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FORGING INTERNATIONAL COOPERATION IN SPACE

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Scholar Paper Series: SPACE

Forging International Cooperation in Space

FORGING INTERNATIONAL COOPERATION IN SPACE

INTRODUCTION

At the dawn of the Space Age, Earth's orbit was accessible by only two nations, the United States and the Soviet Union. Today, it is an international and commercial theater of operations for countries and companies around the globe. American power is still dominant in this arena, but it is not absolute. Other nations, both allied and adversarial, have entered the arena with their own organic space programs.

Protecting US national interests is unachievable if the Department of Defense (DoD)[1] relies solely on traditional military-owned space systems. International partners integrated alongside intelligence community, civil, commercial, and military capabilities must band together to create a hybrid architecture.[2] An effective, integrated hybrid architecture will provide the speed, capacity, interoperability, and resilience to ensure American space superiority, deter adversaries like China, and, if necessary, defeat them. Delay in fielding an international hybrid architecture risks ceding the advantage permanently.

The US Space Force (USSF) must embrace international counterparts as valued partners, which can amplify the reach and power of the hybrid architecture into an enduring advantage for America and its allies. That means removing barriers to entry, avoiding classification challenges, and ensuring that partners are properly incentivized to support and participate in operations. It also means using USSF tools to bring long-standing allies and new-found partners to the table to advance strategic goals.

The successes of the Artemis Accords for civil space[3] and Operation Olympic Defender[4] offer a template for a new set of national security-focused accords that could establish a shared vision of "peace through strength" in space. This set of agreements (referred to here as the Athena Accords, named after the Greek goddess of wisdom and strategic warfare who provided advice and protection to heroes) would offer myriad benefits to American

KEY POINTS

- Maintaining US space superiority and deterring peer adversaries like China requires the effective employment of an integrated USSF hybrid architecture, which includes allies and international partners.
- Since the US Space Force will not be able to operate a hybrid architecture alone, the US must forge new international alliances and partnerships grounded in a clear, enduring understanding of operational, cultural, and partnership goals.
- Incentivizing allies and partners to join USSF hybrid architecture operations will provide numerous benefits and fulfill US government, USSF, and foreign partner objectives. Understanding these objectives is critical to properly incentivizing participation.
- Information sharing and agreed classification systems will be critical in a hybrid architecture and must be worked out in advance among international partners.
- Creating a formal, multilateral framework of national security-focused space accords will incentivize foreign participation, distribute developmental costs, and allow the USSF hybrid architecture to execute complex multi-domain international operations and wargames under a unified strategy of "peace through strength."

and allied security in space. The Accords would encourage allies to invest and partner more closely, encourage multilateral national security space collaboration, and support complex multinational exercises, wargames, and real-world operations. In so doing, the United States, US allies and partners, and other hybrid architecture participants can practice multi-domain operations and create mature policies for responding to space-based threats.

Not all countries will be able to participate in a space hybrid architecture. Space has always been, and remains, a complex, costly, and constrained theater to access. Understanding which international partners are best positioned to enter into and support hybrid architecture operations can streamline effective recruitment efforts.

THE NEED FOR INTERNATIONAL PARTICIPATION IN USSF'S HYBRID ARCHITECTURE

Potential adversaries' use of space and counterspace capabilities has grown significantly. To support an ever-increasing cadence of national security operations in space, the US government and USSF require resilience, deterrence, and protection against identified threats. Yet this is not achievable if solely relying on US sovereign assets. To gain and maintain advantages, the United States must leverage innovations and key capabilities of foreign partners and allies.

This effort cannot and should not be an ad-hoc "coalition of the willing." Instead, it should be a fully developed, interoperable, interconnected partnership, capable of protecting space assets from attack.

The rise of space as a theater of conflict has driven many allied nations to make policy and organizational shifts toward space as a warfighting domain. This aligns with US policy decisions. It also provides an opportune landscape for the further development and support of a hybrid architecture, if other countries can be persuaded to join. The ability to operate jointly with international allies can lead to benefits in supply chain resilience, interoperability, and collaborative warfighting exercises (as shown in standardization agreements for 7.62mm munitions[5]).

Combined action with allies and partners is a force multiplier of influence internationally. However, just as each country pursues its own objectives and requires its own incentives, each nation is also bound by its internal laws and regulations about foreign relations. International partnerships may be able to exert influence to change some aspects of the organization and culture of its various components. However, in most cases, international partnerships navigate various space governance processes as they are.

For USSF, bringing in international partners will involve some form of negotiated agreement with the partners involved. Under US law, treaty-level agreements necessitate the advice and consent of the US Senate for ratification. Yet even non-treaty international agreements require consultation with the Secretary of State prior to negotiating an agreement and reporting to Congress upon conclusion of an agreement (as laid out in the Case-Zablocki Act of 1972).[6]

Employing a USSF hybrid architecture with international partners raises many legal questions.[7] An agreement like the Artemis Accords provides the USSF, and US broadly, with a way to define and answer them. International agreements like the Accords can also act as a forcing mechanism, creating a shared understanding of international law, and eventually, even binding adversaries. Similarly, when ratified, accords can often reshape or overcome internal domestic and foreign barriers.

Enacting the Athena Accords will not be easy, but if successful, can provide a powerful boost to—and incentive for—allied and partner hybrid architecture participation.

Overcoming Classification Challenges in an Internationally Supported USSF Hybrid Architecture

Operations in space have been highly classified for decades. Programs are maintained at the highest levels of classification regardless of effects on cost, schedule, technical maturation, or partnership. Many DoD space programs reserve participation for US citizens only or are "Not Releasable to Foreign Nationals" (NOFORN). However, these default restrictions hinder collaboration with allies, so they should only be applied when necessary and required by regulations. Too often, DoD culture has assumed NOFORN and demanded justification for its removal, as opposed to assuming sharing and requiring justification for NOFORN application. Objectively, seamless sharing could be the rule rather than the exception. Ideally, such information would default to "YESFORN" to be shared with allies and partners, unless otherwise designated.

Yet, the technological and operational value of a hybrid architecture can be compromised if the design and structure are shared with unauthorized participants, and individual nations may have restrictions on how their assets and information can be shared. The challenge then becomes creating and maintaining a "zero trust" environment where information can be more appropriately compartmentalized.[8] This is not a minor issue inside a hybrid architecture.

A hybrid architecture built on excessive data-sharing rules determined on a case-by-case basis cannot succeed. There must be seamless interactions between all partners to the greatest extent possible. This means overcoming data sharing, classification, and overclassification issues among international participants to ensure seamless coordination.

The difficulty of coordination can vary significantly depending on the states involved. For example, the "Five Eyes" partner states (Australia, Canada, the United Kingdom, and New Zealand) are easier to incorporate into a hybrid architecture because they are exempt from Committee on Foreign Investment in the United States (CFIUS) oversight. Similarly, policy on sharing classified information with military and intelligence forces of allied and partner countries is often tailored for the country involved. Information sharing agreements among international participants inside a hybrid architecture can also be an element of the Athena Accords, which would specify levels of involvement and partnership.

There must be seamless interactions between all partners to the greatest extent possible.

UNDERSTANDING THE NEEDS OF INTERNATIONAL PARTNERS

As stated in the introduction, the USSF must embrace its international counterparts as valued partners, which can amplify the reach and power of a hybrid architecture, creating an enduring orbital advantage. However, to effectively incentivize international participants, it is vital to understand the core objectives of international partners, why they act as they do, and how they can be incentivized to participate.

Core Objectives of Potential Hybrid Architecture Partners

All countries define and act in their own national interests. International partnerships are selected for a variety of reasons and motivations. While foreign nations' objectives may not fully align with US goals, examples of multilateral initiatives, like the aforementioned Artemis Accords and proposed Athena Accords, offer cross-cutting benefits that support both US and partner objectives.

Although foreign countries' motivations may be multifaceted, they generally fall into the following categories:

OPERATIONAL

To increase military effectiveness through interoperability with allies and coalition partners

A strong interoperable network of allies deters peer competitors, ensuring freedom of action and stability in space. This interoperability provides seamless operations with the United States in joint exercises and missions enabled by data-sharing arrangements.[9] Similarly, foreign military sales (FMS) and direct commercial sales (DCS) build partner capacity and interoperability, providing allies with space capabilities.

ECONOMIC

To reduce costs by sharing financial burdens, and/or avoiding duplication efforts with US allies and partners

Economic cooperation accelerates the growth of the commercial space economy, reducing the financial burden of space exploration and strengthening the industrial base through technology sharing and market development. Pax Silica, for example, helps all participants, including the United States, protect and build economic cooperation and advantage through international partnerships. Such partnerships create jobs, foster innovation, and establish industry-friendly standards for future commercial activities. International partnerships can also facilitate a "commercial-led ecosystem" transition from government-operated to commercially provided services, fostering a thriving market.

TECHNICAL

To minimize capability gaps by accessing the best defense technologies and help close the capabilities gap with allies and coalition partners

Technical cooperation enhances resilience, interoperability, and capability. Collaborative research on space systems fuels innovation that leads to terrestrial spin-offs, creating new, high-skilled jobs in fields like medicine, materials, and artificial intelligence (AI). International partnering on key projects shares development costs and specialized expertise, which accelerates innovation. This further drives the adoption of common international standards, protocols, and data-sharing formats to ensure seamless, secure collaboration.

POLITICAL

To strengthen alliances and relationships with other friendly countries

Key goals include shaping international norms to align with common values, enhancing the resilience of space systems, and leveraging partner capabilities for deep space exploration. Partnerships secure economic, security, and diplomatic advantages. By acting as the "partner of choice" for international space missions, the United States reinforces its leadership in space exploration. Space cooperation also strengthens US allies by creating "force multipliers" and preventing competitors from setting alternative governance models.

INDUSTRIAL

To strengthen the domestic and allied space industrial base, enhance the resilience of supply chains, and foster a competitive, innovative, and secure global space economy

International industrial partnerships accelerate technology development, share financial burdens, and promote access to international markets. Working with international partners to adopt common international standards improves interoperability and reduces costs for developing key space systems (e.g., launch services, satellite communications).

Incentivizing International Partnerships

Under Executive Order 14369, Ensuring American Space Superiority, of December 18, 2025, the Secretary of Defense, in coordination with the Secretary of State and the Director of National Intelligence, "...shall implement a plan to strengthen ally and partner contributions to United States and collective space security...including through increased space security spending, operational cooperation, basing agreements, and ally and partner investments in America's space industrial base."

Programs like the Athena Accords are designed with these goals in mind. Through international collaboration and incentives for increased foreign participation, the United States can support greater operational cooperation and investment in space with US allies rather than bearing the financial and technological costs alone. **The USSF can incentivize international participation through three main avenues that allies are seeking: information, cost and risk reductions, and access to technology sharing. Specific incentives are outlined as follows.**

INFORMATION SHARING

Access to shared strategic capabilities and information sharing

Currently there is a trend away from purely scientific, government-led partnerships in space and toward strategic, defense-oriented, and commercial alliances aimed at ensuring sovereignty, sustainability, and technological advancement. Nations are aggressively collaborating on next-generation platforms, lunar infrastructure, and AI-driven defense systems. The United States and US allies are prioritizing the development of space capabilities in communication, Earth observation (EO), and defense. The expansion of EO is driving demand for collaborative Satellite as a Service (SaaS) models, allowing the United States and US allies to access data via international, AI-driven platforms.

Enhanced space domain awareness

Space domain awareness is a key element of any hybrid architecture, and new technologies in a hybrid architecture should be allied by design. The Deep Space Advanced Radar Capability (DARC) is a trilateral international collaboration for Space Domain Awareness.[10] The first DARC ground station has been completed and leveraged international cooperation between Australia, the United Kingdom, and the United States. Consistent with a hybrid architecture, the collaboration also included a collaborative relationship with Australian industry. DARC testing in August 2025 successfully characterized the movement of multiple satellites and demonstrated the effectiveness of the system's precision radar tracking technology.[11] The USSF is incentivizing other allies (e.g., Canada, France, Germany, Japan, Italy, Norway, and New Zealand) to participate in DARC to leverage shared data and capabilities, improving interoperability. Offering countries access to US space domain awareness provides technical support for partner countries and can provide operational value as well, since such information can be readily shared among partner nations.

COST AND RISK SHARING

Gaining access to cutting-edge technology

Allies can be motivated to cooperate by providing access to US space assets and technology through FMS and DCS. In addition, R&D to build their own national space assets can be facilitated under international agreements (IAs) for cooperative R&D.[12] IAs can be multilateral frameworks like the Responsive Space Capabilities Memorandum of Understanding (RSC MOU) between Australia, Canada, Germany, Italy, the Netherlands, Norway, Spain, Sweden, the United Kingdom, and the United States. They can also be bilateral (e.g., the MOU with Japan concerning the space situational awareness services and information sharing for the safety of space.[13]) The exercise of FMS/DCS and cooperative R&D IAs spreads costs, risks, and technical challenges of developing space capabilities across the United States and US allies. The benefits of this approach cut across all objectives, but especially technical and economic ones.

Supply chain security and resilience

Alliances are increasingly focused on supply chain resilience, reducing reliance on adversarial states, and controlling advanced technology (e.g., semiconductors, AI). In 2026, space economic and technological security is focused on safeguarding increasingly contested, congested, and commercialized orbital environments. Key trends include AI-driven security, proliferation of secure low Earth orbit (LEO) networks, on-orbit refueling, and stronger supply chain resilience. The market is shifting from experimentation to large-scale, high-value infrastructure, with private investment and international partnerships defining the new space economy. The commercial space industry continues to drive rapid, cost-effective, flexible, and scalable advancements in satellite technology, outpacing legacy systems.

TECHNOLOGY SHARING

Interoperability for seamless coalition operations

A strong network of allies that can work seamlessly together deters peer competitors, ensuring freedom of action and stability in space for the United States and its allies. When US systems are widely adopted, they become international standards. Interoperability provides seamless operations with the USSF[14] in joint exercises, as well as missions enabled by data-sharing arrangements. FMS/DCS builds partner capacity and interoperability, helping partners avoid the cost of developing expensive space capabilities independently. Large-scale training exercises like Global Sentinel further enhance interoperability. For example, the 2025 Global Sentinel exercise, a modeling and simulation gameplay, brought together nearly 30 partner nations plus NATO, demonstrating interoperability with daily unclassified space operations. This not only helps international partners meet operational objectives; it also supports industrial and economic activity.

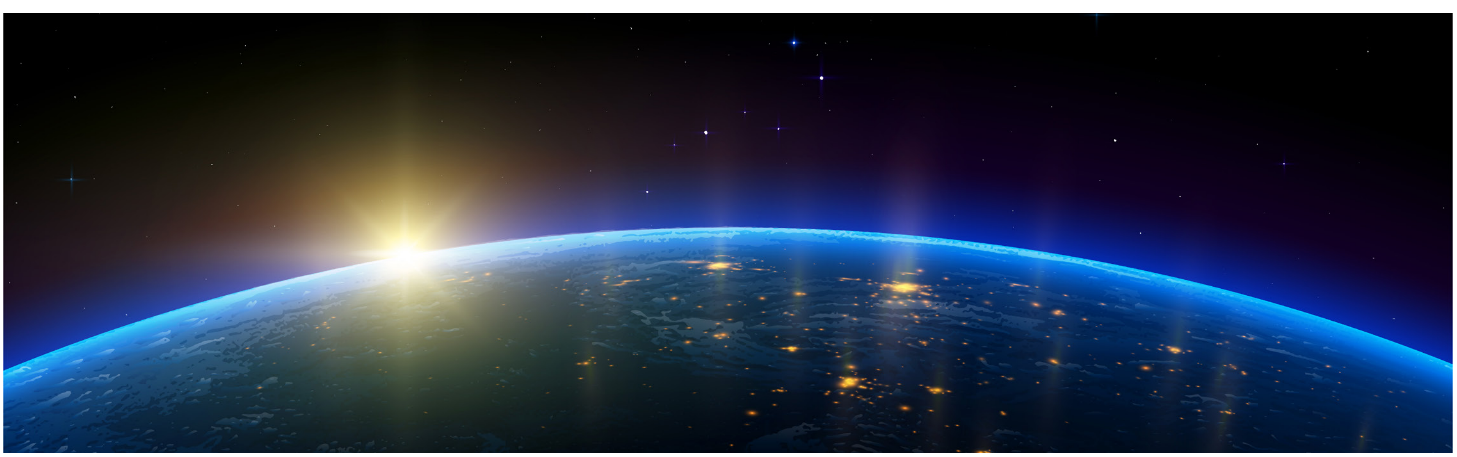
Joint training with allies

Training with allies is another cross-cutting incentive, in that it offers the chance to highlight FMS and DCS capabilities (boosting economic aspects), work with the latest US technology (enhancing the technical objective), and increase operational capabilities. The Combined Space Operations Center (CSpOC) highlights this value. The CSpOC provides a model and opportunity to advance better information sharing, situational awareness, and intelligence.[15] The CSpOC works closely with the national space operations centers of Australia, Canada, France, Germany, New Zealand, and the United Kingdom. USSF personnel are embedded as Regional Space Advisors (RSAs) with allies to build relationships and align strategies. Through the CSpOC, exercises like the Schriever Wargame test cooperative frameworks, share sensitive data in special access cells, and develop strategies for deterring threats, focusing on coalition-led approaches, and ensuring a free and open space domain.[16] Such wargaming and training not only advance operational objectives but also strengthen political ones by cementing alliances.

Access to non-traditional security inherent in a USSF hybrid architecture

Intensified cooperation on cybersecurity, disinformation, climate change, and economic coercion offers additional incentives for participation in a USSF-led hybrid architecture. Space systems are now primary targets for state-sponsored espionage and disruption. The Space Information Sharing and Analysis Center (Space ISAC) is leading efforts in sharing threat intelligence and implementing quantum-resilient, secure architectures. Security is moving from an afterthought to "secure-by-design" for spacecraft and ground systems, ensuring operators can maintain control during attacks. Their participation would increase shared data and capabilities, improve interoperability, and enhance technical, operational, and security objectives. The ability to offer this non-traditional security knowledge can boost operational and technical objectives of participants but also assures interoperability does not lead to overly increased risk.

As noted previously, each country will be focused on its own objectives and require its own incentives to participate in a USSF hybrid architecture. However, the advances, capabilities, and collaborative potential of partnering with the USSF offers a way for these countries to fulfill their own objectives, while also benefiting US and USSF capabilities.



IDENTIFICATION AND CATEGORIZATION OF INTERNATIONAL PARTNERS

With 195 nations recognized by the United States, the choice of international partners will always be one of prioritization. As referenced above, routine access to space is a technical, political, and financial challenge, even for the most industrialized countries. Not all countries will be able to participate fully in a USSF hybrid architecture. To maximize the effectiveness of the hybrid architecture and its international partners, it will be critical to understand the benefits and capabilities allies can offer, and to prioritize and incentivize participation appropriately. Countries may be able to support a hybrid architecture politically, technologically, financially, geographically, or through some combination thereof.

It is worth noting that not all countries with technological capabilities are friendly to the United States (e.g., Russia and China). This does not mean, however, that their participation or cooperation should be immediately dismissed. The United States and Russian governments have collaborated closely in space through civilian partnership and the International Space Station. Tracking space debris or supporting collision avoidance in orbit, for example, benefits all space-based infrastructure.

So, with an understanding of the issues, objectives, and incentives available to the USSF, it is vital to determine the capabilities of different allies and the advantage they could provide to a nascent hybrid architecture partnership.

To facilitate USSF prioritization, this paper identifies five critical metrics that should be considered:

- National scientific and technological capabilities
- National spending on space programs
- High levels of military spending
- The ability to exchange classified data, and
- Countries with supportive geography

National Scientific and Technological Capabilities in Space

In seeking international partnerships with technologically advanced countries, it is worth examining which nations can meaningfully assist USSF's technology development work in the space domain. While many are aware of high-profile space programs such as the United States' National Aeronautics and Space Administration (NASA), Russia's State Corporation for Space Activities (ROSCOSMOS), China's National Space Administration (CNSA), and the European Space Agency (ESA)—a multinational alliance of 22 European nations—these are far from the only space programs on Earth. More than 70 countries have space programs. Only 16 can conduct a space launch. Seven have the capability to send a probe to extraterrestrial locations such as the moon, Mars, or deep space, and only three are known to be able to conduct human spaceflights.

Countries without this level of development are unlikely to be able to contribute much to a hybrid architecture, aside from their geography. While this is not an insignificant addition (as addressed below), advanced countries with which USSF could seek more integrated partnerships should be a higher priority. Table 1 identifies countries with scientific and technological capabilities in comparison with that of the United States.[17]

COUNTRY	SCORE
Japan	100%
South Korea	99.5%
Germany	93.4%
Singapore	74.8%
United Kingdom	66.6%
United Arab Emirates	62.9%
Switzerland	57.6%
Canada	55.2%
France	53.5%
Sweden	49.9%

Table 1. Technologically Advanced Countries 2023

National Spending on Space Programs

A country's space program includes space expertise and focus, national goals, international cooperation, and commercial space sector activities, if applicable. Table 2 provides a list of countries' spending on space programs (both military and commercial).

It is important to note that the European Union/European Space Agency's (EU/ESA) announced budget for 2025 was approximately $7.9 billion. This would place the EU/ESA among the top 10 spenders on space programs. The EU contributes about 25% of ESA's budget, with the remaining funding provided by the individual member states.[18]

COUNTRY	TOTAL SPACE SPENDING
France	Pledged more than $9 billion on civilian space programs from 2023 to 2025, and about $6.7 billion for military space programs from 2024 to 2030.
United Kingdom	In 2022, pledged about $6.5 billion over a 10-year period to improve secure satellite communications, space-based intelligence, surveillance and reconnaissance, and other space capabilities.
United Arab Emirates (UAE)	As of 2021, the UAE Government invested nearly $6 billion in its space industry sector and received more than $5 billion in government, private, and semi-private support.
Japan	In 2023, the country spent approximately $4.5 billion across multiple agencies and established a 10-year, $6.7 billion fund for the Japan Aerospace Exploration Agency (JAXA) to support development, demonstration, and commercialization of advanced technologies.
Canada	In 2023, committed about $2.5 billion to further Canadian space exploration through 2036.
Germany	In 2023, committed approximately $2.3 billion.
Saudi Arabia	In 2020, Saudi Arabia pledged to spend approximately $2 billion on space programs by 2030.
India	In 2022, pledged approximately $2 billion for the Department of Space and approximately $75 million for the 2023 Chandrayaan-3 mission.
South Korea	in 2021, has allocated approximately $1.8 billion on its space program and pledged to spend another $1.4 billion over the next 10 years. In 2022 further pledged to double the annual space budget and invest over $70 billion into the space sector by 2045.
Taiwan	In 2024, pledged $1.3 billion for an indigenous LEO communications satellite project.

Table 2. Space Spending by Country 2025

High Levels of Military Spending

Technological capability alone is insufficient when determining international partnerships. While not all space programs are military in nature, a high level of military spending is likely to correlate with the ability to join advanced operations like a hybrid architecture. This also offers the opportunity to expand military-to-military ties and support FMS/DCS efforts in ways that would benefit the USSF.

Countries with high military spending will have a greater overall ability to substantively contribute to international cooperative operations and activities. This should be a significant factor to consider when prioritizing new partnerships. Table 3 identifies countries with a high level of military spending.

COUNTRY	TOTAL MILITARY SPENDING 2023
India	$8.3B
Saudi Arabia	$7.4B
United Kingdom	$6.9B
Ukraine	$6.2B
Germany	$6.1B
France	$5.7B
Japan	$5.2B
South Korea	$4.7B
Italy	$3.3B
Australia	$3.2B

Table 3. Military Spending by Country 2023

The Ability to Exchange Classified Information

The United States' ability to exchange classified information is also critical to establishing international partnerships. The United States assesses potential partners' ability to protect and share classified information. These assessments are memorialized through General Security of Information and General Security of Military Information Agreements (GSOIAs/GSOMIAs).

These security agreements establish, through bilateral treaties, the procedures and standards governing secure information exchange. In doing so, they facilitate cooperation on defense matters, intelligence sharing, and joint military operations. Table 4 identifies countries with current GSOIAs/GSOMIAs.

COUNTRY	ENTRY INTO FORCE/EFFECT
France	GSOIA entered into force on September 7, 1977.
Israel	GSOIA and exchange of notes entered into force December 10, 1982.
Singapore	GSOMIA and exchange of notes entered into force March 9, 1983.
Sweden	GSOMIA and exchange of notes entered into force December 23, 1981.
United Arab Emirates	GSOMIA entered into force May 23, 1987.
Japan	GSOMIA entered into force on August 10, 2007.
United Kingdom	GSOMIA entered into force on April 14, 1961.
South Korea	GSOMIA entered into force on November 29, 2024.
India	GSOMIA entered into force on January 17, 2002.
Germany	GSOIA entered into force on April 30, 2007.
Canada	GSOMIA entered into effect on January 30, 1962.

Table 4. Countries with General Security of Information and General Security of Military Information Agreements (GSOIAs/GSOMIAs)

The Best Geography to Support Space Activities

Geography plays a foundational, strategic, and operational role in supporting space activities of a global hybrid architecture. Key functions include optimizing launch site locations for efficiency and safety, providing spatial data for navigation and mission planning, and enabling the management of "space terrain." Even when countries are able to contribute to the hybrid architecture in other ways (technological, financial, etc.), certain countries offer advantages to the hybrid architecture by having appropriate geography for space launches. These are countries that are near the equator, have a rotational advantage, or have access to large bodies of water for safety during launch. The following countries are geographically advantageous for space launch and related operations.

A list like this is going to include several obvious allies, such as Japan, Canada, and the United Kingdom, but it is also worth considering the value of allied but not obvious candidates, like Sweden, or Singapore, which have distinct advantages and are places where US participation can shape their programs and gain benefits for USSF.

> Access to the right geography can be as strategically important as access to the right technology.

- **Australia:** The tip of Cape York, Queensland, has been identified as a strong potential location for a new spaceport due to its proximity to the equator, sparse population, and open ocean downrange.
- **Brazil:** The Alcântara Launch Center is located very close to the equator and offers advantages similar to those of French Guiana.
- **Canada:** Canada is suitable for launching satellites, particularly because of its access to both the Atlantic and Pacific oceans, as well as its vast, sparsely populated landmass, which supports varied launch trajectories and high-inclination orbits. Canada is also establishing its first commercial spaceports to enable domestic launches into orbit.
- **France (through French Guiana):** The Guiana Space Centre is located near the equator in South America, providing significant rotational advantage.
- **India:** Launch sites like the Satish Dhawan Space Centre are close to the equator, benefiting from Earth's rotation, which reduces the energy and fuel needed for launches.
- **Japan:** Japan's geography, with the Pacific Ocean to its east and south, supports accessible and relatively safe launch operations.
- **Kenya:** Areas along the eastern coast are geographically ideal because of their equatorial location, although factors like political stability and infrastructure remain important considerations in their development as major launch centers.
- **Norway:** Norway is well-suited for launching satellites, particularly into polar and sun-synchronous orbits, due to its northern location and access to large, sparsely populated sea areas. The Andøya Spaceport offers a strategic advantage by providing safe launch corridors over oceans with limited air traffic, a key benefit for safely launching larger rockets and achieving specific orbits.
- **Singapore (proposed offshore site):** Singapore is developing plans for an offshore launch site in the South China Sea, which would provide safe, equatorial-adjacent launch trajectories.
- **South Korea:** South Korea is developing launch capabilities and aiming for an expanded presence in space.

FINDINGS AND RECOMMENDATIONS

Adversaries like China are working rapidly to take advantage of the space domain. By accelerating the development of their own hybrid architecture, US adversaries have taken away the luxury of time. The earlier the United States deploys and employs an effective, international hybrid architecture, the faster, smoother, and more effective US space operations will be. To that end, and with knowledge gained from this study, we offer the following findings and recommendations:

FINDING 1

Bureaucracy, overclassification, and culturally disjointed vision hinder collaboration with allies and partners.

Allied cooperation benefits all participants by promoting global stability, providing deterrence against competitors, ensuring shared values, and enhancing allied competitiveness in a new space race. However, barriers to bringing allies into a hybrid architecture system must be resolved. Initiatives like the State Department's **Pax Silica**[19] offer a template for hybrid architecture efforts to realize true interoperability and secure cooperation among allies and partners.

FINDING 2

The promulgation and enforcement of technical interoperability standards are foundational to allied combined operations.

Technical interoperability standards have been an extremely successful cornerstone of NATO and other international partnerships (e.g., Standardization Agreements for 7.62mm munitions). Initial interoperability standards for hybrid architecture should focus on interfaces for multi-domain command and control to ensure real-time machine-to-machine data flow across relevant DoD platforms, using missile defense as a specified near-term critical mission. In addition, with space logistics in its infancy but growing in importance, now is the ideal time to promulgate and enforce standards for space refueling and re-arming, especially for geosynchronous orbits (GEO) and cislunar operations.

FINDING 3

The exercise of FMS/DCS and cooperative R&D IAs spreads the costs, risks, and technical challenges of developing space capabilities across the United States and its allies.

Allies are motivated to cooperate by providing access to US space assets and technology through FMS or US government authorized DCS. In addition, R&D to build their own national space assets is facilitated under international agreements for cooperative R&D. IAs can be multilateral frameworks like the Responsive Space Capabilities Memorandum of Understanding (RSC MOU) between Australia, Canada, Germany, Italy, the Netherlands, Norway, Spain, Sweden, the United Kingdom, and the United States, or bilateral, e.g., the MOU with Japan concerning the space situational awareness services and information sharing for space safety. FMS and IAs are hindered by unnecessary bureaucracy, overclassification, and hazy vision.

RECOMMENDATION 1

Form the Athena Accords to drive international space security cooperation.

To best engage international collaboration to prepare for and deter war, the United States should develop a comprehensive framework for multilateral international space security collaboration akin to the United States' participation in the Artemis Accords.

The success of the Artemis Accords for civil space offers a template for a national security analog. The United States should build upon Operation Olympic Defender to establish a shared vision of "peace through strength" in space and incentivize allies to invest and partner more closely by creating categories for multilateral national security space collaboration. The Accords will expand collaboration to include conducting complex multinational exercises, wargames, and real-world operations, allowing them to practice multi-domain operations and mature policies for responding to space-based threats. A USSF-led drafting team should brainstorm and refine details such as specific sharing guidance for consideration by the USSF, the Secretary of Defense, the Department of State, the President of the United States, and Congress.

These Accords might delineate various levels of acquisition and operational collaboration.

- **Level 1:** shared intent/rules, for example, no debris-creating anti-satellite (ASAT) tests.
- **Level 2:** shared real-time Space Domain Awareness (an evolution of the current space situational awareness sharing agreements).
- **Level 3:** development/acquisition collaboration and co-development; FMS/DCS.
- **Level 4**: combined defensive and offensive exercises, wargames, and operations.
- **Level 5:** mutual defense pact/treaty.

Every Athena Accords signatory could be a Level 1 partner, with each subsequent level requiring additional actions and investment from the ally in return for greater benefits and deeper mutual acquisition, operations, and protection. There is significant international interest in partnering with the United States for space security; providing a guiding framework and a streamlined, “open for business” approach would encourage allies and partners to align with the United States rather than China.

RECOMMENDATION 2

The USSF and SAF/SQ should work directly with the DoD, the Department of Commerce, international standards organizations, and other stakeholders to develop, publish, and implement interoperability standards for space logistics, core space networking, and information exchange.

More broadly, US leadership on 6G and other critical next-generation communication standards that will directly impact government and commercial space capabilities has largely been ceded to other countries and must be reclaimed. A lack of American leadership in shaping international standards contributes to the negative perceptions of US technology leadership, lost revenue for US industry, and—most importantly for the DoD and USSF—potential cyber and mission vulnerabilities. The USSF and SAF/SQ cannot tackle those leadership challenges alone; they must work collaboratively through the Department of Commerce and appropriate international and professional bodies.

RECOMMENDATION 3

Dominate global space services markets by initiating a USSF FMS pilot program for RG-XX and LEO data communications.

President Trump’s April 9, 2025, Executive Order, “Reforming Foreign Defense Sales to Improve Speed and Accountability” realigned authority for the implementation and management of the FMS process. Capitalizing on these moves, the OUSD(A&S) should work with colleagues across the government to create a pilot program under the Secretary of Defense’s acquisition transformation initiatives. This program could further streamline the FMS bureaucracy by empowering the USSF to approve space FMS cases and trade exemptions within the Service, and within prescribed boundaries. OUSD(A&S) could also use lessons learned from the USSF pilot program to streamline the international collaboration bureaucracy more broadly and propose appropriate legislative changes.

The FMS pilot program should focus on RG-XX (GEO space domain awareness) and proliferated LEO data communication and processing capabilities (e.g., StarShield, Amazon LEO, Link-16/182, and on-orbit data centers). RG-XX and LEO data communications capabilities are in relatively early stages of development and are of high interest and value to allies. Research and co-development opportunities for allies and their space industries (particularly experts in satellite build and integration, non-Earth imaging electro-optical payloads, rendezvous and proximity operations sensors and algorithms, and on-orbit refueling) should also be included in the pilot program. Where appropriate, these efforts should focus on the Urgent Capability Acquisition cycle.

Unit cost for these sales will be low enough to allow many allies to participate. The DoD and USSF will benefit from interoperability and additional capacity; US industry will profit from additional sales, and the USSF hybrid architecture will gain greater communications resilience. The programs and underlying technologies are evolving quickly and are not so exquisite or unique as to warrant strict export controls.

CONCLUSION

Shaping a common international agenda in selected areas of civilian and national security space activity can address global problems and maintain influence. It is a necessity for US international partnerships in space to center on collaboration for sustainability, the shift toward hybrid architectures, and the formation of distinct geopolitical blocs.

The DoD and USSF must prudently and deliberately double down on hybrid architecture with speed but also through coordination and integration across missions and potential partners. This ensures potential barriers are proactively resolved and expected mission benefits—peace through strength—are realized. For example, if left to the traditional, existing bureaucracy and processes, FMS of RG-XX and LEO data communications will fail because approval processes will be too slow, leaving potential international partners to develop their own incompatible capabilities or turn to China. Instead, the USSF and US industry should be empowered to aggressively market these critical capabilities to allies so that the US systems become interoperable international standards.

Whether through the Athena Accords or other international arrangements, allied and partner contributions to a USSF-led hybrid architecture will be critical to ensuring it maintains the strength, resilience, and technological edge necessary for continued American superiority in space.

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ENDNOTES

1 The Potomac Institute uses US Department of Defense and associated terminology in accordance with statutes passed by the US Congress, until and unless the department name is changed.

2 See the SmallSat Alliance HA definition in the *Making Space: Clearing the Way for Hybrid Architecture* report, March 12, 2026, https://potomacinstitute.org/reports/making-space-clearing-the-way-for-hybrid-architecture.

3 U.S. Department of State. (n.d.). *Artemis Accords*. Bureau of Oceans and International Environmental and Scientific Affairs. https://www.state.gov/bureau-of-oceans-and-international-environmental-and-scientific-affairs/artemis-accords

4 United States Space Command. (n.d.). *Multinational Force Operation Olympic Defender*. Retrieved May 4, 2026, from https://www.spacecom.mil/About/Multinational-Force-Operation-Olympic-Defender/

5 North Atlantic Treaty Organization. (2020, June 5). *Technical performance specification providing for the interchangeability of 7.62 mm x 51 ammunition* (Standard No. AOP-2310(A)(1)). European Defence Agency EDSTAR. https://edstar.eda.europa.eu/Standards/Details/a0a73927-cf78-4de0-86ff-1b185831abbd

6 Case-Zablocki Act, 1 U.S.C. § 112b (1994). https://www.govinfo.gov/content/pkg/USCODE-1994-title1/html/USCODE-1994-title1-chap2-sec112b.htm

7 As laid out in the Potomac Institute Paper: Targets, Treaties, and Trade Secrets: Understanding Hybrid Architectures Legal Challenges: https://potomacinstitute.org/papers/targets-treaties-and-trade-secrets-understanding-space-hybrid-architectures-legal-challenges

8 For more information about this paper see the Potomac Institute paper: "Never Trust, Always Verify: Improving Cybersecurity in Hybrid Architectures for Space" https://www.potomacinstitute.org/papers/never-trust-always-verify-improving-cybersecurity-in-hybrid-architectures-for-space

9 For example, the 2025 Global Sentinel exercise, a modeling and simulation gameplay, brought together almost 30 partner nations plus NATO. The exercise demonstrated interoperability with daily unclassified space operations.

10 Lisa Sodders. (2025a, February 20). *Deep Space Advanced Radar Capability Makes Tremendous Progress in First Year*. United States Space Force. https://www.spaceforce.mil/News/Article-Display/Article/4072069/deep-space-advanced-radar-capability-makes-tremendous-progress-in-first-year/.

11 *Northrop Grumman Integrates Multiple Antennas to Track Satellites in First-Time USSF DARC Demo*. (2025, August 12). Northrop Grumman. https://news.northropgrumman.com/milsatcom/northrop-grumman-integrates-multiple-antennas-to-track-satellites-in-first-time-ussf-darc-demo.

12 United States Department of Defense. (2014). *Memorandum of Understanding Concerning Cooperation in Responsive Space Capabilities Research, Development, Test, and Evaluation*.

13 United States Department of State. (2013). *Memorandum of Understanding for Sharing the Space Situational Awareness Services and Information*.

14 LaDonna Davis. (2025, May 6). *U.S. Space Command Hosts Global Sentinel 2025 Exercise*. United States Space Force. https://www.spaceforce.mil/news/article-display/article/4175650/us-space-command-hosts-global-sentinel-2025-exercise/.

15 United States Space Force. (n.d.). *Combined Space Operations Center / Space Delta 5 Fact Sheet*. https://www.vandenberg.spaceforce.mil/Portals/18/documents/CFSCC/CSpOC-Delta5-FactSheet.pdf?ver=2020-07-23-181257-343

16 Brandon Kalloo Sanes. (2025, August 26). *Schriever Wargame 2025 Strengthens International Partnerships, Shapes Future Space Operations*. United States Space Force. https://www.spaceforce.mil/News/Article-Display/Article/4286153/schriever-wargame-2025-strengthens-international-partnerships-shapes-future-spa/.

17 Rankings were determined by survey responses that reflect global perceptions of a country's performance in various areas. These surveys consider multiple factors, which are weighted to produce an overall score and ranking. For this particular evaluation, in addition to focusing on technological expertise, scores for other critical attributes such as innovation, skilled labor, and infrastructure were included. These factors were added because they all play a crucial role in supporting and advancing a country's technological capabilities.

18 ESA operates on the principle of geographical or fair return ("juste retour"), i.e., it invests in each member state through industrial contracts for space programs, an amount more or less equivalent to each country's contribution. For example, in 2023, Italy contributed over $600 million (12%) of the ESA's 2023 budget. Italy's juste retour is that Italian companies like Airbus Italia SpA and SITAEL SpA are participants in the ESA's Jupiter Icy Moons Explorer (JUICE) and the MicroHETSat programs.

19 United States Department of State Under Secretary for Economic Affairs. (2025, December 11). *Pax Silica*. https://www.state.gov/pax-silica.

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