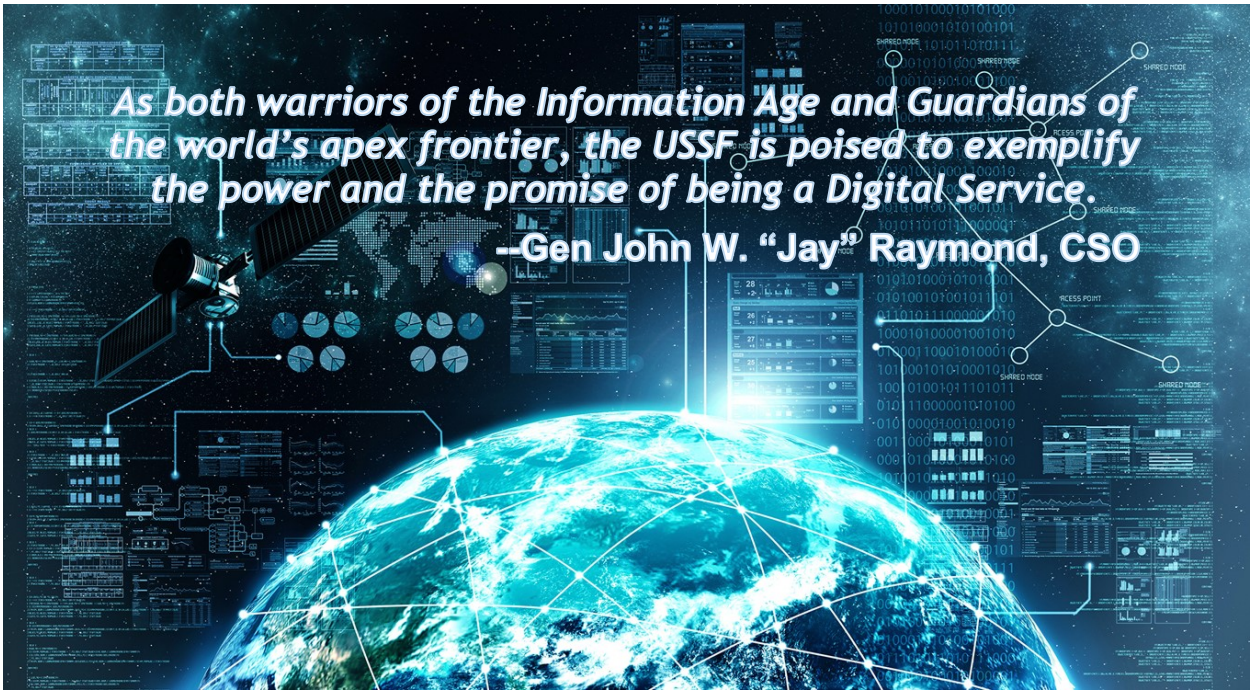
Years of adversary investment have been thwarted, and the USSF has parlayed its digital dominance into unassailable battlespace superiority.

CALL TO ACTION

Given the size of our Service, the Digital Space Force will be vital to effectively counter the threat in support of national security objectives. We will set the standard for how a Digital Service should operate, forging a digital culture by empowering our workforce and harnessing the power of game-changing technologies. Establishing a common understanding of what it means to be a Digital Service will create the environment necessary for a lasting and implementable digital transformation.

Critically, every Guardian must be bold in identifying opportunities for innovation and evolution toward our Vision of a Digital Service. We must be diligent in continually looking for ways to improve every aspect of what we do as a Space Force; innovation must be ceaseless and pervasive across the Service. In the spirit of collaboration and empowerment, we will continue to provide venues for this dialogue and for information-sharing on current and planned digital transformation initiatives. This will help inform and mature our forthcoming roadmap, which will establish the pathway to achieve our Vision. Consistent with the premise of that Vision, we will move fast to produce an initial version of this roadmap that is bold and innovative, and you can expect it to be continually updated as part of a strategy to readily adapt to changing circumstances.

Finally, this Digital Space Force Vision—and the digital transformation to implement it—is not achievable by senior leadership alone. Every Guardian—from entry level to the highest echelons of leadership—has a role to play in fulfilling this Vision; our success hinges upon developing a unified base of support for this effort throughout the force. Later this year, the Technology and Innovation Office will lead development of the roadmap to implement the Digital Space Force Vision, distilling the four Digital Focus Areas into specific objectives and initiatives to pursue as part of our ongoing journey together to achieve *an interconnected, innovative, digitally dominant force*. Semper supra!



GLOSSARY

Term	Definition
Adaptiveness	A guiding principle of being a Digital Service aimed at ensuring the USSF prioritizes iterative, flexible strategies in all endeavors to maximize its ability to effectively confront uncertainty in a volatile, competitive environment.
Agile	An incremental capability development approach in which developers collaborate with end users to make instant decisions on user functionality to quickly field working products (based on definition from Defense Acquisition University).
Authoritative Source of Truth ("ASOT")	The single, definitive source of a given piece of information that all consumers of that information should reference to mitigate the risk of relying on outdated, inconsistent, or inaccurate information.
Boldness	A guiding principle of being a Digital Service aimed at ensuring Guardians are empowered at all levels to achieve innovation via proactive decision-making and calculated risk-taking.
Collaboration	A guiding principle of being a Digital Service aimed at ensuring the USSF establishes and enforces open, transparent communications and data sharing across all stakeholders to achieve unity of effort across the force.
Continuous Learning	A guiding principle of being a Digital Service aimed at ensuring the USSF fosters ongoing development and growth in all personnel to gain and retain proficiency in a highly dynamic environment.
DevSecOps	An organizational software engineering culture and practice that aims at unifying software development (Dev), security (Sec) and operations (Ops) (DoD Enterprise DevSecOps Reference Design, 2019).
Digital Engineering (DE)	One of four key focus areas that comprise the framework for implementing the changes necessary to realize the Digital Space Force Vision. DE is "an integrated digital approach that uses authoritative sources of data and models as a continuum across disciplines to support lifecycle activities from concept through disposal" (DoD Digital Engineering Strategy, 2018). For the purpose of this Vision document and related roadmap development, DE includes all aspects of capability development as well as the supporting DEE.
Digital Engineering Ecosystem (DEE)	The interconnected infrastructure, environment, and methodology (process, methods, and tools) used to store, access, analyze, and visualize data and models to address the needs of stakeholders (based on definition from Defense Acquisition University).
Digital Headquarters	One of four key focus areas that comprise the framework for implementing the changes necessary to realize the Digital Space Force Vision. Digital Headquarters includes all echelons of leadership and the streamlined, digital processes they use to support data-driven decision-making across the Force.
Digital Infrastructure	The core hardware, software, and networks that provide foundational information technology services such as storage, processing, communications, and data security. This infrastructure is typically not user-facing and includes significant elements not within the direct control of the USSF.
Digital Nomads	People who can effectively leverage technology to effectively work remotely, untethered to a single, fixed location.
Digital Operations	One of four key focus areas that comprise the framework for implementing the changes necessary to realize the Digital Space Force Vision. Digital Operations predominantly consists of leveraging and applying the other three focus areas to create a lethal space warfighting force that translates USSF digital dominance into battlespace superiority.
Digital Thread	An extensible analytic and communication framework to connect models—and all associated data, software, and functional support that govern system lifecycle phases—to create an authoritative, digital source of truth with one-to-one real-world traceability (based on definition found in "There Is No Spoon: The New Digital Acquisition Reality" by Dr. Roper).

Term	Definition
Digital Twin	An integrated digital representation of an entity of interest (e.g., a subsystem, system, or system of systems) that uses increasingly refined models, simulation, and data over time to inform decisions about that entity of interest.[3]
Digital Workforce	One of four key focus areas that comprise the framework for implementing the changes necessary to realize the Digital Space Force Vision. Digital Workforce is focused on ensuring we establish and maintain a community of digitally fluent personnel at all levels of the organization who have the necessary aptitude and attitude to succeed in a Digital Service.
Digitally Dominant	One of the three key tenets of the **Digital Space Force Vision**. Digitally dominant describes the ability to translate cumulative technical prowess into potent force-multiplying effects to develop, field, and operate capabilities more quickly and effectively than any potential adversary.
Diversity and Inclusion	A guiding principle of being a Digital Service aimed at ensuring the USSF seeks out variety in thought, experience, and demographics, as part of a deliberate strategy to incorporate multiple perspectives and consistently bring the best ideas to bear.
Innovative	One of the three key tenets of the **Digital Space Force Vision**. Being innovative refers to the ability and propensity to routinely embrace new approaches and readily challenge the status quo as part of a deliberate commitment to continuously evolve, improve, and advance.
Interconnected	One of the three key tenets of the **Digital Space Force Vision**. Interconnected refers to the ability to effectively and efficiently share relevant information with a broad array of stakeholders in support of the mission.
Intrapreneurship	A system that allows an employee to act like an entrepreneur within an organization. Intrapreneurs are self-motivated, proactive, and action-oriented people who take the initiative to pursue an innovative product or service
Model-Based Systems Engineering (MBSE)	The formalized application of modeling to support system requirements, design, analysis, and verification and validation activities beginning in the conceptual design phase and continuing throughout development and later lifecycle phases (International Council on Systems Engineering, 2007); MBSE is a subset of Digital Engineering.
Modeling and Simulation (M&S)	The discipline that comprises the development and/or use of models (i.e., a logical representation of a system, entity, phenomenon, or process) or simulations (i.e., a method for implementing a model over time), (based on DoDI 5000.61: DoD Modeling and Simulation (M&S) Verification, Validation, and Accreditation (VV&A), 2009).
Robotic Process Automation (RPA)	Technology that allows anyone to configure computer software (i.e., a "robot") to emulate and integrate the actions of a human interacting within digital systems to execute a business process.
SpOC (Space Operations Command)	USSF field command with a stated mission to generate, present, and sustain combat-ready intelligence, cyber, space, and combat support forces and serve as the USSF Service Component to USSPACECOM.
Supra Coders	Guardians equipped through the Software Development Immersive with the learning resources, network, and tools to deploy DevSecOps-accredited code to military systems.
Tech Stack	A "technology stack" is all data, models, software, and associated infrastructure needed to create and optimize a system's lifecycle digitally; it is the combination of frameworks, languages, and software products that everything else is built on.
Technology and Innovation Office (TIO)	The portion of HQ USSF charged with developing strategy and policy to advance Science and Technology (S&T) and Research; employing cutting edge technologies to digitally transform the USSF; assuring USSF information technology needs are met; effectively managing USSF data; and conducting analysis supporting all USSF staff elements.

[3] Merges and evolves definitions of "digital thread" from multiple sources, including "HPCMP CREATETM-AV and the Air Force Digital Thread" by E. Kraft (2015) and "There Is No Spoon: The New Digital Acquisition Reality" by W. Roper (2020).


DIGITAL ENGINEERING
DIGITAL WORKFORCE
INTERCONNECTED
INNOVATIVE
DIGITALLY DOMINANT
DIGITAL HEADQUARTERS
DIGITAL OPERATIONS