

From Orbit to Ocean: Harnessing U.S. Space Capabilities in Support of U.S. Naval Power

Dr. Ivan Gulmesoff, DGS, MAS

Independent Global Security Scholar

ivan.gulmesoff@gmail.com

ABSTRACT

The days when the United States' space capabilities were secondary to its naval power are long gone; today, they are essential. This research article highlights how the integration of U.S. space capabilities with naval power has become a strategic necessity, as emerging threats from space-faring adversaries like Iran increasingly reveal how space operations directly shape maritime security and national defense. Integrating services within the U.S. Department of Defense can be particularly challenging due to the need for interoperability, resource access, a skilled workforce, and adequate funding. Among these challenges, funding often presents the most significant barrier to starting integration efforts. However, gaining an understanding of the available technology, systems, and resources across different services is a crucial first step.

Successful integration should not be expected to occur immediately; it requires careful planning and execution. Planning any operation demands a thorough understanding of the resources available within a given timeframe, along with their associated limitations. This research article serves as a foundational resource that can be developed further for future integration planning, providing a starting point for ongoing efforts. Since the establishment of the U.S. Space Force within the Department of War, the military has gained access to new technological capabilities and resources that can benefit various branches and operations. While integrating these services can be challenging, it simplifies the process by reducing bureaucratic hurdles that often complicate the funding process. Instead of a military branch seeking capabilities from civilian companies and selecting the lowest bidder, the Space Force is more likely to be favored as it works internally within the Department of War and under the Department of Air Force. This is similar to how the United States Marine Corps falls under the Department of the Navy. In addition, the U.S. Space Force is represented within the

Joint Chief of Staff with its top uniformed officer. This representation of the U.S. Space Force not only serves as the military advisor to the President, Secretary of War, and National Security Council but also ensures the Space Force Mission is carried out. The contemporary Space Force Mission already aligns in many ways with other missions within the Department of War.

Keywords: U.S. Space Capabilities, U.S. Navy, U.S. Space Force, National Defense, Strategic Integration

De la órbita al océano: Aprovechar las capacidades espaciales de EE. UU. en apoyo del poder naval estadounidense

RESUMEN

Atrás quedaron los días en que las capacidades espaciales de Estados Unidos eran secundarias a su poder naval; hoy son esenciales. Este artículo de investigación destaca cómo la integración de las capacidades espaciales estadounidenses con el poder naval se ha convertido en una necesidad estratégica, a medida que las amenazas emergentes de adversarios espaciales como Irán revelan cada vez más cómo las operaciones espaciales influyen directamente en la seguridad marítima y la defensa nacional. Integrar los servicios dentro del Departamento de Defensa de Estados Unidos puede ser particularmente difícil debido a la necesidad de interoperabilidad, acceso a recursos, una fuerza laboral cualificada y financiación adecuada. Entre estos desafíos, la financiación suele ser el obstáculo más importante para iniciar los esfuerzos de integración. Sin embargo, comprender la tecnología, los sistemas y los recursos disponibles en los diferentes servicios es un primer paso crucial.

No se debe esperar que la integración sea exitosa de inmediato; requiere una planificación y ejecución cuidadosas. Planificar cualquier operación exige un conocimiento profundo de los recursos disponibles en un plazo determinado, junto con sus limitaciones. Este artículo de investigación sirve como recurso fundamental que puede desarrollarse para la planificación de futuras integraciones, proporcionando un punto de partida para los esfuerzos en curso. Desde la creación de la Fuerza Espacial de los Estados Unidos dentro del Departamento de Guerra, las fuerzas armadas han accedido a nuevas capacidades y recursos tecnológicos que pueden beneficiar a diversas ramas y operaciones. Si bien la integración de estos

servicios puede ser un desafío, simplifica el proceso al reducir los obstáculos burocráticos que a menudo complican el proceso de financiación. En lugar de que una rama militar busque capacidades en empresas civiles y seleccione la oferta más baja, es más probable que la Fuerza Espacial sea la favorita, ya que trabaja internamente dentro del Departamento de Guerra y bajo la supervisión del Departamento de la Fuerza Aérea. Esto es similar a cómo el Cuerpo de Marines de los Estados Unidos depende del Departamento de la Armada. Además, la Fuerza Espacial de los Estados Unidos está representada en el Estado Mayor Conjunto con su oficial uniformado de mayor rango. Esta representación de la Fuerza Espacial de EE. UU. no solo actúa como asesor militar del Presidente, el Secretario de Guerra y el Consejo de Seguridad Nacional, sino que también garantiza el cumplimiento de la Misión de la Fuerza Espacial. La Misión de la Fuerza Espacial actual ya se alinea en muchos aspectos con otras misiones del Departamento de Guerra.

Palabras clave: Capacidades Espaciales de EE. UU., Armada de EE. UU., Fuerza Espacial de EE. UU., Defensa Nacional, Integración Estratégica

从轨道到海洋：利用美国太空能力支持美国海军力量 摘要

美国太空能力屈居海军力量之下的时代早已过去；如今，太空能力至关重要。本文强调，美国太空能力与海军力量的融合已成为一项战略要务，因为来自伊朗等太空对手的新兴威胁日益表明，太空行动如何直接影响着海上安全和国防。由于需要实现互操作性、资源共享、熟练人员、以及充足的资金，美国国防部内部各军种的整合尤其具有挑战性。在这些挑战中，资金往往是启动整合工作的最大障碍。然而，了解不同军种可用的技术、系统和资源是至关重要的第一步。

成功的整合并非一蹴而就；它需要周密的计划和执行。任何行动的计划都需要对特定时间范围内可用的资源及其局限性进行全面了解。本文可作为未来整合计划的基础性资源，为后续工作提供起点。自美国太空军在战争部成立以来，美军获得了新的技术能力和资源，这些能力和资源能够惠及各个军种和作战行动。虽然整合这些部门可能充满挑战，但它能减少一系列通常会使拨款过程复杂化的官僚障碍，进而简化流程。太空军不像其他军种那样向民用公司寻求能力并选择

出价最低的供应商，而是更有可能获得优先考虑，因为它在战争部内部运作，并隶属于空军部。这与美国海军陆战队隶属于海军部的情况类似。此外，美国太空军的最高军官在参谋长联席会议上拥有代表席位。太空军的这一代表不仅为总统、战争部长和国家安全委员会提供军事建议，而且还确保太空军任务的顺利完成。如今，太空军的任务在许多方面已经与战争部的其他任务相契合。

关键词：美国太空能力，美国海军，美国太空军，国防，战略一体化

Introduction

The overarching objectives of the U.S. Navy have remained largely consistent for decades, with a primary focus on maintaining freedom of navigation through maritime power projection. Utilizing U.S. space assets for Navy operations could be critical for achieving successful and essential outcomes. What may seem unrelated to space can actually be highly relevant in contested areas worldwide. For example, analyzing the conflict between Israel and Iran can offer valuable insights into the space domain, potentially enhancing the capabilities of the U.S. armed forces or its allies. Notably, both Israel and Iran are recognized as space-faring nations. Although U.S. space power may appear relatively new—especially following the establishment of the U.S. Space Force in 2019—it has been a longstanding concern for U.S. national security. This concern arises from the multiple threats posed by adversaries in the space domain.

The 2025 Space Threat Assessment detailed Iran's commitment to not only advancing its space program,

but also weaponizing space through cyber-attacks (Clayton Swope et al., 2025). While one might assume no progress has been made in this area, the intent remains. Similar to findings from the recent Operation Midnight Hammer on June 21-22, 2025, the U.S. might have overlooked this issue if not prompted by the nuclear threat. Effectively utilizing U.S. space power could not only advance U.S. Navy objectives, but also benefit other Department of Defense agencies that have yet to explore these possibilities. Within the 2025 Space Threat Assessment alone, it explained how Iran continues to launch satellites into orbit with the assistance of the Russian Space Program, also known as Roscosmos. Within the past four years, three remote sensing satellites have been placed in orbit, with one of them claiming to be a space tug satellite for repositioning the orbit of a satellite. While the repositioning of a satellite may seem beneficial, it can also be perceived as a threat to other space-faring nations for various reasons.

Every satellite has an intended orbit location for operation. For example, the majority of satellites launched

are operated in a Low Earth Orbit (LEO) for better overall efficacy, such as aiding in communication through shorter transmission signals. However, as Cresto et al. explain, at times the use of a space tug can be employed for more efficient and cost-effective positioning (Cresto et al. 2016). This repositioning by the space tug can be accomplished by either a robotic arm, a grapple mechanism, or a docking port. Once the tug is docked to the satellite being repositioned, it applies its own additional propulsion for the specific task at hand. These jobs can include adjusting the satellite's position in orbit or performing general servicing of the satellite. Understanding the common uses of a space tug also provides insight into how it can be operated for nefarious purposes. Even though the Outer Space Treaty limits space from being weaponized, it does not consider a space tug as a threat. For this reason, a nefarious actor could pre-position a space tug, stay within the treaty's guidelines, and operate it against an adversary when most needed. The Outer Space Treaty of 1967 outlined how the space environment should be treated as a global common for space exploration, implying a shared common good for humanity (Gulmesoff, 2019). Although some remain questionable, to date, most space-faring nations operate satellites within different orbits for specific and obvious purposes.

While the Iranian Space Agency has not demonstrated advanced space weaponry in the form of kinetic or non-kinetic weapons, it has proven its capabilities in jamming and spoofing technology, along with other cy-

berwarfare capabilities. As Polkowska suggests, much of Iran's space technology appears to have come from Russia or North Korea (Polkowska 2019). This technology may appear helpful at first, but it can later become antiquated without adequate improvements or updates. As Zhi referenced regarding Unmanned Aerial Vehicle (UAV) security, Iran leveraged its cyber warfare capabilities for a successful attack on a Lockheed Martin RQ-170 (Zhi et al., 2020). Once within range, the Iranian Space Agency was effectively able to gain control of the UAV and land it. Another example of the Iranian Space Agency's effective cyber warfare comes from its ability to interfere with satellite communications. As the 2025 Space Threat Assessment suggests, multiple cyberattacks from Iran were launched on aerospace and satellite infrastructure throughout 2024 (Clayton Swope, 2025). These cyberattacks were part of a larger, more calculated series of cyberattacks across multiple states worldwide by Iran's Islamic Revolutionary Guard Corps, known as the Peach Sandstorm.

The U.S. satellite infrastructure faces considerable vulnerabilities to cyberattacks, akin to other sophisticated communication systems. A successful cyberattack could specifically target transmission capabilities, leading to significant operational disruptions. Beyond the immediate impact, such incidents would result in substantial financial burdens for repairs and the critical upgrading of cybersecurity measures to prevent future threats. It is not only important to recognize these risks but also to invest in robust defenses to safeguard

our satellite systems. For this reason, one of the priorities of the U.S. Space Force specifically addresses safeguarding our satellite infrastructure through several active and passive measures.

Strategic Objectives of the U.S. Space Force

The objectives of the U.S. Space Force are founded on our reliance on space-based technology and the threats its vulnerability poses to national security. As Colonel Knisley of the U.S. Space Force has suggested, our space-based assets are continually threatened by cyber-attacks using advanced artificial intelligence technology, many of which are facilitated by either illegal satellite data uplinks or jamming (Wolfe 2023). Any cyber-attack on the U.S. satellite infrastructure could wreak havoc on the United States by either disrupting communication or completely ceasing it altogether. On the other hand, for the U.S. military, communication is essential for critical decision-making. According to the U.S. Space Force website (<https://www.spaceforce.com/>), the U.S. Space Force was established to protect the United States, “with the freedom to operate in space, keeping it secure, stable and accessible for military space power and new waves of innovation.” However, the overarching strategy of the United States Space Force is much more comprehensive. The Department of War, previously known as the Department of Defense, states that the United States Space Force will pursue three goals with four lines of effort specified for threats,

opportunities, and space challenges:

“Maintain Space Superiority; Provide Space Support to National, Joint, and Combined Operations; and Ensure Space Stability.

- Build a comprehensive military advantage in space.
- Integrate military space power into national, joint, and combined operations.
- Shape the strategic environment.
- Cooperate with allies, partners, industry, and other U.S. Government departments and agencies” (DoD, 2020).

Brief Exploratory Case Study

Between 2019 and 2025 alone, there were approximately seven significant confrontations or threats that escalated tensions between Iran (or Iranian state-affiliated actors) and the United States Navy. These incidents not only underscore the potential for future escalation but also demonstrate how modern space capabilities can aid in managing such interactions. Below is a list of each incident, which involved unsafe interactions, harassment, attempted seizures, or conflicts. Each occurrence was characterized by one or more of these elements.

US Navy vs Iran & Iran-aligned Maritime Incidents Timeline (2020–2025)

Date	Location	Actors	Incident / Threat	US Response / Outcome	Reference(s)
Apr 27, 2021	Persian Gulf	US Navy/USCG vs IRGC	IRGC fast-attack boats harassed US ships, closing to ~68 yards.	USS Firebolt fired warning shots; IRGC backed off.	Navy Times, Reuters, Military.com
May 10, 2021	Strait of Hormuz	USCG Maui & US Navy vs IRGC	13 Iranian fast boats approached US ships escorting a submarine.	USCG Maui fired ~30 warning shots; boats broke off.	Navy Times, Iran Primer (USIP)
Nov 10, 2021	Gulf of Oman	Iranian helicopter vs USS Essex	Iranian helicopter circled US amphibious ship “unsafe & unprofessional.”	No damage; US issued public protest.	Iran Primer (USIP)
Oct 2023 → 2025	Red Sea / Bab el-Mandeb	Houthis (Iran-backed) vs US/coalition & commercial vessels	Houthis launched widespread missile/drone/boat attacks.	US ships shot down threats, conducted strikes (Op Prosperity Guardian).	Wilson Center, USNI News, CFR, ACLED
Jan 11, 2024	Yemen / Red Sea	US & UK vs Houthis	Coalition strikes on >60 Houthi targets (air defense, radars, C2).	Degraded capability; continued operations.	Defense Priorities, USNI News
Nov 2024	Red Sea / Bab el-Mandeb	Houthis vs USS Stockdale & USS Spruance	Houthis launched drones, cruise & ballistic missiles.	US ships intercepted; no damage or casualties.	AP News
Mar–May 2025	Yemen / Red Sea	US vs Houthis	‘Operation Rough Rider’ strikes on Houthi missile launch sites.	Significant degradation of Houthi capabilities.	USNI News

Enhancing U.S Naval Power via U.S. Space Capabilities

There are several different avenues through which the incident/threat listed above could

have been linked to space assets. A clear and pressing requirement for timely and accurate information emerges from these scenarios. When data is inaccurate, it can lead to misguided decisions, potentially resulting in unintended-

ed consequences or escalating tensions among both state and non-state actors. The capabilities of U.S. space assets may encompass a range of advanced technologies and systems, including but not limited to satellite reconnaissance, communications, and navigation systems, all of which are essential for maintaining situational awareness and effective response strategies in an increasingly complex and interconnected global landscape.

U.S. Space capabilities could include:

- Communication & Early Warning Systems (tracking/targeting)
- GPS/Navigations systems
- Resilient Active/Passive Cyber Operations

For instance, surveillance, reconnaissance, and early warning systems can provide the U.S. Navy with time-sensitive information about threats from ballistic or cruise missiles. As Mercier explains, applying multiple sensors across various frequency ranges can enhance the intelligence and surveillance data collected (Mercier, 2025). In other words, different systems can gather data, which is then combined to accurately assess a potential event or an ongoing incident, such as a missile strike. This approach can also be applied to other space capabilities, including navigation and cyber warfare, to ensure data accuracy.

Recommendations

The United States Navy has consistently established superior dominance across the globe, particularly in strategically contested regions such as the East China Sea. To maintain this level of dominance in an increasingly complex security environment, the Navy must ensure it remains combat-ready, adaptable to rapid changes, and resilient against various emerging threats.

A critical aspect of achieving and sustaining this operational superiority is the alignment with U.S. Space Power. Access to advanced space technology significantly enhances the Navy's capabilities, particularly in time-sensitive operations. For instance, accurate and rapid communication systems enable efficient coordination among naval forces, enhancing situational awareness and decision-making processes during operations.

The confrontations with Iran and its proxy forces illuminate the pressing need for integrating space capabilities into naval strategies. These incidents underscore the necessity of having real-time intelligence and communication, which are vital for effective response and operational readiness. By leveraging satellite technology and other space-based systems, the Navy can ensure that commanders have access to accurate information swiftly, allowing for informed decisions that can alter the course of engagements. Investing in the deliberate integration of sophisticated and resilient space systems is not merely

an enhancement but a strategic imperative. It can bolster deterrence efforts, reinforcing the National Defense Strategy and ensuring that the United States maintains a formidable presence in not only maritime operations but also in the expansive and vital domain of space. By doing so, the U.S. can contribute to regional stability and a more secure international maritime environment.

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