

# Issue

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# Brief

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# Enhancing Aerospace Power Engagement Among the Quad Countries: A Roadmap

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### Abstract

The Indo-Pacific region is becoming the world's new strategic and economic 'centre of gravity'. Indeed, the accelerated trajectory of the Quadrilateral Security Dialogue (Quad) in recent years highlights the region's growing importance. The Quad countries have committed to a rules-based order and a free and open Indo-Pacific, and are aiming to develop resilience across domains, such as in the maritime space, to counter and deter aggressive behaviour in the region. Aerospace power will be a significant element and enabler in deterrence in the region's maritime spaces. As such, the Quad countries must enhance cooperation in the aerospace power domain to build robust resilience and deterrence against coercive actions. This brief assesses the need for and scope of cooperation among Quad air forces and recommends a roadmap to achieve such collaboration in the aerospace power domain.

The Quadrilateral Security Dialogue (Quad)—comprising India, the United States (US), Japan, and Australia—has evolved from a senior-level security dialogue to a leaders-level summit, despite China (who views the grouping as an attempt to counter it) initially dismissing it as an idea that would “dissipate like sea foam”.<sup>1</sup> While the Quad’s stated goals do not mention containing China, the grouping’s frequent references to a rules-based international order, freedom of navigation, and a free and open Indo-Pacific (FOIP) reflect its security dimensions aimed at deterring China. China has repeatedly displayed its uneasiness about the Quad’s formation and activities. Still, for now, the Quad countries appear to be employing the viable strategy of cooperating on smaller and less controversial aspects to build better interoperability and communication before taking bigger steps in military cooperation and security issues.

Cooperation in the maritime domain will be crucial for the Quad to effectively enhance security in the Indo-Pacific, especially given its geographic features. The grouping is already cooperating in the maritime domain, with the four navies participating in the Malabar Exercises since 2020. However, given the vastness of the Indo-Pacific, air power coupled with space capabilities—together referred to as aerospace power—will be critical in projecting combat power and countering an adversary. Air power, with its inherent characteristics of flexibility, mobility, speed, and precision, can compress the factors of space and time for the application of effective force over large distances. Space utilities are critical for intelligence surveillance reconnaissance (ISR), position navigation and timing (PNT), and targeting. As such, aerospace power is vital for multidomain operations in the Indo-Pacific. Therefore, to enhance cooperation in the security domain, the Quad nations must enhance collaboration in aerospace alongside naval exercises. Indeed, the grouping’s militaries are already vying for Quad exercises to include an air force component to improve interoperability.<sup>2</sup>

To be sure, the Quad air forces have already participated in several bilateral and multilateral exercises, such as Veer Guardian (India and Japan), Cope India (India and the US), and Pitch Black (all four countries). However, the four air forces have not fully engaged exclusively on one platform. Given the geography of the Indo-Pacific and the likely contours of any potential confrontation in the region, aerospace power will be essential for the grouping to deter any aggression therein.<sup>3</sup> For the Quad’s air forces and naval/maritime air power to operate jointly, a better understanding of each other’s capabilities,

shortcomings, communications, tactics, techniques, and procedures (TTPs) is necessary. To achieve the ability to operate together during a crisis, the Quad countries must plan for logistical procedures, basing issues (including operational and administrative infrastructure at joint air bases), and the acclimatisation and familiarisation of personnel to operate from such bases. Joint exercises, discussions, information sharing, and tabletop exercises are some ways to achieve a degree of interoperability among operators and the various platforms and equipment.

This brief assesses the scope of cooperation among the Quad countries in the aerospace domain and presents a roadmap to achieve such collaboration.

“Given the vastness of the Indo-Pacific, air power coupled with space capabilities—together referred to as aerospace power—will be critical in projecting combat power and countering an adversary.”

The Quad countries have repeatedly reiterated their support for the principles of freedom, the rule of law, sovereignty, territorial integrity, the peaceful settlement of disputes without resorting to threats or the use of force, and freedom of navigation and overflight in the Indo-Pacific, and have opposed any unilateral attempt to change the status quo in the region.<sup>4,5</sup> Notably, most of these principles have a security undertone and cannot be achieved without military cooperation. While the Quad has taken a broad-ranging approach to collaboration,<sup>a</sup> the grouping has increasingly adopted a more security-focused agenda, particularly as military activities in the region have intensified.<sup>b,6</sup>

The US's Indo-Pacific strategy, released in February 2022, notes that the country intends to better integrate efforts across the warfighting domains and the spectrum of conflict to ensure that it can, with its partners and allies, dissuade or defeat aggression in the region. Notably, although the strategy document stresses the importance of the maritime and air domain—noting that the US will work closely with like-minded partners to ensure that the Indo-Pacific's "seas and skies" are governed and used according to the international law—it does not dwell on the role of air power in addressing maritime challenges.<sup>7</sup>

Cooperation in the maritime domain by the four navies has led to efforts to enhance maritime security and shared domain awareness in the region. This is planned to be achieved via technology and training support through the Indo-Pacific Maritime Domain Awareness Initiative (launched at the Tokyo Summit in May 2020).<sup>8</sup> Similar cooperation in the aerospace domain could lead to enhanced space domain awareness,<sup>c</sup> which will be a critical enabler in any operations in the vast Indo-Pacific region. Enhanced cooperation in the aerospace domain will complement the progress and interoperability achieved in the maritime domain.

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- a The areas of cooperation have expanded to include COVID-19 vaccines, maritime diplomacy, supply chain resilience, critical and emerging technologies, climate action, and counterterrorism.
- b In 2022, China sent 1,727 planes into Taiwan's Air Defence Identification Zone. (For more, see: "China's warplane incursions into Taiwan air defence zone doubled in 2022," *The Guardian*, January 2, 2023, <https://www.theguardian.com/world/2023/jan/02/chinas-warplane-incursions-into-taiwan-air-defence-zone-doubled-in-2022>); In March 2024, several Filipino seamen were injured when a Chinese vessel sideswiped a smaller Philippine vessel, and two Chinese Coast Guard ships used high-pressure water spray to shatter the Philippine vessel's windscreen. (For more, see: "US Indo-Pacific Commander 'very, very concerned' about Chinese aggression in South China Sea," *The Indian Express*, April 9, 2024, <https://indianexpress.com/article/world/us-indo-pacific-commander-chinese-aggression-south-china-sea-9260363/>); Additionally, on 23 April 2023, two Chinese Coast Guard ships nearly struck a Philippine Coast Guard vessel. Beijing has also made greater use of its Coast Guard and maritime militia for surveillance and harassment (For more, see: Riley Walters, "China's military puts Indo-Pacific on edge," *GIS*, May 26, 2023, <https://www.gisreportsonline.com/r/china-indo-pacific-military/>).
- c Space domain awareness (SDA) refers to the timely, relevant, and actionable understanding of the operational space environment that allows military forces to plan, integrate, execute, and assess space operations. SDA goes beyond space surveillance (object tracking, characterisation, and establishing pattern of life) to include understanding intent, motive, and predicted actions across the terrestrial and link segments (For more, see: United States Space Force, *Space Doctrine Publication 3-100, Space Domain Awareness*, November 2023, [https://www.starcom.spaceforce.mil/Portals/2/SDP%203-100%20Space%20Domain%20Awareness%20\(November%202023\)\\_pdf\\_safe.pdf](https://www.starcom.spaceforce.mil/Portals/2/SDP%203-100%20Space%20Domain%20Awareness%20(November%202023)_pdf_safe.pdf))

# Aerospace Power Analysis: Quad vs China

Any confrontation in the Indo-Pacific region will likely be in the maritime and air domains. China has realised the importance of the aerospace medium in future wars and is evolving its operational doctrines, missions, and roles, including concentrating on long-range precision strikes. The People's Liberation Army Air Force (PLAAF) is the largest air force in the region and the third largest in the world,<sup>9</sup> with over 2300 combat aircraft in its inventory. In recent years, the PLAAF has expedited the pace of modernisation, with the newer fifth-generation fighter aircraft J-20 and other fourth-generation-plus aircraft now replacing the ageing J-7s. The PLAAF has 19 airborne early warning and control (AEW&C) aircraft, including 11 KJ-500s and four KJ-2000s, and 13 tanker aircraft, including 10 H-6Us and three IL 78s. China's aerospace prowess is also complemented by the organic air power of the People's Liberation Army Navy (PLAN), which has two aircraft carriers, 426 combat-capable aircraft, and 24 AEW&C aircraft.<sup>10</sup> Given these formidable numbers, China has the air power to pursue its aggressive designs in the Indo-Pacific and complement the PLAN in the maritime domain.

In comparison, Australia has 145 combat-capable aircraft, with six AEW&C aircraft and seven tanker aircraft. Japan has 534 combat-capable aircraft, 21 AEW&C, six tanker aircraft, and 72 combat-capable aircraft in naval aviation. The Indian Air Force has about 600 combat aircraft, six tanker aircraft, and five airborne warning and control system (AWACS) or AEW&C aircraft in its inventory, and the Indian Navy has about 45 combat aircraft.<sup>11</sup>

**Table 1: Air Power Capabilities of the Quad Countries (except the US) and China**

Type of Asset	China	Australia	Japan	India
Combat aircraft	2300 + 426 naval air assets	145	534 + 72 naval air assets	600 + 45 naval air assets
AWACS/AEW&C	19 + 24 naval air assets	6	21	5
Tankers/Refuellers	13	7	6	6

Source: Authors' own

# Aerospace Power Analysis: Quad vs China

The combined air power assets of Australia, Japan, and India do not match those of China. (see Table 1). This highlights the importance of US air power in the Indo-Pacific. The US possesses the strongest air power worldwide, with 13,209 aircraft in its armed forces,<sup>12</sup> outmatching Chinese air power. The US Indo-Pacific Command operates 2500 aircraft from US Pacific bases, relies on foreign bases in Japan, South Korea, and Australia, and also has access to specific military installations in the Philippines and Singapore.<sup>13</sup> The Pacific Air Forces, under the US Air Force, has about 334 fixed-wing aircraft that include fighters (like F-35s, F-22As, F-16 C/D Eagle, F-16CJ/DJ), heavy lift aircraft (like C-17s and C-130s), AWACS, and flight refuelling aircraft.<sup>14</sup> Therefore, the combined air power assets of the Quad nations, including the US, exceed that of China. However, for the combined assets to be used as a cohesive force, the forces need to be interoperable, which is only possible through joint exercises and deployments.

Additionally, the US has the most accomplished space programme worldwide. However, China's space proficiency has grown substantially in the last two decades, and its space programme is thriving.<sup>15</sup> China has 670 satellites in space, the US has 7864, Japan has 208, India has 109, and Australia has 36.<sup>16</sup> China has multiplied its on-orbit satellites tenfold over the past decade. It operates over 300 remote sensing satellites with diverse sensors, improving the Chinese military's ability to observe US aircraft carriers, expeditionary strike groups, and deployed air wings. China also possesses anti-satellite weapons and has experimented with other offensive capabilities like moving close to other satellites and employing a robotic arm designed to grab and disrupt other satellites.<sup>17</sup> Thus, Growing Chinese space capabilities can pose a challenge for Quad nations in case of a military confrontation in the future. To be sure, Chinese military academic writings stress the necessity of destroying, damaging and interfering with adversary's reconnaissance and communication satellites.<sup>18</sup>

In such a scenario, the Quad members must ramp up aerospace power capabilities and enhance cooperation in this domain to achieve the required balance of power against China in the Indo-Pacific.

# Boosting Cooperations: Recommendations

The instruments of air power, including combat platforms, networks, communications, and combat enablers, are intrinsically linked and produce optimum output when employed as a cohesive unit. For the Quad air forces to cooperate and be effective as an operational entity, far more is needed than merely adding to the inventories (although the smooth and synergistic integration of additional assets can produce better results than currently expected due to the numerical increase in assets). Interoperability, compatible communications, and commonality in TTPs are the essential prerequisites to facilitate a synergistic integration among the air forces. The forces need to plan, discuss, train, and operate together. Once the basic level of interoperability and integration is achieved, the combined force will likely be able to deter and counter even a numerically stronger air power.

For the Quad air forces to cooperate, various elements of the individual forces must be made more interoperable through op discussions, tabletop exercises, and flying exercises. Notably, the Quad militaries are already exercising bilaterally or in non-exclusive multilateral forums. With that as a launch pad, a higher degree of interoperability must be achieved among the four countries' air forces and other air power elements. The Quad countries must complement each other's strengths and mitigate their individual shortcomings. For example, the number of AWACS/AEW&C platforms that can be deployed by any of the Quad nations in the region may be lesser than that of China. However, through exercises and training, the air forces can attain the capability to seamlessly exploit/utilise each other's AEW&C platforms, mitigating this shortcoming. Similarly, common/joint exploitation of other enablers, such as air-to-air refuellers, and space and cyber assets, can enhance the overall capability to deter any aggressive force in the region.

Consider, for example, if China were to challenge the rules-based order and attempt to militarily counter freedom of navigation operations<sup>d</sup> patrol being conducted jointly by the US and one or more Quad countries between the Malacca Strait and the South China Sea. Given the strategic importance of the Malacca Strait, there may be attempts to dominate the seas and skies around this choke point. In such a scenario, cooperation in the space domain to effectively exploit the combined space assets over the region will be critical to provide the required maritime awareness. Additionally, air power will be required to have adequate strength to complement the maritime forces seeking control over the region. Due to the vast geographic distances involved, Japanese airbases and

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<sup>d</sup> Freedom of navigation operations (FONOPs) are voyages meant to enforce international law in contested waterways. FONOPs are also conducted by air by flying military aircraft through the airspace above these same contested regions.



# Boosting Cooperations: Recommendations

some US bases in the Pacific will be unable to contribute effectively. Given their proximity to the Malacca Strait, airbases in the Andaman and Nicobar Islands and those in northern and western Australia could be instrumental in projecting air power in the area and dominating the skies while supporting the maritime forces operating in the region. India operates its air power elements from the island territory regularly and can position its assets quickly to these forward locations. This would provide some interim deterrence until the US can move its aircraft carriers to a favourable position in the area. However, to provide adequate deterrence on short notice, the Quad countries must be capable of jointly operating their air assets from each other's airbases with commonalities in TTPs. This can be achieved only when the four nations have trained for these scenarios and operated jointly from each other's airbases in dedicated exercises.

Cooperation can increase incrementally, starting with humanitarian assistance and disaster relief (HADR) exercises involving the Quad air forces. The next edition could focus on practising the enforcement of no-fly zones using combat and enabling platforms such as fighter jets and AWACS/AEW&Cs. It could entail the interoperability of fighter jets from all four nations being controlled by the airborne control platform of any one country before being handed over to a second country. Similarly, the tankers can also undertake air-to-air refuelling exercises for fighter jets. Notably, these exercises should incorporate ISR sharing; cyber, electronic warfare, and information warfare components; and space domain awareness to practice realistic scenarios and enhance cooperation. Once the air forces have achieved an adequate degree of commonality in TTPs, they can consider mixed offensive and air defence exercises, which include large force engagement missions.

Since space capabilities are time-consuming and expensive to develop, the Quad countries must focus on sharing their existing space assets (and their output) to enhance their individual and combined operational abilities. Other requirements, such as the infrastructure, maintenance, and administrative support services to operate assets of other nations from a particular base, should be identified and developed to facilitate the integration. Once this level of integration and interoperability is achieved, the Quad will have a significant deterrence capability in the Indo-Pacific.

Some of the efforts to synergise the aerospace capability of the Quad members could include:

# Boosting Cooperations: Recommendations

- Ensuring seamless sharing of ISR data gathered through each country's space and aerial assets.
- Enhancing cooperation in the space domain through transferring technology and knowledge, and facilitating launches of other members.
- Establishing logistics exchange agreements (similar to the US's India-specific Logistics Exchange Memorandum of Agreement) among the four countries to facilitate joint operations from each other's airbases.
- Establishing communication agreements (similar to the US-India Communications Compatibility and Security Agreement) to facilitate compatible and secure communication among all four nations.
- Identifying each country's air assets compatible with joint operations.
- Identifying bases in each country for operating jointly. Developing infrastructure and positioning ground support systems to facilitate the operations of aircraft/equipment in other countries.
- Increasing the interaction and familiarisation among aircrew and operators through exercises and exchange visits.
- Developing the capability and procedures to operate jointly in mixed formations to undertake dedicated air power roles such as air defence, suppression/destruction of air defence, anti-submarine operations, maritime strikes, and anti-shipping strikes.

## The Roadmap


The Quad countries can consider the following proposed roadmap to increase cooperation in the aerospace domain. The Indian Air Force can take the lead in presenting such a roadmap to national decision-makers, such as the Ministry of Defence, Ministry of External Affairs, and the National Security Council, to include it as an agenda point for the next Quad dialogue. The likely contours of the roadmap should be:

- Establishing a joint aerospace cooperation mechanism, headed by a two-star ranked officer (major general/ air vice marshal equivalent) of one Quad country (on a rotational basis) and supported by a one-star officer (brigadier/air commodore equivalent) from each of the other three countries.

# Boosting Cooperations: Recommendations

- Organising an initial in-person meeting to discuss and propose the areas of cooperation and potential roadblocks and issues.
- Conducting an op discussion/tabletop exercise as a precursor to the first Quad flying exercise. This could be a HADR exercise incorporating ISR sharing, information warfare, and cyber. A flying exercise can be executed following the successful completion of the tabletop exercise and after assimilating the lessons learned.
- All bilateral flying exercises planned between the Quad air forces should focus on increasing interoperability and improving communication, with a larger Quad flying exercise as the backdrop. Lessons learned from these bilateral exercises should be shared with all Quad members.
- Planning a comprehensive flying exercise simulation with adequate air assets and participants from the four countries. The assets can be divided into red and blue forces for a more realistic scenario. Russian-origin Indian Air Force assets should be part of the simulation as no other Quad country possesses such Russian equipment. Each country's naval air power element should be adequately represented. The individual nation could decide the level of participation of each navy based on the capability and strength of the naval air arm.
- Sharing space assets for ISR, PNT, and targeting must be considered. Simulations involving the denial of space services to replicate realistic combat situations must also be part of the exercise.
- Representatives of each country's defence and foreign ministries and national security councils could participate in the joint aerospace cooperation mechanism to witness and convey the implications of aerospace cooperation on larger national security and diplomatic aims.
- All activities must be time-bound to ensure the required milestones are achieved on time. Once agreed upon, the effort should be to achieve adequate interoperability in the shortest possible timeframe to build the necessary deterrence against any aggressive air power in the region.

The level and frequency of Quad dialogues indicate that the member countries agree on the need to build resilience in various areas (such as semiconductors, rare earth elements, supply chain, connectivity, 5G technology, infrastructure development, trade, and commerce) to reduce their dependence on China. As the dependency on China reduces, the Quad nations can take more robust actions towards establishing a rules-based order and make further strides on the FOIP strategy. As these actions (building resilience and reducing dependency) start hurting China, the Quad countries should be prepared for a backlash, which could spill into the security domain and lead to confrontation between China and one or more Quad members. If the Quad decided to confront the aggressor unitedly, it would require all the main components of deterrence (economic, maritime, and air) to be adequately synchronised and interoperable.

Aerospace power will be critical in addressing any security situation developing in the Indo-Pacific. Since achieving interoperability and commonality in operations in the air domain takes time, the process should begin early—not once a threat emerges—and must be executed in a time-bound manner to produce the required deterrence. In addition to its deterrence value, a flying exercise among the Quad nations will be a diplomatic signal to adversarial forces in the region. An exclusive Quad flying exercise conducted in the Indo-Pacific region will help address specific operational issues while strongly communicating the intent of the member countries to enhance cooperation in the aerospace domain. 

*The opinions expressed in this paper are those of the officer and do not represent the views of the service or the government.*

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