Shared Situational and Domain Awareness as an Initial Framework for Strengthening the Quadrilateral Security Dialogue

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Abstract

The Quadrilateral Security Dialogue was formed in 2007 as a minilateral initiative between the big four democracies of the Indo-Pacific region: India, Australia, Japan, and the United States. While the dialogue displayed a lot of potential between the four nations at the time of its inception, it failed to translate into a formal multilateral organization that could counter growing Chinese belligerence in the Indo-Pacific region. While the four democracies consider China a common threat, diverging priorities, lack of leadership, and a fractured approach have prevented them from taking concrete steps together. The article contends that shared situational and domain awareness (SSDA) cooperation could cement the Quad partnership and become the cornerstone of enhanced strategic cooperation between the four nations. The article puts forth tangible solutions for integrating all-domain capabilities of the four nations and creating mechanisms through SSDA that could become a strong bulwark against Chinese aggression. The paper also provides practical suggestions for blending command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) capabilities of "non-ally" India with the ongoing US Department of Defense project of Joint All Domain Command and Control network architecture in the Indo-Pacific.

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Beijing has incrementally developed China's combat capability, militarized the South China Sea, and inflicted a destabilizing effect within the region through coercion and intimidation tactics to establish a new normal. The PRC's actions are defining modern–day colonialism in which its practices entrap and diminish national sovereignty. While nations have become more vocal about the nefarious activities executed by the PRC, a comprehensive and coordinated effort is lacking.
——Gen Charles CQ Brown, Jr, former commander, Pacific Air Forces

In terms of geospatiality, the Indo-Pacific extends from the eastern shores of Africa to the western coast of the United States. Since the region contains the world's most critical sea routes, the Indo-Pacific is considered the epicenter of the globe and has become a hotbed for strategic rivalries.[1] In the last few decades,

with the United States largely focused on the Middle East and Afghanistan, China has been surreptitiously gaining strategic spaces and is on course to militarize the region to its advantage. Through its Belt and Road Initiative (BRI), China also seeks to reshape the geopolitical landscape of the Indo-Pacific with an unprecedented wave of infrastructure investments.[2] Lately, the United States has refocused on the region and has also renamed the erstwhile Pacific Command to the Indo-Pacific Command. However, given the enormous lead held by China, the United States and its partners need to take substantial measures to retain their influence.

The Quad started as an informal grouping of like-minded democracies of the Indo-Pacific—India, Australia, Japan, and the United States—who were connected by the common concern of growing Chinese bellicosity in the region. Characterized by China as a replication of NATO for Asia, the Quad essentially is a loose-knit network of like-minded nations with common uniting principles—democracy, a rules-based order, and a "free, open, and inclusive Indo-Pacific."[3] Although the four powers were best equipped geographically and militarily to take on China, differing priorities in the past, individual national interests, and the undefined agenda of the Quad precluded them from acting in unison. Tokyo's defense centers around its Japan Self-Defense Force (JSDF), New Delhi largely invests in its army to defend India's northern borders, and Australia looks to find a balance to ensure immediate regional security.[4] Moreover, since the Quad economies are deeply intertwined with China, apprehensions of Chinese commercial reprisal have precluded them from giving distinctiveness to their counterstrategy or adding a military dimension to the partnership. After the Quad meeting of 2017, instead of releasing joint statements, the four nations issued four separate press releases in varied tones and languages indicating how their strategic objectives and preferences in the region differed.[5] However, after the recent events of Chinese territorial aggression with India and Japan and the offensive warnings to Australia over Taiwan, the requirement of incorporating hard-power options and espousing a politico-military strategy in the four-way dialogue is being felt by the Quad.

The renewed focus in the last few years on reinvigorating the alliance is being touted as "Quad 2.0" by some strategists.[6] The first in-person Quad summit hosted by President Joe Biden on 24 September 2021 demonstrated an overarching commitment by the four nations. The highlight of the Joint Statement was the release of the *Quad Principles on Technology Design, Development, Governance, and Use* toward high-standard innovation.[7] The post-summit statements also underscored the urgency and seriousness required for addressing the core issues of lack of purpose and lack of definition within the Quad. The *Indo-Pacific Strategy of the United States*, released in February 2022, confers high importance to the grouping and calls for pooling collective strength to bolster the Quad as the premier regional grouping.[8] The latest strategy also

highlights the much-needed sincerity from the four nations to prove through deeds, not merely words, that they are seeking out areas of alignment and cohesion.

While the combined potency of the Quad exceeds China's organic capabilities, given the substantial Chinese strength in the region, the four nations should still avoid confrontation. An overt display of hard power could be deemed escalatory and may provoke larger Russian involvement in the region. Hence a dexterous approach involving a graduated increment of military cooperation and collective capacity building in the region is desirable. By coalescing their all-domain capabilities, the Quad would be able to collectively dissuade China's antiaccess/area-denial (A2/AD) tactics, deter its gray zone coercion, and defend Freedom of Navigation Operations (FONOPs).[9] To this end, shared situational and domain awareness (SSDA) cooperation provides a balanced option for positioning the Quad as a formal strategic framework of integrated partnership without giving an explicit impression of an offensive alliance. If successfully implemented, SSDA could also act as a lynchpin in strengthening the existing partnerships and could transform the security dialogue into a quasi-military alliance for the Indo-Pacific region.

The article attempts to amalgamate the informational and military dimensions of the Quad to develop a benign strategy based on SSDA cooperation that is effective but not overtly escalatory. The suggested approach is designed to capitalize on the existing agreements between the four nations to build an integrated multidomain partnership around SSDA cooperation. The first half of the article covers Chinese designs in the region, varying levels of strategic engagements at the political and diplomatic levels between the Quad nations, and the impediments due to India's non-ally status. The second half of the paper emphasizes the importance of SSDA cooperation and recommends measures to be taken at the functional level to blend the command, control, communications, computers, intelligence, surveillance, and reconnaissance (C4ISR) capabilities of India with the future communication network of the United States in the Indo-Pacific. The recommended SSDA cooperation is conceived on a graded response model and incorporates strategic dissuasion, offensive defense, and deterrence by active denial as part of its overarching strategy.

Grand Chinese Designs

With its irredentist claims in the South China Sea and the creation of "String of Pearls" facilities as part of the BRI, China has become a predominant power capable of overshadowing the US influence in the region.[10] While Beijing has maintained that the infrastructure facilities in the Indo-Pacific reflect its legitimate economic interests, their proximity to strategic choke points and important sea lines of communication (SLOCs) provides China with an asymmetric advantage. As part of the BRI, China's Maritime Silk Road initiative is also being touted

as an attempt to create an Indo-Pacific with Chinese characteristics.[11] Since most of the BRI infrastructural projects are designed to be of dual use, the Indo-Pacific is rapidly getting militarized with Chinese characteristics. During hostilities, China would be able to leverage these facilities to form a "Great Wall at Sea," to keep the maritime forces of the United States and its partners at bay.[12]

At the same time, to increase its global maritime footprint, China has embarked on developing the People's Liberation Army Navy (PLAN) into a true "blue water navy" capable of undertaking deep seas operations.[13] Riding on sophisticated aircraft carriers with fifth-generation deck launch interceptors and ballistic missile submarines, the PLAN is rapidly becoming a multilayered force capable of high-end power projection. China is also building its naval and air forces at an alarming speed and some of these are qualitatively superior to the United States. With this tsunami of Chinese shipbuilding, Beijing aims to coercively envelop Taiwan, resolve sovereignty disputes in its favor, and carve out the region as a zone of exceptionalism to international rules and norms.[14] The comparison of estimated major weapon systems between 2030 and 2040 with China and Quad nations in Table 1 below highlights the importance of combining the assets of the Quad nations to match China's future capabilities.

Table 1. Major weapon systems comparison, 2030–2040 estimates[15]

Weapon Systems	United States	Australia	Japan	India	Quad Total	China
5th-generation fighters	1,321	72	147	0	1,468	200
Bombers	88	0	0	0	88	150–172
Major surface combatants	78	12	54	22	166	150
Submarines	25	12	22	24	83	70
Aircraft carriers	5	0	0	3	8	2

Note: All US numbers at 50 percent to account for other global activities and US homeland defense.

China has also taken significant strides in the realms of information, cyber, and space and is using leapfrogging technologies for information domination. Since C4ISR is extremely critical to the PLAN's blue water presence and A2/AD capabilities, "informationization" has become a fundamental goal of China in network-centric warfare.[16] In the last few years, China has made huge advances in counter-space technology, and its kinetic-kill-vehicles and electronic antisatellite capabilities have wide-ranging space security implications for the Indo-Pacific. China is also testing multiple next-generation capabilities, such as the world's first quantum communications satellite, and plans to develop at least three new constellations.[17] During conflicts, the persistent coverage of the Beidou satellite network would allow China to carry out precision strikes even in a GPS-denied environment. Furthermore, as part of its "Three Warfare" strategy in legal, psychological, and information domains there has been a surge of offensive peacetime operations in these domains from China against the United States and allies.[18]

More importantly, China's intentions to provide a "Chinese solution" (Zhong-guo Fangan) to Asian countries and play a leadership role in international affairs is seen as Beijing's intention to shape a China-centric regional order.[19] The huge presence of PLAN vessels and a free trade agreement with Association of Southeast Asian Nations (ASEAN) member states are a few tools through which China is influencing the region with a combination of hard and soft power. The Chinese juggernaut is unlikely to stop until it emerges as a substitute for the United States and through the twin processes of "regionalism and regionalization," Beijing plans to get a firm grip on the region.[20] To rein China in from becoming the domineering power in the Indo-Pacific, the Quad nations need to act swiftly and coherently.

Present Cooperation, Engagement, and Interplay between the Quad Nations

Quad Cooperation between the United States, Japan, and Australia

While the four nations have been engaging with each other outside the Quad, as major non-NATO allies of the United States, in the Quad grouping, Australia, Japan, and the United States have much closer politico-military relationships with each other as compared to India. Being a part of the Australia, New Zealand, and the United States alliance and the Five Eyes intelligence network, the United States and Australia have information-sharing arrangements in multiple domains.[21] Similarly, the Treaty of Mutual Cooperation and Security between the United States and Japan has been the hallmark of defense cooperation between the two countries. Additionally, the trilateral Acquisition and Cross-Servicing Agreement and the General Security of Military Information Agreement have bolstered multilayered cooperation between the US military, JSDF, and Australian Defence Force (ADF).[22] Furthermore, the commonality of US-origin communication systems, network compatibility, and platform designs also allow the three nations to be well equipped for seamless interoperability.

Integrating the Outlier India

Among the Quad nations, India at first glance comes across as an outlier from the politico-military perspective. The cool relations from the Cold War era separated the world's two oldest and largest democracies, the United States and India. However, since the inking of the historic Indo-US civil nuclear deal in 2007, the two estranged democracies are on the course of becoming natural allies of the future.[23] Having signed a string of foundational agreements in the last decade, the Indo-US relationship trajectory is on a huge upswing. Notably,

the Logistics Exchange Memorandum of Agreement in 2016, Communications Compatibility and Security Agreement in 2018, and Basic Exchange and Cooperation Agreement in 2020 between India and the United States have facilitated the transfer of high-end technologies.[24] These latest agreements also act as enablers for sharing of classified data and intelligence and help in mitigating the outlier tag that India holds because of the preponderance of Russian equipment. In recent years, with a strategic convergence between the United States' "Rebalance to the Asia-Pacific Region" and India's "Act East" policy, the United States has been seeking to reinforce India as a net provider of security in the Indian Ocean Region (IOR) and beyond.[25]

In the last few years, India has elevated its partnership with Australia and Japan as well. The comprehensive strategic partnership in 2020 resulted in India and Australia signing the Mutual Logistics Support Agreement (MLSA), which allows for greater interoperability across defense and strategic planning.[26] Since the inking of the MLSA, both nations have engaged in a host of air and naval exercises thereby further cementing the relationship. A second agreement in the form of the Defence Science and Technology Implementing Arrangement has the potential to enhance defense research collaboration and develop future defense capabilities.[27] These arrangements have paved the way for greater cross-service military activity across multiple domains and could also become the foundation for building mutual trust toward intelligence sharing. With the establishment of a 2+2 bilateral dialogue between foreign and defense secretaries of India and Australia in 2017, India now holds 2+2 dialogues with each of three other Quad countries.[28]

While India and Japan have had close political and trade relationships in the past, their geographical proximity with China and history of unresolved territorial issues have brought them together in recent years. Concerned by growing Chinese assertiveness in the region, both nations upgraded their bilateral relationship to a "Special Strategic and Global Partnership" in 2014.[29] Since then, India and Japan have expanded their high-level ministerial contacts, diplomatic engagements, and are looking for increased avenues for cooperation in multiple areas. The Free and Open Indo-Pacific strategy mooted by Japan has become essential in international political interactions between India, the United States, Japan, and other Pacific actors in the Indian Ocean.[30] Defense cooperation has further expanded with the signing of the memorandum on the transfer of defense equipment and technology and the Acquisition and Cross-Servicing Agreement in 2020. The agreement establishes a framework for the reciprocal provision of supplies and services between the armed forces and promotes closer cooperation.[31] The current partnership between the Quad nations is highlighted in figure 1.

Treaties and Partnerships Across the Quad
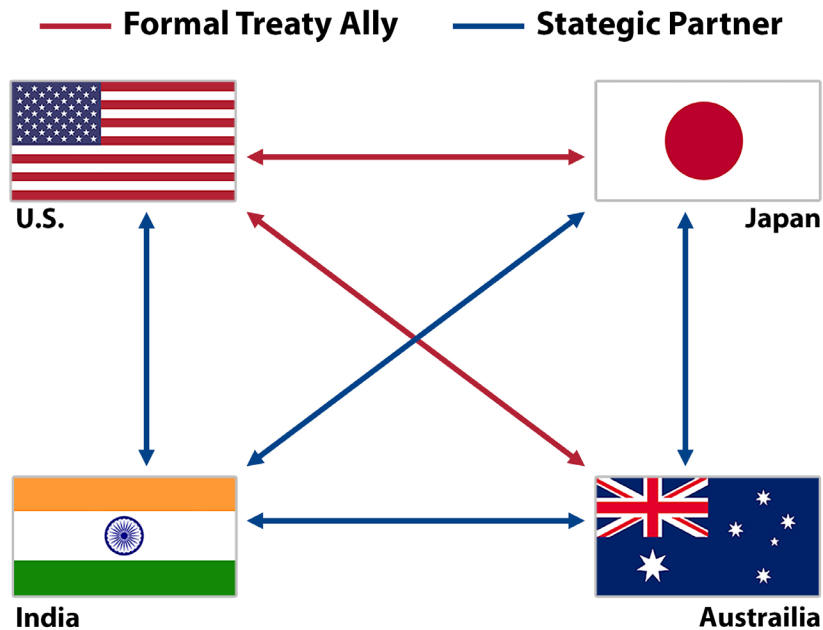
(Source: Jeff Smith, "The Quad 2.0: A Foundation for a Free and Open Indo-Pacific." Heritage Foundation Backgrounder 3481 (2020), https://www.heritage.org/global-politics/report/the-Quad-20-foundation-free-and-open-indo-pacific.)

Figure 1. Treaties and partnerships across the Quad

Military Cooperation between and among Quad Members

The four nations have also stepped up their military cooperation in the last few years. While the US Air Force regularly operates with the Indian Air Force (IAF), Japanese Air Self-Defense Force (JASDF), and Royal Australian Air Force separately, there has been a steady increase in engagements between the three Air Forces independent of US involvement. In 2018, for the first time, IAF Su-30MKI aircraft participated in Exercise Pitch Black in Australia, and the IAF and JASDF have been conducting annual bilateral Exercise Dharma Guardian since 2018. In terms of the naval exercises, the Royal Australian Navy joining the navies of the United States, Japan, and India in the 2020 edition of Exercise Malabar was an important development and an illustration of the Quad's stance on counterbalancing China's rising influence.[32] Malabar 2021, hosted by the United States off the Guam coast in the Philippine Sea, was of particular importance as it was seen as the first riposte in China's maritime backyard by the Quad. Australia is also keen to include India in its largest bilateral naval wargames with the United States

in Exercise Talisman-Sabre, for which a formal invitation for participation in 2023 is expected.[33]

Although these joint exercises by the Quad do not overtly name any country, they do send an explicit signal about the growing military dimension of the informal security arrangement with China. These exercises also portray the proactive resolve of the Quad to push back against Chinese expansionism, demonstrate collective capabilities and enhance the credibility of the grouping. While a formal multilateral security alliance may seem like a far-fetched idea for the Quad currently, its burgeoning military cooperation is laying the bedrock for the future, and SSDA could become the keystone of this cooperation.

The Benefits of Shared Situational and Domain Awareness

Cooperative intelligence, surveillance and reconnaissance (ISR) provides information advantage over an opposing force and helps strengthen alliances and partnerships by generating shared awareness of malign adversary actions.[34] The Chinese maritime strategy in the Indo-Pacific has been mostly gray zone coercion, which relies on achieving its geopolitical objectives without triggering a tripwire that could elicit a response from the United States and its allies.[35] The declaration of its air defense identification zone (ADIZ) in the East China Sea while violating the ADIZ of Taiwan is part of its broad lineup of gray zone actions to intimidate other nations in the region. By contesting operational access to foreign militaries through shadowing, harassing, and interfering in international waters, China has been attempting muscular enforcement of its territorial claims.[36] The overwhelming presence of Chinese militia boats and white hulls in the Indo-Pacific requires a huge amount of monitoring, which the United States may not be capable of without the support of its partners. Cooperation in form of SSDA, therefore, becomes a strategic necessity between the other great powers of the region to expose and counter the gray zone maritime coercion of Beijing.[37]

SSDA also has the potential to become a potent tool for assertive diplomacy and an important instrument for escalation control against Chinese aggression. As a subset of SSDA, cooperative C4ISR between the Quad could help predict and prevent future conflicts in the region. Sharing of air and maritime domain awareness (MDA) pictures would help locate, track, and identify potential threats in the waterways, SLOCs, and airways across the region thereby allowing the Quad nations to preempt Chinese actions. Persistent surveillance would also allow monitoring of flying activities in the Woody and Spratly Island groups, construction activities in Fiery Cross, Mischief, and Subi reefs as well as deployment of a2/ad weapons such as antiship cruise missiles, antiship ballistic missiles, and land-attack cruise missiles.[38] Going further, the amalgamation of space and cyber

domains as part of the SSDA would bolster the capabilities required to conduct FONOPs against Chinese gray zone coercion. The multidomain cooperative SSDA relationship would also mesh with the Phase Zero operations of the United States designed to prevent conflicts through combined capacity building.[39]

Present Cooperative C4ISR and Network Capabilities in the Indo-Pacific

The United States has robust multilayered information-sharing arrangements with its allies and partners in the region. Recently, Australia has adopted the US Distributed Common Ground System, which optimizes the processing, exploitation, and dissemination of intelligence between the two nations.[40] These centralized nodes permit a broad range of information to be absorbed and disseminated thereby facilitating expeditious decisions by the operational and tactical commanders of both nations. With several interoperable platforms such as the Boeing P8, MQ-9 Reaper, and MQ-4 Triton fielded by the ADF, Australia has a strong intelligence partnership in the Indo-Pacific with the United States. Being a part of the Anglosphere Five Eyes intelligence alliance, the two nations have also optimized architectures for the seamless exchange of processed intelligence.

With Japan, the "reinterpretation" of Article 9 has enabled the United States and Japan to focus on building the organic capabilities of the JSDF and engaging in a wider range of operations.[41] Since 2014, there has been a spurt in the capacity building of the information architecture of Japan toward island defense. As part of the Security Consultative Committee meetings, the two countries are discussing setting up an X-band radar missile defense system and intensifying bilateral cooperation in training and intelligence.[42] To enhance Japan's ability to monitor the airspace and improve its maritime surveillance capability, the United States has signed multiple military deals with Japan. As part of these contracts, the United States is providing amphibious assault vehicles, V-22 Ospreys, E-2D Hawkeyes, and Global Hawk unmanned aerial vehicles to Japan, which will immensely enhance its military prowess in the region.[43]

In addition to Australia and Japan, cooperation with South Korea, New Zealand, and the Philippines in the information domain provides the United States with a robust ISR capability in the Pacific region. However, the United States does not enjoy the same advantage in the IOR because of its low footprint and limited resources in the region. Therefore, the Indo-US strategic partnership, if manifested into SSDA cooperation, would allow the United States, India, and Quad partners to harness each other's capabilities and fill the current resource gap in the IOR.
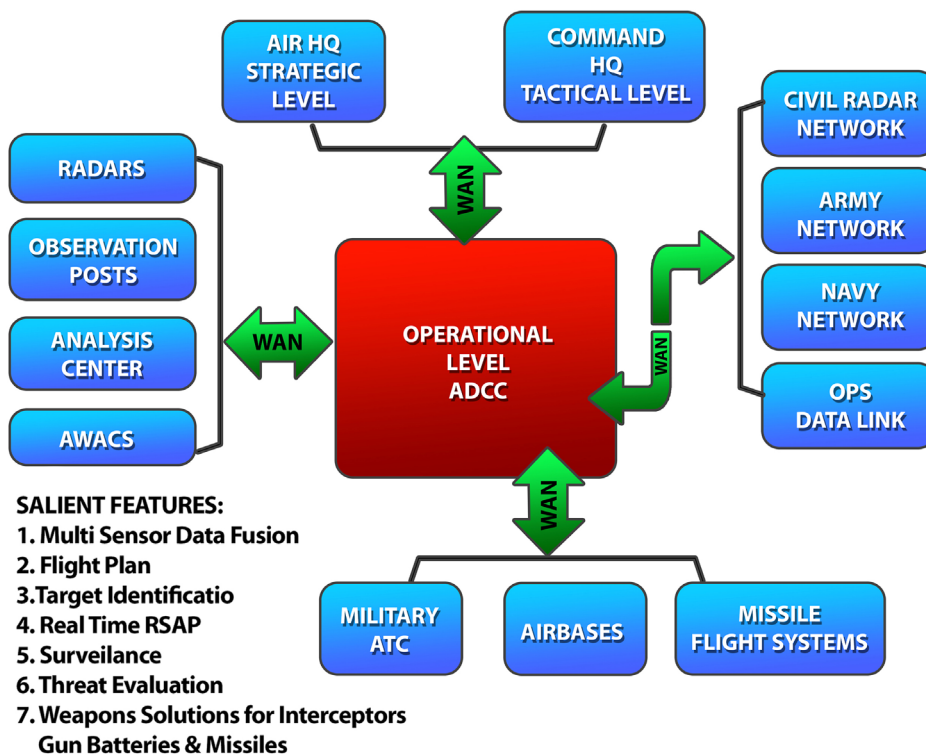
Indian C4ISR Capabilities in the IOR

In the last few years, India has completed numerous organizational and operational changes to create a national MDA grid. Toward this end, the Indian Navy (IN) has set up the National Command, Control, Communication, and Intelligence network that hosts the Information Management and Analysis Centre (IMAC).[44] Managed jointly by the IN and the Indian Coast Guard, IMAC is responsible for connecting, collating, fusing, and disseminating actionable information and critical real-time intelligence over its entire coastline and the island territories. The system also receives vital operational data from the coastal radar stations, automatic identification systems, long-range identification and tracking data from IOR countries of Maldives, Mauritius, Seychelles, Sri Lanka, Bangladesh, and Myanmar through white shipping arrangements.[45]

In 2018, the scope of IMAC was further expanded with the launch of the National Information Fusion Centre–Indian Ocean Region (IFC-IOR), a maritime information hub for the region. Having established collaborative links with 97 other centers in 41 countries, the IFC-IOR coordinates with like-minded stakeholders in multilateral information-sharing networks and provides actionable information to maritime agencies.[46] The ability to share critical intelligence posthaste results in enhanced synergy and engagements among the maritime agencies of the region. Both IMAC and the IFC-IOR at the national and international levels aim to create predictive analysis to aid in India's MDA capabilities and highlight trends and incidents that might potentially trigger a crisis.[47]

In the air domain, the IAF has commissioned the Air Defense Command and Control Center in form of an integrated air command and control system (IACCS) for automated controlling and monitoring of air operations. The IACCS system integrates data elements from multiple ground-based and airborne platforms to create a real-time comprehensive recognized air situation picture.[48] As part of network-centric warfare by the IAF, all civilian and military radars including the ship radars have been integrated to form a composite picture of the aerial activity. The IAF has also digitized communication and data transmission through the Air Force Network (AFNet) and integrated air force installations and communications nodes into a high-bandwidth secure network. The AFNet provides taut communications grid links between the IAF's command and control center, sensors, airborne early warning and control aircraft, and ISR platforms with shooters.[49] The network architecture of IACCS is indicated in Fig.3.

INTEGRATED AIR COMMAND & CONTROL SYSTEM

Figure 2. IACCS network architecture

Furthermore, both the IAF and IN have dedicated geostationary satellites of their own which have allowed them persistent surveillance capabilities at extended operational ranges and have also provided secure communication and data link capability. The GSAT-7A communications satellite, equipped with Ku-band transponders, allows the IAF to interconnect a variety of ground-based radar stations, airbases, and platforms and has helped to strengthen drone operations by expanding communications links from ground-based stations with unmanned aerial vehicles.[50] A separate satellite, GSAT-7 provides the IN with a digital view of the dispersion of fleets, aircraft, and submarines on the high seas and allows it to monitor activities in most of India's strategic sphere of interest, stretching from the Persian Gulf to the Strait of Malacca.[51] This pervasive and dedicated satellite network has provided the IAF and IN with seamless complementarity for the conduct of joint operations in the region. Additionally, both the services have

created huge repositories of signal intelligence (SIGINT) and imagery intelligence (IMINT) of the Chinese aircraft and PLAN vessels, which would complement the threat library of Quad militaries.

Linking JADC2 with Indian C4ISR Network

The ongoing US Department of Defense project of Joint All Domain Command and Control (JADC2) aims to connect sensors into a single network making it compatible with all the military agencies. The JADC2 architecture would enable commanders to rapidly understand the battlespace, direct forces faster than the enemy, and deliver synchronized combat effects across all domains.[52] The proposed network architecture also supports the integration of partners and allies through compatible protocols, secured gateways, and common data standards.

Linking JADC2 with Indian C4ISR capabilities (IACCS and IMAC) would facilitate secure data transfer and provide the Quad nations with a common operational picture. The coupling of both the networks would also allow the Quad to generate a composite picture of the aerial and surface activity and would facilitate sharing of huge SIGINT and IMINT information. In the future, with JADC2 operating as the backbone of systems such as the Air Battle Management System, enabled by joint space assets, all four nations could be networked, linked, and integrated in one common lattice.[53]

Obstacles to SSDA Cooperation between Quad Members

For the SSDA mechanism to take a robust shape, political integration at the national level would be a prerequisite for the Quad. Especially for India, the convergence of its foreign policy objectives in the region with the United States would be one of the biggest challenges. While the United States wants India to play a larger role in Southeast Asia and the Asia-Pacific region, India's maritime focus is limited and there has been an inherent reluctance to participate outside the IOR.[54] Additionally, India has always maintained a neutral approach in its foreign policy and prefers strategic autonomy when dealing with the great powers. SSDA cooperation with military characteristics with the United States in the Indo-Pacific may be viewed as India formally entering the US-led camp which may also affect its strategic relations with Russia. This would require a pragmatic balancing act between Indian foreign policy imperatives and a strategic empathy from the United States to recognize that a complete decoupling by India from Russia should not become a precondition for moving forward in this endeavor. A difficult test of the US-India-Russia foreign policy conundrum would be a Countering

America's Adversaries Through Sanctions Act waiver, which India hopes to obtain from the United States upon inducting the Russian S-400 system.[55]

The second major issue would be the preponderance of Russian manufactured weapon systems in the Indian military arsenal, which may cause concerns among the Quad for the fear of data pilferage. While these apprehensions may be legitimate, it is important to note that, barring the S-400, over the last few years India has inducted high-tech equipment predominantly from the United States, Israel, and other Western suppliers to replace its legacy Soviet systems.[56] Furthermore, most of the radars, electronic warfare systems, tactical communications systems, and network-centric situational awareness solutions such as the IACCS have been built indigenously by Bharat Electronics, an Indian Defense Public Sector unit that has no Russian linkages.[57] By linking these Western systems with indigenous Indian equipment; and by excluding the Russian systems from the SSDA network architecture, India could allay the concerns of the United States. Furthermore, India would need to assure the United States that its continuing military cooperation with Russia is due to bureaucratic inertia and that sensitive technology shared with India will remain closely guarded. In the ongoing Russia-Ukraine crisis, India's abstention from voting against Russia in the UN highlights its precarious position. While India has supported the international calls for the cessation of hostilities and an immediate ceasefire, it has stopped short of condemning Moscow and maintained a neutral stand. The military dependence makes India liable to Russian retaliation which would be especially costly as it continues to be in an eyeball-to-eyeball standoff with China at various points along their shared border.[58] India is also concerned with the growing closeness between its archrival Pakistan and Russia in the last few years. With an existing strategic partnership between Pakistan and China, India cannot afford a quasi-alliance between Pakistan-China-Russia in its neighborhood. Notwithstanding, India is rapidly breaking free from its conventional reliance on Russian weaponry and is undertaking large-scale efforts through diversification of imported arms from Western markets and rejuvenating the indigenous military-industrial complex.

Seven-Step Framework for SSDA Cooperation

To pragmatically address the diverse issues, the Quad nations must take a graduated approach to create an effective information-sharing apparatus underpinned by mutual trust. Toward this end, a seven-step framework for SSDA cooperation is proposed in the succeeding paragraphs.

Creation of an Indo-Pacific Maritime Fusion Center

As the starting point, the Quad must create an Indo-Pacific Maritime Fusion Center (IPMFC), which could be modeled on the lines of the IFC-IOR. The IPMFC could merge and manage the MDA pictures of Quad nations and employ a single system that could fuse data feeds from other regional national MFCs (NMFCs) in the future.[59] Space-based synthetic-aperture radar, electro-optical data, and surface automatic identification systems could be integrated into these NMFCs and the IPMFC. The scope could gradually be expanded to include air, space, and cyber domains to allow a composite picture available to all stakeholders. These centers could act as a central clearinghouse with an option to expand the cooperation with other nations of the Indo-Pacific Region.[60] These fusion centers would also lay the foundation for the dispersed and decentralized combat operations of the future and align with the Agile Combat Employment philosophy of the United States.

Develop Robust Network Architecture

The second step of SSDA cooperation should focus on designing the information-sharing architecture and constructing flexible yet robust apparatuses that could integrate disparate elements irrespective of the make of the equipment. This would require the standardization of data, information-sharing gateways, compatible hardware, and a cloud environment in the form of a data lake acting as a repository for all information collected by any sensor and any coalition member.[61] With the dispersed and distributed future architecture and the ability of small combat units to undertake independent informational and combat functions, there would be a requirement for functional coupling of these units for achieving convergent capabilities. The sensing grid architecture of the JADC2 networks should therefore apply industry data standards at the initial data life cycle, which allows collaboration and future compatibility with allies and partners.[62] The adaptive wide-area information architecture of JADC2 should provide a secure "plug and play" option with accommodative security protocols for connecting the dissimilar equipment utilizing common bulk encryption units at the information gateways.

Integration of Indian Equipment and Platforms

The third step of SSDA cooperation would entail the Quad devising mechanisms to surmount the limitations of the noncompatibility of Indian equipment and platforms. India has a substantial inventory of US-origin ISR platforms in form of the Sea Guardian MQ-9B and is the largest international operator of

Boeing P-8 aircraft.[63] As a pilot project, these two platforms could be integrated into the combined network to optimize the processing, exploitation, and dissemination of intelligence for partner operations.[64] The integration of these two platforms with the IPMFC would enhance the collective MDA capability of the Quad substantially. Subsequently, the modalities for data-linking the C4ISR network with JADC2 to provide a composite common operational picture could be worked out.

Strategic Dissuasion through Space Cooperation

Strategic dissuasion seeks to prevent incitements, not through the direct threat of military retaliation but through thwarting and frustrating hostile steps through countervailing measures.[65] Therefore, the fourth step of SSDA cooperation should concentrate on dissuading China's A2/AD network through space cooperation to monitor, expose, and attribute malign Chinese activities in the Indo-Pacific region. Collaboration in space domain awareness and integration of space-based capabilities of the Quad would deliver game-changing predictive intelligence and provide assertive global response capabilities.[66] Since 2014, the United States has partnered with other space-faring nations in the field of space situational awareness (SSA) through the Global Sentinel experiment. Led by the US Strategic Command, the experiment intends to formulate a fully integrated, Federation Space Operations Center to demonstrate the value of a combined and integrated C2 capability.[67] Since India is one of the strongest space powers in the region, the inclusion of Indian space capabilities as part of Global Sentinel SSA would enhance the collective space-based C4ISR capabilities of the Quad.

Deterrence by Active Denial

The fifth step of SSDA cooperation should focus on deterrence by active denial strategy, which could be achieved through the integration of intelligence resources. Expansion of the Five Eyes intelligence alliance to include India and Japan would remove the current information-sharing constraints between the Quad and integrate the resources of Canada, New Zealand, and the United Kingdom. It would also allow the United States to share the burden of gathering and analyzing foreign communications intelligence in the region without overextending its resources.[68] The initiative by the US House Subcommittee on Intelligence and Special Operations in August 2021 for possible expansion of intelligence sharing with South Korea, Japan, India, and Germany is a welcome step in this direction.[69] The inclusion of India and Japan in the Five Eyes would increase collective intelligence contributions and permit expanded collaborations thereby providing in-

formation dominance to the Quad. It would also galvanize joint planning against the Chinese Three Warfare Doctrine, which calls for manipulating legal, psychological, and media targets.[70]

Offensive Defense

An offensive defense strategy for building informational resilience should be the sixth step of SSDA cooperation. Such a strategy encompasses actions required for defending the physical as well as informational infrastructure while continuing to develop capabilities for offensive actions. The integration of the partners within a cloud environment would require impregnable firewalls, homomorphic encryption, distributed architecture, and strong security protocols to ensure adequate defense while permitting seamless access to the authorized users. Protecting the collaborative sensing grid should be the biggest focus in a Quad network-sharing arrangement. Designs for the sensing grid would call for a resilient, penetrating, and persistent capability equipped with disruptive technologies and the ability to cue data from sensors to sensors.[71] In the future, if the SSDA cooperation takes shape of a military alliance, the sensing grid design should cater to a sensor-shooter coupling for rapid targeting of the adversary during combat operations.

Collective Creation and Usage of Quad SSDA Infrastructure

The final step of SSDA cooperation should be toward the shared creation and usage of SSDA infrastructure for establishing C4ISR terrestrial structures and fusion centers as well as basing for maritime surveillance platforms. With almost all the current US regional bases within the Chinese missile threat rings, there is a requirement for dispersed joint-use strategic basing options to increase China's strategic ambiguity.[72] With its proximity to the Strait of Malacca, India's Andaman and the Nicobar Island chain (A&N) is ideal for establishing the Quad SSDA nerve center and the IPMFC. Due to its status as a key economic corridor housing the world's busiest shipping lane, the establishment of the IPMFC in the A&N islands would allow the Quad to monitor one of the most important Chinese chokepoints. With four operational airfields and multiple port facilities, the A&N islands would also weave into the overarching US strategy of regional base cluster positioning operations and Agile Combat Employment. The existing fusion centers such as India's IFC-IOR and Singapore's Information Fusion Centre could be integrated with other like-minded ASEAN partner nations to create a web of information capacity in the region.[73]

Conclusion

Even though in its current form the Quad appears as a patchworked forum of bilateral and trilateral cooperation, it contains all the essential ingredients to transform into a truly cohesive alliance. Since policy coordination mechanisms are prerequisites for achieving expanded intelligence sharing, functional coordination in all domains requires relentless efforts from all the members to achieve the vision of a free and open Indo-Pacific.[74] As part of the initial framework, collaboration in SSDA could become the core of Quad cooperation to transform the informal agreement into a robust politico-military partnership. The proposed seven-step approach would strengthen relations, enhance mutual trust, and will allow shared capacity building between the four nations in a graduated manner. While the initial steps are benign and are focused predominantly on creating information-sharing mechanisms, they do set the stage for the creation of an official military alliance should the Quad nations feel the requirement of the same in the future. The opportunities for the Quad are limitless, both in terms of developing new domains of collaboration or in expanding cooperation with other nations of the Indo-Pacific. If the Quad is successful in developing and implementing its strategic framework, it would attract the Southeast Asian states to create a much larger arrangement in the form of a "Quad Plus" in the future.[75] ✪

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